CITY OF COOS BAY, OREGON

WASTEWATER TREATMENT PLANT 1 PHASE 1A IMPROVEMENTS

SEPTEMBER 2025

SECTION 40 95 80

FIBER OPTIC COMMUNICATION SYSTEM

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  - BILL OF MATERIALS
  - DRAWINGS
  - MANUALS & CUT SHEETS

SPARE PARTS 1495

OPTIMAL CONTROL SYSTEMS, INC.
2324 Three Lakes Road SE
Albany, OR 97322
Phone: (541) 967-9323
Fax: (541) 967-9485
Project No. 0723-08MSI

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PLACEHOLDER

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

☐ Installed in accordance with Manufacturer's recommendations.

☐ Inspected, checked, and adjusted.

☐ Serviced with proper initial lubricants.

☐ Electrical and mechanical connections meet quality and safety standards.

☐ All applicable safety equipment has been properly installed.

☐ Functional tests.

☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer:_____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

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PLACEHOLDER

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO.:_____

1. EQUIPMENT ITEM_____
2. MANUFACTURER _____
3. EQUIPMENT/TAG NUMBER(S) _____
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____
5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____
6. MANUFACTURER'S LOCAL REPRESENTATIVE _____
   a. Name_____ Telephone No. _____
   b. Address _____
7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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PLACEHOLDER

8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

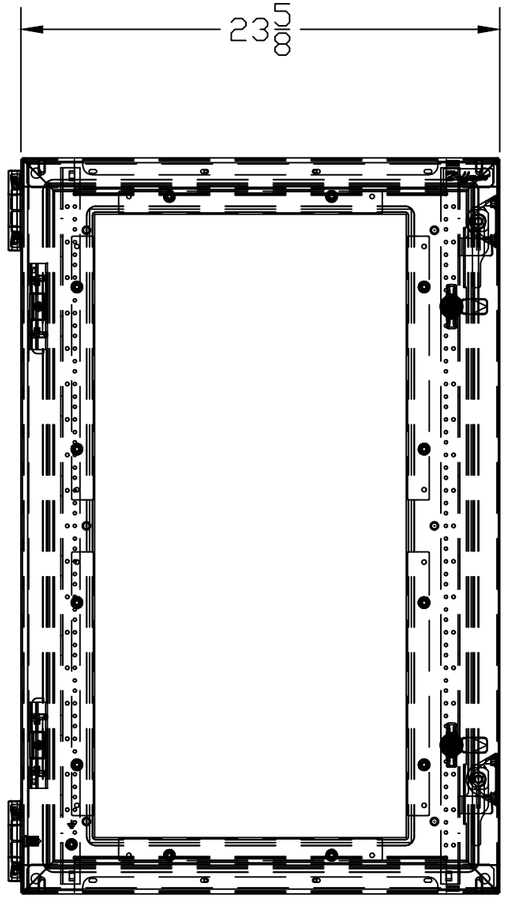
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Bill of Materials

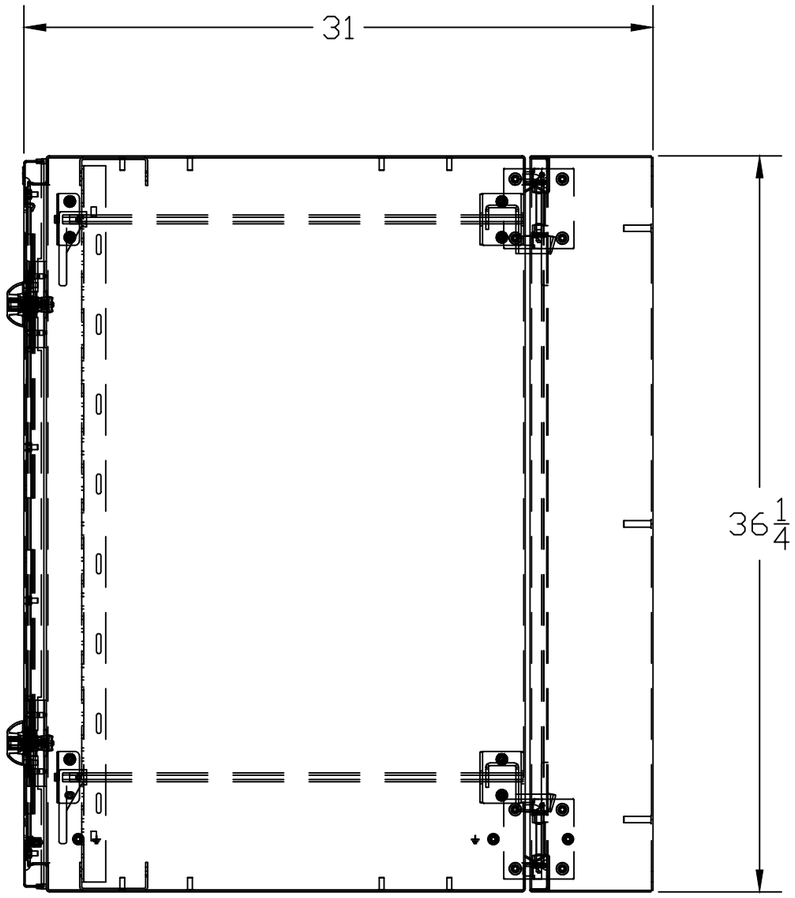
Project: Coos Bay Wastewater Treatment Plant 1 Phase 1A Improvements
Specification Section(s): Section 40 95 80 – Fiber Optic Communication System
Date: September 2025

Item No.	Qty.	Network Interface Panel	Description	Manufacturer	Manufacturer Part Number	Specification Section	Drawing
001	1	C10NIP0001	ProTek, Double-Hinge, Window, NEMA 4/12, 36.30" H x 23.62" W x 29.92" D	Hoffman	PTHW362430G2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
002	1	C10NIP0001	CableTek Horizontal Cable Manager, 2U, Double-Sided	Hoffman	DCHD2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
003	1	C10NIP0001	Power Distribution Unit, 10 Receptacle, 20 Amp	Hoffman	DP1N191020	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
004	1	C10NIP0001	Q-Series Rackmount Enclosure, 2U	Ortronics	EQ02U-CHC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
005	6	C10NIP0001	6-LC Single-Mode Adapters w/ Ceramic Alignment Sleeves	Ortronics	OFP-LCD12AC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
006	1	C10NIP0001	Modular Managed Ethernet Switch, Dual AC	Red Lion	NT24K-AC2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
007	1	C10NIP0001	Module 8 Port 10/100/1000BaseT	Red Lion	NT24K-TX8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
008	2	C10NIP0001	Module-8 SFP Expansion Slots 1000Base Only	Red Lion	NT24K-SFP8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
009	2	C10NIP0001	SFP Transceiver, Singlemode Gigabit Fiber, 10km	Red Lion	NTSFP-LX-10	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
010	1	C10NIP0001	9PX Lithium Ion Uninterruptible Power Supply, 1500 VA	Eaton	9PX1500RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
011	1	C10NIP0001	9PX Lithium Ion Extended Battery Module	Eaton	9PXEBM48RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
012	1	C10NIP0001	HotSwap Maintenance Bypass PDU	Eaton	EHBPL1500R-PDU1U	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
013	2	C10NIP0001	Fiber Optic Patch Cable, 2 Meter, LC UPC to LC UPC Singlemode Duplex	LANshack	SFPC-SMLCLC-2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
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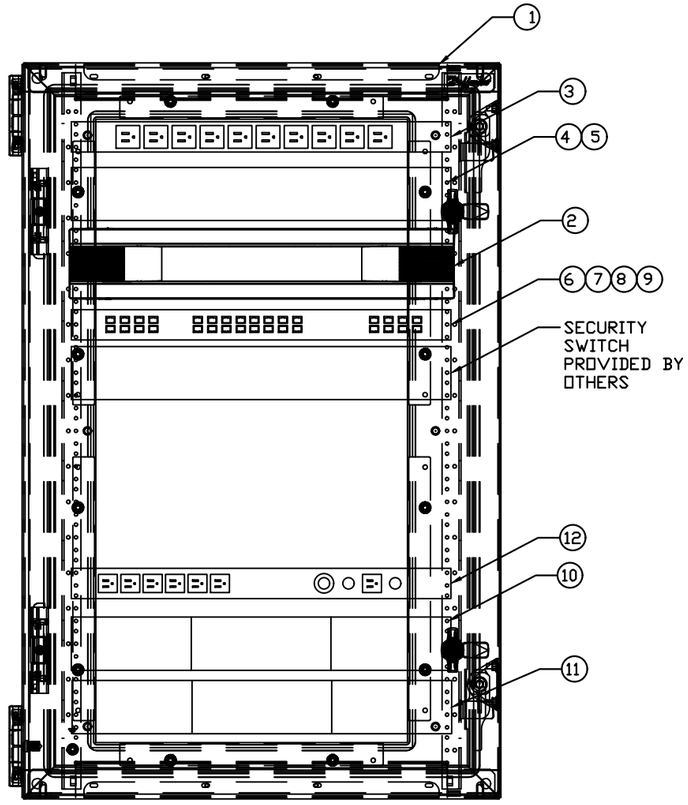
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FRONT VIEW



SIDE VIEW



INTERNAL VIEW

NAMEPLATE SCHEDULE			
PANEL	ITEM	SIZE	DESCRIPTION
C10NIP0001	A	2"x6"x 5/16"	C10NIP0001

PARTS LIST		
ITEM	DSECRIPTION	PART #
1	PRO-TEK NEMA 4/12, 36.30Hx23.62Wx29.92D	PTHW362430G2
2	CABLE TEK HORIZ. CABLE MANAGER 2U, DBL SIDED	DCHD2
3	POWER DIST. UNIT, 10 RECEPTACLE, 20 AMP	DP1N191020
4	Q-SERIES RACKMOUNT ENCLOSURE, 2U	EQ02U-CHC
5	6-LC SINGLE MODE ADAPTERS W/CERAMIC SLVS.	OFP-LCD12AC
6	MODULAR MANAGED ETHERNET SWITCH, DUAL AC	NT24K-AC2
7	MODULE 8 PORT, 10/100/1000 BASE ONLY	NT24K-TX8
8	MODULE 8 SFP EXPANSION SLOTS 1000 BASE ONLY	NT24K-SFP8
9	SFP TRANSCEIVER, SINGLE MODE GIGABIT FIBER, 10KM	NTSFP-LX-10
10	9PX LITHIUM ION UNINTERRUPTIBLE PS, 1500 VA	9PX1500RT-L
11	9PX LITHIUM ION EXTENDED BATTERY MODULE	9PXEBM48RT-L
12	HOT SWAP MAINTENANCE BYPASS PDU	EHBPL1500R-PDU1U

REV	DATE	DESCRIPTION	INIT
H			
G			
F			
E			
D			
C			
B			
A	2023.12.13	Original Draft	KCD

REVISIONS

OPTIMAL CONTROL SYSTEMS
2324 THREE LAKES RD / PO BOX 462
ALBANY, OR 97321
PHONE (541) 967-9323 FAX (541) 967-9485

CLIENT McCLURE & SONS

TITLE COOS BAY WASTE WATER TREATMENT PLANT
C10NIP0001 LAYOUT DRAWING

DRAWN KCD	ISSUED	JOB NO. 0723-08MSI	
CHECKED ME	DATE 2023.10.23	DWG NO. 0723-08MSI-C10	
APPROVED HAD	SCALE NONE	SHEET 1	OF 1

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PROTEK DOUBLE-HINGED, UL AND NEMA TYPE 4, 4X OR 12



INDUSTRY STANDARDS

UL 508A Listed; File Number E61997
cUL Listed per CSA C22.2 No. 94; File Number E619967
Solid Door: Type 4 and 12
Window Door: Type 12
Solid Door, Stainless Steel: Type 4, 4X and 12

NEMA / EEMAC: Type 4, 4X or 12
IEC 60529, IP66 or IP55, IK 10

APPLICATION

ProTek Double-Hinged cabinets are an excellent, off-the-shelf choice for mounting 19-in. rack, panel-mounted devices or other electronic equipment. The cabinets are designed to provide both front and rear access to 19-in. rack-mounted equipment. They provide protection against water, dirt, corrosive agents and other contaminants. ProTek is an excellent choice for applications where space is at a premium and the only option is wall mounting. ProTek comes in a broad range of sizes, materials and configurations to meet many demanding applications.

FEATURES

- Front and rear access to 19-in. rack equipment provided by three-part design: door, center section and wall section
- Solid door provides complete physical and visual protection
- Window door, made of scratch-resistant safety glass, provides visual monitoring of internal equipment while maintaining equipment protection
- All seams are fully welded and ground smooth
- Doors, center section and wall section are provided with ground studs to facilitate proper bonding and grounding of the cabinet
- Premium seamless, foam-in-place gasket prevents contaminants from entering the cabinet
- Keylocking wing knob is included on painted steel cabinet, providing access control to the cabinet; two keys are included with each cabinet
- Stainless steel cabinet is provided with a quarter-turn slotted latch
- One set of plated, self-grounding, tapped 10-32 rack angles per EIA universal spacing standards, which can be adjusted front-to-back, is provided with each center section of the cabinet; additional tapped- or square-hole rack angles can be added to the cabinet to provide additional mounting
- Wall section welded panel studs which accommodate standard panels (steel and wood available), can be ordered separately
- On 28-in. (700 mm) wide enclosures, a 4-in. vertical cable manager with composite fingers is provided on hinge side of cabinet
- AC unit included (T15, N21 or N28) on models with AC cutout
- See T15, N21 and N28 air conditioner specifications following the product tables; full AC specifications available in the Thermal chapter

SPECIFICATIONS

- Doors made of 16 gauge; center and wall sections made of 14 gauge steel. Stainless steel enclosures made from Type 304 stainless steel
- Window made of .25-in. thick, scratch- and impact-resistant safety glass
- Rack angles made of plated 12 gauge steel
- M6 ground studs on door, center and wall sections are masked from paint
- Twenty 10-32 screws included with cabinet
- Foam-in-place gasket made of durable polyurethane

FINISH

- Pretreated steel coated with RAL 7035 light-gray, low-gloss, lightly textured polyester powder paint
- Stainless steel is provided with a smooth-grain finish

LOAD RATING

Center hinged section:

Height	Maximum Load Rating
16 in.	175 lb./79.4 kg
24 in.	250 lb./113.4 kg
36 in.	300 lb./136.1 kg
48 in.	350 lb./158.8 kg
60 in.	400 lb./181.4 kg

ACCESSORIES

Locks and handles
Panels (steel and wood)
Grounding kits
Power Distribution Units (PDUs)
Rack angles

BULLETIN: DWDH2

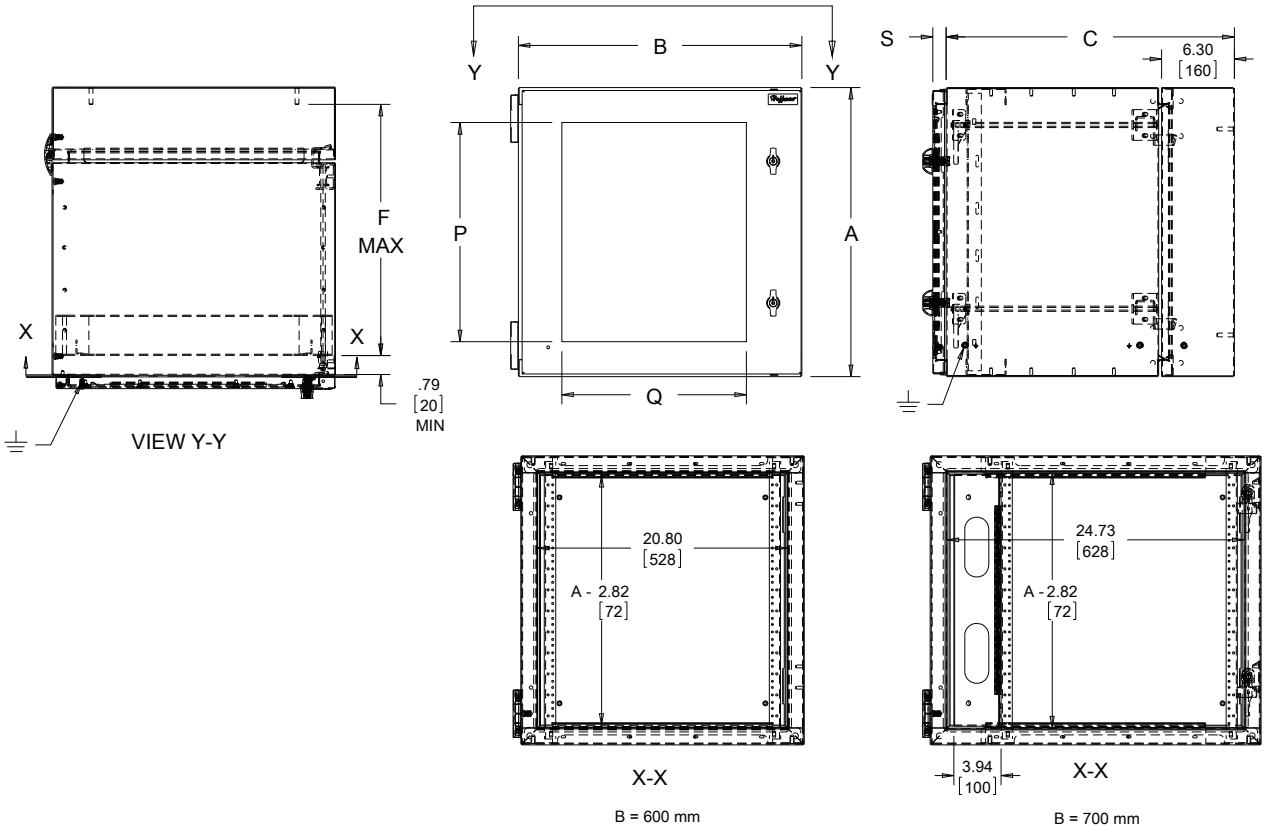
Standard Product **Window Door, NEMA Type 12**

Catalog Number	AxBxC in./mm	Rack Units	F in./mm	P in./mm	Q in./mm	S in./mm	Optional Steel Panel	Optional Wood Panel	Additional Rack Angles [a]
PTHW162415G2	17.09 x 23.62 x 14.96 434 x 600 x 380	8	12.66 322	11.87 301	15.38 391	1.11 28	CP2014	—	PTRA16T or PTRA16S
PTHW242415G2	24.09 x 23.62 x 14.96 612 x 600 x 380	12	12.66 322	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242424G2	24.09 x 23.62 x 24.02 612 x 600 x 610	12	21.72 552	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242430G2	24.09 x 23.62 x 29.92 612 x 600 x 760	12	27.64 702	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242824G2	24.09 x 27.56 x 24.02 612 x 700 x 610	12	21.72 552	18.25 464	19.38 492	1.11 28	CP2420	—	PTRA24T or PTRA24S
PTHW362415G2	36.30 x 23.62 x 14.96 922 x 600 x 380	19	12.66 322	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362424G2	36.30 x 23.62 x 24.02 922 x 600 x 610	19	21.72 552	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362430G2	36.30 x 23.62 x 29.92 922 x 600 x 760	19	27.64 702	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362824G2	36.30 x 27.56 x 24.02 922 x 700 x 610	19	21.72 552	30.75 781	19.38 492	1.11 28	CP3024	—	PTRA36T or PTRA36S
PTHW482415G2	48.54 x 23.62 x 14.96 1233 x 600 x 380	26	12.66 322	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482424G2	48.54 x 23.62 x 24.02 1233 x 600 x 610	26	21.72 552	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482430G2	48.54 x 23.62 x 29.92 1233 x 600 x 760	26	27.64 702	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482824G2	48.54 x 27.56 x 24.02 1233 x 700 x 610	26	21.72 552	42.70 1085	19.38 492	1.11 28	CP2442	—	PTRA48T or PTRA48S
PTHW602415G2	60.04 x 23.62 x 14.96 1525 x 600 x 380	32	12.66 322	54.39 1377	15.38 391	1.11 28	CP5620	—	PTRA60T or PTRA60S
PTHW602424G2	60.04 x 23.62 x 24.02 1525 x 600 x 610	32	21.72 552	54.39 1377	15.38 391	1.11 28	CP5620	—	PTRA60T or PTRA60S
PTHW242436G2	24.09 x 23.62 x 36.02 612 x 600 x 915	12	33.72 856	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242836G2	24.09 x 27.56 x 36.02 612 x 700 x 915	12	33.72 856	18.25 464	19.38 492	1.11 28	CP2420	—	PTRA24T or PTRA24S
PTHW362436G2	36.30 x 23.62 x 36.02 922 x 600 x 915	19	33.72 856	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362836G2	36.30 x 27.56 x 36.02 922 x 700 x 915	19	33.72 856	30.75 781	19.38 492	1.11 28	CP3024	—	PTRA36T or PTRA36S
PTHW482436G2	48.54 x 23.62 x 36.02 1233 x 600 x 915	26	33.72 856	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482836G2	48.54 x 27.56 x 36.02 1233 x 700 x 915	26	33.72 856	42.70 1085	19.38 492	1.11 28	CP2442	—	PTRA48T or PTRA48S

[a] T = tapped 10-32, S = square hole (.375 in. x .375 in.)

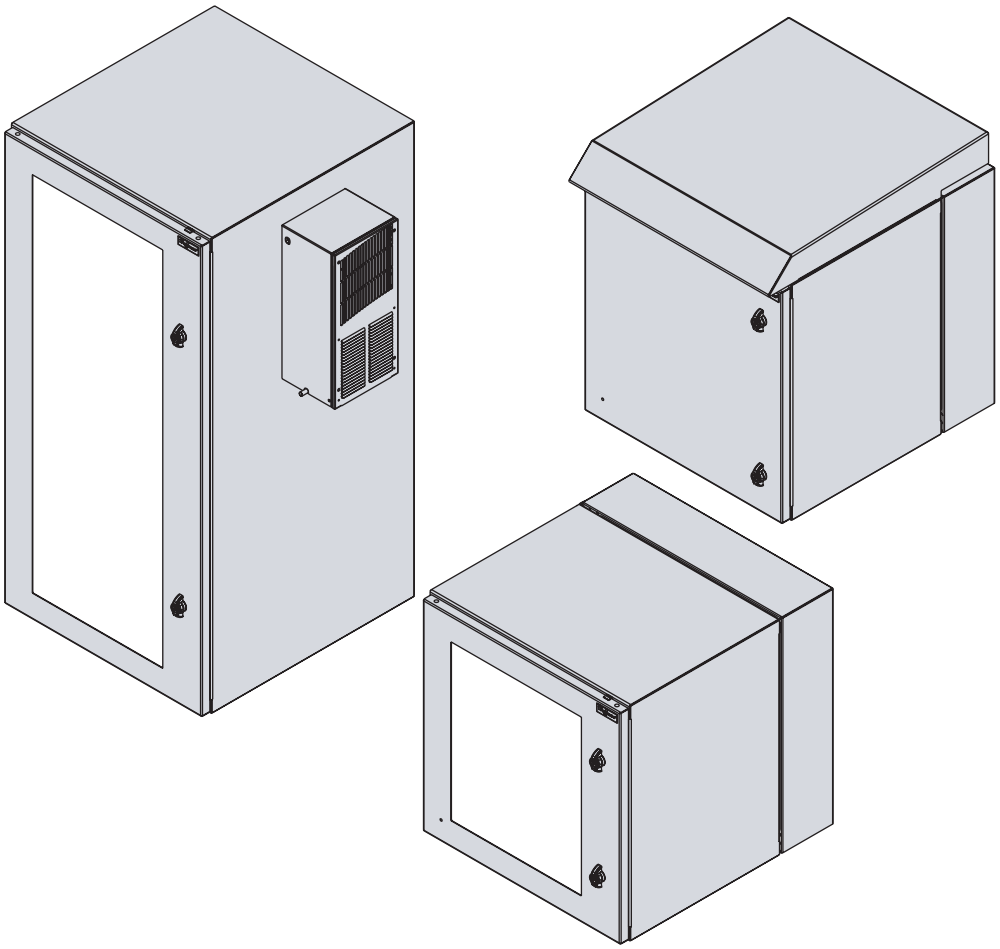
Cable manager supplied with 700 mm wide enclosures



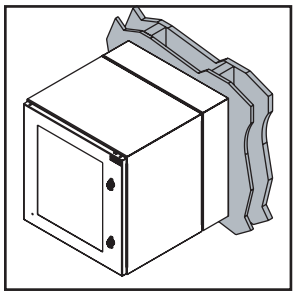

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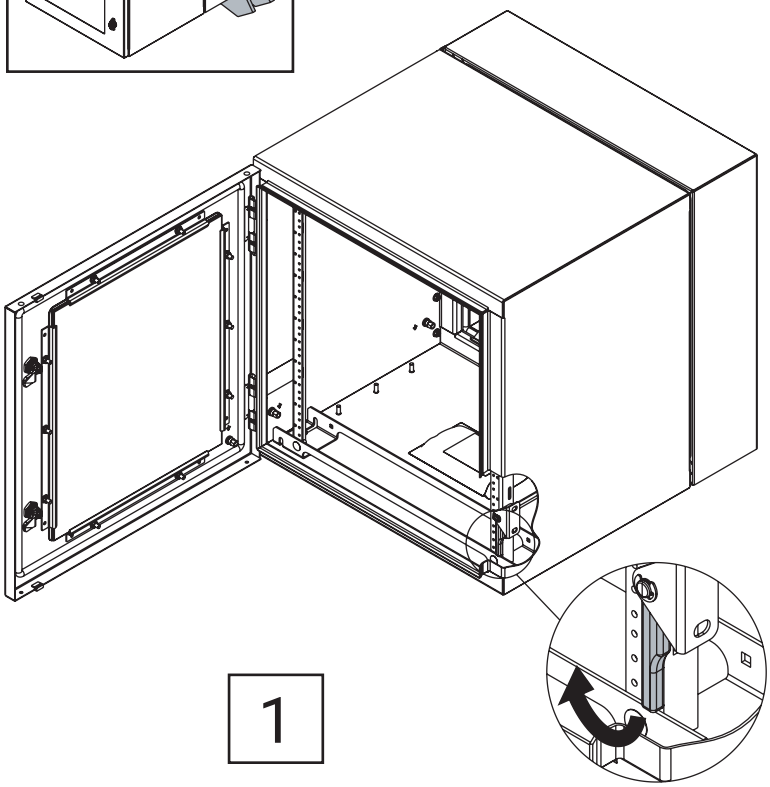
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PROTEK®

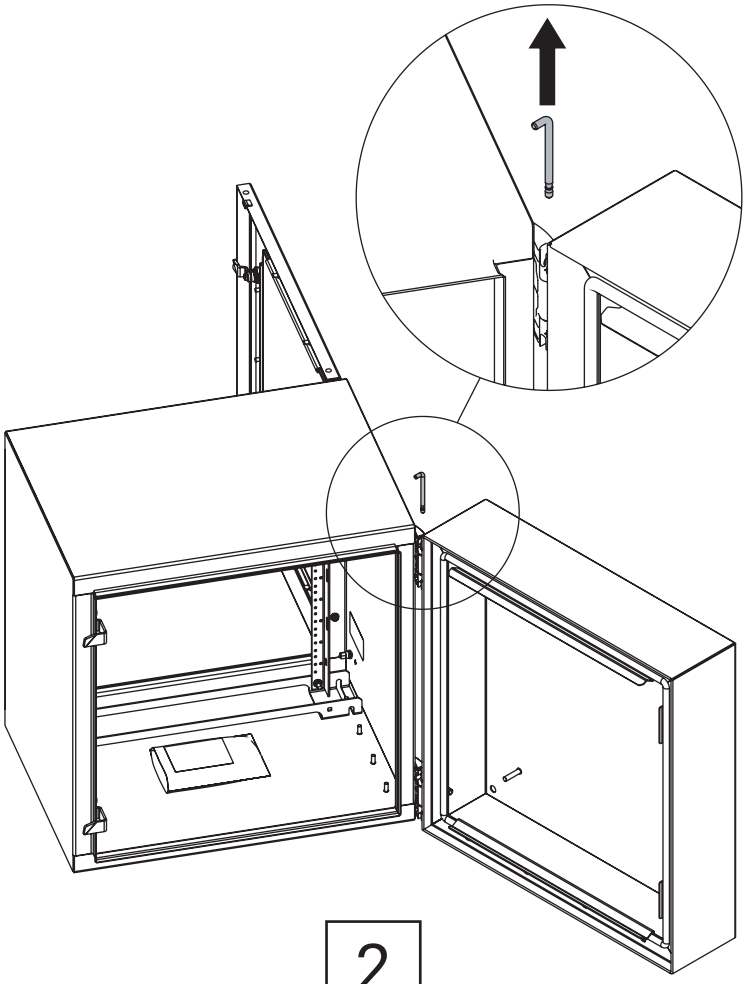


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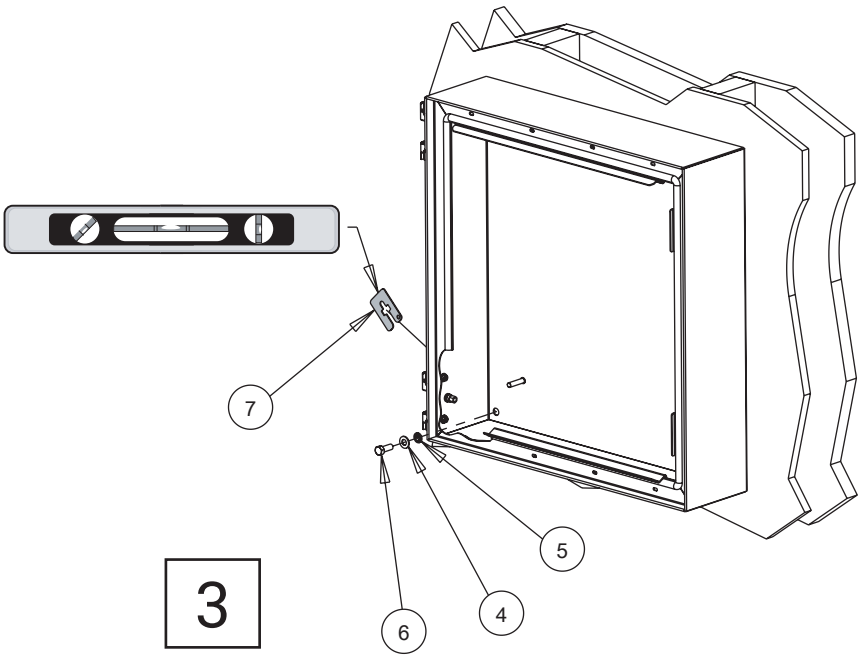




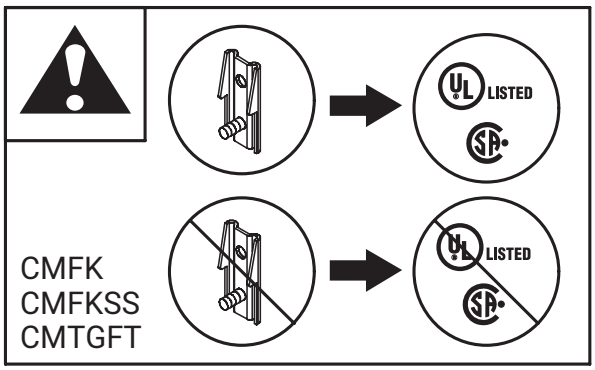
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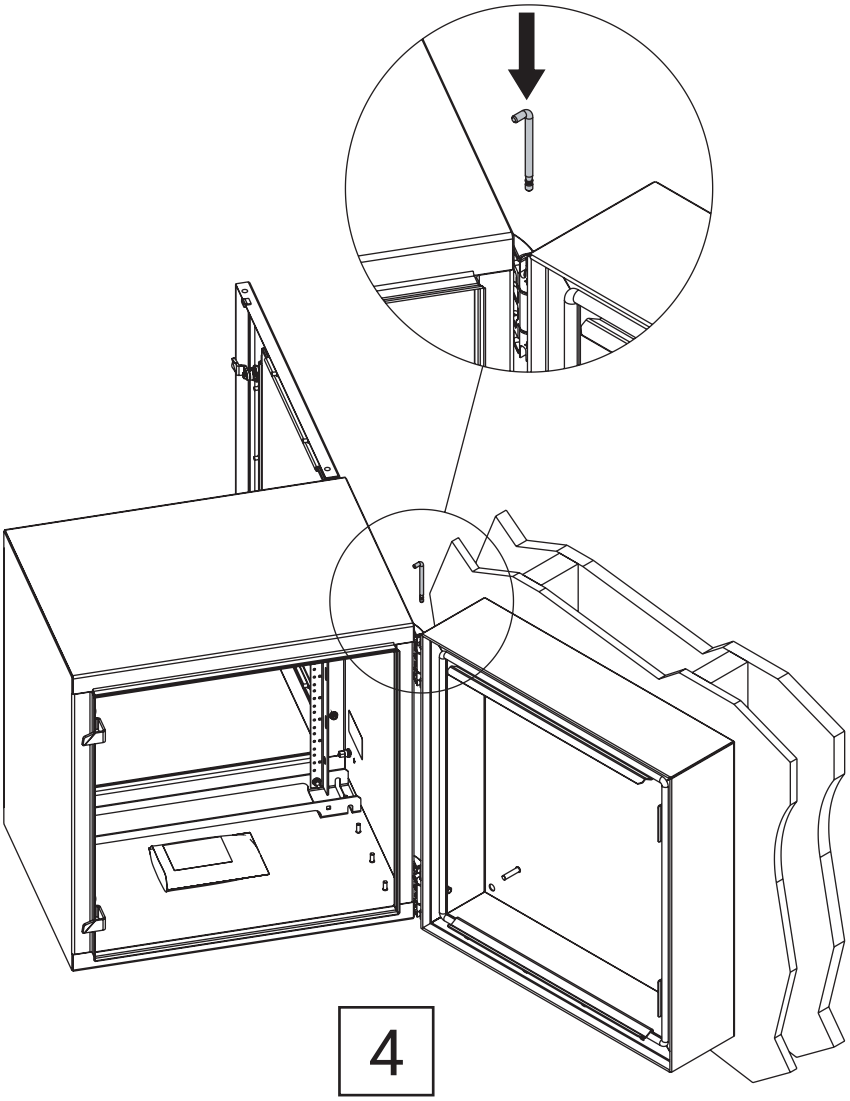
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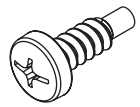
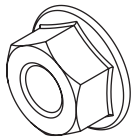
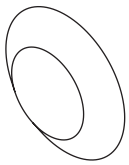
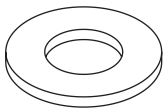
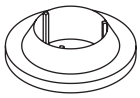
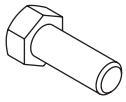
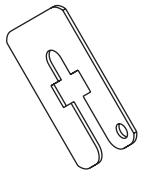
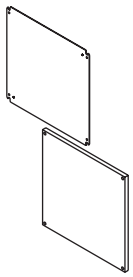
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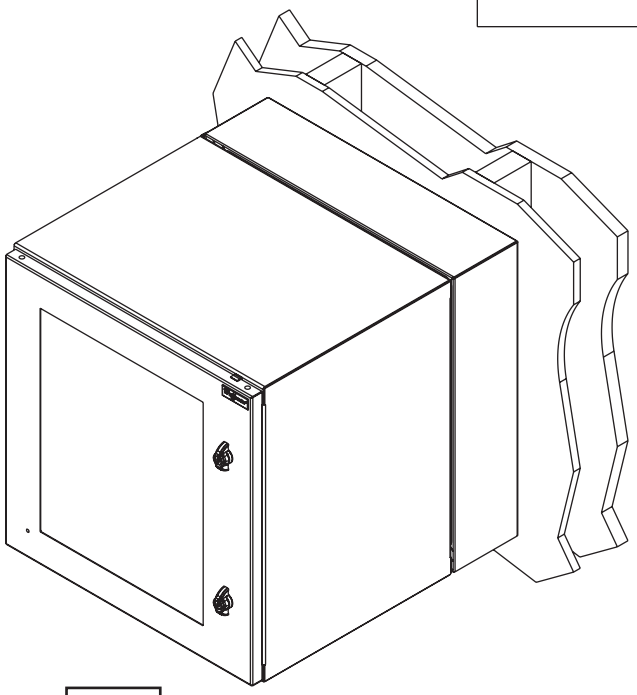


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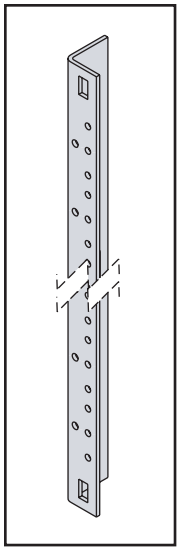
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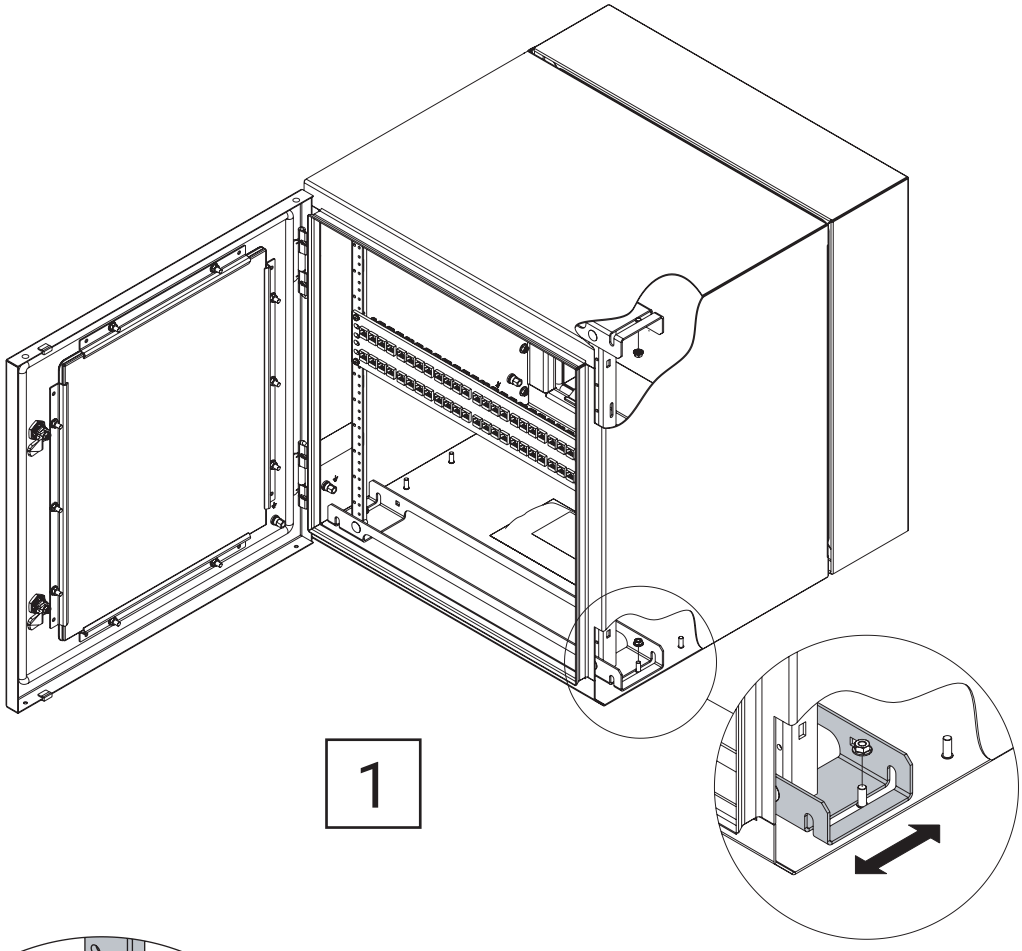
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3  (4x)	4  (4x)
5  (4x)	6  (0x)
7  (4x)	8  (0x)



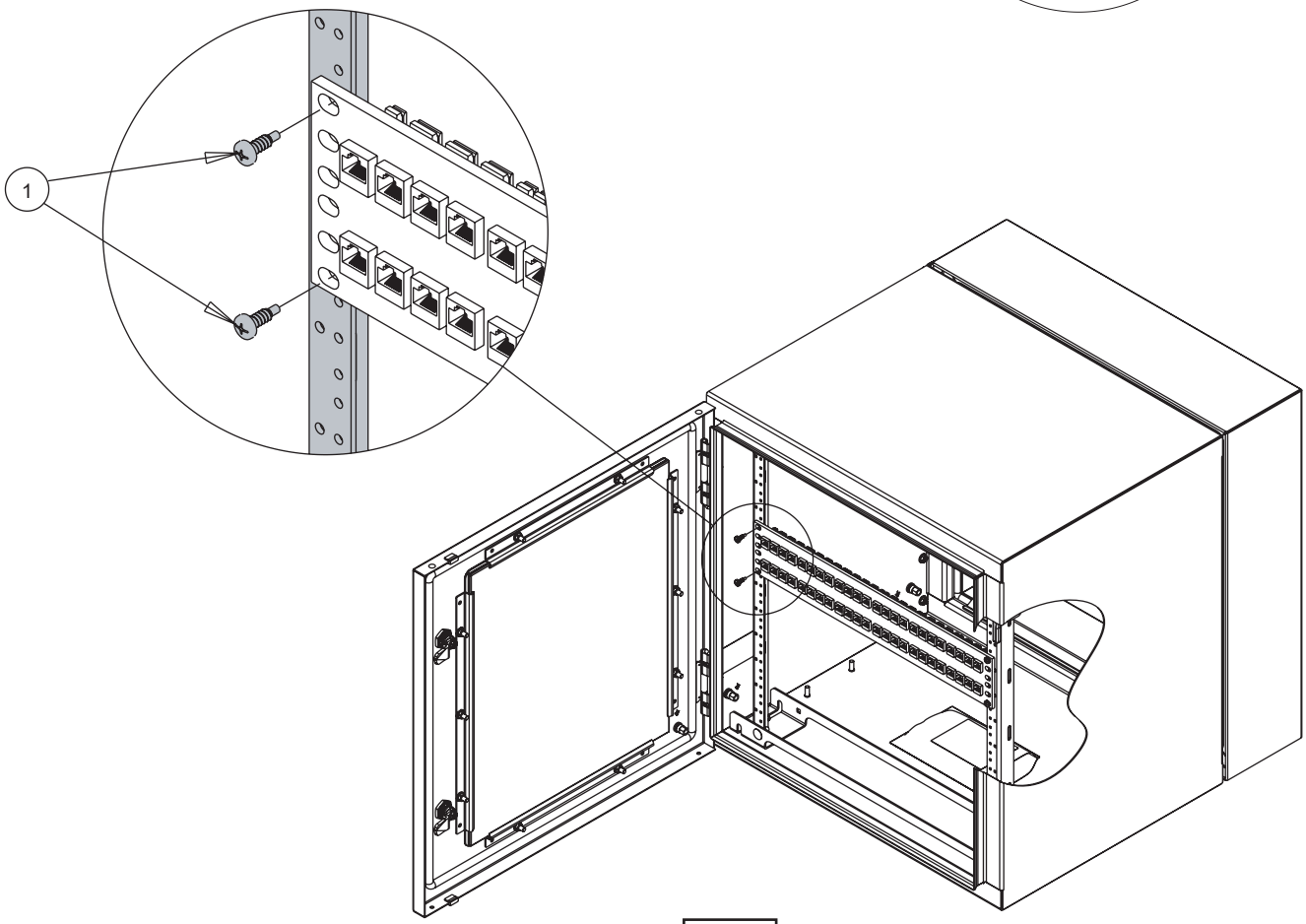
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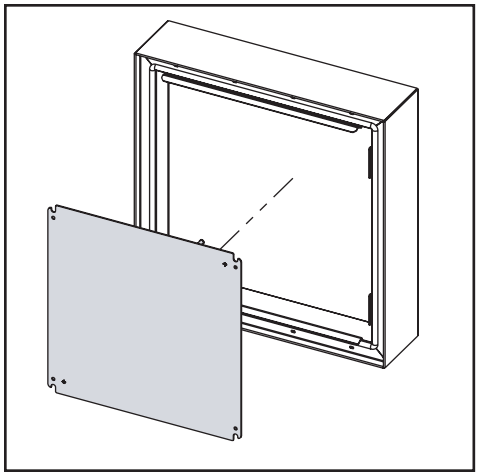


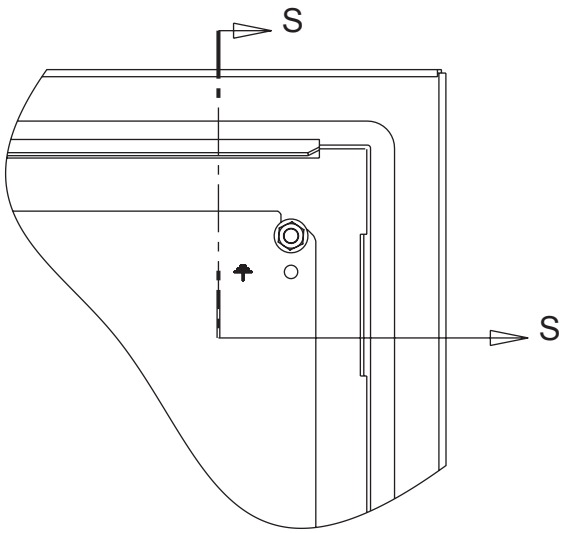
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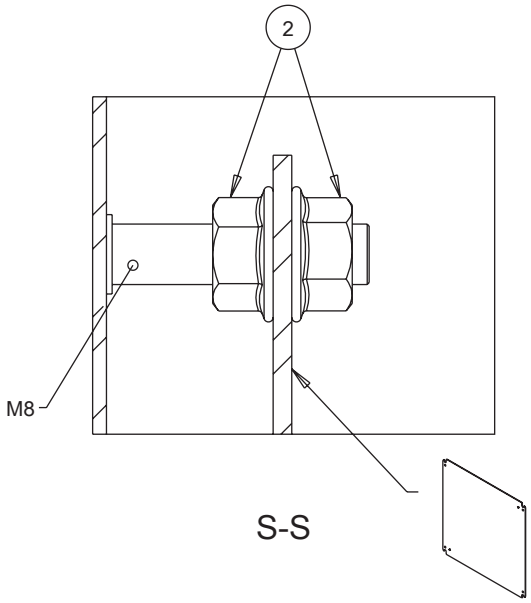


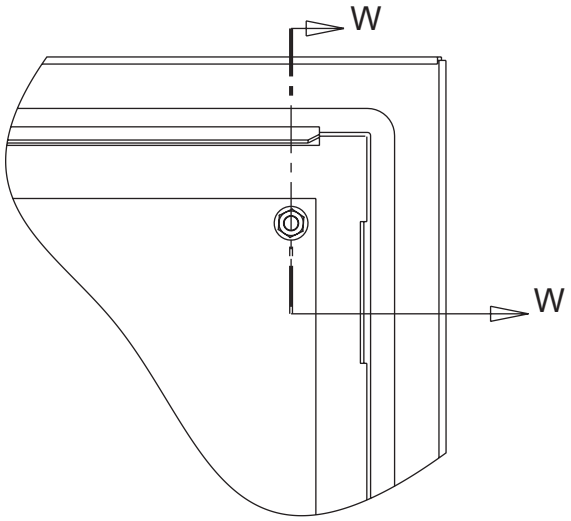
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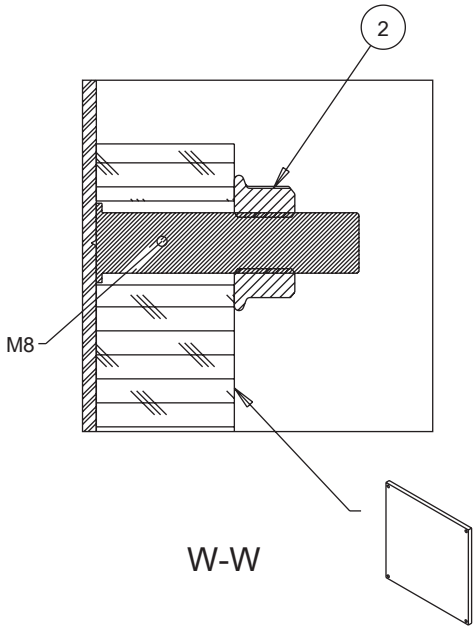
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Guide to Mounting and Squaring Enclosures

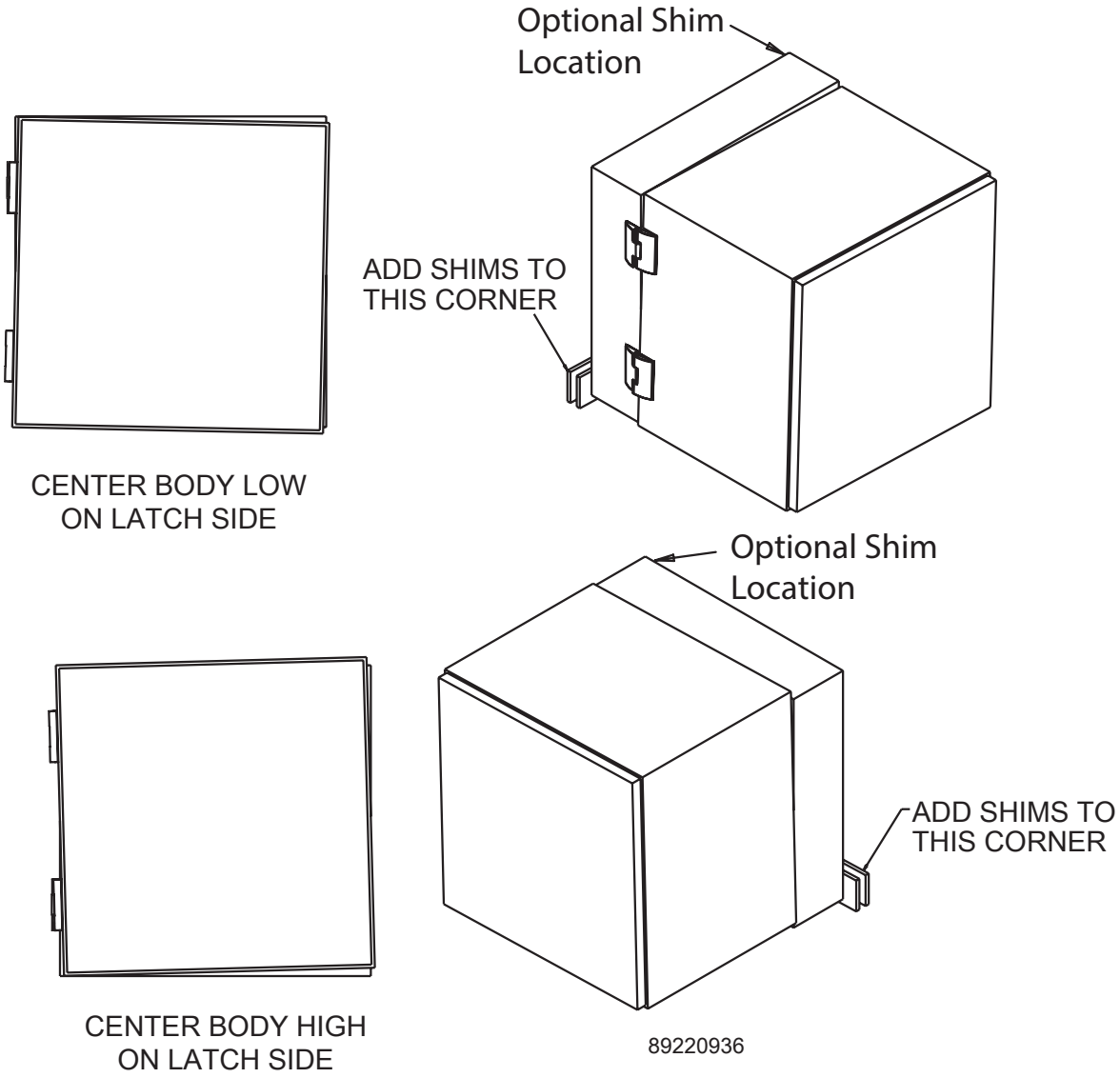
nVent HOFFMAN'S industry-leading enclosures are designed to provide years of reliable service when properly mounted, leveled and maintained. The following recommendations will help ensure that Hoffman enclosures are installed correctly.

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Double-Hinge Mounting

Double-Hinge Enclosure Mounted on Walls or Unistrut Frames

Hoffman double-hinge enclosures are designed for mounting on rigid, flat surfaces or walls. After mounting, add shims to enclosures as required to ensure the sealing contact surface and the enclosure are square. This is necessary for the door to close correctly and provide a reliable seal. To square enclosures mounted on a wall or Unistrut frame, add shims as shown below. Shims should be made of a material such as stainless steel, aluminum, nylon, or plastic to reduce corrosion.



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CABLETEK HORIZONTAL CABLE MANAGER



DCHD2 shown



Arrowhead fingers funnel cable into base and hold it securely



DCHS4 shown



Vertical and horizontal cable manager system installed on a 2-post rack. Vertical and horizontal cable managers work together to make an orderly installation.

INDUSTRY STANDARDS
EIA 310-D

APPLICATION
This cable manager features heavy-duty endposts, arrowhead fingers and tool-less mounting to easily route copper and fiber data cables horizontally in standard 19-in. cabinets or on 2- or 4-post open frame racks.

FEATURES
- Snap-in mounting provision holds cable manager in place while mounting screws are installed
- Robust arrowhead fingers are shaped to funnel cables into base and are made of black composite material
- Robust rounded end posts support cable as it enters and leaves cable manager and maintains proper cable bend radius
- Deep cable compartments allow maximum cable density
- Rounded edges throughout protect cable jackets from damage
- Pass-through holes on double-sided models protect cable while facilitating routing between front and back sides
- Single- and double-sided units provide high cable capacity, including fiber and copper category cables
- 1 RU and 2 RU heights allow greater flexibility in optimizing rack capacity
- Removable hinged cover opens top or bottom, snaps closed for assured cable protection and professional appearance
- Double-sided model has covers on both front and back
- Covers stay open during installation and maintenance procedures
- Horizontal and vertical cable managers designed as a system for streamlined appearance and improved functionality
- Combination head 10-32 and 12-24 screws included for mounting

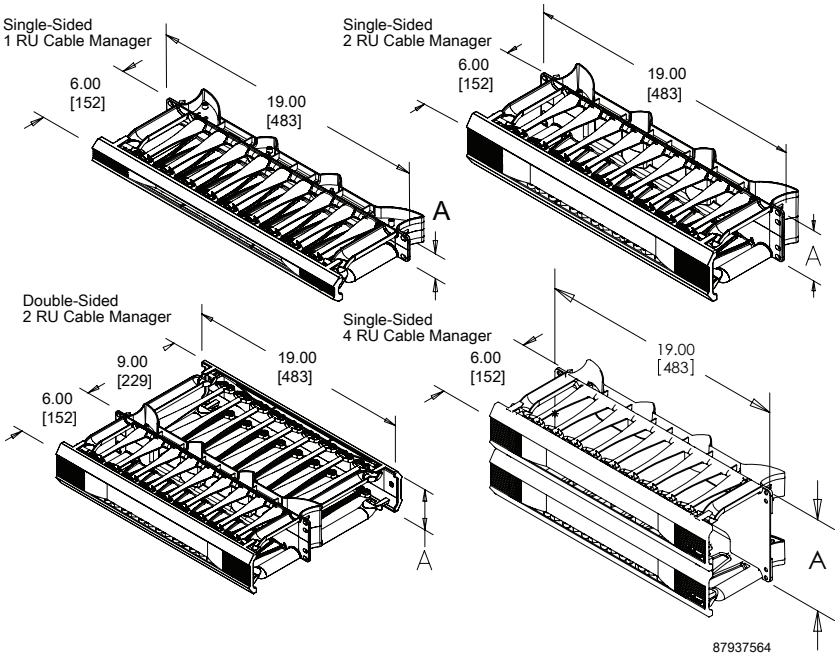
SPECIFICATIONS
- Made of UL listed black composite material

FINISH
Low gloss, matches look of RAL 9005 textured paint

BULLETIN: DACCY

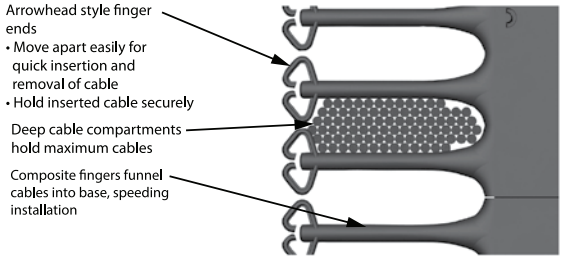
Standard Product **CABLETEK Horizontal Cable Managers; 60% Cable Manager Fill Rate**

Catalog Number	Description	Rack Units	A in./mm	Front Cross-Section Area (in.^{2})	Front Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Front Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Front Cable Fill Rate 60% 6A Cable (0.30-in. dia.)	Back Cross-Section Area (in.^{2})	Back Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Back Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Back Cable Fill Rate 60% 6A Cable (0.30-in. dia.)
DCHS1	Single-Sided	1	1.75 44	4.2	66	57	35	–	–	–	–
DCHS2	Single-Sided	2	3.50 89	13.2	208	161	112	–	–	–	–
DCHD2	Double-Sided	2	3.50 89	13.2	208	161	112	14.1	223	172	119
DCHS4	Single-Sided	4	7.0 178	26.9	416	322	224	–	–	–	–



Arrowhead Cable Capacity; 60% Fill Rate

Location	Cross-Section Area (in.^{2})	5e Cable (0.22-in. dia.)	6 Cable (0.25-in. dia.)	6A Cable (0.30-in. dia.)
Front	5.52	90	67	46
Back	9.27	145	113	78



RACK- AND PANEL-MOUNT POWER DISTRIBUTION UNITS (PDUS)



FEATURES

- Power on/off LED indicates whether power is available at the PDU
- External ground stud provided on single-phase models for secure grounding
- Circuit breakers provide additional equipment protection
- Circuits are isolated on dual circuit model; each has its own circuit breaker
- Reset button provides easy access to circuit breaker reset
- Surge protector models have an indicator LED to verify surge circuitry protection
- Rack-mount models mount directly to rack or with adapter bracket
- Rack-mount models designed for single-phase applications
- Panel-mount models can be mounted flush or with hanging bracket

SPECIFICATIONS

- Steel housing
- Power cord with molded-on plug:
  - 12-in. (305-mm) long single-phase model: 6 ft. (1.8 m)
  - Other single-phase models: 15 ft. (4.6 m)

Contact Hoffman for custom modifications and non-standard offerings.

FINISH

Black, low-gloss textured paint.

BULLETIN: DPS

INDUSTRY STANDARDS

UL/cUL 60950 listed
UL 1449 (Surge protector models only)

EIA 310-D (19-in. rack-mount models only)

APPLICATION

Rack- and Panel-Mount PDUs not only provide convenient, reliable power to equipment mounted in cabinets or on open frame racks, they can also be configured to meet a wide range of design specifications.

Standard Product **Single-Phase Rack-Mount**

Catalog Number	Surge Protection	Amp Meter	Load Rating	Voltage (VAC)	Joule Rating	Receptacle Location	No. of Receptacles	Receptacle Style	Power Cord Plug	Rack Units
DP1N190615	No	No	15A	120	–	Front	6	NEMA 5-15R	NEMA 5-15P	1
DP1N191415	No	No	15A	120	–	6 front, 8 back	14	NEMA 5-15R	NEMA 5-15P	1
DP1N191015S	Yes	No	15A	120	2000	2 front, 8 back	10	NEMA 5-15R	NEMA 5-15P	1
DP1N191020	No	No	20A	120	–	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020S	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020ST	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA L5-20P Twist Lock	1

Isolated circuits on dual-circuit models with separate circuit breakers.

Plugs and Receptacles

NEMA Type	Plug	Receptacle
NEMA 15 Amp, 120V, Duplex	5-15P	5-15R
NEMA 20 Amp, 120V, Duplex	5-20P	5-20R
NEMA 20 Amp, 120V, Twist Lock	L5-20P	L5-20R
30 Amp, 120/208V Wye, Twist Lock	L21-30P	L21-30R

IEC Type	Inlet	Outlet
IEC 15 Amp, 125/250V	C-14	C-13
IEC 20 Amp, 125/250V	C-20	C-19

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DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure



Overview

The Q-Series fiber enclosure system is designed to support standard density applications in building networks. The all steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 LC fibers in per RU, accepting OFP adapter panels, M2 pre-terminated cassettes, and splice cassettes.

Features

- **Highly Accessible:** Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables
- **Simplified Installation:** The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation
- **Versatile Installation:** Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes
- Max number of fibers per RU (SC) - 36
- Max number of fibers per RU (LC) - 72
- Max number of fibers per RU (12F MPO) - 288
- Max number of fibers per RU (24F MPO) - 576
- Cassette / Adapter panels per RU - 3

Part Number	Description
EQ01U-CHC	Q-Series 1U Standard Density (SD) Rackmount Fiber Enclosure
EQ02U-CHC	Q-Series 2U Standard Density (SD) Rackmount Fiber Enclosure
EQ04U-CVC	Q-Series 4U Standard Density (SD) Rackmount Fiber Enclosure

Dimensions

Part Number	Depth (Metric)	Depth (US)	Height (Metric)	Height (US)	Width (Metric)
EQ01U-CHC	485.90mm	19.13 in.	44.45mm	1.75 in.	434.85mm
EQ02U-CHC	485.90mm	19.13 in.	88.90mm	3.50 in.	434.85mm
EQ04U-CVC	485.90mm	19.13 in.	177.80mm	7.00 in.	434.85mm

DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure

General Information

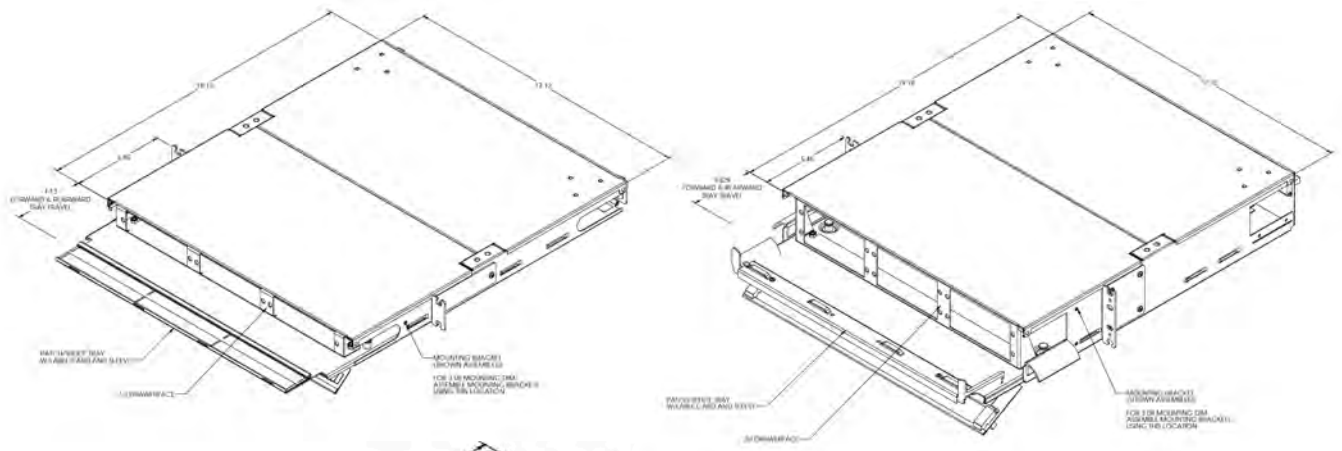
- Color: Black
- Installation: Rack or Cabinet
- Product Series: Q-Series
- Type: Standard Density Fiber Enclosure

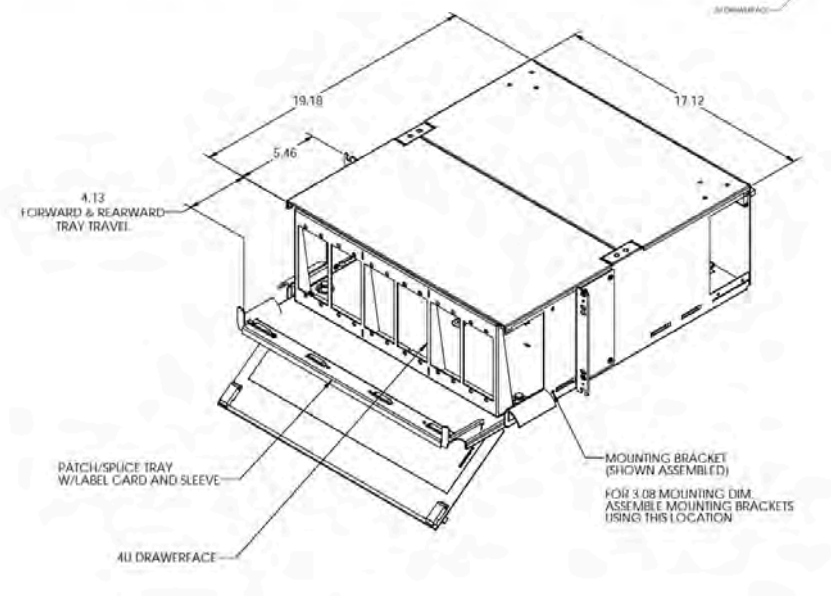
Listing Agencies/Third Party Certifications

- RoHS: Yes

Technical Information

- Mounting Hardware Included: Yes
- Cassette / Adapter Panel Capacity per RU: 3
- SC - Fiber Capacity Per RU: 36
- LC - Fiber Capacity Per RU: 72
- 12F MPO - Fiber Capacity Per RU: 216
- 24F MPO - Fiber Capacity Per RU: 432





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Legrand, North and Central America

60 Woodlawn Street
West Hartford, CT 06110
1.877.BY.LEGRAND (295.3472)
www.legrand.us

Ortronics

2 RU Q-Series Standard Density Rack-Mount Fiber Enclosure

Part No. EQ02U-CHC



The 2U Q-Series Standard Density (SD) footprint fiber enclosure system is designed to support standard density applications in building networks. The all-steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 fibers with LC connectivity and 144 fibers with MDC per Rack Unit (RU), or a maximum capacity of 144 fibers LC and 288 MDC (VSFF), utilizing OFP adapter panels, LM2 pre-terminated cassettes, and M2 splice cassettes.

Features & Benefits

Highly Accessible: Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables

Simplified Installation: The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation

Versatile Installation: Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes - Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Max number of fibers per RU (SC): 36

Max number of fibers per RU (LC): 72

Max number of fibers per RU (12F MPO): 288

Max number of fibers per RU (24F MPO): 576

Cassette / Adapter panels per RU: 3

Specifications

General Info

Product Line	Ortronics	Color	Black
UPC Number	662875019978	Country Of Origin	Mexico
Features	Drawer Slide, Removable Cover	Application Sector	Commercial, Data Center, Industrial
Standard	RoHS;REACH Compliant	Type	Enclosure

Dimensions

Product Width US	17.12 in	Product Depth US	19.13 in

Product Height US	3.5 in

Technical Information

Fiber Optic Cable Type	OM3, OM4, OM5	Compatibility	OFP, M2, LM2
Rack Units	2	Capacity	6 Adapter Panels, 6 Cassettes
Mounting	Rack Mount		

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3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE
4.0 ACCESSORIES PURCHASED SEPERATELY
5.0 ENCLOSURE ASSEMBLY
6.0 INSTALLATION OF ACCESSORIES
7.0 CABLE ROUTING AND INSTALLATION

1.0 GENERAL

This document describes the assembly procedure for the LEGRAND Patch and Splice Rack Mount Enclosures. Part numbers EQ02U-CHC (2 Rack Unit), EQ04U-CVC (4 Rack Unit), EQ02U-KHC (2 Rack Unit HD), EQ04U-KHC (4 Rack Unit HD), EQ02U-KHL-M (2 Magnesium Rack Unit HD), EQ04U-KHL-M (4 Magnesium Rack Unit HD). Hardware is provided for mounting 19" racks.

2.0 TOOLS REQUIRED FOR ASSEMBLY

2.1) #2 Phillips Head Screwdriver – required for enclosure assembly
2.2) #3 Phillips Head Screwdriver – required to mount the enclosure to the rack

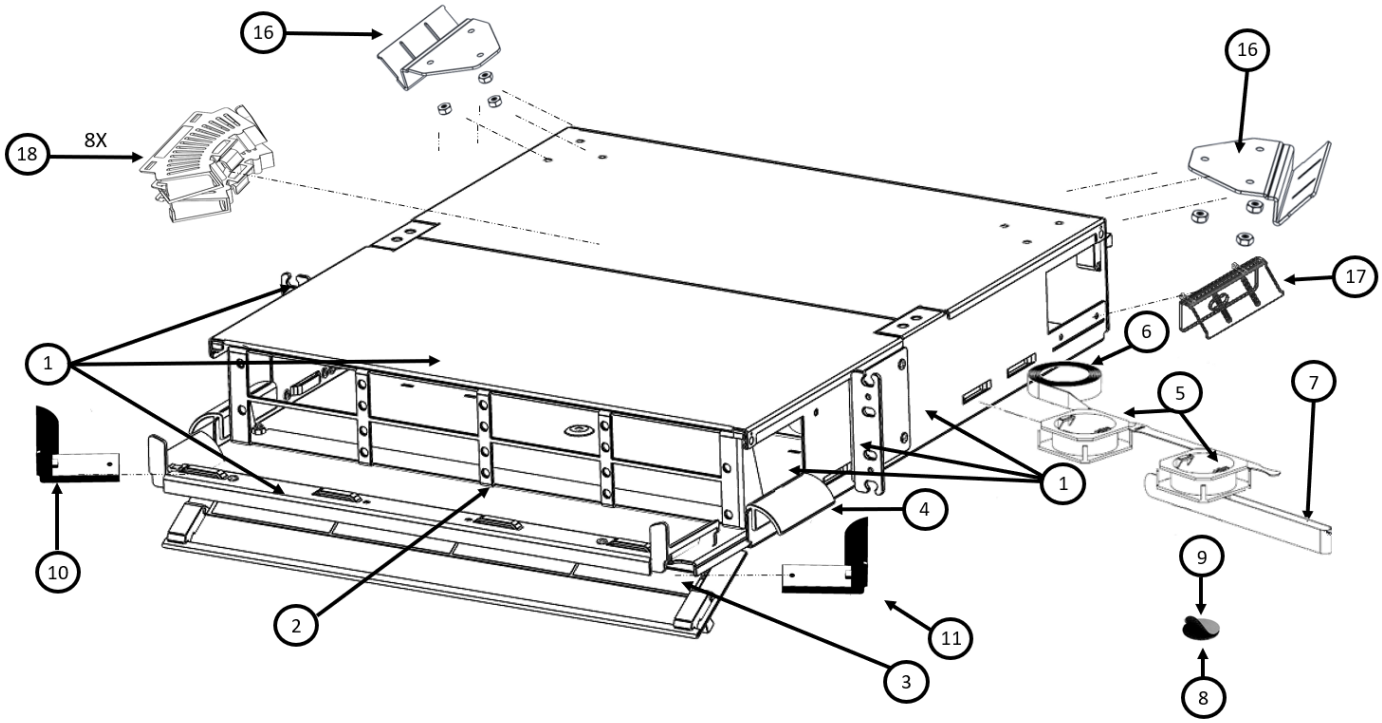
3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
1	Enclosure, Tray and Mounting Brackets, 2 Rack Unit	EQ02U-CHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit	EQ04U-CVC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD	EQ02U-KHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD	EQ04U-KHC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD, Magnesium	EQ02U-KHL-M	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD, Magnesium	EQ04U-KHL-M	-	1
2*	Drawer Face, 2 Rack Unit	41400024-00	1	-
	Drawer Face, 4 Rack Unit	41400007-00	-	1
	Drawer Face, 2 Rack Unit, HD	41400931	1	-
	Drawer Face, 4 Rack Unit, HD	41400932	-	1
3*	Port Identification Card, 2 Rack Unit	70400879	1	-
	Port Identification Card, 4 Rack Unit	70400902	-	1
	Port Identification Card, 2 Rack Unit, HD	70401094	1	-
	Port Identification Card, 4 Rack Unit, HD	70401095	-	1
4	Bend Limiter	71200061	2	2
5	Cable Manager, Fiber Spool.	70800327	4	8
6	Straps, Hooks/Loops, Cable Mgt.	70700145	8	8
7	Straps, D-Ring, Hooks/Loops, 18" Long, Cable Mgt.	70700199-00	4	4
8	Loop, Dot, .50 Dia.	70700077	3	3
9	Hook, Dot, .50 Dia.	70700078	3	3

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
10	Cable Manager, Left	71200062-001	1	1
11	Cable Manager, Right	71200062-002	1	1
12	Washer, lock, #12, External star, phosphor bronze	70100090	1	1
13	Screw 12-24 x .625, PN HD, CMB DRV, ZNC PLT	70100070 / 70100070-59	4	4
14	Screw, machine, #6-32 Unc X .31, Pan HD, CR, Black	70100425	2	2
15	#6-32 screws for Mounting Brackets.		8	8
(*) If item 1 is a 2 or 4 Rack Unit, then items 2 & 3 will be for 2 or 4 Rack Units, etc.				

4.0 ACCESSORIES PURCHASED SEPARATELY

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
16	Strain Relief Bracket, Upper	ECQ-BR	2	2
17	Strain Relief Bracket, Lower	FCBR-003	2	2
18	Kit, Fiber Spool, 8 Pieces	60401185	2	4



5.0 ENCLOSURE ASSEMBLY

5.1) Inspect the package contents before assembling to ensure conformance with the parts listed in Section **3.0**, then determine if the accessories listed in Section **4.0,** are required.

5.2) The Drawer Face (Item 2) is pre-assembled to the tray at the factory (Figure 1).

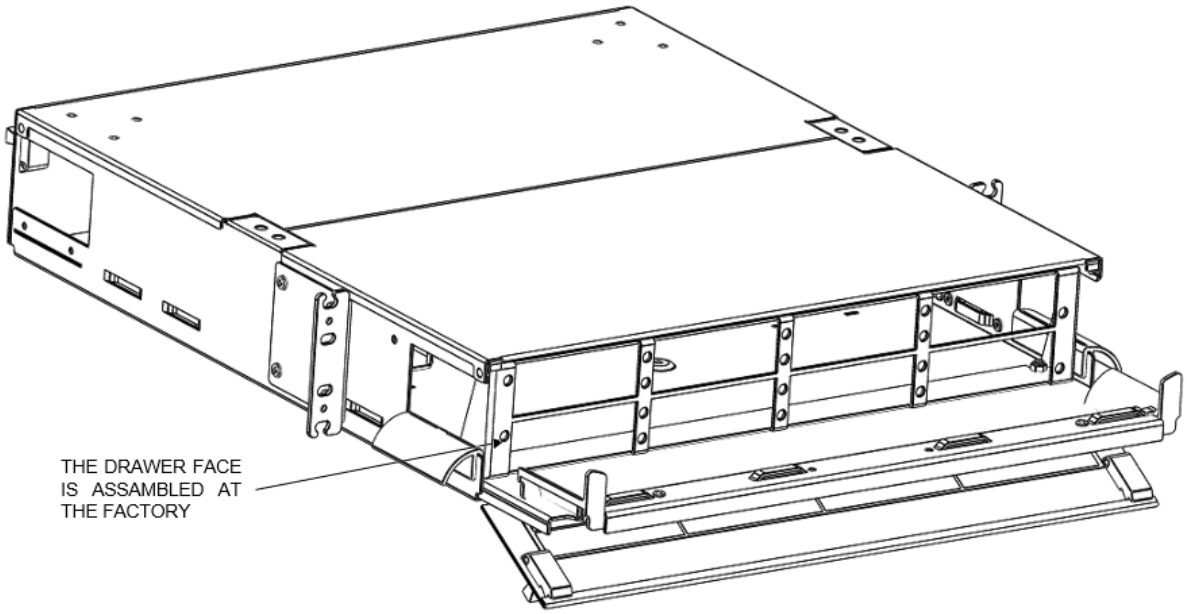


Figure 1

5.3) If your enclosure does not have the mounting brackets factory installed, use a #2 Phillips Head Screwdriver and the screws provided with the enclosure to attach one mounting bracket to each side of the enclosure using the holes provided. Figure 2 illustrates the mounting scheme. An alternate mounting position (Figure 2a) is available for 19" enclosures. To have an enclosure that installs more rearward in racks use the 4-hole pattern closest to the front side of the enclosure.

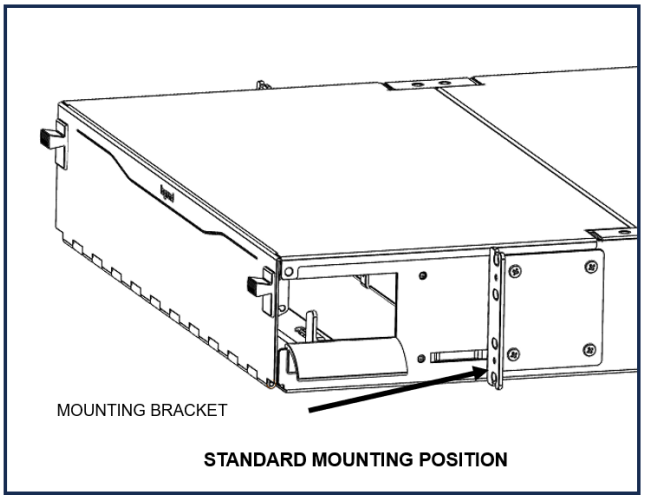


Figure 2

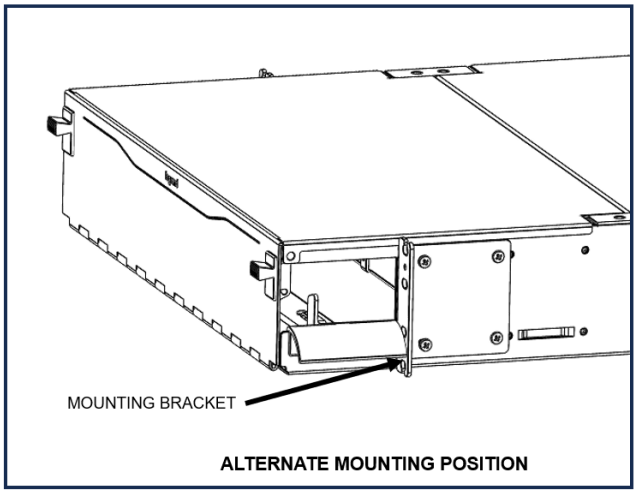


Figure 2a

5.4) Mate each Hook with a Loop dot. Remove protective backing from Hook or Loop and attach to underside of identification label, as required. Remove backing from the remaining side. Put label into place and press against the door to secure, approximately where shown (Figure 3).

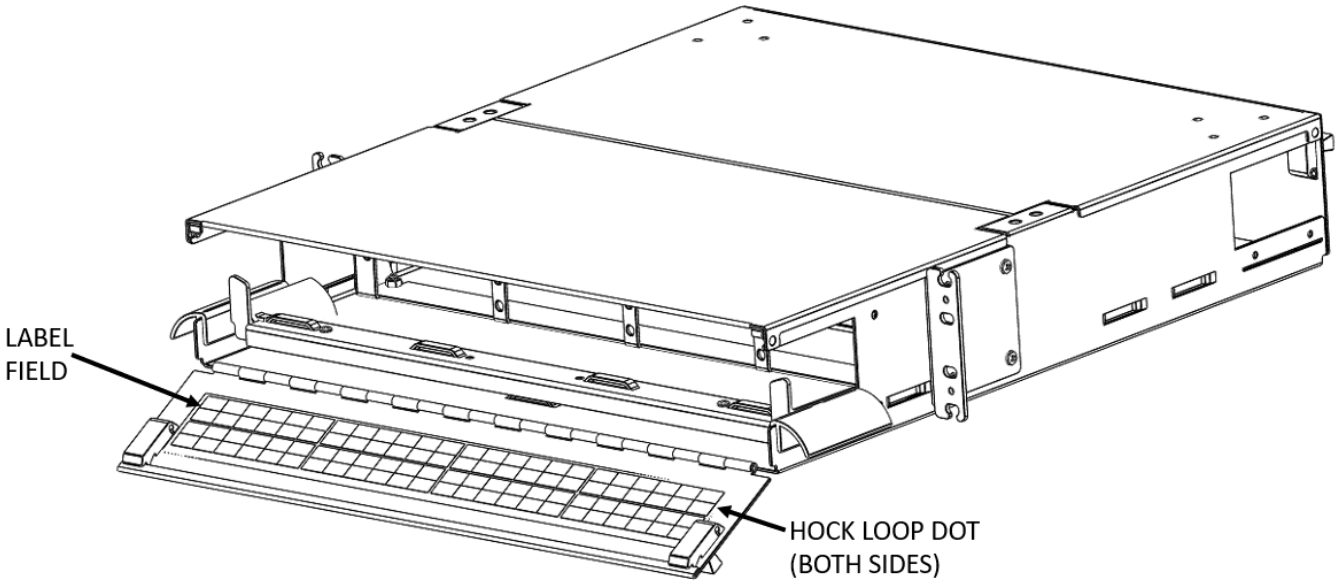


Figure 3

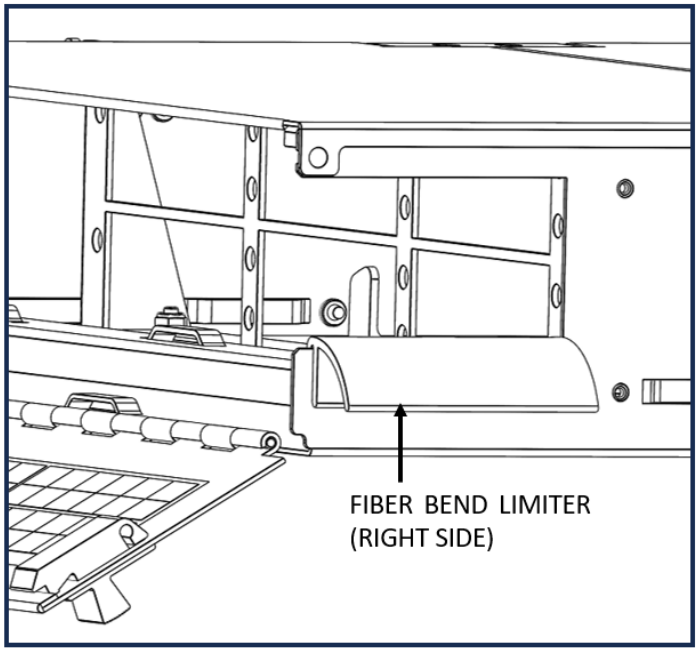


Figure 4

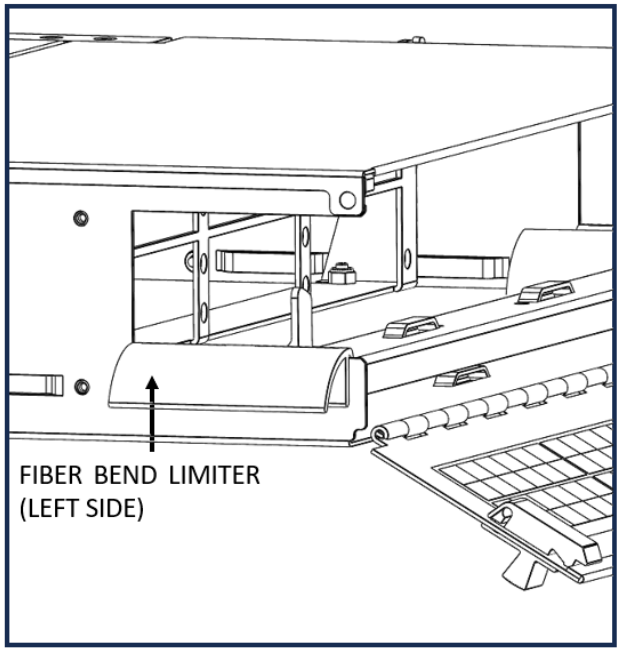


Figure 4a

5.5) Attach bend limiters to the enclosure as shown in Figures 4 & 4a (will be provided in black but shown in white for clarity).
5.6) The enclosure is ready to be mounted to the rack using the screws provided, and a #3 Phillips Head Screwdriver.

6.0 INSTALLATION OF ACCESSORIES

The fiber enclosures can support different styles of fiber bend radius control. The 2U & 4U enclosure trays can accept both styles. Figure 5a illustrates the current style and Figure 5b illustrates an alternate style.

6.1) To assemble the fiber manager provided with this enclosure: Attach Fiber Spool Cable Managers to the tray by inserting the (2) snap hook tabs into their mating tray slots then push the part down towards the tray until the snap hooks engage. An audible click will indicate a locked-in position. Follow the same procedure for additional assemblies. The fiber manager is capable of stacking although the enclosure will limit the number of fiber managers in a stack.
6.2) Figure 5a depicts the fiber spools secured to the tray (rear section).
6.3) When required, attach the Upper and/or Lower strain relief brackets to the rear of the enclosure as shown in Figure 6. Threaded studs are provided on the inside surface of the enclosure to accommodate the brackets.
6.4) To install the cable managers (item 10, 11), orient the curved sides to face each other. Place the short tab up and facing towards you as depicted in figure 8. Item 11 is the right-side cable manager. Item 10 is the left side cable manager. To attach them to the tray, place the long tab under the tray and align the holes to the threaded feature. Use the #6-32 screws provided (1) each, to fasten each cable manager. Do not overtighten.
6.5) Repeat steps **5.0** through **5.6** to assemble additional enclosures, and steps **6.0** through **6.4** for installation of accessories.

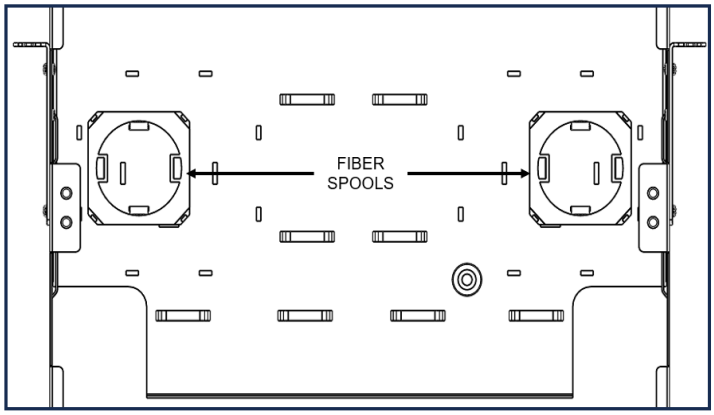


Figure 5a

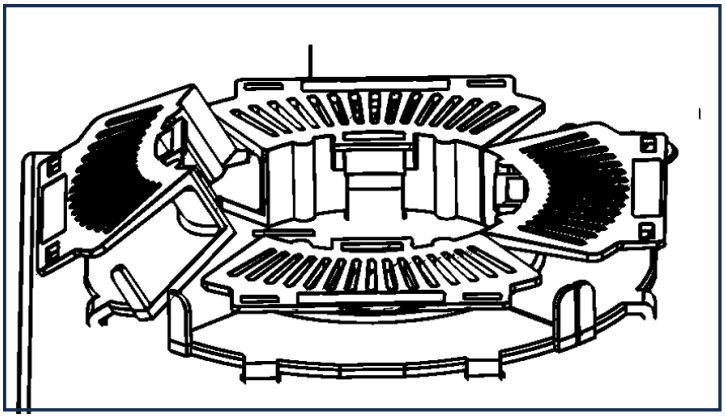


Figure 5b

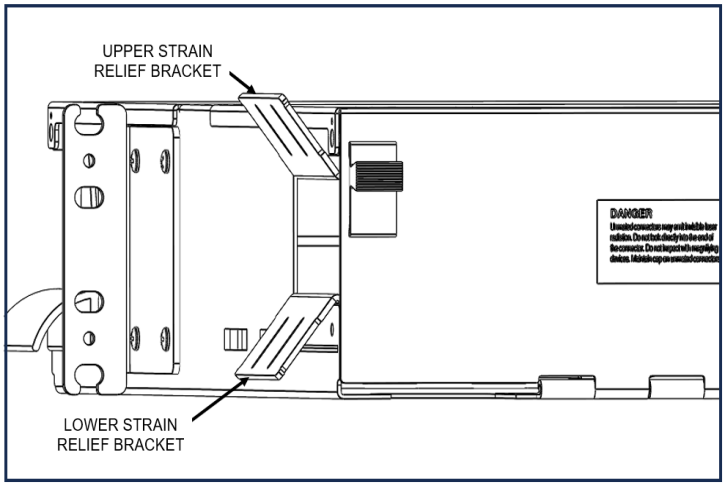


Figure 6

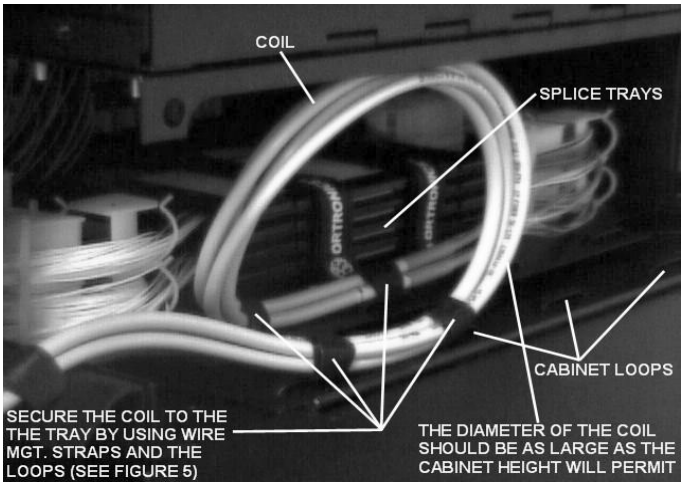


Figure 7

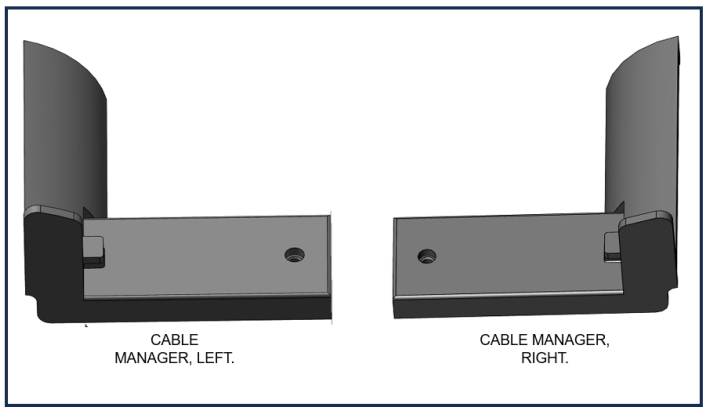


Figure 8

7.0 CABLE ROUTING AND INSTALLATION

7.1) Strip off approximately 1 meter (39 inches) of cable jacket. Trim the central strength member and/or the aramid yarn back to the cable jacket. Terminate connectors (if required) per the manufacturer's instructions.

7.2) With the jacketed portion of the fiber, make a service coil as large as the cabinet height will permit, as shown in Figure 7. The service coil is required to allow the tray to slide out the front of the cabinet freely.

7.3) Secure the outside coil to the cabinet utilizing management straps and the loops provided. Secure the inside coil to the tray utilizing wire management straps and the loops provided.

7.4) An example of a Patch and Splice wiring scheme is depicted in Figure 9.

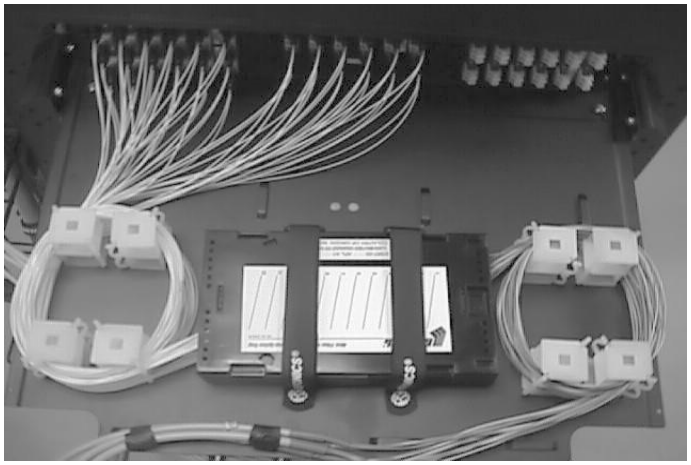


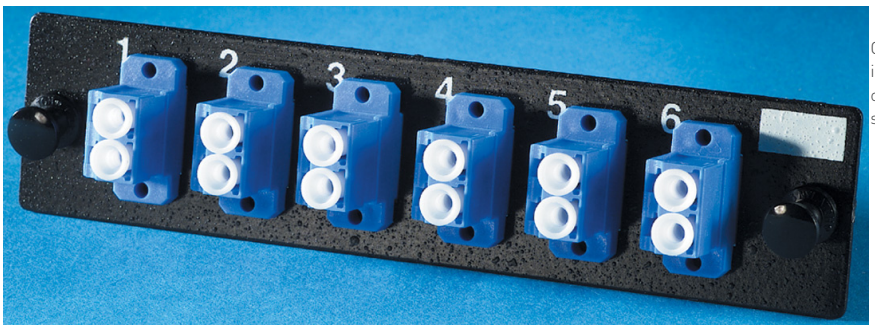
Figure 9

FOR QUESTIONS AND/OR ADDITIONAL INFORMATION, CONTACT LEGRAND AT THE FOLLOWING WEB ADDRESS, OR YOUR MANUFACTURER'S REPRESENTATIVE.

WWW.LEGRAND.US

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Ortronics
6-LC (12 fibers) single mode adapters with ceramic alignment sleeves
Part No. OFP-LCD12AC



Ortronics fiber adapter panel allows for flexibility and expansion with an industry accepted style. The adapter panel snaps in for installation and can be removed easily for future changes. The adapter panel is silkscreened for easy port identification.

Features & Benefits

- Up to 72 LC fibers per RU
- Made of durable polycarbonate
- 6, 8, 12 & 24 port panels
- Available in, LC, SC, ST and blank styles
- Zirconia ceramic sleeves for optimal performance
- Color options available

Specifications

General Info

Product Line	Ortronics	Color	Blue
UPC Number	662875593799	Country Of Origin	Mexico
Features	Shuttered	Included	Cover
Application Sector	Commercial, Data Center	Standard	RoHS compliant. Meets or exceeds TIA/EIA-568-C.3 requirements.
Warranty Type	5-Year	Type	Adapter Panel

Dimensions

Product Width US	5.12 in	Product Depth US	1.15 in
Product Height US	1.19 in		

Additional Information

Product Environmental Profile	Yes

Technical Information

Fiber Optic Cable Type	OS2	Operating Temperature Min	-10 °C
Compatibility	OFP	Number of Ports	12
Simplex/Duplex	Duplex	Operating Temperature Max	60 °C
Shuttered Adapters	No	Single/Multimode	Single-Mode
Number of Fibers	12	Fiber Type	Single-Mode
Form Factor	LC Duplex	Operating Temperature	-10°-60°C
Durability	500 matings	Operating Humidity	0-80% RH (Non-Condensing)
Storage Temperature	-40° - 75° C		

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NT24k® Modular Industrial Switch

N-Tron® Networking Series

RED LION®
a spectris company

Managed Gigabit Industrial Ethernet Switch

The N-Tron® series NT24k® is a modular managed switch designed for factory automation, utilities, SCADA, security surveillance and other industrial applications.



The Red Lion N-Tron series NT24k managed industrial Ethernet switch features connectivity for up to 24 Gigabit ports and offers a wide range of connectivity options—including 100Base, Gigabit, fiber optic and copper options—in a rugged 1U 19" rackmount enclosure. Designed to handle the most demanding environments, the NT24k delivers wire-speed throughput and includes dual power inputs, expanded shock and vibration tolerances, extreme operating temperature range and three slots to accommodate mix-and-match port modules. N-Ring™ technology restores network communication within ~30ms of fault detection. Robust remote monitoring capabilities make management easy.

APPLICATIONS

- Factory Automation
- Utilities
- SCADA
- Security Surveillance
- Transportation
- Alternative Energy

PRODUCT HIGHLIGHTS

- All Gigabit Modular Design
- Up to 24 Port Connections
- High Environmental Specifications
- N-Ring™ Advanced Ring Technology
- Robust Remote Monitoring
- Smart Plug-and-Play Operation

IEEE 1588v2 PTP OPTIONS

- Boundary Clock
- Transparent Clock

IEEE 1588v2 applications include

- Coordinated motion control
- Time-stamped data logging
- Time-stamped fault detection

PTP Models & Upgrade Kit Available

FEATURES & BENEFITS

- Supports up to three of the following port modules:
  - 8-port 10/100/1000BaseT(X) module
  - 8-port 100Base fiber module
  - 8-port 1000Base fiber module
  - 8-port Gigabit SFP module
  - 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- -40°C to 85°C operating temperature
- Dual power input options:
  - Low Voltage: 18-49 VDC
  - High Voltage: 90-264 VAC or 90-300 VDC
- Onboard temperature sensor
- ESD and surge protection diodes on all copper ports
- Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
- USB configuration port
- Configurable alarm contact
- Optional backup/restore configuration device
- Fully managed features include:
  - SSH/SSL/HTTPS
  - SNMP v1, v2, v3
  - Web browser management
  - Detailed ring map and fault location charting
  - RSTP - 802.1d, 802.1w, 802.1D
  - Trunking and port mirroring
  - 802.1Q tag VLAN and port VLAN
  - IEEE 802.1x with RADIUS remote server authentication
  - DHCP Server, Option 82 relay, Option 61, IP fallback
  - Port Security – MAC address based
  - 802.1p QoS, port QoS and DSCP
  - Event Log/Syslog
  - SNTP (Simple Network Time Protocol)
  - IEEE 1588v2 (PTP) models available
  - Multi-Member N-Ring™ technology with ~30ms healing
  - N-Link redundant ring technology
  - N-View™ monitoring technology
  - EtherNet/IP™ CIP™ messaging
  - 802.1AB-2005 LLDP (Link Layer Discovery Protocol)

FC c UL us LISTED 65SN CE UKCA ABS TYPE APPROVED PRODUCT RoHS compliant EtherNet/IP

Managed Gigabit Industrial Ethernet Switch Specifications

SWITCH PROPERTIES

Number of MAC Addresses: 16K
IEEE 1588v2 Software-Based Option
Aging Time: Programmable
Latency (typical): 1.6 µs
Switching Method: Store & Forward
MTBF: >1 million hours
Jumbo Frame Support

POWER INPUT

Input Voltages:
Low Voltage: 18-49 VDC
High Voltage: 90-264 VAC or 90-300 VDC
Input Current (max): 2.26A @ 24VDC
Input Current (max): 790mA @120 VAC/450mA @ 124VDC
BTU/hr: 185 @ 24VDC
BTU/hr: 365 @ 120VAC/190 @ 124VDC

CONNECTORS

10/100/1000BaseT(X): Up to 24 RJ45 copper ports
100BaseFX: Up to 24 SC or ST fiber ports
1000BaseFX: Up to 24 SC fiber ports
100BaseSX/LX SFP: Up to 24 LC fiber ports
1000BaseGX SFP: Up to 24 LC fiber ports

RELIABILITY

MTBF: >1 million hours

NETWORK MEDIA

10BaseT: ≥Cat3 cable
100BaseTX: ≥Cat5 cable
1000BaseT: ≥Cat5 cable
100BaseFX, 1000BaseSX Multimode: 50-62.5/125µm
100BaseFX, 1000BaseLX Singlemode: 7-10/125µm

RECOMMENDED WIRING CLEARANCE

Front and Back: 4" (10.2 cm)

CERTIFICATION & COMPLIANCE

Product Safety:
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions:
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009; Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity:
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Other:
ABS Type Approval for Shipboard Applications; EMC Directive 2014/30/EU; LV Directive 2014/35/EU, RoHS Compliant

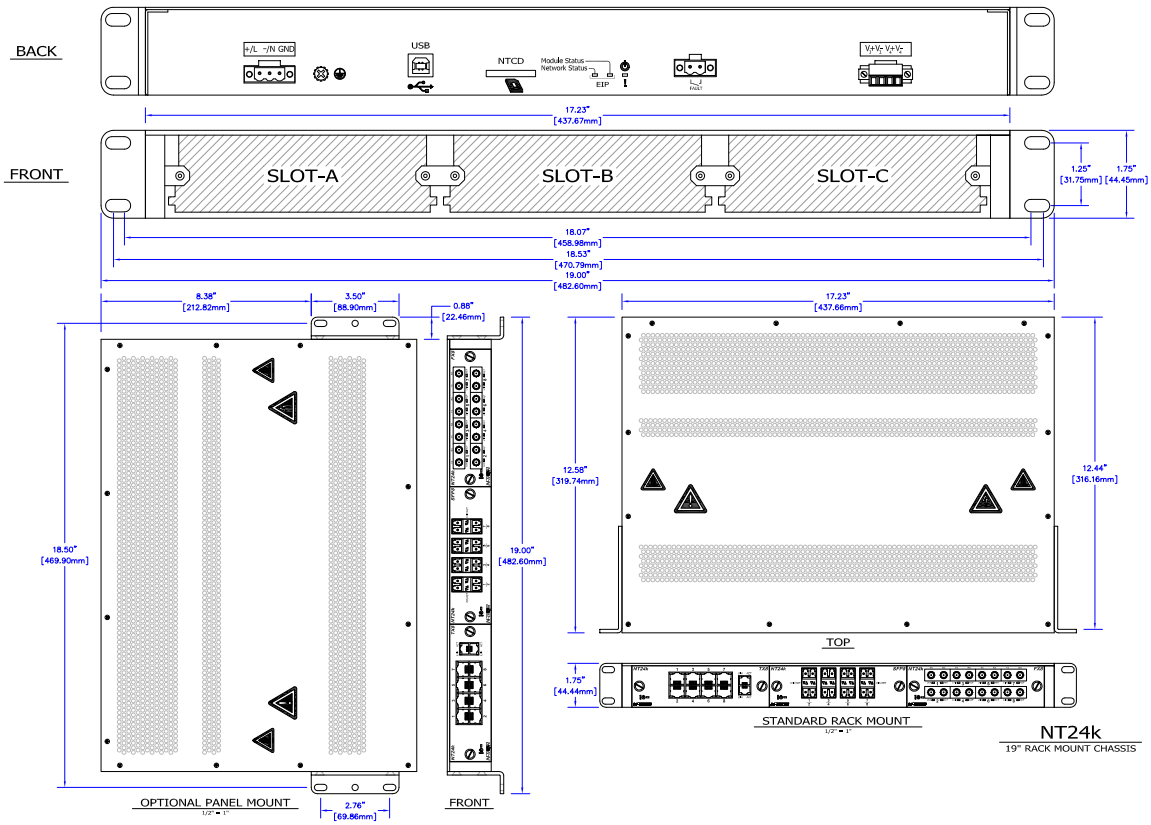
ENVIRONMENTAL

Operating Temperature: -40° C to 85° C
Operating Humidity: 5% to 95% (Non Condensing)
Operating Altitude: 0 to 10,000 ft.
Shock: 50g @ 10ms
Vibration/Seismic: 30g, 10-200 Hz, triaxial

MECHANICAL

Case Dimensions
Height: 1.9" (4.8 cm)
Width: 17.5" (44.5 cm)
Depth: 12.7" (32.0 cm)
Weight (maximum): 12.85 lbs (5.83 kg)
Mount: Rackmount 1U

DIMENSIONS



Specifications are subject to change. Visit www.redlion.net for more information.

Managed Gigabit Industrial Ethernet Switch Specifications

NT24K-FX8 MODULE - 100 MB FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24K-GX8 MODULE - GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 300m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24K-SFP-DM8 MODULE - SFP 100BASE FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24K-SFP-DM8 OR NT24K-SFP8 MODULES- SFP GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 275m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance.
Link budgets should be evaluated based on specific application conditions.

ORDERING GUIDE

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input PTP Enabled
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-DC2-PT	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs PTP Enabled
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input
NT24K-AC1-PT	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input
NT24K-AC2-PT	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs
NT24K-AC1-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs PTP Enabled
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device
NTPC-AC-US	AC power cord
NTPS-24-3	DIN rail power supply 3.0 Amp@24 VDC
NT24K-KIT-PTP	NT24k Upgrade License to Enable IEEE 1588/PTP on Non-PT NT24k Switches
PORT MODULES & TRANSCEIVERS	
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*
NTSFP-FX	100BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2km)**
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP pluggable mini-GBIC transceiver (LC style connector)**
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode. *SFP transceivers sold separately. **For use with SFP DM8 module only

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For over 50 years, Red Lion has strived to be THE Industrial Data Company™. The company empowers industrial organizations around the world to unlock the value of data by developing and manufacturing innovative solutions to access, connect and visualize their information. Red Lion products make it easy for companies to gain real-time data visibility that drives productivity. Red Lion is part of Spectris plc, the experts in providing insight through precision measurement. For more information, please visit www.redlion.net.

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N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches

Hardware Guide | January 2023
LP0982 | Revision C

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UK: +44 (0) 20 3868 0909
Hours: 9 am-5 pm Central European Time
(UTC/GMT +1 hour)

Website: www.redlion.net
Support: support.redlion.net

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Preface

Disclaimer

This hardware guide provides an overview of installation, maintenance and operation of the N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls, Inc. is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Users of this document are urged to heed warnings and cautions used throughout the document.

Compliance Information

It is recommended that the owner of this equipment determine and ensure conformance with any specific and applicable local regulations.

FCC Statement

This product complies with Part 15 of the FCC-A Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful Interference
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Déclaration de conformité FCC

Ce produit est conforme à la partie 15 des règles de la FCC–A

Utilisation est soumise aux conditions suivantes:

1. Ce dispositif ne doit pas causer des interférences nuisibles
2. Cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent causer un mauvais fonctionnement.

Note: Cet équipement a été testé et jugé conforme aux limites de la classe A des appareils numériques, conformément à la partie 15 des règles de la FCC . Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie radiofréquence et, si il n'est pas installé et utilize conformément aux instructions, peut causer des interférences nuisibles aux communications radio. L'utilisation de cet appareil dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur sera tenu de corriger les interférences à ses propres frais.

Industry Canada

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe A répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

Environmental Impact Statement

Red Lion equipment contains no hazardous materials as defined by the United States Environmental Protection Agency (USEPA). Red Lion recommends that all failed product be returned to Red Lion for failure analysis and proper disposal.

Toxic Emissions

Red Lion equipment releases no toxic emissions.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- Ethernet is a registered trademark of Xerox Corporation.
- EtherNet/IP and CIP are registered trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at

www.redlion.net/support/documentation.

Additional Product Information

Additional product information can be obtained by contacting the local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Cautions and Warnings / Mises en Garde et Avertissements

Warnings apply to situations where personal injury or death may result.

Cautions apply to where reduced function or damage to equipment may result.

General Safety Cautions and Warnings / Précautions et Avertissements de Sécurité Générale

	**CAUTION:** If the equipment is used in the manner not specified by Red Lion, the protection provided by the equipment may be impaired. **ATTENTION:** Si l' équipement est utilisé d'une manière non spécifiée par Red Lion, la protection fournie par l'équipement peut être compromise.

	**CAUTION:** Do not remove any of the covers. There are no serviceable parts within the unit. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne retirez aucun des couvercles. Il n'y a pas des pieces utilisables à l'intérieur de l'appareil. Ne pas remplacer les pièces non-autorisées ou effectuer des modifications non-autorisées de l'appareil.

	**CAUTION:** Do not block any air vents on the unit. **ATTENTION:** N'obstruez pas les fentes d'aération de l'unité.

	**CAUTION:** Do not operate the equipment in a manner not specified by this manual. **ATTENTION:** Ne pas faire fonctionner l'équipement d'une manière non spécifiée par ce manuel.

	**WARNING:** Install only in accordance with Local and National Codes of authorities having jurisdiction. **AVERTISSEMENT:** Installer uniquement, conformément aux codes locaux et nationaux des autorités ayant compétence.

Electrical Safety Warnings / Avertissements de Sécurité Électrique

	**WARNING:** Never install or work on electrical equipment or cabling during periods of lightning activity. **AVERTISSEMENT:** Ne jamais installer ou travailler sur équipement électrique ou de câblage pendant les périodes d'activité de la foudre.

	**CAUTION:** Do not perform any services on the unit unless qualified to do so. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne pas effectuer de services sur l'appareil s'il n'est pas qualifié pour le faire. Ne pas substituer pièces non autorisées ou de modifications non autorisées de l'appareil.

	**WARNING:** Properly ground the unit before connecting anything else to the unit. Units not properly grounded may result in a safety risk and could be hazardous and may void the warranty. See the grounding technique section of this manual for proper ways to ground the unit. **AVERTISSEMENT:** L'unité doit être correctement mise à la terre avant tout raccordement à l'unité. Unités pas correctement mise à la terre peuvent causer un risque de sécurité et pourraient être dangereuses et peuvent annuler la garantie. Voir la section technique de mise à la terre dans ce mode d'emploi pour des moyens appropriés à la masse de l'appareil.

	**WARNING:** Device must be supplied by a Class 2 power source (except for POE models). **AVERTISSEMENT:** l'appareil doit être alimenté par une source d'alimentation de classe 2 (sauf pour les modèles POE).

	**WARNING:** Do not operate the unit with the top cover removed, as this could create a shock or fire hazard. **AVERTISSEMENT:** Ne pas faire fonctionner l'unité avec le couvercle retiré, ceci pourrait créer une décharge électrique ou un incendie.

	**CAUTION:** Observe proper DC Voltage polarity when installing power input cables. Reversing voltage polarity can cause permanent damage to the unit and void the warranty. **ATTENTION:** Respectez la polarité correcte de tension DC lors de l'installation des câbles d'alimentation d'entrée. Inversion de polarité de tension peut causer des dommages permanents à l'appareil et annule la garantie.

Environmental Safety Cautions and Warnings / Sécurité Environnementale Mises en Garde et Avertissements



WARNING: Do not operate the equipment in the presence of flammable gases or fumes. Operating electrical equipment in such an environment constitutes a definite safety hazard.

AVERTISSEMENT: Ne pas utiliser le matériel en présence de gaz ou de vapeurs inflammables. L'utilisation de matériel électrique dans un tel environnement constitue un danger certain.



WARNING: Disconnect the power and allow to cool 5 minutes before touching.

AVERTISSEMENT: Déconnectez le câble d'alimentation et laisser refroidir 5 minutes avant de la toucher.

Hazardous Location Warnings / Les Avertissements d'Emplacement Dangereux



CAUTION: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

ATTENTION: Cet appareil est adapté pour utilisation en Classe I, Division 2, Groupes A, B, C, D ou endroits non-dangereux seulement.



WARNING: Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.

AVERTISSEMENT - Risque d'explosion - La substitution de tout composant peut nuire à la conformité de Classe 1, Division 2.



WARNING: Explosion Hazard – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux.



WARNING: Exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relay U40.

AVERTISSEMENT: L'exposition à certains produits chimiques peut dégrader les propriétés d'étanchéité des matériaux utilisés dans les dispositifs suivants: relais par U40.



WARNING: Explosion Hazard – Do not replace the device unless power has been switched off or the area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas remplacer l'appareil à moins que l'alimentation a été coupée ou que la zone est connue pour être non-dangereuse.



WARNING: Never connect or disconnect power when hazardous gases are present.

AVERTISSEMENT: Ne jamais brancher ou débrancher l'alimentation lorsqu'en presence de gaz dangereux.

Surrounding Air Temperature / Temperature Ambiante

NT24k-DC and NT24k-AC rackmount models: -40°C to 85°C

NT24k-DR16 and NT24k-DR24 models: -40°C to 75°C

Note: Use 105 °C or higher rated copper wire, (0.22NM) 2lb/in tightening torque for field installed conductors.
Remarque: Utilisez fil de cuivre classé 105 °C ou plus, (0.22Nm) 2 pouces/livres couple de serrage pour les connecteurs installés sur le terrain.

Laser Safety Warnings / Avertissements de Sécurité Laser

(Options: NTSFP-FX, NTSFP-FXE, NTSFP-SX, NTSFP-LX)



CAUTION: CLASS 1 LASER PRODUCT. Do not stare into the laser.
ATTENTION: PRODUIT LASER CLASSE 1. Ne pas regarder dans le laser.

Regulatory Information

Product Safety
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009
Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Marine
ABS Type Approval for Shipboard Applications
Other
EMC Directive 2014/30/EU
LV Directive 2014/35/EU GOST-R
RoHS compliant

KC Mark (Korea)

A 급 기기 (업무용 방송통신 기자재)	이기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외 지역에서 사용하는 것을 목적으로 합니다.
Class A device (Broadcasting and communication equipments for office work)	This equipment is office use (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

Chapter 1 Product Overview

NT24k® Modular Series Common Features

Red Lion's N-Tron® series NT24k modular switches are available in rackmount or 35mm DIN rail mountable configurations with high density Gigabit ports. The NT24k offers a wide array of port configurations and power input options that include Fast Ethernet and Gigabit speeds in copper or fiber. The hot-swappable port modules are auto-detected and configured by the switch, adding new definition to plug-and-play performance. Housed in rugged hardened enclosures, the NT24k series features extended shock and vibration specifications (bulkhead mount required to meet requirements), wide operating temperature ratings and best-in-class technology.

Connectivity

The NT24k series switches feature hot-swappable connectivity modules. These modules are available in Fast or Gigabit Ethernet, and are optionally available with copper, fiber or SFP ports. The NT24k accepts up to three modules for a maximum of 24 Ethernet ports, and can be changed without removing power from the switch.

Performance

The NT24k line of managed switches provide uncompromising performance in harsh environments including network features like N-Ring™, VLAN, Quality of Service (QoS), port mirroring, IGMP and SNMP.

Environmental

The NT24k series of managed switches are available in rackmount or 35mm DIN rail mountable configurations with operating temperatures up to -40° to 85°C. With UL Class I, Division 2 listing and CE certifications, these switches are built to last in the most demanding environments.

Monitoring

The NT24k Series includes N-View™ monitoring technology. N-View combines switch based technology with a Windows based OPC server and client monitoring tool. When N-View is enabled, the switch periodically autocasts a small Ethernet packet containing switch and port statistics. The data is captured by the N-View OPC server software and can be displayed by the provided N-View client or third party OPC client application running in the same Windows environment. For more information, please reference the N-View Installation and User's Guide.

Security

The NT24k series provides a high level of security utilizing IEEE 802.1x port-based network access control with RADIUS remote server authentication and SNMPv3 communication protocol to ensure the safest connections.

Available Models

PART #	TOTAL PORTS	MOUNTING	OPERATING TEMPERATURE	10/100/1000 COPPER	100 FIBER	GIG FIBER	SFP'S	18-49 VDC REDUNDANT POWER INPUT*	90-264 VAC/90-300 VDC POWER INPUT
NT24k-DR16-AC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	-	1
NT24k-DR16-DC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	1	-
NT24k-DR24-AC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-DR24-DC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-AC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-AC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	2
NT24k-AC1-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	1
NT24k-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-DC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	2	-

* Each 18-49VDC power input option includes redundant (2) power connections.

NT24k® Rackmount

The NT24k Rackmount Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 1U 19" rack mount enclosure. Designed to handle the most demanding environments, the NT24k supports up to two power inputs, extreme operating temperature range and three slots to accommodate mix-and-match port modules.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- Easily transitions to Gigabit network requirements

-40°C to 85°C operating temperature
Dual power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

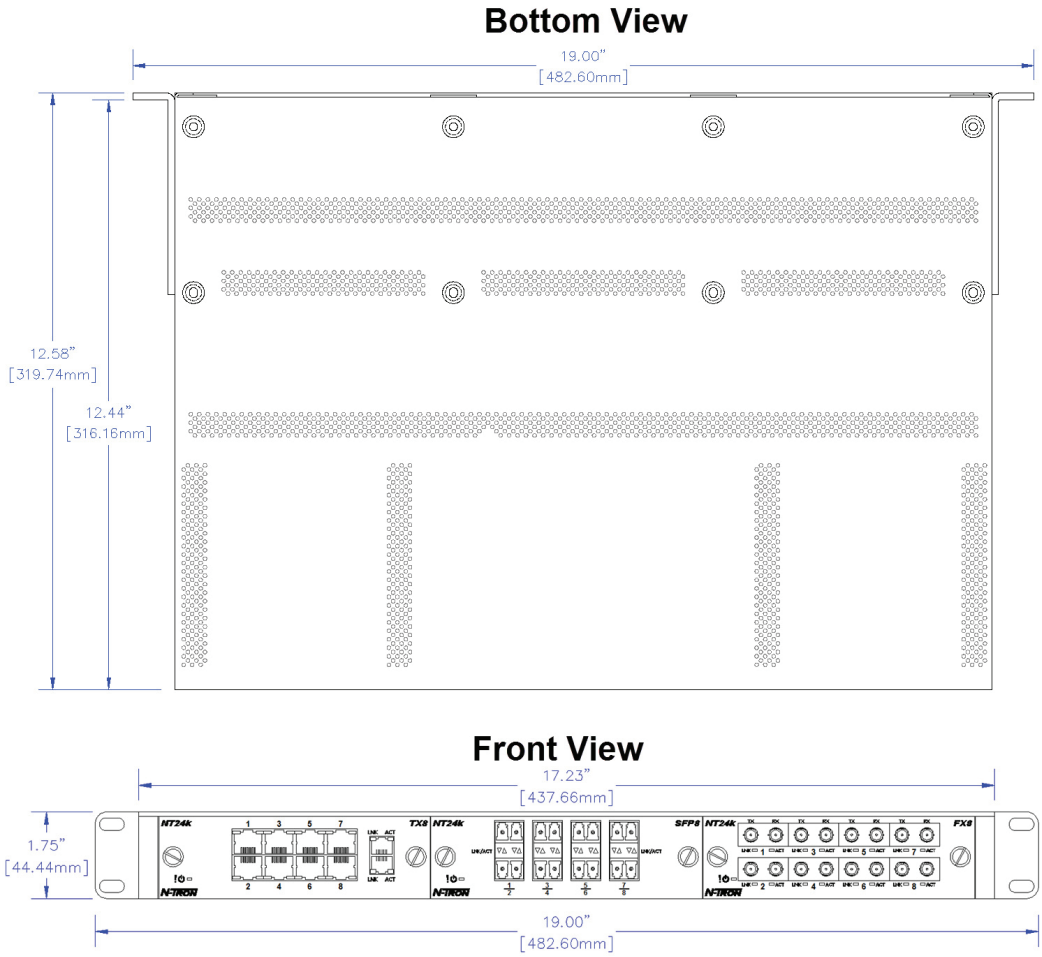
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- Trunking and port mirroring
- 802.1Q VLAN Tagging and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k® Rackmount Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
1.9" (4.8 cm)	17.5" (44.5 cm)	12.7" (32.0 cm)	12.85 lbs (5.83 kg)	Rackmount 1U
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.26 A @ 24 VDC Max: 790 mA @ 120 VAC/450 mA @ 124 VDC	185 @ 24 VDC 365 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 85 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k® Rackmount Dimensions



All specifications are subject to change. Consult the company website for more information.

NT24k-DR16

The NT24k-DR16 Managed Industrial Ethernet Switch features connectivity for up to 16 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to two of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

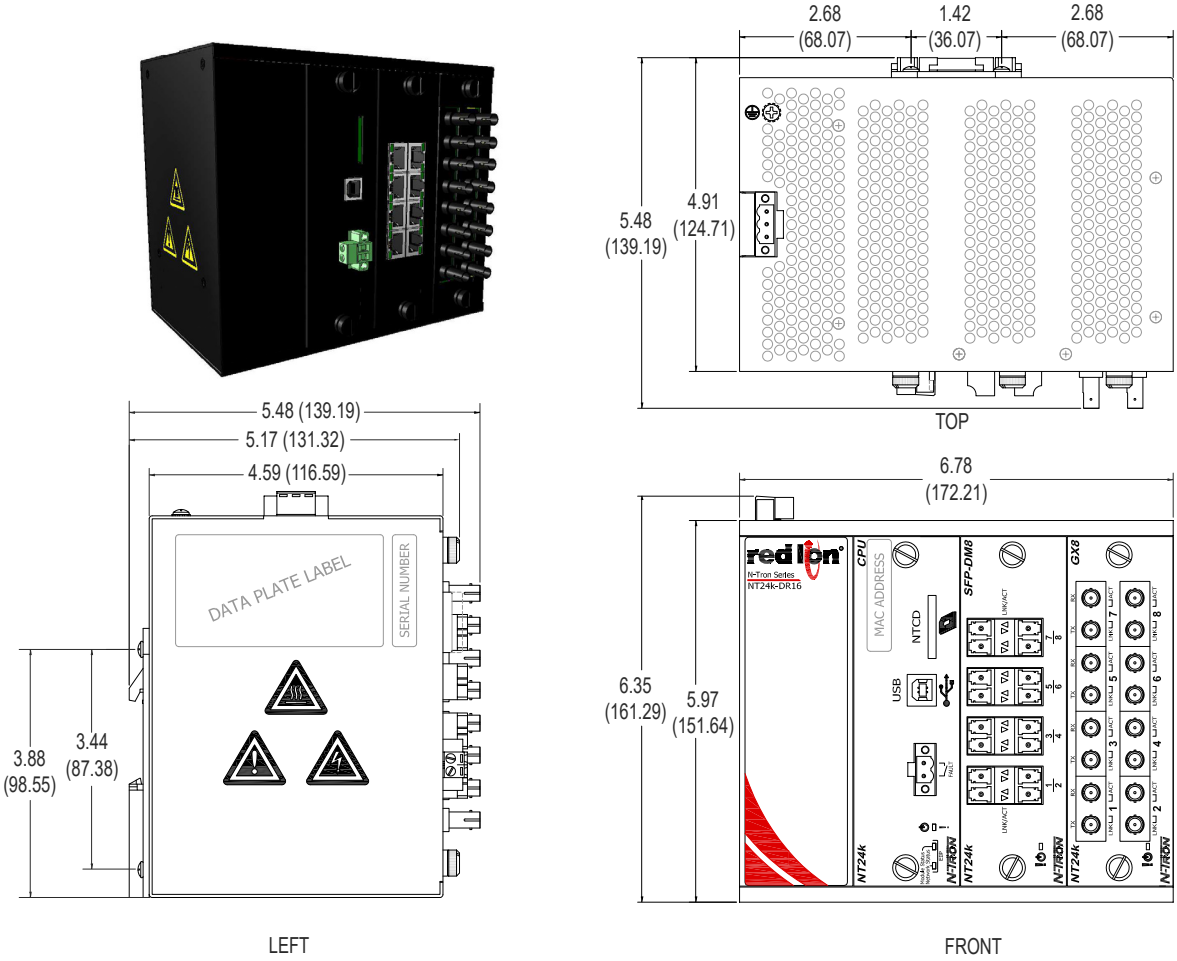
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x. with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k-DR16 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	6.78" (17.22 cm)	4.59" (11.65 cm)	6.4 lbs (2.9 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 1.52 A @ 24 VDC Max: 580 mA @ 120 VAC/300 mA @ 124 VDC	125 @ 24 VDC 268 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**		**Note**	
50g @ 10ms	30g, 10-200Hz, Triaxial		Unit must be bulkhead mounted to achieve these levels.	
CONNECTORS				
10/100/1000BaseT:(X): Up to 16 RJ45 ports				
100BaseFX: Up to 16 SC or ST fiber ports				
1000BaseSX/LX: Up to 16 SC fiber ports				
100BaseSX/LX SFP: Up to 16 LC fiber ports				
1000BaseGX SFP: Up to 16 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR16 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k-DR24

The NT24k-DR24 Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

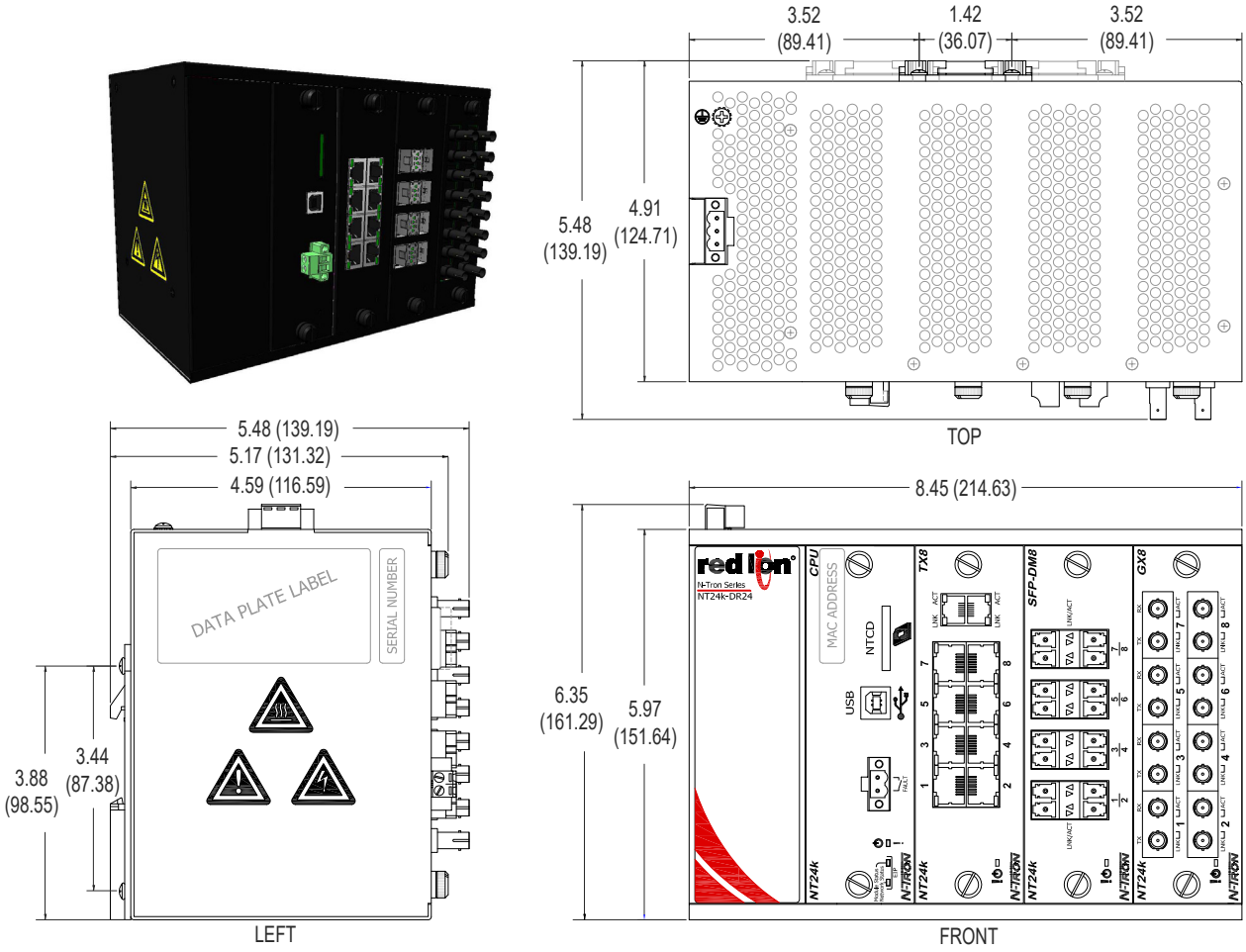
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™ CIP™ messaging

NT24k-DR24 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	8.45" (21.46 cm)	4.59" (11.65 cm)	7.8 lbs (3.54 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.14 A @ 24 VDC Max: 780 mA @ 120 VAC/430 mA @ 124 VDC	175 @ 24 VDC 360 @ 120 VAC/182 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR24 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k Views

NT24k Rackmount Unit Front View



NT24k Rackmount Unit View (Module Slots Identified)

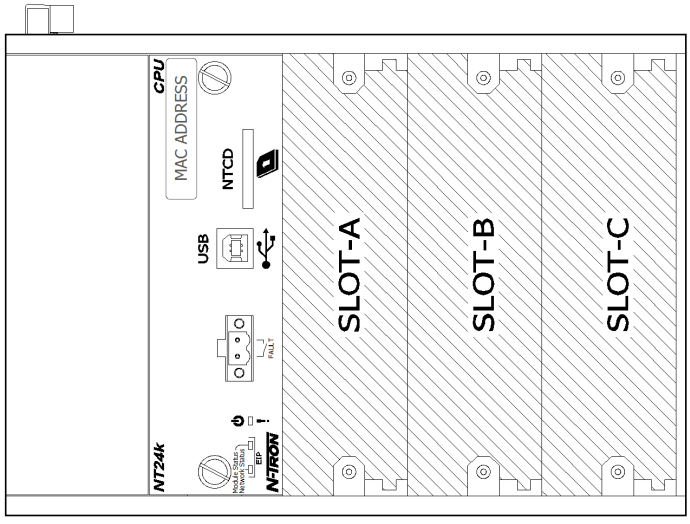


See “Ordering Information” for available module(s).

NT24k-DR16 Front View



NT24k DR Unit View (Module Slots Identified)



LEDs

The RJ45 data ports have two LEDs located on each connector. The left LED indicates link status and the right LED indicates activity.



The table below describes the operating modes:

LED	COLOR	DESCRIPTION
⏻	Green	Power is On
	Red	Power is On and a fault condition exists
	Off	Power is Off
LNK	Green	10/100/1000 Mb Link between ports
	Off	No link between ports
ACT	Green	Data is active between ports. Activity light blink rate indicates activity, not necessarily the volume of activity
	Off	Data is inactive between ports

EIP Indicators

The EIP Indicators are located either on the back of the rackmount version, or on the front of the CPU module of the DIN rail versions of the switch. The Module Status indicator shows the status of the switch. The Network Status indicator shows the status of the network interface.

MODULE STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up
Steady Green	The switch is operating normally
Flashing Green	The switch has not been configured
Flashing Red	A recoverable minor fault has occurred
Steady Red	A non-recoverable major fault has occurred
NETWORK STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up, or an IP address has not been configured
Flashing Green	An IP address is configured, but no connections have been established
Steady Green	A connection has been established
Flashing Red	A connection has timed out

Transceiver Characteristics

NT24k-FX8 Module - 100 MB Fiber Transceiver Characteristics

Fiber Length*	2 km	15 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24k-GX8 Module - Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 300 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24k-SFP-DM8 Module - SFP 100Base Fiber Transceiver Characteristics

Fiber Length*	2 km	10 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24k-SFP-DM8 or NT24k-SFP8 Modules - SFP Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 275 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance. Link budgets should be evaluated based on specific application conditions.

Chapter 2 Hardware Installation

Unpacking

Remove all the equipment from the packaging and store the packaging in a safe place. File any damage claims with the carrier.

Make certain the NT24k® Ethernet Switch package contains the following items:

1. NT24k switch
2. Product CD

Module Installation

Technicians performing the following steps should wear proper anti-static equipment to protect the circuit boards. Before removing the module from the ESD bag, touch a known grounded piece of metal to discharge any possible static electricity from the body.

1. Remove the faceplate from the slot in which the module will be inserted by turning the thumb screws counter clockwise.
2. Remove the module from the anti-static bag and insert into the slot aligning the board with the guide rails on either side. The module should slide smoothly into the slot.
3. Press the module firmly in place until the faceplate is flush against the front of the enclosure.
4. Align the threads of the thumb screws with the threads in the enclosure and screw them down until they are finger tight.

Ensure that all empty slots are covered with a faceplate to meet both emissions and safety requirements.

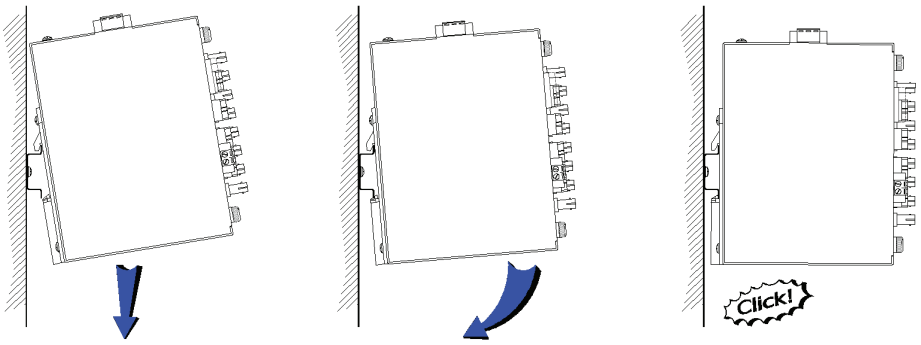
Mounting the NT24k

Rackmount Installation Instructions

The NT24k Rackmount unit comes configured with standard rack mount brackets which may be used to mount our products to standard 19" racks. As an alternative, Red Lion offers its NT24k Panel Mount Assembly (P/N: NT24k-PMK) used to securely mount the NT24k products to a panel or other flat surface.

A clearance of one inch should be observed on the sides, back, top and bottom to allow proper ventilation. Also a cable bend radius of 4 inches should be observed for the front and back of the unit.

DIN Rail Mounting Instructions

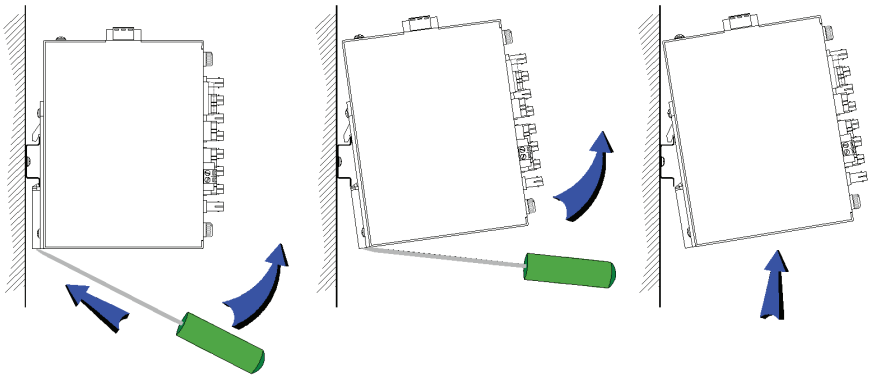


Install the switch to standard 35mm DIN rail as shown in the diagram above.

1. First, hook the top of the 35mm DIN rail clip on the back of the switch to the rail.
2. Then, gently rotate the front of the switch downward, towards the panel.
3. Push the bottom of the switch towards the rail until it locks into place.
4. Apply upward force to verify the switch is securely installed.

5. Connect any communications cables to the switch.
6. Install the power and ground wires.
7. Apply power to the power supply.

DIN Rail Removal Instructions



Remove the switch from standard 35mm DIN rail as shown in the diagram above.

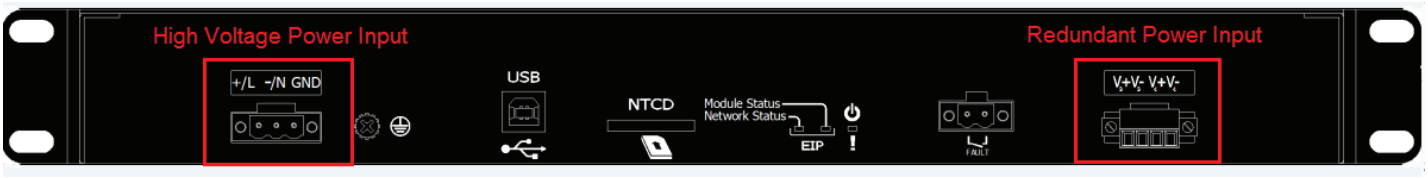
1. Ensure power from the power source is off.
2. Disconnect power and ground wires.
3. Disconnect any communications cables from the unit.
4. Insert a standard flat/slotted screwdriver into the slot provided on the DIN rail clip.
5. Using the base of the switch as a pivot point, apply upward force on the screwdriver to release the DIN rail clip.
6. With the DIN rail clip latching mechanism released, continue to rotate the switch upward and away from the panel.
7. Once the switch has been rotated upward, remove the screwdriver.
8. Carefully lift the switch upward and away from the DIN rail and panel.

Power Source

The NT24k-DR16 and NT24k-DR24 series operate with one power supply, either AC or DC.

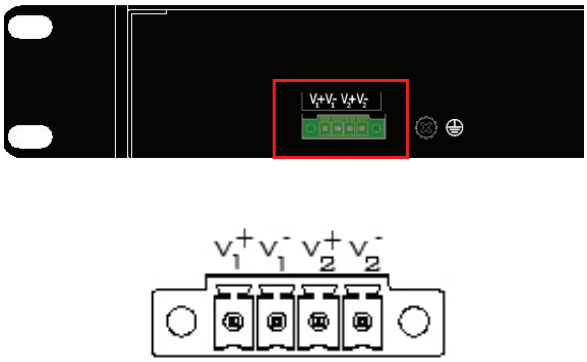
The Rack Mount NT24k® can be ordered with one or two power input options.

Each power supply can be AC or DC. Each low voltage DC Power supply includes redundancy (two DC supplies). The NT24k-AC1-DC1 model shown below comes with a high voltage power input on the left (90-264VAC / 90-300VDC) and a redundant 18-49VDC power input on the right.



Note: LEDs are described in detail in “LEDs”.

NT24k® Rack Mount with DC Power Input Installed

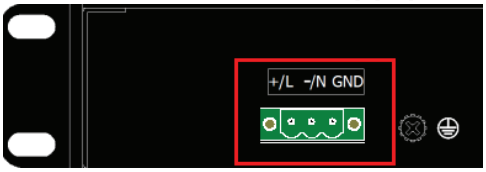


1. Unscrew and remove the DC voltage input plug from the power input header.
2. Install the DC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

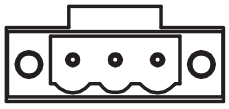
Note: When a DC power supply is installed, only one power supply must be connected to power for minimal operation. For redundant power operation, V1 and V2 inputs must be connected to separate DC voltage sources. This device will draw current from both sources simultaneously. Use 16-28 gauge wire when connecting to the power supply.

Recommended 24 VDC power supply, similar to Red Lion's P/N NTPS-24-3.

NT24k with AC Power Supply Installed



+/L -/N GND



1. Unscrew and remove the AC voltage input plug from the power input header.
2. Install the AC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

Note: When an AC power supply is installed (i.e. the -AC option), use 12-24 gauge wire when connecting to the power supply.

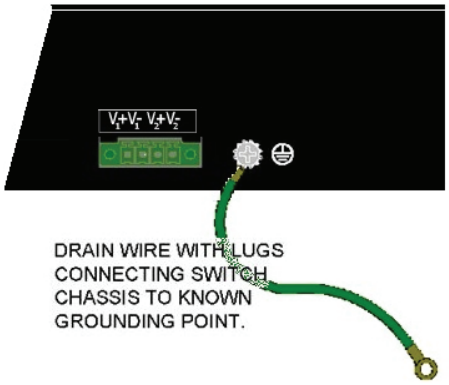
Grounding the Unit

The grounding of any control system is an integral part of the design. The optimum noise immunity and emissions are obtained when the NT24k® chassis is connected to earth ground via a 14-18 gauge drain wire. The NT24k units provide a ground lug (see illustration) that is used to provide a safe grounding path of the device. For the NT24k-AC power supplies, the chassis may also be connected to earth ground using the input power plug labeled “GND.”

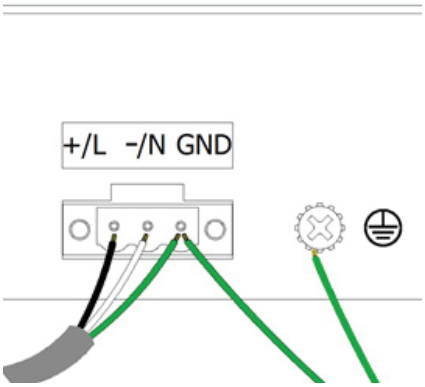
Note: The NT24k power input (V-) pins are isolated from chassis ground. Do not attempt to ground the switch to earth ground via the power input pins (V-).

Remarque: La NT24k puissance d’entrée (V-) broches sont isolés de la masse du châssis. Ne pas essayer pour mettre le commutateur à la terre via les broches d’entrée d’alimentation (V-).

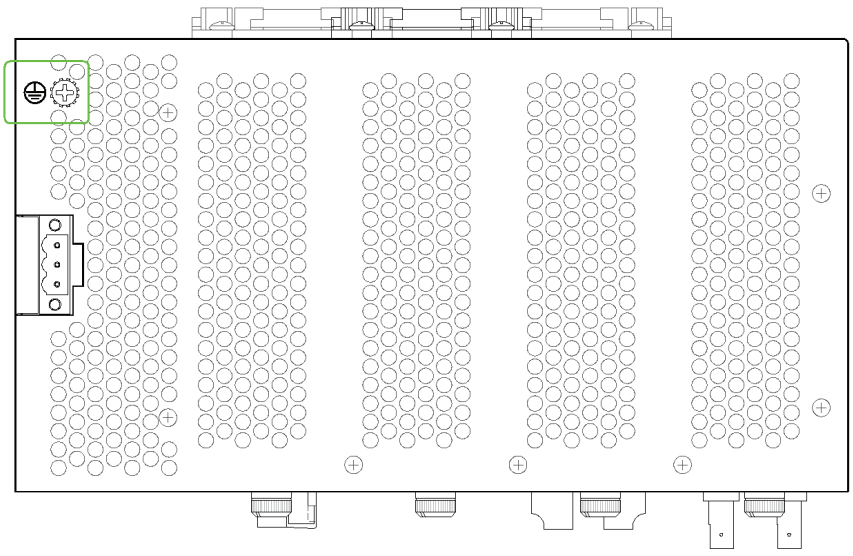
NT24k DC Power



NT24k AC Power



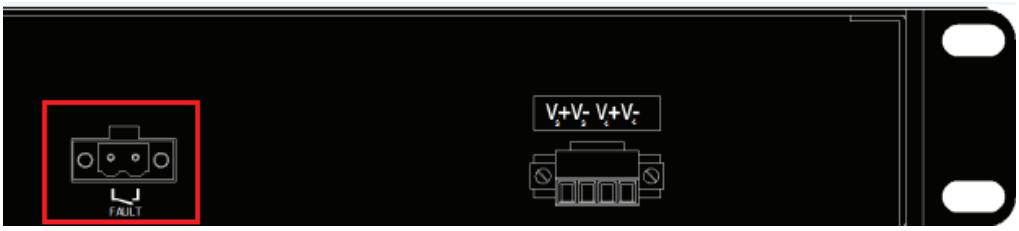
For the DIN rail models, see the illustration below for grounding:



Configurable Alarm Contact

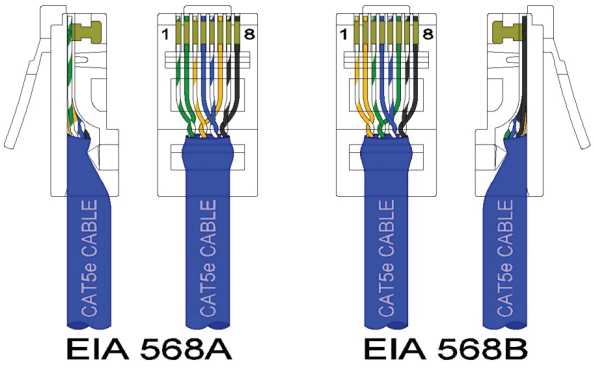
The alarm contact located on the back of the NT24k® rack mount unit or on the front of the NT24k-DR16 and NT24k-DR24 models, can be used to control an external warning device based on an event. The current carrying capacity is 1A at 24VDC. It is normally open and the relay closes when a fault condition occurs, though this can be reversed via configuration. These pins can be used to connect an external warning device such as a light in order to provide an external alarm. The conditions for generating a fault condition (closing the relay) can be configured through software.

Refer to the NT24k Software User's Guide for more information.



Connecting the Unit

For 10/100/1000/T(x) ports, plug a Category 5E twisted pair cable into the RJ45 connector. Connect the other end to the far end station. Verify that the LNK LEDs are ON once the connection has been completed. To connect any port to another device, use a standard CAT5E straight through or crossover cable with a minimum length of one meter and a maximum length of 100 meters.



Red Lion recommends the use of pre-manufactured CAT5E cables to ensure the best performance. If this is not an option and users must terminate their own ends on the CAT5E cables; one of the two color coded standards shown to the right should be utilized. If a user does not follow one of these standards then the performance and maximum cable distance will be reduced significantly, and may prevent the switch from establishing a link.

For FX/FXE/GX/GXE units, remove the dust cap from the fiber optic connectors and connect the fiber optic cables. The TX port on the FX/FXE/GX/GXE models should be connected to the RX port of the far end station. The RX port on the FX/FXE/GX/GXE versions should be connected to the TX port of the far end station.

⚠	**WARNING –** Creating a network loop without employing a network path protocol such as N-Ring™, N-Link, or RSTP is an illegal operation that can create a network storm which will crash the network. **Avertissement -** La création d'un réseau sans boucle employant un chemin réseau protocole tels que N-Ring, N-Link, ou RSTP est une opération illégale que peut créer une tempête du réseau qui va planter le réseau.

Ethernet Cable

If you are connecting to the unit via the copper port, you will need a straight or crossover cable with two 8-pin RJ45 connectors on each end.

To visually confirm that Ethernet cabling was done properly, check the LED indication on the Ethernet port of the unit. The link LED should be on when the correct cable is used.

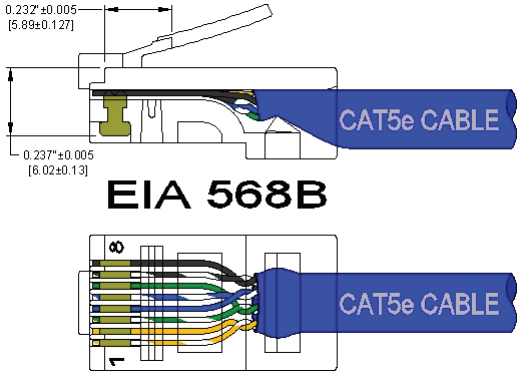
Note: A shielded cable is required to fully meet EMC standards.

When using shielded cables, it is generally recommended to only connect the shield at one end to prevent ground loops and interference with low level signals (i.e. thermocouples, RTD, etc.). CAT5e cables manufactured to EIA-568A or 568B specifications are required for use with Red Lion series switches.



In the event all CAT5e patch cables are short (i.e. All Ethernet devices are located in the same local cabinet and/or referenced to the same earth ground), it is permissible to use fully shielded cables terminated to chassis ground at both ends in systems avoid low level analog signals.

RJ45 Connector Crimp Specifications



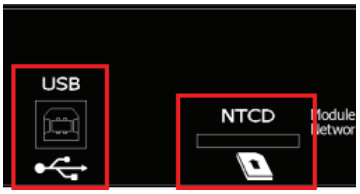
NTCD

NTCD-CFG Configuration Device

NTCD-CFG Configuration Device



Ideal for saving, or restoring switch configuration parameters quickly without the need for a computer or software. One configuration device per switch is recommended.



The USB configuration slot is located on the back of the NT24k® rackmount models and on the front of the NT24k-DR16 and NT24k-DR24 models.

The unit could be configured with multiple power supply configurations.

⚠	**WARNING – Explosion Hazard** – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion** - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

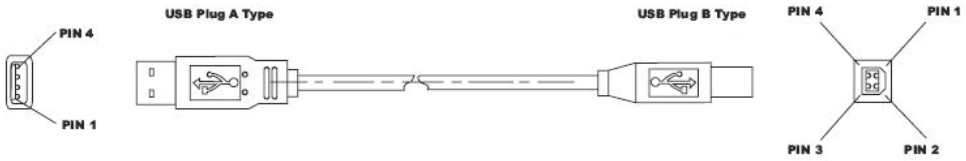
USB Interface

The NT24k switches provide a USB interface accessed via the USB connector labeled as "USB" on the back of the NT24k rackmount models and the front of the NT24k-DR16 and NT24k-DR24 models. The USB connection is used to access the Command Line Interpreter (CLI) or PPP (Point-to-Point Protocol).



USB Cable

Connect the USB port of your PC and the Switch using a standard USB cable. A cable with a Type A connector for the PC end, and a Type B connector for the switch end must be used.



Standard USB cables are readily available from a variety of computer stores.

Terminal

The following configuration should be used in HyperTerminal:

Port Settings: 115200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

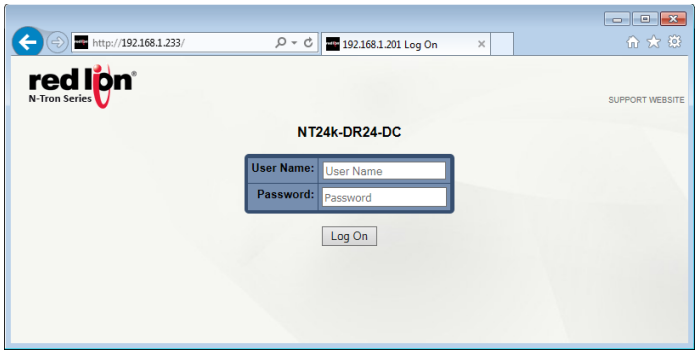
⚠	**WARNING – Explosion Hazard –** The USB connection is for temporary connection only. Do not use, connect, or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion -** La connection USB est pour la connexion temporaire seulement. Ne pas utiliser, connecter ou déconnecter sauf si la zone est connue pour être non dangereuse. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

Cleaning

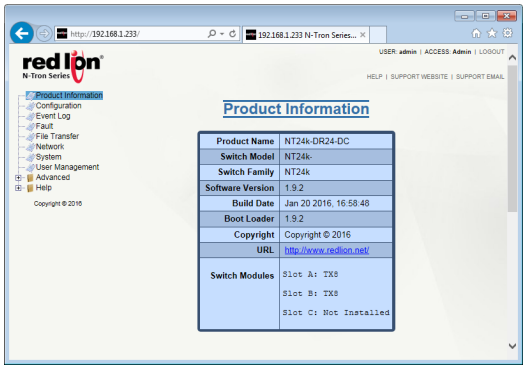
Clean only with a damp cloth. Excess moisture or harsh chemicals can cause damage to the unit.

Chapter 3 Accessing the Web Software Interface

1. Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default by entering 192.168.1.201 as the fallback address.
2. The following login screen will appear.



3. For the User Name, enter: **admin** (all lowercase).
4. For the Password, enter: **admin** (all lowercase).
   Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.
5. Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Please consult the NT24k® Software Guide for configuration options.

Service and Support Information

Service Information

We sincerely hope that you never experience a problem with any of our products. If you do need service, call Red Lion at 1-877-432-9908 for Technical Support. A trained specialist will help you determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RO (Repair Order) can be obtained on the Red Lion website.

Red Lion tracks the flow of returned material with our RO system to ensure speedy service. You must include this RO number on the outside of the box so that your return can be processed immediately.

Be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RO form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Repairs are completed as soon as possible. If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your Red Lion system for future reference.

P.O. #: _____ Date Purchased: _____
Purchased From: _____
Serial Number: _____

Product Support

Technical Support:
Inside US: +1 (877) 432-9908
Outside US: +1 (717) 767-6511
Support: support.redlion.net
Hours: 8:00 am to 6:00 pm EST

Red Lion Controls
35 Willow Springs Circle
York, PA 17406
Website: www.redlion.net

Ordering Information

NT24k® Rackmount

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC / 90-300 VDC power input
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC / 90-300 VDC power inputs
NT24K AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC / 90-300 VDC and 18-49 VDC power inputs
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR16

PART NUMBER	DESCRIPTION
NT24K-DR16-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; redundant 18-49 VDC power input
NT24K-DR16-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR24

PART NUMBER	DESCRIPTION
NT24K-DR24-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; redundant 18-49 VDC power input
NT24K-DR24-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

Port Modules

PART NUMBER	DESCRIPTION
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2 km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550 m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

SFP Transceivers

PART NUMBER	DESCRIPTION	MAXIMUM CAPACITY PER SWITCH	MODULE REQUIRED
NTSFP-FX	100 BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2 km)	Up to 24	NT24k-SFP-DM8
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP luggable mini-GBIC transceiver (LC style connector)	Up to 24	NT24k-SFP-DM8
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver	Up to 16	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

LIMITED WARRANTY

(a) Red Lion Controls Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

(d) **THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a).**

BY INSTALLING THIS PRODUCT, YOU AGREE TO THE TERMS OF THIS WARRANTY, AS WELL AS ALL OTHER DISCLAIMERS AND WARRANTIES IN THIS DOCUMENT.

N-Tron® Series
NT24k® Gigabit Ethernet Switches

Software Guide | February 2024

LP0991 | Revision H

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York, PA 17406

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(UTC/GMT +1 hour)

Website: www.redlion.net
Support: support.redlion.net

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Preface

Disclaimer

This software guide provides guidance on how to use the NT24k®. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

This guide is intended to be used by personnel responsible for configuring and commissioning NT24k devices for use in visualization, monitoring, and control applications. Users of this document are urged to heed warnings and cautions used throughout the document.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- EtherNet/IP™and CIP™ are trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Certifications

Red Lion Controls ensures that this device meets all the ODVA technology and standards guidelines for the Common Industrial Protocol (CIP) for industrial automation.

ODVA CONFORMANT

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at: https://www.redlion.net/support/documentation/user-manuals.

Additional Product Information

Additional product information can be obtained by contacting your local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Chapter 1 Security Best Practices

Introduction

It is more important than ever to secure network devices from unauthorized access, both within and outside of your organization. Red Lion strongly recommends installing managed layer-2 switches behind a secure network firewall in access controlled locations, and immediately changing all default user accounts and passwords, as well as disabling protocols that are not needed in your application.

Protocols and user names with their default passwords are listed in the table below.

PROTOCOLS/USERS	DEFAULT NAME	DEFAULT PASSWORD
User Login	admin	Admin
SNMPv3 User Authentication	initial	Authpass
SNMPv3 User Privacy	initial	Privpass
SNMP v1/v2	read community	Public
SNMP v1/v2	write community	Private
SNMP v1/v2	trap community	public

Some protocols and special devices are enabled by default for the best overall out of the box experience. However, if any in this group will not be used or needed in your network, then these should be disabled to prevent unexpected behavior, unauthorized access or usage. These protocols and special devices are listed in the table below:

PROTOCOLS OR SPECIAL DEVICES
CIP™
SNMP
NTCD
DHCP Client
RSTP
LLDP
N-View™

Managing Local and Remote Access Using 802.1X

Red Lion strongly recommends using 802.1X to manage local and remote access as a best practice for larger installations. 802.1X allows for the management of users, devices, profiles, certificates, and so forth from a single location which also provides a high degree of security.

Default Passwords

User Passwords

The NT24k® ships from the factory with a default ***admin*** user account. Red Lion strongly recommends creating a new user with administrative privileges and then deleting the default ***admin*** user before the unit is deployed.

At a minimum, the default password for the ***admin*** user should be changed.

SNMPv3 Users

The NT24k® ships from the factory with SNMP enabled and a default SNMPv3 user. If SNMP will be used, then Red Lion strongly recommends creating a new SNMPv3 user and then deleting the default ***initial*** SNMPv3 credentials. At a minimum, the default password for the ***default*** user should be changed.

It is strongly recommended that both authentication and privacy protocols are enabled for all v3 users. Setting the option to ***None*** for either protocol is discouraged.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

SNMP v1/v2 Community Names

The NT24k ships with default Community Names for SNMP v1/v2 operation. SNMP v1/v2 traffic per the standard is neither hashed nor encrypted. Therefore, it is Red Lion's recommendation that customers requiring SNMP use SNMPv3, which offers more secure SNMP communication.

If SNMP v1/v2 is required in your application, Red Lion strongly recommends changing the default SNMP credentials before deployment.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

Legacy Protocols

When multiple revisions of a protocol are supported, Red Lion enables the most secure version by default and disables legacy (unsecure) versions of the protocol. We strongly recommend leaving the older revisions disabled.

LEGACY PROTOCOL	SECURE PROTOCOL EQUIPMENT
HTTP	HTTPS
Telnet	SSH

Disabling Unused Protocols and Special Devices

Certain network protocols and special devices are enabled by default for the best overall out of the box experience. However, some of these protocols and devices have the capability of configuring and/or reading network settings or causing unexpected network behavior. These protocols and devices should be disabled when they are not being utilized in your network to prevent unexpected behavior, unauthorized access and/or control of your network and individual network devices.

The following protocols or special devices meet these criteria:

- CIP™
- SNMP
- NTCD (Configuration Device)
- DHCP Client
- RSTP
- LLDP
- N-View™

Chapter 2 Features and Specifications

NT24k® Series Common Features

Red Lion's N-Tron® Series NT24k all-Gigabit managed industrial Ethernet switches are available in rack or DIN-rail mountable configurations. The NT24k platform offers a wide array of port configurations, media types and Power over Ethernet Plus (PoE+) models including Fast Ethernet, Gigabit copper and fiber options. All NT24k switches are plug-and-play installable with Internet Group Management Protocol (IGMP) auto-configuration, media/port auto-detection and simple ring configuration, making the NT24k platform one of the easiest to deploy managed switches in the industry. Housed in rugged hardened enclosures, NT24k switches feature extended shock and vibration specifications, wide operating temperature ratings, and best-in-class ring technology.

Connectivity

The modular NT24k switches are available in 2 or 3 slot configurations. Port modules are hot-swappable. Available modules include 10/100/1000Base Copper, 100Base Fiber, 1000Base Fiber, Gigabit Small Form-factor Pluggable (SFP) Ports and Dual Mode (100Base/1000Base) SFP ports. Modules and SFP transceivers are sold separately. Please reference the N-Tron Series “NT24k Modular Series Hardware & Installation Manual” for available configuration options.

The compact series offers a wide variety of copper and fiber configurations, including all Gigabit copper, Gigabit fiber or SFP ports. IEEE 802.3af/at Power over Ethernet (PoE) models are also available. Please reference the N-Tron Series “NT24k Compact Industrial Managed Gigabit Ethernet Switches Hardware Manual” for more information.

Performance

NT24k-managed switches provide uncompromising performance in harsh environments, including network features like N-Ring™, Virtual Local Area Network (VLAN), Quality of Service (QoS), port mirroring, IGMP, Simple Network Time Protocol (SNTP) and Simple Network Management Protocol (SNMP). IEEE 1588v2 (Precision Time Protocol, or simply PTP) models are also available. Additionally, the NT24k offers IEEE 802.1X with RADIUS remote server authentication to ensure port security. These network management features provide best-in-class visibility, security, and uptime performance.

Environmental

The ultra-reliable NT24k switches are available in rackmount or DIN-rail mountable configurations with operating temperatures from -40 to 85°C. With UL Class I, Division 2 listing and CE certifications, these industrial switches are built to last in the most demanding and hazardous environments.

Monitoring

The N-View™ monitoring technology software provides 47 different status points on switch and port conditions and displays that information on any networked computer.

Security

The NT24k series provides a high level of security by utilizing IEEE 802.1X with RADIUS remote server authentication, MAC address based port security, Hyper Text Transfer Protocol Secure (HTTPS), Secure Shell or Secure Socket Shell (SSH), and SNMPv3 communication protocol to ensure the safest networks.

Refer to the NT24k Hardware Manuals for more information on our Modular and Compact Series.

Overview of Advanced Features

Mode of Operation

Each port on the switch can be configured to support different modes of operation as shown below:

Copper Ports:
- Half-Duplex
- Full-Duplex
- Auto-Negotiation

1000Base Copper or any Fiber Ports:
- Full-Duplex

Half-Duplex

In half-duplex mode, the CSMA/CD media access ports share a common transmission medium. To transmit, a port waits (defers) for a quiet period on the medium (that is, no other port is transmitting) and then sends the intended message in bit-serial form. If, after initiating a transmission, the message collides with that of another port, then each transmitting port intentionally transmits for an additional predefined period to ensure propagation of the collision throughout the system. The port remains silent for a random amount of time (back-off) before attempting to transmit again.

Full-Duplex

Full-duplex operation allows simultaneous communication between a pair of ports using point-to-point media (dedicated channel). Full-duplex operation does not require that transmitters defer, nor do they monitor or react to receive activity, as there is no contention for a shared medium in this mode.

However, a receiving endpoint may request that the transmitting endpoint pause transmission to prevent receive buffer overflow. When the receiving buffer capacity becomes sufficient again, the receiving endpoint will notify the transmitting endpoint that transmission may resume.

Auto-Negotiation

In Auto-Negotiation mode, the port/hardware detects the mode of operation of the port that it is connected to and sets its mode to match.

Port Mirroring

A Mirroring Port is a dedicated port that is configured to forward copies of Ethernet frames that are being sent or received from a monitored port. This is normally only used during troubleshooting and debug of the network. Under normal operation, Port Mirroring is disabled.

Port Trunking

Port Trunking is the ability to group network ports to increase the bandwidth between two machines (e.g., switch or any work station). This feature allows grouping of high-speed connectivity and provides a redundant connection between switches, so that a trunk can act as a single link between the switches.

Quality of Service (QoS)

QoS refers to resource reservation control mechanisms. QoS is the ability to provide different priorities to different applications, users, or data flows. QoS guarantees are important if the network capacity is insufficient, especially for real-time streaming multimedia applications such as Voice over IP, high resolution images, online games and IP-TV, since these often require fixed bit rate and are delay sensitive, and in networks where the capacity is a limited resource, for example in cellular data communication. In the absence of network congestion, QoS mechanisms are not required.

The QoS of an egressing frame can be set based on the three QoS mechanisms listed below:

1. IEEE 802.1p (Tagged QOS)

2. DSCP (differentiated services code points) (RFC 2474)
3. Port (Default Priority)

Virtual Local Area Network (VLAN)

The switch provides support for setting up tagged VLANs. A port may belong to any number of VLANs. The VLAN membership of an end device is determined by the VLAN(s) defined for the port to which the device is connected. If a device should move from one port to another, it loses its current VLAN membership and inherits that of its new port.

VLANs facilitate easy administration of logical groups of devices that can communicate as if they were physically on the same LAN. Traffic between VLANs is restricted unless the ports are explicitly configured as overlapping VLANs. Switches forward unicast, multicast, and broadcast traffic only on LAN segments that serve the VLAN to which the traffic belongs.

A default Virtual LAN (VID=1) exists so if a port is not a member of any other VLAN, it will default back to VLAN 1. This allows the switch to operate as a 'normal' switch when it is used in a network. A port may be automatically removed from the default VLAN when it is reconfigured to belong to another VLAN. By default, the switch will automatically remove a port from the default VLAN when it is reconfigured to another VLAN. See the VLAN configuration section in Chapter 2 for additional information.

If switch ports are configured to transmit and receive untagged frames, then their connected devices are able to communicate throughout the LAN. Using Tagged VLANs, the switch has the ability to take non-tagged packets in some ports, add a VLAN tag to the packet and send it out to tagged ports on the switch. VLANs can also be configured to accept tagged packets in tagged ports, strip the tags off the packets, and then send the packets back out to other untagged ports. This allows a network administrator to set up the switch to support devices on the network that do not support VLAN tagged packets. The administrator can also set up the ports to discard any packets that are tagged or to discard any packets that are untagged, based on a hybrid VLAN of both tagged and untagged ports and by using the VLAN Ingress Filter on the switch.

For each switch port there is one and only one PVID (port VLAN ID) setting. If an incoming frame is untagged and untagged frames are being accepted, then that frame will inherit the tag of the PVID value for that port. Subsequent switch routing and treatment will be in accordance with that VLAN switch map. By configuring PVIDs properly and configuring for all frames to exit untagged, the switch can achieve a 'port VLAN' configuration in which all frames in and out can be untagged, thus not requiring external devices to be VLAN cognizant.

To understand how a VLAN configuration will perform, first look at the port on which the frame enters the switch, then the VLAN ID (VID) (if the frame is tagged) or the PVID (if the frame is untagged). The VLAN defined by the VID or PVID defines a VLAN group with a membership of ports. This membership determines whether a port is included or excluded as to frame egress from the switch.

The NT24k® switch also has the ability to allow overlapping VLANs. Overlapping VLANs give the user the ability to have one or more ports share two or more VLAN groups. For more information and examples on how this could be implemented, refer to the 'VLAN Configuration Examples' in this document, and/or our website's technical documents.

Note: RSTP is only supported on one VLAN.

Rapid Spanning Tree Protocol (RSTP)

Rapid Spanning Tree Protocol as specified in IEEE 802.1D-2004, is supported. One Spanning Tree on one VLAN is supported. (RSTP supersedes the Spanning Tree Protocol (STP) described in IEEE 802.1D-1998.) RSTP establishes a simply connected active network topology from the arbitrarily connected bridges of a bridged network. Bridges effectively connect just the LANs to which their forwarding ports are attached. Ports that are in a blocking state do not forward frames. The bridges in the network exchange sufficient information to automatically derive a spanning tree.

RSTP provides quicker learning of network topology changes than the older STP. RSTP supports new and improved features such as the rapid transition of ports to the forwarding state. While STP transmits BPDUs (Bridge Protocol Data Units) from only the root bridge, RSTP transmits BPDUs from every bridge. RSTP inter-operates with older STP switches by falling back to STP when the older BPDUs are detected on bridge ports. The user can also manually configure bridge ports to use STP, if desired.

SNMP Traps

The NT24k® Series switch supports SNMP Trap Stations to which SNMP Traps will be sent. Four standard SNMP traps are supported: Link Status (Link Up / Link Down), Cold Start, Warm Start, and Authentication Errors. SNMP Traps are sent to all trap stations configured on a given switch when the corresponding trap is enabled.

IGMP Snooping

IGMP Snooping is enabled by default. The switch provides automatic (Plug and Play) IGMP configuration. IGMP snooping provides intelligent network support for multicast applications, reducing unneeded network traffic. IGMP Snooping is configured via the web console and if enabled, operates dynamically upon each power up. Also, there can be manual only or manual and dynamic operation. Note that “static multicast group address” can be used whether IGMP Snooping is enabled or not.

The Internet Group Management Protocol (IGMP) is a protocol that provides a way for a device to report its multicast group membership to adjacent 'routers'. In this case NT24k switches provide router-like functionality. Multicasting allows one computer to send content to multiple other computers that have identified themselves as interested in receiving the originating computer's content. Multicasting can be used to transmit only to an audience that has joined (and not left) a multicast group membership. IGMP version 2 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 2236. IGMP version 1 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 1112. The NT24k series supports v1 and v2.

IGMP Snooping will function dynamically without user intervention. If some of the devices in the LAN do not understand IGMP, then manual settings are provided to accommodate them.

N-Link

The purpose of N-Link is to provide a way to redundantly couple an N-Ring topology to another topology, typically another N-Ring topology. Each N-Link configuration requires 4 switches, two on each network. On the N-Ring network, one switch is the N-Link Master and an adjacent switch is the N-Link Slave. On the connected network, one switch is the N-Link Primary Coupler and another switch is the N-Link Standby Coupler.

N-Link monitors the link status of the Primary and Standby Coupler links. As long as the Primary Coupler link is healthy, N-Link forwards network traffic and the Standby Coupler link blocks network traffic. When a problem is detected on the Primary Coupler link, the Primary Coupler link blocks network traffic and the Standby Coupler forwards network traffic. While the N-Link Master and Slave are in communication via the Control link, only one Coupler link (Primary or Standby) forwards network traffic, while the other Coupler link blocks network traffic.

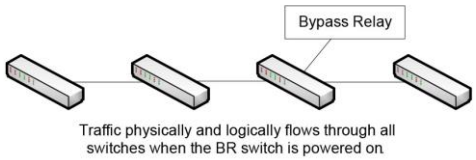
N-Ring™

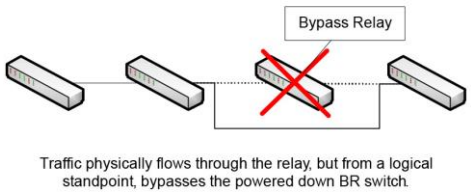
N-Ring is designed for easy setup. Switches are configured for N-Ring membership, by default. Setting a switch as the N-Ring Manager is the only required step for enabling the ring as long as preset ports are used to connect ring members. Subsequently, N-Ring operates dynamically upon each power up. N-Ring technology offers expanded ring size capacity, detailed fault diagnostics, and a standard healing time of 30ms. The N-Ring Manager periodically checks the health of the N-Ring via health check packets. If the N-Ring Manager stops receiving the health check packets, it times-out and converts the N-Ring to a

backbone within 30ms. When using all N-Ring enabled switches in the ring, a detailed ring map and fault location chart is also provided on the N-Ring Manager's web browser. N-Ring status is also sent from the N-Ring Manager to the N-View™ OLE for Process Control (OPC) Server to identify the health status of the ring. Up to 250 N-Ring enabled switches can participate in one N-Ring topology. Switches that do not have N-Ring capability may be used in an N-Ring, however the ring map and fault location chart cannot be as detailed at these locations.

Bypass Relay (BR)

BR ports have an internal hardware technology that forces paired BR ports to create a physical connection when the switch powers down. The BR switch is in bypass mode when it is powered down. This feature allows devices connected via these ports to continue communicating despite the BR switch being powered down.





Note: BR ports are only supported on select NT24k® models. BR-capable equipment is denoted by a "-R" in the model name. Likewise, BR capable ports are denoted by a "-R" in the port description.

Note: Some port protocols and port properties are not supported or may be affected by BR ports.

Affected Port Protocols

802.1X

802.1X security cannot be enabled on BR ports. Allowing this protocol on BR ports will lead to network security issues when the switch enters bypass mode. Therefore, 802.1X security is not allowed.

N-Link

N-Link Coupler and Control ports cannot be selected on BR ports. If BR ports were utilized for these links, there would be connection issues upon the switch entering bypass mode. It is also a best practice to ensure that neither the Master nor Slave Partner ports are connected to a BR port. Unlike the Coupler and Control ports, these ports are not user configured, but are auto-detected by the N-Link protocol. Use extra care when introducing BR equipment into an N-Link topology and avoid using BR ports for the N-Link connections.

N-Ring™

N-Ring Manager, Auto Member, and Multi Member cannot be enabled on BR port sets. N-Ring port sets exclude BR-capable ports.

RSTP

RSTP is disabled on BR ports to prevent unacceptable performance within an RSTP topology.

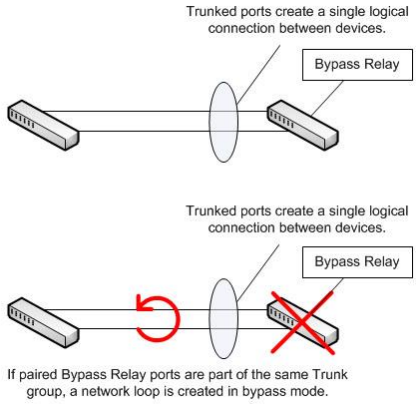
IGMP

Caution must be taken when IGMP is enabled. Devices connected to BR ports must be able to accommodate higher traffic rates. Test your network conditions with the BR switch both powered on and off if IGMP is to be enabled on a BR port.

Affected Port Properties

Port Trunking

BR port pairs cannot be members of the same trunk group to prevent a network loop being created in bypass mode.



VLAN

VLAN group membership must be identical between BR port pairs to ensure proper flow of traffic when the switch enters bypass mode. Caution must also be taken when modifying VLAN tags or filtering VLAN traffic on BR ports to ensure that all devices connected to BR ports can accommodate VLAN traffic whether the BR switch is powered on or powered off.

Note: The VLAN(s) associated with RSTP may contain BR ports, however RSTP will be disabled on the BR ports.

Port Compatibility

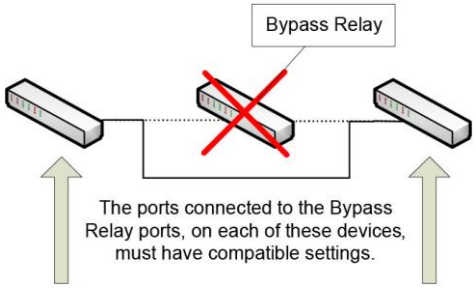
Care should be taken to ensure port characteristics of devices connected via BR ports are compatible, so that there are no interruptions in traffic when a BR switch enters bypass mode.

Ports and/or devices connected to the BR ports must be configured with compatible settings.

The following characteristics should be compatible for devices connected via BR ports:

- Auto-Negotiation
- Port Speed
- Duplex Mode
- Flow Control
- Flow Control
- PVID
- QoS
- Rate Limiting

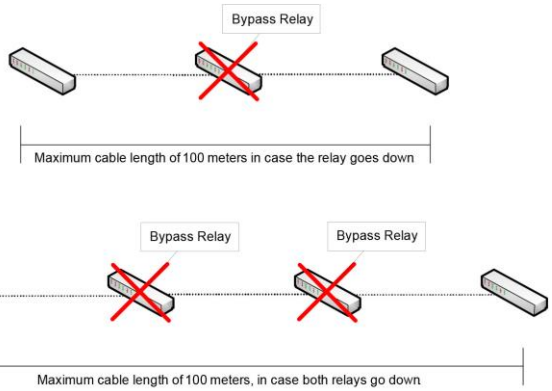
For example, if switches A and B are connected via a BR switch, the connecting port on switch A should have the same configured port speed as the connecting port on switch B. If these ports have incompatible speeds, they may have issues communicating once the switch enters bypass mode.



Note: It is still possible to customize port settings in any configuration desired, based on network requirements. Network testing must be performed to ensure correct network operation whether the switch is powered on or powered off.

Segment Length

Based on IEEE specifications, the maximum segment length for 10/100/1000BaseT(X) is 100 meters (328 ft). This requirement applies to combined segment lengths between all devices connected via BR port pairs. Staying within the IEEE specified segment length ensures proper operation.



CIP™

The CIP (Common Industrial Protocol) feature allows N-Tron® Series switches to directly provide switch information and configuration access to Programmable Logic Controller (PLC) and Human Machine Interface (HMI) applications via a standardized communication protocol. For example, a PLC may be programmed to monitor port links or N-Ring™ status and trigger a status indicator to turn red on an HMI if a port goes link down or if N-Ring has a fault. CIP is formally described in ODVA Publication Number PUB00001 (Volume 1: Common Industrial Protocol (CIP)), and Publication Number: PUB00002 (Volume 2: Ethernet/IP™ Adaptation of CIP). Red Lion created EDS and ICO files are provided with the NT24k® switch series.

Note: Information about using CIP with the NT24k can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family.

PTP

Precision Time Protocol (PTP), IEEE 1588v2, is supported on licensed NT24k models. PTP allows users to configure a network with very accurate, coordinated timing among devices. NT24k models with software implementations of PTP are capable of achieving accuracy in the low microseconds range. PTP is disabled by default and can be enabled as a Boundary or Transparent clock through the Web Browser interface. The switch must have a valid PTP license installed before PTP can be enabled.

Point-to-Point Protocol (PPP)

PPP allows a browser-like interface over the CLI port.

Dynamic Host Configuration Protocol (DHCP)

DHCP (Dynamic Host Configuration Protocol) simplifies network configuration by automatically assigning IP addresses from a DHCP server to connected DHCP capable devices (DHCP clients). NT24k® switch configuration options include:

- DHCP Server
- DHCP Relay Agent
- DHCP Client

DHCP Server

DHCP Server allows DHCP Client devices to automatically obtain an IP assignment. IP assignments can be set up as a dynamic range of IP addresses available to any client device; or specific IP addresses based on the client's Client ID (Option 61), or Relay Agent connection (Option 82). It also allows for a device on a specific port to receive a specific IP address and if the device is replaced, the replacement receives the same IP address as the original device.

DHCP Relay Agent

DHCP Relay Agent (Option 82) allows communication between the client and server to cross subnet and VLAN boundaries.

DHCP Client

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

Event Logging

The switch can be configured to log certain system events as they occur. Event Logging is enabled by default for critical events. Event log options are easily changed through a Web browser.

Even Logging includes:

- System startup and shutdown
- Logon and logout from the Web or Console
- Ports becoming enabled or disabled
- Port link up or link down changes
- N-Ring™ status changes

The most recent log information is visible via the web interface and the complete log file may be exported for external analysis.

Event Log Filter

The Event Log Filter enables the user to define which events are logged, based on severity level. Events that do not meet the minimum severity level for that component are not logged.

Syslog

The Syslog protocol, as specified in RFC-3164 and RFC-5424, are supported. The Syslog allows users to configure the switch so that certain system events (see Event Logging) are transmitted to a remote

logging device, known as a Syslog Collector. The Syslog is disabled by default but can be enabled/disabled through the Web Browser interface.

Local Security

The switch is configured for secure access by the SSH and HTTPS. The Telnet Server and Hypertext Transfer Protocol (HTTP) may be enabled to provide backwards compatibility with less secure clients.

Secure Shell

SSH, is a secure alternative to Telnet. A maximum of two concurrent SSH / Telnet connections are allowed.

The commands SFTP (SSH File Transfer Protocol or Secure File Transfer Protocol) and SCP (Secure Copy) are not supported.

Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the ports that the address is authorized on. A non-authorized MAC address will be discarded and will be listed in the intruder log.

Port security supports RSTP provided the MAC address(es) are manually authorized on the RSTP ports.

LLDP

The Link Layer Discovery Protocol (LLDP), as specified in IEEE 802.1AB and IEEE 802.3-2012, is used by networking devices to advertise there identity and capabilities and to discover their network neighbors. LLDP can be configured in one of three modes: Enabled, Auto and Disabled. The "Auto" mode is an enhancement to the LLDP protocol.

When in Auto mode, LLDP is inactive until a switch sends a wake up packet. At this point, all switches set to Auto mode will become active until the Wake Time interval expires.

Troubleshooting

1. Make sure the Power LED is ON.
2. Make sure sufficient current is supplied to the switch (per model specifications).
   Note: The Inrush current will exceed the steady state current by ~ 2X.
3. Verify that Link LEDs are ON for connected ports.
4. Verify integrity of cabling between stations.
5. Verify that cabling is Category 5E or greater for 100Mbit and Gigabit operation.

Chapter 3 Web Software Configuration

Accessing the Web Software Interface

Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default with 192.168.1.201 as the fallback address.

The following login screen will appear:



- For the User Name, enter: **admin** (all lowercase)
- For the password, enter: **admin** (all lowercase)

Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.

Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Organization

After logging onto a NT24k® switch, the Product Information page will be displayed. On the left-hand side of the screen is a list of configurable settings supported by the NT24k switch. Below is a list of these settings with a description of their purpose.



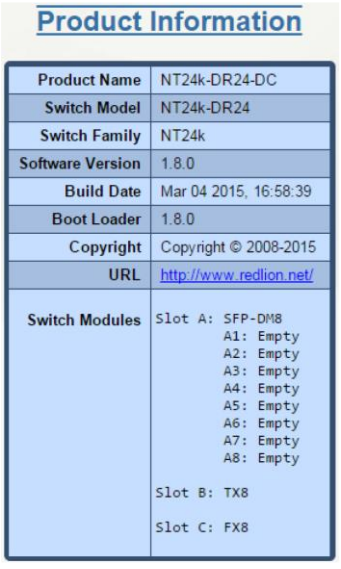
- **Product Information:** Basic information about the switch is provided in this menu.

- **Configuration:** The Configuration page is used to save or reset a running configuration.
- **Event Log:** The Event Log page is used for modifying and viewing the internal event logs.
- **Fault:** A fault is a notification of a destabilizing event. Which events are watched for and how notifications occur are configured on the Fault page.
- **File Transfer:** The File Transfer page provides the administrator the ability to upgrade the firmware or to import or export a configuration file, and export the Event Log to a file.
- **Network:** The network page is used to setup the device's IP and IP Fallback addresses, as well as Client ID and IP Configuration.
- **System:** The System page provides information pertaining to the whole system.
- **User Management:** The User Management page is used to view, add, modify and remove system user accounts, and set permissions.
- **Advanced:** The Advanced section is used to setup advanced features of the system.
- **Help:** The Help section is used to display information on configuring and monitoring the manageable parameters of the device. Specific help can be found by using the left navigation menu.

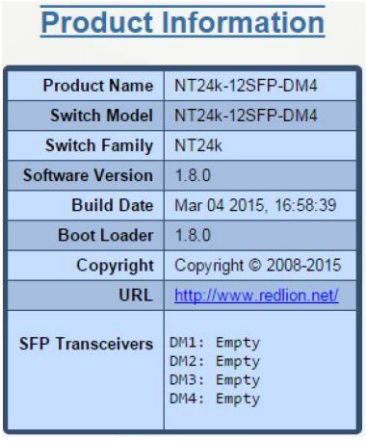
Product Information

Once a user logs onto an NT24k® switch, the Product Information page is displayed. This page shows basic information about the switch and can also be accessed by selecting the Product Information menu item on the left-hand menu.

Modular Models



Compact Series



Product Name: The full name of the switch, including any factory configured options will be displayed in this field.

For example, the product name will show NT24K-AC1 if there is one AC power unit in either location and NT24K-AC2 if there are two AC power units. If the product name ends with DC1 or DC2, this indicates that there is either one or two DC power units.

Switch Model: The base model of the switch.

Switch Family: The switch family this model and similar models belong to.

Software Version: The current firmware software version.

Build Date: The build date of the firmware.

Boot Loader: The boot loader version.

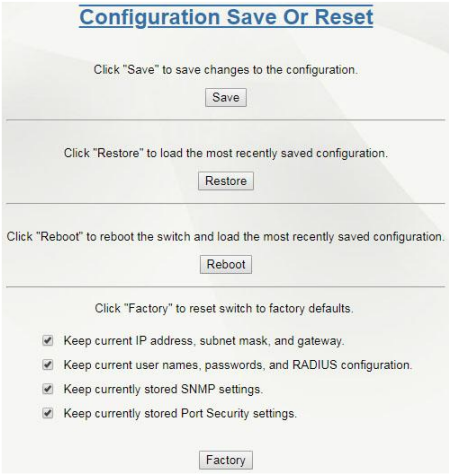
URL: This field links to Red Lion's website.

Switch Modules: The modules currently installed, including installed SFP transceivers. This option may not be present on models where modules or SFPs are not supported.

SFP Transceivers: On models where SFP transceivers are supported, the currently installed SFP transceivers will be shown in this field.

Configuration

The Configuration page allows the Administrator to save a running configuration in the switches non-volatile memory. This step is required if the switch is to remember any configuration changes after a power cycle or reboot. From this page, the Administrator can also restore a previously saved configuration, restore factory defaults or force a system reboot.



Save: Click on the *Save* button to save all current changes to the configuration stored in non-volatile memory for use after the next power cycle or reboot. If a configuration device is installed and enabled, the configuration will also be saved to the device. This option is only available when there is no misconfiguration.

Restore: Click on the *Restore* button to discard all unsaved changes and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Reboot: Click on the *Reboot* button to reboot the switch and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Factory: Click on the *Factory* button to reset the switch's configuration to factory defaults except for any of the selected items. Selecting the Factory option will only affect the current configuration. A *Save* must be performed in order to retain these changes after a power cycle or reboot.

- **Keep current IP address, subnet mask, and gateway:** Retains the existing IP address, subnet mask and gateway if desired.
- **Keep current user names, passwords, and RADIUS configuration:** Retain the existing user names, passwords, and RADIUS configuration if desired.

- **Keep currently stored SNMP settings:** Retains the existing SNMP settings if desired.
- **Keep currently stored Port Security settings:** Retain the existing Port Security settings if desired.
- **Keep current PoE Settings:** Retains the existing PoE settings if desired (PoE models only).

Note: When the configuration is loaded from the Configuration Device, it must be saved for it to be available if the Configuration Device is removed.

Note: When the switch is shipped, it does not have a "configuration file" since the unit is using the factory defaults. Before a configuration can be customized, click on the Save button in order to create the file.

Configuration Fault

When the switch is booted and misconfigured settings are detected, a Configuration Fault will be triggered and the configuration may not be saved. This can occur when updating system firmware where settings permitted in the previous release may no longer be permitted. In this case, the *Save* button will be replaced with a *Show Errors* button (as seen below) and the misconfigured settings must be fixed before the configuration may be saved.

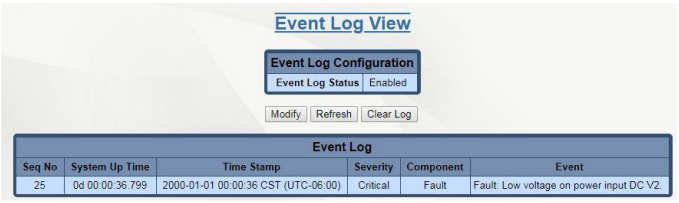


Show Errors: Click on the Show Errors button to view the current configuration and display any detected errors. This button is only visible when there is a settings misconfiguration.

Event Log

The Event Log View page displays the most recent 200 events that have occurred since the latest system startup or since the log was cleared. Event logging is enabled by default for critical events. Only events that occur while the Event Log was enabled will be displayed and saved with the exception of the Clear Log message which will always be displayed. Therefore, previously enabled events are still displayed when Event Logging is disabled albeit they may not be recent events.

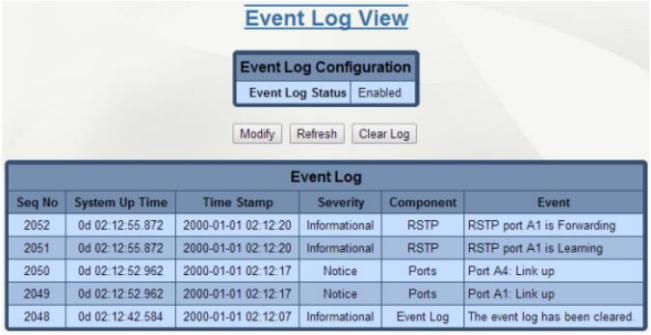
If the Event Log was disabled when the latest Startup event occurred, no events will be displayed as shown below.



When the Event Log is cleared, an informational event will be displayed.

Note: All enabled events since the last Clear Log event, including multiple Startup and Shutdown events, are stored on the system and may be exported as a CSV file from the switch for additional analysis.

Note: The event log can contain 2000 or more entries depending on individual message size. If the event log becomes full, new entries will overwrite the oldest entries.



A normal startup or reboot will show startup, RSTP status, N-Ring™ and logon events. An example reboot is shown below.

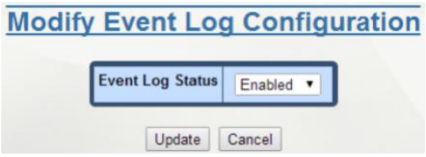


Modify: Display the Modify Event Log Configuration page.

Refresh: Refresh the current Event Log display.

Clear Log: Remove all entries from the event log and then add “The event log has been cleared.” message.

The Modify Event Log Configuration page controls whether Event Logging is Enabled or Disabled.

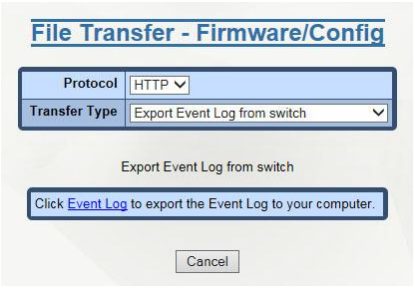


Event Log Status: Select Enabled/Disabled.

Update: Set the new Event Log Status.

Cancel: Return to Event Log View without modifying Event Log Status.

The entire Event Log may be exported to the host PC for further analysis and archiving purposes. It will contain all events that occurred while Event Log was enabled since the last Clear Log event.



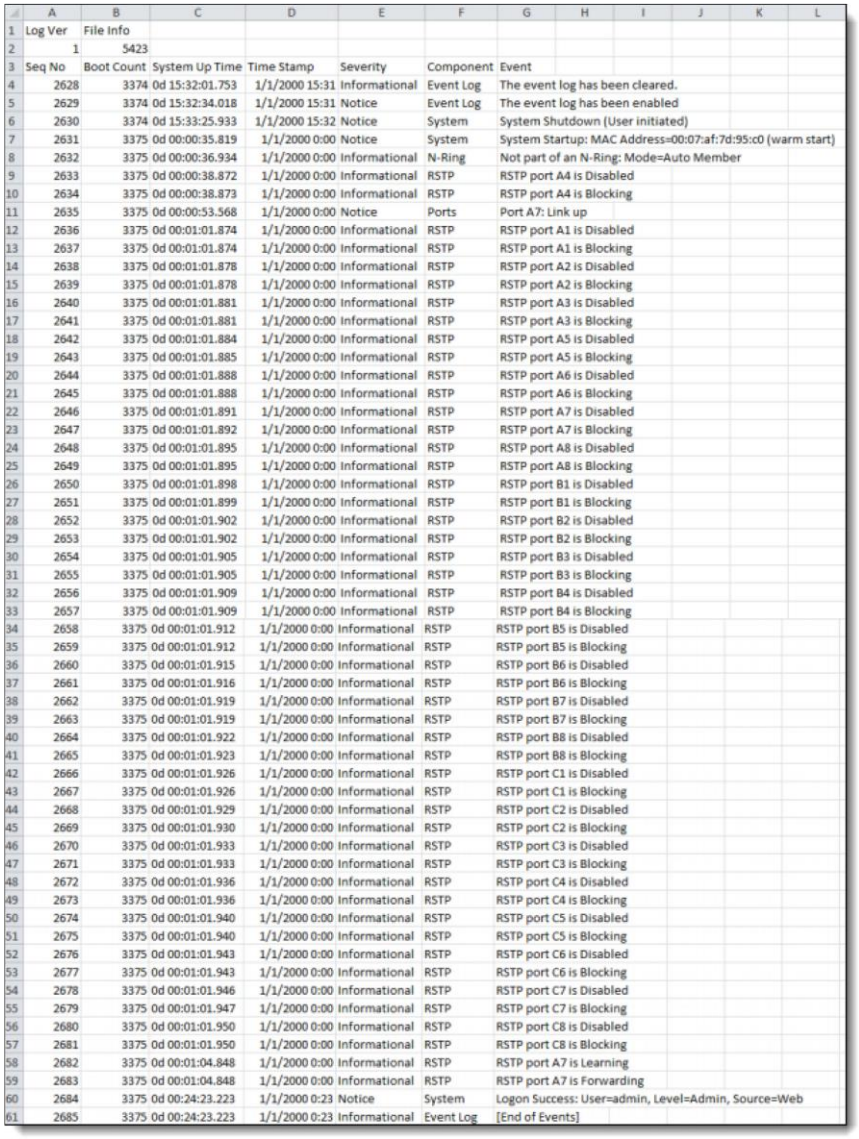
On the File Transfer - Firmware/Config page, select Transfer Type: Export Event Log from switch.

Click on Event Log in the Export Event Log from switch panel, and select the storage location for the exported file on the PC.

The default file name is “eventlog.csv”, which outputs each line in the Event Log as comma separated fields with the final text field surrounded by quotation marks. This file can be viewed with a spreadsheet application or a simple text file viewer.

The Cancel button selection will return to the Product Information page without executing any transfers.

Example Event Log CSV in Microsoft Excel:



	A	B	C	D	E	F	G
1	Log Ver	File Info					
2	1	5423					
3	Seq No	Boot Count	System Up Time	Time Stamp	Severity	Component	Event
4	2628	3374	0d 15:32:01.753	1/1/2000 15:31	Informational	Event Log	The event log has been cleared.
5	2629	3374	0d 15:32:34.018	1/1/2000 15:31	Notice	Event Log	The event log has been enabled
6	2630	3374	0d 15:33:25.933	1/1/2000 15:32	Notice	System	System Shutdown (User initiated)
7	2631	3375	0d 00:00:35.819	1/1/2000 0:00	Notice	System	System Startup: MAC Address=00:07:af:7d:95:c0 (warm start)
8	2632	3375	0d 00:00:36.934	1/1/2000 0:00	Informational	N-Ring	Not part of an N-Ring: Mode=Auto Member
9	2633	3375	0d 00:00:38.872	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Disabled
10	2634	3375	0d 00:00:38.873	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Blocking
11	2635	3375	0d 00:00:53.568	1/1/2000 0:00	Notice	Ports	Port A7: Link up
12	2636	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Disabled
13	2637	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Blocking
14	2638	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Disabled
15	2639	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Blocking
16	2640	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Disabled
17	2641	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Blocking
18	2642	3375	0d 00:01:01.884	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Disabled
19	2643	3375	0d 00:01:01.885	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Blocking
20	2644	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Disabled
21	2645	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Blocking
22	2646	3375	0d 00:01:01.891	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Disabled
23	2647	3375	0d 00:01:01.892	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Blocking
24	2648	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Disabled
25	2649	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Blocking
26	2650	3375	0d 00:01:01.898	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Disabled
27	2651	3375	0d 00:01:01.899	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Blocking
28	2652	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Disabled
29	2653	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Blocking
30	2654	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Disabled
31	2655	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Blocking
32	2656	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Disabled
33	2657	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Blocking
34	2658	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Disabled
35	2659	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Blocking
36	2660	3375	0d 00:01:01.915	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Disabled
37	2661	3375	0d 00:01:01.916	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Blocking
38	2662	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Disabled
39	2663	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Blocking
40	2664	3375	0d 00:01:01.922	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Disabled
41	2665	3375	0d 00:01:01.923	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Blocking
42	2666	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Disabled
43	2667	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Blocking
44	2668	3375	0d 00:01:01.929	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Disabled
45	2669	3375	0d 00:01:01.930	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Blocking
46	2670	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Disabled
47	2671	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Blocking
48	2672	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Disabled
49	2673	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Blocking
50	2674	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Disabled
51	2675	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Blocking
52	2676	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Disabled
53	2677	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Blocking
54	2678	3375	0d 00:01:01.946	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Disabled
55	2679	3375	0d 00:01:01.947	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Blocking
56	2680	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Disabled
57	2681	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Blocking
58	2682	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Learning
59	2683	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Forwarding
60	2684	3375	0d 00:24:23.223	1/1/2000 0:23	Notice	System	Logon Success: User=admin, Level=Admin, Source=Web
61	2685	3375	0d 00:24:23.223	1/1/2000 0:23	Informational	Event Log	[End of Events]

Where the fields are:

Sequence Number: Each entry is assigned the next sequence number – these may not always be listed in numerical order due to the priority of the internal tasks which generate the events.

Note: The "[End of Events]" message at the end of the file will contain the next sequence number, but that number will be reused for the next system event on the switch when it occurs.

Boot Count: A count of how many times the switch has been powered up or restarted.

System Up Time: The amount of time since the system was started in days, hours, minutes, seconds, milliseconds.

Time Stamp: Corresponding date, hours, minutes, seconds, based on the initial value of Current System Time as defined in the System Configuration View.

Severity: (most severe to least severe):

Emergency: Major failure, Immediate intervention required

Alert: Failure of a component, Immediate corrective steps should be taken
Critical: Partial failure of a component, Immediate corrective action should be taken
Error: Non-urgent failure
Warning: Not an error, but may lead to an error if action is not taken
Notice: Unusual event, but not an error
Informational: General Information
Debug: Information useful to a support technician for debugging the switch operation.

Component: Internal component that generated the event entry.

Event Description: Description of the event entry.

Fault

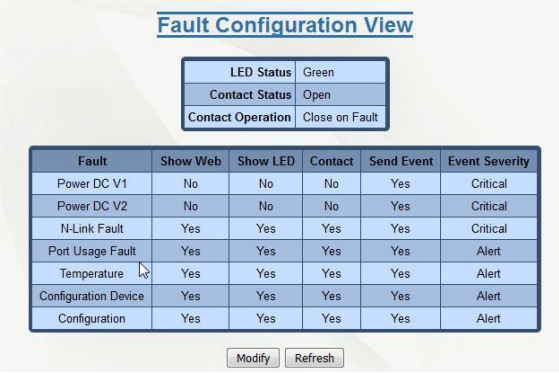
The Fault page provides configurable selections indicating the different ways to notify an administrator when a fault occurs. In each case, the notification may consist of any combination: Show Web, Show LED and/or Contact. Some fault configurations are only available under specific conditions. For example, Power AC is only available when an AC power supply is installed in the switch. N-Ring™ faults are only available when the switch is set to N-Ring Manager mode. The page below is an example of what may be seen on the Fault dialog window.

Additionally, when a fault is triggered, an event may be generated at the severity selected by the user. The event will be logged unless it is filtered by the Event Log Filter.

The event's severity can be set to any of the following values.

Note: These are based on the Event Log's Severity:

Emergency
Alert
Critical
Error
Warning
Notice
Informational
Debug



LED Status: This field shows the current color of the Power/Fault LED. Green indicates there is no fault and Red indicates a fault condition exists.

Contact Status: This field shows the current open/closed status of the fault relay.*

Contact Operation: This field determines if the fault relay is normally open (Close on Fault) or normally closed (Open on Fault).*

Show Web: If the *Show Web* option is enabled, the fault is displayed on the browser pages.

Show LED: If the *Show LED* option is enabled, the fault is indicated on the Power LED as red.

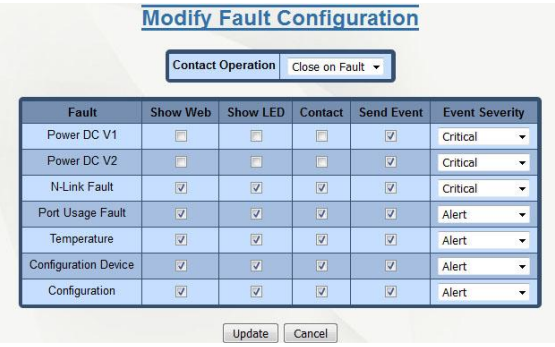
Contact: If *Contact* is enabled, the fault is indicated by opening or closing the contact switch.

Send Event: The fault is sent to the configured log(s). See the Event Log and Syslog configuration.

Event Severity: The fault will generate an event based on the configured severity level.

To make changes to the *Fault Configuration* settings, click on the *Modify* button.

* **Note:** Fault's contact is only supported on certain NT24k® switches.



Select the desired notification settings and click on the *Update* button to save any changes. Once the save is complete, the dialog window will change to Fault Configuration.

Power Fault Descriptions

The location of a power input is clearly marked on the device. Depending on the specific device configuration, some of the faults listed below may not be shown.

Note: Power Fault notifications are disabled in factory defaults on a low voltage power supply.

Power AC1: Indicates a low voltage on power input AC1.
Power AC2: Indicates a low voltage on power input AC2.
Power DC V1: Indicates a low voltage on power input DC V_1.
Power DC V2: Indicates a low voltage on power input DC V_2.
Power DC V3: Indicates a low voltage on power input DC V_3.
Power DC V4: Indicates a low voltage on power input DC V_4.

N-Ring™ Manager Fault Descriptions

The faults listed below appear when the switch is configured as an N-Ring manager.

N-Ring Broken: Indicates that an N-Ring connection is completely broken.
N-Ring Partial Break (High): Indicates that an N-Ring connection is only broken in the direction of the higher port.
N-Ring Partial Break (Low): Indicates than an N-Ring connection is only broken in the direction of the lower port.
N-Ring Multiple Managers: Indicates that more than one N-Ring Manager exists on an N-Ring.

Miscellaneous Fault Descriptions

N-Link Fault: Indicates a problem with the N-Link configuration.
Port Usage Fault: Indicates that the port usage, for one or more ports, is below the Usage Alarm Low setting, or above the Usage Alarm High setting (see Port Configuration View and Port Utilization View).
Temperature: Indicates that the temperature of the switch is outside of the configured limits.
Configuration Device: Indicates that the configuration on an installed configuration device is invalid.
Configuration: Indicates that a setting misconfiguration needs to be resolved.

File Transfer

File Transfer gives the administrator the ability to import files to the switch or export files from the switch.

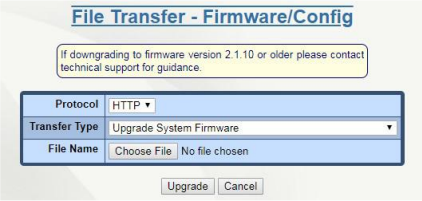
Note: Do not cycle power on the switch or interrupt the data connection between the PC and the switch while a file is being transferred.

Protocol: Select whether HTTP, HTTPS, or TFTP protocol is to be used for transfers.

Transfer Type: The different types of transfer that can be used are listed in the drop-down list. The options are: Upgrade System Firmware, Upgrade BootLoader Firmware, Import Configuration to Switch, Import Port Security Authorization List to Switch, Import License to Switch, Export Saved Configuration from Switch, Export Saved Port Security Authorization List from Switch, and Export Event Log from Switch.

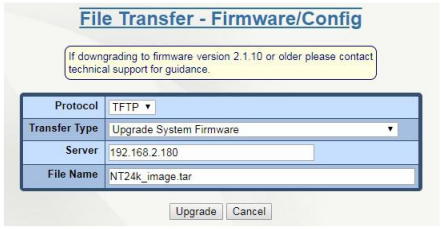
Upgrade System Firmware: Select this option to install the system firmware to the switch.

HTTP/HTTPS Protocol



File Name: Click on the *Browse* button to browse to the desired location and select an image file (typically called NT24k_image.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server. It is automatically populated with the IP address of the PC which is connected to the switch.
File Name: This field displays the name of the file to be imported (typically NT24k_image.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

WARNING: Due to security enhancements, downgrading the system firmware to 2.1.10 or older will reset all passwords to “password” (users and administrators). The Administrator should immediately change each user’s password and notify the user.

Upgrade BootLoader Firmware: Select this option to install the bootloader firmware.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select an image file (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



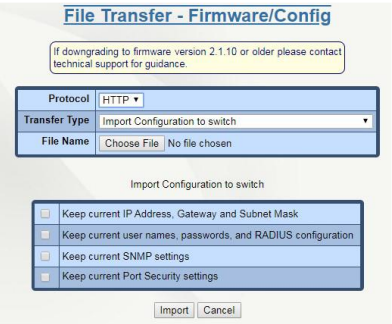
Server: This field displays the IP address of the TFTP server.
File Name: This field displays the name of the file to be imported (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

Import Configuration to Switch: Select this option to change the switch configuration by importing a configuration file.

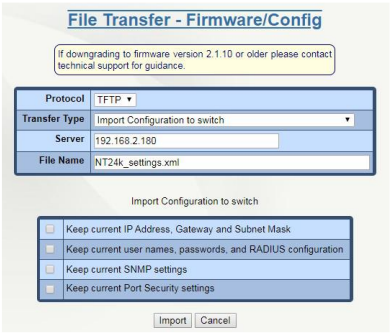
HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a configuration file (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

Import Port Security Authorization List to Switch: Select this option to change the Port Security Authorization List by importing a configuration file.

HTTP/HTTPS Protocol



File Name: Click on the Choose File button to browse to the desired location and select a configuration file (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

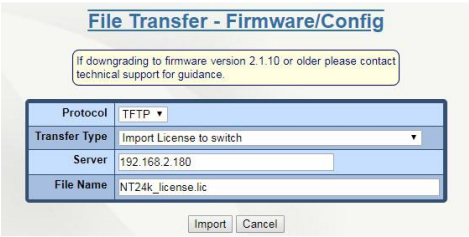
Import License to Switch: Select this option to install a license to the switch by importing a license file.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the license.

*The same file transfer dialog box is used for both HTTP and HTTPS.

Import Security Certificate to Switch:

HTTP/HTTPS Protocol



Certificate File Name: Click on the Choose File button to browse to the desired location and select a certificate file (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: Click on the Choose File button to browse to the desired location and select a key file (typically key.pem). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

Certificate File Name: This field displays the name of the file to be imported (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: This field displays the name of the file to be imported (typically key.pem). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the Security Certificate.
*The same file transfer dialog box is used for both HTTP and HTTPS.

Note: After successfully transferring a new Security Certificate to the switch, the switch must be rebooted.

Export Saved Configuration from Switch: Select Export Saved Configuration from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Configuration Settings* link to export the settings to your computer. This option allows administrators to back up their configurations to an offsite server in case a custom configuration must be reloaded at a later time.

A download dialog pop-up will appear, prompting the user to open or save the configuration file. The file is called *NT24k_settings.xml* per default.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_settings.xml). File names are limited to 63 characters maximum.

Click on the *Export* button to export the settings to the specified TFTP server.

Export Saved Port Security Authorization List from Switch: Select Export Saved Port Security Authorization List from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Port Security Authorization List* link to export the authorization list to your computer. This option allows administrators to back up their Port Security Authorization List.

A download dialog pop-up will appear, prompting the user to open or save the authorization file. The file is called *NT24k_portsecurity.auth* per default.

TFTP Protocol



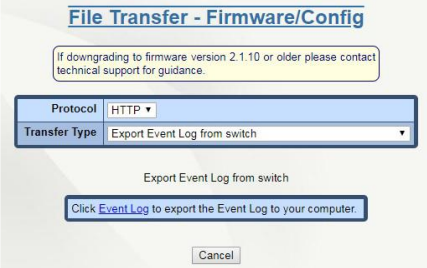
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_portsecurity.auth). File names are limited to 63 characters maximum.

Click on the *Export* button to export the configuration file to the specified TFTP server.

Export Event Log from switch: The entire Event Log may be exported to the host PC for further analysis and archiving purposes. The log file lists all events that occurred while event logging was enabled and since the last Clear Log event was performed.

HTTP/HTTPS Protocol



Click on the *Event Log* link to export the log file to your computer. A download dialog pop-up will appear, prompting the user to open or save the configuration file.

TFTP Protocol



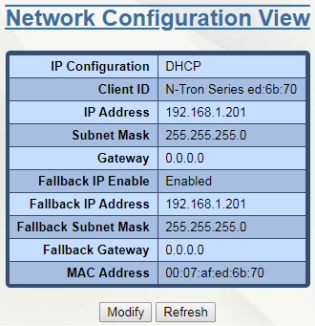
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically eventlog.csv). File names are limited to a maximum length of 63 characters.

Click on the *Export* button to export the log file to the specified TFTP server.

Network

Setting the IP Configuration to DHCP will use the Primary Management VLAN ports to receive an IP address from the DHCP Server. Changes to the Primary Management VLAN are made in the VLAN section. If no changes are made, the default VLAN will be used as the default Primary Management VLAN.



IP Configuration: Determines the method used to obtain an IP address, Subnet Mask, and Gateway address. When Static is selected, the statically configured values are used. When DHCP is selected, DHCP protocols are used to obtain these values.

Client ID: This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters. (Only shown in DHCP Mode) The DHCP option 61 client identifier will be sent with a preceding type-byte as listed below:

MAC Address = 0x01
Switch Name = 0x00 (Default)
Other String = 0x00
Other HEX = 0x00

IP Address: Contains the current IP Address of the device.

Subnet Mask: Contains the current Subnet Mask of the device.

Gateway: Contains the current Gateway of the device.

Fallback IP Enable: Enables/disables the use of the Fallback IP address.

Fallback IP Address: Contains the configured Fallback IP address of the device. This address will be used if the switch fails to obtain a DHCP address from the DHCP Server. This option is only shown in DHCP Mode and if Fallback IP is enabled.

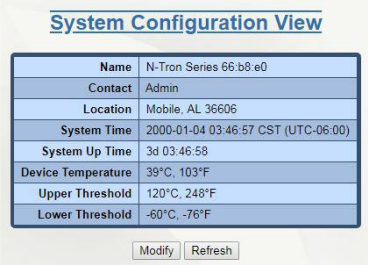
Fallback Subnet Mask: Contains the configured Fallback Subnet Mask of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

Fallback Gateway: Contains the configured Fallback Gateway of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

MAC Address: MAC Address of the device.

To modify any of the fields, click on Modify. Enter the desired system settings and click on the *Update* button.

System



The System page presents the user with current system information.

Name: Contains the name assigned to the device, which allows alphanumeric and special characters (,#_-:) only. When IP Configuration is DHCP, then this may be used as the Client ID (Option 61) of the DHCP Request.

Contact: The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters (,#_-) are allowed.

Location: The physical location of the switch. Only alphanumeric and special characters (,#_-) are allowed.

System Time: Displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start.

System Up Time: Parameter represents the total time elapsed since the switch was turned on or rebooted.

Device Temperature: The device temperature reported by the on-board digital temperature sensor. This option is only shown on devices with temperature sensors.

Upper Threshold: The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in degrees Celsius. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Lower Threshold: The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in Celsius degrees. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Power DC V1: The voltage measurement on power input DC V1. This option is only shown on devices with a voltage sensor.

Power DC V2: The voltage measurement on power input DC V2. This option is only shown on devices with a voltage sensor.

Total Current: The total input current measurement in Amps. This option is only shown on devices with a current sensor.

Total Power: The calculated power in Watts obtained from voltage and current measurements. This option is only shown on devices with a voltage and current sensor.

To make modifications to the fields above, click on the Modify button. Enter the desired settings and click on the *Update* button.

Bridging

Aging Time

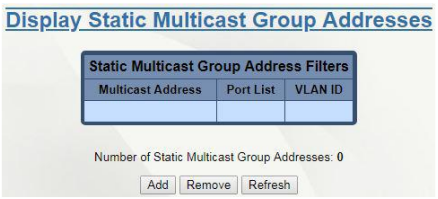
The Aging menu item under the Bridging category displays the currently configured Aging Time. This configurable field shows the desired aging time for dynamically learned MAC addresses. Inactive MAC addresses will be removed from the Hardware Address Entry Table after the aging time period has expired. The internal aging time period will be between 1 and 2 times the selected aging time value.



To modify the Aging Time field, click on the Modify button. Enter the desired Aging Time (value must be between 10 - 630 seconds) and click on the *Update* button. The default value for this field is 300 seconds. To save the changes made, return to the Configuration menu and click on the *Save* button.

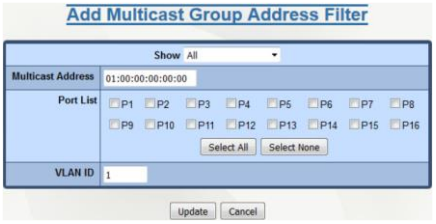
Multicast Addresses

The Multicast Addresses page displays a list of Multicast Group Addresses that are associated with respective port numbers.



Adding a Multicast Group Address

To add a Multicast Address, click on the Add button and the following dialog window will appear:



Enter a valid Multicast Group Address and VLAN ID, then select the port(s) to which matching packets will be directed.

Click on the *Update* button to return to the Display Static Multicast Group Addresses page.

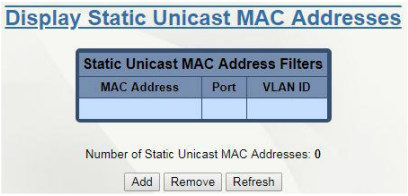
To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Multicast Group Address

To remove a Multicast Address, click on the *Remove* button. A listing of available Multicast Group Addresses will appear. Click on the *Delete* button to remove an address.

Unicast Addresses

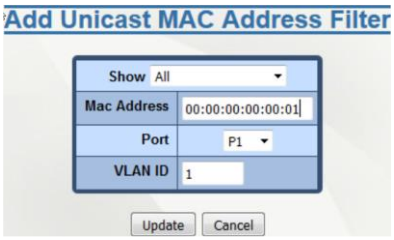
The Unicast Addresses dialog window displays a list of MAC addresses that are associated with each respective port number. This can be used to statically assign a MAC address access to a single port on the switch.



Adding a Unicast Address

To add a Unicast Address, click on the Add button and the following dialog window will appear:

Enter a valid MAC address and VLAN ID, then select the port to which matching packets will be directed.



Click on the Update button to add the unicast address and return to the Display Static Unicast MAC Addresses dialog window.

To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Unicast MAC Address

To remove a Unicast Address, click on the *Remove* button and a dialog window with a listing of available Unicast MAC Addresses will appear. Click on the *Delete* button to remove the MAC Address and return to the *Display Static Unicast MAC Addresses* dialog window.

CIP™

EtherNet/IP™, better known as the Common Industrial Protocol (CIP), was designed for use in process control and industrial automation applications. CIP was designed to provide consistent device access to eliminate the need for vendor specific software for configuration and monitoring of their devices.

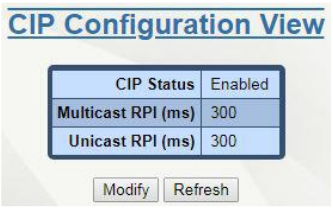
N-Tron® switches with CIP support can be used to communicate with other industrial devices.

Note: Information about using CIP with the NT24k® can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family. This manual can be found on the Red Lion website.

Configuration

The CIP Configuration View dialog window displays the CIP status as well as the Multicast and Unicast RPIs (Requested Packet Interval).

Click on the *Modify* button to make changes to the CIP Configuration:



CIP Status: This field determines whether CIP is enabled or disabled on the NT24k switch. The default setting is Enabled.

Multicast RPI: The minimum Requested Packet Interval for Class 1 (multicast) connections in milliseconds is shown in this field. Requests for less than this value will be rejected. The default value for this option is 300 ms. The available range is 300 - 300,000.

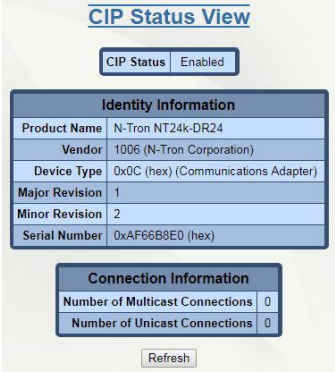
Unicast RPI: This field shows the minimum Request Packet Interval for Class 3 (unicast) connections in milliseconds. Requests for less than this value will be rejected. The default value for this field is 300ms. The available range is 300 - 300,000.

Click on the *Update* button once the desired information is entered and to return to the *CIP Configuration View* dialog window. To save the changes made, return to the Configuration menu and click on the *Save* button.

Status

The Status menu item displays the CIP status. The switch status and partner status information will be shown.

Example CIP™ Status View showing a Connection Summary table with one Multicast connection:



Identity Information

Product Name: This field displays the Switch Model Number.

Vendor: This field shows N-Tron®'s ODVA Ethernet/IP™ Vendor ID (1006).

Device Type: This field displays that the ODVA device type is Communications Adapter (0x0C hex).

Major Revision: This field displays the major revision of the CIP implementation.

Minor Revision: This field shows the minor revision of the CIP implementation.

Serial Number (hex): This field shows the CIP serial number, which is unique across all N-Tron CIP devices. The number shown is the last 4 octets of the base switch MAC address.

Connection Information

Number of Multicast Connections: This field shows the current number of CIP Ethernet/IP class 1 (multicast) connections.

Number of Unicast Connections: This field displays the current number of CIP Ethernet/IP class 3 (unicast) connections.

Connection Summary

Transport Class: This field displays the Transport class for the connection, such as class 1 (multicast) or class 3 (unicast).

Connection State: This field indicates the state of the connection (established, timed out, closing or configuring).

RPI: The field displays the Requested Packet Interval in milliseconds.

Config Assembly: This field shows the configuration assembly number.

Output Assembly: This field displays the Output assembly number (the assembly that is sent out from the switch).

Input Assembly: This field displays the input assembly number (the assembly that is received into the switch).

Peer Address: This field shows the peer IP address of the device connected to the switch.

EIP Indicators

The module status indicator shows the current status of the switch. The network status indicator shows the status of the EtherNet/IP™ network interface. These indicators are located on the back of the rack mount version of the switch or on the front of the CPU module on the DIN-Rail versions of the switch.

Module Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	No power	The switch is not powered up.
Steady Green	Device operational	The switch is operating normally.
Flashing Green	Standby	The switch has not been configured for CIP™ operations.
Flashing Red	Minor fault	A recoverable minor fault has occurred.
Steady Red	Major fault	A non-recoverable major fault has occurred.

Network Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	Not powered, no IP address	The switch is not powered up, or an IP address has not been configured.
Flashing Green	No connections	An IP address is configured, but no connections have been established.
Steady Green	Connected	A connection has been established
Flashing Red	Connection timeout	A connection has timed out.

DHCP Client Configuration

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

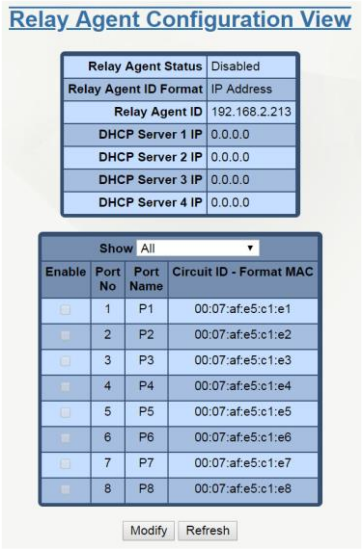
Refer to Network for enabling DHCP Client mode.

DHCP Relay Agent Configuration

A relay agent, configured via the Relay Agent Configuration View, provides a way for DHCP client requests to reach DHCP servers, including those that reside on a different subnet and/or VLAN.

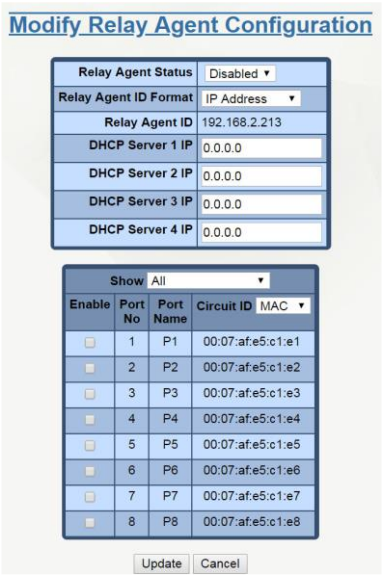
Note: DHCP traffic is sent and received only on Management VLANs.

View Page



Click on the *Modify* button to open the DHCP Server Configuration Modification page.

Modify Page



Click on the *Update* button to apply the changes.

Relay Agent Status: Indicates whether the DHCP relay agent is active. The default is Disabled.

Relay Agent ID Format: The format selector with options for IP address, MAC address, Client ID, Other String, or Other Hex characters.

Relay Agent ID: A unique identifier that designates this relay agent switch.

DHCP Server 1-4 IP: The configured IP address of the DHCP servers.

Enable: Indicates whether relay agent functionality is enabled for the port.

Port No: The number of the port. This field is read-only.

Port Name: The descriptive name of the port. This field is read-only.

Circuit ID: When enabled, the Circuit ID for the port can be specified. By default, the Circuit ID is set to the MAC Address of the port. Circuit IDs must be unique for each port.

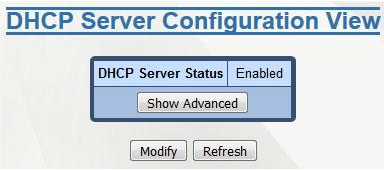
Circuit ID Format: The format selector with options for MAC, Hex, and String.

DHCP Server Configuration

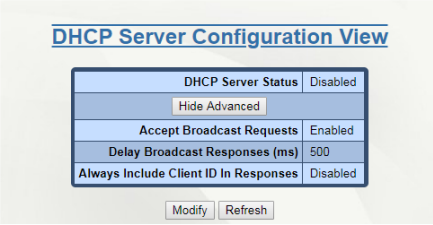
The DHCP Server provides IP addresses to DHCP clients on the same subnet or VLAN. DHCP traffic is sent and received only on Management LANs.

Note: A DHCP Relay Agent is required, to provide an IP address to clients on a different subnet or VLAN.

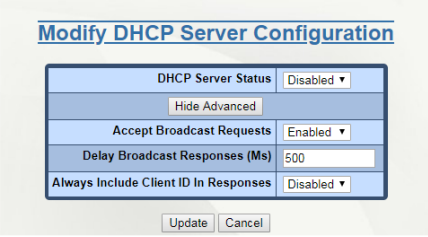
The following screen shows the Advanced configuration hidden:



The following screen shows the Advanced configuration unhidden:



Click on the *Modify* button to open the DHCP Server Configuration Modification page.
Click on the *Update* button to apply the changes.



DHCP Server Status: Indicates whether the DHCP server is active. The default is Disabled.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Accept Broadcast Requests: Indicates whether the DHCP server will process broadcast messages. Typically, client requests are broadcast and relay agent requests are unicast. When enabled, the server will respond to broadcast requests. When disabled, the server will ignore broadcast requests. The default is Enabled.

Delay Broadcast Responses (Ms): The amount of time (in milliseconds) that the DHCP server will delay the processing of a broadcast message. This setting is used when clients and relay agents are on the same subnet and/or VLAN. A delay provides the opportunity for relay agent requests to be honored before client requests. This setting only applies when Allow Broadcast is Enabled. The range is 0-2500 and the default is 500.

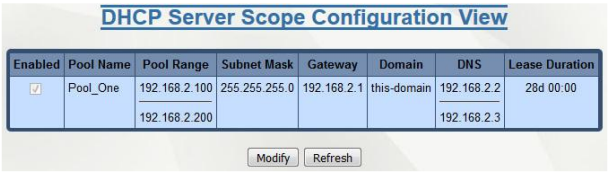
Always Include Client ID In Responses: Indicates whether the DHCP Server will always respond to the client with the Client ID in the frame. This should be disabled for a network that is non-compliant to the RFC- 6842(2013). The default is Disabled.

DHCP Server Scope Configuration

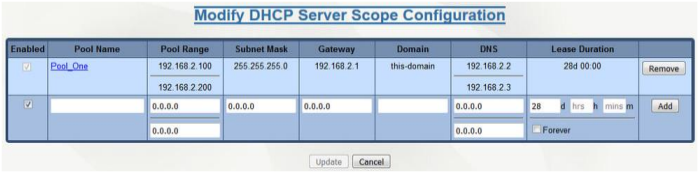
Scope Configuration Pools

The DHCP Server Scope Configuration contains vital network configuration options, called scope configuration pools, for potential clients. At least one scope configuration pool is necessary to create static assignments.

View Page



Modify Page



On the Modify page, the last column contains various buttons. The *Remove* button removes the corresponding scope configuration pool along with all static assignment and bindings associated with the pool. The *Add* button is used to add a new scope configuration pool.

Click on the *Add* button to add the new scope.
Click on the *Remove* button to remove an existing or new scope.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled.

Pool Name: Descriptive name of the scope configuration pool. This field is required and must be unique.

Pool Range: Starting and ending IP addresses for the pool of addresses.

Subnet Mask: The subnet mask for the IP address pool.

Gateway: The gateway IP address offered to the client. This field is optional.

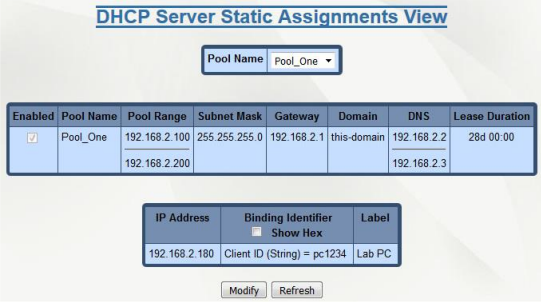
Domain: The domain name offered to the client. This field is optional.

DNS: The DNS server IP addresses offered to the client. These fields are optional.

Lease Duration: The lease time (in days, hours and minutes) offered to the client. The range is 1 minute to 1000 days. The default is 28 days. If the Forever checkbox is checked, the lease does not expire.

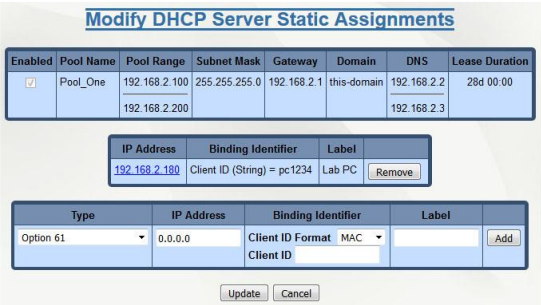
DHCP Server Static Assignments

View Page



Select the Pool Name drop-down list to filter on a specified pool.
Click on the *Modify* button to open the Modify DHCP Server Static Assignments page.

Modify Page



Click on the IP address hyperlink to modify the corresponding static assignment.
Click on the *Add* button to add the new static assignment.
Click on the *Remove* button to remove an existing or new static assignment.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled. This field is read-only.

Pool Name: Descriptive name of the scope configuration pool. This field is read-only.

Pool Range: Starting and ending IP addresses of a pool of addresses. This field is read-only.

Subnet Mask: The subnet mask offered to the client. This field is read-only.

Gateway: The gateway IP address offered to the client. This field is read-only.

Domain: The domain name offered to the client. This field is read-only.

DNS: The DNS server IP addresses offered to the client. This field is read-only.

Lease Duration: The lease time (in days, hours and minutes) that will be offered to a client. This field is read-only.

Type: The type of binding identifier for the static assignment. The options are Option 61 and Relay Agent (Option 82).

IP Address: The static IP address offered to the DHCP client.

Binding Identifier: The binding identifier of the static IP address assignment. For Option 61, the binding identifier requires a Client ID, the identifier of the desired client. The identifier formats are MAC, HEX, and String. A type-byte is assumed to precede the identifier and does not have to be entered here. The type-byte value is assumed to be as follows:

MAC = 0x01
String = 0x00
HEX = 0x00

For Option 82, the binding identifier requires a Remote Agent ID and Circuit ID. These identifiers must match the relay agent's Remote ID and Circuit ID. The identifier formats are IP (for a Remote ID), MAC, Hex, and String.

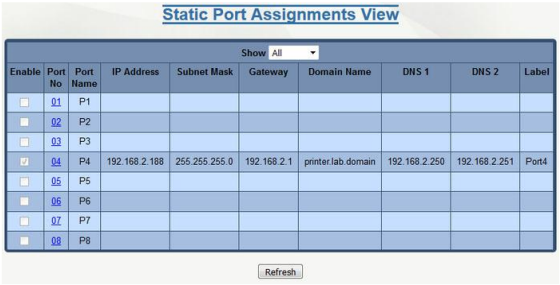
Label: The descriptive name of the static assignment. The field is optional.

DHCP Static Port Assignments

When a static port assignment is enabled on the port, the port will act as a DHCP server and provide a static IP address to the client connected to the port.

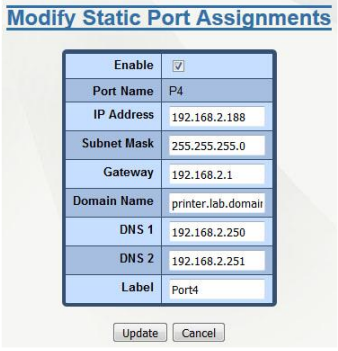
Note: Only one DHCP client can be connected per port.

View Page



Select the Show drop-down list to show only enabled ports or all ports. Click on the port number hyperlink to modify the port's static port assignment.

Modify Page



Click on the *Update* button to apply the changes.

Enable: Indicates whether Static Port Assignment is enabled on the port.

Port No: The number of the port.

Port Name: The descriptive name of the port. This field is read-only.

IP Address: The IP address offer to the DHCP client connected to the port.

Subnet Mask: The subnet mask offer to the DHCP client connected to the port.

Gateway: The gateway offer to the DHCP client connected to the port.

Domain Name: The domain name offer to the DHCP client connected to the port. The field is optional.

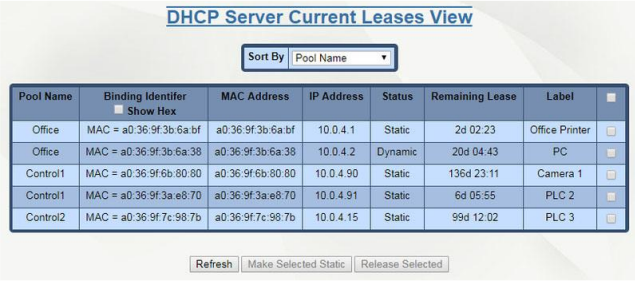
DNS 1: The primary DNS offer to the DHCP client connected to the port. The field is optional.

DNS 2: The secondary DNS offer to the DHCP client connected to the port. The field is optional.

Label: The descriptive name of the DHCP client connected to the port. The field is optional.

DHCP Server Current Leases

The Current Leases table shows the IP addresses that have been leased, or offered, to devices.



Sort By: Sort the current leases by Pool Name, Binding Identifier, MAC Address, IP Address, Status, Remaining Lease, or Label.

Pool Name: The pool from which the lease was obtained.

Binding Identifier: The client associated with the lease entry. If Show Hex checkbox is checked, then detailed hex data about the Binding Identifier is displayed.

MAC Address: Indicates the MAC address of the client associated with the lease.

IP Address: Indicates the IP address assigned to the lease entry.

Status: Indicates the current status of the lease entry.

- Dynamic = Assigned dynamic IP.
- Static = Assigned static IP.

Remaining Lease: The client's remaining lease time.

Label: The descriptive name of the client.

Check Box: Click the individual checkbox to either make the clients static or release its lease.

Note: Only clients with a dynamic lease can be made static.

Make Selected Static: Make the selected client dynamic IP address static.

Release Selected: Release selected client lease.

Event Notification

Event Notification is a combination of features that deal with filtering and routing system and fault events to different destinations.

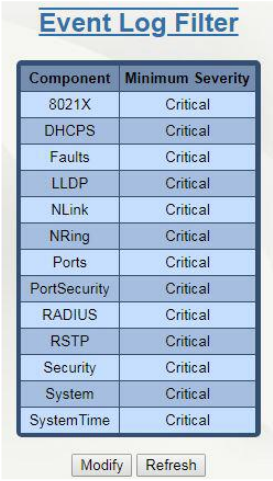
Event Log Filter

The Event Log Filter allows the user to define which events will be logged based on the severity level of the event.

Note: The event log is enabled by default for critical events.

Event Log Filter View

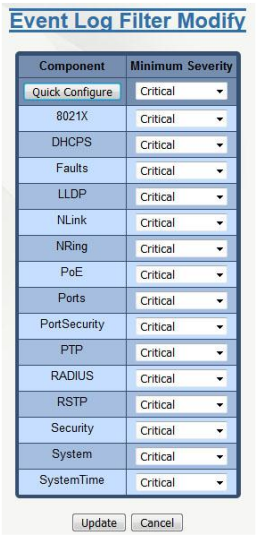
The Event Log Filter page displays the current minimum severity settings for each component. Events below the minimum severity level will not be logged.



Click on the Modify button to make changes to the Event Log Filter.

Event Log Filter Modify

The Event Log Filter configuration can be changed by clicking on the Modify button.



Quick Configure: Use Quick Configure to change all components to the same severity level.

Component: The feature, protocol, or system service of the switch that generates events. The component list is model dependent.

Minimum Severity: Events below the minimum severity level will not be logged. A severity of None will disable events for that component. For more information, see Severity under the section Event Log.

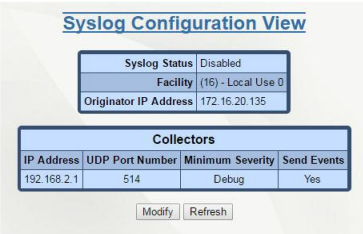
Syslog

The Syslog feature allows certain system events (see Event Log) to be sent as messages to remote hosts for monitoring and analysis.

The messages can be sent to up to 5 different remote hosts, known as Syslog Collectors. A minimum severity level is associated with each Syslog Collector. Events below the minimum severity level will not be sent out from the switch. Syslog is disabled by default and can be enabled through the Web Browser interface.

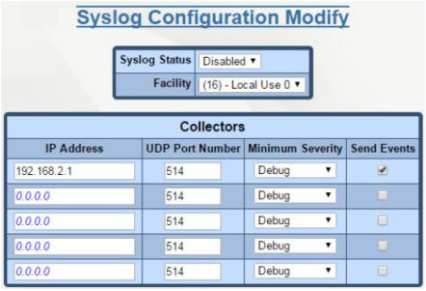
Syslog Configuration View

The Syslog Configuration View is accessible under Event Notification within the Advanced section. Below is an example of the current configuration status of Syslog, the configuration of each Syslog Collector, and a list of the Syslog Collectors.



Syslog Configuration Modify

The Syslog configuration may be changed by an admin level user by clicking on the Modify button. In this section the settings of each Syslog Collector can be updated and the Syslog Distributor itself can be disabled or enabled.



Syslog Status: This field indicates whether the Syslog Distributor (client) has been enabled or disabled. To enable Syslog at least one Syslog Collector (server) must be specified.

Facility: This is used to identify which process is logging the message. This is a global setting for the switch and will be used for all messages. Available Facility values as defined per RFC-5424 are 1 (user level) and 16 - 23 (local use).

Originator IP Address: The field displays the configured IP address of the switch.

Collector: The Syslog server to which the messages are sent.

IP Address: The IP address of the Collector (server) to receive a log message.

UDP Port Number: The UDP port on the Collector (server) to receive the message. The default port number is 514, per RFC-5424, but can be changed to meet installation requirements. Allowed port numbers are 1 - 65535.

Minimum Severity: The minimum Severity level of the messages that will be sent to the specified Collector (server). Values range from Debug (7) to Emergency (0). For example, a Collector configured with a value of Warning (4) will receive all messages from 4 to 0. The importance of a message increases with a lower severity level setting value. These are the same Severity level setting values as the Event Log and Event Log Filter. For more information, see Severity under the section Event Log.

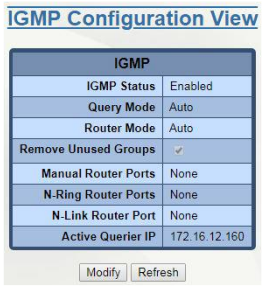
Send Events: This setting can be enabled or disabled, per Collector, to control the distribution of Event Log messages.

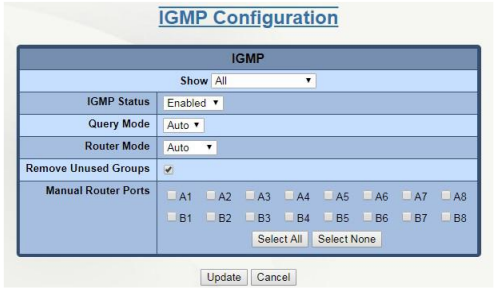
IGMP

Configuration

The Configuration dialog window displays the IGMP basic configuration settings. If an active N-Ring™ participant, the ring ports are informatively shown as N-Ring router ports. On an N-Link Master, Slave or Coupler switch, the coupler port is shown as an N-Link router port.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).





IGMP Status: This field indicates whether the IGMP is enabled or disabled. The default value for this field is *Enabled*.

Query Mode: The default value for this option is Auto. Available options are:

Auto: Multiple switches will ensure that only one switch is the active querier.
On: This switch is always an active querier.
Off: This switch never queries.

Router Mode: The available options for this field are:

Auto: This option allows for dynamically detected and manually set router ports. This is the default value.
None: This option allows for no router ports.
Manual: This option allows for manually set router ports.

Remove Unused Groups: If this option is checked, unused IGMP Groups will be removed and traffic with those multicast addresses will be treated as normal multicast. If this option is unchecked, unused IGMP Groups will remain and traffic with those multicast addresses will be limited. The default value for this field is checked.

Note: IGMP Groups are not retained through a power cycle.

Manual Router Ports: Manually specify the used ports.

N-Ring™ Router Ports: This field displays the N-Ring ports designated as active IGMP Router ports.

N-Link Router Port: This field indicates the N-Link ports that have been designated as active IGMP Router ports.

Active Querier IP: This field shows the IP address of the Active Querier.

Click on the *Modify* button to make changes to the IGMP Status, Query Mode, Router Mode and Manual Router Ports.

Groups

The Groups dialog window displays a list of IGMP groups based on the Group IP and the port that it is associated with.



Total Number of Active IP Group Memberships: The total number of active group IP memberships based on the dotted quad view (aaa.bbb.ccc.ddd) counting each joined port are displayed here.

Group IP: This field shows the dynamically created multicast group IP address.

Port Name: The descriptive name of the port is shown here.

VLAN ID: This field indicates the VLAN in which the Group IP is assigned. The available range is 1-4094.

RFilter Ports

From the RFilter (Router Multicast Data Filter) option, the user can choose whether or not data frames with known group multicast addresses are sent to the router ports. Control packets will be sent to the router(s) regardless of this setting.



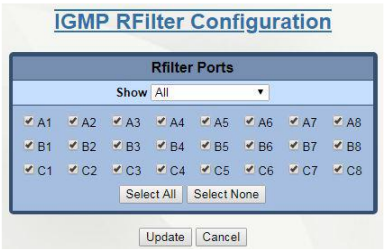
Known group multicast addresses are learned from dynamic IGMP Snooping operations. If IGMP is enabled and a port is a router port, then having RFilter enabled will stop IGMP group data from egressing on the port unless a join to that specific IGMP group has come into the port. IGMP controls (Join, Leave, Query) are still sent.

The Router Multicast Data Filter is enabled for all ports by default. Router ports do not get data frames with known multicast destination addresses unless a join for that specific multicast address has been received on that port. Join overrides an RFilter.

If RFilter is disabled, the router ports get data frames with known multicast destination addresses.

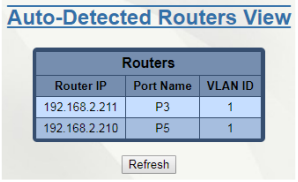
RFilter can be set for individual ports: any, all or none. For each port, RFilter will have an impact only if that port is manually or dynamically chosen as a router port.

Click on the *Modify* button to make changes to the IGMP RFilter Configuration. The following dialog window will appear:



From this dialog window, the administrator selects which ports to identify as RFilter ports and can view all possible ports (Modules), currently installed ports or currently linked up ports. Click on the *Update* button when done with required changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Routers



The Routers dialog window displays a list of the following:

Router IP: Auto-detected router IP address.

Port Name: The descriptive name of the port.

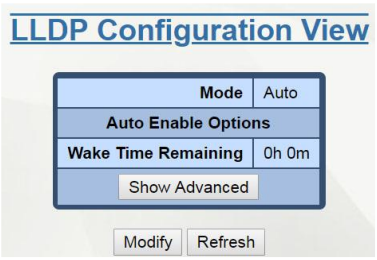
VLAN ID: VLAN in which the Router IP is assigned. The range is 1 - 4094.

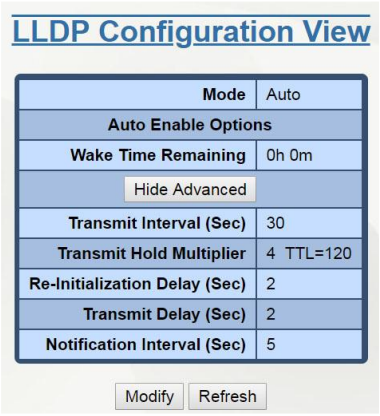
LLDP

LLDP Configuration

The LLDP Configuration Page can be used to view or configure LLDP operation on the switch. The default mode for LLDP is Auto. Other configurable options are revealed by clicking on the "Show Advanced" button.

To enable LLDP on all switches that are in Auto mode, set the mode to Auto, set the Wake Time to a non-zero time, and click the "Send" button.





Mode: The LLDP mode can be Enabled, Disabled, or Auto. In Auto mode, LLDP is inactive until a switch sends a wake-up packet. The default is Auto.

Wake Time: The length of time LLDP will be active on switches that are in Auto mode. A value of 0 hours and 0 minutes will deactivate LLDP. Modify this value and click the "Send" button to set the wake time on all switches that are in Auto mode. The default is 0 hours and 0 minutes.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Transmit Interval (Sec): The interval at which periodic LLDP frames are transmitted. The default is 30 seconds.

Transmit Hold Multiplier: A multiplier on the Transmit Interval when calculating a Time-to-Live value. The default is 4.

Re-Initialization Delay (Sec): The minimum time an LLDP port will wait before re-initializing after its setting has changed from disabled to Tx-Only or Tx/Rx. This prevents excessive notifications when LLDP Port settings are changed. The default is 2 seconds.

Transmit Delay (Sec): When LLDP information is changing on the switch, the time to wait before sending an LLDP frame with the updated information. The default is 2 seconds.

Notification Interval (Sec): The interval between notifications sent by the switch. If a port sends out a notification and another port tries to send out a notification, then the subsequent notification will not be sent until the interval expires. The default is 5 seconds.

LLDP Ports Configuration

The LLDP Ports Configuration Page displays and configures LLDP options for each port.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

Port No: The number of the port.

Mode: The port mode can be Tx Only, Rx Only, Tx/Rx, or Disabled. This configures whether or not LLDP frames are transmitted or received. The default is Tx/Rx.

Allow Management Data: Allows the transmission of management type information. Example: IP address of the switch. The default is checked.

Allow Notification: Allows an SNMP notification to be transmitted when local or remote data changes. The default is unchecked. Note: SNMP Notification Traps must be enabled under SNMP.

Port Description: Indicates whether or not to send the descriptive name of the port in the transmitted LLDP frame. The default is unchecked.

System Name: Indicates whether or not to send the name assigned to the device on the System page in the transmitted LLDP frame. The default is unchecked.

System Description: Indicates whether or not to send the switch model and current firmware version in the transmitted LLDP frame. The default is unchecked.

System Capabilities: Indicates whether or not to send the primary function(s) of the system in the transmitted LLDP frame. The default is unchecked.

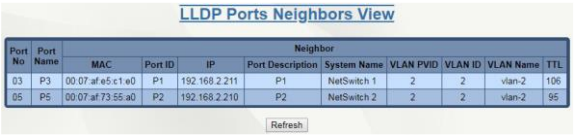
VLAN PVID: Indicates whether or not to send the Port VLAN identifier (PVID) associated with the port in the transmitted LLDP frame. The default is unchecked.

VLAN Name: Indicates whether or not to send the VLAN IDs and Names associated with the port in the trans-mitted LLDP frame. The default is unchecked.

LLDP Ports Neighbors

The LLDP Ports Neighbors shows the results of LLDP discovery. The LLDP Ethernet frames received from neighboring ports are composed of collections of data units called Type Length Value (TLV). Each TLV contains a defined type of information such as the Chassis ID described below, which contains the

MAC address of the device sending the frame. The maximum number of six neighbors can be displayed per each port.



Port No: The port the neighbor information was received from.

MAC: MAC address of neighbor device. Corresponds to the LLDP Chassis ID TLV.

Port ID: Identifier of the neighbor port from which the LLDP frame was sent.

IP: IP address of neighbor device. Corresponds to the LLDP Management Address TLV.

Port Description: Description of the neighbor port from which the LLDP frame was sent.

System Name: The system's administratively assigned name on the neighbor device.

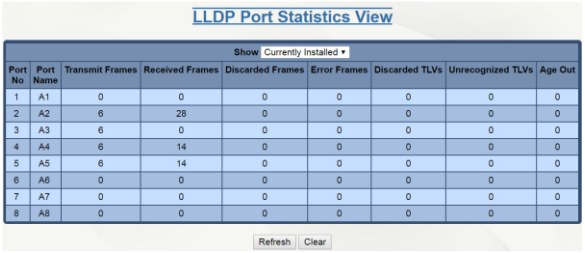
VLAN PVID: The Port VLAN identifier (PVID) associated with the neighbor port.

VLAN ID: A list of all VLAN IDs associated with the neighbor port.

VLAN Name: A list of all VLAN Names associated with the neighbor port.

TTL: Indicates the number of seconds that the information associated with this neighbor will be valid. Time to Live (TTL)

LLDP Port Statistics



Port No: The number of the port.

Port Name: The descriptive name of the port.

Transmit Frames: The total number of LLDP frames transmitted by the local switch.

Received Frames: Total number of LLDP frames received by the local switch.

Discarded Frames: The total number of frames discarded due to incorrect Type Length Values (TLVs) in the frames.

Errors Frames: Total count of all LLDP frames received with one or more errors.

Discarded TLVs: The count of all TLVs discarded for any reason.

Unrecognized TLVs: The count of all TLVs received on the port that are not recognized by LLDP.

Age Out: The count of times that a neighbor's information has been deleted because its Time To Live (TTL) has expired.

N-Link

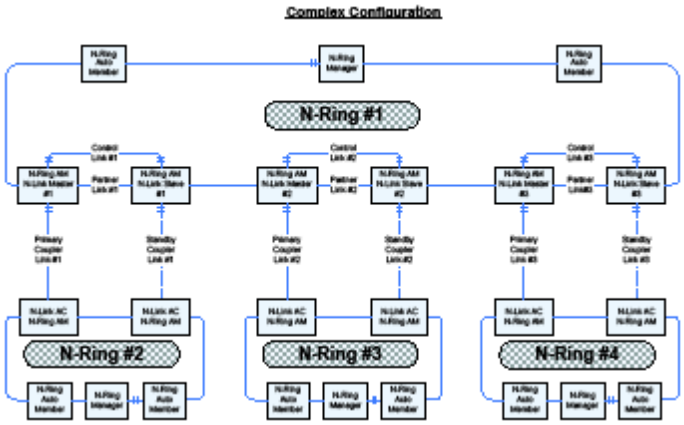
N-Link provides a way to couple an N-Ring topology to one or more other topologies, usually other N-Ring topologies. Each N-Link configuration requires 4 switches: N-Link Master, N-Link Slave, N-Link Primary Coupler and N-Link Standby Coupler.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).

Example of a standard N-Link configuration



Example of a complex N-Link configuration



Configuration steps to redundantly couple 2 N-Ring™ networks:

1. Ensure the Coupler and Control cables are disconnected at this point.
2. Get Both N-Rings working with a status of OK.
3. Configure N-Link Slave: Ensure that the N-Link Slave is set to Auto Configure and select a Default Coupler Port. Save Configuration.
4. Configure N-Link Master: Select the Control and Coupler ports. Save the Configuration.
5. Connect the Control Link cable. Ensure that the Slave switch status now shows a state of “Slave”.
6. Connect the Coupler Link cables.
7. Check N-Link status on the Master by selecting the N-Link Status View page.

Configuration Requirements:

- The Master and Slave must be part of the N-Ring topology.

- If using default configuration choices, the administrator only needs to configure the N-Link Master. The N-Link Slave and both Coupler switches will auto-detect any needed configuration.
- If not using default configuration choices, the administrator may also need to configure the Default Coupler port on the N-Link Slave.
- There must be a direct link between the Master and Slave Control ports. Use of media converters or other switches is not supported.
- There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported.
- There must be an N-Link aware switch on each side of the Master.
- N-Link will only support a single point of failure. Multiple points of failure and misconfiguration are not supported and may cause a network storm under some circumstances.
- Control and Partner connections should be either fiber or 10/100Base-TX copper.

  The use of copper SFP transceivers for N-Link control and partner connections is not recommended due to the variances of link performance between SFP manufacturers.

  Per the IEEE 802.3 standard (Clause 40), a 1000Base-T PHY is required to wait 350-750 milliseconds before reporting a link down condition; and is therefore unsuitable for use as an N-Link control or partner connection.
- For optimal performance:

  The speed of the Partner segment must match the speed of the other N-Ring™ segments. Therefore, the Partner connection must be 1 gigabit fiber when the other N-Ring segments have a 1 gigabit speed.

  When using a 700/7000 Series N-Link Slave, the control port should use a fiber connection.

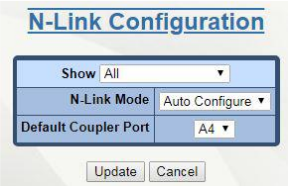
Configuration/Basic

The Basic tab under the N-Link Configuration category will display the basic configuration settings. By default, N-Link is in Auto-Configuration mode and will use A4 as the Default Coupler port.

The port configured as the Default Coupler Port will be used as the Standby Coupler port if the switch detects an N-Link Master and becomes an N-Link Slave.



Click on the *Modify* button to make changes. Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

N-Link Mode: Select the required N-Link mode from the drop-down list. The available options are:

Disabled: N-Link is disabled and will not operate as an N-Link capable switch.
Auto Configure: In this mode, the switch will automatically detect whether it is a slave or a coupler.
Master: If this option is selected, then the administrator must configure the Control Port (default: A3) and the Primary Coupler Port (default: A4).

Default Coupler Port: The Coupler Port is used to establish a redundant path for Ethernet data. If the role of the switch is Slave the port will be a Standby Coupler. The default is A4.

Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Configuration/Advanced

The Advanced dialog window displays the advanced configuration settings. If N-Link is set to *Auto Configure*, the following configuration data will be used. The selected Auto Configure detection timeout value range is 2-180 seconds. The default Auto Configure detection time is 4 seconds.



Click on the *Modify* button to change the detection timeout. Click on the *Update* button once the field has been updated with the required information. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Status

The Status dialog window displays the N-Link status. If the switch is an N-Link Master or Slave, the following switch status and partner status information will be shown. Fields with a red background designate a fault condition.

N-Link Master or Slave

The following switch status and partner status information are shown.

State: This field displays the current N-Link mode of the switch.

Partner Port: This field shows the port being used for normal communication between the N-Link Master and N-Link Slave switches. There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported. This port will be detected automatically.

Coupler Port: The port being used to establish a redundant path for Ethernet data transmission is displayed in this field.

Coupler Port State: Blocking, Forwarding.

Status: If there are no errors, the status shows OK. Otherwise, a description of the faults detected is shown.

N-Link Partner Information

The following switch statuses are shown.

State: Current N-Link mode of switch.

MAC: The MAC address of the N-Link Partner switch.

Coupler Port State: Blocking or Forwarding.

Status: If there are no errors, the status will show OK. Otherwise, a description of the faults detected will be shown.

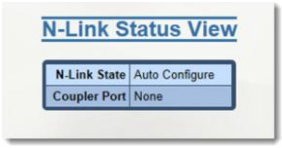
N-Link Auto Configure

N-Link State: Current N-Link mode of switch.

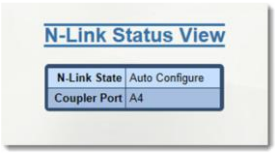
Coupler State: The port used to establish a redundant path for Ethernet data transmission. This port will be detected automatically.

Status Examples

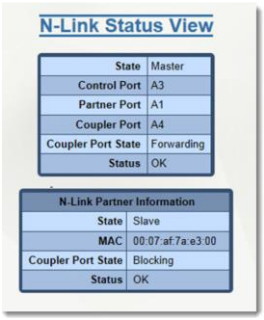
N-Link Auto Configure that is not an N-Link Master and has not become an N-Link Slave or an N-Link Coupler:



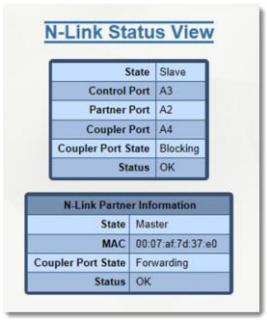
N-Link Coupler Switch:



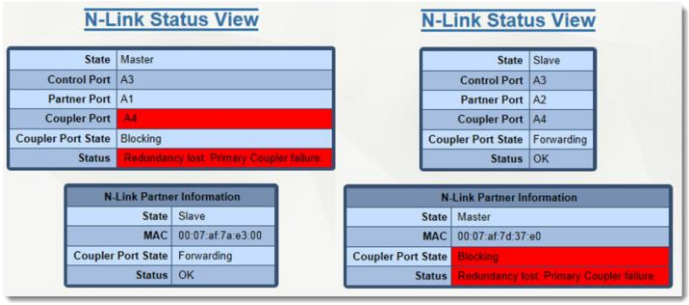
N-Link Master Switch:



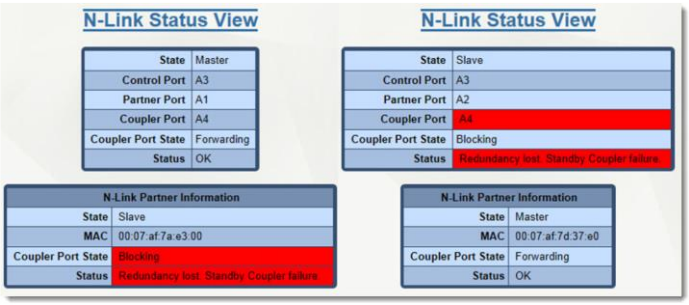
N-Link Slave Switch:



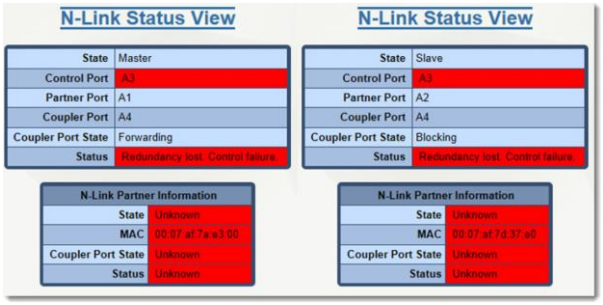
N-Link Status Master and Slave where the Primary Coupler is broken:



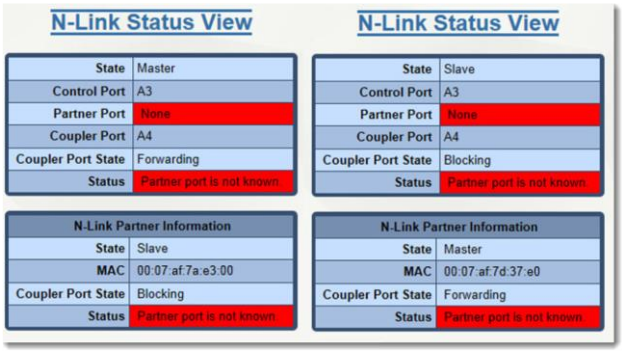
N-Link Master and Slave where the Standby Coupler link is broken:



N-Link Master and Slave where the Control link is broken:



N-Link Master and Slave where the Partner link is broken:



N-Ring™

Configuration/Basic

The Basic dialog window displays the N-Ring basic configuration settings. By default, N-Ring is in Auto Member mode.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Click on the *Modify* button to make changes to the N-Ring Basic Configuration:



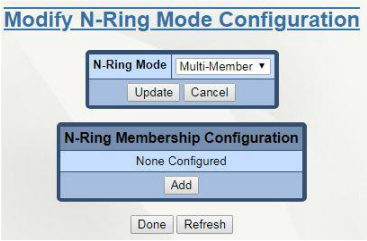
Disabled: If selected, this option disables the N-Ring capabilities on the switch.

Auto Member: When set to auto member, the switch automatically detects when it is a part of an N-Ring for participation in the ring.

Manager: When in Manager mode, the administrator may select different Port Sets as N-Ring ports. (See the Port Set Configuration section for information on adding and deleting port sets.)

N-Ring Ports: Defines the two ports that are used to connect to the N-Ring.
N-Ring™ Number: The N-Ring number can be selected from a range of 1 - 16 or a custom N-Ring number can also be chosen. The selected N-Ring number determines the VLAN ID. See table below for N-Ring numbers and corresponding VLAN IDs.
VLAN ID: This field is auto-generated based on the selected N-Ring number. See table for N-Ring numbers and corresponding VLAN IDs.
Tagging: The type of VLAN tagging used. Currently, tagged mode is the only supported mode.

Multi-Member: When in Multi-Member mode, a switch can be a member of multiple rings. If selected, then N-Ring Membership Configurations can be added for each N-Ring to which the switch will be connected. The image below shows one configured N-Ring.



To delete an existing N-Ring Membership, click on the *Delete* button.

To add a new N-Ring Membership, click on the *Add* button. The screen below will appear.



Select the N-Ring Ports and N-Ring Number to be used for the N-Ring. The VLAN ID for each N-Ring Membership must match that of the N-Ring Manager on each specific N-Ring to which the N-Ring Multi- Member will be connected.

Click on the *Update* button once the required selection has been made. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

List of available N-Ring Numbers and their corresponding VLAN ID:

N-RING NUMBER	VLAN ID	N-RING NUMER	VLAN ID
1	3333	9	3341
2	3334	10	3342

3	3335	11	3343
4	3336	12	3344
5	3337	13	3345
6	3338	14	3346
7	3339	15	3347
8	3340	16	3348

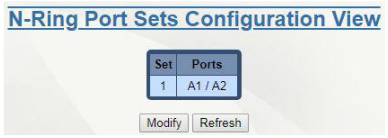
Configuration Requirements:

1. N-Ring requires tagged frames to optimize frame prioritization.
2. Do not create redundant links unless either RSTP or N-Ring is enabled.
3. The Default VLAN and any active N-Ring VLAN cannot be deleted.
4. RSTP and N-Ring™ are different modes and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then RSTP will be disabled for that port. Other ports may have RSTP enabled.
5. Do not connect the N-Ring to actively Trunking ports on an Auto Member or Multi-Member configured switch.
6. An NT24k® switch can only participate in one N-Ring unless in Multi-Member mode.
7. Since VLANs are implemented for security reasons as well as traffic flow, N-Ring only makes minimal VLAN changes. It is up to the administrator to ensure that VLANs are configured correctly on the N-Ring manager and all N-Ring members.
8. For optimal performance, all N-Ring segments must be configured for the same speed.

> **WARNING:** To prevent a network storm, multiple segments between N-Ring members on one or more N-Rings must not occur. N-Ring members should only be connected to each other by the N-Ring ports.

Configuration/Port Sets

A port set is a group of two ports that may be used for an N-Ring. The default N-Ring Port Set is A1/A2. Click on the *Modify* button to make changes to the Port Sets.



Set: This field displays the Port set table index.

Ports: This field indicates the designated pair of N-Ring ports. To reassign different pairs, the Port sets containing those ports, if any, must be deleted before the ports can be reassigned (a port can only belong to one port set).

Delete: To delete a port set, check the box next to the line item to be deleted and click on the *Delete* button.

Click on the *Add* button below the Set column.



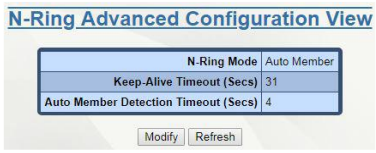
N-Ring Ports: A new port set can be added by selecting the N-Ring ports from the N-Ring Ports pull-down lists and clicking on the *Add* button.

Port Sets: Port Sets can be removed by selecting the port set from the Port Sets pull-down and pressing the *Remove* button.

Click on the *Update* button when port set configuration is complete. The N-Ring Port Sets Entry dialog window will appear. Click on the *Done* button. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Configuration/Advanced

Auto Member Mode



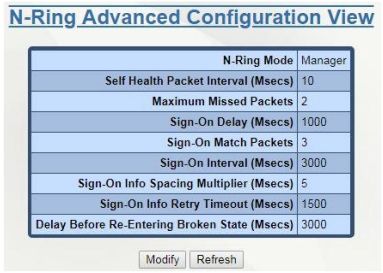
N-Ring™ Mode: This field is defined in the N-Ring/Configuration/Basic dialog window.

Keep-Alive Timeout (Sec): This field displays the amount of time to wait (in seconds) to receive a keep-alive request before switching from active member back to auto member. The default value is 31 seconds and the available range is 15 to 300 seconds. A entry of 0 will disable the feature.

Auto Member Detection Timeout (Sec): This field shows the amount of time to wait in seconds to receive N-Ring frames on any auto member port (at boot up) before assuming the switch is not part of an N-Ring. The default value is 4 seconds and the available range is 2 to 180 seconds.

Click on the *Modify* button and enter the required changes. When entries are complete, click on the *Update* button. To save the changes, return to the *Configuration* menu and click on the *Save* button.

Manager Mode



When in Manager mode, the following advanced configuration data are displayed in their respective fields:

Self Health Packet Interval (Msecs): The amount of time to wait in milliseconds before sending Self-Health packets. The default value for this field is 10.

Maximum Missed Packets: The number of consecutive missed Self-Health packets that constitute a fault. The default value for this field is 2 packets.

Sign-On Delay (Msecs): The amount of time to wait in milliseconds before requesting initial sign-on information from ring members. The default value is 1000 Msecs.

Sign-On Match Packets: The number of times the switch count must match before starting the sign-on process. The default value is 3.

Sign-On Interval (Msecs): The interval of time to wait in milliseconds before requesting subsequent sign-on information from ring members when the ring is broken. The default value for this field is 3000 Msecs.

Sign-On Info Spacing Multiplier (Msecs): The amount of time to wait in milliseconds, scaled by switch number, before sending information to the ring manager. The default value is 5 Msecs.

Sign-On Info Retry Timeout (Msecs): The amount of time the ring member will wait in milliseconds for the ring manager to acknowledge receipt of the member's information before the member tries to resend the information. The default value for this field is 1500 Msecs.

Delay Before Re-entering Broken State (Msecs): The amount of time, in milliseconds, that must elapse before the ring is allowed to go back into the broken state. The default is 3000 Msecs.

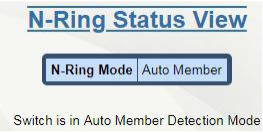
Click on the *Modify* button and make the required changes. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Multi-Member mode

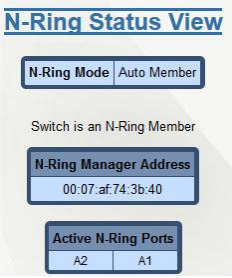
There are no advanced options when operating in Multi-Member mode.

Configuration Status

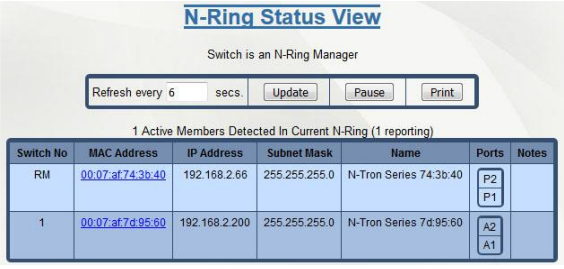
When an N-Ring™ Auto Member is not participating in an N-Ring, the following information is shown:



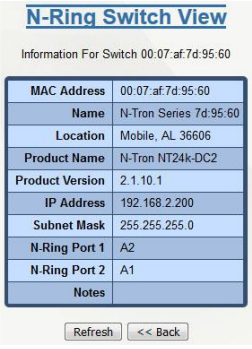
When an N-Ring Auto Member is participating in an N-Ring, the following information is shown:



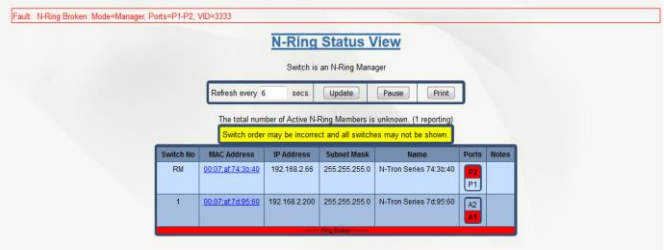
When N-Ring is in Manager Mode, the following data will be as shown below.



If the MAC is selected, more data is retrieved and shown about the N-Ring Member switch.



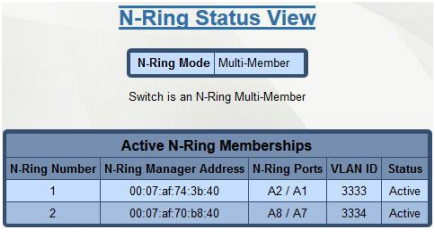
N-Ring™ Manager View for a faulted N-Ring:



A fault warning *Fault: N-Ring Fault* in red will show at the top of the dialog window.

The break is identified in red. In this case, N-Ring manager A2 to N-Ring active member Switch Number 1 TX2 is broken. A warning *Switch order may be incorrect and all switches may not be shown* is displayed in yellow. This indicates that the Sign On frames cannot get around the N-Ring and the data may not have been updated since the last successful update.

N-Ring Multi-Member Status View



N-Ring Number: N-Ring number to which the N-Ring Membership is associated.

N-Ring Manager Address: Show the MAC address of the switch acting as the N-Ring Manager.

N-Ring Ports: The port set linked to this N-Ring.

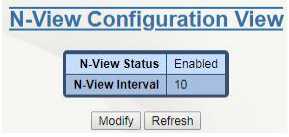
VLAN ID: The VLAN ID tag to be used with this N-Ring. The VLAN ID is associated with the N-Ring, and can be changed by switching the N-Ring number.

Status: Current status of the N-Ring Membership. The values are:

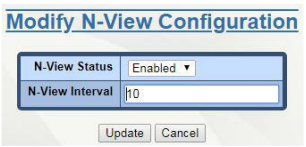
Active: The N-Ring Membership is connected and operating normally.
Inactive: The N-Ring Membership is not responding and not functioning correctly.

N-View™

The N-View Configuration dialog window displays the basic configuration for N-View. The status (enabled or disabled) and the interval between packets.



Click on the *Modify* button to make changes to the N-View Configuration.



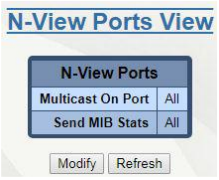
N-View™ Status: This field determines whether the N-Ring™ is enabled or disabled.

N-View Interval: This field determines the frequency in which N-View reports its information. Increasing the interval slows the update rate and decreasing it allows N-View to report more frequently. The available range is 10-500 seconds. Interval values are converted to increments of 10 seconds. The default value is 10 seconds.

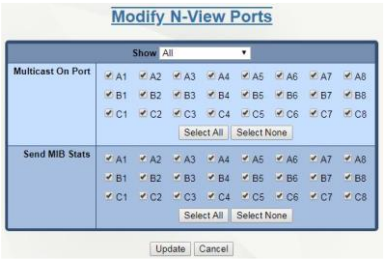
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Ports

The Ports dialog window displays a list of the configured ports on the NT24k® unit, along with the ports transmitting N-View related multicast packets and MIB stats respectively.



Click on the *Modify* button to make changes to the N-View Ports.



The user can modify these two variables to enable or disable N-View related multicast out of the port and if MIB stats are sent out for those ports. The ports that can be installed (Modules), currently installed or currently linked up can also be viewed.

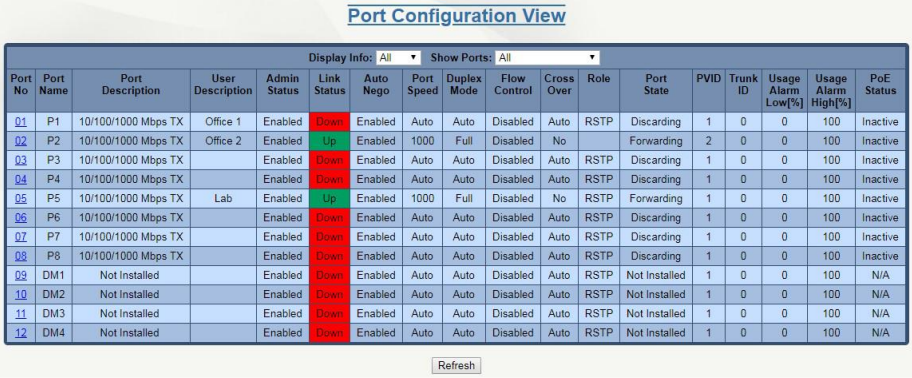
Click on the *Update* button after required changes have been made. To save the settings, navigate to the *Configuration* menu and click on the *Save* button.

Ports

Configuration

The Ports Configuration dialog window shows a detailed overview of all the ports on the switch. The administrator can view the ports that are available to install (Modules), currently installed or currently linked up.

The information displayed on the page can be changed by changing the *Display Info* from *Basic* to *All*. *Basic* shows the most commonly used information while *All* shows all of the available information.



Port Configuration View

Display Info: All Show Ports: All

Port No	Port Name	Port Description	User Description	Admin Status	Link Status	Auto Nego	Port Speed	Duplex Mode	Flow Control	Cross Over	Role	Port State	PVID	Trunk ID	Usage Alarm Low[%]	Usage Alarm High[%]	PoE Status
01	P1	10/100/1000 Mbps TX	Office 1	Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
02	P2	10/100/1000 Mbps TX	Office 2	Enabled	Up	Enabled	1000	Full	Disabled	No		Forwarding	2	0	0	100	Inactive
03	P3	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
04	P4	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
05	P5	10/100/1000 Mbps TX	Lab	Enabled	Up	Enabled	1000	Full	Disabled	No	RSTP	Forwarding	1	0	0	100	Inactive
06	P6	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
07	P7	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
08	P8	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
09	DM1	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
10	DM2	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
11	DM3	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
12	DM4	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A

Refresh

The screen above represents the Port Configuration View for a PoE model. If not using a PoE model, the page will be similar except the PoE Status column will not be present.

Port No: This field indicates the port number.

Port Name: This field displays the descriptive name of the port.

Port Description: This column provides a brief description of the port. Ports with "-R" in their description are Bypass Relay capable ports. Refer to the section Bypass Relay (BR) for more information on Bypass Relay devices and ports.

User Description: Description of the port set by a user.

Admin Status: This configurable field displays the existing status of the port. The two options are *Enabled* or *Disabled*.

Link Status: Shows the current state of the port. The two options are *Up* or *Down*.

Auto Nego: This configurable field displays the current auto-negotiation state whether it is *Enabled* or *Disabled*. Auto-negotiation cannot be disabled on a port connected to a gigabit device.

Port Speed: This configurable field displays the speed of each port. The available values are 10/100/1000 Mbps.

Duplex Mode: The existing mode of the port, whether it is *Full Duplex* or *Half Duplex*, is shown in this configurable field.

Flow Control: This configurable field displays the existing flow control status of each port.

Cross Over: This configurable field displays the existing crossover mode of the port. This can be indicated with a *Yes*, *No* or *Auto*. The default value for this field is Auto.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, and N-Link Coupler. For example, if a port is actively participating in an N-Ring and as an N-Link Partner, the role would be: N-Ring, N-Link Partner.

Port State: This column displays the current RSTP status of a port. It may contain *Disable*, *Discarding*, *Learning* or *Forwarding*.

PVID: This configurable field displays the existing port VLAN ID setting. The allowable range is 1-4094.

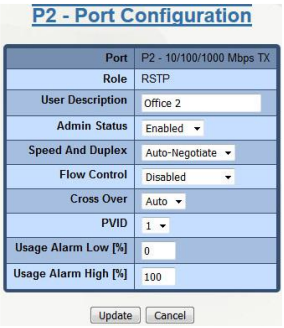
Trunk ID: When the port is an active member of a trunk group, the trunk's ID value is shown. A zero value indicates that the port is not an active trunk member.

Usage Alarm Low [%]: This field indicates the bandwidth utilization percentage below which a fault is triggered if enabled. For the half-duplex option, the bandwidth utilization percentage is the sum of both RX and TX bandwidth utilization. For the full-duplex option, this is the higher of TX or RX bandwidth utilization.

Usage Alarm High [%]: This field displays the bandwidth utilization percentage above which a fault is triggered if enabled. For half duplex the bandwidth utilization percentage is the sum of both RX and TX band-width utilization, and for full duplex this is the lower of TX or RX bandwidth utilization.

PoE Status: The current status of the PoE will be displayed in this column. It may show *Inactive*, *Active*, *Disabled* or *N/A*.

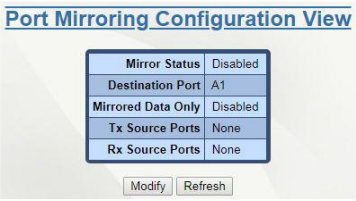
Click on the *Port Number* to configure each port individually. This will allow the user to change the port's settings.



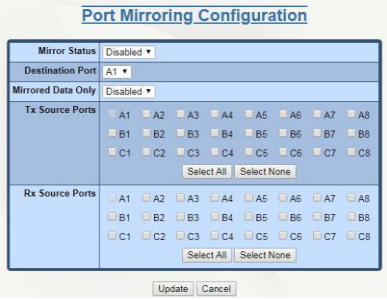
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Mirroring

A Mirroring Port is a dedicated port that is configured to receive copies of Ethernet frames that are sent or received from a monitored port. The Mirroring dialog window displays the status including the list of Source Ports and the Destination Port that the Sources are being mirrored to.



Click on the *Modify* button to make changes to the *Port Mirroring Configuration*.



Mirror Status: Enable or Disable the Mirroring functionality by selecting the option in the drop-down menu.

Destination Port: Select the destination ports that the source ports will be mirrored to.

Mirrored Data Only: Select the mirrored data to be transmitted to the destination port.

Tx Source Ports: Select the transmitting ports to be mirrored by checking on the desired ports or the *Select All* button.

Rx Source Ports: Select the receiving ports to be mirrored by checking on the desired ports or the *Select All* button.

Configuration Notes:

1. Non-mirrored frames take priority over mirrored frames. Mirrored frames may be discarded under rare instances when resource contention occurs.
2. The mirroring destination port is not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, Trunking.

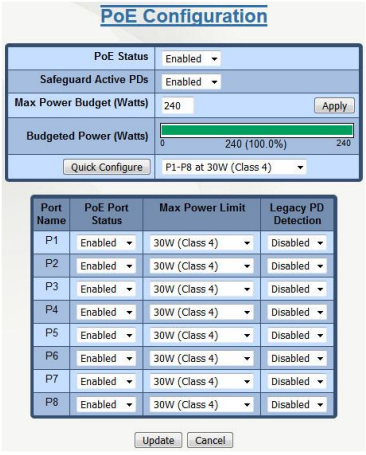
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

PoE

PoE (Power Over Ethernet) is an internal hardware capability that outputs power and data on Ethernet cabling to Powered Devices (PDs) such as VoIP phones, IP camera, and industrial devices. PoE eliminates the need to run separate data and power cables between the PSE (PoE Source Equipment) and the PoE powered device.

PoE Management on the NT24k® provides the ability to set the PoE power budget, enable/disable PoE on specific ports, and set power limits per port.

Note: PoE is only supported on certain NT24k switches.



PoE Configuration: Table 1

PoE Status: This configurable field indicates whether the global PoE is enabled or disabled. PoE ports must also be individually enabled on the PoE configuration page. The default value for this field is Enabled.

Safeguard Active PDs: This configurable field indicates whether an active PD is safeguarded from losing power because of a configuration change. If enabled, the Max Power Limit cannot be changed if it can cause a power loss to the active PD. Similarly, Legacy PD Detection cannot be disabled on an active legacy powered device. The default value for this field is Enabled.

Max Power Budget (Watts): The maximum amount of power available for PoE. The value can range from 4 to the max power supply support for the switch.

Quick Configure: The quick configure selection menu updates the PoE port table with the desired settings based on the quick configuration option selected.The following values for 8 PoE Ports are:

- P1-P8 at 30W (Class 4) (default)
- P1-P8 at 15.4W (Class 3/0)
- P1-P8 at 7W (Class 2)
- P1-P8 at 4W (Class 1)
- All ports disabled.

For 16 PoE Ports the values are:

- P1-P8 at 30W (Class 4) (default)
- P9-P16 at 30W (Class 4)
- P1-P16 at 15.4W (Class 3/0)
- P1-P16 at 7W (Class 2)
- P1-P16 at 4W (Class 1)
- All ports disabled.

PoE Configuration: Table 2

PoE Port Status: This configurable field indicates whether PoE is enabled or disabled on the port.The default value is enabled on the first 8 PoE ports.

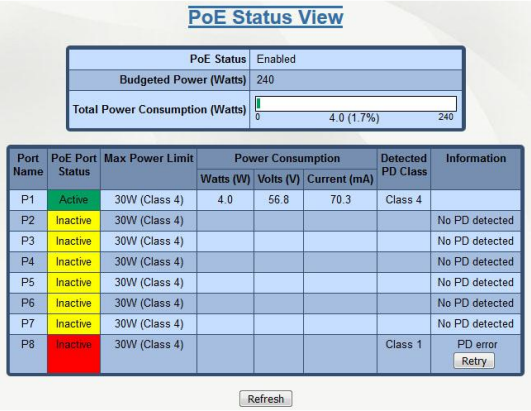
Max Power Limit: This configurable field indicates the maximum budgeted power for the port. The values are:

- 4W (Class 1)
- 7W (Class 2)
- 15.4W (Class 3/0)
- 30W (Class 4)

Legacy PD Detection: This field indicates whether legacy PD detection is enabled or disabled on the port. If enabled, legacy powered devices will be recognized. The default value is disabled.

Note: The sum of the Port Max Power Limit should not exceed the MaxBudgeted Power.

PoE Status: Table 3



Port Name: This field displays the descriptive name of the port.

PoE Port Status: Current status of the PoE port. The values are:

- Active: PoE power is outputted on the specific port
- Inactive: PoE power is not outputted on the specific port
- Disabled: PoE functionality is disabled on the specific port

Max Power Limit: The maximum budgeted power for the port.

Power Consumption: The actual power consumption of the port.

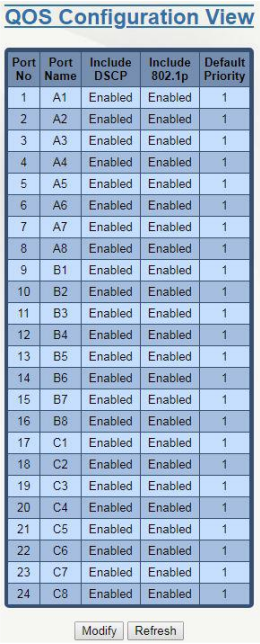
Detected PD Class: The classification of the connected device, which can range from Class 0-4.

Information: Details about the port's current state. If a Powered Device attempts to negotiate more power than the allocated maximum, PoE will be turned off on the port and a re-negotiation period will start. If re-negotiation is unsuccessful, a Retry button will be displayed below the PD error message. Select the retry button to restart negotiation after the cause of the overload is resolved.

QOS (Quality of Service)

The QOS decision tree chooses a frame's output port priority and the egress frame's IEEE 802.1p User Priority value (if needed) based on the QOS settings and the User Priority value (if any) in the ingress frame. Both the internal port priority setting and the egress frame User Priority value are always assigned the same value. The available values are 0 through 7 where 7 is the highest priority. If the ingress frame is an IP packet, the RFC 2474 DSCP field in the packet will be passed unchanged to the egress frame.

Click on the *Modify* button to make changes to the QOS Configuration.



Include DSCP: This configurable field displays the status of whether or not to include the ingress frame's RFC 2474 DSCP value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. If the ingress frame type is IP (IPv4 or IPv6) and Include DSCP is enabled, DSCP processing will override all other settings. (see QOS SELECTION CHART below). The default value is enabled.

Include 802.1p: This configurable field displays the status of whether or not to include the ingress frame's IEEE 802.1p User Priority value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. This setting is used only if the frame type is not IP (IPv4 or IPv6) or the Include DSCP setting is disabled. (see QOS SELECTION CHART below). The default value is enabled.

Default Priority: This configurable field displays the default QOS priority for the transmit priority value and the egress frame's IEEE 802.1p User Priority value if not otherwise assigned by DSCP or IEEE 802.1p processing. The range is 0-7, highest priority=7. The default value is 1.

QOS Selection Chart:

INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Enabled	N.A.	IP	N.A.	Ingress DSCP Value
N.A.	Enabled	Not IP	Yes	Ingress IEEE 802.1p UP
N.A.	Enabled	Not IP	No	Default Priority Setting
N.A.	Disabled	Not IP	N.A.	Default Priority Setting
Disabled	Enabled	N.A.	Yes	Ingress IEEE 802.1p UP
Disabled	Enabled	N.A.	No	Default Priority Setting
Disabled	Disabled	N.A.	N.A.	Default Priority Setting
Legend				
IP	Ingress packet type is IPv4 or IPv6.			
Ingress DSCP Value	Use the high order three bits of the ingress frame’s IP DSCP value.			

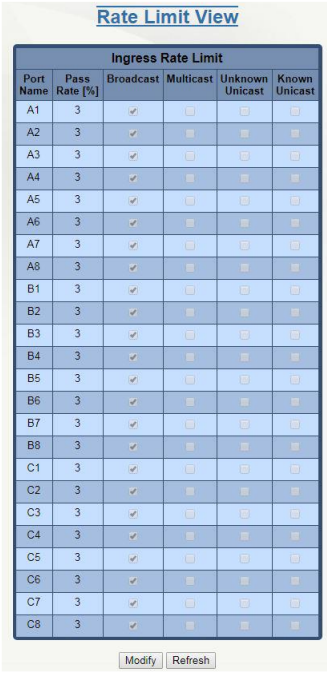
INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Ingress IEEE 802.1p UP	Use the ingress packet's IEEE 802.1p User Priority value.			
N.A.	Not applicable			

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

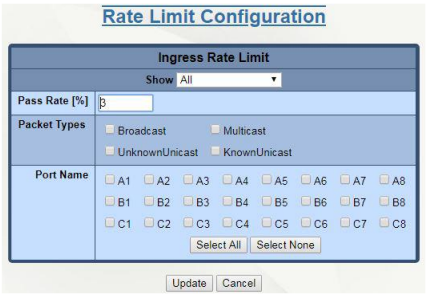
Rate Limiting

The Rate Limiting dialog window shows the NT24k® installed ports and the Pass Rate Percentage per port for each of the following: Broadcast, Multicast, Unknown Unicast and Known Unicast.

A packet type will be affected by the rate limit setting if the check box is selected and it exceeds the total number of packets established by the ingress rate limit within an assigned time period. The time periods are: 1 Gbps = 10 ms, 100 Mbps = 100 ms and 10 Mbps = 1 sec.



Click on the *Modify* button to make changes to the Rate Limiting settings.



Show: View the ports that are available to install (Modules), currently installed or currently linked up.

Pass Rate [%]: Modify the pass rate percentage for each and every port by entering the desired value.

Packet Types: Select what Packet Types are to be passed: Broadcast, Multicast, Unknown Unicast and Known Unicast.

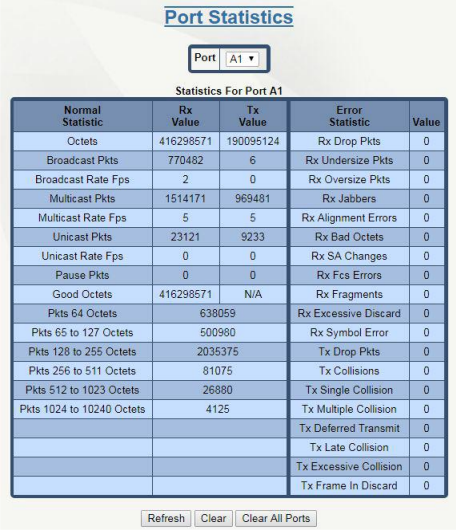
Port Name: Select which ports are affected by the changes made.

Note: Unicast packets with destinations not in the ARL table can be rate limited rather than all being flooded. This is known as “Unknown Unicast”.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Status/Statistics

This dialog window displays the MIB counters for the selected port, specified by the Port pull-down menu.

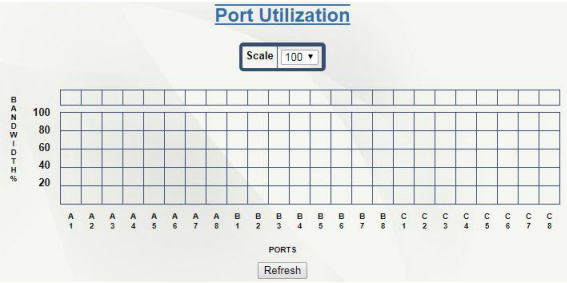


Normal Statistic	Rx Value	Tx Value	Error Statistic	Value
Octets	416298571	190095124	Rx Drop Pkts	0
Broadcast Pkts	770482	6	Rx Undersize Pkts	0
Broadcast Rate Fps	2	0	Rx Oversize Pkts	0
Multicast Pkts	1514171	969481	Rx Jabbers	0
Multicast Rate Fps	5	5	Rx Alignment Errors	0
Unicast Pkts	23121	9233	Rx Bad Octets	0
Unicast Rate Fps	0	0	Rx SA Changes	0
Pause Pkts	0	0	Rx Fcs Errors	0
Good Octets	416298571	N/A	Rx Fragments	0
Pkts 64 Octets	638059		Rx Excessive Discard	0
Pkts 65 to 127 Octets	500980		Rx Symbol Error	0
Pkts 128 to 255 Octets	2035375		Tx Drop Pkts	0
Pkts 256 to 511 Octets	81075		Tx Collisions	0
Pkts 512 to 1023 Octets	26880		Tx Single Collision	0
Pkts 1024 to 10240 Octets	4125		Tx Multiple Collision	0
			Tx Deferred Transmit	0
			Tx Late Collision	0
			Tx Excessive Collision	0
			Tx Frame In Discard	0

Pressing the *Clear* button resets all counters for the selected port. The *Clear All Ports* button resets all counters for all ports, including the selected port. The *Refresh* button reloads the dialog window.

Status/Utilization

This dialog window displays the bandwidth percentage graph of all the ports. The graph is scaled based on the “*Scale*” drop-down list.



Trunking

The Trunking dialog window displays trunking information.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Trunk ID: This column displays the trunk identifier number. The valid range is 1-127.

Trunk Name: This column shows the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

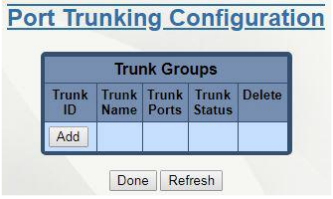
Trunk Ports: This column displays the ports associated with the trunk.

Trunk Status: The existing status of the trunk is shown in this column. Available trunk status options are *Enabled* or *Disabled*.

Configuration Note:

Note: The trunk ports are not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, 802.1X, Mirroring.

Click on the *Modify* button to add, modify or delete ports.



Click on the Add button and the following dialog window will appear:



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

ID: Enter the desired Trunk ID. Valid range is 1- 127. There can be no duplicate Trunk IDs.

Name: Enter the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

Ports: Select the required ports from the Ports list. The list of ports shown will vary depending on the selection in the *Show* field.

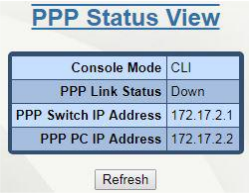
Status: Select the status of the port that is being added. Options are *Enabled* or *Disabled*.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

To modify an existing Trunk Group, click on the *Trunk ID* and make the required changes. To Delete an existing Trunk Group, click on the *Delete* button associated with the Trunk ID to be deleted.

PPP

The console can be either in CLI mode or PPP mode. The PPP mode provides a TCP/IP connection over the serial port. A browser may then be used to view switch information or make configuration changes. PPP mode is entered by using the PPP command on the console. To change from PPP to CLI mode, you must reboot the switch.



Console Mode: When CLI is shown, the console is in the command mode, which is the default mode. When PPP is shown, the console is in PPP mode.

PPP Link Status: This field indicates the current PPP link state.

PPP Switch IP Address: This field displays the IP address for the switch side of the PPP link.

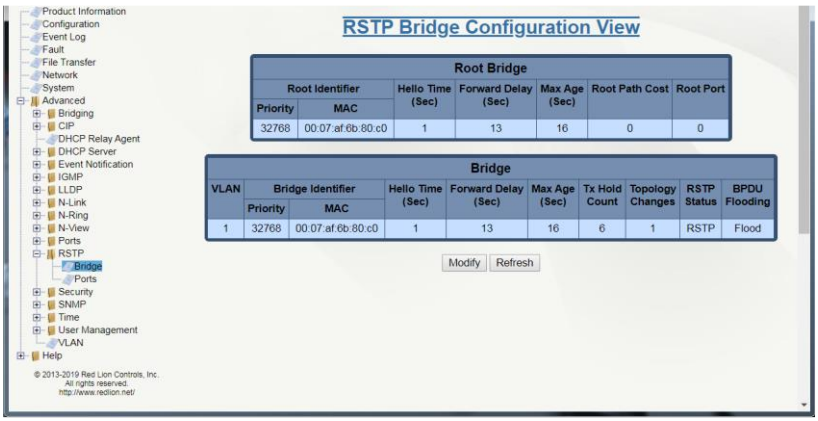
PPP PC IP Address: This field indicates the IP address for the PC side of the PPP link.

RSTP

Bridge

The Bridge dialog window displays the RSTP information for the RSTP Root Bridge and for the RSTP Bridge on this switch.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Root Bridge: This is the identity and parameters of the RSTP Root Bridge.

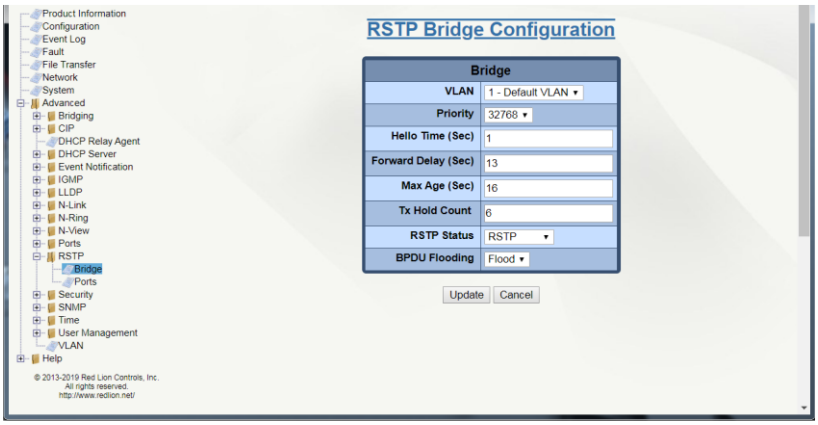
Root Identifier - Priority: This field indicates the priority of the Root Bridge.
Root Identifier - MAC: The unique MAC address of the Root Bridge is shown here.
Hello Time (Sec): This field indicates the time interval, in seconds, between the transmission of configuration BPDUs by designated ports.
Forward Delay (Sec): This field shows the time spent, in seconds, by legacy STP Bridges in transitioning Root and designated ports to forwarding. This delays port transitions until other bridges have received spanning tree information.

Max Age (Sec): For RSTP, this is the maximum time, in seconds, that a bridge will wait for configuration BPDUs before deciding it is no longer connected to the root bridge.
Root Path Cost: The cost of the path to the Root Bridge via the Root Port of this bridge.
Root Port: The Root Port of this Bridge. The Root Port provides the lowest cost path from this bridge to the Root Bridge.

Bridge: This is the configuration of the RSTP bridge on this switch.

VLAN: RSTP will operate on all ports of this VLAN. BPDUs will be transmitted with or without VLAN tags depending on the settings for this VLAN. This should be a valid VLAN ID. The default value for this field is VLAN 1.
Bridge Identifier Priority: This field indicates the Bridge priority. The range is 0 - 61440. The default value is 32768.
Bridge Identifier MAC: The unique MAC address of the Bridge is displayed in this field. This is possibly a different network device.
Hello Time (Sec): This field indicates the Hello time, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time interval, in seconds, between the transmission of Configuration BPDUs by Designated Ports. The range is 1 - 10. The default value is 1.
Forward Delay (Sec): This field displays the Forward Delay, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time spent, in seconds, by legacy STP Bridges in transitioning Root and Designated Ports to Forwarding. This delays Port transitions until other bridges have received spanning tree information. The range is 4 - 30. The default value is 13 seconds.
Max Age (Sec): This field displays the Max Age when this bridge is the Root Bridge or is attempting to become the Root Bridge. For RSTP, this is the maximum hops allowed for any protocol message before it is discarded and no longer retransmitted. For STP, this is the maximum time, in seconds, that a bridge will wait for Configuration BPDUs before deciding it is no longer connected to the root bridge. The range is 6 - 40. The default value is 16 seconds.
Tx Hold Count: This is the maximum number of configuration BPDUs that can be transmitted in one second from a port on this Bridge before transmission is throttled. The range is 1 to 10. The default value for this field is 6.
Topology Changes: This is the number of RSTP topology changes since the switch has been powered on or rebooted.
RSTP Status: This is the current status of the RSTP protocol on this bridge. The available options for this field are RSTP, Force STP or Disabled.
Note: RSTP & N-Ring™ are different network topology protocols and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then the port will be disabled for RSTP.
Note: Do not create redundant network paths unless either RSTP or N-Ring is enabled.
Note: If a port is both an RSTP port and an enabled trunk group member, then the port will be disabled for RSTP. The RSTP port status can be seen under advanced RSTP ports.
Note: It is recommended that an RSTP network consist of RSTP capable switches.
Note: RSTP is supported on only one VLAN.
Note: When operating in a VLAN with legacy STP devices, use these values for the Bridge: Hello Time (Sec) = 2, Forward Delay (Sec) = 15 and Max Age (Sec) = 20.
BPDU Flooding: This value allows for flooding or blocking of BPDUs to other ports when the global spanning tree is disabled or when spanning tree is disabled on a specific port. If Flood is selected, BPDUs are flooded to all other ports based on the VLAN assignment. The options are Flood or Block. The default is Flood.

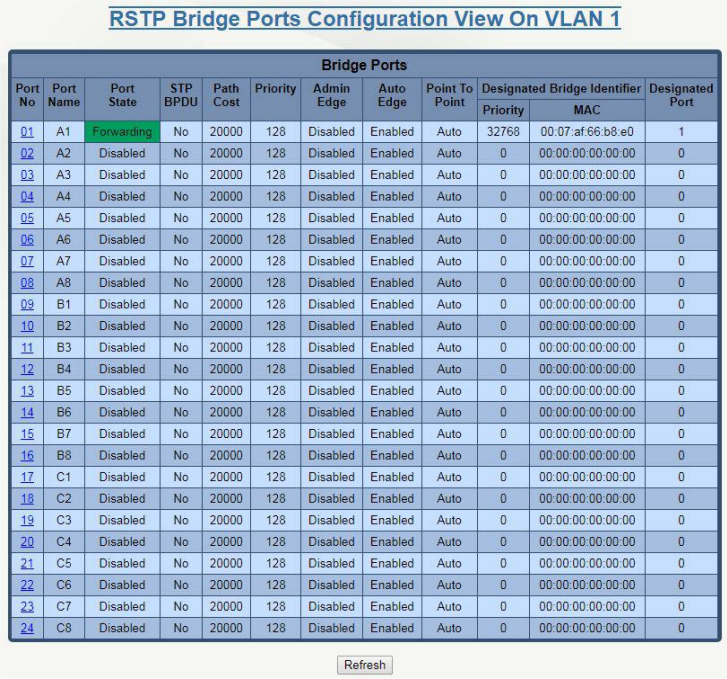
Click on the *Modify* button and the following dialog window will appear:



Make the required modifications, and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

The RSTP Ports dialog window displays information such as the path cost and the port state. If the switch sees a redundant network path, it will put the port with the highest path cost into the Blocking port state where it will discard packets coming in on that port.

In the example shown below, A2 is a redundant port with port A1, therefore A1 is forwarding and A2 is discarding.



Port No	Port Name	Port State	STP BPDU	Path Cost	Priority	Admin Edge	Auto Edge	Point To Point	Designated Bridge Identifier		Designated Port
									Priority	MAC	
01	A1	Forwarding	No	20000	128	Disabled	Enabled	Auto	32768	00:07:af:66:b8:e0	1
02	A2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
03	A3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
04	A4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
05	A5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
06	A6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
07	A7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
08	A8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
09	B1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
10	B2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
11	B3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
12	B4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
13	B5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
14	B6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
15	B7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
16	B8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
17	C1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
18	C2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
19	C3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
20	C4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
21	C5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
22	C6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
23	C7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
24	C8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0

Port No: Indicates the number of the port.

Port Name: Displays the descriptive name of the port.

Port State: The current RSTP state of the port is shown here. This state may be seen as "Forwarding, No STP, Disabled, Listening, Learning, and Discarding.

STP BPDU: Shows whether or not a legacy STP BPDU has been received or not.

Path Cost: Displays the current path cost of the port. The range is 0 - 200,000,000. If configured to 0 or Auto, the path cost will be calculated automatically using the actual speed of the port; otherwise the configured value will be used. The default value for this field is Auto.

Priority: The priority of the port is displayed in this column. The available range is 0 - 255. The default value for this field is 128.

Admin Edge: Indicates whether or not this port is treated as an Edge Port and can immediately enter the forwarding state. If set to Enabled, no BPDUs are expected to be received at the port. Set this option to Enable only when an end device is linked to this port. The default value is Disabled.

Auto Edge: Indicates whether or not to use a short timeout when waiting for BPDUs before determining that this is an Edge Port (if no BPDUs are received). It may have to be disabled for a very large network. The default value is Enabled.

Point to Point: Displays whether at most one other network port is attached to the port's LAN segment. The port may transition to Forwarding very quickly on a point-to-point MAC link. Values may be Auto (full-duplex links are assumed to be point-to-point, half duplex are not), and Force True or Force False (if the automatic determination would be wrong). The default value is Auto.

Designated Bridge Identifier Priority: The priority of the designated bridge associated with the port's LAN segment is shown in this field. The designated bridge provides the lowest cost path from this bridge port's LAN segment, through the designated bridge, to the root bridge.

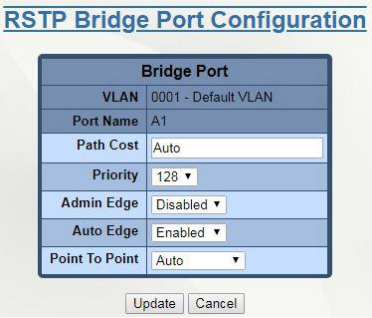
Designated Bridge Identifier MAC: Indicates the unique MAC of the designated bridge associated with the port's LAN segment.

Designated Port: The designated port of the designated bridge is shown here.

Note: When event logging is enabled, all RSTP controlled ports will log events about their status whether or not the modular based port is currently installed.

Note: When operating in a VLAN with legacy STP devices, set the Auto Edge field to Disabled for Bridge Ports.

To make changes to a Bridge port, click on the *Port No hyperlink* and the following window will appear:



Make the required modifications to the following parameters: Path Cost, Priority, Admin Edge, Auto Edge and Point to Point fields, then click on the *Update* button.

Security

Local Security

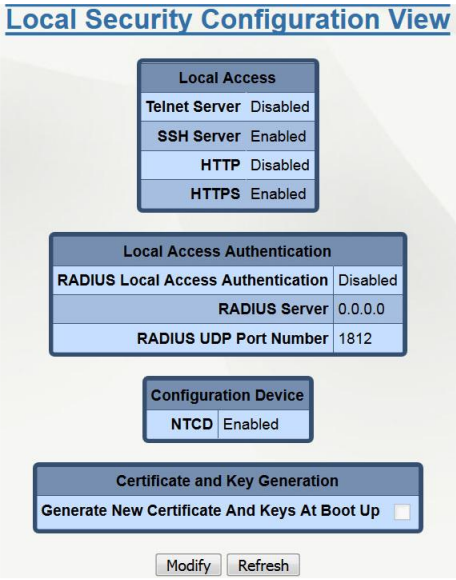
The Local Security feature allows an administrator to control local access (logins) to the switch.

Local Security Configuration View

The Local Security Configuration page displays the status of the Telnet server, SSH Server, HTTP protocol, and HTTPS protocol. The administrator can disable or enable these protocols, as desired. A RADIUS server can be configured to authenticate the user name and password entered for local access.

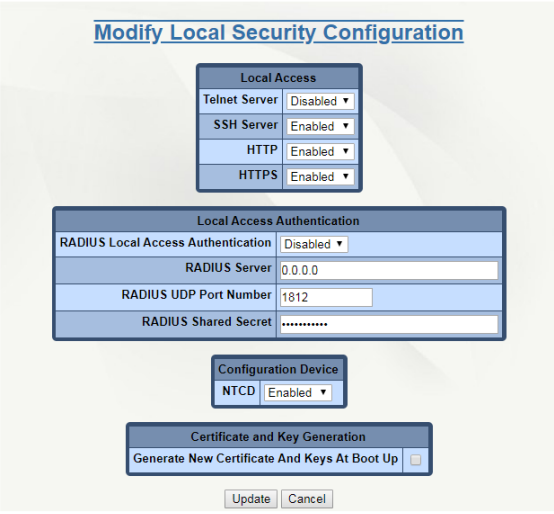
The N-Tron® Configuration Device (NTCD) SD card slot can be enabled or disabled, allowing an administrator to block and unblock reading and writing settings from the SD card as desired. A new certificate and keys can also be generated at boot up by selecting the *Generate New Certificate and Keys At Boot Up* option.

WARNING: If the NTCD device slot is disabled and the switch password is forgotten, access to the switch can only be recovered by sending it back to the factory to be unlocked.



Modify Local Security Configuration

Click on the *Modify* button and the page below will appear. Make the desired changes, and then click on the *Update* button. To save changes, navigate to the Configuration menu and click on the *Save* button.



These settings address local access to the switch. For better security, keep the Telnet Server and HTTP disabled.

Telnet Server: This field indicates whether the Telnet Server is enabled or disabled. Disabling the Telnet Server does not impact SSH. The default is disabled.

SSH Server: This field indicates whether the SSH Server is enabled or disabled. Disabling the SSH Server does not impact Telnet. The default is disabled.

HTTP: This field indicates whether HTTP is enabled or disabled. Disabling HTTP does not affect HTTPS secure connections. The default is disabled. HTTP users are not authenticated by the RADUIS server. If Radius authentication is exclusively required, then HTTP should be disabled.

HTTPS: This field indicates whether HTTPS is enabled or disabled. Disabling HTTPS requires HTTP to be enabled. The default is enabled.

A RADIUS server may be used to manage user accounts that have access to the switches.

RADIUS Local Access Authentication: This field indicates whether RADIUS Local Access Authentication is enabled or disabled. RADIUS authentication is not supported on HTTP connections. The default is disabled.

RADIUS Server: This field is the IP address of the RADIUS server used when RADIUS Local Access Authentication is enabled.

RADIUS UDP Port Number: The UDP port number of the RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

RADIUS Shared Secret: The shared secret for the local access authentication server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

NTCD: This field indicates whether the Configuration Device is enabled or disabled. The default is enabled. Disabling the NTCD SD card slot allows an administrator to block and unblock reading and writing settings to and from the SD card.

Generate New Certificate and Keys at Boot Up: This field indicates whether certificate and keys will be generated when the switch boots up. *A change to this setting requires that settings be saved and that the switch be rebooted before changes take effect*. The value will reset to be unchecked when the switch boots up. The default is no.

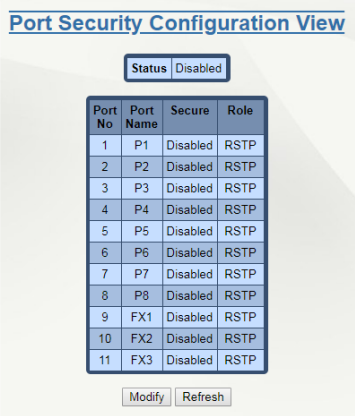
Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the port(s) that the address is authorized on. A non-authorized MAC address will be discarded and will be shown on the intruder log.

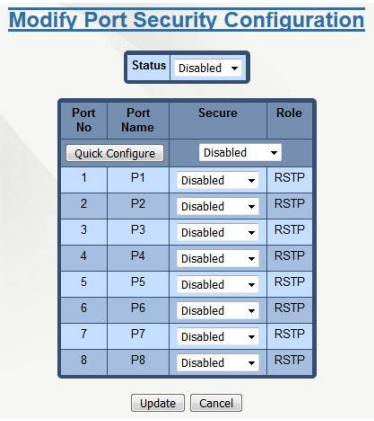
Port security allows secured ports to run with RSTP enabled on the port. Port security also allows the same MAC address to be authorized on multiple ports. When setting up authorization lists for RSTP ports, any MAC address that could migrate to other secured ports should also be placed, by the user, in the authorization list for those ports.

Port Security – Configuration

The Port Security Configuration View displays the status of Port Security and all the ports with their current settings. When Status is 'Locked' it is in secure mode. When Status is 'Learning' it builds an internal list of authorized MAC addresses and no ports are secured during this time.



The Modify button allows the administrator to change the Status of Port Security and Secure mode for all ports.



Status: The current status of Port Security. It can be Disabled, Learning, or Locked. Transitioning from Locked to Learning clears the Authorization List table on all ports. Transitioning from Locked to Disabled retains the current Authorization List. When transitioning from Learning to Locked, the Authorization List represents the authorized MAC addresses. The default value is Disabled.

Port No: The number of the port.

Port Name: The descriptive name of the port.

Secure: Displays Secure mode for the associated port. It can be Disabled, Enabled, or Single Mac.

- **Disabled:** Port Security is not active on the port regardless of the current Port Security Status.
- **Enabled:** Port Security is active when the current Port Security Status is Learning or Locked.
- **Single MAC:** Port Security will take the first learned MAC address and lock the port when current Port Security Status is Learning or Locked.

The default value is Disabled.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, N-Link Coupler, 802.1X, and Trunk.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Note: Security is not configurable on N-Ring or N-Link interconnecting ports. These ports must be linked to adjacent switches that have the protocol enabled. This link is considered to be a

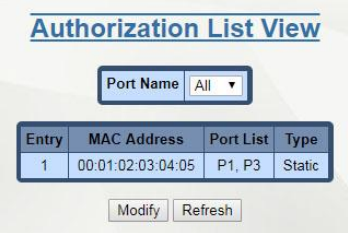
closed proprietary connection/segment that is not directly accessible. If both switches are otherwise properly secured then the proprietary connection/segment requires no additional security.

Note: It is recommended that the Bridging Aging Time be 300 seconds (the default) or longer while Port Security is Learning.

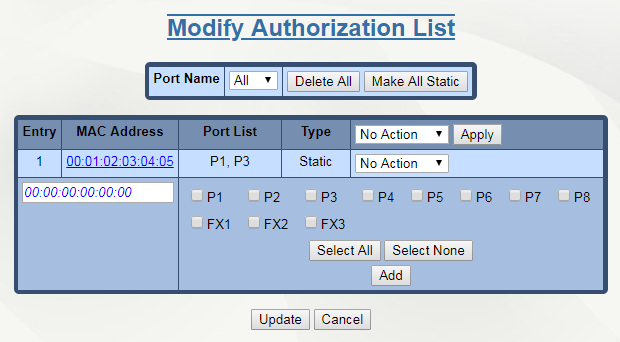
Ports Security – Authorization List

The Authorization List View displays a drop-down list of the available ports that is used to filter the authorization list. Below the drop-down list is the table of authorized Static and Learned MAC addresses and ports.

Note: Multicast Source Addresses will not show up in the Authorization List.



The Modify button allows the administrator to add new MAC addresses, and to modify and remove existing MAC addresses. The last row is used to add new MAC addresses and to change the ports of an existing MAC address.



Port Name: The descriptive name of the port.

MAC Address: The authorized host MAC address.

Port List: The port(s) that are authorized for the associated MAC address.

Type: The type of the authorized MAC Address. It can be either Learned, Static, or Single MAC.

Action: Action for the authorized MAC address. It can be No Action, Make Static from Learning mode, or Delete from the Authorization List. The maximum number of actions that may be performed on the Authorization List in a single update is 100.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Delete All Authorization List

To delete the complete authorization list associated with the selected port(s), click on *Delete All* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

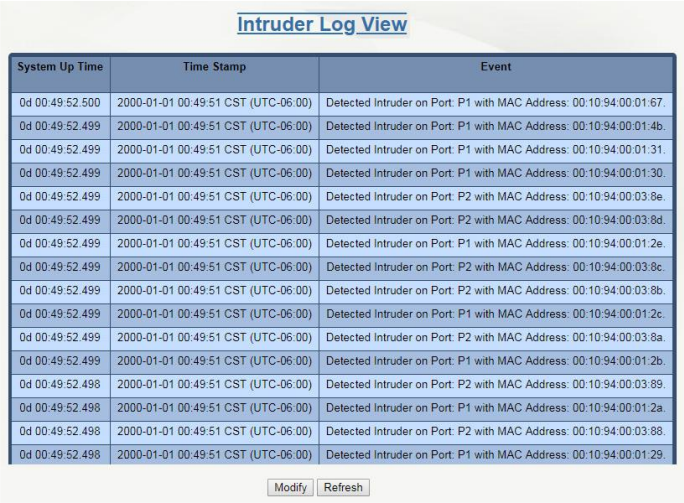
Make All Learned Authorization Entries Static

To make all learned authorization entries associated with the selected port(s) as Static, click on *Make All Static* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

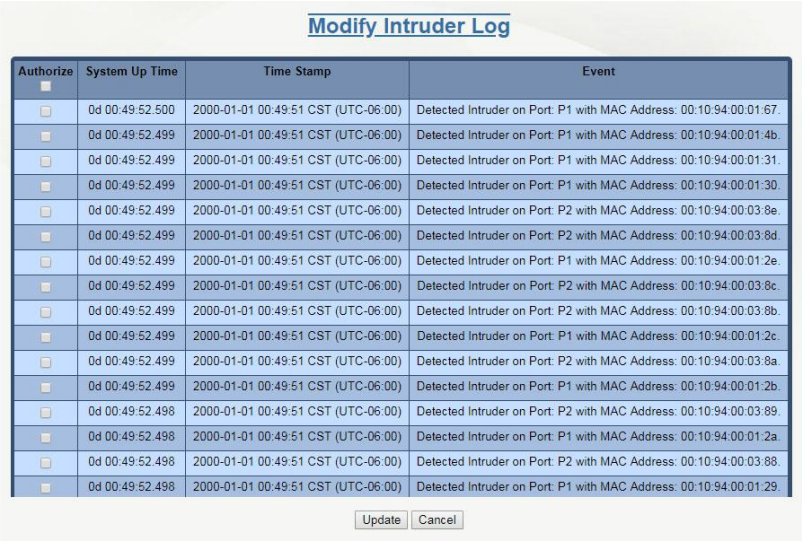
Note: Ports that are set to Single MAC cannot be included in static entries in the Authorization List.

Ports Security – Intruder Log

The Intruder Log page displays a list of unauthorized MAC addresses that attempted to access the secured device. Each intruder entry in the log is based on MAC address and Port. Multicast source MAC addresses will not be displayed in the Intruder Log table. The log is ordered by most recent first, based on the system up time and time stamp. The maximum number of entries is 100. If more than 100 intruders are detected, the oldest entries are deleted. The log is not saved through a power cycle.



To authorize a particular MAC Address from the Intruder Log, click on the Modify button and an "Authorize" field will be added as a checkbox as shown below:



Displays the most recent 100 intruders since the latest system startup. To review a complete list, please see the Event Log page.

FIELD	DESCRIPTION
Authorize	This is the selection to Authorize MAC Address(es) from the Intruder Log.
System Up Time	The elapsed time since the switch was powered on or rebooted.
Time Stamp	The date/time when the event was logged.
Event	The description of the intrusion.

Make the required modifications and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

An authorized entry will be displayed as green text color for that particular row in the Intruder Log table. The corresponding checkbox in the Authorize column will be checked and cannot be modified.

Port Security – Single MAC

Single MAC is a port security mode that allows a port to lock on a dynamically learned MAC address. The first MAC address to be learned and processed by the port will be locked in and any further traffic will be blocked as an intruder. The locking of the address is not dependent on switching the port security status to Locked. This feature helps in providing security for ports that may only have a single device plugged into the switch. The Single MAC address is not persistent following a reboot. The Single MAC will remain locked until a reboot upon which time a new MAC address will be learned and assigned as the new Single MAC entry.

Single MAC can be configured per port from the Port Security Configuration page. Manually added MAC addresses are not allowed to be assigned to a port designated as Single MAC. If a port is enabled under port security and then changed to Single MAC all learned addresses will be cleared and the next MAC address that comes in will be the new Single MAC address.

Single MAC addresses reset anytime the port security status is changed to Learning. Single MAC addresses are persistent when port security status is changed from Learning or Locked to Disabled and then back to Locked.

Single MAC limitations include: intruders on the Single MAC port cannot be manually authorized, and new addresses cannot be manually added to a Single MAC port.

Radius Server Configuration Information

The NT24k® takes advantage of Vendor Specific Attributes (VSA) as defined in section 5.26 of RFC 2865 so that multiple user levels can be authenticated using a Radius server. The VSA is defined as follows:

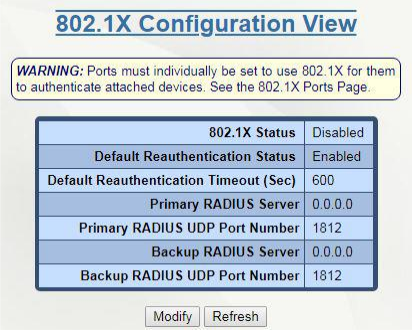
VENDOR ID	28381
Vendor ID	28381
Attribute Number	1
Attribute Format	string
Attribute Value	"AccessLevel:admin" or "AccessLevel:user"

The server and access list will need to be configured accordingly.

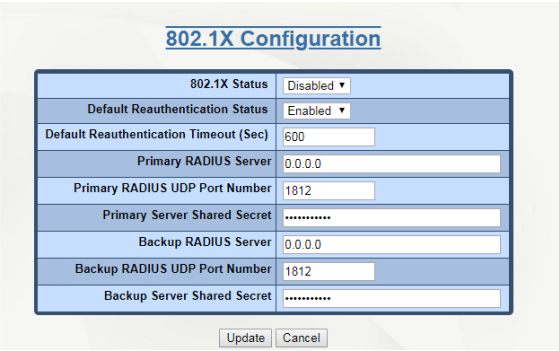
802.1X/Configuration

The Configuration dialog window displays the 802.1X status, reauthentication information, and RADIUS server information.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



To make changes to the Security settings, click on the *Modify* button and the fields shown below will become editable:



802.1X Status: This field indicates whether the 802.1X feature is enabled or disabled. At least one RADIUS server must be specified for 802.1X to be enabled. Ports must also be individually enabled on the ports configuration page.

Default Reauthentication Status: Select whether the 802.1X Reauthentication option is enabled or disabled. With reauthentication enabled, a device will be required to reauthenticate itself based on the time period specified by the reauthentication timeout field. 802.1X must be disabled to change this value.

Default Reauthentication Timeout (Sec): Enter the time period, in seconds, between 802.1X reauthentication. This value cannot be zero (0). 802.1X must be disabled in order to change this value.

Primary RADIUS Server: This field indicates the IP address of the primary RADIUS server. If contact with this server is lost, then contact with the backup server will be attempted.

Primary RADIUS UDP Port Number: The UDP port number of the Primary RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Primary Server Shared Secret: This field displays the shared secret for the primary server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Backup RADIUS Server: This field indicates the IP address of the backup RADIUS server. If contact with the primary server is lost, contact with the backup server will then be attempted.

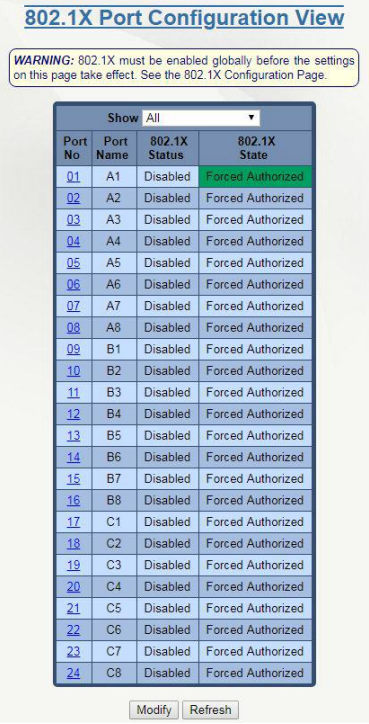
Backup RADIUS UDP Port Number: The UDP port number of the Backup RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Backup Server Shared Secret: This field displays the shared secret for the backup server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Make the required modifications and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

802.1X/Ports

The 802.1X Port Configuration View dialog window displays all the ports and their current settings. To modify this information, click on the *Modify* button.



Port No: This column shows the number of the port.

Port Name: This column displays the port's descriptive name.

802.1X Status: This column indicates whether the existing 802.1X port is enabled or disabled. Ports only require 802.1X authentication if they are enabled and 802.1X is globally enabled on the configuration page.

802.1X State: This column shows the current state of the port. This option is only valid when the port is enabled and 802.1X is globally enabled.

Link Down: There is no link detected on the port.
Initialize: The port is being setup for 802.1X authentication.
Disconnected: A valid 802.1X client has not been detected.
Connecting: A valid 802.1X client has been detected, but authentication has not begun.
Authenticating: The 802.1X client is being authenticated.
Authenticated: The 802.1X client has been authenticated.

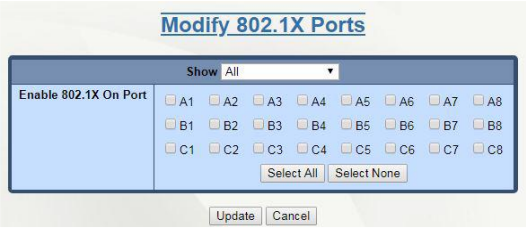
Aborting: The port is no longer authorized and is preparing to move back to the Disconnected state.

Held: The 802.1X client failed authentication and the switch is preventing new authentication attempts for a defined period of time. Default: 60 seconds.

Forced Authorized: Occurs when a port has had 802.1X disabled. The result is all traffic is allowed to pass through that port.

Forced Unauthorized: Occurs when a port is administratively disabled through the port configuration. The result is no traffic is allowed to pass through that port.

Click on the *Modify* button and the page below will appear. Select the required ports, and then click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



IEEE 802.1X MIB

The IEEE 802.1X MIB, IEEE 8021-PAE-MIB, is supported by the NT24k®. Since the NT24k does not support the supplicant features of 802.1X, the MIB tables pertaining to the supplicant behavior will not be populated and will be blank when queried.

With this release, the IEEE 802.1X MIB support is limited. Ports are only tracked when an 802.1X aware supplicant is attached. This means that not all 802.1X enabled ports will be visible, only those with valid supplicants. The statistics available through the MIB only pertain to the device since it either passed or failed authentication. Once the link goes down on the port, the statistics will be reset. Furthermore, any configuration items accessed through the IEEE 802.1X MIB can be set to modify the behavior of the port, but these changes will not persist across link events or power cycles.

Configuration changes that occur through the NT24k MIB will be persisted across link events and power cycles. Support for persisted statistics and configuration settings in the IEEE 802.1X MIB will be added to the NT24k in a future release.

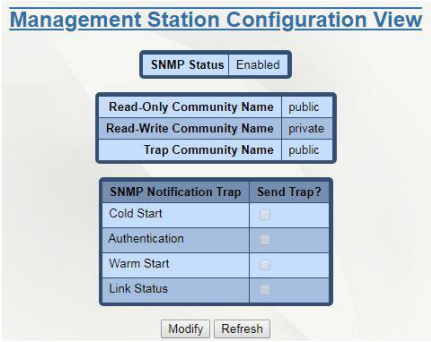
The IEEE 802.1X MIB allows for the writing to dot1xPaeSystemAuthControl. This is not supported in the current release of the NT24k firmware. dot1xPaeSystemAuthControl is considered a read-only attribute. The functionality for this is located in the NT24k MIB as ntronSecurityDot1xConfigStatus.

The IEEE 802.1X MIB allows for the writing to dot1xAuthAdminControlledDirections. Controlling the direction of the port traffic is not currently supported in the NT24k firmware and writing to dot1xAuthAdminControlledDirections will not have an effect on the system.

SNMP

Configuration

The SNMP Configuration displays the SNMP status and allows the administrator to disable or enable the protocol. The Read-Only, Read-Write and Trap Community Names are also displayed in this dialog window.



SNMP Status: This field indicates whether SNMP is enabled or disabled.

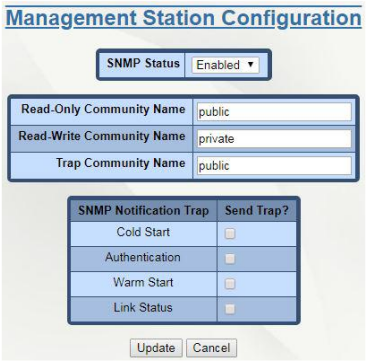
Read-Only Community Name: This configurable field represents the Authorized Community Name for SNMP Get requests. Only alphanumeric characters are allowed. The default value for this field is public.

Read-Write Community Name: This configurable field represents the Authorized Community Name for SNMP Set requests. Only alphanumeric characters are allowed. The default is for this field is private. Only administrators can view or modify this field.

Trap Community Name: This configurable field represents the Authorized Community Name for SNMP Traps. Only alphanumeric characters are allowed. The default is for this field is public.

SNMP Notification Traps: This section allows for control of which SNMP traps will be sent by this switch. Each of the four available traps can be enabled or disabled individually. The traps are: Cold Start, Authentication, Warm Start and Link Status.

Click on the *Modify* button to make changes to the SNMP Configuration. This will enable all configurable fields. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



Trap Stations

The Trap Stations dialog window displays the SNMP Trap Stations.

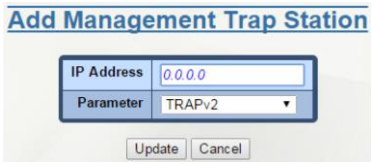


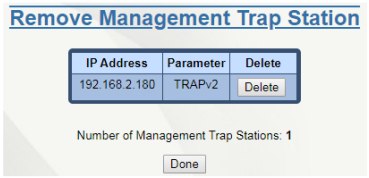
IP Address: This field represents the IP address of the Management Station to be sent SNMP Traps.

Parameter: This field displays the Target Parameters entry (TRAPv1, TRAPv2, etc) to be used for sending traps to the Management Station.

Adding Management Trap Stations

To add trap stations, click on the *Add* button and the following will appear:





Enter the required IP address and select the parameter to be used. Click on the *Update* button and the Display Management Trap Stations screen will appear.

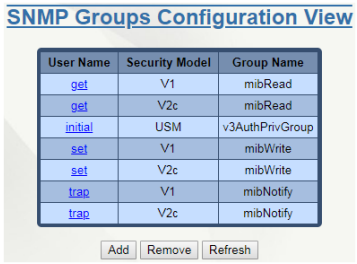
***SNMP V3 Default Security Parameters*:** The SNMP V3 default user parameters are shown here for reference only, as they are necessary for connecting to the switch securely using an SNMP V3 client when in defaults.The default user and other users can be added, deleted or modified by an administrator via either an SNMP V3 client or web browser, and the values below may be invalid if they are changed by an SNMP administrator.

Username: initial
Authentication Password: authpass
Authentication Protocol: MD5
Privacy Password: privpass
Privacy Protocol: DES

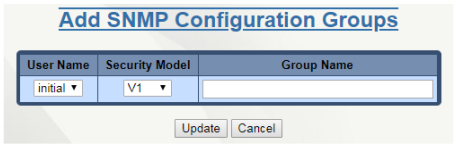
To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

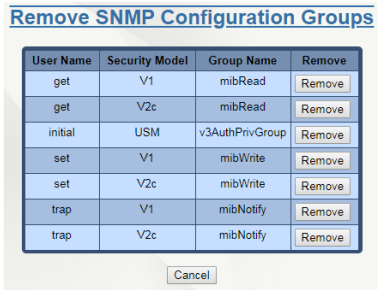
Groups

The SNMP Groups page allows the customer to configure SNMP group settings for specific SNMP users.



Click on the *Add* button to create a new SNMP group, or click the hyperlink under User Name to modify existing group settings for a user. Click the *Remove* button to display a list of current configured group and user settings, with an option to remove specific ones.





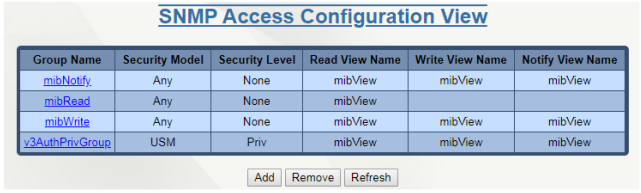
User Name: This field represents the SNMP User Name. It is a drop down list with an option for every SNMP user defined on the **Users** page.

Security Model: This field represents the security model the SNMP protocol will use for the defined group. The default is Any, while V1, V2c and USM (User-based Security) are the other available options.

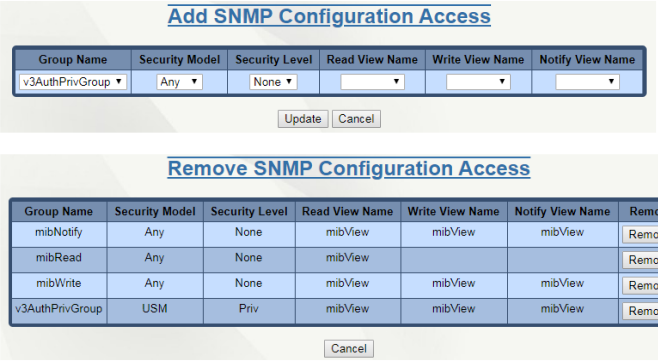
Group Name: This field represents the SNMP Group to which the SNMP user belongs.

Access

The SNMP Access page allows the customer to define various types of MIB access based on the defined view settings for each SNMP group.



Click on the *Add* button to define new access settings for a group, or click the hyperlink under Group Name to modify existing access for a group. Click the *Remove* button to display a list of current configured group and access settings, with an option to remove specific ones.



Group Name: This field represents the name of the group the user defines access settings for. It is a drop down list with an option for every SNMP group defined on the **Groups** page.

Security Model: This field represents the security model used to validate group access to views. The options are V1, V2c and USM (User-based Security).

Security Level: This field represents the security level of SNMP communications for the defined group. The options are None, Auth, and Priv.

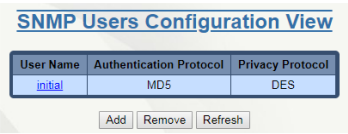
Read View Name: The name of the view that the defined group has read access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Write View Name: The name of the view that the defined group has write access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

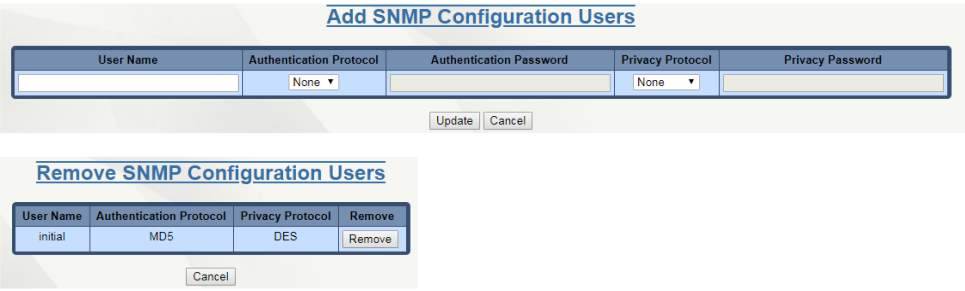
Notify View Name: The name of the view that the defined group has notify access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Users

The SNMP Users page allows a customer to create custom user names for group access and set the authentication and privacy protocols for that user. It is important to note that authorization and privacy passwords, when created, are hashed internally for security and will not be able to be retrieved.



Click on the *Add* button to create a new SNMP user, or click on a hyperlink in the *User Name* column to edit the information for that user. Click the *Remove* button to display a list of current configured users, with an option to remove specific ones.



User Name: This field represents the SNMP User Name.

Authentication Protocol: This field represents the authentication protocol utilized by the SNMP user. The options are None, MD5, and SHA1.

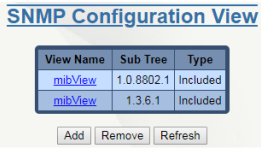
Authentication Password: The defined authentication password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

Privacy Protocol: This field represents the privacy protocol utilized by the SNMP user. The options are None, DES, and AES-128.

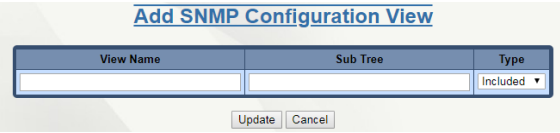
Privacy Password: The defined privacy password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

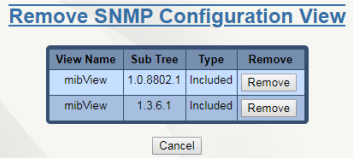
View

The SNMP View page allows a customer to define different view groups, which either include or exclude specific sub trees from the MIB tree based on the configuration.



Click on the *Add* button to create a new SNMP view, or click on a hyperlink in the *View Name* column to edit the information for that view. Click the *Remove* button to display a list of current configured views, with an option to remove specific ones.





View Name: This field represents the name of the SNMP view.

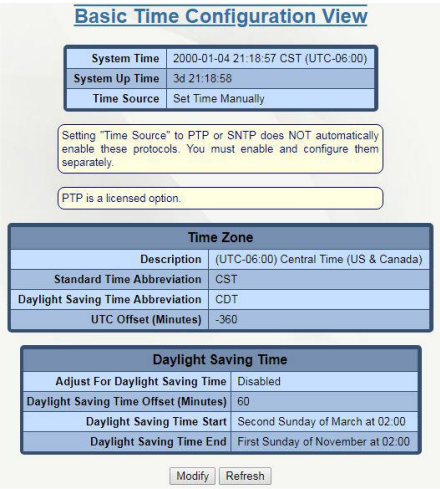
Sub Tree: This field allows the user to enter an OID string representing the sub tree being included or excluded from the view, based on the **Type** setting.

Type: This field allows the user to configure what the SNMP view does with the sub tree defined in the *Sub Tree* field. The options are Included and Excluded.

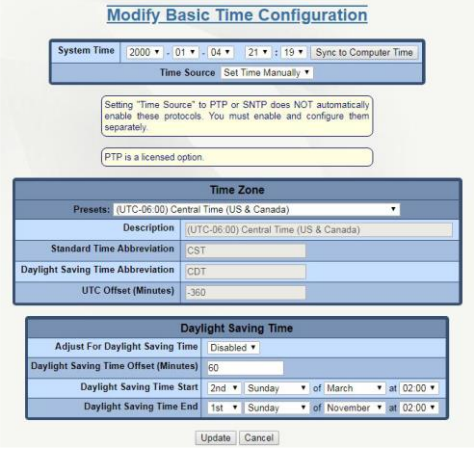
Time

Basic

From the Basic Time Configuration View dialog, the administrator can define the system time, time zone, daylight savings time and time source settings for the unit.



Click on the *Modify* button to make modifications to the unit's time settings.



System Time: This field displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start. The system date/time can be set manually but in the event of a power cycle or reboot it will revert to the default value.

Time Source: This field controls how the switch will automatically set its clock. The default value of "Set Time Manually" means that the time the switch uses can only be set manually. Setting this field to either "SNTP" or "PTP" causes the protocol to continuously update the system clock. Note that these must be enabled and configured separately from the basic time configuration. PTP is a licensed option and is unavailable otherwise.

Time Zone

Presets: This field provides a list of global time zones and cities within the time zones. Selecting from this list provides easy local time configuration and automatically populates the fields below. Choosing the "Custom..." option allows for editing of the below fields to satisfy specific requirements that are not met by one of the preset time zones.

Description: This field provides a description of the time zone selected. It contains the city and the offset from UTC for the selected location. If a custom preset is selected the description may be edited.

Standard Time Abbreviation: The common abbreviation for the selected time zone during standard daylight time is shown in this field. If a custom preset is selected the abbreviation may be edited.

Daylight Saving Time Abbreviation: This field represents the common abbreviation for the selected time zone during daylight saving time or summertime. If a custom preset is selected the abbreviation may be edited.

UTC Offset (Minutes): This field displays the offset, in minutes, from UTC. This is used to determine the local time. If a custom preset is selected the offset may be edited. Any change to the offset will affect the time calculation.

Daylight Saving Time

Adjust For Daylight Saving Time: This field indicates whether automatic adjustment for daylight saving time is made. The settings for this adjustment are defined below.

Daylight Saving Time Offset (Minutes): This field defines how much, in minutes, to adjust the time when daylight saving time starts and ends.

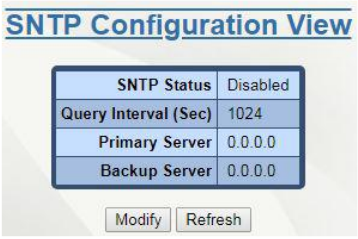
Daylight Saving Time Start: The week, the day of the week, the month, and the time at which daylight saving time should start.

Daylight Saving Time End: The week, the day of the week, the month, and the time at which daylight saving time should end.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

SNTP

From the SNTP Configuration View, the SNTP status can be changed, and the primary and back-up servers can be defined. Click on the *Modify* button to enable or modify the current settings.



SNTP Status: Indicates whether the SNTP client has been enabled. In order to enable SNTP, at least one SNTP or NTP server must be specified.

Query Interval (Sec): The periodic query interval used to request the time from the server(s). The valid range is between 4 and 129600. The default value is 1024.

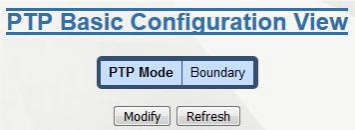
Primary Server: The address of the server to query first and most often. If contact with this server is lost, then contact with the backup server will be attempted. Either an SNTP or an NTP server may be specified.

Backup Server: The address of the backup server to query in the event that access is lost to the primary server. Either an SNTP or an NTP server may be specified. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Precision Time Protocol (PTP)

PTP Basic Configuration

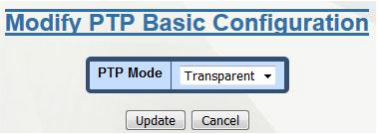
The PTP Basic Configuration View displays the PTP Mode and allows the administrator to disable the protocol, or enable one of two clock modes, Boundary or Transparent.



PTP Mode: This field indicates whether PTP is disabled, operating as a Boundary clock, or operating as a Transparent clock. When PTP is disabled, PTP traffic will route through the switch like any other multicast traffic.

Transparent Clock mode generally provides the most accurate time to a PTP client when the network is lightly loaded and there are only a few PTP clients connected to the switch. Boundary Clock mode is a better choice for a congested network. Boundary Clock mode also becomes a better choice as more PTP clients are connected to the switch.

Click on the *Modify* button to change the PTP Mode. When the desired mode has been selected, click *Update*.

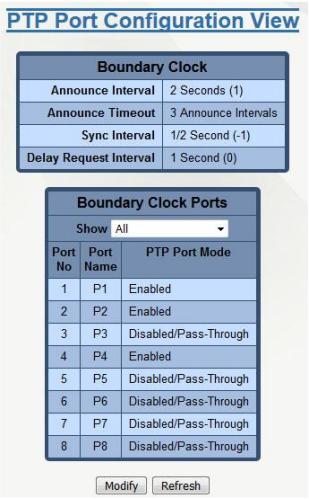


Note: When switching between PTP modes, it will be necessary to save the configuration and reboot the switch for the change to take effect.

PTP Port Configuration

The PTP Port Configuration View displays global and per port settings that relate to PTP.

The settings in the **Boundary Clock** table are applied to every port of a switch in Boundary Clock mode. The **Boundary Clock Ports** or **Transparent Clock Ports** table displays the PTP Port Mode for every port on the switch.



Global Boundary Clock Settings

Announce Interval: This is the log2 value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Announce Timeout: This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Sync Interval: This log2 value determines how often a sync message will be sent. The default value of "- 1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Delay Request Interval: This log2 value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

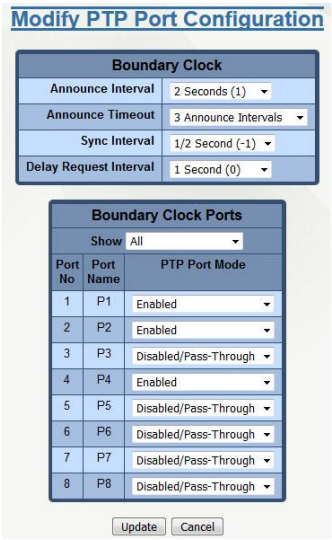
Boundary Clock Ports or Transparent Clock Ports Settings

Port No: Indicates the number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked". When Enabled, PTP packets will be processed by the switch PTP software. When Disabled/Blocked, PTP packets will be discarded as they enter the port. When Disabled/Pass- Through, PTP packets will be forwarded to other pass-through ports (within VLAN restrictions) with no PTP processing.

Click the *Modify* button to change any of the global settings or to change the PTP Port Mode of specific ports.

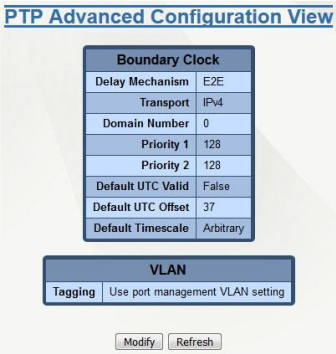


Once modifications to Announce Interval, Announce Timeout, Sync Interval, Delay Request Interval or PTP Port Mode have been made, click on the *Update* button.

Note: The settings on the PTP Port Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

PTP Advanced Configuration

The PTP Advanced Configuration View displays common advanced PTP settings and advanced settings that relate specifically to the Boundary Clock mode of operation. The Common values are read-only and only some values can be modified.



Boundary Clock

Delay Mechanism: The Delay Mechanism specifies the method used by PTP to handle delay correction values. E2E is the only delay mechanism currently supported.

Transport: IPv4/UDP is the only network transport method currently supported.

Domain Number: The Domain Number selects a PTP Domain. Only PTP packets in the same domain will be received and processed, and all sent PTP packets will be tagged with the same Domain Number. The range is 0-127. The default is 0.

Priority1: This value sets the priority of this switch as a Master clock. It is the most important value used by the Best Master Clock (BMC) algorithm of other PTP devices when selecting a Master clock. The range is 0-255, with 0 being most important. The default is 128.

Priority2: This value is used to break ties in the BMC algorithm. The range is 0-255, with 0 being most important. The default is 128.

Default UTC Valid: Current UTC Valid is a field in PTP packets that tells other devices whether the UTC Offset field that is also being sent in the packet should be considered valid. The Current UTC Valid value is set to this default at boot time, until it is updated by making a connection to a PTP Master. The default is "False" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

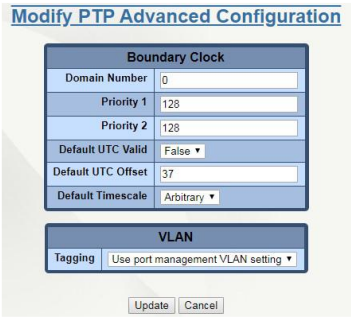
Default UTC Offset: The Current UTC Offset value is set to this default at boot time. The range is 0-127. The default is 36.

Default Timescale: The Current Timescale value is set to this default at boot time. All times exchanged in the PTP protocol are either "Arbitrary" or "PTP". Times that are "Arbitrary" cannot be converted to calendar time correctly and may have no connection to external accurate time. Times that are "PTP" can be converted to accurate calendar time using the UTC offset. The default is "Arbitrary" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

VLAN Tagging: PTP frames that egress a PTP port may have a VLAN tag or may be untagged. When "Use port Management VLAN setting" is selected, the PTP frame is untagged if the Management VLAN is set to 'Untag on Egress'. Otherwise, the frame is tagged with the Management VLAN ID. This is the default setting. When "Use port PVID setting" is selected, the PTP frame is untagged if the VLAN used as the PVID is set to 'Untag on Egress'. Otherwise, the frame is tagged with the port's PVID.

Note: When PTP Mode is "Transparent Clock", PTP frames will obey VLAN restrictions and will not cross VLAN boundaries.

To make changes, click on the *Modify* button. Once the desired changes have been made, click on the *Update* button to apply changes to settings.

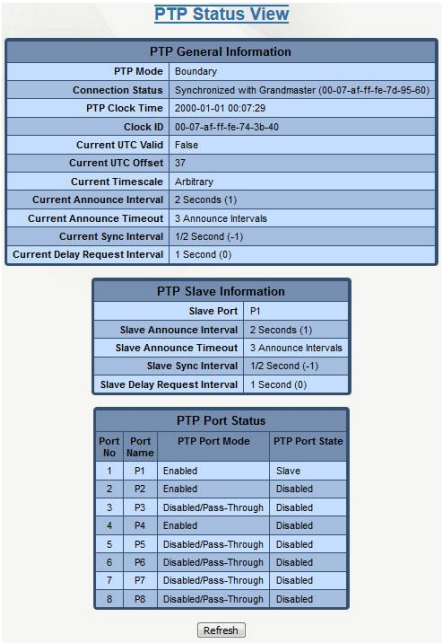


Note: The settings on the PTP Advanced Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

Note: The Current UTC Valid, Current UTC Offset and Current Timescale values are not displayed on the View or Modify pages when PTP is currently disabled or in Transparent Clock mode because they do not apply.

Status

The PTP Status and Information page displays read only information about a device's PTP configuration. General and per port information is displayed on this page.



Note: When PTP is disabled, the only information displayed on this page is PTP Mode and Clock ID, because nothing else applies when PTP is disabled.

PTP General Information

PTP Mode: The PTP mode of the switch. Options include "Disabled", "Boundary Clock", and "Transparent Clock". The default is "Disabled". If the PTP protocol is disabled on the switch, all ports behave as Disabled/Pass-Through. Changes to this setting require a reboot of the switch.

Connection Status: This only applies to Boundary Clock mode. This is the current PTP Master clock of the switch. If this switch is the Master clock, then the connection status indicates that PTP is not synchronized with a Grandmaster.

PTP Clock Time: This only applies to Boundary Clock mode. This displays the date/time of the PTP Clock. The PTP Clock defaults to the system clock when not synchronized to a PTP Master clock.

Clock ID: The unique Clock ID of this PTP device. It is constructed automatically based on the switch MAC address.

Current UTC Valid: A field in exchanged PTP packets that says whether the UTC Offset field that is also being sent in the packet should be considered valid. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current UTC Offset: A field in exchanged PTP packets that provides the current offset to UTC. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current Timescale: A field in exchanged PTP packets that provides the most recently received Timescale value from the Master. This is a run-time value that is dynamically updated based on the most recently connected PTP Master. If this value is "PTP", the internal PTP time can be converted to a calendar time using the Current UTC offset.

Current Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Slave Information

Slave Port: This only applies to Boundary Clock mode. This is the port that is connected to and inheriting configuration values from a PTP Master. If no port is acting as a PTP Slave this field will have a value of “N/A”.

Slave Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Port Status

Port No: The number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked".

PTP Port State: The current PTP state of a port. It should be noted that when PTP is in Transparent Clock mode the port state is not applicable and will not be displayed.

User Management

Authorized Users

The User Management screen allows users to view, add, modify and remove system user accounts. The display includes a list of all the users who have access to the management features of the switch and their access permissions.

Note: Up to 5 web users may be logged into the Web Management tool at once.



Adding Users

The system administrator can add users, change passwords and define access permissions for each user. Click on the *Add* button and the following dialog window will appear:



User Name: User names may include all alphanumerical characters, as well as the following 2 characters: _ - , and must be 3 to 15 characters long.

Password: Passwords can include all printable characters, except for the colon (:) and spaces, and the password length must be in the range specified by the "Password Length Min" and "Password Length

Max" fields. These fields are configurable under the User Management Configuration screen. The background print in the Password entry field will specify the currently configured range.

Access Permission: This field determines whether a user has standard *User* rights or *Admin* access.

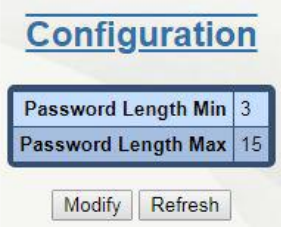
- *User* permission gives the right to view switch configurations and to view current port settings.
- *Admin* permission gives the right to change and view any switch configuration and to change and view any current port settings.

Removing Users

Users can be removed by a user with Admin access. Click on the *Remove* button, enter the User Name to be deleted and click on the *Remove* button.

Configuration

The User Management Configuration screen allows for the switch to be configured with a user password length minimum and user password length maximum.



Password Length Min: The minimum number of characters allowed in a user password. The default is 3 characters.

Password Length Max: The maximum number of characters allowed in a user password. The default is 15 characters.

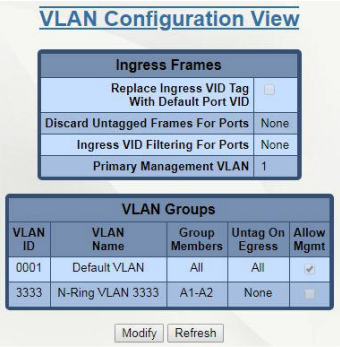
The Configuration screen allows modification of the minimum user password length and the maximum user password length. Both fields, 'Password Length Min' and 'Password Length Max' must be within the overall range of 3 to 15 characters, inclusive.

A configuration change, min or max, will not be allowed if an existing user password will fall out of the desired range (or become non-compliant). Each of the users preventing the change will be listed in the error message. In this case, each of the users that would become non-compliant would need to have their password lengths changed to fall into the new desired range before the configuration change can be applied.

VLAN

The VLAN Configuration View dialog window shows information about the existing VLANs.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Ingress Frames

Replaces Ingress VID Tag With Default Port VID: Specifies whether or not to replace the VID tag of ingress frames with the port's default VID (PVID).

Discard Untagged Frames For Ports: Specifies whether or not untagged ingress frames are dropped by the selected ports.

Ingress VID Filtering for Ports: Specifies whether or not to filter out ingress frames when a VID violation is detected on the selected ports.

Primary Management VLAN: The default egress VLAN used for communications initiated by the switch i.e. DHCP requests.

VLAN Groups

VLAN ID: Displays the VLAN identification for the group members. The range should be 1 - 4094.

VLAN Name: This field displays the VLAN name, which accepts alphanumeric and only the following special characters (including the period)**: # _ - .**

Group Members: This field specifies which ports are members of the VLAN group.

Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Allow Mgmt: Specifies whether or not all ports in this VLAN are management ports.

VLAN Group Members

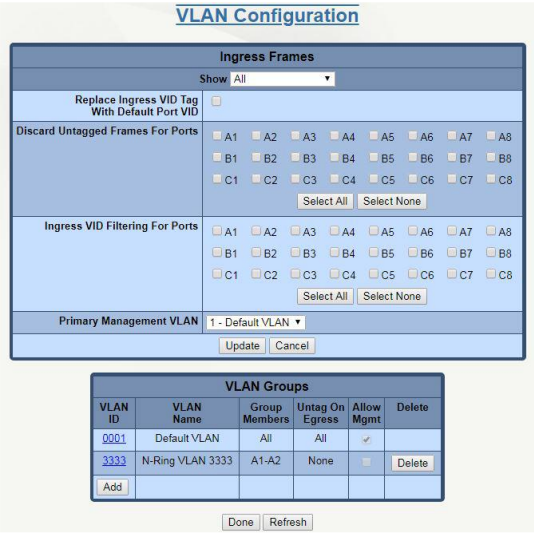
Port No.: The number of the port.

Port Name: The descriptive name of the port.

Group Member: Specifies whether or not the port is a member of the VLAN group.

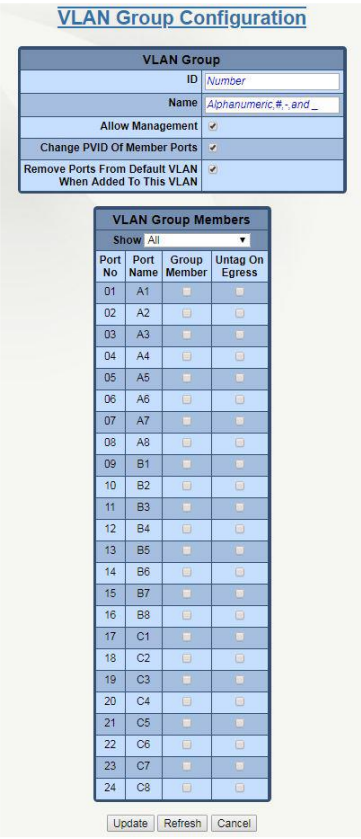
Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Click on the *Modify* button and the following VLAN Configuration page will appear:



The top table is used for general VLAN changes. Once the required changes have been made, click on the *Update* button and then go to the Configuration menu and click on the *Save* button to ensure all changes are saved.

The bottom table is where new VLANs are added and existing ones are modified or deleted.Click on the *Add* button in the bottom table and the following dialog window will appear:



Note: The system is limited to a maximum of 60 configured VLAN groups.

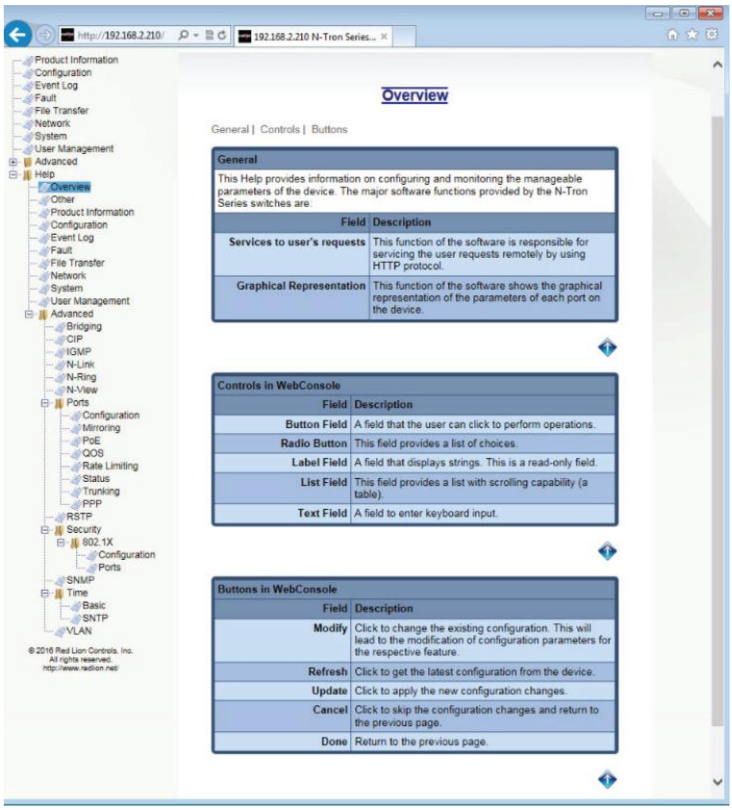
Note: The total number of configured VLAN groups is constrained by system resource usage which varies depending upon network configuration, with VLAN port membership count being the most significant factor.

Note: A port is automatically moved to the Default VLAN if no other VLAN contains that port.

Once the required changes have been made, click on the *Update* button and then go to the *Configuration* menu and click on the *Save* button to ensure all changes are saved.

Help

The Help menu provides information on monitoring and configuring the manageable parameters of the device. Specific help can be found by using the left-hand navigation menu or clicking on the Help link in the top menu.



Appendix A

Command Line Interface

The Command Line Interface (CLI) can be accessed by connecting a host device to the USB connector on the switch. Once connected, the switch will appear as a serial connection. A standard terminal application may be used to communicate to the switch through the serial connection. For serial port settings, see the “USB INTERFACE” section of the NT24k® Series Hardware Manual.

There are two additional methods for connecting to the CLI, Telnet and SSH. Using any standard Telnet client, sim-ply enter the IP address of the switch to start a connection to the CLI. SSH, the secure alternative to Telnet, can also be used with any standard SSH client by simply entering the IP address of the switch to start a secure connection to the CLI.

The CLI contains some status and configuration capability. To interact with the CLI, a login is required. The default username and password is 'admin'. Once logged in, a listing of available commands can be obtained through the help interface. This is accessible by typing either “?” or “help?”. The following commands are available:

NT24k CLI Commands

COMMAND	ARGUMENTS	DESCRIPTION
?		Show system commands. This command is the same as 'help commands' which is shown below.
admin		Administration settings, including IP settings and DHCP mode.
admin system set		Set general system settings.
admin system set contact	<contactname>	The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set location	<locationname>	The physical location of the switch. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set name	<switchname>	Contains the name assigned to the device, which allows alphanumeric and special characters '#', '_', '-', and ':' only. When IP Configuration is DHCP, this may be used as the Client ID (Option 61) of the DHCP Request.
admin system set upper Threshold	<upperThreshold> - An integer from -60 to 120.	The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system set lower Threshold	<lowerThreshold> - An integer from -60 to 120.	The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system show		Show general system information.
admin ip set		Set Internet protocol settings.
admin ip set clientid	<type> - A client ID type: [0-switch name, 1-switch MAC, 2-other text, 3-other hex] <value>	This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters.

COMMAND	ARGUMENTS	DESCRIPTION
	- A string when the type is 2 or a hex string when the type is 3.	• Usage: admin ip set clientid 0 • Usage: admin ip set clientid 2 "Switch53"
admin ip set dhcp admin ip set no dhcp		Determines the method used to obtain an IP address, Subnet Mask, and Gateway. When DHCP is enabled, DHCP protocols are used to obtain these values. When DHCP is disabled, Static is selected, and the statically configured values are used. • Usage: "admin ip set dhcp" to enable DHCP mode. • Usage: "admin ip set no dhcp" to disable DHCP and return back to Static.
admin ip set ip	[address <ipaddress>] - The IP address of the device. [mask <subnetmask>] - The Subnet mask of the device. [gateway <gateway>] - The Gateway address of the device.	Set the Static IP address, subnet mask, and/or gateway. • Usage: admin ip set ip [address (IP address)] [mask (Subnet mask)] [gateway (Gateway address)] **Example:** CLI> admin ip set ip address 192.168.2.212 mask 255.255.255.0 gateway 192.168.2.1
admin ip show		Show Internet protocol settings. **Example:** CLI> admin ip show
arl		Show ARL Configuration.
arl show		Show ARL Configuration. Example: CLI> arl show Arl Settings Src MAC Address Vlan Sta Drop Blk Loc Destination Ports Applies only to Ports ================== ==== === ==== === === ========== 00:07:af:7d:37:e0 1 Y N N FDB CPU All 01:00:5e:00:00:fb 1 Y N N FDB C7 All 01:00:5e:00:00:fc 1 Y N N FDB C7 All 01:00:5e:7f:ff:fa 1 Y N N FDB C7 All 01:07:af:00:de:d1 ANY Y N N POL CPU A1-A2 01:07:af:00:de:d2 ANY Y N N POL Drop All 01:07:af:00:de:f0 ANY Y N N POL Drop All 01:07:af:00:de:f1 ANY Y N N POL Drop All 01:07:af:00:de:f2 ANY Y N N POL Drop All 01:07:af:00:df:48 ANY Y N N POL Drop All 01:07:af:01:3d:1b ANY Y N N POL CPU All 01:07:af:7d:37:e0 ANY Y N N POL Drop All 01:80:c2:00:00:00 1 Y N Y POL CPU All a0:36:9f:3b:6c:b2 1 N N N FDB C7

COMMAND	ARGUMENTS	DESCRIPTION
		All ff:ff:ff:ff:ff:ff ANY Y N N POL CPU All
arp		Address Resolution display and control.
arp	[<arguments>]	Use arp without arguments to get help. Example: CLI> arp <arp>arguments> - Use arp without arguments to get help. Surround multiple arguments with double quotes. EX: arp "-r 192.168.2.117" CLI> arp NAME arp - address resolution display and control SYNOPSIS arp [-silent] [-V <routetab>] [-i <ifname>] –a arp [-silent] [-V <routetab>] [-i <ifname>] –A arp [-silent] [-V <routetab>] [-i <ifname>] -d <hostaddress> arp [-silent] [-V <routetab>] [-i <ifname>] [-p] [-t] -s <hostaddress> <ether_addr> arp [-silent] [-V <routetab>] [-i <ifname>] -r <hostaddress> DESCRIPTION The arp program displays and modifies the Internet-to-Ethernet address translation tables used by the address resolution protocol. Options: -silent Suppress output. MUST be the first argument. -i <ifname> Specify interface. First one if not specified. -t Temporary ARP entry. -p Public ARP entry (i.e. proxy ARP entry). -r Send an ARP request to the host address. -V <routetab> Specify route table. 0 if not specified. Commands: -a Display the currently existing ARP entries. -A Delete all the ARP entries. -d Delete specified ARP entry. -s Register a ARP entry for a node.
clear		Clear the screen.
config		Save changes to the configuration or reset the configuration to factory defaults.
config reset		Reset configuration settings to factory defaults.
config save		Save current running configuration settings.
dhcpServer		DHCP Server.
dhcpServer status set	<statusValue>	Set DHCP Server status (disabled or enabled).
dhcpServer status show		Show DHCP Server status.
exit		Exit immediate mode. **Example:** CLI> admin ip CLI(admin-ip)> exit CLI>
fileTransfer	tftp server <ip address> transferType	Transfer files to or from the switch.

COMMAND	ARGUMENTS	DESCRIPTION
	<UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]	
help		Show command help.
help commands		Show system commands. Example: CLI> help commands admin - Administration settings, including IP settings and DHCP mode. arl - Arl Settings arp - Address Resolution Protocol (ARP) clear - Clear the screen config - Save changes to the configuration, or reset switch to factory defaults. dhcpServer - DHCP Server exit - Exit immediate mode fileTransfer - Transfer files help - Show command help history - Show command history lldp - Link Layer Discovery Protocol logout - Log off this system ping - Ping a host. port - Port settings portSecurity - Port Security ppp - Start PPP server (use from serial console only). reboot - Reboot the switch and load the most recently saved configuration. who - Display users currently logged in whoami - Show current user info
help edit		Show editing keys. **Example:** CLI> help edit Available editing keystrokes: Delete current character.....Ctrl-d Delete text up to cursor.....Ctrl-u Delete from cursor to end of line.....Ctrl-k Move to beginning of line..... Ctrl-a Move to end of line.....Ctrl-e Get prior command from history.....Ctrl-p Get next command from history.....Ctrl-n Move cursor left..... Ctrl-b

COMMAND	ARGUMENTS	DESCRIPTION
		Move cursor right.....Ctrl-f Move back one word.....Esc-b Move forward one word.....Esc-f Convert rest of word to uppercase.....Esc-c Convert rest of word to lowercase.....Esc-l Delete remainder of word.....Esc-d Delete word up to cursor.....Ctrl-w Transpose current and previous character..... Ctrl-t Enter command and return to root prompt..... Ctrl-z Refresh input line..... Ctrl-l
help help		Show command help. **Example:** CLI> help help help - Show command help commands - show system commands edit - Show editing keys
history		Show command history. **Example:** CLI> history 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history
history clear		Reset all history.
history enable		Turn history capture on.
history filter		Do not capture repeated input into history.
history info		Information **Example:** CLI> history info 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history 3 history info History filter: off History modal : off History ring : on
lldp		Link Layer Discovery Protocol.
lldp mode show		Show LLDP mode.
lldp mode set	disable, enabled, auto	Set LLDP mode.
lldp wakeTime show		Show remaining wake time in auto LLDP mode.
lldp wakeTime send	hours <hours> minutes <minutes>	Send wake time in auto LLDP mode to all switches.
logout		Log off this system.
ping		Ping a host.
ping	[<arguments>]	Use ping without arguments to get help. Surround multiple arguments with double quotes. **Example:** ping "-c 3 192.168.2.121"
port		Port Mirroring configuration display and control.

COMMAND	ARGUMENTS	DESCRIPTION
port config show	<portlist>	Show all port configuration information for the specified ports.
port config show all		Show all port configuration information for all ports on the switch.
port config show basic	[<portlist>]	Show basic port configuration information for the specified ports.
port mirror set		Set Port Mirroring configuration.
port mirror set enable port mirror set no enable		Enable or disable Port Mirroring. Use "no enable" to disable.
port mirror set destination	<port>	Set the destination port for Port Mirroring. For example, "A4".
port mirror set txsource	<portlist>	Set the transmit source ports that are mirrored to the destination port. For example, "A1,A2".
port mirror set rxsource	<portlist>	Set the receive source ports that are mirrored to the destination port. For example, "A1-A3,A6".
port mirror set dataonly port mirror set no dataonly		Set mirrored data only. Use "no dataonly" to disable.
port mirror show		Show Port Mirroring configuration. **Example:** CLI> port mirror show Port Mirroring Settings Mirror Status : Enabled Destination Port : A1 Mirrored Data Only : Enabled Tx Source Ports : None Rx Source Ports : A4
portSecurity		Port Security
portSecurity status set	disabled, learning, locked	Set port security status
portSecurity status show		Show port security status.
portSecurity intruderLog show		Show the contents of the intruder log
portSecurity authList show	[<portlist>]	Show the contents of the authorization list
ppp		Start PPP server (available from the serial console only).
reboot		Reboot the switch and load the most recently saved configuration.
who		Display users currently logged in. **Example:** CLI> who Line User Host(s) Idle Location 00:00:00 admin Console
whoami		Show current user information. **Example:** CLI> whoami

COMMAND	ARGUMENTS	DESCRIPTION
		User name: admin

System Information

Command: admin system show
Description: Show general system information

```
CLI>    admin system show

System Settings

Name                              : NT24k-DR16-DC

Model Name                        : NT24k-DR16

Family Name                       : NT24k

Software Version                  : 2.2.3

Build Date                        : Oct 25 2019. 16:36:28

Boot Loader                       : 2.0.7

Copyright                         : Copyright <c> 2013-2019

URL                          : http://www.redlion.net/

Ram Size                     : 128 MB

Flash Size                   : 64 MB

Internet Protocol (IP) Settings

IP Configuration             : DHCP

DHCP Client ID Type          : Switch Name

DHCP Client ID Data          : N-Tron Series 77:fd:00

Fallback IP Enable           : Enabled

Fallback IP Address          : 192.168.1.201

Fallback IP Subnet           : 255.255.255.0

Fallback IP Gateway          : 0.0.0.0

Current IP Address           : 0.0.0.0

Current Subnet Mask          : 0.0.0.0

Current Gateway Address      : 0.0.0.0

MAC Address                  : 00:07:af:77:fd:00

--------

System Up Time               : 0d 04:05:42

System Time                  : 2000-01-01 04:05:41 CST (UTC-06:00)

Switch Name                  : N-Tron Series 77:fd:00

Switch Contact               : Admin
```

```
Switch Location            : Mobile, AL 36606

--------

Device Temperature         : 50 C, 122 F

Upper Temperature Limit    : 120

Lower Temperature Limit    : -60

CLI>
```

Displaying Port Information

Command: port config show <all|basic> <port-list>

Description: Show general port configuration, similar to what is displayed in the Web Software. The first parameter ("all" or "basic") specifies how much information to show and the port-list parameter can be used to filter the displayed ports. This can be a single port, a range of ports (ex. 1-3) or multiple ranges of ports, separated by a comma. Ports can also be selected by name or by number.

Note: If you want all information for a specific port, or set of ports, simply call **port config show <port-list>**. If you want only basic information, you will need to include "basic" before **<port-list>**.

```
CLI> port config show basic

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
3    P3   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
4    P4   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
6    P6   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
7    P7   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
8    P8   10/100/1000 Mbps TX Enabled  Up     1000  RSTP Forwarding    1
9    DM1  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
10   DM2  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
11   DM3  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
12   DM4  Not Installed        Enabled  Down   1000  RSTP Not Installed 1

CLI> port config show P1

Port Configuration View

Port Number:            1
Port Name:              P1
Port Description:       10/100/1000 Mbps TX
Admin Status:           Enabled
Link Status:            Down
Auto Nego:              Enabled
Port Speed:             Auto
Duplex Mode:            Auto
Flow Control:           Disabled
Cross Over:             Auto
Role:                   RSTP
Port State:             Discarding
PVID:                   1
Trunk ID:               0
Usage Alarm Low:        0
Usage Alarm High:       100

CLI> port config show basic P1-P2,P5

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1

CLI>
```

Setting a Static IP Address

By default, the switch will use the DHCP protocol for IP address assignment. The switch may also be configured to use a static IP address.

Command: admin ip set

Description: Moves the CLI to the IP address settings immediate mode. Typing "?" will provide the command options available here.

Once in the IP immediate mode, it is easy to change the address configuration. Once set, the new configuration must be saved for this change to be retained after a reboot.

```
CLI(admin-ip-set)> ip address 192.168.2.209 mask 255.255.255.0 gateway 0.0.0.0
CLI(admin-ip-set)> no dhcp

        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       Static Settings
        +               IP Address:     192.168.2.209
        +               Subnet Mask:    255.255.255.0
        +               Gateway:        0.0.0.0
        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
CLI(admin-ip-set)> exit
CLI>
```

Performing a File Transfer

File transfers can be initiated through the CLI by using TFTP Protocol.

Command: fileTransfer tftp server <ip address> transferType <UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]

Description: Initiates the file transfer from the CLI.

```
CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType Upgrade System

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed

Processing '/ram0/xfr/NT24k_image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done reading contents


Extracting from /ram0.xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

extracting file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done extracting tar.

file NT24k_image.xml, size 1287 bytes, 3 blocks

moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image


Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.247 (130370
bytes/second)

Done Processing '/ram0/xfr/NT24k_image.tar'. Elapsed time: 1:25.996

File Transfer: Completed

CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType UpgradeSystem file
NT24k_Image.tar

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed
```

```
Processing '/ram0/xfr/NT24k_Image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done reading contents.

Extracting from/ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done extracting tar.
file NT24k_image.xml, size 1287 bytes, 3 blocks
moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image

Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.595 (130370
bytes/second)
Done Processing '/ram0/xfr/NT24k_Image.tar'. Elapsed time: 1:26.333
File Transfer: Completed
```

Saving the Configuration

When configuration changes are made, they are not automatically saved to NVRAM and will be discarded at the next power cycle. Configuration changes must be saved to be retained across power cycles.

Command: config save

Description: Save all current changes to the configuration for use after the next power cycle. If a Configuration Device is installed, the configuration will also be saved to the device.

```
CLI>
CLI> config save
CLI>
```

Appendix B

Working with Configuration Files

Importing a Subset of an XML Configuration File

The XML configuration file may be used to set all of the configurable parameters on a NT24k® switch or to configure a subset of parameters. Setting common parameters across multiple switches can be easily accomplished by creating and importing an abridged configuration file for this purpose.

Appendix C contains an example XML Configuration file. A simple way to start an XML configuration file is to export the existing saved configuration file from the switch and modifying it to meet your new configuration needs.

When creating a configuration file for a subset of available parameters, setting the system configuration mode to *Keep* will maintain the current settings for all parameters other than those explicitly set by the new file being imported. If the system configuration mode is not set to *Keep*, all parameters other than those being set by the configuration file, will be reset to their default setting.

In the example below, the mode is set to Keep so that other switch settings are not reset to defaults. Additional information about the content of the configuration file can be found at the top of any exported configuration file.

```
<SystemConfiguration Mode="Keep"?
  <SystemGroup>
    <SystemConfig>
      <SwitchContact>IT Department Manager</SwitchContact>
      <SwitchLocation>Factory Floor B</SwitchLocation>
    </SystemConfig>
  </SystemGroup>
</SystemConfiguration>
```

Using Port Numbers instead of Port Names

In a configuration file, it is valid to use port numbers instead of names to simplify the sharing of configuration settings. Ports are numbered starting at 1.

Port names may differ between switch models. For example, the NT24k-DR24 uses A1-A8, B1-B8, and C1-C8 and the NT24k-14FX6 uses P1-P8 and FX1-FX6. However the configuration files can reference ports 1-24 for an NT24k and ports 1-14 for an NT24k-14FX6.

In the following example, VLAN 1 is configured for ports 1 through 8 and VLAN 2 is configured for ports 9 through 16. This settings file can be imported into any NT24k switch that supports 16 or more ports. Note that the configuration file must also set the appropriate port PVIDs.

```
<SystemConfiguration Mode="Keep">
  "VlanGroup>
    <IngressDiscardUntagged>None</IngressDisgardUntagged>
    <IngressReplaceVID>Disabled</IngressReplaceVID>
    <IngressVidFilter>None</IngressVidFilter>
    <PrimaryMgmtVlanId>1</PrimaryMgmtVlanId>
    <RemoveportsFromDefaultVlan>Enabled</RemovePortsFromDefaultVlan>
    <TaggedVlans>
      <Vlan>
            <AllowManagement>Enabled</AllowManagement?
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
```

```
            <VlanId>1</VlanId>
        </Vlan>
        <Vlan>
            <AllowManagement>Enabled</AllowManagement>
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
            <VlanId>1</VlanId>
        </Vlan>
    </TaggedVlans>
    <Type>Tagged</Type>
```

Importing an Incompatible XML Configuration File

Errors related to invalid port names or numbers may occur when importing a configuration file from one model of an NT24k® switch into a different model of an NT24k switch.

Field	Description
Destination	XML line:(216) - Could not set '/SystemConfiguration/MirrorGroup/MirrorConfig/Destination' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
ControlPort	XML line:(226) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort' to value 'P3'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
CouplerPort	XML line:(227) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort' to value 'P4'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Portx	XML line:(244) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Portx' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Porty	XML line:(245) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Porty' to value 'P2'

Resolving Invalid Port Mappings

If the number of ports in the XML configuration file is greater than on the target model, then the following sections should be removed for each of the extra ports.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/Port (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port

Notice that if the target switch has additional ports whose settings are not specified in the imported configuration file, then these additional ports will have their settings set to default values if the mode has not been set to “Keep”.

Ports on the target switch that do not exist in the configuration file will be added to Default VLAN 1. If the configuration file has extra VLANs with ports that do not exist, an error will be generated for each non-existent port.

Resolving Invalid Port Names

If the port names in the XML configuration file are different than on the target model, then rename the ports for the following sections so that the new names correspond to the intended ports on the target model.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port/PortNumber
- SystemConfiguration/MirrorGroup/MirrorConfig/Destination

- SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort
- SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Portx
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Porty
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/PortNumber (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port/PortNumber
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry/PortNumber
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit/PortNumber
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port/PortNumber

Depending on the exported values, some of the following sections in the XML configuration file may also need to have their ports renamed.

- SystemConfiguration/BridgingGroup/BridgingConfig/MulticastFilters/PortList
- SystemConfiguration/BridgingGroup/BridgingConfig/UnicastFilters/PortNumber
- SystemConfiguration/IgmpGroup/IgmpConfig/ManualRouterPorts
- SystemConfiguration/IgmpGroup/IgmpConfig/RFilterPorts
- SystemConfiguration/MirrorGroup/MirrorConfig/RxSourcePorts
- SystemConfiguration/MirrorGroup/MirrorConfig/TxSourcePorts
- SystemConfiguration/NViewGroup/NViewConfig/SendAutocastPorts
- SystemConfiguration/NViewGroup/NViewConfig/SendMibStatsPorts
- SystemConfiguration/SecurityDot1xGroup/SecurityDot1xConfig/EnabledPorts
- SystemConfiguration/TrunkGroup/TrunkConfig/Trunks
- SystemConfiguration/VlanGroup/VlanConfig/IngressDiscardUntagged
- SystemConfiguration/VlanGroup/VlanConfig/IngressVidFilterf
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/MemberPorts
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/UntagEgressPorts

Example Scenarios

MODEL OF EXPORTED CONFIGURATION FILE	TARGET MODEL	EXPECTED RESULTS OF IMPORTING XML CONFIGURATION FILE
NT24k-DR16	NT24k-DR24	Import successful; Last 8 ports on target model will reset to default values if the mode has not been set to “Keep”.
NT24k-DR24	NT24k-DR16	Invalid port mappings
NT24k-DR16	NT24k-16TX	Invalid port names
NT24k-DR16	NT24k-8TX	Invalid port mappings and names

Appendix C

XML Configuration File

Factory Defaults

The following is a shortened example of an XML configuration file:

```
<!-- ************************************************************************
    Overview of XML settings for the N-Tron NT24k series switches
    XML settings can be downloaded to a switch to configure the switch.
    There are several top level configuration sections. Each section is optional.
    Common Attributes:
    ******************
    The following attributes are common to all sections. If omitted from a section,
      then the value from the parent section is used. If completely omitted, a
      system default value is used.

     Crc            Optional. This is not used in this release, but may be
                    used in a future release.
     CurSwVer       Optional. String representation of switch version that the
                    settings were exported from.
     Version        Optional. If present, represents the version of the
                    section. If not present, the default value is used instead
                    of being inherited from the parent section.
                    Default = "1".
     MinSwVer       Optional. String representation of switch version. If
                    present, ignore settings for the section if switch
                    software version does not meet minimum requirement.
                    Default = "1.0".
     Mode           Optional. If present, determines the type of action to
                    take on existing data in the section. In the event of a
                    conflict, precedence goes to the deepest level that is
                    explicitly expressed.
                    Possible values:
                    Delete   (Default) Delete all existing data for the
                    section and replace it with the values in this section.
                    Any missing data gets set to factory default values.
                    Keep   Keep existing data, unless new values are specified
                    in this section. A factory default value is used if there
                    is no previously existing data.
     Convert        Optional. If present, determines whether data conversion
                    is performed when necessary.
                    Possible values:
                    Auto   (Default) When a data conversion is determined to
                    be necessary it will be done automatically, without any
                    user intervention.
                    No   Data conversion is not performed, but settings are
                    validated.
     ValidatePorts  Optional. If present, determines if port names or numbers,
                    within lists, that are not valid on this device should be
                    ignored or generate an error.
```

```
                    Possible values:
                    Yes   (Default) Ports are validated.
                    No   Invalid ports are ignored.
      Model         Optional. If present, represents the switch model that the
                    settings were exported from.

  Notes:
  ******
  Comments added to this file will not be preserved.
  ************************************************************************ -->
  <!-- ************************************************************************
  SystemConfiguration ******************************************************
************************************************************************** -->
  <SystemConfiguration Model="NT24k-DR16" ValidatePorts="Yes" Convert="Auto"
Mode="Delete" MinSwVer="1.0" Version="2" CurSwVer="1.9.2">
  <BridgingGroup>
       <BridgingConfig>
             <AgingTime>300</AgingTime>
             <EnableIpProbe>Disabled</EnableIpProbe>
             <MulticastFilters></MulticastFilters>
             <UnicastFilters></UnicastFilters>
       </BridgingConfig> </BridgingGroup>
  [ content intentionally omitted ]
  </SystemConfiguration>
```

For a complete example of an XML configuration file, click on the following link: http://www.redlion.net/resources/software/n-tron-software and refer to section NT24k® Industrial Ethernet Switches.

RED LION™
a spectris company

▶▶▶ Puggable Mini-GBIC Transceivers

Gigabit Transceivers

Mini-GBIC SFP transceivers for
N-Tron's Gigabit Network Products



Gigabit SFP Fiber Transceiver Characteristics

Fiber Length	*550m for 50/125µm 275m for 62.5/125µm*	*10km*	*40km*	*80km*
TX Power Min	*-9.5dBm*	*-9.5dBm*	*-2dBm*	*0dBm*
RX Sensitivity Max	*-17dBm*	*-20dBm*	*-22dBm*	*-24dBm*
Wavelength	*850nm*	*1310nm*	*1310nm*	*1550nm*
Assumed Fiber Loss	*3.5 to 3.75 dB/km*	*0.45 dB/km*	*0.35 dB/km*	*0.25 dB/km*
Laser Type	*VCSEL*	*FP*	*DFB*	*DFB*

Variety and Flexibility

Pluggable mini-GBIC transceivers from N-Tron® fully comply with strict industry standards to ensure robust functionality in fiber optic networks. All modules are designed with high-performance industrial features, including expanded temperature ranges, to operate reliably under harsh conditions. N-Tron's SFPs may be used in combination on each switch. Varieties include 1000Base-T, 1000Base-SX and 1000Base-LX.

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
NTSFP-TX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseT GB Copper Port (up to 100 meters)
NTSFP-SX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseSX Multimode GB Fiber Optic Port
NTSFP-LX-ZZ ZZ = 10, 40, or 80 km	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseLX Singlemode GB Fiber Optic Port

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As global experts in communication, monitoring and control for industrial automation and networking, Red Lion has been delivering innovative solutions for over forty years. Our award-winning technology enables companies worldwide to gain real-time data visibility that drives productivity. Product brands include Red Lion, N-Tron and Sixnet. With headquarters in York, Pennsylvania, the company has offices across the Americas, Asia-Pacific and Europe. For more information, please visit www.redlion.net. Red Lion is a Spectris company.

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Product brochure

1.5 – 6 kVA



Eaton 9PX lithium-ion UPS

Double-conversion UPS that offers a set it and forget it deployment

The 9PX lithium-ion UPS is part of the Eaton 9 series single-phase double-conversion UPS line, best applied to mission-critical equipment for constant power conditioning. The 9PX lithium-ion UPS provides 8 to 10 years of life expectancy for UPS and its batteries, and has power ratings ranging from 1–6 kVA, while also offering up to four external battery modules (EBM) for extra runtime. The 9PX lithium-ion UPS has the same reliable features as the 9PX lead-acid UPS, including load segments for prioritized shutdowns, remote power on (RPO), remote on/off (ROO) and output relay ports that increase control capabilities. For connectivity, the 9PX is compatible with the Gigabit Network Card (NETWORK-M2), which is the first UPS connectivity device to meet both UL and IEC cybersecurity standards. This network interface card improves power system reliability by providing warnings of pending issues and helping to perform orderly graceful shutdown of servers and storage.



2U UPS with 1U EBM in 4-post rack

Key features and benefits

Save money

- **2-3X longer battery life:** minimize battery maintenance expense—ideal for large deployments and edge applications
- **Runtime:** UPS provides up to 2–3X more runtime at full load compared to lead-acid batteries
- **Warranty:** 5-year all-inclusive (electronics and battery) warranty

Save space

- **1U lithium EBM vs 2U lead-acid EBM** (1–3 kVA models)
- **2U lithium EBM vs. 3U lead-acid EBM** (6 kVA model)
- **Lightweight design** up to 40% less weight than a comparable lead-acid UPS allowing easier installation and saving time

Reduce risk

- **24/7 monitoring:** battery management system (BMS) improves reliability and performance by actively monitoring temperature and charge
- **Cybersecure:** remote monitoring service and network connectivity card options provide cybersecurity protection and keeps you connected with your UPS status updates
- **On-board BMS monitoring** in combination with proven Lithium Iron Phosphate (LFP) chemistry provides a reliable and safe offering, giving you peace of mind

Powering Business Worldwide

Remotely automate and monitor your UPS with Brightlayer Data Centers suite software

The power of automation.

With our Disaster Avoidance software, also known as Intelligent Power Manager (IPM), you can create triggering alerts and automate resolutions to keep applications running. This software enables you to:

- **Leverage** Eaton's integrations with industry leaders such as VMware, Microsoft and VirtualBox
- **Migrate** workloads to increase system uptime and minimize generator load by suspending non-critical virtual machines
- **Power cap** servers to keep critical loads running longer by limiting server power consumption

Learn more at Eaton.com/IPM

The power of monitoring.

With our Distributed IT Performance Management (DITPM) software, you can remotely monitor up to thousands of PDUs and UPSs – no matter where they're located. This software enables you to:

- **Know** what's happening with real-time reports, trend charts, dashboards and alerts that are prioritized by severity and escalated when unacknowledged to speed resolution
- **Troubleshoot** and resolve issues
- **Remotely control** UPS load segments regardless of vendor, automating device response and diagnosing equipment performance
- **Update** firmware remotely to improve cybersecurity and eliminate the need for in-person firmware updates

Learn more at Eaton.com/DITPM

The power of predictability.

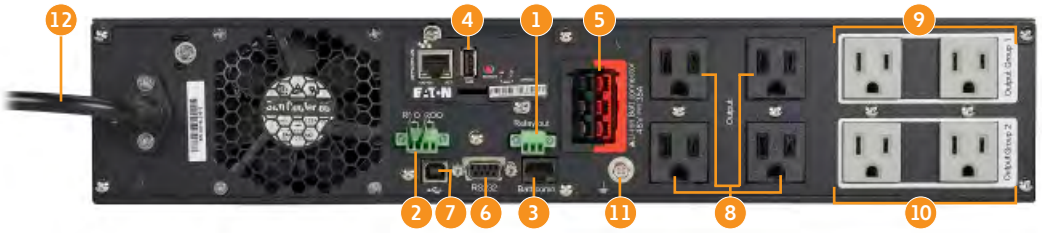
Our Remote Monitoring Service, also known as PredictPulse, is the industry's first cloud-based 24x7 remote monitoring and predictive analytics subscription service to forecast data center power component failure and proactively replace components before failure. This software enables you to:

- **Focus** on other critical IT tasks while our experts remotely monitor your IT infrastructure power quality equipment around the clock and dispatch field service technicians when needed
- **Eliminate** surprise maintenance expenses— this subscription-based service includes parts, labor, on-going preventive maintenance and expedited repairs
- **Propriety algorithms**, based on data from thousands of installed devices, predict UPS component failure so we can proactively replace parts before issues arise

Learn more at Eaton.com/RemoteMonitoringService

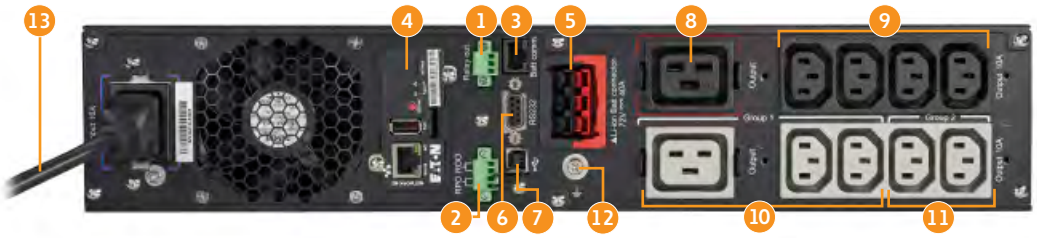
Rear panel overview

Model 9PX1500RT-L



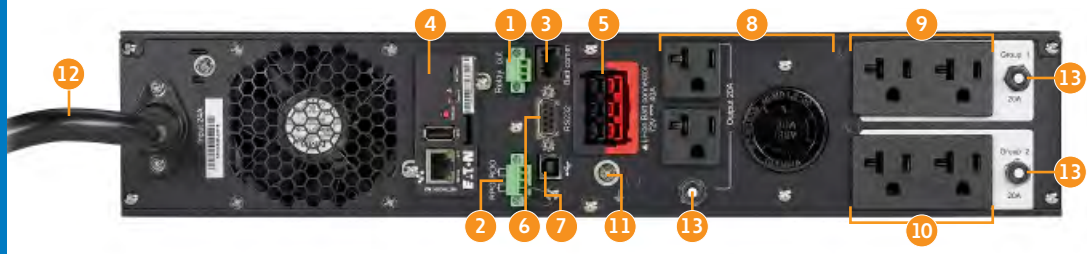
1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-15R managed outlets (primary group)
9. (2) 5-15R (load segment group 1)
10. (2) 5-15R (load segment group 2)
11. Ground bonding screw
12. 8-feet line cord with 5-15P

Model 9PX2200GRT-L and 9PX3000GRT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (1) C19 outlet
9. (4) C13 managed outlets (primary group)
10. (1) C19 and (2) C13 managed outlets (load segment group 1)
11. (2) C13 managed outlets (load segment group 2)
12. Ground bonding screw
13. C20/L6-20P input connection (detachable L6-20P to C19 input cord is 6-feet long)

Model 9PX3000RT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-20R and (1) L5-30R managed outlets (primary group)
9. (2) 5-20R managed outlets (load segment group 1)
10. (2) 5-20R managed outlets (load segment group 2)
11. Ground bonding screw
12. L5-30P input cord (8-feet long)
13. AC output branch protector

For additional rear panel views, please visit **Eaton.com/9PX.**

9PX 1 to 3 kVA lithium-ion rackmount and tower model selection guide

The 9PX lithium-ion comes as a stand-alone UPS or as part of a network bundle for easy configuration and deployment. For complete specifications, including interactive battery runtime graphs, visit **Eaton.com/9PX.**

120V (default), 100V, 110V, 115V, 125V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RT-L	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	35.5
9PX2000RT-L	2000 / 1800	5-20P, 8 ft.	(1) L5-20R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	50.6
9PX3000RT-L	3000 / 2700	L5-30P, 8 ft.	(1) L5-30R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	52.7

Global UPS, 208V (default), 230V, 240V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500GRT-L	1500 / 1350	C14	(8) C13	3.41 (2U) x 17.32 x 17.72	34.8
9PX2200GRT-L	2200 / 2000	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	48.6
9PX3000GRT-L	3000 / 2700	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	50.2

120V (default), 100V, 110V, 115V, 125V RT network card bundles

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RTN-L (includes NETWORK-M2 network card)	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	36.5
9PX2000RTN-L (includes NETWORK-M2 network card)	2000 / 1800	5-20P, 8 ft.	(6) 5-20R, (1) L5-20R	3.41 (2U) x 17.32 x 23.83	51.6
9PX3000RTN-L (includes NETWORK-M2 network card)	3000 / 2700	L5-30P, 8 ft.	(6) 5-20R, (1) L5-30R	3.41 (2U) x 17.32 x 23.84	53.7

9PX 1 to 3 kVA lithium-ion extended battery module (EBM) options

Catalog number	Description	Rack size	Weight, lb.
9PXEBM48RT-L	Extended battery module for 9PX1500RT-L and 9PX1500GRT-L	1U	36.5
9PXEBM72RT-L	Extended battery module for 9PX2000RT-L, 9PX2200GRT-L, 9PX3000RT-L and 9PX3000GRT-L	1U	46.6

Power distribution (PDU) and maintenance bypass (MBP) options

Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.
EHBPL1500R-PDU1U	HotSwap MBP for use with 9PX1500RT-L, 9PX1500GRT-L	5-15P	(6) 5-15R	2.1 (2U) x 17.3 x 3.8
EHBPL2000R-PDU1U	HotSwap MBP for use with 9PX2000RT-L, 9PX2200GRT-L	5-20P	(6) 5-20R	2.1 (2U) x 17.3 x 3.8
EHBPL3000R-PDU1U	HotSwap MBP for use with 9PX3000RT-L, 9PX3000GRT-L	L5-30P	(5) 5-20R	2.1 (2U) x 17.3 x 3.8
PDUV20-72	Basic PDU	L5-20P	(36) 5-15/20R	72.47 x 1.50 x 1.64
PDU2430	Basic PDU	L5-30P	(24) 5-15R	1.75 x 17.25 x 4.50
PDUV20HVL6-72	Basic PDU	L6-20P	(32) C13, (6) C19	63.75 x 3.50 x 2.25
EATS115	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-15P	(10) 5-15R	1.7 (1U) x 17.25 x 9.94
EATS120	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-20P	(10) 5-20R	1.7 (1U) x 17.25 x 9.84

* For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2*	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PA	1U two-post rail kit (optional for EBM)
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

* Included with N and 6K models

What's in the box

- 9PX UPS
- RS-232 communication cable
- USB communication cable
- Software leaflet
- Safety instructions
- Quick start guide
- 4-post mounting rail kit for 19-inch enclosures
- 2 pedestals for tower position
- Gigabit Network Card (NETWORK-M2) – included with N and 9PX6K-L models

Lithium-ion vs lead-acid

Characteristic	VRLA (lead-acid) battery	Lithium-ion battery	Lithium-ion benefit
Average battery lifespan	3–5 years	8-10 years	**2–3X longer life**
Weight	43–150 lb.	34.8–79 lb.	**20% lighter UPS, 40% lighter EBM**
EBM footprint	2U 3U	1U (1–3 kVA models) 2U (6 kVA model)	**Increased U space for critical equipment**
Warranty	2 years	5 years	**2.5X warranty coverage**
Battery replacement cost	$650*	$0	**Reduced TCO**

* Battery and labor cost for one replacement



Eaton's Gigabit Network Card adds advanced control with IPM software allows for remote management and integration into leading virtualization platforms **Eaton.com/Network-M2**

9PX 6 kVA lithium-ion rackmount and tower model selection guide

Global UPS, 208V (default) 200V, 208V, 220V, 230V, 240V models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX6K-L	6000 / 5400*	L6-30P, 10 ft. Hardwire	(2) L6-30R (2) L6-20R Hardwire	5.12 x 17.33 x 28.43	81.2

* Derated at 200, 208, 220V. See 9PX6K-L technical specifications for full information.

9PX 6 kVA lithium-ion extended battery module (EBM) and accessories

Catalog number	Description	Rack size	Weight, lb.
9PXEBM192RT-L	Extended battery module for 9PX6K-L	2U	79
EBMCBL192-L	EBM cable extension, 6 feet (1.8 meters)		

Power distribution (PDU), maintenance bypass (MBP), PowerPass distribution (PPDM) and transformer options

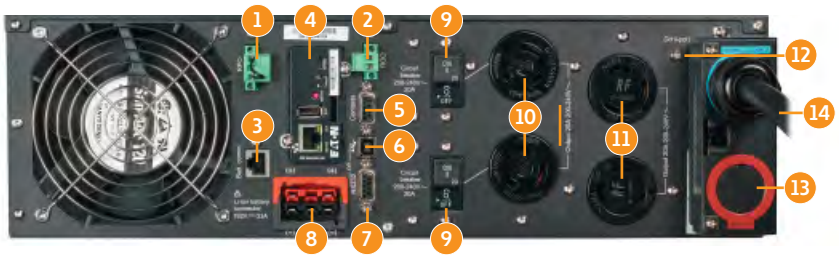
Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
MBP6K208	208V maintenance bypass module	L6-30P*	(2) L6-30R Hardwired	5.1 (3U) x 7.0 x 4.3	5.5
PDUV30HV	Basic PDU	L6-30P	(32) C13, (6) C19	63.75 x 3.5 x 2.25	8
PDU1230	Basic PDU	L6-30P	(16) C13, (4) C19	1.75 (1U) x 17.5 x 5.2	7.5
9PXTFMR5	9PX stepdown transformer	L6-30P	(18) 5-20R	5.1 (3U) x 17.3 x 25.4	95
9PXPPDM1	9PX PowerPass distribution module	L6-30P	(1) L6-30R, (1) L14-30R, (6) 5-20R outlets	5.1 (3U) x 17.3 x 25.4	97
9PXPPDM2	9PX PowerPass distribution module	Hardwired	Hardwired	5.1 (3U) x 17.3 x 25.4	95

* Terminal block with L6-30P cord (included with UPS)
For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

Rear panel overview

Model 9PX 6 kVA lithium-ion UPS



1. Remote power off (RPO) port
2. Remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card
5. Output relay contact – DB-9 dry contact
6. USB port (cable included)
7. RS-232 serial communication port (cable included)
8. EBM connector
9. Output circuit breaker protection
10. (2) L6-20R
11. (2) L6-30R
12. Ground bonding screw
13. Output terminal block for hardwired applications
14. 10-foot line cord with L6-30P

To view battery runtimes and interact with the Eaton 9PX lithium-ion UPS, please visit: **Eaton.com/9PX**

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Powering Business Worldwide

Eaton 9PX Li-Ion UPS technical specifications (1500-3000 VA 2U models[1])

Model overview

Catalog number	Power rating (VA/ watts)	Input connection	Output receptacles	Dimensions (HxWxD, in.)[2]	Weigh t (lb.)
120V output, 50/60 Hz					
9PX1500RT-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	35.5
9PX1500RTN-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	36.5
9PX2000RT-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	50.6
9PX2000RTN-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	51.6
9PX3000RT-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	52.7
9PX3000RTN-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	53.7
208V output, 50/60 Hz bundles					
9PX1500GRT-L	1500/1350[4]	C14	(8) C13	3.4 (2U) x 17.3 x 17.7	34.8
9PX2200GRT-L	2200/2000[5]	C20 / L6-20P[5]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	48.6
9PX3000GRT-L	3000/2700[6]	C20 / L6-20P[4]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	50.2

Additional specifications

General	
Topology	Double-conversion, online
Configuration	Rack/tower
Color	Black and silver
Diagnostics	Full system self-test at power up
Warranty	5 years electronics and battery
Rail kit	4-post rail kit included; Max length:30.0in, Min length:17.4in Tower ped estals includ ed *Optional 2-post rail kit available, part number: RK2PC(UPS) and RK2PA(EBM)*
Remote power off	Remote On/Off (ROO) and Remote Power Off (RPO) rear terminal blocks
Contents (Ships with the following items)	UPS 4-post rail kit Safety manual Output cables (for G models) Input cables (for G models) Cable lockers (for G models) Tower pedestals RS-232 serial cable USB cable

1. Due to continuing product improvement programs, specifications are subject to change without notice.
2. Each 9PX and EBM ships with a 4-post rail kit.
3. Input line cord is 8 feet long.
4. 1500 VA Global model wattage: 200V, 208V: input limited to 1350 watts; 220V, 230V, 240V: 1500 watts
5. C19 to L6-20P input cord is 6 feet long.
6. Models derated at lower voltag es due to input cord limitations. See Power ratings table below for further details.

	Communication card (optional)	
Electrical input	208V	120V
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Input voltage range	Full load: 176-276V, <40% load: 100-276V	Full load: 100-144V, <30% load: 60-144V
Freq uency	50/60 Hz	
Freq uency range	60 Hz: 50–70 Hz, 50 Hz: 40–60 Hz	
Input power factor	≥.99	
Input current distortion	≤5% (≤10% frequency converter mode)	
Circuit breaker	1500VA: None 2200VA: None 3000VA: None	1500VA: None 2000VA: None 3000VA: (3) 20A for (2) 5-20R each
Electrical output	208V	120V
Power ratings	9PX1500GRT-L 220/230/240V: 1500VA / 1500W 200/208V: 1500VA / 1350 9PX2200GRT-L: 220/230/240V: 2200VA / 2200W 208/200V: 2200VA / 2000W 9PX3000GRT-L: 220/230/240V: 3000VA / 3000W 208/200V: 3000VA / 2700W	9PX1500RT-L: 120/125V: 1500VA / 1350W 110V: 1350VA / 1215W 100V: 1200VA / 1080W 9PX2000RT-L: 120/125V: 2000VA / 1800W 110V: 1800VA / 1620W 100V: 1600VA / 1440W 9PX3000RT-L: 120/125V: 3000VA / 2700W 110V: 2700VA / 2430W 100V: 2400VA / 2160W
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Output voltage regulation, steady state	±1% normal mode ±2% battery mode	
Voltage THD (online)	Linear: 3% Non-linear: 5%	
Power factor	0.9	
Efficiency	9PX1500GRT-L: 92% online 9PX2200GRT-L: 93% online 9PX3000GRT-L: 93.7% online	9PX1500RT-L: 90% online 9PX2000RT-L: 91.4% online 9PX3000RT-L: 91.6% online
Transfer time	0 ms	
Battery		
Optional extended battery module (EBM)	9PXEBM48RT-L: 1500 VA models (1U form factor) 9PXEBM72RT-L: 2000-3000 models (1U form factor)	
Maximum number of EBMs	Add up to 4 EBMs	
Battery description	Lithium Ion, LiFePO4 chemistry	
Battery management	BMS: Advanced battery man ag ement with health monitoring and prediction features	
Battery replacement	Hot-swappable internal batteries and EBMs	
Start on battery	Cold-start en abled; first cold start is always forbidden	
Communications		
User interface	Graphical display. UPS status in a single view.	
LEDs	4 status-indicating LEDs	
Communication ports	RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables includ ed	

Communications card	Network Card-M2 optional, stan dard on network bundles (bun dled models include an N)	
Power management software	Integrates with Eaton Intelligent Power Manager software	
Environmental & standards		
RoHS compliance	Yes	
Surge protection	MOV: 510V, 296Joules	MOV ratings : 271Volt (from L-N) and 510 Volt (from L-G and N-G), 190 Joules
EMC markings	IEC 62040-2 Class B Cat C2 / CISPR22 Class B / FCC part 15 Class B / VCCI Class B	IEC 62040-2 Cat C1 / CISPR22 / FCC part 15 Class B / VCCI Class B
Heat dissipation (BTU)	9PX1500GRT: 494 online, 731 battery 9PX2200GRT: 513 online, 741 battery 9PX3000GRT: 619 online, 1150 battery	9PX1500RT: 512 online, 897 battery 9PX2000RT: 578 online, 974 battery 9PX3000RT: 844 online, 1462 battery
Audible noise	≤47 dB at 1 meter	
Operating temperature	0 to 40°C (32°F to 104°F)	
Altitude operating temperature range	0-1500m @ 0°C - 40°C 1500m-3000m @ 0°C - 35°C	
Safety conformance	CE / cULus	CE / cULus / NOM
Storage temperature	-20 to 35°C (-4°F to 95°F); without batteries: -13 to 55°C (5°F to 131°F)	
Relative humidity	0 to 96% non-condensing	

9PX Li-Ion 1-3kVA Battery Backup Times (in minutes)**

Load(Watts)	Internal batteries	+1 EBM	+2 EBMs	+3 EBMs	+4 EBMs
9PX1500RT-L					
1350	11.2	30.0	47.1	64.3	81.4
1215	12.6	33.5	52.7	71.9	91.0
1080	14.2	38.0	59.7	81.4	103.0
945	16.3	43.5	68.4	93.3	118.1
810	19.1	50.8	79.8	108.9	137.9
675	22.9	61.0	95.9	130.7	165.6
540	28.1	74.8	117.6	160.3	203.1
405	37.0	98.6	154.9	211.2	267.5
270	54.4	145.2	228.1	311.0	394.0
9PX1500GRT-L					
1350	12.0	31.9	50.2	68.4	86.7
1215	13.3	35.5	55.8	76.0	96.3
1080	15.0	39.9	62.7	85.4	108.2
945	17.0	45.2	71.0	96.9	122.7
810	19.7	52.5	82.5	112.5	142.5
675	23.4	62.5	98.2	133.9	169.6
540	28.7	76.4	120.1	163.8	207.5
405	37.1	99.0	155.6	212.1	268.7
270	52.0	138.7	218.0	297.3	376.6
9PX2000RT-L					
1800	13.6	36.3	57.0	77.8	98.5
1620	15.2	40.4	63.5	86.6	109.7
1440	17.1	45.5	71.6	97.6	123.6

1260	19.5	52.0	81.7	111.4	141.1
1080	22.6	60.3	94.8	129.3	163.8
900	27.1	72.3	113.6	154.8	196.1
720	33.5	89.3	140.3	191.4	242.4
540	43.8	116.7	183.4	250.1	316.8
360	62.6	167.0	262.4	357.8	453.2
9PX2200GRT-L					
2000	12.3	32.8	51.5	70.2	88.9
1800	13.6	36.3	57.1	77.8	98.6
1600	15.2	40.6	63.8	87.0	110.2
1400	17.3	46.2	72.6	99.0	125.4
1200	20.2	53.8	84.5	115.3	146.0
1000	23.9	63.8	100.3	136.7	173.2
800	29.4	78.4	123.1	167.9	212.7
600	38.2	101.8	159.9	218.1	276.2
400	54.3	144.7	227.4	310.1	392.9
9PX3000RT-L					
2700	9.1	24.1	37.9	51.7	65.5
2400	10.2	26.9	42.2	57.6	72.9
2160	11.3	30.3	47.7	65.0	82.3
1890	12.9	34.7	54.5	74.3	94.1
1620	14.8	40.4	63.5	86.5	109.6
1350	18.0	48.3	75.9	103.5	131.1
1080	23.0	59.9	94.2	128.4	162.6
810	28.0	79.1	124.3	169.5	214.7
540	43.0	114.3	179.5	244.8	310.1
9PX3000GRT-L					
2700	9.1	24.2	38.0	51.8	65.6
2400	10.5	26.9	42.2	57.5	72.9
2160	11.3	30.2	47.5	64.7	82.0
1890	12.8	34.6	54.4	74.2	94.0
1620	14.9	40.3	63.3	86.3	109.4
1350	18.0	47.9	75.3	102.7	130.0
1080	23.0	59.4	93.4	127.4	161.4
810	30.0	77.6	121.9	166.3	210.6

**Runtimes shown at full load with maximum power factor, are approximate and may vary with equipment, configuration, battery age, temperature, etc. View interactive graphs at www.eaton.com/9PX

Product specifications

Eaton 9PX1500RT-L

Catalog Number: 9PX1500RT-L

Eaton 9PX lithium ion UPS, 2U, 1500 VA, 1350 W, 5-15P input, Outputs: (8) 5-15R, 120V

General specifications

Product Name	**Catalog Number**
Eaton 9PX UPS	9PX1500RT-L
UPC	**Product Length/Depth**
743172105455	17.72 in
Product Height	**Product Width**
3.41 in	17.32 in
Product Weight	**Warranty**
35.6 lb	5 year limited
Compliances	**Certifications**
CE Marked FCC part 15 Class B IEC 62040-2 Cat C1	cULus Listed NOM

Product specifications

Battery management

Integrated battery management system (BMS) for temperature regulation and life cycle monitoring

Output waveform

True sine wave

VA rating

1500 VA

Max number of battery packs

4

Wattage

1350 W

Output power factor

0.9

Form factor

Rack/tower

Receptacle

(8) 5-15R, 120V

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 5 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Package contents

UPS
Quick start guide
Safety instructions
USB communciation cable
RS-232 serial communication cable
4-post rail for 19-inch enclosures
Software leaflet
Software leaflet
2 pedestals for tower poition

Input connection

5-15P

Noise level

<47 dB at 1 meter

Runtime graph

Resources

Application notes

9PX1500RT-L runtime graph

Brochures

Eaton 9PX lithium-ion UPS brochure

Competitive comparisons

9PX Lithium-ion UPS Competitive Comparison Battlecard

Drawings

Eaton 9PX lithium-ion 1.5 kVA 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

Eaton 9PX lithium-ion UPS guide specification: 1-3 kVA

Eaton Specification Sheet - 9PX1500RT-L

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide

Warranty guides

Eaton 9PX lithium-ion UPS warranty

View runtime graph

Software compatibility

Intelligent Power Software Suite

User interface

Graphical display, 5-button programmable menu

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Efficiency

90 %

Rack size

2U

Number of Outputs 5-15R

8

Voltage

120V

Input cord length

8 ft

Temperature range

0° to 40°C (32° to 104°F)

Communication

RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables included

Relative humidity

0-96% non-condensing

Color

Black/silver

Rack mounting kit

Yes

Extended battery capability

Add up to 4 extended battery modules (EBM). Part number 9PXEBM48RT-L

Output voltage range

±1% steady-state

Topology

Online/Double-conversion

BTU Rating

Online: 512, Battery: 897

Output frequency

50/60 Hz

Runtime at full load

11.2 min

Type

UPS

Output nominal voltage

120V default (100/110/120/125V)

Input nominal voltage

120V default (100/110/120/125V)

Input power factor

>0.99 typical

Expansion slots

(1) Mini-Slot (MS) expansion port. The following optional connectivity cards may be ordered separately.
Gigabit Network Card part number: NETWORK-M2
Modbus card part number: INDGW-M2
Relay card part number: RELAY-MS

Input frequency range

60 Hz: 50-70 Hz, 50 Hz: 40-60 Hz

Internal bypass

Yes

Altitude

0-1500m (0° to 40°C), 1500-3000m (0° to 35°C)

Eaton Corporation plc
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30 Pembroke Road
Dublin 4, Ireland
Eaton.com

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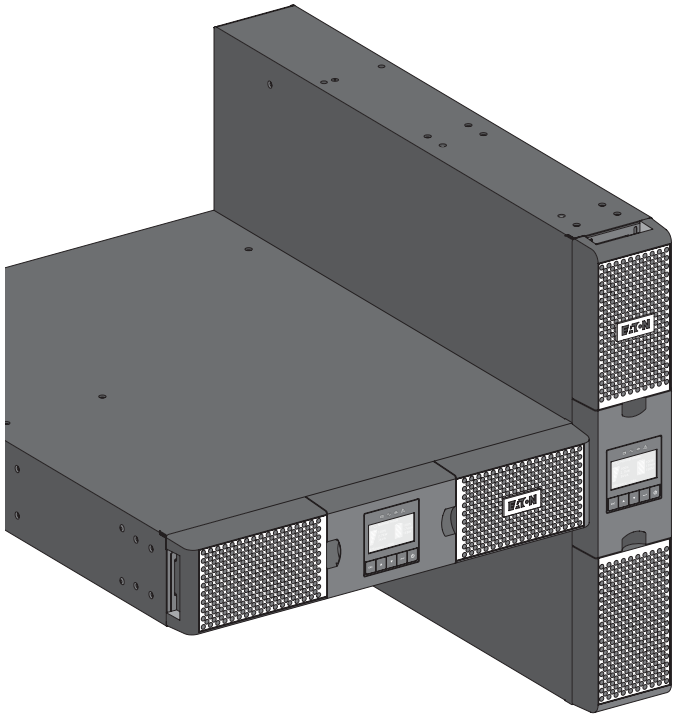
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Eaton 9PX Lithium-Ion

Advanced Users Guide



9PX1500RT-L
9PX2000RT-L
9PX3000RT-L
9PX1500GRT-L
9PX2200GRT-L
9PX3000GRT-L
9PXEBM48RT-L
9PXEBM72RT-L

Powering Business Worldwide

p/n: P-164001006
Revision 06

Safety Instructions

SAVE THESE INSTRUCTIONS.

This manual contains important instructions **that should be followed during installation and maintenance of the UPS and batteries.**

The 9PX models that are covered in this manual are intended for installation n an environment within 0 to 40°C, free of conductive contaminant.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to IEC62040-2 & FCC standards. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Special Symbols

The following are examples of symbols used on the product to alert you to important information:



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



CAUTION: REFER TO OPERATOR'S MANUAL - Refer to your operator's manual for additional information, such as important operating and maintenance instructions.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

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Safety of Persons

- The system has its own power source (the battery). Consequently, the power outlets may be energized ven if the systems is disconnected from the AC power source. Dangerous voltage levels are resent within the system. It should be opened exclusively by qualified service personnel.
- The system must be properly grounded at all times.
- The battery supplied with the system contains small amounts of toxic materials. To avoid accidents, the directives listed below must be observed:
  - Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
  - When replacing batteries, replace with the same type and number of batteries or battery packs.
  - Do not dispose of batteries in a fire. The batteries may explode.
  - Batteries constitute a danger (electrical shock, burns). The short-circuit current may be very high.
- Precautions must be taken for all handling:
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries.
  - Disconnect charging source prior to connecting or disconnecting battery terminals.
  - Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

Product Safety

- To connect the UPS, instructions and operation described in the manual must be followed in the indicated order.
- CAUTION - To reduce the risk of fire, the unit connects only to a circuit provided with 20 or 30 amperes maximum branch circuit overcurrent protection in accordance with the National Electric Code, ANSI/NFPA 70 (US installations only).
- Check that the indications on the rating plate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the system.
- For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible
- Never install the system near liquids or in an excessively damp environment.
- Never let a foreign body penetrate inside the system.
- Never block the ventilation grates of the system.
- Never expose the system to direct sunlight or source of heat.
- If the system must be stored prior to installation, storage must be in a dry place.
- The admissible storage temperature range is -25ºC to +55ºC without batteries, 0°C to 40°C with batteries.
- The system is not for use in a computer room AS DEFINED IN the standard for the Protection of Information Technology Equipment, ANSI/NFPA 75 (US installations only).

Special Precautions

- The unit is heavy: wear safety shoes and use vacuum lifter preferentially for handling operations.
- All handling operations will require at least two people (unpacking, lifting, installation in rack system).
- Before and after the installation, if the UPS remains de-energized for a long period, the UPS must be energized for a period of 24 hours, at least once every 6 months (for a normal storage temperature less than 25°C). This charges the battery, thus avoiding possible irreversible damage.
- During the replacement of the Battery Module, it is imperative to use the same type and number of element as the original Battery Module provided with the UPS to maintain an identical level of performance and safety. If there are any questions, don't hesitate to contact your local EATON representative.
- All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the UPS.
- For potential safety issue on defective UPS : DISCONNECT INTERNAL BATTERY for storage and transportation.

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Chapter 1 Introduction

1.1 Overview

1.2 Environmental Protection

EATON has implemented an environmental-protection policy.

Products are developed according to an eco-design approach.

Substances

This product does not contain CFCs, HCFCs, or asbestos.

Packing

To improve waste treatment and facilitate recycling, separate the various packing components.

- The cardboard we use comprises over 50% of recycled cardboard.
- Sacks and bags are made of polyethylene.
- Packing materials are recyclable and bear the appropriate identification symbol 

Table 1. Packing Material Symbols

Materials	Abbreviations	Number in the symbols
Polyethylene terephthalat	PET	01
High-density polyethylene	HDPE	02
Polyvinyl chloride	PVC	03
Low-density polyethylene	LDPE	04
Polypropylene	PP	05
Polystyrene	PS	06

Follow all local regulations for the disposal of packing materials.

End of Life

Eaton will process products at the end of their service life in compliance with local regulations. Eaton works with companies in charge of collecting and eliminating our products at the end of their service life.

Product

The product is made up of recyclable materials.

Dismantling and destruction must take place in compliance with all local regulations concerning waste. At the end of its service life, the product must be transported to a processing center for electrical and electronic waste.

Battery

The product contains lithium-ion (LFP) batteries that must be processed according to applicable local regulations concerning batteries.

The battery may be removed to comply with regulations and in view of correct disposal.

The Eaton® 9PX uninterruptible power system (UPS) protects your sensitive electronic equipment from the most common power problems, including power failures, power sags, power surges, brownouts, line noise, high voltage spikes, frequency variations, switching transients, and harmonic distortion.

Power outages can occur when you least expect it and power quality can be erratic. These power problems have the potential to corrupt critical data, destroy unsaved work sessions, and damage hardware causing hours of lost productivity and expensive repairs.

With the Eaton 9PX, you can safely eliminate the effects of power disturbances and guard the integrity of your equipment. Providing outstanding performance and reliability, the Eaton 9PX's unique benefits include:

- True online double-conversion technology with high power density, utility frequency independence, and generator compatibility.
- Constant mode battery charger with a integrated battery management system (BMS) for temperature regulation and life cycle monitoring.
- Selectable High Efficiency mode of operation.
- Standard communication options: one RS-232 communication port, one USB communication port, and relay output contacts.
- Optional connectivity cards with enhanced communication capabilities.
- Extended runtime with up to four Extended Battery Modules (EBMs) per UPS.
- Remote On/Off control through Remote On/Off (ROO) and Remote Power Off (RPO) ports.
- Backed by worldwide agency approvals.

Chapter 2 Presentation

2.1 Standard Installations

Figure 1. Tower Installation

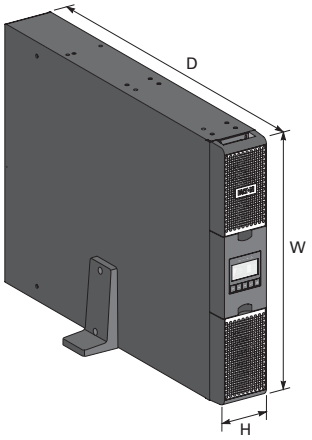


Figure 2. Rack Installation

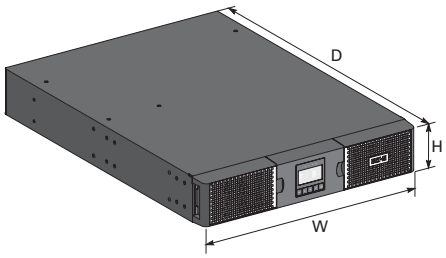
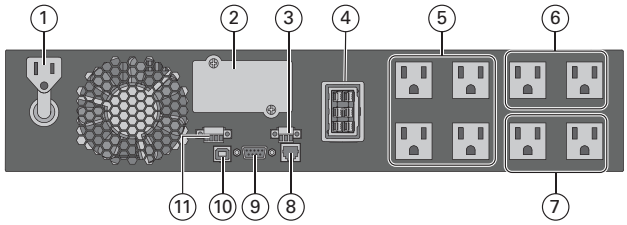


Table 2. Weights and Dimensions

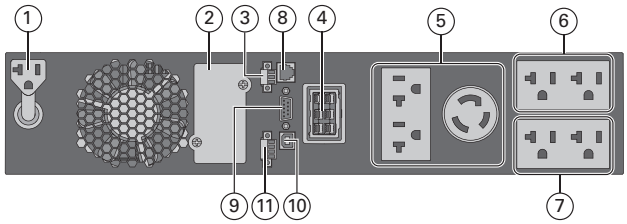
Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

2.2 Rear Panels

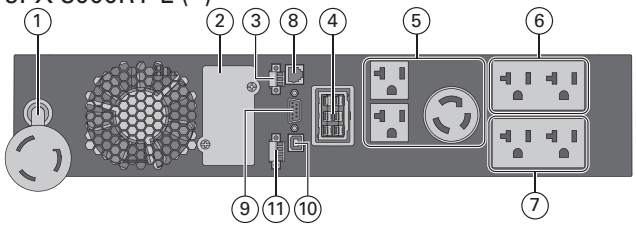
9PX 1500RT-L



9PX 2000RT-L



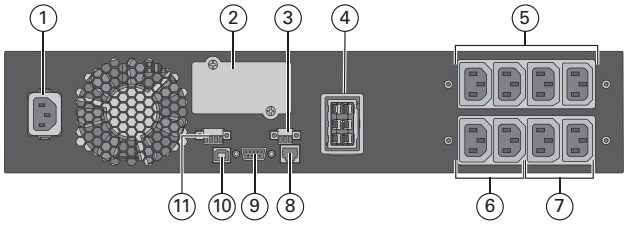
9PX 3000RT-L (*)



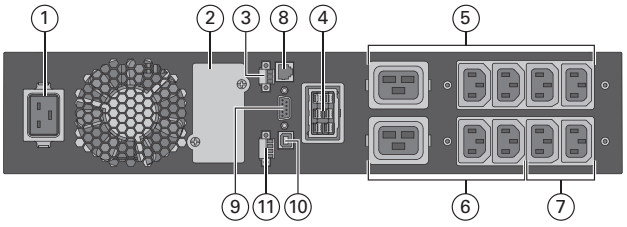
① Socket for connection to AC power source
② Slot for optional communication card
③ Relay output contact
④ Connector for additional battery module
⑤ Primary group: outlets for connection of critical equipment
⑥ Group 1: programmable outlets for connection of equipment
⑦ Group 2: programmable outlets for connection of equipment
⑧ Connector for automatic recognition of an additional battery module
⑨ RS232 communication port
⑩ USB communication port
⑪ Connector for ROO (Remote On/Off) control and RPO (Remote Power Off)

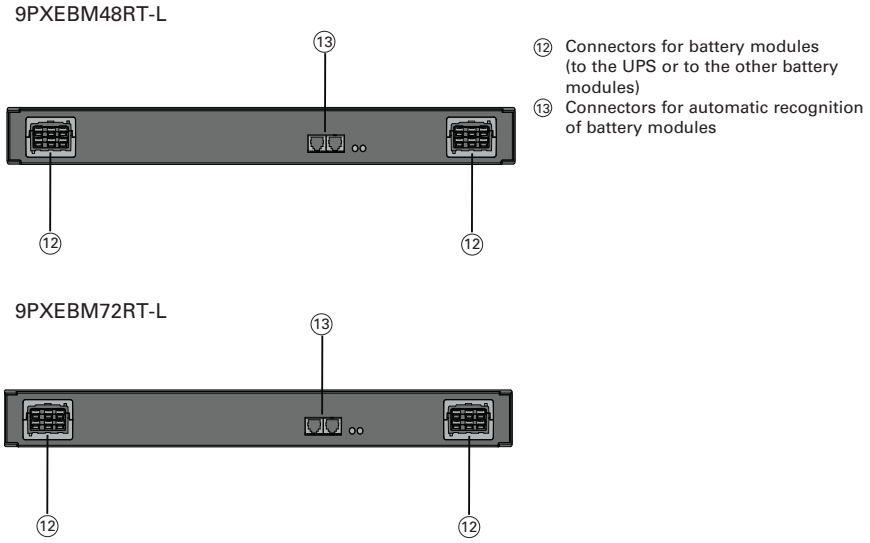
(*) Primary and Grouped outlets (⑤, ⑥, ⑦) are protected by 20A circuit breakers.

9PX 1500GRT-L



9PX 2000GRT-L & 9PX 3000GRT-L





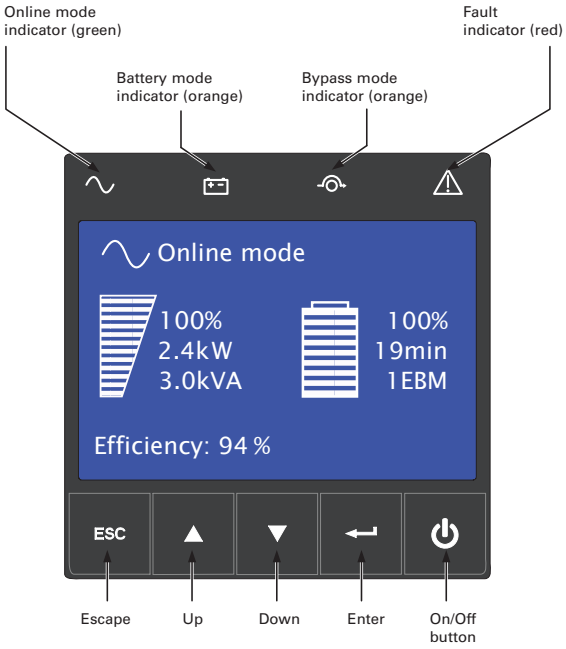
2.3 Accessories

Table 3. UPS Accessories

Part number	Description
9PXEBM48RT-L 9PXEBM72RT-L	Extended Battery Module
9RK	Rack Kit 9PX
Network-M2 / Network-M3	Network Card
INDGW-M2	Industrial Gateway Card (Modbus TCP / RTU)
Relay-MS	Relay Card

2.4 Control Panel

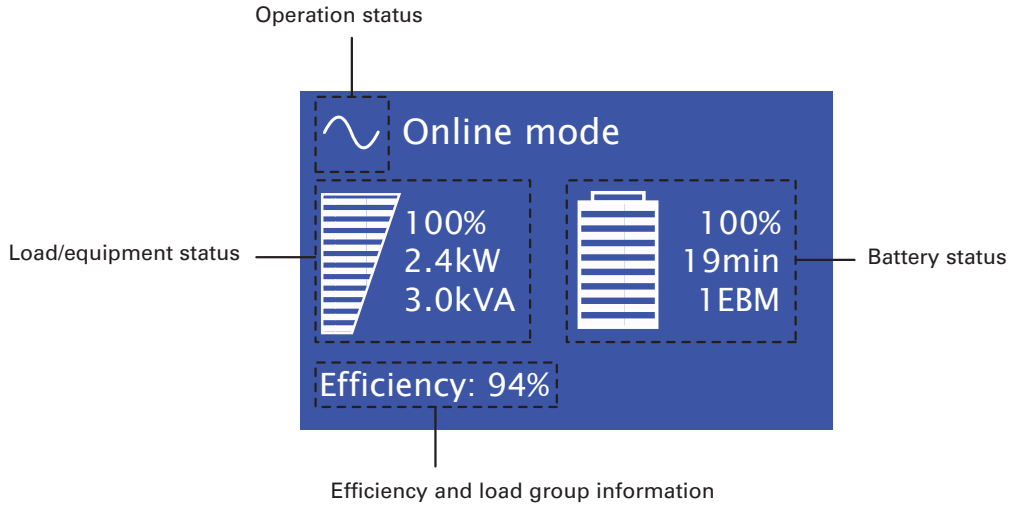
The UPS has a five-button graphical LCD. It provides useful information about the UPS itself, load status, events, measurements and settings.



Indicator	Status	Description
Green	On	The UPS is operating normally on Online or on High Efficiency mode.
Orange	On	The UPS is on Battery mode.
Orange	On	The UPS is on Bypass mode.
Red	On	The UPS has an active alarm or fault.

2.5 LCD Description

Figure 3. LCD Description



The following table describes the status information provided by the UPS

Note: If other indicator appears, see the troubleshooting for additional information.

Table 4. LCD Operating Status

Operation status	Cause	Description
Standby mode 	The UPS is Off, waiting for startup command from user.	Equipment is not powered until ⏻ button is pressed.
Online mode 	The UPS is operating normally.	The UPS is powering and protecting the equipment.
Battery mode 	A utility failure has occured and the UPS is on Battery mode.	The UPS is powering the equipment with the battery power. Prepare your equipment for shutdown.
End of backup time 	The UPS is on Battery mode and the battery is running low.	Low Battery Warning settings: [Capacity] [0%] ... [100%] [Runtime] [0mn] ... [60mn] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.

Table 4. LCD Operating Status (Continued)

Operation status	Cause	Description
High Efficiency mode 	The UPS is operating on High Efficiency mode.	The UPS is powering and protecting the equipment
Bypass mode 	An overload or a fault has occurred, or a command has been received, and the UPS is in Bypass mode.	Equipment is powered but not protected by the UPS.

2.6 Display Functions

Press the (⏎) button to activate the menu options. use the two middle buttons (▲and ▼) to scroll through the menu structure. Press the (⏎) button to select an option. Press the ESC button to cancel or return to the previous menu.

Table 5. Display Functions

Main menu	Submenu	Display information or Menu function
Measurements		[Load] W VA A pf / [Input/Output] V Hz / [Efficiency] % / [Battery] % min V n° EBM / [Battery remaining life] months / [Average power usage] Wh / [Cumulated power] Wh / BMS Information
Control	Go to Bypass	Transfers the UPS on Bypass mode
	Load segments On/Off	Commands the load segments
	Start battery test	Starts a manual battery test
	Connectivity test	Tests dry contact relay outputs and relay card contacts. Simulates line failure and battery low
	Function reset	Clears active fault, power usage, battery remaining life, reset NMC, Restore factory settings.
Settings	Local settings	Sets product general parameters
	In/out settings	Sets Input and Output parameters
	On/Off settings	Sets On/Off conditions
	Battery settings	Sets battery configuration
	Com settings	Sets communication parameters
Event Log	Event filter	Selects faults, alarms and/or events to display
	Event list	Displays the events stored
	Reset fault list	Clears events

Table 5. Display Functions (Continued)

Main menu	Submenu	Display information or Menu function
Fault log	Fault list	Displays the faults stored
	Reset fault list	Clears faults
Identification		[Product type/model] / [Part/Serial number] / [UPS/NMC firmware] / [Com card IPv4], [Com card IPv6], [Com card MAC]
Registration		Links to Eaton registration website

2.7 User Settings

The following table displays the options that can be changed by the user.

Table 6. User Settings

	Submenu	Available Settings	Default settings
Local Settings	Language	[English] [Français] [Deutsch] [Español] [Русский] [Português] [Italiano] [Simplified Chinese] [Japanese] Menus, status, notices and alarms, UPS fault, Event Log data and settings are in all supported languages.	[English] User selectable when UPS is powered for the first time.
	Date/ time	Format: [International] [US]	[US]
	LCD	Modify LCD screen brightness and contrast to be adapted to room light conditions.	
	Audible alarm	Mode: [Enabled] [Disabled on battery] [Always disabled] Enable or disable the buzzer if an alarm occurs. Level: [High] [Low]	[Enabled] [High]
	Protected access	[Enabled] [Disabled] Password is: 0577	[Disabled]
In/Out settings	Output voltage	100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V]	[120V] [208V]
	Output frequency	Mode: [Normal] [Converter] [Marine] Frequency can be changed in Frequency [Converter] mode In [Marine] mode output frequency follows input frequency	[Normal]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
	Output mode	Mode: [Industrial] [IT] [Custom] Overload: [Inv>Stop] [Inv>BP] [Inv>BP>Inv] Short-circuit: [Inv>Stop] [Inv>BP] [Inv>BP>Inv]	[IT] [Inv>BP>Inv] [Inv>Stop]
	Input volt hysteresis	Sets input voltage hysteresis from [1] to |10V]	[10V]
	High Efficiency mode	[Enabled] [Disabled] Power the output from Bypass for high efficiency	[Disabled]
	Bypass settings	[Volt low] [Volt high] [Qualify] [Hz synch] [Unsynch]	[80V] LV; [160V] HV; [144V] LV; [276V] HV; [In spec]; [5%]; [Half cycle]
	Load segments	[Auto start delay] [Auto shutdown delay]	UPS: [0s]; Group1: [3s]; Group2: [6s] UPS: [Disabled]; Group1: [Disabled]; Group2: [Disabled]
	Overload prealarm	[10%] … [102%] Load % when overload alarm occurs	[102%]
On/Off Settings	Start/Restart	[Cold start] [Auto restart] [Auto start] [Start on bypass]	[Cold start] [Auto restart] are Enabled [Auto start] [Start on bypass] are Disabled
	Forced reboot	[Enabled] [Disabled] [Timer] [10s] … [180s] When mains recover during a shutdown sequence: If set to Enabled, shutdown sequence will complete and wait 10 seconds prior to restart, If set to Disabled, shutdown sequence will not complete, UPS stays on.	[Enabled] [10s]
	Energy saving	[Enabled] [Disabled] [Timer] [1min] … [15min] [Level] [100W] … [1000W]	[Disabled] [5min] [100W]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		If Enabled, UPS will shut-down after defined duration. of back-up time, if load is less than set value.	
	Sleep mode	[Enabled] [Disabled] [Timer] [10min] … [120min] If Disabled, LCD and communication will turn OFF immediately after UPS is OFF. If Enabled, LCD and communication stays ON 1h30 min after UPS is OFF.	[Enabled] [90min]
	Site wiring fault	[Enabled] [Disabled] Prevents from starting the UPS in case of phase vs neutral wires swapping.	[Disabled]
	Power Off alert	[Enabled] [Disabled] If Enabled, activates a confirmation screen that requires user confirmation after pressing the power button, before the UPS shutdown occurs.	[Enabled]
Battery settings	Low battery warning	[Capacity] [0%] … [100%] [Runtime] [0min] … [60min] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.	[0%] [3min]
	Restart bat. level	[0%] ... [100%] If set, automatic restart will occur only when percentage of battery charge is reached.	[0%]
Com settings	Input signals	Sets Input signals parameters (function, delay, operation) through external contact connectors or RS232. ROO port: - [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	[No]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Closed]
		RPO port:	
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	No
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Open]
		DB9-4 port:	No
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [High] [Low]	[High]
	Output signals	[Relay] [DB9-1] [DB9-7] [DB9-8] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232	
		[Relay]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[Relay] [Bypass]
		[DB9-1]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-1] [Low bat]
		[DB9-7]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-7] [UPS OK]
		[DB9-8]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-8] [On bat]
Com settings (cont)	Remote command	[Enabled] [Disabled] If Enabled, shutdown or restart	[Enabled]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		commands from software are authorized.	
	Shutdown commands	[Send CMD] [Output OFF] [OFF delay] [restart] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232 port	
		[Send CMD]: [Yes] [No]	Send CMD: [No]
		[Output OFF]: [No] [UPS] [Group 1]	Output OFF: [No]
		[Group 2] [Group 1 + Group 2]	
		[OFF delay]: [0s] …[999s]	OFF delay: [0s]
		[Restart]: [Yes] [No]	Restart: [Yes]
	On battery notice delay	Sets delay before noticing on battery information to software.	[0s]
	General alarm	[On battery] [Battery fault]	[Internal fault]
		[Overload pre-alarm] [Internal fault]	
		[Ambient temp.] [Fan lock]	
		[Bypass overload] [Current limit]	
		[Short circuit] [Inverter overload]	
		[Power overload] [Low battery]	
		[On bypass] [UPS OK] [Load protected]	
		[Load powered] [Ext. charger ON]	
		Defines which event or fault generate	
		a general alarm through Output signal screen.	

Chapter 3 Installation

3.1 Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping cartons and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage:

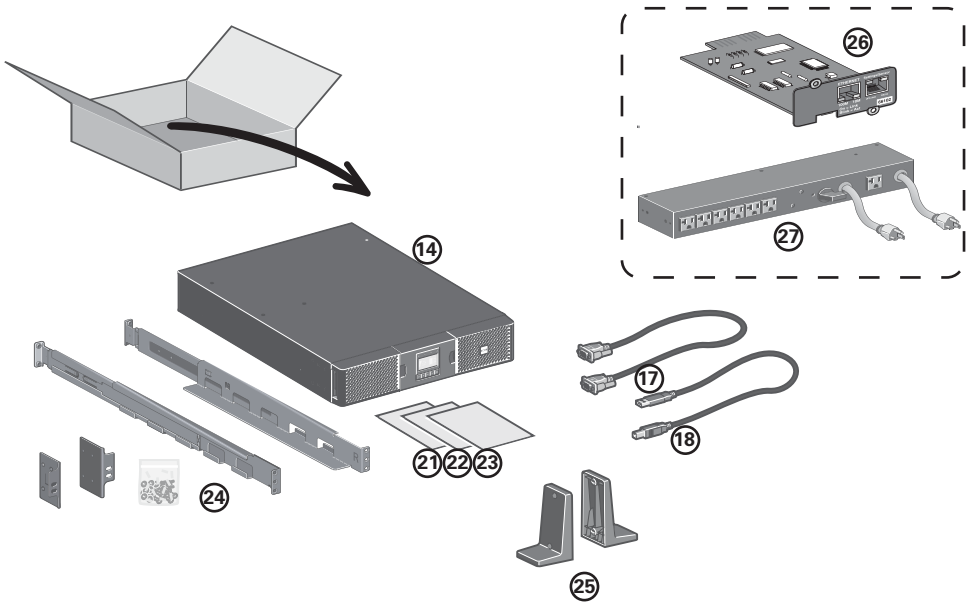
1. File with the carrier within 15 days of receipt of the equipment;
2. Send a copy of the damage claim within 15 days to your service representative.

⚠ IMPORTANT

Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use the UPS. Contact your service representative.

3.2 Checking the Accessory Kit

Figure 4. 9PX1500RT-L / 9PX2000RT-L / 9PX3000RT-L



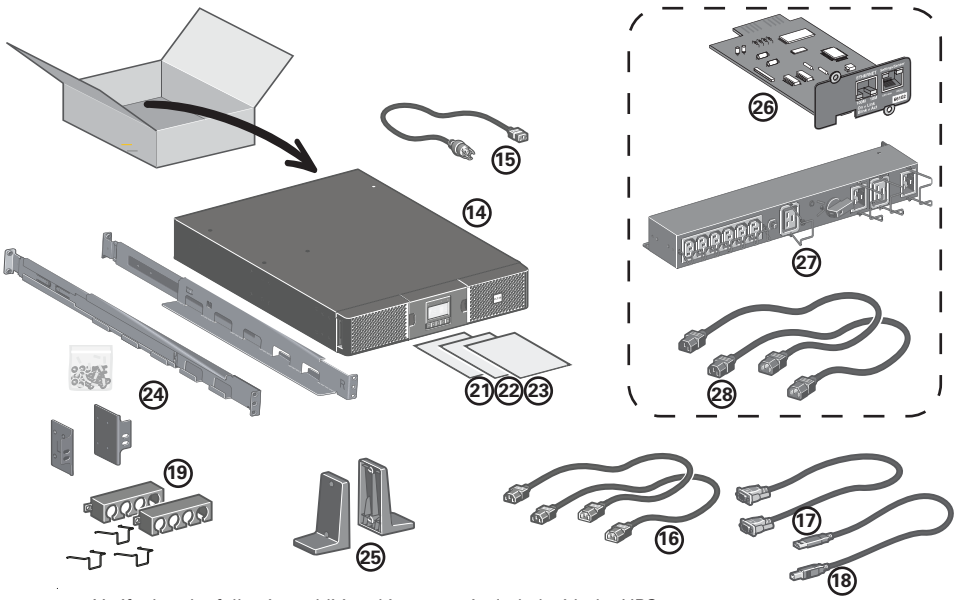
Verify that the following additional items are included with the UPS:

⑭ 9PX UPS
⑰ RS232 communication cable
⑱ USB communication cable
㉑ Software leaflet
㉒ Safety instructions
㉓ Quick start
㉔ Mounting kit for 19-inch enclosures
㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card (optional, standard on Network Bundle models)
㉗ MBP-115 module for 9PX 1500RT (optional)
MBP-120 module for 9PX 2000RT (optional)
MBP-130 module for 9PX 3000RT(optional)

Figure 5. 9PX1500GRT-L / 9PX2200GRT-L / 9PX3000GRT-L



Verify that the following additional items are included with the UPS:

⑭ 9PX UPS

⑮ Connection cable to AC-power source

⑯ 2 connection cables for the protected equipment

⑰ RS232 communication cable

⑱ USB communication cable

⑲ 3 cable locking systems

㉑ Software leaflet

㉒ Safety instructions

㉓ Quick start

㉔ Mounting kit for 19-inch enclosures

㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card(optional,standard on Network Bundle options

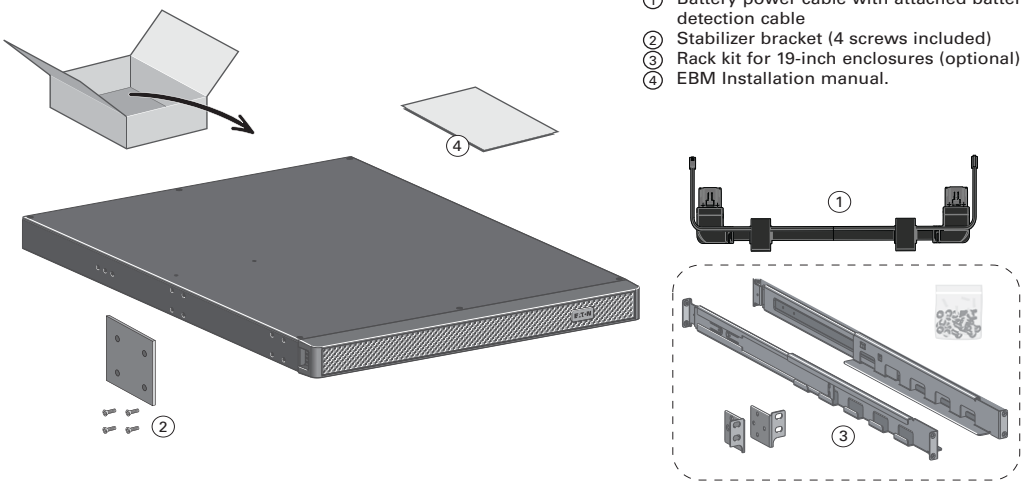
㉗ HotSwap MBP module (optional)

㉘ Connection cables between Hotswap MBP module and UPS

Figure 6. 9PXEBM48RT-L / 9PXEBM72RT-L

- If you ordered an optional Extended Battery Module (EBM), verify that the following additional items are included with the EBM:

① Battery power cable with attached battery detection cable
② Stabilizer bracket (4 screws included)
③ Rack kit for 19-inch enclosures (optional)
④ EBM Installation manual.



NOTE 1 Discard the EBM user's guide if you are installing the EBM with a new UPS at the same time.

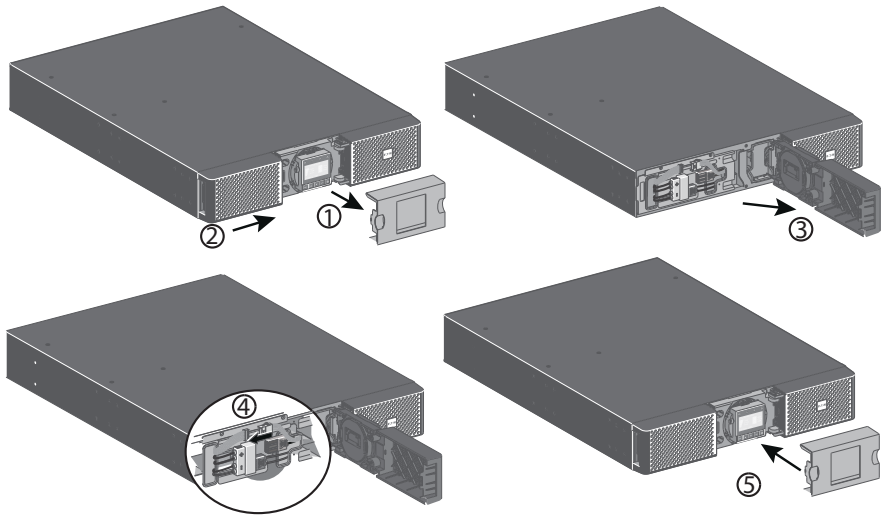
NOTE 2 Use the UPS user's guide to install both the UPS and the EBM.

Remember If you ordered other UPS accessories, refer to specific user manuals to check the packing contents.

3.3 Connecting the Internal Battery

NOTE Do not connect the UPS to the utility until installation is complete.

Figure 7. Internal Battery Connection



To connect to the UPS:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the left side of the front panel.

NOTE A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.

⚠CAUTION

A small amount of arcing may occur when connecting the internal batteries. This is normal and will not harm personnel. Connect the cables quickly and firmly.

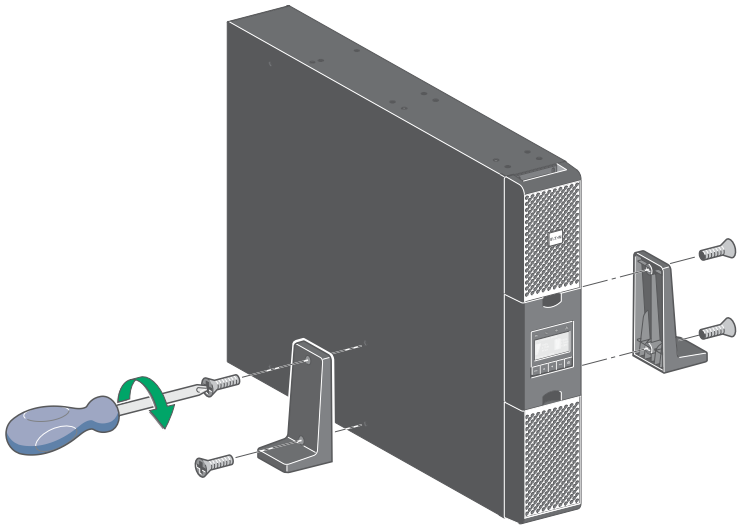
4. Connect the two battery connectors together.
5. Put back the front panel, then clip the center cover.

3.4 Tower Installation

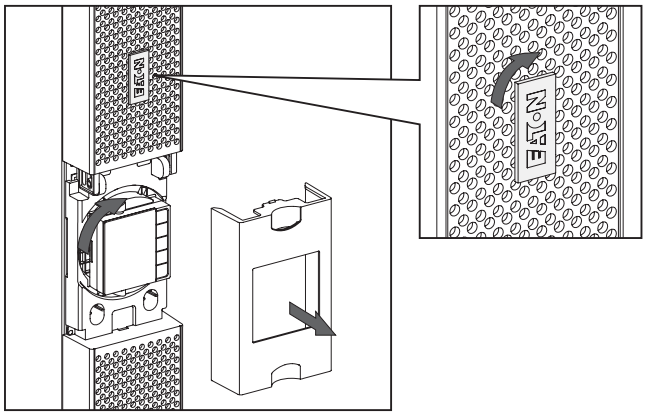
Tip If you ordered other UPS accessories, refer to specific user manuals to check the tower installation with the UPS.

To install the cabinet:

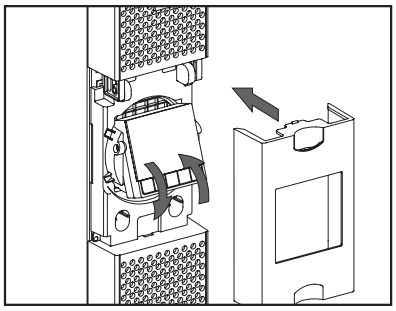
1. Place the UPS on a flat, stable surface in its final location.
2. Always keep 6" or 150 mm of free space behind the UPS rear panel for ventilation.
3. If installing additional cabinets, place them next to the UPS in their final location.



- Adjustment of the orientation of the LCD panel and of the logo.



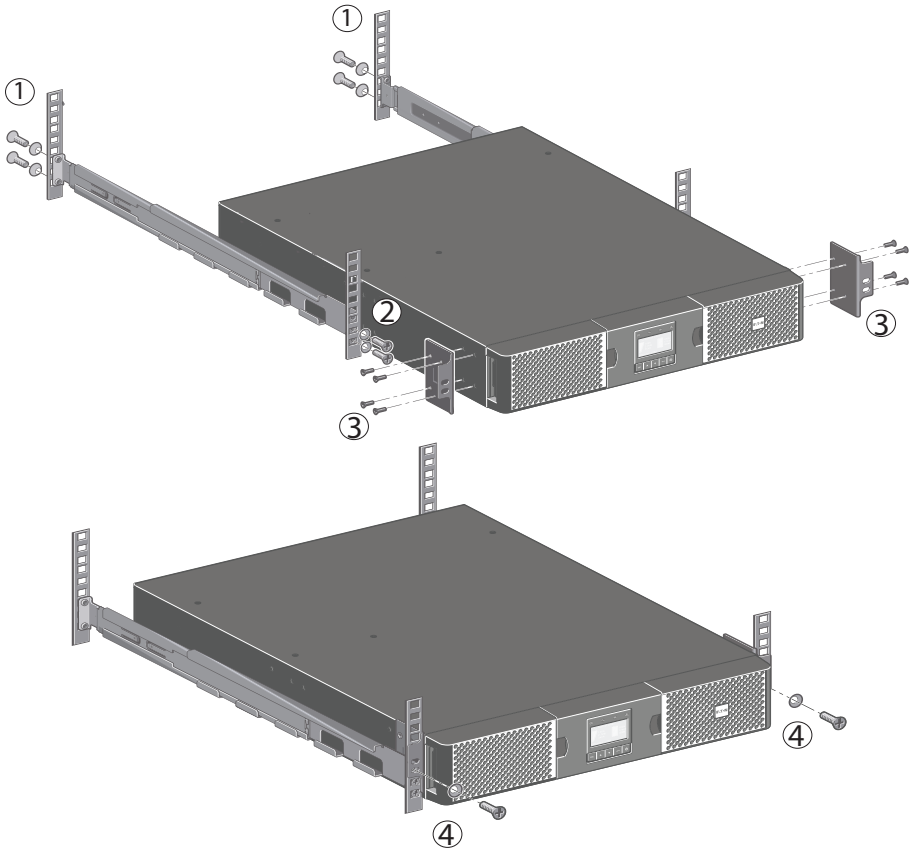
- Adjustment of the angle of vision of the LCD panel.



3.5 Rack Installation

- Rack mounting of UPS, EBM, and accessory modules.

Follow steps 1 to 4 for module mounting on the rails.



The rails and necessary hardware are supplied by EATON.

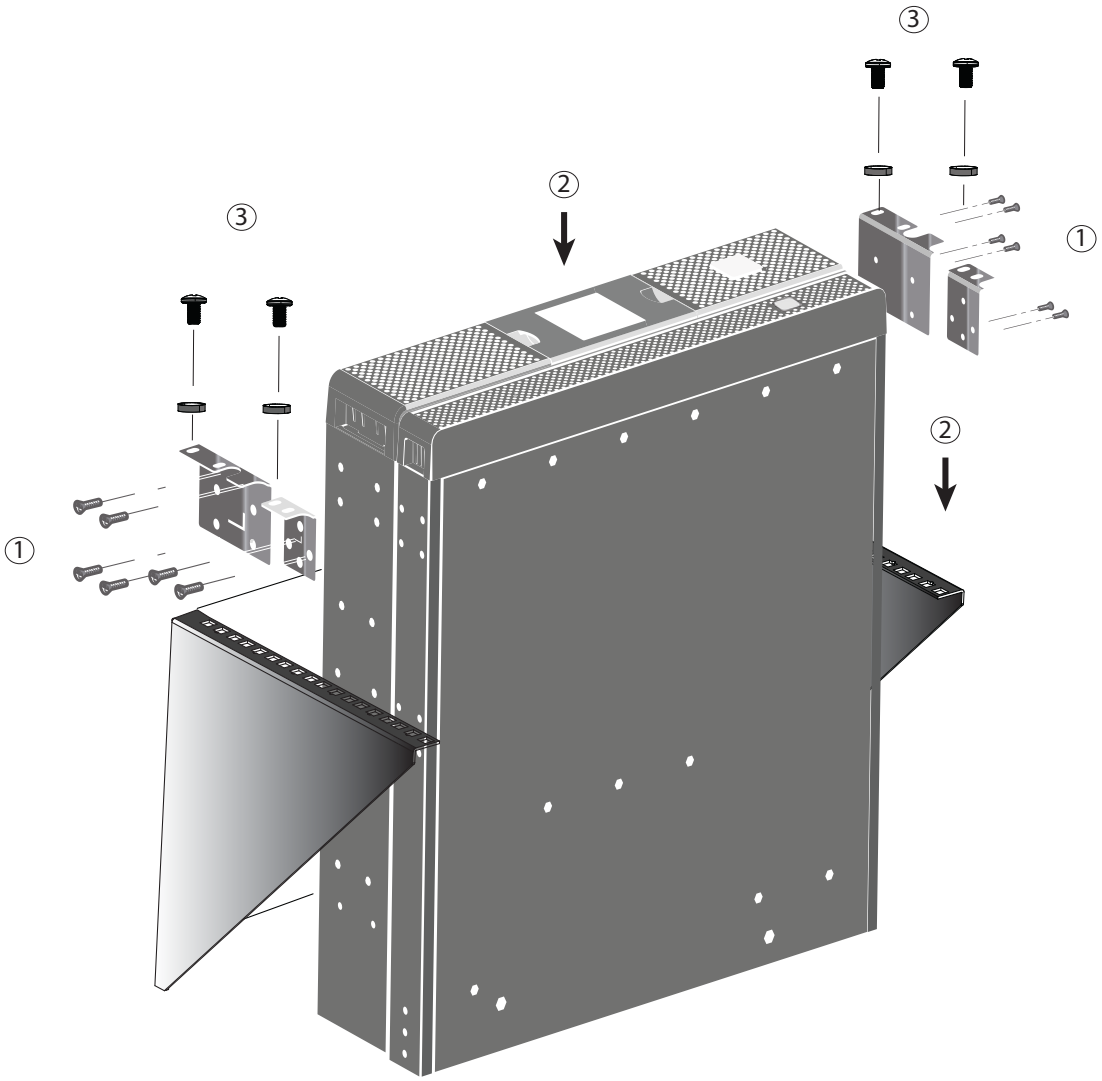
3.6 Vertical Installation

NOTE 1 This vertical installation is available only for UL/cTUVus.

NOTE 2 Suitable for mounting on concrete or other noncombustible surfaces only.

- The UPS, EBM, and accessory modules can be installed vertically in a rack or on a wall.

Follow steps 1 to 3 for module mounting on the rails.



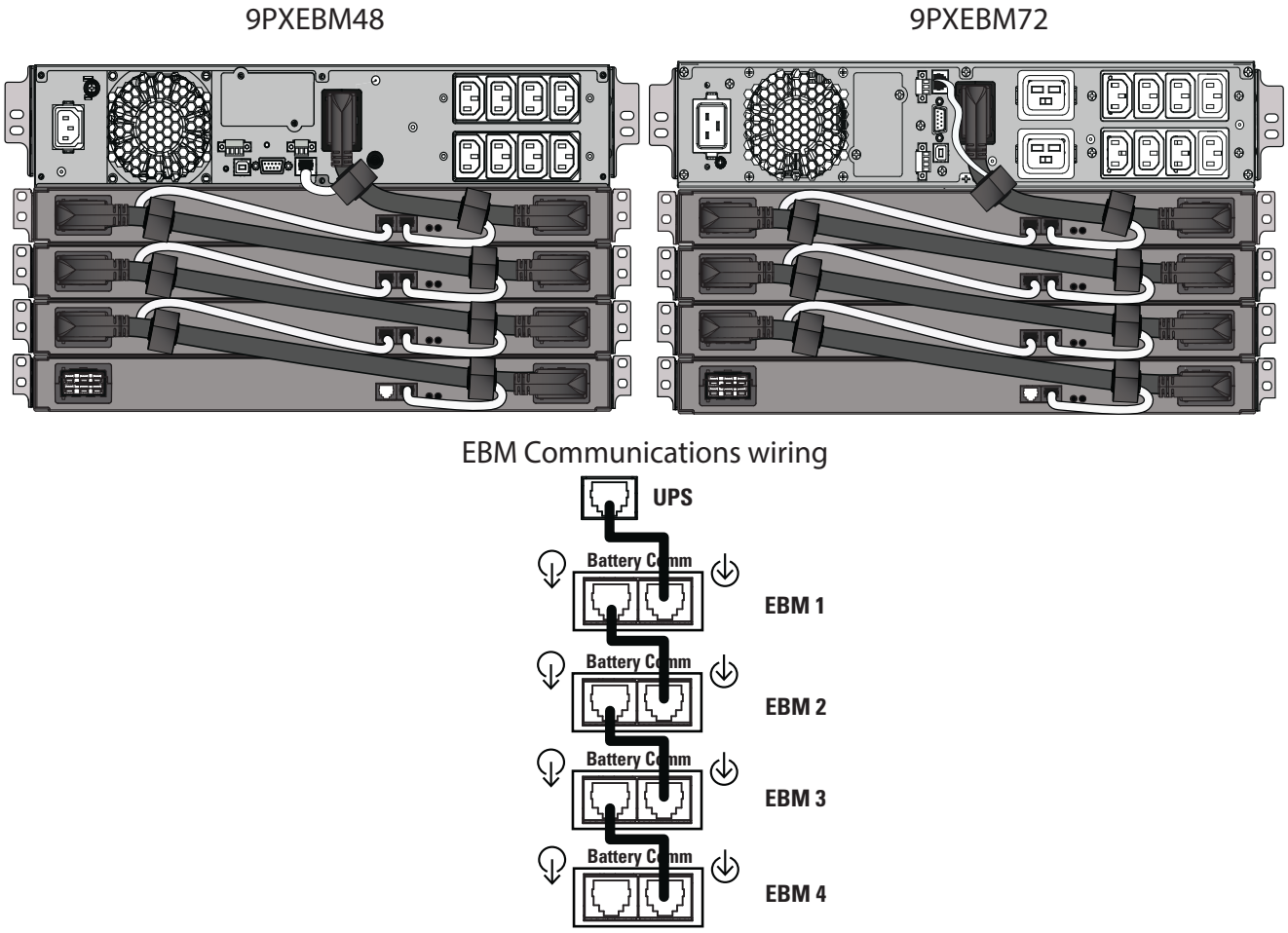
3.7 Connecting the EBM(s)

⚠CAUTION

A small amount of arching may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.

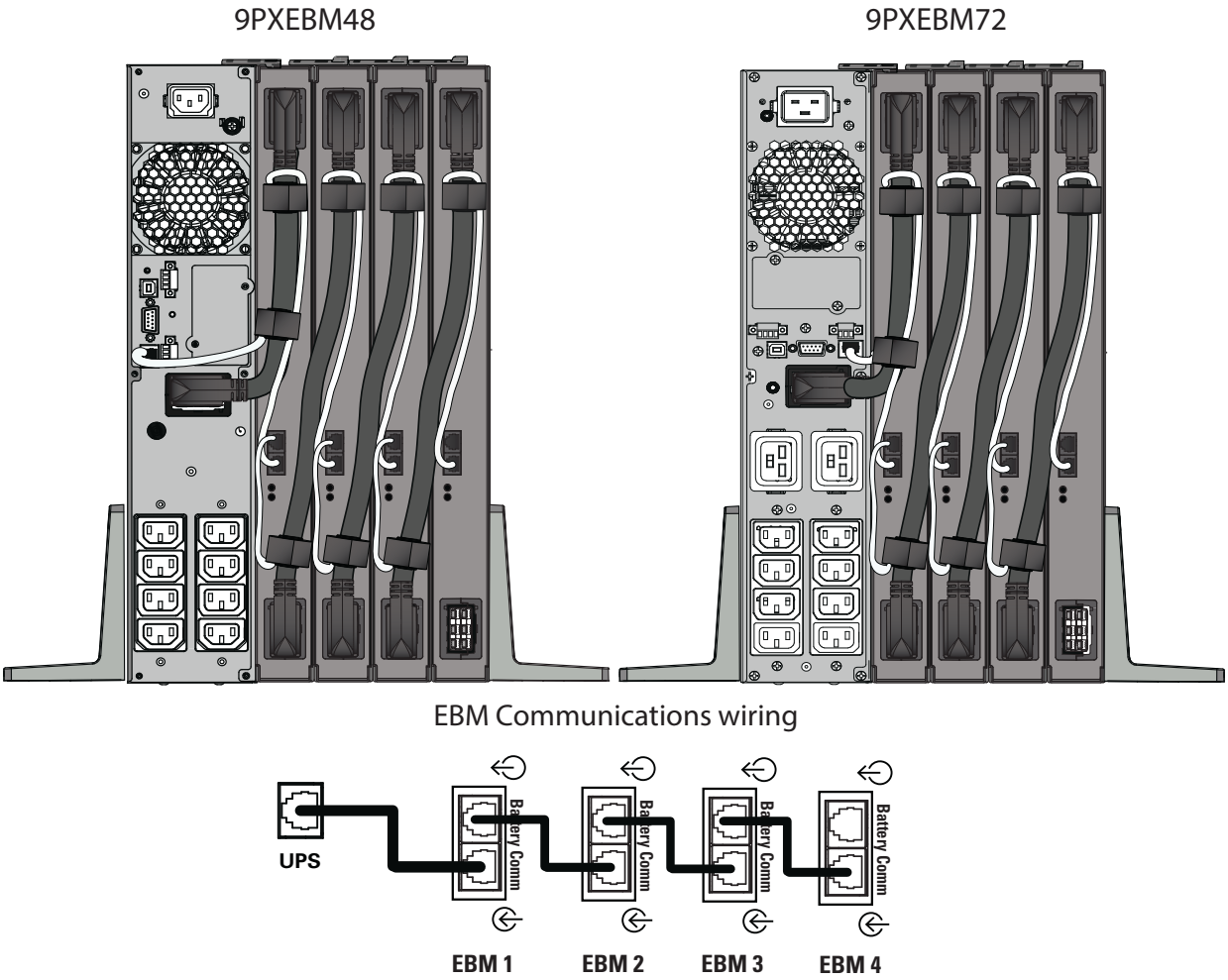
1. Plug the EBM power cable(s) into the battery connector(s). Up to 4 EBMs may be connected to the UPS.
2. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
3. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).

Figure 8. 9PXEBM Rack Mount Connections



NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

Figure 9. 9PXEBM Tower Mount Connections



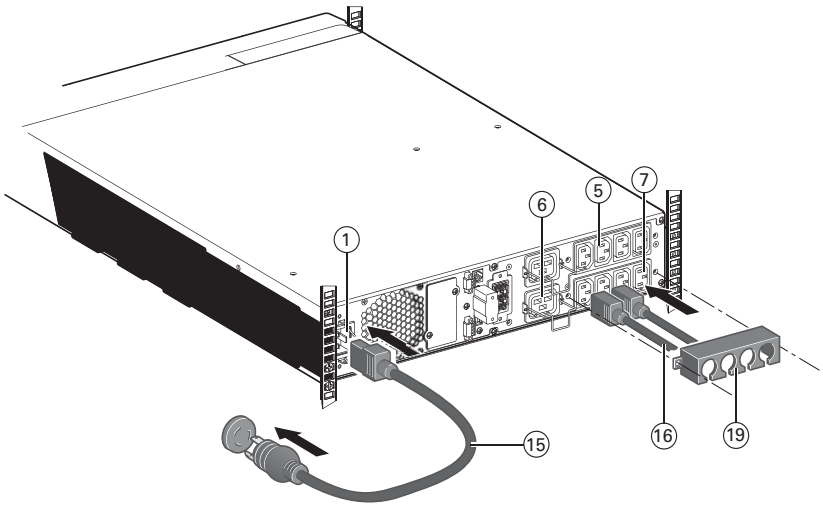
NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

3.8 Detecting other Accessories

Tip If you ordered other UPS accessories, refer to specific user manuals to check the connection to the UPS.

3.9 UPS Connection without Hotswap MBP Module

Check that the indications on the name plate located on the back of the UPS correspond to the AC-power source and the true electrical consumption of the total load.

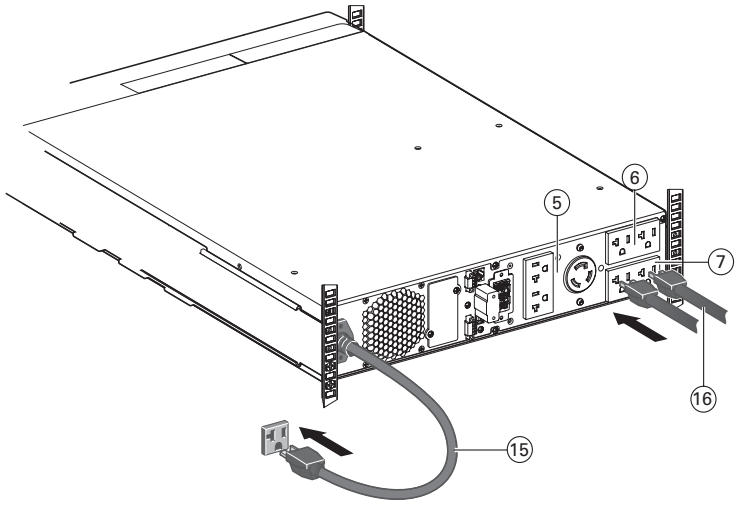


1. 9PX 2000RT-L / 3000RT-L connect the UPS input socket ① to the AC-power source.
   9PX 2200GRT-L / 3000GRT-L / 3000GLRT-L: connect the supplied cable ⑮ (250 V - 16 A) to the socket ①, then to the AC-power source.

2. Connect the loads to the UPS using the cables ⑯.
   It is preferable to connect the priority loads to the outlets marked ⑤ and the non-priority loads to the outlets marked ⑥ ⑦ that can be programmed.
   Connect any high-power devices to the 16 A outlet.

To program shutdown of outlets ⑥ ⑦ during operation on battery power and thus optimise the available backup time, please check the in/out settings.

3. For G models, fit the cable locking system ⑲ that prevents the plugs from being pulled out accidentally.

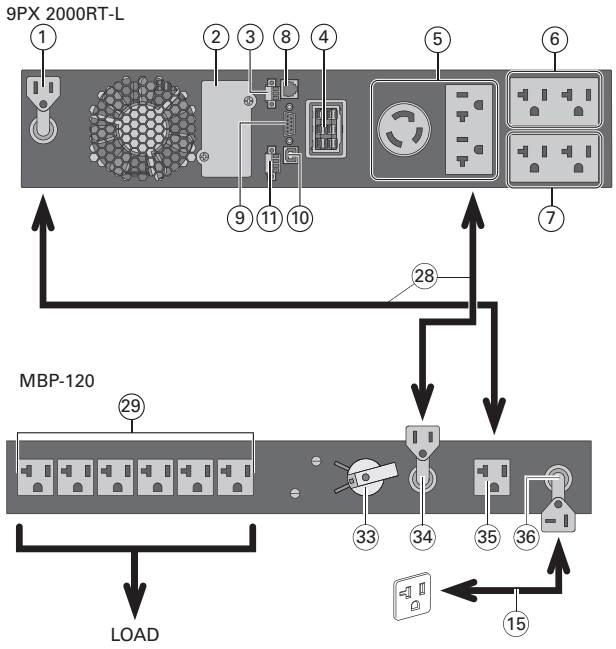


Note. The UPS charges the battery as soon as it is connected to the AC-power source, even if ⏻ button is not pressed

Once the UPS is connected to the AC-power source, eight hours of charging are required before the battery can supply the rated backup time.

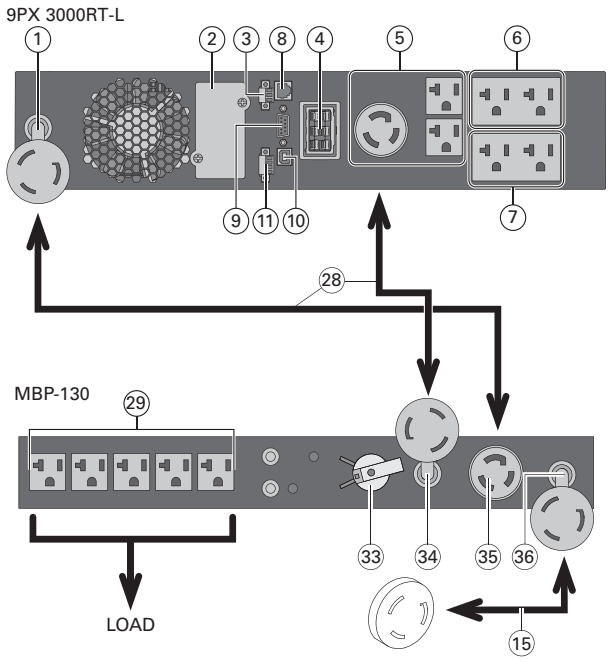
3.10 Connection with a Hotswap MBP Module (Optional Accessory)

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads.



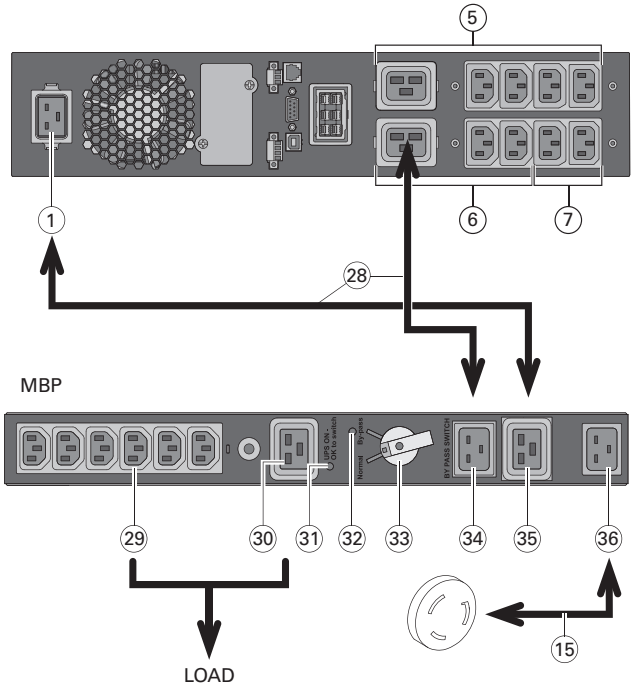
1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the “UPS Input socket” ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the “UPS Output” ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.



* 9PX 1500RT-L: To connect to MBP-115, follow the same procedure as for the 9PX 2000RT / 9PX 3000RT.

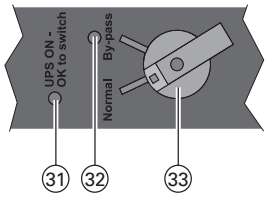
9PX 2200GRT-L & 9PX 3000GRT-L



1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the "UPS Input socket" ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the "UPS Output" ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.

HotSwap MBP module operation



The HotSwap MBP module has a rotary switch ㉝ with two positions:

Normal	the load is supplied by the UPS, LED ㉛ is on.
Bypass	the load is supplied directly by the AC-power source. LED ㉜ is on.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch ㉝ to Normal position.
3. Start the UPS by pressing the ON/OFF button ⏻ on the UPS control panel.

The load is supplied by the UPS.
LED ㉛ "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

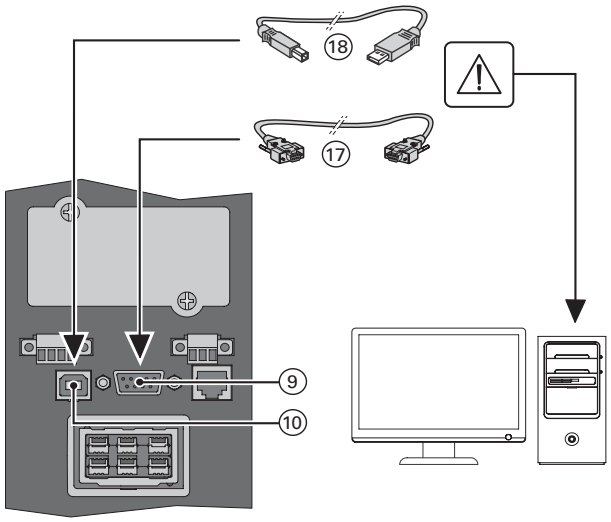
HotSwap MBP module test

1. Set switch ㉝ to Bypass position and check that the load is still supplied.
2. Set switch ㉝ back to Normal position.

Chapter 4 Communication

4.1 Communication Ports

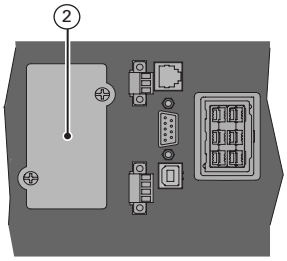
The RS232 and USB communication ports cannot operate simultaneously.



1. Connect the RS232 ⑰ or USB ⑱ communication cable to the serial or USB port on the computer equipment.
2. Connect the other end of the communication cable ⑰ or ⑱ to the USB ⑩ or RS232 ⑨ communication port on the UPS.

The UPS can now communicate with EATON power management software.

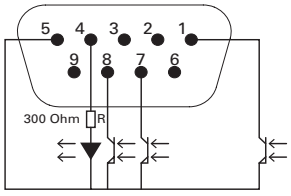
Installation of the communication cards



It is not necessary to shutdown the UPS before installing a communication card.

1. Remove the slot cover ② secured by screws.
2. Insert the communication card in the slot.
3. Secure the card cover with the 2 screws.

Characteristics of the contact RS232 communication port



Pin	Signal	Direction	Function
1	Bat Low	Output	Low Battery Output
2	TxD	Output	Transmit to external device
3	RxD	Input	Receive from external device
4	I/P SIG	Input	-
5	GNDS	-	Signal Common tied to chassis
6	PNP	Input	Plug and Play
7	UPS ON	Output	UPS ON
8	BAT Mode	Output	-
9	+5V	Output	Power supply for external signals or options

Contact characteristics (optocoupler)

- Voltage: 48 V DC max
- Current: 25 mA max

4.2 UPS Remote Control Functions

Programmable Signal Inputs

The 9PX incorporates 3 programmable signal inputs: one Remote Power Off (RPO) input terminal, one Remote On/Off (ROO) input terminal, one RS-232 input (pin-4). Signal inputs can be configured see Settings > Com settings > Signal Input in to have one of the following functions:

Function	Description
No	No function, please choose a function if you want to use input signal
RPO	Remote Power Off (RPO) is used to shutdown the UPS remotely
ROO	Remote On/Off allows remote action of button to switch On/Off the UPS. (Cold start is prohibited while using the ROO function)
Forced bypass	If feeding the load the unit goes to bypass operation and stays there regardless of the bypass state until the input is inactivated
Building alarm	Active input generates an alarm "building alarm"
On generator	Active input disables synchronization and transfers to bypass
Remote shutdown	Active input turns UPS output (or outlet groups) off after a user defined shutdown delay but keeps on charging batteries according to a selected charging scheme, inactive input does not abort shutdown countdown. Depending on the "Restart" parameter (see Settings > Com Settings > Shutdown commands on page 16) the unit may startup automatically.

IMPORTANT

Warning Signal inputs have no function by default please choose a function through the LCD **(Settings > Com settings > Input signals).**

See below 2 examples of configuration with RPO terminal used as RPO function and ROO terminal use as ROO function:

Remote Power Off (RPO)

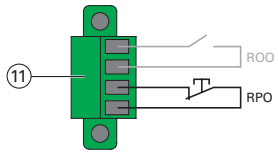
RPO is used to shutdown the UPS remotely when the contact is open. This feature can be used for shutting down the load and the UPS by thermal relay, for instance in the event of room over temperature. When RPO is activated, the UPS shuts down the output and all its power converters immediately. The UPS remains on to alarm the fault. The RPO circuit is an IEC 60950 safety extra low voltage (SELV) circuit. This circuit must be separated from any hazardous voltage circuits by reinforced insulation.

- The RPO must not be connected to any utility connected circuits. Reinforced insulation to the utility is required. The RPO switch must be a dedicated latching-type switch not tied into any other circuit. The RPO signal must remain active for at least 250 ms for proper operation.
- To ensure the UPS stops supplying power to the load during any mode of operation, the input power must be disconnected from the UPS when the Remote Power Off function is activated.

Leave the RPO connector installed in the RPO port on the UPS even if the RPO function is not needed.

RPO connections:

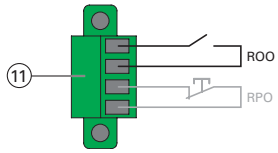
RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote On/Off (ROO)

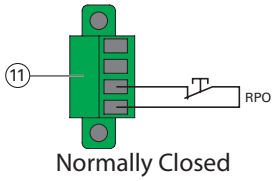
- Remote On/Off allows remote action of button to switch On/Off the UPS.
- When contact changes from open to closed, the UPS is switched-on (or stays On).
- When contact changes from closed to open, the UPS is switched-off (or stays Off).
- On/Off control via button has priority over the remote control.

RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote Control Connection and Test

1. Check the UPS is shut down and the electrical supply network disconnected.
2. Remove RPO connector from the UPS by unfitting the screws.
3. Connect a normally closed volt-free contact between the two pins of connector.

 Normally Closed	Contact open: shut down of UPS To return to normal operation, deactivate the external remote shut down contact and restart the UPS from the front panel.

4. Plug the RPO connector into the back of the UPS and fix the screws.
5. Connect and restart the UPS according to the previously described procedures.

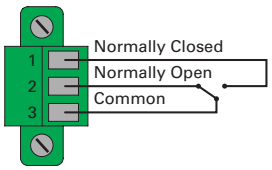
6. Activate the external remote shut down contact to test the function. Always test the RPO function before applying your critical load to avoid accidental load loss.

Programmable Signal Outputs

The 9PX incorporates 4 programmable signal outputs: one relay output, three optocouplers outputs (pin- 1/7/8). Signal outputs can be configured (see Settings > Com settings > Output Signals in to report the following information:

Signal	Default Assignment	Description
On battery (On bat)	DB9-Pin 8	UPS is in battery mode
Low battery (Low bat)	DB9-Pin 1	Battery is nearly empty
Battery fault (Bat fault)	-	Battery fault
Bypass	Relay output **(1)**	UPS is operating in Bypass mode
UPS OK	DB9-Pin 7	Load is powered (from inverter or bypass), with no alarm
Load powered	-	Load is powered (from inverter or bypass)
Load protected	-	UPS is on inverter, with no alarm and ready to go to battery
General alarm	-	• Choose events that will trigger this alarm trough the LCD • (Settings > Com settings > General alarm) for more information on possible events please look at page 16.
Ext charger ON	-	Control an optional external battery charger on and off.
OVL pre-alarm	-	Overload pre-alarm

(1) Relay output:



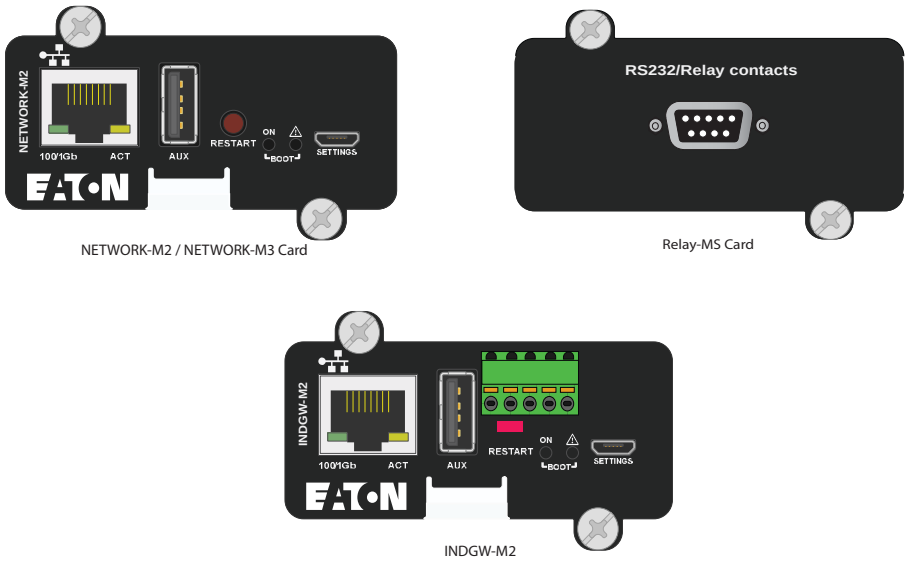
Connectivity Cards

Connectivity cards allow the UPS to communicate in a variety of networking environments and with different types of devices. The 9PX models have one available communication bay for the following connectivity cards:

- **Network-M2 card** — has SNMP and HTTP capabilities as well as monitoring through a Web browser interface; connects to a Gigabit Ethernet network. In addition, a Environmental Monitoring Probe can be attached to obtain humidity, temperature, smoke alarm, and security information.
- **INDGW-M2 card**- has SNMP and HTTP capabilities and a Modbus to facilitate remote monitoring of the UPS system through any Building Management System.

- **Relay-MS card**- has isolated dry contact (Form-C) relay outputs for UPS status: Utility failure, Battery low, UPS alarm/OK, or on Bypass.

Figure 10. Connectivity Card Options



NETWORK-M2 / NETWORK-M3 Card

Relay-MS Card

INDGW-M2

Eaton Intelligent Power Software suite

Eaton Intelligent Power Software suite is available from eaton.com/download. Eaton Software suite provides up-to-date graphics of UPS power and system data and power flow. It also gives you a complete record of critical power events, and it notifies you of important UPS or power information. If there is a power outage and the 9PX UPS battery power becomes low, Eaton Software suite can automatically shut down your computer system to protect your data before the UPS shutdown occurs.

Chapter 5 Operation

5.1 Start-up and Normal Operation

To start the UPS:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. Verify that the UPS power cord is plugged in.
4. The UPS front panel display illuminates and shows EATON logo.
5. Verify that the UPS status screen shows ⏻
6. Press the ⏻ button on the UPS front panel for at least 2 seconds.
7. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear. Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.
8. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode.

5.2 Starting the UPS on Battery

Before using this feature, the UPS must have been powered by utility power with output enabled at least once. Battery start can be disabled. See the "Cold start" setting in "ON/OFF Settings" in .

To start the UPS on battery:

1. Press the ⏻ button on the UPS front panel until the UPS front panel display illuminates and shows a status of "UPS starting...". The UPS transfers from Standby mode to Battery mode. The 🔋 indicator illuminates solid. The UPS supplies power to your equipment.
2. Check the UPS front panel display for active alarms or notices besides the "Battery mode" notice and notices that indicate missing utility power. Resolve any active alarms before continuing. See the "Troubleshooting" section . Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.

5.3 UPS Shutdown

To shut down the UPS:

1. Press the ⏻ button on the front panel for three seconds. A confirmation message will appear. When confirmed, the UPS starts to beep and shows a status of "UPS shutting OFF...". The UPS then transfers to Standby mode, and the ∿ indicator turns off.

5.4 Operating Modes

The Eaton 9PX front panel indicates the UPS status through the UPS indicators, see section 2.4 *Control Panel* .

Online Mode ∿

During Online mode, the ∿ indicator illuminates solid and the UPS is powered from the utility. The UPS monitors and charges the batteries as needed and provides filtered power protection to your equipment.

Optional High Efficiency and Energy Saving settings minimize heat contribution to the rack environment. See section 2.7 *User Settings* .

Battery Mode

When the UPS is operating during a power outage, the alarm beeps once every ten seconds and the indicator illuminates solid. The necessary energy is provided by the battery. When the utility power returns, the UPS transfers to Online mode operation while the battery recharges. If battery capacity becomes low while on Battery mode, the audible alarm beeps once every 3 seconds. This warning is approximate, and the actual time to shutdown may vary significantly. Shutdown all applications on the connected equipment because automatic UPS shutdown is imminent. When utility power is restored after the UPS shuts down, the UPS automatically restarts.

Low-Battery Warning

- The indicator illuminates solid.
- The audio alarm beeps every three seconds.

The remaining battery power is low. Shut down all applications on the connected equipment because automatic UPS shutdown is imminent.

End of battery backup time

- LCD displays "End of backup time".
- All the LEDs go OFF.
- The audio alarms stops.

Bypass Mode

In the event of a UPS overload or internal failure, the UPS transfers your equipment to utility power. Battery mode is not available and your equipment is not protected; however, the utility power continues to be passively filtered by the UPS. The indicator illuminates. Depending on overload conditions, the UPS remains in Bypass mode for at least 5 seconds and will stay in this mode if three transfers to Bypass occur within 20 minutes.

The UPS transfers to Bypass mode when:

- the user activates Bypass mode through the front panel.
- the UPS detects an internal failure.
- the UPS has an overtemperature condition.
- the UPS has an overload condition listed in Table 12 .

The UPS shuts down after a specified delay for overload conditions listed in Table 12 . The UPS remains on to alarm the fault.

5.5 Return of AC Power

Following an outage, the UPS restarts automatically when AC input power returns (unless the restart function has been disabled) and the load is supplied again.

5.6 Setting High Efficiency Mode

In High Efficiency mode, the UPS operates normally on Bypass and transfers to Online (or Battery) mode in less than 10 ms when utility fails. Transfers to High Efficiency mode will be active after 5 minutes of Bypass voltage monitoring: if Bypass quality is not in tolerance, then the UPS will remain in Online mode.

Eaton recommends to use the HE mode only to protect IT equipment.

To set the High Efficiency mode:

1. Select Settings, In/Out settings, and High Efficiency mode.
2. Select Enabled and Enter to confirm.
3. The UPS transfers to High Efficiency mode after 5 minutes.

5.7 Configuring Bypass Settings

The following settings are available for configuring Bypass operation.

Changing the settings changes UPS behavior and may result in decreased protection.

Bypass Voltage Low Limit

The default disables a transfer to Bypass if the measured bypass voltage level is below the nominal output voltage minus 20%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Bypass Voltage High Limit

The default disables a transfer to Bypass if the measured bypass voltage level is above the nominal output voltage plus 15%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Qualify Bypass

The default setting ("In spec") allows a transfer to Bypass only when Bypass is within the following specifications:

- Bypass voltage is between the "Bypass Voltage Low Limit" and "Bypass Voltage High Limit" settings
- Bypass frequency is within nominal frequency 5%.

You can prohibit Bypass ("Never") or always allow Bypass with no specification checking ("Always"). For "Always on UPS Fault," transfer to Bypass is always made on UPS fault; otherwise, operation proceeds as with the default setting.

Synchronization Window

The UPS tries to synchronize with Bypass when the Bypass frequency is less than the value set for the "Synchronization Window" setting. When the Bypass frequency is more than the set value, the UPS goes to nominal frequency.

Unsynchronized Transfers

When Qualify Bypass is set to "Always" or "Always on Fault" you can select the interruption time when transferring to bypass, default setting is "Half Cycle" but can be changed to "Full cycle".

5.8 Configuring Battery Settings

Low battery warning

During discharge, the low battery alarm is activated if the remaining runtime goes below 3 minutes or less than the setting capacity threshold (0 % by default). This threshold can be modified.

Restart battery level

This setting is used to define the battery restart level. The battery level must reach this threshold to enable UPS start.

5.9 Retrieving the Event Log

To retrieve the Event log through the display:

1. Press any button to activate the menu options, then select Event log.
2. Scroll through the listed events.

5.10 Retrieving the Fault Log

To retrieve the Fault log through the display:

1. Press any button to activate the menu options, then select Fault log.
2. Scroll through the listed faults.

Chapter 6 UPS Maintenance

6.1 Storing the Equipment

If you store the equipment for a long period, recharge the battery every 6 months by connecting the UPS to utility power. The internal batteries charge to 90% capacity in less than 3 hours. However, Eaton recommends that the batteries charge for 48 hours after long-term storage. Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use them. Contact your service representative.

6.2 Replacing Batteries

IMPORTANT

DO NOT DISCONNECT the batteries while the UPS is in Battery mode.

Batteries can be replaced easily without turning off the UPS or disconnecting the load. If you prefer to remove input power to change the batteries, see "UPS Shutdown".

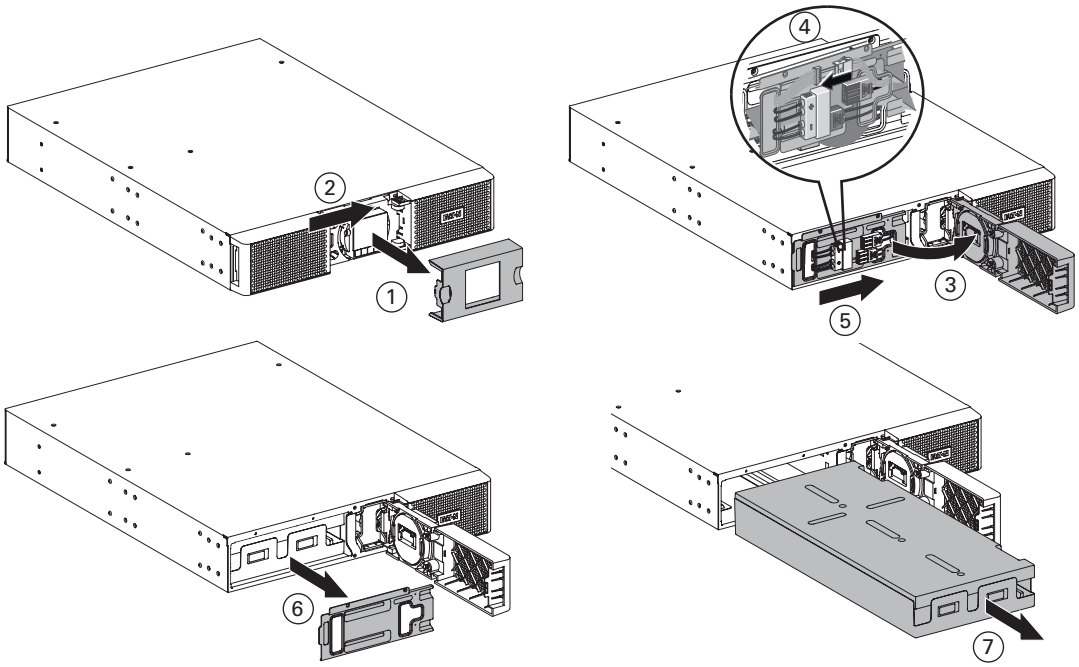
Consider all warnings, cautions, and notes before replacing batteries.

- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
- Batteries can present a risk of electrical shock or burn from high short circuit current. Observe the following precautions:
    1. Remove watches, rings, or other metal objects,
    2. Use tools with insulated handles,
    3. Do not lay tools or metal parts on top of batteries,
    4. Wear rubber gloves and boots.
- When replacing batteries, replace with the same type and number of batteries or battery packs. Contact your service representative to order new batteries.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire. Batteries may explode when exposed to flame.
- Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes and may be extremely toxic.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).
- ELECTRIC ENERGY HAZARD. Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.
- Disconnect charging source prior to connecting or disconnecting battery terminals.

Replacing the internal battery

The internal battery is heavy. Use caution when handling the heavy batteries.

Figure 11. Internal Battery Pack Replacement



To replace the battery pack:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the battery door.
4. Disconnect the battery connectors.

   A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.
5. Remove the two screws to pull out the metal protection cover of the battery.
6. Pull out the plastic handle of the battery pack, and slide the pack out slowly on to a flat and stable surface. Use two hands to support the battery pack. See "Recycling the used equipment" on page 38 for proper disposal.
7. Verify that the replacement batteries have the same rating as the batteries being replaced.
8. Put the new battery pack into the UPS. Push the battery pack firmly, reconnect the red and black battery connectors then reconnect the BMS communication cable.
9. Verify that all of the alarms have cleared on the display.
10. Screw back the metal protection cover and the front panel, then clip the center cover.
11. If there are no EBM modules that need to be replaced continue to the 6.3 *Battery Settings Reset* .
12. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

Replacing the EBM(s)

The EBM is heavy. Lifting the cabinet into a rack requires a minimum of two people.

To replace the EBM(s):

1. Unplug the EBM power cable and battery detection cable from the UPS. If additional EBM(s) are installed, unplug the EBM power cable and battery detection cable from each EBM.
2. Replace the EBM(s). See "Recycling the used equipment" for proper disposal.

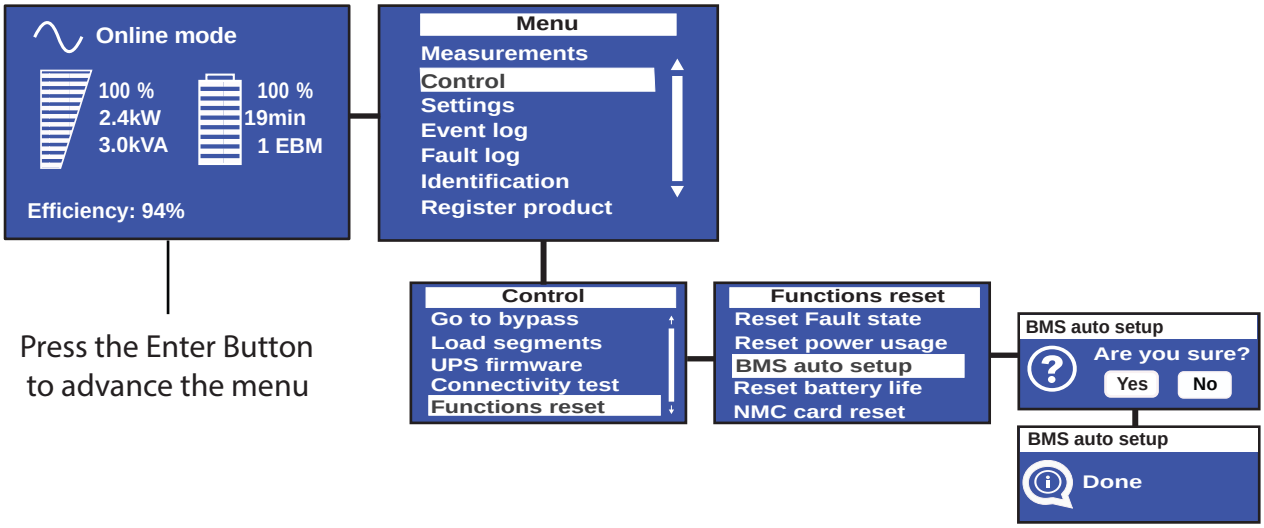
   A small amount of arcing may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.
3. Plug the EBM cable(s) into the battery connector(s). Up to four EBMs may be connected to the UPS.
4. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
5. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).
6. Continue to the 6.3 *Battery Settings Reset*.
7. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

6.3 Battery Settings Reset

After replacement of the internal UPS batteries and extended battery modules the BMS auto setup and battery life settings will need to be reset in the "*Control*" menu of the display.

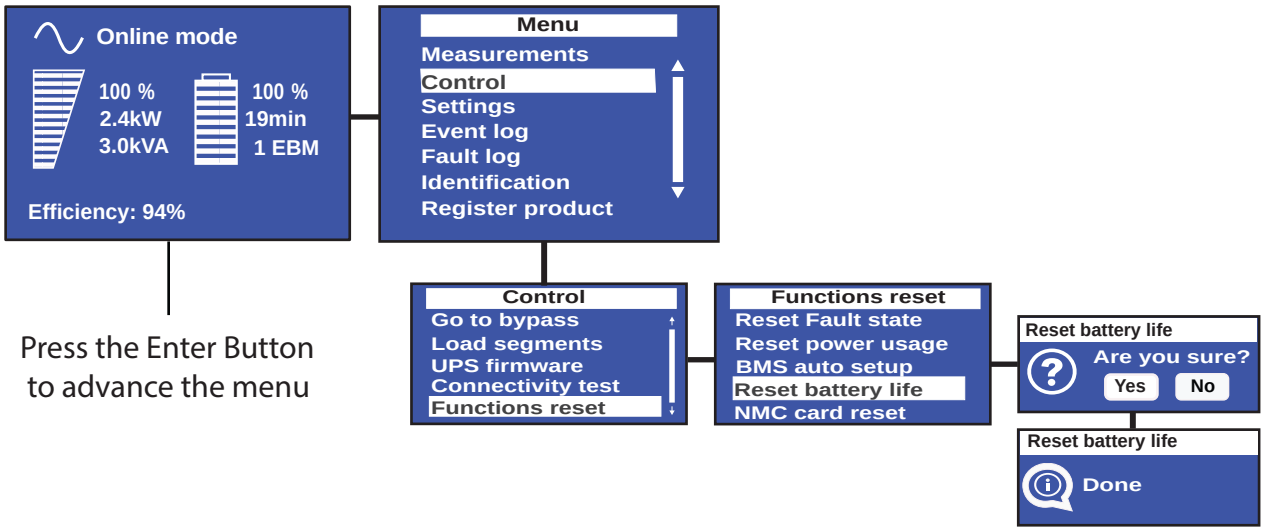
1. Reset the BMS auto setup function in the "Functions Reset" option of the control menu.

Figure 12. BMS Auto Setup Reset



2. Reset the battery life counter in the "Functions Reset" option of the control menu.

Figure 13. Battery Life Reset



Return the UPS to Normal Operation

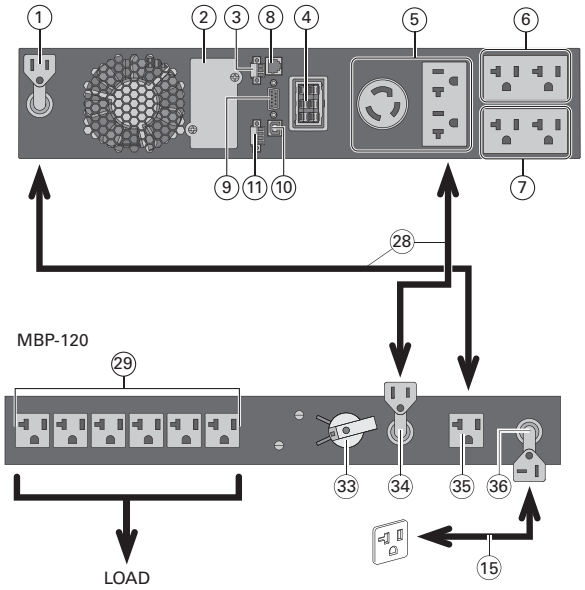
If the UPS internal batteries and external battery packs were replaced without powering down the UPS:

1. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear.
2. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode. See 5.1 *Start-up and Normal Operation* .

If the UPS internal batteries and external battery packs were replaced and the UPS was powered off:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. See section 5.1 *Start-up and Normal Operation* for powering the UPS back to normal operation.
4. If the UPS has a MBP module attached see 3.8 *Detecting other Accessories* for the correct startup procedure.

6.4 Replacing the UPS Equipped with a HotSwap MBP



The **HotSwap MBP** module makes it possible to service or even replace the UPS without affecting the connected loads.

Maintenance

1. Set switch (33) to Bypass position. The red LED on the **HotSwap MBP** module goes ON, indicating that the load is supplied directly with AC input source power.
2. Stop the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation

1. Check that the UPS is correctly connected to the **HotSwap MBP** module.
2. Start the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" on the **HotSwap MBP** module goes ON (otherwise, there is a connection error between the **HotSwap MBP** module and the UPS).
3. Set switch (33) to Normal position. The red LED on the **HotSwap MBP** module goes OFF.

6.5 Recycling The Used Equipment

Contact your local recycling or hazardous waste center for information on proper disposal of the used equipment.



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

Chapter 7 Troubleshooting

7.1 Typical Alarms and Faults

The Eaton 9PX are designed for durable, automatic operation and also alert you whenever potential operating problems may occur. Usually the alarms shown by the control panel do not mean that the output power is affected. Instead, they are preventive alarms intended to alert the user.

- Events are silent status information that are recorded into the Event log. Example = "AC freq in range".
- Alarms are recorded into the Event log and displayed on the LCD status screen with the logo blinking. Some alarms may be announced by a beep every 3 seconds. Example = "Battery low".
- Faults are announced by a continuous beep and red LED, recorded into the Fault log and displayed on the LCD with a specific message box. Example = Out. short circuit.

Use the following troubleshooting chart to determine the UPS alarm condition.

Checking the Alarms and Faults

To check the Event log or Fault log :

1. Press any button on the front panel display to activate the menu options.
2. Press the button to select Event log or Fault log.
3. Scroll through the listed events or faults.

The following table describes typical conditions.

Conditions	Possible cause	Action
Battery mode  LED is On. 1 beep every 10 seconds	A utility failure has occurred and the UPS is in battery mode.	The UPS is powering the equipment with battery power. Prepare your equipment for shutdown.
Battery mode  LED is On. 1 beep every 3 seconds	The UPS is in Battery mode and the battery is running low.	This warning is approximate, and the actual time to shutdown may vary significantly. Depending on the UPS load and number of Extended Battery Modules (EBMs), the "Battery Low" warning may occur before the batteries reach 20% capacity.
No battery  LED is On Beep continuous	The batteries are disconnected.	Verify that all batteries are properly connected. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.
Battery fault  LED is On Beep continuous	The battery test is failed due to bad or disconnected batteries.	Verify that all batteries are properly connected. If the condition persists, contact your service representative. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.

Conditions	Possible cause	Action
The UPS does not provide the expected backup time.	The batteries need charging or service.	Apply utility power for 48 hours to charge the batteries. If the condition persists, contact your service representative.
Bypass mode  LED is on.	An overload or a fault has occurred, or a command has been received and the UPS is in Bypass	Equipment is powered but not protected by the UPS. Check for one of the following alarms: overtemperature, overload or UPS LED is on. failure.
Power Overload  LED is on.	Power requirements exceed the UPS capacity (greater than 100% of nominal; see “User Settings” on page 8 for specific output overload ranges).	Remove some of the equipment from the UPS. The UPS continues to operate, but may switch to Bypass mode or shut down if the load increases. The alarm resets when the condition becomes inactive.
UPS Overtemperature  LED is on. 1 beep every 3 seconds	The UPS internal temperature is too high or a fan has failed. At the warning level, the UPS generates the alarm but remains in the current operating state. If the temperature rises another 10°C, the UPS transfers to Bypass mode or shuts down if Bypass is unusable.	If the UPS transferred to Bypass mode, the UPS will return to normal operation when the temperature drops 5°C below the warning level. If the condition persists, shut down the UPS. Clear vents and remove any heat sources. Allow the UPS to cool. Ensure the airflow around the UPS is not restricted. Restart the UPS. If the condition continues to persist, contact your service representative.
The UPS does not start	The input source is not connected correctly.	Check the input connections.
	The Remote Power Off (RPO) switch is active or the RPO connector is missing.	If the UPS Status menu displays the "Remote Power Off" notice, inactivate the RPO input.

7.2 Silencing the Alarm

Press the ESC (Escape) button on the front panel display to silence the alarm. Check the alarm condition and perform the applicable action to resolve the condition. If the alarm status changes, the alarm beeps again, overriding the previous alarm silencing.

7.3 Service and Support

If you have any questions or problems with the UPS, call your **Local Distributor** or your local service representative and ask for a UPS technical representative. Please have the following information ready when you call for service:

- Model number
- Serial number
- Firmware version number
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

If repair is required, you will be given a Returned Material Authorization (RMA) number. This number must appear on the outside of the package and on the Bill Of Lading (if applicable). Use the original packaging or request packaging from the Help Desk or distributor. Units damaged in shipment as a result of improper packaging are not covered under warranty. A replacement or repair unit will be shipped, freight prepaid for all warrantied units.

IMPORTANT

For critical applications, immediate replacement may be available. Call the Help Desk for the dealer or distributor nearest you.

7.4 CE Compliance Contact

- Eaton I.F. SAS - 110 Rue Blaise Pascal - 38330 Montbonnot St Martin – France.

Chapter 8 Specifications

8.1 Model Specifications

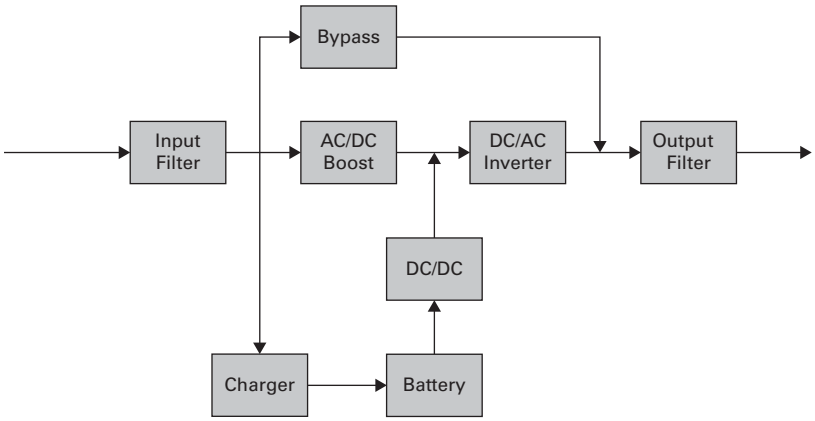


Table 7. Power Module List

Model	Power ratings
9PX1500RT-L	1500VA / 1350W
9PX2000RT-L	2000VA / 1800W
9PX3000RT-L	3000VA / 2700W
9PX1500GRT-L	1500VA / 1350W
9PX2200GRT-L	2200VA / 2000W
9PX3000GRT-L	3000VA / 2700W

Table 8. Extended Battery Module List

Model	Configuration	Battery Voltage	For Power Module
9PXEBM48RT-L	Rack / Tower	48Vdc	1500VA
9PXEBM72RT-L	Rack / Tower	72Vdc	2000 – 2200 – 3000VA

Table 9. Weights and Dimensions

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8

Table 9. Weights and Dimensions (Continued)

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

Table 10. Electrical Input

Model	Default Input (Voltage/Max Current)	Input Nominal Voltages	Input Voltage Window at Rated Load
9PX1500RT-L	120V / 12.5A	100V, 110V, 120V, 125V	100–138V
9PX2000RT-L	120V / 16A		
9PX3000RT-L	120V / 24A		
9PX1500GRT-L	208V / 7.2A	200V, 208V, 220V, 230V, 240V	176V-276V
9PX2200GRT-L	208V / 10.57A		
9PX3000GRT-L	208V / 14.42A		
Nominal Frequency		50/60Hz auto-sensing	
Frequency Range		40-70Hz before transfer to battery	
Bypass Voltage Range		-20% / +15% of nominal value (default)	
Noise Filtering		Input EMC filter	

Table 11. Electrical Input Connections

Model	Input Connection	Input cable
9PX1500RT-L	5–15P	8ft / 2.4m
9PX2000RT-L	5–20P	8ft / 2.4m
9PX3000RT-L	L5–30P	8ft / 2.4m
9PX1500GRT-L	IEC-C14, IEC 10A	6ft / 1.8m
9PX2200GRT-L	IEC-C20, 16 A inlet L6-20P to C19 jumper provided	6ft / 1.8m
9PX3000GRT-L		

Table 12. Electrical Output

All Models	Normal Mode	Efficiency Mode	Battery Mode
Voltage Regulation	±1%		±2%
Efficiency	90.0% for 1.5K LV models 91% for 1.5K G models 91.4% for 2K LV models 93% for 2K G models 94% for 3K G models	95.8% for 1K5 LV models 96.5% for 1.5K G models 96.8% for 2K LV models 98% for 2K G models 97.2% for 3K LV models 98% for 3K G models	84% for 1.5K LV models 87.5% for 1.5K G models 86% for 2K LV models 90% fo r 2K G models 86% for 3K LV models 89% for 3K G models

Table 12. Electrical Output (Continued)

All Models	Normal Mode	Efficiency Mode	Battery Mode
Frequency Regulation	Sync with line ±5% of nominal line frequency (outside this range: ±0.5% of auto-selected nominal frequency)		±0.5% of auto-selected nominal frequency
Nominal Output	[100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V] (G models)		
Frequency	50 or 60 Hz, autosensing or configurable as a frequency converter		
Output Overload	Online mode: 102%~130% :12s 130%~150% :2s >150% :shutdown after 300ms Percent is based on nominal Watt/VA. Transfer behavior can change (see output mode setting on page 14) Battery mode: 102%~130% :12s >130% :2s Overload warning then transfer to stop output		
Output Overload (Bypass Mode)	102%~110% :Overload warning 110%~130% :shutdown after 5mins 130%~150% :shutdown after 15s >150% :shutdown after 300ms Percent is based on nominal current in bypass mode		
Voltage Waveform	Sinewave		
Harmonic Distortion	< 3% THDV on linear load < 5% THDV on non-linear load		
Transfer Time	Online Mode: 0ms High Efficiency mode: 10ms maximum (due to loss of utility)		
Power Factor	Up to 1.0		
Load Crest Ratio	Up to 3:1		

Table 13. Electrical Output Connections

Model	Output Connection	Output Cable
9PX1500RT-L	5-15R (8)	No
9PX2000RT-L	5-20R(2) + L5-20R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX3000RT-L	5-20R(2) + L5-30R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX1500GRT-L	(4) IEC10A (2) IEC10A (2) IEC10A (2) IEC 10A	No

Table 13. Electrical Output Connections (Continued)

Model	Output Connection	Output Cable
9PX2200GRT-L	(4) IEC10A + (1) IEC16A (2) IEC10A + (1) IEC16A group 1 (2) IEC10A group 2	(2) IEC 10A
9PX3000GRT-L		

Table 14. Environmental and Safety

Certifications	IEC/EN 62040-1 IEC/EN 62040-2 : Cat. C1 IEC/EN 62040-3 UL1778 5th edition CSA 22.2
EMC (Emissions)*	CISPR22 Class B FCC part 15 Class B / ICES-003
EMC (Immunity)*	IEC 61000-4-2, (ESD): 8 kV Contact Discharge / 15 kV Air Discharge IEC 61000-4-3, (Radiated field): 10 V/m IEC 61000-4-4, (EFT): Power (Coupling network) 4 kV / Ethernet (Coupling clamp) 2 kV IEC 61000-4-5, (Surges): 2 kV Differentiel Mode / 4 kV Common Mode / 1 kV Ethernet IEC 61000-4-6, (Electromagnetic field): 10 V IEC 61000-4-8, (Conducted magnetic field): 30 A/m
* for output cable < 10m.	
Agency Markings*	cULus / NOM / Energy Star / BSMI
Operating Temperatures	0 to 40°C (32 to 104°F) in Online mode, with linear derating for altitude **Note:** thermal protection switches load to Bypass in case of overheating.
Storage Temperatures	0 to 40°C (32 to 104°F) with batteries -25 to 55°C (-13 to 130°F) without batteries
Transit Temperature	-25 to 55°C (-13 to 130°F)
Relative Humidity	0 to 96% no condensing
Operating Altitude	Up to 3,000 meters (9,843 ft) above sea level, no derating for 35°c (95°F) room temperature
Transit Altitude	Up to 10,000 meters (32,808 ft) above sea level
Audible Noise	< 47 dBA at 1 meter typical for 2K et 3K models < 40 dBA at 1 meter typical for 70, 1K et 1K5 models
***** 9PX1500RT-L, 9PX2000RT-L, 9PX3000RT-L, 9PX1500GRT-L, 9PX2200GRT-L, 9PX3000GRT-L have cULus/Energy Star/ BSMI. 9PXEBM48RT-L, 9PXEBM72RT-L have cULus / NOM.	

Table 15. Battery

	Internal Batteries	EBM
Rack / Tower configuration	1500VA: 48Vdc 2200VA: 72Vdc 3000VA: 72Vdc	9PXEBM48RT: 48Vdc 9PXEBM72RT: 72Vdc
Type	Lithium Iron Phosphate (LFP) battery module Lithium-Ion float service life 8 years /25°C	
Monitoring	Integrated battery management system (BMS) for temperature regulation and life cycle monitoring.	
EBM Battery Cable Length	350 mm / 13.78 in	

P-164001006 06

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Five-Year Limited Warranty (US and Canada)

Eaton UPS Models: 9PX Lithium-ion

WARRANTOR: The warrantor for the limited warranties set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED WARRANTY: This limited warranty (this "Warranty") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") purchased on or after March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Company for resale to an End-User.

LIMITED WARRANTY PERIOD: The period covered by this Warranty for Product installed [and currently located] in the fifty (50) United States, the District of Columbia, and Canada is sixty (60) months from the date of purchase, or sixty six (66) months from the date of shipment.

WHAT THIS LIMITED WARRANTY COVERS: The warrantor warrants that the Product and battery (individually and collectively, the "Warranted Items") are free from defects in material and workmanship. If, in the opinion of Company, a Warranted Item is defective and the defect is within the terms of this Warranty, Company's sole obligation will be to repair or replace such defective Warranted Item (including by providing service, parts and labor, as applicable), at the option of Company.

PROCEDURES FOR REPAIR OR REPLACEMENT OF WARRANTED ITEMS: The Warranted Item will be repaired or replaced at a Company site or such other location as determined by Company.

If the Warranted Item is to be replaced by Company, and the End-User supplies a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives notice of the warranty claim. In such case, the End-User must return (at Company's expense) the defective Warranted Item to Company in the same packaging as the replacement Warranted Item received by the End-User or as otherwise instructed by Company. If Company does not receive the defective Warranted Item, Company will either charge the End-User's credit card, or send the End-User an invoice (which the End-User agrees to pay), for the value of the replacement Product.

If the Warranted Item is to be replaced by Company, but the End-User is unwilling or unable to supply a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives the defective Product from the End-User.

In any case, Company will provide shipping instructions and will pay its designated carrier for all shipping charges for return of defective equipment and replacement of Warranted Items. Any returned Warranted Item or parts that are replaced may be new or reconditioned. All Warranted Items returned to Company and all parts replaced by Company shall become the property of Company.

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.

This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.

Company shall not be responsible for any charges for testing, checking, removal, or installation of Warranted Items.

COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.

COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.

THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON-CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY), OR OTHERWISE.

LIMITATION OF LIABILITY: The remedies of the End-User set forth herein are exclusive and are the sole remedies for any failure of Company to comply with its obligations hereunder. In no event shall Company be liable in contract, in tort (including negligence or strict liability) or otherwise for damage to property or equipment other than the Products, including loss of profits or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of Company hereunder whether the claims are based in contract (including indemnity), in tort (including negligence or strict liability), or otherwise, shall not exceed the price of the Product on which such liability is based.

Company shall not be responsible for failure to provide service or parts due to causes beyond Company's reasonable control.

END-USER'S OBLIGATIONS: In order to receive the benefits of this Warranty, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.

OTHER LIMITATIONS: Company's obligations under this Warranty are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Warranty. Also during such time, the period of this Warranty shall continue to run and the expiration of this Warranty shall not be extended upon payment of any overdue or unpaid amounts.

COSTS NOT RELATED TO WARRANTY: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Warranty, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Warranty will be borne by the End-User.

OBTAINING WARRANTY SERVICE: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, call your local Eaton product sales or service representative. For comments or questions about this Warranty, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.

Load Protection Guarantee (US and Canada)

Eaton UPS Models 9PX Lithium-ion

GUARANTOR: The Guarantor for the load protection guarantee set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED GUARANTEE: This load protection guarantee (this "Guarantee") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") and cannot be transferred. This Guarantee applies even in the event that the Product is initially sold by Company for resale to an End-User.

WHAT THIS GUARANTEE COVERS: For the lifetime of the Product, Guarantor promises to repair or replace, at Guarantor's option, the equipment (valued up to the limits shown below*) that is damaged by an AC power line surge, spike, or other transient when properly connected to Guarantor's uninterruptible power system ("UPS"). Reimbursement for or restoration of data loss excluded. This Guarantee applies only if all of the following circumstances arise:

1. The UPS is plugged into properly grounded and wired outlets, using no extension cords, adapters, other ground wires, or other electrical connectors;
2. The installation of the UPS complies with all applicable electrical and safety codes described by the National Electrical Code® (NEC®);
3. The UPS was used under normal operating conditions and in accordance with all labels and instructions; and
4. The UPS was not damaged by accident (other than AC power line transient), misuse, or abuse.

***Cumulative Limits to be paid by Guarantor under this Load Protection Guarantee:**

$150,000 for Eaton UPS Models 9PX Lithium-ion

WHAT THIS GUARANTEE DOES NOT COVER: Any reimbursement or repair to End-User's equipment does not include reimbursement for or restoration of any data loss. This Guarantee does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation of Product; (d) repair or alteration of Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind to the Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Guarantee is not valid: if the Product's serial numbers have been removed or are illegible.
Company shall not be responsible for any charges for testing, checking, removal, or installation of any items.

LIMITATION OF LIABILITY: The remedies of the END-USER set forth HEREIN are exclusive and are THE sole remedies for any failure of COMPANY to comply with its obligations hereunder. EXCEPT AS OTHERWISE PROVIDED FOR IN THIS GUARANTEE, in no event shall COMPANY be liable in contract, in tort (including negligence or strict liability), or otherwise for damage to property or equipment other than THE products, INCLUDING loss of profits or revenue, loss of use of products, LOSS OF DATA, cost of capital, claims of customers of the END-USER or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of COMPANY HEREUNDER whether the claims are based in contract (INCLUDING INDEMNITY), in tort (including negligence or strict liability), or otherwise, shall not exceed THOSE SET FORTH ABOVE.
Company shall not be responsible for failure to provide repair or replacement under this Guarantee due to causes beyond Company's reasonable control.
END-USER'S OBLIGATIONS: In order to receive the benefits of this Guarantee, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.
OTHER LIMITATIONS: Company's obligations under this Guarantee are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Guarantee.
COSTS NOT RELATED TO GUARANTEE: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Guarantee, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Guarantee will be borne by the End-User.
TO MAKE A CLAIM: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, contact your local Eaton product sales or service representative. For comments or questions about this Load Protection Guarantee, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.
WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.
Company shall not be responsible for any charges for testing, checking, removal or installation of Warranted Items.
COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.
COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.
THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON- CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE

Product specifications

Eaton 9PXEBM48RT-L

Catalog Number: 9PXEBM48RT-L

Eaton 9PX lithium ion extended battery module (EBM), 1U, used with 9PX1500RT-L, 9PX1500RTN-L, 9PX1500GRT-L

General specifications

Product Name
Eaton 9PX extended battery module (EBM)

Catalog Number
9PXEBM48RT-L

UPC
743172105592

Product Length/Depth
17.6 in

Product Height
1.7 in

Product Width
17.2 in

Product Weight
36.5 lb

Compliances
CE Marked
FCC part 15 Class B
IEC 62040-2 Cat C1

Certifications
NOM
cTUVus

Product specifications

Type

Extended Battery Module (EBM)

Runtime graph

View runtime graph

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Used with

9PX1500RT-L, 9PX1500GRT-L, 9PX1000GRT-L

Rack size

1U

Color

Black/silver

Rack mounting kit

Yes

Form factor

Rack/tower

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 2 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Temperature range

0° to 40°C (32° to 104°F)

Relative humidity

0-96% non-condensing

Resources

Brochures

Eaton 9PX lithium-ion UPS brochure

Drawings

Eaton 9PXEBM4RT-L 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide



Eaton Corporation plc
Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com

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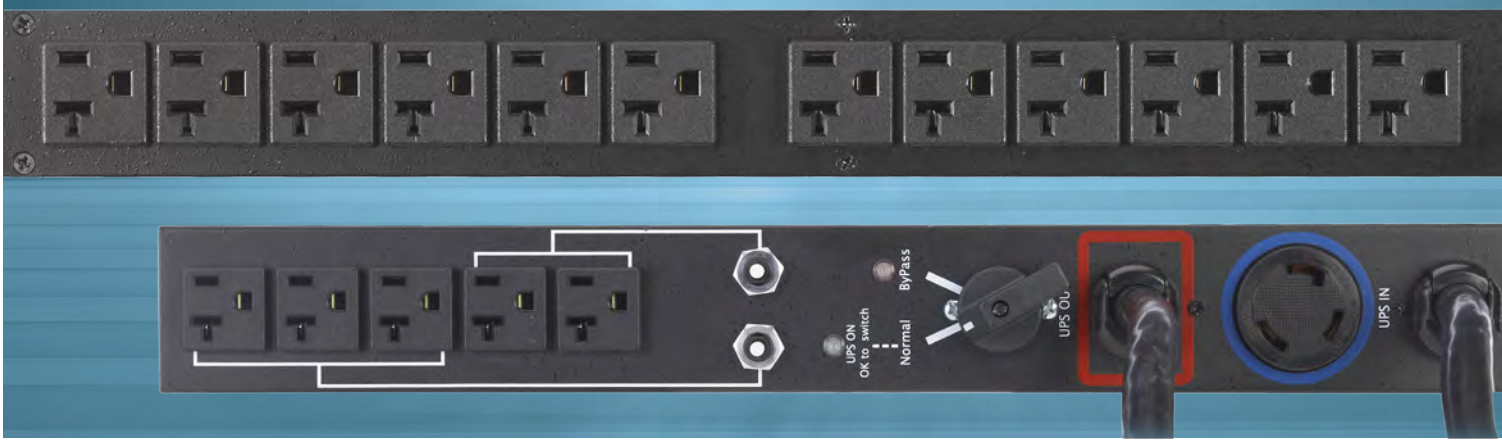
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Product brochure



Eaton FlexPDU and Maintenance Bypass PDU

Eaton provides five different functions for rack power distribution solutions. Two of these functions, FlexPDU and Maintenances Bypass PDU, were created as accessories specific to some of our UPSs. Both of these units offer the flexibility of connections to meet the demanding requirements of today's data center architects.

The HotSwap Maintenance Bypass (MBP) unit enables easy UPS replacement without interruption of the load. The HotSwap MBP is ideal when exchanging a unit or servicing a UPS. For added convenience, the HotSwap MBP offers two types of receptacles: 5-15R or 5-20R.

The FlexPDU is a basic function power distribution unit with a short power cord for easy, close mounting. FlexPDUs are available with 5-15R, 5-20R or L5-20R output receptacles, for connection to a wide range of equipment.

Both of these options allow for easy deployment, even in space-constrained environments. You have a variety of mounting options, including top and side mounting.

Features

- HotSwap MBP provides service continuity during UPS maintenance or upgrade
- Both units offer connections to all types of equipment
- Eases installation with flexible mounting options
- Minimal depth accommodates most space constraints



Side mounting Flex PDU with Tower UPS



Top mounting horizontal FlexPDU with 2U UPS

HotSwap MBPs rackmounted horizontally in rack



Top mounting vertical FlexPDU



Powering Business Worldwide

FLEXPDU MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EFLXL1500R-PDU1U	58015	5-15P	None	1.44	BA	3	1U	(12) 5-15R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1U	58020	5-20P	None	1.92	BA	3	1U	(12) 5-20R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1UL	58021	5-20P	None	1.92	BA	3	1U	(5) L5-20R	1.7 x 19.0 x 3.0
EFLXI3000R-PDU1UIEC	68438	C20 Inlet	(2) 20A	3.33	BA	3	1U	(12) C13, (1) C19	1.7 x 19.0 x 2.4

HOTSWAP MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EHBPL1500R-PDU1U	58115	5-15P	None	1.44	BA	8	2U	(6) 5-15R	2.1 x 17.3 x 3.8
EHBPL2000R-PDU1U	58120	5-20P	None	1.92	BA	8	2U	(6) 5-20R	2.1 x 17.3 x 3.8
EHBPL3000R-PDU1U	58130	L5-30P	(2) 20A	2.88	BA	3.3	2U	(5) 5-20R	2.1 x 17.3 x 3.8

COMPATIBILITY MATRIX FOR RACKMOUNT UPSs*

FlexPDU plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P 1U UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5) 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓

*For tower models, all FlexPDUs can be wall-mounted. ** Rear mounting available on 3U models only.

HotSwap MBP plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5P 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓
30A	Eaton 5PX UPS, 3000 VA	✓
	Eaton 9PX UPS, 3000 VA	✓

*For tower models, all HotSwap MBPs can be wall-mounted. **Rear mounting available on 3U models only.

To interact with the FlexPDU and Maintenance Bypass PDF, please visit: **Eaton.com/epdu**

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

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Printed in USA
Publication No. PDU17FXA / GG
August 2017

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Powering Business Worldwide

Product specifications

Eaton EHBPL1500R-PDU1U

Catalog Number: EHBPL1500R-PDU1U

Eaton Basic rack PDU, 1U - EHBPL1500R-PDU1U



General specifications

Product Name	**Catalog Number**
Eaton HotSwap MBP	EHBPL1500R-PDU1U
UPC	**Product Length/Depth**
743172067340	17.3 in
Product Height	**Product Width**
2.1 in	3.8 in
Product Weight	**Warranty**
0.0001 lb	3 year
Compliances	**Certifications**
Contact Manufacturer	UL Listed

Powering Business Worldwide

Product specifications

Outlet control
No

Cord length
8 ft

Phase
Single-phase

Input voltage
110-125V

Color
Black

Wattage
1.44 kW max

Form factor
2U

Mounting direction
Horizontal

Amperage Rating
12A

Input connection
5-15P

Outlets
(6) 5-15R

Type
PDU

Frequency rating
50-60 Hz

Operating Temperature
0° to 60°C (32° to 140°F)

Number of Outputs 5-15R
6

Circuit breaker
None

Resources

Brochures

Eaton Flex and Hotswap MBP ePDU brochure

Drawings

Eaton ePDU visio stencils

Eaton FlexPDU EHBPL 1500R-PDU1U technical drawing

Specifications and datasheets

Eaton Specification Sheet - EHBPL1500R-PDU1U

User guides

Eaton FlexPDUs and HotSwap MBP installation and user manual



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Eaton.com

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HotSwap

Maintenance ByPass

MBP - 115 / EHBPL1500R-PDU1U

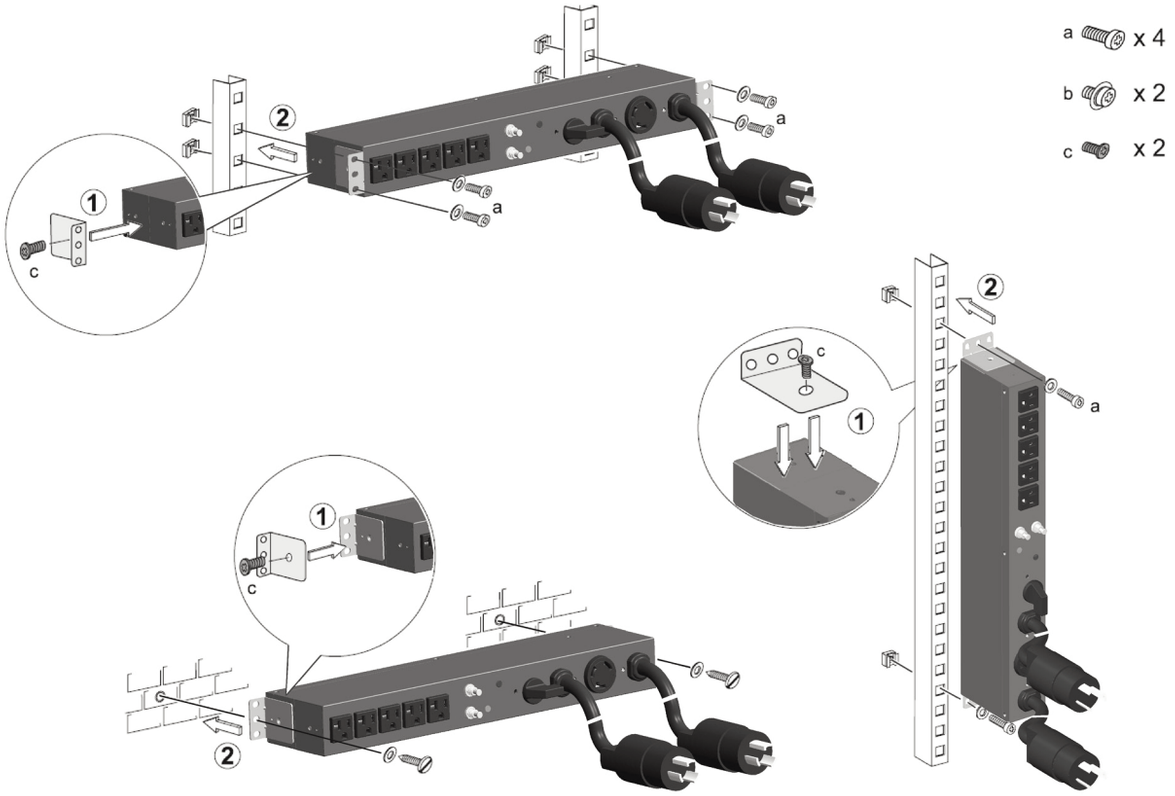
MBP - 120 / EHBPL2000R-PDU1U

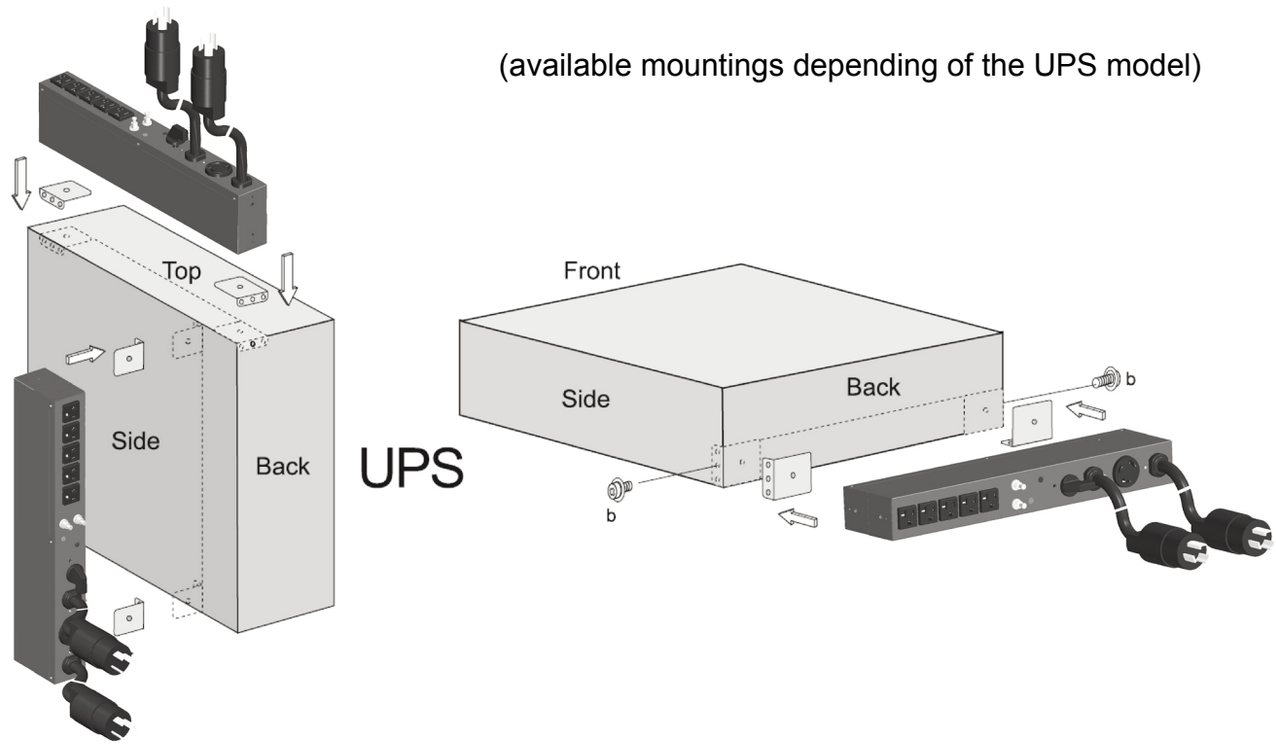
MBP - 130 / EHBPL3000R-PDU1U

Installation and User Manual

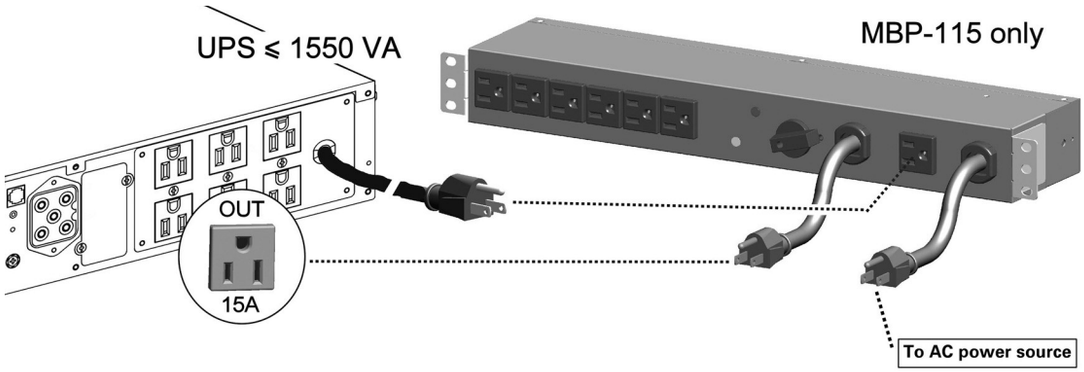
English
Français
Español
Português

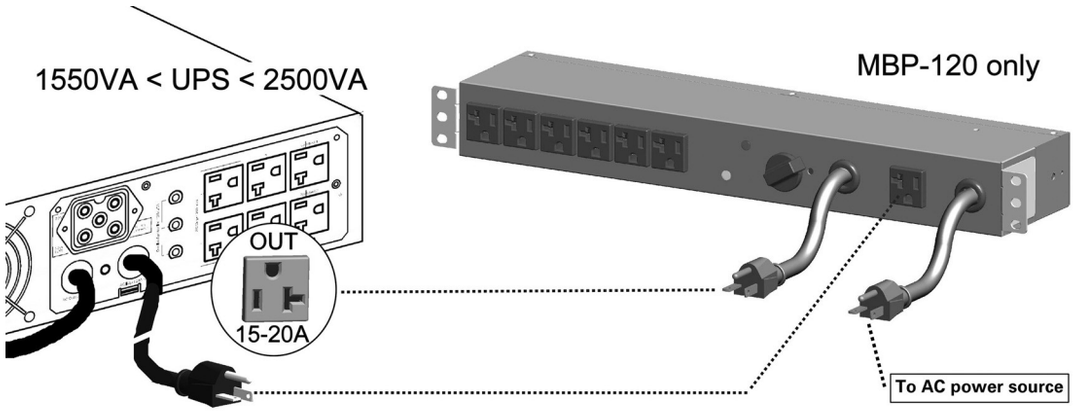
HotSwap Connections

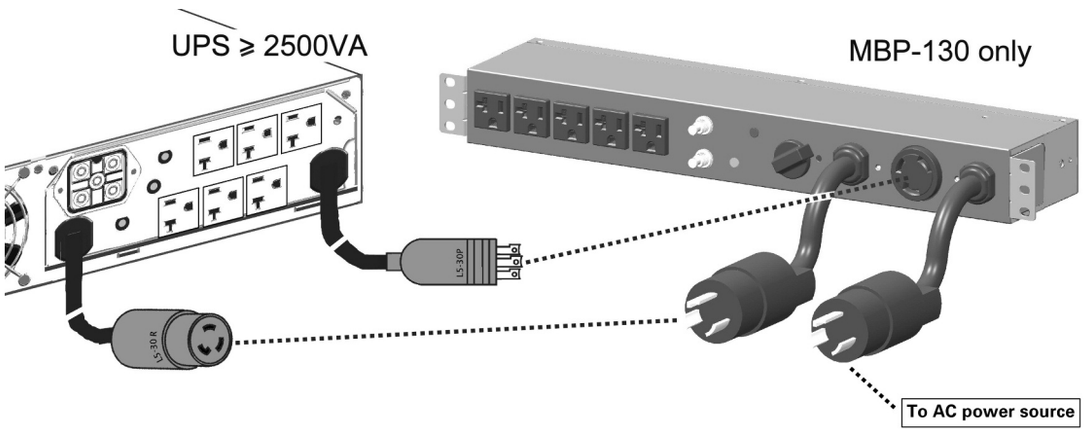


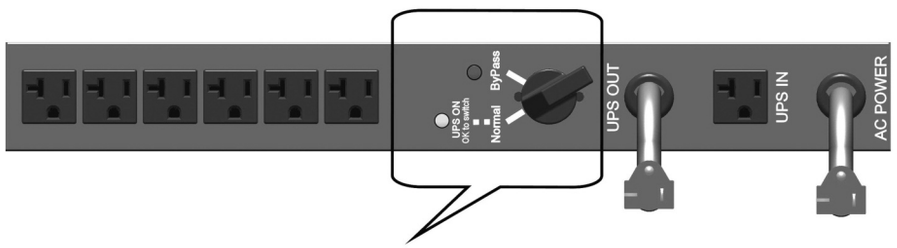


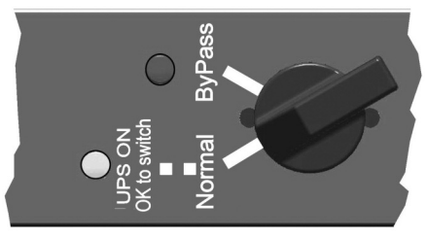
(available mountings depending of the UPS model)


UPS ≤ 1550 VA
MBP-115 only
OUT
15A
To AC power source


1550VA < UPS < 2500VA
MBP-120 only
OUT
15-20A
To AC power source


UPS ≥ 2500VA
MBP-130 only
L5-30P
L5-30R
To AC power source


UPS ON
OK to switch
Normal
ByPass
UPS OUT
UPS IN
AC POWER


UPS ON
OK to switch
Normal
ByPass

English

Safety guidelines to read before installing the product

- The product must be used indoors only.
- Do not place the product near liquid or in an excessively damp environment.
- Do not place the product directly in the sun or near a heat source.
- Do not let liquid or foreign objects enter the product.
- Ground the product using a 2 poles + ground socket (2P + G).
- When installing the product, ensure that the sum of the leakage currents of the product and the devices it supplies does not exceed 3.5 mA.
- The AC-power input must be connected to an appropriate electrical network protection or tap-off circuit (fuse or circuit-breaker).

Use

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function). Refer to the illustrations.

Installation

Refer to the UPS installation and user manual.

HotSwap MBP module operation

The HotSwap MBP module has a rotary switch with two positions:

- Normal - the load is supplied by the UPS,
- Bypass - the load is supplied directly by the AC-power source.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch to the Normal position.
3. Start the UPS by pressing the ON/OFF button on the UPS control panel:

- The load is supplied by the UPS.
- Green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

HotSwap MBP module test

1. Set switch to the Bypass position and check that the load is still supplied.
2. Set switch back to the Normal position.

Maintenance on a UPS equipped with the HotSwap MBP module

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function).

Maintenance:

1. Set switch to the Bypass position. The red LED on the HotSwap MBP module goes ON, indicating that the load is supplied directly with AC power.
2. Stop the UPS: green LED "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation:

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Start the UPS: green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON (otherwise, there is a connection error between the HotSwap MBP module and the UPS).
3. Set switch to the Normal position. The red LED on the HotSwap MBP module goes OFF.

Français

Consignes de sécurité, à lire avant l'installation du produit

- Le produit doit être utilisé à l'intérieur seulement.
- Ne pas placer le produit à proximité de liquide, ou dans un environnement d'humidité excessive.
- Ne pas placer le produit directement au soleil ou à proximité d'une source de chaleur.
- Ne pas laisser pénétrer de liquide ou d'objet étranger à l'intérieur du produit.
- Relier impérativement le produit à la terre à l'aide d'une prise de courant 2 pôles + terre (2P+T).
- S'assurer lors de l'installation du produit que la somme des courants de fuite du produit et des appareils qu'il alimente ne dépasse pas 3.5 mA.
- La fiche d'alimentation doit être connectée à un circuit de dérivation ou de protection du réseau électrique (fusible ou disjoncteur) approprié.

Utilisation

Le Module HotSwap MBP permet la maintenance et éventuellement le remplacement de l'ASI sans affecter l'alimentation électrique des équipements connectés (fonction HotSwap).

Installation

Se reporter au manuel d'installation et d'utilisation de l'ASI.

Fonctionnement du module HotSwap MBP

Le module HotSwap MBP utilise un commutateur rotatif à 2 positions :

- Normal : les équipements sont alimentés par l'ASI.
- By-pass : les équipements sont alimentés par le réseau électrique.

Mise en service de l'ASI avec le module HotSwap MBP :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Placer le commutateur en position Normal.
3. Mettre en marche l'ASI :

- Les équipements sont alors alimentés par l'ASI.
- Le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP.

Test du module HotSwap MBP

1. Placer le commutateur en position By-pass et vérifier que les équipements sont toujours alimentés.
2. Remettre le commutateur en position Normal.

Maintenance d'une ASI équipée d'un module HotSwap MBP

Remplacement de l'ASI sans interrompre l'alimentation électrique des équipements connectés :

1. Placer le commutateur en position By-pass : le voyant rouge du module HotSwap MBP s'allume pour indiquer que les équipements sont alimentés directement par le réseau électrique.
2. Arrêter l'ASI : le voyant vert "UPS ON - OK to switch" s'éteint, l'ASI peut alors être déconnectée et remplacée.

Retour en fonctionnement normal :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Mettre en marche l'ASI : le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP (sinon il y a erreur de raccordement du module HotSwap MBP avec l'ASI).
3. Mettre le commutateur en position Normal : le voyant rouge du module HotSwap MBP s'éteint.

Español

Consignas de seguridad leer antes de instalar el producto

- El producto debe utilizarse únicamente al interior.
- No colocar el producto cerca de líquidos o en un entorno de humedad excesiva.
- No colocar el producto directamente bajo los rayos del sol ni cerca de una fuente de calor.
- No dejar que penetre líquido u objeto ajeno al interior del producto.
- Conectar imperativamente el producto a tierra utilizando una toma de corriente de 2 polos + tierra (2P+T).
- Cerciorarse durante la instalación del producto que la suma de las corrientes de fuga del producto y de los aparatos que alimenta no excede 3.5 mA.
- La toma de la red debe estar conectada a un circuito de derivación o de protección de la red eléctrica (fusible o interruptor automático) apropiado.

Utilización

La función del módulo HotSwap MBP es permitir el mantenimiento y, eventualmente, la sustitución del SAI sin que ello afecte a la alimentación eléctrica de los equipos conectados (función HotSwap).

Instalación

Véase el manual de instalación y empleo del SAI.

Funcionamiento del módulo HotSwap MBP

El módulo HotSwap MBP utiliza un conmutador rotativo de 2 posiciones:

- Normal: los equipos están siendo alimentados por el SAI.
- Bypass: los equipos están siendo alimentados por la red eléctrica.

Puesta en servicio del SAI con el módulo HotSwap MBP:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Colocar el conmutador en posición Normal.
3. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI.

- Los equipos están siendo alimentados ya por el SAI.
- El indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP.

Test del módulo HotSwap MBP

1. Colocar el conmutador en posición Bypass y comprobar que los equipos sigan estando alimentados.
2. Volver a poner el conmutador en posición Normal.

Mantenimiento de un SAI equipado con un módulo HotSwap MBP

Mantenimiento:

1. Colocar el conmutador en posición Bypass: el indicador luminoso rojo del módulo HotSwap MBP se enciende para indicar que los equipos están siendo alimentados directamente por la red eléctrica.
2. Parar el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI:

El indicador luminoso verde "UPS ON - OK to switch" se apaga, ya se puede desconectar el SAI y sustituirlo.

Vuelta a funcionamiento normal:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI: el indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP (en caso contrario, hay un error en la conexión entre el módulo HotSwap MBP y el SAI).
3. Poner el conmutador en posición Normal: el indicador luminoso rojo del módulo HotSwap MBP se apaga.

Português

Instruções de segurança: ler antes da instalação do produto

- O produto deve ser unicamente utilizado no interior.
- Não coloque o produto na proximidade de líquidos, ou num ambiente de humidade excessiva.
- Não coloque o produto directamente ao sol ou na proximidade de uma fonte de calor.
- Não deixe penetrar líquido ou objecto estranho dentro do produto.
- Ligue imperativamente o produto à terra graças a uma ficha de corrente 2 pólos + terra (2P+T).
- Verifique durante a instalação do produto que a soma das correntes de fuga do produto e dos aparelhos que o mesmo alimenta não ultrapassa 3.5 mA.
- A tomada sector deve estar ligada a um circuito de derivação ou de protecção da rede eléctrica (fusível ou disjuntor) apropriado.

HotSwap MBP models: MBP - 115, MBP - 120, MBP - 130

Input	MBP - 115 MBP - 120 MBP - 130	NEMA 5-15P 15A cord (3.3 ft length) NEMA 5-20P 20A cord (3.3 ft length) NEMA L5-30P 30A cord (3.3 ft length)
Output	MBP - 115 MBP - 120 MBP - 130	6 NEMA 5-15R 15A socket outlets 6 NEMA 5-20R 20A socket outlets 5 NEMA 5-20R 20A socket outlets
Dimensions (HxLxD)	2.1 x 17.3 x 3.8 inches	
Performances Nominal voltage Frequency	100/104/110/120/127 50/60 Hz	
Input nominal current	MBP - 115 MBP - 120 MBP - 130	12 A 16 A 24 A
Maximal power	MBP - 115 MBP - 120 MBP - 130	1440 VA 1920 VA 2880 VA
Standards Product	MBP - 115 MBP - 120 MBP - 130	UL 1778
Marking	C UL US LISTED CE	
Environment Temperature Humidity Altitude	 Storage -25°C to 55°C (-77°F to 131°F), operation 0°C to 45°C (32°F to 113°F) Storage 10% to 90%, operation 20% to 90% Transportation up to 12000 m (39370 ft), operation up to 1500 m (4921 ft)	

8609 Six Forks Road
Raleigh, NC 27615 U.S.A
1-800-356-5794 or 919-872-3020

www.eaton.com/powerquality

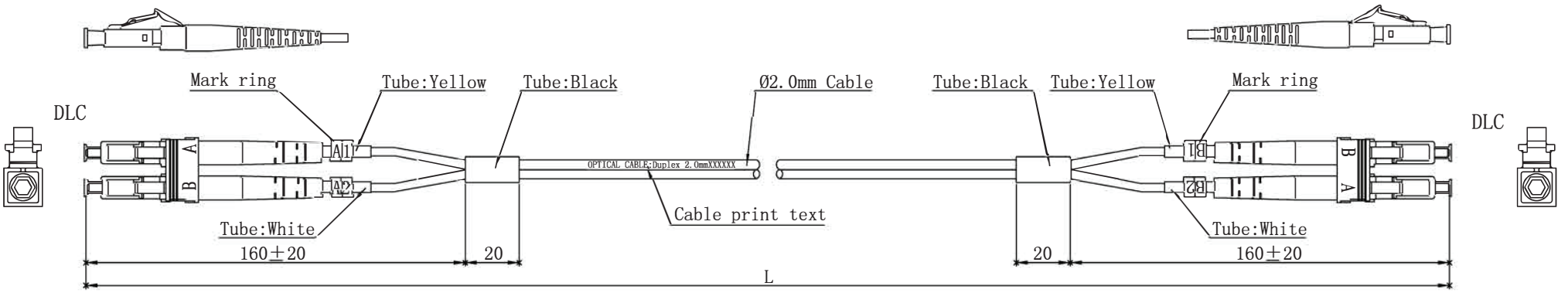
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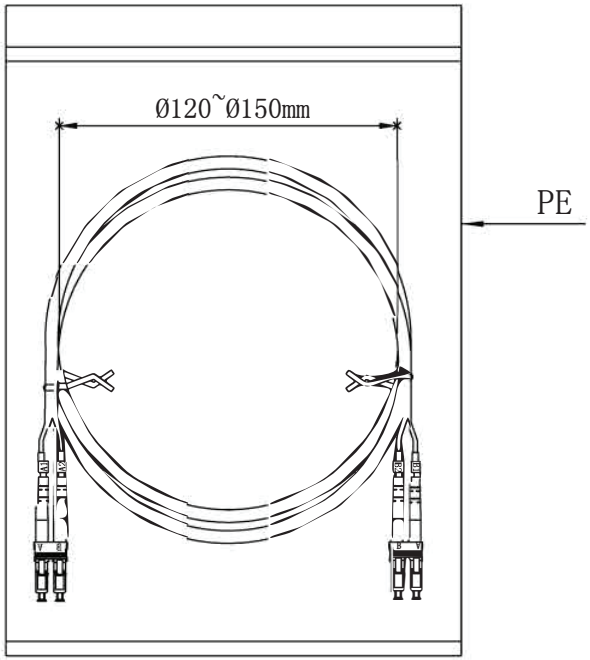
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NOTE:ALL MATERIAL COMPLIANT ROHS STANDARD

REVISION INFORMATION			
Rev.	Rev. Date	Modified By	Brief Description





Specifications:

Type	DLC/UPC-DLC/UPC
Fiber Mode	SM
Core Diameter(um)	9/125
Operating Wavelength(nm)	1310/1550
Cable Color	Yellow
Cable Diameter(mm)	Ø2.0
Operating Temperature(° C)	-40~+75
Storage Temperature(° C)	-40~+85
Insertion loss(dB)	≤0.3dB
Return loss(dB)	≥50dB

L≤5m, TOLERANCES:0≤ΔL≤5cm
L>5m, TOLERANCES:0≤ΔL≤1%*L

NO.	PART NAME	SPECIFICATION DESCRIPTION	QT'Y	UNIT
①				
②				
③				

Unless specified on the drawing, tolerances are per the follows:

. +1
.x +0.2
.xx +0.05

LANshack
Sales@LANshack.com | 888-568-1230

DRAWN BY	DATE: 2015/05/14	DESCRIPTION: LC-LC-DX SM Patchcord	
CHECKED BY	SHEET 1of1	ITEM NO. SFPC-SM-LCLC-XX	
APPROVED BY	SCALE 1:1	REV. 00	UNIT:mm

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PLACEHOLDER

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

☐ Installed in accordance with Manufacturer's recommendations.

☐ Inspected, checked, and adjusted.

☐ Serviced with proper initial lubricants.

☐ Electrical and mechanical connections meet quality and safety standards.

☐ All applicable safety equipment has been properly installed.

☐ Functional tests.

☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer:_____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

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PLACEHOLDER

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO.:_____

1. EQUIPMENT ITEM_____
2. MANUFACTURER _____
3. EQUIPMENT/TAG NUMBER(S) _____
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____
5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____
6. MANUFACTURER'S LOCAL REPRESENTATIVE _____
   a. Name_____ Telephone No. _____
   b. Address _____
7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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PLACEHOLDER

8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

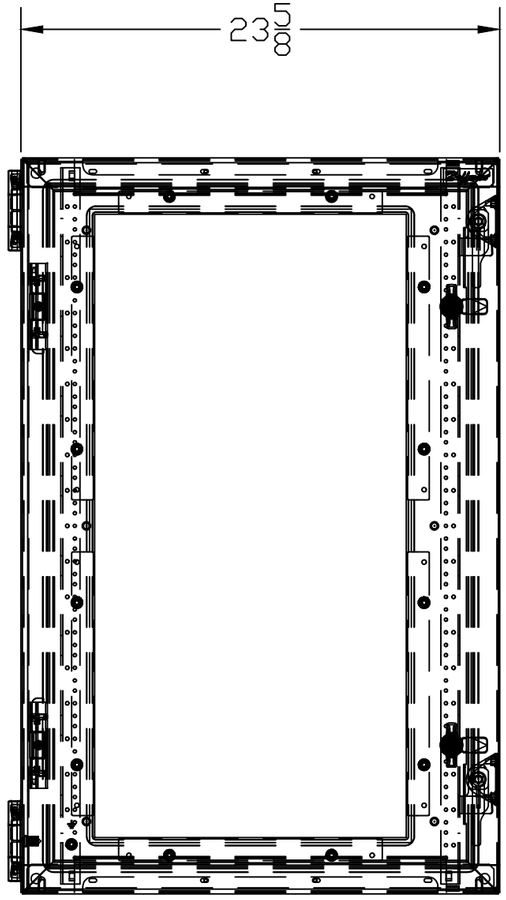
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Bill of Materials

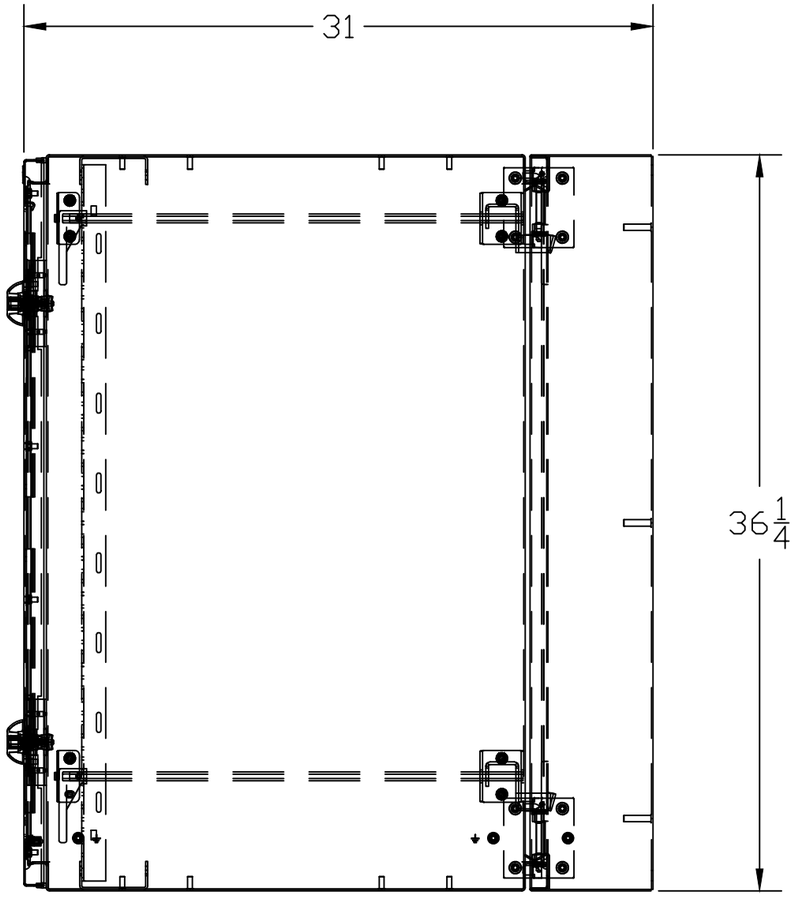
Project: Coos Bay Wastewater Treatment Plant 1 Phase 1A Improvements
Specification Section(s): Section 40 95 80 – Fiber Optic Communication System
Date: September 2025

Item No.	Qty.	Network Interface Panel	Description	Manufacturer	Manufacturer Part Number	Specification Section	Drawing
001	1	C28NIP0001	ProTek, Double-Hinge, Window, NEMA 4/12, 36.30" H x 23.62" W x 29.92" D	Hoffman	PTHW362430G2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
002	1	C28NIP0001	CableTek Horizontal Cable Manager, 2U, Double-Sided	Hoffman	DCHD2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
003	1	C28NIP0001	Power Distribution Unit, 10 Receptacle, 20 Amp	Hoffman	DP1N191020	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
004	1	C28NIP0001	Q-Series Rackmount Enclosure, 2U	Ortronics	EQ02U-CHC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
005	6	C28NIP0001	6-LC Single-Mode Adapters w/ Ceramic Alignment Sleeves	Ortronics	OFP-LCD12AC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
006	1	C28NIP0001	Modular Managed Ethernet Switch, Dual AC	Red Lion	NT24K-AC2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
007	1	C28NIP0001	Module 8 Port 10/100/1000BaseT	Red Lion	NT24K-TX8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
008	2	C28NIP0001	Module-8 SFP Expansion Slots 1000Base Only	Red Lion	NT24K-SFP8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
009	2	C28NIP0001	SFP Transceiver, Singlemode Gigabit Fiber, 10km	Red Lion	NTSFP-LX-10	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
010	1	C28NIP0001	9PX Lithium Ion Uninterruptible Power Supply, 1500 VA	Eaton	9PX1500RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
011	1	C28NIP0001	9PX Lithium Ion Extended Battery Module	Eaton	9PXEBM48RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
012	1	C28NIP0001	HotSwap Maintenance Bypass PDU	Eaton	EHBPL1500R-PDU1U	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
013	2	C28NIP0001	Fiber Optic Patch Cable, 2 Meter, LC UPC to LC UPC Singlemode Duplex	LANshack	SFPC-SMLCLC-2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
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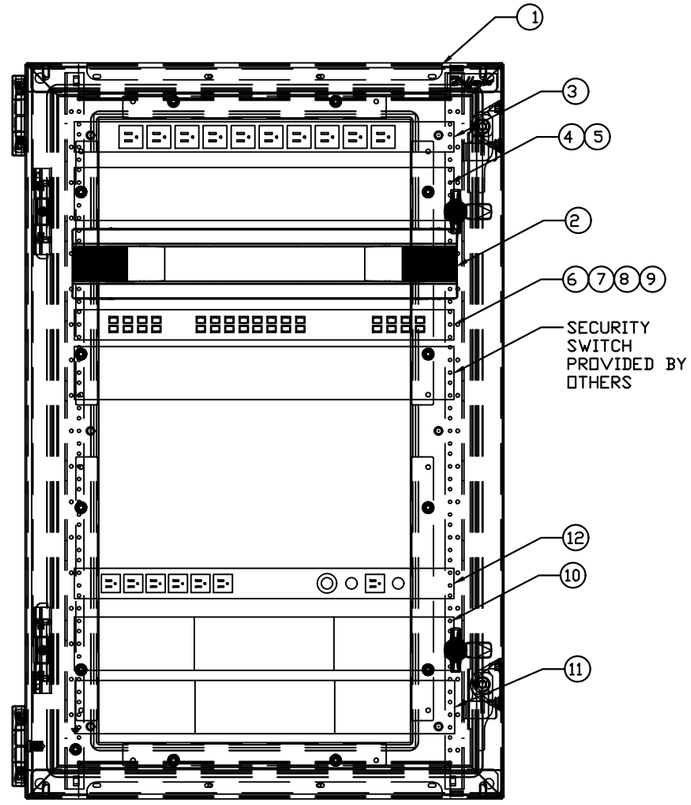
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FRONT VIEW



SIDE VIEW



INTERNAL VIEW

NAMEPLATE SCHEDULE			
PANEL	ITEM	SIZE	DESCRIPTION
C28NIP0001	A	2"x6"x 5/16"	C28NIP0001

PARTS LIST		
ITEM	DSECRIPTION	PART #
1	PRO-TEK NEMA 4/12, 36.30Hx23.62Wx29.92D	PTHW362430G2
2	CABLE TEK HORIZ. CABLE MANAGER 2U, DBL SIDED	DCHD2
3	POWER DIST. UNIT, 10 RECEPTACLE, 20 AMP	DP1N191020
4	Q-SERIES RACKMOUNT ENCLOSURE, 2U	EQ02U-CHC
5	6-LC SINGLE MODE ADAPTERS W/CERAMIC SLVS.	OFP-LCD12AC
6	MODULAR MANAGED ETHERNET SWITCH, DUAL AC	NT24K-AC2
7	MODULE 8 PORT, 10/100/1000 BASE ONLY	NT24K-TX8
8	MODULE 8 SFP EXPANSION SLOTS 1000 BASE ONLY	NT24K-SFP8
9	SFP TRANSCEIVER, SINGLE MODE GIGABIT FIBER, 10KM	NTSFP-LX-10
10	9PX LITHIUM ION UNINTERRUPTIBLE PS, 1500 VA	9PX1500RT-L
11	9PX LITHIUM ION EXTENDED BATTERY MODULE	9PXEBM48RT-L
12	HOT SWAP MAINTENANCE BYPASS PDU	EHBPL1500R-PDU1U

REVISIONS			
REV	DATE	DESCRIPTION	INIT
H			
G			
F			
E			
D			
C			
B			
A	2023.12.13	Original Draft	KCD

OPTIMAL CONTROL SYSTEMS
2324 THREE LAKES RD / PO BOX 462
ALBANY, OR 97321
PHONE (541) 967-9323 FAX (541) 967-9485

CLIENT McCLURE & SONS

TITLE COOS BAY WASTE WATER TREATMENT PLANT
C28NIP0001 LAYOUT DRAWING

DRAWN KCD	ISSUED	JOB NO. 0723-08MSI	
CHECKED ME	DATE 2023.10.23	DWG NO. 0723-08MSI-C28	
APPROVED HAD	SCALE NONE	SHEET 1 OF 1	

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PROTEK DOUBLE-HINGED, UL AND NEMA TYPE 4, 4X OR 12



INDUSTRY STANDARDS

UL 508A Listed; File Number E61997
cUL Listed per CSA C22.2 No. 94; File Number E619967
Solid Door: Type 4 and 12
Window Door: Type 12
Solid Door, Stainless Steel: Type 4, 4X and 12

NEMA / EEMAC: Type 4, 4X or 12
IEC 60529, IP66 or IP55, IK 10

APPLICATION

ProTek Double-Hinged cabinets are an excellent, off-the-shelf choice for mounting 19-in. rack, panel-mounted devices or other electronic equipment. The cabinets are designed to provide both front and rear access to 19-in. rack-mounted equipment. They provide protection against water, dirt, corrosive agents and other contaminants. ProTek is an excellent choice for applications where space is at a premium and the only option is wall mounting. ProTek comes in a broad range of sizes, materials and configurations to meet many demanding applications.

FEATURES

- Front and rear access to 19-in. rack equipment provided by three-part design: door, center section and wall section
- Solid door provides complete physical and visual protection
- Window door, made of scratch-resistant safety glass, provides visual monitoring of internal equipment while maintaining equipment protection
- All seams are fully welded and ground smooth
- Doors, center section and wall section are provided with ground studs to facilitate proper bonding and grounding of the cabinet
- Premium seamless, foam-in-place gasket prevents contaminants from entering the cabinet
- Keylocking wing knob is included on painted steel cabinet, providing access control to the cabinet; two keys are included with each cabinet
- Stainless steel cabinet is provided with a quarter-turn slotted latch
- One set of plated, self-grounding, tapped 10-32 rack angles per EIA universal spacing standards, which can be adjusted front-to-back, is provided with each center section of the cabinet; additional tapped- or square-hole rack angles can be added to the cabinet to provide additional mounting
- Wall section welded panel studs which accommodate standard panels (steel and wood available), can be ordered separately
- On 28-in. (700 mm) wide enclosures, a 4-in. vertical cable manager with composite fingers is provided on hinge side of cabinet
- AC unit included (T15, N21 or N28) on models with AC cutout
- See T15, N21 and N28 air conditioner specifications following the product tables; full AC specifications available in the Thermal chapter

SPECIFICATIONS

- Doors made of 16 gauge; center and wall sections made of 14 gauge steel. Stainless steel enclosures made from Type 304 stainless steel
- Window made of .25-in. thick, scratch- and impact-resistant safety glass
- Rack angles made of plated 12 gauge steel
- M6 ground studs on door, center and wall sections are masked from paint
- Twenty 10-32 screws included with cabinet
- Foam-in-place gasket made of durable polyurethane

FINISH

- Pretreated steel coated with RAL 7035 light-gray, low-gloss, lightly textured polyester powder paint
- Stainless steel is provided with a smooth-grain finish

LOAD RATING

Center hinged section:

Height	Maximum Load Rating
16 in.	175 lb./79.4 kg
24 in.	250 lb./113.4 kg
36 in.	300 lb./136.1 kg
48 in.	350 lb./158.8 kg
60 in.	400 lb./181.4 kg

ACCESSORIES

Locks and handles
Panels (steel and wood)
Grounding kits
Power Distribution Units (PDUs)
Rack angles

BULLETIN: DWDH2

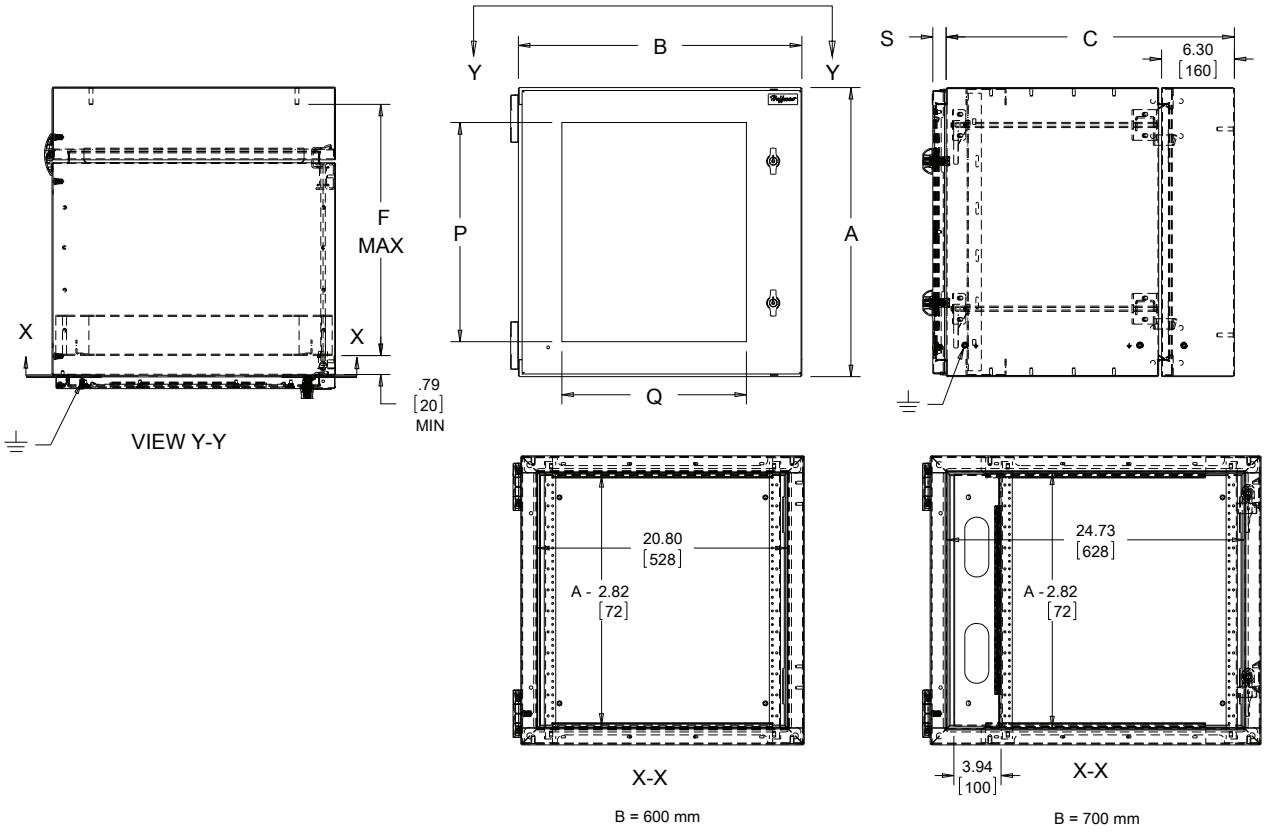
Standard Product **Window Door, NEMA Type 12**

Catalog Number	AxBxC in./mm	Rack Units	F in./mm	P in./mm	Q in./mm	S in./mm	Optional Steel Panel	Optional Wood Panel	Additional Rack Angles [a]
PTHW162415G2	17.09 x 23.62 x 14.96 434 x 600 x 380	8	12.66 322	11.87 301	15.38 391	1.11 28	CP2014	—	PTRA16T or PTRA16S
PTHW242415G2	24.09 x 23.62 x 14.96 612 x 600 x 380	12	12.66 322	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242424G2	24.09 x 23.62 x 24.02 612 x 600 x 610	12	21.72 552	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242430G2	24.09 x 23.62 x 29.92 612 x 600 x 760	12	27.64 702	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242824G2	24.09 x 27.56 x 24.02 612 x 700 x 610	12	21.72 552	18.25 464	19.38 492	1.11 28	CP2420	—	PTRA24T or PTRA24S
PTHW362415G2	36.30 x 23.62 x 14.96 922 x 600 x 380	19	12.66 322	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362424G2	36.30 x 23.62 x 24.02 922 x 600 x 610	19	21.72 552	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362430G2	36.30 x 23.62 x 29.92 922 x 600 x 760	19	27.64 702	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362824G2	36.30 x 27.56 x 24.02 922 x 700 x 610	19	21.72 552	30.75 781	19.38 492	1.11 28	CP3024	—	PTRA36T or PTRA36S
PTHW482415G2	48.54 x 23.62 x 14.96 1233 x 600 x 380	26	12.66 322	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482424G2	48.54 x 23.62 x 24.02 1233 x 600 x 610	26	21.72 552	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482430G2	48.54 x 23.62 x 29.92 1233 x 600 x 760	26	27.64 702	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482824G2	48.54 x 27.56 x 24.02 1233 x 700 x 610	26	21.72 552	42.70 1085	19.38 492	1.11 28	CP2442	—	PTRA48T or PTRA48S
PTHW602415G2	60.04 x 23.62 x 14.96 1525 x 600 x 380	32	12.66 322	54.39 1377	15.38 391	1.11 28	CP5620	—	PTRA60T or PTRA60S
PTHW602424G2	60.04 x 23.62 x 24.02 1525 x 600 x 610	32	21.72 552	54.39 1377	15.38 391	1.11 28	CP5620	—	PTRA60T or PTRA60S
PTHW242436G2	24.09 x 23.62 x 36.02 612 x 600 x 915	12	33.72 856	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242836G2	24.09 x 27.56 x 36.02 612 x 700 x 915	12	33.72 856	18.25 464	19.38 492	1.11 28	CP2420	—	PTRA24T or PTRA24S
PTHW362436G2	36.30 x 23.62 x 36.02 922 x 600 x 915	19	33.72 856	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362836G2	36.30 x 27.56 x 36.02 922 x 700 x 915	19	33.72 856	30.75 781	19.38 492	1.11 28	CP3024	—	PTRA36T or PTRA36S
PTHW482436G2	48.54 x 23.62 x 36.02 1233 x 600 x 915	26	33.72 856	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482836G2	48.54 x 27.56 x 36.02 1233 x 700 x 915	26	33.72 856	42.70 1085	19.38 492	1.11 28	CP2442	—	PTRA48T or PTRA48S

[a] T = tapped 10-32, S = square hole (.375 in. x .375 in.)

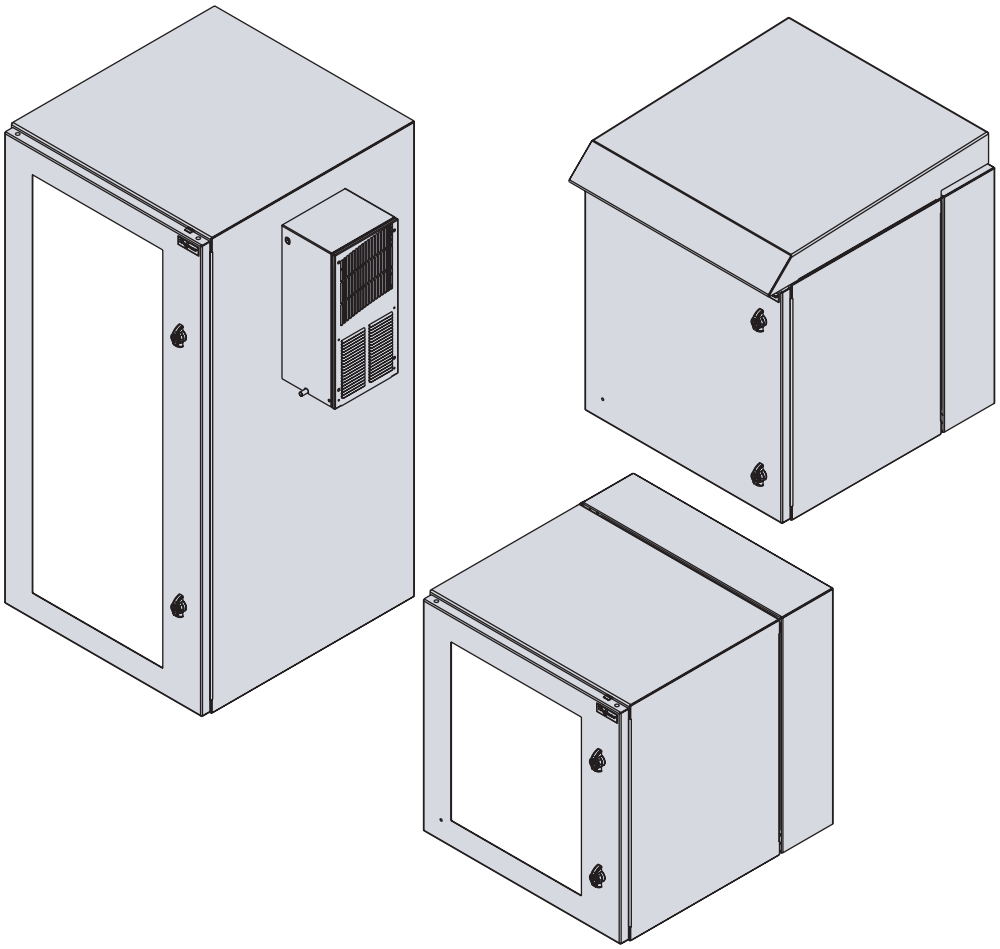
Cable manager supplied with 700 mm wide enclosures



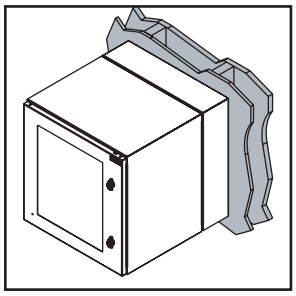

B
Y
Y
S
C
6.30
[160]
F
MAX
P
A
X
X
.79
[20]
MIN
Q
VIEW Y-Y
20.80
[528]
A - 2.82
[72]
X-X
B = 600 mm
24.73
[628]
A - 2.82
[72]
3.94
[100]
X-X
B = 700 mm

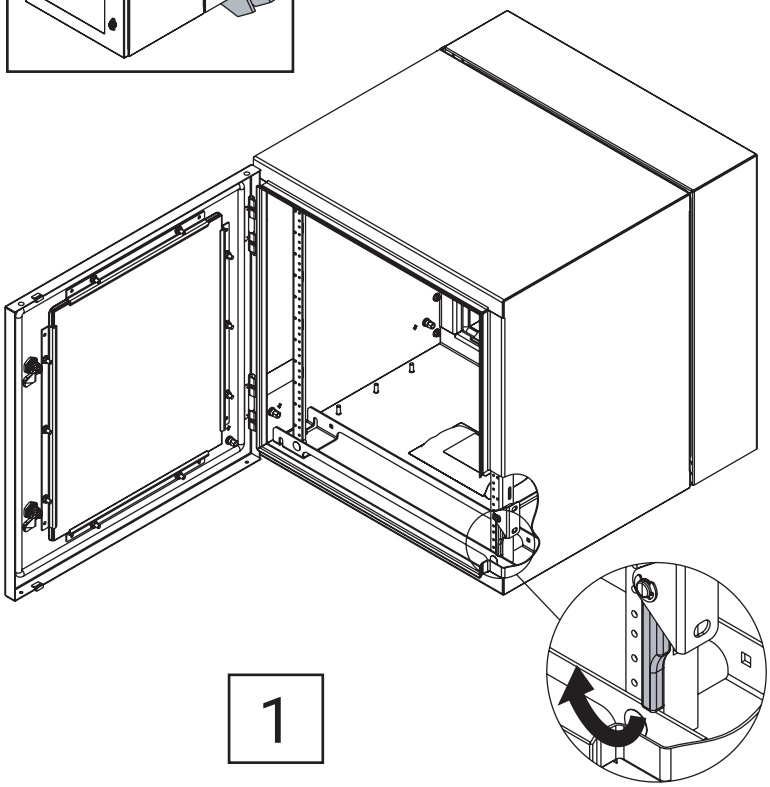
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PROTEK®

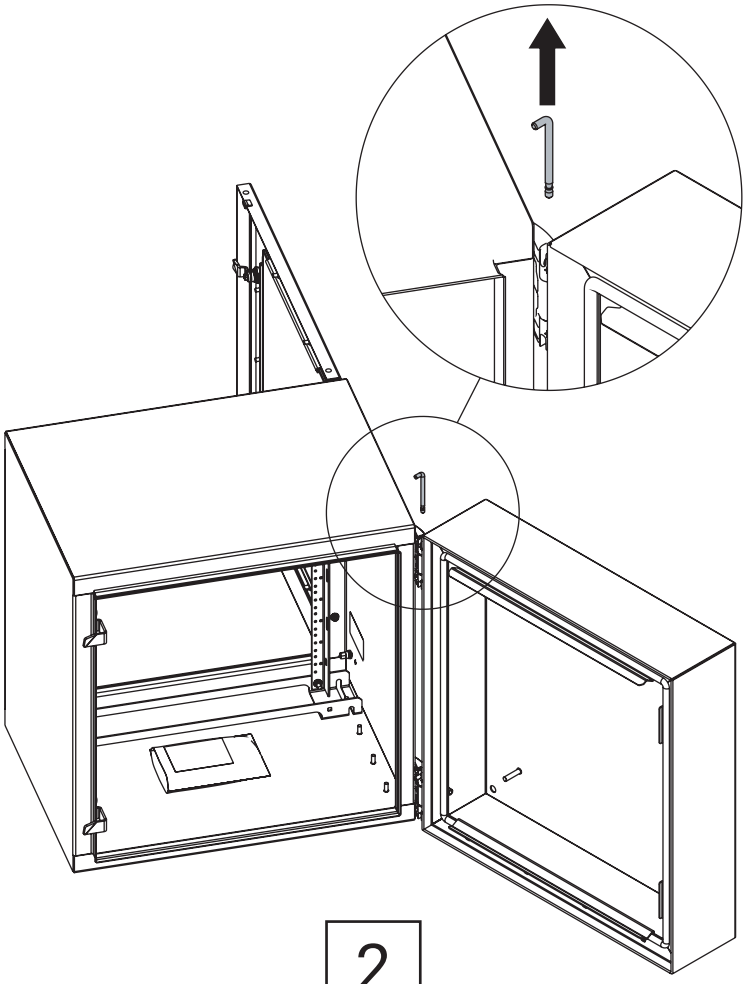


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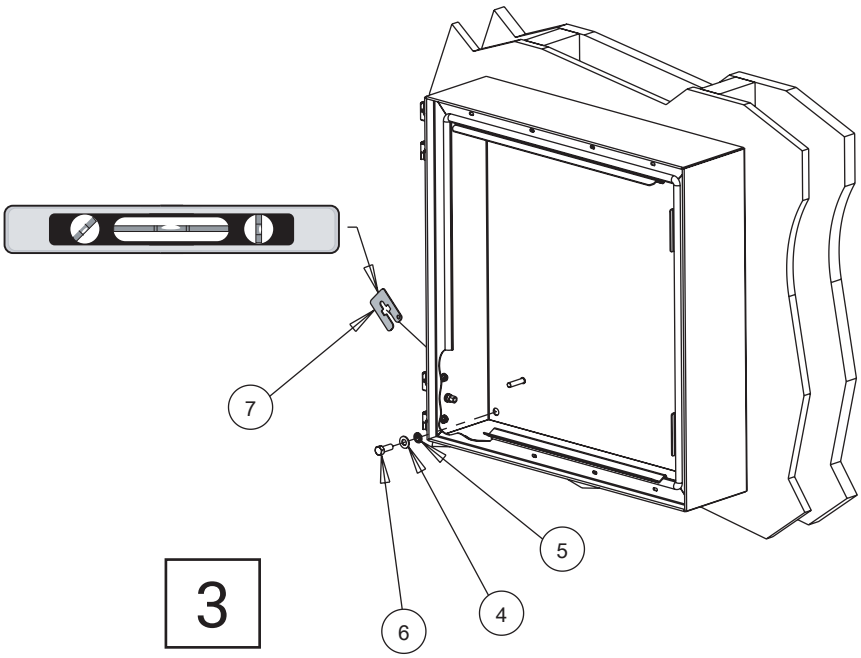




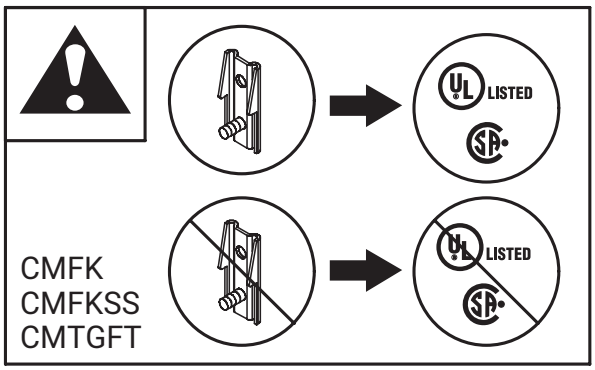
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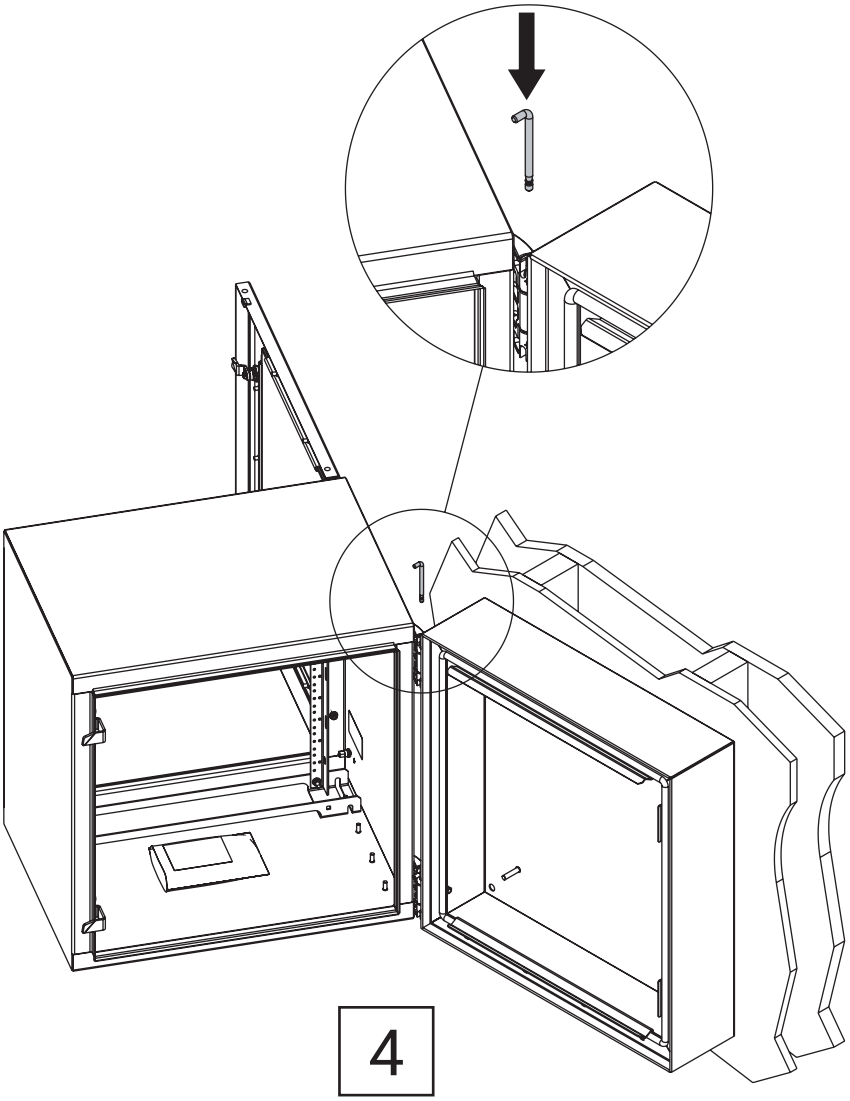
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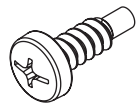
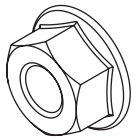
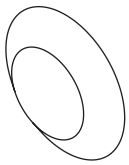
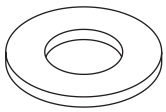
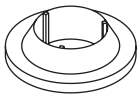
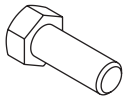
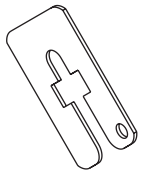
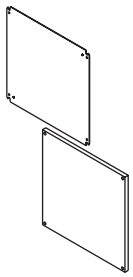
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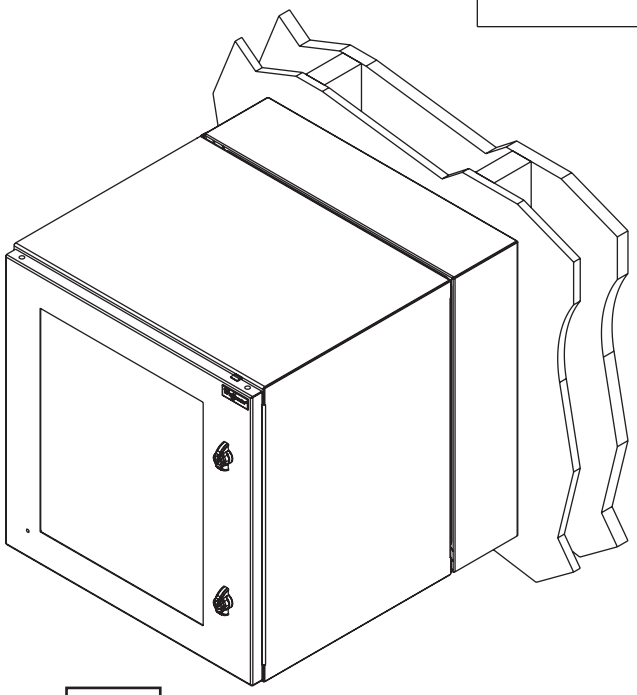


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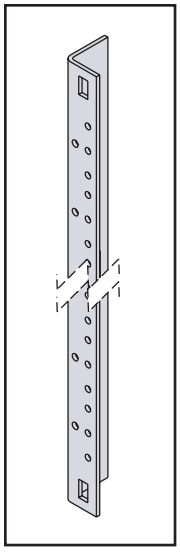
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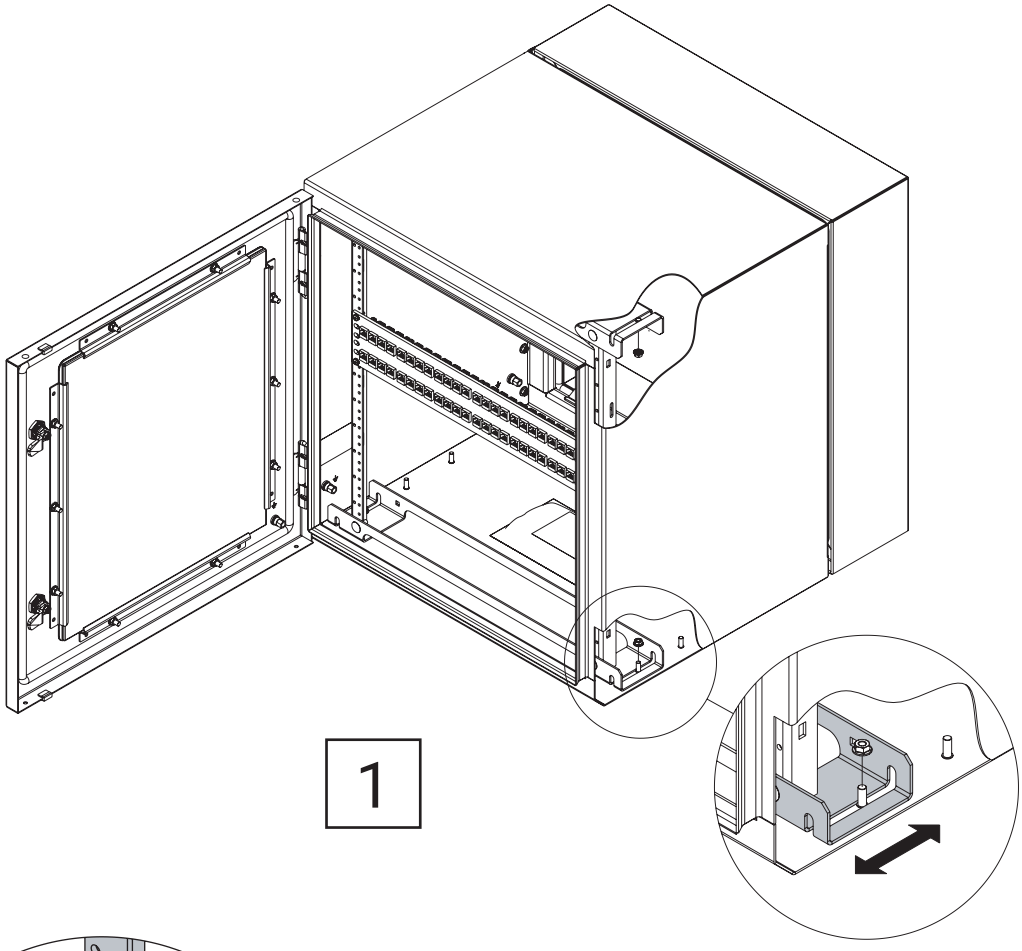
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3  (4x)	4  (4x)
5  (4x)	6  (0x)
7  (4x)	8  (0x)



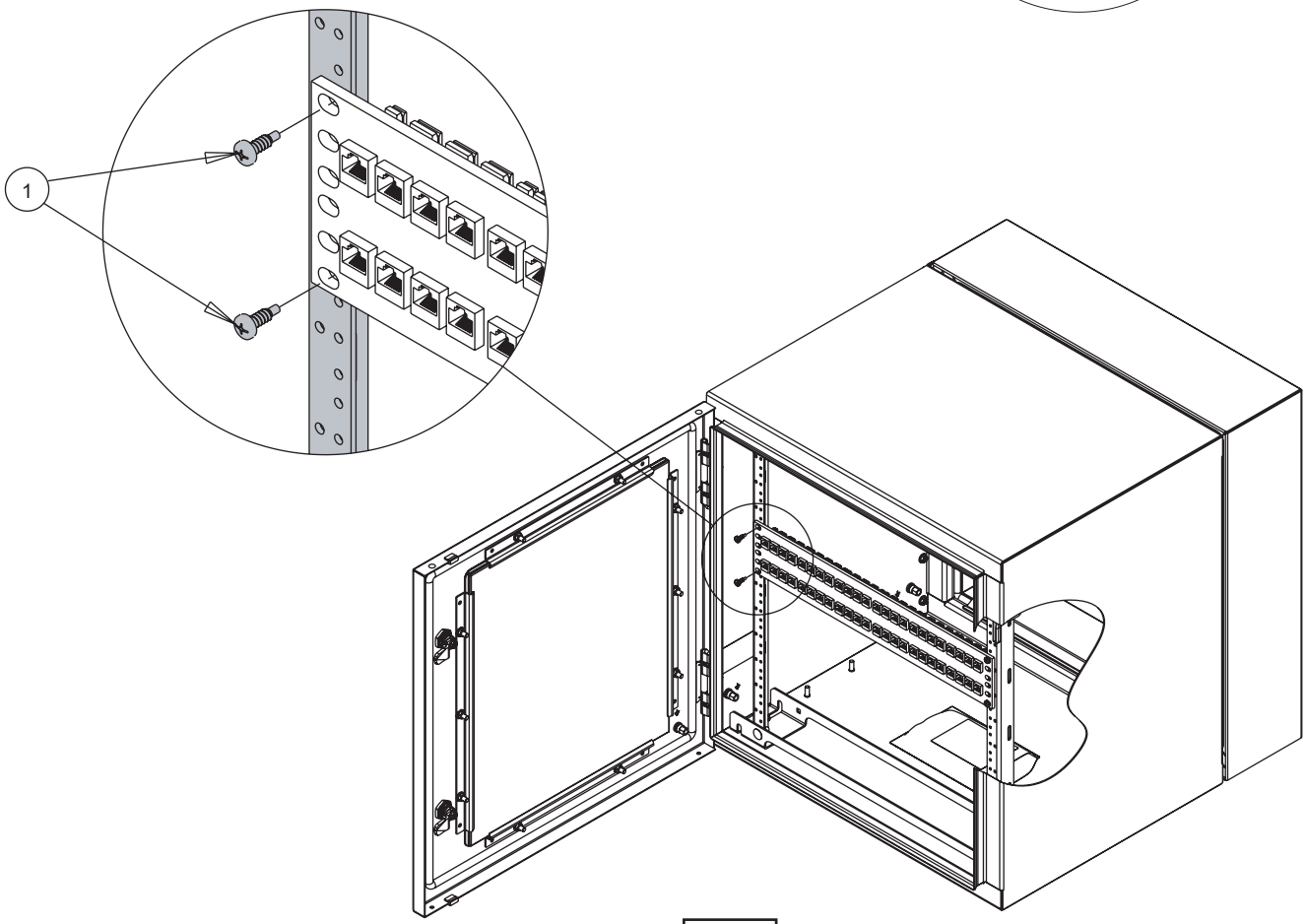
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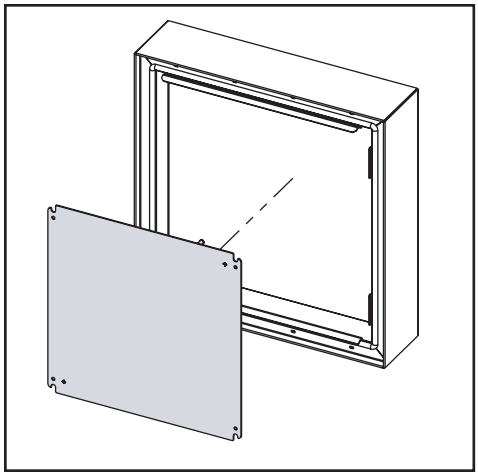


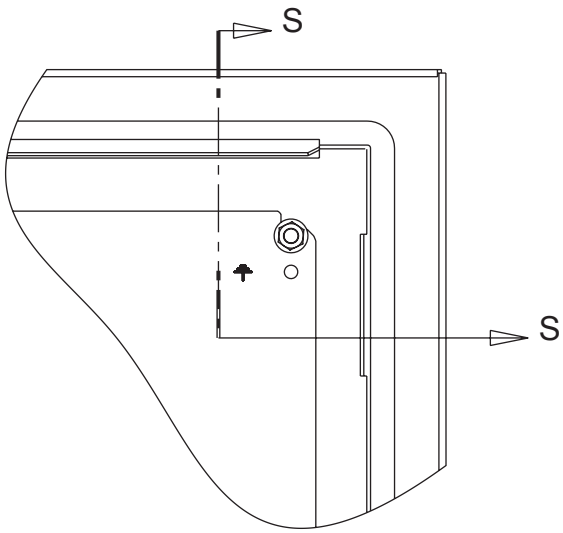
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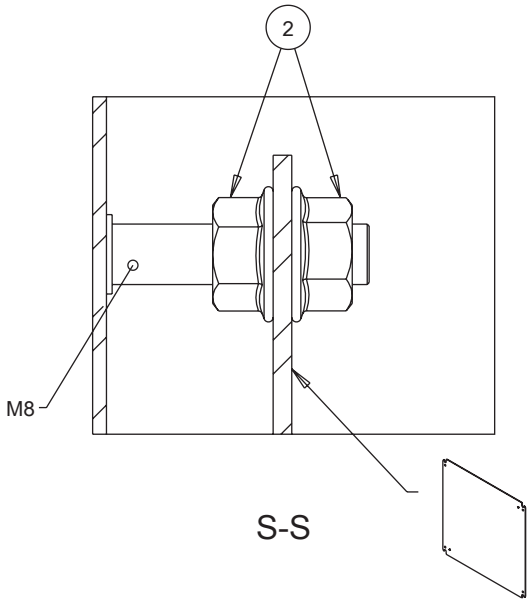


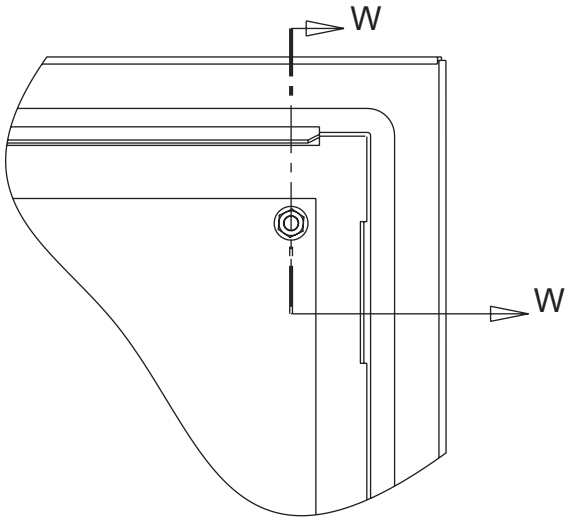
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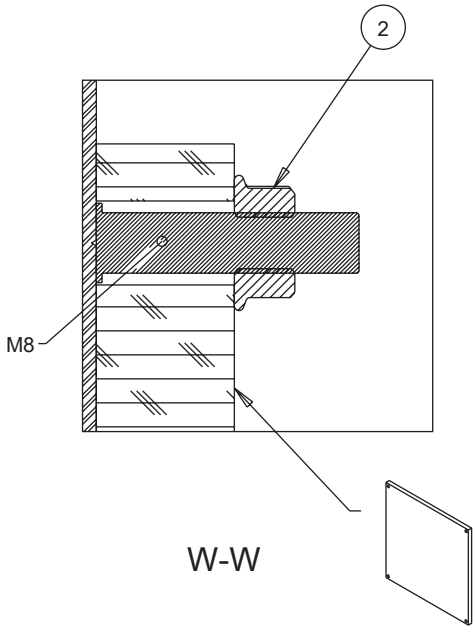
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Guide to Mounting and Squaring Enclosures

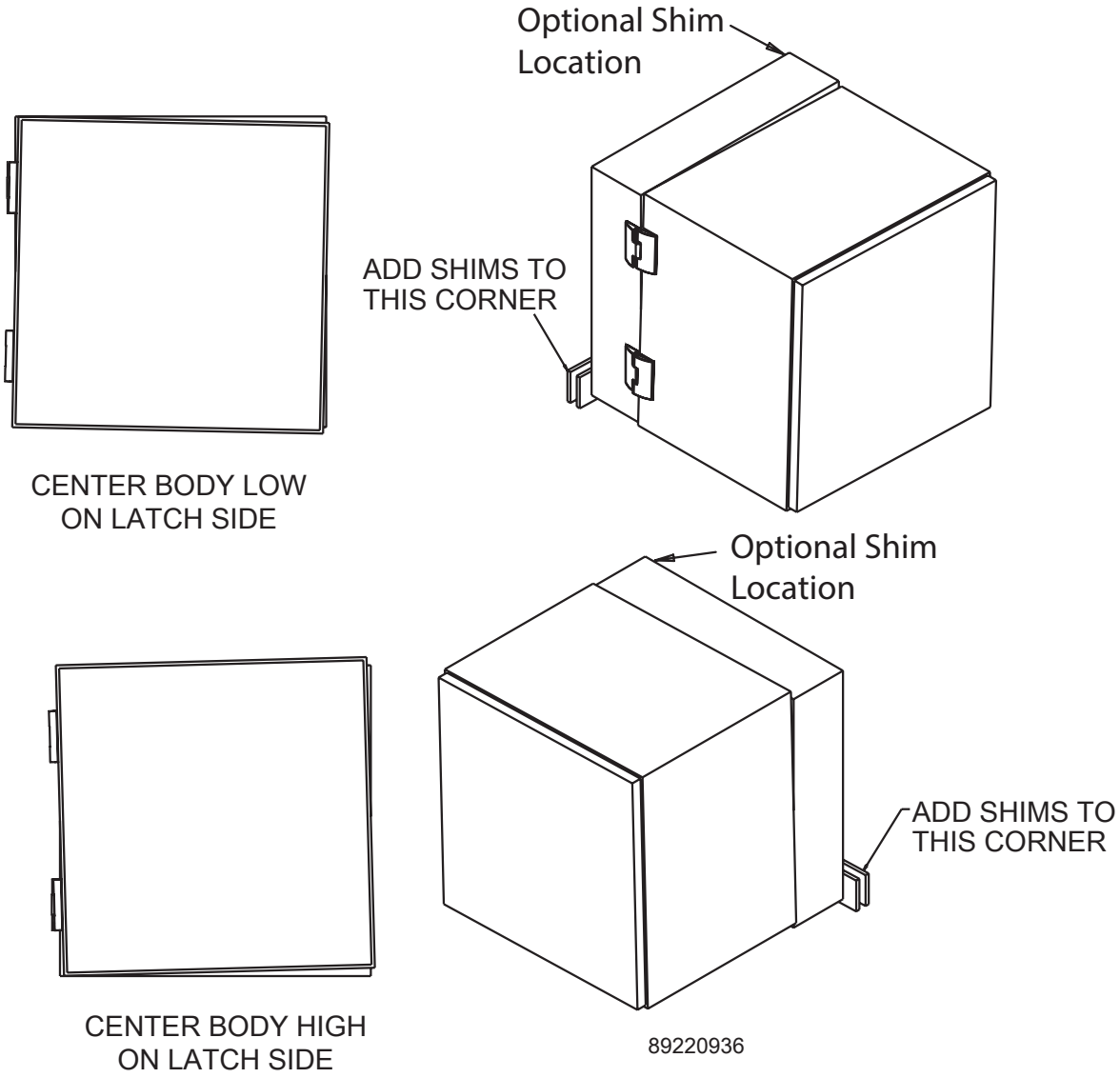
nVent HOFFMAN'S industry-leading enclosures are designed to provide years of reliable service when properly mounted, leveled and maintained. The following recommendations will help ensure that Hoffman enclosures are installed correctly.

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Double-Hinge Mounting

Double-Hinge Enclosure Mounted on Walls or Unistrut Frames

Hoffman double-hinge enclosures are designed for mounting on rigid, flat surfaces or walls. After mounting, add shims to enclosures as required to ensure the sealing contact surface and the enclosure are square. This is necessary for the door to close correctly and provide a reliable seal. To square enclosures mounted on a wall or Unistrut frame, add shims as shown below. Shims should be made of a material such as stainless steel, aluminum, nylon, or plastic to reduce corrosion.



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CABLETEK HORIZONTAL CABLE MANAGER



DCHD2 shown



Arrowhead fingers funnel cable into base and hold it securely



DCHS4 shown



Vertical and horizontal cable manager system installed on a 2-post rack. Vertical and horizontal cable managers work together to make an orderly installation.

INDUSTRY STANDARDS
EIA 310-D

APPLICATION
This cable manager features heavy-duty endposts, arrowhead fingers and tool-less mounting to easily route copper and fiber data cables horizontally in standard 19-in. cabinets or on 2- or 4-post open frame racks.

FEATURES
- Snap-in mounting provision holds cable manager in place while mounting screws are installed
- Robust arrowhead fingers are shaped to funnel cables into base and are made of black composite material
- Robust rounded end posts support cable as it enters and leaves cable manager and maintains proper cable bend radius
- Deep cable compartments allow maximum cable density
- Rounded edges throughout protect cable jackets from damage
- Pass-through holes on double-sided models protect cable while facilitating routing between front and back sides
- Single- and double-sided units provide high cable capacity, including fiber and copper category cables
- 1 RU and 2 RU heights allow greater flexibility in optimizing rack capacity
- Removable hinged cover opens top or bottom, snaps closed for assured cable protection and professional appearance
- Double-sided model has covers on both front and back
- Covers stay open during installation and maintenance procedures
- Horizontal and vertical cable managers designed as a system for streamlined appearance and improved functionality
- Combination head 10-32 and 12-24 screws included for mounting

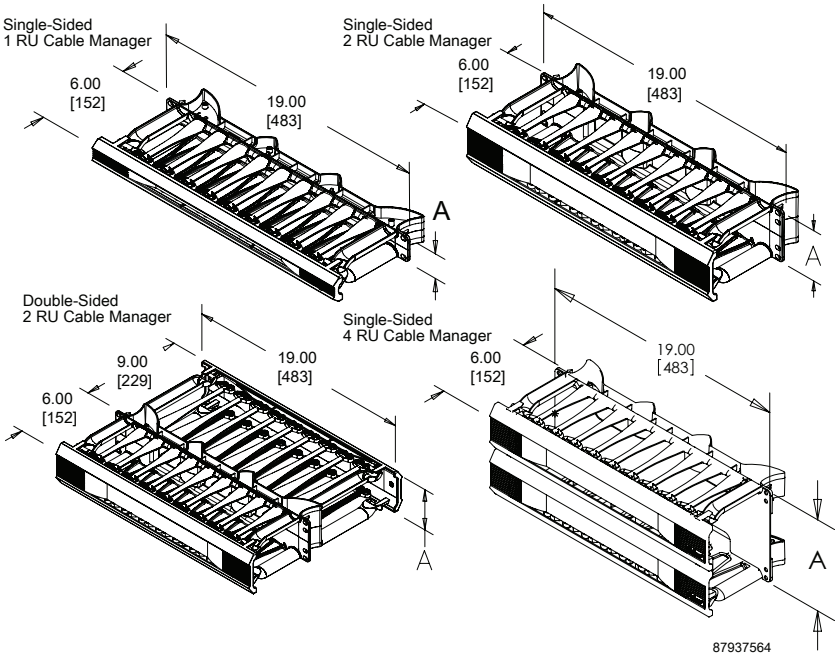
SPECIFICATIONS
- Made of UL listed black composite material

FINISH
Low gloss, matches look of RAL 9005 textured paint

BULLETIN: DACCY

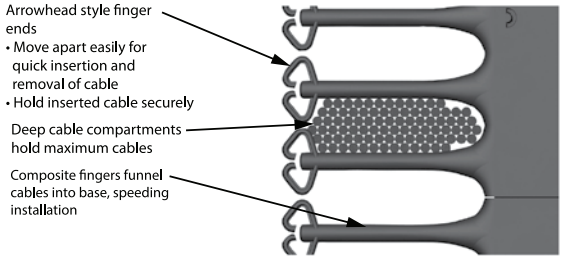
Standard Product **CABLETEK Horizontal Cable Managers; 60% Cable Manager Fill Rate**

Catalog Number	Description	Rack Units	A in./mm	Front Cross-Section Area (in.^{2})	Front Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Front Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Front Cable Fill Rate 60% 6A Cable (0.30-in. dia.)	Back Cross-Section Area (in.^{2})	Back Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Back Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Back Cable Fill Rate 60% 6A Cable (0.30-in. dia.)
DCHS1	Single-Sided	1	1.75 44	4.2	66	57	35	–	–	–	–
DCHS2	Single-Sided	2	3.50 89	13.2	208	161	112	–	–	–	–
DCHD2	Double-Sided	2	3.50 89	13.2	208	161	112	14.1	223	172	119
DCHS4	Single-Sided	4	7.0 178	26.9	416	322	224	–	–	–	–



Arrowhead Cable Capacity; 60% Fill Rate

Location	Cross-Section Area (in.^{2})	5e Cable (0.22-in. dia.)	6 Cable (0.25-in. dia.)	6A Cable (0.30-in. dia.)
Front	5.52	90	67	46
Back	9.27	145	113	78



RACK- AND PANEL-MOUNT POWER DISTRIBUTION UNITS (PDUS)



FEATURES

- Power on/off LED indicates whether power is available at the PDU
- External ground stud provided on single-phase models for secure grounding
- Circuit breakers provide additional equipment protection
- Circuits are isolated on dual circuit model; each has its own circuit breaker
- Reset button provides easy access to circuit breaker reset
- Surge protector models have an indicator LED to verify surge circuitry protection
- Rack-mount models mount directly to rack or with adapter bracket
- Rack-mount models designed for single-phase applications
- Panel-mount models can be mounted flush or with hanging bracket

SPECIFICATIONS

- Steel housing
- Power cord with molded-on plug:
  - 12-in. (305-mm) long single-phase model: 6 ft. (1.8 m)
  - Other single-phase models: 15 ft. (4.6 m)

Contact Hoffman for custom modifications and non-standard offerings.

FINISH

Black, low-gloss textured paint.

BULLETIN: DPS

INDUSTRY STANDARDS

UL/cUL 60950 listed
UL 1449 (Surge protector models only)

EIA 310-D (19-in. rack-mount models only)

APPLICATION

Rack- and Panel-Mount PDUs not only provide convenient, reliable power to equipment mounted in cabinets or on open frame racks, they can also be configured to meet a wide range of design specifications.

Standard Product **Single-Phase Rack-Mount**

Catalog Number	Surge Protection	Amp Meter	Load Rating	Voltage (VAC)	Joule Rating	Receptacle Location	No. of Receptacles	Receptacle Style	Power Cord Plug	Rack Units
DP1N190615	No	No	15A	120	–	Front	6	NEMA 5-15R	NEMA 5-15P	1
DP1N191415	No	No	15A	120	–	6 front, 8 back	14	NEMA 5-15R	NEMA 5-15P	1
DP1N191015S	Yes	No	15A	120	2000	2 front, 8 back	10	NEMA 5-15R	NEMA 5-15P	1
DP1N191020	No	No	20A	120	–	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020S	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020ST	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA L5-20P Twist Lock	1

Isolated circuits on dual-circuit models with separate circuit breakers.

Plugs and Receptacles

NEMA Type	Plug	Receptacle
NEMA 15 Amp, 120V, Duplex	5-15P	5-15R
NEMA 20 Amp, 120V, Duplex	5-20P	5-20R
NEMA 20 Amp, 120V, Twist Lock	L5-20P	L5-20R
30 Amp, 120/208V Wye, Twist Lock	L21-30P	L21-30R

IEC Type	Inlet	Outlet
IEC 15 Amp, 125/250V	C-14	C-13
IEC 20 Amp, 125/250V	C-20	C-19

87922518

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DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure



Overview

The Q-Series fiber enclosure system is designed to support standard density applications in building networks. The all steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 LC fibers in per RU, accepting OFP adapter panels, M2 pre-terminated cassettes, and splice cassettes.

Features

- **Highly Accessible:** Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables
- **Simplified Installation:** The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation
- **Versatile Installation:** Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes
- Max number of fibers per RU (SC) - 36
- Max number of fibers per RU (LC) - 72
- Max number of fibers per RU (12F MPO) - 288
- Max number of fibers per RU (24F MPO) - 576
- Cassette / Adapter panels per RU - 3

Part Number	Description
EQ01U-CHC	Q-Series 1U Standard Density (SD) Rackmount Fiber Enclosure
EQ02U-CHC	Q-Series 2U Standard Density (SD) Rackmount Fiber Enclosure
EQ04U-CVC	Q-Series 4U Standard Density (SD) Rackmount Fiber Enclosure

Dimensions

Part Number	Depth (Metric)	Depth (US)	Height (Metric)	Height (US)	Width (Metric)
EQ01U-CHC	485.90mm	19.13 in.	44.45mm	1.75 in.	434.85mm
EQ02U-CHC	485.90mm	19.13 in.	88.90mm	3.50 in.	434.85mm
EQ04U-CVC	485.90mm	19.13 in.	177.80mm	7.00 in.	434.85mm

DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure

General Information

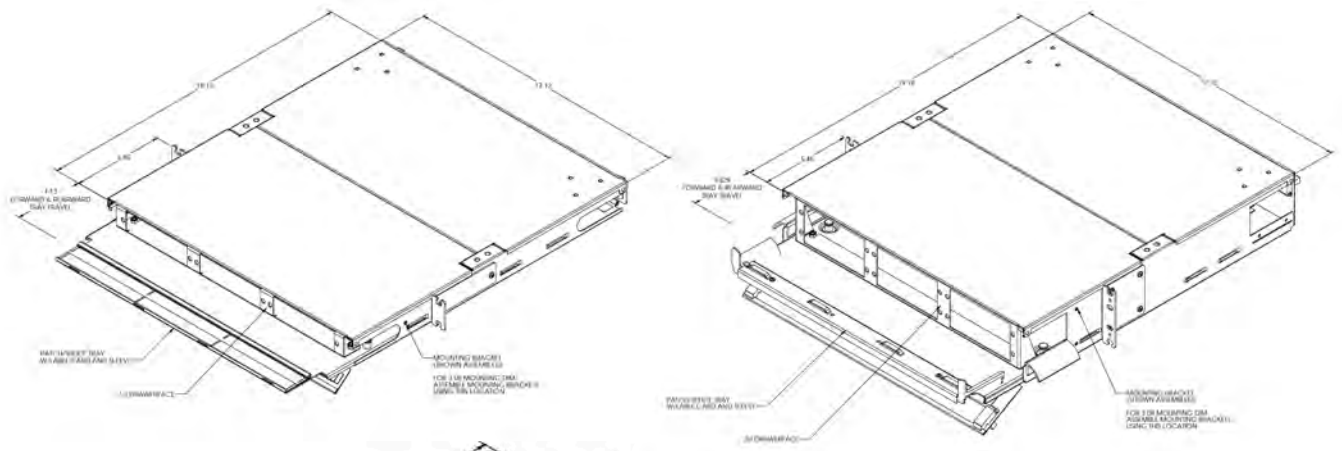
- Color: Black
- Installation: Rack or Cabinet
- Product Series: Q-Series
- Type: Standard Density Fiber Enclosure

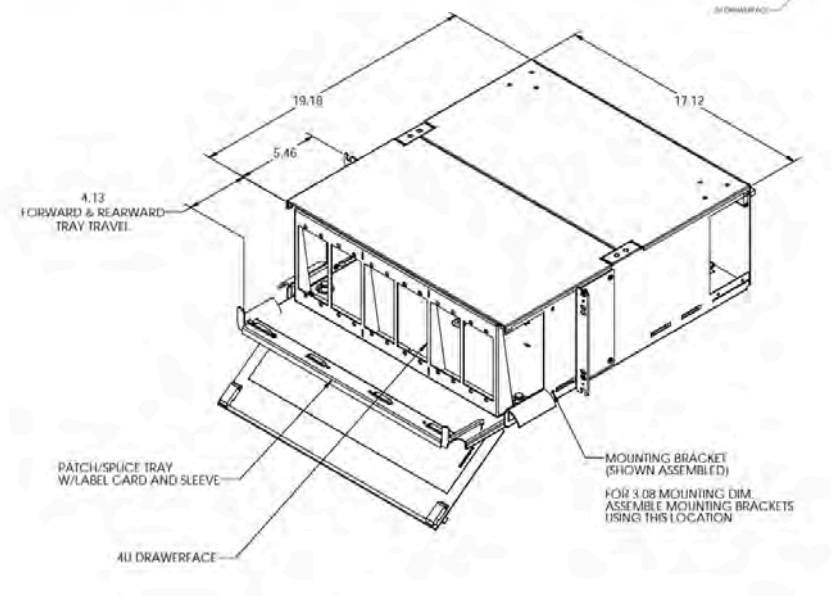
Listing Agencies/Third Party Certifications

- RoHS: Yes

Technical Information

- Mounting Hardware Included: Yes
- Cassette / Adapter Panel Capacity per RU: 3
- SC - Fiber Capacity Per RU: 36
- LC - Fiber Capacity Per RU: 72
- 12F MPO - Fiber Capacity Per RU: 216
- 24F MPO - Fiber Capacity Per RU: 432





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Legrand, North and Central America

60 Woodlawn Street
West Hartford, CT 06110
1.877.BY.LEGRAND (295.3472)
www.legrand.us

Ortronics

2 RU Q-Series Standard Density Rack-Mount Fiber Enclosure

Part No. EQ02U-CHC



The 2U Q-Series Standard Density (SD) footprint fiber enclosure system is designed to support standard density applications in building networks. The all-steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 fibers with LC connectivity and 144 fibers with MDC per Rack Unit (RU), or a maximum capacity of 144 fibers LC and 288 MDC (VSFF), utilizing OFP adapter panels, LM2 pre-terminated cassettes, and M2 splice cassettes.

Features & Benefits

Highly Accessible: Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables

Simplified Installation: The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation

Versatile Installation: Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes - Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Max number of fibers per RU (SC): 36

Max number of fibers per RU (LC): 72

Max number of fibers per RU (12F MPO): 288

Max number of fibers per RU (24F MPO): 576

Cassette / Adapter panels per RU: 3

Specifications

General Info

Product Line	Ortronics	Color	Black
UPC Number	662875019978	Country Of Origin	Mexico
Features	Drawer Slide, Removable Cover	Application Sector	Commercial, Data Center, Industrial
Standard	RoHS;REACH Compliant	Type	Enclosure

Dimensions

Product Width US	17.12 in	Product Depth US	19.13 in

Product Height US	3.5 in

Technical Information

Fiber Optic Cable Type	OM3, OM4, OM5	Compatibility	OFP, M2, LM2
Rack Units	2	Capacity	6 Adapter Panels, 6 Cassettes
Mounting	Rack Mount		

TABLE OF CONTENTS

1.0 GENERAL
2.0 TOOLS REQUIRED FOR ASSEMBLY
3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE
4.0 ACCESSORIES PURCHASED SEPERATELY
5.0 ENCLOSURE ASSEMBLY
6.0 INSTALLATION OF ACCESSORIES
7.0 CABLE ROUTING AND INSTALLATION

1.0 GENERAL

This document describes the assembly procedure for the LEGRAND Patch and Splice Rack Mount Enclosures. Part numbers EQ02U-CHC (2 Rack Unit), EQ04U-CVC (4 Rack Unit), EQ02U-KHC (2 Rack Unit HD), EQ04U-KHC (4 Rack Unit HD), EQ02U-KHL-M (2 Magnesium Rack Unit HD), EQ04U-KHL-M (4 Magnesium Rack Unit HD). Hardware is provided for mounting 19" racks.

2.0 TOOLS REQUIRED FOR ASSEMBLY

2.1) #2 Phillips Head Screwdriver – required for enclosure assembly
2.2) #3 Phillips Head Screwdriver – required to mount the enclosure to the rack

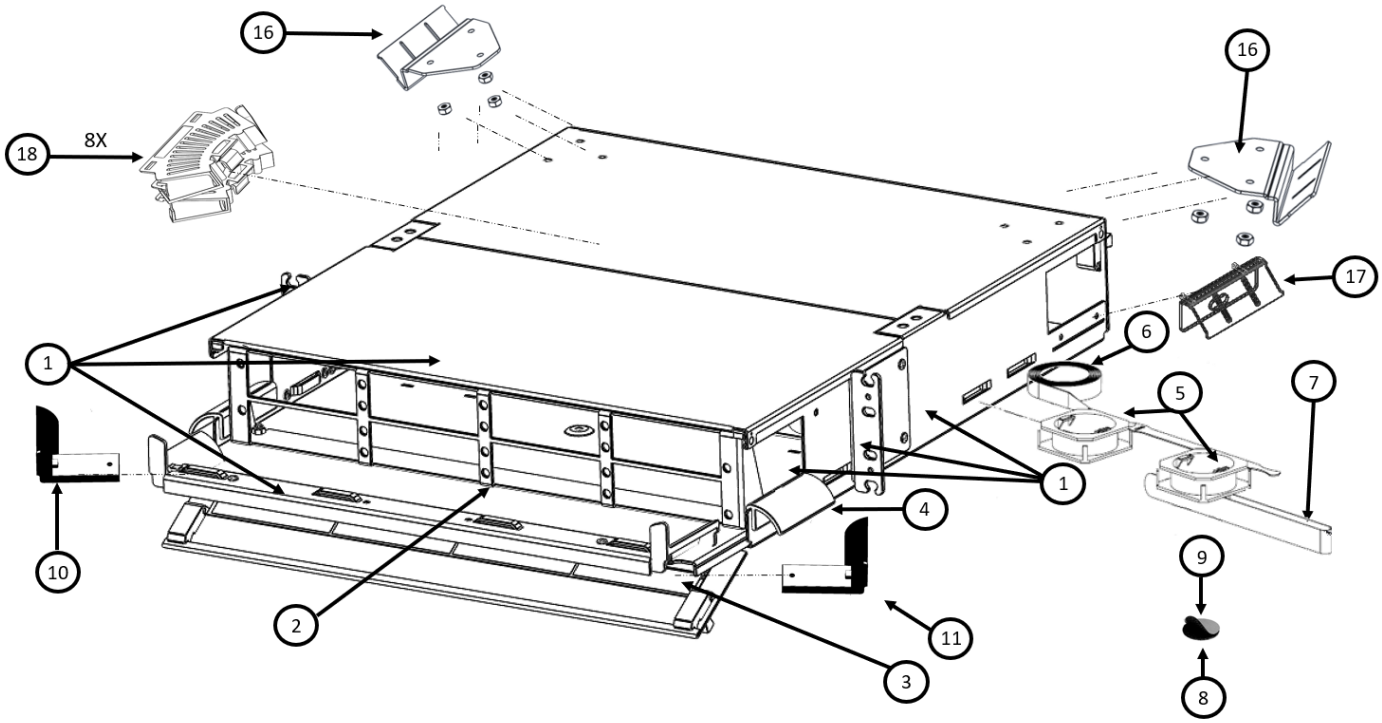
3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
1	Enclosure, Tray and Mounting Brackets, 2 Rack Unit	EQ02U-CHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit	EQ04U-CVC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD	EQ02U-KHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD	EQ04U-KHC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD, Magnesium	EQ02U-KHL-M	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD, Magnesium	EQ04U-KHL-M	-	1
2*	Drawer Face, 2 Rack Unit	41400024-00	1	-
	Drawer Face, 4 Rack Unit	41400007-00	-	1
	Drawer Face, 2 Rack Unit, HD	41400931	1	-
	Drawer Face, 4 Rack Unit, HD	41400932	-	1
3*	Port Identification Card, 2 Rack Unit	70400879	1	-
	Port Identification Card, 4 Rack Unit	70400902	-	1
	Port Identification Card, 2 Rack Unit, HD	70401094	1	-
	Port Identification Card, 4 Rack Unit, HD	70401095	-	1
4	Bend Limiter	71200061	2	2
5	Cable Manager, Fiber Spool.	70800327	4	8
6	Straps, Hooks/Loops, Cable Mgt.	70700145	8	8
7	Straps, D-Ring, Hooks/Loops, 18" Long, Cable Mgt.	70700199-00	4	4
8	Loop, Dot, .50 Dia.	70700077	3	3
9	Hook, Dot, .50 Dia.	70700078	3	3

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
10	Cable Manager, Left	71200062-001	1	1
11	Cable Manager, Right	71200062-002	1	1
12	Washer, lock, #12, External star, phosphor bronze	70100090	1	1
13	Screw 12-24 x .625, PN HD, CMB DRV, ZNC PLT	70100070 / 70100070-59	4	4
14	Screw, machine, #6-32 Unc X .31, Pan HD, CR, Black	70100425	2	2
15	#6-32 screws for Mounting Brackets.		8	8
(*) If item 1 is a 2 or 4 Rack Unit, then items 2 & 3 will be for 2 or 4 Rack Units, etc.				

4.0 ACCESSORIES PURCHASED SEPARATELY

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
16	Strain Relief Bracket, Upper	ECQ-BR	2	2
17	Strain Relief Bracket, Lower	FCBR-003	2	2
18	Kit, Fiber Spool, 8 Pieces	60401185	2	4



5.0 ENCLOSURE ASSEMBLY

5.1) Inspect the package contents before assembling to ensure conformance with the parts listed in Section **3.0**, then determine if the accessories listed in Section **4.0,** are required.

5.2) The Drawer Face (Item 2) is pre-assembled to the tray at the factory (Figure 1).

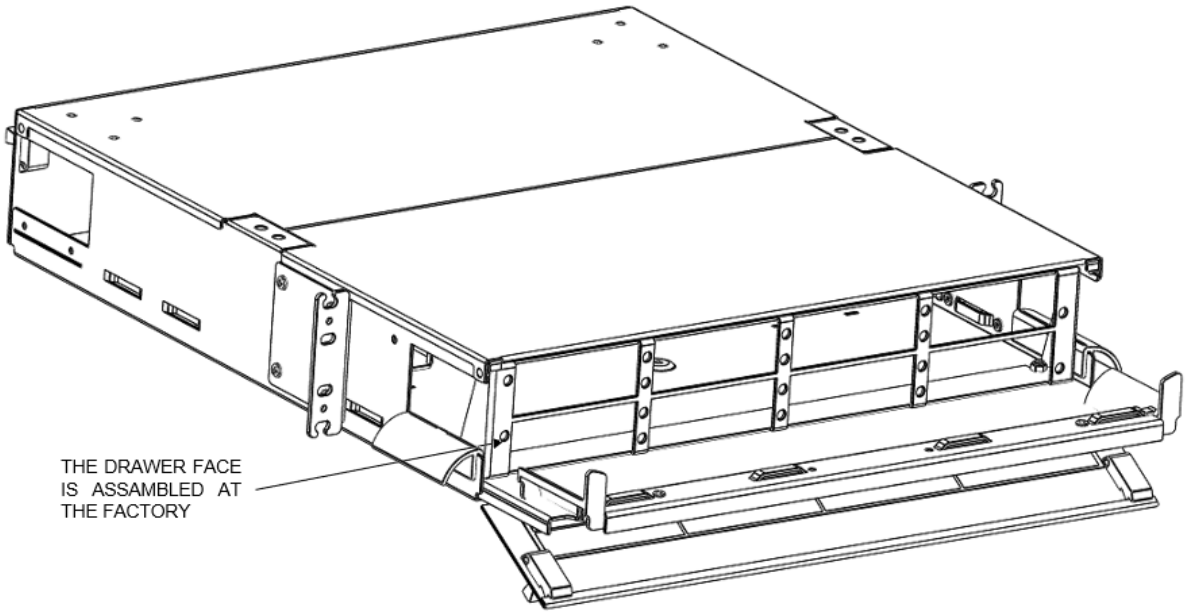


Figure 1

5.3) If your enclosure does not have the mounting brackets factory installed, use a #2 Phillips Head Screwdriver and the screws provided with the enclosure to attach one mounting bracket to each side of the enclosure using the holes provided. Figure 2 illustrates the mounting scheme. An alternate mounting position (Figure 2a) is available for 19" enclosures. To have an enclosure that installs more rearward in racks use the 4-hole pattern closest to the front side of the enclosure.

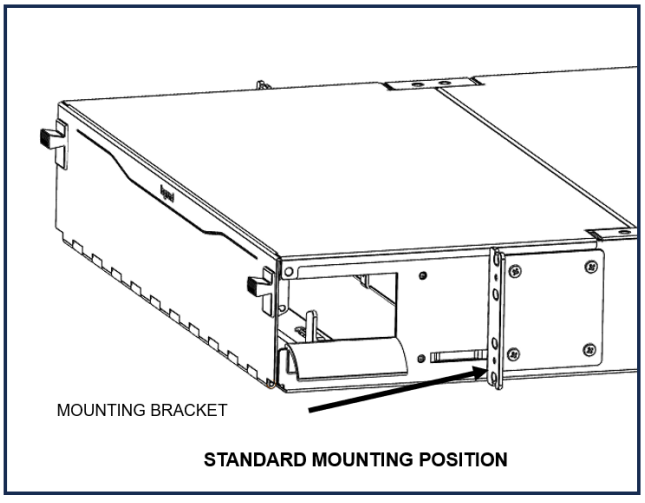


Figure 2

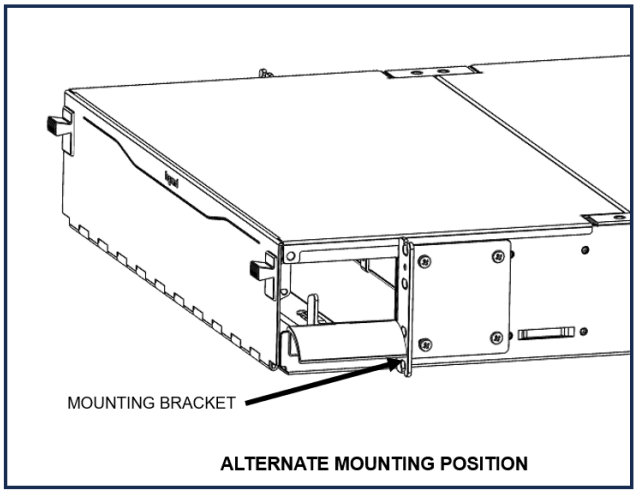


Figure 2a

5.4) Mate each Hook with a Loop dot. Remove protective backing from Hook or Loop and attach to underside of identification label, as required. Remove backing from the remaining side. Put label into place and press against the door to secure, approximately where shown (Figure 3).

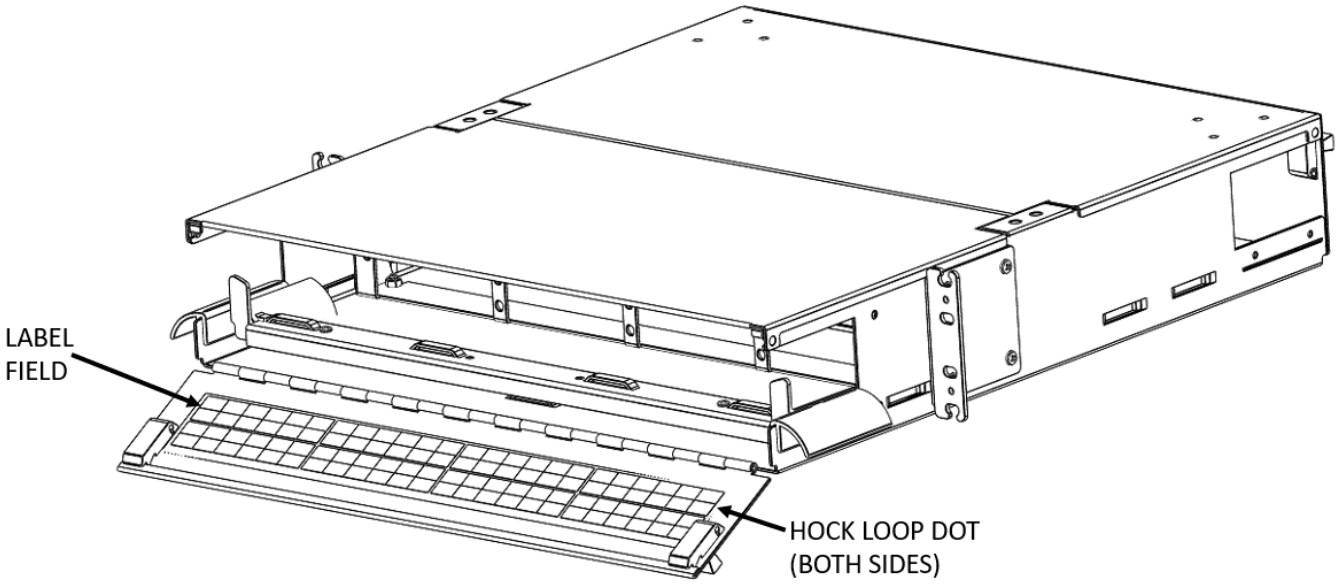


Figure 3

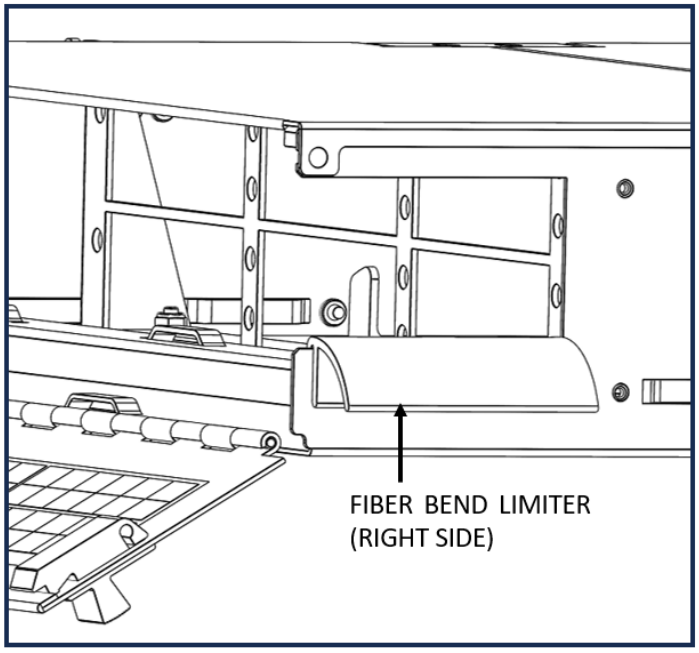


Figure 4

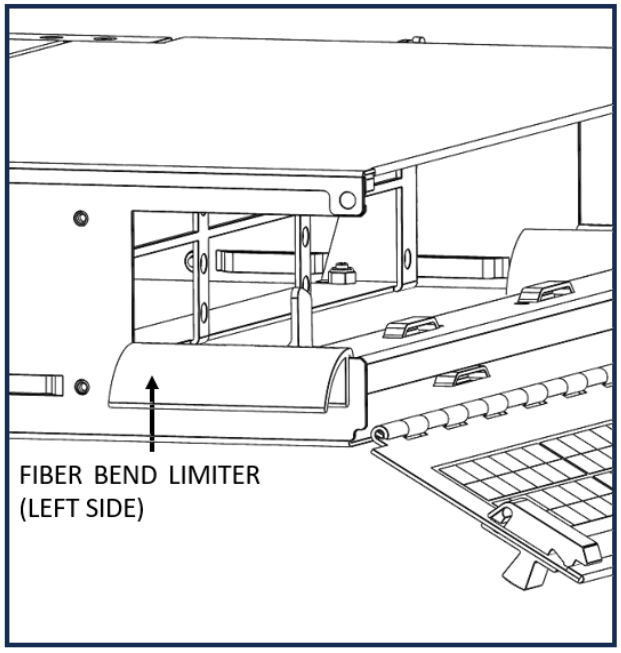


Figure 4a

5.5) Attach bend limiters to the enclosure as shown in Figures 4 & 4a (will be provided in black but shown in white for clarity).
5.6) The enclosure is ready to be mounted to the rack using the screws provided, and a #3 Phillips Head Screwdriver.

6.0 INSTALLATION OF ACCESSORIES

The fiber enclosures can support different styles of fiber bend radius control. The 2U & 4U enclosure trays can accept both styles. Figure 5a illustrates the current style and Figure 5b illustrates an alternate style.

6.1) To assemble the fiber manager provided with this enclosure: Attach Fiber Spool Cable Managers to the tray by inserting the (2) snap hook tabs into their mating tray slots then push the part down towards the tray until the snap hooks engage. An audible click will indicate a locked-in position. Follow the same procedure for additional assemblies. The fiber manager is capable of stacking although the enclosure will limit the number of fiber managers in a stack.
6.2) Figure 5a depicts the fiber spools secured to the tray (rear section).
6.3) When required, attach the Upper and/or Lower strain relief brackets to the rear of the enclosure as shown in Figure 6. Threaded studs are provided on the inside surface of the enclosure to accommodate the brackets.
6.4) To install the cable managers (item 10, 11), orient the curved sides to face each other. Place the short tab up and facing towards you as depicted in figure 8. Item 11 is the right-side cable manager. Item 10 is the left side cable manager. To attach them to the tray, place the long tab under the tray and align the holes to the threaded feature. Use the #6-32 screws provided (1) each, to fasten each cable manager. Do not overtighten.
6.5) Repeat steps **5.0** through **5.6** to assemble additional enclosures, and steps **6.0** through **6.4** for installation of accessories.

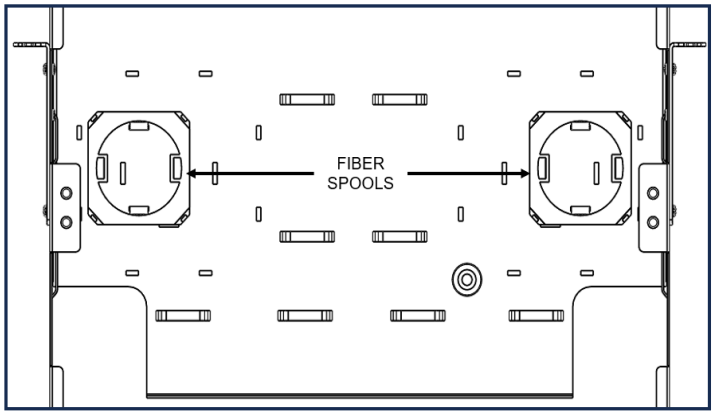


Figure 5a

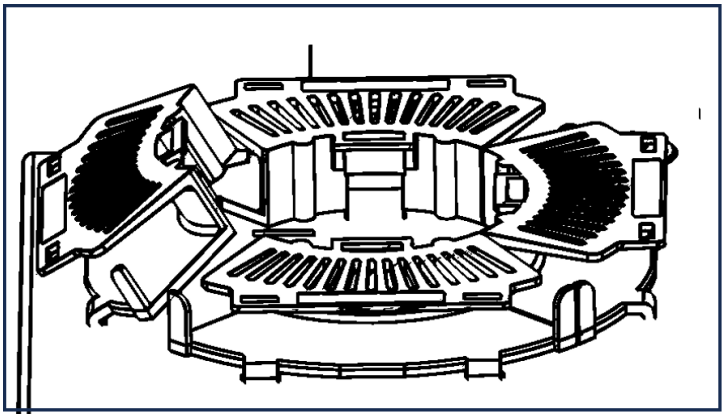


Figure 5b

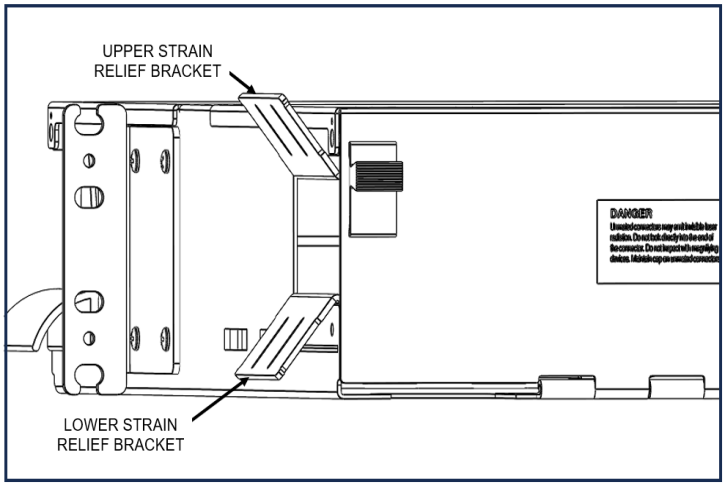


Figure 6

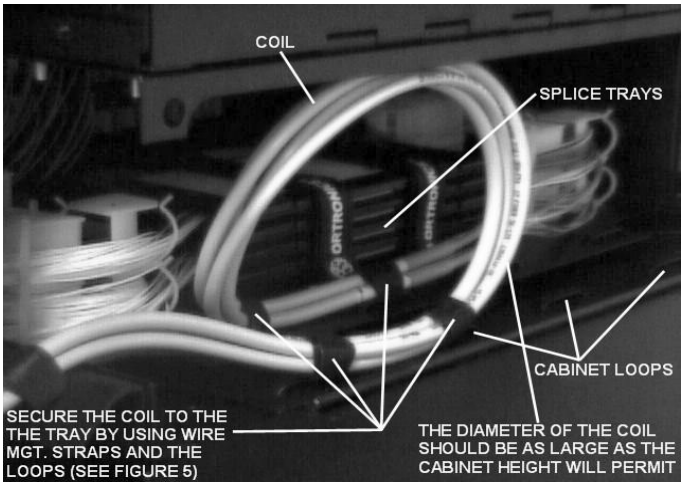


Figure 7

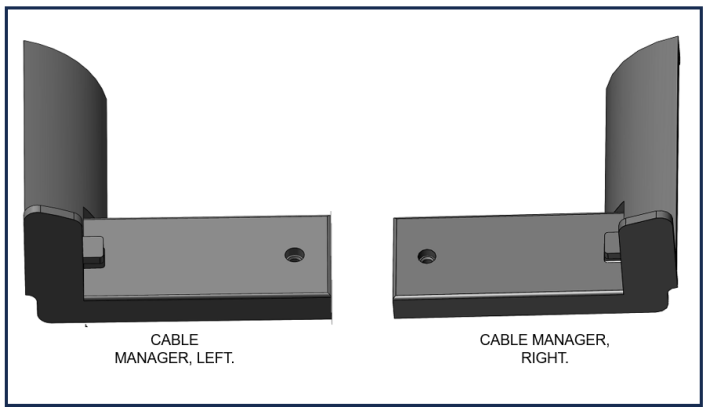


Figure 8

7.0 CABLE ROUTING AND INSTALLATION

7.1) Strip off approximately 1 meter (39 inches) of cable jacket. Trim the central strength member and/or the aramid yarn back to the cable jacket. Terminate connectors (if required) per the manufacturer's instructions.

7.2) With the jacketed portion of the fiber, make a service coil as large as the cabinet height will permit, as shown in Figure 7. The service coil is required to allow the tray to slide out the front of the cabinet freely.

7.3) Secure the outside coil to the cabinet utilizing management straps and the loops provided. Secure the inside coil to the tray utilizing wire management straps and the loops provided.

7.4) An example of a Patch and Splice wiring scheme is depicted in Figure 9.

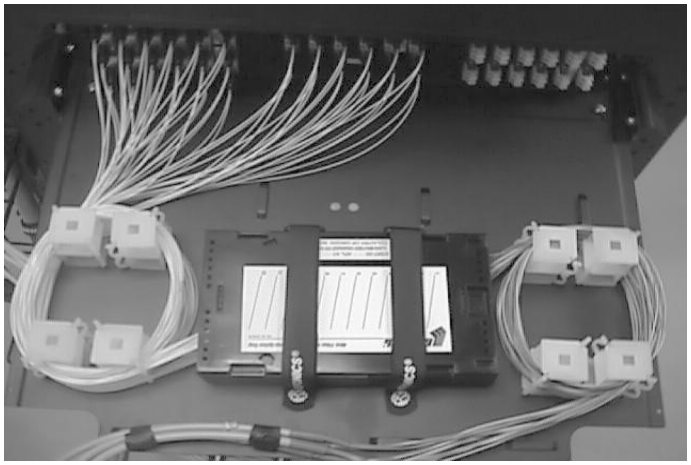


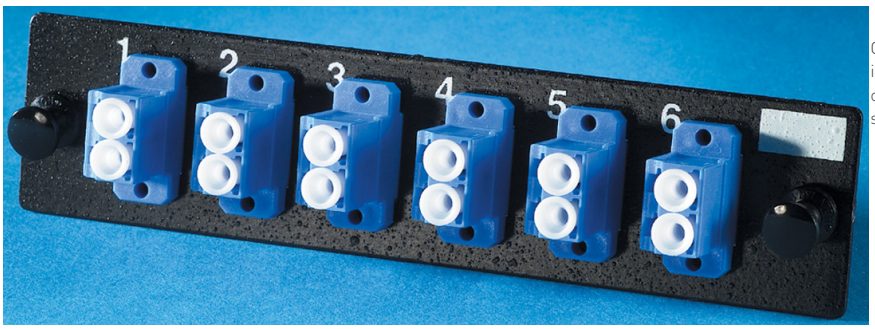
Figure 9

FOR QUESTIONS AND/OR ADDITIONAL INFORMATION, CONTACT LEGRAND AT THE FOLLOWING WEB ADDRESS, OR YOUR MANUFACTURER'S REPRESENTATIVE.

WWW.LEGRAND.US

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Ortronics
6-LC (12 fibers) single mode adapters with ceramic alignment sleeves
Part No. OFP-LCD12AC



Ortronics fiber adapter panel allows for flexibility and expansion with an industry accepted style. The adapter panel snaps in for installation and can be removed easily for future changes. The adapter panel is silkscreened for easy port identification.

Features & Benefits

- Up to 72 LC fibers per RU
- Made of durable polycarbonate
- 6, 8, 12 & 24 port panels
- Available in, LC, SC, ST and blank styles
- Zirconia ceramic sleeves for optimal performance
- Color options available

Specifications

General Info

Product Line	Ortronics	Color	Blue
UPC Number	662875593799	Country Of Origin	Mexico
Features	Shuttered	Included	Cover
Application Sector	Commercial, Data Center	Standard	RoHS compliant. Meets or exceeds TIA/EIA-568-C.3 requirements.
Warranty Type	5-Year	Type	Adapter Panel

Dimensions

Product Width US	5.12 in	Product Depth US	1.15 in
Product Height US	1.19 in		

Additional Information

Product Environmental Profile	Yes

Technical Information

Fiber Optic Cable Type	OS2	Operating Temperature Min	-10 °C
Compatibility	OFP	Number of Ports	12
Simplex/Duplex	Duplex	Operating Temperature Max	60 °C
Shuttered Adapters	No	Single/Multimode	Single-Mode
Number of Fibers	12	Fiber Type	Single-Mode
Form Factor	LC Duplex	Operating Temperature	-10°-60°C
Durability	500 matings	Operating Humidity	0-80% RH (Non-Condensing)
Storage Temperature	-40° - 75° C		

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NT24k® Modular Industrial Switch

N-Tron® Networking Series

RED LION®
a spectris company

Managed Gigabit Industrial Ethernet Switch

The N-Tron® series NT24k® is a modular managed switch designed for factory automation, utilities, SCADA, security surveillance and other industrial applications.



The Red Lion N-Tron series NT24k managed industrial Ethernet switch features connectivity for up to 24 Gigabit ports and offers a wide range of connectivity options—including 100Base, Gigabit, fiber optic and copper options—in a rugged 1U 19" rackmount enclosure. Designed to handle the most demanding environments, the NT24k delivers wire-speed throughput and includes dual power inputs, expanded shock and vibration tolerances, extreme operating temperature range and three slots to accommodate mix-and-match port modules. N-Ring™ technology restores network communication within ~30ms of fault detection. Robust remote monitoring capabilities make management easy.

APPLICATIONS

- Factory Automation
- Utilities
- SCADA
- Security Surveillance
- Transportation
- Alternative Energy

PRODUCT HIGHLIGHTS

- All Gigabit Modular Design
- Up to 24 Port Connections
- High Environmental Specifications
- N-Ring™ Advanced Ring Technology
- Robust Remote Monitoring
- Smart Plug-and-Play Operation

IEEE 1588v2 PTP OPTIONS

- Boundary Clock
- Transparent Clock

IEEE 1588v2 applications include

- Coordinated motion control
- Time-stamped data logging
- Time-stamped fault detection

PTP Models & Upgrade Kit Available

FEATURES & BENEFITS

- Supports up to three of the following port modules:
  - 8-port 10/100/1000BaseT(X) module
  - 8-port 100Base fiber module
  - 8-port 1000Base fiber module
  - 8-port Gigabit SFP module
  - 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- -40°C to 85°C operating temperature
- Dual power input options:
  - Low Voltage: 18-49 VDC
  - High Voltage: 90-264 VAC or 90-300 VDC
- Onboard temperature sensor
- ESD and surge protection diodes on all copper ports
- Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
- USB configuration port
- Configurable alarm contact
- Optional backup/restore configuration device
- Fully managed features include:
  - SSH/SSL/HTTPS
  - SNMP v1, v2, v3
  - Web browser management
  - Detailed ring map and fault location charting
  - RSTP - 802.1d, 802.1w, 802.1D
  - Trunking and port mirroring
  - 802.1Q tag VLAN and port VLAN
  - IEEE 802.1x with RADIUS remote server authentication
  - DHCP Server, Option 82 relay, Option 61, IP fallback
  - Port Security – MAC address based
  - 802.1p QoS, port QoS and DSCP
  - Event Log/Syslog
  - SNTP (Simple Network Time Protocol)
  - IEEE 1588v2 (PTP) models available
  - Multi-Member N-Ring™ technology with ~30ms healing
  - N-Link redundant ring technology
  - N-View™ monitoring technology
  - EtherNet/IP™ CIP™ messaging
  - 802.1AB-2005 LLDP (Link Layer Discovery Protocol)

FC c UL us LISTED 65SN CE UKCA ABS TYPE APPROVED PRODUCT RoHS compliant EtherNet/IP

Managed Gigabit Industrial Ethernet Switch Specifications

SWITCH PROPERTIES

Number of MAC Addresses: 16K
IEEE 1588v2 Software-Based Option
Aging Time: Programmable
Latency (typical): 1.6 µs
Switching Method: Store & Forward
MTBF: >1 million hours
Jumbo Frame Support

POWER INPUT

Input Voltages:
Low Voltage: 18-49 VDC
High Voltage: 90-264 VAC or 90-300 VDC
Input Current (max): 2.26A @ 24VDC
Input Current (max): 790mA @120 VAC/450mA @ 124VDC
BTU/hr: 185 @ 24VDC
BTU/hr: 365 @ 120VAC/190 @ 124VDC

CONNECTORS

10/100/1000BaseT(X): Up to 24 RJ45 copper ports
100BaseFX: Up to 24 SC or ST fiber ports
1000BaseFX: Up to 24 SC fiber ports
100BaseSX/LX SFP: Up to 24 LC fiber ports
1000BaseGX SFP: Up to 24 LC fiber ports

RELIABILITY

MTBF: >1 million hours

NETWORK MEDIA

10BaseT: ≥Cat3 cable
100BaseTX: ≥Cat5 cable
1000BaseT: ≥Cat5 cable
100BaseFX, 1000BaseSX Multimode: 50-62.5/125µm
100BaseFX, 1000BaseLX Singlemode: 7-10/125µm

RECOMMENDED WIRING CLEARANCE

Front and Back: 4" (10.2 cm)

CERTIFICATION & COMPLIANCE

Product Safety:
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions:
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009; Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity:
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Other:
ABS Type Approval for Shipboard Applications; EMC Directive 2014/30/EU; LV Directive 2014/35/EU, RoHS Compliant

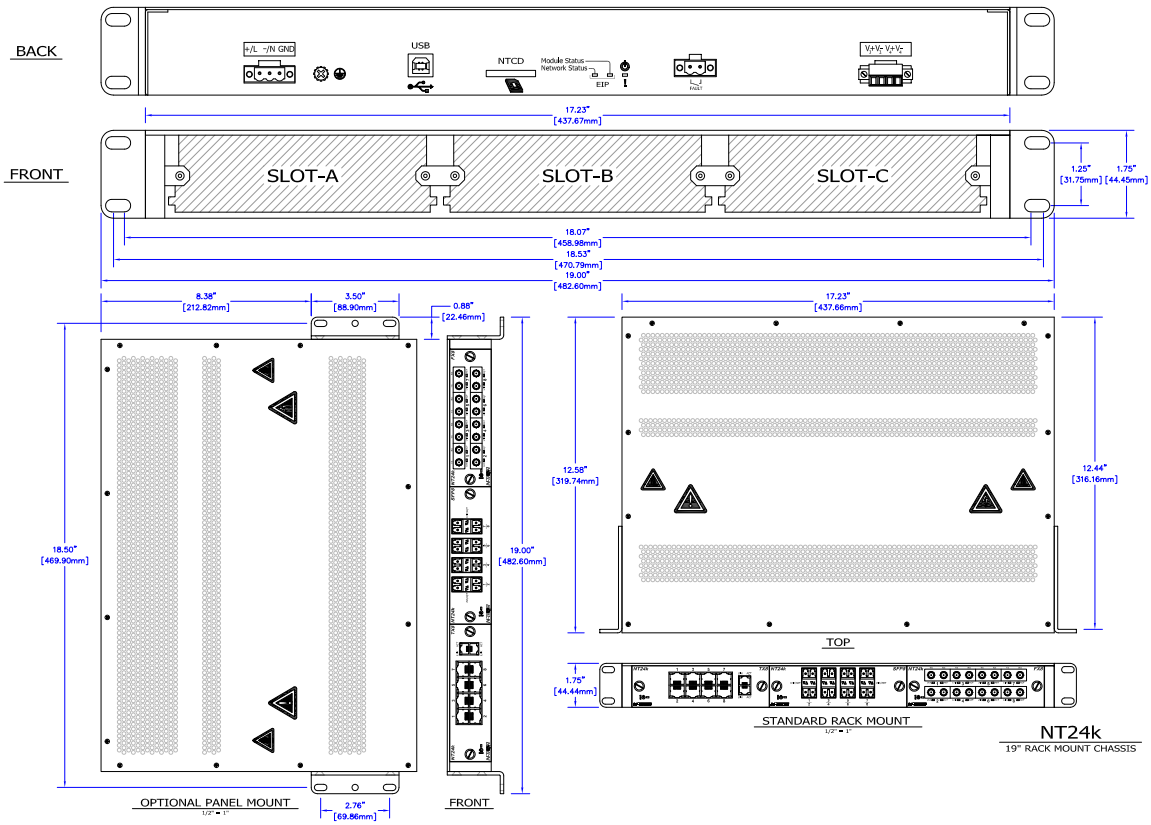
ENVIRONMENTAL

Operating Temperature: -40° C to 85° C
Operating Humidity: 5% to 95% (Non Condensing)
Operating Altitude: 0 to 10,000 ft.
Shock: 50g @ 10ms
Vibration/Seismic: 30g, 10-200 Hz, triaxial

MECHANICAL

Case Dimensions
Height: 1.9" (4.8 cm)
Width: 17.5" (44.5 cm)
Depth: 12.7" (32.0 cm)
Weight (maximum): 12.85 lbs (5.83 kg)
Mount: Rackmount 1U

DIMENSIONS



Specifications are subject to change. Visit www.redlion.net for more information.

Managed Gigabit Industrial Ethernet Switch Specifications

NT24K-FX8 MODULE - 100 MB FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24K-GX8 MODULE - GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 300m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24K-SFP-DM8 MODULE - SFP 100BASE FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24K-SFP-DM8 OR NT24K-SFP8 MODULES- SFP GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 275m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance.
Link budgets should be evaluated based on specific application conditions.

ORDERING GUIDE

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input PTP Enabled
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-DC2-PT	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs PTP Enabled
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input
NT24K-AC1-PT	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input
NT24K-AC2-PT	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs
NT24K-AC1-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs PTP Enabled
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device
NTPC-AC-US	AC power cord
NTPS-24-3	DIN rail power supply 3.0 Amp@24 VDC
NT24K-KIT-PTP	NT24k Upgrade License to Enable IEEE 1588/PTP on Non-PT NT24k Switches
PORT MODULES & TRANSCEIVERS	
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*
NTSFP-FX	100BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2km)**
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP pluggable mini-GBIC transceiver (LC style connector)**
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode. *SFP transceivers sold separately. **For use with SFP DM8 module only

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For over 50 years, Red Lion has strived to be THE Industrial Data Company™. The company empowers industrial organizations around the world to unlock the value of data by developing and manufacturing innovative solutions to access, connect and visualize their information. Red Lion products make it easy for companies to gain real-time data visibility that drives productivity. Red Lion is part of Spectris plc, the experts in providing insight through precision measurement. For more information, please visit www.redlion.net.

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N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches

Hardware Guide | January 2023
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Support: support.redlion.net

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Preface

Disclaimer

This hardware guide provides an overview of installation, maintenance and operation of the N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls, Inc. is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Users of this document are urged to heed warnings and cautions used throughout the document.

Compliance Information

It is recommended that the owner of this equipment determine and ensure conformance with any specific and applicable local regulations.

FCC Statement

This product complies with Part 15 of the FCC-A Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful Interference
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Déclaration de conformité FCC

Ce produit est conforme à la partie 15 des règles de la FCC–A

Utilisation est soumise aux conditions suivantes:

1. Ce dispositif ne doit pas causer des interférences nuisibles
2. Cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent causer un mauvais fonctionnement.

Note: Cet équipement a été testé et jugé conforme aux limites de la classe A des appareils numériques, conformément à la partie 15 des règles de la FCC . Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie radiofréquence et, si il n'est pas installé et utilize conformément aux instructions, peut causer des interférences nuisibles aux communications radio. L'utilisation de cet appareil dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur sera tenu de corriger les interférences à ses propres frais.

Industry Canada

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe A répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

Environmental Impact Statement

Red Lion equipment contains no hazardous materials as defined by the United States Environmental Protection Agency (USEPA). Red Lion recommends that all failed product be returned to Red Lion for failure analysis and proper disposal.

Toxic Emissions

Red Lion equipment releases no toxic emissions.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- Ethernet is a registered trademark of Xerox Corporation.
- EtherNet/IP and CIP are registered trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at

www.redlion.net/support/documentation.

Additional Product Information

Additional product information can be obtained by contacting the local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Cautions and Warnings / Mises en Garde et Avertissements

Warnings apply to situations where personal injury or death may result.

Cautions apply to where reduced function or damage to equipment may result.

General Safety Cautions and Warnings / Précautions et Avertissements de Sécurité Générale

	**CAUTION:** If the equipment is used in the manner not specified by Red Lion, the protection provided by the equipment may be impaired. **ATTENTION:** Si l' équipement est utilisé d'une manière non spécifiée par Red Lion, la protection fournie par l'équipement peut être compromise.

	**CAUTION:** Do not remove any of the covers. There are no serviceable parts within the unit. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne retirez aucun des couvercles. Il n'y a pas des pieces utilisables à l'intérieur de l'appareil. Ne pas remplacer les pièces non-autorisées ou effectuer des modifications non-autorisées de l'appareil.

	**CAUTION:** Do not block any air vents on the unit. **ATTENTION:** N'obstruez pas les fentes d'aération de l'unité.

	**CAUTION:** Do not operate the equipment in a manner not specified by this manual. **ATTENTION:** Ne pas faire fonctionner l'équipement d'une manière non spécifiée par ce manuel.

	**WARNING:** Install only in accordance with Local and National Codes of authorities having jurisdiction. **AVERTISSEMENT:** Installer uniquement, conformément aux codes locaux et nationaux des autorités ayant compétence.

Electrical Safety Warnings / Avertissements de Sécurité Électrique

	**WARNING:** Never install or work on electrical equipment or cabling during periods of lightning activity. **AVERTISSEMENT:** Ne jamais installer ou travailler sur équipement électrique ou de câblage pendant les périodes d'activité de la foudre.

	**CAUTION:** Do not perform any services on the unit unless qualified to do so. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne pas effectuer de services sur l'appareil s'il n'est pas qualifié pour le faire. Ne pas substituer pièces non autorisées ou de modifications non autorisées de l'appareil.

	**WARNING:** Properly ground the unit before connecting anything else to the unit. Units not properly grounded may result in a safety risk and could be hazardous and may void the warranty. See the grounding technique section of this manual for proper ways to ground the unit. **AVERTISSEMENT:** L'unité doit être correctement mise à la terre avant tout raccordement à l'unité. Unités pas correctement mise à la terre peuvent causer un risque de sécurité et pourraient être dangereuses et peuvent annuler la garantie. Voir la section technique de mise à la terre dans ce mode d'emploi pour des moyens appropriés à la masse de l'appareil.

	**WARNING:** Device must be supplied by a Class 2 power source (except for POE models). **AVERTISSEMENT:** l'appareil doit être alimenté par une source d'alimentation de classe 2 (sauf pour les modèles POE).

	**WARNING:** Do not operate the unit with the top cover removed, as this could create a shock or fire hazard. **AVERTISSEMENT:** Ne pas faire fonctionner l'unité avec le couvercle retiré, ceci pourrait créer une décharge électrique ou un incendie.

	**CAUTION:** Observe proper DC Voltage polarity when installing power input cables. Reversing voltage polarity can cause permanent damage to the unit and void the warranty. **ATTENTION:** Respectez la polarité correcte de tension DC lors de l'installation des câbles d'alimentation d'entrée. Inversion de polarité de tension peut causer des dommages permanents à l'appareil et annule la garantie.

Environmental Safety Cautions and Warnings / Sécurité Environnementale Mises en Garde et Avertissements



WARNING: Do not operate the equipment in the presence of flammable gases or fumes. Operating electrical equipment in such an environment constitutes a definite safety hazard.

AVERTISSEMENT: Ne pas utiliser le matériel en présence de gaz ou de vapeurs inflammables. L'utilisation de matériel électrique dans un tel environnement constitue un danger certain.



WARNING: Disconnect the power and allow to cool 5 minutes before touching.

AVERTISSEMENT: Déconnectez le câble d'alimentation et laisser refroidir 5 minutes avant de la toucher.

Hazardous Location Warnings / Les Avertissements d'Emplacement Dangereux



CAUTION: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

ATTENTION: Cet appareil est adapté pour utilisation en Classe I, Division 2, Groupes A, B, C, D ou endroits non-dangereux seulement.



WARNING: Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.

AVERTISSEMENT - Risque d'explosion - La substitution de tout composant peut nuire à la conformité de Classe 1, Division 2.



WARNING: Explosion Hazard – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux.



WARNING: Exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relay U40.

AVERTISSEMENT: L'exposition à certains produits chimiques peut dégrader les propriétés d'étanchéité des matériaux utilisés dans les dispositifs suivants: relais par U40.



WARNING: Explosion Hazard – Do not replace the device unless power has been switched off or the area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas remplacer l'appareil à moins que l'alimentation a été coupée ou que la zone est connue pour être non-dangereuse.



WARNING: Never connect or disconnect power when hazardous gases are present.

AVERTISSEMENT: Ne jamais brancher ou débrancher l'alimentation lorsqu'en presence de gaz dangereux.

Surrounding Air Temperature / Temperature Ambiante

NT24k-DC and NT24k-AC rackmount models: -40°C to 85°C

NT24k-DR16 and NT24k-DR24 models: -40°C to 75°C

Note: Use 105 °C or higher rated copper wire, (0.22NM) 2lb/in tightening torque for field installed conductors.
Remarque: Utilisez fil de cuivre classé 105 °C ou plus, (0.22Nm) 2 pouces/livres couple de serrage pour les connecteurs installés sur le terrain.

Laser Safety Warnings / Avertissements de Sécurité Laser

(Options: NTSFP-FX, NTSFP-FXE, NTSFP-SX, NTSFP-LX)



CAUTION: CLASS 1 LASER PRODUCT. Do not stare into the laser.
ATTENTION: PRODUIT LASER CLASSE 1. Ne pas regarder dans le laser.

Regulatory Information

Product Safety
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009
Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Marine
ABS Type Approval for Shipboard Applications
Other
EMC Directive 2014/30/EU
LV Directive 2014/35/EU GOST-R
RoHS compliant

KC Mark (Korea)

A 급 기기 (업무용 방송통신 기자재)	이기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외 지역에서 사용하는 것을 목적으로 합니다.
Class A device (Broadcasting and communication equipments for office work)	This equipment is office use (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

Chapter 1 Product Overview

NT24k® Modular Series Common Features

Red Lion's N-Tron® series NT24k modular switches are available in rackmount or 35mm DIN rail mountable configurations with high density Gigabit ports. The NT24k offers a wide array of port configurations and power input options that include Fast Ethernet and Gigabit speeds in copper or fiber. The hot-swappable port modules are auto-detected and configured by the switch, adding new definition to plug-and-play performance. Housed in rugged hardened enclosures, the NT24k series features extended shock and vibration specifications (bulkhead mount required to meet requirements), wide operating temperature ratings and best-in-class technology.

Connectivity

The NT24k series switches feature hot-swappable connectivity modules. These modules are available in Fast or Gigabit Ethernet, and are optionally available with copper, fiber or SFP ports. The NT24k accepts up to three modules for a maximum of 24 Ethernet ports, and can be changed without removing power from the switch.

Performance

The NT24k line of managed switches provide uncompromising performance in harsh environments including network features like N-Ring™, VLAN, Quality of Service (QoS), port mirroring, IGMP and SNMP.

Environmental

The NT24k series of managed switches are available in rackmount or 35mm DIN rail mountable configurations with operating temperatures up to -40° to 85°C. With UL Class I, Division 2 listing and CE certifications, these switches are built to last in the most demanding environments.

Monitoring

The NT24k Series includes N-View™ monitoring technology. N-View combines switch based technology with a Windows based OPC server and client monitoring tool. When N-View is enabled, the switch periodically autocasts a small Ethernet packet containing switch and port statistics. The data is captured by the N-View OPC server software and can be displayed by the provided N-View client or third party OPC client application running in the same Windows environment. For more information, please reference the N-View Installation and User's Guide.

Security

The NT24k series provides a high level of security utilizing IEEE 802.1x port-based network access control with RADIUS remote server authentication and SNMPv3 communication protocol to ensure the safest connections.

Available Models

PART #	TOTAL PORTS	MOUNTING	OPERATING TEMPERATURE	10/100/1000 COPPER	100 FIBER	GIG FIBER	SFP'S	18-49 VDC REDUNDANT POWER INPUT*	90-264 VAC/90-300 VDC POWER INPUT
NT24k-DR16-AC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	-	1
NT24k-DR16-DC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	1	-
NT24k-DR24-AC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-DR24-DC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-AC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-AC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	2
NT24k-AC1-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	1
NT24k-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-DC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	2	-

* Each 18-49VDC power input option includes redundant (2) power connections.

NT24k® Rackmount

The NT24k Rackmount Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 1U 19" rack mount enclosure. Designed to handle the most demanding environments, the NT24k supports up to two power inputs, extreme operating temperature range and three slots to accommodate mix-and-match port modules.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- Easily transitions to Gigabit network requirements

-40°C to 85°C operating temperature
Dual power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

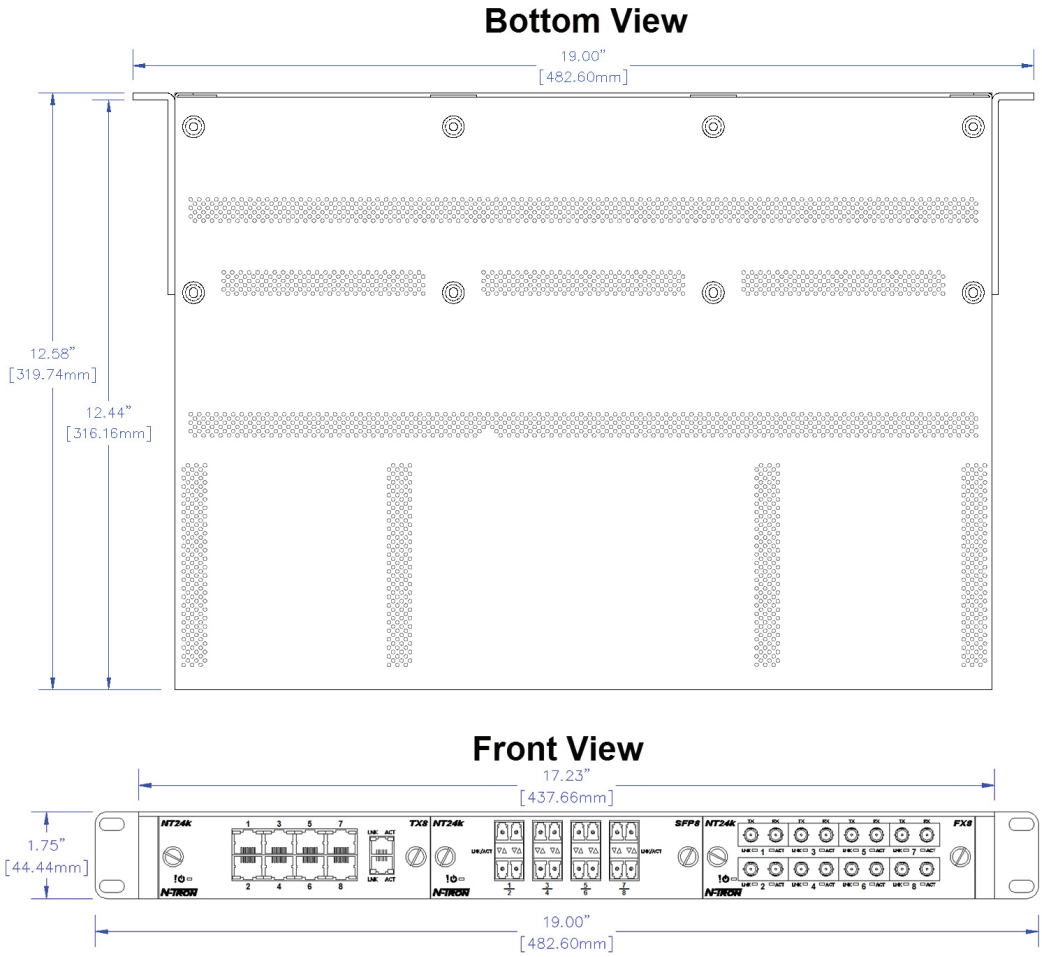
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- Trunking and port mirroring
- 802.1Q VLAN Tagging and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k® Rackmount Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
1.9" (4.8 cm)	17.5" (44.5 cm)	12.7" (32.0 cm)	12.85 lbs (5.83 kg)	Rackmount 1U
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.26 A @ 24 VDC Max: 790 mA @ 120 VAC/450 mA @ 124 VDC	185 @ 24 VDC 365 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 85 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k® Rackmount Dimensions



All specifications are subject to change. Consult the company website for more information.

NT24k-DR16

The NT24k-DR16 Managed Industrial Ethernet Switch features connectivity for up to 16 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to two of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

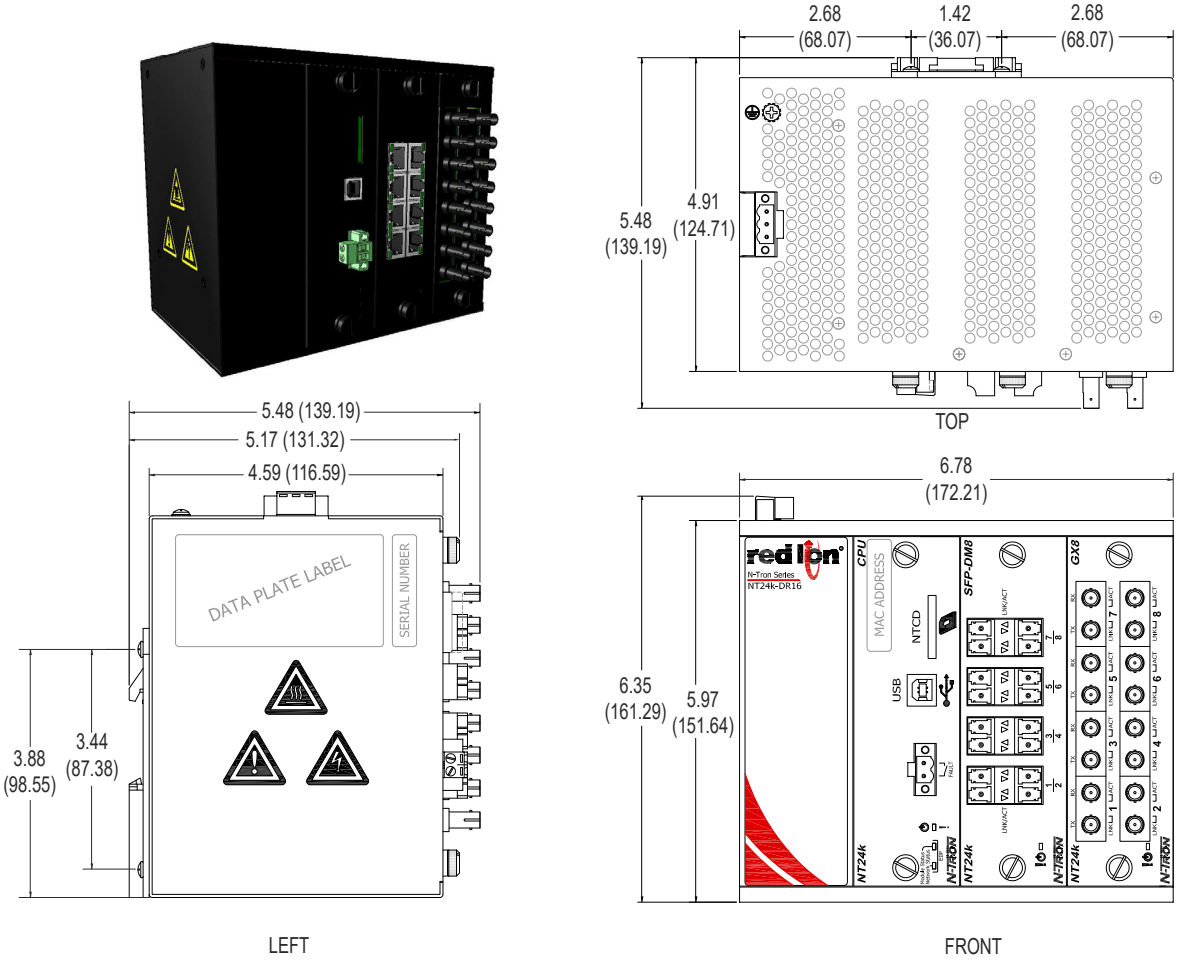
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x. with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k-DR16 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	6.78" (17.22 cm)	4.59" (11.65 cm)	6.4 lbs (2.9 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 1.52 A @ 24 VDC Max: 580 mA @ 120 VAC/300 mA @ 124 VDC	125 @ 24 VDC 268 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**		**Note**	
50g @ 10ms	30g, 10-200Hz, Triaxial		Unit must be bulkhead mounted to achieve these levels.	
CONNECTORS				
10/100/1000BaseT:(X): Up to 16 RJ45 ports				
100BaseFX: Up to 16 SC or ST fiber ports				
1000BaseSX/LX: Up to 16 SC fiber ports				
100BaseSX/LX SFP: Up to 16 LC fiber ports				
1000BaseGX SFP: Up to 16 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR16 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k-DR24

The NT24k-DR24 Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

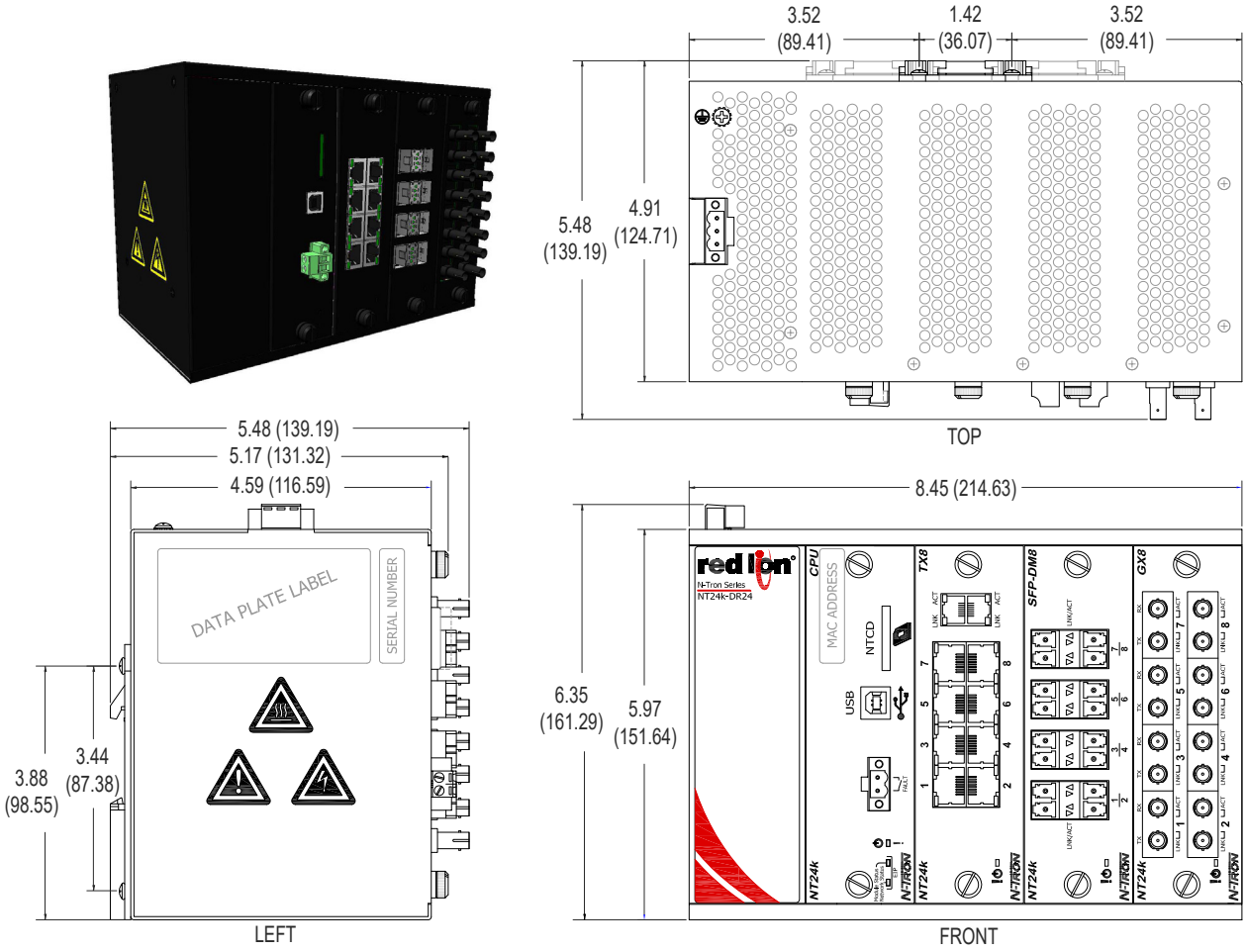
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™ CIP™ messaging

NT24k-DR24 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	8.45" (21.46 cm)	4.59" (11.65 cm)	7.8 lbs (3.54 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.14 A @ 24 VDC Max: 780 mA @ 120 VAC/430 mA @ 124 VDC	175 @ 24 VDC 360 @ 120 VAC/182 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR24 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k Views

NT24k Rackmount Unit Front View



NT24k Rackmount Unit View (Module Slots Identified)

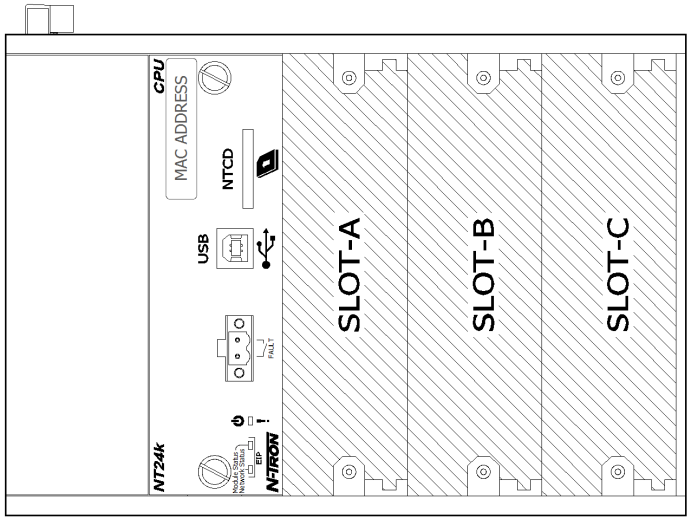


See “Ordering Information” for available module(s).

NT24k-DR16 Front View



NT24k DR Unit View (Module Slots Identified)



LEDs

The RJ45 data ports have two LEDs located on each connector. The left LED indicates link status and the right LED indicates activity.



The table below describes the operating modes:

LED	COLOR	DESCRIPTION
⏻	Green	Power is On
	Red	Power is On and a fault condition exists
	Off	Power is Off
LNK	Green	10/100/1000 Mb Link between ports
	Off	No link between ports
ACT	Green	Data is active between ports. Activity light blink rate indicates activity, not necessarily the volume of activity
	Off	Data is inactive between ports

EIP Indicators

The EIP Indicators are located either on the back of the rackmount version, or on the front of the CPU module of the DIN rail versions of the switch. The Module Status indicator shows the status of the switch. The Network Status indicator shows the status of the network interface.

MODULE STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up
Steady Green	The switch is operating normally
Flashing Green	The switch has not been configured
Flashing Red	A recoverable minor fault has occurred
Steady Red	A non-recoverable major fault has occurred
NETWORK STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up, or an IP address has not been configured
Flashing Green	An IP address is configured, but no connections have been established
Steady Green	A connection has been established
Flashing Red	A connection has timed out

Transceiver Characteristics

NT24k-FX8 Module - 100 MB Fiber Transceiver Characteristics

Fiber Length*	2 km	15 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24k-GX8 Module - Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 300 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24k-SFP-DM8 Module - SFP 100Base Fiber Transceiver Characteristics

Fiber Length*	2 km	10 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24k-SFP-DM8 or NT24k-SFP8 Modules - SFP Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 275 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance. Link budgets should be evaluated based on specific application conditions.

Chapter 2 Hardware Installation

Unpacking

Remove all the equipment from the packaging and store the packaging in a safe place. File any damage claims with the carrier.

Make certain the NT24k® Ethernet Switch package contains the following items:

1. NT24k switch
2. Product CD

Module Installation

Technicians performing the following steps should wear proper anti-static equipment to protect the circuit boards. Before removing the module from the ESD bag, touch a known grounded piece of metal to discharge any possible static electricity from the body.

1. Remove the faceplate from the slot in which the module will be inserted by turning the thumb screws counter clockwise.
2. Remove the module from the anti-static bag and insert into the slot aligning the board with the guide rails on either side. The module should slide smoothly into the slot.
3. Press the module firmly in place until the faceplate is flush against the front of the enclosure.
4. Align the threads of the thumb screws with the threads in the enclosure and screw them down until they are finger tight.

Ensure that all empty slots are covered with a faceplate to meet both emissions and safety requirements.

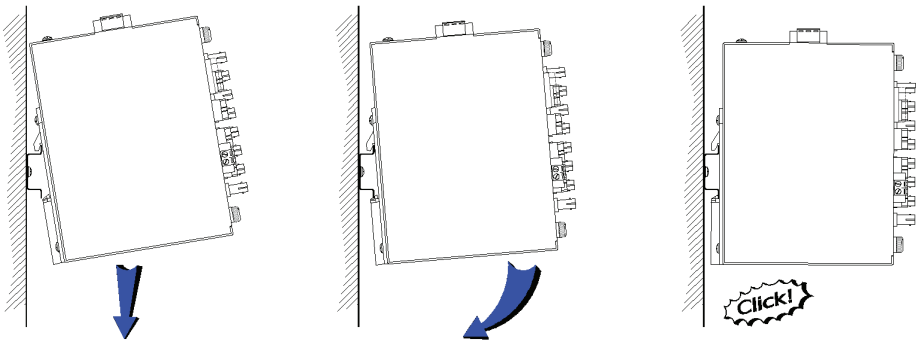
Mounting the NT24k

Rackmount Installation Instructions

The NT24k Rackmount unit comes configured with standard rack mount brackets which may be used to mount our products to standard 19" racks. As an alternative, Red Lion offers its NT24k Panel Mount Assembly (P/N: NT24k-PMK) used to securely mount the NT24k products to a panel or other flat surface.

A clearance of one inch should be observed on the sides, back, top and bottom to allow proper ventilation. Also a cable bend radius of 4 inches should be observed for the front and back of the unit.

DIN Rail Mounting Instructions

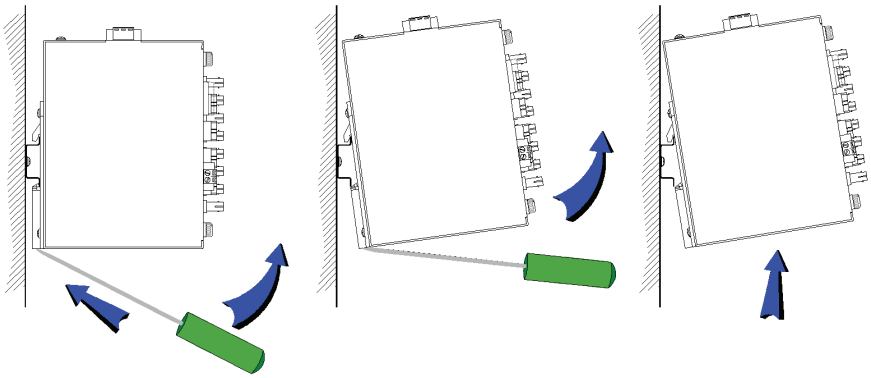


Install the switch to standard 35mm DIN rail as shown in the diagram above.

1. First, hook the top of the 35mm DIN rail clip on the back of the switch to the rail.
2. Then, gently rotate the front of the switch downward, towards the panel.
3. Push the bottom of the switch towards the rail until it locks into place.
4. Apply upward force to verify the switch is securely installed.

5. Connect any communications cables to the switch.
6. Install the power and ground wires.
7. Apply power to the power supply.

DIN Rail Removal Instructions



Remove the switch from standard 35mm DIN rail as shown in the diagram above.

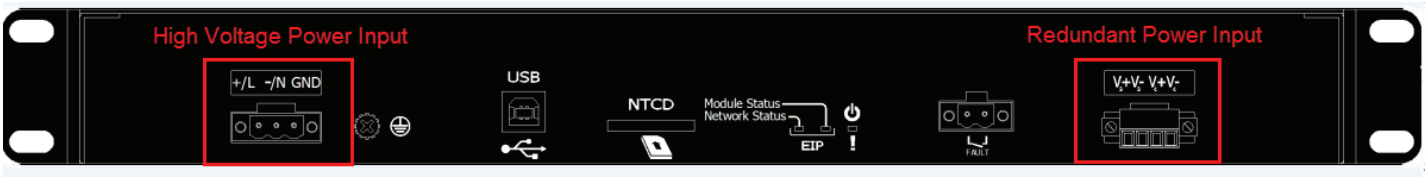
1. Ensure power from the power source is off.
2. Disconnect power and ground wires.
3. Disconnect any communications cables from the unit.
4. Insert a standard flat/slotted screwdriver into the slot provided on the DIN rail clip.
5. Using the base of the switch as a pivot point, apply upward force on the screwdriver to release the DIN rail clip.
6. With the DIN rail clip latching mechanism released, continue to rotate the switch upward and away from the panel.
7. Once the switch has been rotated upward, remove the screwdriver.
8. Carefully lift the switch upward and away from the DIN rail and panel.

Power Source

The NT24k-DR16 and NT24k-DR24 series operate with one power supply, either AC or DC.

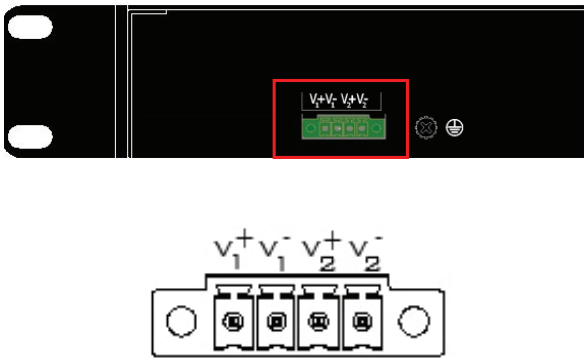
The Rack Mount NT24k® can be ordered with one or two power input options.

Each power supply can be AC or DC. Each low voltage DC Power supply includes redundancy (two DC supplies). The NT24k-AC1-DC1 model shown below comes with a high voltage power input on the left (90-264VAC / 90-300VDC) and a redundant 18-49VDC power input on the right.



Note: LEDs are described in detail in “LEDs”.

NT24k® Rack Mount with DC Power Input Installed

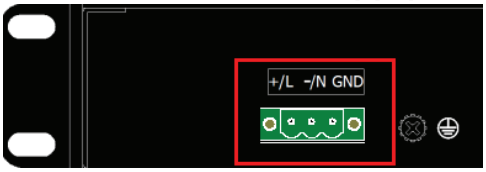


1. Unscrew and remove the DC voltage input plug from the power input header.
2. Install the DC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

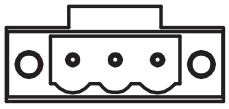
Note: When a DC power supply is installed, only one power supply must be connected to power for minimal operation. For redundant power operation, V1 and V2 inputs must be connected to separate DC voltage sources. This device will draw current from both sources simultaneously. Use 16-28 gauge wire when connecting to the power supply.

Recommended 24 VDC power supply, similar to Red Lion's P/N NTPS-24-3.

NT24k with AC Power Supply Installed



+/L -/N GND



1. Unscrew and remove the AC voltage input plug from the power input header.
2. Install the AC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

Note: When an AC power supply is installed (i.e. the -AC option), use 12-24 gauge wire when connecting to the power supply.

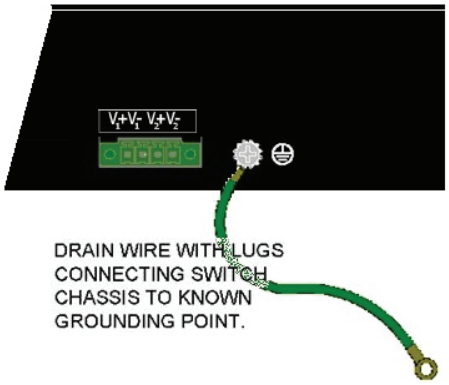
Grounding the Unit

The grounding of any control system is an integral part of the design. The optimum noise immunity and emissions are obtained when the NT24k® chassis is connected to earth ground via a 14-18 gauge drain wire. The NT24k units provide a ground lug (see illustration) that is used to provide a safe grounding path of the device. For the NT24k-AC power supplies, the chassis may also be connected to earth ground using the input power plug labeled “GND.”

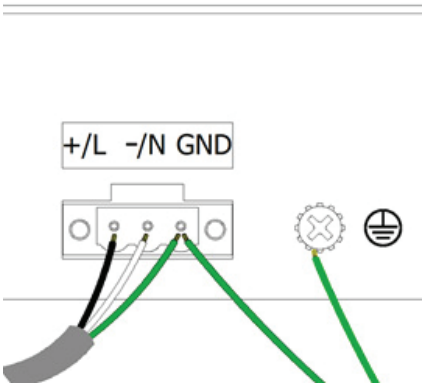
Note: The NT24k power input (V-) pins are isolated from chassis ground. Do not attempt to ground the switch to earth ground via the power input pins (V-).

Remarque: La NT24k puissance d’entrée (V-) broches sont isolés de la masse du châssis. Ne pas essayer pour mettre le commutateur à la terre via les broches d’entrée d’alimentation (V-).

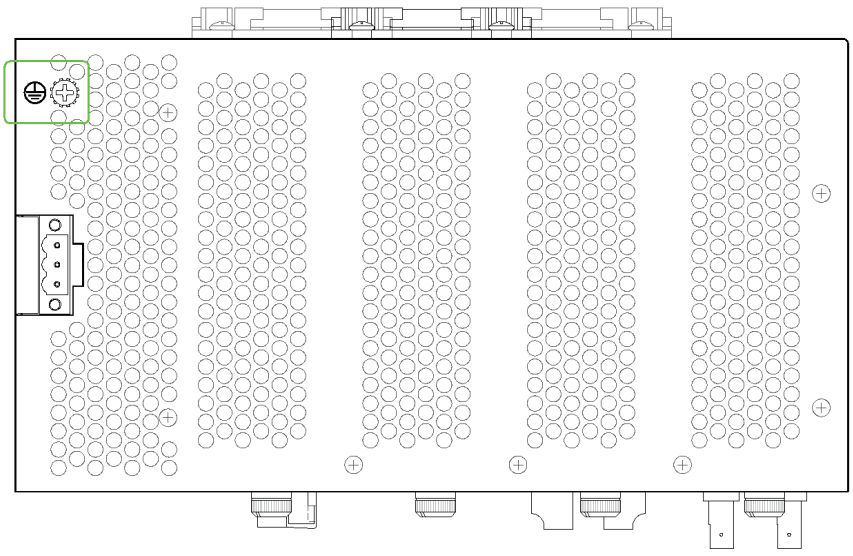
NT24k DC Power



NT24k AC Power



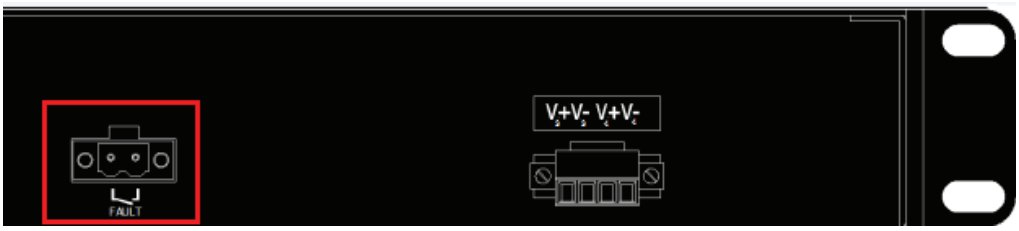
For the DIN rail models, see the illustration below for grounding:



Configurable Alarm Contact

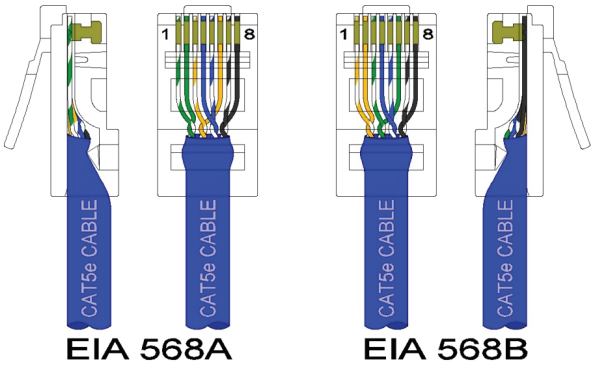
The alarm contact located on the back of the NT24k® rack mount unit or on the front of the NT24k-DR16 and NT24k-DR24 models, can be used to control an external warning device based on an event. The current carrying capacity is 1A at 24VDC. It is normally open and the relay closes when a fault condition occurs, though this can be reversed via configuration. These pins can be used to connect an external warning device such as a light in order to provide an external alarm. The conditions for generating a fault condition (closing the relay) can be configured through software.

Refer to the NT24k Software User's Guide for more information.



Connecting the Unit

For 10/100/1000/T(x) ports, plug a Category 5E twisted pair cable into the RJ45 connector. Connect the other end to the far end station. Verify that the LNK LEDs are ON once the connection has been completed. To connect any port to another device, use a standard CAT5E straight through or crossover cable with a minimum length of one meter and a maximum length of 100 meters.



Red Lion recommends the use of pre-manufactured CAT5E cables to ensure the best performance. If this is not an option and users must terminate their own ends on the CAT5E cables; one of the two color coded standards shown to the right should be utilized. If a user does not follow one of these standards then the performance and maximum cable distance will be reduced significantly, and may prevent the switch from establishing a link.

For FX/FXE/GX/GXE units, remove the dust cap from the fiber optic connectors and connect the fiber optic cables. The TX port on the FX/FXE/GX/GXE models should be connected to the RX port of the far end station. The RX port on the FX/FXE/GX/GXE versions should be connected to the TX port of the far end station.

⚠	**WARNING –** Creating a network loop without employing a network path protocol such as N-Ring™, N-Link, or RSTP is an illegal operation that can create a network storm which will crash the network. **Avertissement -** La création d'un réseau sans boucle employant un chemin réseau protocole tels que N-Ring, N-Link, ou RSTP est une opération illégale que peut créer une tempête du réseau qui va planter le réseau.

Ethernet Cable

If you are connecting to the unit via the copper port, you will need a straight or crossover cable with two 8-pin RJ45 connectors on each end.

To visually confirm that Ethernet cabling was done properly, check the LED indication on the Ethernet port of the unit. The link LED should be on when the correct cable is used.

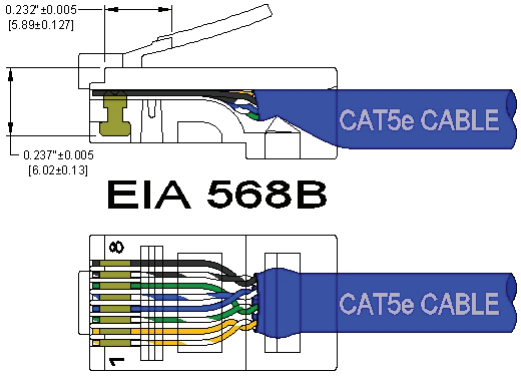
Note: A shielded cable is required to fully meet EMC standards.

When using shielded cables, it is generally recommended to only connect the shield at one end to prevent ground loops and interference with low level signals (i.e. thermocouples, RTD, etc.). CAT5e cables manufactured to EIA-568A or 568B specifications are required for use with Red Lion series switches.



In the event all CAT5e patch cables are short (i.e. All Ethernet devices are located in the same local cabinet and/or referenced to the same earth ground), it is permissible to use fully shielded cables terminated to chassis ground at both ends in systems avoid low level analog signals.

RJ45 Connector Crimp Specifications



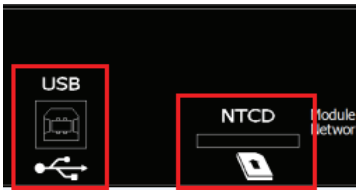
NTCD

NTCD-CFG Configuration Device

NTCD-CFG Configuration Device



Ideal for saving, or restoring switch configuration parameters quickly without the need for a computer or software. One configuration device per switch is recommended.



The USB configuration slot is located on the back of the NT24k® rackmount models and on the front of the NT24k-DR16 and NT24k-DR24 models.

The unit could be configured with multiple power supply configurations.

⚠	**WARNING – Explosion Hazard** – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion** - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

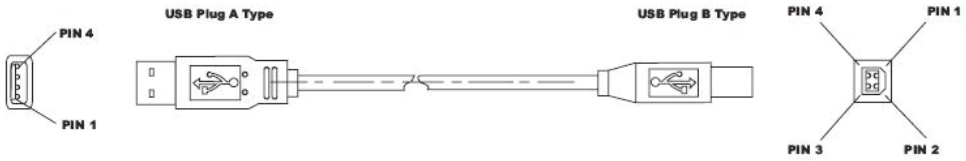
USB Interface

The NT24k switches provide a USB interface accessed via the USB connector labeled as "USB" on the back of the NT24k rackmount models and the front of the NT24k-DR16 and NT24k-DR24 models. The USB connection is used to access the Command Line Interpreter (CLI) or PPP (Point-to-Point Protocol).



USB Cable

Connect the USB port of your PC and the Switch using a standard USB cable. A cable with a Type A connector for the PC end, and a Type B connector for the switch end must be used.



Standard USB cables are readily available from a variety of computer stores.

Terminal

The following configuration should be used in HyperTerminal:

Port Settings: 115200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

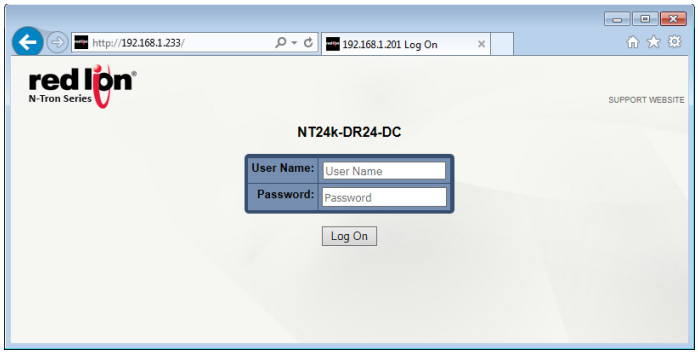
⚠	**WARNING – Explosion Hazard –** The USB connection is for temporary connection only. Do not use, connect, or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion -** La connection USB est pour la connexion temporaire seulement. Ne pas utiliser, connecter ou déconnecter sauf si la zone est connue pour être non dangereuse. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

Cleaning

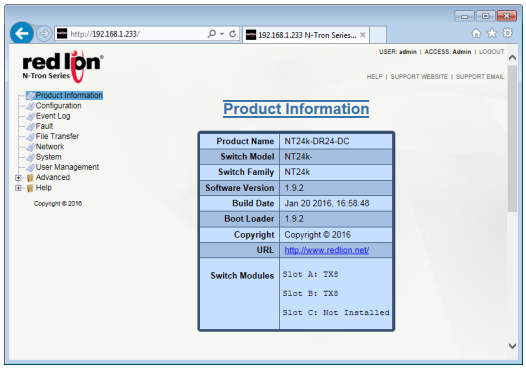
Clean only with a damp cloth. Excess moisture or harsh chemicals can cause damage to the unit.

Chapter 3 Accessing the Web Software Interface

1. Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default by entering 192.168.1.201 as the fallback address.
2. The following login screen will appear.



3. For the User Name, enter: **admin** (all lowercase).
4. For the Password, enter: **admin** (all lowercase).
   Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.
5. Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Please consult the NT24k® Software Guide for configuration options.

Service and Support Information

Service Information

We sincerely hope that you never experience a problem with any of our products. If you do need service, call Red Lion at 1-877-432-9908 for Technical Support. A trained specialist will help you determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RO (Repair Order) can be obtained on the Red Lion website.

Red Lion tracks the flow of returned material with our RO system to ensure speedy service. You must include this RO number on the outside of the box so that your return can be processed immediately.

Be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RO form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Repairs are completed as soon as possible. If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your Red Lion system for future reference.

P.O. #: _____ Date Purchased: _____
Purchased From: _____
Serial Number: _____

Product Support

Technical Support:
Inside US: +1 (877) 432-9908
Outside US: +1 (717) 767-6511
Support: support.redlion.net
Hours: 8:00 am to 6:00 pm EST

Red Lion Controls
35 Willow Springs Circle
York, PA 17406
Website: www.redlion.net

Ordering Information

NT24k® Rackmount

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC / 90-300 VDC power input
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC / 90-300 VDC power inputs
NT24K AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC / 90-300 VDC and 18-49 VDC power inputs
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR16

PART NUMBER	DESCRIPTION
NT24K-DR16-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; redundant 18-49 VDC power input
NT24K-DR16-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR24

PART NUMBER	DESCRIPTION
NT24K-DR24-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; redundant 18-49 VDC power input
NT24K-DR24-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

Port Modules

PART NUMBER	DESCRIPTION
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2 km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550 m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

SFP Transceivers

PART NUMBER	DESCRIPTION	MAXIMUM CAPACITY PER SWITCH	MODULE REQUIRED
NTSFP-FX	100 BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2 km)	Up to 24	NT24k-SFP-DM8
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP luggable mini-GBIC transceiver (LC style connector)	Up to 24	NT24k-SFP-DM8
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver	Up to 16	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

LIMITED WARRANTY

(a) Red Lion Controls Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

(d) **THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a).**

BY INSTALLING THIS PRODUCT, YOU AGREE TO THE TERMS OF THIS WARRANTY, AS WELL AS ALL OTHER DISCLAIMERS AND WARRANTIES IN THIS DOCUMENT.

N-Tron® Series
NT24k® Gigabit Ethernet Switches

Software Guide | February 2024

LP0991 | Revision H

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Website: www.redlion.net
Support: support.redlion.net

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Preface

Disclaimer

This software guide provides guidance on how to use the NT24k®. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

This guide is intended to be used by personnel responsible for configuring and commissioning NT24k devices for use in visualization, monitoring, and control applications. Users of this document are urged to heed warnings and cautions used throughout the document.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- EtherNet/IP™and CIP™ are trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Certifications

Red Lion Controls ensures that this device meets all the ODVA technology and standards guidelines for the Common Industrial Protocol (CIP) for industrial automation.

ODVA CONFORMANT

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at: https://www.redlion.net/support/documentation/user-manuals.

Additional Product Information

Additional product information can be obtained by contacting your local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Chapter 1 Security Best Practices

Introduction

It is more important than ever to secure network devices from unauthorized access, both within and outside of your organization. Red Lion strongly recommends installing managed layer-2 switches behind a secure network firewall in access controlled locations, and immediately changing all default user accounts and passwords, as well as disabling protocols that are not needed in your application.

Protocols and user names with their default passwords are listed in the table below.

PROTOCOLS/USERS	DEFAULT NAME	DEFAULT PASSWORD
User Login	admin	Admin
SNMPv3 User Authentication	initial	Authpass
SNMPv3 User Privacy	initial	Privpass
SNMP v1/v2	read community	Public
SNMP v1/v2	write community	Private
SNMP v1/v2	trap community	public

Some protocols and special devices are enabled by default for the best overall out of the box experience. However, if any in this group will not be used or needed in your network, then these should be disabled to prevent unexpected behavior, unauthorized access or usage. These protocols and special devices are listed in the table below:

PROTOCOLS OR SPECIAL DEVICES
CIP™
SNMP
NTCD
DHCP Client
RSTP
LLDP
N-View™

Managing Local and Remote Access Using 802.1X

Red Lion strongly recommends using 802.1X to manage local and remote access as a best practice for larger installations. 802.1X allows for the management of users, devices, profiles, certificates, and so forth from a single location which also provides a high degree of security.

Default Passwords

User Passwords

The NT24k® ships from the factory with a default ***admin*** user account. Red Lion strongly recommends creating a new user with administrative privileges and then deleting the default ***admin*** user before the unit is deployed.

At a minimum, the default password for the ***admin*** user should be changed.

SNMPv3 Users

The NT24k® ships from the factory with SNMP enabled and a default SNMPv3 user. If SNMP will be used, then Red Lion strongly recommends creating a new SNMPv3 user and then deleting the default ***initial*** SNMPv3 credentials. At a minimum, the default password for the ***default*** user should be changed.

It is strongly recommended that both authentication and privacy protocols are enabled for all v3 users. Setting the option to ***None*** for either protocol is discouraged.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

SNMP v1/v2 Community Names

The NT24k ships with default Community Names for SNMP v1/v2 operation. SNMP v1/v2 traffic per the standard is neither hashed nor encrypted. Therefore, it is Red Lion's recommendation that customers requiring SNMP use SNMPv3, which offers more secure SNMP communication.

If SNMP v1/v2 is required in your application, Red Lion strongly recommends changing the default SNMP credentials before deployment.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

Legacy Protocols

When multiple revisions of a protocol are supported, Red Lion enables the most secure version by default and disables legacy (unsecure) versions of the protocol. We strongly recommend leaving the older revisions disabled.

LEGACY PROTOCOL	SECURE PROTOCOL EQUIPMENT
HTTP	HTTPS
Telnet	SSH

Disabling Unused Protocols and Special Devices

Certain network protocols and special devices are enabled by default for the best overall out of the box experience. However, some of these protocols and devices have the capability of configuring and/or reading network settings or causing unexpected network behavior. These protocols and devices should be disabled when they are not being utilized in your network to prevent unexpected behavior, unauthorized access and/or control of your network and individual network devices.

The following protocols or special devices meet these criteria:

- CIP™
- SNMP
- NTCD (Configuration Device)
- DHCP Client
- RSTP
- LLDP
- N-View™

Chapter 2 Features and Specifications

NT24k® Series Common Features

Red Lion's N-Tron® Series NT24k all-Gigabit managed industrial Ethernet switches are available in rack or DIN-rail mountable configurations. The NT24k platform offers a wide array of port configurations, media types and Power over Ethernet Plus (PoE+) models including Fast Ethernet, Gigabit copper and fiber options. All NT24k switches are plug-and-play installable with Internet Group Management Protocol (IGMP) auto-configuration, media/port auto-detection and simple ring configuration, making the NT24k platform one of the easiest to deploy managed switches in the industry. Housed in rugged hardened enclosures, NT24k switches feature extended shock and vibration specifications, wide operating temperature ratings, and best-in-class ring technology.

Connectivity

The modular NT24k switches are available in 2 or 3 slot configurations. Port modules are hot-swappable. Available modules include 10/100/1000Base Copper, 100Base Fiber, 1000Base Fiber, Gigabit Small Form-factor Pluggable (SFP) Ports and Dual Mode (100Base/1000Base) SFP ports. Modules and SFP transceivers are sold separately. Please reference the N-Tron Series “NT24k Modular Series Hardware & Installation Manual” for available configuration options.

The compact series offers a wide variety of copper and fiber configurations, including all Gigabit copper, Gigabit fiber or SFP ports. IEEE 802.3af/at Power over Ethernet (PoE) models are also available. Please reference the N-Tron Series “NT24k Compact Industrial Managed Gigabit Ethernet Switches Hardware Manual” for more information.

Performance

NT24k-managed switches provide uncompromising performance in harsh environments, including network features like N-Ring™, Virtual Local Area Network (VLAN), Quality of Service (QoS), port mirroring, IGMP, Simple Network Time Protocol (SNTP) and Simple Network Management Protocol (SNMP). IEEE 1588v2 (Precision Time Protocol, or simply PTP) models are also available. Additionally, the NT24k offers IEEE 802.1X with RADIUS remote server authentication to ensure port security. These network management features provide best-in-class visibility, security, and uptime performance.

Environmental

The ultra-reliable NT24k switches are available in rackmount or DIN-rail mountable configurations with operating temperatures from -40 to 85°C. With UL Class I, Division 2 listing and CE certifications, these industrial switches are built to last in the most demanding and hazardous environments.

Monitoring

The N-View™ monitoring technology software provides 47 different status points on switch and port conditions and displays that information on any networked computer.

Security

The NT24k series provides a high level of security by utilizing IEEE 802.1X with RADIUS remote server authentication, MAC address based port security, Hyper Text Transfer Protocol Secure (HTTPS), Secure Shell or Secure Socket Shell (SSH), and SNMPv3 communication protocol to ensure the safest networks.

Refer to the NT24k Hardware Manuals for more information on our Modular and Compact Series.

Overview of Advanced Features

Mode of Operation

Each port on the switch can be configured to support different modes of operation as shown below:

Copper Ports:
- Half-Duplex
- Full-Duplex
- Auto-Negotiation

1000Base Copper or any Fiber Ports:
- Full-Duplex

Half-Duplex

In half-duplex mode, the CSMA/CD media access ports share a common transmission medium. To transmit, a port waits (defers) for a quiet period on the medium (that is, no other port is transmitting) and then sends the intended message in bit-serial form. If, after initiating a transmission, the message collides with that of another port, then each transmitting port intentionally transmits for an additional predefined period to ensure propagation of the collision throughout the system. The port remains silent for a random amount of time (back-off) before attempting to transmit again.

Full-Duplex

Full-duplex operation allows simultaneous communication between a pair of ports using point-to-point media (dedicated channel). Full-duplex operation does not require that transmitters defer, nor do they monitor or react to receive activity, as there is no contention for a shared medium in this mode.

However, a receiving endpoint may request that the transmitting endpoint pause transmission to prevent receive buffer overflow. When the receiving buffer capacity becomes sufficient again, the receiving endpoint will notify the transmitting endpoint that transmission may resume.

Auto-Negotiation

In Auto-Negotiation mode, the port/hardware detects the mode of operation of the port that it is connected to and sets its mode to match.

Port Mirroring

A Mirroring Port is a dedicated port that is configured to forward copies of Ethernet frames that are being sent or received from a monitored port. This is normally only used during troubleshooting and debug of the network. Under normal operation, Port Mirroring is disabled.

Port Trunking

Port Trunking is the ability to group network ports to increase the bandwidth between two machines (e.g., switch or any work station). This feature allows grouping of high-speed connectivity and provides a redundant connection between switches, so that a trunk can act as a single link between the switches.

Quality of Service (QoS)

QoS refers to resource reservation control mechanisms. QoS is the ability to provide different priorities to different applications, users, or data flows. QoS guarantees are important if the network capacity is insufficient, especially for real-time streaming multimedia applications such as Voice over IP, high resolution images, online games and IP-TV, since these often require fixed bit rate and are delay sensitive, and in networks where the capacity is a limited resource, for example in cellular data communication. In the absence of network congestion, QoS mechanisms are not required.

The QoS of an egressing frame can be set based on the three QoS mechanisms listed below:

1. IEEE 802.1p (Tagged QOS)

2. DSCP (differentiated services code points) (RFC 2474)
3. Port (Default Priority)

Virtual Local Area Network (VLAN)

The switch provides support for setting up tagged VLANs. A port may belong to any number of VLANs. The VLAN membership of an end device is determined by the VLAN(s) defined for the port to which the device is connected. If a device should move from one port to another, it loses its current VLAN membership and inherits that of its new port.

VLANs facilitate easy administration of logical groups of devices that can communicate as if they were physically on the same LAN. Traffic between VLANs is restricted unless the ports are explicitly configured as overlapping VLANs. Switches forward unicast, multicast, and broadcast traffic only on LAN segments that serve the VLAN to which the traffic belongs.

A default Virtual LAN (VID=1) exists so if a port is not a member of any other VLAN, it will default back to VLAN 1. This allows the switch to operate as a 'normal' switch when it is used in a network. A port may be automatically removed from the default VLAN when it is reconfigured to belong to another VLAN. By default, the switch will automatically remove a port from the default VLAN when it is reconfigured to another VLAN. See the VLAN configuration section in Chapter 2 for additional information.

If switch ports are configured to transmit and receive untagged frames, then their connected devices are able to communicate throughout the LAN. Using Tagged VLANs, the switch has the ability to take non-tagged packets in some ports, add a VLAN tag to the packet and send it out to tagged ports on the switch. VLANs can also be configured to accept tagged packets in tagged ports, strip the tags off the packets, and then send the packets back out to other untagged ports. This allows a network administrator to set up the switch to support devices on the network that do not support VLAN tagged packets. The administrator can also set up the ports to discard any packets that are tagged or to discard any packets that are untagged, based on a hybrid VLAN of both tagged and untagged ports and by using the VLAN Ingress Filter on the switch.

For each switch port there is one and only one PVID (port VLAN ID) setting. If an incoming frame is untagged and untagged frames are being accepted, then that frame will inherit the tag of the PVID value for that port. Subsequent switch routing and treatment will be in accordance with that VLAN switch map. By configuring PVIDs properly and configuring for all frames to exit untagged, the switch can achieve a 'port VLAN' configuration in which all frames in and out can be untagged, thus not requiring external devices to be VLAN cognizant.

To understand how a VLAN configuration will perform, first look at the port on which the frame enters the switch, then the VLAN ID (VID) (if the frame is tagged) or the PVID (if the frame is untagged). The VLAN defined by the VID or PVID defines a VLAN group with a membership of ports. This membership determines whether a port is included or excluded as to frame egress from the switch.

The NT24k® switch also has the ability to allow overlapping VLANs. Overlapping VLANs give the user the ability to have one or more ports share two or more VLAN groups. For more information and examples on how this could be implemented, refer to the 'VLAN Configuration Examples' in this document, and/or our website's technical documents.

Note: RSTP is only supported on one VLAN.

Rapid Spanning Tree Protocol (RSTP)

Rapid Spanning Tree Protocol as specified in IEEE 802.1D-2004, is supported. One Spanning Tree on one VLAN is supported. (RSTP supersedes the Spanning Tree Protocol (STP) described in IEEE 802.1D-1998.) RSTP establishes a simply connected active network topology from the arbitrarily connected bridges of a bridged network. Bridges effectively connect just the LANs to which their forwarding ports are attached. Ports that are in a blocking state do not forward frames. The bridges in the network exchange sufficient information to automatically derive a spanning tree.

RSTP provides quicker learning of network topology changes than the older STP. RSTP supports new and improved features such as the rapid transition of ports to the forwarding state. While STP transmits BPDUs (Bridge Protocol Data Units) from only the root bridge, RSTP transmits BPDUs from every bridge. RSTP inter-operates with older STP switches by falling back to STP when the older BPDUs are detected on bridge ports. The user can also manually configure bridge ports to use STP, if desired.

SNMP Traps

The NT24k® Series switch supports SNMP Trap Stations to which SNMP Traps will be sent. Four standard SNMP traps are supported: Link Status (Link Up / Link Down), Cold Start, Warm Start, and Authentication Errors. SNMP Traps are sent to all trap stations configured on a given switch when the corresponding trap is enabled.

IGMP Snooping

IGMP Snooping is enabled by default. The switch provides automatic (Plug and Play) IGMP configuration. IGMP snooping provides intelligent network support for multicast applications, reducing unneeded network traffic. IGMP Snooping is configured via the web console and if enabled, operates dynamically upon each power up. Also, there can be manual only or manual and dynamic operation. Note that “static multicast group address” can be used whether IGMP Snooping is enabled or not.

The Internet Group Management Protocol (IGMP) is a protocol that provides a way for a device to report its multicast group membership to adjacent 'routers'. In this case NT24k switches provide router-like functionality. Multicasting allows one computer to send content to multiple other computers that have identified themselves as interested in receiving the originating computer's content. Multicasting can be used to transmit only to an audience that has joined (and not left) a multicast group membership. IGMP version 2 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 2236. IGMP version 1 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 1112. The NT24k series supports v1 and v2.

IGMP Snooping will function dynamically without user intervention. If some of the devices in the LAN do not understand IGMP, then manual settings are provided to accommodate them.

N-Link

The purpose of N-Link is to provide a way to redundantly couple an N-Ring topology to another topology, typically another N-Ring topology. Each N-Link configuration requires 4 switches, two on each network. On the N-Ring network, one switch is the N-Link Master and an adjacent switch is the N-Link Slave. On the connected network, one switch is the N-Link Primary Coupler and another switch is the N-Link Standby Coupler.

N-Link monitors the link status of the Primary and Standby Coupler links. As long as the Primary Coupler link is healthy, N-Link forwards network traffic and the Standby Coupler link blocks network traffic. When a problem is detected on the Primary Coupler link, the Primary Coupler link blocks network traffic and the Standby Coupler forwards network traffic. While the N-Link Master and Slave are in communication via the Control link, only one Coupler link (Primary or Standby) forwards network traffic, while the other Coupler link blocks network traffic.

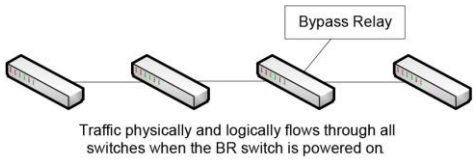
N-Ring™

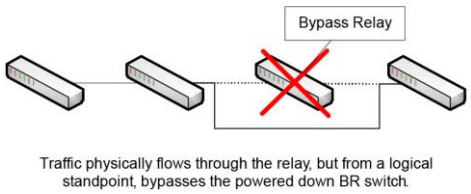
N-Ring is designed for easy setup. Switches are configured for N-Ring membership, by default. Setting a switch as the N-Ring Manager is the only required step for enabling the ring as long as preset ports are used to connect ring members. Subsequently, N-Ring operates dynamically upon each power up. N-Ring technology offers expanded ring size capacity, detailed fault diagnostics, and a standard healing time of 30ms. The N-Ring Manager periodically checks the health of the N-Ring via health check packets. If the N-Ring Manager stops receiving the health check packets, it times-out and converts the N-Ring to a

backbone within 30ms. When using all N-Ring enabled switches in the ring, a detailed ring map and fault location chart is also provided on the N-Ring Manager's web browser. N-Ring status is also sent from the N-Ring Manager to the N-View™ OLE for Process Control (OPC) Server to identify the health status of the ring. Up to 250 N-Ring enabled switches can participate in one N-Ring topology. Switches that do not have N-Ring capability may be used in an N-Ring, however the ring map and fault location chart cannot be as detailed at these locations.

Bypass Relay (BR)

BR ports have an internal hardware technology that forces paired BR ports to create a physical connection when the switch powers down. The BR switch is in bypass mode when it is powered down. This feature allows devices connected via these ports to continue communicating despite the BR switch being powered down.





Note: BR ports are only supported on select NT24k® models. BR-capable equipment is denoted by a "-R" in the model name. Likewise, BR capable ports are denoted by a "-R" in the port description.

Note: Some port protocols and port properties are not supported or may be affected by BR ports.

Affected Port Protocols

802.1X

802.1X security cannot be enabled on BR ports. Allowing this protocol on BR ports will lead to network security issues when the switch enters bypass mode. Therefore, 802.1X security is not allowed.

N-Link

N-Link Coupler and Control ports cannot be selected on BR ports. If BR ports were utilized for these links, there would be connection issues upon the switch entering bypass mode. It is also a best practice to ensure that neither the Master nor Slave Partner ports are connected to a BR port. Unlike the Coupler and Control ports, these ports are not user configured, but are auto-detected by the N-Link protocol. Use extra care when introducing BR equipment into an N-Link topology and avoid using BR ports for the N-Link connections.

N-Ring™

N-Ring Manager, Auto Member, and Multi Member cannot be enabled on BR port sets. N-Ring port sets exclude BR-capable ports.

RSTP

RSTP is disabled on BR ports to prevent unacceptable performance within an RSTP topology.

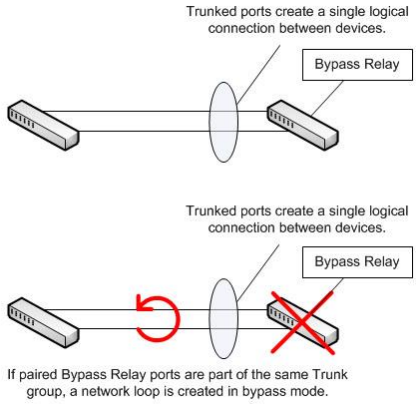
IGMP

Caution must be taken when IGMP is enabled. Devices connected to BR ports must be able to accommodate higher traffic rates. Test your network conditions with the BR switch both powered on and off if IGMP is to be enabled on a BR port.

Affected Port Properties

Port Trunking

BR port pairs cannot be members of the same trunk group to prevent a network loop being created in bypass mode.



VLAN

VLAN group membership must be identical between BR port pairs to ensure proper flow of traffic when the switch enters bypass mode. Caution must also be taken when modifying VLAN tags or filtering VLAN traffic on BR ports to ensure that all devices connected to BR ports can accommodate VLAN traffic whether the BR switch is powered on or powered off.

Note: The VLAN(s) associated with RSTP may contain BR ports, however RSTP will be disabled on the BR ports.

Port Compatibility

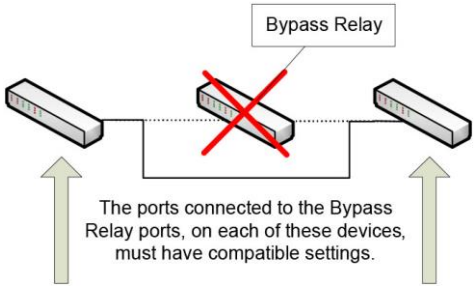
Care should be taken to ensure port characteristics of devices connected via BR ports are compatible, so that there are no interruptions in traffic when a BR switch enters bypass mode.

Ports and/or devices connected to the BR ports must be configured with compatible settings.

The following characteristics should be compatible for devices connected via BR ports:

- Auto-Negotiation
- Port Speed
- Duplex Mode
- Flow Control
- Flow Control
- PVID
- QoS
- Rate Limiting

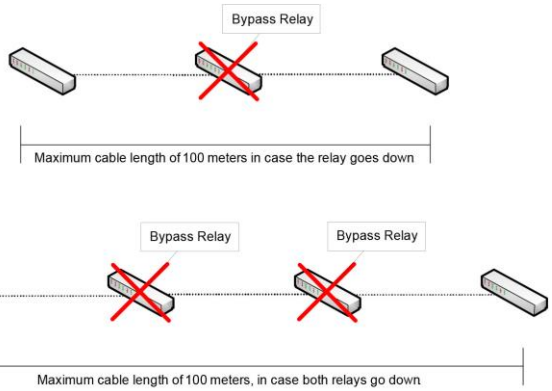
For example, if switches A and B are connected via a BR switch, the connecting port on switch A should have the same configured port speed as the connecting port on switch B. If these ports have incompatible speeds, they may have issues communicating once the switch enters bypass mode.



Note: It is still possible to customize port settings in any configuration desired, based on network requirements. Network testing must be performed to ensure correct network operation whether the switch is powered on or powered off.

Segment Length

Based on IEEE specifications, the maximum segment length for 10/100/1000BaseT(X) is 100 meters (328 ft). This requirement applies to combined segment lengths between all devices connected via BR port pairs. Staying within the IEEE specified segment length ensures proper operation.



CIP™

The CIP (Common Industrial Protocol) feature allows N-Tron® Series switches to directly provide switch information and configuration access to Programmable Logic Controller (PLC) and Human Machine Interface (HMI) applications via a standardized communication protocol. For example, a PLC may be programmed to monitor port links or N-Ring™ status and trigger a status indicator to turn red on an HMI if a port goes link down or if N-Ring has a fault. CIP is formally described in ODVA Publication Number PUB00001 (Volume 1: Common Industrial Protocol (CIP)), and Publication Number: PUB00002 (Volume 2: Ethernet/IP™ Adaptation of CIP). Red Lion created EDS and ICO files are provided with the NT24k® switch series.

Note: Information about using CIP with the NT24k can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family.

PTP

Precision Time Protocol (PTP), IEEE 1588v2, is supported on licensed NT24k models. PTP allows users to configure a network with very accurate, coordinated timing among devices. NT24k models with software implementations of PTP are capable of achieving accuracy in the low microseconds range. PTP is disabled by default and can be enabled as a Boundary or Transparent clock through the Web Browser interface. The switch must have a valid PTP license installed before PTP can be enabled.

Point-to-Point Protocol (PPP)

PPP allows a browser-like interface over the CLI port.

Dynamic Host Configuration Protocol (DHCP)

DHCP (Dynamic Host Configuration Protocol) simplifies network configuration by automatically assigning IP addresses from a DHCP server to connected DHCP capable devices (DHCP clients). NT24k® switch configuration options include:

- DHCP Server
- DHCP Relay Agent
- DHCP Client

DHCP Server

DHCP Server allows DHCP Client devices to automatically obtain an IP assignment. IP assignments can be set up as a dynamic range of IP addresses available to any client device; or specific IP addresses based on the client's Client ID (Option 61), or Relay Agent connection (Option 82). It also allows for a device on a specific port to receive a specific IP address and if the device is replaced, the replacement receives the same IP address as the original device.

DHCP Relay Agent

DHCP Relay Agent (Option 82) allows communication between the client and server to cross subnet and VLAN boundaries.

DHCP Client

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

Event Logging

The switch can be configured to log certain system events as they occur. Event Logging is enabled by default for critical events. Event log options are easily changed through a Web browser.

Even Logging includes:

- System startup and shutdown
- Logon and logout from the Web or Console
- Ports becoming enabled or disabled
- Port link up or link down changes
- N-Ring™ status changes

The most recent log information is visible via the web interface and the complete log file may be exported for external analysis.

Event Log Filter

The Event Log Filter enables the user to define which events are logged, based on severity level. Events that do not meet the minimum severity level for that component are not logged.

Syslog

The Syslog protocol, as specified in RFC-3164 and RFC-5424, are supported. The Syslog allows users to configure the switch so that certain system events (see Event Logging) are transmitted to a remote

logging device, known as a Syslog Collector. The Syslog is disabled by default but can be enabled/disabled through the Web Browser interface.

Local Security

The switch is configured for secure access by the SSH and HTTPS. The Telnet Server and Hypertext Transfer Protocol (HTTP) may be enabled to provide backwards compatibility with less secure clients.

Secure Shell

SSH, is a secure alternative to Telnet. A maximum of two concurrent SSH / Telnet connections are allowed.

The commands SFTP (SSH File Transfer Protocol or Secure File Transfer Protocol) and SCP (Secure Copy) are not supported.

Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the ports that the address is authorized on. A non-authorized MAC address will be discarded and will be listed in the intruder log.

Port security supports RSTP provided the MAC address(es) are manually authorized on the RSTP ports.

LLDP

The Link Layer Discovery Protocol (LLDP), as specified in IEEE 802.1AB and IEEE 802.3-2012, is used by networking devices to advertise there identity and capabilities and to discover their network neighbors. LLDP can be configured in one of three modes: Enabled, Auto and Disabled. The "Auto" mode is an enhancement to the LLDP protocol.

When in Auto mode, LLDP is inactive until a switch sends a wake up packet. At this point, all switches set to Auto mode will become active until the Wake Time interval expires.

Troubleshooting

1. Make sure the Power LED is ON.
2. Make sure sufficient current is supplied to the switch (per model specifications).
   Note: The Inrush current will exceed the steady state current by ~ 2X.
3. Verify that Link LEDs are ON for connected ports.
4. Verify integrity of cabling between stations.
5. Verify that cabling is Category 5E or greater for 100Mbit and Gigabit operation.

Chapter 3 Web Software Configuration

Accessing the Web Software Interface

Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default with 192.168.1.201 as the fallback address.

The following login screen will appear:



- For the User Name, enter: **admin** (all lowercase)
- For the password, enter: **admin** (all lowercase)

Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.

Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Organization

After logging onto a NT24k® switch, the Product Information page will be displayed. On the left-hand side of the screen is a list of configurable settings supported by the NT24k switch. Below is a list of these settings with a description of their purpose.



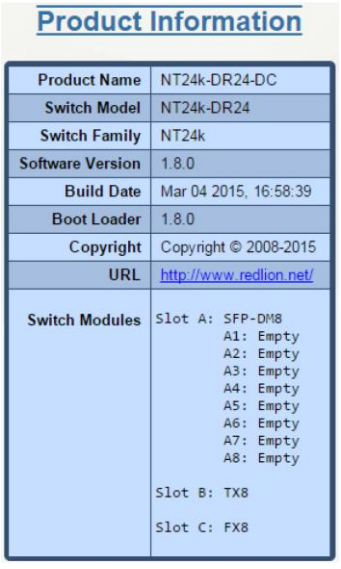
- **Product Information:** Basic information about the switch is provided in this menu.

- **Configuration:** The Configuration page is used to save or reset a running configuration.
- **Event Log:** The Event Log page is used for modifying and viewing the internal event logs.
- **Fault:** A fault is a notification of a destabilizing event. Which events are watched for and how notifications occur are configured on the Fault page.
- **File Transfer:** The File Transfer page provides the administrator the ability to upgrade the firmware or to import or export a configuration file, and export the Event Log to a file.
- **Network:** The network page is used to setup the device's IP and IP Fallback addresses, as well as Client ID and IP Configuration.
- **System:** The System page provides information pertaining to the whole system.
- **User Management:** The User Management page is used to view, add, modify and remove system user accounts, and set permissions.
- **Advanced:** The Advanced section is used to setup advanced features of the system.
- **Help:** The Help section is used to display information on configuring and monitoring the manageable parameters of the device. Specific help can be found by using the left navigation menu.

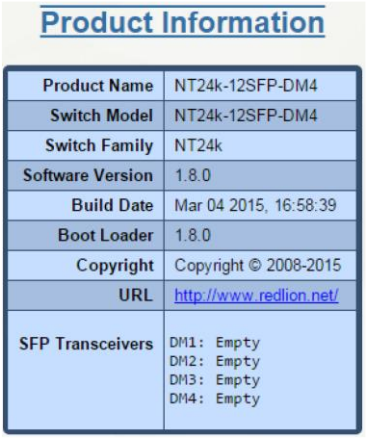
Product Information

Once a user logs onto an NT24k® switch, the Product Information page is displayed. This page shows basic information about the switch and can also be accessed by selecting the Product Information menu item on the left-hand menu.

Modular Models



Compact Series



Product Name: The full name of the switch, including any factory configured options will be displayed in this field.

For example, the product name will show NT24K-AC1 if there is one AC power unit in either location and NT24K-AC2 if there are two AC power units. If the product name ends with DC1 or DC2, this indicates that there is either one or two DC power units.

Switch Model: The base model of the switch.

Switch Family: The switch family this model and similar models belong to.

Software Version: The current firmware software version.

Build Date: The build date of the firmware.

Boot Loader: The boot loader version.

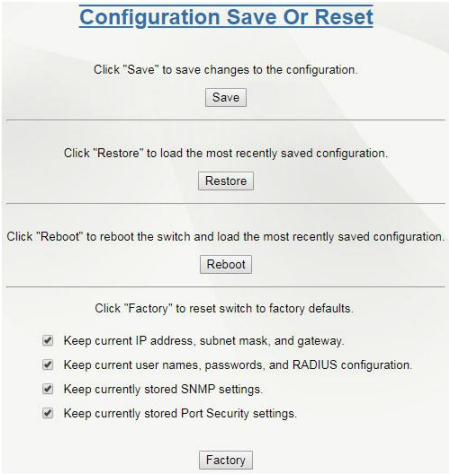
URL: This field links to Red Lion's website.

Switch Modules: The modules currently installed, including installed SFP transceivers. This option may not be present on models where modules or SFPs are not supported.

SFP Transceivers: On models where SFP transceivers are supported, the currently installed SFP transceivers will be shown in this field.

Configuration

The Configuration page allows the Administrator to save a running configuration in the switches non-volatile memory. This step is required if the switch is to remember any configuration changes after a power cycle or reboot. From this page, the Administrator can also restore a previously saved configuration, restore factory defaults or force a system reboot.



Save: Click on the *Save* button to save all current changes to the configuration stored in non-volatile memory for use after the next power cycle or reboot. If a configuration device is installed and enabled, the configuration will also be saved to the device. This option is only available when there is no misconfiguration.

Restore: Click on the *Restore* button to discard all unsaved changes and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Reboot: Click on the *Reboot* button to reboot the switch and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Factory: Click on the *Factory* button to reset the switch's configuration to factory defaults except for any of the selected items. Selecting the Factory option will only affect the current configuration. A *Save* must be performed in order to retain these changes after a power cycle or reboot.

- **Keep current IP address, subnet mask, and gateway:** Retains the existing IP address, subnet mask and gateway if desired.
- **Keep current user names, passwords, and RADIUS configuration:** Retain the existing user names, passwords, and RADIUS configuration if desired.

- **Keep currently stored SNMP settings:** Retains the existing SNMP settings if desired.
- **Keep currently stored Port Security settings:** Retain the existing Port Security settings if desired.
- **Keep current PoE Settings:** Retains the existing PoE settings if desired (PoE models only).

Note: When the configuration is loaded from the Configuration Device, it must be saved for it to be available if the Configuration Device is removed.

Note: When the switch is shipped, it does not have a "configuration file" since the unit is using the factory defaults. Before a configuration can be customized, click on the Save button in order to create the file.

Configuration Fault

When the switch is booted and misconfigured settings are detected, a Configuration Fault will be triggered and the configuration may not be saved. This can occur when updating system firmware where settings permitted in the previous release may no longer be permitted. In this case, the *Save* button will be replaced with a *Show Errors* button (as seen below) and the misconfigured settings must be fixed before the configuration may be saved.

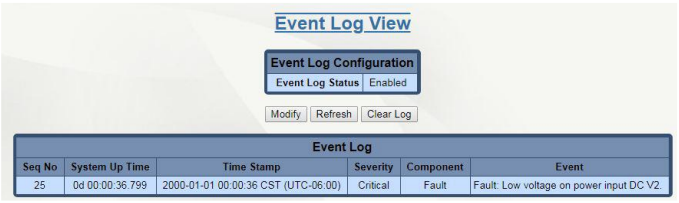


Show Errors: Click on the Show Errors button to view the current configuration and display any detected errors. This button is only visible when there is a settings misconfiguration.

Event Log

The Event Log View page displays the most recent 200 events that have occurred since the latest system startup or since the log was cleared. Event logging is enabled by default for critical events. Only events that occur while the Event Log was enabled will be displayed and saved with the exception of the Clear Log message which will always be displayed. Therefore, previously enabled events are still displayed when Event Logging is disabled albeit they may not be recent events.

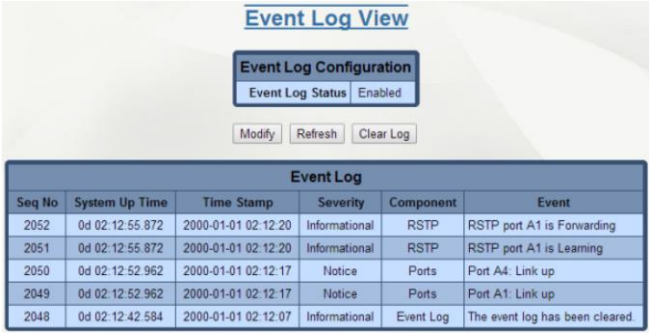
If the Event Log was disabled when the latest Startup event occurred, no events will be displayed as shown below.



When the Event Log is cleared, an informational event will be displayed.

Note: All enabled events since the last Clear Log event, including multiple Startup and Shutdown events, are stored on the system and may be exported as a CSV file from the switch for additional analysis.

Note: The event log can contain 2000 or more entries depending on individual message size. If the event log becomes full, new entries will overwrite the oldest entries.



A normal startup or reboot will show startup, RSTP status, N-Ring™ and logon events. An example reboot is shown below.

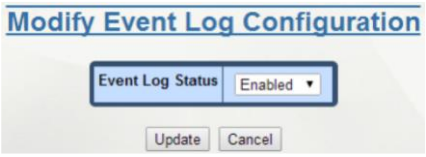


Modify: Display the Modify Event Log Configuration page.

Refresh: Refresh the current Event Log display.

Clear Log: Remove all entries from the event log and then add “The event log has been cleared.” message.

The Modify Event Log Configuration page controls whether Event Logging is Enabled or Disabled.

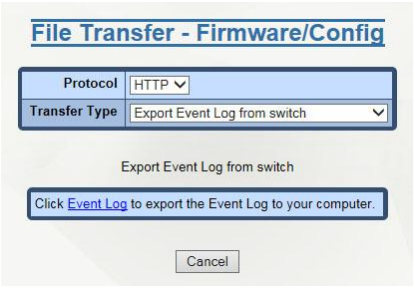


Event Log Status: Select Enabled/Disabled.

Update: Set the new Event Log Status.

Cancel: Return to Event Log View without modifying Event Log Status.

The entire Event Log may be exported to the host PC for further analysis and archiving purposes. It will contain all events that occurred while Event Log was enabled since the last Clear Log event.



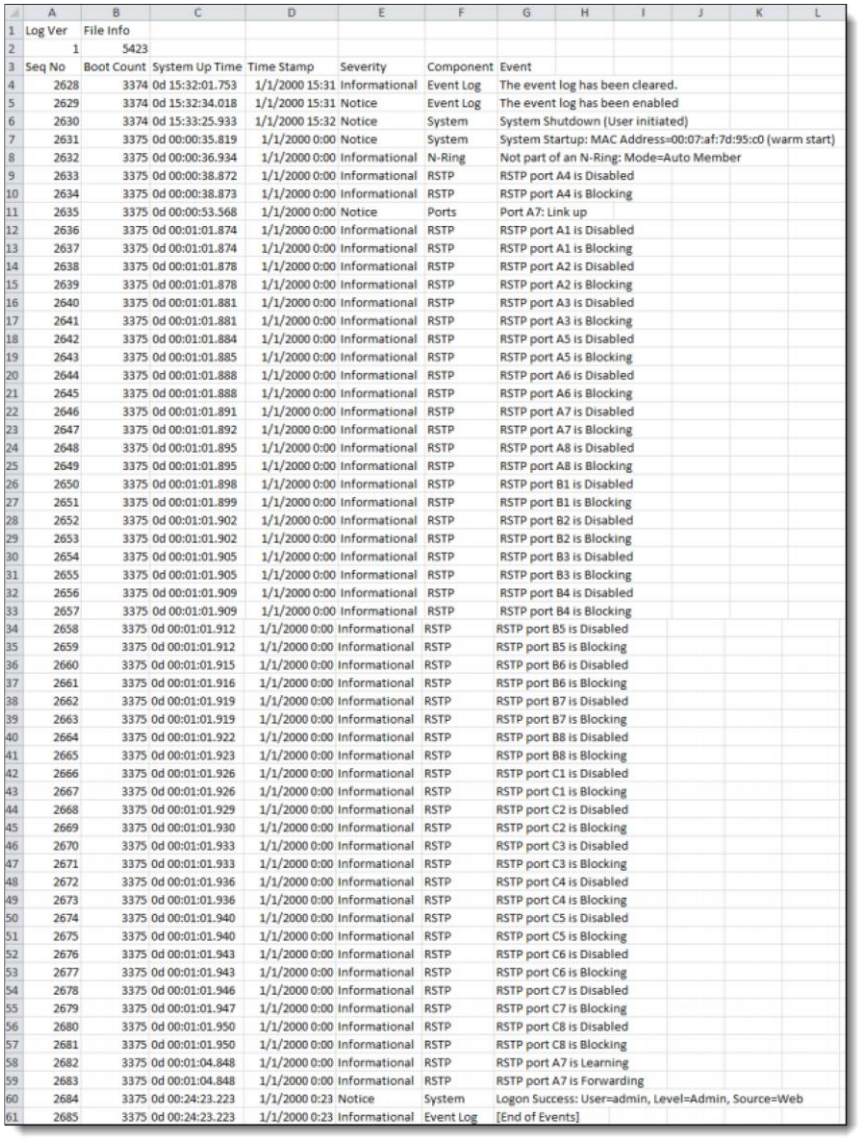
On the File Transfer - Firmware/Config page, select Transfer Type: Export Event Log from switch.

Click on Event Log in the Export Event Log from switch panel, and select the storage location for the exported file on the PC.

The default file name is “eventlog.csv”, which outputs each line in the Event Log as comma separated fields with the final text field surrounded by quotation marks. This file can be viewed with a spreadsheet application or a simple text file viewer.

The Cancel button selection will return to the Product Information page without executing any transfers.

Example Event Log CSV in Microsoft Excel:



	A	B	C	D	E	F	G
1	Log Ver	File Info					
2	1	5423					
3	Seq No	Boot Count	System Up Time	Time Stamp	Severity	Component	Event
4	2628	3374	0d 15:32:01.753	1/1/2000 15:31	Informational	Event Log	The event log has been cleared.
5	2629	3374	0d 15:32:34.018	1/1/2000 15:31	Notice	Event Log	The event log has been enabled
6	2630	3374	0d 15:33:25.933	1/1/2000 15:32	Notice	System	System Shutdown (User initiated)
7	2631	3375	0d 00:00:35.819	1/1/2000 0:00	Notice	System	System Startup: MAC Address=00:07:af:7d:95:c0 (warm start)
8	2632	3375	0d 00:00:36.934	1/1/2000 0:00	Informational	N-Ring	Not part of an N-Ring: Mode=Auto Member
9	2633	3375	0d 00:00:38.872	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Disabled
10	2634	3375	0d 00:00:38.873	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Blocking
11	2635	3375	0d 00:00:53.568	1/1/2000 0:00	Notice	Ports	Port A7: Link up
12	2636	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Disabled
13	2637	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Blocking
14	2638	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Disabled
15	2639	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Blocking
16	2640	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Disabled
17	2641	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Blocking
18	2642	3375	0d 00:01:01.884	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Disabled
19	2643	3375	0d 00:01:01.885	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Blocking
20	2644	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Disabled
21	2645	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Blocking
22	2646	3375	0d 00:01:01.891	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Disabled
23	2647	3375	0d 00:01:01.892	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Blocking
24	2648	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Disabled
25	2649	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Blocking
26	2650	3375	0d 00:01:01.898	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Disabled
27	2651	3375	0d 00:01:01.899	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Blocking
28	2652	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Disabled
29	2653	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Blocking
30	2654	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Disabled
31	2655	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Blocking
32	2656	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Disabled
33	2657	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Blocking
34	2658	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Disabled
35	2659	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Blocking
36	2660	3375	0d 00:01:01.915	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Disabled
37	2661	3375	0d 00:01:01.916	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Blocking
38	2662	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Disabled
39	2663	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Blocking
40	2664	3375	0d 00:01:01.922	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Disabled
41	2665	3375	0d 00:01:01.923	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Blocking
42	2666	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Disabled
43	2667	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Blocking
44	2668	3375	0d 00:01:01.929	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Disabled
45	2669	3375	0d 00:01:01.930	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Blocking
46	2670	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Disabled
47	2671	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Blocking
48	2672	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Disabled
49	2673	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Blocking
50	2674	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Disabled
51	2675	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Blocking
52	2676	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Disabled
53	2677	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Blocking
54	2678	3375	0d 00:01:01.946	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Disabled
55	2679	3375	0d 00:01:01.947	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Blocking
56	2680	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Disabled
57	2681	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Blocking
58	2682	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Learning
59	2683	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Forwarding
60	2684	3375	0d 00:24:23.223	1/1/2000 0:23	Notice	System	Logon Success: User=admin, Level=Admin, Source=Web
61	2685	3375	0d 00:24:23.223	1/1/2000 0:23	Informational	Event Log	[End of Events]

Where the fields are:

Sequence Number: Each entry is assigned the next sequence number – these may not always be listed in numerical order due to the priority of the internal tasks which generate the events.

Note: The "[End of Events]" message at the end of the file will contain the next sequence number, but that number will be reused for the next system event on the switch when it occurs.

Boot Count: A count of how many times the switch has been powered up or restarted.

System Up Time: The amount of time since the system was started in days, hours, minutes, seconds, milliseconds.

Time Stamp: Corresponding date, hours, minutes, seconds, based on the initial value of Current System Time as defined in the System Configuration View.

Severity: (most severe to least severe):

Emergency: Major failure, Immediate intervention required

Alert: Failure of a component, Immediate corrective steps should be taken
Critical: Partial failure of a component, Immediate corrective action should be taken
Error: Non-urgent failure
Warning: Not an error, but may lead to an error if action is not taken
Notice: Unusual event, but not an error
Informational: General Information
Debug: Information useful to a support technician for debugging the switch operation.

Component: Internal component that generated the event entry.

Event Description: Description of the event entry.

Fault

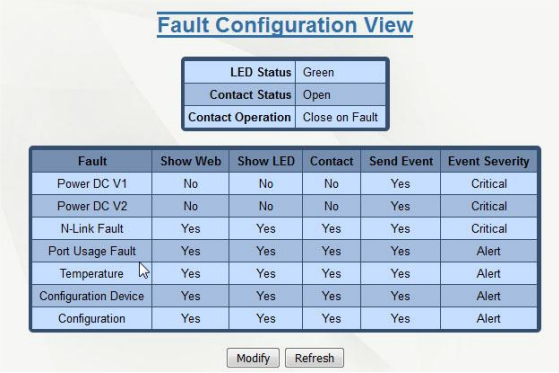
The Fault page provides configurable selections indicating the different ways to notify an administrator when a fault occurs. In each case, the notification may consist of any combination: Show Web, Show LED and/or Contact. Some fault configurations are only available under specific conditions. For example, Power AC is only available when an AC power supply is installed in the switch. N-Ring™ faults are only available when the switch is set to N-Ring Manager mode. The page below is an example of what may be seen on the Fault dialog window.

Additionally, when a fault is triggered, an event may be generated at the severity selected by the user. The event will be logged unless it is filtered by the Event Log Filter.

The event's severity can be set to any of the following values.

Note: These are based on the Event Log's Severity:

Emergency
Alert
Critical
Error
Warning
Notice
Informational
Debug



LED Status: This field shows the current color of the Power/Fault LED. Green indicates there is no fault and Red indicates a fault condition exists.

Contact Status: This field shows the current open/closed status of the fault relay.*

Contact Operation: This field determines if the fault relay is normally open (Close on Fault) or normally closed (Open on Fault).*

Show Web: If the *Show Web* option is enabled, the fault is displayed on the browser pages.

Show LED: If the *Show LED* option is enabled, the fault is indicated on the Power LED as red.

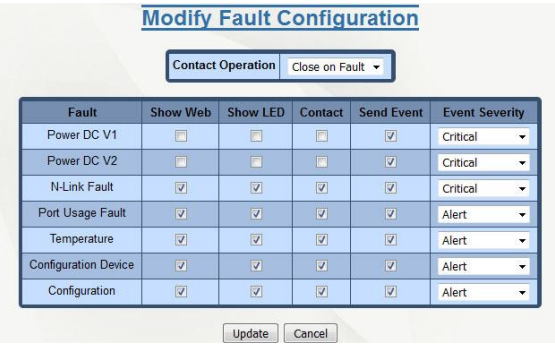
Contact: If *Contact* is enabled, the fault is indicated by opening or closing the contact switch.

Send Event: The fault is sent to the configured log(s). See the Event Log and Syslog configuration.

Event Severity: The fault will generate an event based on the configured severity level.

To make changes to the *Fault Configuration* settings, click on the *Modify* button.

* **Note:** Fault's contact is only supported on certain NT24k® switches.



Select the desired notification settings and click on the *Update* button to save any changes. Once the save is complete, the dialog window will change to Fault Configuration.

Power Fault Descriptions

The location of a power input is clearly marked on the device. Depending on the specific device configuration, some of the faults listed below may not be shown.

Note: Power Fault notifications are disabled in factory defaults on a low voltage power supply.

Power AC1: Indicates a low voltage on power input AC1.
Power AC2: Indicates a low voltage on power input AC2.
Power DC V1: Indicates a low voltage on power input DC V_1.
Power DC V2: Indicates a low voltage on power input DC V_2.
Power DC V3: Indicates a low voltage on power input DC V_3.
Power DC V4: Indicates a low voltage on power input DC V_4.

N-Ring™ Manager Fault Descriptions

The faults listed below appear when the switch is configured as an N-Ring manager.

N-Ring Broken: Indicates that an N-Ring connection is completely broken.
N-Ring Partial Break (High): Indicates that an N-Ring connection is only broken in the direction of the higher port.
N-Ring Partial Break (Low): Indicates than an N-Ring connection is only broken in the direction of the lower port.
N-Ring Multiple Managers: Indicates that more than one N-Ring Manager exists on an N-Ring.

Miscellaneous Fault Descriptions

N-Link Fault: Indicates a problem with the N-Link configuration.
Port Usage Fault: Indicates that the port usage, for one or more ports, is below the Usage Alarm Low setting, or above the Usage Alarm High setting (see Port Configuration View and Port Utilization View).
Temperature: Indicates that the temperature of the switch is outside of the configured limits.
Configuration Device: Indicates that the configuration on an installed configuration device is invalid.
Configuration: Indicates that a setting misconfiguration needs to be resolved.

File Transfer

File Transfer gives the administrator the ability to import files to the switch or export files from the switch.

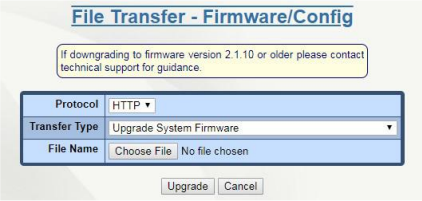
Note: Do not cycle power on the switch or interrupt the data connection between the PC and the switch while a file is being transferred.

Protocol: Select whether HTTP, HTTPS, or TFTP protocol is to be used for transfers.

Transfer Type: The different types of transfer that can be used are listed in the drop-down list. The options are: Upgrade System Firmware, Upgrade BootLoader Firmware, Import Configuration to Switch, Import Port Security Authorization List to Switch, Import License to Switch, Export Saved Configuration from Switch, Export Saved Port Security Authorization List from Switch, and Export Event Log from Switch.

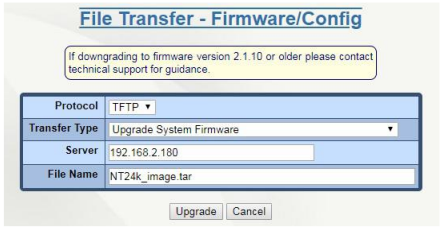
Upgrade System Firmware: Select this option to install the system firmware to the switch.

HTTP/HTTPS Protocol



File Name: Click on the *Browse* button to browse to the desired location and select an image file (typically called NT24k_image.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server. It is automatically populated with the IP address of the PC which is connected to the switch.
File Name: This field displays the name of the file to be imported (typically NT24k_image.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

WARNING: Due to security enhancements, downgrading the system firmware to 2.1.10 or older will reset all passwords to “password” (users and administrators). The Administrator should immediately change each user’s password and notify the user.

Upgrade BootLoader Firmware: Select this option to install the bootloader firmware.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select an image file (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



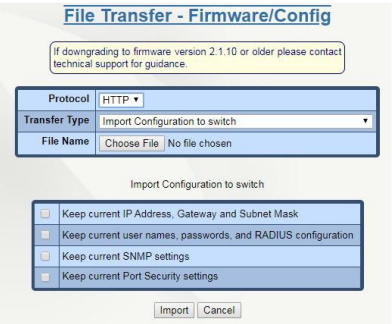
Server: This field displays the IP address of the TFTP server.
File Name: This field displays the name of the file to be imported (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

Import Configuration to Switch: Select this option to change the switch configuration by importing a configuration file.

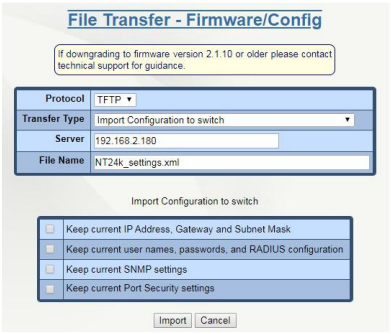
HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a configuration file (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

Import Port Security Authorization List to Switch: Select this option to change the Port Security Authorization List by importing a configuration file.

HTTP/HTTPS Protocol



File Name: Click on the Choose File button to browse to the desired location and select a configuration file (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

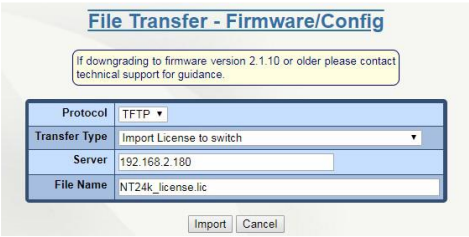
Import License to Switch: Select this option to install a license to the switch by importing a license file.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the license.

*The same file transfer dialog box is used for both HTTP and HTTPS.

Import Security Certificate to Switch:

HTTP/HTTPS Protocol



Certificate File Name: Click on the Choose File button to browse to the desired location and select a certificate file (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: Click on the Choose File button to browse to the desired location and select a key file (typically key.pem). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

Certificate File Name: This field displays the name of the file to be imported (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: This field displays the name of the file to be imported (typically key.pem). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the Security Certificate.
*The same file transfer dialog box is used for both HTTP and HTTPS.

Note: After successfully transferring a new Security Certificate to the switch, the switch must be rebooted.

Export Saved Configuration from Switch: Select Export Saved Configuration from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Configuration Settings* link to export the settings to your computer. This option allows administrators to back up their configurations to an offsite server in case a custom configuration must be reloaded at a later time.

A download dialog pop-up will appear, prompting the user to open or save the configuration file. The file is called *NT24k_settings.xml* per default.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_settings.xml). File names are limited to 63 characters maximum.

Click on the *Export* button to export the settings to the specified TFTP server.

Export Saved Port Security Authorization List from Switch: Select Export Saved Port Security Authorization List from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Port Security Authorization List* link to export the authorization list to your computer. This option allows administrators to back up their Port Security Authorization List.

A download dialog pop-up will appear, prompting the user to open or save the authorization file. The file is called *NT24k_portsecurity.auth* per default.

TFTP Protocol



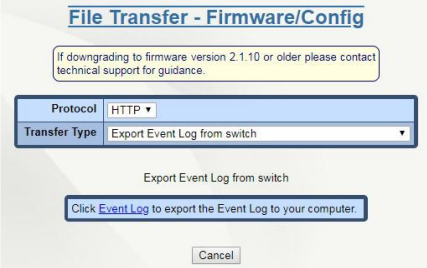
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_portsecurity.auth). File names are limited to 63 characters maximum.

Click on the *Export* button to export the configuration file to the specified TFTP server.

Export Event Log from switch: The entire Event Log may be exported to the host PC for further analysis and archiving purposes. The log file lists all events that occurred while event logging was enabled and since the last Clear Log event was performed.

HTTP/HTTPS Protocol



Click on the *Event Log* link to export the log file to your computer. A download dialog pop-up will appear, prompting the user to open or save the configuration file.

TFTP Protocol



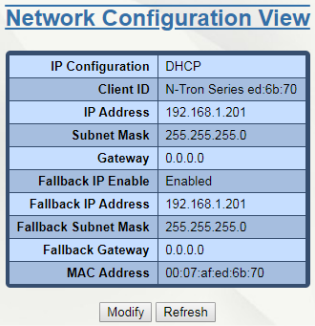
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically eventlog.csv). File names are limited to a maximum length of 63 characters.

Click on the *Export* button to export the log file to the specified TFTP server.

Network

Setting the IP Configuration to DHCP will use the Primary Management VLAN ports to receive an IP address from the DHCP Server. Changes to the Primary Management VLAN are made in the VLAN section. If no changes are made, the default VLAN will be used as the default Primary Management VLAN.



IP Configuration: Determines the method used to obtain an IP address, Subnet Mask, and Gateway address. When Static is selected, the statically configured values are used. When DHCP is selected, DHCP protocols are used to obtain these values.

Client ID: This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters. (Only shown in DHCP Mode) The DHCP option 61 client identifier will be sent with a preceding type-byte as listed below:

MAC Address = 0x01
Switch Name = 0x00 (Default)
Other String = 0x00
Other HEX = 0x00

IP Address: Contains the current IP Address of the device.

Subnet Mask: Contains the current Subnet Mask of the device.

Gateway: Contains the current Gateway of the device.

Fallback IP Enable: Enables/disables the use of the Fallback IP address.

Fallback IP Address: Contains the configured Fallback IP address of the device. This address will be used if the switch fails to obtain a DHCP address from the DHCP Server. This option is only shown in DHCP Mode and if Fallback IP is enabled.

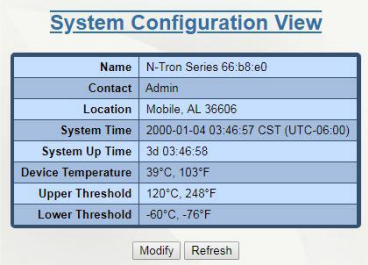
Fallback Subnet Mask: Contains the configured Fallback Subnet Mask of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

Fallback Gateway: Contains the configured Fallback Gateway of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

MAC Address: MAC Address of the device.

To modify any of the fields, click on Modify. Enter the desired system settings and click on the *Update* button.

System



The System page presents the user with current system information.

Name: Contains the name assigned to the device, which allows alphanumeric and special characters (,#_-:) only. When IP Configuration is DHCP, then this may be used as the Client ID (Option 61) of the DHCP Request.

Contact: The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters (,#_-) are allowed.

Location: The physical location of the switch. Only alphanumeric and special characters (,#_-) are allowed.

System Time: Displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start.

System Up Time: Parameter represents the total time elapsed since the switch was turned on or rebooted.

Device Temperature: The device temperature reported by the on-board digital temperature sensor. This option is only shown on devices with temperature sensors.

Upper Threshold: The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in degrees Celsius. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Lower Threshold: The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in Celsius degrees. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Power DC V1: The voltage measurement on power input DC V1. This option is only shown on devices with a voltage sensor.

Power DC V2: The voltage measurement on power input DC V2. This option is only shown on devices with a voltage sensor.

Total Current: The total input current measurement in Amps. This option is only shown on devices with a current sensor.

Total Power: The calculated power in Watts obtained from voltage and current measurements. This option is only shown on devices with a voltage and current sensor.

To make modifications to the fields above, click on the Modify button. Enter the desired settings and click on the *Update* button.

Bridging

Aging Time

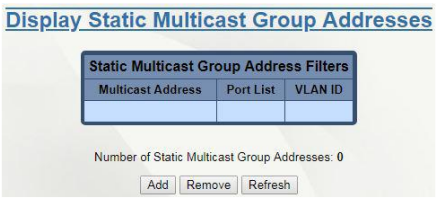
The Aging menu item under the Bridging category displays the currently configured Aging Time. This configurable field shows the desired aging time for dynamically learned MAC addresses. Inactive MAC addresses will be removed from the Hardware Address Entry Table after the aging time period has expired. The internal aging time period will be between 1 and 2 times the selected aging time value.



To modify the Aging Time field, click on the Modify button. Enter the desired Aging Time (value must be between 10 - 630 seconds) and click on the *Update* button. The default value for this field is 300 seconds. To save the changes made, return to the Configuration menu and click on the *Save* button.

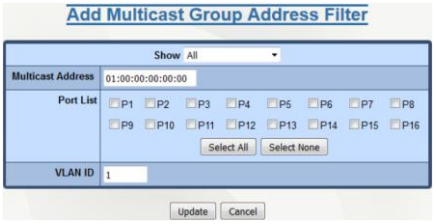
Multicast Addresses

The Multicast Addresses page displays a list of Multicast Group Addresses that are associated with respective port numbers.



Adding a Multicast Group Address

To add a Multicast Address, click on the Add button and the following dialog window will appear:



Enter a valid Multicast Group Address and VLAN ID, then select the port(s) to which matching packets will be directed.

Click on the *Update* button to return to the Display Static Multicast Group Addresses page.

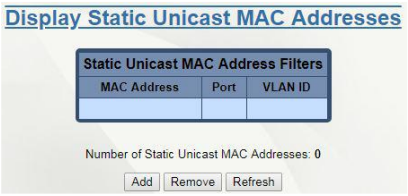
To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Multicast Group Address

To remove a Multicast Address, click on the *Remove* button. A listing of available Multicast Group Addresses will appear. Click on the *Delete* button to remove an address.

Unicast Addresses

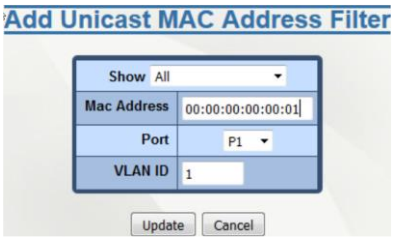
The Unicast Addresses dialog window displays a list of MAC addresses that are associated with each respective port number. This can be used to statically assign a MAC address access to a single port on the switch.



Adding a Unicast Address

To add a Unicast Address, click on the Add button and the following dialog window will appear:

Enter a valid MAC address and VLAN ID, then select the port to which matching packets will be directed.



Click on the Update button to add the unicast address and return to the Display Static Unicast MAC Addresses dialog window.

To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Unicast MAC Address

To remove a Unicast Address, click on the *Remove* button and a dialog window with a listing of available Unicast MAC Addresses will appear. Click on the *Delete* button to remove the MAC Address and return to the *Display Static Unicast MAC Addresses* dialog window.

CIP™

EtherNet/IP™, better known as the Common Industrial Protocol (CIP), was designed for use in process control and industrial automation applications. CIP was designed to provide consistent device access to eliminate the need for vendor specific software for configuration and monitoring of their devices.

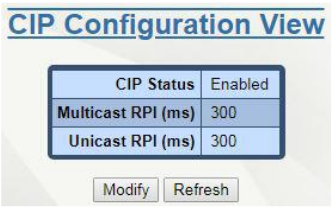
N-Tron® switches with CIP support can be used to communicate with other industrial devices.

Note: Information about using CIP with the NT24k® can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family. This manual can be found on the Red Lion website.

Configuration

The CIP Configuration View dialog window displays the CIP status as well as the Multicast and Unicast RPIs (Requested Packet Interval).

Click on the *Modify* button to make changes to the CIP Configuration:



CIP Status: This field determines whether CIP is enabled or disabled on the NT24k switch. The default setting is Enabled.

Multicast RPI: The minimum Requested Packet Interval for Class 1 (multicast) connections in milliseconds is shown in this field. Requests for less than this value will be rejected. The default value for this option is 300 ms. The available range is 300 - 300,000.

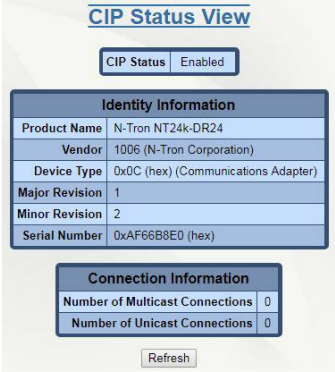
Unicast RPI: This field shows the minimum Request Packet Interval for Class 3 (unicast) connections in milliseconds. Requests for less than this value will be rejected. The default value for this field is 300ms. The available range is 300 - 300,000.

Click on the *Update* button once the desired information is entered and to return to the *CIP Configuration View* dialog window. To save the changes made, return to the Configuration menu and click on the *Save* button.

Status

The Status menu item displays the CIP status. The switch status and partner status information will be shown.

Example CIP™ Status View showing a Connection Summary table with one Multicast connection:



Identity Information

Product Name: This field displays the Switch Model Number.

Vendor: This field shows N-Tron®'s ODVA Ethernet/IP™ Vendor ID (1006).

Device Type: This field displays that the ODVA device type is Communications Adapter (0x0C hex).

Major Revision: This field displays the major revision of the CIP implementation.

Minor Revision: This field shows the minor revision of the CIP implementation.

Serial Number (hex): This field shows the CIP serial number, which is unique across all N-Tron CIP devices. The number shown is the last 4 octets of the base switch MAC address.

Connection Information

Number of Multicast Connections: This field shows the current number of CIP Ethernet/IP class 1 (multicast) connections.

Number of Unicast Connections: This field displays the current number of CIP Ethernet/IP class 3 (unicast) connections.

Connection Summary

Transport Class: This field displays the Transport class for the connection, such as class 1 (multicast) or class 3 (unicast).

Connection State: This field indicates the state of the connection (established, timed out, closing or configuring).

RPI: The field displays the Requested Packet Interval in milliseconds.

Config Assembly: This field shows the configuration assembly number.

Output Assembly: This field displays the Output assembly number (the assembly that is sent out from the switch).

Input Assembly: This field displays the input assembly number (the assembly that is received into the switch).

Peer Address: This field shows the peer IP address of the device connected to the switch.

EIP Indicators

The module status indicator shows the current status of the switch. The network status indicator shows the status of the EtherNet/IP™ network interface. These indicators are located on the back of the rack mount version of the switch or on the front of the CPU module on the DIN-Rail versions of the switch.

Module Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	No power	The switch is not powered up.
Steady Green	Device operational	The switch is operating normally.
Flashing Green	Standby	The switch has not been configured for CIP™ operations.
Flashing Red	Minor fault	A recoverable minor fault has occurred.
Steady Red	Major fault	A non-recoverable major fault has occurred.

Network Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	Not powered, no IP address	The switch is not powered up, or an IP address has not been configured.
Flashing Green	No connections	An IP address is configured, but no connections have been established.
Steady Green	Connected	A connection has been established
Flashing Red	Connection timeout	A connection has timed out.

DHCP Client Configuration

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

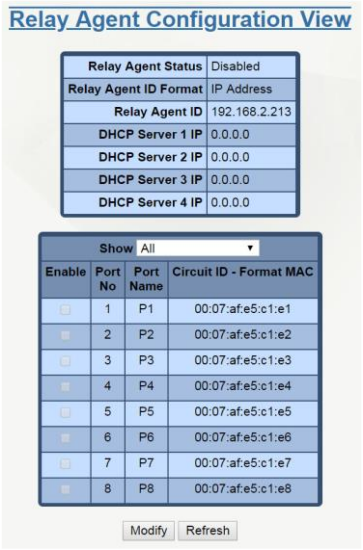
Refer to Network for enabling DHCP Client mode.

DHCP Relay Agent Configuration

A relay agent, configured via the Relay Agent Configuration View, provides a way for DHCP client requests to reach DHCP servers, including those that reside on a different subnet and/or VLAN.

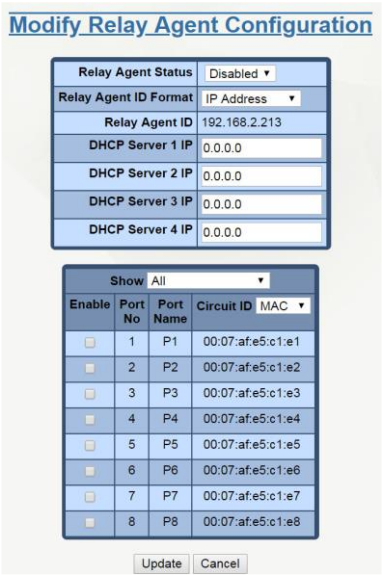
Note: DHCP traffic is sent and received only on Management VLANs.

View Page



Click on the *Modify* button to open the DHCP Server Configuration Modification page.

Modify Page



Click on the *Update* button to apply the changes.

Relay Agent Status: Indicates whether the DHCP relay agent is active. The default is Disabled.

Relay Agent ID Format: The format selector with options for IP address, MAC address, Client ID, Other String, or Other Hex characters.

Relay Agent ID: A unique identifier that designates this relay agent switch.

DHCP Server 1-4 IP: The configured IP address of the DHCP servers.

Enable: Indicates whether relay agent functionality is enabled for the port.

Port No: The number of the port. This field is read-only.

Port Name: The descriptive name of the port. This field is read-only.

Circuit ID: When enabled, the Circuit ID for the port can be specified. By default, the Circuit ID is set to the MAC Address of the port. Circuit IDs must be unique for each port.

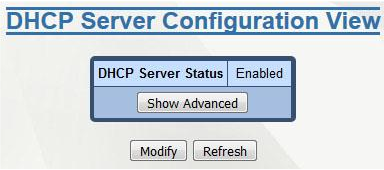
Circuit ID Format: The format selector with options for MAC, Hex, and String.

DHCP Server Configuration

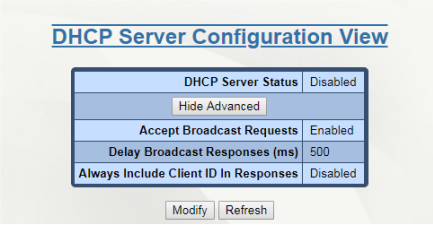
The DHCP Server provides IP addresses to DHCP clients on the same subnet or VLAN. DHCP traffic is sent and received only on Management LANs.

Note: A DHCP Relay Agent is required, to provide an IP address to clients on a different subnet or VLAN.

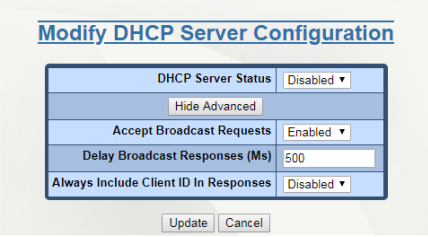
The following screen shows the Advanced configuration hidden:



The following screen shows the Advanced configuration unhidden:



Click on the *Modify* button to open the DHCP Server Configuration Modification page.
Click on the *Update* button to apply the changes.



DHCP Server Status: Indicates whether the DHCP server is active. The default is Disabled.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Accept Broadcast Requests: Indicates whether the DHCP server will process broadcast messages. Typically, client requests are broadcast and relay agent requests are unicast. When enabled, the server will respond to broadcast requests. When disabled, the server will ignore broadcast requests. The default is Enabled.

Delay Broadcast Responses (Ms): The amount of time (in milliseconds) that the DHCP server will delay the processing of a broadcast message. This setting is used when clients and relay agents are on the same subnet and/or VLAN. A delay provides the opportunity for relay agent requests to be honored before client requests. This setting only applies when Allow Broadcast is Enabled. The range is 0-2500 and the default is 500.

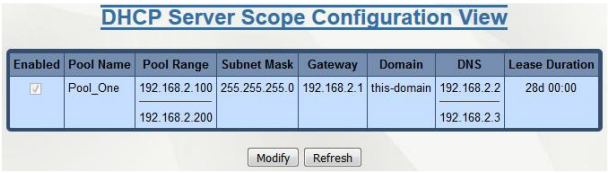
Always Include Client ID In Responses: Indicates whether the DHCP Server will always respond to the client with the Client ID in the frame. This should be disabled for a network that is non-compliant to the RFC- 6842(2013). The default is Disabled.

DHCP Server Scope Configuration

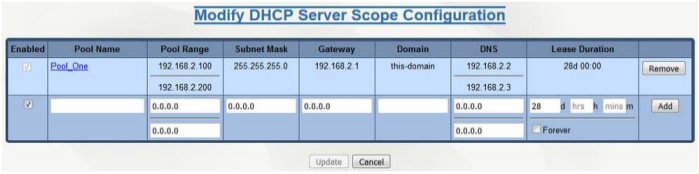
Scope Configuration Pools

The DHCP Server Scope Configuration contains vital network configuration options, called scope configuration pools, for potential clients. At least one scope configuration pool is necessary to create static assignments.

View Page



Modify Page



On the Modify page, the last column contains various buttons. The *Remove* button removes the corresponding scope configuration pool along with all static assignment and bindings associated with the pool. The *Add* button is used to add a new scope configuration pool.

Click on the *Add* button to add the new scope.
Click on the *Remove* button to remove an existing or new scope.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled.

Pool Name: Descriptive name of the scope configuration pool. This field is required and must be unique.

Pool Range: Starting and ending IP addresses for the pool of addresses.

Subnet Mask: The subnet mask for the IP address pool.

Gateway: The gateway IP address offered to the client. This field is optional.

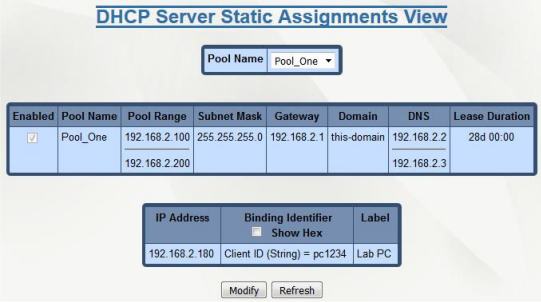
Domain: The domain name offered to the client. This field is optional.

DNS: The DNS server IP addresses offered to the client. These fields are optional.

Lease Duration: The lease time (in days, hours and minutes) offered to the client. The range is 1 minute to 1000 days. The default is 28 days. If the Forever checkbox is checked, the lease does not expire.

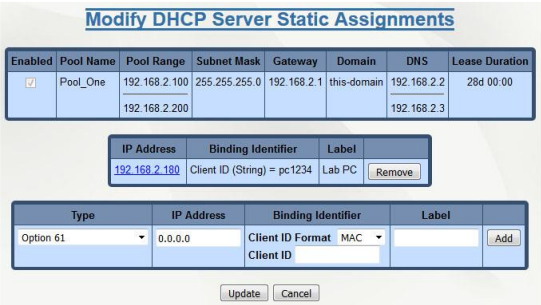
DHCP Server Static Assignments

View Page



Select the Pool Name drop-down list to filter on a specified pool.
Click on the *Modify* button to open the Modify DHCP Server Static Assignments page.

Modify Page



Click on the IP address hyperlink to modify the corresponding static assignment.
Click on the *Add* button to add the new static assignment.
Click on the *Remove* button to remove an existing or new static assignment.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled. This field is read-only.

Pool Name: Descriptive name of the scope configuration pool. This field is read-only.

Pool Range: Starting and ending IP addresses of a pool of addresses. This field is read-only.

Subnet Mask: The subnet mask offered to the client. This field is read-only.

Gateway: The gateway IP address offered to the client. This field is read-only.

Domain: The domain name offered to the client. This field is read-only.

DNS: The DNS server IP addresses offered to the client. This field is read-only.

Lease Duration: The lease time (in days, hours and minutes) that will be offered to a client. This field is read-only.

Type: The type of binding identifier for the static assignment. The options are Option 61 and Relay Agent (Option 82).

IP Address: The static IP address offered to the DHCP client.

Binding Identifier: The binding identifier of the static IP address assignment. For Option 61, the binding identifier requires a Client ID, the identifier of the desired client. The identifier formats are MAC, HEX, and String. A type-byte is assumed to precede the identifier and does not have to be entered here. The type-byte value is assumed to be as follows:

MAC = 0x01
String = 0x00
HEX = 0x00

For Option 82, the binding identifier requires a Remote Agent ID and Circuit ID. These identifiers must match the relay agent's Remote ID and Circuit ID. The identifier formats are IP (for a Remote ID), MAC, Hex, and String.

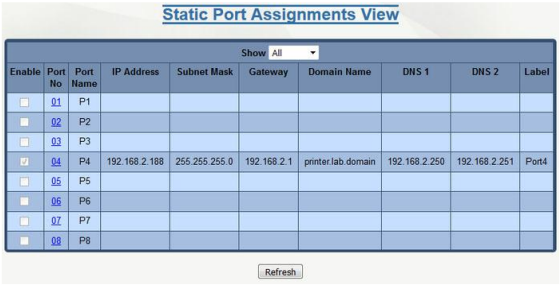
Label: The descriptive name of the static assignment. The field is optional.

DHCP Static Port Assignments

When a static port assignment is enabled on the port, the port will act as a DHCP server and provide a static IP address to the client connected to the port.

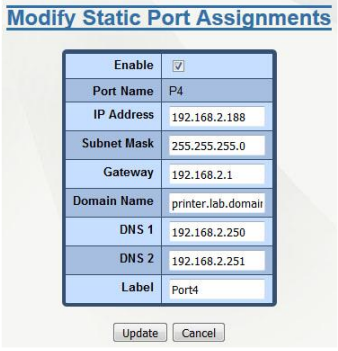
Note: Only one DHCP client can be connected per port.

View Page



Select the Show drop-down list to show only enabled ports or all ports. Click on the port number hyperlink to modify the port's static port assignment.

Modify Page



Click on the *Update* button to apply the changes.

Enable: Indicates whether Static Port Assignment is enabled on the port.

Port No: The number of the port.

Port Name: The descriptive name of the port. This field is read-only.

IP Address: The IP address offer to the DHCP client connected to the port.

Subnet Mask: The subnet mask offer to the DHCP client connected to the port.

Gateway: The gateway offer to the DHCP client connected to the port.

Domain Name: The domain name offer to the DHCP client connected to the port. The field is optional.

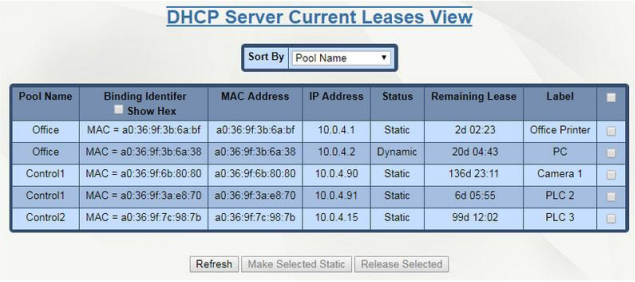
DNS 1: The primary DNS offer to the DHCP client connected to the port. The field is optional.

DNS 2: The secondary DNS offer to the DHCP client connected to the port. The field is optional.

Label: The descriptive name of the DHCP client connected to the port. The field is optional.

DHCP Server Current Leases

The Current Leases table shows the IP addresses that have been leased, or offered, to devices.



Sort By: Sort the current leases by Pool Name, Binding Identifier, MAC Address, IP Address, Status, Remaining Lease, or Label.

Pool Name: The pool from which the lease was obtained.

Binding Identifier: The client associated with the lease entry. If Show Hex checkbox is checked, then detailed hex data about the Binding Identifier is displayed.

MAC Address: Indicates the MAC address of the client associated with the lease.

IP Address: Indicates the IP address assigned to the lease entry.

Status: Indicates the current status of the lease entry.

- Dynamic = Assigned dynamic IP.
- Static = Assigned static IP.

Remaining Lease: The client's remaining lease time.

Label: The descriptive name of the client.

Check Box: Click the individual checkbox to either make the clients static or release its lease.

Note: Only clients with a dynamic lease can be made static.

Make Selected Static: Make the selected client dynamic IP address static.

Release Selected: Release selected client lease.

Event Notification

Event Notification is a combination of features that deal with filtering and routing system and fault events to different destinations.

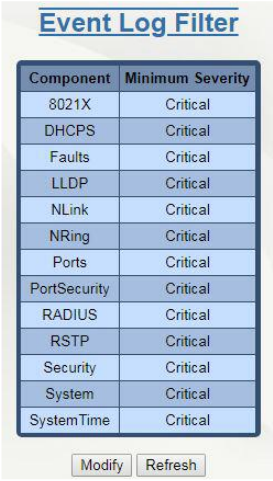
Event Log Filter

The Event Log Filter allows the user to define which events will be logged based on the severity level of the event.

Note: The event log is enabled by default for critical events.

Event Log Filter View

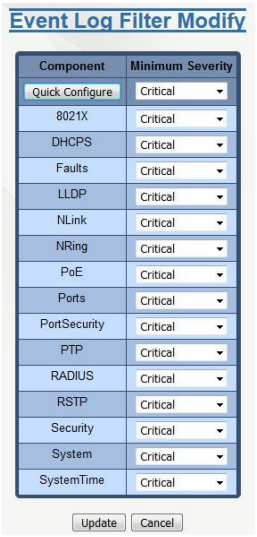
The Event Log Filter page displays the current minimum severity settings for each component. Events below the minimum severity level will not be logged.



Click on the Modify button to make changes to the Event Log Filter.

Event Log Filter Modify

The Event Log Filter configuration can be changed by clicking on the Modify button.



Quick Configure: Use Quick Configure to change all components to the same severity level.

Component: The feature, protocol, or system service of the switch that generates events. The component list is model dependent.

Minimum Severity: Events below the minimum severity level will not be logged. A severity of None will disable events for that component. For more information, see Severity under the section Event Log.

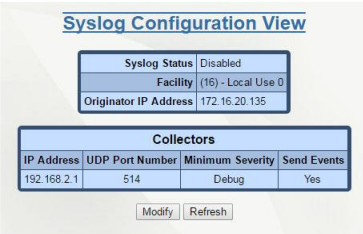
Syslog

The Syslog feature allows certain system events (see Event Log) to be sent as messages to remote hosts for monitoring and analysis.

The messages can be sent to up to 5 different remote hosts, known as Syslog Collectors. A minimum severity level is associated with each Syslog Collector. Events below the minimum severity level will not be sent out from the switch. Syslog is disabled by default and can be enabled through the Web Browser interface.

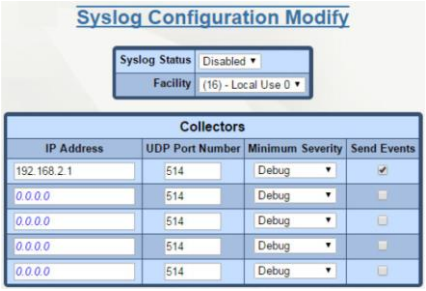
Syslog Configuration View

The Syslog Configuration View is accessible under Event Notification within the Advanced section. Below is an example of the current configuration status of Syslog, the configuration of each Syslog Collector, and a list of the Syslog Collectors.



Syslog Configuration Modify

The Syslog configuration may be changed by an admin level user by clicking on the Modify button. In this section the settings of each Syslog Collector can be updated and the Syslog Distributor itself can be disabled or enabled.



Syslog Status: This field indicates whether the Syslog Distributor (client) has been enabled or disabled. To enable Syslog at least one Syslog Collector (server) must be specified.

Facility: This is used to identify which process is logging the message. This is a global setting for the switch and will be used for all messages. Available Facility values as defined per RFC-5424 are 1 (user level) and 16 - 23 (local use).

Originator IP Address: The field displays the configured IP address of the switch.

Collector: The Syslog server to which the messages are sent.

IP Address: The IP address of the Collector (server) to receive a log message.

UDP Port Number: The UDP port on the Collector (server) to receive the message. The default port number is 514, per RFC-5424, but can be changed to meet installation requirements. Allowed port numbers are 1 - 65535.

Minimum Severity: The minimum Severity level of the messages that will be sent to the specified Collector (server). Values range from Debug (7) to Emergency (0). For example, a Collector configured with a value of Warning (4) will receive all messages from 4 to 0. The importance of a message increases with a lower severity level setting value. These are the same Severity level setting values as the Event Log and Event Log Filter. For more information, see Severity under the section Event Log.

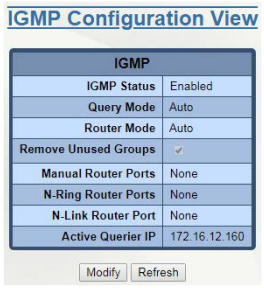
Send Events: This setting can be enabled or disabled, per Collector, to control the distribution of Event Log messages.

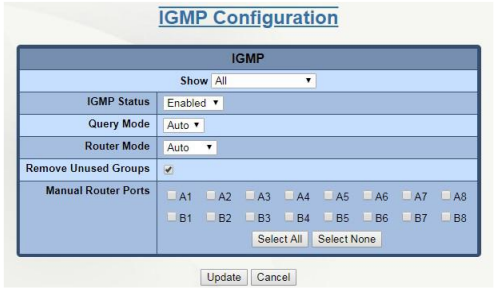
IGMP

Configuration

The Configuration dialog window displays the IGMP basic configuration settings. If an active N-Ring™ participant, the ring ports are informatively shown as N-Ring router ports. On an N-Link Master, Slave or Coupler switch, the coupler port is shown as an N-Link router port.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).





IGMP Status: This field indicates whether the IGMP is enabled or disabled. The default value for this field is *Enabled*.

Query Mode: The default value for this option is Auto. Available options are:

Auto: Multiple switches will ensure that only one switch is the active querier.
On: This switch is always an active querier.
Off: This switch never queries.

Router Mode: The available options for this field are:

Auto: This option allows for dynamically detected and manually set router ports. This is the default value.
None: This option allows for no router ports.
Manual: This option allows for manually set router ports.

Remove Unused Groups: If this option is checked, unused IGMP Groups will be removed and traffic with those multicast addresses will be treated as normal multicast. If this option is unchecked, unused IGMP Groups will remain and traffic with those multicast addresses will be limited. The default value for this field is checked.

Note: IGMP Groups are not retained through a power cycle.

Manual Router Ports: Manually specify the used ports.

N-Ring™ Router Ports: This field displays the N-Ring ports designated as active IGMP Router ports.

N-Link Router Port: This field indicates the N-Link ports that have been designated as active IGMP Router ports.

Active Querier IP: This field shows the IP address of the Active Querier.

Click on the *Modify* button to make changes to the IGMP Status, Query Mode, Router Mode and Manual Router Ports.

Groups

The Groups dialog window displays a list of IGMP groups based on the Group IP and the port that it is associated with.



Total Number of Active IP Group Memberships: The total number of active group IP memberships based on the dotted quad view (aaa.bbb.ccc.ddd) counting each joined port are displayed here.

Group IP: This field shows the dynamically created multicast group IP address.

Port Name: The descriptive name of the port is shown here.

VLAN ID: This field indicates the VLAN in which the Group IP is assigned. The available range is 1-4094.

RFilter Ports

From the RFilter (Router Multicast Data Filter) option, the user can choose whether or not data frames with known group multicast addresses are sent to the router ports. Control packets will be sent to the router(s) regardless of this setting.



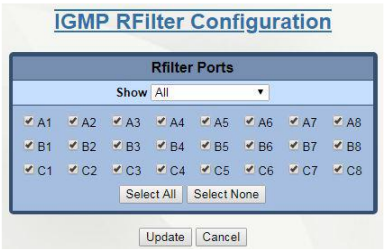
Known group multicast addresses are learned from dynamic IGMP Snooping operations. If IGMP is enabled and a port is a router port, then having RFilter enabled will stop IGMP group data from egressing on the port unless a join to that specific IGMP group has come into the port. IGMP controls (Join, Leave, Query) are still sent.

The Router Multicast Data Filter is enabled for all ports by default. Router ports do not get data frames with known multicast destination addresses unless a join for that specific multicast address has been received on that port. Join overrides an RFilter.

If RFilter is disabled, the router ports get data frames with known multicast destination addresses.

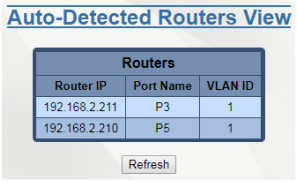
RFilter can be set for individual ports: any, all or none. For each port, RFilter will have an impact only if that port is manually or dynamically chosen as a router port.

Click on the *Modify* button to make changes to the IGMP RFilter Configuration. The following dialog window will appear:



From this dialog window, the administrator selects which ports to identify as RFilter ports and can view all possible ports (Modules), currently installed ports or currently linked up ports. Click on the *Update* button when done with required changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Routers



The Routers dialog window displays a list of the following:

Router IP: Auto-detected router IP address.

Port Name: The descriptive name of the port.

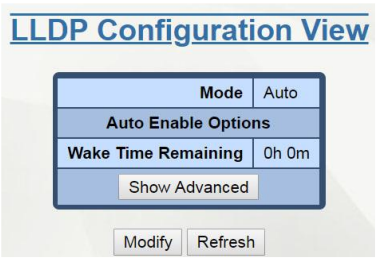
VLAN ID: VLAN in which the Router IP is assigned. The range is 1 - 4094.

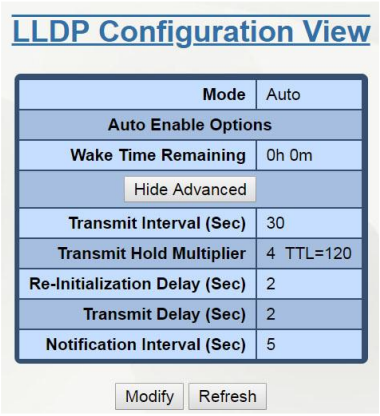
LLDP

LLDP Configuration

The LLDP Configuration Page can be used to view or configure LLDP operation on the switch. The default mode for LLDP is Auto. Other configurable options are revealed by clicking on the "Show Advanced" button.

To enable LLDP on all switches that are in Auto mode, set the mode to Auto, set the Wake Time to a non-zero time, and click the "Send" button.





Mode: The LLDP mode can be Enabled, Disabled, or Auto. In Auto mode, LLDP is inactive until a switch sends a wake-up packet. The default is Auto.

Wake Time: The length of time LLDP will be active on switches that are in Auto mode. A value of 0 hours and 0 minutes will deactivate LLDP. Modify this value and click the "Send" button to set the wake time on all switches that are in Auto mode. The default is 0 hours and 0 minutes.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Transmit Interval (Sec): The interval at which periodic LLDP frames are transmitted. The default is 30 seconds.

Transmit Hold Multiplier: A multiplier on the Transmit Interval when calculating a Time-to-Live value. The default is 4.

Re-Initialization Delay (Sec): The minimum time an LLDP port will wait before re-initializing after its setting has changed from disabled to Tx-Only or Tx/Rx. This prevents excessive notifications when LLDP Port settings are changed. The default is 2 seconds.

Transmit Delay (Sec): When LLDP information is changing on the switch, the time to wait before sending an LLDP frame with the updated information. The default is 2 seconds.

Notification Interval (Sec): The interval between notifications sent by the switch. If a port sends out a notification and another port tries to send out a notification, then the subsequent notification will not be sent until the interval expires. The default is 5 seconds.

LLDP Ports Configuration

The LLDP Ports Configuration Page displays and configures LLDP options for each port.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

Port No: The number of the port.

Mode: The port mode can be Tx Only, Rx Only, Tx/Rx, or Disabled. This configures whether or not LLDP frames are transmitted or received. The default is Tx/Rx.

Allow Management Data: Allows the transmission of management type information. Example: IP address of the switch. The default is checked.

Allow Notification: Allows an SNMP notification to be transmitted when local or remote data changes. The default is unchecked. Note: SNMP Notification Traps must be enabled under SNMP.

Port Description: Indicates whether or not to send the descriptive name of the port in the transmitted LLDP frame. The default is unchecked.

System Name: Indicates whether or not to send the name assigned to the device on the System page in the transmitted LLDP frame. The default is unchecked.

System Description: Indicates whether or not to send the switch model and current firmware version in the transmitted LLDP frame. The default is unchecked.

System Capabilities: Indicates whether or not to send the primary function(s) of the system in the transmitted LLDP frame. The default is unchecked.

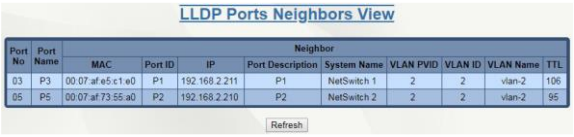
VLAN PVID: Indicates whether or not to send the Port VLAN identifier (PVID) associated with the port in the transmitted LLDP frame. The default is unchecked.

VLAN Name: Indicates whether or not to send the VLAN IDs and Names associated with the port in the trans-mitted LLDP frame. The default is unchecked.

LLDP Ports Neighbors

The LLDP Ports Neighbors shows the results of LLDP discovery. The LLDP Ethernet frames received from neighboring ports are composed of collections of data units called Type Length Value (TLV). Each TLV contains a defined type of information such as the Chassis ID described below, which contains the

MAC address of the device sending the frame. The maximum number of six neighbors can be displayed per each port.



Port No: The port the neighbor information was received from.

MAC: MAC address of neighbor device. Corresponds to the LLDP Chassis ID TLV.

Port ID: Identifier of the neighbor port from which the LLDP frame was sent.

IP: IP address of neighbor device. Corresponds to the LLDP Management Address TLV.

Port Description: Description of the neighbor port from which the LLDP frame was sent.

System Name: The system's administratively assigned name on the neighbor device.

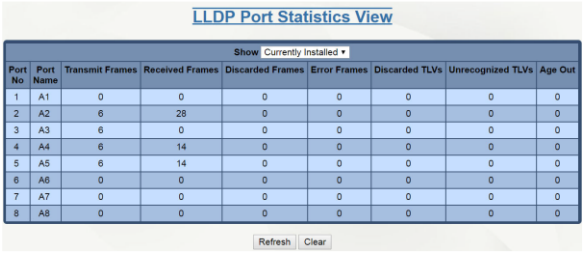
VLAN PVID: The Port VLAN identifier (PVID) associated with the neighbor port.

VLAN ID: A list of all VLAN IDs associated with the neighbor port.

VLAN Name: A list of all VLAN Names associated with the neighbor port.

TTL: Indicates the number of seconds that the information associated with this neighbor will be valid. Time to Live (TTL)

LLDP Port Statistics



Port No: The number of the port.

Port Name: The descriptive name of the port.

Transmit Frames: The total number of LLDP frames transmitted by the local switch.

Received Frames: Total number of LLDP frames received by the local switch.

Discarded Frames: The total number of frames discarded due to incorrect Type Length Values (TLVs) in the frames.

Errors Frames: Total count of all LLDP frames received with one or more errors.

Discarded TLVs: The count of all TLVs discarded for any reason.

Unrecognized TLVs: The count of all TLVs received on the port that are not recognized by LLDP.

Age Out: The count of times that a neighbor's information has been deleted because its Time To Live (TTL) has expired.

N-Link

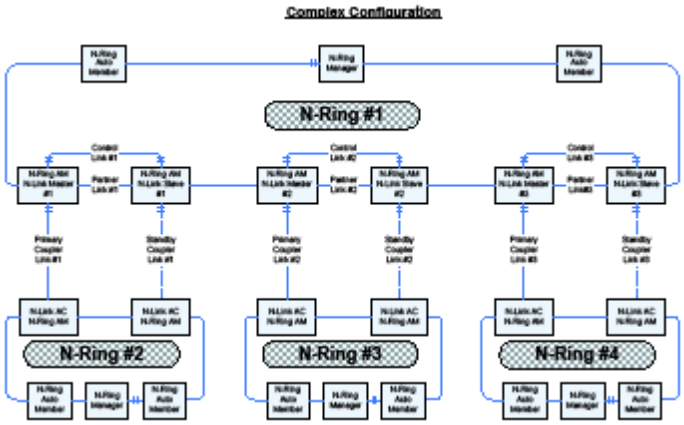
N-Link provides a way to couple an N-Ring topology to one or more other topologies, usually other N-Ring topologies. Each N-Link configuration requires 4 switches: N-Link Master, N-Link Slave, N-Link Primary Coupler and N-Link Standby Coupler.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).

Example of a standard N-Link configuration



Example of a complex N-Link configuration



Configuration steps to redundantly couple 2 N-Ring™ networks:

1. Ensure the Coupler and Control cables are disconnected at this point.
2. Get Both N-Rings working with a status of OK.
3. Configure N-Link Slave: Ensure that the N-Link Slave is set to Auto Configure and select a Default Coupler Port. Save Configuration.
4. Configure N-Link Master: Select the Control and Coupler ports. Save the Configuration.
5. Connect the Control Link cable. Ensure that the Slave switch status now shows a state of “Slave”.
6. Connect the Coupler Link cables.
7. Check N-Link status on the Master by selecting the N-Link Status View page.

Configuration Requirements:

- The Master and Slave must be part of the N-Ring topology.

- If using default configuration choices, the administrator only needs to configure the N-Link Master. The N-Link Slave and both Coupler switches will auto-detect any needed configuration.
- If not using default configuration choices, the administrator may also need to configure the Default Coupler port on the N-Link Slave.
- There must be a direct link between the Master and Slave Control ports. Use of media converters or other switches is not supported.
- There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported.
- There must be an N-Link aware switch on each side of the Master.
- N-Link will only support a single point of failure. Multiple points of failure and misconfiguration are not supported and may cause a network storm under some circumstances.
- Control and Partner connections should be either fiber or 10/100Base-TX copper.

  The use of copper SFP transceivers for N-Link control and partner connections is not recommended due to the variances of link performance between SFP manufacturers.

  Per the IEEE 802.3 standard (Clause 40), a 1000Base-T PHY is required to wait 350-750 milliseconds before reporting a link down condition; and is therefore unsuitable for use as an N-Link control or partner connection.
- For optimal performance:

  The speed of the Partner segment must match the speed of the other N-Ring™ segments. Therefore, the Partner connection must be 1 gigabit fiber when the other N-Ring segments have a 1 gigabit speed.

  When using a 700/7000 Series N-Link Slave, the control port should use a fiber connection.

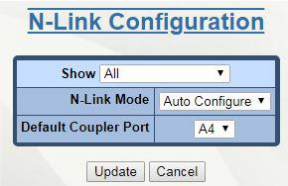
Configuration/Basic

The Basic tab under the N-Link Configuration category will display the basic configuration settings. By default, N-Link is in Auto-Configuration mode and will use A4 as the Default Coupler port.

The port configured as the Default Coupler Port will be used as the Standby Coupler port if the switch detects an N-Link Master and becomes an N-Link Slave.



Click on the *Modify* button to make changes. Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

N-Link Mode: Select the required N-Link mode from the drop-down list. The available options are:

Disabled: N-Link is disabled and will not operate as an N-Link capable switch.
Auto Configure: In this mode, the switch will automatically detect whether it is a slave or a coupler.
Master: If this option is selected, then the administrator must configure the Control Port (default: A3) and the Primary Coupler Port (default: A4).

Default Coupler Port: The Coupler Port is used to establish a redundant path for Ethernet data. If the role of the switch is Slave the port will be a Standby Coupler. The default is A4.

Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Configuration/Advanced

The Advanced dialog window displays the advanced configuration settings. If N-Link is set to *Auto Configure*, the following configuration data will be used. The selected Auto Configure detection timeout value range is 2-180 seconds. The default Auto Configure detection time is 4 seconds.



Click on the *Modify* button to change the detection timeout. Click on the *Update* button once the field has been updated with the required information. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Status

The Status dialog window displays the N-Link status. If the switch is an N-Link Master or Slave, the following switch status and partner status information will be shown. Fields with a red background designate a fault condition.

N-Link Master or Slave

The following switch status and partner status information are shown.

State: This field displays the current N-Link mode of the switch.

Partner Port: This field shows the port being used for normal communication between the N-Link Master and N-Link Slave switches. There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported. This port will be detected automatically.

Coupler Port: The port being used to establish a redundant path for Ethernet data transmission is displayed in this field.

Coupler Port State: Blocking, Forwarding.

Status: If there are no errors, the status shows OK. Otherwise, a description of the faults detected is shown.

N-Link Partner Information

The following switch statuses are shown.

State: Current N-Link mode of switch.

MAC: The MAC address of the N-Link Partner switch.

Coupler Port State: Blocking or Forwarding.

Status: If there are no errors, the status will show OK. Otherwise, a description of the faults detected will be shown.

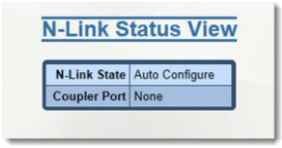
N-Link Auto Configure

N-Link State: Current N-Link mode of switch.

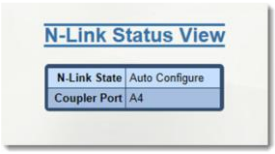
Coupler State: The port used to establish a redundant path for Ethernet data transmission. This port will be detected automatically.

Status Examples

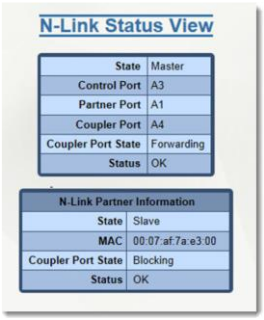
N-Link Auto Configure that is not an N-Link Master and has not become an N-Link Slave or an N-Link Coupler:



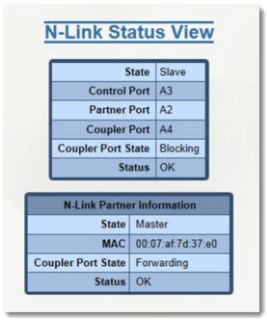
N-Link Coupler Switch:



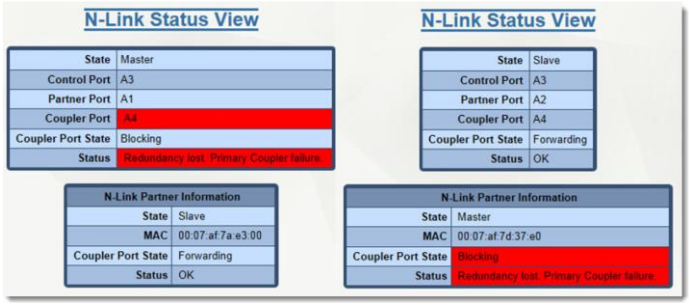
N-Link Master Switch:



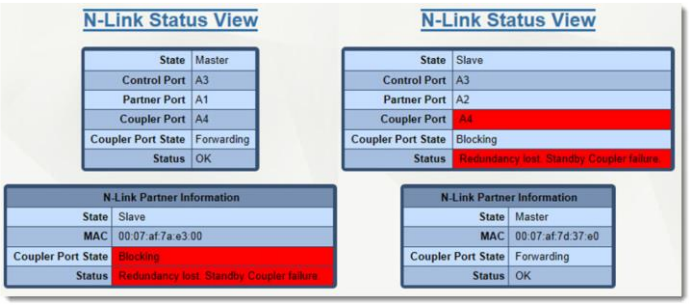
N-Link Slave Switch:



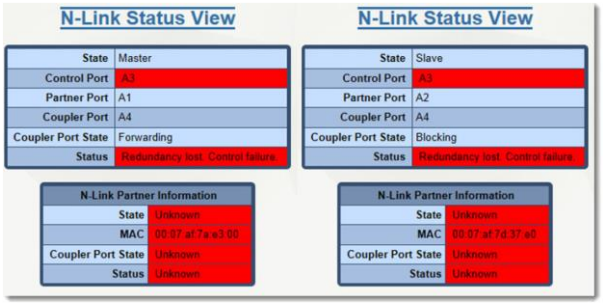
N-Link Status Master and Slave where the Primary Coupler is broken:



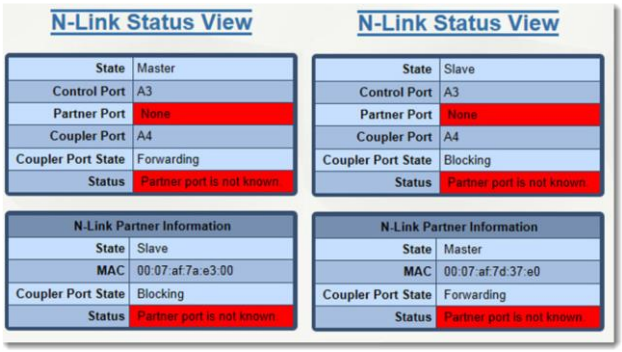
N-Link Master and Slave where the Standby Coupler link is broken:



N-Link Master and Slave where the Control link is broken:



N-Link Master and Slave where the Partner link is broken:



N-Ring™

Configuration/Basic

The Basic dialog window displays the N-Ring basic configuration settings. By default, N-Ring is in Auto Member mode.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Click on the *Modify* button to make changes to the N-Ring Basic Configuration:



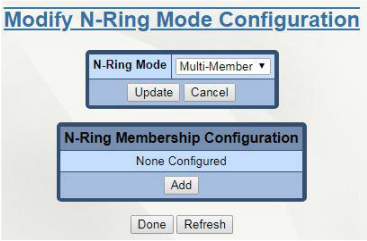
Disabled: If selected, this option disables the N-Ring capabilities on the switch.

Auto Member: When set to auto member, the switch automatically detects when it is a part of an N-Ring for participation in the ring.

Manager: When in Manager mode, the administrator may select different Port Sets as N-Ring ports. (See the Port Set Configuration section for information on adding and deleting port sets.)

N-Ring Ports: Defines the two ports that are used to connect to the N-Ring.
N-Ring™ Number: The N-Ring number can be selected from a range of 1 - 16 or a custom N-Ring number can also be chosen. The selected N-Ring number determines the VLAN ID. See table below for N-Ring numbers and corresponding VLAN IDs.
VLAN ID: This field is auto-generated based on the selected N-Ring number. See table for N-Ring numbers and corresponding VLAN IDs.
Tagging: The type of VLAN tagging used. Currently, tagged mode is the only supported mode.

Multi-Member: When in Multi-Member mode, a switch can be a member of multiple rings. If selected, then N-Ring Membership Configurations can be added for each N-Ring to which the switch will be connected. The image below shows one configured N-Ring.



To delete an existing N-Ring Membership, click on the *Delete* button.

To add a new N-Ring Membership, click on the *Add* button. The screen below will appear.



Select the N-Ring Ports and N-Ring Number to be used for the N-Ring. The VLAN ID for each N-Ring Membership must match that of the N-Ring Manager on each specific N-Ring to which the N-Ring Multi- Member will be connected.

Click on the *Update* button once the required selection has been made. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

List of available N-Ring Numbers and their corresponding VLAN ID:

N-RING NUMBER	VLAN ID	N-RING NUMER	VLAN ID
1	3333	9	3341
2	3334	10	3342

3	3335	11	3343
4	3336	12	3344
5	3337	13	3345
6	3338	14	3346
7	3339	15	3347
8	3340	16	3348

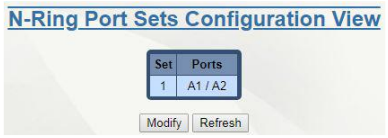
Configuration Requirements:

1. N-Ring requires tagged frames to optimize frame prioritization.
2. Do not create redundant links unless either RSTP or N-Ring is enabled.
3. The Default VLAN and any active N-Ring VLAN cannot be deleted.
4. RSTP and N-Ring™ are different modes and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then RSTP will be disabled for that port. Other ports may have RSTP enabled.
5. Do not connect the N-Ring to actively Trunking ports on an Auto Member or Multi-Member configured switch.
6. An NT24k® switch can only participate in one N-Ring unless in Multi-Member mode.
7. Since VLANs are implemented for security reasons as well as traffic flow, N-Ring only makes minimal VLAN changes. It is up to the administrator to ensure that VLANs are configured correctly on the N-Ring manager and all N-Ring members.
8. For optimal performance, all N-Ring segments must be configured for the same speed.

> **WARNING:** To prevent a network storm, multiple segments between N-Ring members on one or more N-Rings must not occur. N-Ring members should only be connected to each other by the N-Ring ports.

Configuration/Port Sets

A port set is a group of two ports that may be used for an N-Ring. The default N-Ring Port Set is A1/A2. Click on the *Modify* button to make changes to the Port Sets.



Set: This field displays the Port set table index.

Ports: This field indicates the designated pair of N-Ring ports. To reassign different pairs, the Port sets containing those ports, if any, must be deleted before the ports can be reassigned (a port can only belong to one port set).

Delete: To delete a port set, check the box next to the line item to be deleted and click on the *Delete* button.

Click on the *Add* button below the Set column.



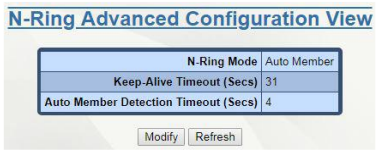
N-Ring Ports: A new port set can be added by selecting the N-Ring ports from the N-Ring Ports pull-down lists and clicking on the *Add* button.

Port Sets: Port Sets can be removed by selecting the port set from the Port Sets pull-down and pressing the *Remove* button.

Click on the *Update* button when port set configuration is complete. The N-Ring Port Sets Entry dialog window will appear. Click on the *Done* button. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Configuration/Advanced

Auto Member Mode



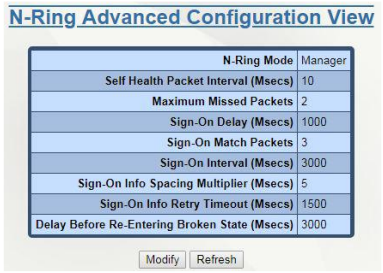
N-Ring™ Mode: This field is defined in the N-Ring/Configuration/Basic dialog window.

Keep-Alive Timeout (Sec): This field displays the amount of time to wait (in seconds) to receive a keep-alive request before switching from active member back to auto member. The default value is 31 seconds and the available range is 15 to 300 seconds. A entry of 0 will disable the feature.

Auto Member Detection Timeout (Sec): This field shows the amount of time to wait in seconds to receive N-Ring frames on any auto member port (at boot up) before assuming the switch is not part of an N-Ring. The default value is 4 seconds and the available range is 2 to 180 seconds.

Click on the *Modify* button and enter the required changes. When entries are complete, click on the *Update* button. To save the changes, return to the *Configuration* menu and click on the *Save* button.

Manager Mode



When in Manager mode, the following advanced configuration data are displayed in their respective fields:

Self Health Packet Interval (Msecs): The amount of time to wait in milliseconds before sending Self-Health packets. The default value for this field is 10.

Maximum Missed Packets: The number of consecutive missed Self-Health packets that constitute a fault. The default value for this field is 2 packets.

Sign-On Delay (Msecs): The amount of time to wait in milliseconds before requesting initial sign-on information from ring members. The default value is 1000 Msecs.

Sign-On Match Packets: The number of times the switch count must match before starting the sign-on process. The default value is 3.

Sign-On Interval (Msecs): The interval of time to wait in milliseconds before requesting subsequent sign-on information from ring members when the ring is broken. The default value for this field is 3000 Msecs.

Sign-On Info Spacing Multiplier (Msecs): The amount of time to wait in milliseconds, scaled by switch number, before sending information to the ring manager. The default value is 5 Msecs.

Sign-On Info Retry Timeout (Msecs): The amount of time the ring member will wait in milliseconds for the ring manager to acknowledge receipt of the member's information before the member tries to resend the information. The default value for this field is 1500 Msecs.

Delay Before Re-entering Broken State (Msecs): The amount of time, in milliseconds, that must elapse before the ring is allowed to go back into the broken state. The default is 3000 Msecs.

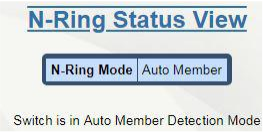
Click on the *Modify* button and make the required changes. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Multi-Member mode

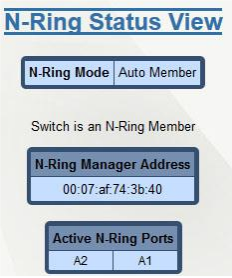
There are no advanced options when operating in Multi-Member mode.

Configuration Status

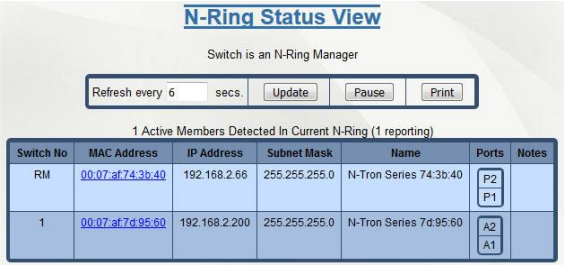
When an N-Ring™ Auto Member is not participating in an N-Ring, the following information is shown:



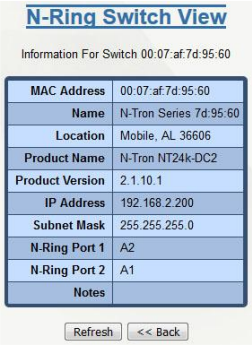
When an N-Ring Auto Member is participating in an N-Ring, the following information is shown:



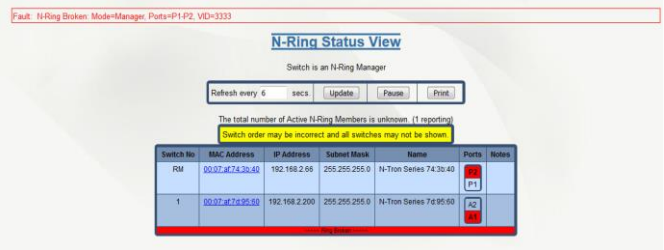
When N-Ring is in Manager Mode, the following data will be as shown below.



If the MAC is selected, more data is retrieved and shown about the N-Ring Member switch.



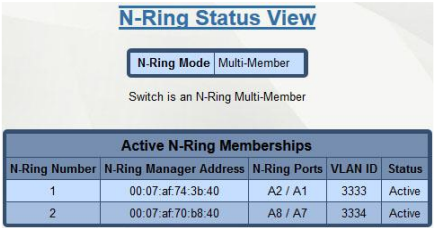
N-Ring™ Manager View for a faulted N-Ring:



A fault warning *Fault: N-Ring Fault* in red will show at the top of the dialog window.

The break is identified in red. In this case, N-Ring manager A2 to N-Ring active member Switch Number 1 TX2 is broken. A warning *Switch order may be incorrect and all switches may not be shown* is displayed in yellow. This indicates that the Sign On frames cannot get around the N-Ring and the data may not have been updated since the last successful update.

N-Ring Multi-Member Status View



N-Ring Number: N-Ring number to which the N-Ring Membership is associated.

N-Ring Manager Address: Show the MAC address of the switch acting as the N-Ring Manager.

N-Ring Ports: The port set linked to this N-Ring.

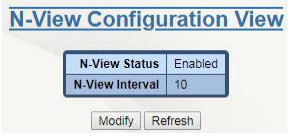
VLAN ID: The VLAN ID tag to be used with this N-Ring. The VLAN ID is associated with the N-Ring, and can be changed by switching the N-Ring number.

Status: Current status of the N-Ring Membership. The values are:

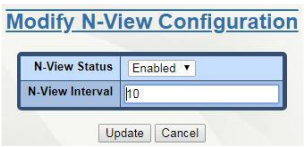
Active: The N-Ring Membership is connected and operating normally.
Inactive: The N-Ring Membership is not responding and not functioning correctly.

N-View™

The N-View Configuration dialog window displays the basic configuration for N-View. The status (enabled or disabled) and the interval between packets.



Click on the *Modify* button to make changes to the N-View Configuration.



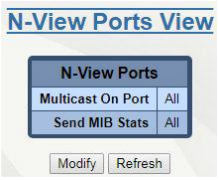
N-View™ Status: This field determines whether the N-Ring™ is enabled or disabled.

N-View Interval: This field determines the frequency in which N-View reports its information. Increasing the interval slows the update rate and decreasing it allows N-View to report more frequently. The available range is 10-500 seconds. Interval values are converted to increments of 10 seconds. The default value is 10 seconds.

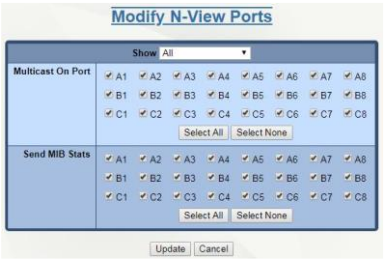
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Ports

The Ports dialog window displays a list of the configured ports on the NT24k® unit, along with the ports transmitting N-View related multicast packets and MIB stats respectively.



Click on the *Modify* button to make changes to the N-View Ports.



The user can modify these two variables to enable or disable N-View related multicast out of the port and if MIB stats are sent out for those ports. The ports that can be installed (Modules), currently installed or currently linked up can also be viewed.

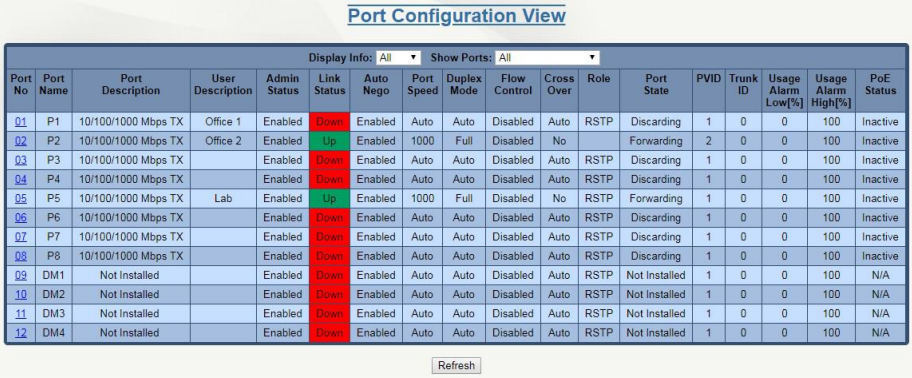
Click on the *Update* button after required changes have been made. To save the settings, navigate to the *Configuration* menu and click on the *Save* button.

Ports

Configuration

The Ports Configuration dialog window shows a detailed overview of all the ports on the switch. The administrator can view the ports that are available to install (Modules), currently installed or currently linked up.

The information displayed on the page can be changed by changing the *Display Info* from *Basic* to *All*. *Basic* shows the most commonly used information while *All* shows all of the available information.



Port Configuration View

Display Info: All Show Ports: All

Port No	Port Name	Port Description	User Description	Admin Status	Link Status	Auto Nego	Port Speed	Duplex Mode	Flow Control	Cross Over	Role	Port State	PVID	Trunk ID	Usage Alarm Low[%]	Usage Alarm High[%]	PoE Status
01	P1	10/100/1000 Mbps TX	Office 1	Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
02	P2	10/100/1000 Mbps TX	Office 2	Enabled	Up	Enabled	1000	Full	Disabled	No		Forwarding	2	0	0	100	Inactive
03	P3	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
04	P4	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
05	P5	10/100/1000 Mbps TX	Lab	Enabled	Up	Enabled	1000	Full	Disabled	No	RSTP	Forwarding	1	0	0	100	Inactive
06	P6	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
07	P7	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
08	P8	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
09	DM1	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
10	DM2	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
11	DM3	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
12	DM4	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A

Refresh

The screen above represents the Port Configuration View for a PoE model. If not using a PoE model, the page will be similar except the PoE Status column will not be present.

Port No: This field indicates the port number.

Port Name: This field displays the descriptive name of the port.

Port Description: This column provides a brief description of the port. Ports with "-R" in their description are Bypass Relay capable ports. Refer to the section Bypass Relay (BR) for more information on Bypass Relay devices and ports.

User Description: Description of the port set by a user.

Admin Status: This configurable field displays the existing status of the port. The two options are *Enabled* or *Disabled*.

Link Status: Shows the current state of the port. The two options are *Up* or *Down*.

Auto Nego: This configurable field displays the current auto-negotiation state whether it is *Enabled* or *Disabled*. Auto-negotiation cannot be disabled on a port connected to a gigabit device.

Port Speed: This configurable field displays the speed of each port. The available values are 10/100/1000 Mbps.

Duplex Mode: The existing mode of the port, whether it is *Full Duplex* or *Half Duplex*, is shown in this configurable field.

Flow Control: This configurable field displays the existing flow control status of each port.

Cross Over: This configurable field displays the existing crossover mode of the port. This can be indicated with a *Yes*, *No* or *Auto*. The default value for this field is Auto.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, and N-Link Coupler. For example, if a port is actively participating in an N-Ring and as an N-Link Partner, the role would be: N-Ring, N-Link Partner.

Port State: This column displays the current RSTP status of a port. It may contain *Disable*, *Discarding*, *Learning* or *Forwarding*.

PVID: This configurable field displays the existing port VLAN ID setting. The allowable range is 1-4094.

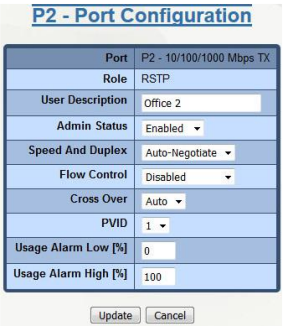
Trunk ID: When the port is an active member of a trunk group, the trunk's ID value is shown. A zero value indicates that the port is not an active trunk member.

Usage Alarm Low [%]: This field indicates the bandwidth utilization percentage below which a fault is triggered if enabled. For the half-duplex option, the bandwidth utilization percentage is the sum of both RX and TX bandwidth utilization. For the full-duplex option, this is the higher of TX or RX bandwidth utilization.

Usage Alarm High [%]: This field displays the bandwidth utilization percentage above which a fault is triggered if enabled. For half duplex the bandwidth utilization percentage is the sum of both RX and TX band-width utilization, and for full duplex this is the lower of TX or RX bandwidth utilization.

PoE Status: The current status of the PoE will be displayed in this column. It may show *Inactive*, *Active*, *Disabled* or *N/A*.

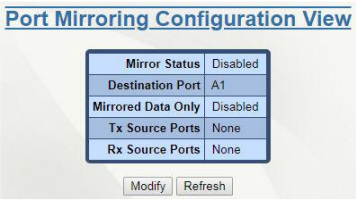
Click on the *Port Number* to configure each port individually. This will allow the user to change the port's settings.



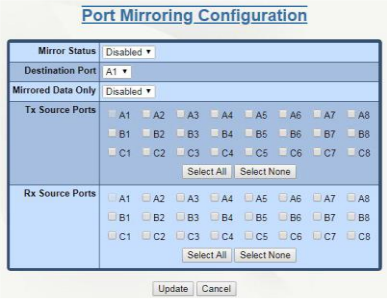
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Mirroring

A Mirroring Port is a dedicated port that is configured to receive copies of Ethernet frames that are sent or received from a monitored port. The Mirroring dialog window displays the status including the list of Source Ports and the Destination Port that the Sources are being mirrored to.



Click on the *Modify* button to make changes to the *Port Mirroring Configuration*.



Mirror Status: Enable or Disable the Mirroring functionality by selecting the option in the drop-down menu.

Destination Port: Select the destination ports that the source ports will be mirrored to.

Mirrored Data Only: Select the mirrored data to be transmitted to the destination port.

Tx Source Ports: Select the transmitting ports to be mirrored by checking on the desired ports or the *Select All* button.

Rx Source Ports: Select the receiving ports to be mirrored by checking on the desired ports or the *Select All* button.

Configuration Notes:

1. Non-mirrored frames take priority over mirrored frames. Mirrored frames may be discarded under rare instances when resource contention occurs.
2. The mirroring destination port is not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, Trunking.

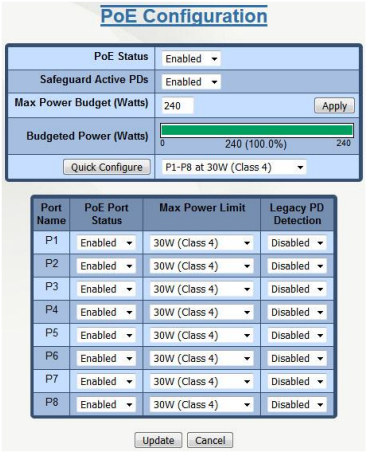
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

PoE

PoE (Power Over Ethernet) is an internal hardware capability that outputs power and data on Ethernet cabling to Powered Devices (PDs) such as VoIP phones, IP camera, and industrial devices. PoE eliminates the need to run separate data and power cables between the PSE (PoE Source Equipment) and the PoE powered device.

PoE Management on the NT24k® provides the ability to set the PoE power budget, enable/disable PoE on specific ports, and set power limits per port.

Note: PoE is only supported on certain NT24k switches.



PoE Configuration: Table 1

PoE Status: This configurable field indicates whether the global PoE is enabled or disabled. PoE ports must also be individually enabled on the PoE configuration page. The default value for this field is Enabled.

Safeguard Active PDs: This configurable field indicates whether an active PD is safeguarded from losing power because of a configuration change. If enabled, the Max Power Limit cannot be changed if it can cause a power loss to the active PD. Similarly, Legacy PD Detection cannot be disabled on an active legacy powered device. The default value for this field is Enabled.

Max Power Budget (Watts): The maximum amount of power available for PoE. The value can range from 4 to the max power supply support for the switch.

Quick Configure: The quick configure selection menu updates the PoE port table with the desired settings based on the quick configuration option selected.The following values for 8 PoE Ports are:

- P1-P8 at 30W (Class 4) (default)
- P1-P8 at 15.4W (Class 3/0)
- P1-P8 at 7W (Class 2)
- P1-P8 at 4W (Class 1)
- All ports disabled.

For 16 PoE Ports the values are:

- P1-P8 at 30W (Class 4) (default)
- P9-P16 at 30W (Class 4)
- P1-P16 at 15.4W (Class 3/0)
- P1-P16 at 7W (Class 2)
- P1-P16 at 4W (Class 1)
- All ports disabled.

PoE Configuration: Table 2

PoE Port Status: This configurable field indicates whether PoE is enabled or disabled on the port.The default value is enabled on the first 8 PoE ports.

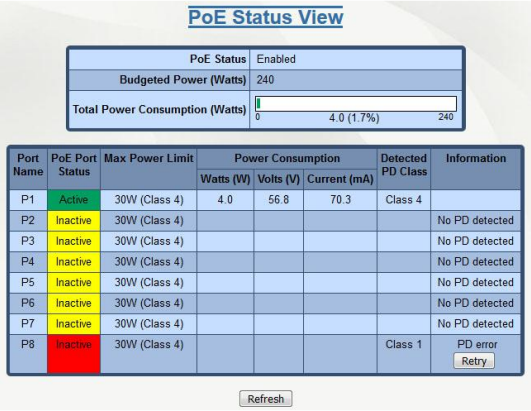
Max Power Limit: This configurable field indicates the maximum budgeted power for the port. The values are:

- 4W (Class 1)
- 7W (Class 2)
- 15.4W (Class 3/0)
- 30W (Class 4)

Legacy PD Detection: This field indicates whether legacy PD detection is enabled or disabled on the port. If enabled, legacy powered devices will be recognized. The default value is disabled.

Note: The sum of the Port Max Power Limit should not exceed the MaxBudgeted Power.

PoE Status: Table 3



Port Name: This field displays the descriptive name of the port.

PoE Port Status: Current status of the PoE port. The values are:

- Active: PoE power is outputted on the specific port
- Inactive: PoE power is not outputted on the specific port
- Disabled: PoE functionality is disabled on the specific port

Max Power Limit: The maximum budgeted power for the port.

Power Consumption: The actual power consumption of the port.

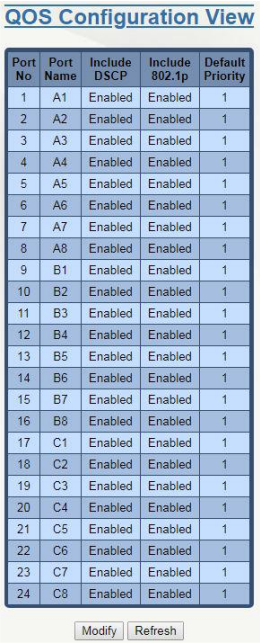
Detected PD Class: The classification of the connected device, which can range from Class 0-4.

Information: Details about the port's current state. If a Powered Device attempts to negotiate more power than the allocated maximum, PoE will be turned off on the port and a re-negotiation period will start. If re-negotiation is unsuccessful, a Retry button will be displayed below the PD error message. Select the retry button to restart negotiation after the cause of the overload is resolved.

QOS (Quality of Service)

The QOS decision tree chooses a frame's output port priority and the egress frame's IEEE 802.1p User Priority value (if needed) based on the QOS settings and the User Priority value (if any) in the ingress frame. Both the internal port priority setting and the egress frame User Priority value are always assigned the same value. The available values are 0 through 7 where 7 is the highest priority. If the ingress frame is an IP packet, the RFC 2474 DSCP field in the packet will be passed unchanged to the egress frame.

Click on the *Modify* button to make changes to the QOS Configuration.



Include DSCP: This configurable field displays the status of whether or not to include the ingress frame's RFC 2474 DSCP value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. If the ingress frame type is IP (IPv4 or IPv6) and Include DSCP is enabled, DSCP processing will override all other settings. (see QOS SELECTION CHART below). The default value is enabled.

Include 802.1p: This configurable field displays the status of whether or not to include the ingress frame's IEEE 802.1p User Priority value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. This setting is used only if the frame type is not IP (IPv4 or IPv6) or the Include DSCP setting is disabled. (see QOS SELECTION CHART below). The default value is enabled.

Default Priority: This configurable field displays the default QOS priority for the transmit priority value and the egress frame's IEEE 802.1p User Priority value if not otherwise assigned by DSCP or IEEE 802.1p processing. The range is 0-7, highest priority=7. The default value is 1.

QOS Selection Chart:

INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Enabled	N.A.	IP	N.A.	Ingress DSCP Value
N.A.	Enabled	Not IP	Yes	Ingress IEEE 802.1p UP
N.A.	Enabled	Not IP	No	Default Priority Setting
N.A.	Disabled	Not IP	N.A.	Default Priority Setting
Disabled	Enabled	N.A.	Yes	Ingress IEEE 802.1p UP
Disabled	Enabled	N.A.	No	Default Priority Setting
Disabled	Disabled	N.A.	N.A.	Default Priority Setting
Legend				
IP	Ingress packet type is IPv4 or IPv6.			
Ingress DSCP Value	Use the high order three bits of the ingress frame’s IP DSCP value.			

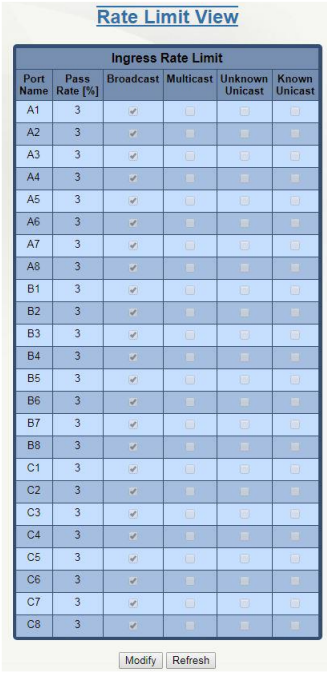
INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Ingress IEEE 802.1p UP	Use the ingress packet's IEEE 802.1p User Priority value.			
N.A.	Not applicable			

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

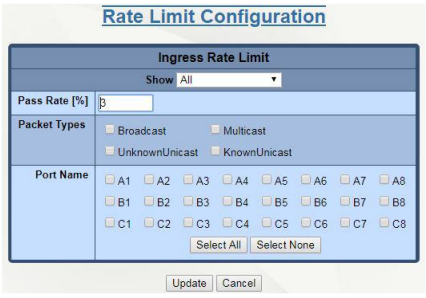
Rate Limiting

The Rate Limiting dialog window shows the NT24k® installed ports and the Pass Rate Percentage per port for each of the following: Broadcast, Multicast, Unknown Unicast and Known Unicast.

A packet type will be affected by the rate limit setting if the check box is selected and it exceeds the total number of packets established by the ingress rate limit within an assigned time period. The time periods are: 1 Gbps = 10 ms, 100 Mbps = 100 ms and 10 Mbps = 1 sec.



Click on the *Modify* button to make changes to the Rate Limiting settings.



Show: View the ports that are available to install (Modules), currently installed or currently linked up.

Pass Rate [%]: Modify the pass rate percentage for each and every port by entering the desired value.

Packet Types: Select what Packet Types are to be passed: Broadcast, Multicast, Unknown Unicast and Known Unicast.

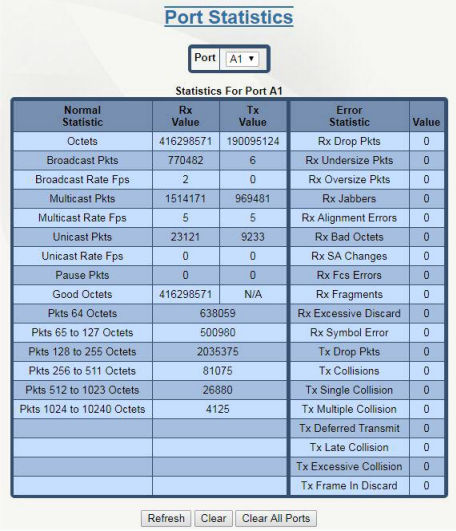
Port Name: Select which ports are affected by the changes made.

Note: Unicast packets with destinations not in the ARL table can be rate limited rather than all being flooded. This is known as “Unknown Unicast”.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Status/Statistics

This dialog window displays the MIB counters for the selected port, specified by the Port pull-down menu.

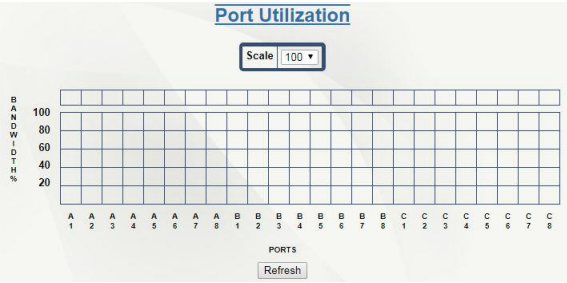


Normal Statistic	Rx Value	Tx Value	Error Statistic	Value
Octets	416298571	190095124	Rx Drop Pkts	0
Broadcast Pkts	770482	6	Rx Undersize Pkts	0
Broadcast Rate Fps	2	0	Rx Oversize Pkts	0
Multicast Pkts	1514171	969481	Rx Jabbers	0
Multicast Rate Fps	5	5	Rx Alignment Errors	0
Unicast Pkts	23121	9233	Rx Bad Octets	0
Unicast Rate Fps	0	0	Rx SA Changes	0
Pause Pkts	0	0	Rx Fcs Errors	0
Good Octets	416298571	N/A	Rx Fragments	0
Pkts 64 Octets	638059		Rx Excessive Discard	0
Pkts 65 to 127 Octets	500980		Rx Symbol Error	0
Pkts 128 to 255 Octets	2035375		Tx Drop Pkts	0
Pkts 256 to 511 Octets	81075		Tx Collisions	0
Pkts 512 to 1023 Octets	26880		Tx Single Collision	0
Pkts 1024 to 10240 Octets	4125		Tx Multiple Collision	0
			Tx Deferred Transmit	0
			Tx Late Collision	0
			Tx Excessive Collision	0
			Tx Frame In Discard	0

Pressing the *Clear* button resets all counters for the selected port. The *Clear All Ports* button resets all counters for all ports, including the selected port. The *Refresh* button reloads the dialog window.

Status/Utilization

This dialog window displays the bandwidth percentage graph of all the ports. The graph is scaled based on the “*Scale*” drop-down list.



Trunking

The Trunking dialog window displays trunking information.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Trunk ID: This column displays the trunk identifier number. The valid range is 1-127.

Trunk Name: This column shows the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

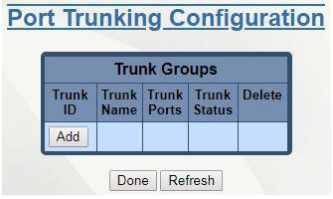
Trunk Ports: This column displays the ports associated with the trunk.

Trunk Status: The existing status of the trunk is shown in this column. Available trunk status options are *Enabled* or *Disabled*.

Configuration Note:

Note: The trunk ports are not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, 802.1X, Mirroring.

Click on the *Modify* button to add, modify or delete ports.



Click on the Add button and the following dialog window will appear:



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

ID: Enter the desired Trunk ID. Valid range is 1- 127. There can be no duplicate Trunk IDs.

Name: Enter the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

Ports: Select the required ports from the Ports list. The list of ports shown will vary depending on the selection in the *Show* field.

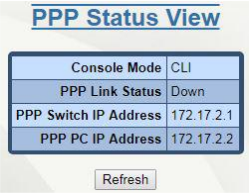
Status: Select the status of the port that is being added. Options are *Enabled* or *Disabled*.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

To modify an existing Trunk Group, click on the *Trunk ID* and make the required changes. To Delete an existing Trunk Group, click on the *Delete* button associated with the Trunk ID to be deleted.

PPP

The console can be either in CLI mode or PPP mode. The PPP mode provides a TCP/IP connection over the serial port. A browser may then be used to view switch information or make configuration changes. PPP mode is entered by using the PPP command on the console. To change from PPP to CLI mode, you must reboot the switch.



Console Mode: When CLI is shown, the console is in the command mode, which is the default mode. When PPP is shown, the console is in PPP mode.

PPP Link Status: This field indicates the current PPP link state.

PPP Switch IP Address: This field displays the IP address for the switch side of the PPP link.

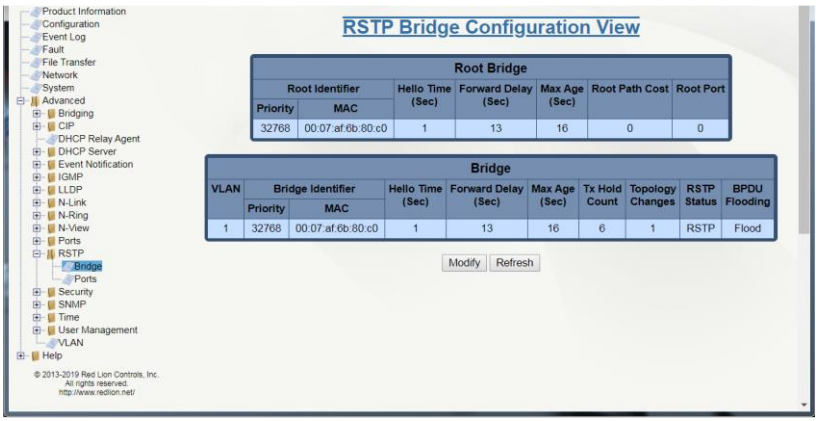
PPP PC IP Address: This field indicates the IP address for the PC side of the PPP link.

RSTP

Bridge

The Bridge dialog window displays the RSTP information for the RSTP Root Bridge and for the RSTP Bridge on this switch.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Root Bridge: This is the identity and parameters of the RSTP Root Bridge.

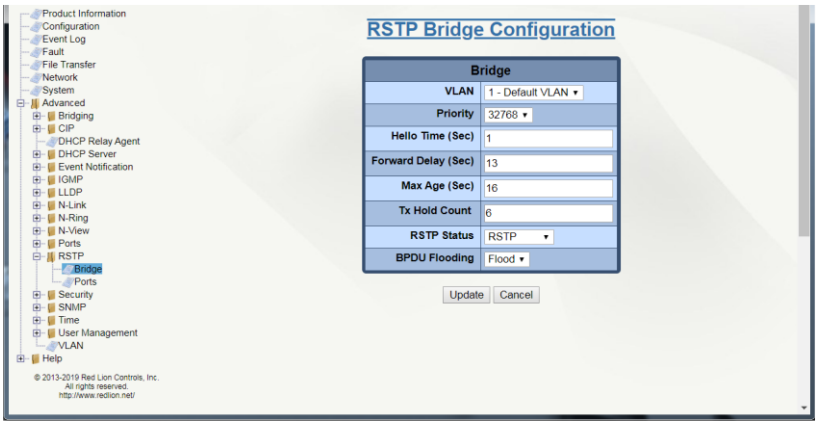
Root Identifier - Priority: This field indicates the priority of the Root Bridge.
Root Identifier - MAC: The unique MAC address of the Root Bridge is shown here.
Hello Time (Sec): This field indicates the time interval, in seconds, between the transmission of configuration BPDUs by designated ports.
Forward Delay (Sec): This field shows the time spent, in seconds, by legacy STP Bridges in transitioning Root and designated ports to forwarding. This delays port transitions until other bridges have received spanning tree information.

Max Age (Sec): For RSTP, this is the maximum time, in seconds, that a bridge will wait for configuration BPDUs before deciding it is no longer connected to the root bridge.
Root Path Cost: The cost of the path to the Root Bridge via the Root Port of this bridge.
Root Port: The Root Port of this Bridge. The Root Port provides the lowest cost path from this bridge to the Root Bridge.

Bridge: This is the configuration of the RSTP bridge on this switch.

VLAN: RSTP will operate on all ports of this VLAN. BPDUs will be transmitted with or without VLAN tags depending on the settings for this VLAN. This should be a valid VLAN ID. The default value for this field is VLAN 1.
Bridge Identifier Priority: This field indicates the Bridge priority. The range is 0 - 61440. The default value is 32768.
Bridge Identifier MAC: The unique MAC address of the Bridge is displayed in this field. This is possibly a different network device.
Hello Time (Sec): This field indicates the Hello time, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time interval, in seconds, between the transmission of Configuration BPDUs by Designated Ports. The range is 1 - 10. The default value is 1.
Forward Delay (Sec): This field displays the Forward Delay, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time spent, in seconds, by legacy STP Bridges in transitioning Root and Designated Ports to Forwarding. This delays Port transitions until other bridges have received spanning tree information. The range is 4 - 30. The default value is 13 seconds.
Max Age (Sec): This field displays the Max Age when this bridge is the Root Bridge or is attempting to become the Root Bridge. For RSTP, this is the maximum hops allowed for any protocol message before it is discarded and no longer retransmitted. For STP, this is the maximum time, in seconds, that a bridge will wait for Configuration BPDUs before deciding it is no longer connected to the root bridge. The range is 6 - 40. The default value is 16 seconds.
Tx Hold Count: This is the maximum number of configuration BPDUs that can be transmitted in one second from a port on this Bridge before transmission is throttled. The range is 1 to 10. The default value for this field is 6.
Topology Changes: This is the number of RSTP topology changes since the switch has been powered on or rebooted.
RSTP Status: This is the current status of the RSTP protocol on this bridge. The available options for this field are RSTP, Force STP or Disabled.
Note: RSTP & N-Ring™ are different network topology protocols and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then the port will be disabled for RSTP.
Note: Do not create redundant network paths unless either RSTP or N-Ring is enabled.
Note: If a port is both an RSTP port and an enabled trunk group member, then the port will be disabled for RSTP. The RSTP port status can be seen under advanced RSTP ports.
Note: It is recommended that an RSTP network consist of RSTP capable switches.
Note: RSTP is supported on only one VLAN.
Note: When operating in a VLAN with legacy STP devices, use these values for the Bridge: Hello Time (Sec) = 2, Forward Delay (Sec) = 15 and Max Age (Sec) = 20.
BPDU Flooding: This value allows for flooding or blocking of BPDUs to other ports when the global spanning tree is disabled or when spanning tree is disabled on a specific port. If Flood is selected, BPDUs are flooded to all other ports based on the VLAN assignment. The options are Flood or Block. The default is Flood.

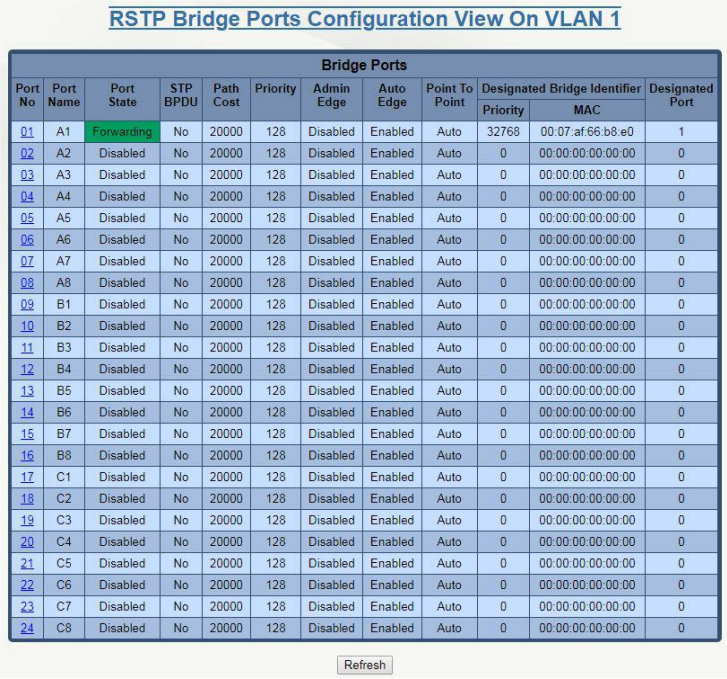
Click on the *Modify* button and the following dialog window will appear:



Make the required modifications, and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

The RSTP Ports dialog window displays information such as the path cost and the port state. If the switch sees a redundant network path, it will put the port with the highest path cost into the Blocking port state where it will discard packets coming in on that port.

In the example shown below, A2 is a redundant port with port A1, therefore A1 is forwarding and A2 is discarding.



Port No	Port Name	Port State	STP BPDU	Path Cost	Priority	Admin Edge	Auto Edge	Point To Point	Designated Bridge Identifier		Designated Port
									Priority	MAC	
01	A1	Forwarding	No	20000	128	Disabled	Enabled	Auto	32768	00:07:af:66:b8:e0	1
02	A2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
03	A3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
04	A4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
05	A5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
06	A6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
07	A7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
08	A8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
09	B1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
10	B2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
11	B3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
12	B4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
13	B5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
14	B6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
15	B7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
16	B8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
17	C1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
18	C2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
19	C3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
20	C4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
21	C5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
22	C6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
23	C7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
24	C8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0

Port No: Indicates the number of the port.

Port Name: Displays the descriptive name of the port.

Port State: The current RSTP state of the port is shown here. This state may be seen as "Forwarding, No STP, Disabled, Listening, Learning, and Discarding.

STP BPDU: Shows whether or not a legacy STP BPDU has been received or not.

Path Cost: Displays the current path cost of the port. The range is 0 - 200,000,000. If configured to 0 or Auto, the path cost will be calculated automatically using the actual speed of the port; otherwise the configured value will be used. The default value for this field is Auto.

Priority: The priority of the port is displayed in this column. The available range is 0 - 255. The default value for this field is 128.

Admin Edge: Indicates whether or not this port is treated as an Edge Port and can immediately enter the forwarding state. If set to Enabled, no BPDUs are expected to be received at the port. Set this option to Enable only when an end device is linked to this port. The default value is Disabled.

Auto Edge: Indicates whether or not to use a short timeout when waiting for BPDUs before determining that this is an Edge Port (if no BPDUs are received). It may have to be disabled for a very large network. The default value is Enabled.

Point to Point: Displays whether at most one other network port is attached to the port's LAN segment. The port may transition to Forwarding very quickly on a point-to-point MAC link. Values may be Auto (full-duplex links are assumed to be point-to-point, half duplex are not), and Force True or Force False (if the automatic determination would be wrong). The default value is Auto.

Designated Bridge Identifier Priority: The priority of the designated bridge associated with the port's LAN segment is shown in this field. The designated bridge provides the lowest cost path from this bridge port's LAN segment, through the designated bridge, to the root bridge.

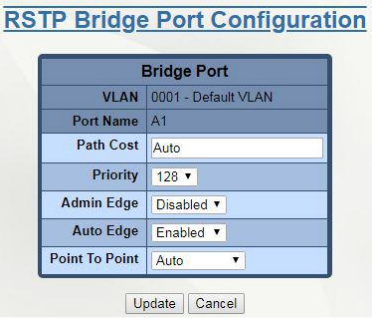
Designated Bridge Identifier MAC: Indicates the unique MAC of the designated bridge associated with the port's LAN segment.

Designated Port: The designated port of the designated bridge is shown here.

Note: When event logging is enabled, all RSTP controlled ports will log events about their status whether or not the modular based port is currently installed.

Note: When operating in a VLAN with legacy STP devices, set the Auto Edge field to Disabled for Bridge Ports.

To make changes to a Bridge port, click on the *Port No hyperlink* and the following window will appear:



Make the required modifications to the following parameters: Path Cost, Priority, Admin Edge, Auto Edge and Point to Point fields, then click on the *Update* button.

Security

Local Security

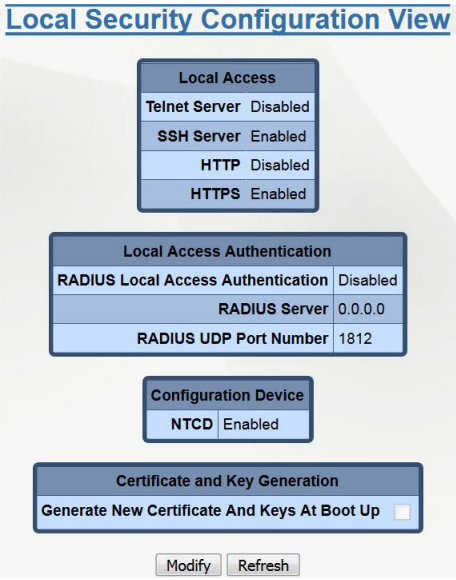
The Local Security feature allows an administrator to control local access (logins) to the switch.

Local Security Configuration View

The Local Security Configuration page displays the status of the Telnet server, SSH Server, HTTP protocol, and HTTPS protocol. The administrator can disable or enable these protocols, as desired. A RADIUS server can be configured to authenticate the user name and password entered for local access.

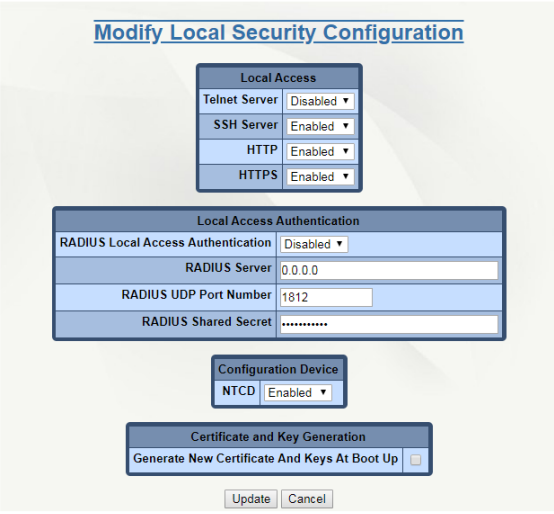
The N-Tron® Configuration Device (NTCD) SD card slot can be enabled or disabled, allowing an administrator to block and unblock reading and writing settings from the SD card as desired. A new certificate and keys can also be generated at boot up by selecting the *Generate New Certificate and Keys At Boot Up* option.

WARNING: If the NTCD device slot is disabled and the switch password is forgotten, access to the switch can only be recovered by sending it back to the factory to be unlocked.



Modify Local Security Configuration

Click on the *Modify* button and the page below will appear. Make the desired changes, and then click on the *Update* button. To save changes, navigate to the Configuration menu and click on the *Save* button.



These settings address local access to the switch. For better security, keep the Telnet Server and HTTP disabled.

Telnet Server: This field indicates whether the Telnet Server is enabled or disabled. Disabling the Telnet Server does not impact SSH. The default is disabled.

SSH Server: This field indicates whether the SSH Server is enabled or disabled. Disabling the SSH Server does not impact Telnet. The default is disabled.

HTTP: This field indicates whether HTTP is enabled or disabled. Disabling HTTP does not affect HTTPS secure connections. The default is disabled. HTTP users are not authenticated by the RADUIS server. If Radius authentication is exclusively required, then HTTP should be disabled.

HTTPS: This field indicates whether HTTPS is enabled or disabled. Disabling HTTPS requires HTTP to be enabled. The default is enabled.

A RADIUS server may be used to manage user accounts that have access to the switches.

RADIUS Local Access Authentication: This field indicates whether RADIUS Local Access Authentication is enabled or disabled. RADIUS authentication is not supported on HTTP connections. The default is disabled.

RADIUS Server: This field is the IP address of the RADIUS server used when RADIUS Local Access Authentication is enabled.

RADIUS UDP Port Number: The UDP port number of the RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

RADIUS Shared Secret: The shared secret for the local access authentication server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

NTCD: This field indicates whether the Configuration Device is enabled or disabled. The default is enabled. Disabling the NTCD SD card slot allows an administrator to block and unblock reading and writing settings to and from the SD card.

Generate New Certificate and Keys at Boot Up: This field indicates whether certificate and keys will be generated when the switch boots up. *A change to this setting requires that settings be saved and that the switch be rebooted before changes take effect*. The value will reset to be unchecked when the switch boots up. The default is no.

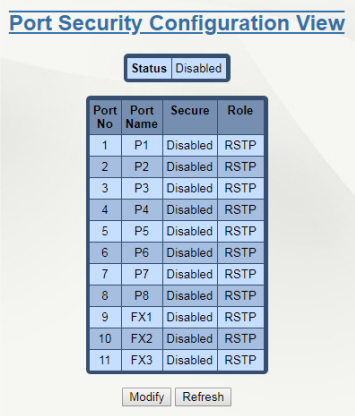
Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the port(s) that the address is authorized on. A non-authorized MAC address will be discarded and will be shown on the intruder log.

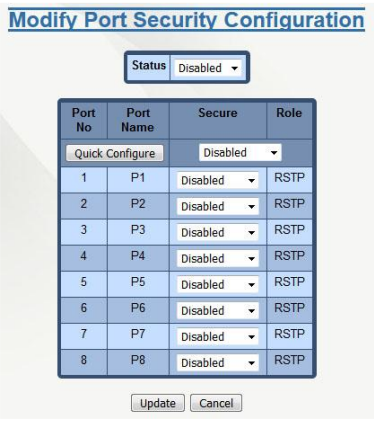
Port security allows secured ports to run with RSTP enabled on the port. Port security also allows the same MAC address to be authorized on multiple ports. When setting up authorization lists for RSTP ports, any MAC address that could migrate to other secured ports should also be placed, by the user, in the authorization list for those ports.

Port Security – Configuration

The Port Security Configuration View displays the status of Port Security and all the ports with their current settings. When Status is 'Locked' it is in secure mode. When Status is 'Learning' it builds an internal list of authorized MAC addresses and no ports are secured during this time.



The Modify button allows the administrator to change the Status of Port Security and Secure mode for all ports.



Status: The current status of Port Security. It can be Disabled, Learning, or Locked. Transitioning from Locked to Learning clears the Authorization List table on all ports. Transitioning from Locked to Disabled retains the current Authorization List. When transitioning from Learning to Locked, the Authorization List represents the authorized MAC addresses. The default value is Disabled.

Port No: The number of the port.

Port Name: The descriptive name of the port.

Secure: Displays Secure mode for the associated port. It can be Disabled, Enabled, or Single Mac.

- **Disabled:** Port Security is not active on the port regardless of the current Port Security Status.
- **Enabled:** Port Security is active when the current Port Security Status is Learning or Locked.
- **Single MAC:** Port Security will take the first learned MAC address and lock the port when current Port Security Status is Learning or Locked.

The default value is Disabled.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, N-Link Coupler, 802.1X, and Trunk.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Note: Security is not configurable on N-Ring or N-Link interconnecting ports. These ports must be linked to adjacent switches that have the protocol enabled. This link is considered to be a

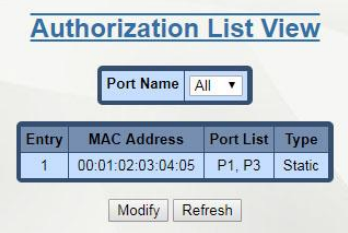
closed proprietary connection/segment that is not directly accessible. If both switches are otherwise properly secured then the proprietary connection/segment requires no additional security.

Note: It is recommended that the Bridging Aging Time be 300 seconds (the default) or longer while Port Security is Learning.

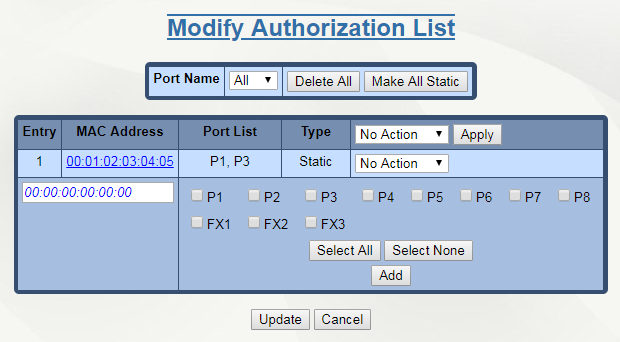
Ports Security – Authorization List

The Authorization List View displays a drop-down list of the available ports that is used to filter the authorization list. Below the drop-down list is the table of authorized Static and Learned MAC addresses and ports.

Note: Multicast Source Addresses will not show up in the Authorization List.



The Modify button allows the administrator to add new MAC addresses, and to modify and remove existing MAC addresses. The last row is used to add new MAC addresses and to change the ports of an existing MAC address.



Port Name: The descriptive name of the port.

MAC Address: The authorized host MAC address.

Port List: The port(s) that are authorized for the associated MAC address.

Type: The type of the authorized MAC Address. It can be either Learned, Static, or Single MAC.

Action: Action for the authorized MAC address. It can be No Action, Make Static from Learning mode, or Delete from the Authorization List. The maximum number of actions that may be performed on the Authorization List in a single update is 100.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Delete All Authorization List

To delete the complete authorization list associated with the selected port(s), click on *Delete All* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

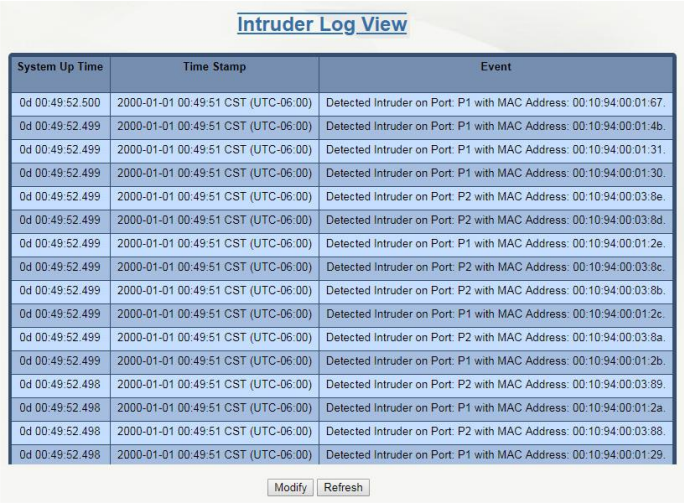
Make All Learned Authorization Entries Static

To make all learned authorization entries associated with the selected port(s) as Static, click on *Make All Static* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

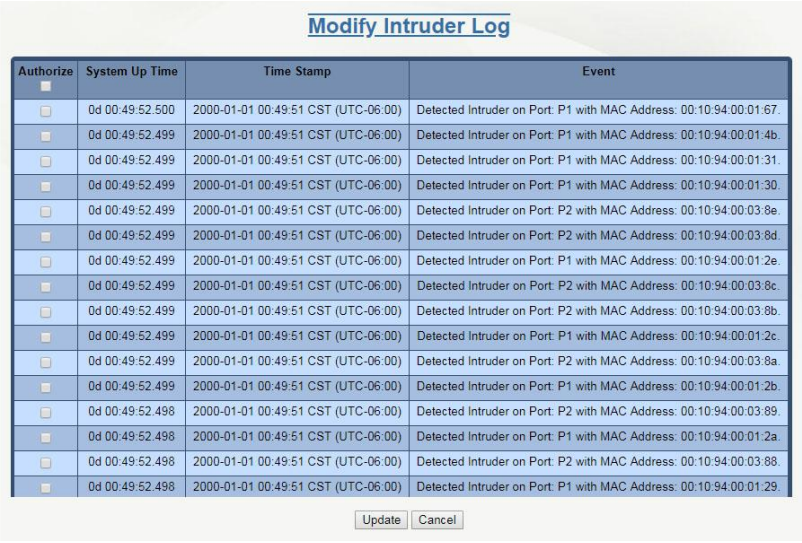
Note: Ports that are set to Single MAC cannot be included in static entries in the Authorization List.

Ports Security – Intruder Log

The Intruder Log page displays a list of unauthorized MAC addresses that attempted to access the secured device. Each intruder entry in the log is based on MAC address and Port. Multicast source MAC addresses will not be displayed in the Intruder Log table. The log is ordered by most recent first, based on the system up time and time stamp. The maximum number of entries is 100. If more than 100 intruders are detected, the oldest entries are deleted. The log is not saved through a power cycle.



To authorize a particular MAC Address from the Intruder Log, click on the Modify button and an "Authorize" field will be added as a checkbox as shown below:



Displays the most recent 100 intruders since the latest system startup. To review a complete list, please see the Event Log page.

FIELD	DESCRIPTION
Authorize	This is the selection to Authorize MAC Address(es) from the Intruder Log.
System Up Time	The elapsed time since the switch was powered on or rebooted.
Time Stamp	The date/time when the event was logged.
Event	The description of the intrusion.

Make the required modifications and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

An authorized entry will be displayed as green text color for that particular row in the Intruder Log table. The corresponding checkbox in the Authorize column will be checked and cannot be modified.

Port Security – Single MAC

Single MAC is a port security mode that allows a port to lock on a dynamically learned MAC address. The first MAC address to be learned and processed by the port will be locked in and any further traffic will be blocked as an intruder. The locking of the address is not dependent on switching the port security status to Locked. This feature helps in providing security for ports that may only have a single device plugged into the switch. The Single MAC address is not persistent following a reboot. The Single MAC will remain locked until a reboot upon which time a new MAC address will be learned and assigned as the new Single MAC entry.

Single MAC can be configured per port from the Port Security Configuration page. Manually added MAC addresses are not allowed to be assigned to a port designated as Single MAC. If a port is enabled under port security and then changed to Single MAC all learned addresses will be cleared and the next MAC address that comes in will be the new Single MAC address.

Single MAC addresses reset anytime the port security status is changed to Learning. Single MAC addresses are persistent when port security status is changed from Learning or Locked to Disabled and then back to Locked.

Single MAC limitations include: intruders on the Single MAC port cannot be manually authorized, and new addresses cannot be manually added to a Single MAC port.

Radius Server Configuration Information

The NT24k® takes advantage of Vendor Specific Attributes (VSA) as defined in section 5.26 of RFC 2865 so that multiple user levels can be authenticated using a Radius server. The VSA is defined as follows:

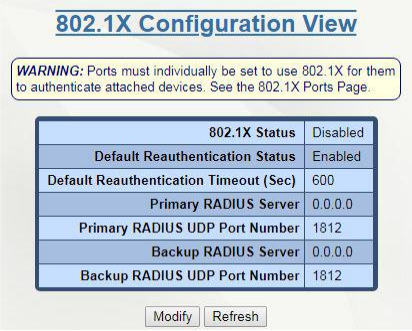
VENDOR ID	28381
Vendor ID	28381
Attribute Number	1
Attribute Format	string
Attribute Value	"AccessLevel:admin" or "AccessLevel:user"

The server and access list will need to be configured accordingly.

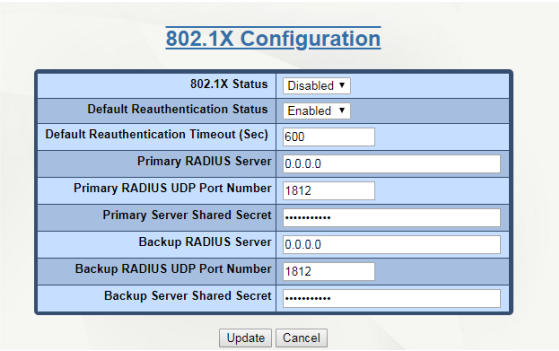
802.1X/Configuration

The Configuration dialog window displays the 802.1X status, reauthentication information, and RADIUS server information.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



To make changes to the Security settings, click on the *Modify* button and the fields shown below will become editable:



802.1X Status: This field indicates whether the 802.1X feature is enabled or disabled. At least one RADIUS server must be specified for 802.1X to be enabled. Ports must also be individually enabled on the ports configuration page.

Default Reauthentication Status: Select whether the 802.1X Reauthentication option is enabled or disabled. With reauthentication enabled, a device will be required to reauthenticate itself based on the time period specified by the reauthentication timeout field. 802.1X must be disabled to change this value.

Default Reauthentication Timeout (Sec): Enter the time period, in seconds, between 802.1X reauthentication. This value cannot be zero (0). 802.1X must be disabled in order to change this value.

Primary RADIUS Server: This field indicates the IP address of the primary RADIUS server. If contact with this server is lost, then contact with the backup server will be attempted.

Primary RADIUS UDP Port Number: The UDP port number of the Primary RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Primary Server Shared Secret: This field displays the shared secret for the primary server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Backup RADIUS Server: This field indicates the IP address of the backup RADIUS server. If contact with the primary server is lost, contact with the backup server will then be attempted.

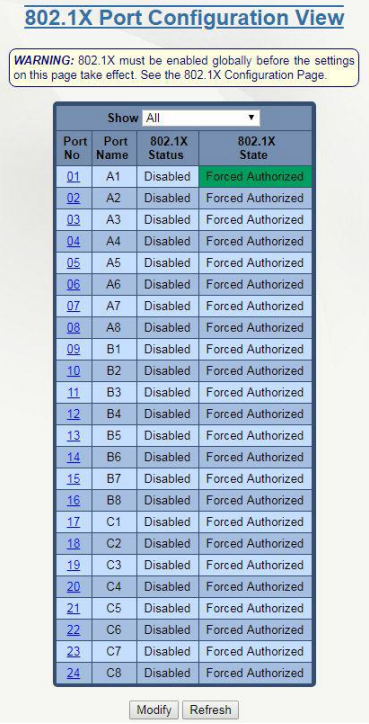
Backup RADIUS UDP Port Number: The UDP port number of the Backup RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Backup Server Shared Secret: This field displays the shared secret for the backup server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Make the required modifications and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

802.1X/Ports

The 802.1X Port Configuration View dialog window displays all the ports and their current settings. To modify this information, click on the *Modify* button.



Port No: This column shows the number of the port.

Port Name: This column displays the port's descriptive name.

802.1X Status: This column indicates whether the existing 802.1X port is enabled or disabled. Ports only require 802.1X authentication if they are enabled and 802.1X is globally enabled on the configuration page.

802.1X State: This column shows the current state of the port. This option is only valid when the port is enabled and 802.1X is globally enabled.

Link Down: There is no link detected on the port.
Initialize: The port is being setup for 802.1X authentication.
Disconnected: A valid 802.1X client has not been detected.
Connecting: A valid 802.1X client has been detected, but authentication has not begun.
Authenticating: The 802.1X client is being authenticated.
Authenticated: The 802.1X client has been authenticated.

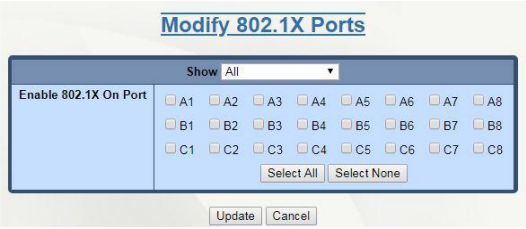
Aborting: The port is no longer authorized and is preparing to move back to the Disconnected state.

Held: The 802.1X client failed authentication and the switch is preventing new authentication attempts for a defined period of time. Default: 60 seconds.

Forced Authorized: Occurs when a port has had 802.1X disabled. The result is all traffic is allowed to pass through that port.

Forced Unauthorized: Occurs when a port is administratively disabled through the port configuration. The result is no traffic is allowed to pass through that port.

Click on the *Modify* button and the page below will appear. Select the required ports, and then click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



IEEE 802.1X MIB

The IEEE 802.1X MIB, IEEE 8021-PAE-MIB, is supported by the NT24k®. Since the NT24k does not support the supplicant features of 802.1X, the MIB tables pertaining to the supplicant behavior will not be populated and will be blank when queried.

With this release, the IEEE 802.1X MIB support is limited. Ports are only tracked when an 802.1X aware supplicant is attached. This means that not all 802.1X enabled ports will be visible, only those with valid supplicants. The statistics available through the MIB only pertain to the device since it either passed or failed authentication. Once the link goes down on the port, the statistics will be reset. Furthermore, any configuration items accessed through the IEEE 802.1X MIB can be set to modify the behavior of the port, but these changes will not persist across link events or power cycles.

Configuration changes that occur through the NT24k MIB will be persisted across link events and power cycles. Support for persisted statistics and configuration settings in the IEEE 802.1X MIB will be added to the NT24k in a future release.

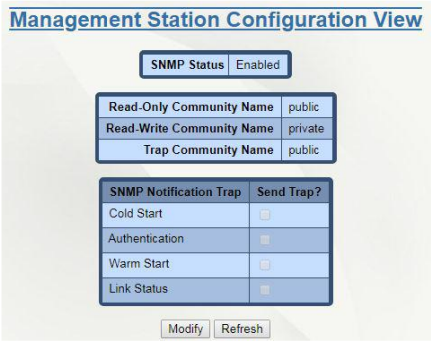
The IEEE 802.1X MIB allows for the writing to dot1xPaeSystemAuthControl. This is not supported in the current release of the NT24k firmware. dot1xPaeSystemAuthControl is considered a read-only attribute. The functionality for this is located in the NT24k MIB as ntronSecurityDot1xConfigStatus.

The IEEE 802.1X MIB allows for the writing to dot1xAuthAdminControlledDirections. Controlling the direction of the port traffic is not currently supported in the NT24k firmware and writing to dot1xAuthAdminControlledDirections will not have an effect on the system.

SNMP

Configuration

The SNMP Configuration displays the SNMP status and allows the administrator to disable or enable the protocol. The Read-Only, Read-Write and Trap Community Names are also displayed in this dialog window.



SNMP Status: This field indicates whether SNMP is enabled or disabled.

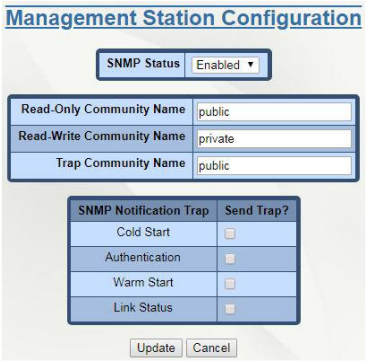
Read-Only Community Name: This configurable field represents the Authorized Community Name for SNMP Get requests. Only alphanumeric characters are allowed. The default value for this field is public.

Read-Write Community Name: This configurable field represents the Authorized Community Name for SNMP Set requests. Only alphanumeric characters are allowed. The default is for this field is private. Only administrators can view or modify this field.

Trap Community Name: This configurable field represents the Authorized Community Name for SNMP Traps. Only alphanumeric characters are allowed. The default is for this field is public.

SNMP Notification Traps: This section allows for control of which SNMP traps will be sent by this switch. Each of the four available traps can be enabled or disabled individually. The traps are: Cold Start, Authentication, Warm Start and Link Status.

Click on the *Modify* button to make changes to the SNMP Configuration. This will enable all configurable fields. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



Trap Stations

The Trap Stations dialog window displays the SNMP Trap Stations.

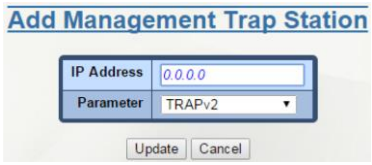


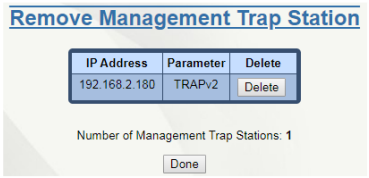
IP Address: This field represents the IP address of the Management Station to be sent SNMP Traps.

Parameter: This field displays the Target Parameters entry (TRAPv1, TRAPv2, etc) to be used for sending traps to the Management Station.

Adding Management Trap Stations

To add trap stations, click on the *Add* button and the following will appear:





Enter the required IP address and select the parameter to be used. Click on the *Update* button and the Display Management Trap Stations screen will appear.

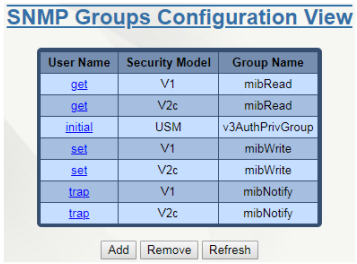
***SNMP V3 Default Security Parameters*:** The SNMP V3 default user parameters are shown here for reference only, as they are necessary for connecting to the switch securely using an SNMP V3 client when in defaults.The default user and other users can be added, deleted or modified by an administrator via either an SNMP V3 client or web browser, and the values below may be invalid if they are changed by an SNMP administrator.

Username: initial
Authentication Password: authpass
Authentication Protocol: MD5
Privacy Password: privpass
Privacy Protocol: DES

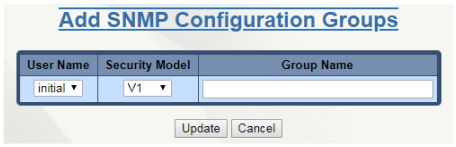
To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

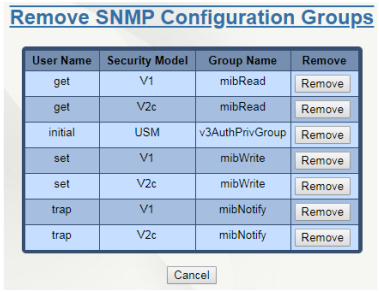
Groups

The SNMP Groups page allows the customer to configure SNMP group settings for specific SNMP users.



Click on the *Add* button to create a new SNMP group, or click the hyperlink under User Name to modify existing group settings for a user. Click the *Remove* button to display a list of current configured group and user settings, with an option to remove specific ones.





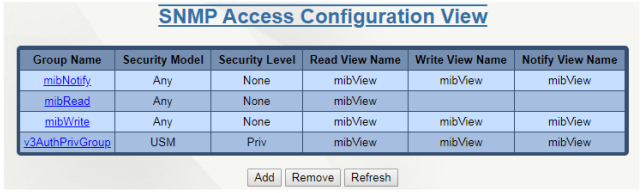
User Name: This field represents the SNMP User Name. It is a drop down list with an option for every SNMP user defined on the **Users** page.

Security Model: This field represents the security model the SNMP protocol will use for the defined group. The default is Any, while V1, V2c and USM (User-based Security) are the other available options.

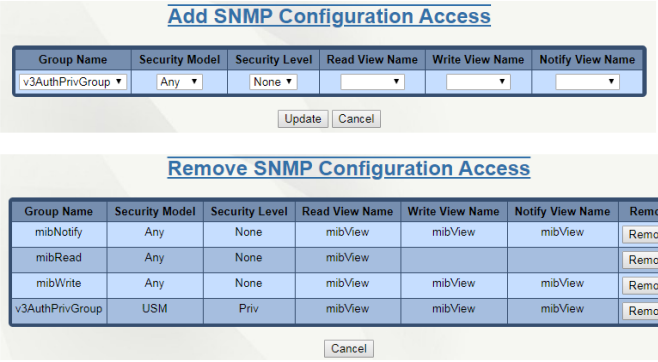
Group Name: This field represents the SNMP Group to which the SNMP user belongs.

Access

The SNMP Access page allows the customer to define various types of MIB access based on the defined view settings for each SNMP group.



Click on the *Add* button to define new access settings for a group, or click the hyperlink under Group Name to modify existing access for a group. Click the *Remove* button to display a list of current configured group and access settings, with an option to remove specific ones.



Group Name: This field represents the name of the group the user defines access settings for. It is a drop down list with an option for every SNMP group defined on the **Groups** page.

Security Model: This field represents the security model used to validate group access to views. The options are V1, V2c and USM (User-based Security).

Security Level: This field represents the security level of SNMP communications for the defined group. The options are None, Auth, and Priv.

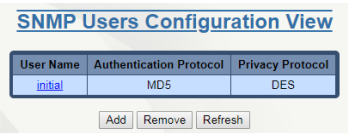
Read View Name: The name of the view that the defined group has read access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Write View Name: The name of the view that the defined group has write access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

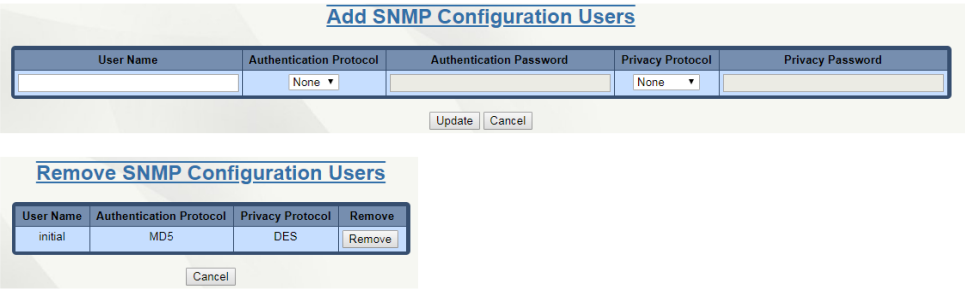
Notify View Name: The name of the view that the defined group has notify access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Users

The SNMP Users page allows a customer to create custom user names for group access and set the authentication and privacy protocols for that user. It is important to note that authorization and privacy passwords, when created, are hashed internally for security and will not be able to be retrieved.



Click on the *Add* button to create a new SNMP user, or click on a hyperlink in the *User Name* column to edit the information for that user. Click the *Remove* button to display a list of current configured users, with an option to remove specific ones.



User Name: This field represents the SNMP User Name.

Authentication Protocol: This field represents the authentication protocol utilized by the SNMP user. The options are None, MD5, and SHA1.

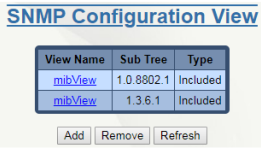
Authentication Password: The defined authentication password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

Privacy Protocol: This field represents the privacy protocol utilized by the SNMP user. The options are None, DES, and AES-128.

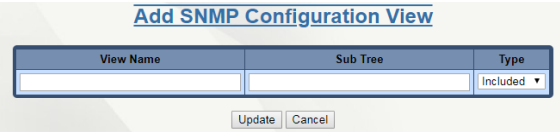
Privacy Password: The defined privacy password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

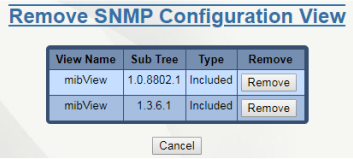
View

The SNMP View page allows a customer to define different view groups, which either include or exclude specific sub trees from the MIB tree based on the configuration.



Click on the *Add* button to create a new SNMP view, or click on a hyperlink in the *View Name* column to edit the information for that view. Click the *Remove* button to display a list of current configured views, with an option to remove specific ones.





View Name: This field represents the name of the SNMP view.

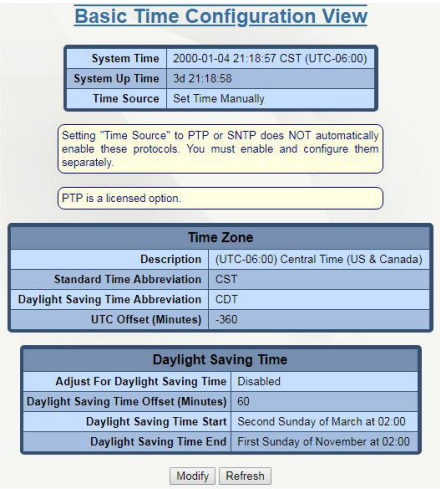
Sub Tree: This field allows the user to enter an OID string representing the sub tree being included or excluded from the view, based on the **Type** setting.

Type: This field allows the user to configure what the SNMP view does with the sub tree defined in the *Sub Tree* field. The options are Included and Excluded.

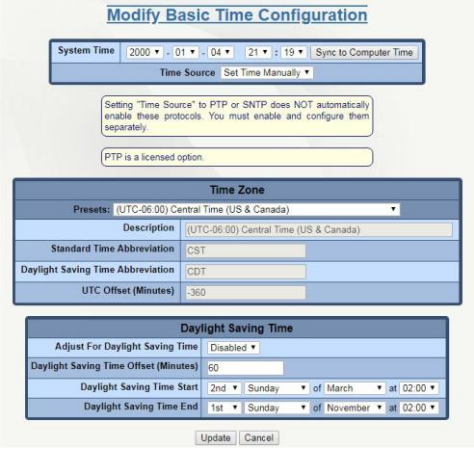
Time

Basic

From the Basic Time Configuration View dialog, the administrator can define the system time, time zone, daylight savings time and time source settings for the unit.



Click on the *Modify* button to make modifications to the unit's time settings.



System Time: This field displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start. The system date/time can be set manually but in the event of a power cycle or reboot it will revert to the default value.

Time Source: This field controls how the switch will automatically set its clock. The default value of "Set Time Manually" means that the time the switch uses can only be set manually. Setting this field to either "SNTP" or "PTP" causes the protocol to continuously update the system clock. Note that these must be enabled and configured separately from the basic time configuration. PTP is a licensed option and is unavailable otherwise.

Time Zone

Presets: This field provides a list of global time zones and cities within the time zones. Selecting from this list provides easy local time configuration and automatically populates the fields below. Choosing the "Custom..." option allows for editing of the below fields to satisfy specific requirements that are not met by one of the preset time zones.

Description: This field provides a description of the time zone selected. It contains the city and the offset from UTC for the selected location. If a custom preset is selected the description may be edited.

Standard Time Abbreviation: The common abbreviation for the selected time zone during standard daylight time is shown in this field. If a custom preset is selected the abbreviation may be edited.

Daylight Saving Time Abbreviation: This field represents the common abbreviation for the selected time zone during daylight saving time or summertime. If a custom preset is selected the abbreviation may be edited.

UTC Offset (Minutes): This field displays the offset, in minutes, from UTC. This is used to determine the local time. If a custom preset is selected the offset may be edited. Any change to the offset will affect the time calculation.

Daylight Saving Time

Adjust For Daylight Saving Time: This field indicates whether automatic adjustment for daylight saving time is made. The settings for this adjustment are defined below.

Daylight Saving Time Offset (Minutes): This field defines how much, in minutes, to adjust the time when daylight saving time starts and ends.

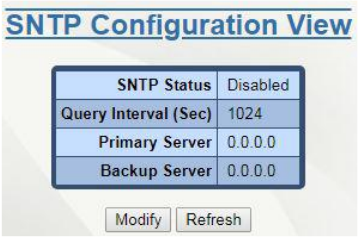
Daylight Saving Time Start: The week, the day of the week, the month, and the time at which daylight saving time should start.

Daylight Saving Time End: The week, the day of the week, the month, and the time at which daylight saving time should end.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

SNTP

From the SNTP Configuration View, the SNTP status can be changed, and the primary and back-up servers can be defined. Click on the *Modify* button to enable or modify the current settings.



SNTP Status: Indicates whether the SNTP client has been enabled. In order to enable SNTP, at least one SNTP or NTP server must be specified.

Query Interval (Sec): The periodic query interval used to request the time from the server(s). The valid range is between 4 and 129600. The default value is 1024.

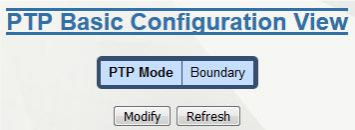
Primary Server: The address of the server to query first and most often. If contact with this server is lost, then contact with the backup server will be attempted. Either an SNTP or an NTP server may be specified.

Backup Server: The address of the backup server to query in the event that access is lost to the primary server. Either an SNTP or an NTP server may be specified. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Precision Time Protocol (PTP)

PTP Basic Configuration

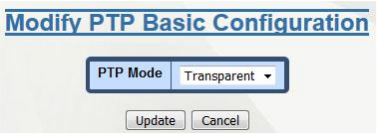
The PTP Basic Configuration View displays the PTP Mode and allows the administrator to disable the protocol, or enable one of two clock modes, Boundary or Transparent.



PTP Mode: This field indicates whether PTP is disabled, operating as a Boundary clock, or operating as a Transparent clock. When PTP is disabled, PTP traffic will route through the switch like any other multicast traffic.

Transparent Clock mode generally provides the most accurate time to a PTP client when the network is lightly loaded and there are only a few PTP clients connected to the switch. Boundary Clock mode is a better choice for a congested network. Boundary Clock mode also becomes a better choice as more PTP clients are connected to the switch.

Click on the *Modify* button to change the PTP Mode. When the desired mode has been selected, click *Update*.

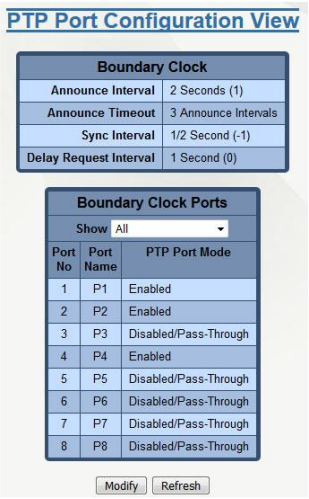


Note: When switching between PTP modes, it will be necessary to save the configuration and reboot the switch for the change to take effect.

PTP Port Configuration

The PTP Port Configuration View displays global and per port settings that relate to PTP.

The settings in the **Boundary Clock** table are applied to every port of a switch in Boundary Clock mode. The **Boundary Clock Ports** or **Transparent Clock Ports** table displays the PTP Port Mode for every port on the switch.



Global Boundary Clock Settings

Announce Interval: This is the log2 value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Announce Timeout: This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Sync Interval: This log2 value determines how often a sync message will be sent. The default value of "- 1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Delay Request Interval: This log2 value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

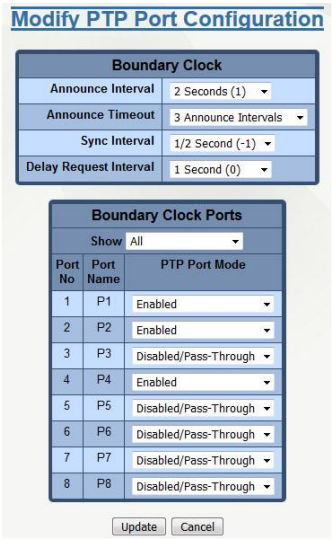
Boundary Clock Ports or Transparent Clock Ports Settings

Port No: Indicates the number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked". When Enabled, PTP packets will be processed by the switch PTP software. When Disabled/Blocked, PTP packets will be discarded as they enter the port. When Disabled/Pass- Through, PTP packets will be forwarded to other pass-through ports (within VLAN restrictions) with no PTP processing.

Click the *Modify* button to change any of the global settings or to change the PTP Port Mode of specific ports.

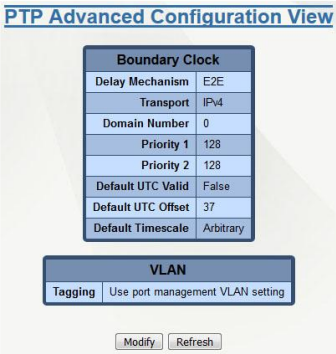


Once modifications to Announce Interval, Announce Timeout, Sync Interval, Delay Request Interval or PTP Port Mode have been made, click on the *Update* button.

Note: The settings on the PTP Port Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

PTP Advanced Configuration

The PTP Advanced Configuration View displays common advanced PTP settings and advanced settings that relate specifically to the Boundary Clock mode of operation. The Common values are read-only and only some values can be modified.



Boundary Clock

Delay Mechanism: The Delay Mechanism specifies the method used by PTP to handle delay correction values. E2E is the only delay mechanism currently supported.

Transport: IPv4/UDP is the only network transport method currently supported.

Domain Number: The Domain Number selects a PTP Domain. Only PTP packets in the same domain will be received and processed, and all sent PTP packets will be tagged with the same Domain Number. The range is 0-127. The default is 0.

Priority1: This value sets the priority of this switch as a Master clock. It is the most important value used by the Best Master Clock (BMC) algorithm of other PTP devices when selecting a Master clock. The range is 0-255, with 0 being most important. The default is 128.

Priority2: This value is used to break ties in the BMC algorithm. The range is 0-255, with 0 being most important. The default is 128.

Default UTC Valid: Current UTC Valid is a field in PTP packets that tells other devices whether the UTC Offset field that is also being sent in the packet should be considered valid. The Current UTC Valid value is set to this default at boot time, until it is updated by making a connection to a PTP Master. The default is "False" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

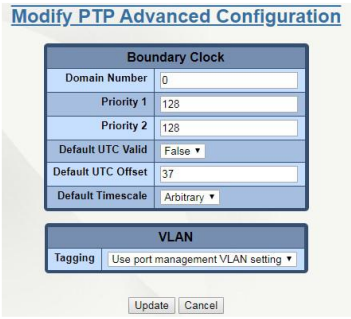
Default UTC Offset: The Current UTC Offset value is set to this default at boot time. The range is 0-127. The default is 36.

Default Timescale: The Current Timescale value is set to this default at boot time. All times exchanged in the PTP protocol are either "Arbitrary" or "PTP". Times that are "Arbitrary" cannot be converted to calendar time correctly and may have no connection to external accurate time. Times that are "PTP" can be converted to accurate calendar time using the UTC offset. The default is "Arbitrary" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

VLAN Tagging: PTP frames that egress a PTP port may have a VLAN tag or may be untagged. When "Use port Management VLAN setting" is selected, the PTP frame is untagged if the Management VLAN is set to 'Untag on Egress'. Otherwise, the frame is tagged with the Management VLAN ID. This is the default setting. When "Use port PVID setting" is selected, the PTP frame is untagged if the VLAN used as the PVID is set to 'Untag on Egress'. Otherwise, the frame is tagged with the port's PVID.

Note: When PTP Mode is "Transparent Clock", PTP frames will obey VLAN restrictions and will not cross VLAN boundaries.

To make changes, click on the *Modify* button. Once the desired changes have been made, click on the *Update* button to apply changes to settings.

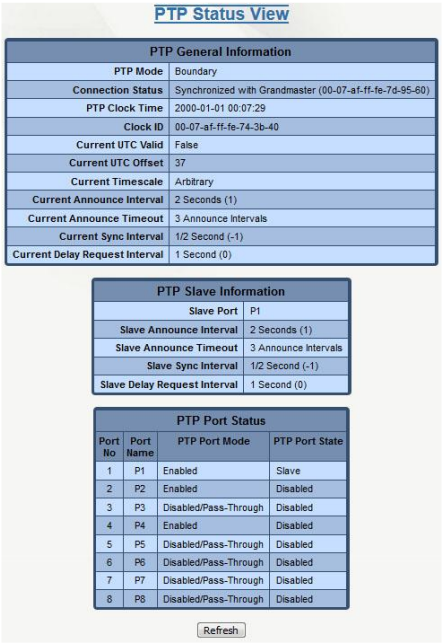


Note: The settings on the PTP Advanced Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

Note: The Current UTC Valid, Current UTC Offset and Current Timescale values are not displayed on the View or Modify pages when PTP is currently disabled or in Transparent Clock mode because they do not apply.

Status

The PTP Status and Information page displays read only information about a device's PTP configuration. General and per port information is displayed on this page.



Note: When PTP is disabled, the only information displayed on this page is PTP Mode and Clock ID, because nothing else applies when PTP is disabled.

PTP General Information

PTP Mode: The PTP mode of the switch. Options include "Disabled", "Boundary Clock", and "Transparent Clock". The default is "Disabled". If the PTP protocol is disabled on the switch, all ports behave as Disabled/Pass-Through. Changes to this setting require a reboot of the switch.

Connection Status: This only applies to Boundary Clock mode. This is the current PTP Master clock of the switch. If this switch is the Master clock, then the connection status indicates that PTP is not synchronized with a Grandmaster.

PTP Clock Time: This only applies to Boundary Clock mode. This displays the date/time of the PTP Clock. The PTP Clock defaults to the system clock when not synchronized to a PTP Master clock.

Clock ID: The unique Clock ID of this PTP device. It is constructed automatically based on the switch MAC address.

Current UTC Valid: A field in exchanged PTP packets that says whether the UTC Offset field that is also being sent in the packet should be considered valid. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current UTC Offset: A field in exchanged PTP packets that provides the current offset to UTC. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current Timescale: A field in exchanged PTP packets that provides the most recently received Timescale value from the Master. This is a run-time value that is dynamically updated based on the most recently connected PTP Master. If this value is "PTP", the internal PTP time can be converted to a calendar time using the Current UTC offset.

Current Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Slave Information

Slave Port: This only applies to Boundary Clock mode. This is the port that is connected to and inheriting configuration values from a PTP Master. If no port is acting as a PTP Slave this field will have a value of “N/A”.

Slave Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Port Status

Port No: The number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked".

PTP Port State: The current PTP state of a port. It should be noted that when PTP is in Transparent Clock mode the port state is not applicable and will not be displayed.

User Management

Authorized Users

The User Management screen allows users to view, add, modify and remove system user accounts. The display includes a list of all the users who have access to the management features of the switch and their access permissions.

Note: Up to 5 web users may be logged into the Web Management tool at once.



Adding Users

The system administrator can add users, change passwords and define access permissions for each user. Click on the *Add* button and the following dialog window will appear:



User Name: User names may include all alphanumerical characters, as well as the following 2 characters: _ - , and must be 3 to 15 characters long.

Password: Passwords can include all printable characters, except for the colon (:) and spaces, and the password length must be in the range specified by the "Password Length Min" and "Password Length

Max" fields. These fields are configurable under the User Management Configuration screen. The background print in the Password entry field will specify the currently configured range.

Access Permission: This field determines whether a user has standard *User* rights or *Admin* access.

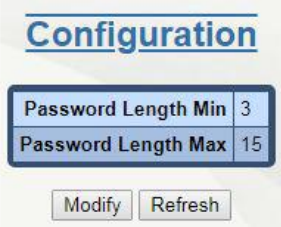
- *User* permission gives the right to view switch configurations and to view current port settings.
- *Admin* permission gives the right to change and view any switch configuration and to change and view any current port settings.

Removing Users

Users can be removed by a user with Admin access. Click on the *Remove* button, enter the User Name to be deleted and click on the *Remove* button.

Configuration

The User Management Configuration screen allows for the switch to be configured with a user password length minimum and user password length maximum.



Password Length Min: The minimum number of characters allowed in a user password. The default is 3 characters.

Password Length Max: The maximum number of characters allowed in a user password. The default is 15 characters.

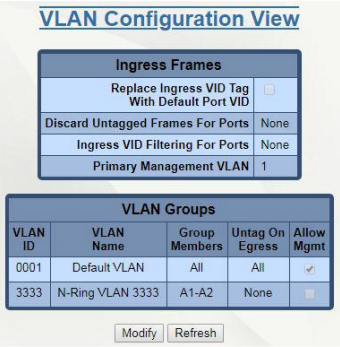
The Configuration screen allows modification of the minimum user password length and the maximum user password length. Both fields, 'Password Length Min' and 'Password Length Max' must be within the overall range of 3 to 15 characters, inclusive.

A configuration change, min or max, will not be allowed if an existing user password will fall out of the desired range (or become non-compliant). Each of the users preventing the change will be listed in the error message. In this case, each of the users that would become non-compliant would need to have their password lengths changed to fall into the new desired range before the configuration change can be applied.

VLAN

The VLAN Configuration View dialog window shows information about the existing VLANs.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Ingress Frames

Replaces Ingress VID Tag With Default Port VID: Specifies whether or not to replace the VID tag of ingress frames with the port's default VID (PVID).

Discard Untagged Frames For Ports: Specifies whether or not untagged ingress frames are dropped by the selected ports.

Ingress VID Filtering for Ports: Specifies whether or not to filter out ingress frames when a VID violation is detected on the selected ports.

Primary Management VLAN: The default egress VLAN used for communications initiated by the switch i.e. DHCP requests.

VLAN Groups

VLAN ID: Displays the VLAN identification for the group members. The range should be 1 - 4094.

VLAN Name: This field displays the VLAN name, which accepts alphanumeric and only the following special characters (including the period)**: # _ - .**

Group Members: This field specifies which ports are members of the VLAN group.

Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Allow Mgmt: Specifies whether or not all ports in this VLAN are management ports.

VLAN Group Members

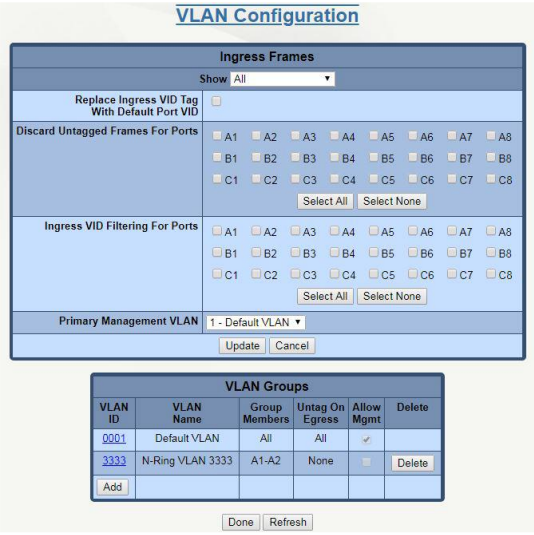
Port No.: The number of the port.

Port Name: The descriptive name of the port.

Group Member: Specifies whether or not the port is a member of the VLAN group.

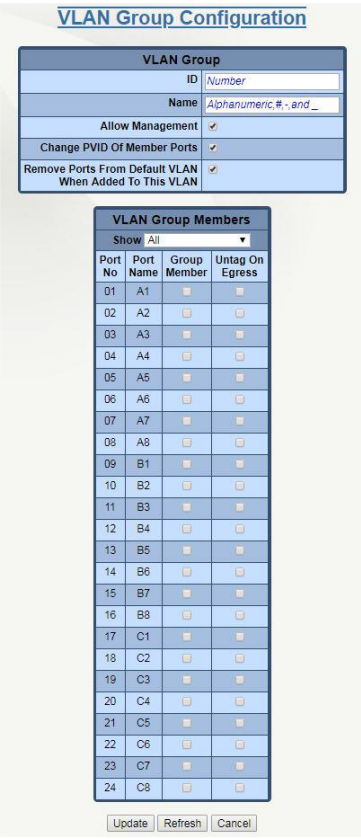
Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Click on the *Modify* button and the following VLAN Configuration page will appear:



The top table is used for general VLAN changes. Once the required changes have been made, click on the *Update* button and then go to the Configuration menu and click on the *Save* button to ensure all changes are saved.

The bottom table is where new VLANs are added and existing ones are modified or deleted.Click on the *Add* button in the bottom table and the following dialog window will appear:



Note: The system is limited to a maximum of 60 configured VLAN groups.

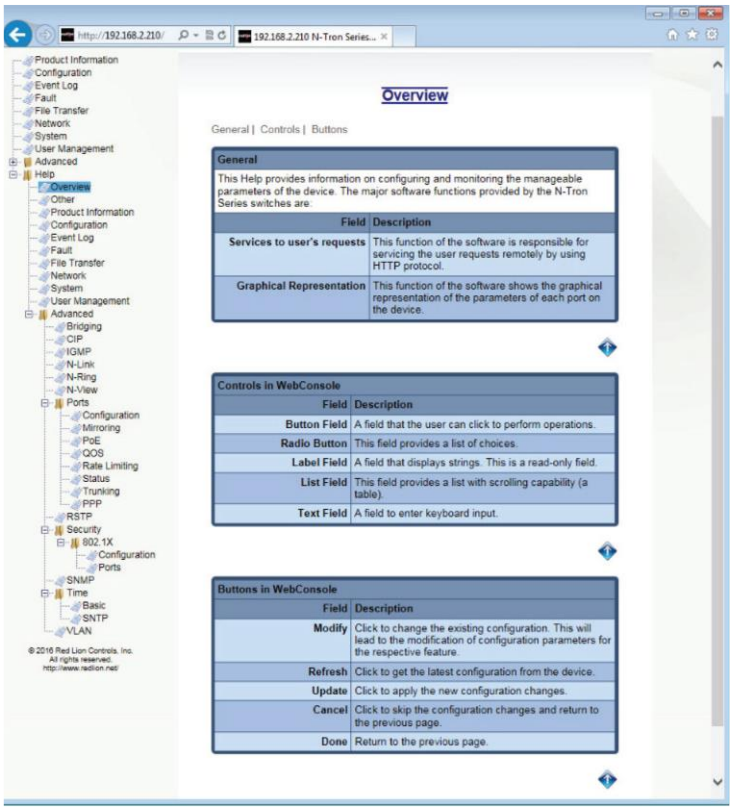
Note: The total number of configured VLAN groups is constrained by system resource usage which varies depending upon network configuration, with VLAN port membership count being the most significant factor.

Note: A port is automatically moved to the Default VLAN if no other VLAN contains that port.

Once the required changes have been made, click on the *Update* button and then go to the *Configuration* menu and click on the *Save* button to ensure all changes are saved.

Help

The Help menu provides information on monitoring and configuring the manageable parameters of the device. Specific help can be found by using the left-hand navigation menu or clicking on the Help link in the top menu.



Appendix A

Command Line Interface

The Command Line Interface (CLI) can be accessed by connecting a host device to the USB connector on the switch. Once connected, the switch will appear as a serial connection. A standard terminal application may be used to communicate to the switch through the serial connection. For serial port settings, see the “USB INTERFACE” section of the NT24k® Series Hardware Manual.

There are two additional methods for connecting to the CLI, Telnet and SSH. Using any standard Telnet client, sim-ply enter the IP address of the switch to start a connection to the CLI. SSH, the secure alternative to Telnet, can also be used with any standard SSH client by simply entering the IP address of the switch to start a secure connection to the CLI.

The CLI contains some status and configuration capability. To interact with the CLI, a login is required. The default username and password is 'admin'. Once logged in, a listing of available commands can be obtained through the help interface. This is accessible by typing either “?” or “help?”. The following commands are available:

NT24k CLI Commands

COMMAND	ARGUMENTS	DESCRIPTION
?		Show system commands. This command is the same as 'help commands' which is shown below.
admin		Administration settings, including IP settings and DHCP mode.
admin system set		Set general system settings.
admin system set contact	<contactname>	The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set location	<locationname>	The physical location of the switch. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set name	<switchname>	Contains the name assigned to the device, which allows alphanumeric and special characters '#', '_', '-', and ':' only. When IP Configuration is DHCP, this may be used as the Client ID (Option 61) of the DHCP Request.
admin system set upper Threshold	<upperThreshold> - An integer from -60 to 120.	The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system set lower Threshold	<lowerThreshold> - An integer from -60 to 120.	The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system show		Show general system information.
admin ip set		Set Internet protocol settings.
admin ip set clientid	<type> - A client ID type: [0-switch name, 1-switch MAC, 2-other text, 3-other hex] <value>	This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters.

COMMAND	ARGUMENTS	DESCRIPTION
	- A string when the type is 2 or a hex string when the type is 3.	• Usage: admin ip set clientid 0 • Usage: admin ip set clientid 2 "Switch53"
admin ip set dhcp admin ip set no dhcp		Determines the method used to obtain an IP address, Subnet Mask, and Gateway. When DHCP is enabled, DHCP protocols are used to obtain these values. When DHCP is disabled, Static is selected, and the statically configured values are used. • Usage: "admin ip set dhcp" to enable DHCP mode. • Usage: "admin ip set no dhcp" to disable DHCP and return back to Static.
admin ip set ip	[address <ipaddress>] - The IP address of the device. [mask <subnetmask>] - The Subnet mask of the device. [gateway <gateway>] - The Gateway address of the device.	Set the Static IP address, subnet mask, and/or gateway. • Usage: admin ip set ip [address (IP address)] [mask (Subnet mask)] [gateway (Gateway address)] **Example:** CLI> admin ip set ip address 192.168.2.212 mask 255.255.255.0 gateway 192.168.2.1
admin ip show		Show Internet protocol settings. **Example:** CLI> admin ip show
arl		Show ARL Configuration.
arl show		Show ARL Configuration. Example: CLI> arl show Arl Settings Src MAC Address Vlan Sta Drop Blk Loc Destination Ports Applies only to Ports ================== ==== === ==== === === ========== 00:07:af:7d:37:e0 1 Y N N FDB CPU All 01:00:5e:00:00:fb 1 Y N N FDB C7 All 01:00:5e:00:00:fc 1 Y N N FDB C7 All 01:00:5e:7f:ff:fa 1 Y N N FDB C7 All 01:07:af:00:de:d1 ANY Y N N POL CPU A1-A2 01:07:af:00:de:d2 ANY Y N N POL Drop All 01:07:af:00:de:f0 ANY Y N N POL Drop All 01:07:af:00:de:f1 ANY Y N N POL Drop All 01:07:af:00:de:f2 ANY Y N N POL Drop All 01:07:af:00:df:48 ANY Y N N POL Drop All 01:07:af:01:3d:1b ANY Y N N POL CPU All 01:07:af:7d:37:e0 ANY Y N N POL Drop All 01:80:c2:00:00:00 1 Y N Y POL CPU All a0:36:9f:3b:6c:b2 1 N N N FDB C7

COMMAND	ARGUMENTS	DESCRIPTION
		All ff:ff:ff:ff:ff:ff ANY Y N N POL CPU All
arp		Address Resolution display and control.
arp	[<arguments>]	Use arp without arguments to get help. Example: CLI> arp <arp>arguments> - Use arp without arguments to get help. Surround multiple arguments with double quotes. EX: arp "-r 192.168.2.117" CLI> arp NAME arp - address resolution display and control SYNOPSIS arp [-silent] [-V <routetab>] [-i <ifname>] –a arp [-silent] [-V <routetab>] [-i <ifname>] –A arp [-silent] [-V <routetab>] [-i <ifname>] -d <hostaddress> arp [-silent] [-V <routetab>] [-i <ifname>] [-p] [-t] -s <hostaddress> <ether_addr> arp [-silent] [-V <routetab>] [-i <ifname>] -r <hostaddress> DESCRIPTION The arp program displays and modifies the Internet-to-Ethernet address translation tables used by the address resolution protocol. Options: -silent Suppress output. MUST be the first argument. -i <ifname> Specify interface. First one if not specified. -t Temporary ARP entry. -p Public ARP entry (i.e. proxy ARP entry). -r Send an ARP request to the host address. -V <routetab> Specify route table. 0 if not specified. Commands: -a Display the currently existing ARP entries. -A Delete all the ARP entries. -d Delete specified ARP entry. -s Register a ARP entry for a node.
clear		Clear the screen.
config		Save changes to the configuration or reset the configuration to factory defaults.
config reset		Reset configuration settings to factory defaults.
config save		Save current running configuration settings.
dhcpServer		DHCP Server.
dhcpServer status set	<statusValue>	Set DHCP Server status (disabled or enabled).
dhcpServer status show		Show DHCP Server status.
exit		Exit immediate mode. **Example:** CLI> admin ip CLI(admin-ip)> exit CLI>
fileTransfer	tftp server <ip address> transferType	Transfer files to or from the switch.

COMMAND	ARGUMENTS	DESCRIPTION
	<UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]	
help		Show command help.
help commands		Show system commands. Example: CLI> help commands admin - Administration settings, including IP settings and DHCP mode. arl - Arl Settings arp - Address Resolution Protocol (ARP) clear - Clear the screen config - Save changes to the configuration, or reset switch to factory defaults. dhcpServer - DHCP Server exit - Exit immediate mode fileTransfer - Transfer files help - Show command help history - Show command history lldp - Link Layer Discovery Protocol logout - Log off this system ping - Ping a host. port - Port settings portSecurity - Port Security ppp - Start PPP server (use from serial console only). reboot - Reboot the switch and load the most recently saved configuration. who - Display users currently logged in whoami - Show current user info
help edit		Show editing keys. **Example:** CLI> help edit Available editing keystrokes: Delete current character.....Ctrl-d Delete text up to cursor.....Ctrl-u Delete from cursor to end of line.....Ctrl-k Move to beginning of line..... Ctrl-a Move to end of line.....Ctrl-e Get prior command from history.....Ctrl-p Get next command from history.....Ctrl-n Move cursor left..... Ctrl-b

COMMAND	ARGUMENTS	DESCRIPTION
		Move cursor right.....Ctrl-f Move back one word.....Esc-b Move forward one word.....Esc-f Convert rest of word to uppercase.....Esc-c Convert rest of word to lowercase.....Esc-l Delete remainder of word.....Esc-d Delete word up to cursor.....Ctrl-w Transpose current and previous character..... Ctrl-t Enter command and return to root prompt..... Ctrl-z Refresh input line..... Ctrl-l
help help		Show command help. **Example:** CLI> help help help - Show command help commands - show system commands edit - Show editing keys
history		Show command history. **Example:** CLI> history 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history
history clear		Reset all history.
history enable		Turn history capture on.
history filter		Do not capture repeated input into history.
history info		Information **Example:** CLI> history info 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history 3 history info History filter: off History modal : off History ring : on
lldp		Link Layer Discovery Protocol.
lldp mode show		Show LLDP mode.
lldp mode set	disable, enabled, auto	Set LLDP mode.
lldp wakeTime show		Show remaining wake time in auto LLDP mode.
lldp wakeTime send	hours <hours> minutes <minutes>	Send wake time in auto LLDP mode to all switches.
logout		Log off this system.
ping		Ping a host.
ping	[<arguments>]	Use ping without arguments to get help. Surround multiple arguments with double quotes. **Example:** ping "-c 3 192.168.2.121"
port		Port Mirroring configuration display and control.

COMMAND	ARGUMENTS	DESCRIPTION
port config show	<portlist>	Show all port configuration information for the specified ports.
port config show all		Show all port configuration information for all ports on the switch.
port config show basic	[<portlist>]	Show basic port configuration information for the specified ports.
port mirror set		Set Port Mirroring configuration.
port mirror set enable port mirror set no enable		Enable or disable Port Mirroring. Use "no enable" to disable.
port mirror set destination	<port>	Set the destination port for Port Mirroring. For example, "A4".
port mirror set txsource	<portlist>	Set the transmit source ports that are mirrored to the destination port. For example, "A1,A2".
port mirror set rxsource	<portlist>	Set the receive source ports that are mirrored to the destination port. For example, "A1-A3,A6".
port mirror set dataonly port mirror set no dataonly		Set mirrored data only. Use "no dataonly" to disable.
port mirror show		Show Port Mirroring configuration. **Example:** CLI> port mirror show Port Mirroring Settings Mirror Status : Enabled Destination Port : A1 Mirrored Data Only : Enabled Tx Source Ports : None Rx Source Ports : A4
portSecurity		Port Security
portSecurity status set	disabled, learning, locked	Set port security status
portSecurity status show		Show port security status.
portSecurity intruderLog show		Show the contents of the intruder log
portSecurity authList show	[<portlist>]	Show the contents of the authorization list
ppp		Start PPP server (available from the serial console only).
reboot		Reboot the switch and load the most recently saved configuration.
who		Display users currently logged in. **Example:** CLI> who Line User Host(s) Idle Location 00:00:00 admin Console
whoami		Show current user information. **Example:** CLI> whoami

COMMAND	ARGUMENTS	DESCRIPTION
		User name: admin

System Information

Command: admin system show
Description: Show general system information

```
CLI>    admin system show

System Settings

Name                              : NT24k-DR16-DC

Model Name                        : NT24k-DR16

Family Name                       : NT24k

Software Version                  : 2.2.3

Build Date                        : Oct 25 2019. 16:36:28

Boot Loader                       : 2.0.7

Copyright                         : Copyright <c> 2013-2019

URL                          : http://www.redlion.net/

Ram Size                     : 128 MB

Flash Size                   : 64 MB

Internet Protocol (IP) Settings

IP Configuration             : DHCP

DHCP Client ID Type          : Switch Name

DHCP Client ID Data          : N-Tron Series 77:fd:00

Fallback IP Enable           : Enabled

Fallback IP Address          : 192.168.1.201

Fallback IP Subnet           : 255.255.255.0

Fallback IP Gateway          : 0.0.0.0

Current IP Address           : 0.0.0.0

Current Subnet Mask          : 0.0.0.0

Current Gateway Address      : 0.0.0.0

MAC Address                  : 00:07:af:77:fd:00

--------

System Up Time               : 0d 04:05:42

System Time                  : 2000-01-01 04:05:41 CST (UTC-06:00)

Switch Name                  : N-Tron Series 77:fd:00

Switch Contact               : Admin
```

```
Switch Location            : Mobile, AL 36606

--------

Device Temperature         : 50 C, 122 F

Upper Temperature Limit    : 120

Lower Temperature Limit    : -60

CLI>
```

Displaying Port Information

Command: port config show <all|basic> <port-list>

Description: Show general port configuration, similar to what is displayed in the Web Software. The first parameter ("all" or "basic") specifies how much information to show and the port-list parameter can be used to filter the displayed ports. This can be a single port, a range of ports (ex. 1-3) or multiple ranges of ports, separated by a comma. Ports can also be selected by name or by number.

Note: If you want all information for a specific port, or set of ports, simply call **port config show <port-list>**. If you want only basic information, you will need to include "basic" before **<port-list>**.

```
CLI> port config show basic

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
3    P3   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
4    P4   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
6    P6   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
7    P7   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
8    P8   10/100/1000 Mbps TX Enabled  Up     1000  RSTP Forwarding    1
9    DM1  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
10   DM2  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
11   DM3  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
12   DM4  Not Installed        Enabled  Down   1000  RSTP Not Installed 1

CLI> port config show P1

Port Configuration View

Port Number:            1
Port Name:              P1
Port Description:       10/100/1000 Mbps TX
Admin Status:           Enabled
Link Status:            Down
Auto Nego:              Enabled
Port Speed:             Auto
Duplex Mode:            Auto
Flow Control:           Disabled
Cross Over:             Auto
Role:                   RSTP
Port State:             Discarding
PVID:                   1
Trunk ID:               0
Usage Alarm Low:        0
Usage Alarm High:       100

CLI> port config show basic P1-P2,P5

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1

CLI>
```

Setting a Static IP Address

By default, the switch will use the DHCP protocol for IP address assignment. The switch may also be configured to use a static IP address.

Command: admin ip set

Description: Moves the CLI to the IP address settings immediate mode. Typing "?" will provide the command options available here.

Once in the IP immediate mode, it is easy to change the address configuration. Once set, the new configuration must be saved for this change to be retained after a reboot.

```
CLI(admin-ip-set)> ip address 192.168.2.209 mask 255.255.255.0 gateway 0.0.0.0
CLI(admin-ip-set)> no dhcp

        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       Static Settings
        +               IP Address:     192.168.2.209
        +               Subnet Mask:    255.255.255.0
        +               Gateway:        0.0.0.0
        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
CLI(admin-ip-set)> exit
CLI>
```

Performing a File Transfer

File transfers can be initiated through the CLI by using TFTP Protocol.

Command: fileTransfer tftp server <ip address> transferType <UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]

Description: Initiates the file transfer from the CLI.

```
CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType Upgrade System

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed

Processing '/ram0/xfr/NT24k_image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done reading contents


Extracting from /ram0.xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

extracting file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done extracting tar.

file NT24k_image.xml, size 1287 bytes, 3 blocks

moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image


Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.247 (130370
bytes/second)

Done Processing '/ram0/xfr/NT24k_image.tar'. Elapsed time: 1:25.996

File Transfer: Completed

CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType UpgradeSystem file
NT24k_Image.tar

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed
```

```
Processing '/ram0/xfr/NT24k_Image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done reading contents.

Extracting from/ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done extracting tar.
file NT24k_image.xml, size 1287 bytes, 3 blocks
moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image

Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.595 (130370
bytes/second)
Done Processing '/ram0/xfr/NT24k_Image.tar'. Elapsed time: 1:26.333
File Transfer: Completed
```

Saving the Configuration

When configuration changes are made, they are not automatically saved to NVRAM and will be discarded at the next power cycle. Configuration changes must be saved to be retained across power cycles.

Command: config save

Description: Save all current changes to the configuration for use after the next power cycle. If a Configuration Device is installed, the configuration will also be saved to the device.

```
CLI>
CLI> config save
CLI>
```

Appendix B

Working with Configuration Files

Importing a Subset of an XML Configuration File

The XML configuration file may be used to set all of the configurable parameters on a NT24k® switch or to configure a subset of parameters. Setting common parameters across multiple switches can be easily accomplished by creating and importing an abridged configuration file for this purpose.

Appendix C contains an example XML Configuration file. A simple way to start an XML configuration file is to export the existing saved configuration file from the switch and modifying it to meet your new configuration needs.

When creating a configuration file for a subset of available parameters, setting the system configuration mode to *Keep* will maintain the current settings for all parameters other than those explicitly set by the new file being imported. If the system configuration mode is not set to *Keep*, all parameters other than those being set by the configuration file, will be reset to their default setting.

In the example below, the mode is set to Keep so that other switch settings are not reset to defaults. Additional information about the content of the configuration file can be found at the top of any exported configuration file.

```
<SystemConfiguration Mode="Keep"?
  <SystemGroup>
    <SystemConfig>
      <SwitchContact>IT Department Manager</SwitchContact>
      <SwitchLocation>Factory Floor B</SwitchLocation>
    </SystemConfig>
  </SystemGroup>
</SystemConfiguration>
```

Using Port Numbers instead of Port Names

In a configuration file, it is valid to use port numbers instead of names to simplify the sharing of configuration settings. Ports are numbered starting at 1.

Port names may differ between switch models. For example, the NT24k-DR24 uses A1-A8, B1-B8, and C1-C8 and the NT24k-14FX6 uses P1-P8 and FX1-FX6. However the configuration files can reference ports 1-24 for an NT24k and ports 1-14 for an NT24k-14FX6.

In the following example, VLAN 1 is configured for ports 1 through 8 and VLAN 2 is configured for ports 9 through 16. This settings file can be imported into any NT24k switch that supports 16 or more ports. Note that the configuration file must also set the appropriate port PVIDs.

```
<SystemConfiguration Mode="Keep">
  "VlanGroup>
    <IngressDiscardUntagged>None</IngressDisgardUntagged>
    <IngressReplaceVID>Disabled</IngressReplaceVID>
    <IngressVidFilter>None</IngressVidFilter>
    <PrimaryMgmtVlanId>1</PrimaryMgmtVlanId>
    <RemoveportsFromDefaultVlan>Enabled</RemovePortsFromDefaultVlan>
    <TaggedVlans>
      <Vlan>
            <AllowManagement>Enabled</AllowManagement?
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
```

```
            <VlanId>1</VlanId>
        </Vlan>
        <Vlan>
            <AllowManagement>Enabled</AllowManagement>
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
            <VlanId>1</VlanId>
        </Vlan>
    </TaggedVlans>
    <Type>Tagged</Type>
```

Importing an Incompatible XML Configuration File

Errors related to invalid port names or numbers may occur when importing a configuration file from one model of an NT24k® switch into a different model of an NT24k switch.

Field	Description
Destination	XML line:(216) - Could not set '/SystemConfiguration/MirrorGroup/MirrorConfig/Destination' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
ControlPort	XML line:(226) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort' to value 'P3'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
CouplerPort	XML line:(227) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort' to value 'P4'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Portx	XML line:(244) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Portx' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Porty	XML line:(245) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Porty' to value 'P2'

Resolving Invalid Port Mappings

If the number of ports in the XML configuration file is greater than on the target model, then the following sections should be removed for each of the extra ports.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/Port (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port

Notice that if the target switch has additional ports whose settings are not specified in the imported configuration file, then these additional ports will have their settings set to default values if the mode has not been set to “Keep”.

Ports on the target switch that do not exist in the configuration file will be added to Default VLAN 1. If the configuration file has extra VLANs with ports that do not exist, an error will be generated for each non-existent port.

Resolving Invalid Port Names

If the port names in the XML configuration file are different than on the target model, then rename the ports for the following sections so that the new names correspond to the intended ports on the target model.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port/PortNumber
- SystemConfiguration/MirrorGroup/MirrorConfig/Destination

- SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort
- SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Portx
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Porty
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/PortNumber (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port/PortNumber
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry/PortNumber
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit/PortNumber
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port/PortNumber

Depending on the exported values, some of the following sections in the XML configuration file may also need to have their ports renamed.

- SystemConfiguration/BridgingGroup/BridgingConfig/MulticastFilters/PortList
- SystemConfiguration/BridgingGroup/BridgingConfig/UnicastFilters/PortNumber
- SystemConfiguration/IgmpGroup/IgmpConfig/ManualRouterPorts
- SystemConfiguration/IgmpGroup/IgmpConfig/RFilterPorts
- SystemConfiguration/MirrorGroup/MirrorConfig/RxSourcePorts
- SystemConfiguration/MirrorGroup/MirrorConfig/TxSourcePorts
- SystemConfiguration/NViewGroup/NViewConfig/SendAutocastPorts
- SystemConfiguration/NViewGroup/NViewConfig/SendMibStatsPorts
- SystemConfiguration/SecurityDot1xGroup/SecurityDot1xConfig/EnabledPorts
- SystemConfiguration/TrunkGroup/TrunkConfig/Trunks
- SystemConfiguration/VlanGroup/VlanConfig/IngressDiscardUntagged
- SystemConfiguration/VlanGroup/VlanConfig/IngressVidFilterf
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/MemberPorts
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/UntagEgressPorts

Example Scenarios

MODEL OF EXPORTED CONFIGURATION FILE	TARGET MODEL	EXPECTED RESULTS OF IMPORTING XML CONFIGURATION FILE
NT24k-DR16	NT24k-DR24	Import successful; Last 8 ports on target model will reset to default values if the mode has not been set to “Keep”.
NT24k-DR24	NT24k-DR16	Invalid port mappings
NT24k-DR16	NT24k-16TX	Invalid port names
NT24k-DR16	NT24k-8TX	Invalid port mappings and names

Appendix C

XML Configuration File

Factory Defaults

The following is a shortened example of an XML configuration file:

```
<!-- ************************************************************************
    Overview of XML settings for the N-Tron NT24k series switches
    XML settings can be downloaded to a switch to configure the switch.
    There are several top level configuration sections. Each section is optional.
    Common Attributes:
    ******************
    The following attributes are common to all sections. If omitted from a section,
      then the value from the parent section is used. If completely omitted, a
      system default value is used.

     Crc            Optional. This is not used in this release, but may be
                    used in a future release.
     CurSwVer       Optional. String representation of switch version that the
                    settings were exported from.
     Version        Optional. If present, represents the version of the
                    section. If not present, the default value is used instead
                    of being inherited from the parent section.
                    Default = "1".
     MinSwVer       Optional. String representation of switch version. If
                    present, ignore settings for the section if switch
                    software version does not meet minimum requirement.
                    Default = "1.0".
     Mode           Optional. If present, determines the type of action to
                    take on existing data in the section. In the event of a
                    conflict, precedence goes to the deepest level that is
                    explicitly expressed.
                    Possible values:
                    Delete   (Default) Delete all existing data for the
                    section and replace it with the values in this section.
                    Any missing data gets set to factory default values.
                    Keep   Keep existing data, unless new values are specified
                    in this section. A factory default value is used if there
                    is no previously existing data.
     Convert        Optional. If present, determines whether data conversion
                    is performed when necessary.
                    Possible values:
                    Auto   (Default) When a data conversion is determined to
                    be necessary it will be done automatically, without any
                    user intervention.
                    No   Data conversion is not performed, but settings are
                    validated.
     ValidatePorts  Optional. If present, determines if port names or numbers,
                    within lists, that are not valid on this device should be
                    ignored or generate an error.
```

```
                    Possible values:
                    Yes   (Default) Ports are validated.
                    No   Invalid ports are ignored.
      Model         Optional. If present, represents the switch model that the
                    settings were exported from.

  Notes:
  ******
  Comments added to this file will not be preserved.
  ************************************************************************ -->
  <!-- ************************************************************************
  SystemConfiguration ******************************************************
************************************************************************** -->
  <SystemConfiguration Model="NT24k-DR16" ValidatePorts="Yes" Convert="Auto"
Mode="Delete" MinSwVer="1.0" Version="2" CurSwVer="1.9.2">
  <BridgingGroup>
       <BridgingConfig>
             <AgingTime>300</AgingTime>
             <EnableIpProbe>Disabled</EnableIpProbe>
             <MulticastFilters></MulticastFilters>
             <UnicastFilters></UnicastFilters>
       </BridgingConfig> </BridgingGroup>
  [ content intentionally omitted ]
  </SystemConfiguration>
```

For a complete example of an XML configuration file, click on the following link: http://www.redlion.net/resources/software/n-tron-software and refer to section NT24k® Industrial Ethernet Switches.

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▶▶▶ Puggable Mini-GBIC Transceivers

Gigabit Transceivers

Mini-GBIC SFP transceivers for
N-Tron's Gigabit Network Products



Gigabit SFP Fiber Transceiver Characteristics

Fiber Length	*550m for 50/125µm 275m for 62.5/125µm*	*10km*	*40km*	*80km*
TX Power Min	*-9.5dBm*	*-9.5dBm*	*-2dBm*	*0dBm*
RX Sensitivity Max	*-17dBm*	*-20dBm*	*-22dBm*	*-24dBm*
Wavelength	*850nm*	*1310nm*	*1310nm*	*1550nm*
Assumed Fiber Loss	*3.5 to 3.75 dB/km*	*0.45 dB/km*	*0.35 dB/km*	*0.25 dB/km*
Laser Type	*VCSEL*	*FP*	*DFB*	*DFB*

Variety and Flexibility

Pluggable mini-GBIC transceivers from N-Tron® fully comply with strict industry standards to ensure robust functionality in fiber optic networks. All modules are designed with high-performance industrial features, including expanded temperature ranges, to operate reliably under harsh conditions. N-Tron's SFPs may be used in combination on each switch. Varieties include 1000Base-T, 1000Base-SX and 1000Base-LX.

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
NTSFP-TX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseT GB Copper Port (up to 100 meters)
NTSFP-SX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseSX Multimode GB Fiber Optic Port
NTSFP-LX-ZZ ZZ = 10, 40, or 80 km	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseLX Singlemode GB Fiber Optic Port

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Product brochure

1.5 – 6 kVA



Eaton 9PX lithium-ion UPS

Double-conversion UPS that offers a set it and forget it deployment

The 9PX lithium-ion UPS is part of the Eaton 9 series single-phase double-conversion UPS line, best applied to mission-critical equipment for constant power conditioning. The 9PX lithium-ion UPS provides 8 to 10 years of life expectancy for UPS and its batteries, and has power ratings ranging from 1–6 kVA, while also offering up to four external battery modules (EBM) for extra runtime. The 9PX lithium-ion UPS has the same reliable features as the 9PX lead-acid UPS, including load segments for prioritized shutdowns, remote power on (RPO), remote on/off (ROO) and output relay ports that increase control capabilities. For connectivity, the 9PX is compatible with the Gigabit Network Card (NETWORK-M2), which is the first UPS connectivity device to meet both UL and IEC cybersecurity standards. This network interface card improves power system reliability by providing warnings of pending issues and helping to perform orderly graceful shutdown of servers and storage.



2U UPS with 1U EBM in 4-post rack

Key features and benefits

Save money

- **2-3X longer battery life:** minimize battery maintenance expense—ideal for large deployments and edge applications
- **Runtime:** UPS provides up to 2–3X more runtime at full load compared to lead-acid batteries
- **Warranty:** 5-year all-inclusive (electronics and battery) warranty

Save space

- **1U lithium EBM vs 2U lead-acid EBM** (1–3 kVA models)
- **2U lithium EBM vs. 3U lead-acid EBM** (6 kVA model)
- **Lightweight design** up to 40% less weight than a comparable lead-acid UPS allowing easier installation and saving time

Reduce risk

- **24/7 monitoring:** battery management system (BMS) improves reliability and performance by actively monitoring temperature and charge
- **Cybersecure:** remote monitoring service and network connectivity card options provide cybersecurity protection and keeps you connected with your UPS status updates
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The power of predictability.

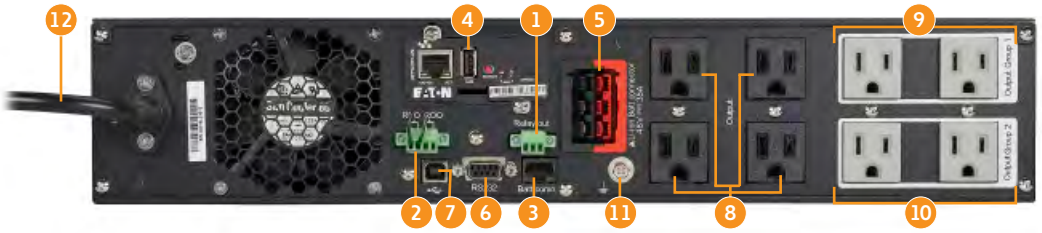
Our Remote Monitoring Service, also known as PredictPulse, is the industry's first cloud-based 24x7 remote monitoring and predictive analytics subscription service to forecast data center power component failure and proactively replace components before failure. This software enables you to:

- **Focus** on other critical IT tasks while our experts remotely monitor your IT infrastructure power quality equipment around the clock and dispatch field service technicians when needed
- **Eliminate** surprise maintenance expenses— this subscription-based service includes parts, labor, on-going preventive maintenance and expedited repairs
- **Propriety algorithms**, based on data from thousands of installed devices, predict UPS component failure so we can proactively replace parts before issues arise

Learn more at Eaton.com/RemoteMonitoringService

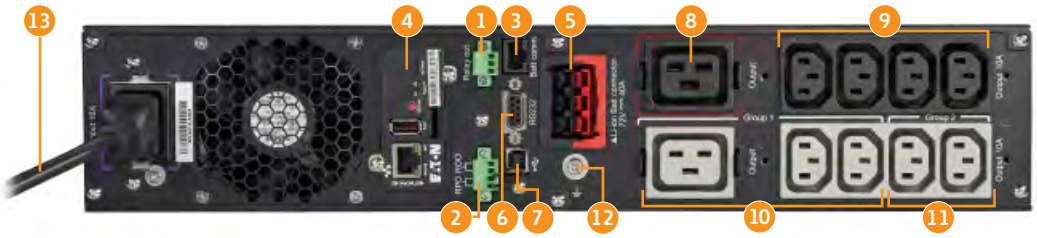
Rear panel overview

Model 9PX1500RT-L



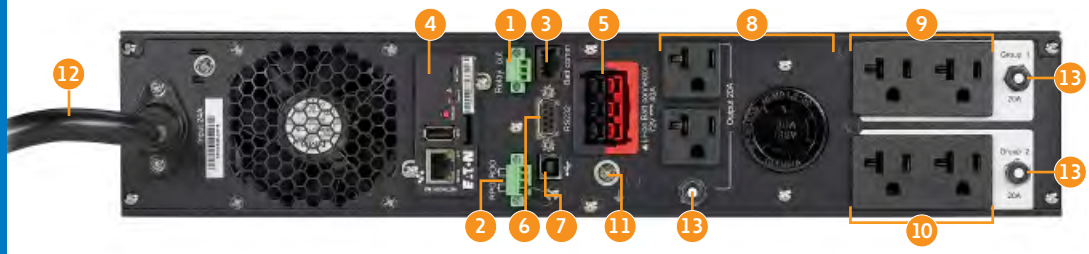
1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-15R managed outlets (primary group)
9. (2) 5-15R (load segment group 1)
10. (2) 5-15R (load segment group 2)
11. Ground bonding screw
12. 8-feet line cord with 5-15P

Model 9PX2200GRT-L and 9PX3000GRT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (1) C19 outlet
9. (4) C13 managed outlets (primary group)
10. (1) C19 and (2) C13 managed outlets (load segment group 1)
11. (2) C13 managed outlets (load segment group 2)
12. Ground bonding screw
13. C20/L6-20P input connection (detachable L6-20P to C19 input cord is 6-feet long)

Model 9PX3000RT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-20R and (1) L5-30R managed outlets (primary group)
9. (2) 5-20R managed outlets (load segment group 1)
10. (2) 5-20R managed outlets (load segment group 2)
11. Ground bonding screw
12. L5-30P input cord (8-feet long)
13. AC output branch protector

For additional rear panel views, please visit **Eaton.com/9PX.**

9PX 1 to 3 kVA lithium-ion rackmount and tower model selection guide

The 9PX lithium-ion comes as a stand-alone UPS or as part of a network bundle for easy configuration and deployment. For complete specifications, including interactive battery runtime graphs, visit **Eaton.com/9PX.**

120V (default), 100V, 110V, 115V, 125V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RT-L	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	35.5
9PX2000RT-L	2000 / 1800	5-20P, 8 ft.	(1) L5-20R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	50.6
9PX3000RT-L	3000 / 2700	L5-30P, 8 ft.	(1) L5-30R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	52.7

Global UPS, 208V (default), 230V, 240V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500GRT-L	1500 / 1350	C14	(8) C13	3.41 (2U) x 17.32 x 17.72	34.8
9PX2200GRT-L	2200 / 2000	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	48.6
9PX3000GRT-L	3000 / 2700	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	50.2

120V (default), 100V, 110V, 115V, 125V RT network card bundles

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RTN-L (includes NETWORK-M2 network card)	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	36.5
9PX2000RTN-L (includes NETWORK-M2 network card)	2000 / 1800	5-20P, 8 ft.	(6) 5-20R, (1) L5-20R	3.41 (2U) x 17.32 x 23.83	51.6
9PX3000RTN-L (includes NETWORK-M2 network card)	3000 / 2700	L5-30P, 8 ft.	(6) 5-20R, (1) L5-30R	3.41 (2U) x 17.32 x 23.84	53.7

9PX 1 to 3 kVA lithium-ion extended battery module (EBM) options

Catalog number	Description	Rack size	Weight, lb.
9PXEBM48RT-L	Extended battery module for 9PX1500RT-L and 9PX1500GRT-L	1U	36.5
9PXEBM72RT-L	Extended battery module for 9PX2000RT-L, 9PX2200GRT-L, 9PX3000RT-L and 9PX3000GRT-L	1U	46.6

Power distribution (PDU) and maintenance bypass (MBP) options

Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.
EHBPL1500R-PDU1U	HotSwap MBP for use with 9PX1500RT-L, 9PX1500GRT-L	5-15P	(6) 5-15R	2.1 (2U) x 17.3 x 3.8
EHBPL2000R-PDU1U	HotSwap MBP for use with 9PX2000RT-L, 9PX2200GRT-L	5-20P	(6) 5-20R	2.1 (2U) x 17.3 x 3.8
EHBPL3000R-PDU1U	HotSwap MBP for use with 9PX3000RT-L, 9PX3000GRT-L	L5-30P	(5) 5-20R	2.1 (2U) x 17.3 x 3.8
PDUV20-72	Basic PDU	L5-20P	(36) 5-15/20R	72.47 x 1.50 x 1.64
PDU2430	Basic PDU	L5-30P	(24) 5-15R	1.75 x 17.25 x 4.50
PDUV20HVL6-72	Basic PDU	L6-20P	(32) C13, (6) C19	63.75 x 3.50 x 2.25
EATS115	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-15P	(10) 5-15R	1.7 (1U) x 17.25 x 9.94
EATS120	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-20P	(10) 5-20R	1.7 (1U) x 17.25 x 9.84

* For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2*	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PA	1U two-post rail kit (optional for EBM)
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

* Included with N and 6K models

What's in the box

- 9PX UPS
- RS-232 communication cable
- USB communication cable
- Software leaflet
- Safety instructions
- Quick start guide
- 4-post mounting rail kit for 19-inch enclosures
- 2 pedestals for tower position
- Gigabit Network Card (NETWORK-M2) – included with N and 9PX6K-L models

Lithium-ion vs lead-acid

Characteristic	VRLA (lead-acid) battery	Lithium-ion battery	Lithium-ion benefit
Average battery lifespan	3–5 years	8-10 years	**2–3X longer life**
Weight	43–150 lb.	34.8–79 lb.	**20% lighter UPS, 40% lighter EBM**
EBM footprint	2U 3U	1U (1–3 kVA models) 2U (6 kVA model)	**Increased U space for critical equipment**
Warranty	2 years	5 years	**2.5X warranty coverage**
Battery replacement cost	$650*	$0	**Reduced TCO**

* Battery and labor cost for one replacement



Eaton's Gigabit Network Card adds advanced control with IPM software allows for remote management and integration into leading virtualization platforms **Eaton.com/Network-M2**

9PX 6 kVA lithium-ion rackmount and tower model selection guide

Global UPS, 208V (default) 200V, 208V, 220V, 230V, 240V models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX6K-L	6000 / 5400*	L6-30P, 10 ft. Hardwire	(2) L6-30R (2) L6-20R Hardwire	5.12 x 17.33 x 28.43	81.2

* Derated at 200, 208, 220V. See 9PX6K-L technical specifications for full information.

9PX 6 kVA lithium-ion extended battery module (EBM) and accessories

Catalog number	Description	Rack size	Weight, lb.
9PXEBM192RT-L	Extended battery module for 9PX6K-L	2U	79
EBMCBL192-L	EBM cable extension, 6 feet (1.8 meters)		

Power distribution (PDU), maintenance bypass (MBP), PowerPass distribution (PPDM) and transformer options

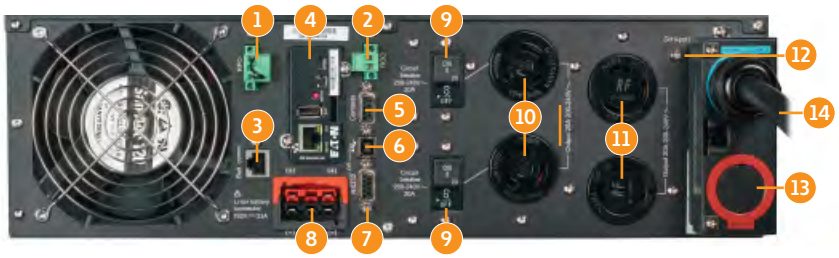
Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
MBP6K208	208V maintenance bypass module	L6-30P*	(2) L6-30R Hardwired	5.1 (3U) x 7.0 x 4.3	5.5
PDUV30HV	Basic PDU	L6-30P	(32) C13, (6) C19	63.75 x 3.5 x 2.25	8
PDU1230	Basic PDU	L6-30P	(16) C13, (4) C19	1.75 (1U) x 17.5 x 5.2	7.5
9PXTFMR5	9PX stepdown transformer	L6-30P	(18) 5-20R	5.1 (3U) x 17.3 x 25.4	95
9PXPPDM1	9PX PowerPass distribution module	L6-30P	(1) L6-30R, (1) L14-30R, (6) 5-20R outlets	5.1 (3U) x 17.3 x 25.4	97
9PXPPDM2	9PX PowerPass distribution module	Hardwired	Hardwired	5.1 (3U) x 17.3 x 25.4	95

* Terminal block with L6-30P cord (included with UPS)
For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

Rear panel overview

Model 9PX 6 kVA lithium-ion UPS



1. Remote power off (RPO) port
2. Remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card
5. Output relay contact – DB-9 dry contact
6. USB port (cable included)
7. RS-232 serial communication port (cable included)
8. EBM connector
9. Output circuit breaker protection
10. (2) L6-20R
11. (2) L6-30R
12. Ground bonding screw
13. Output terminal block for hardwired applications
14. 10-foot line cord with L6-30P

To view battery runtimes and interact with the Eaton 9PX lithium-ion UPS, please visit: **Eaton.com/9PX**

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Powering Business Worldwide

Eaton 9PX Li-Ion UPS technical specifications (1500-3000 VA 2U models[1])

Model overview

Catalog number	Power rating (VA/ watts)	Input connection	Output receptacles	Dimensions (HxWxD, in.)[2]	Weigh t (lb.)
120V output, 50/60 Hz					
9PX1500RT-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	35.5
9PX1500RTN-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	36.5
9PX2000RT-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	50.6
9PX2000RTN-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	51.6
9PX3000RT-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	52.7
9PX3000RTN-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	53.7
208V output, 50/60 Hz bundles					
9PX1500GRT-L	1500/1350[4]	C14	(8) C13	3.4 (2U) x 17.3 x 17.7	34.8
9PX2200GRT-L	2200/2000[5]	C20 / L6-20P[5]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	48.6
9PX3000GRT-L	3000/2700[6]	C20 / L6-20P[4]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	50.2

Additional specifications

General	
Topology	Double-conversion, online
Configuration	Rack/tower
Color	Black and silver
Diagnostics	Full system self-test at power up
Warranty	5 years electronics and battery
Rail kit	4-post rail kit included; Max length:30.0in, Min length:17.4in Tower ped estals includ ed *Optional 2-post rail kit available, part number: RK2PC(UPS) and RK2PA(EBM)*
Remote power off	Remote On/Off (ROO) and Remote Power Off (RPO) rear terminal blocks
Contents (Ships with the following items)	UPS 4-post rail kit Safety manual Output cables (for G models) Input cables (for G models) Cable lockers (for G models) Tower pedestals RS-232 serial cable USB cable

1. Due to continuing product improvement programs, specifications are subject to change without notice.
2. Each 9PX and EBM ships with a 4-post rail kit.
3. Input line cord is 8 feet long.
4. 1500 VA Global model wattage: 200V, 208V: input limited to 1350 watts; 220V, 230V, 240V: 1500 watts
5. C19 to L6-20P input cord is 6 feet long.
6. Models derated at lower voltag es due to input cord limitations. See Power ratings table below for further details.

	Communication card (optional)	
Electrical input	208V	120V
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Input voltage range	Full load: 176-276V, <40% load: 100-276V	Full load: 100-144V, <30% load: 60-144V
Freq uency	50/60 Hz	
Freq uency range	60 Hz: 50–70 Hz, 50 Hz: 40–60 Hz	
Input power factor	≥.99	
Input current distortion	≤5% (≤10% frequency converter mode)	
Circuit breaker	1500VA: None 2200VA: None 3000VA: None	1500VA: None 2000VA: None 3000VA: (3) 20A for (2) 5-20R each
Electrical output	208V	120V
Power ratings	9PX1500GRT-L 220/230/240V: 1500VA / 1500W 200/208V: 1500VA / 1350 9PX2200GRT-L: 220/230/240V: 2200VA / 2200W 208/200V: 2200VA / 2000W 9PX3000GRT-L: 220/230/240V: 3000VA / 3000W 208/200V: 3000VA / 2700W	9PX1500RT-L: 120/125V: 1500VA / 1350W 110V: 1350VA / 1215W 100V: 1200VA / 1080W 9PX2000RT-L: 120/125V: 2000VA / 1800W 110V: 1800VA / 1620W 100V: 1600VA / 1440W 9PX3000RT-L: 120/125V: 3000VA / 2700W 110V: 2700VA / 2430W 100V: 2400VA / 2160W
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Output voltage regulation, steady state	±1% normal mode ±2% battery mode	
Voltage THD (online)	Linear: 3% Non-linear: 5%	
Power factor	0.9	
Efficiency	9PX1500GRT-L: 92% online 9PX2200GRT-L: 93% online 9PX3000GRT-L: 93.7% online	9PX1500RT-L: 90% online 9PX2000RT-L: 91.4% online 9PX3000RT-L: 91.6% online
Transfer time	0 ms	
Battery		
Optional extended battery module (EBM)	9PXEBM48RT-L: 1500 VA models (1U form factor) 9PXEBM72RT-L: 2000-3000 models (1U form factor)	
Maximum number of EBMs	Add up to 4 EBMs	
Battery description	Lithium Ion, LiFePO4 chemistry	
Battery management	BMS: Advanced battery man ag ement with health monitoring and prediction features	
Battery replacement	Hot-swappable internal batteries and EBMs	
Start on battery	Cold-start en abled; first cold start is always forbidden	
Communications		
User interface	Graphical display. UPS status in a single view.	
LEDs	4 status-indicating LEDs	
Communication ports	RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables includ ed	

Communications card	Network Card-M2 optional, stan dard on network bundles (bun dled models include an N)	
Power management software	Integrates with Eaton Intelligent Power Manager software	
Environmental & standards		
RoHS compliance	Yes	
Surge protection	MOV: 510V, 296Joules	MOV ratings : 271Volt (from L-N) and 510 Volt (from L-G and N-G), 190 Joules
EMC markings	IEC 62040-2 Class B Cat C2 / CISPR22 Class B / FCC part 15 Class B / VCCI Class B	IEC 62040-2 Cat C1 / CISPR22 / FCC part 15 Class B / VCCI Class B
Heat dissipation (BTU)	9PX1500GRT: 494 online, 731 battery 9PX2200GRT: 513 online, 741 battery 9PX3000GRT: 619 online, 1150 battery	9PX1500RT: 512 online, 897 battery 9PX2000RT: 578 online, 974 battery 9PX3000RT: 844 online, 1462 battery
Audible noise	≤47 dB at 1 meter	
Operating temperature	0 to 40°C (32°F to 104°F)	
Altitude operating temperature range	0-1500m @ 0°C - 40°C 1500m-3000m @ 0°C - 35°C	
Safety conformance	CE / cULus	CE / cULus / NOM
Storage temperature	-20 to 35°C (-4°F to 95°F); without batteries: -13 to 55°C (5°F to 131°F)	
Relative humidity	0 to 96% non-condensing	

9PX Li-Ion 1-3kVA Battery Backup Times (in minutes)**

Load(Watts)	Internal batteries	+1 EBM	+2 EBMs	+3 EBMs	+4 EBMs
9PX1500RT-L					
1350	11.2	30.0	47.1	64.3	81.4
1215	12.6	33.5	52.7	71.9	91.0
1080	14.2	38.0	59.7	81.4	103.0
945	16.3	43.5	68.4	93.3	118.1
810	19.1	50.8	79.8	108.9	137.9
675	22.9	61.0	95.9	130.7	165.6
540	28.1	74.8	117.6	160.3	203.1
405	37.0	98.6	154.9	211.2	267.5
270	54.4	145.2	228.1	311.0	394.0
9PX1500GRT-L					
1350	12.0	31.9	50.2	68.4	86.7
1215	13.3	35.5	55.8	76.0	96.3
1080	15.0	39.9	62.7	85.4	108.2
945	17.0	45.2	71.0	96.9	122.7
810	19.7	52.5	82.5	112.5	142.5
675	23.4	62.5	98.2	133.9	169.6
540	28.7	76.4	120.1	163.8	207.5
405	37.1	99.0	155.6	212.1	268.7
270	52.0	138.7	218.0	297.3	376.6
9PX2000RT-L					
1800	13.6	36.3	57.0	77.8	98.5
1620	15.2	40.4	63.5	86.6	109.7
1440	17.1	45.5	71.6	97.6	123.6

1260	19.5	52.0	81.7	111.4	141.1
1080	22.6	60.3	94.8	129.3	163.8
900	27.1	72.3	113.6	154.8	196.1
720	33.5	89.3	140.3	191.4	242.4
540	43.8	116.7	183.4	250.1	316.8
360	62.6	167.0	262.4	357.8	453.2
9PX2200GRT-L					
2000	12.3	32.8	51.5	70.2	88.9
1800	13.6	36.3	57.1	77.8	98.6
1600	15.2	40.6	63.8	87.0	110.2
1400	17.3	46.2	72.6	99.0	125.4
1200	20.2	53.8	84.5	115.3	146.0
1000	23.9	63.8	100.3	136.7	173.2
800	29.4	78.4	123.1	167.9	212.7
600	38.2	101.8	159.9	218.1	276.2
400	54.3	144.7	227.4	310.1	392.9
9PX3000RT-L					
2700	9.1	24.1	37.9	51.7	65.5
2400	10.2	26.9	42.2	57.6	72.9
2160	11.3	30.3	47.7	65.0	82.3
1890	12.9	34.7	54.5	74.3	94.1
1620	14.8	40.4	63.5	86.5	109.6
1350	18.0	48.3	75.9	103.5	131.1
1080	23.0	59.9	94.2	128.4	162.6
810	28.0	79.1	124.3	169.5	214.7
540	43.0	114.3	179.5	244.8	310.1
9PX3000GRT-L					
2700	9.1	24.2	38.0	51.8	65.6
2400	10.5	26.9	42.2	57.5	72.9
2160	11.3	30.2	47.5	64.7	82.0
1890	12.8	34.6	54.4	74.2	94.0
1620	14.9	40.3	63.3	86.3	109.4
1350	18.0	47.9	75.3	102.7	130.0
1080	23.0	59.4	93.4	127.4	161.4
810	30.0	77.6	121.9	166.3	210.6

**Runtimes shown at full load with maximum power factor, are approximate and may vary with equipment, configuration, battery age, temperature, etc. View interactive graphs at www.eaton.com/9PX

Product specifications

Eaton 9PX1500RT-L

Catalog Number: 9PX1500RT-L

Eaton 9PX lithium ion UPS, 2U, 1500 VA, 1350 W, 5-15P input, Outputs: (8) 5-15R, 120V

General specifications

Product Name	**Catalog Number**
Eaton 9PX UPS	9PX1500RT-L
UPC	**Product Length/Depth**
743172105455	17.72 in
Product Height	**Product Width**
3.41 in	17.32 in
Product Weight	**Warranty**
35.6 lb	5 year limited
Compliances	**Certifications**
CE Marked FCC part 15 Class B IEC 62040-2 Cat C1	cULus Listed NOM

Product specifications

Battery management

Integrated battery management system (BMS) for temperature regulation and life cycle monitoring

Output waveform

True sine wave

VA rating

1500 VA

Max number of battery packs

4

Wattage

1350 W

Output power factor

0.9

Form factor

Rack/tower

Receptacle

(8) 5-15R, 120V

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 5 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Package contents

UPS
Quick start guide
Safety instructions
USB communciation cable
RS-232 serial communication cable
4-post rail for 19-inch enclosures
Software leaflet
Software leaflet
2 pedestals for tower poition

Input connection

5-15P

Noise level

<47 dB at 1 meter

Runtime graph

Resources

Application notes

9PX1500RT-L runtime graph

Brochures

Eaton 9PX lithium-ion UPS brochure

Competitive comparisons

9PX Lithium-ion UPS Competitive Comparison Battlecard

Drawings

Eaton 9PX lithium-ion 1.5 kVA 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

Eaton 9PX lithium-ion UPS guide specification: 1-3 kVA

Eaton Specification Sheet - 9PX1500RT-L

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide

Warranty guides

Eaton 9PX lithium-ion UPS warranty

View runtime graph

Software compatibility

Intelligent Power Software Suite

User interface

Graphical display, 5-button programmable menu

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Efficiency

90 %

Rack size

2U

Number of Outputs 5-15R

8

Voltage

120V

Input cord length

8 ft

Temperature range

0° to 40°C (32° to 104°F)

Communication

RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables included

Relative humidity

0-96% non-condensing

Color

Black/silver

Rack mounting kit

Yes

Extended battery capability

Add up to 4 extended battery modules (EBM). Part number 9PXEBM48RT-L

Output voltage range

±1% steady-state

Topology

Online/Double-conversion

BTU Rating

Online: 512, Battery: 897

Output frequency

50/60 Hz

Runtime at full load

11.2 min

Type

UPS

Output nominal voltage

120V default (100/110/120/125V)

Input nominal voltage

120V default (100/110/120/125V)

Input power factor

>0.99 typical

Expansion slots

(1) Mini-Slot (MS) expansion port. The following optional connectivity cards may be ordered separately.
Gigabit Network Card part number: NETWORK-M2
Modbus card part number: INDGW-M2
Relay card part number: RELAY-MS

Input frequency range

60 Hz: 50-70 Hz, 50 Hz: 40-60 Hz

Internal bypass

Yes

Altitude

0-1500m (0° to 40°C), 1500-3000m (0° to 35°C)

Eaton Corporation plc
Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com

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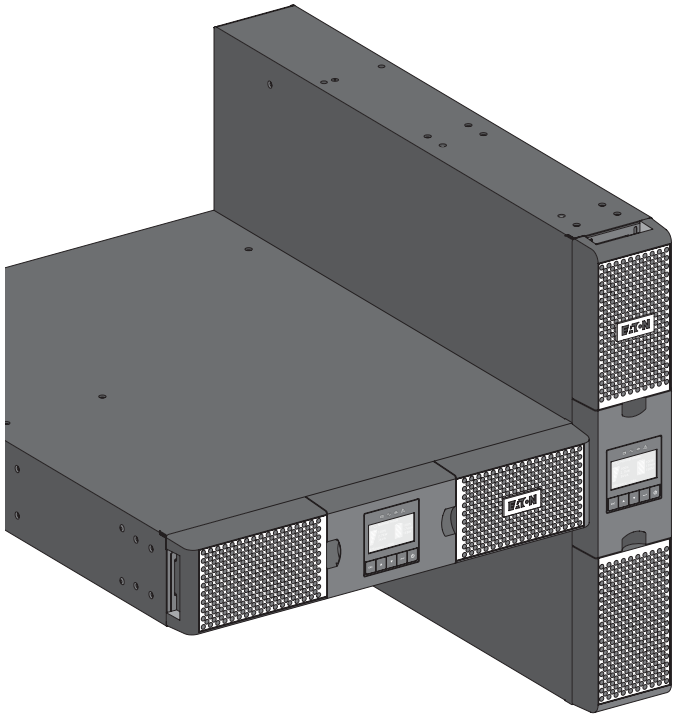
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Eaton 9PX Lithium-Ion

Advanced Users Guide



9PX1500RT-L
9PX2000RT-L
9PX3000RT-L
9PX1500GRT-L
9PX2200GRT-L
9PX3000GRT-L
9PXEBM48RT-L
9PXEBM72RT-L

Powering Business Worldwide

p/n: P-164001006
Revision 06

Safety Instructions

SAVE THESE INSTRUCTIONS.

This manual contains important instructions **that should be followed during installation and maintenance of the UPS and batteries.**

The 9PX models that are covered in this manual are intended for installation n an environment within 0 to 40°C, free of conductive contaminant.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to IEC62040-2 & FCC standards. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Special Symbols

The following are examples of symbols used on the product to alert you to important information:



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



CAUTION: REFER TO OPERATOR'S MANUAL - Refer to your operator's manual for additional information, such as important operating and maintenance instructions.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

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Safety of Persons

- The system has its own power source (the battery). Consequently, the power outlets may be energized ven if the systems is disconnected from the AC power source. Dangerous voltage levels are resent within the system. It should be opened exclusively by qualified service personnel.
- The system must be properly grounded at all times.
- The battery supplied with the system contains small amounts of toxic materials. To avoid accidents, the directives listed below must be observed:
  - Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
  - When replacing batteries, replace with the same type and number of batteries or battery packs.
  - Do not dispose of batteries in a fire. The batteries may explode.
  - Batteries constitute a danger (electrical shock, burns). The short-circuit current may be very high.
- Precautions must be taken for all handling:
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries.
  - Disconnect charging source prior to connecting or disconnecting battery terminals.
  - Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

Product Safety

- To connect the UPS, instructions and operation described in the manual must be followed in the indicated order.
- CAUTION - To reduce the risk of fire, the unit connects only to a circuit provided with 20 or 30 amperes maximum branch circuit overcurrent protection in accordance with the National Electric Code, ANSI/NFPA 70 (US installations only).
- Check that the indications on the rating plate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the system.
- For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible
- Never install the system near liquids or in an excessively damp environment.
- Never let a foreign body penetrate inside the system.
- Never block the ventilation grates of the system.
- Never expose the system to direct sunlight or source of heat.
- If the system must be stored prior to installation, storage must be in a dry place.
- The admissible storage temperature range is -25ºC to +55ºC without batteries, 0°C to 40°C with batteries.
- The system is not for use in a computer room AS DEFINED IN the standard for the Protection of Information Technology Equipment, ANSI/NFPA 75 (US installations only).

Special Precautions

- The unit is heavy: wear safety shoes and use vacuum lifter preferentially for handling operations.
- All handling operations will require at least two people (unpacking, lifting, installation in rack system).
- Before and after the installation, if the UPS remains de-energized for a long period, the UPS must be energized for a period of 24 hours, at least once every 6 months (for a normal storage temperature less than 25°C). This charges the battery, thus avoiding possible irreversible damage.
- During the replacement of the Battery Module, it is imperative to use the same type and number of element as the original Battery Module provided with the UPS to maintain an identical level of performance and safety. If there are any questions, don't hesitate to contact your local EATON representative.
- All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the UPS.
- For potential safety issue on defective UPS : DISCONNECT INTERNAL BATTERY for storage and transportation.

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Chapter 1 Introduction

1.1 Overview

1.2 Environmental Protection

EATON has implemented an environmental-protection policy.

Products are developed according to an eco-design approach.

Substances

This product does not contain CFCs, HCFCs, or asbestos.

Packing

To improve waste treatment and facilitate recycling, separate the various packing components.

- The cardboard we use comprises over 50% of recycled cardboard.
- Sacks and bags are made of polyethylene.
- Packing materials are recyclable and bear the appropriate identification symbol 

Table 1. Packing Material Symbols

Materials	Abbreviations	Number in the symbols
Polyethylene terephthalat	PET	01
High-density polyethylene	HDPE	02
Polyvinyl chloride	PVC	03
Low-density polyethylene	LDPE	04
Polypropylene	PP	05
Polystyrene	PS	06

Follow all local regulations for the disposal of packing materials.

End of Life

Eaton will process products at the end of their service life in compliance with local regulations. Eaton works with companies in charge of collecting and eliminating our products at the end of their service life.

Product

The product is made up of recyclable materials.

Dismantling and destruction must take place in compliance with all local regulations concerning waste. At the end of its service life, the product must be transported to a processing center for electrical and electronic waste.

Battery

The product contains lithium-ion (LFP) batteries that must be processed according to applicable local regulations concerning batteries.

The battery may be removed to comply with regulations and in view of correct disposal.

The Eaton® 9PX uninterruptible power system (UPS) protects your sensitive electronic equipment from the most common power problems, including power failures, power sags, power surges, brownouts, line noise, high voltage spikes, frequency variations, switching transients, and harmonic distortion.

Power outages can occur when you least expect it and power quality can be erratic. These power problems have the potential to corrupt critical data, destroy unsaved work sessions, and damage hardware causing hours of lost productivity and expensive repairs.

With the Eaton 9PX, you can safely eliminate the effects of power disturbances and guard the integrity of your equipment. Providing outstanding performance and reliability, the Eaton 9PX's unique benefits include:

- True online double-conversion technology with high power density, utility frequency independence, and generator compatibility.
- Constant mode battery charger with a integrated battery management system (BMS) for temperature regulation and life cycle monitoring.
- Selectable High Efficiency mode of operation.
- Standard communication options: one RS-232 communication port, one USB communication port, and relay output contacts.
- Optional connectivity cards with enhanced communication capabilities.
- Extended runtime with up to four Extended Battery Modules (EBMs) per UPS.
- Remote On/Off control through Remote On/Off (ROO) and Remote Power Off (RPO) ports.
- Backed by worldwide agency approvals.

Chapter 2 Presentation

2.1 Standard Installations

Figure 1. Tower Installation

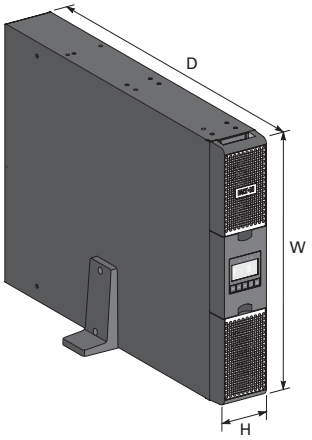


Figure 2. Rack Installation

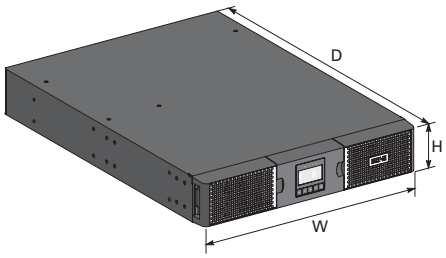
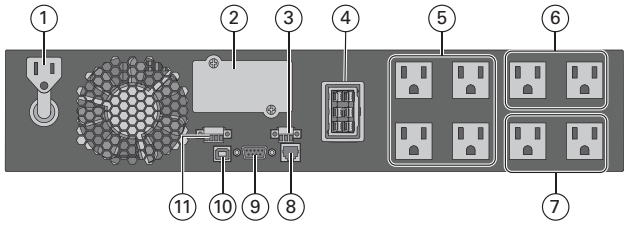


Table 2. Weights and Dimensions

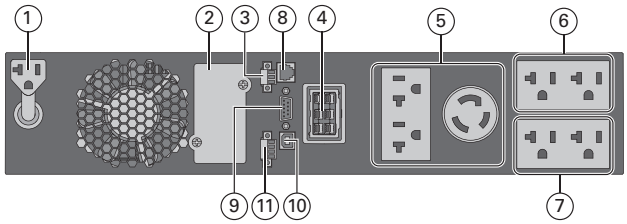
Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

2.2 Rear Panels

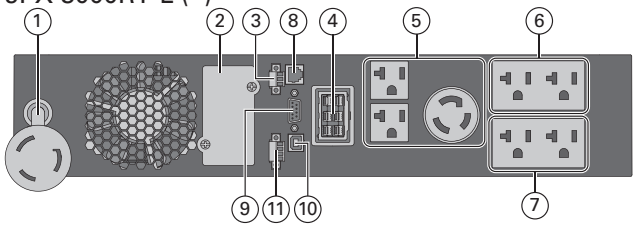
9PX 1500RT-L



9PX 2000RT-L



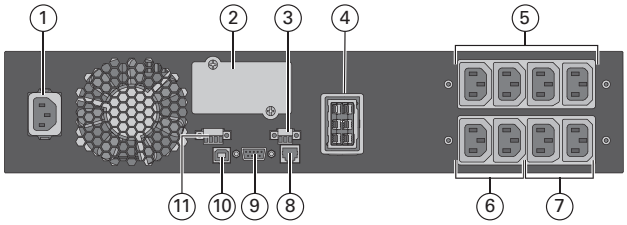
9PX 3000RT-L (*)



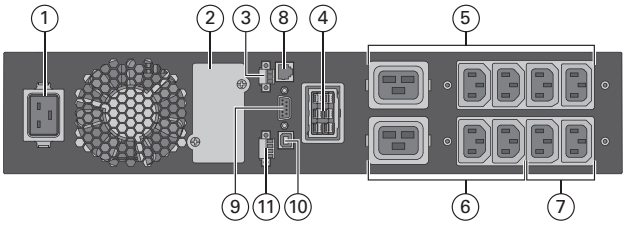
① Socket for connection to AC power source
② Slot for optional communication card
③ Relay output contact
④ Connector for additional battery module
⑤ Primary group: outlets for connection of critical equipment
⑥ Group 1: programmable outlets for connection of equipment
⑦ Group 2: programmable outlets for connection of equipment
⑧ Connector for automatic recognition of an additional battery module
⑨ RS232 communication port
⑩ USB communication port
⑪ Connector for ROO (Remote On/Off) control and RPO (Remote Power Off)

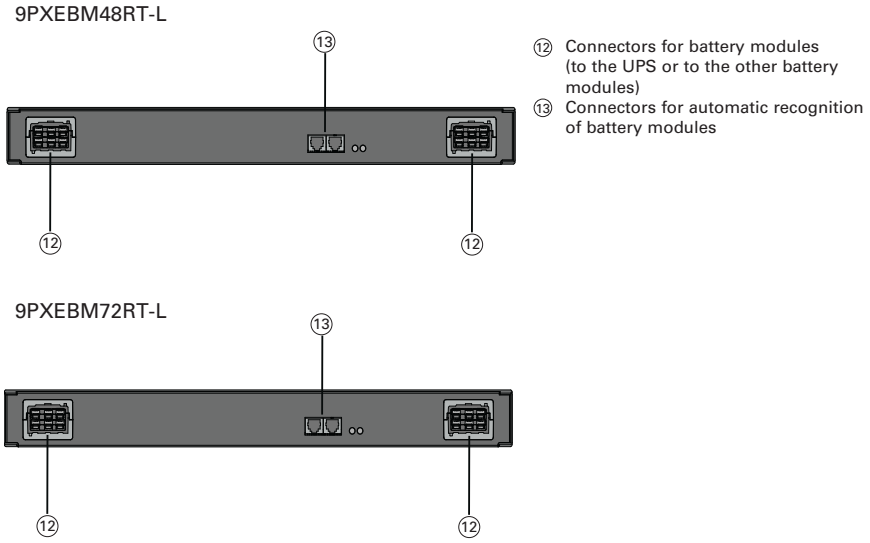
(*) Primary and Grouped outlets (⑤, ⑥, ⑦) are protected by 20A circuit breakers.

9PX 1500GRT-L



9PX 2000GRT-L & 9PX 3000GRT-L





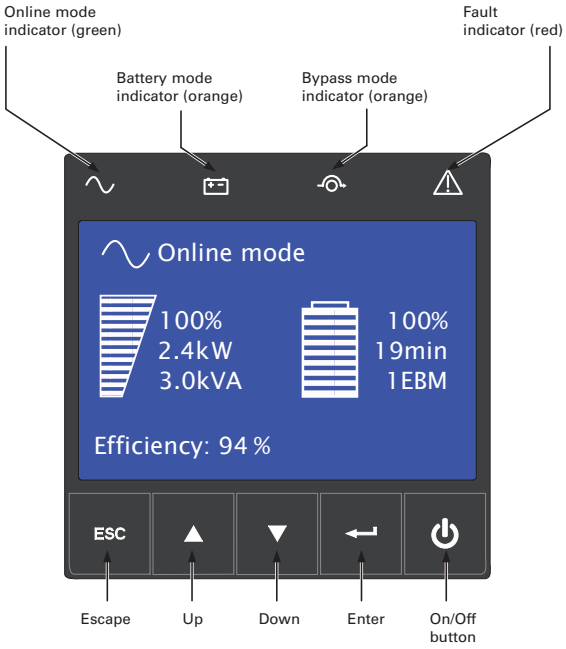
2.3 Accessories

Table 3. UPS Accessories

Part number	Description
9PXEBM48RT-L 9PXEBM72RT-L	Extended Battery Module
9RK	Rack Kit 9PX
Network-M2 / Network-M3	Network Card
INDGW-M2	Industrial Gateway Card (Modbus TCP / RTU)
Relay-MS	Relay Card

2.4 Control Panel

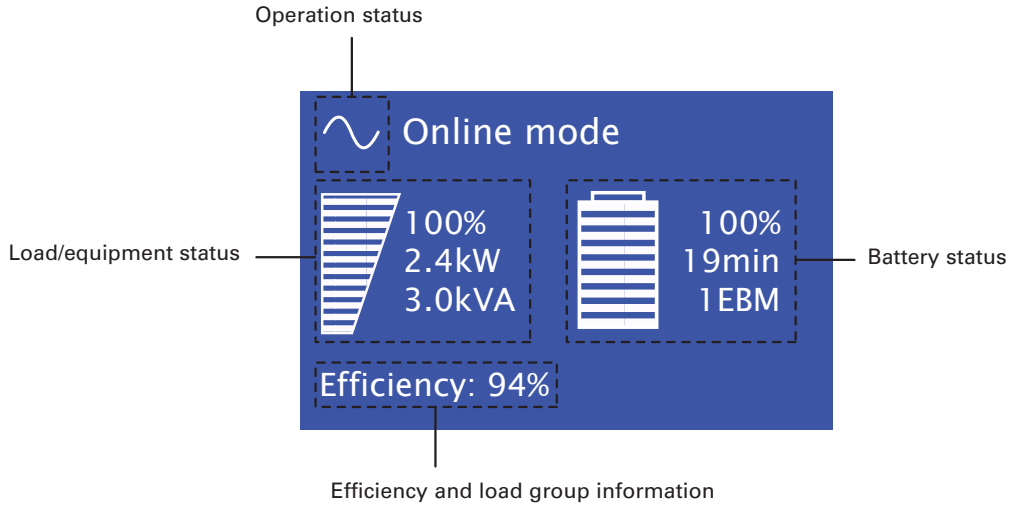
The UPS has a five-button graphical LCD. It provides useful information about the UPS itself, load status, events, measurements and settings.



Indicator	Status	Description
Green	On	The UPS is operating normally on Online or on High Efficiency mode.
Orange	On	The UPS is on Battery mode.
Orange	On	The UPS is on Bypass mode.
Red	On	The UPS has an active alarm or fault.

2.5 LCD Description

Figure 3. LCD Description



The following table describes the status information provided by the UPS

Note: If other indicator appears, see the troubleshooting for additional information.

Table 4. LCD Operating Status

Operation status	Cause	Description
Standby mode 	The UPS is Off, waiting for startup command from user.	Equipment is not powered until ⏻ button is pressed.
Online mode 	The UPS is operating normally.	The UPS is powering and protecting the equipment.
Battery mode 	A utility failure has occured and the UPS is on Battery mode.	The UPS is powering the equipment with the battery power. Prepare your equipment for shutdown.
End of backup time 	The UPS is on Battery mode and the battery is running low.	Low Battery Warning settings: [Capacity] [0%] ... [100%] [Runtime] [0mn] ... [60mn] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.

Table 4. LCD Operating Status (Continued)

Operation status	Cause	Description
High Efficiency mode 	The UPS is operating on High Efficiency mode.	The UPS is powering and protecting the equipment
Bypass mode 	An overload or a fault has occurred, or a command has been received, and the UPS is in Bypass mode.	Equipment is powered but not protected by the UPS.

2.6 Display Functions

Press the (⏎) button to activate the menu options. use the two middle buttons (▲and ▼) to scroll through the menu structure. Press the (⏎) button to select an option. Press the ESC button to cancel or return to the previous menu.

Table 5. Display Functions

Main menu	Submenu	Display information or Menu function
Measurements		[Load] W VA A pf / [Input/Output] V Hz / [Efficiency] % / [Battery] % min V n° EBM / [Battery remaining life] months / [Average power usage] Wh / [Cumulated power] Wh / BMS Information
Control	Go to Bypass	Transfers the UPS on Bypass mode
	Load segments On/Off	Commands the load segments
	Start battery test	Starts a manual battery test
	Connectivity test	Tests dry contact relay outputs and relay card contacts. Simulates line failure and battery low
	Function reset	Clears active fault, power usage, battery remaining life, reset NMC, Restore factory settings.
Settings	Local settings	Sets product general parameters
	In/out settings	Sets Input and Output parameters
	On/Off settings	Sets On/Off conditions
	Battery settings	Sets battery configuration
	Com settings	Sets communication parameters
Event Log	Event filter	Selects faults, alarms and/or events to display
	Event list	Displays the events stored
	Reset fault list	Clears events

Table 5. Display Functions (Continued)

Main menu	Submenu	Display information or Menu function
Fault log	Fault list	Displays the faults stored
	Reset fault list	Clears faults
Identification		[Product type/model] / [Part/Serial number] / [UPS/NMC firmware] / [Com card IPv4], [Com card IPv6], [Com card MAC]
Registration		Links to Eaton registration website

2.7 User Settings

The following table displays the options that can be changed by the user.

Table 6. User Settings

	Submenu	Available Settings	Default settings
Local Settings	Language	[English] [Français] [Deutsch] [Español] [Русский] [Português] [Italiano] [Simplified Chinese] [Japanese] Menus, status, notices and alarms, UPS fault, Event Log data and settings are in all supported languages.	[English] User selectable when UPS is powered for the first time.
	Date/ time	Format: [International] [US]	[US]
	LCD	Modify LCD screen brightness and contrast to be adapted to room light conditions.	
	Audible alarm	Mode: [Enabled] [Disabled on battery] [Always disabled] Enable or disable the buzzer if an alarm occurs. Level: [High] [Low]	[Enabled] [High]
	Protected access	[Enabled] [Disabled] Password is: 0577	[Disabled]
In/Out settings	Output voltage	100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V]	[120V] [208V]
	Output frequency	Mode: [Normal] [Converter] [Marine] Frequency can be changed in Frequency [Converter] mode In [Marine] mode output frequency follows input frequency	[Normal]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
	Output mode	Mode: [Industrial] [IT] [Custom] Overload: [Inv>Stop] [Inv>BP] [Inv>BP>Inv] Short-circuit: [Inv>Stop] [Inv>BP] [Inv>BP>Inv]	[IT] [Inv>BP>Inv] [Inv>Stop]
	Input volt hysteresis	Sets input voltage hysteresis from [1] to |10V]	[10V]
	High Efficiency mode	[Enabled] [Disabled] Power the output from Bypass for high efficiency	[Disabled]
	Bypass settings	[Volt low] [Volt high] [Qualify] [Hz synch] [Unsynch]	[80V] LV; [160V] HV; [144V] LV; [276V] HV; [In spec]; [5%]; [Half cycle]
	Load segments	[Auto start delay] [Auto shutdown delay]	UPS: [0s]; Group1: [3s]; Group2: [6s] UPS: [Disabled]; Group1: [Disabled]; Group2: [Disabled]
	Overload prealarm	[10%] … [102%] Load % when overload alarm occurs	[102%]
On/Off Settings	Start/Restart	[Cold start] [Auto restart] [Auto start] [Start on bypass]	[Cold start] [Auto restart] are Enabled [Auto start] [Start on bypass] are Disabled
	Forced reboot	[Enabled] [Disabled] [Timer] [10s] … [180s] When mains recover during a shutdown sequence: If set to Enabled, shutdown sequence will complete and wait 10 seconds prior to restart, If set to Disabled, shutdown sequence will not complete, UPS stays on.	[Enabled] [10s]
	Energy saving	[Enabled] [Disabled] [Timer] [1min] … [15min] [Level] [100W] … [1000W]	[Disabled] [5min] [100W]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		If Enabled, UPS will shut-down after defined duration. of back-up time, if load is less than set value.	
	Sleep mode	[Enabled] [Disabled] [Timer] [10min] … [120min] If Disabled, LCD and communication will turn OFF immediately after UPS is OFF. If Enabled, LCD and communication stays ON 1h30 min after UPS is OFF.	[Enabled] [90min]
	Site wiring fault	[Enabled] [Disabled] Prevents from starting the UPS in case of phase vs neutral wires swapping.	[Disabled]
	Power Off alert	[Enabled] [Disabled] If Enabled, activates a confirmation screen that requires user confirmation after pressing the power button, before the UPS shutdown occurs.	[Enabled]
Battery settings	Low battery warning	[Capacity] [0%] … [100%] [Runtime] [0min] … [60min] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.	[0%] [3min]
	Restart bat. level	[0%] ... [100%] If set, automatic restart will occur only when percentage of battery charge is reached.	[0%]
Com settings	Input signals	Sets Input signals parameters (function, delay, operation) through external contact connectors or RS232. ROO port: - [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	[No]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Closed]
		RPO port:	
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	No
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Open]
		DB9-4 port:	No
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [High] [Low]	[High]
	Output signals	[Relay] [DB9-1] [DB9-7] [DB9-8] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232	
		[Relay]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[Relay] [Bypass]
		[DB9-1]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-1] [Low bat]
		[DB9-7]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-7] [UPS OK]
		[DB9-8]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-8] [On bat]
Com settings (cont)	Remote command	[Enabled] [Disabled] If Enabled, shutdown or restart	[Enabled]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		commands from software are authorized.	
	Shutdown commands	[Send CMD] [Output OFF] [OFF delay] [restart] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232 port	
		[Send CMD]: [Yes] [No]	Send CMD: [No]
		[Output OFF]: [No] [UPS] [Group 1]	Output OFF: [No]
		[Group 2] [Group 1 + Group 2]	
		[OFF delay]: [0s] …[999s]	OFF delay: [0s]
		[Restart]: [Yes] [No]	Restart: [Yes]
	On battery notice delay	Sets delay before noticing on battery information to software.	[0s]
	General alarm	[On battery] [Battery fault]	[Internal fault]
		[Overload pre-alarm] [Internal fault]	
		[Ambient temp.] [Fan lock]	
		[Bypass overload] [Current limit]	
		[Short circuit] [Inverter overload]	
		[Power overload] [Low battery]	
		[On bypass] [UPS OK] [Load protected]	
		[Load powered] [Ext. charger ON]	
		Defines which event or fault generate	
		a general alarm through Output signal screen.	

Chapter 3 Installation

3.1 Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping cartons and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage:

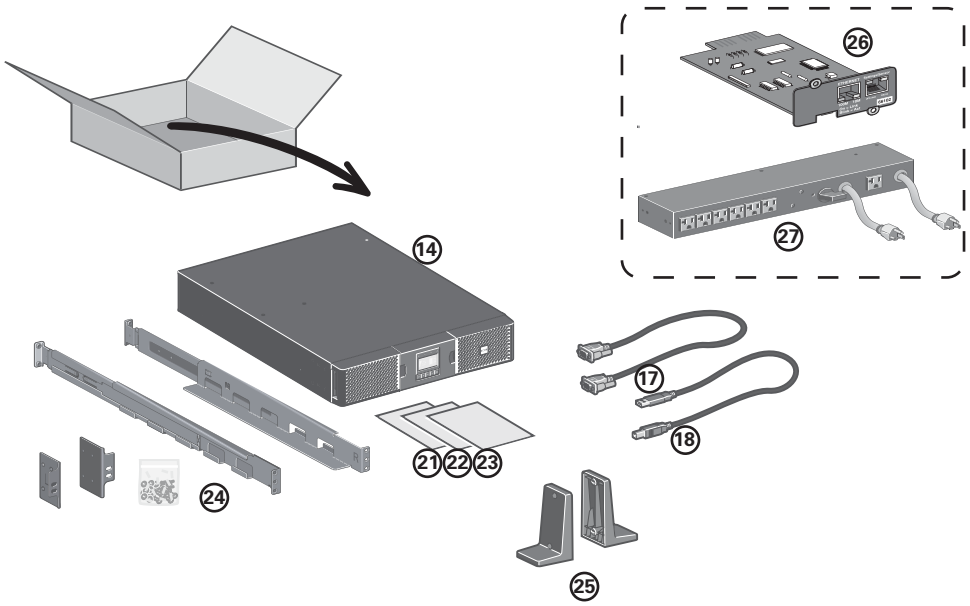
1. File with the carrier within 15 days of receipt of the equipment;
2. Send a copy of the damage claim within 15 days to your service representative.

⚠ IMPORTANT

Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use the UPS. Contact your service representative.

3.2 Checking the Accessory Kit

Figure 4. 9PX1500RT-L / 9PX2000RT-L / 9PX3000RT-L



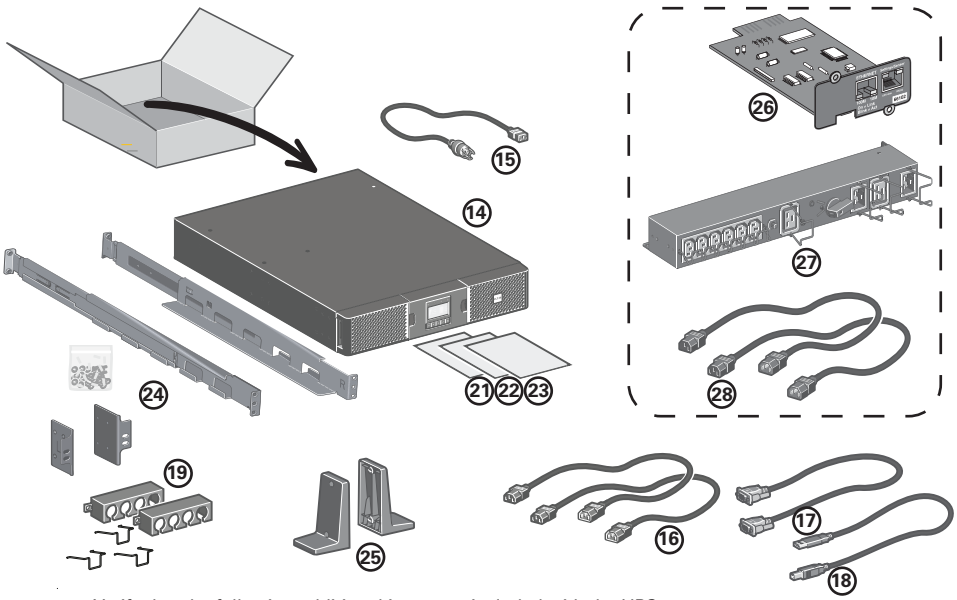
Verify that the following additional items are included with the UPS:

⑭ 9PX UPS
⑰ RS232 communication cable
⑱ USB communication cable
㉑ Software leaflet
㉒ Safety instructions
㉓ Quick start
㉔ Mounting kit for 19-inch enclosures
㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card (optional, standard on Network Bundle models)
㉗ MBP-115 module for 9PX 1500RT (optional)
MBP-120 module for 9PX 2000RT (optional)
MBP-130 module for 9PX 3000RT(optional)

Figure 5. 9PX1500GRT-L / 9PX2200GRT-L / 9PX3000GRT-L



Verify that the following additional items are included with the UPS:

⑭ 9PX UPS

⑮ Connection cable to AC-power source

⑯ 2 connection cables for the protected equipment

⑰ RS232 communication cable

⑱ USB communication cable

⑲ 3 cable locking systems

㉑ Software leaflet

㉒ Safety instructions

㉓ Quick start

㉔ Mounting kit for 19-inch enclosures

㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card(optional,standard on Network Bundle options

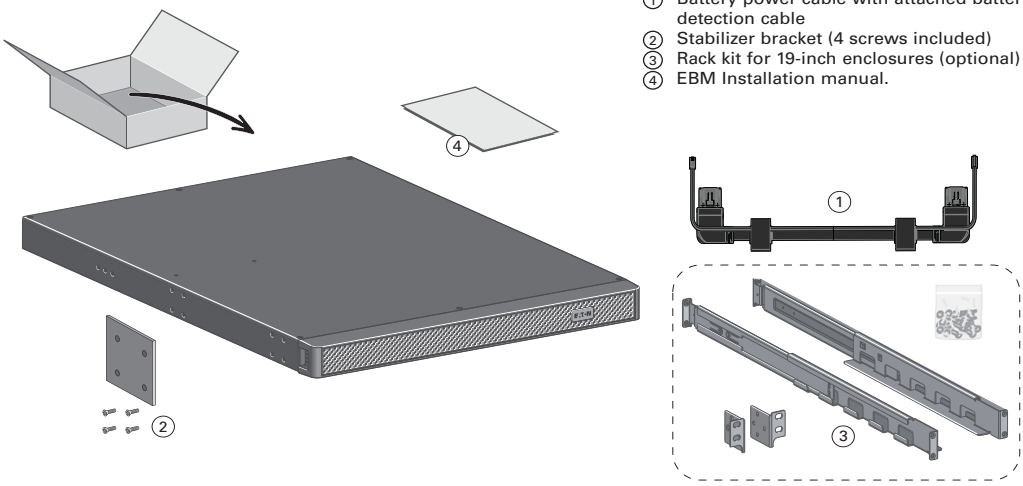
㉗ HotSwap MBP module (optional)

㉘ Connection cables between Hotswap MBP module and UPS

Figure 6. 9PXEBM48RT-L / 9PXEBM72RT-L

- If you ordered an optional Extended Battery Module (EBM), verify that the following additional items are included with the EBM:

① Battery power cable with attached battery detection cable
② Stabilizer bracket (4 screws included)
③ Rack kit for 19-inch enclosures (optional)
④ EBM Installation manual.



NOTE 1 Discard the EBM user's guide if you are installing the EBM with a new UPS at the same time.

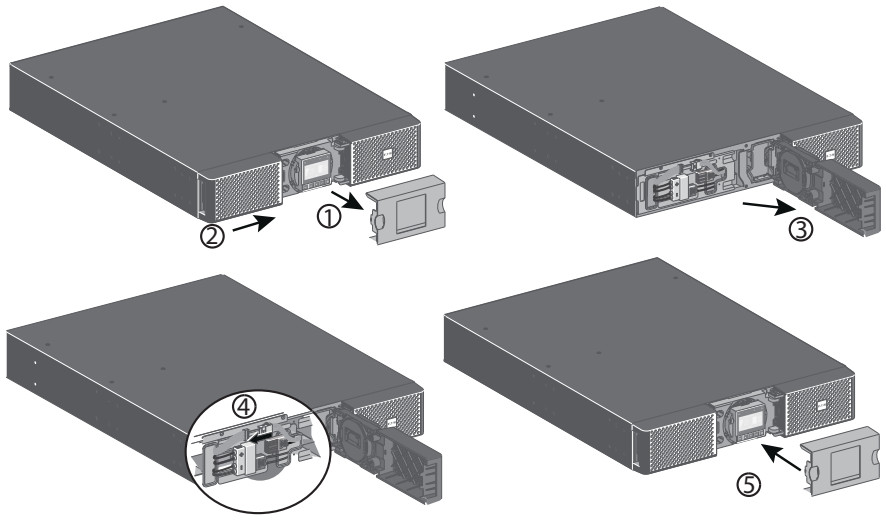
NOTE 2 Use the UPS user's guide to install both the UPS and the EBM.

Remember If you ordered other UPS accessories, refer to specific user manuals to check the packing contents.

3.3 Connecting the Internal Battery

NOTE Do not connect the UPS to the utility until installation is complete.

Figure 7. Internal Battery Connection



To connect to the UPS:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the left side of the front panel.

NOTE A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.

⚠CAUTION

A small amount of arcing may occur when connecting the internal batteries. This is normal and will not harm personnel. Connect the cables quickly and firmly.

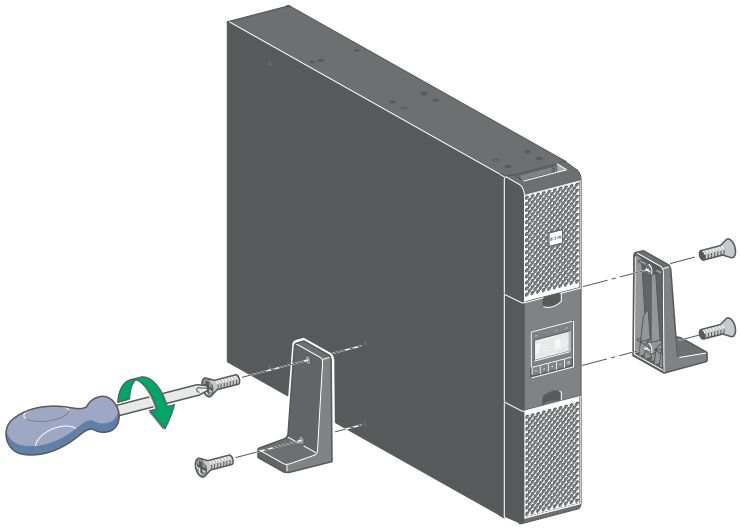
4. Connect the two battery connectors together.
5. Put back the front panel, then clip the center cover.

3.4 Tower Installation

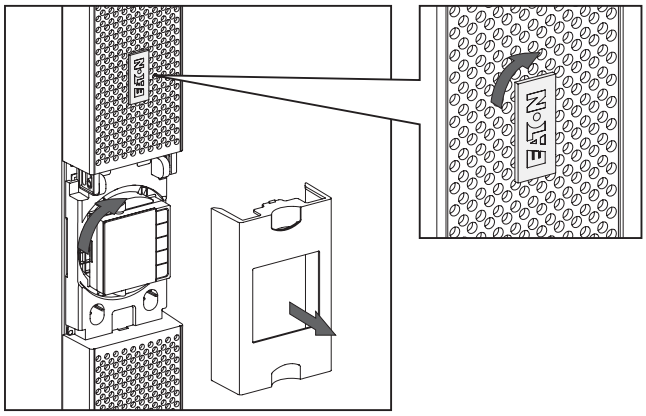
Tip If you ordered other UPS accessories, refer to specific user manuals to check the tower installation with the UPS.

To install the cabinet:

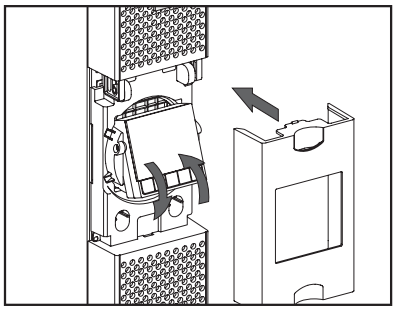
1. Place the UPS on a flat, stable surface in its final location.
2. Always keep 6" or 150 mm of free space behind the UPS rear panel for ventilation.
3. If installing additional cabinets, place them next to the UPS in their final location.



- Adjustment of the orientation of the LCD panel and of the logo.



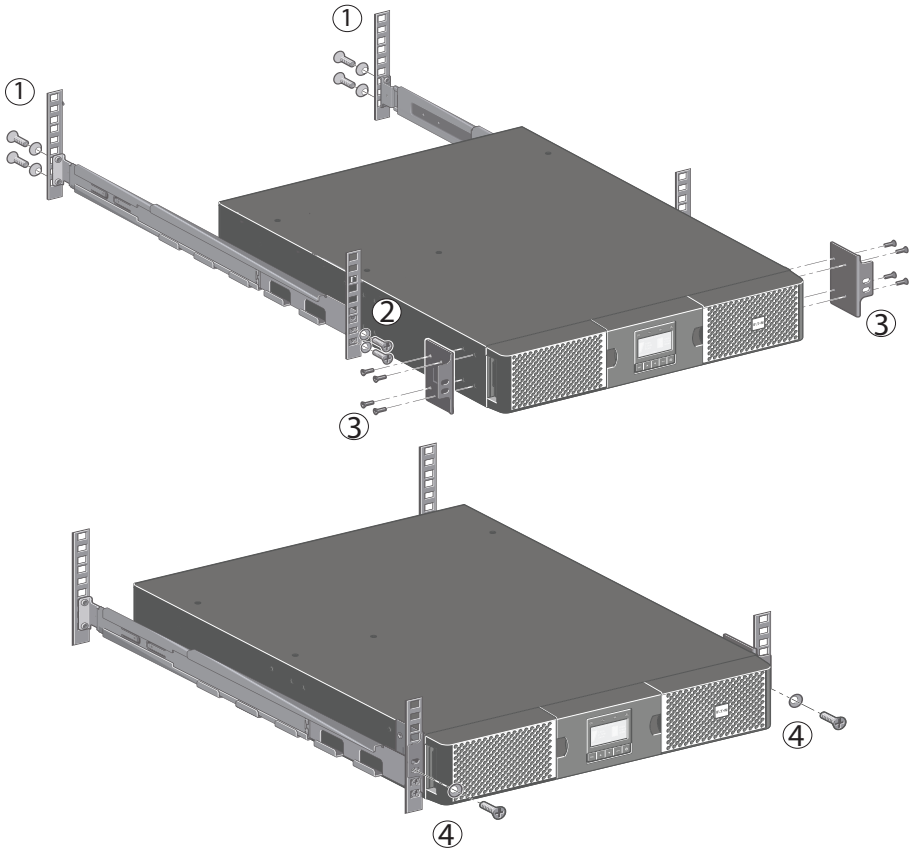
- Adjustment of the angle of vision of the LCD panel.



3.5 Rack Installation

- Rack mounting of UPS, EBM, and accessory modules.

Follow steps 1 to 4 for module mounting on the rails.



The rails and necessary hardware are supplied by EATON.

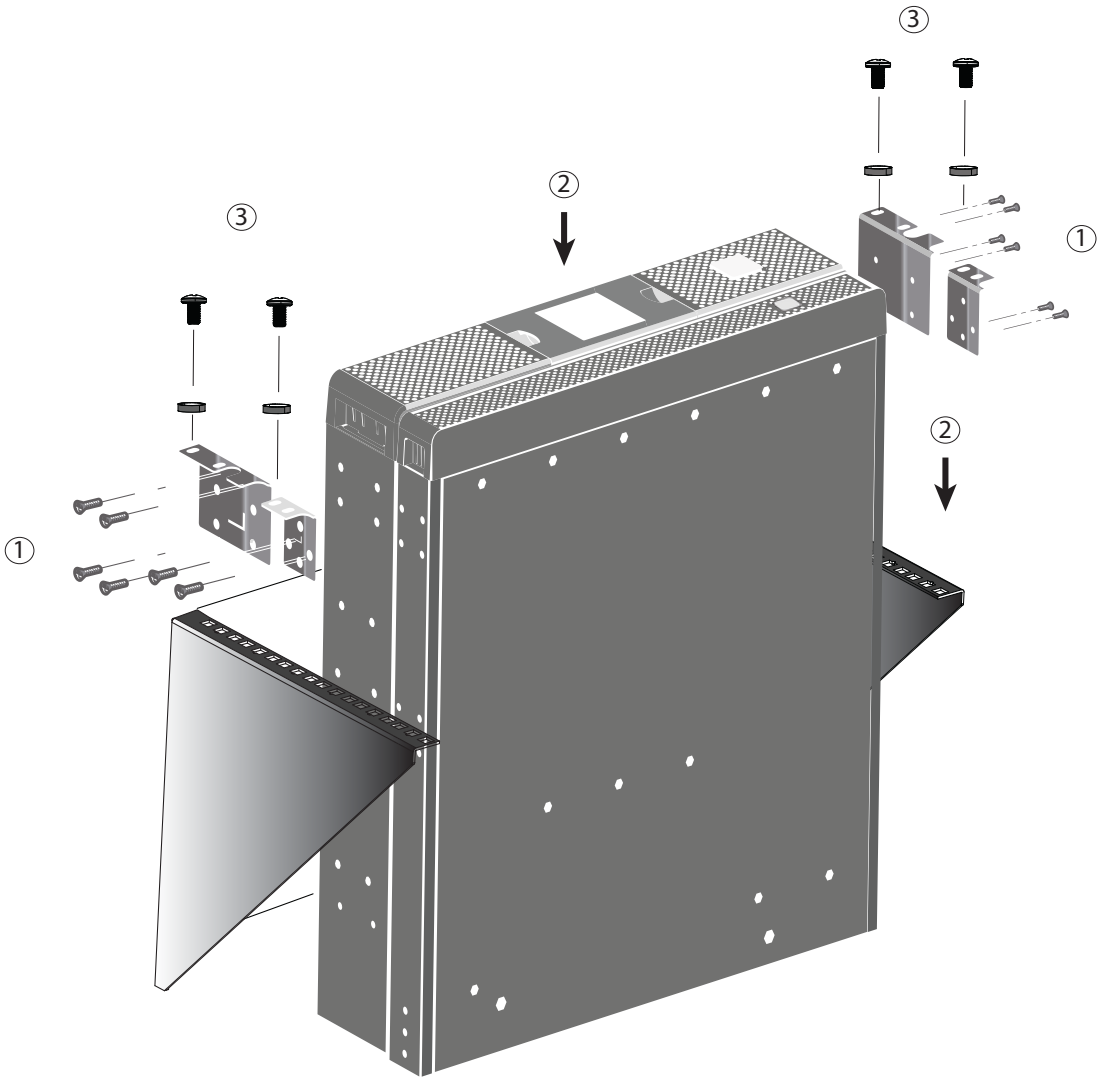
3.6 Vertical Installation

NOTE 1 This vertical installation is available only for UL/cTUVus.

NOTE 2 Suitable for mounting on concrete or other noncombustible surfaces only.

- The UPS, EBM, and accessory modules can be installed vertically in a rack or on a wall.

Follow steps 1 to 3 for module mounting on the rails.



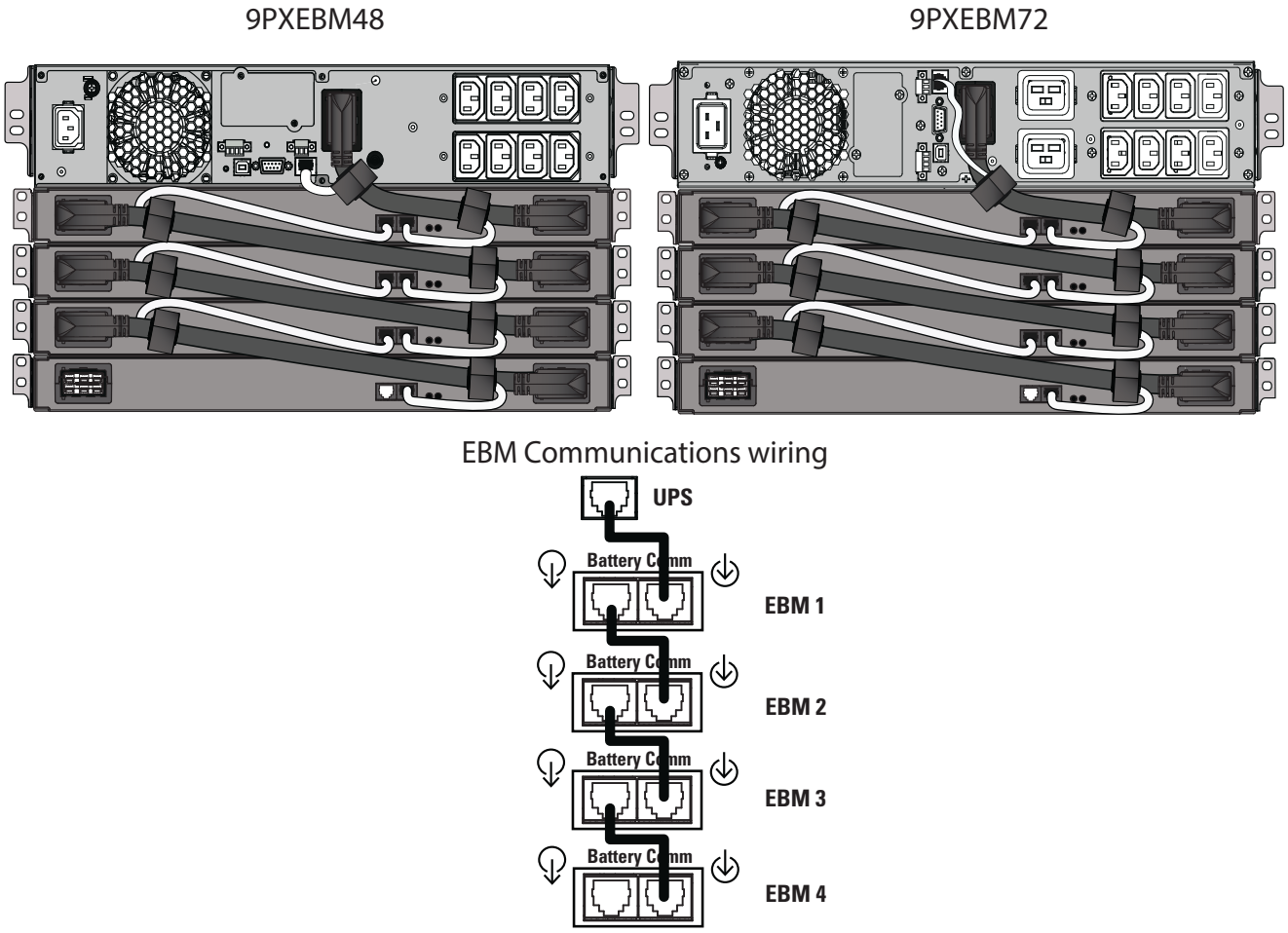
3.7 Connecting the EBM(s)

⚠CAUTION

A small amount of arching may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.

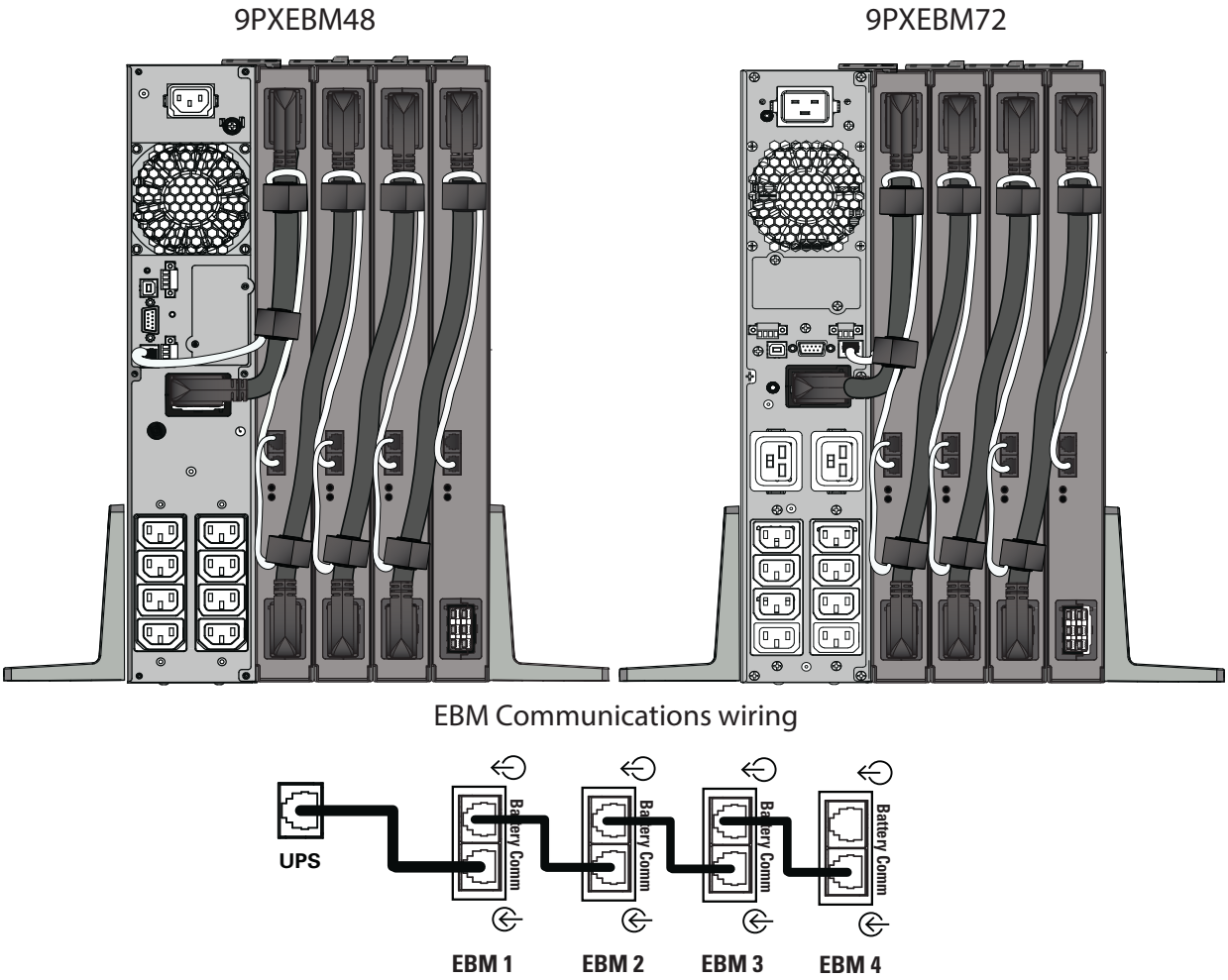
1. Plug the EBM power cable(s) into the battery connector(s). Up to 4 EBMs may be connected to the UPS.
2. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
3. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).

Figure 8. 9PXEBM Rack Mount Connections



NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

Figure 9. 9PXEBM Tower Mount Connections



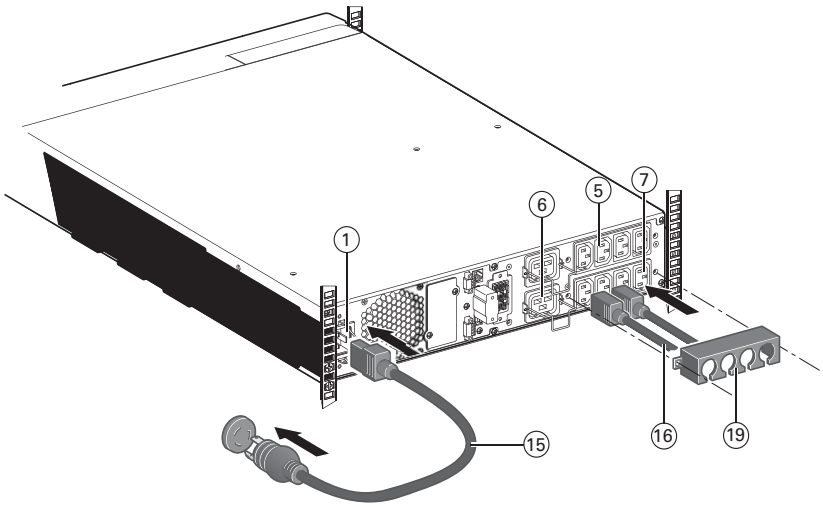
NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

3.8 Detecting other Accessories

Tip If you ordered other UPS accessories, refer to specific user manuals to check the connection to the UPS.

3.9 UPS Connection without Hotswap MBP Module

Check that the indications on the name plate located on the back of the UPS correspond to the AC-power source and the true electrical consumption of the total load.

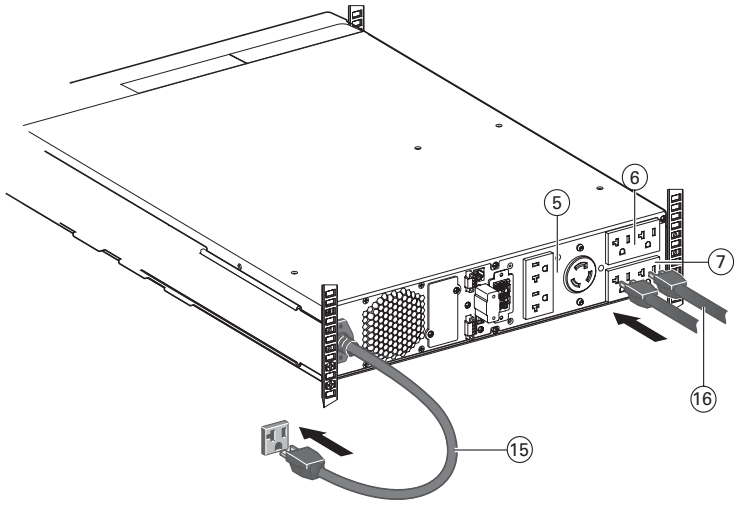


1. 9PX 2000RT-L / 3000RT-L connect the UPS input socket ① to the AC-power source.
   9PX 2200GRT-L / 3000GRT-L / 3000GLRT-L: connect the supplied cable ⑮ (250 V - 16 A) to the socket ①, then to the AC-power source.

2. Connect the loads to the UPS using the cables ⑯.
   It is preferable to connect the priority loads to the outlets marked ⑤ and the non-priority loads to the outlets marked ⑥ ⑦ that can be programmed.
   Connect any high-power devices to the 16 A outlet.

To program shutdown of outlets ⑥ ⑦ during operation on battery power and thus optimise the available backup time, please check the in/out settings.

3. For G models, fit the cable locking system ⑲ that prevents the plugs from being pulled out accidentally.

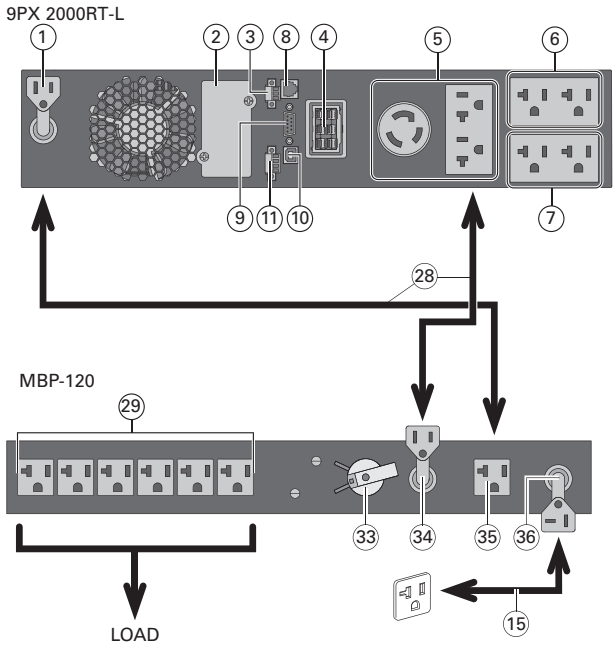


Note. The UPS charges the battery as soon as it is connected to the AC-power source, even if ⏻ button is not pressed

Once the UPS is connected to the AC-power source, eight hours of charging are required before the battery can supply the rated backup time.

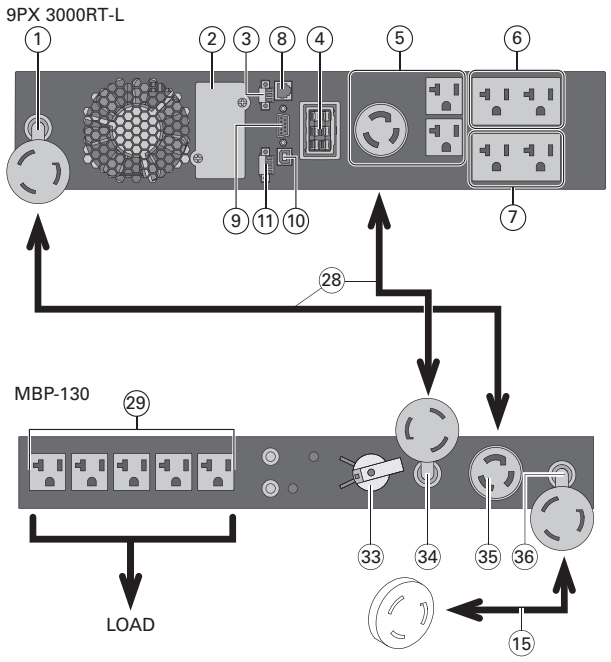
3.10 Connection with a Hotswap MBP Module (Optional Accessory)

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads.



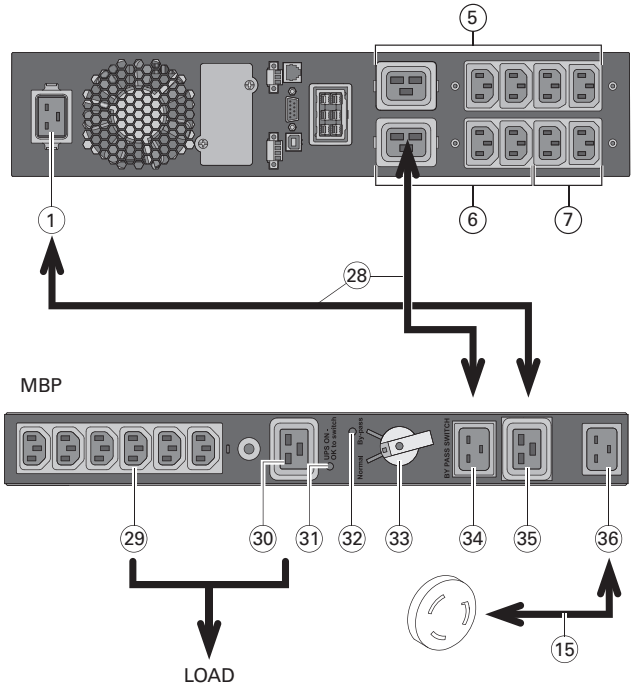
1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the “UPS Input socket” ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the “UPS Output” ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.



* 9PX 1500RT-L: To connect to MBP-115, follow the same procedure as for the 9PX 2000RT / 9PX 3000RT.

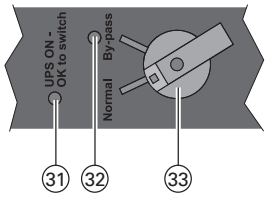
9PX 2200GRT-L & 9PX 3000GRT-L



1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the "UPS Input socket" ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the "UPS Output" ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.

HotSwap MBP module operation



The HotSwap MBP module has a rotary switch ㉝ with two positions:

Normal	the load is supplied by the UPS, LED ㉛ is on.
Bypass	the load is supplied directly by the AC-power source. LED ㉜ is on.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch ㉝ to Normal position.
3. Start the UPS by pressing the ON/OFF button ⏻ on the UPS control panel.

The load is supplied by the UPS.
LED ㉛ "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

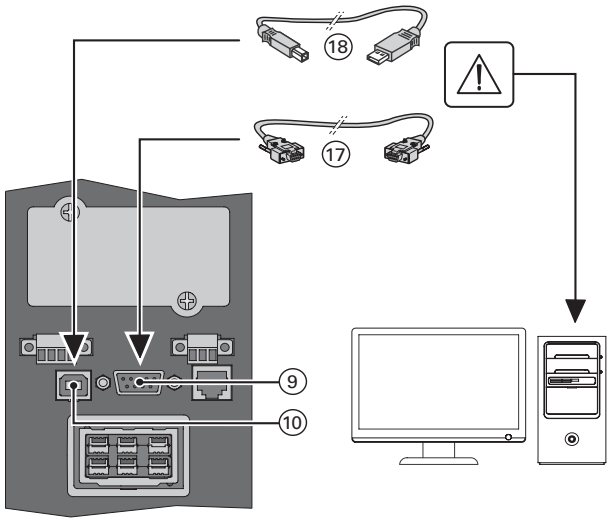
HotSwap MBP module test

1. Set switch ㉝ to Bypass position and check that the load is still supplied.
2. Set switch ㉝ back to Normal position.

Chapter 4 Communication

4.1 Communication Ports

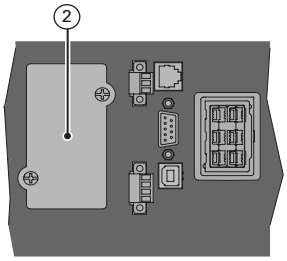
The RS232 and USB communication ports cannot operate simultaneously.



1. Connect the RS232 ⑰ or USB ⑱ communication cable to the serial or USB port on the computer equipment.
2. Connect the other end of the communication cable ⑰ or ⑱ to the USB ⑩ or RS232 ⑨ communication port on the UPS.

The UPS can now communicate with EATON power management software.

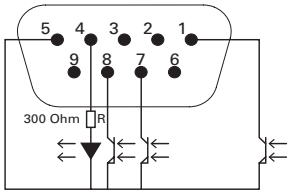
Installation of the communication cards



It is not necessary to shutdown the UPS before installing a communication card.

1. Remove the slot cover ② secured by screws.
2. Insert the communication card in the slot.
3. Secure the card cover with the 2 screws.

Characteristics of the contact RS232 communication port



Pin	Signal	Direction	Function
1	Bat Low	Output	Low Battery Output
2	TxD	Output	Transmit to external device
3	RxD	Input	Receive from external device
4	I/P SIG	Input	-
5	GNDS	-	Signal Common tied to chassis
6	PNP	Input	Plug and Play
7	UPS ON	Output	UPS ON
8	BAT Mode	Output	-
9	+5V	Output	Power supply for external signals or options

Contact characteristics (optocoupler)

- Voltage: 48 V DC max
- Current: 25 mA max

4.2 UPS Remote Control Functions

Programmable Signal Inputs

The 9PX incorporates 3 programmable signal inputs: one Remote Power Off (RPO) input terminal, one Remote On/Off (ROO) input terminal, one RS-232 input (pin-4). Signal inputs can be configured see Settings > Com settings > Signal Input in to have one of the following functions:

Function	Description
No	No function, please choose a function if you want to use input signal
RPO	Remote Power Off (RPO) is used to shutdown the UPS remotely
ROO	Remote On/Off allows remote action of button to switch On/Off the UPS. (Cold start is prohibited while using the ROO function)
Forced bypass	If feeding the load the unit goes to bypass operation and stays there regardless of the bypass state until the input is inactivated
Building alarm	Active input generates an alarm "building alarm"
On generator	Active input disables synchronization and transfers to bypass
Remote shutdown	Active input turns UPS output (or outlet groups) off after a user defined shutdown delay but keeps on charging batteries according to a selected charging scheme, inactive input does not abort shutdown countdown. Depending on the "Restart" parameter (see Settings > Com Settings > Shutdown commands on page 16) the unit may startup automatically.

IMPORTANT

Warning Signal inputs have no function by default please choose a function through the LCD **(Settings > Com settings > Input signals).**

See below 2 examples of configuration with RPO terminal used as RPO function and ROO terminal use as ROO function:

Remote Power Off (RPO)

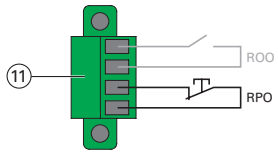
RPO is used to shutdown the UPS remotely when the contact is open. This feature can be used for shutting down the load and the UPS by thermal relay, for instance in the event of room over temperature. When RPO is activated, the UPS shuts down the output and all its power converters immediately. The UPS remains on to alarm the fault. The RPO circuit is an IEC 60950 safety extra low voltage (SELV) circuit. This circuit must be separated from any hazardous voltage circuits by reinforced insulation.

- The RPO must not be connected to any utility connected circuits. Reinforced insulation to the utility is required. The RPO switch must be a dedicated latching-type switch not tied into any other circuit. The RPO signal must remain active for at least 250 ms for proper operation.
- To ensure the UPS stops supplying power to the load during any mode of operation, the input power must be disconnected from the UPS when the Remote Power Off function is activated.

Leave the RPO connector installed in the RPO port on the UPS even if the RPO function is not needed.

RPO connections:

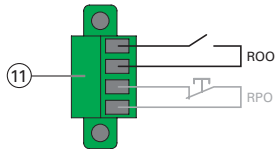
RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote On/Off (ROO)

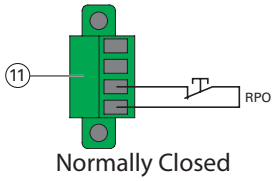
- Remote On/Off allows remote action of button to switch On/Off the UPS.
- When contact changes from open to closed, the UPS is switched-on (or stays On).
- When contact changes from closed to open, the UPS is switched-off (or stays Off).
- On/Off control via button has priority over the remote control.

RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote Control Connection and Test

1. Check the UPS is shut down and the electrical supply network disconnected.
2. Remove RPO connector from the UPS by unfitting the screws.
3. Connect a normally closed volt-free contact between the two pins of connector.

 Normally Closed	Contact open: shut down of UPS To return to normal operation, deactivate the external remote shut down contact and restart the UPS from the front panel.

4. Plug the RPO connector into the back of the UPS and fix the screws.
5. Connect and restart the UPS according to the previously described procedures.

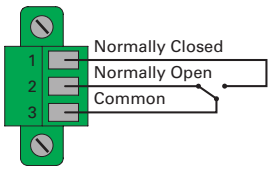
6. Activate the external remote shut down contact to test the function. Always test the RPO function before applying your critical load to avoid accidental load loss.

Programmable Signal Outputs

The 9PX incorporates 4 programmable signal outputs: one relay output, three optocouplers outputs (pin- 1/7/8). Signal outputs can be configured (see Settings > Com settings > Output Signals in to report the following information:

Signal	Default Assignment	Description
On battery (On bat)	DB9-Pin 8	UPS is in battery mode
Low battery (Low bat)	DB9-Pin 1	Battery is nearly empty
Battery fault (Bat fault)	-	Battery fault
Bypass	Relay output **(1)**	UPS is operating in Bypass mode
UPS OK	DB9-Pin 7	Load is powered (from inverter or bypass), with no alarm
Load powered	-	Load is powered (from inverter or bypass)
Load protected	-	UPS is on inverter, with no alarm and ready to go to battery
General alarm	-	• Choose events that will trigger this alarm trough the LCD • (Settings > Com settings > General alarm) for more information on possible events please look at page 16.
Ext charger ON	-	Control an optional external battery charger on and off.
OVL pre-alarm	-	Overload pre-alarm

(1) Relay output:



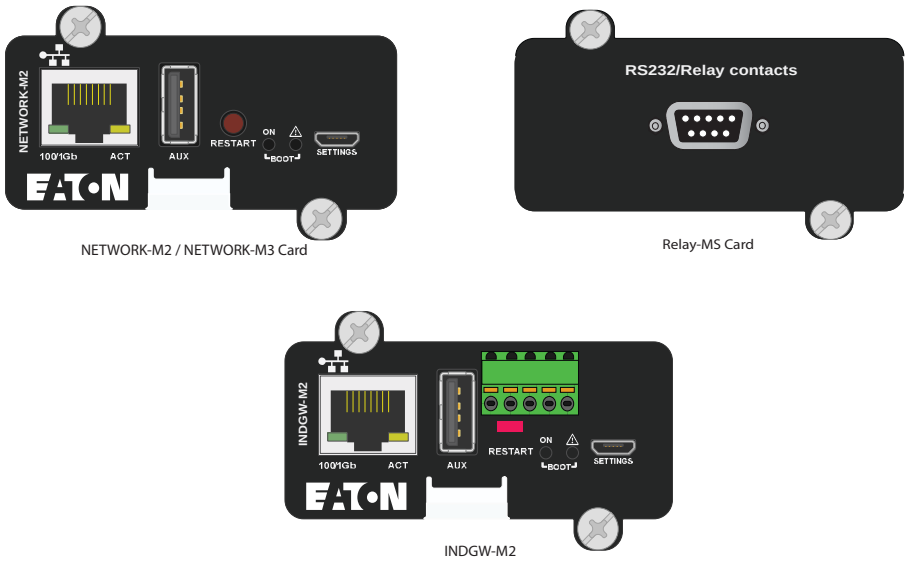
Connectivity Cards

Connectivity cards allow the UPS to communicate in a variety of networking environments and with different types of devices. The 9PX models have one available communication bay for the following connectivity cards:

- **Network-M2 card** — has SNMP and HTTP capabilities as well as monitoring through a Web browser interface; connects to a Gigabit Ethernet network. In addition, a Environmental Monitoring Probe can be attached to obtain humidity, temperature, smoke alarm, and security information.
- **INDGW-M2 card**- has SNMP and HTTP capabilities and a Modbus to facilitate remote monitoring of the UPS system through any Building Management System.

- **Relay-MS card**- has isolated dry contact (Form-C) relay outputs for UPS status: Utility failure, Battery low, UPS alarm/OK, or on Bypass.

Figure 10. Connectivity Card Options



NETWORK-M2 / NETWORK-M3 Card

Relay-MS Card

INDGW-M2

Eaton Intelligent Power Software suite

Eaton Intelligent Power Software suite is available from eaton.com/download. Eaton Software suite provides up-to-date graphics of UPS power and system data and power flow. It also gives you a complete record of critical power events, and it notifies you of important UPS or power information. If there is a power outage and the 9PX UPS battery power becomes low, Eaton Software suite can automatically shut down your computer system to protect your data before the UPS shutdown occurs.

Chapter 5 Operation

5.1 Start-up and Normal Operation

To start the UPS:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. Verify that the UPS power cord is plugged in.
4. The UPS front panel display illuminates and shows EATON logo.
5. Verify that the UPS status screen shows ⏻
6. Press the ⏻ button on the UPS front panel for at least 2 seconds.
7. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear. Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.
8. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode.

5.2 Starting the UPS on Battery

Before using this feature, the UPS must have been powered by utility power with output enabled at least once. Battery start can be disabled. See the "Cold start" setting in "ON/OFF Settings" in .

To start the UPS on battery:

1. Press the ⏻ button on the UPS front panel until the UPS front panel display illuminates and shows a status of "UPS starting...". The UPS transfers from Standby mode to Battery mode. The 🔋 indicator illuminates solid. The UPS supplies power to your equipment.
2. Check the UPS front panel display for active alarms or notices besides the "Battery mode" notice and notices that indicate missing utility power. Resolve any active alarms before continuing. See the "Troubleshooting" section . Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.

5.3 UPS Shutdown

To shut down the UPS:

1. Press the ⏻ button on the front panel for three seconds. A confirmation message will appear. When confirmed, the UPS starts to beep and shows a status of "UPS shutting OFF...". The UPS then transfers to Standby mode, and the ∿ indicator turns off.

5.4 Operating Modes

The Eaton 9PX front panel indicates the UPS status through the UPS indicators, see section 2.4 *Control Panel* .

Online Mode ∿

During Online mode, the ∿ indicator illuminates solid and the UPS is powered from the utility. The UPS monitors and charges the batteries as needed and provides filtered power protection to your equipment.

Optional High Efficiency and Energy Saving settings minimize heat contribution to the rack environment. See section 2.7 *User Settings* .

Battery Mode

When the UPS is operating during a power outage, the alarm beeps once every ten seconds and the indicator illuminates solid. The necessary energy is provided by the battery. When the utility power returns, the UPS transfers to Online mode operation while the battery recharges. If battery capacity becomes low while on Battery mode, the audible alarm beeps once every 3 seconds. This warning is approximate, and the actual time to shutdown may vary significantly. Shutdown all applications on the connected equipment because automatic UPS shutdown is imminent. When utility power is restored after the UPS shuts down, the UPS automatically restarts.

Low-Battery Warning

- The indicator illuminates solid.
- The audio alarm beeps every three seconds.

The remaining battery power is low. Shut down all applications on the connected equipment because automatic UPS shutdown is imminent.

End of battery backup time

- LCD displays "End of backup time".
- All the LEDs go OFF.
- The audio alarms stops.

Bypass Mode

In the event of a UPS overload or internal failure, the UPS transfers your equipment to utility power. Battery mode is not available and your equipment is not protected; however, the utility power continues to be passively filtered by the UPS. The indicator illuminates. Depending on overload conditions, the UPS remains in Bypass mode for at least 5 seconds and will stay in this mode if three transfers to Bypass occur within 20 minutes.

The UPS transfers to Bypass mode when:

- the user activates Bypass mode through the front panel.
- the UPS detects an internal failure.
- the UPS has an overtemperature condition.
- the UPS has an overload condition listed in Table 12 .

The UPS shuts down after a specified delay for overload conditions listed in Table 12 . The UPS remains on to alarm the fault.

5.5 Return of AC Power

Following an outage, the UPS restarts automatically when AC input power returns (unless the restart function has been disabled) and the load is supplied again.

5.6 Setting High Efficiency Mode

In High Efficiency mode, the UPS operates normally on Bypass and transfers to Online (or Battery) mode in less than 10 ms when utility fails. Transfers to High Efficiency mode will be active after 5 minutes of Bypass voltage monitoring: if Bypass quality is not in tolerance, then the UPS will remain in Online mode.

Eaton recommends to use the HE mode only to protect IT equipment.

To set the High Efficiency mode:

1. Select Settings, In/Out settings, and High Efficiency mode.
2. Select Enabled and Enter to confirm.
3. The UPS transfers to High Efficiency mode after 5 minutes.

5.7 Configuring Bypass Settings

The following settings are available for configuring Bypass operation.

Changing the settings changes UPS behavior and may result in decreased protection.

Bypass Voltage Low Limit

The default disables a transfer to Bypass if the measured bypass voltage level is below the nominal output voltage minus 20%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Bypass Voltage High Limit

The default disables a transfer to Bypass if the measured bypass voltage level is above the nominal output voltage plus 15%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Qualify Bypass

The default setting ("In spec") allows a transfer to Bypass only when Bypass is within the following specifications:

- Bypass voltage is between the "Bypass Voltage Low Limit" and "Bypass Voltage High Limit" settings
- Bypass frequency is within nominal frequency 5%.

You can prohibit Bypass ("Never") or always allow Bypass with no specification checking ("Always"). For "Always on UPS Fault," transfer to Bypass is always made on UPS fault; otherwise, operation proceeds as with the default setting.

Synchronization Window

The UPS tries to synchronize with Bypass when the Bypass frequency is less than the value set for the "Synchronization Window" setting. When the Bypass frequency is more than the set value, the UPS goes to nominal frequency.

Unsynchronized Transfers

When Qualify Bypass is set to "Always" or "Always on Fault" you can select the interruption time when transferring to bypass, default setting is "Half Cycle" but can be changed to "Full cycle".

5.8 Configuring Battery Settings

Low battery warning

During discharge, the low battery alarm is activated if the remaining runtime goes below 3 minutes or less than the setting capacity threshold (0 % by default). This threshold can be modified.

Restart battery level

This setting is used to define the battery restart level. The battery level must reach this threshold to enable UPS start.

5.9 Retrieving the Event Log

To retrieve the Event log through the display:

1. Press any button to activate the menu options, then select Event log.
2. Scroll through the listed events.

5.10 Retrieving the Fault Log

To retrieve the Fault log through the display:

1. Press any button to activate the menu options, then select Fault log.
2. Scroll through the listed faults.

Chapter 6 UPS Maintenance

6.1 Storing the Equipment

If you store the equipment for a long period, recharge the battery every 6 months by connecting the UPS to utility power. The internal batteries charge to 90% capacity in less than 3 hours. However, Eaton recommends that the batteries charge for 48 hours after long-term storage. Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use them. Contact your service representative.

6.2 Replacing Batteries

IMPORTANT

DO NOT DISCONNECT the batteries while the UPS is in Battery mode.

Batteries can be replaced easily without turning off the UPS or disconnecting the load. If you prefer to remove input power to change the batteries, see "UPS Shutdown".

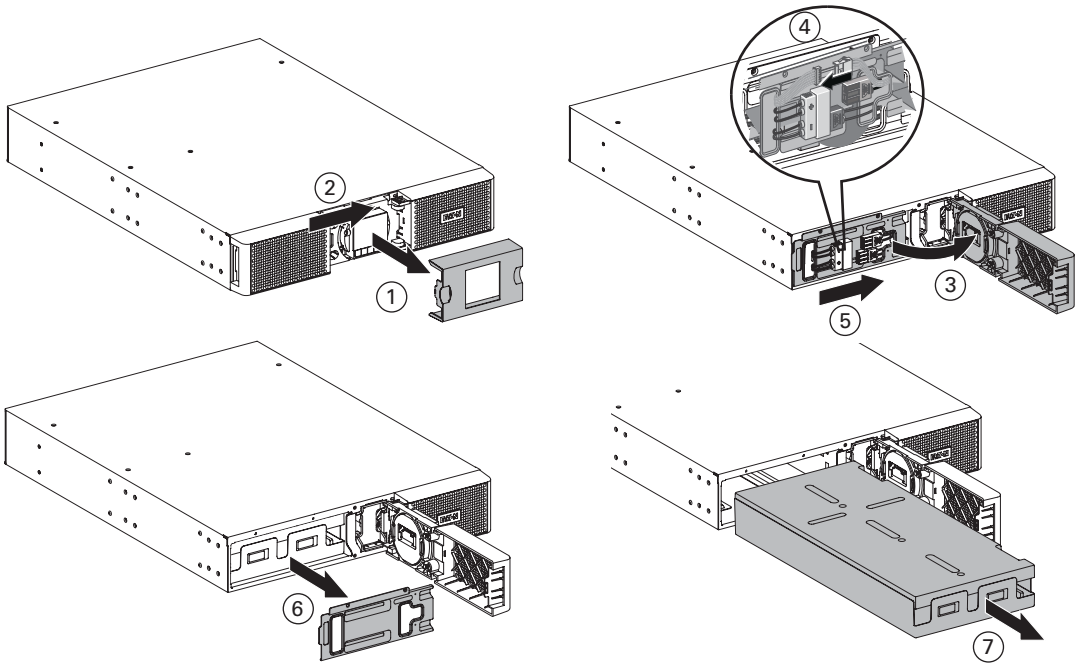
Consider all warnings, cautions, and notes before replacing batteries.

- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
- Batteries can present a risk of electrical shock or burn from high short circuit current. Observe the following precautions:
    1. Remove watches, rings, or other metal objects,
    2. Use tools with insulated handles,
    3. Do not lay tools or metal parts on top of batteries,
    4. Wear rubber gloves and boots.
- When replacing batteries, replace with the same type and number of batteries or battery packs. Contact your service representative to order new batteries.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire. Batteries may explode when exposed to flame.
- Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes and may be extremely toxic.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).
- ELECTRIC ENERGY HAZARD. Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.
- Disconnect charging source prior to connecting or disconnecting battery terminals.

Replacing the internal battery

The internal battery is heavy. Use caution when handling the heavy batteries.

Figure 11. Internal Battery Pack Replacement



To replace the battery pack:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the battery door.
4. Disconnect the battery connectors.

   A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.
5. Remove the two screws to pull out the metal protection cover of the battery.
6. Pull out the plastic handle of the battery pack, and slide the pack out slowly on to a flat and stable surface. Use two hands to support the battery pack. See "Recycling the used equipment" on page 38 for proper disposal.
7. Verify that the replacement batteries have the same rating as the batteries being replaced.
8. Put the new battery pack into the UPS. Push the battery pack firmly, reconnect the red and black battery connectors then reconnect the BMS communication cable.
9. Verify that all of the alarms have cleared on the display.
10. Screw back the metal protection cover and the front panel, then clip the center cover.
11. If there are no EBM modules that need to be replaced continue to the 6.3 *Battery Settings Reset* .
12. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

Replacing the EBM(s)

The EBM is heavy. Lifting the cabinet into a rack requires a minimum of two people.

To replace the EBM(s):

1. Unplug the EBM power cable and battery detection cable from the UPS. If additional EBM(s) are installed, unplug the EBM power cable and battery detection cable from each EBM.
2. Replace the EBM(s). See "Recycling the used equipment" for proper disposal.

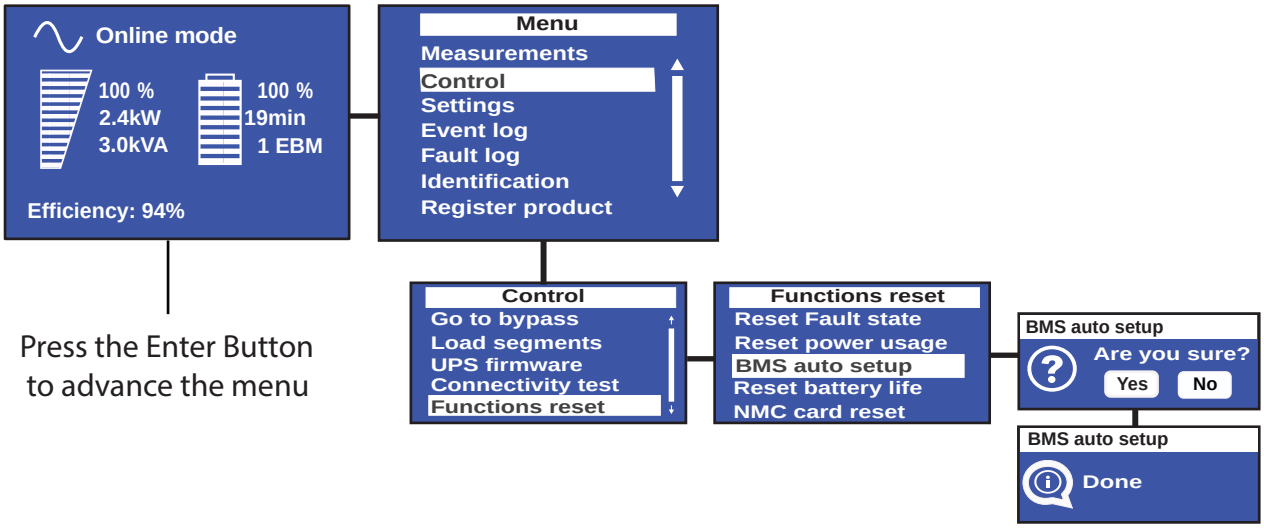
   A small amount of arcing may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.
3. Plug the EBM cable(s) into the battery connector(s). Up to four EBMs may be connected to the UPS.
4. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
5. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).
6. Continue to the 6.3 *Battery Settings Reset*.
7. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

6.3 Battery Settings Reset

After replacement of the internal UPS batteries and extended battery modules the BMS auto setup and battery life settings will need to be reset in the "*Control*" menu of the display.

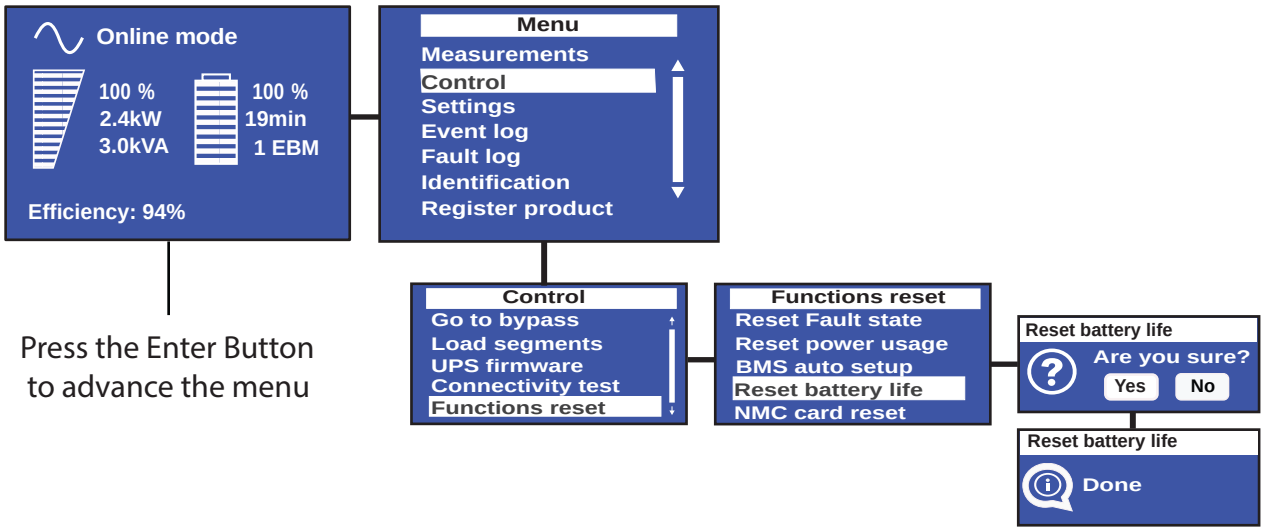
1. Reset the BMS auto setup function in the "Functions Reset" option of the control menu.

Figure 12. BMS Auto Setup Reset



2. Reset the battery life counter in the "Functions Reset" option of the control menu.

Figure 13. Battery Life Reset



Return the UPS to Normal Operation

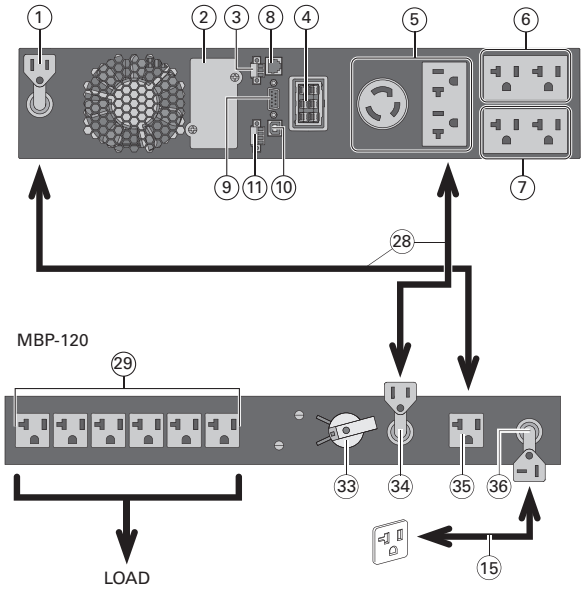
If the UPS internal batteries and external battery packs were replaced without powering down the UPS:

1. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear.
2. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode. See 5.1 *Start-up and Normal Operation* .

If the UPS internal batteries and external battery packs were replaced and the UPS was powered off:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. See section 5.1 *Start-up and Normal Operation* for powering the UPS back to normal operation.
4. If the UPS has a MBP module attached see 3.8 *Detecting other Accessories* for the correct startup procedure.

6.4 Replacing the UPS Equipped with a HotSwap MBP



The **HotSwap MBP** module makes it possible to service or even replace the UPS without affecting the connected loads.

Maintenance

1. Set switch (33) to Bypass position. The red LED on the **HotSwap MBP** module goes ON, indicating that the load is supplied directly with AC input source power.
2. Stop the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation

1. Check that the UPS is correctly connected to the **HotSwap MBP** module.
2. Start the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" on the **HotSwap MBP** module goes ON (otherwise, there is a connection error between the **HotSwap MBP** module and the UPS).
3. Set switch (33) to Normal position. The red LED on the **HotSwap MBP** module goes OFF.

6.5 Recycling The Used Equipment

Contact your local recycling or hazardous waste center for information on proper disposal of the used equipment.



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

Chapter 7 Troubleshooting

7.1 Typical Alarms and Faults

The Eaton 9PX are designed for durable, automatic operation and also alert you whenever potential operating problems may occur. Usually the alarms shown by the control panel do not mean that the output power is affected. Instead, they are preventive alarms intended to alert the user.

- Events are silent status information that are recorded into the Event log. Example = "AC freq in range".
- Alarms are recorded into the Event log and displayed on the LCD status screen with the logo blinking. Some alarms may be announced by a beep every 3 seconds. Example = "Battery low".
- Faults are announced by a continuous beep and red LED, recorded into the Fault log and displayed on the LCD with a specific message box. Example = Out. short circuit.

Use the following troubleshooting chart to determine the UPS alarm condition.

Checking the Alarms and Faults

To check the Event log or Fault log :

1. Press any button on the front panel display to activate the menu options.
2. Press the button to select Event log or Fault log.
3. Scroll through the listed events or faults.

The following table describes typical conditions.

Conditions	Possible cause	Action
Battery mode  LED is On. 1 beep every 10 seconds	A utility failure has occurred and the UPS is in battery mode.	The UPS is powering the equipment with battery power. Prepare your equipment for shutdown.
Battery mode  LED is On. 1 beep every 3 seconds	The UPS is in Battery mode and the battery is running low.	This warning is approximate, and the actual time to shutdown may vary significantly. Depending on the UPS load and number of Extended Battery Modules (EBMs), the "Battery Low" warning may occur before the batteries reach 20% capacity.
No battery  LED is On Beep continuous	The batteries are disconnected.	Verify that all batteries are properly connected. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.
Battery fault  LED is On Beep continuous	The battery test is failed due to bad or disconnected batteries.	Verify that all batteries are properly connected. If the condition persists, contact your service representative. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.

Conditions	Possible cause	Action
The UPS does not provide the expected backup time.	The batteries need charging or service.	Apply utility power for 48 hours to charge the batteries. If the condition persists, contact your service representative.
Bypass mode  LED is on.	An overload or a fault has occurred, or a command has been received and the UPS is in Bypass	Equipment is powered but not protected by the UPS. Check for one of the following alarms: overtemperature, overload or UPS LED is on. failure.
Power Overload  LED is on.	Power requirements exceed the UPS capacity (greater than 100% of nominal; see “User Settings” on page 8 for specific output overload ranges).	Remove some of the equipment from the UPS. The UPS continues to operate, but may switch to Bypass mode or shut down if the load increases. The alarm resets when the condition becomes inactive.
UPS Overtemperature  LED is on. 1 beep every 3 seconds	The UPS internal temperature is too high or a fan has failed. At the warning level, the UPS generates the alarm but remains in the current operating state. If the temperature rises another 10°C, the UPS transfers to Bypass mode or shuts down if Bypass is unusable.	If the UPS transferred to Bypass mode, the UPS will return to normal operation when the temperature drops 5°C below the warning level. If the condition persists, shut down the UPS. Clear vents and remove any heat sources. Allow the UPS to cool. Ensure the airflow around the UPS is not restricted. Restart the UPS. If the condition continues to persist, contact your service representative.
The UPS does not start	The input source is not connected correctly.	Check the input connections.
	The Remote Power Off (RPO) switch is active or the RPO connector is missing.	If the UPS Status menu displays the "Remote Power Off" notice, inactivate the RPO input.

7.2 Silencing the Alarm

Press the ESC (Escape) button on the front panel display to silence the alarm. Check the alarm condition and perform the applicable action to resolve the condition. If the alarm status changes, the alarm beeps again, overriding the previous alarm silencing.

7.3 Service and Support

If you have any questions or problems with the UPS, call your **Local Distributor** or your local service representative and ask for a UPS technical representative. Please have the following information ready when you call for service:

- Model number
- Serial number
- Firmware version number
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

If repair is required, you will be given a Returned Material Authorization (RMA) number. This number must appear on the outside of the package and on the Bill Of Lading (if applicable). Use the original packaging or request packaging from the Help Desk or distributor. Units damaged in shipment as a result of improper packaging are not covered under warranty. A replacement or repair unit will be shipped, freight prepaid for all warrantied units.

IMPORTANT

For critical applications, immediate replacement may be available. Call the Help Desk for the dealer or distributor nearest you.

7.4 CE Compliance Contact

- Eaton I.F. SAS - 110 Rue Blaise Pascal - 38330 Montbonnot St Martin – France.

Chapter 8 Specifications

8.1 Model Specifications

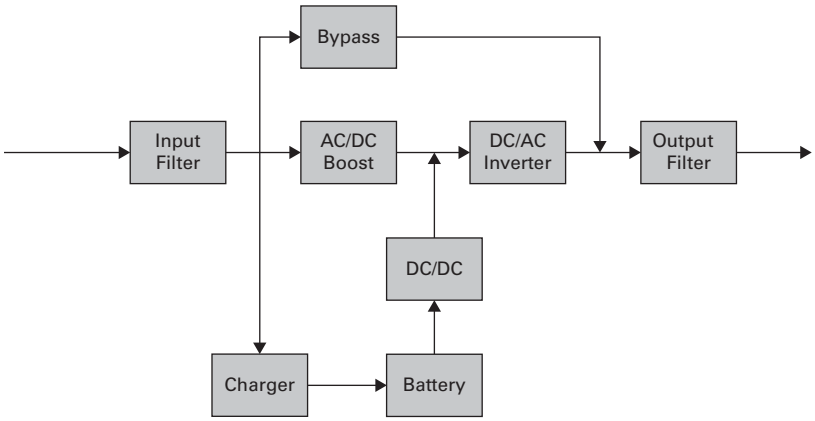


Table 7. Power Module List

Model	Power ratings
9PX1500RT-L	1500VA / 1350W
9PX2000RT-L	2000VA / 1800W
9PX3000RT-L	3000VA / 2700W
9PX1500GRT-L	1500VA / 1350W
9PX2200GRT-L	2200VA / 2000W
9PX3000GRT-L	3000VA / 2700W

Table 8. Extended Battery Module List

Model	Configuration	Battery Voltage	For Power Module
9PXEBM48RT-L	Rack / Tower	48Vdc	1500VA
9PXEBM72RT-L	Rack / Tower	72Vdc	2000 – 2200 – 3000VA

Table 9. Weights and Dimensions

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8

Table 9. Weights and Dimensions (Continued)

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

Table 10. Electrical Input

Model	Default Input (Voltage/Max Current)	Input Nominal Voltages	Input Voltage Window at Rated Load
9PX1500RT-L	120V / 12.5A	100V, 110V, 120V, 125V	100–138V
9PX2000RT-L	120V / 16A		
9PX3000RT-L	120V / 24A		
9PX1500GRT-L	208V / 7.2A	200V, 208V, 220V, 230V, 240V	176V-276V
9PX2200GRT-L	208V / 10.57A		
9PX3000GRT-L	208V / 14.42A		
Nominal Frequency		50/60Hz auto-sensing	
Frequency Range		40-70Hz before transfer to battery	
Bypass Voltage Range		-20% / +15% of nominal value (default)	
Noise Filtering		Input EMC filter	

Table 11. Electrical Input Connections

Model	Input Connection	Input cable
9PX1500RT-L	5–15P	8ft / 2.4m
9PX2000RT-L	5–20P	8ft / 2.4m
9PX3000RT-L	L5–30P	8ft / 2.4m
9PX1500GRT-L	IEC-C14, IEC 10A	6ft / 1.8m
9PX2200GRT-L	IEC-C20, 16 A inlet L6-20P to C19 jumper provided	6ft / 1.8m
9PX3000GRT-L		

Table 12. Electrical Output

All Models	Normal Mode	Efficiency Mode	Battery Mode
Voltage Regulation	±1%		±2%
Efficiency	90.0% for 1.5K LV models 91% for 1.5K G models 91.4% for 2K LV models 93% for 2K G models 94% for 3K G models	95.8% for 1K5 LV models 96.5% for 1.5K G models 96.8% for 2K LV models 98% for 2K G models 97.2% for 3K LV models 98% for 3K G models	84% for 1.5K LV models 87.5% for 1.5K G models 86% for 2K LV models 90% fo r 2K G models 86% for 3K LV models 89% for 3K G models

Table 12. Electrical Output (Continued)

All Models	Normal Mode	Efficiency Mode	Battery Mode
Frequency Regulation	Sync with line ±5% of nominal line frequency (outside this range: ±0.5% of auto-selected nominal frequency)		±0.5% of auto-selected nominal frequency
Nominal Output	[100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V] (G models)		
Frequency	50 or 60 Hz, autosensing or configurable as a frequency converter		
Output Overload	Online mode: 102%~130% :12s 130%~150% :2s >150% :shutdown after 300ms Percent is based on nominal Watt/VA. Transfer behavior can change (see output mode setting on page 14) Battery mode: 102%~130% :12s >130% :2s Overload warning then transfer to stop output		
Output Overload (Bypass Mode)	102%~110% :Overload warning 110%~130% :shutdown after 5mins 130%~150% :shutdown after 15s >150% :shutdown after 300ms Percent is based on nominal current in bypass mode		
Voltage Waveform	Sinewave		
Harmonic Distortion	< 3% THDV on linear load < 5% THDV on non-linear load		
Transfer Time	Online Mode: 0ms High Efficiency mode: 10ms maximum (due to loss of utility)		
Power Factor	Up to 1.0		
Load Crest Ratio	Up to 3:1		

Table 13. Electrical Output Connections

Model	Output Connection	Output Cable
9PX1500RT-L	5-15R (8)	No
9PX2000RT-L	5-20R(2) + L5-20R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX3000RT-L	5-20R(2) + L5-30R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX1500GRT-L	(4) IEC10A (2) IEC10A (2) IEC10A (2) IEC 10A	No

Table 13. Electrical Output Connections (Continued)

Model	Output Connection	Output Cable
9PX2200GRT-L	(4) IEC10A + (1) IEC16A (2) IEC10A + (1) IEC16A group 1 (2) IEC10A group 2	(2) IEC 10A
9PX3000GRT-L		

Table 14. Environmental and Safety

Certifications	IEC/EN 62040-1 IEC/EN 62040-2 : Cat. C1 IEC/EN 62040-3 UL1778 5th edition CSA 22.2
EMC (Emissions)*	CISPR22 Class B FCC part 15 Class B / ICES-003
EMC (Immunity)*	IEC 61000-4-2, (ESD): 8 kV Contact Discharge / 15 kV Air Discharge IEC 61000-4-3, (Radiated field): 10 V/m IEC 61000-4-4, (EFT): Power (Coupling network) 4 kV / Ethernet (Coupling clamp) 2 kV IEC 61000-4-5, (Surges): 2 kV Differentiel Mode / 4 kV Common Mode / 1 kV Ethernet IEC 61000-4-6, (Electromagnetic field): 10 V IEC 61000-4-8, (Conducted magnetic field): 30 A/m
* for output cable < 10m.	
Agency Markings*	cULus / NOM / Energy Star / BSMI
Operating Temperatures	0 to 40°C (32 to 104°F) in Online mode, with linear derating for altitude **Note:** thermal protection switches load to Bypass in case of overheating.
Storage Temperatures	0 to 40°C (32 to 104°F) with batteries -25 to 55°C (-13 to 130°F) without batteries
Transit Temperature	-25 to 55°C (-13 to 130°F)
Relative Humidity	0 to 96% no condensing
Operating Altitude	Up to 3,000 meters (9,843 ft) above sea level, no derating for 35°c (95°F) room temperature
Transit Altitude	Up to 10,000 meters (32,808 ft) above sea level
Audible Noise	< 47 dBA at 1 meter typical for 2K et 3K models < 40 dBA at 1 meter typical for 70, 1K et 1K5 models
***** 9PX1500RT-L, 9PX2000RT-L, 9PX3000RT-L, 9PX1500GRT-L, 9PX2200GRT-L, 9PX3000GRT-L have cULus/Energy Star/ BSMI. 9PXEBM48RT-L, 9PXEBM72RT-L have cULus / NOM.	

Table 15. Battery

	Internal Batteries	EBM
Rack / Tower configuration	1500VA: 48Vdc 2200VA: 72Vdc 3000VA: 72Vdc	9PXEBM48RT: 48Vdc 9PXEBM72RT: 72Vdc
Type	Lithium Iron Phosphate (LFP) battery module Lithium-Ion float service life 8 years /25°C	
Monitoring	Integrated battery management system (BMS) for temperature regulation and life cycle monitoring.	
EBM Battery Cable Length	350 mm / 13.78 in	

P-164001006 06

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Five-Year Limited Warranty (US and Canada)

Eaton UPS Models: 9PX Lithium-ion

WARRANTOR: The warrantor for the limited warranties set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED WARRANTY: This limited warranty (this "Warranty") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") purchased on or after March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Company for resale to an End-User.

LIMITED WARRANTY PERIOD: The period covered by this Warranty for Product installed [and currently located] in the fifty (50) United States, the District of Columbia, and Canada is sixty (60) months from the date of purchase, or sixty six (66) months from the date of shipment.

WHAT THIS LIMITED WARRANTY COVERS: The warrantor warrants that the Product and battery (individually and collectively, the "Warranted Items") are free from defects in material and workmanship. If, in the opinion of Company, a Warranted Item is defective and the defect is within the terms of this Warranty, Company's sole obligation will be to repair or replace such defective Warranted Item (including by providing service, parts and labor, as applicable), at the option of Company.

PROCEDURES FOR REPAIR OR REPLACEMENT OF WARRANTED ITEMS: The Warranted Item will be repaired or replaced at a Company site or such other location as determined by Company.

If the Warranted Item is to be replaced by Company, and the End-User supplies a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives notice of the warranty claim. In such case, the End-User must return (at Company's expense) the defective Warranted Item to Company in the same packaging as the replacement Warranted Item received by the End-User or as otherwise instructed by Company. If Company does not receive the defective Warranted Item, Company will either charge the End-User's credit card, or send the End-User an invoice (which the End-User agrees to pay), for the value of the replacement Product.

If the Warranted Item is to be replaced by Company, but the End-User is unwilling or unable to supply a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives the defective Product from the End-User.

In any case, Company will provide shipping instructions and will pay its designated carrier for all shipping charges for return of defective equipment and replacement of Warranted Items. Any returned Warranted Item or parts that are replaced may be new or reconditioned. All Warranted Items returned to Company and all parts replaced by Company shall become the property of Company.

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.

This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.

Company shall not be responsible for any charges for testing, checking, removal, or installation of Warranted Items.

COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.

COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.

THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON-CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY), OR OTHERWISE.

LIMITATION OF LIABILITY: The remedies of the End-User set forth herein are exclusive and are the sole remedies for any failure of Company to comply with its obligations hereunder. In no event shall Company be liable in contract, in tort (including negligence or strict liability) or otherwise for damage to property or equipment other than the Products, including loss of profits or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of Company hereunder whether the claims are based in contract (including indemnity), in tort (including negligence or strict liability), or otherwise, shall not exceed the price of the Product on which such liability is based.

Company shall not be responsible for failure to provide service or parts due to causes beyond Company's reasonable control.

END-USER'S OBLIGATIONS: In order to receive the benefits of this Warranty, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.

OTHER LIMITATIONS: Company's obligations under this Warranty are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Warranty. Also during such time, the period of this Warranty shall continue to run and the expiration of this Warranty shall not be extended upon payment of any overdue or unpaid amounts.

COSTS NOT RELATED TO WARRANTY: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Warranty, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Warranty will be borne by the End-User.

OBTAINING WARRANTY SERVICE: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, call your local Eaton product sales or service representative. For comments or questions about this Warranty, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.

Load Protection Guarantee (US and Canada)

Eaton UPS Models 9PX Lithium-ion

GUARANTOR: The Guarantor for the load protection guarantee set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED GUARANTEE: This load protection guarantee (this "Guarantee") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") and cannot be transferred. This Guarantee applies even in the event that the Product is initially sold by Company for resale to an End-User.

WHAT THIS GUARANTEE COVERS: For the lifetime of the Product, Guarantor promises to repair or replace, at Guarantor's option, the equipment (valued up to the limits shown below*) that is damaged by an AC power line surge, spike, or other transient when properly connected to Guarantor's uninterruptible power system ("UPS"). Reimbursement for or restoration of data loss excluded. This Guarantee applies only if all of the following circumstances arise:

1. The UPS is plugged into properly grounded and wired outlets, using no extension cords, adapters, other ground wires, or other electrical connectors;
2. The installation of the UPS complies with all applicable electrical and safety codes described by the National Electrical Code® (NEC®);
3. The UPS was used under normal operating conditions and in accordance with all labels and instructions; and
4. The UPS was not damaged by accident (other than AC power line transient), misuse, or abuse.

***Cumulative Limits to be paid by Guarantor under this Load Protection Guarantee:**

$150,000 for Eaton UPS Models 9PX Lithium-ion

WHAT THIS GUARANTEE DOES NOT COVER: Any reimbursement or repair to End-User's equipment does not include reimbursement for or restoration of any data loss. This Guarantee does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation of Product; (d) repair or alteration of Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind to the Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Guarantee is not valid: if the Product's serial numbers have been removed or are illegible.
Company shall not be responsible for any charges for testing, checking, removal, or installation of any items.

LIMITATION OF LIABILITY: The remedies of the END-USER set forth HEREIN are exclusive and are THE sole remedies for any failure of COMPANY to comply with its obligations hereunder. EXCEPT AS OTHERWISE PROVIDED FOR IN THIS GUARANTEE, in no event shall COMPANY be liable in contract, in tort (including negligence or strict liability), or otherwise for damage to property or equipment other than THE products, INCLUDING loss of profits or revenue, loss of use of products, LOSS OF DATA, cost of capital, claims of customers of the END-USER or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of COMPANY HEREUNDER whether the claims are based in contract (INCLUDING INDEMNITY), in tort (including negligence or strict liability), or otherwise, shall not exceed THOSE SET FORTH ABOVE.
Company shall not be responsible for failure to provide repair or replacement under this Guarantee due to causes beyond Company's reasonable control.
END-USER'S OBLIGATIONS: In order to receive the benefits of this Guarantee, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.
OTHER LIMITATIONS: Company's obligations under this Guarantee are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Guarantee.
COSTS NOT RELATED TO GUARANTEE: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Guarantee, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Guarantee will be borne by the End-User.
TO MAKE A CLAIM: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, contact your local Eaton product sales or service representative. For comments or questions about this Load Protection Guarantee, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.
WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.
Company shall not be responsible for any charges for testing, checking, removal or installation of Warranted Items.
COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.
COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.
THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON- CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE

Product specifications

Eaton 9PXEBM48RT-L

Catalog Number: 9PXEBM48RT-L

Eaton 9PX lithium ion extended battery module (EBM), 1U, used with 9PX1500RT-L, 9PX1500RTN-L, 9PX1500GRT-L

General specifications

Product Name
Eaton 9PX extended battery module (EBM)

Catalog Number
9PXEBM48RT-L

UPC
743172105592

Product Length/Depth
17.6 in

Product Height
1.7 in

Product Width
17.2 in

Product Weight
36.5 lb

Compliances
CE Marked
FCC part 15 Class B
IEC 62040-2 Cat C1

Certifications
NOM
cTUVus

Product specifications

Type

Extended Battery Module (EBM)

Runtime graph

View runtime graph

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Used with

9PX1500RT-L, 9PX1500GRT-L, 9PX1000GRT-L

Rack size

1U

Color

Black/silver

Rack mounting kit

Yes

Form factor

Rack/tower

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 2 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Temperature range

0° to 40°C (32° to 104°F)

Relative humidity

0-96% non-condensing

Resources

Brochures

Eaton 9PX lithium-ion UPS brochure

Drawings

Eaton 9PXEBM4RT-L 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide



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Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com

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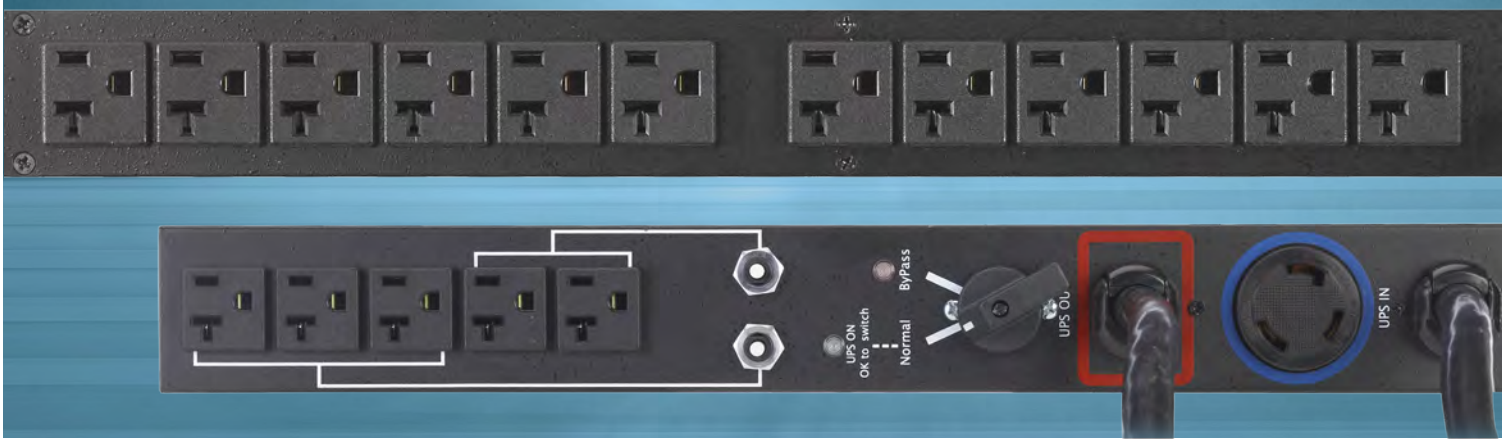
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Product brochure



Eaton FlexPDU and Maintenance Bypass PDU

Eaton provides five different functions for rack power distribution solutions. Two of these functions, FlexPDU and Maintenances Bypass PDU, were created as accessories specific to some of our UPSs. Both of these units offer the flexibility of connections to meet the demanding requirements of today's data center architects.

The HotSwap Maintenance Bypass (MBP) unit enables easy UPS replacement without interruption of the load. The HotSwap MBP is ideal when exchanging a unit or servicing a UPS. For added convenience, the HotSwap MBP offers two types of receptacles: 5-15R or 5-20R.

The FlexPDU is a basic function power distribution unit with a short power cord for easy, close mounting. FlexPDUs are available with 5-15R, 5-20R or L5-20R output receptacles, for connection to a wide range of equipment.

Both of these options allow for easy deployment, even in space-constrained environments. You have a variety of mounting options, including top and side mounting.

Features

- HotSwap MBP provides service continuity during UPS maintenance or upgrade
- Both units offer connections to all types of equipment
- Eases installation with flexible mounting options
- Minimal depth accommodates most space constraints



Side mounting Flex PDU with Tower UPS



Top mounting horizontal FlexPDU with 2U UPS

HotSwap MBPs rackmounted horizontally in rack



Top mounting vertical FlexPDU



Powering Business Worldwide

FLEXPDU MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EFLXL1500R-PDU1U	58015	5-15P	None	1.44	BA	3	1U	(12) 5-15R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1U	58020	5-20P	None	1.92	BA	3	1U	(12) 5-20R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1UL	58021	5-20P	None	1.92	BA	3	1U	(5) L5-20R	1.7 x 19.0 x 3.0
EFLXI3000R-PDU1UIEC	68438	C20 Inlet	(2) 20A	3.33	BA	3	1U	(12) C13, (1) C19	1.7 x 19.0 x 2.4

HOTSWAP MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EHBPL1500R-PDU1U	58115	5-15P	None	1.44	BA	8	2U	(6) 5-15R	2.1 x 17.3 x 3.8
EHBPL2000R-PDU1U	58120	5-20P	None	1.92	BA	8	2U	(6) 5-20R	2.1 x 17.3 x 3.8
EHBPL3000R-PDU1U	58130	L5-30P	(2) 20A	2.88	BA	3.3	2U	(5) 5-20R	2.1 x 17.3 x 3.8

COMPATIBILITY MATRIX FOR RACKMOUNT UPSs*

FlexPDU plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P 1U UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5) 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓

*For tower models, all FlexPDUs can be wall-mounted. ** Rear mounting available on 3U models only.

HotSwap MBP plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5P 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓
30A	Eaton 5PX UPS, 3000 VA	✓
	Eaton 9PX UPS, 3000 VA	✓

*For tower models, all HotSwap MBPs can be wall-mounted. **Rear mounting available on 3U models only.

To interact with the FlexPDU and Maintenance Bypass PDF, please visit: **Eaton.com/epdu**

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Product specifications

Eaton EHBPL1500R-PDU1U

Catalog Number: EHBPL1500R-PDU1U

Eaton Basic rack PDU, 1U - EHBPL1500R-PDU1U



General specifications

Product Name	**Catalog Number**
Eaton HotSwap MBP	EHBPL1500R-PDU1U
UPC	**Product Length/Depth**
743172067340	17.3 in
Product Height	**Product Width**
2.1 in	3.8 in
Product Weight	**Warranty**
0.0001 lb	3 year
Compliances	**Certifications**
Contact Manufacturer	UL Listed

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Product specifications

Outlet control
No

Cord length
8 ft

Phase
Single-phase

Input voltage
110-125V

Color
Black

Wattage
1.44 kW max

Form factor
2U

Mounting direction
Horizontal

Amperage Rating
12A

Input connection
5-15P

Outlets
(6) 5-15R

Type
PDU

Frequency rating
50-60 Hz

Operating Temperature
0° to 60°C (32° to 140°F)

Number of Outputs 5-15R
6

Circuit breaker
None

Resources

Brochures

Eaton Flex and Hotswap MBP ePDU brochure

Drawings

Eaton ePDU visio stencils

Eaton FlexPDU EHBPL 1500R-PDU1U technical drawing

Specifications and datasheets

Eaton Specification Sheet - EHBPL1500R-PDU1U

User guides

Eaton FlexPDUs and HotSwap MBP installation and user manual



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HotSwap

Maintenance ByPass

MBP - 115 / EHBPL1500R-PDU1U

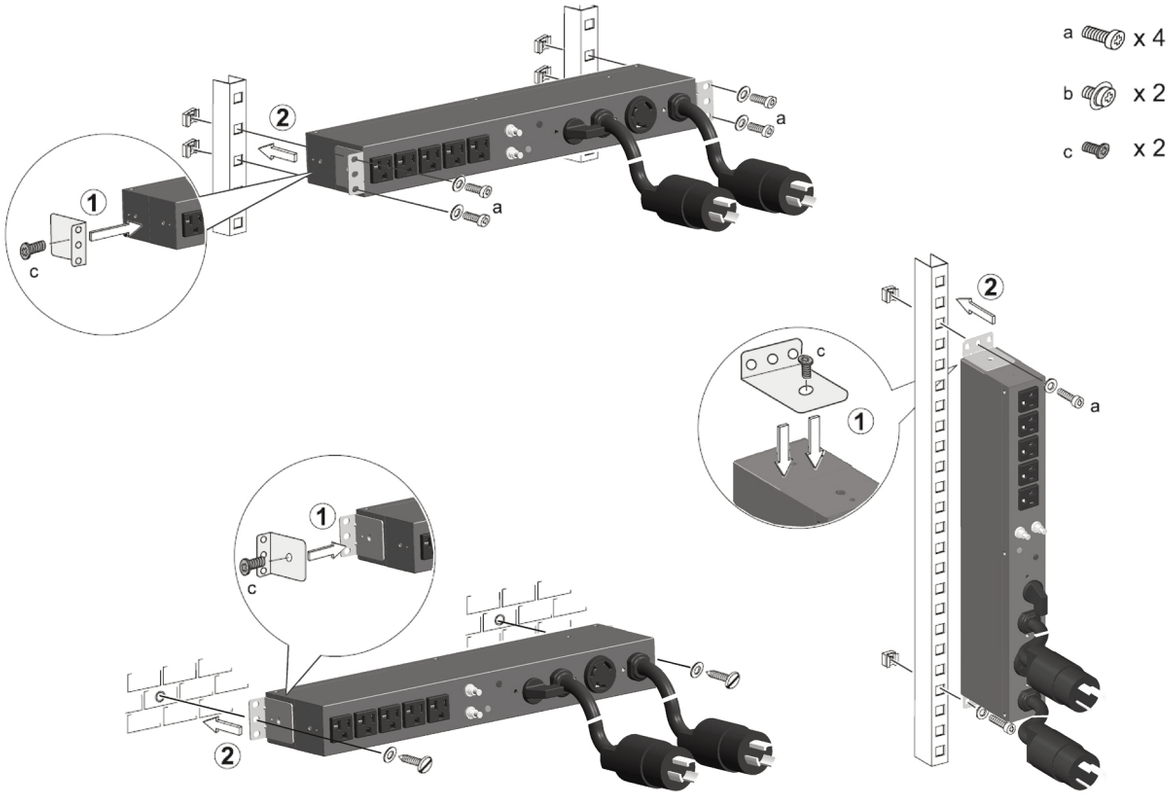
MBP - 120 / EHBPL2000R-PDU1U

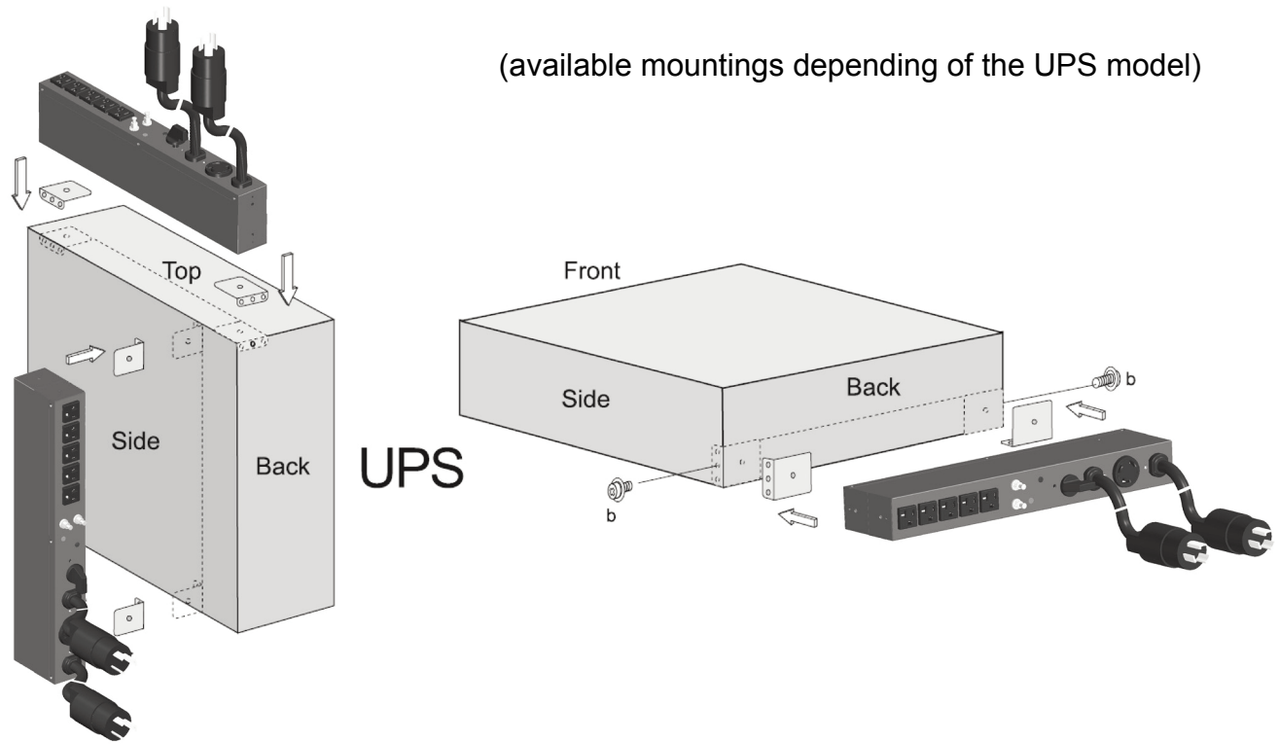
MBP - 130 / EHBPL3000R-PDU1U

Installation and User Manual

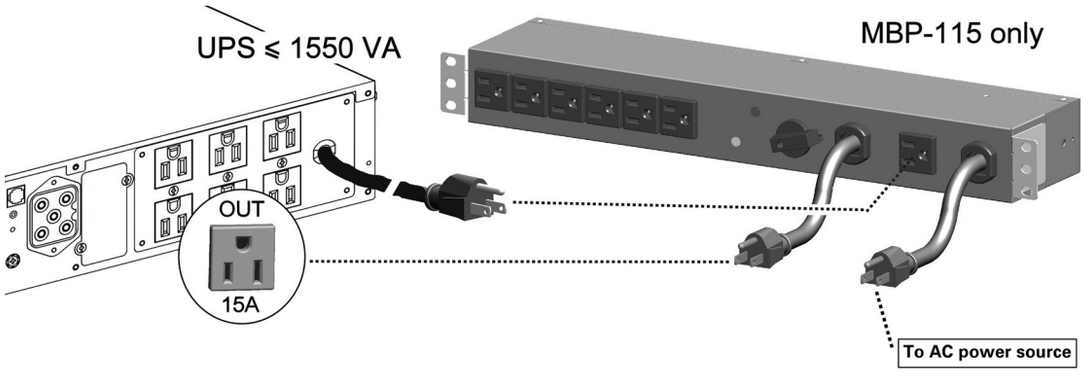
English
Français
Español
Português

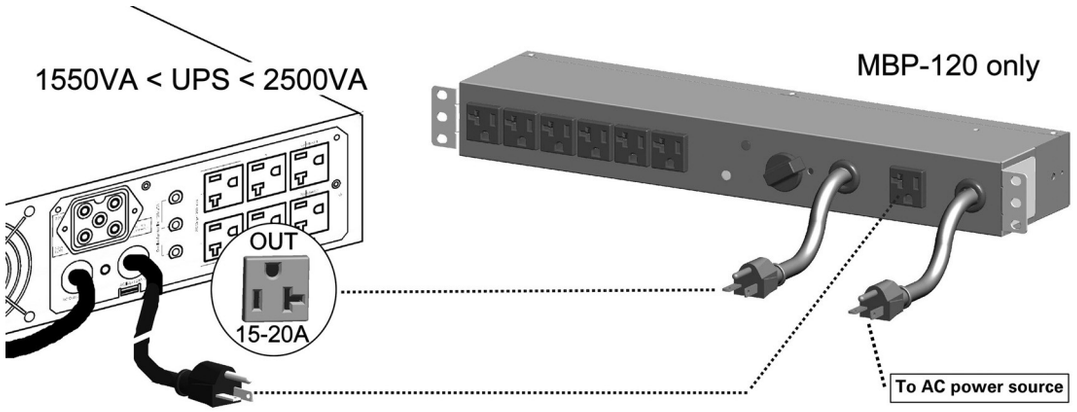
HotSwap Connections

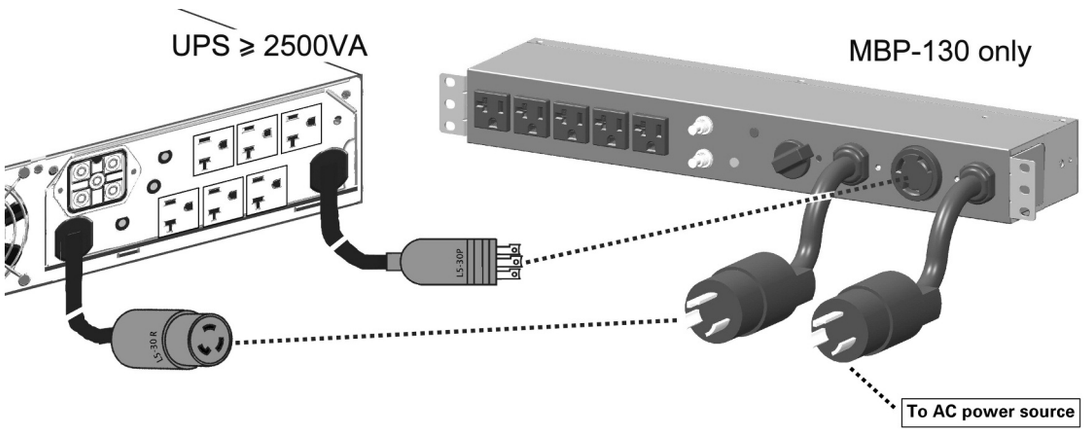


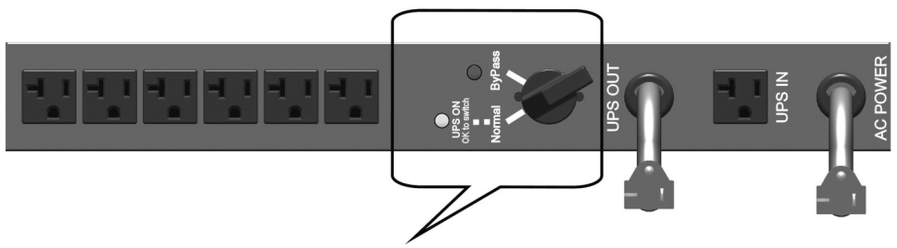


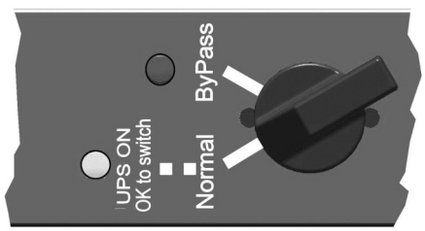
(available mountings depending of the UPS model)


UPS ≤ 1550 VA
MBP-115 only
OUT
15A
To AC power source


1550VA < UPS < 2500VA
MBP-120 only
OUT
15-20A
To AC power source


UPS ≥ 2500VA
MBP-130 only
L5-30P
L5-30R
To AC power source


UPS ON
OK to switch
Normal
ByPass
UPS OUT
UPS IN
AC POWER


UPS ON
OK to switch
Normal
ByPass

English

Safety guidelines to read before installing the product

- The product must be used indoors only.
- Do not place the product near liquid or in an excessively damp environment.
- Do not place the product directly in the sun or near a heat source.
- Do not let liquid or foreign objects enter the product.
- Ground the product using a 2 poles + ground socket (2P + G).
- When installing the product, ensure that the sum of the leakage currents of the product and the devices it supplies does not exceed 3.5 mA.
- The AC-power input must be connected to an appropriate electrical network protection or tap-off circuit (fuse or circuit-breaker).

Use

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function). Refer to the illustrations.

Installation

Refer to the UPS installation and user manual.

HotSwap MBP module operation

The HotSwap MBP module has a rotary switch with two positions:

- Normal - the load is supplied by the UPS,
- Bypass - the load is supplied directly by the AC-power source.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch to the Normal position.
3. Start the UPS by pressing the ON/OFF button on the UPS control panel:

- The load is supplied by the UPS.
- Green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

HotSwap MBP module test

1. Set switch to the Bypass position and check that the load is still supplied.
2. Set switch back to the Normal position.

Maintenance on a UPS equipped with the HotSwap MBP module

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function).

Maintenance:

1. Set switch to the Bypass position. The red LED on the HotSwap MBP module goes ON, indicating that the load is supplied directly with AC power.
2. Stop the UPS: green LED "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation:

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Start the UPS: green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON (otherwise, there is a connection error between the HotSwap MBP module and the UPS).
3. Set switch to the Normal position. The red LED on the HotSwap MBP module goes OFF.

Français

Consignes de sécurité, à lire avant l'installation du produit

- Le produit doit être utilisé à l'intérieur seulement.
- Ne pas placer le produit à proximité de liquide, ou dans un environnement d'humidité excessive.
- Ne pas placer le produit directement au soleil ou à proximité d'une source de chaleur.
- Ne pas laisser pénétrer de liquide ou d'objet étranger à l'intérieur du produit.
- Relier impérativement le produit à la terre à l'aide d'une prise de courant 2 pôles + terre (2P+T).
- S'assurer lors de l'installation du produit que la somme des courants de fuite du produit et des appareils qu'il alimente ne dépasse pas 3.5 mA.
- La fiche d'alimentation doit être connectée à un circuit de dérivation ou de protection du réseau électrique (fusible ou disjoncteur) approprié.

Utilisation

Le Module HotSwap MBP permet la maintenance et éventuellement le remplacement de l'ASI sans affecter l'alimentation électrique des équipements connectés (fonction HotSwap).

Installation

Se reporter au manuel d'installation et d'utilisation de l'ASI.

Fonctionnement du module HotSwap MBP

Le module HotSwap MBP utilise un commutateur rotatif à 2 positions :

- Normal : les équipements sont alimentés par l'ASI.
- By-pass : les équipements sont alimentés par le réseau électrique.

Mise en service de l'ASI avec le module HotSwap MBP :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Placer le commutateur en position Normal.
3. Mettre en marche l'ASI :

- Les équipements sont alors alimentés par l'ASI.
- Le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP.

Test du module HotSwap MBP

1. Placer le commutateur en position By-pass et vérifier que les équipements sont toujours alimentés.
2. Remettre le commutateur en position Normal.

Maintenance d'une ASI équipée d'un module HotSwap MBP

Remplacement de l'ASI sans interrompre l'alimentation électrique des équipements connectés :

1. Placer le commutateur en position By-pass : le voyant rouge du module HotSwap MBP s'allume pour indiquer que les équipements sont alimentés directement par le réseau électrique.
2. Arrêter l'ASI : le voyant vert "UPS ON - OK to switch" s'éteint, l'ASI peut alors être déconnectée et remplacée.

Retour en fonctionnement normal :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Mettre en marche l'ASI : le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP (sinon il y a erreur de raccordement du module HotSwap MBP avec l'ASI).
3. Mettre le commutateur en position Normal : le voyant rouge du module HotSwap MBP s'éteint.

Español

Consignas de seguridad leer antes de instalar el producto

- El producto debe utilizarse únicamente al interior.
- No colocar el producto cerca de líquidos o en un entorno de humedad excesiva.
- No colocar el producto directamente bajo los rayos del sol ni cerca de una fuente de calor.
- No dejar que penetre líquido u objeto ajeno al interior del producto.
- Conectar imperativamente el producto a tierra utilizando una toma de corriente de 2 polos + tierra (2P+T).
- Cerciorarse durante la instalación del producto que la suma de las corrientes de fuga del producto y de los aparatos que alimenta no excede 3.5 mA.
- La toma de la red debe estar conectada a un circuito de derivación o de protección de la red eléctrica (fusible o interruptor automático) apropiado.

Utilización

La función del módulo HotSwap MBP es permitir el mantenimiento y, eventualmente, la sustitución del SAI sin que ello afecte a la alimentación eléctrica de los equipos conectados (función HotSwap).

Instalación

Véase el manual de instalación y empleo del SAI.

Funcionamiento del módulo HotSwap MBP

El módulo HotSwap MBP utiliza un conmutador rotativo de 2 posiciones:

- Normal: los equipos están siendo alimentados por el SAI.
- Bypass: los equipos están siendo alimentados por la red eléctrica.

Puesta en servicio del SAI con el módulo HotSwap MBP:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Colocar el conmutador en posición Normal.
3. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI.

- Los equipos están siendo alimentados ya por el SAI.
- El indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP.

Test del módulo HotSwap MBP

1. Colocar el conmutador en posición Bypass y comprobar que los equipos sigan estando alimentados.
2. Volver a poner el conmutador en posición Normal.

Mantenimiento de un SAI equipado con un módulo HotSwap MBP

Mantenimiento:

1. Colocar el conmutador en posición Bypass: el indicador luminoso rojo del módulo HotSwap MBP se enciende para indicar que los equipos están siendo alimentados directamente por la red eléctrica.
2. Parar el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI:

El indicador luminoso verde "UPS ON - OK to switch" se apaga, ya se puede desconectar el SAI y sustituirlo.

Vuelta a funcionamiento normal:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI: el indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP (en caso contrario, hay un error en la conexión entre el módulo HotSwap MBP y el SAI).
3. Poner el conmutador en posición Normal: el indicador luminoso rojo del módulo HotSwap MBP se apaga.

Português

Instruções de segurança: ler antes da instalação do produto

- O produto deve ser unicamente utilizado no interior.
- Não coloque o produto na proximidade de líquidos, ou num ambiente de humidade excessiva.
- Não coloque o produto directamente ao sol ou na proximidade de uma fonte de calor.
- Não deixe penetrar líquido ou objecto estranho dentro do produto.
- Ligue imperativamente o produto à terra graças a uma ficha de corrente 2 pólos + terra (2P+T).
- Verifique durante a instalação do produto que a soma das correntes de fuga do produto e dos aparelhos que o mesmo alimenta não ultrapassa 3.5 mA.
- A tomada sector deve estar ligada a um circuito de derivação ou de protecção da rede eléctrica (fusível ou disjuntor) apropriado.

HotSwap MBP models: MBP - 115, MBP - 120, MBP - 130

Input	MBP - 115 MBP - 120 MBP - 130	NEMA 5-15P 15A cord (3.3 ft length) NEMA 5-20P 20A cord (3.3 ft length) NEMA L5-30P 30A cord (3.3 ft length)
Output	MBP - 115 MBP - 120 MBP - 130	6 NEMA 5-15R 15A socket outlets 6 NEMA 5-20R 20A socket outlets 5 NEMA 5-20R 20A socket outlets
Dimensions (HxLxD)	2.1 x 17.3 x 3.8 inches	
Performances Nominal voltage Frequency	100/104/110/120/127 50/60 Hz	
Input nominal current	MBP - 115 MBP - 120 MBP - 130	12 A 16 A 24 A
Maximal power	MBP - 115 MBP - 120 MBP - 130	1440 VA 1920 VA 2880 VA
Standards Product	MBP - 115 MBP - 120 MBP - 130	UL 1778
Marking	C UL US LISTED CE	
Environment Temperature Humidity Altitude	 Storage -25°C to 55°C (-77°F to 131°F), operation 0°C to 45°C (32°F to 113°F) Storage 10% to 90%, operation 20% to 90% Transportation up to 12000 m (39370 ft), operation up to 1500 m (4921 ft)	

8609 Six Forks Road
Raleigh, NC 27615 U.S.A
1-800-356-5794 or 919-872-3020

www.eaton.com/powerquality

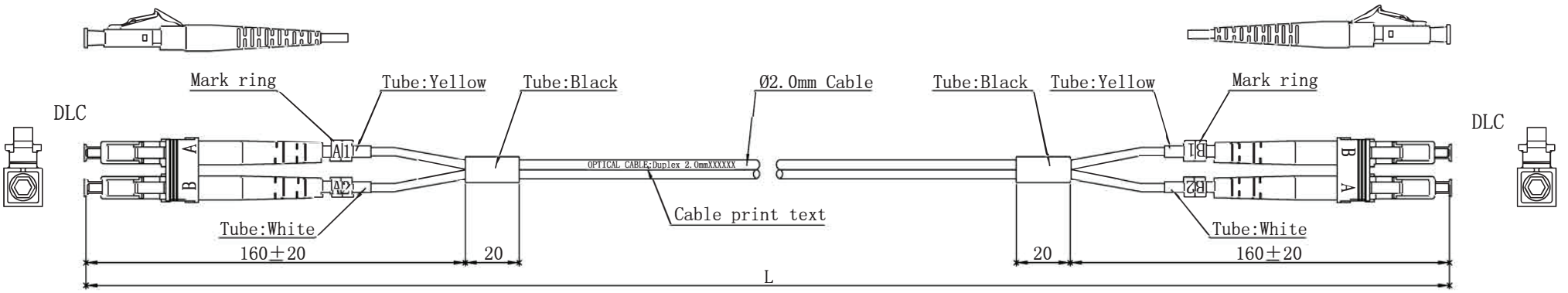
Powering Business Worldwide

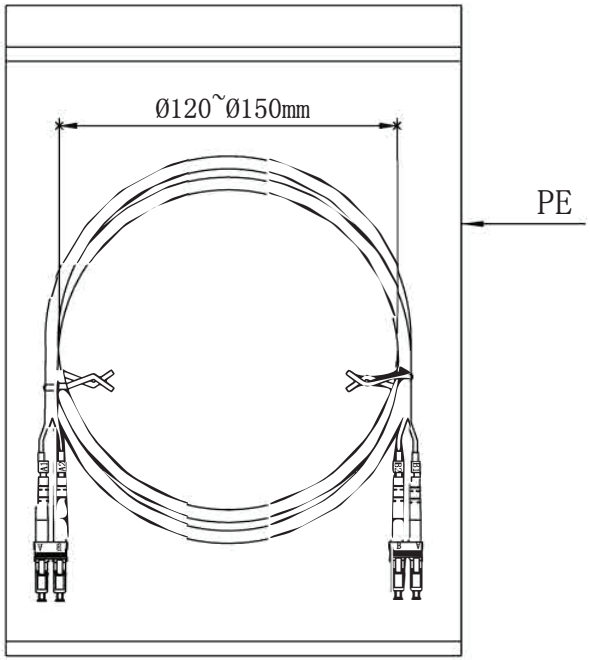
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NOTE:ALL MATERIAL COMPLIANT ROHS STANDARD

REVISION INFORMATION			
Rev.	Rev. Date	Modified By	Brief Description





Specifications:

Type	DLC/UPC-DLC/UPC
Fiber Mode	SM
Core Diameter(um)	9/125
Operating Wavelength(nm)	1310/1550
Cable Color	Yellow
Cable Diameter(mm)	Ø2.0
Operating Temperature(° C)	-40~+75
Storage Temperature(° C)	-40~+85
Insertion loss(dB)	≤0.3dB
Return loss(dB)	≥50dB

L≤5m, TOLERANCES:0≤ΔL≤5cm
L>5m, TOLERANCES:0≤ΔL≤1%*L

NO.	PART NAME	SPECIFICATION DESCRIPTION	QT'Y	UNIT
①				
②				
③				

Unless specified on the drawing, tolerances are per the follows:

. +1
.x +0.2
.xx +0.05

LANshack
Sales@LANshack.com | 888-568-1230

DRAWN BY	DATE: 2015/05/14	DESCRIPTION: LC-LC-DX SM Patchcord	
CHECKED BY	SHEET 1of1	ITEM NO. SFPC-SM-LCLC-XX	
APPROVED BY	SCALE 1:1	REV. 00	UNIT:mm

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PLACEHOLDER

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

☐ Installed in accordance with Manufacturer's recommendations.

☐ Inspected, checked, and adjusted.

☐ Serviced with proper initial lubricants.

☐ Electrical and mechanical connections meet quality and safety standards.

☐ All applicable safety equipment has been properly installed.

☐ Functional tests.

☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer:_____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

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PLACEHOLDER

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO.:_____

1. EQUIPMENT ITEM_____
2. MANUFACTURER _____
3. EQUIPMENT/TAG NUMBER(S) _____
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____
5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____
6. MANUFACTURER'S LOCAL REPRESENTATIVE _____
   a. Name_____ Telephone No. _____
   b. Address _____
7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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PLACEHOLDER

8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

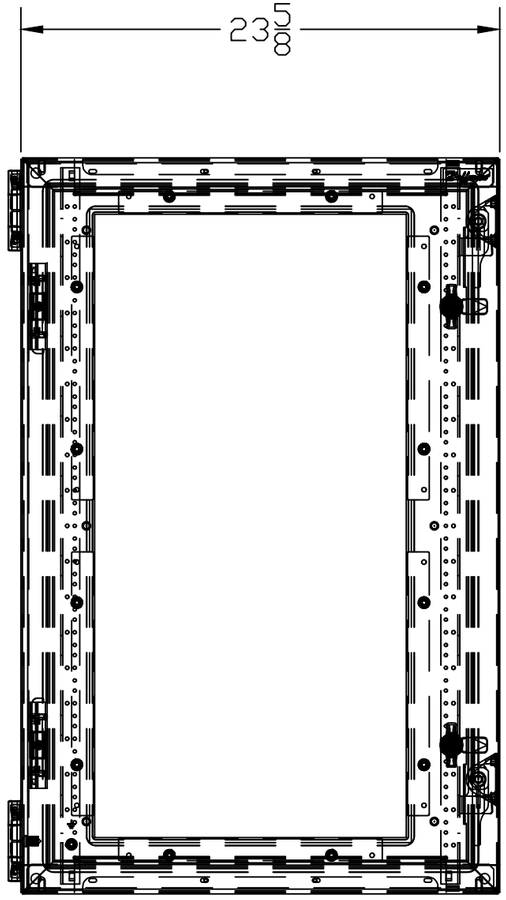
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Bill of Materials

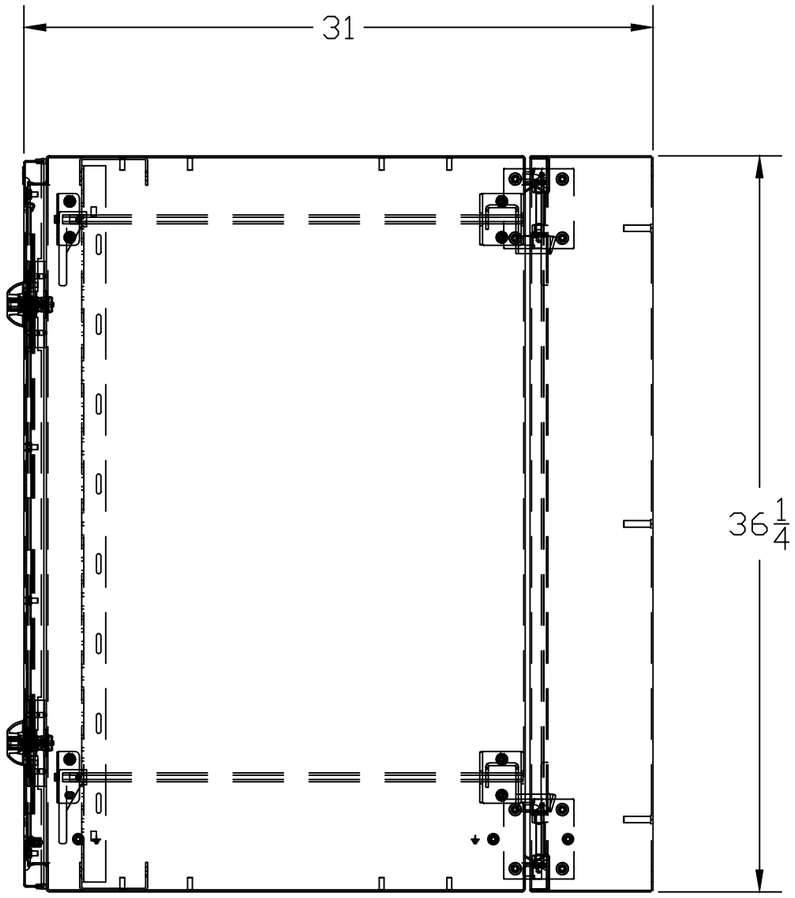
Project: Coos Bay Wastewater Treatment Plant 1 Phase 1A Improvements
Specification Section(s): Section 40 95 80 – Fiber Optic Communication System
Date: September 2025

Item No.	Qty.	Network Interface Panel	Description	Manufacturer	Manufacturer Part Number	Specification Section	Drawing
001	1	C56NIP0001	ProTek, Double-Hinge, Window, NEMA 4/12, 36.30" H x 23.62" W x 29.92" D	Hoffman	PTHW362430G2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
002	1	C56NIP0001	CableTek Horizontal Cable Manager, 2U, Double-Sided	Hoffman	DCHD2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
003	1	C56NIP0001	Power Distribution Unit, 10 Receptacle, 20 Amp	Hoffman	DP1N191020	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
004	1	C56NIP0001	Q-Series Rackmount Enclosure, 2U	Ortronics	EQ02U-CHC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
005	6	C56NIP0001	6-LC Single-Mode Adapters w/ Ceramic Alignment Sleeves	Ortronics	OFP-LCD12AC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
006	1	C56NIP0001	Modular Managed Ethernet Switch, Dual AC	Red Lion	NT24K-AC2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
007	1	C56NIP0001	Module 8 Port 10/100/1000BaseT	Red Lion	NT24K-TX8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
008	2	C56NIP0001	Module-8 SFP Expansion Slots 1000Base Only	Red Lion	NT24K-SFP8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
009	2	C56NIP0001	SFP Transceiver, Singlemode Gigabit Fiber, 10km	Red Lion	NTSFP-LX-10	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
010	1	C56NIP0001	9PX Lithium Ion Uninterruptible Power Supply, 1500 VA	Eaton	9PX1500RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
011	1	C56NIP0001	9PX Lithium Ion Extended Battery Module	Eaton	9PXEBM48RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
012	1	C56NIP0001	HotSwap Maintenance Bypass PDU	Eaton	EHBPL1500R-PDU1U	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
013	2	C56NIP0001	Fiber Optic Patch Cable, 2 Meter, LC UPC to LC UPC Singlemode Duplex	LANshack	SFPC-SMLCLC-2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
014							
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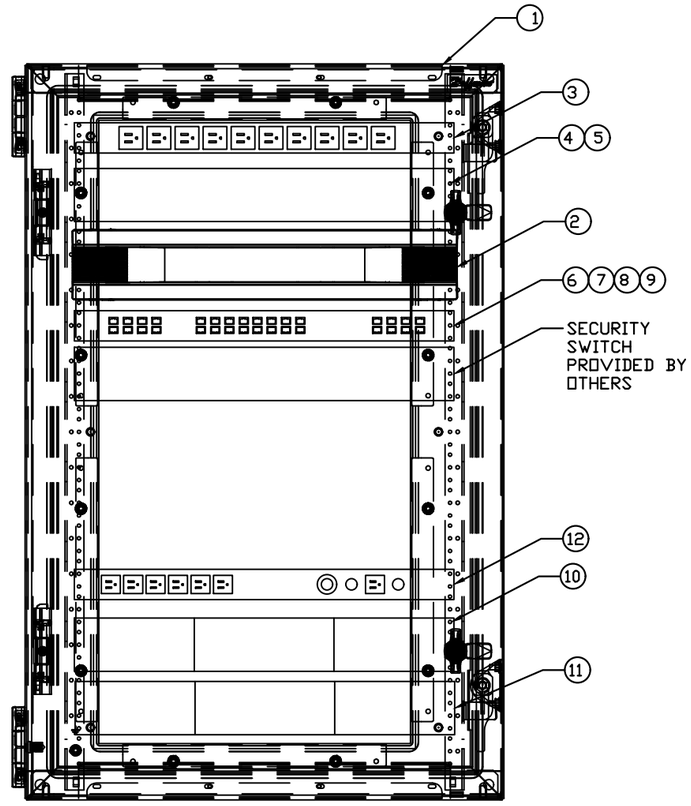
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FRONT VIEW



SIDE VIEW



INTERNAL VIEW

NAMEPLATE SCHEDULE			
PANEL	ITEM	SIZE	DESCRIPTION
C56NIP0001	A	2"x6"x 5/16"	C56NIP0001

PARTS LIST		
ITEM	DSECRIPTION	PART #
1	PRO-TEK NEMA 4/12, 36.30Hx23.62Wx29.92D	PTHW362430G2
2	CABLE TEK HORIZ. CABLE MANAGER 2U, DBL SIDED	DCHD2
3	POWER DIST. UNIT, 10 RECEPTACLE, 20 AMP	DP1N191020
4	Q-SERIES RACKMOUNT ENCLOSURE, 2U	EQ02U-CHC
5	6-LC SINGLE MODE ADAPTERS W/CERAMIC SLVS.	OFP-LCD12AC
6	MODULAR MANAGED ETHERNET SWITCH, DUAL AC	NT24K-AC2
7	MODULE 8 PORT, 10/100/1000 BASE ONLY	NT24K-TX8
8	MODULE 8 SFP EXPANSION SLOTS 1000 BASE ONLY	NT24K-SFP8
9	SFP TRANSCEIVER, SINGLE MODE GIGABIT FIBER, 10KM	NTSFP-LX-10
10	9PX LITHIUM ION UNINTERRUPTIBLE PS, 1500 VA	9PX1500RT-L
11	9PX LITHIUM ION EXTENDED BATTERY MODULE	9PXEBM48RT-L
12	HOT SWAP MAINTENANCE BYPASS PDU	EHBPL1500R-PDU1U

REV	DATE	DESCRIPTION	INIT
H			
G			
F			
E			
D			
C			
B			
A	2023.12.13	Original Draft	KCD

REVISIONS

OPTIMAL CONTROL SYSTEMS
2324 THREE LAKES RD / PO BOX 462
ALBANY, OR 97321
PHONE (541) 967-9323 FAX (541) 967-9485

CLIENT McCLURE & SONS

TITLE COOS BAY WASTE WATER TREATMENT PLANT
C56NIP0001 LAYOUT DRAWING

DRAWN KCD	ISSUED	JOB NO. 0723-08MSI	
CHECKED ME	DATE 2023.10.23	DWG NO. 0723-08MSI-C56	
APPROVED HAD	SCALE NONE	SHEET 1	OF 1

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PROTEK DOUBLE-HINGED, UL AND NEMA TYPE 4, 4X OR 12



INDUSTRY STANDARDS

UL 508A Listed; File Number E61997
cUL Listed per CSA C22.2 No. 94; File Number E619967
Solid Door: Type 4 and 12
Window Door: Type 12
Solid Door, Stainless Steel: Type 4, 4X and 12

NEMA / EEMAC: Type 4, 4X or 12
IEC 60529, IP66 or IP55, IK 10

APPLICATION

ProTek Double-Hinged cabinets are an excellent, off-the-shelf choice for mounting 19-in. rack, panel-mounted devices or other electronic equipment. The cabinets are designed to provide both front and rear access to 19-in. rack-mounted equipment. They provide protection against water, dirt, corrosive agents and other contaminants. ProTek is an excellent choice for applications where space is at a premium and the only option is wall mounting. ProTek comes in a broad range of sizes, materials and configurations to meet many demanding applications.

FEATURES

- Front and rear access to 19-in. rack equipment provided by three-part design: door, center section and wall section
- Solid door provides complete physical and visual protection
- Window door, made of scratch-resistant safety glass, provides visual monitoring of internal equipment while maintaining equipment protection
- All seams are fully welded and ground smooth
- Doors, center section and wall section are provided with ground studs to facilitate proper bonding and grounding of the cabinet
- Premium seamless, foam-in-place gasket prevents contaminants from entering the cabinet
- Keylocking wing knob is included on painted steel cabinet, providing access control to the cabinet; two keys are included with each cabinet
- Stainless steel cabinet is provided with a quarter-turn slotted latch
- One set of plated, self-grounding, tapped 10-32 rack angles per EIA universal spacing standards, which can be adjusted front-to-back, is provided with each center section of the cabinet; additional tapped- or square-hole rack angles can be added to the cabinet to provide additional mounting
- Wall section welded panel studs which accommodate standard panels (steel and wood available), can be ordered separately
- On 28-in. (700 mm) wide enclosures, a 4-in. vertical cable manager with composite fingers is provided on hinge side of cabinet
- AC unit included (T15, N21 or N28) on models with AC cutout
- See T15, N21 and N28 air conditioner specifications following the product tables; full AC specifications available in the Thermal chapter

SPECIFICATIONS

- Doors made of 16 gauge; center and wall sections made of 14 gauge steel. Stainless steel enclosures made from Type 304 stainless steel
- Window made of .25-in. thick, scratch- and impact-resistant safety glass
- Rack angles made of plated 12 gauge steel
- M6 ground studs on door, center and wall sections are masked from paint
- Twenty 10-32 screws included with cabinet
- Foam-in-place gasket made of durable polyurethane

FINISH

- Pretreated steel coated with RAL 7035 light-gray, low-gloss, lightly textured polyester powder paint
- Stainless steel is provided with a smooth-grain finish

LOAD RATING

Center hinged section:

Height	Maximum Load Rating
16 in.	175 lb./79.4 kg
24 in.	250 lb./113.4 kg
36 in.	300 lb./136.1 kg
48 in.	350 lb./158.8 kg
60 in.	400 lb./181.4 kg

ACCESSORIES

Locks and handles
Panels (steel and wood)
Grounding kits
Power Distribution Units (PDUs)
Rack angles

BULLETIN: DWDH2

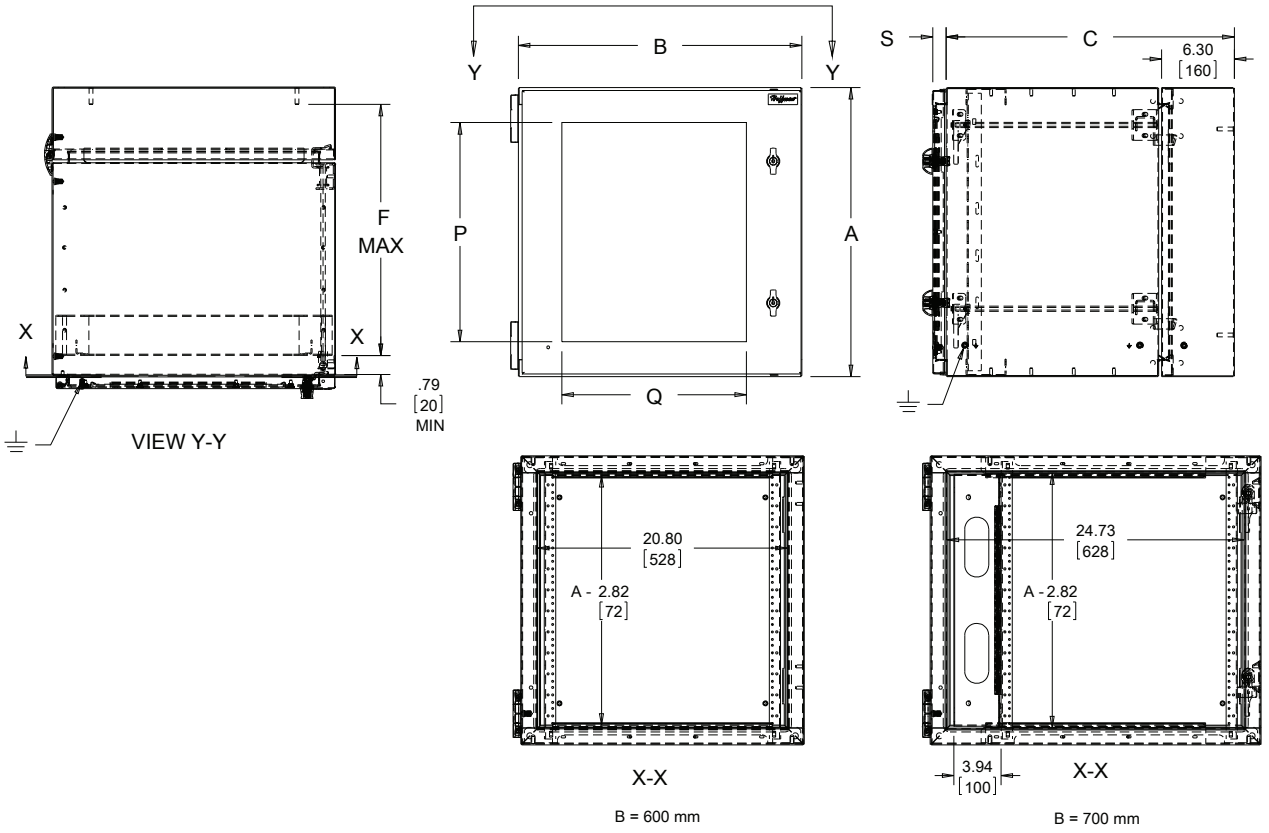
Standard Product **Window Door, NEMA Type 12**

Catalog Number	AxBxC in./mm	Rack Units	F in./mm	P in./mm	Q in./mm	S in./mm	Optional Steel Panel	Optional Wood Panel	Additional Rack Angles [a]
PTHW162415G2	17.09 x 23.62 x 14.96 434 x 600 x 380	8	12.66 322	11.87 301	15.38 391	1.11 28	CP2014	—	PTRA16T or PTRA16S
PTHW242415G2	24.09 x 23.62 x 14.96 612 x 600 x 380	12	12.66 322	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242424G2	24.09 x 23.62 x 24.02 612 x 600 x 610	12	21.72 552	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242430G2	24.09 x 23.62 x 29.92 612 x 600 x 760	12	27.64 702	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242824G2	24.09 x 27.56 x 24.02 612 x 700 x 610	12	21.72 552	18.25 464	19.38 492	1.11 28	CP2420	—	PTRA24T or PTRA24S
PTHW362415G2	36.30 x 23.62 x 14.96 922 x 600 x 380	19	12.66 322	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362424G2	36.30 x 23.62 x 24.02 922 x 600 x 610	19	21.72 552	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362430G2	36.30 x 23.62 x 29.92 922 x 600 x 760	19	27.64 702	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362824G2	36.30 x 27.56 x 24.02 922 x 700 x 610	19	21.72 552	30.75 781	19.38 492	1.11 28	CP3024	—	PTRA36T or PTRA36S
PTHW482415G2	48.54 x 23.62 x 14.96 1233 x 600 x 380	26	12.66 322	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482424G2	48.54 x 23.62 x 24.02 1233 x 600 x 610	26	21.72 552	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482430G2	48.54 x 23.62 x 29.92 1233 x 600 x 760	26	27.64 702	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482824G2	48.54 x 27.56 x 24.02 1233 x 700 x 610	26	21.72 552	42.70 1085	19.38 492	1.11 28	CP2442	—	PTRA48T or PTRA48S
PTHW602415G2	60.04 x 23.62 x 14.96 1525 x 600 x 380	32	12.66 322	54.39 1377	15.38 391	1.11 28	CP5620	—	PTRA60T or PTRA60S
PTHW602424G2	60.04 x 23.62 x 24.02 1525 x 600 x 610	32	21.72 552	54.39 1377	15.38 391	1.11 28	CP5620	—	PTRA60T or PTRA60S
PTHW242436G2	24.09 x 23.62 x 36.02 612 x 600 x 915	12	33.72 856	18.25 464	15.38 391	1.11 28	CP2020	CP2020W	PTRA24T or PTRA24S
PTHW242836G2	24.09 x 27.56 x 36.02 612 x 700 x 915	12	33.72 856	18.25 464	19.38 492	1.11 28	CP2420	—	PTRA24T or PTRA24S
PTHW362436G2	36.30 x 23.62 x 36.02 922 x 600 x 915	19	33.72 856	30.75 781	15.38 391	1.11 28	CP3220	CP3220W	PTRA36T or PTRA36S
PTHW362836G2	36.30 x 27.56 x 36.02 922 x 700 x 915	19	33.72 856	30.75 781	19.38 492	1.11 28	CP3024	—	PTRA36T or PTRA36S
PTHW482436G2	48.54 x 23.62 x 36.02 1233 x 600 x 915	26	33.72 856	42.70 1085	15.38 391	1.11 28	CP4420	CP4420W	PTRA48T or PTRA48S
PTHW482836G2	48.54 x 27.56 x 36.02 1233 x 700 x 915	26	33.72 856	42.70 1085	19.38 492	1.11 28	CP2442	—	PTRA48T or PTRA48S

[a] T = tapped 10-32, S = square hole (.375 in. x .375 in.)

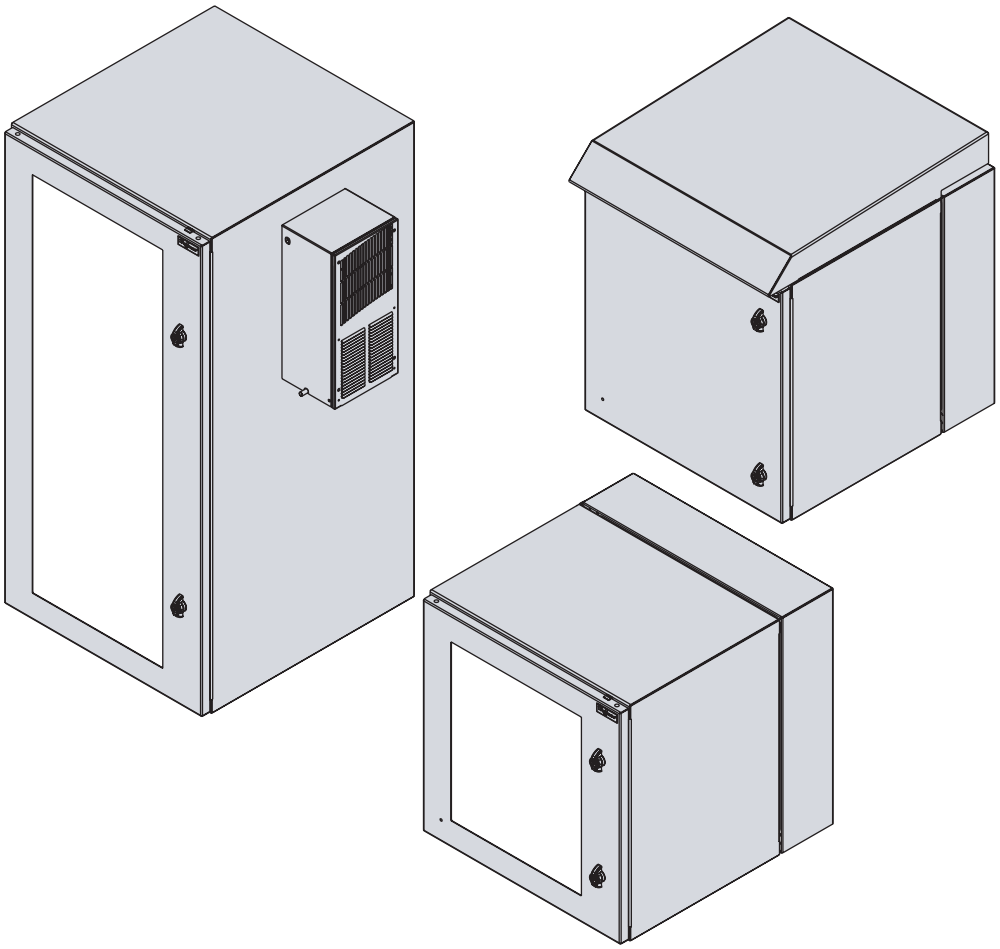
Cable manager supplied with 700 mm wide enclosures



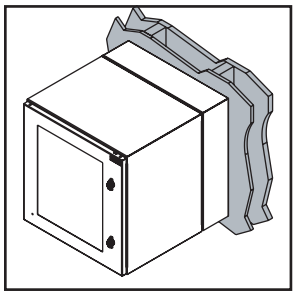

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Q
VIEW Y-Y
20.80
[528]
A - 2.82
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X-X
B = 600 mm
24.73
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A - 2.82
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B = 700 mm

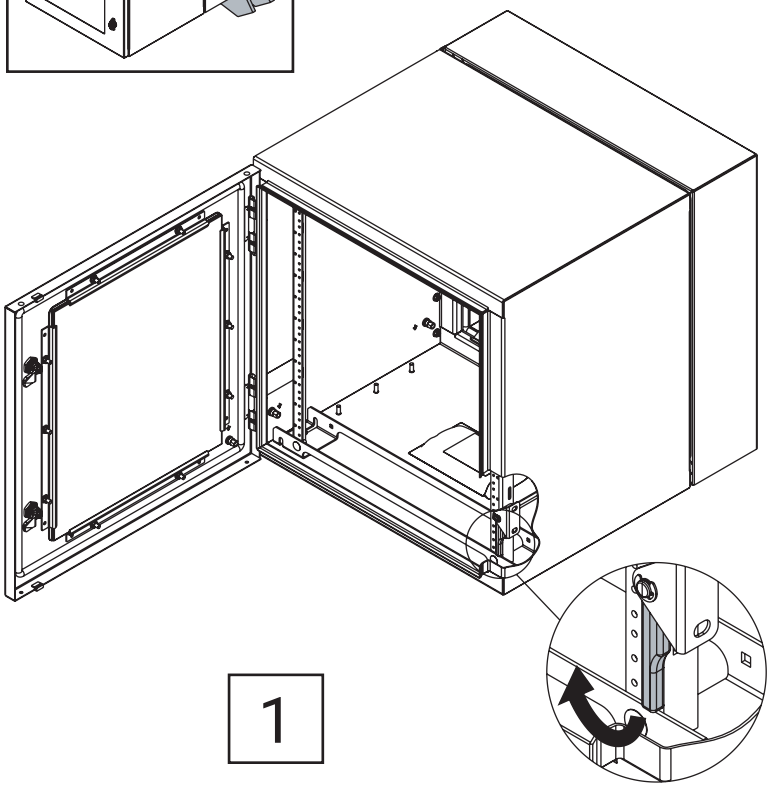
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PROTEK®

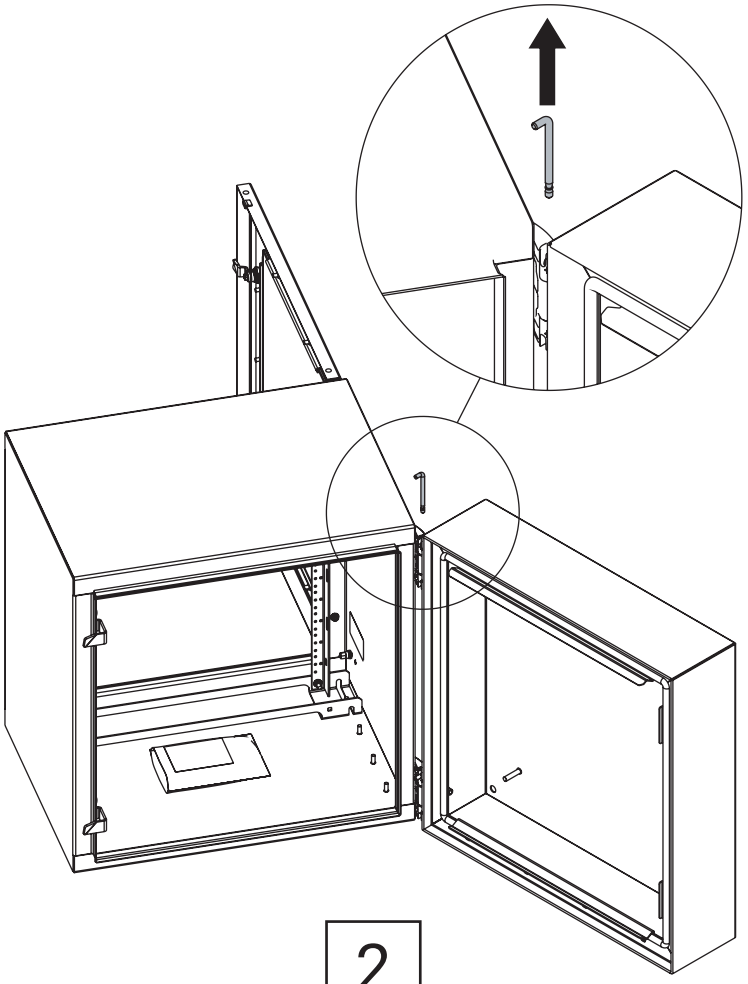


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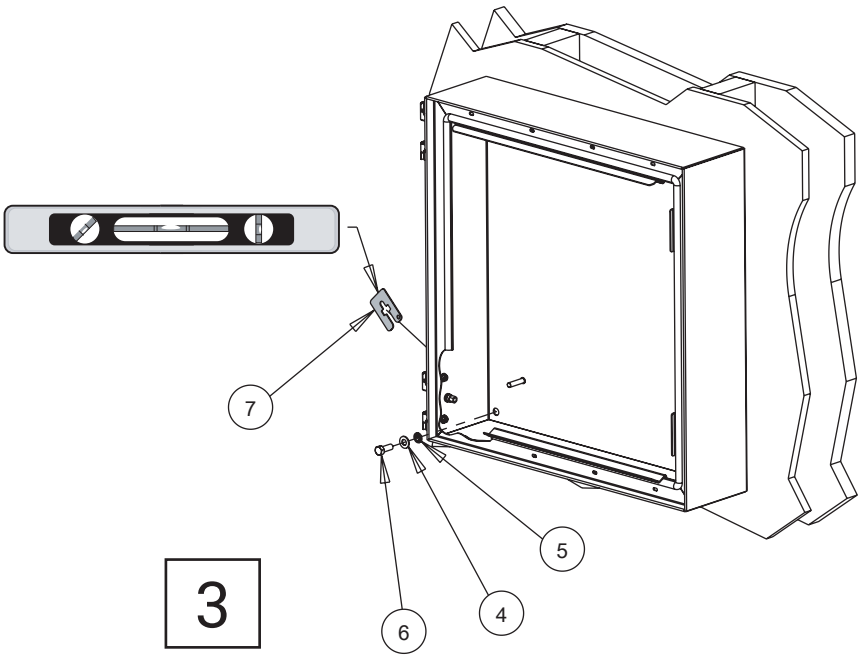




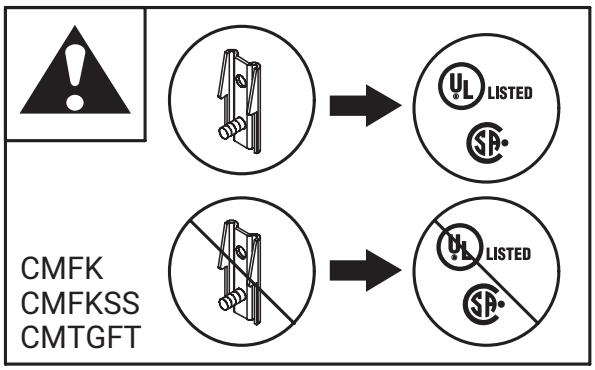
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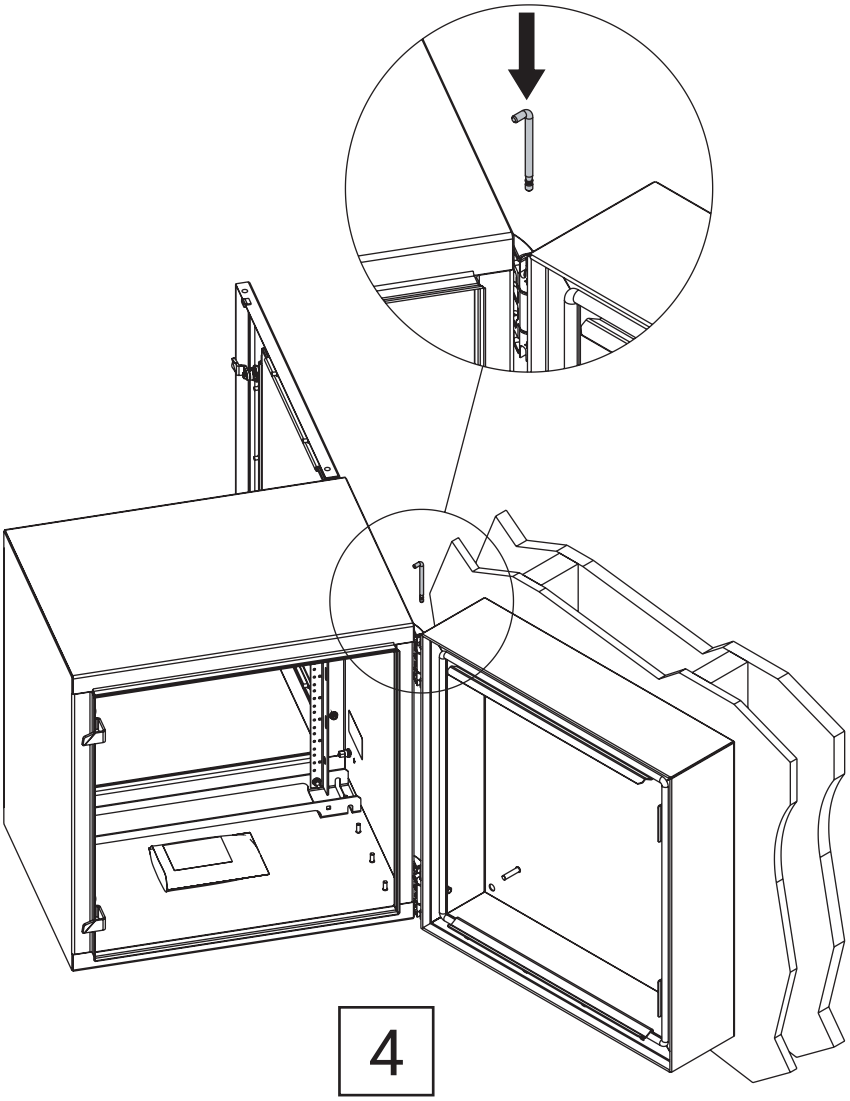
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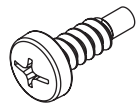
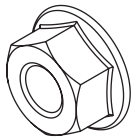
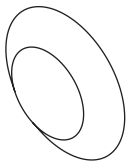
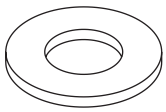
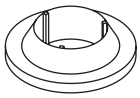
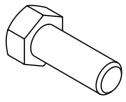
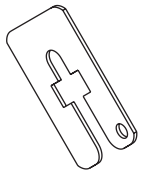
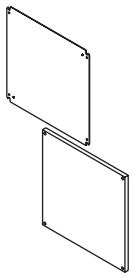
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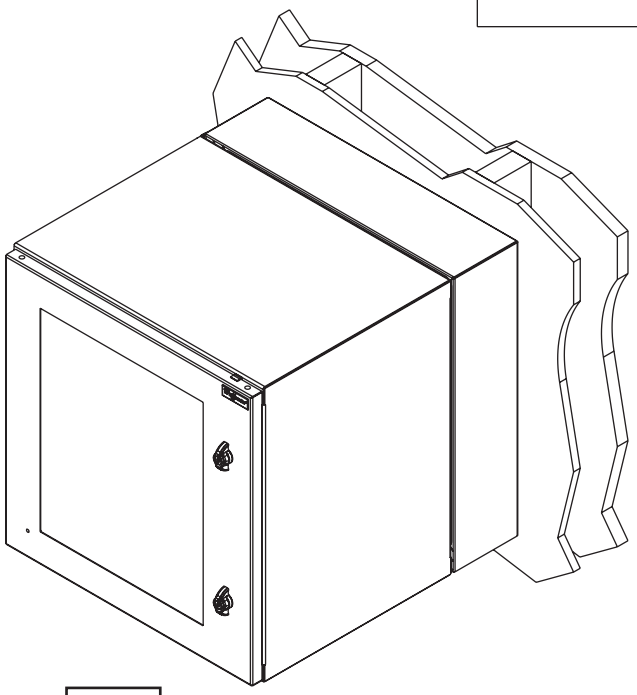


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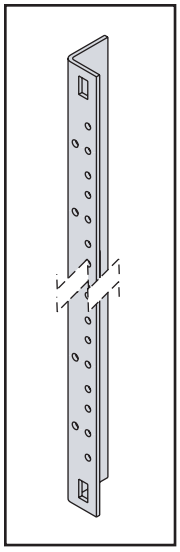
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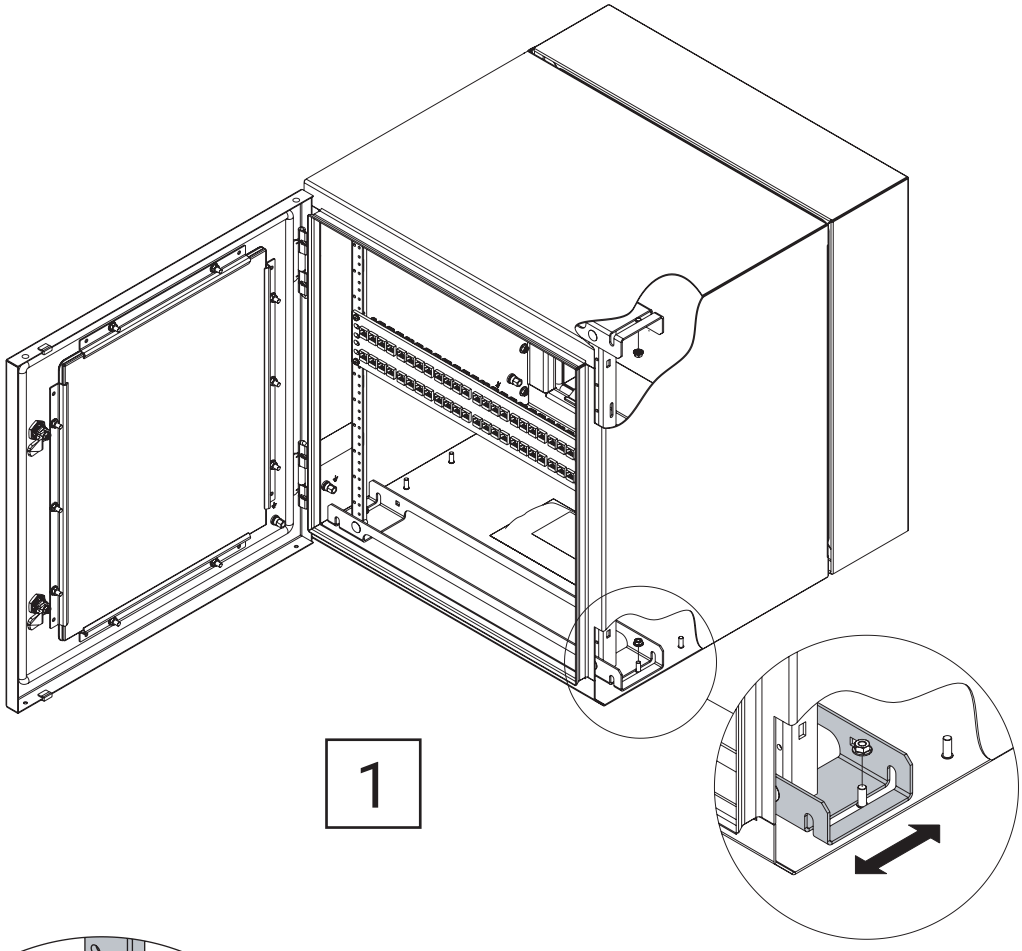
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5  (4x)	6  (0x)
7  (4x)	8  (0x)



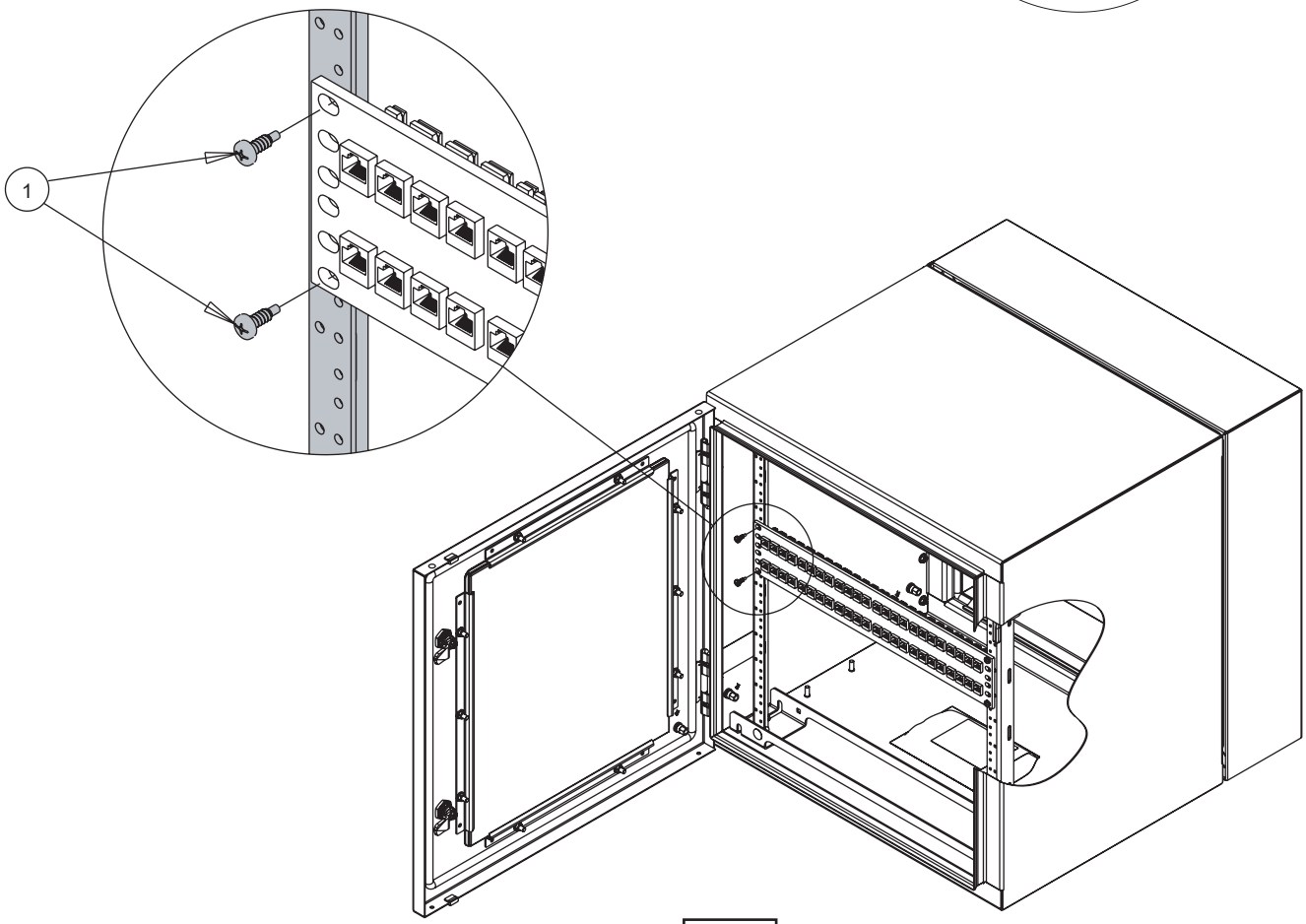
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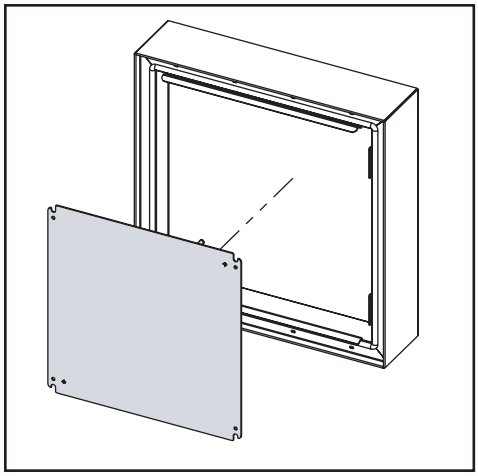


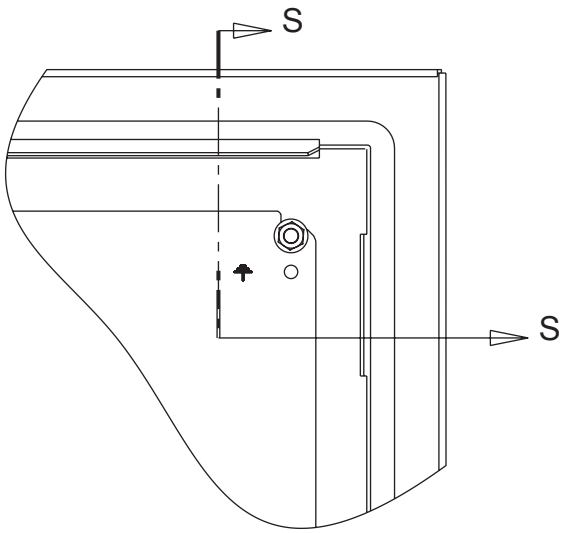
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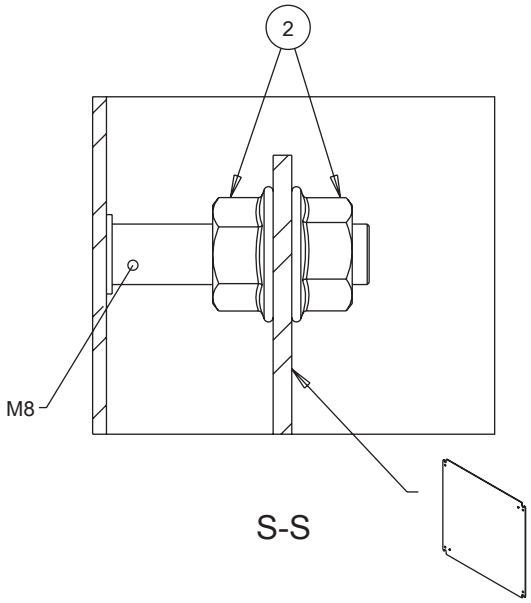


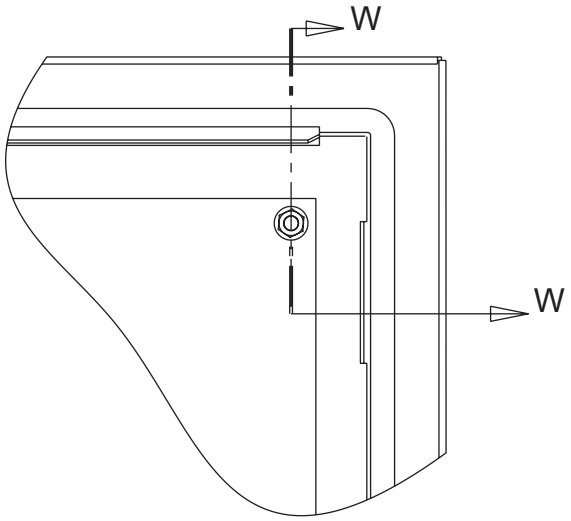
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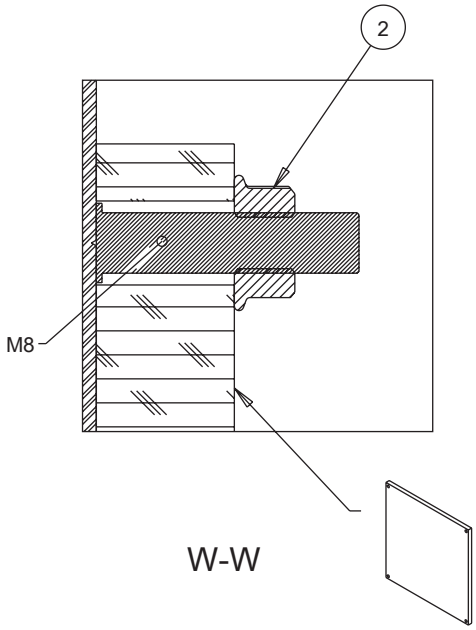
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Guide to Mounting and Squaring Enclosures

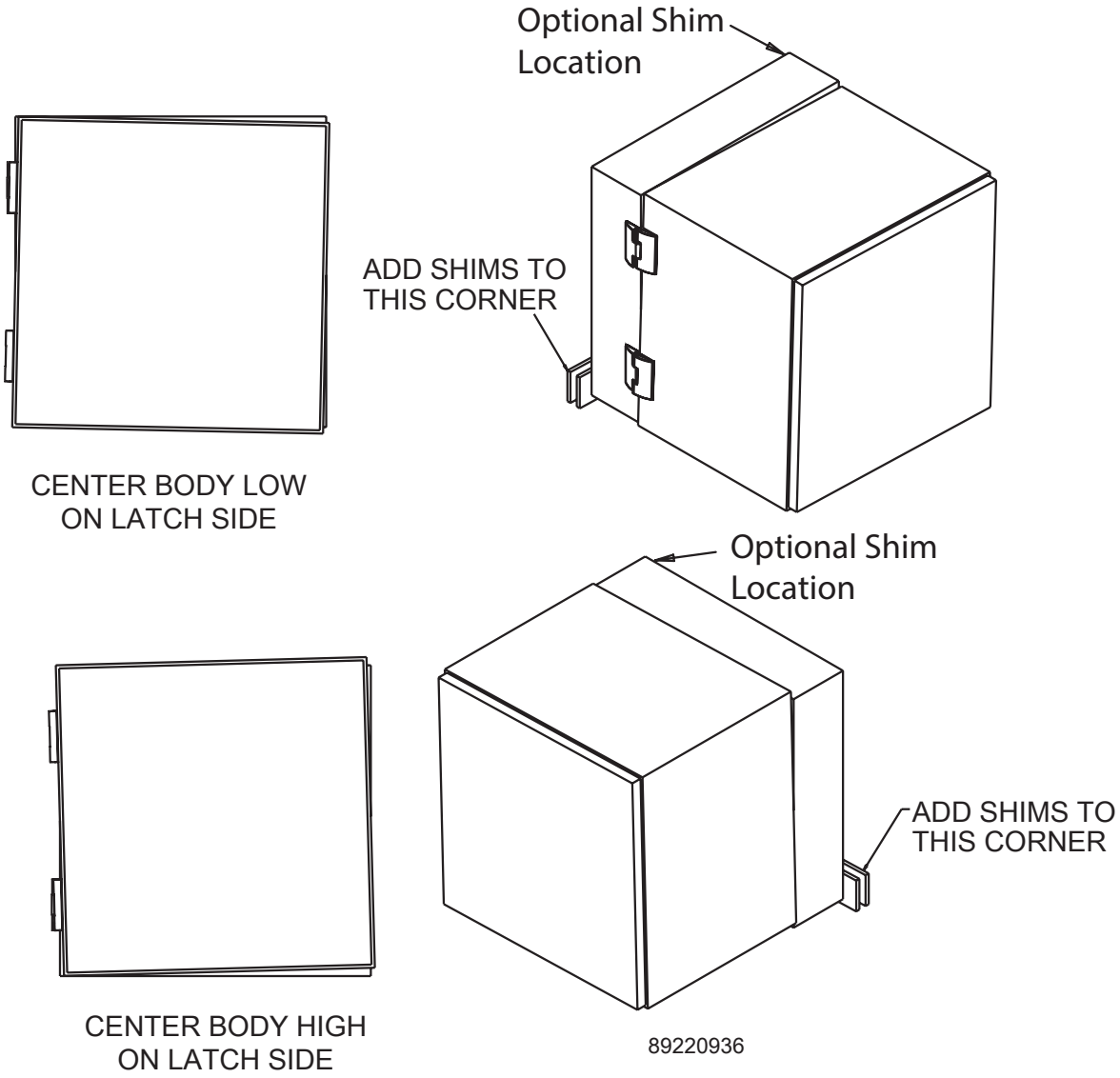
nVent HOFFMAN'S industry-leading enclosures are designed to provide years of reliable service when properly mounted, leveled and maintained. The following recommendations will help ensure that Hoffman enclosures are installed correctly.

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Double-Hinge Mounting

Double-Hinge Enclosure Mounted on Walls or Unistrut Frames

Hoffman double-hinge enclosures are designed for mounting on rigid, flat surfaces or walls. After mounting, add shims to enclosures as required to ensure the sealing contact surface and the enclosure are square. This is necessary for the door to close correctly and provide a reliable seal. To square enclosures mounted on a wall or Unistrut frame, add shims as shown below. Shims should be made of a material such as stainless steel, aluminum, nylon, or plastic to reduce corrosion.



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CABLETEK HORIZONTAL CABLE MANAGER



DCHD2 shown



Arrowhead fingers funnel cable into base and hold it securely



DCHS4 shown



Vertical and horizontal cable manager system installed on a 2-post rack. Vertical and horizontal cable managers work together to make an orderly installation.

INDUSTRY STANDARDS
EIA 310-D

APPLICATION
This cable manager features heavy-duty endposts, arrowhead fingers and tool-less mounting to easily route copper and fiber data cables horizontally in standard 19-in. cabinets or on 2- or 4-post open frame racks.

FEATURES
- Snap-in mounting provision holds cable manager in place while mounting screws are installed
- Robust arrowhead fingers are shaped to funnel cables into base and are made of black composite material
- Robust rounded end posts support cable as it enters and leaves cable manager and maintains proper cable bend radius
- Deep cable compartments allow maximum cable density
- Rounded edges throughout protect cable jackets from damage
- Pass-through holes on double-sided models protect cable while facilitating routing between front and back sides
- Single- and double-sided units provide high cable capacity, including fiber and copper category cables
- 1 RU and 2 RU heights allow greater flexibility in optimizing rack capacity
- Removable hinged cover opens top or bottom, snaps closed for assured cable protection and professional appearance
- Double-sided model has covers on both front and back
- Covers stay open during installation and maintenance procedures
- Horizontal and vertical cable managers designed as a system for streamlined appearance and improved functionality
- Combination head 10-32 and 12-24 screws included for mounting

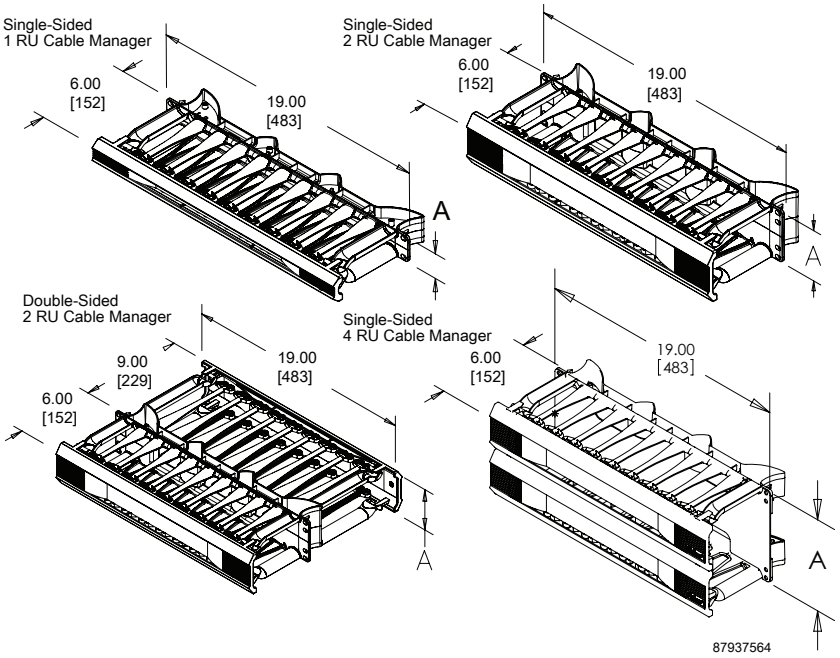
SPECIFICATIONS
- Made of UL listed black composite material

FINISH
Low gloss, matches look of RAL 9005 textured paint

BULLETIN: DACCY

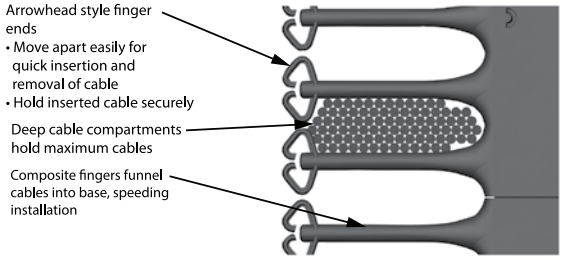
Standard Product **CABLETEK Horizontal Cable Managers; 60% Cable Manager Fill Rate**

Catalog Number	Description	Rack Units	A in./mm	Front Cross-Section Area (in.^{2})	Front Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Front Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Front Cable Fill Rate 60% 6A Cable (0.30-in. dia.)	Back Cross-Section Area (in.^{2})	Back Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Back Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Back Cable Fill Rate 60% 6A Cable (0.30-in. dia.)
DCHS1	Single-Sided	1	1.75 44	4.2	66	57	35	–	–	–	–
DCHS2	Single-Sided	2	3.50 89	13.2	208	161	112	–	–	–	–
DCHD2	Double-Sided	2	3.50 89	13.2	208	161	112	14.1	223	172	119
DCHS4	Single-Sided	4	7.0 178	26.9	416	322	224	–	–	–	–



Arrowhead Cable Capacity; 60% Fill Rate

Location	Cross-Section Area (in.^{2})	5e Cable (0.22-in. dia.)	6 Cable (0.25-in. dia.)	6A Cable (0.30-in. dia.)
Front	5.52	90	67	46
Back	9.27	145	113	78



RACK- AND PANEL-MOUNT POWER DISTRIBUTION UNITS (PDUS)



FEATURES

- Power on/off LED indicates whether power is available at the PDU
- External ground stud provided on single-phase models for secure grounding
- Circuit breakers provide additional equipment protection
- Circuits are isolated on dual circuit model; each has its own circuit breaker
- Reset button provides easy access to circuit breaker reset
- Surge protector models have an indicator LED to verify surge circuitry protection
- Rack-mount models mount directly to rack or with adapter bracket
- Rack-mount models designed for single-phase applications
- Panel-mount models can be mounted flush or with hanging bracket

SPECIFICATIONS

- Steel housing
- Power cord with molded-on plug:
  - 12-in. (305-mm) long single-phase model: 6 ft. (1.8 m)
  - Other single-phase models: 15 ft. (4.6 m)

Contact Hoffman for custom modifications and non-standard offerings.

FINISH

Black, low-gloss textured paint.

BULLETIN: DPS

INDUSTRY STANDARDS

UL/cUL 60950 listed
UL 1449 (Surge protector models only)

EIA 310-D (19-in. rack-mount models only)

APPLICATION

Rack- and Panel-Mount PDUs not only provide convenient, reliable power to equipment mounted in cabinets or on open frame racks, they can also be configured to meet a wide range of design specifications.

Standard Product **Single-Phase Rack-Mount**

Catalog Number	Surge Protection	Amp Meter	Load Rating	Voltage (VAC)	Joule Rating	Receptacle Location	No. of Receptacles	Receptacle Style	Power Cord Plug	Rack Units
DP1N190615	No	No	15A	120	–	Front	6	NEMA 5-15R	NEMA 5-15P	1
DP1N191415	No	No	15A	120	–	6 front, 8 back	14	NEMA 5-15R	NEMA 5-15P	1
DP1N191015S	Yes	No	15A	120	2000	2 front, 8 back	10	NEMA 5-15R	NEMA 5-15P	1
DP1N191020	No	No	20A	120	–	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020S	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020ST	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA L5-20P Twist Lock	1

Isolated circuits on dual-circuit models with separate circuit breakers.

Plugs and Receptacles

NEMA Type	Plug	Receptacle
NEMA 15 Amp, 120V, Duplex	5-15P	5-15R
NEMA 20 Amp, 120V, Duplex	5-20P	5-20R
NEMA 20 Amp, 120V, Twist Lock	L5-20P	L5-20R
30 Amp, 120/208V Wye, Twist Lock	L21-30P	L21-30R

IEC Type	Inlet	Outlet
IEC 15 Amp, 125/250V	C-14	C-13
IEC 20 Amp, 125/250V	C-20	C-19

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DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure



Overview

The Q-Series fiber enclosure system is designed to support standard density applications in building networks. The all steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 LC fibers in per RU, accepting OFP adapter panels, M2 pre-terminated cassettes, and splice cassettes.

Features

- **Highly Accessible:** Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables
- **Simplified Installation:** The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation
- **Versatile Installation:** Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes
- Max number of fibers per RU (SC) - 36
- Max number of fibers per RU (LC) - 72
- Max number of fibers per RU (12F MPO) - 288
- Max number of fibers per RU (24F MPO) - 576
- Cassette / Adapter panels per RU - 3

Part Number	Description
EQ01U-CHC	Q-Series 1U Standard Density (SD) Rackmount Fiber Enclosure
EQ02U-CHC	Q-Series 2U Standard Density (SD) Rackmount Fiber Enclosure
EQ04U-CVC	Q-Series 4U Standard Density (SD) Rackmount Fiber Enclosure

Dimensions

Part Number	Depth (Metric)	Depth (US)	Height (Metric)	Height (US)	Width (Metric)
EQ01U-CHC	485.90mm	19.13 in.	44.45mm	1.75 in.	434.85mm
EQ02U-CHC	485.90mm	19.13 in.	88.90mm	3.50 in.	434.85mm
EQ04U-CVC	485.90mm	19.13 in.	177.80mm	7.00 in.	434.85mm

DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure

General Information

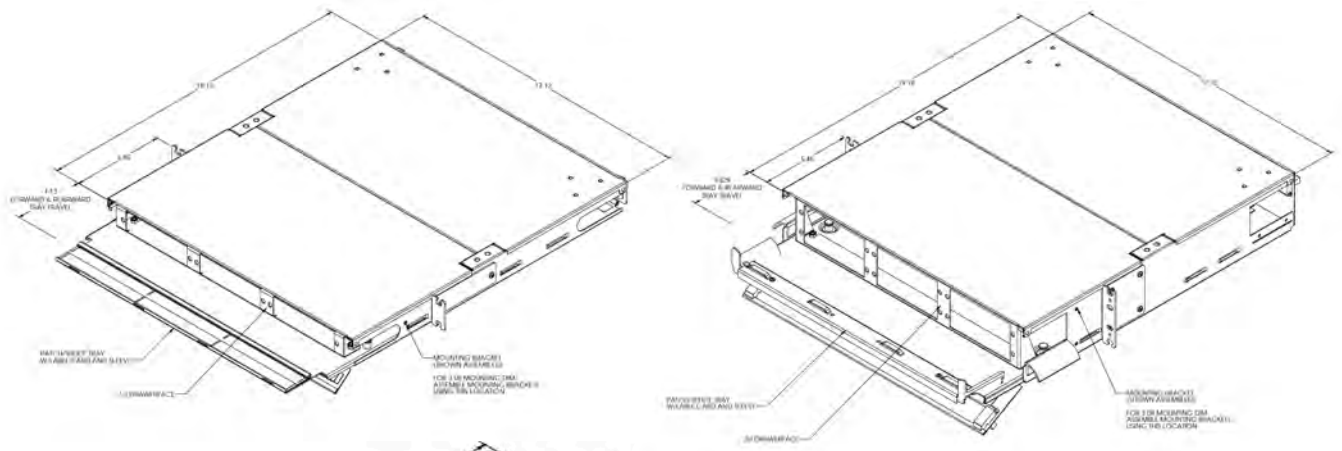
- Color: Black
- Installation: Rack or Cabinet
- Product Series: Q-Series
- Type: Standard Density Fiber Enclosure

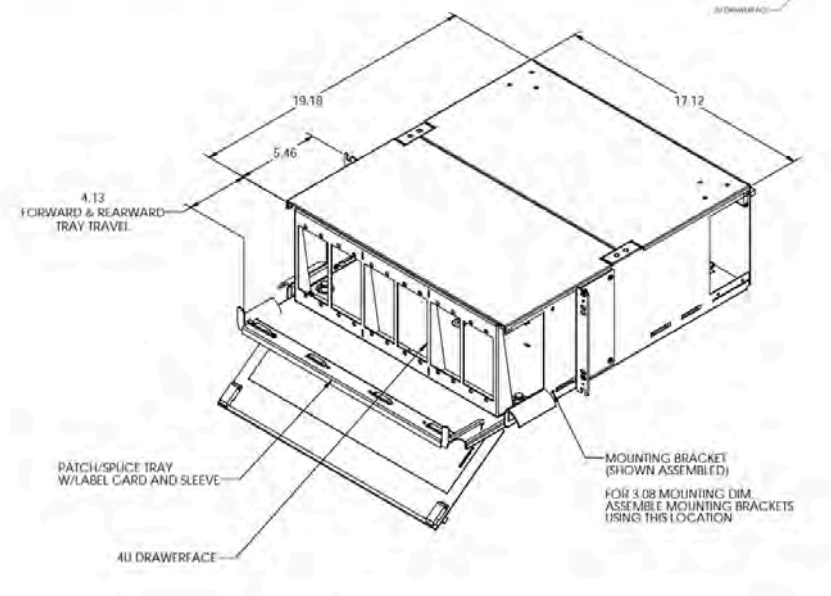
Listing Agencies/Third Party Certifications

- RoHS: Yes

Technical Information

- Mounting Hardware Included: Yes
- Cassette / Adapter Panel Capacity per RU: 3
- SC - Fiber Capacity Per RU: 36
- LC - Fiber Capacity Per RU: 72
- 12F MPO - Fiber Capacity Per RU: 216
- 24F MPO - Fiber Capacity Per RU: 432





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Legrand, North and Central America

60 Woodlawn Street
West Hartford, CT 06110
1.877.BY.LEGRAND (295.3472)
www.legrand.us

Ortronics

2 RU Q-Series Standard Density Rack-Mount Fiber Enclosure

Part No. EQ02U-CHC



The 2U Q-Series Standard Density (SD) footprint fiber enclosure system is designed to support standard density applications in building networks. The all-steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 fibers with LC connectivity and 144 fibers with MDC per Rack Unit (RU), or a maximum capacity of 144 fibers LC and 288 MDC (VSFF), utilizing OFP adapter panels, LM2 pre-terminated cassettes, and M2 splice cassettes.

Features & Benefits

Highly Accessible: Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables

Simplified Installation: The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation

Versatile Installation: Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes - Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Max number of fibers per RU (SC): 36

Max number of fibers per RU (LC): 72

Max number of fibers per RU (12F MPO): 288

Max number of fibers per RU (24F MPO): 576

Cassette / Adapter panels per RU: 3

Specifications

General Info

Product Line	Ortronics	Color	Black
UPC Number	662875019978	Country Of Origin	Mexico
Features	Drawer Slide, Removable Cover	Application Sector	Commercial, Data Center, Industrial
Standard	RoHS;REACH Compliant	Type	Enclosure

Dimensions

Product Width US	17.12 in	Product Depth US	19.13 in

Product Height US	3.5 in

Technical Information

Fiber Optic Cable Type	OM3, OM4, OM5	Compatibility	OFP, M2, LM2
Rack Units	2	Capacity	6 Adapter Panels, 6 Cassettes
Mounting	Rack Mount		

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1.0 GENERAL
2.0 TOOLS REQUIRED FOR ASSEMBLY
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4.0 ACCESSORIES PURCHASED SEPERATELY
5.0 ENCLOSURE ASSEMBLY
6.0 INSTALLATION OF ACCESSORIES
7.0 CABLE ROUTING AND INSTALLATION

1.0 GENERAL

This document describes the assembly procedure for the LEGRAND Patch and Splice Rack Mount Enclosures. Part numbers EQ02U-CHC (2 Rack Unit), EQ04U-CVC (4 Rack Unit), EQ02U-KHC (2 Rack Unit HD), EQ04U-KHC (4 Rack Unit HD), EQ02U-KHL-M (2 Magnesium Rack Unit HD), EQ04U-KHL-M (4 Magnesium Rack Unit HD). Hardware is provided for mounting 19" racks.

2.0 TOOLS REQUIRED FOR ASSEMBLY

2.1) #2 Phillips Head Screwdriver – required for enclosure assembly
2.2) #3 Phillips Head Screwdriver – required to mount the enclosure to the rack

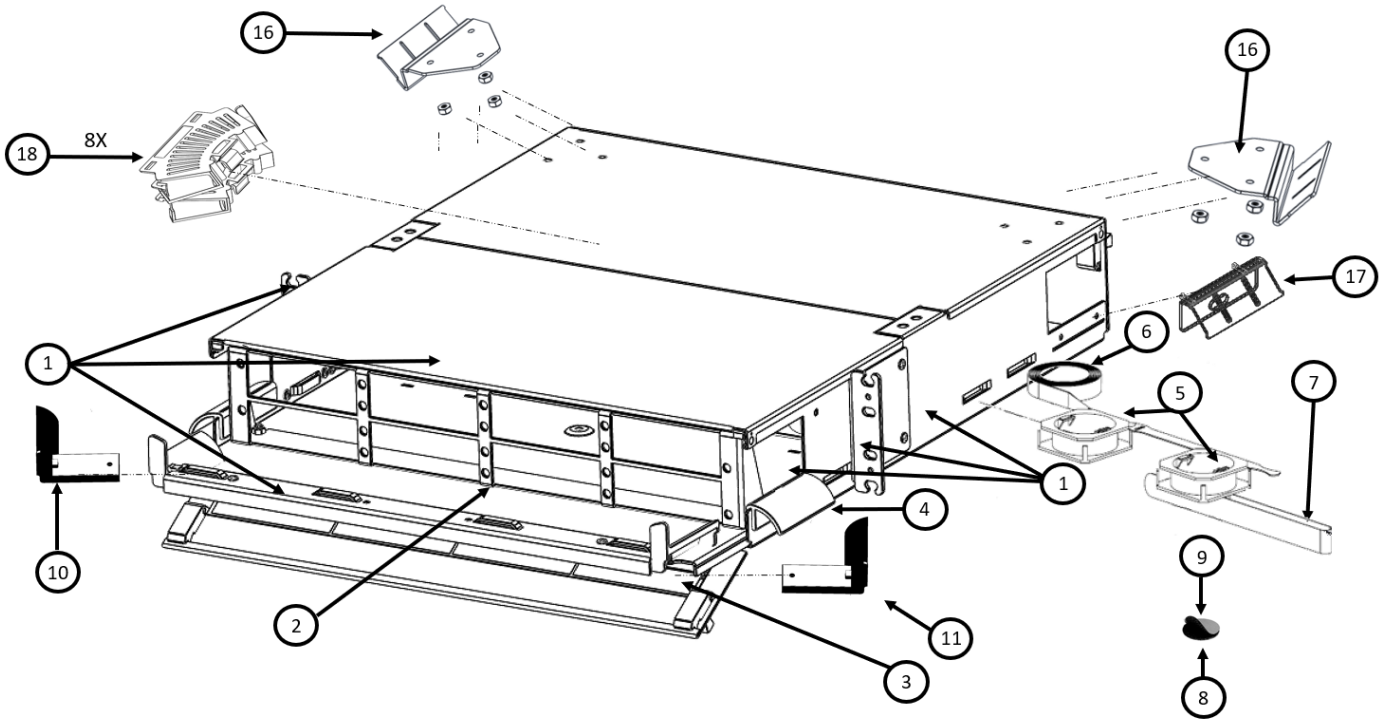
3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
1	Enclosure, Tray and Mounting Brackets, 2 Rack Unit	EQ02U-CHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit	EQ04U-CVC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD	EQ02U-KHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD	EQ04U-KHC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD, Magnesium	EQ02U-KHL-M	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD, Magnesium	EQ04U-KHL-M	-	1
2*	Drawer Face, 2 Rack Unit	41400024-00	1	-
	Drawer Face, 4 Rack Unit	41400007-00	-	1
	Drawer Face, 2 Rack Unit, HD	41400931	1	-
	Drawer Face, 4 Rack Unit, HD	41400932	-	1
3*	Port Identification Card, 2 Rack Unit	70400879	1	-
	Port Identification Card, 4 Rack Unit	70400902	-	1
	Port Identification Card, 2 Rack Unit, HD	70401094	1	-
	Port Identification Card, 4 Rack Unit, HD	70401095	-	1
4	Bend Limiter	71200061	2	2
5	Cable Manager, Fiber Spool.	70800327	4	8
6	Straps, Hooks/Loops, Cable Mgt.	70700145	8	8
7	Straps, D-Ring, Hooks/Loops, 18" Long, Cable Mgt.	70700199-00	4	4
8	Loop, Dot, .50 Dia.	70700077	3	3
9	Hook, Dot, .50 Dia.	70700078	3	3

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
10	Cable Manager, Left	71200062-001	1	1
11	Cable Manager, Right	71200062-002	1	1
12	Washer, lock, #12, External star, phosphor bronze	70100090	1	1
13	Screw 12-24 x .625, PN HD, CMB DRV, ZNC PLT	70100070 / 70100070-59	4	4
14	Screw, machine, #6-32 Unc X .31, Pan HD, CR, Black	70100425	2	2
15	#6-32 screws for Mounting Brackets.		8	8
(*) If item 1 is a 2 or 4 Rack Unit, then items 2 & 3 will be for 2 or 4 Rack Units, etc.				

4.0 ACCESSORIES PURCHASED SEPARATELY

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
16	Strain Relief Bracket, Upper	ECQ-BR	2	2
17	Strain Relief Bracket, Lower	FCBR-003	2	2
18	Kit, Fiber Spool, 8 Pieces	60401185	2	4



5.0 ENCLOSURE ASSEMBLY

5.1) Inspect the package contents before assembling to ensure conformance with the parts listed in Section **3.0**, then determine if the accessories listed in Section **4.0,** are required.

5.2) The Drawer Face (Item 2) is pre-assembled to the tray at the factory (Figure 1).

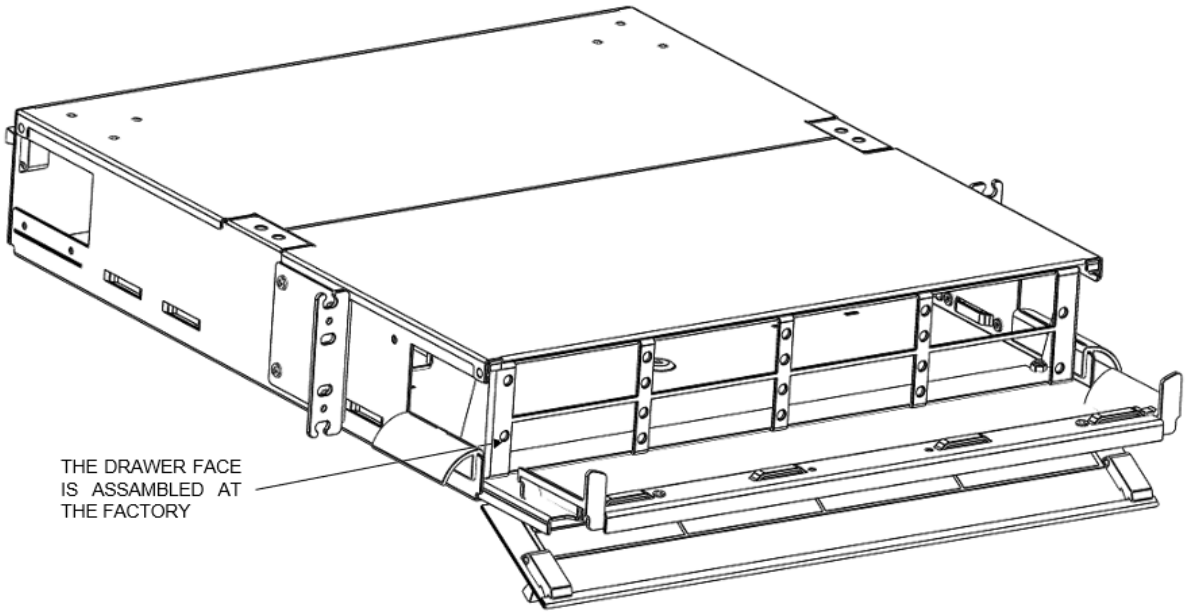


Figure 1

5.3) If your enclosure does not have the mounting brackets factory installed, use a #2 Phillips Head Screwdriver and the screws provided with the enclosure to attach one mounting bracket to each side of the enclosure using the holes provided. Figure 2 illustrates the mounting scheme. An alternate mounting position (Figure 2a) is available for 19" enclosures. To have an enclosure that installs more rearward in racks use the 4-hole pattern closest to the front side of the enclosure.

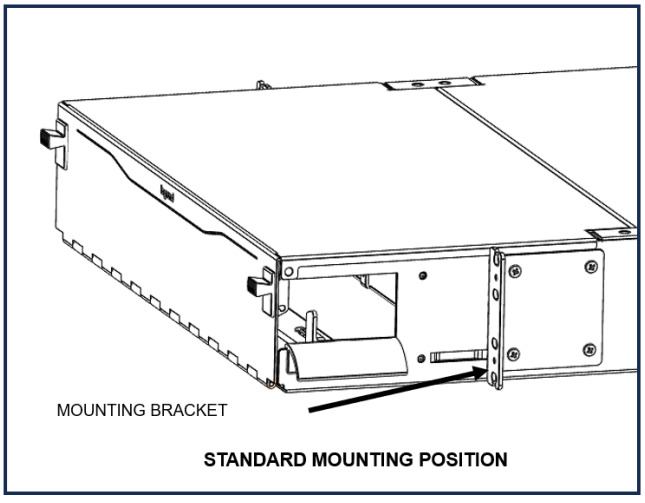


Figure 2

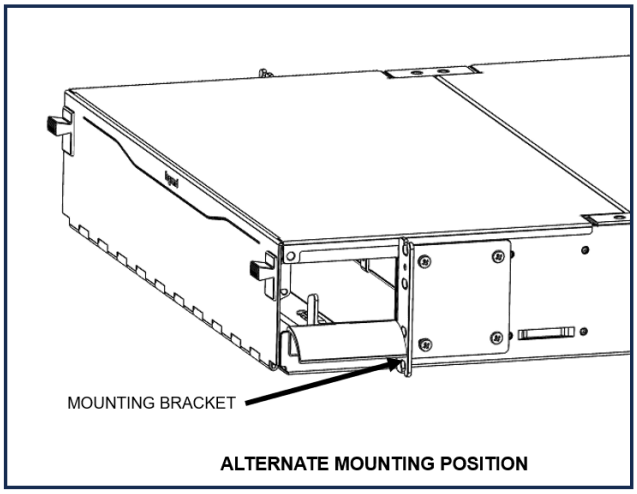


Figure 2a

5.4) Mate each Hook with a Loop dot. Remove protective backing from Hook or Loop and attach to underside of identification label, as required. Remove backing from the remaining side. Put label into place and press against the door to secure, approximately where shown (Figure 3).

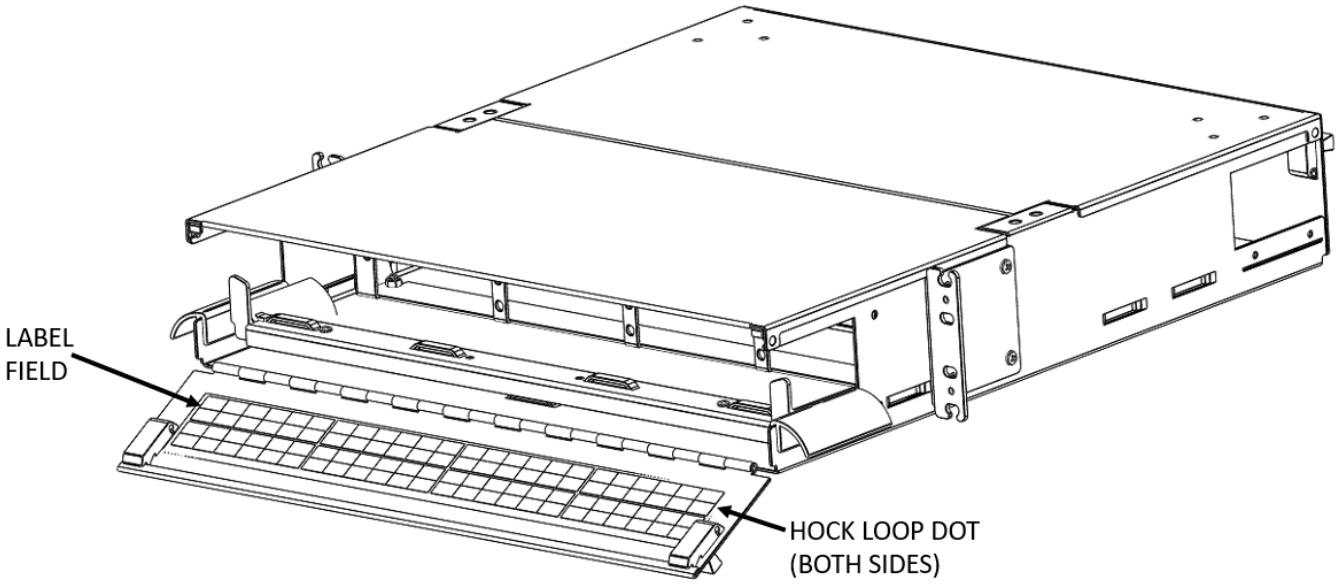


Figure 3

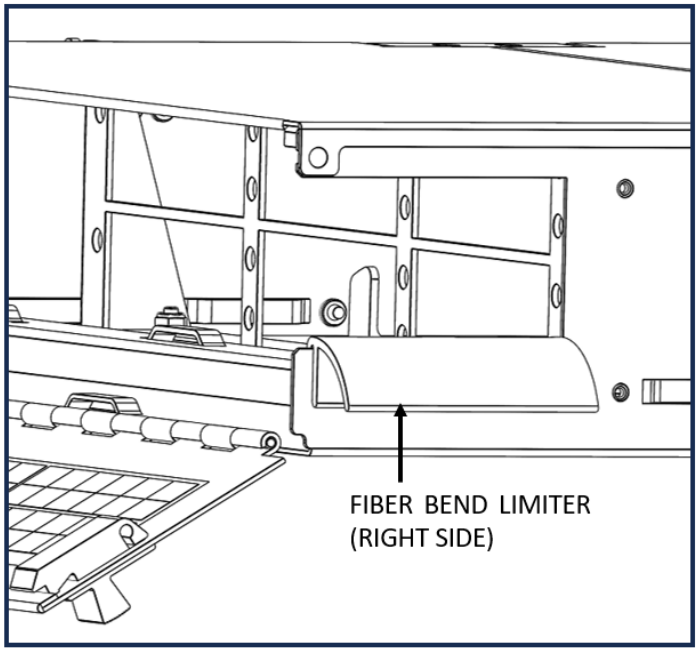


Figure 4

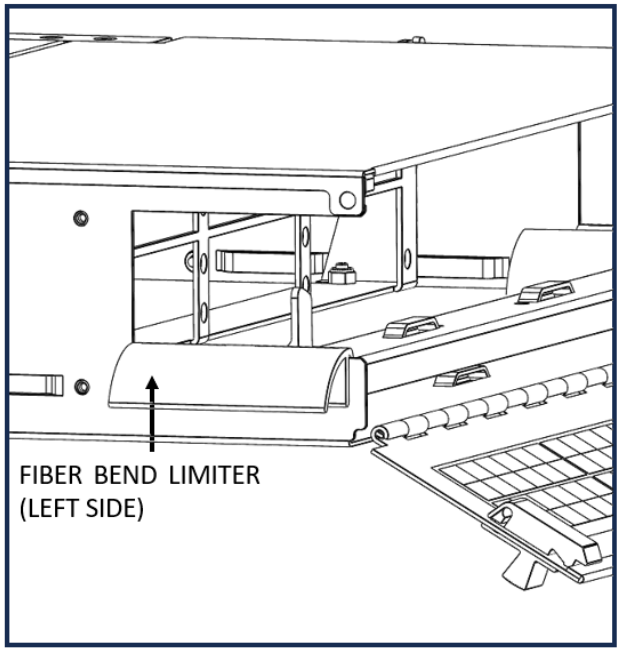


Figure 4a

5.5) Attach bend limiters to the enclosure as shown in Figures 4 & 4a (will be provided in black but shown in white for clarity).
5.6) The enclosure is ready to be mounted to the rack using the screws provided, and a #3 Phillips Head Screwdriver.

6.0 INSTALLATION OF ACCESSORIES

The fiber enclosures can support different styles of fiber bend radius control. The 2U & 4U enclosure trays can accept both styles. Figure 5a illustrates the current style and Figure 5b illustrates an alternate style.

6.1) To assemble the fiber manager provided with this enclosure: Attach Fiber Spool Cable Managers to the tray by inserting the (2) snap hook tabs into their mating tray slots then push the part down towards the tray until the snap hooks engage. An audible click will indicate a locked-in position. Follow the same procedure for additional assemblies. The fiber manager is capable of stacking although the enclosure will limit the number of fiber managers in a stack.
6.2) Figure 5a depicts the fiber spools secured to the tray (rear section).
6.3) When required, attach the Upper and/or Lower strain relief brackets to the rear of the enclosure as shown in Figure 6. Threaded studs are provided on the inside surface of the enclosure to accommodate the brackets.
6.4) To install the cable managers (item 10, 11), orient the curved sides to face each other. Place the short tab up and facing towards you as depicted in figure 8. Item 11 is the right-side cable manager. Item 10 is the left side cable manager. To attach them to the tray, place the long tab under the tray and align the holes to the threaded feature. Use the #6-32 screws provided (1) each, to fasten each cable manager. Do not overtighten.
6.5) Repeat steps **5.0** through **5.6** to assemble additional enclosures, and steps **6.0** through **6.4** for installation of accessories.

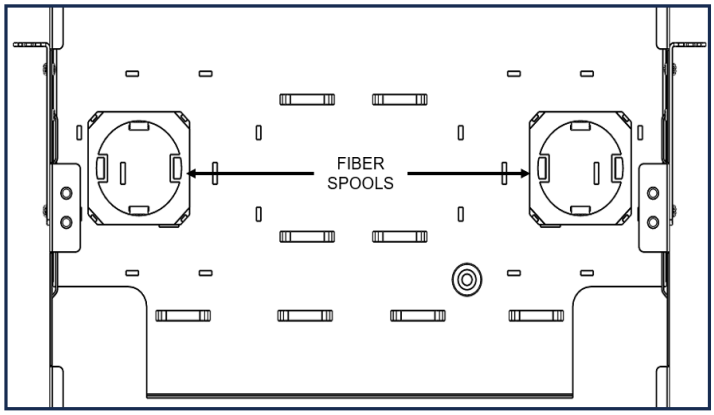


Figure 5a

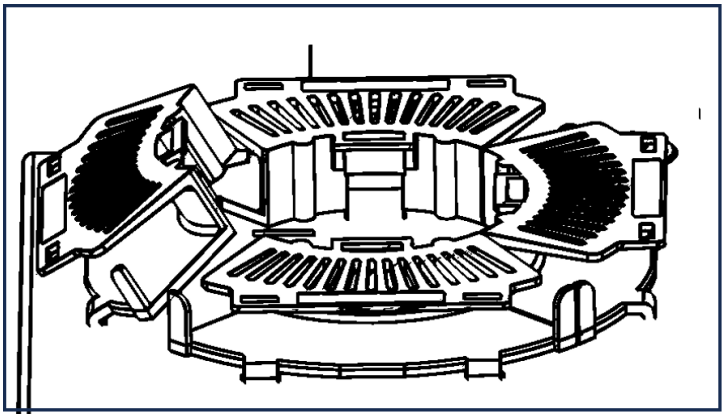


Figure 5b

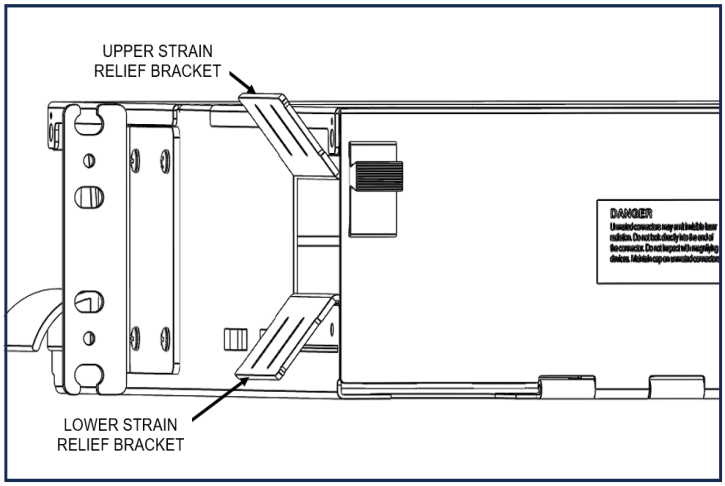


Figure 6

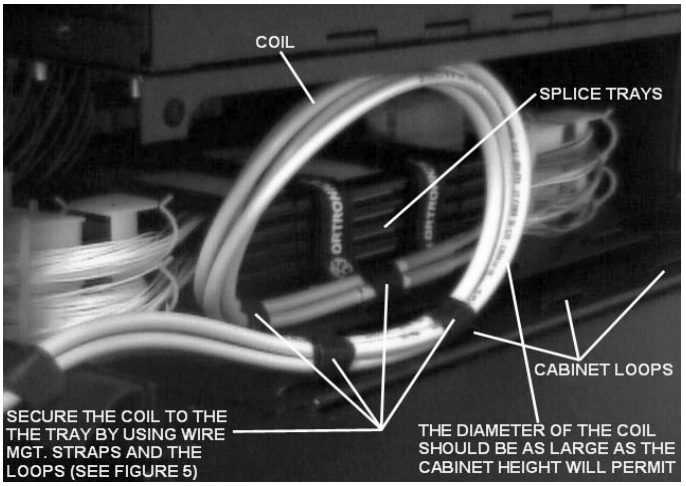


Figure 7

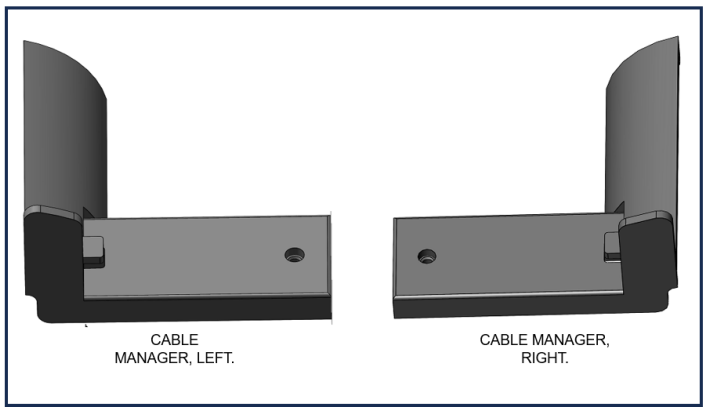


Figure 8

7.0 CABLE ROUTING AND INSTALLATION

7.1) Strip off approximately 1 meter (39 inches) of cable jacket. Trim the central strength member and/or the aramid yarn back to the cable jacket. Terminate connectors (if required) per the manufacturer's instructions.

7.2) With the jacketed portion of the fiber, make a service coil as large as the cabinet height will permit, as shown in Figure 7. The service coil is required to allow the tray to slide out the front of the cabinet freely.

7.3) Secure the outside coil to the cabinet utilizing management straps and the loops provided. Secure the inside coil to the tray utilizing wire management straps and the loops provided.

7.4) An example of a Patch and Splice wiring scheme is depicted in Figure 9.

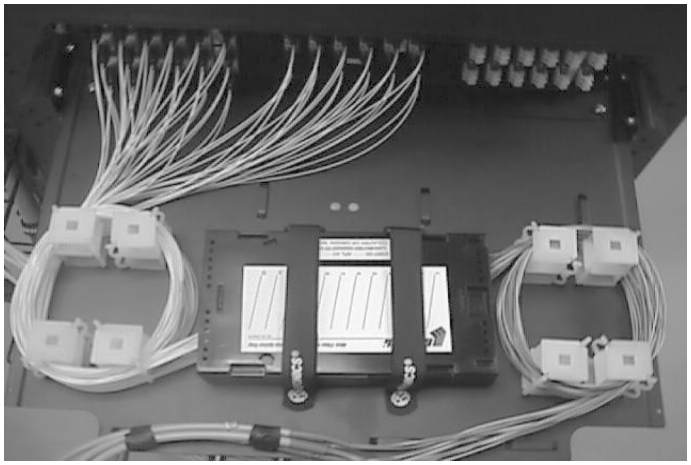


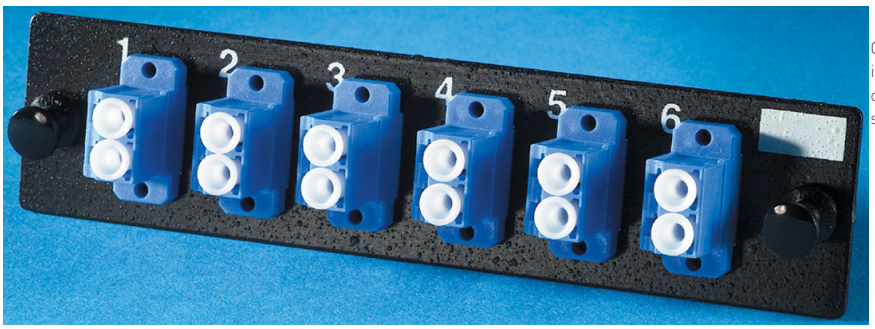
Figure 9

FOR QUESTIONS AND/OR ADDITIONAL INFORMATION, CONTACT LEGRAND AT THE FOLLOWING WEB ADDRESS, OR YOUR MANUFACTURER'S REPRESENTATIVE.

WWW.LEGRAND.US

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Ortronics
6-LC (12 fibers) single mode adapters with ceramic alignment sleeves
Part No. OFP-LCD12AC



Ortronics fiber adapter panel allows for flexibility and expansion with an industry accepted style. The adapter panel snaps in for installation and can be removed easily for future changes. The adapter panel is silkscreened for easy port identification.

Features & Benefits

- Up to 72 LC fibers per RU
- Made of durable polycarbonate
- 6, 8, 12 & 24 port panels
- Available in, LC, SC, ST and blank styles
- Zirconia ceramic sleeves for optimal performance
- Color options available

Specifications

General Info

Product Line	Ortronics	Color	Blue
UPC Number	662875593799	Country Of Origin	Mexico
Features	Shuttered	Included	Cover
Application Sector	Commercial, Data Center	Standard	RoHS compliant. Meets or exceeds TIA/EIA-568-C.3 requirements.
Warranty Type	5-Year	Type	Adapter Panel

Dimensions

Product Width US	5.12 in	Product Depth US	1.15 in
Product Height US	1.19 in		

Additional Information

Product Environmental Profile	Yes

Technical Information

Fiber Optic Cable Type	OS2	Operating Temperature Min	-10 °C
Compatibility	OFP	Number of Ports	12
Simplex/Duplex	Duplex	Operating Temperature Max	60 °C
Shuttered Adapters	No	Single/Multimode	Single-Mode
Number of Fibers	12	Fiber Type	Single-Mode
Form Factor	LC Duplex	Operating Temperature	-10°-60°C
Durability	500 matings	Operating Humidity	0-80% RH (Non-Condensing)
Storage Temperature	-40° - 75° C		

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NT24k® Modular Industrial Switch

N-Tron® Networking Series

RED LION®
a spectris company

Managed Gigabit Industrial Ethernet Switch

The N-Tron® series NT24k® is a modular managed switch designed for factory automation, utilities, SCADA, security surveillance and other industrial applications.



The Red Lion N-Tron series NT24k managed industrial Ethernet switch features connectivity for up to 24 Gigabit ports and offers a wide range of connectivity options—including 100Base, Gigabit, fiber optic and copper options—in a rugged 1U 19" rackmount enclosure. Designed to handle the most demanding environments, the NT24k delivers wire-speed throughput and includes dual power inputs, expanded shock and vibration tolerances, extreme operating temperature range and three slots to accommodate mix-and-match port modules. N-Ring™ technology restores network communication within ~30ms of fault detection. Robust remote monitoring capabilities make management easy.

APPLICATIONS

- Factory Automation
- Utilities
- SCADA
- Security Surveillance
- Transportation
- Alternative Energy

PRODUCT HIGHLIGHTS

- All Gigabit Modular Design
- Up to 24 Port Connections
- High Environmental Specifications
- N-Ring™ Advanced Ring Technology
- Robust Remote Monitoring
- Smart Plug-and-Play Operation

IEEE 1588v2 PTP OPTIONS

- Boundary Clock
- Transparent Clock

IEEE 1588v2 applications include

- Coordinated motion control
- Time-stamped data logging
- Time-stamped fault detection

PTP Models & Upgrade Kit Available

FEATURES & BENEFITS

- Supports up to three of the following port modules:
  - 8-port 10/100/1000BaseT(X) module
  - 8-port 100Base fiber module
  - 8-port 1000Base fiber module
  - 8-port Gigabit SFP module
  - 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- -40°C to 85°C operating temperature
- Dual power input options:
  - Low Voltage: 18-49 VDC
  - High Voltage: 90-264 VAC or 90-300 VDC
- Onboard temperature sensor
- ESD and surge protection diodes on all copper ports
- Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
- USB configuration port
- Configurable alarm contact
- Optional backup/restore configuration device
- Fully managed features include:
  - SSH/SSL/HTTPS
  - SNMP v1, v2, v3
  - Web browser management
  - Detailed ring map and fault location charting
  - RSTP - 802.1d, 802.1w, 802.1D
  - Trunking and port mirroring
  - 802.1Q tag VLAN and port VLAN
  - IEEE 802.1x with RADIUS remote server authentication
  - DHCP Server, Option 82 relay, Option 61, IP fallback
  - Port Security – MAC address based
  - 802.1p QoS, port QoS and DSCP
  - Event Log/Syslog
  - SNTP (Simple Network Time Protocol)
  - IEEE 1588v2 (PTP) models available
  - Multi-Member N-Ring™ technology with ~30ms healing
  - N-Link redundant ring technology
  - N-View™ monitoring technology
  - EtherNet/IP™ CIP™ messaging
  - 802.1AB-2005 LLDP (Link Layer Discovery Protocol)

FC c UL us LISTED 65SN CE UKCA ABS TYPE APPROVED PRODUCT RoHS compliant EtherNet/IP

Managed Gigabit Industrial Ethernet Switch Specifications

SWITCH PROPERTIES

Number of MAC Addresses: 16K
IEEE 1588v2 Software-Based Option
Aging Time: Programmable
Latency (typical): 1.6 µs
Switching Method: Store & Forward
MTBF: >1 million hours
Jumbo Frame Support

POWER INPUT

Input Voltages:
Low Voltage: 18-49 VDC
High Voltage: 90-264 VAC or 90-300 VDC
Input Current (max): 2.26A @ 24VDC
Input Current (max): 790mA @120 VAC/450mA @ 124VDC
BTU/hr: 185 @ 24VDC
BTU/hr: 365 @ 120VAC/190 @ 124VDC

CONNECTORS

10/100/1000BaseT(X): Up to 24 RJ45 copper ports
100BaseFX: Up to 24 SC or ST fiber ports
1000BaseFX: Up to 24 SC fiber ports
100BaseSX/LX SFP: Up to 24 LC fiber ports
1000BaseGX SFP: Up to 24 LC fiber ports

RELIABILITY

MTBF: >1 million hours

NETWORK MEDIA

10BaseT: ≥Cat3 cable
100BaseTX: ≥Cat5 cable
1000BaseT: ≥Cat5 cable
100BaseFX, 1000BaseSX Multimode: 50-62.5/125µm
100BaseFX, 1000BaseLX Singlemode: 7-10/125µm

RECOMMENDED WIRING CLEARANCE

Front and Back: 4" (10.2 cm)

CERTIFICATION & COMPLIANCE

Product Safety:
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions:
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009; Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity:
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Other:
ABS Type Approval for Shipboard Applications; EMC Directive 2014/30/EU; LV Directive 2014/35/EU, RoHS Compliant

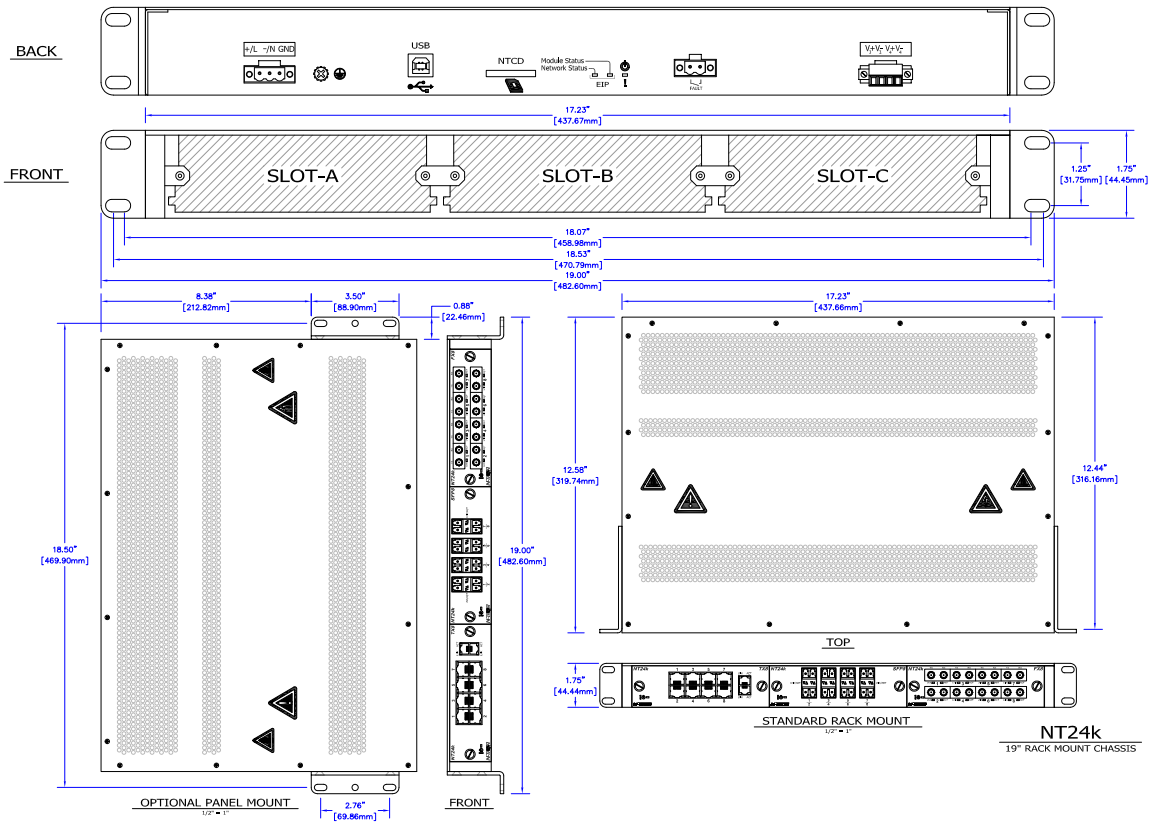
ENVIRONMENTAL

Operating Temperature: -40° C to 85° C
Operating Humidity: 5% to 95% (Non Condensing)
Operating Altitude: 0 to 10,000 ft.
Shock: 50g @ 10ms
Vibration/Seismic: 30g, 10-200 Hz, triaxial

MECHANICAL

Case Dimensions
Height: 1.9" (4.8 cm)
Width: 17.5" (44.5 cm)
Depth: 12.7" (32.0 cm)
Weight (maximum): 12.85 lbs (5.83 kg)
Mount: Rackmount 1U

DIMENSIONS



Specifications are subject to change. Visit www.redlion.net for more information.

Managed Gigabit Industrial Ethernet Switch Specifications

NT24K-FX8 MODULE - 100 MB FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24K-GX8 MODULE - GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 300m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24K-SFP-DM8 MODULE - SFP 100BASE FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24K-SFP-DM8 OR NT24K-SFP8 MODULES- SFP GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 275m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance.
Link budgets should be evaluated based on specific application conditions.

ORDERING GUIDE

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input PTP Enabled
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-DC2-PT	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs PTP Enabled
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input
NT24K-AC1-PT	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input
NT24K-AC2-PT	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs
NT24K-AC1-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs PTP Enabled
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device
NTPC-AC-US	AC power cord
NTPS-24-3	DIN rail power supply 3.0 Amp@24 VDC
NT24K-KIT-PTP	NT24k Upgrade License to Enable IEEE 1588/PTP on Non-PT NT24k Switches
PORT MODULES & TRANSCEIVERS	
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*
NTSFP-FX	100BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2km)**
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP pluggable mini-GBIC transceiver (LC style connector)**
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode. *SFP transceivers sold separately. **For use with SFP DM8 module only

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N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches

Hardware Guide | January 2023
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Preface

Disclaimer

This hardware guide provides an overview of installation, maintenance and operation of the N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls, Inc. is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Users of this document are urged to heed warnings and cautions used throughout the document.

Compliance Information

It is recommended that the owner of this equipment determine and ensure conformance with any specific and applicable local regulations.

FCC Statement

This product complies with Part 15 of the FCC-A Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful Interference
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Déclaration de conformité FCC

Ce produit est conforme à la partie 15 des règles de la FCC–A

Utilisation est soumise aux conditions suivantes:

1. Ce dispositif ne doit pas causer des interférences nuisibles
2. Cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent causer un mauvais fonctionnement.

Note: Cet équipement a été testé et jugé conforme aux limites de la classe A des appareils numériques, conformément à la partie 15 des règles de la FCC . Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie radiofréquence et, si il n'est pas installé et utilize conformément aux instructions, peut causer des interférences nuisibles aux communications radio. L'utilisation de cet appareil dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur sera tenu de corriger les interférences à ses propres frais.

Industry Canada

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe A répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

Environmental Impact Statement

Red Lion equipment contains no hazardous materials as defined by the United States Environmental Protection Agency (USEPA). Red Lion recommends that all failed product be returned to Red Lion for failure analysis and proper disposal.

Toxic Emissions

Red Lion equipment releases no toxic emissions.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- Ethernet is a registered trademark of Xerox Corporation.
- EtherNet/IP and CIP are registered trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at

www.redlion.net/support/documentation.

Additional Product Information

Additional product information can be obtained by contacting the local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Cautions and Warnings / Mises en Garde et Avertissements

Warnings apply to situations where personal injury or death may result.

Cautions apply to where reduced function or damage to equipment may result.

General Safety Cautions and Warnings / Précautions et Avertissements de Sécurité Générale

	**CAUTION:** If the equipment is used in the manner not specified by Red Lion, the protection provided by the equipment may be impaired. **ATTENTION:** Si l' équipement est utilisé d'une manière non spécifiée par Red Lion, la protection fournie par l'équipement peut être compromise.

	**CAUTION:** Do not remove any of the covers. There are no serviceable parts within the unit. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne retirez aucun des couvercles. Il n'y a pas des pieces utilisables à l'intérieur de l'appareil. Ne pas remplacer les pièces non-autorisées ou effectuer des modifications non-autorisées de l'appareil.

	**CAUTION:** Do not block any air vents on the unit. **ATTENTION:** N'obstruez pas les fentes d'aération de l'unité.

	**CAUTION:** Do not operate the equipment in a manner not specified by this manual. **ATTENTION:** Ne pas faire fonctionner l'équipement d'une manière non spécifiée par ce manuel.

	**WARNING:** Install only in accordance with Local and National Codes of authorities having jurisdiction. **AVERTISSEMENT:** Installer uniquement, conformément aux codes locaux et nationaux des autorités ayant compétence.

Electrical Safety Warnings / Avertissements de Sécurité Électrique

	**WARNING:** Never install or work on electrical equipment or cabling during periods of lightning activity. **AVERTISSEMENT:** Ne jamais installer ou travailler sur équipement électrique ou de câblage pendant les périodes d'activité de la foudre.

	**CAUTION:** Do not perform any services on the unit unless qualified to do so. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne pas effectuer de services sur l'appareil s'il n'est pas qualifié pour le faire. Ne pas substituer pièces non autorisées ou de modifications non autorisées de l'appareil.

	**WARNING:** Properly ground the unit before connecting anything else to the unit. Units not properly grounded may result in a safety risk and could be hazardous and may void the warranty. See the grounding technique section of this manual for proper ways to ground the unit. **AVERTISSEMENT:** L'unité doit être correctement mise à la terre avant tout raccordement à l'unité. Unités pas correctement mise à la terre peuvent causer un risque de sécurité et pourraient être dangereuses et peuvent annuler la garantie. Voir la section technique de mise à la terre dans ce mode d'emploi pour des moyens appropriés à la masse de l'appareil.

	**WARNING:** Device must be supplied by a Class 2 power source (except for POE models). **AVERTISSEMENT:** l'appareil doit être alimenté par une source d'alimentation de classe 2 (sauf pour les modèles POE).

	**WARNING:** Do not operate the unit with the top cover removed, as this could create a shock or fire hazard. **AVERTISSEMENT:** Ne pas faire fonctionner l'unité avec le couvercle retiré, ceci pourrait créer une décharge électrique ou un incendie.

	**CAUTION:** Observe proper DC Voltage polarity when installing power input cables. Reversing voltage polarity can cause permanent damage to the unit and void the warranty. **ATTENTION:** Respectez la polarité correcte de tension DC lors de l'installation des câbles d'alimentation d'entrée. Inversion de polarité de tension peut causer des dommages permanents à l'appareil et annule la garantie.

Environmental Safety Cautions and Warnings / Sécurité Environnementale Mises en Garde et Avertissements



WARNING: Do not operate the equipment in the presence of flammable gases or fumes. Operating electrical equipment in such an environment constitutes a definite safety hazard.

AVERTISSEMENT: Ne pas utiliser le matériel en présence de gaz ou de vapeurs inflammables. L'utilisation de matériel électrique dans un tel environnement constitue un danger certain.



WARNING: Disconnect the power and allow to cool 5 minutes before touching.

AVERTISSEMENT: Déconnectez le câble d'alimentation et laisser refroidir 5 minutes avant de la toucher.

Hazardous Location Warnings / Les Avertissements d'Emplacement Dangereux



CAUTION: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

ATTENTION: Cet appareil est adapté pour utilisation en Classe I, Division 2, Groupes A, B, C, D ou endroits non-dangereux seulement.



WARNING: Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.

AVERTISSEMENT - Risque d'explosion - La substitution de tout composant peut nuire à la conformité de Classe 1, Division 2.



WARNING: Explosion Hazard – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux.



WARNING: Exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relay U40.

AVERTISSEMENT: L'exposition à certains produits chimiques peut dégrader les propriétés d'étanchéité des matériaux utilisés dans les dispositifs suivants: relais par U40.



WARNING: Explosion Hazard – Do not replace the device unless power has been switched off or the area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas remplacer l'appareil à moins que l'alimentation a été coupée ou que la zone est connue pour être non-dangereuse.



WARNING: Never connect or disconnect power when hazardous gases are present.

AVERTISSEMENT: Ne jamais brancher ou débrancher l'alimentation lorsqu'en presence de gaz dangereux.

Surrounding Air Temperature / Temperature Ambiante

NT24k-DC and NT24k-AC rackmount models: -40°C to 85°C

NT24k-DR16 and NT24k-DR24 models: -40°C to 75°C

Note: Use 105 °C or higher rated copper wire, (0.22NM) 2lb/in tightening torque for field installed conductors.
Remarque: Utilisez fil de cuivre classé 105 °C ou plus, (0.22Nm) 2 pouces/livres couple de serrage pour les connecteurs installés sur le terrain.

Laser Safety Warnings / Avertissements de Sécurité Laser

(Options: NTSFP-FX, NTSFP-FXE, NTSFP-SX, NTSFP-LX)



CAUTION: CLASS 1 LASER PRODUCT. Do not stare into the laser.
ATTENTION: PRODUIT LASER CLASSE 1. Ne pas regarder dans le laser.

Regulatory Information

Product Safety
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009
Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Marine
ABS Type Approval for Shipboard Applications
Other
EMC Directive 2014/30/EU
LV Directive 2014/35/EU GOST-R
RoHS compliant

KC Mark (Korea)

A 급 기기 (업무용 방송통신 기자재)	이기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외 지역에서 사용하는 것을 목적으로 합니다.
Class A device (Broadcasting and communication equipments for office work)	This equipment is office use (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

Chapter 1 Product Overview

NT24k® Modular Series Common Features

Red Lion's N-Tron® series NT24k modular switches are available in rackmount or 35mm DIN rail mountable configurations with high density Gigabit ports. The NT24k offers a wide array of port configurations and power input options that include Fast Ethernet and Gigabit speeds in copper or fiber. The hot-swappable port modules are auto-detected and configured by the switch, adding new definition to plug-and-play performance. Housed in rugged hardened enclosures, the NT24k series features extended shock and vibration specifications (bulkhead mount required to meet requirements), wide operating temperature ratings and best-in-class technology.

Connectivity

The NT24k series switches feature hot-swappable connectivity modules. These modules are available in Fast or Gigabit Ethernet, and are optionally available with copper, fiber or SFP ports. The NT24k accepts up to three modules for a maximum of 24 Ethernet ports, and can be changed without removing power from the switch.

Performance

The NT24k line of managed switches provide uncompromising performance in harsh environments including network features like N-Ring™, VLAN, Quality of Service (QoS), port mirroring, IGMP and SNMP.

Environmental

The NT24k series of managed switches are available in rackmount or 35mm DIN rail mountable configurations with operating temperatures up to -40° to 85°C. With UL Class I, Division 2 listing and CE certifications, these switches are built to last in the most demanding environments.

Monitoring

The NT24k Series includes N-View™ monitoring technology. N-View combines switch based technology with a Windows based OPC server and client monitoring tool. When N-View is enabled, the switch periodically autocasts a small Ethernet packet containing switch and port statistics. The data is captured by the N-View OPC server software and can be displayed by the provided N-View client or third party OPC client application running in the same Windows environment. For more information, please reference the N-View Installation and User's Guide.

Security

The NT24k series provides a high level of security utilizing IEEE 802.1x port-based network access control with RADIUS remote server authentication and SNMPv3 communication protocol to ensure the safest connections.

Available Models

PART #	TOTAL PORTS	MOUNTING	OPERATING TEMPERATURE	10/100/1000 COPPER	100 FIBER	GIG FIBER	SFP'S	18-49 VDC REDUNDANT POWER INPUT*	90-264 VAC/90-300 VDC POWER INPUT
NT24k-DR16-AC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	-	1
NT24k-DR16-DC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	1	-
NT24k-DR24-AC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-DR24-DC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-AC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-AC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	2
NT24k-AC1-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	1
NT24k-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-DC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	2	-

* Each 18-49VDC power input option includes redundant (2) power connections.

NT24k® Rackmount

The NT24k Rackmount Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 1U 19" rack mount enclosure. Designed to handle the most demanding environments, the NT24k supports up to two power inputs, extreme operating temperature range and three slots to accommodate mix-and-match port modules.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- Easily transitions to Gigabit network requirements

-40°C to 85°C operating temperature
Dual power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

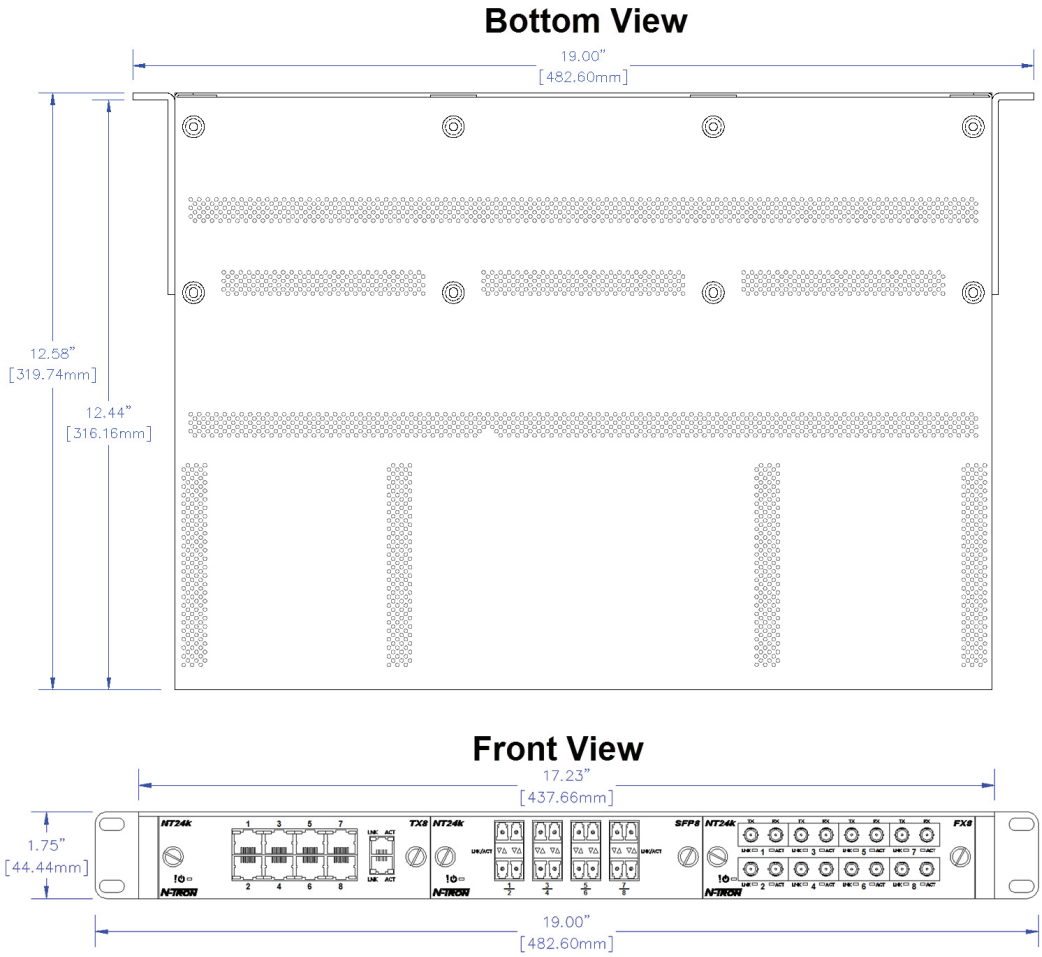
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- Trunking and port mirroring
- 802.1Q VLAN Tagging and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k® Rackmount Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
1.9" (4.8 cm)	17.5" (44.5 cm)	12.7" (32.0 cm)	12.85 lbs (5.83 kg)	Rackmount 1U
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.26 A @ 24 VDC Max: 790 mA @ 120 VAC/450 mA @ 124 VDC	185 @ 24 VDC 365 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 85 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k® Rackmount Dimensions



All specifications are subject to change. Consult the company website for more information.

NT24k-DR16

The NT24k-DR16 Managed Industrial Ethernet Switch features connectivity for up to 16 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to two of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

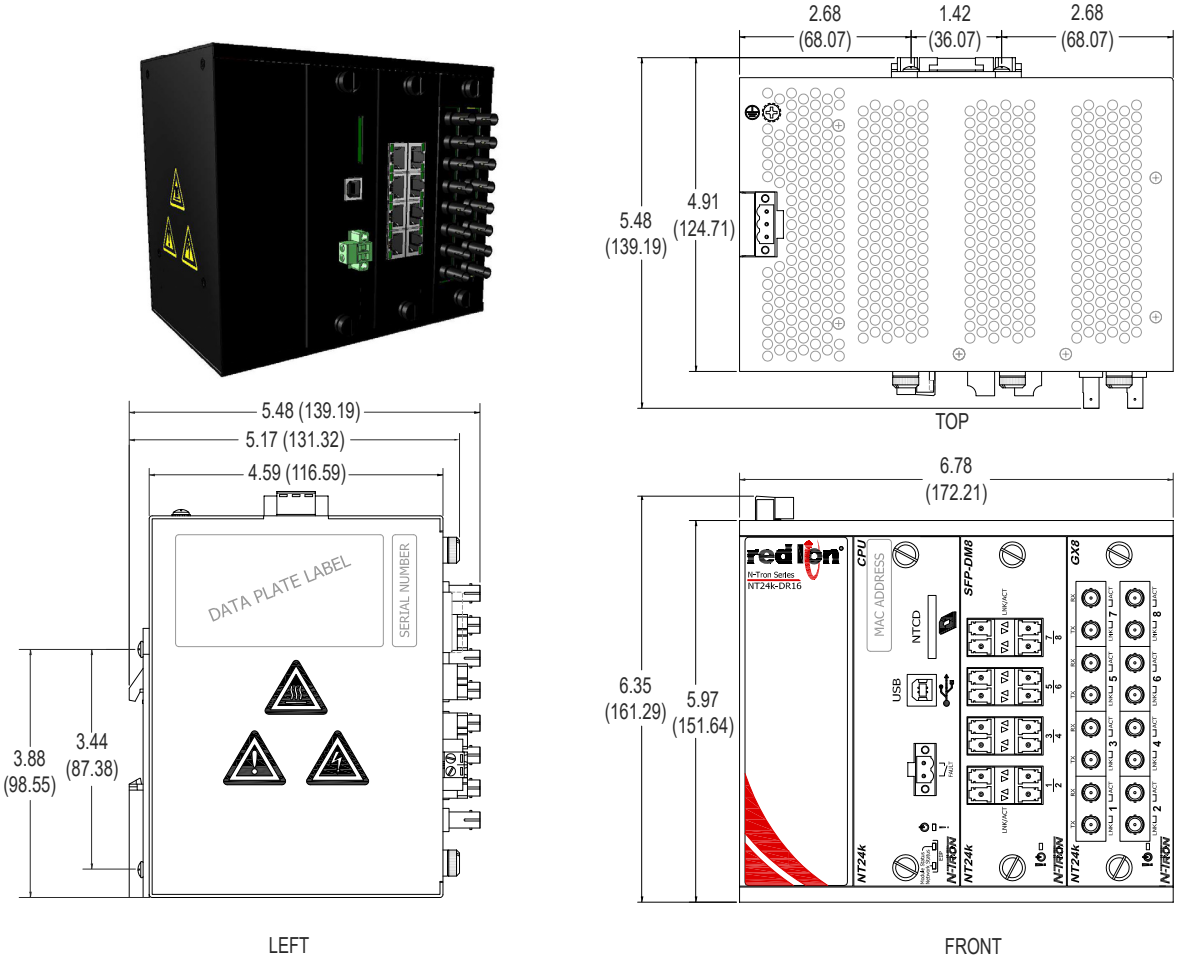
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x. with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k-DR16 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	6.78" (17.22 cm)	4.59" (11.65 cm)	6.4 lbs (2.9 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 1.52 A @ 24 VDC Max: 580 mA @ 120 VAC/300 mA @ 124 VDC	125 @ 24 VDC 268 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**		**Note**	
50g @ 10ms	30g, 10-200Hz, Triaxial		Unit must be bulkhead mounted to achieve these levels.	
CONNECTORS				
10/100/1000BaseT:(X): Up to 16 RJ45 ports				
100BaseFX: Up to 16 SC or ST fiber ports				
1000BaseSX/LX: Up to 16 SC fiber ports				
100BaseSX/LX SFP: Up to 16 LC fiber ports				
1000BaseGX SFP: Up to 16 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR16 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k-DR24

The NT24k-DR24 Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

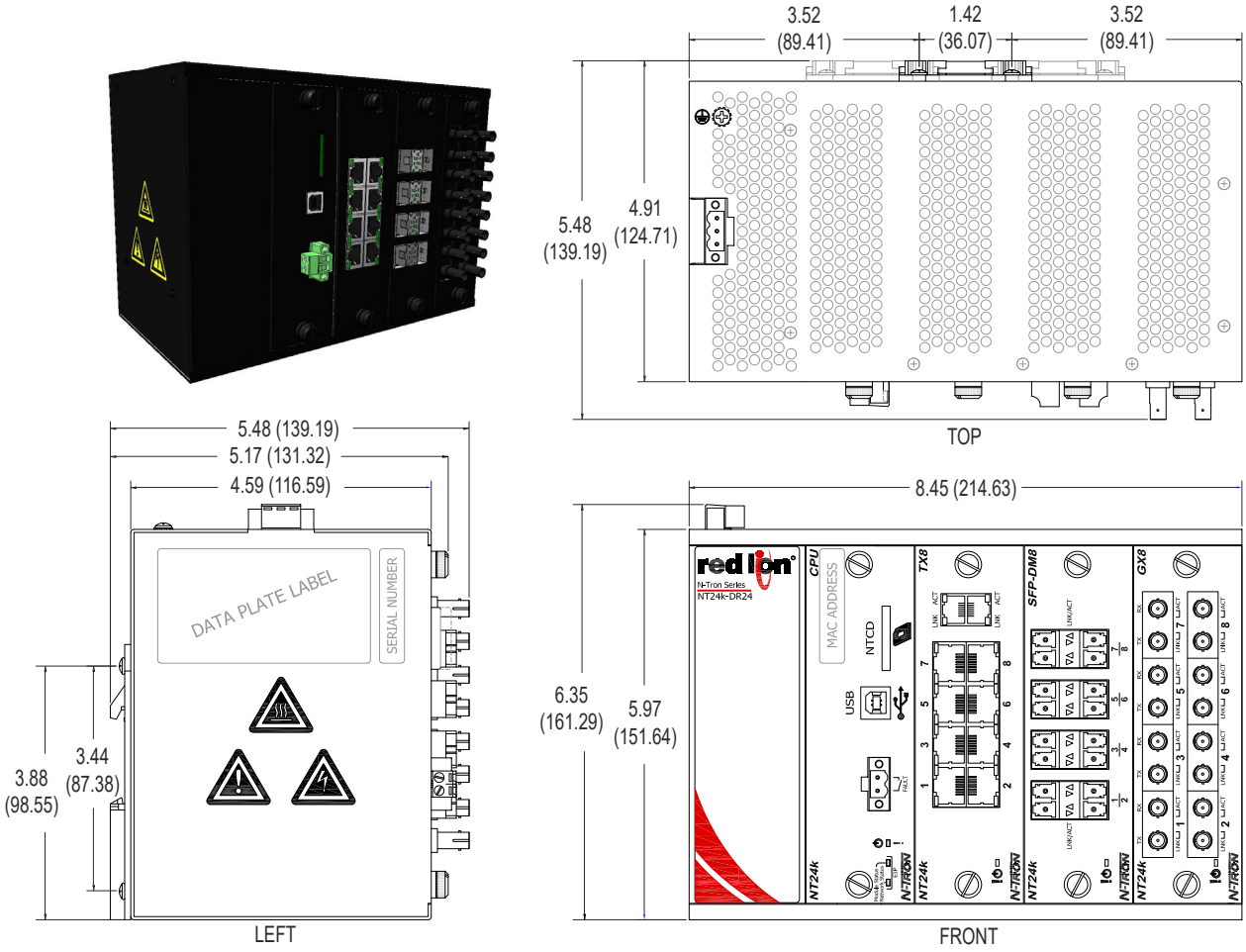
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™ CIP™ messaging

NT24k-DR24 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	8.45" (21.46 cm)	4.59" (11.65 cm)	7.8 lbs (3.54 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.14 A @ 24 VDC Max: 780 mA @ 120 VAC/430 mA @ 124 VDC	175 @ 24 VDC 360 @ 120 VAC/182 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR24 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k Views

NT24k Rackmount Unit Front View



NT24k Rackmount Unit View (Module Slots Identified)

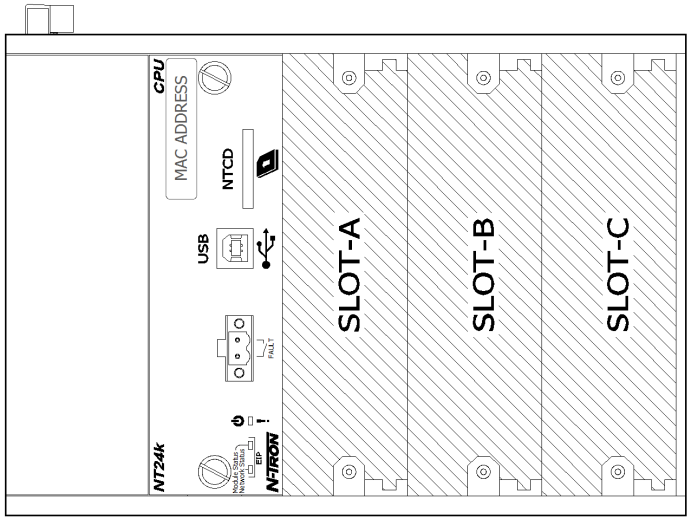


See “Ordering Information” for available module(s).

NT24k-DR16 Front View



NT24k DR Unit View (Module Slots Identified)



LEDs

The RJ45 data ports have two LEDs located on each connector. The left LED indicates link status and the right LED indicates activity.



The table below describes the operating modes:

LED	COLOR	DESCRIPTION
⏻	Green	Power is On
	Red	Power is On and a fault condition exists
	Off	Power is Off
LNK	Green	10/100/1000 Mb Link between ports
	Off	No link between ports
ACT	Green	Data is active between ports. Activity light blink rate indicates activity, not necessarily the volume of activity
	Off	Data is inactive between ports

EIP Indicators

The EIP Indicators are located either on the back of the rackmount version, or on the front of the CPU module of the DIN rail versions of the switch. The Module Status indicator shows the status of the switch. The Network Status indicator shows the status of the network interface.

MODULE STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up
Steady Green	The switch is operating normally
Flashing Green	The switch has not been configured
Flashing Red	A recoverable minor fault has occurred
Steady Red	A non-recoverable major fault has occurred
NETWORK STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up, or an IP address has not been configured
Flashing Green	An IP address is configured, but no connections have been established
Steady Green	A connection has been established
Flashing Red	A connection has timed out

Transceiver Characteristics

NT24k-FX8 Module - 100 MB Fiber Transceiver Characteristics

Fiber Length*	2 km	15 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24k-GX8 Module - Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 300 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24k-SFP-DM8 Module - SFP 100Base Fiber Transceiver Characteristics

Fiber Length*	2 km	10 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24k-SFP-DM8 or NT24k-SFP8 Modules - SFP Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 275 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance. Link budgets should be evaluated based on specific application conditions.

Chapter 2 Hardware Installation

Unpacking

Remove all the equipment from the packaging and store the packaging in a safe place. File any damage claims with the carrier.

Make certain the NT24k® Ethernet Switch package contains the following items:

1. NT24k switch
2. Product CD

Module Installation

Technicians performing the following steps should wear proper anti-static equipment to protect the circuit boards. Before removing the module from the ESD bag, touch a known grounded piece of metal to discharge any possible static electricity from the body.

1. Remove the faceplate from the slot in which the module will be inserted by turning the thumb screws counter clockwise.
2. Remove the module from the anti-static bag and insert into the slot aligning the board with the guide rails on either side. The module should slide smoothly into the slot.
3. Press the module firmly in place until the faceplate is flush against the front of the enclosure.
4. Align the threads of the thumb screws with the threads in the enclosure and screw them down until they are finger tight.

Ensure that all empty slots are covered with a faceplate to meet both emissions and safety requirements.

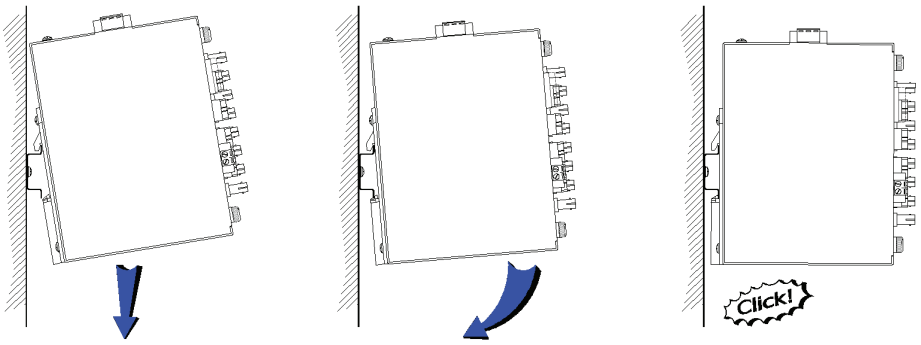
Mounting the NT24k

Rackmount Installation Instructions

The NT24k Rackmount unit comes configured with standard rack mount brackets which may be used to mount our products to standard 19" racks. As an alternative, Red Lion offers its NT24k Panel Mount Assembly (P/N: NT24k-PMK) used to securely mount the NT24k products to a panel or other flat surface.

A clearance of one inch should be observed on the sides, back, top and bottom to allow proper ventilation. Also a cable bend radius of 4 inches should be observed for the front and back of the unit.

DIN Rail Mounting Instructions

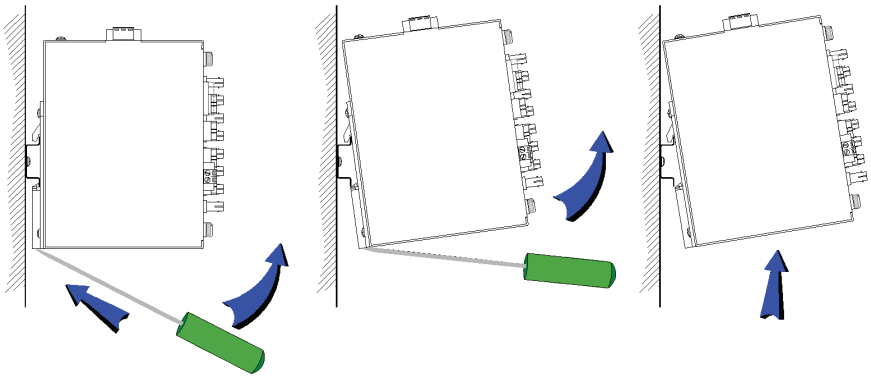


Install the switch to standard 35mm DIN rail as shown in the diagram above.

1. First, hook the top of the 35mm DIN rail clip on the back of the switch to the rail.
2. Then, gently rotate the front of the switch downward, towards the panel.
3. Push the bottom of the switch towards the rail until it locks into place.
4. Apply upward force to verify the switch is securely installed.

5. Connect any communications cables to the switch.
6. Install the power and ground wires.
7. Apply power to the power supply.

DIN Rail Removal Instructions



Remove the switch from standard 35mm DIN rail as shown in the diagram above.

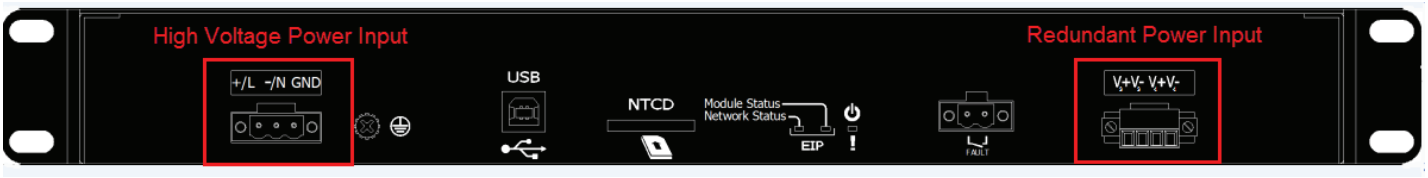
1. Ensure power from the power source is off.
2. Disconnect power and ground wires.
3. Disconnect any communications cables from the unit.
4. Insert a standard flat/slotted screwdriver into the slot provided on the DIN rail clip.
5. Using the base of the switch as a pivot point, apply upward force on the screwdriver to release the DIN rail clip.
6. With the DIN rail clip latching mechanism released, continue to rotate the switch upward and away from the panel.
7. Once the switch has been rotated upward, remove the screwdriver.
8. Carefully lift the switch upward and away from the DIN rail and panel.

Power Source

The NT24k-DR16 and NT24k-DR24 series operate with one power supply, either AC or DC.

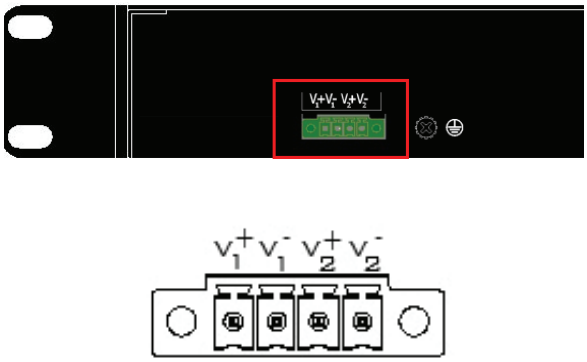
The Rack Mount NT24k® can be ordered with one or two power input options.

Each power supply can be AC or DC. Each low voltage DC Power supply includes redundancy (two DC supplies). The NT24k-AC1-DC1 model shown below comes with a high voltage power input on the left (90-264VAC / 90-300VDC) and a redundant 18-49VDC power input on the right.



Note: LEDs are described in detail in “LEDs”.

NT24k® Rack Mount with DC Power Input Installed

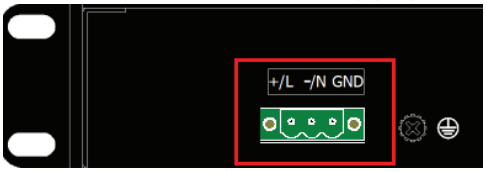


1. Unscrew and remove the DC voltage input plug from the power input header.
2. Install the DC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

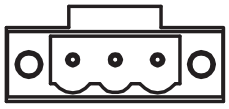
Note: When a DC power supply is installed, only one power supply must be connected to power for minimal operation. For redundant power operation, V1 and V2 inputs must be connected to separate DC voltage sources. This device will draw current from both sources simultaneously. Use 16-28 gauge wire when connecting to the power supply.

Recommended 24 VDC power supply, similar to Red Lion's P/N NTPS-24-3.

NT24k with AC Power Supply Installed



+/L -/N GND



1. Unscrew and remove the AC voltage input plug from the power input header.
2. Install the AC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

Note: When an AC power supply is installed (i.e. the -AC option), use 12-24 gauge wire when connecting to the power supply.

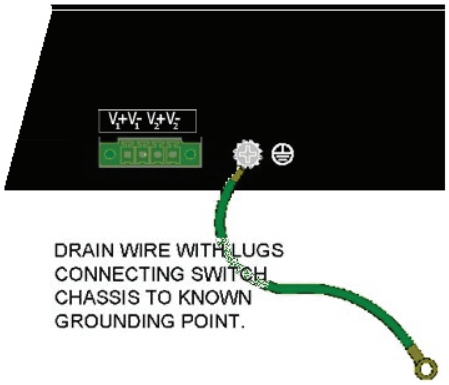
Grounding the Unit

The grounding of any control system is an integral part of the design. The optimum noise immunity and emissions are obtained when the NT24k® chassis is connected to earth ground via a 14-18 gauge drain wire. The NT24k units provide a ground lug (see illustration) that is used to provide a safe grounding path of the device. For the NT24k-AC power supplies, the chassis may also be connected to earth ground using the input power plug labeled “GND.”

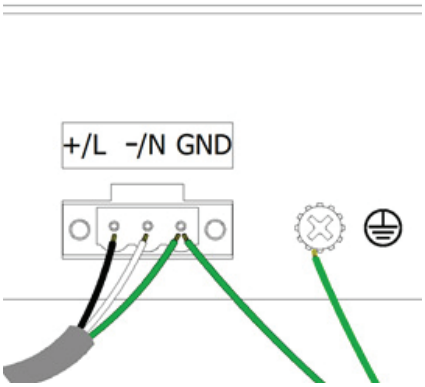
Note: The NT24k power input (V-) pins are isolated from chassis ground. Do not attempt to ground the switch to earth ground via the power input pins (V-).

Remarque: La NT24k puissance d’entrée (V-) broches sont isolés de la masse du châssis. Ne pas essayer pour mettre le commutateur à la terre via les broches d’entrée d’alimentation (V-).

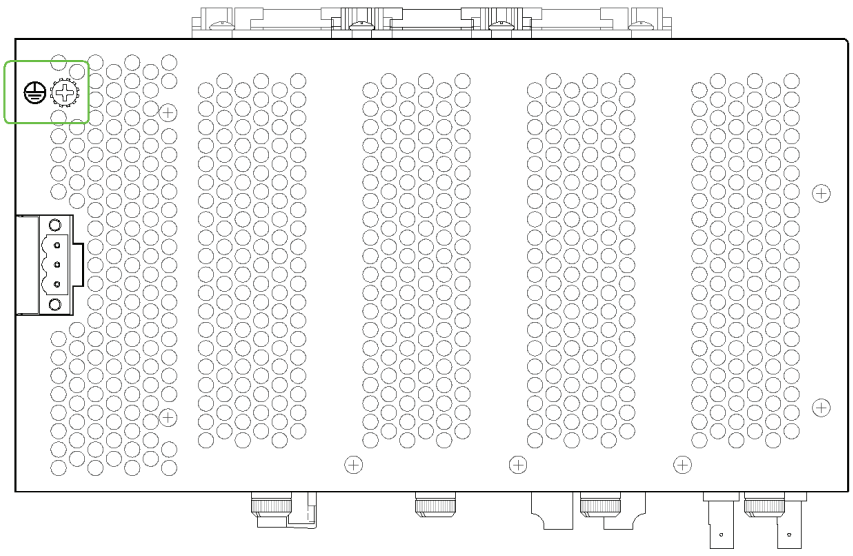
NT24k DC Power



NT24k AC Power



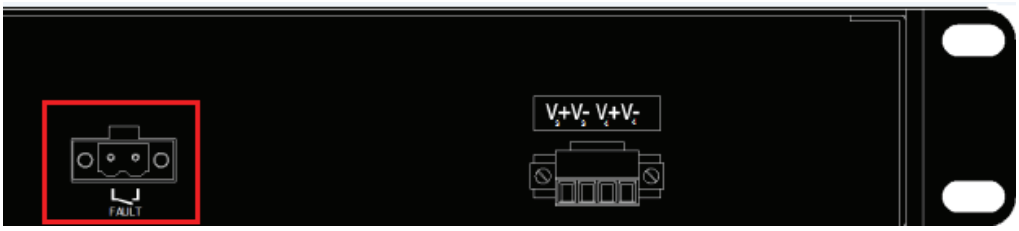
For the DIN rail models, see the illustration below for grounding:



Configurable Alarm Contact

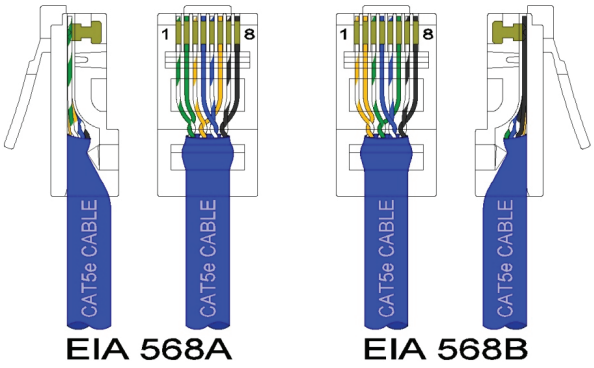
The alarm contact located on the back of the NT24k® rack mount unit or on the front of the NT24k-DR16 and NT24k-DR24 models, can be used to control an external warning device based on an event. The current carrying capacity is 1A at 24VDC. It is normally open and the relay closes when a fault condition occurs, though this can be reversed via configuration. These pins can be used to connect an external warning device such as a light in order to provide an external alarm. The conditions for generating a fault condition (closing the relay) can be configured through software.

Refer to the NT24k Software User's Guide for more information.



Connecting the Unit

For 10/100/1000/T(x) ports, plug a Category 5E twisted pair cable into the RJ45 connector. Connect the other end to the far end station. Verify that the LNK LEDs are ON once the connection has been completed. To connect any port to another device, use a standard CAT5E straight through or crossover cable with a minimum length of one meter and a maximum length of 100 meters.



Red Lion recommends the use of pre-manufactured CAT5E cables to ensure the best performance. If this is not an option and users must terminate their own ends on the CAT5E cables; one of the two color coded standards shown to the right should be utilized. If a user does not follow one of these standards then the performance and maximum cable distance will be reduced significantly, and may prevent the switch from establishing a link.

For FX/FXE/GX/GXE units, remove the dust cap from the fiber optic connectors and connect the fiber optic cables. The TX port on the FX/FXE/GX/GXE models should be connected to the RX port of the far end station. The RX port on the FX/FXE/GX/GXE versions should be connected to the TX port of the far end station.

⚠	**WARNING –** Creating a network loop without employing a network path protocol such as N-Ring™, N-Link, or RSTP is an illegal operation that can create a network storm which will crash the network. **Avertissement -** La création d'un réseau sans boucle employant un chemin réseau protocole tels que N-Ring, N-Link, ou RSTP est une opération illégale que peut créer une tempête du réseau qui va planter le réseau.

Ethernet Cable

If you are connecting to the unit via the copper port, you will need a straight or crossover cable with two 8-pin RJ45 connectors on each end.

To visually confirm that Ethernet cabling was done properly, check the LED indication on the Ethernet port of the unit. The link LED should be on when the correct cable is used.

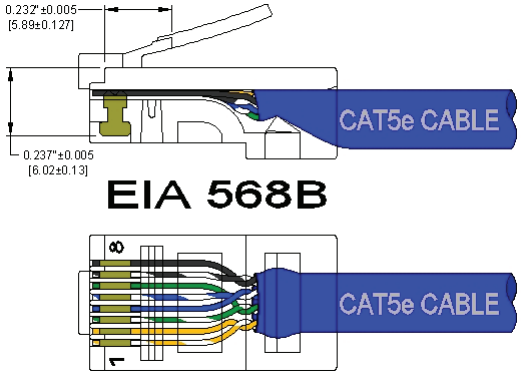
Note: A shielded cable is required to fully meet EMC standards.

When using shielded cables, it is generally recommended to only connect the shield at one end to prevent ground loops and interference with low level signals (i.e. thermocouples, RTD, etc.). CAT5e cables manufactured to EIA-568A or 568B specifications are required for use with Red Lion series switches.



In the event all CAT5e patch cables are short (i.e. All Ethernet devices are located in the same local cabinet and/or referenced to the same earth ground), it is permissible to use fully shielded cables terminated to chassis ground at both ends in systems avoid low level analog signals.

RJ45 Connector Crimp Specifications



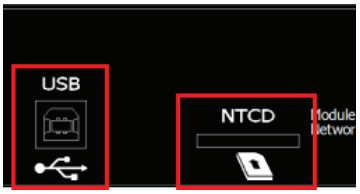
NTCD

NTCD-CFG Configuration Device

NTCD-CFG Configuration Device



Ideal for saving, or restoring switch configuration parameters quickly without the need for a computer or software. One configuration device per switch is recommended.



The USB configuration slot is located on the back of the NT24k® rackmount models and on the front of the NT24k-DR16 and NT24k-DR24 models.

The unit could be configured with multiple power supply configurations.

⚠	**WARNING – Explosion Hazard** – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion** - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

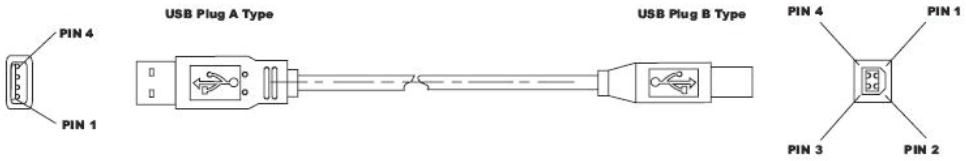
USB Interface

The NT24k switches provide a USB interface accessed via the USB connector labeled as "USB" on the back of the NT24k rackmount models and the front of the NT24k-DR16 and NT24k-DR24 models. The USB connection is used to access the Command Line Interpreter (CLI) or PPP (Point-to-Point Protocol).



USB Cable

Connect the USB port of your PC and the Switch using a standard USB cable. A cable with a Type A connector for the PC end, and a Type B connector for the switch end must be used.



Standard USB cables are readily available from a variety of computer stores.

Terminal

The following configuration should be used in HyperTerminal:

Port Settings: 115200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

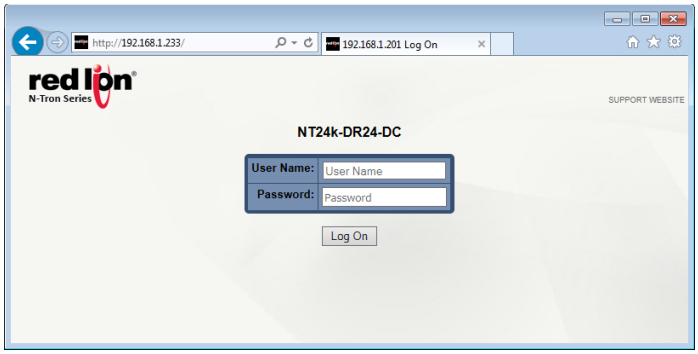
⚠	**WARNING – Explosion Hazard –** The USB connection is for temporary connection only. Do not use, connect, or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion -** La connection USB est pour la connexion temporaire seulement. Ne pas utiliser, connecter ou déconnecter sauf si la zone est connue pour être non dangereuse. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

Cleaning

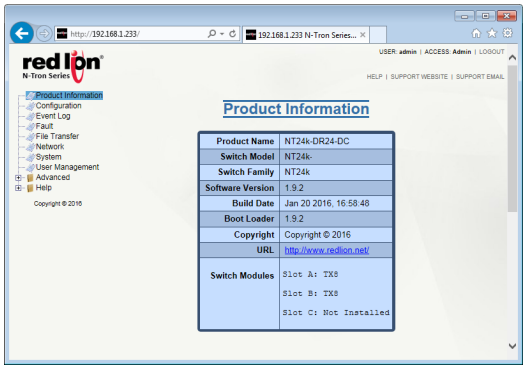
Clean only with a damp cloth. Excess moisture or harsh chemicals can cause damage to the unit.

Chapter 3 Accessing the Web Software Interface

1. Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default by entering 192.168.1.201 as the fallback address.
2. The following login screen will appear.



3. For the User Name, enter: **admin** (all lowercase).
4. For the Password, enter: **admin** (all lowercase).
   Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.
5. Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Please consult the NT24k® Software Guide for configuration options.

Service and Support Information

Service Information

We sincerely hope that you never experience a problem with any of our products. If you do need service, call Red Lion at 1-877-432-9908 for Technical Support. A trained specialist will help you determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RO (Repair Order) can be obtained on the Red Lion website.

Red Lion tracks the flow of returned material with our RO system to ensure speedy service. You must include this RO number on the outside of the box so that your return can be processed immediately.

Be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RO form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Repairs are completed as soon as possible. If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your Red Lion system for future reference.

P.O. #: _____ Date Purchased: _____
Purchased From: _____
Serial Number: _____

Product Support

Technical Support:
Inside US: +1 (877) 432-9908
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Support: support.redlion.net
Hours: 8:00 am to 6:00 pm EST

Red Lion Controls
35 Willow Springs Circle
York, PA 17406
Website: www.redlion.net

Ordering Information

NT24k® Rackmount

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC / 90-300 VDC power input
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC / 90-300 VDC power inputs
NT24K AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC / 90-300 VDC and 18-49 VDC power inputs
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR16

PART NUMBER	DESCRIPTION
NT24K-DR16-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; redundant 18-49 VDC power input
NT24K-DR16-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR24

PART NUMBER	DESCRIPTION
NT24K-DR24-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; redundant 18-49 VDC power input
NT24K-DR24-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

Port Modules

PART NUMBER	DESCRIPTION
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2 km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550 m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

SFP Transceivers

PART NUMBER	DESCRIPTION	MAXIMUM CAPACITY PER SWITCH	MODULE REQUIRED
NTSFP-FX	100 BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2 km)	Up to 24	NT24k-SFP-DM8
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP luggable mini-GBIC transceiver (LC style connector)	Up to 24	NT24k-SFP-DM8
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver	Up to 16	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

LIMITED WARRANTY

(a) Red Lion Controls Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

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BY INSTALLING THIS PRODUCT, YOU AGREE TO THE TERMS OF THIS WARRANTY, AS WELL AS ALL OTHER DISCLAIMERS AND WARRANTIES IN THIS DOCUMENT.

N-Tron® Series
NT24k® Gigabit Ethernet Switches

Software Guide | February 2024

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Preface

Disclaimer

This software guide provides guidance on how to use the NT24k®. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

This guide is intended to be used by personnel responsible for configuring and commissioning NT24k devices for use in visualization, monitoring, and control applications. Users of this document are urged to heed warnings and cautions used throughout the document.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- EtherNet/IP™and CIP™ are trademarks of ODVA.

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Certifications

Red Lion Controls ensures that this device meets all the ODVA technology and standards guidelines for the Common Industrial Protocol (CIP) for industrial automation.

ODVA CONFORMANT

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at: https://www.redlion.net/support/documentation/user-manuals.

Additional Product Information

Additional product information can be obtained by contacting your local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Chapter 1 Security Best Practices

Introduction

It is more important than ever to secure network devices from unauthorized access, both within and outside of your organization. Red Lion strongly recommends installing managed layer-2 switches behind a secure network firewall in access controlled locations, and immediately changing all default user accounts and passwords, as well as disabling protocols that are not needed in your application.

Protocols and user names with their default passwords are listed in the table below.

PROTOCOLS/USERS	DEFAULT NAME	DEFAULT PASSWORD
User Login	admin	Admin
SNMPv3 User Authentication	initial	Authpass
SNMPv3 User Privacy	initial	Privpass
SNMP v1/v2	read community	Public
SNMP v1/v2	write community	Private
SNMP v1/v2	trap community	public

Some protocols and special devices are enabled by default for the best overall out of the box experience. However, if any in this group will not be used or needed in your network, then these should be disabled to prevent unexpected behavior, unauthorized access or usage. These protocols and special devices are listed in the table below:

PROTOCOLS OR SPECIAL DEVICES
CIP™
SNMP
NTCD
DHCP Client
RSTP
LLDP
N-View™

Managing Local and Remote Access Using 802.1X

Red Lion strongly recommends using 802.1X to manage local and remote access as a best practice for larger installations. 802.1X allows for the management of users, devices, profiles, certificates, and so forth from a single location which also provides a high degree of security.

Default Passwords

User Passwords

The NT24k® ships from the factory with a default ***admin*** user account. Red Lion strongly recommends creating a new user with administrative privileges and then deleting the default ***admin*** user before the unit is deployed.

At a minimum, the default password for the ***admin*** user should be changed.

SNMPv3 Users

The NT24k® ships from the factory with SNMP enabled and a default SNMPv3 user. If SNMP will be used, then Red Lion strongly recommends creating a new SNMPv3 user and then deleting the default ***initial*** SNMPv3 credentials. At a minimum, the default password for the ***default*** user should be changed.

It is strongly recommended that both authentication and privacy protocols are enabled for all v3 users. Setting the option to ***None*** for either protocol is discouraged.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

SNMP v1/v2 Community Names

The NT24k ships with default Community Names for SNMP v1/v2 operation. SNMP v1/v2 traffic per the standard is neither hashed nor encrypted. Therefore, it is Red Lion's recommendation that customers requiring SNMP use SNMPv3, which offers more secure SNMP communication.

If SNMP v1/v2 is required in your application, Red Lion strongly recommends changing the default SNMP credentials before deployment.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

Legacy Protocols

When multiple revisions of a protocol are supported, Red Lion enables the most secure version by default and disables legacy (unsecure) versions of the protocol. We strongly recommend leaving the older revisions disabled.

LEGACY PROTOCOL	SECURE PROTOCOL EQUIPMENT
HTTP	HTTPS
Telnet	SSH

Disabling Unused Protocols and Special Devices

Certain network protocols and special devices are enabled by default for the best overall out of the box experience. However, some of these protocols and devices have the capability of configuring and/or reading network settings or causing unexpected network behavior. These protocols and devices should be disabled when they are not being utilized in your network to prevent unexpected behavior, unauthorized access and/or control of your network and individual network devices.

The following protocols or special devices meet these criteria:

- CIP™
- SNMP
- NTCD (Configuration Device)
- DHCP Client
- RSTP
- LLDP
- N-View™

Chapter 2 Features and Specifications

NT24k® Series Common Features

Red Lion's N-Tron® Series NT24k all-Gigabit managed industrial Ethernet switches are available in rack or DIN-rail mountable configurations. The NT24k platform offers a wide array of port configurations, media types and Power over Ethernet Plus (PoE+) models including Fast Ethernet, Gigabit copper and fiber options. All NT24k switches are plug-and-play installable with Internet Group Management Protocol (IGMP) auto-configuration, media/port auto-detection and simple ring configuration, making the NT24k platform one of the easiest to deploy managed switches in the industry. Housed in rugged hardened enclosures, NT24k switches feature extended shock and vibration specifications, wide operating temperature ratings, and best-in-class ring technology.

Connectivity

The modular NT24k switches are available in 2 or 3 slot configurations. Port modules are hot-swappable. Available modules include 10/100/1000Base Copper, 100Base Fiber, 1000Base Fiber, Gigabit Small Form-factor Pluggable (SFP) Ports and Dual Mode (100Base/1000Base) SFP ports. Modules and SFP transceivers are sold separately. Please reference the N-Tron Series “NT24k Modular Series Hardware & Installation Manual” for available configuration options.

The compact series offers a wide variety of copper and fiber configurations, including all Gigabit copper, Gigabit fiber or SFP ports. IEEE 802.3af/at Power over Ethernet (PoE) models are also available. Please reference the N-Tron Series “NT24k Compact Industrial Managed Gigabit Ethernet Switches Hardware Manual” for more information.

Performance

NT24k-managed switches provide uncompromising performance in harsh environments, including network features like N-Ring™, Virtual Local Area Network (VLAN), Quality of Service (QoS), port mirroring, IGMP, Simple Network Time Protocol (SNTP) and Simple Network Management Protocol (SNMP). IEEE 1588v2 (Precision Time Protocol, or simply PTP) models are also available. Additionally, the NT24k offers IEEE 802.1X with RADIUS remote server authentication to ensure port security. These network management features provide best-in-class visibility, security, and uptime performance.

Environmental

The ultra-reliable NT24k switches are available in rackmount or DIN-rail mountable configurations with operating temperatures from -40 to 85°C. With UL Class I, Division 2 listing and CE certifications, these industrial switches are built to last in the most demanding and hazardous environments.

Monitoring

The N-View™ monitoring technology software provides 47 different status points on switch and port conditions and displays that information on any networked computer.

Security

The NT24k series provides a high level of security by utilizing IEEE 802.1X with RADIUS remote server authentication, MAC address based port security, Hyper Text Transfer Protocol Secure (HTTPS), Secure Shell or Secure Socket Shell (SSH), and SNMPv3 communication protocol to ensure the safest networks.

Refer to the NT24k Hardware Manuals for more information on our Modular and Compact Series.

Overview of Advanced Features

Mode of Operation

Each port on the switch can be configured to support different modes of operation as shown below:

Copper Ports:
- Half-Duplex
- Full-Duplex
- Auto-Negotiation

1000Base Copper or any Fiber Ports:
- Full-Duplex

Half-Duplex

In half-duplex mode, the CSMA/CD media access ports share a common transmission medium. To transmit, a port waits (defers) for a quiet period on the medium (that is, no other port is transmitting) and then sends the intended message in bit-serial form. If, after initiating a transmission, the message collides with that of another port, then each transmitting port intentionally transmits for an additional predefined period to ensure propagation of the collision throughout the system. The port remains silent for a random amount of time (back-off) before attempting to transmit again.

Full-Duplex

Full-duplex operation allows simultaneous communication between a pair of ports using point-to-point media (dedicated channel). Full-duplex operation does not require that transmitters defer, nor do they monitor or react to receive activity, as there is no contention for a shared medium in this mode.

However, a receiving endpoint may request that the transmitting endpoint pause transmission to prevent receive buffer overflow. When the receiving buffer capacity becomes sufficient again, the receiving endpoint will notify the transmitting endpoint that transmission may resume.

Auto-Negotiation

In Auto-Negotiation mode, the port/hardware detects the mode of operation of the port that it is connected to and sets its mode to match.

Port Mirroring

A Mirroring Port is a dedicated port that is configured to forward copies of Ethernet frames that are being sent or received from a monitored port. This is normally only used during troubleshooting and debug of the network. Under normal operation, Port Mirroring is disabled.

Port Trunking

Port Trunking is the ability to group network ports to increase the bandwidth between two machines (e.g., switch or any work station). This feature allows grouping of high-speed connectivity and provides a redundant connection between switches, so that a trunk can act as a single link between the switches.

Quality of Service (QoS)

QoS refers to resource reservation control mechanisms. QoS is the ability to provide different priorities to different applications, users, or data flows. QoS guarantees are important if the network capacity is insufficient, especially for real-time streaming multimedia applications such as Voice over IP, high resolution images, online games and IP-TV, since these often require fixed bit rate and are delay sensitive, and in networks where the capacity is a limited resource, for example in cellular data communication. In the absence of network congestion, QoS mechanisms are not required.

The QoS of an egressing frame can be set based on the three QoS mechanisms listed below:

1. IEEE 802.1p (Tagged QOS)

2. DSCP (differentiated services code points) (RFC 2474)
3. Port (Default Priority)

Virtual Local Area Network (VLAN)

The switch provides support for setting up tagged VLANs. A port may belong to any number of VLANs. The VLAN membership of an end device is determined by the VLAN(s) defined for the port to which the device is connected. If a device should move from one port to another, it loses its current VLAN membership and inherits that of its new port.

VLANs facilitate easy administration of logical groups of devices that can communicate as if they were physically on the same LAN. Traffic between VLANs is restricted unless the ports are explicitly configured as overlapping VLANs. Switches forward unicast, multicast, and broadcast traffic only on LAN segments that serve the VLAN to which the traffic belongs.

A default Virtual LAN (VID=1) exists so if a port is not a member of any other VLAN, it will default back to VLAN 1. This allows the switch to operate as a 'normal' switch when it is used in a network. A port may be automatically removed from the default VLAN when it is reconfigured to belong to another VLAN. By default, the switch will automatically remove a port from the default VLAN when it is reconfigured to another VLAN. See the VLAN configuration section in Chapter 2 for additional information.

If switch ports are configured to transmit and receive untagged frames, then their connected devices are able to communicate throughout the LAN. Using Tagged VLANs, the switch has the ability to take non-tagged packets in some ports, add a VLAN tag to the packet and send it out to tagged ports on the switch. VLANs can also be configured to accept tagged packets in tagged ports, strip the tags off the packets, and then send the packets back out to other untagged ports. This allows a network administrator to set up the switch to support devices on the network that do not support VLAN tagged packets. The administrator can also set up the ports to discard any packets that are tagged or to discard any packets that are untagged, based on a hybrid VLAN of both tagged and untagged ports and by using the VLAN Ingress Filter on the switch.

For each switch port there is one and only one PVID (port VLAN ID) setting. If an incoming frame is untagged and untagged frames are being accepted, then that frame will inherit the tag of the PVID value for that port. Subsequent switch routing and treatment will be in accordance with that VLAN switch map. By configuring PVIDs properly and configuring for all frames to exit untagged, the switch can achieve a 'port VLAN' configuration in which all frames in and out can be untagged, thus not requiring external devices to be VLAN cognizant.

To understand how a VLAN configuration will perform, first look at the port on which the frame enters the switch, then the VLAN ID (VID) (if the frame is tagged) or the PVID (if the frame is untagged). The VLAN defined by the VID or PVID defines a VLAN group with a membership of ports. This membership determines whether a port is included or excluded as to frame egress from the switch.

The NT24k® switch also has the ability to allow overlapping VLANs. Overlapping VLANs give the user the ability to have one or more ports share two or more VLAN groups. For more information and examples on how this could be implemented, refer to the 'VLAN Configuration Examples' in this document, and/or our website's technical documents.

Note: RSTP is only supported on one VLAN.

Rapid Spanning Tree Protocol (RSTP)

Rapid Spanning Tree Protocol as specified in IEEE 802.1D-2004, is supported. One Spanning Tree on one VLAN is supported. (RSTP supersedes the Spanning Tree Protocol (STP) described in IEEE 802.1D-1998.) RSTP establishes a simply connected active network topology from the arbitrarily connected bridges of a bridged network. Bridges effectively connect just the LANs to which their forwarding ports are attached. Ports that are in a blocking state do not forward frames. The bridges in the network exchange sufficient information to automatically derive a spanning tree.

RSTP provides quicker learning of network topology changes than the older STP. RSTP supports new and improved features such as the rapid transition of ports to the forwarding state. While STP transmits BPDUs (Bridge Protocol Data Units) from only the root bridge, RSTP transmits BPDUs from every bridge. RSTP inter-operates with older STP switches by falling back to STP when the older BPDUs are detected on bridge ports. The user can also manually configure bridge ports to use STP, if desired.

SNMP Traps

The NT24k® Series switch supports SNMP Trap Stations to which SNMP Traps will be sent. Four standard SNMP traps are supported: Link Status (Link Up / Link Down), Cold Start, Warm Start, and Authentication Errors. SNMP Traps are sent to all trap stations configured on a given switch when the corresponding trap is enabled.

IGMP Snooping

IGMP Snooping is enabled by default. The switch provides automatic (Plug and Play) IGMP configuration. IGMP snooping provides intelligent network support for multicast applications, reducing unneeded network traffic. IGMP Snooping is configured via the web console and if enabled, operates dynamically upon each power up. Also, there can be manual only or manual and dynamic operation. Note that “static multicast group address” can be used whether IGMP Snooping is enabled or not.

The Internet Group Management Protocol (IGMP) is a protocol that provides a way for a device to report its multicast group membership to adjacent 'routers'. In this case NT24k switches provide router-like functionality. Multicasting allows one computer to send content to multiple other computers that have identified themselves as interested in receiving the originating computer's content. Multicasting can be used to transmit only to an audience that has joined (and not left) a multicast group membership. IGMP version 2 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 2236. IGMP version 1 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 1112. The NT24k series supports v1 and v2.

IGMP Snooping will function dynamically without user intervention. If some of the devices in the LAN do not understand IGMP, then manual settings are provided to accommodate them.

N-Link

The purpose of N-Link is to provide a way to redundantly couple an N-Ring topology to another topology, typically another N-Ring topology. Each N-Link configuration requires 4 switches, two on each network. On the N-Ring network, one switch is the N-Link Master and an adjacent switch is the N-Link Slave. On the connected network, one switch is the N-Link Primary Coupler and another switch is the N-Link Standby Coupler.

N-Link monitors the link status of the Primary and Standby Coupler links. As long as the Primary Coupler link is healthy, N-Link forwards network traffic and the Standby Coupler link blocks network traffic. When a problem is detected on the Primary Coupler link, the Primary Coupler link blocks network traffic and the Standby Coupler forwards network traffic. While the N-Link Master and Slave are in communication via the Control link, only one Coupler link (Primary or Standby) forwards network traffic, while the other Coupler link blocks network traffic.

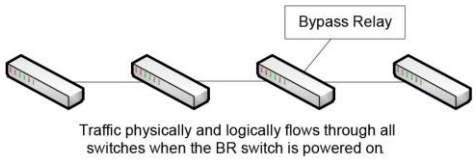
N-Ring™

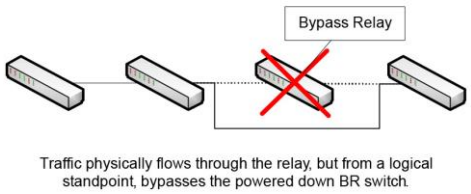
N-Ring is designed for easy setup. Switches are configured for N-Ring membership, by default. Setting a switch as the N-Ring Manager is the only required step for enabling the ring as long as preset ports are used to connect ring members. Subsequently, N-Ring operates dynamically upon each power up. N-Ring technology offers expanded ring size capacity, detailed fault diagnostics, and a standard healing time of 30ms. The N-Ring Manager periodically checks the health of the N-Ring via health check packets. If the N-Ring Manager stops receiving the health check packets, it times-out and converts the N-Ring to a

backbone within 30ms. When using all N-Ring enabled switches in the ring, a detailed ring map and fault location chart is also provided on the N-Ring Manager's web browser. N-Ring status is also sent from the N-Ring Manager to the N-View™ OLE for Process Control (OPC) Server to identify the health status of the ring. Up to 250 N-Ring enabled switches can participate in one N-Ring topology. Switches that do not have N-Ring capability may be used in an N-Ring, however the ring map and fault location chart cannot be as detailed at these locations.

Bypass Relay (BR)

BR ports have an internal hardware technology that forces paired BR ports to create a physical connection when the switch powers down. The BR switch is in bypass mode when it is powered down. This feature allows devices connected via these ports to continue communicating despite the BR switch being powered down.





Note: BR ports are only supported on select NT24k® models. BR-capable equipment is denoted by a "-R" in the model name. Likewise, BR capable ports are denoted by a "-R" in the port description.

Note: Some port protocols and port properties are not supported or may be affected by BR ports.

Affected Port Protocols

802.1X

802.1X security cannot be enabled on BR ports. Allowing this protocol on BR ports will lead to network security issues when the switch enters bypass mode. Therefore, 802.1X security is not allowed.

N-Link

N-Link Coupler and Control ports cannot be selected on BR ports. If BR ports were utilized for these links, there would be connection issues upon the switch entering bypass mode. It is also a best practice to ensure that neither the Master nor Slave Partner ports are connected to a BR port. Unlike the Coupler and Control ports, these ports are not user configured, but are auto-detected by the N-Link protocol. Use extra care when introducing BR equipment into an N-Link topology and avoid using BR ports for the N-Link connections.

N-Ring™

N-Ring Manager, Auto Member, and Multi Member cannot be enabled on BR port sets. N-Ring port sets exclude BR-capable ports.

RSTP

RSTP is disabled on BR ports to prevent unacceptable performance within an RSTP topology.

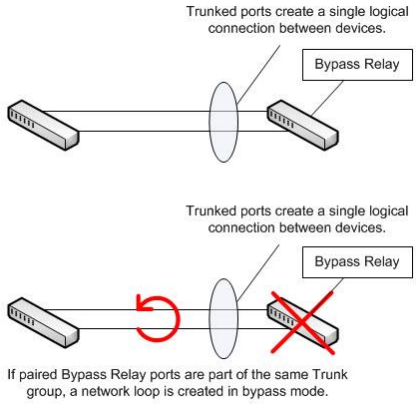
IGMP

Caution must be taken when IGMP is enabled. Devices connected to BR ports must be able to accommodate higher traffic rates. Test your network conditions with the BR switch both powered on and off if IGMP is to be enabled on a BR port.

Affected Port Properties

Port Trunking

BR port pairs cannot be members of the same trunk group to prevent a network loop being created in bypass mode.



VLAN

VLAN group membership must be identical between BR port pairs to ensure proper flow of traffic when the switch enters bypass mode. Caution must also be taken when modifying VLAN tags or filtering VLAN traffic on BR ports to ensure that all devices connected to BR ports can accommodate VLAN traffic whether the BR switch is powered on or powered off.

Note: The VLAN(s) associated with RSTP may contain BR ports, however RSTP will be disabled on the BR ports.

Port Compatibility

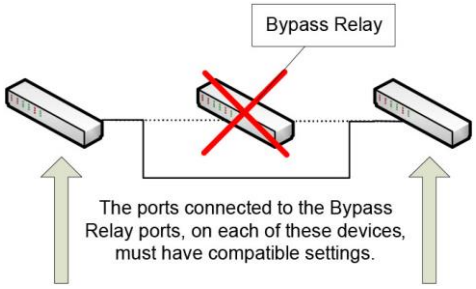
Care should be taken to ensure port characteristics of devices connected via BR ports are compatible, so that there are no interruptions in traffic when a BR switch enters bypass mode.

Ports and/or devices connected to the BR ports must be configured with compatible settings.

The following characteristics should be compatible for devices connected via BR ports:

- Auto-Negotiation
- Port Speed
- Duplex Mode
- Flow Control
- Flow Control
- PVID
- QoS
- Rate Limiting

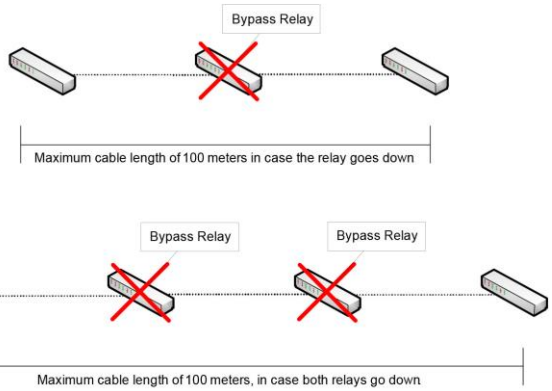
For example, if switches A and B are connected via a BR switch, the connecting port on switch A should have the same configured port speed as the connecting port on switch B. If these ports have incompatible speeds, they may have issues communicating once the switch enters bypass mode.



Note: It is still possible to customize port settings in any configuration desired, based on network requirements. Network testing must be performed to ensure correct network operation whether the switch is powered on or powered off.

Segment Length

Based on IEEE specifications, the maximum segment length for 10/100/1000BaseT(X) is 100 meters (328 ft). This requirement applies to combined segment lengths between all devices connected via BR port pairs. Staying within the IEEE specified segment length ensures proper operation.



CIP™

The CIP (Common Industrial Protocol) feature allows N-Tron® Series switches to directly provide switch information and configuration access to Programmable Logic Controller (PLC) and Human Machine Interface (HMI) applications via a standardized communication protocol. For example, a PLC may be programmed to monitor port links or N-Ring™ status and trigger a status indicator to turn red on an HMI if a port goes link down or if N-Ring has a fault. CIP is formally described in ODVA Publication Number PUB00001 (Volume 1: Common Industrial Protocol (CIP)), and Publication Number: PUB00002 (Volume 2: Ethernet/IP™ Adaptation of CIP). Red Lion created EDS and ICO files are provided with the NT24k® switch series.

Note: Information about using CIP with the NT24k can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family.

PTP

Precision Time Protocol (PTP), IEEE 1588v2, is supported on licensed NT24k models. PTP allows users to configure a network with very accurate, coordinated timing among devices. NT24k models with software implementations of PTP are capable of achieving accuracy in the low microseconds range. PTP is disabled by default and can be enabled as a Boundary or Transparent clock through the Web Browser interface. The switch must have a valid PTP license installed before PTP can be enabled.

Point-to-Point Protocol (PPP)

PPP allows a browser-like interface over the CLI port.

Dynamic Host Configuration Protocol (DHCP)

DHCP (Dynamic Host Configuration Protocol) simplifies network configuration by automatically assigning IP addresses from a DHCP server to connected DHCP capable devices (DHCP clients). NT24k® switch configuration options include:

- DHCP Server
- DHCP Relay Agent
- DHCP Client

DHCP Server

DHCP Server allows DHCP Client devices to automatically obtain an IP assignment. IP assignments can be set up as a dynamic range of IP addresses available to any client device; or specific IP addresses based on the client's Client ID (Option 61), or Relay Agent connection (Option 82). It also allows for a device on a specific port to receive a specific IP address and if the device is replaced, the replacement receives the same IP address as the original device.

DHCP Relay Agent

DHCP Relay Agent (Option 82) allows communication between the client and server to cross subnet and VLAN boundaries.

DHCP Client

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

Event Logging

The switch can be configured to log certain system events as they occur. Event Logging is enabled by default for critical events. Event log options are easily changed through a Web browser.

Even Logging includes:

- System startup and shutdown
- Logon and logout from the Web or Console
- Ports becoming enabled or disabled
- Port link up or link down changes
- N-Ring™ status changes

The most recent log information is visible via the web interface and the complete log file may be exported for external analysis.

Event Log Filter

The Event Log Filter enables the user to define which events are logged, based on severity level. Events that do not meet the minimum severity level for that component are not logged.

Syslog

The Syslog protocol, as specified in RFC-3164 and RFC-5424, are supported. The Syslog allows users to configure the switch so that certain system events (see Event Logging) are transmitted to a remote

logging device, known as a Syslog Collector. The Syslog is disabled by default but can be enabled/disabled through the Web Browser interface.

Local Security

The switch is configured for secure access by the SSH and HTTPS. The Telnet Server and Hypertext Transfer Protocol (HTTP) may be enabled to provide backwards compatibility with less secure clients.

Secure Shell

SSH, is a secure alternative to Telnet. A maximum of two concurrent SSH / Telnet connections are allowed.

The commands SFTP (SSH File Transfer Protocol or Secure File Transfer Protocol) and SCP (Secure Copy) are not supported.

Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the ports that the address is authorized on. A non-authorized MAC address will be discarded and will be listed in the intruder log.

Port security supports RSTP provided the MAC address(es) are manually authorized on the RSTP ports.

LLDP

The Link Layer Discovery Protocol (LLDP), as specified in IEEE 802.1AB and IEEE 802.3-2012, is used by networking devices to advertise there identity and capabilities and to discover their network neighbors. LLDP can be configured in one of three modes: Enabled, Auto and Disabled. The "Auto" mode is an enhancement to the LLDP protocol.

When in Auto mode, LLDP is inactive until a switch sends a wake up packet. At this point, all switches set to Auto mode will become active until the Wake Time interval expires.

Troubleshooting

1. Make sure the Power LED is ON.
2. Make sure sufficient current is supplied to the switch (per model specifications).
   Note: The Inrush current will exceed the steady state current by ~ 2X.
3. Verify that Link LEDs are ON for connected ports.
4. Verify integrity of cabling between stations.
5. Verify that cabling is Category 5E or greater for 100Mbit and Gigabit operation.

Chapter 3 Web Software Configuration

Accessing the Web Software Interface

Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default with 192.168.1.201 as the fallback address.

The following login screen will appear:



- For the User Name, enter: **admin** (all lowercase)
- For the password, enter: **admin** (all lowercase)

Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.

Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Organization

After logging onto a NT24k® switch, the Product Information page will be displayed. On the left-hand side of the screen is a list of configurable settings supported by the NT24k switch. Below is a list of these settings with a description of their purpose.



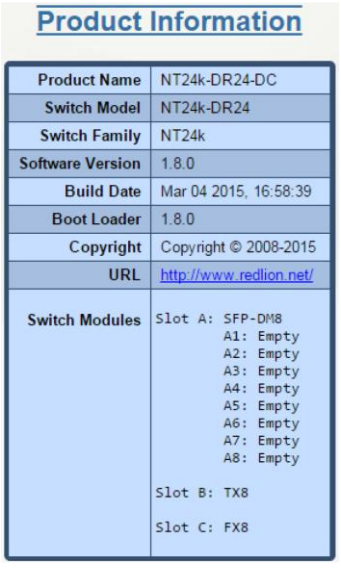
- **Product Information:** Basic information about the switch is provided in this menu.

- **Configuration:** The Configuration page is used to save or reset a running configuration.
- **Event Log:** The Event Log page is used for modifying and viewing the internal event logs.
- **Fault:** A fault is a notification of a destabilizing event. Which events are watched for and how notifications occur are configured on the Fault page.
- **File Transfer:** The File Transfer page provides the administrator the ability to upgrade the firmware or to import or export a configuration file, and export the Event Log to a file.
- **Network:** The network page is used to setup the device's IP and IP Fallback addresses, as well as Client ID and IP Configuration.
- **System:** The System page provides information pertaining to the whole system.
- **User Management:** The User Management page is used to view, add, modify and remove system user accounts, and set permissions.
- **Advanced:** The Advanced section is used to setup advanced features of the system.
- **Help:** The Help section is used to display information on configuring and monitoring the manageable parameters of the device. Specific help can be found by using the left navigation menu.

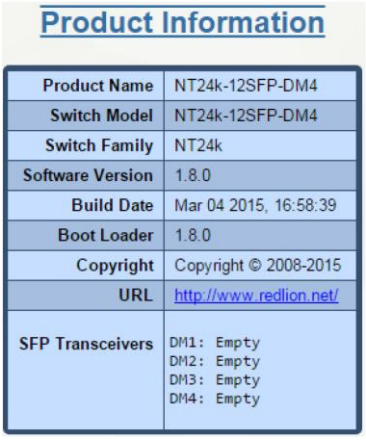
Product Information

Once a user logs onto an NT24k® switch, the Product Information page is displayed. This page shows basic information about the switch and can also be accessed by selecting the Product Information menu item on the left-hand menu.

Modular Models



Compact Series



Product Name: The full name of the switch, including any factory configured options will be displayed in this field.

For example, the product name will show NT24K-AC1 if there is one AC power unit in either location and NT24K-AC2 if there are two AC power units. If the product name ends with DC1 or DC2, this indicates that there is either one or two DC power units.

Switch Model: The base model of the switch.

Switch Family: The switch family this model and similar models belong to.

Software Version: The current firmware software version.

Build Date: The build date of the firmware.

Boot Loader: The boot loader version.

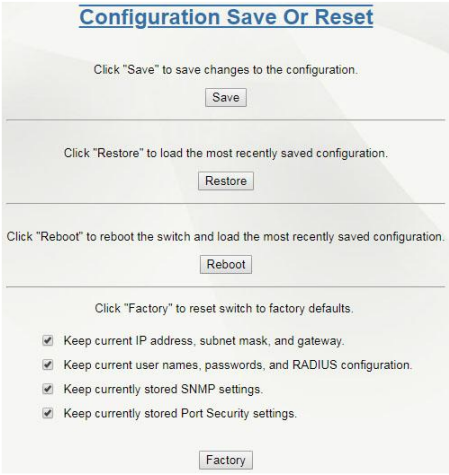
URL: This field links to Red Lion's website.

Switch Modules: The modules currently installed, including installed SFP transceivers. This option may not be present on models where modules or SFPs are not supported.

SFP Transceivers: On models where SFP transceivers are supported, the currently installed SFP transceivers will be shown in this field.

Configuration

The Configuration page allows the Administrator to save a running configuration in the switches non-volatile memory. This step is required if the switch is to remember any configuration changes after a power cycle or reboot. From this page, the Administrator can also restore a previously saved configuration, restore factory defaults or force a system reboot.



Save: Click on the *Save* button to save all current changes to the configuration stored in non-volatile memory for use after the next power cycle or reboot. If a configuration device is installed and enabled, the configuration will also be saved to the device. This option is only available when there is no misconfiguration.

Restore: Click on the *Restore* button to discard all unsaved changes and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Reboot: Click on the *Reboot* button to reboot the switch and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Factory: Click on the *Factory* button to reset the switch's configuration to factory defaults except for any of the selected items. Selecting the Factory option will only affect the current configuration. A *Save* must be performed in order to retain these changes after a power cycle or reboot.

- **Keep current IP address, subnet mask, and gateway:** Retains the existing IP address, subnet mask and gateway if desired.
- **Keep current user names, passwords, and RADIUS configuration:** Retain the existing user names, passwords, and RADIUS configuration if desired.

- **Keep currently stored SNMP settings:** Retains the existing SNMP settings if desired.
- **Keep currently stored Port Security settings:** Retain the existing Port Security settings if desired.
- **Keep current PoE Settings:** Retains the existing PoE settings if desired (PoE models only).

Note: When the configuration is loaded from the Configuration Device, it must be saved for it to be available if the Configuration Device is removed.

Note: When the switch is shipped, it does not have a "configuration file" since the unit is using the factory defaults. Before a configuration can be customized, click on the Save button in order to create the file.

Configuration Fault

When the switch is booted and misconfigured settings are detected, a Configuration Fault will be triggered and the configuration may not be saved. This can occur when updating system firmware where settings permitted in the previous release may no longer be permitted. In this case, the *Save* button will be replaced with a *Show Errors* button (as seen below) and the misconfigured settings must be fixed before the configuration may be saved.

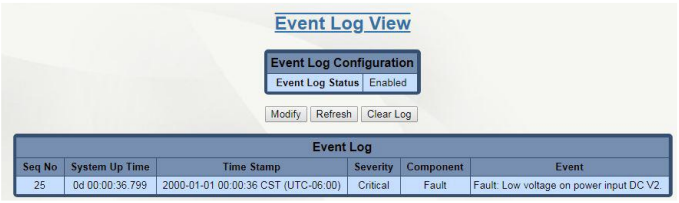


Show Errors: Click on the Show Errors button to view the current configuration and display any detected errors. This button is only visible when there is a settings misconfiguration.

Event Log

The Event Log View page displays the most recent 200 events that have occurred since the latest system startup or since the log was cleared. Event logging is enabled by default for critical events. Only events that occur while the Event Log was enabled will be displayed and saved with the exception of the Clear Log message which will always be displayed. Therefore, previously enabled events are still displayed when Event Logging is disabled albeit they may not be recent events.

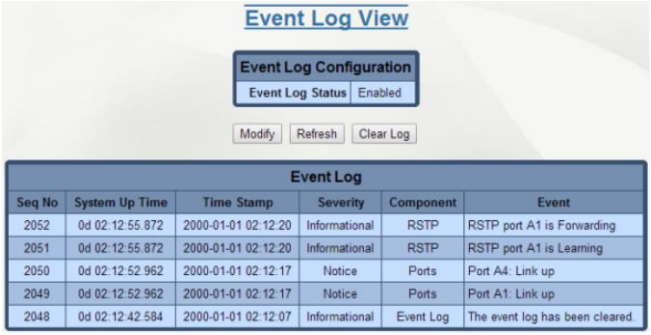
If the Event Log was disabled when the latest Startup event occurred, no events will be displayed as shown below.



When the Event Log is cleared, an informational event will be displayed.

Note: All enabled events since the last Clear Log event, including multiple Startup and Shutdown events, are stored on the system and may be exported as a CSV file from the switch for additional analysis.

Note: The event log can contain 2000 or more entries depending on individual message size. If the event log becomes full, new entries will overwrite the oldest entries.



A normal startup or reboot will show startup, RSTP status, N-Ring™ and logon events. An example reboot is shown below.

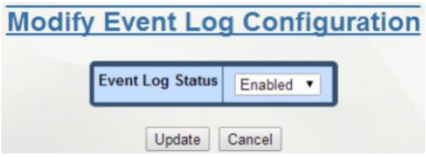


Modify: Display the Modify Event Log Configuration page.

Refresh: Refresh the current Event Log display.

Clear Log: Remove all entries from the event log and then add “The event log has been cleared.” message.

The Modify Event Log Configuration page controls whether Event Logging is Enabled or Disabled.

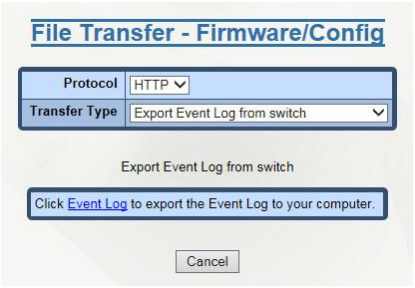


Event Log Status: Select Enabled/Disabled.

Update: Set the new Event Log Status.

Cancel: Return to Event Log View without modifying Event Log Status.

The entire Event Log may be exported to the host PC for further analysis and archiving purposes. It will contain all events that occurred while Event Log was enabled since the last Clear Log event.



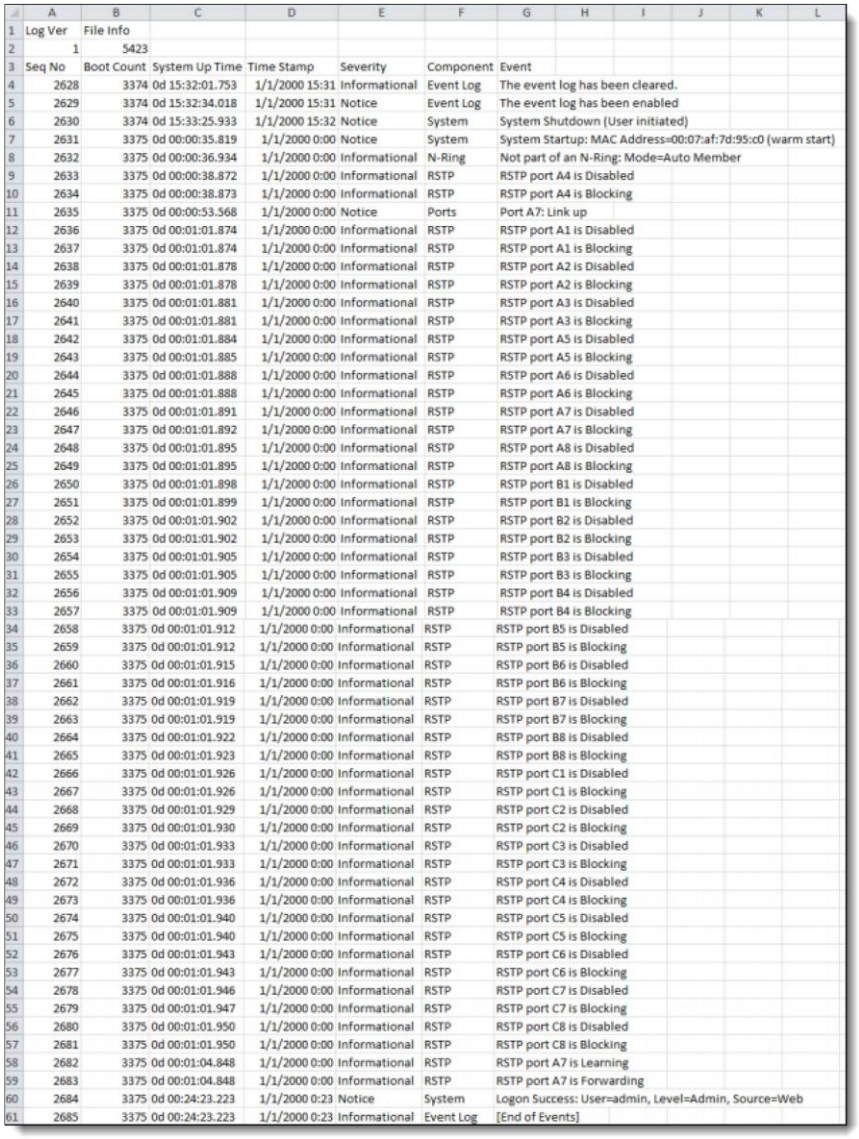
On the File Transfer - Firmware/Config page, select Transfer Type: Export Event Log from switch.

Click on Event Log in the Export Event Log from switch panel, and select the storage location for the exported file on the PC.

The default file name is “eventlog.csv”, which outputs each line in the Event Log as comma separated fields with the final text field surrounded by quotation marks. This file can be viewed with a spreadsheet application or a simple text file viewer.

The Cancel button selection will return to the Product Information page without executing any transfers.

Example Event Log CSV in Microsoft Excel:



	A	B	C	D	E	F	G
1	Log Ver	File Info					
2	1	5423					
3	Seq No	Boot Count	System Up Time	Time Stamp	Severity	Component	Event
4	2628	3374	0d 15:32:01.753	1/1/2000 15:31	Informational	Event Log	The event log has been cleared.
5	2629	3374	0d 15:32:34.018	1/1/2000 15:31	Notice	Event Log	The event log has been enabled
6	2630	3374	0d 15:33:25.933	1/1/2000 15:32	Notice	System	System Shutdown (User initiated)
7	2631	3375	0d 00:00:35.819	1/1/2000 0:00	Notice	System	System Startup: MAC Address=00:07:af:7d:95:c0 (warm start)
8	2632	3375	0d 00:00:36.934	1/1/2000 0:00	Informational	N-Ring	Not part of an N-Ring: Mode=Auto Member
9	2633	3375	0d 00:00:38.872	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Disabled
10	2634	3375	0d 00:00:38.873	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Blocking
11	2635	3375	0d 00:00:53.568	1/1/2000 0:00	Notice	Ports	Port A7: Link up
12	2636	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Disabled
13	2637	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Blocking
14	2638	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Disabled
15	2639	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Blocking
16	2640	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Disabled
17	2641	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Blocking
18	2642	3375	0d 00:01:01.884	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Disabled
19	2643	3375	0d 00:01:01.885	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Blocking
20	2644	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Disabled
21	2645	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Blocking
22	2646	3375	0d 00:01:01.891	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Disabled
23	2647	3375	0d 00:01:01.892	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Blocking
24	2648	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Disabled
25	2649	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Blocking
26	2650	3375	0d 00:01:01.898	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Disabled
27	2651	3375	0d 00:01:01.899	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Blocking
28	2652	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Disabled
29	2653	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Blocking
30	2654	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Disabled
31	2655	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Blocking
32	2656	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Disabled
33	2657	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Blocking
34	2658	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Disabled
35	2659	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Blocking
36	2660	3375	0d 00:01:01.915	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Disabled
37	2661	3375	0d 00:01:01.916	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Blocking
38	2662	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Disabled
39	2663	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Blocking
40	2664	3375	0d 00:01:01.922	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Disabled
41	2665	3375	0d 00:01:01.923	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Blocking
42	2666	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Disabled
43	2667	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Blocking
44	2668	3375	0d 00:01:01.929	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Disabled
45	2669	3375	0d 00:01:01.930	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Blocking
46	2670	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Disabled
47	2671	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Blocking
48	2672	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Disabled
49	2673	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Blocking
50	2674	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Disabled
51	2675	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Blocking
52	2676	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Disabled
53	2677	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Blocking
54	2678	3375	0d 00:01:01.946	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Disabled
55	2679	3375	0d 00:01:01.947	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Blocking
56	2680	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Disabled
57	2681	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Blocking
58	2682	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Learning
59	2683	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Forwarding
60	2684	3375	0d 00:24:23.223	1/1/2000 0:23	Notice	System	Logon Success: User=admin, Level=Admin, Source=Web
61	2685	3375	0d 00:24:23.223	1/1/2000 0:23	Informational	Event Log	[End of Events]

Where the fields are:

Sequence Number: Each entry is assigned the next sequence number – these may not always be listed in numerical order due to the priority of the internal tasks which generate the events.

Note: The "[End of Events]" message at the end of the file will contain the next sequence number, but that number will be reused for the next system event on the switch when it occurs.

Boot Count: A count of how many times the switch has been powered up or restarted.

System Up Time: The amount of time since the system was started in days, hours, minutes, seconds, milliseconds.

Time Stamp: Corresponding date, hours, minutes, seconds, based on the initial value of Current System Time as defined in the System Configuration View.

Severity: (most severe to least severe):

Emergency: Major failure, Immediate intervention required

Alert: Failure of a component, Immediate corrective steps should be taken
Critical: Partial failure of a component, Immediate corrective action should be taken
Error: Non-urgent failure
Warning: Not an error, but may lead to an error if action is not taken
Notice: Unusual event, but not an error
Informational: General Information
Debug: Information useful to a support technician for debugging the switch operation.

Component: Internal component that generated the event entry.

Event Description: Description of the event entry.

Fault

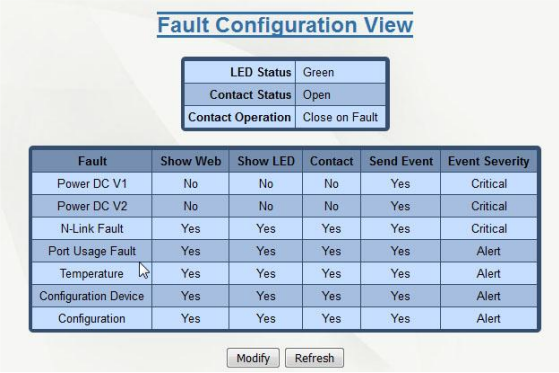
The Fault page provides configurable selections indicating the different ways to notify an administrator when a fault occurs. In each case, the notification may consist of any combination: Show Web, Show LED and/or Contact. Some fault configurations are only available under specific conditions. For example, Power AC is only available when an AC power supply is installed in the switch. N-Ring™ faults are only available when the switch is set to N-Ring Manager mode. The page below is an example of what may be seen on the Fault dialog window.

Additionally, when a fault is triggered, an event may be generated at the severity selected by the user. The event will be logged unless it is filtered by the Event Log Filter.

The event's severity can be set to any of the following values.

Note: These are based on the Event Log's Severity:

Emergency
Alert
Critical
Error
Warning
Notice
Informational
Debug



LED Status: This field shows the current color of the Power/Fault LED. Green indicates there is no fault and Red indicates a fault condition exists.

Contact Status: This field shows the current open/closed status of the fault relay.*

Contact Operation: This field determines if the fault relay is normally open (Close on Fault) or normally closed (Open on Fault).*

Show Web: If the *Show Web* option is enabled, the fault is displayed on the browser pages.

Show LED: If the *Show LED* option is enabled, the fault is indicated on the Power LED as red.

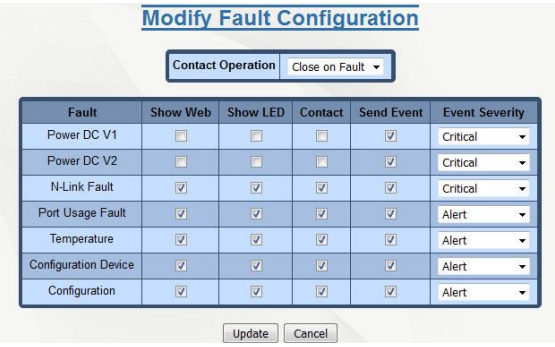
Contact: If *Contact* is enabled, the fault is indicated by opening or closing the contact switch.

Send Event: The fault is sent to the configured log(s). See the Event Log and Syslog configuration.

Event Severity: The fault will generate an event based on the configured severity level.

To make changes to the *Fault Configuration* settings, click on the *Modify* button.

* **Note:** Fault's contact is only supported on certain NT24k® switches.



Select the desired notification settings and click on the *Update* button to save any changes. Once the save is complete, the dialog window will change to Fault Configuration.

Power Fault Descriptions

The location of a power input is clearly marked on the device. Depending on the specific device configuration, some of the faults listed below may not be shown.

Note: Power Fault notifications are disabled in factory defaults on a low voltage power supply.

Power AC1: Indicates a low voltage on power input AC1.
Power AC2: Indicates a low voltage on power input AC2.
Power DC V1: Indicates a low voltage on power input DC V_1.
Power DC V2: Indicates a low voltage on power input DC V_2.
Power DC V3: Indicates a low voltage on power input DC V_3.
Power DC V4: Indicates a low voltage on power input DC V_4.

N-Ring™ Manager Fault Descriptions

The faults listed below appear when the switch is configured as an N-Ring manager.

N-Ring Broken: Indicates that an N-Ring connection is completely broken.
N-Ring Partial Break (High): Indicates that an N-Ring connection is only broken in the direction of the higher port.
N-Ring Partial Break (Low): Indicates than an N-Ring connection is only broken in the direction of the lower port.
N-Ring Multiple Managers: Indicates that more than one N-Ring Manager exists on an N-Ring.

Miscellaneous Fault Descriptions

N-Link Fault: Indicates a problem with the N-Link configuration.
Port Usage Fault: Indicates that the port usage, for one or more ports, is below the Usage Alarm Low setting, or above the Usage Alarm High setting (see Port Configuration View and Port Utilization View).
Temperature: Indicates that the temperature of the switch is outside of the configured limits.
Configuration Device: Indicates that the configuration on an installed configuration device is invalid.
Configuration: Indicates that a setting misconfiguration needs to be resolved.

File Transfer

File Transfer gives the administrator the ability to import files to the switch or export files from the switch.

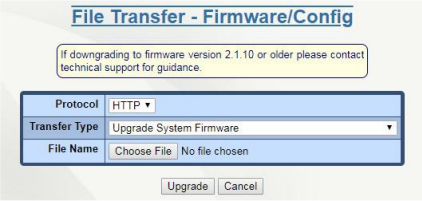
Note: Do not cycle power on the switch or interrupt the data connection between the PC and the switch while a file is being transferred.

Protocol: Select whether HTTP, HTTPS, or TFTP protocol is to be used for transfers.

Transfer Type: The different types of transfer that can be used are listed in the drop-down list. The options are: Upgrade System Firmware, Upgrade BootLoader Firmware, Import Configuration to Switch, Import Port Security Authorization List to Switch, Import License to Switch, Export Saved Configuration from Switch, Export Saved Port Security Authorization List from Switch, and Export Event Log from Switch.

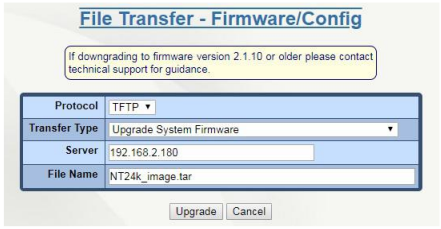
Upgrade System Firmware: Select this option to install the system firmware to the switch.

HTTP/HTTPS Protocol



File Name: Click on the *Browse* button to browse to the desired location and select an image file (typically called NT24k_image.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server. It is automatically populated with the IP address of the PC which is connected to the switch.
File Name: This field displays the name of the file to be imported (typically NT24k_image.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

WARNING: Due to security enhancements, downgrading the system firmware to 2.1.10 or older will reset all passwords to “password” (users and administrators). The Administrator should immediately change each user’s password and notify the user.

Upgrade BootLoader Firmware: Select this option to install the bootloader firmware.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select an image file (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



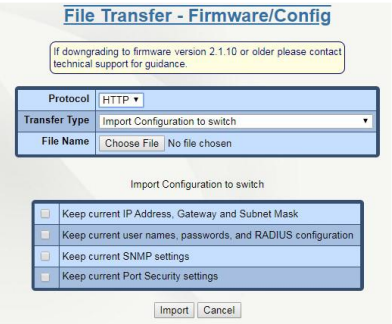
Server: This field displays the IP address of the TFTP server.
File Name: This field displays the name of the file to be imported (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

Import Configuration to Switch: Select this option to change the switch configuration by importing a configuration file.

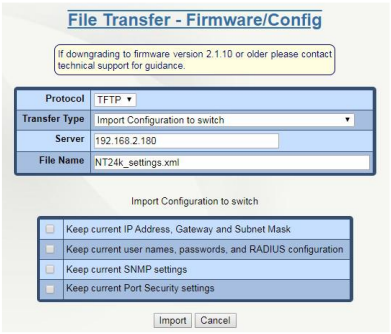
HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a configuration file (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

Import Port Security Authorization List to Switch: Select this option to change the Port Security Authorization List by importing a configuration file.

HTTP/HTTPS Protocol



File Name: Click on the Choose File button to browse to the desired location and select a configuration file (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

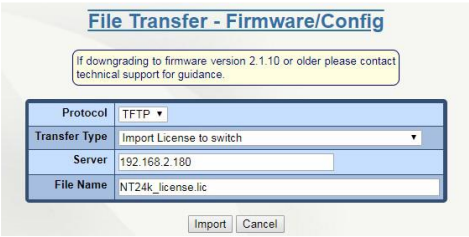
Import License to Switch: Select this option to install a license to the switch by importing a license file.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the license.

*The same file transfer dialog box is used for both HTTP and HTTPS.

Import Security Certificate to Switch:

HTTP/HTTPS Protocol



Certificate File Name: Click on the Choose File button to browse to the desired location and select a certificate file (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: Click on the Choose File button to browse to the desired location and select a key file (typically key.pem). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

Certificate File Name: This field displays the name of the file to be imported (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: This field displays the name of the file to be imported (typically key.pem). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the Security Certificate.
*The same file transfer dialog box is used for both HTTP and HTTPS.

Note: After successfully transferring a new Security Certificate to the switch, the switch must be rebooted.

Export Saved Configuration from Switch: Select Export Saved Configuration from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Configuration Settings* link to export the settings to your computer. This option allows administrators to back up their configurations to an offsite server in case a custom configuration must be reloaded at a later time.

A download dialog pop-up will appear, prompting the user to open or save the configuration file. The file is called *NT24k_settings.xml* per default.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_settings.xml). File names are limited to 63 characters maximum.

Click on the *Export* button to export the settings to the specified TFTP server.

Export Saved Port Security Authorization List from Switch: Select Export Saved Port Security Authorization List from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Port Security Authorization List* link to export the authorization list to your computer. This option allows administrators to back up their Port Security Authorization List.

A download dialog pop-up will appear, prompting the user to open or save the authorization file. The file is called *NT24k_portsecurity.auth* per default.

TFTP Protocol



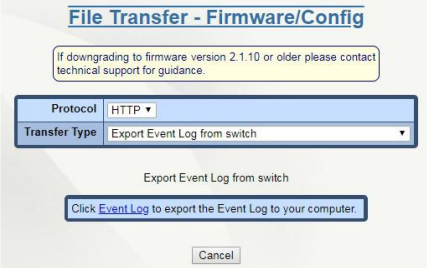
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_portsecurity.auth). File names are limited to 63 characters maximum.

Click on the *Export* button to export the configuration file to the specified TFTP server.

Export Event Log from switch: The entire Event Log may be exported to the host PC for further analysis and archiving purposes. The log file lists all events that occurred while event logging was enabled and since the last Clear Log event was performed.

HTTP/HTTPS Protocol



Click on the *Event Log* link to export the log file to your computer. A download dialog pop-up will appear, prompting the user to open or save the configuration file.

TFTP Protocol



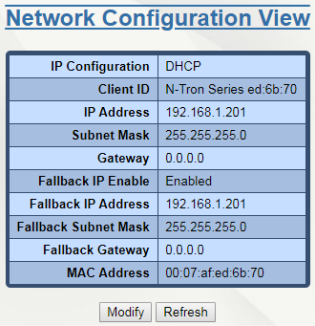
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically eventlog.csv). File names are limited to a maximum length of 63 characters.

Click on the *Export* button to export the log file to the specified TFTP server.

Network

Setting the IP Configuration to DHCP will use the Primary Management VLAN ports to receive an IP address from the DHCP Server. Changes to the Primary Management VLAN are made in the VLAN section. If no changes are made, the default VLAN will be used as the default Primary Management VLAN.



IP Configuration: Determines the method used to obtain an IP address, Subnet Mask, and Gateway address. When Static is selected, the statically configured values are used. When DHCP is selected, DHCP protocols are used to obtain these values.

Client ID: This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters. (Only shown in DHCP Mode) The DHCP option 61 client identifier will be sent with a preceding type-byte as listed below:

MAC Address = 0x01
Switch Name = 0x00 (Default)
Other String = 0x00
Other HEX = 0x00

IP Address: Contains the current IP Address of the device.

Subnet Mask: Contains the current Subnet Mask of the device.

Gateway: Contains the current Gateway of the device.

Fallback IP Enable: Enables/disables the use of the Fallback IP address.

Fallback IP Address: Contains the configured Fallback IP address of the device. This address will be used if the switch fails to obtain a DHCP address from the DHCP Server. This option is only shown in DHCP Mode and if Fallback IP is enabled.

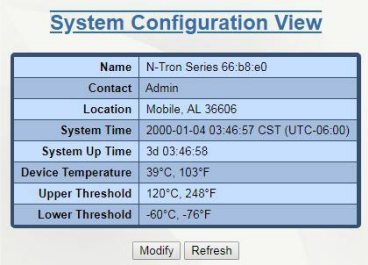
Fallback Subnet Mask: Contains the configured Fallback Subnet Mask of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

Fallback Gateway: Contains the configured Fallback Gateway of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

MAC Address: MAC Address of the device.

To modify any of the fields, click on Modify. Enter the desired system settings and click on the *Update* button.

System



The System page presents the user with current system information.

Name: Contains the name assigned to the device, which allows alphanumeric and special characters (,#_-:) only. When IP Configuration is DHCP, then this may be used as the Client ID (Option 61) of the DHCP Request.

Contact: The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters (,#_-) are allowed.

Location: The physical location of the switch. Only alphanumeric and special characters (,#_-) are allowed.

System Time: Displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start.

System Up Time: Parameter represents the total time elapsed since the switch was turned on or rebooted.

Device Temperature: The device temperature reported by the on-board digital temperature sensor. This option is only shown on devices with temperature sensors.

Upper Threshold: The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in degrees Celsius. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Lower Threshold: The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in Celsius degrees. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Power DC V1: The voltage measurement on power input DC V1. This option is only shown on devices with a voltage sensor.

Power DC V2: The voltage measurement on power input DC V2. This option is only shown on devices with a voltage sensor.

Total Current: The total input current measurement in Amps. This option is only shown on devices with a current sensor.

Total Power: The calculated power in Watts obtained from voltage and current measurements. This option is only shown on devices with a voltage and current sensor.

To make modifications to the fields above, click on the Modify button. Enter the desired settings and click on the *Update* button.

Bridging

Aging Time

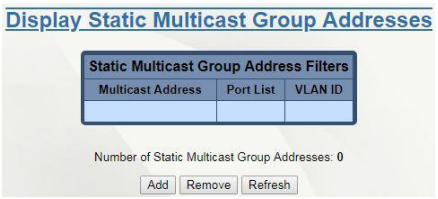
The Aging menu item under the Bridging category displays the currently configured Aging Time. This configurable field shows the desired aging time for dynamically learned MAC addresses. Inactive MAC addresses will be removed from the Hardware Address Entry Table after the aging time period has expired. The internal aging time period will be between 1 and 2 times the selected aging time value.



To modify the Aging Time field, click on the Modify button. Enter the desired Aging Time (value must be between 10 - 630 seconds) and click on the *Update* button. The default value for this field is 300 seconds. To save the changes made, return to the Configuration menu and click on the *Save* button.

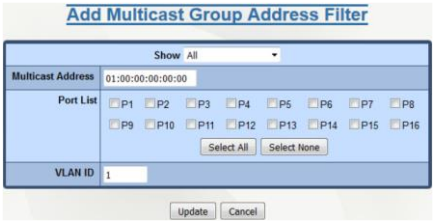
Multicast Addresses

The Multicast Addresses page displays a list of Multicast Group Addresses that are associated with respective port numbers.



Adding a Multicast Group Address

To add a Multicast Address, click on the Add button and the following dialog window will appear:



Enter a valid Multicast Group Address and VLAN ID, then select the port(s) to which matching packets will be directed.

Click on the *Update* button to return to the Display Static Multicast Group Addresses page.

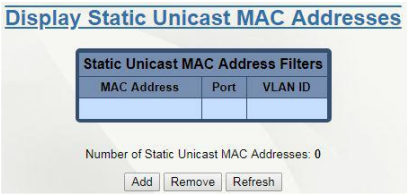
To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Multicast Group Address

To remove a Multicast Address, click on the *Remove* button. A listing of available Multicast Group Addresses will appear. Click on the *Delete* button to remove an address.

Unicast Addresses

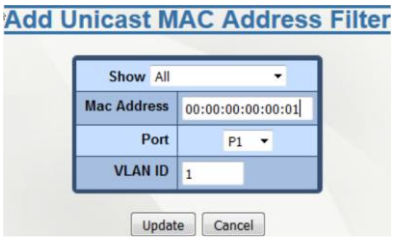
The Unicast Addresses dialog window displays a list of MAC addresses that are associated with each respective port number. This can be used to statically assign a MAC address access to a single port on the switch.



Adding a Unicast Address

To add a Unicast Address, click on the Add button and the following dialog window will appear:

Enter a valid MAC address and VLAN ID, then select the port to which matching packets will be directed.



Click on the Update button to add the unicast address and return to the Display Static Unicast MAC Addresses dialog window.

To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Unicast MAC Address

To remove a Unicast Address, click on the *Remove* button and a dialog window with a listing of available Unicast MAC Addresses will appear. Click on the *Delete* button to remove the MAC Address and return to the *Display Static Unicast MAC Addresses* dialog window.

CIP™

EtherNet/IP™, better known as the Common Industrial Protocol (CIP), was designed for use in process control and industrial automation applications. CIP was designed to provide consistent device access to eliminate the need for vendor specific software for configuration and monitoring of their devices.

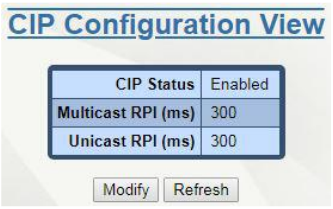
N-Tron® switches with CIP support can be used to communicate with other industrial devices.

Note: Information about using CIP with the NT24k® can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family. This manual can be found on the Red Lion website.

Configuration

The CIP Configuration View dialog window displays the CIP status as well as the Multicast and Unicast RPIs (Requested Packet Interval).

Click on the *Modify* button to make changes to the CIP Configuration:



CIP Status: This field determines whether CIP is enabled or disabled on the NT24k switch. The default setting is Enabled.

Multicast RPI: The minimum Requested Packet Interval for Class 1 (multicast) connections in milliseconds is shown in this field. Requests for less than this value will be rejected. The default value for this option is 300 ms. The available range is 300 - 300,000.

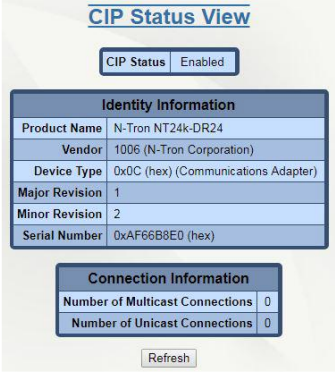
Unicast RPI: This field shows the minimum Request Packet Interval for Class 3 (unicast) connections in milliseconds. Requests for less than this value will be rejected. The default value for this field is 300ms. The available range is 300 - 300,000.

Click on the *Update* button once the desired information is entered and to return to the *CIP Configuration View* dialog window. To save the changes made, return to the Configuration menu and click on the *Save* button.

Status

The Status menu item displays the CIP status. The switch status and partner status information will be shown.

Example CIP™ Status View showing a Connection Summary table with one Multicast connection:



Identity Information

Product Name: This field displays the Switch Model Number.

Vendor: This field shows N-Tron®'s ODVA Ethernet/IP™ Vendor ID (1006).

Device Type: This field displays that the ODVA device type is Communications Adapter (0x0C hex).

Major Revision: This field displays the major revision of the CIP implementation.

Minor Revision: This field shows the minor revision of the CIP implementation.

Serial Number (hex): This field shows the CIP serial number, which is unique across all N-Tron CIP devices. The number shown is the last 4 octets of the base switch MAC address.

Connection Information

Number of Multicast Connections: This field shows the current number of CIP Ethernet/IP class 1 (multicast) connections.

Number of Unicast Connections: This field displays the current number of CIP Ethernet/IP class 3 (unicast) connections.

Connection Summary

Transport Class: This field displays the Transport class for the connection, such as class 1 (multicast) or class 3 (unicast).

Connection State: This field indicates the state of the connection (established, timed out, closing or configuring).

RPI: The field displays the Requested Packet Interval in milliseconds.

Config Assembly: This field shows the configuration assembly number.

Output Assembly: This field displays the Output assembly number (the assembly that is sent out from the switch).

Input Assembly: This field displays the input assembly number (the assembly that is received into the switch).

Peer Address: This field shows the peer IP address of the device connected to the switch.

EIP Indicators

The module status indicator shows the current status of the switch. The network status indicator shows the status of the EtherNet/IP™ network interface. These indicators are located on the back of the rack mount version of the switch or on the front of the CPU module on the DIN-Rail versions of the switch.

Module Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	No power	The switch is not powered up.
Steady Green	Device operational	The switch is operating normally.
Flashing Green	Standby	The switch has not been configured for CIP™ operations.
Flashing Red	Minor fault	A recoverable minor fault has occurred.
Steady Red	Major fault	A non-recoverable major fault has occurred.

Network Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	Not powered, no IP address	The switch is not powered up, or an IP address has not been configured.
Flashing Green	No connections	An IP address is configured, but no connections have been established.
Steady Green	Connected	A connection has been established
Flashing Red	Connection timeout	A connection has timed out.

DHCP Client Configuration

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

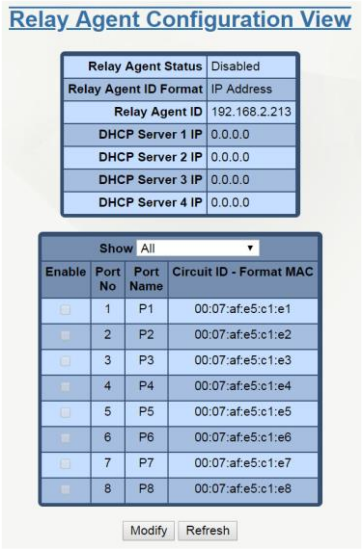
Refer to Network for enabling DHCP Client mode.

DHCP Relay Agent Configuration

A relay agent, configured via the Relay Agent Configuration View, provides a way for DHCP client requests to reach DHCP servers, including those that reside on a different subnet and/or VLAN.

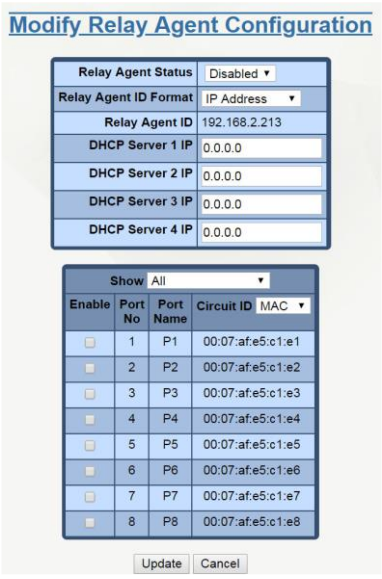
Note: DHCP traffic is sent and received only on Management VLANs.

View Page



Click on the *Modify* button to open the DHCP Server Configuration Modification page.

Modify Page



Click on the *Update* button to apply the changes.

Relay Agent Status: Indicates whether the DHCP relay agent is active. The default is Disabled.

Relay Agent ID Format: The format selector with options for IP address, MAC address, Client ID, Other String, or Other Hex characters.

Relay Agent ID: A unique identifier that designates this relay agent switch.

DHCP Server 1-4 IP: The configured IP address of the DHCP servers.

Enable: Indicates whether relay agent functionality is enabled for the port.

Port No: The number of the port. This field is read-only.

Port Name: The descriptive name of the port. This field is read-only.

Circuit ID: When enabled, the Circuit ID for the port can be specified. By default, the Circuit ID is set to the MAC Address of the port. Circuit IDs must be unique for each port.

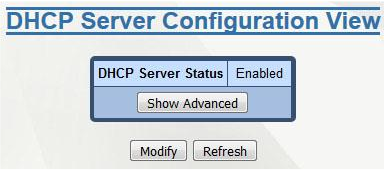
Circuit ID Format: The format selector with options for MAC, Hex, and String.

DHCP Server Configuration

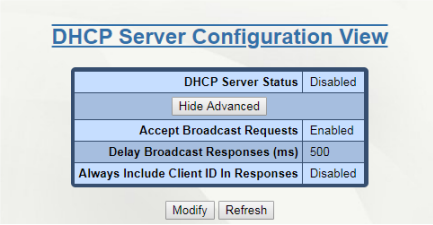
The DHCP Server provides IP addresses to DHCP clients on the same subnet or VLAN. DHCP traffic is sent and received only on Management LANs.

Note: A DHCP Relay Agent is required, to provide an IP address to clients on a different subnet or VLAN.

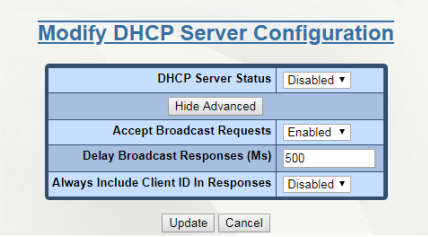
The following screen shows the Advanced configuration hidden:



The following screen shows the Advanced configuration unhidden:



Click on the *Modify* button to open the DHCP Server Configuration Modification page.
Click on the *Update* button to apply the changes.



DHCP Server Status: Indicates whether the DHCP server is active. The default is Disabled.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Accept Broadcast Requests: Indicates whether the DHCP server will process broadcast messages. Typically, client requests are broadcast and relay agent requests are unicast. When enabled, the server will respond to broadcast requests. When disabled, the server will ignore broadcast requests. The default is Enabled.

Delay Broadcast Responses (Ms): The amount of time (in milliseconds) that the DHCP server will delay the processing of a broadcast message. This setting is used when clients and relay agents are on the same subnet and/or VLAN. A delay provides the opportunity for relay agent requests to be honored before client requests. This setting only applies when Allow Broadcast is Enabled. The range is 0-2500 and the default is 500.

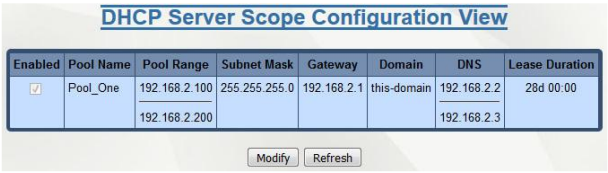
Always Include Client ID In Responses: Indicates whether the DHCP Server will always respond to the client with the Client ID in the frame. This should be disabled for a network that is non-compliant to the RFC- 6842(2013). The default is Disabled.

DHCP Server Scope Configuration

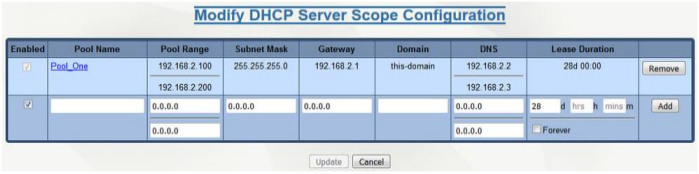
Scope Configuration Pools

The DHCP Server Scope Configuration contains vital network configuration options, called scope configuration pools, for potential clients. At least one scope configuration pool is necessary to create static assignments.

View Page



Modify Page



On the Modify page, the last column contains various buttons. The *Remove* button removes the corresponding scope configuration pool along with all static assignment and bindings associated with the pool. The *Add* button is used to add a new scope configuration pool.

Click on the *Add* button to add the new scope.
Click on the *Remove* button to remove an existing or new scope.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled.

Pool Name: Descriptive name of the scope configuration pool. This field is required and must be unique.

Pool Range: Starting and ending IP addresses for the pool of addresses.

Subnet Mask: The subnet mask for the IP address pool.

Gateway: The gateway IP address offered to the client. This field is optional.

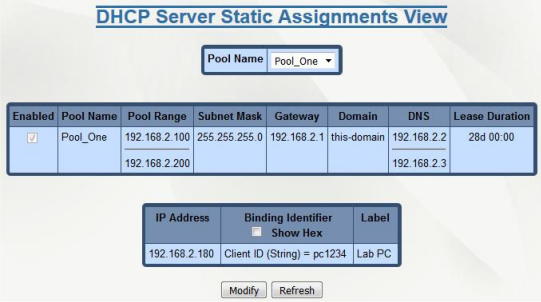
Domain: The domain name offered to the client. This field is optional.

DNS: The DNS server IP addresses offered to the client. These fields are optional.

Lease Duration: The lease time (in days, hours and minutes) offered to the client. The range is 1 minute to 1000 days. The default is 28 days. If the Forever checkbox is checked, the lease does not expire.

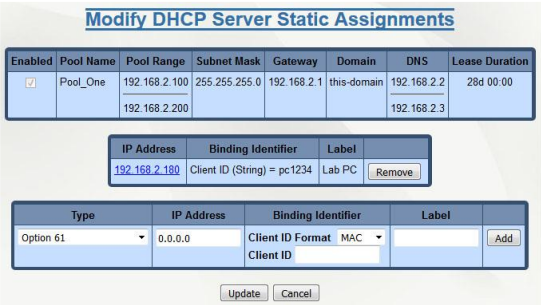
DHCP Server Static Assignments

View Page



Select the Pool Name drop-down list to filter on a specified pool.
Click on the *Modify* button to open the Modify DHCP Server Static Assignments page.

Modify Page



Click on the IP address hyperlink to modify the corresponding static assignment.
Click on the *Add* button to add the new static assignment.
Click on the *Remove* button to remove an existing or new static assignment.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled. This field is read-only.

Pool Name: Descriptive name of the scope configuration pool. This field is read-only.

Pool Range: Starting and ending IP addresses of a pool of addresses. This field is read-only.

Subnet Mask: The subnet mask offered to the client. This field is read-only.

Gateway: The gateway IP address offered to the client. This field is read-only.

Domain: The domain name offered to the client. This field is read-only.

DNS: The DNS server IP addresses offered to the client. This field is read-only.

Lease Duration: The lease time (in days, hours and minutes) that will be offered to a client. This field is read-only.

Type: The type of binding identifier for the static assignment. The options are Option 61 and Relay Agent (Option 82).

IP Address: The static IP address offered to the DHCP client.

Binding Identifier: The binding identifier of the static IP address assignment. For Option 61, the binding identifier requires a Client ID, the identifier of the desired client. The identifier formats are MAC, HEX, and String. A type-byte is assumed to precede the identifier and does not have to be entered here. The type-byte value is assumed to be as follows:

MAC = 0x01
String = 0x00
HEX = 0x00

For Option 82, the binding identifier requires a Remote Agent ID and Circuit ID. These identifiers must match the relay agent's Remote ID and Circuit ID. The identifier formats are IP (for a Remote ID), MAC, Hex, and String.

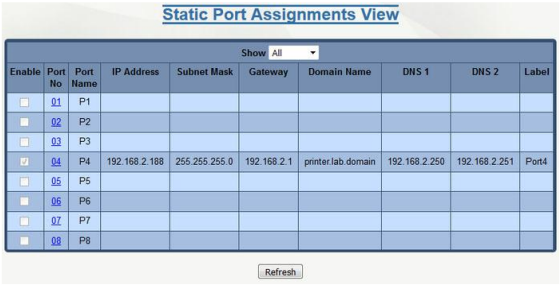
Label: The descriptive name of the static assignment. The field is optional.

DHCP Static Port Assignments

When a static port assignment is enabled on the port, the port will act as a DHCP server and provide a static IP address to the client connected to the port.

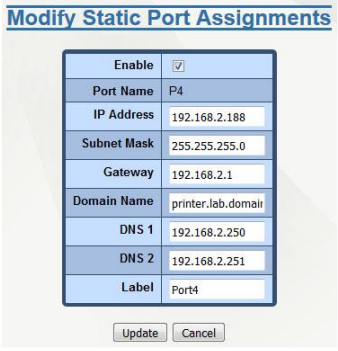
Note: Only one DHCP client can be connected per port.

View Page



Select the Show drop-down list to show only enabled ports or all ports. Click on the port number hyperlink to modify the port's static port assignment.

Modify Page



Click on the *Update* button to apply the changes.

Enable: Indicates whether Static Port Assignment is enabled on the port.

Port No: The number of the port.

Port Name: The descriptive name of the port. This field is read-only.

IP Address: The IP address offer to the DHCP client connected to the port.

Subnet Mask: The subnet mask offer to the DHCP client connected to the port.

Gateway: The gateway offer to the DHCP client connected to the port.

Domain Name: The domain name offer to the DHCP client connected to the port. The field is optional.

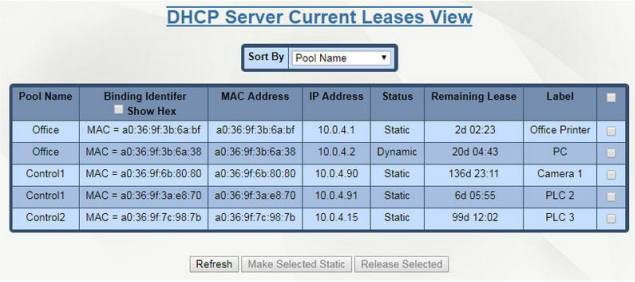
DNS 1: The primary DNS offer to the DHCP client connected to the port. The field is optional.

DNS 2: The secondary DNS offer to the DHCP client connected to the port. The field is optional.

Label: The descriptive name of the DHCP client connected to the port. The field is optional.

DHCP Server Current Leases

The Current Leases table shows the IP addresses that have been leased, or offered, to devices.



Sort By: Sort the current leases by Pool Name, Binding Identifier, MAC Address, IP Address, Status, Remaining Lease, or Label.

Pool Name: The pool from which the lease was obtained.

Binding Identifier: The client associated with the lease entry. If Show Hex checkbox is checked, then detailed hex data about the Binding Identifier is displayed.

MAC Address: Indicates the MAC address of the client associated with the lease.

IP Address: Indicates the IP address assigned to the lease entry.

Status: Indicates the current status of the lease entry.

- Dynamic = Assigned dynamic IP.
- Static = Assigned static IP.

Remaining Lease: The client's remaining lease time.

Label: The descriptive name of the client.

Check Box: Click the individual checkbox to either make the clients static or release its lease.

Note: Only clients with a dynamic lease can be made static.

Make Selected Static: Make the selected client dynamic IP address static.

Release Selected: Release selected client lease.

Event Notification

Event Notification is a combination of features that deal with filtering and routing system and fault events to different destinations.

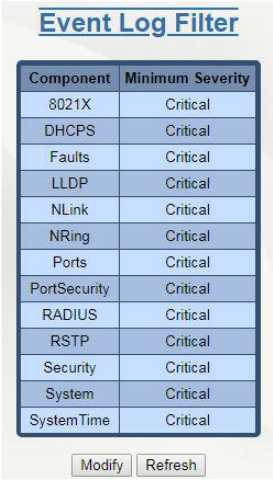
Event Log Filter

The Event Log Filter allows the user to define which events will be logged based on the severity level of the event.

Note: The event log is enabled by default for critical events.

Event Log Filter View

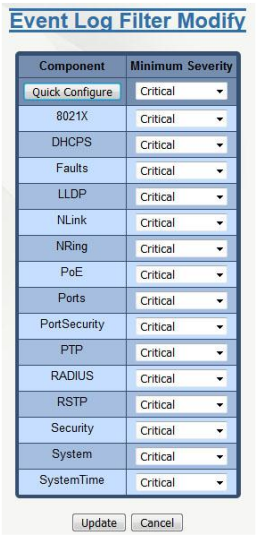
The Event Log Filter page displays the current minimum severity settings for each component. Events below the minimum severity level will not be logged.



Click on the Modify button to make changes to the Event Log Filter.

Event Log Filter Modify

The Event Log Filter configuration can be changed by clicking on the Modify button.



Quick Configure: Use Quick Configure to change all components to the same severity level.

Component: The feature, protocol, or system service of the switch that generates events. The component list is model dependent.

Minimum Severity: Events below the minimum severity level will not be logged. A severity of None will disable events for that component. For more information, see Severity under the section Event Log.

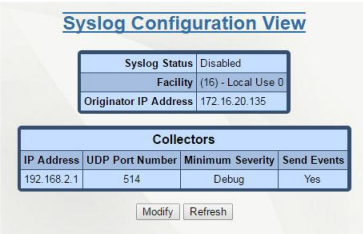
Syslog

The Syslog feature allows certain system events (see Event Log) to be sent as messages to remote hosts for monitoring and analysis.

The messages can be sent to up to 5 different remote hosts, known as Syslog Collectors. A minimum severity level is associated with each Syslog Collector. Events below the minimum severity level will not be sent out from the switch. Syslog is disabled by default and can be enabled through the Web Browser interface.

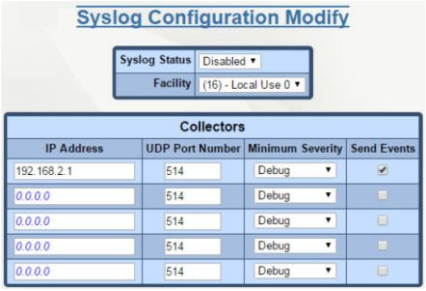
Syslog Configuration View

The Syslog Configuration View is accessible under Event Notification within the Advanced section. Below is an example of the current configuration status of Syslog, the configuration of each Syslog Collector, and a list of the Syslog Collectors.



Syslog Configuration Modify

The Syslog configuration may be changed by an admin level user by clicking on the Modify button. In this section the settings of each Syslog Collector can be updated and the Syslog Distributor itself can be disabled or enabled.



Syslog Status: This field indicates whether the Syslog Distributor (client) has been enabled or disabled. To enable Syslog at least one Syslog Collector (server) must be specified.

Facility: This is used to identify which process is logging the message. This is a global setting for the switch and will be used for all messages. Available Facility values as defined per RFC-5424 are 1 (user level) and 16 - 23 (local use).

Originator IP Address: The field displays the configured IP address of the switch.

Collector: The Syslog server to which the messages are sent.

IP Address: The IP address of the Collector (server) to receive a log message.

UDP Port Number: The UDP port on the Collector (server) to receive the message. The default port number is 514, per RFC-5424, but can be changed to meet installation requirements. Allowed port numbers are 1 - 65535.

Minimum Severity: The minimum Severity level of the messages that will be sent to the specified Collector (server). Values range from Debug (7) to Emergency (0). For example, a Collector configured with a value of Warning (4) will receive all messages from 4 to 0. The importance of a message increases with a lower severity level setting value. These are the same Severity level setting values as the Event Log and Event Log Filter. For more information, see Severity under the section Event Log.

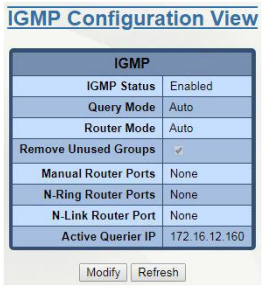
Send Events: This setting can be enabled or disabled, per Collector, to control the distribution of Event Log messages.

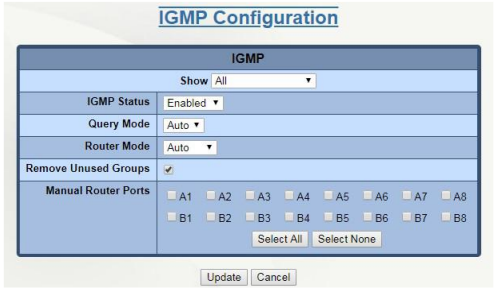
IGMP

Configuration

The Configuration dialog window displays the IGMP basic configuration settings. If an active N-Ring™ participant, the ring ports are informatively shown as N-Ring router ports. On an N-Link Master, Slave or Coupler switch, the coupler port is shown as an N-Link router port.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).





IGMP Status: This field indicates whether the IGMP is enabled or disabled. The default value for this field is *Enabled*.

Query Mode: The default value for this option is Auto. Available options are:

Auto: Multiple switches will ensure that only one switch is the active querier.
On: This switch is always an active querier.
Off: This switch never queries.

Router Mode: The available options for this field are:

Auto: This option allows for dynamically detected and manually set router ports. This is the default value.
None: This option allows for no router ports.
Manual: This option allows for manually set router ports.

Remove Unused Groups: If this option is checked, unused IGMP Groups will be removed and traffic with those multicast addresses will be treated as normal multicast. If this option is unchecked, unused IGMP Groups will remain and traffic with those multicast addresses will be limited. The default value for this field is checked.

Note: IGMP Groups are not retained through a power cycle.

Manual Router Ports: Manually specify the used ports.

N-Ring™ Router Ports: This field displays the N-Ring ports designated as active IGMP Router ports.

N-Link Router Port: This field indicates the N-Link ports that have been designated as active IGMP Router ports.

Active Querier IP: This field shows the IP address of the Active Querier.

Click on the *Modify* button to make changes to the IGMP Status, Query Mode, Router Mode and Manual Router Ports.

Groups

The Groups dialog window displays a list of IGMP groups based on the Group IP and the port that it is associated with.



Total Number of Active IP Group Memberships: The total number of active group IP memberships based on the dotted quad view (aaa.bbb.ccc.ddd) counting each joined port are displayed here.

Group IP: This field shows the dynamically created multicast group IP address.

Port Name: The descriptive name of the port is shown here.

VLAN ID: This field indicates the VLAN in which the Group IP is assigned. The available range is 1-4094.

RFilter Ports

From the RFilter (Router Multicast Data Filter) option, the user can choose whether or not data frames with known group multicast addresses are sent to the router ports. Control packets will be sent to the router(s) regardless of this setting.



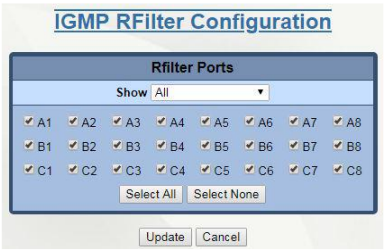
Known group multicast addresses are learned from dynamic IGMP Snooping operations. If IGMP is enabled and a port is a router port, then having RFilter enabled will stop IGMP group data from egressing on the port unless a join to that specific IGMP group has come into the port. IGMP controls (Join, Leave, Query) are still sent.

The Router Multicast Data Filter is enabled for all ports by default. Router ports do not get data frames with known multicast destination addresses unless a join for that specific multicast address has been received on that port. Join overrides an RFilter.

If RFilter is disabled, the router ports get data frames with known multicast destination addresses.

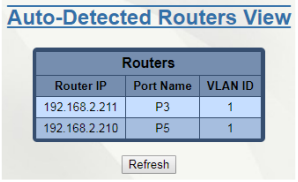
RFilter can be set for individual ports: any, all or none. For each port, RFilter will have an impact only if that port is manually or dynamically chosen as a router port.

Click on the *Modify* button to make changes to the IGMP RFilter Configuration. The following dialog window will appear:



From this dialog window, the administrator selects which ports to identify as RFilter ports and can view all possible ports (Modules), currently installed ports or currently linked up ports. Click on the *Update* button when done with required changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Routers



The Routers dialog window displays a list of the following:

Router IP: Auto-detected router IP address.

Port Name: The descriptive name of the port.

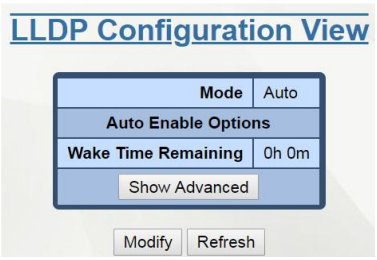
VLAN ID: VLAN in which the Router IP is assigned. The range is 1 - 4094.

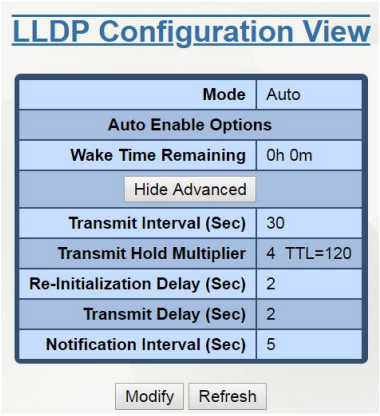
LLDP

LLDP Configuration

The LLDP Configuration Page can be used to view or configure LLDP operation on the switch. The default mode for LLDP is Auto. Other configurable options are revealed by clicking on the "Show Advanced" button.

To enable LLDP on all switches that are in Auto mode, set the mode to Auto, set the Wake Time to a non-zero time, and click the "Send" button.





Mode: The LLDP mode can be Enabled, Disabled, or Auto. In Auto mode, LLDP is inactive until a switch sends a wake-up packet. The default is Auto.

Wake Time: The length of time LLDP will be active on switches that are in Auto mode. A value of 0 hours and 0 minutes will deactivate LLDP. Modify this value and click the "Send" button to set the wake time on all switches that are in Auto mode. The default is 0 hours and 0 minutes.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Transmit Interval (Sec): The interval at which periodic LLDP frames are transmitted. The default is 30 seconds.

Transmit Hold Multiplier: A multiplier on the Transmit Interval when calculating a Time-to-Live value. The default is 4.

Re-Initialization Delay (Sec): The minimum time an LLDP port will wait before re-initializing after its setting has changed from disabled to Tx-Only or Tx/Rx. This prevents excessive notifications when LLDP Port settings are changed. The default is 2 seconds.

Transmit Delay (Sec): When LLDP information is changing on the switch, the time to wait before sending an LLDP frame with the updated information. The default is 2 seconds.

Notification Interval (Sec): The interval between notifications sent by the switch. If a port sends out a notification and another port tries to send out a notification, then the subsequent notification will not be sent until the interval expires. The default is 5 seconds.

LLDP Ports Configuration

The LLDP Ports Configuration Page displays and configures LLDP options for each port.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

Port No: The number of the port.

Mode: The port mode can be Tx Only, Rx Only, Tx/Rx, or Disabled. This configures whether or not LLDP frames are transmitted or received. The default is Tx/Rx.

Allow Management Data: Allows the transmission of management type information. Example: IP address of the switch. The default is checked.

Allow Notification: Allows an SNMP notification to be transmitted when local or remote data changes. The default is unchecked. Note: SNMP Notification Traps must be enabled under SNMP.

Port Description: Indicates whether or not to send the descriptive name of the port in the transmitted LLDP frame. The default is unchecked.

System Name: Indicates whether or not to send the name assigned to the device on the System page in the transmitted LLDP frame. The default is unchecked.

System Description: Indicates whether or not to send the switch model and current firmware version in the transmitted LLDP frame. The default is unchecked.

System Capabilities: Indicates whether or not to send the primary function(s) of the system in the transmitted LLDP frame. The default is unchecked.

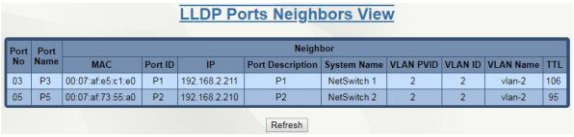
VLAN PVID: Indicates whether or not to send the Port VLAN identifier (PVID) associated with the port in the transmitted LLDP frame. The default is unchecked.

VLAN Name: Indicates whether or not to send the VLAN IDs and Names associated with the port in the trans-mitted LLDP frame. The default is unchecked.

LLDP Ports Neighbors

The LLDP Ports Neighbors shows the results of LLDP discovery. The LLDP Ethernet frames received from neighboring ports are composed of collections of data units called Type Length Value (TLV). Each TLV contains a defined type of information such as the Chassis ID described below, which contains the

MAC address of the device sending the frame. The maximum number of six neighbors can be displayed per each port.



Port No: The port the neighbor information was received from.

MAC: MAC address of neighbor device. Corresponds to the LLDP Chassis ID TLV.

Port ID: Identifier of the neighbor port from which the LLDP frame was sent.

IP: IP address of neighbor device. Corresponds to the LLDP Management Address TLV.

Port Description: Description of the neighbor port from which the LLDP frame was sent.

System Name: The system's administratively assigned name on the neighbor device.

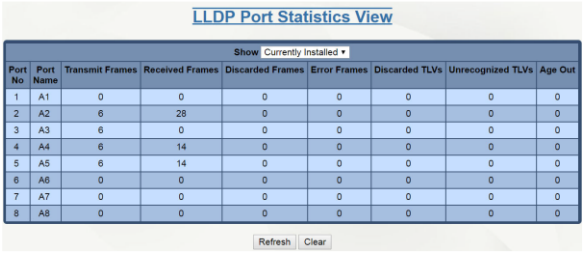
VLAN PVID: The Port VLAN identifier (PVID) associated with the neighbor port.

VLAN ID: A list of all VLAN IDs associated with the neighbor port.

VLAN Name: A list of all VLAN Names associated with the neighbor port.

TTL: Indicates the number of seconds that the information associated with this neighbor will be valid. Time to Live (TTL)

LLDP Port Statistics



Port No: The number of the port.

Port Name: The descriptive name of the port.

Transmit Frames: The total number of LLDP frames transmitted by the local switch.

Received Frames: Total number of LLDP frames received by the local switch.

Discarded Frames: The total number of frames discarded due to incorrect Type Length Values (TLVs) in the frames.

Errors Frames: Total count of all LLDP frames received with one or more errors.

Discarded TLVs: The count of all TLVs discarded for any reason.

Unrecognized TLVs: The count of all TLVs received on the port that are not recognized by LLDP.

Age Out: The count of times that a neighbor's information has been deleted because its Time To Live (TTL) has expired.

N-Link

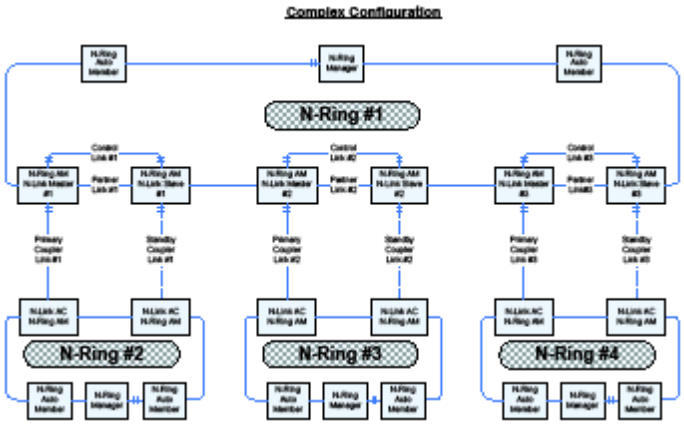
N-Link provides a way to couple an N-Ring topology to one or more other topologies, usually other N-Ring topologies. Each N-Link configuration requires 4 switches: N-Link Master, N-Link Slave, N-Link Primary Coupler and N-Link Standby Coupler.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).

Example of a standard N-Link configuration



Example of a complex N-Link configuration



Configuration steps to redundantly couple 2 N-Ring™ networks:

1. Ensure the Coupler and Control cables are disconnected at this point.
2. Get Both N-Rings working with a status of OK.
3. Configure N-Link Slave: Ensure that the N-Link Slave is set to Auto Configure and select a Default Coupler Port. Save Configuration.
4. Configure N-Link Master: Select the Control and Coupler ports. Save the Configuration.
5. Connect the Control Link cable. Ensure that the Slave switch status now shows a state of “Slave”.
6. Connect the Coupler Link cables.
7. Check N-Link status on the Master by selecting the N-Link Status View page.

Configuration Requirements:

- The Master and Slave must be part of the N-Ring topology.

- If using default configuration choices, the administrator only needs to configure the N-Link Master. The N-Link Slave and both Coupler switches will auto-detect any needed configuration.
- If not using default configuration choices, the administrator may also need to configure the Default Coupler port on the N-Link Slave.
- There must be a direct link between the Master and Slave Control ports. Use of media converters or other switches is not supported.
- There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported.
- There must be an N-Link aware switch on each side of the Master.
- N-Link will only support a single point of failure. Multiple points of failure and misconfiguration are not supported and may cause a network storm under some circumstances.
- Control and Partner connections should be either fiber or 10/100Base-TX copper.

  The use of copper SFP transceivers for N-Link control and partner connections is not recommended due to the variances of link performance between SFP manufacturers.

  Per the IEEE 802.3 standard (Clause 40), a 1000Base-T PHY is required to wait 350-750 milliseconds before reporting a link down condition; and is therefore unsuitable for use as an N-Link control or partner connection.
- For optimal performance:

  The speed of the Partner segment must match the speed of the other N-Ring™ segments. Therefore, the Partner connection must be 1 gigabit fiber when the other N-Ring segments have a 1 gigabit speed.

  When using a 700/7000 Series N-Link Slave, the control port should use a fiber connection.

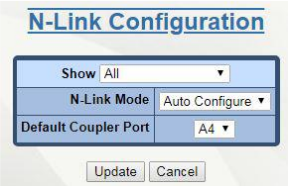
Configuration/Basic

The Basic tab under the N-Link Configuration category will display the basic configuration settings. By default, N-Link is in Auto-Configuration mode and will use A4 as the Default Coupler port.

The port configured as the Default Coupler Port will be used as the Standby Coupler port if the switch detects an N-Link Master and becomes an N-Link Slave.



Click on the *Modify* button to make changes. Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

N-Link Mode: Select the required N-Link mode from the drop-down list. The available options are:

Disabled: N-Link is disabled and will not operate as an N-Link capable switch.
Auto Configure: In this mode, the switch will automatically detect whether it is a slave or a coupler.
Master: If this option is selected, then the administrator must configure the Control Port (default: A3) and the Primary Coupler Port (default: A4).

Default Coupler Port: The Coupler Port is used to establish a redundant path for Ethernet data. If the role of the switch is Slave the port will be a Standby Coupler. The default is A4.

Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Configuration/Advanced

The Advanced dialog window displays the advanced configuration settings. If N-Link is set to *Auto Configure*, the following configuration data will be used. The selected Auto Configure detection timeout value range is 2-180 seconds. The default Auto Configure detection time is 4 seconds.



Click on the *Modify* button to change the detection timeout. Click on the *Update* button once the field has been updated with the required information. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Status

The Status dialog window displays the N-Link status. If the switch is an N-Link Master or Slave, the following switch status and partner status information will be shown. Fields with a red background designate a fault condition.

N-Link Master or Slave

The following switch status and partner status information are shown.

State: This field displays the current N-Link mode of the switch.

Partner Port: This field shows the port being used for normal communication between the N-Link Master and N-Link Slave switches. There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported. This port will be detected automatically.

Coupler Port: The port being used to establish a redundant path for Ethernet data transmission is displayed in this field.

Coupler Port State: Blocking, Forwarding.

Status: If there are no errors, the status shows OK. Otherwise, a description of the faults detected is shown.

N-Link Partner Information

The following switch statuses are shown.

State: Current N-Link mode of switch.

MAC: The MAC address of the N-Link Partner switch.

Coupler Port State: Blocking or Forwarding.

Status: If there are no errors, the status will show OK. Otherwise, a description of the faults detected will be shown.

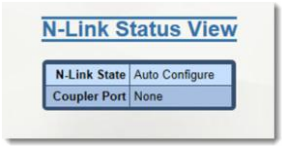
N-Link Auto Configure

N-Link State: Current N-Link mode of switch.

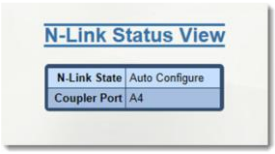
Coupler State: The port used to establish a redundant path for Ethernet data transmission. This port will be detected automatically.

Status Examples

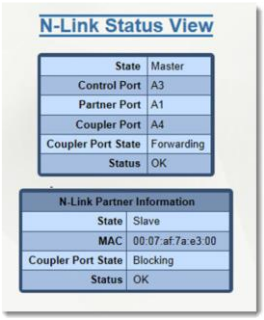
N-Link Auto Configure that is not an N-Link Master and has not become an N-Link Slave or an N-Link Coupler:



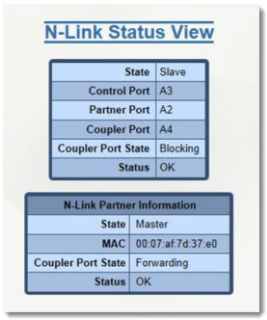
N-Link Coupler Switch:



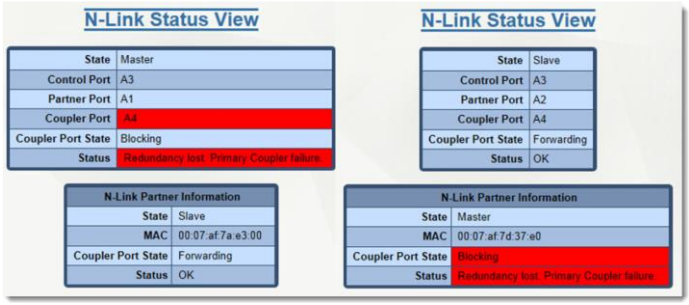
N-Link Master Switch:



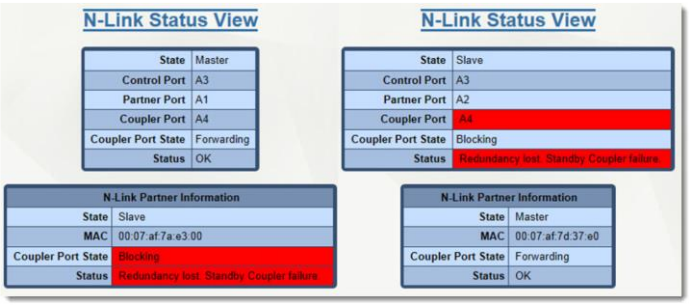
N-Link Slave Switch:



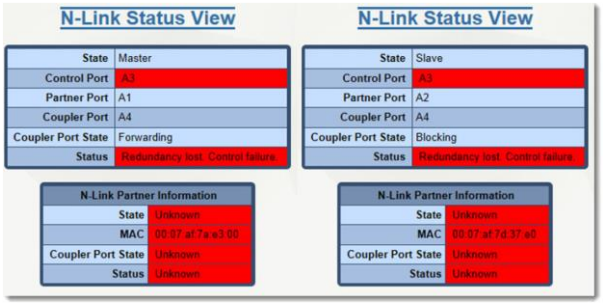
N-Link Status Master and Slave where the Primary Coupler is broken:



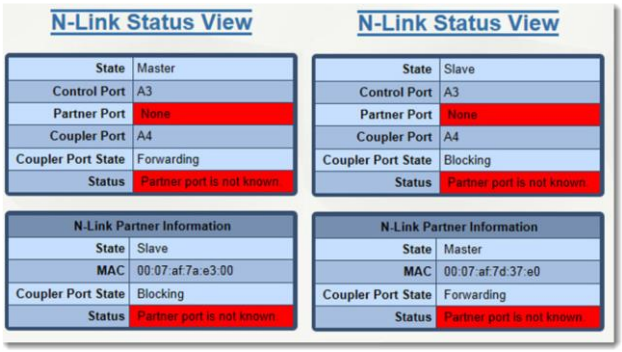
N-Link Master and Slave where the Standby Coupler link is broken:



N-Link Master and Slave where the Control link is broken:



N-Link Master and Slave where the Partner link is broken:



N-Ring™

Configuration/Basic

The Basic dialog window displays the N-Ring basic configuration settings. By default, N-Ring is in Auto Member mode.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Click on the *Modify* button to make changes to the N-Ring Basic Configuration:



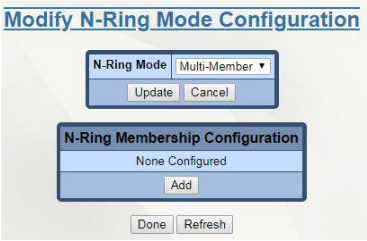
Disabled: If selected, this option disables the N-Ring capabilities on the switch.

Auto Member: When set to auto member, the switch automatically detects when it is a part of an N-Ring for participation in the ring.

Manager: When in Manager mode, the administrator may select different Port Sets as N-Ring ports. (See the Port Set Configuration section for information on adding and deleting port sets.)

N-Ring Ports: Defines the two ports that are used to connect to the N-Ring.
N-Ring™ Number: The N-Ring number can be selected from a range of 1 - 16 or a custom N-Ring number can also be chosen. The selected N-Ring number determines the VLAN ID. See table below for N-Ring numbers and corresponding VLAN IDs.
VLAN ID: This field is auto-generated based on the selected N-Ring number. See table for N-Ring numbers and corresponding VLAN IDs.
Tagging: The type of VLAN tagging used. Currently, tagged mode is the only supported mode.

Multi-Member: When in Multi-Member mode, a switch can be a member of multiple rings. If selected, then N-Ring Membership Configurations can be added for each N-Ring to which the switch will be connected. The image below shows one configured N-Ring.



To delete an existing N-Ring Membership, click on the *Delete* button.

To add a new N-Ring Membership, click on the *Add* button. The screen below will appear.



Select the N-Ring Ports and N-Ring Number to be used for the N-Ring. The VLAN ID for each N-Ring Membership must match that of the N-Ring Manager on each specific N-Ring to which the N-Ring Multi- Member will be connected.

Click on the *Update* button once the required selection has been made. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

List of available N-Ring Numbers and their corresponding VLAN ID:

N-RING NUMBER	VLAN ID	N-RING NUMER	VLAN ID
1	3333	9	3341
2	3334	10	3342

3	3335	11	3343
4	3336	12	3344
5	3337	13	3345
6	3338	14	3346
7	3339	15	3347
8	3340	16	3348

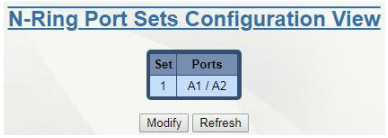
Configuration Requirements:

1. N-Ring requires tagged frames to optimize frame prioritization.
2. Do not create redundant links unless either RSTP or N-Ring is enabled.
3. The Default VLAN and any active N-Ring VLAN cannot be deleted.
4. RSTP and N-Ring™ are different modes and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then RSTP will be disabled for that port. Other ports may have RSTP enabled.
5. Do not connect the N-Ring to actively Trunking ports on an Auto Member or Multi-Member configured switch.
6. An NT24k® switch can only participate in one N-Ring unless in Multi-Member mode.
7. Since VLANs are implemented for security reasons as well as traffic flow, N-Ring only makes minimal VLAN changes. It is up to the administrator to ensure that VLANs are configured correctly on the N-Ring manager and all N-Ring members.
8. For optimal performance, all N-Ring segments must be configured for the same speed.

> **WARNING:** To prevent a network storm, multiple segments between N-Ring members on one or more N-Rings must not occur. N-Ring members should only be connected to each other by the N-Ring ports.

Configuration/Port Sets

A port set is a group of two ports that may be used for an N-Ring. The default N-Ring Port Set is A1/A2. Click on the *Modify* button to make changes to the Port Sets.



Set: This field displays the Port set table index.

Ports: This field indicates the designated pair of N-Ring ports. To reassign different pairs, the Port sets containing those ports, if any, must be deleted before the ports can be reassigned (a port can only belong to one port set).

Delete: To delete a port set, check the box next to the line item to be deleted and click on the *Delete* button.

Click on the *Add* button below the Set column.



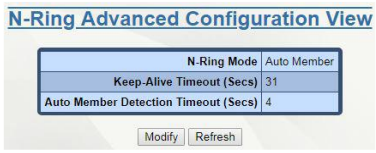
N-Ring Ports: A new port set can be added by selecting the N-Ring ports from the N-Ring Ports pull-down lists and clicking on the *Add* button.

Port Sets: Port Sets can be removed by selecting the port set from the Port Sets pull-down and pressing the *Remove* button.

Click on the *Update* button when port set configuration is complete. The N-Ring Port Sets Entry dialog window will appear. Click on the *Done* button. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Configuration/Advanced

Auto Member Mode



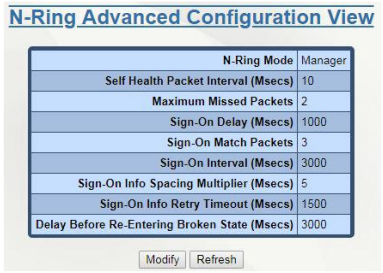
N-Ring™ Mode: This field is defined in the N-Ring/Configuration/Basic dialog window.

Keep-Alive Timeout (Sec): This field displays the amount of time to wait (in seconds) to receive a keep-alive request before switching from active member back to auto member. The default value is 31 seconds and the available range is 15 to 300 seconds. A entry of 0 will disable the feature.

Auto Member Detection Timeout (Sec): This field shows the amount of time to wait in seconds to receive N-Ring frames on any auto member port (at boot up) before assuming the switch is not part of an N-Ring. The default value is 4 seconds and the available range is 2 to 180 seconds.

Click on the *Modify* button and enter the required changes. When entries are complete, click on the *Update* button. To save the changes, return to the *Configuration* menu and click on the *Save* button.

Manager Mode



When in Manager mode, the following advanced configuration data are displayed in their respective fields:

Self Health Packet Interval (Msecs): The amount of time to wait in milliseconds before sending Self-Health packets. The default value for this field is 10.

Maximum Missed Packets: The number of consecutive missed Self-Health packets that constitute a fault. The default value for this field is 2 packets.

Sign-On Delay (Msecs): The amount of time to wait in milliseconds before requesting initial sign-on information from ring members. The default value is 1000 Msecs.

Sign-On Match Packets: The number of times the switch count must match before starting the sign-on process. The default value is 3.

Sign-On Interval (Msecs): The interval of time to wait in milliseconds before requesting subsequent sign-on information from ring members when the ring is broken. The default value for this field is 3000 Msecs.

Sign-On Info Spacing Multiplier (Msecs): The amount of time to wait in milliseconds, scaled by switch number, before sending information to the ring manager. The default value is 5 Msecs.

Sign-On Info Retry Timeout (Msecs): The amount of time the ring member will wait in milliseconds for the ring manager to acknowledge receipt of the member's information before the member tries to resend the information. The default value for this field is 1500 Msecs.

Delay Before Re-entering Broken State (Msecs): The amount of time, in milliseconds, that must elapse before the ring is allowed to go back into the broken state. The default is 3000 Msecs.

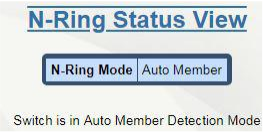
Click on the *Modify* button and make the required changes. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Multi-Member mode

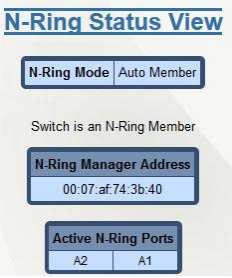
There are no advanced options when operating in Multi-Member mode.

Configuration Status

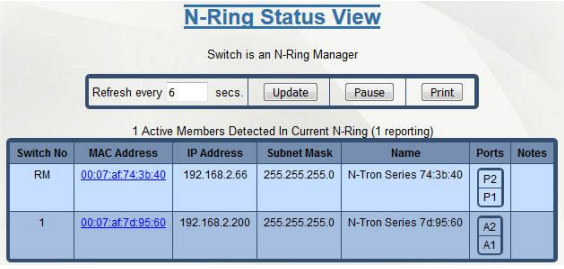
When an N-Ring™ Auto Member is not participating in an N-Ring, the following information is shown:



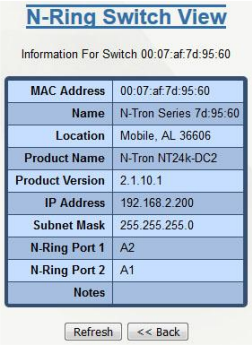
When an N-Ring Auto Member is participating in an N-Ring, the following information is shown:



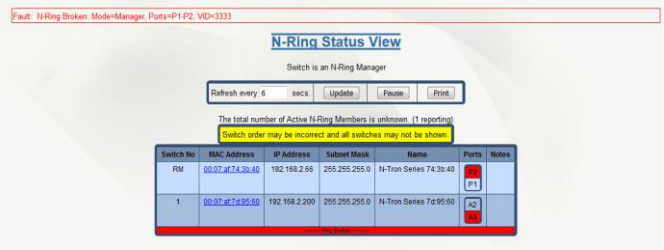
When N-Ring is in Manager Mode, the following data will be as shown below.



If the MAC is selected, more data is retrieved and shown about the N-Ring Member switch.



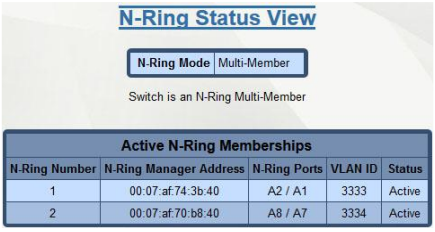
N-Ring™ Manager View for a faulted N-Ring:



A fault warning *Fault: N-Ring Fault* in red will show at the top of the dialog window.

The break is identified in red. In this case, N-Ring manager A2 to N-Ring active member Switch Number 1 TX2 is broken. A warning *Switch order may be incorrect and all switches may not be shown* is displayed in yellow. This indicates that the Sign On frames cannot get around the N-Ring and the data may not have been updated since the last successful update.

N-Ring Multi-Member Status View



N-Ring Number: N-Ring number to which the N-Ring Membership is associated.

N-Ring Manager Address: Show the MAC address of the switch acting as the N-Ring Manager.

N-Ring Ports: The port set linked to this N-Ring.

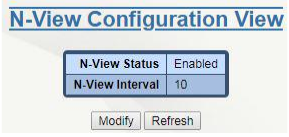
VLAN ID: The VLAN ID tag to be used with this N-Ring. The VLAN ID is associated with the N-Ring, and can be changed by switching the N-Ring number.

Status: Current status of the N-Ring Membership. The values are:

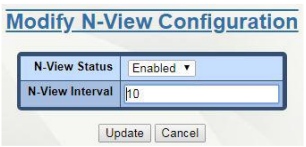
Active: The N-Ring Membership is connected and operating normally.
Inactive: The N-Ring Membership is not responding and not functioning correctly.

N-View™

The N-View Configuration dialog window displays the basic configuration for N-View. The status (enabled or disabled) and the interval between packets.



Click on the *Modify* button to make changes to the N-View Configuration.



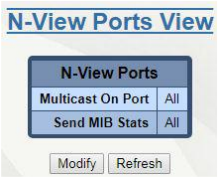
N-View™ Status: This field determines whether the N-Ring™ is enabled or disabled.

N-View Interval: This field determines the frequency in which N-View reports its information. Increasing the interval slows the update rate and decreasing it allows N-View to report more frequently. The available range is 10-500 seconds. Interval values are converted to increments of 10 seconds. The default value is 10 seconds.

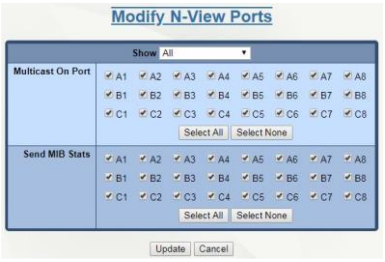
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Ports

The Ports dialog window displays a list of the configured ports on the NT24k® unit, along with the ports transmitting N-View related multicast packets and MIB stats respectively.



Click on the *Modify* button to make changes to the N-View Ports.



The user can modify these two variables to enable or disable N-View related multicast out of the port and if MIB stats are sent out for those ports. The ports that can be installed (Modules), currently installed or currently linked up can also be viewed.

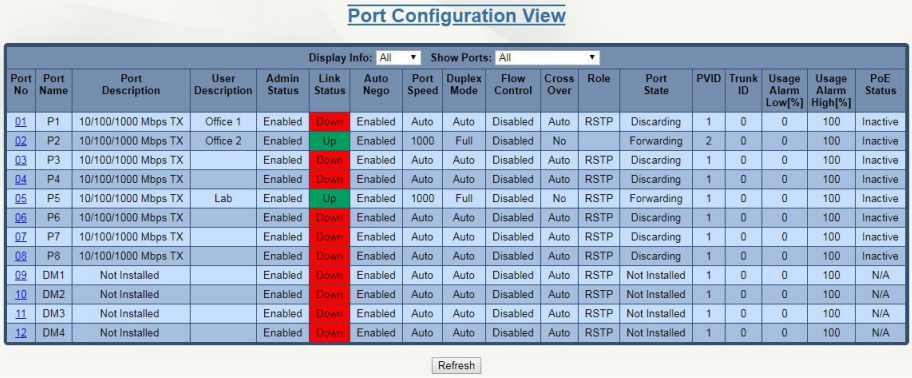
Click on the *Update* button after required changes have been made. To save the settings, navigate to the *Configuration* menu and click on the *Save* button.

Ports

Configuration

The Ports Configuration dialog window shows a detailed overview of all the ports on the switch. The administrator can view the ports that are available to install (Modules), currently installed or currently linked up.

The information displayed on the page can be changed by changing the *Display Info* from *Basic* to *All*. *Basic* shows the most commonly used information while *All* shows all of the available information.



Port Configuration View

Display Info: All Show Ports: All

Port No	Port Name	Port Description	User Description	Admin Status	Link Status	Auto Nego	Port Speed	Duplex Mode	Flow Control	Cross Over	Role	Port State	PVID	Trunk ID	Usage Alarm Low[%]	Usage Alarm High[%]	PoE Status
01	P1	10/100/1000 Mbps TX	Office 1	Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
02	P2	10/100/1000 Mbps TX	Office 2	Enabled	Up	Enabled	1000	Full	Disabled	No		Forwarding	2	0	0	100	Inactive
03	P3	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
04	P4	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
05	P5	10/100/1000 Mbps TX	Lab	Enabled	Up	Enabled	1000	Full	Disabled	No	RSTP	Forwarding	1	0	0	100	Inactive
06	P6	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
07	P7	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
08	P8	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
09	DM1	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
10	DM2	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
11	DM3	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
12	DM4	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A

Refresh

The screen above represents the Port Configuration View for a PoE model. If not using a PoE model, the page will be similar except the PoE Status column will not be present.

Port No: This field indicates the port number.

Port Name: This field displays the descriptive name of the port.

Port Description: This column provides a brief description of the port. Ports with "-R" in their description are Bypass Relay capable ports. Refer to the section Bypass Relay (BR) for more information on Bypass Relay devices and ports.

User Description: Description of the port set by a user.

Admin Status: This configurable field displays the existing status of the port. The two options are *Enabled* or *Disabled*.

Link Status: Shows the current state of the port. The two options are *Up* or *Down*.

Auto Nego: This configurable field displays the current auto-negotiation state whether it is *Enabled* or *Disabled*. Auto-negotiation cannot be disabled on a port connected to a gigabit device.

Port Speed: This configurable field displays the speed of each port. The available values are 10/100/1000 Mbps.

Duplex Mode: The existing mode of the port, whether it is *Full Duplex* or *Half Duplex*, is shown in this configurable field.

Flow Control: This configurable field displays the existing flow control status of each port.

Cross Over: This configurable field displays the existing crossover mode of the port. This can be indicated with a *Yes*, *No* or *Auto*. The default value for this field is Auto.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, and N-Link Coupler. For example, if a port is actively participating in an N-Ring and as an N-Link Partner, the role would be: N-Ring, N-Link Partner.

Port State: This column displays the current RSTP status of a port. It may contain *Disable*, *Discarding*, *Learning* or *Forwarding*.

PVID: This configurable field displays the existing port VLAN ID setting. The allowable range is 1-4094.

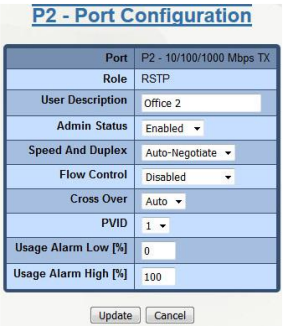
Trunk ID: When the port is an active member of a trunk group, the trunk's ID value is shown. A zero value indicates that the port is not an active trunk member.

Usage Alarm Low [%]: This field indicates the bandwidth utilization percentage below which a fault is triggered if enabled. For the half-duplex option, the bandwidth utilization percentage is the sum of both RX and TX bandwidth utilization. For the full-duplex option, this is the higher of TX or RX bandwidth utilization.

Usage Alarm High [%]: This field displays the bandwidth utilization percentage above which a fault is triggered if enabled. For half duplex the bandwidth utilization percentage is the sum of both RX and TX band-width utilization, and for full duplex this is the lower of TX or RX bandwidth utilization.

PoE Status: The current status of the PoE will be displayed in this column. It may show *Inactive*, *Active*, *Disabled* or *N/A*.

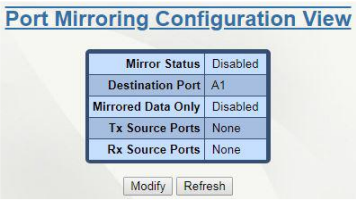
Click on the *Port Number* to configure each port individually. This will allow the user to change the port's settings.



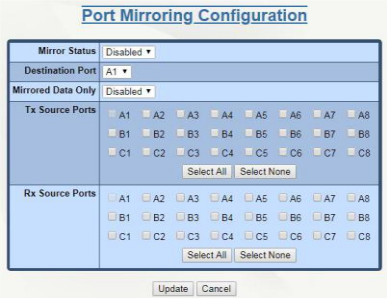
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Mirroring

A Mirroring Port is a dedicated port that is configured to receive copies of Ethernet frames that are sent or received from a monitored port. The Mirroring dialog window displays the status including the list of Source Ports and the Destination Port that the Sources are being mirrored to.



Click on the *Modify* button to make changes to the *Port Mirroring Configuration*.



Mirror Status: Enable or Disable the Mirroring functionality by selecting the option in the drop-down menu.

Destination Port: Select the destination ports that the source ports will be mirrored to.

Mirrored Data Only: Select the mirrored data to be transmitted to the destination port.

Tx Source Ports: Select the transmitting ports to be mirrored by checking on the desired ports or the *Select All* button.

Rx Source Ports: Select the receiving ports to be mirrored by checking on the desired ports or the *Select All* button.

Configuration Notes:

1. Non-mirrored frames take priority over mirrored frames. Mirrored frames may be discarded under rare instances when resource contention occurs.
2. The mirroring destination port is not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, Trunking.

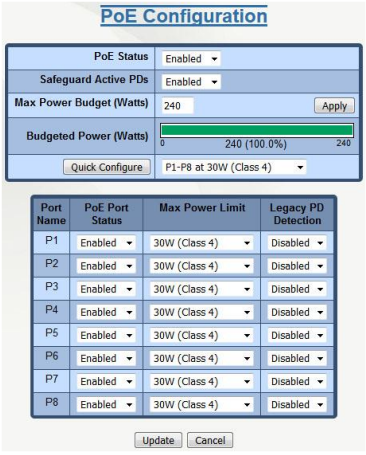
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

PoE

PoE (Power Over Ethernet) is an internal hardware capability that outputs power and data on Ethernet cabling to Powered Devices (PDs) such as VoIP phones, IP camera, and industrial devices. PoE eliminates the need to run separate data and power cables between the PSE (PoE Source Equipment) and the PoE powered device.

PoE Management on the NT24k® provides the ability to set the PoE power budget, enable/disable PoE on specific ports, and set power limits per port.

Note: PoE is only supported on certain NT24k switches.



PoE Configuration: Table 1

PoE Status: This configurable field indicates whether the global PoE is enabled or disabled. PoE ports must also be individually enabled on the PoE configuration page. The default value for this field is Enabled.

Safeguard Active PDs: This configurable field indicates whether an active PD is safeguarded from losing power because of a configuration change. If enabled, the Max Power Limit cannot be changed if it can cause a power loss to the active PD. Similarly, Legacy PD Detection cannot be disabled on an active legacy powered device. The default value for this field is Enabled.

Max Power Budget (Watts): The maximum amount of power available for PoE. The value can range from 4 to the max power supply support for the switch.

Quick Configure: The quick configure selection menu updates the PoE port table with the desired settings based on the quick configuration option selected.The following values for 8 PoE Ports are:

- P1-P8 at 30W (Class 4) (default)
- P1-P8 at 15.4W (Class 3/0)
- P1-P8 at 7W (Class 2)
- P1-P8 at 4W (Class 1)
- All ports disabled.

For 16 PoE Ports the values are:

- P1-P8 at 30W (Class 4) (default)
- P9-P16 at 30W (Class 4)
- P1-P16 at 15.4W (Class 3/0)
- P1-P16 at 7W (Class 2)
- P1-P16 at 4W (Class 1)
- All ports disabled.

PoE Configuration: Table 2

PoE Port Status: This configurable field indicates whether PoE is enabled or disabled on the port.The default value is enabled on the first 8 PoE ports.

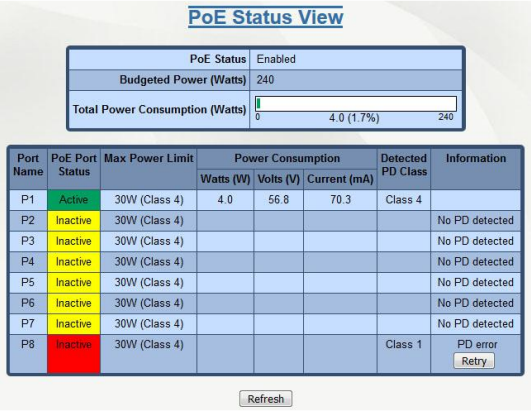
Max Power Limit: This configurable field indicates the maximum budgeted power for the port. The values are:

- 4W (Class 1)
- 7W (Class 2)
- 15.4W (Class 3/0)
- 30W (Class 4)

Legacy PD Detection: This field indicates whether legacy PD detection is enabled or disabled on the port. If enabled, legacy powered devices will be recognized. The default value is disabled.

Note: The sum of the Port Max Power Limit should not exceed the MaxBudgeted Power.

PoE Status: Table 3



Port Name: This field displays the descriptive name of the port.

PoE Port Status: Current status of the PoE port. The values are:

- Active: PoE power is outputted on the specific port
- Inactive: PoE power is not outputted on the specific port
- Disabled: PoE functionality is disabled on the specific port

Max Power Limit: The maximum budgeted power for the port.

Power Consumption: The actual power consumption of the port.

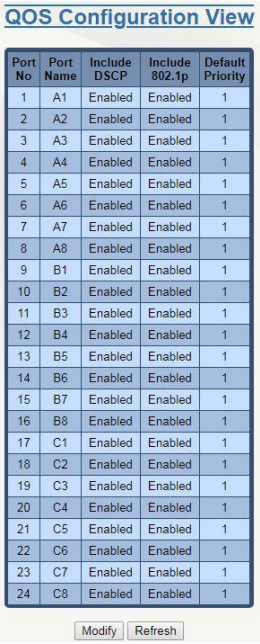
Detected PD Class: The classification of the connected device, which can range from Class 0-4.

Information: Details about the port's current state. If a Powered Device attempts to negotiate more power than the allocated maximum, PoE will be turned off on the port and a re-negotiation period will start. If re-negotiation is unsuccessful, a Retry button will be displayed below the PD error message. Select the retry button to restart negotiation after the cause of the overload is resolved.

QOS (Quality of Service)

The QOS decision tree chooses a frame's output port priority and the egress frame's IEEE 802.1p User Priority value (if needed) based on the QOS settings and the User Priority value (if any) in the ingress frame. Both the internal port priority setting and the egress frame User Priority value are always assigned the same value. The available values are 0 through 7 where 7 is the highest priority. If the ingress frame is an IP packet, the RFC 2474 DSCP field in the packet will be passed unchanged to the egress frame.

Click on the *Modify* button to make changes to the QOS Configuration.



Include DSCP: This configurable field displays the status of whether or not to include the ingress frame's RFC 2474 DSCP value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. If the ingress frame type is IP (IPv4 or IPv6) and Include DSCP is enabled, DSCP processing will override all other settings. (see QOS SELECTION CHART below). The default value is enabled.

Include 802.1p: This configurable field displays the status of whether or not to include the ingress frame's IEEE 802.1p User Priority value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. This setting is used only if the frame type is not IP (IPv4 or IPv6) or the Include DSCP setting is disabled. (see QOS SELECTION CHART below). The default value is enabled.

Default Priority: This configurable field displays the default QOS priority for the transmit priority value and the egress frame's IEEE 802.1p User Priority value if not otherwise assigned by DSCP or IEEE 802.1p processing. The range is 0-7, highest priority=7. The default value is 1.

QOS Selection Chart:

INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Enabled	N.A.	IP	N.A.	Ingress DSCP Value
N.A.	Enabled	Not IP	Yes	Ingress IEEE 802.1p UP
N.A.	Enabled	Not IP	No	Default Priority Setting
N.A.	Disabled	Not IP	N.A.	Default Priority Setting
Disabled	Enabled	N.A.	Yes	Ingress IEEE 802.1p UP
Disabled	Enabled	N.A.	No	Default Priority Setting
Disabled	Disabled	N.A.	N.A.	Default Priority Setting
Legend				
IP	Ingress packet type is IPv4 or IPv6.			
Ingress DSCP Value	Use the high order three bits of the ingress frame’s IP DSCP value.			

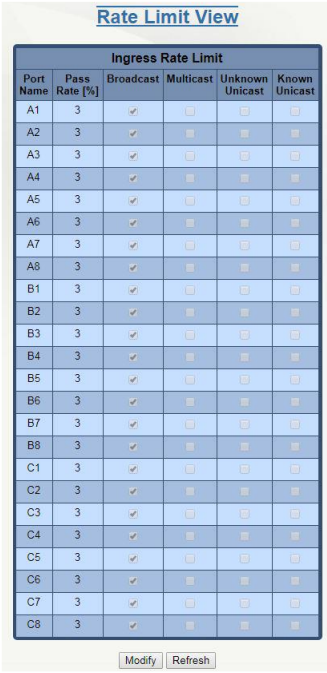
INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Ingress IEEE 802.1p UP	Use the ingress packet's IEEE 802.1p User Priority value.			
N.A.	Not applicable			

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

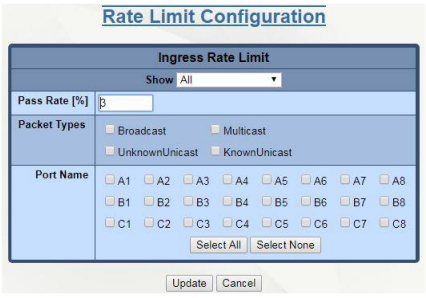
Rate Limiting

The Rate Limiting dialog window shows the NT24k® installed ports and the Pass Rate Percentage per port for each of the following: Broadcast, Multicast, Unknown Unicast and Known Unicast.

A packet type will be affected by the rate limit setting if the check box is selected and it exceeds the total number of packets established by the ingress rate limit within an assigned time period. The time periods are: 1 Gbps = 10 ms, 100 Mbps = 100 ms and 10 Mbps = 1 sec.



Click on the *Modify* button to make changes to the Rate Limiting settings.



Show: View the ports that are available to install (Modules), currently installed or currently linked up.

Pass Rate [%]: Modify the pass rate percentage for each and every port by entering the desired value.

Packet Types: Select what Packet Types are to be passed: Broadcast, Multicast, Unknown Unicast and Known Unicast.

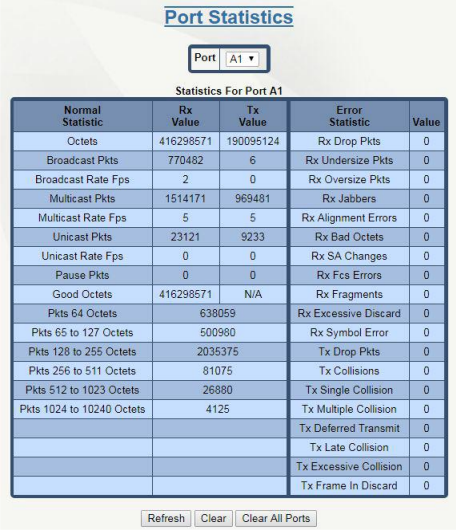
Port Name: Select which ports are affected by the changes made.

Note: Unicast packets with destinations not in the ARL table can be rate limited rather than all being flooded. This is known as “Unknown Unicast”.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Status/Statistics

This dialog window displays the MIB counters for the selected port, specified by the Port pull-down menu.

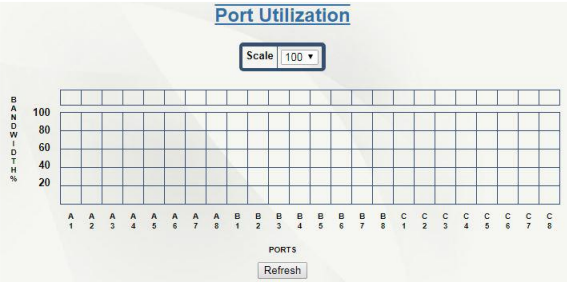


Normal Statistic	Rx Value	Tx Value	Error Statistic	Value
Octets	416298571	190095124	Rx Drop Pkts	0
Broadcast Pkts	770482	6	Rx Undersize Pkts	0
Broadcast Rate Fps	2	0	Rx Oversize Pkts	0
Multicast Pkts	1514171	969481	Rx Jabbers	0
Multicast Rate Fps	5	5	Rx Alignment Errors	0
Unicast Pkts	23121	9233	Rx Bad Octets	0
Unicast Rate Fps	0	0	Rx SA Changes	0
Pause Pkts	0	0	Rx Fcs Errors	0
Good Octets	416298571	N/A	Rx Fragments	0
Pkts 64 Octets	638059		Rx Excessive Discard	0
Pkts 65 to 127 Octets	500980		Rx Symbol Error	0
Pkts 128 to 255 Octets	2035375		Tx Drop Pkts	0
Pkts 256 to 511 Octets	81075		Tx Collisions	0
Pkts 512 to 1023 Octets	26880		Tx Single Collision	0
Pkts 1024 to 10240 Octets	4125		Tx Multiple Collision	0
			Tx Deferred Transmit	0
			Tx Late Collision	0
			Tx Excessive Collision	0
			Tx Frame In Discard	0

Pressing the *Clear* button resets all counters for the selected port. The *Clear All Ports* button resets all counters for all ports, including the selected port. The *Refresh* button reloads the dialog window.

Status/Utilization

This dialog window displays the bandwidth percentage graph of all the ports. The graph is scaled based on the “*Scale*” drop-down list.



Trunking

The Trunking dialog window displays trunking information.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Trunk ID: This column displays the trunk identifier number. The valid range is 1-127.

Trunk Name: This column shows the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

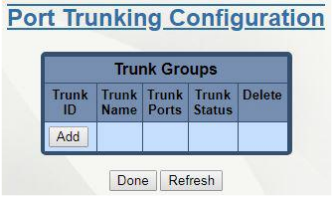
Trunk Ports: This column displays the ports associated with the trunk.

Trunk Status: The existing status of the trunk is shown in this column. Available trunk status options are *Enabled* or *Disabled*.

Configuration Note:

Note: The trunk ports are not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, 802.1X, Mirroring.

Click on the *Modify* button to add, modify or delete ports.



Click on the Add button and the following dialog window will appear:



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

ID: Enter the desired Trunk ID. Valid range is 1- 127. There can be no duplicate Trunk IDs.

Name: Enter the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

Ports: Select the required ports from the Ports list. The list of ports shown will vary depending on the selection in the *Show* field.

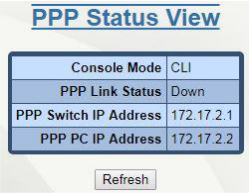
Status: Select the status of the port that is being added. Options are *Enabled* or *Disabled*.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

To modify an existing Trunk Group, click on the *Trunk ID* and make the required changes. To Delete an existing Trunk Group, click on the *Delete* button associated with the Trunk ID to be deleted.

PPP

The console can be either in CLI mode or PPP mode. The PPP mode provides a TCP/IP connection over the serial port. A browser may then be used to view switch information or make configuration changes. PPP mode is entered by using the PPP command on the console. To change from PPP to CLI mode, you must reboot the switch.



Console Mode: When CLI is shown, the console is in the command mode, which is the default mode. When PPP is shown, the console is in PPP mode.

PPP Link Status: This field indicates the current PPP link state.

PPP Switch IP Address: This field displays the IP address for the switch side of the PPP link.

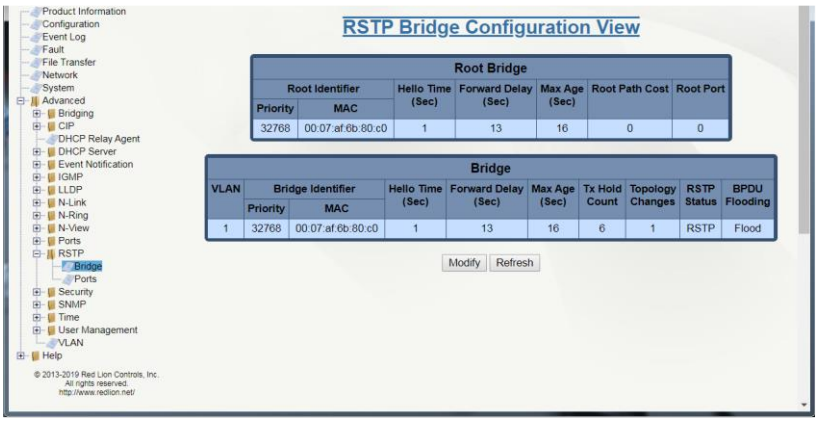
PPP PC IP Address: This field indicates the IP address for the PC side of the PPP link.

RSTP

Bridge

The Bridge dialog window displays the RSTP information for the RSTP Root Bridge and for the RSTP Bridge on this switch.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Root Bridge: This is the identity and parameters of the RSTP Root Bridge.

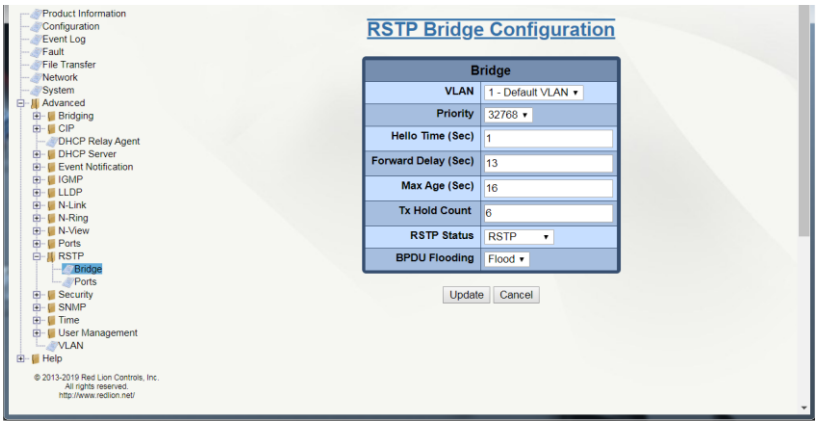
Root Identifier - Priority: This field indicates the priority of the Root Bridge.
Root Identifier - MAC: The unique MAC address of the Root Bridge is shown here.
Hello Time (Sec): This field indicates the time interval, in seconds, between the transmission of configuration BPDUs by designated ports.
Forward Delay (Sec): This field shows the time spent, in seconds, by legacy STP Bridges in transitioning Root and designated ports to forwarding. This delays port transitions until other bridges have received spanning tree information.

Max Age (Sec): For RSTP, this is the maximum time, in seconds, that a bridge will wait for configuration BPDUs before deciding it is no longer connected to the root bridge.
Root Path Cost: The cost of the path to the Root Bridge via the Root Port of this bridge.
Root Port: The Root Port of this Bridge. The Root Port provides the lowest cost path from this bridge to the Root Bridge.

Bridge: This is the configuration of the RSTP bridge on this switch.

VLAN: RSTP will operate on all ports of this VLAN. BPDUs will be transmitted with or without VLAN tags depending on the settings for this VLAN. This should be a valid VLAN ID. The default value for this field is VLAN 1.
Bridge Identifier Priority: This field indicates the Bridge priority. The range is 0 - 61440. The default value is 32768.
Bridge Identifier MAC: The unique MAC address of the Bridge is displayed in this field. This is possibly a different network device.
Hello Time (Sec): This field indicates the Hello time, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time interval, in seconds, between the transmission of Configuration BPDUs by Designated Ports. The range is 1 - 10. The default value is 1.
Forward Delay (Sec): This field displays the Forward Delay, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time spent, in seconds, by legacy STP Bridges in transitioning Root and Designated Ports to Forwarding. This delays Port transitions until other bridges have received spanning tree information. The range is 4 - 30. The default value is 13 seconds.
Max Age (Sec): This field displays the Max Age when this bridge is the Root Bridge or is attempting to become the Root Bridge. For RSTP, this is the maximum hops allowed for any protocol message before it is discarded and no longer retransmitted. For STP, this is the maximum time, in seconds, that a bridge will wait for Configuration BPDUs before deciding it is no longer connected to the root bridge. The range is 6 - 40. The default value is 16 seconds.
Tx Hold Count: This is the maximum number of configuration BPDUs that can be transmitted in one second from a port on this Bridge before transmission is throttled. The range is 1 to 10. The default value for this field is 6.
Topology Changes: This is the number of RSTP topology changes since the switch has been powered on or rebooted.
RSTP Status: This is the current status of the RSTP protocol on this bridge. The available options for this field are RSTP, Force STP or Disabled.
Note: RSTP & N-Ring™ are different network topology protocols and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then the port will be disabled for RSTP.
Note: Do not create redundant network paths unless either RSTP or N-Ring is enabled.
Note: If a port is both an RSTP port and an enabled trunk group member, then the port will be disabled for RSTP. The RSTP port status can be seen under advanced RSTP ports.
Note: It is recommended that an RSTP network consist of RSTP capable switches.
Note: RSTP is supported on only one VLAN.
Note: When operating in a VLAN with legacy STP devices, use these values for the Bridge: Hello Time (Sec) = 2, Forward Delay (Sec) = 15 and Max Age (Sec) = 20.
BPDU Flooding: This value allows for flooding or blocking of BPDUs to other ports when the global spanning tree is disabled or when spanning tree is disabled on a specific port. If Flood is selected, BPDUs are flooded to all other ports based on the VLAN assignment. The options are Flood or Block. The default is Flood.

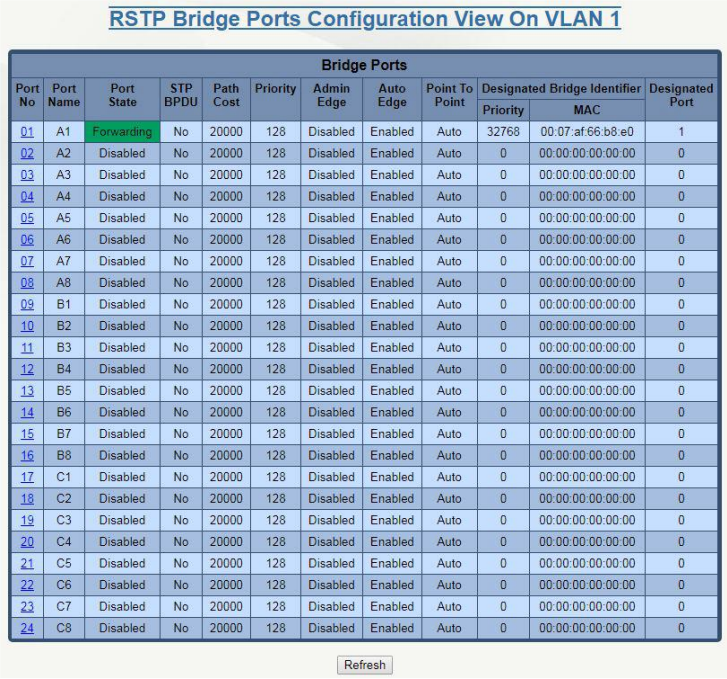
Click on the *Modify* button and the following dialog window will appear:



Make the required modifications, and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

The RSTP Ports dialog window displays information such as the path cost and the port state. If the switch sees a redundant network path, it will put the port with the highest path cost into the Blocking port state where it will discard packets coming in on that port.

In the example shown below, A2 is a redundant port with port A1, therefore A1 is forwarding and A2 is discarding.



Port No	Port Name	Port State	STP BPDU	Path Cost	Priority	Admin Edge	Auto Edge	Point To Point	Designated Bridge Identifier		Designated Port
									Priority	MAC	
01	A1	Forwarding	No	20000	128	Disabled	Enabled	Auto	32768	00:07:af:66:b8:e0	1
02	A2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
03	A3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
04	A4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
05	A5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
06	A6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
07	A7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
08	A8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
09	B1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
10	B2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
11	B3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
12	B4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
13	B5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
14	B6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
15	B7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
16	B8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
17	C1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
18	C2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
19	C3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
20	C4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
21	C5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
22	C6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
23	C7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
24	C8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0

Port No: Indicates the number of the port.

Port Name: Displays the descriptive name of the port.

Port State: The current RSTP state of the port is shown here. This state may be seen as "Forwarding, No STP, Disabled, Listening, Learning, and Discarding.

STP BPDU: Shows whether or not a legacy STP BPDU has been received or not.

Path Cost: Displays the current path cost of the port. The range is 0 - 200,000,000. If configured to 0 or Auto, the path cost will be calculated automatically using the actual speed of the port; otherwise the configured value will be used. The default value for this field is Auto.

Priority: The priority of the port is displayed in this column. The available range is 0 - 255. The default value for this field is 128.

Admin Edge: Indicates whether or not this port is treated as an Edge Port and can immediately enter the forwarding state. If set to Enabled, no BPDUs are expected to be received at the port. Set this option to Enable only when an end device is linked to this port. The default value is Disabled.

Auto Edge: Indicates whether or not to use a short timeout when waiting for BPDUs before determining that this is an Edge Port (if no BPDUs are received). It may have to be disabled for a very large network. The default value is Enabled.

Point to Point: Displays whether at most one other network port is attached to the port's LAN segment. The port may transition to Forwarding very quickly on a point-to-point MAC link. Values may be Auto (full-duplex links are assumed to be point-to-point, half duplex are not), and Force True or Force False (if the automatic determination would be wrong). The default value is Auto.

Designated Bridge Identifier Priority: The priority of the designated bridge associated with the port's LAN segment is shown in this field. The designated bridge provides the lowest cost path from this bridge port's LAN segment, through the designated bridge, to the root bridge.

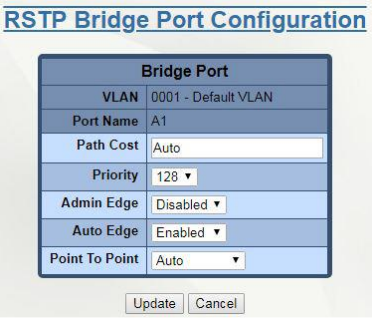
Designated Bridge Identifier MAC: Indicates the unique MAC of the designated bridge associated with the port's LAN segment.

Designated Port: The designated port of the designated bridge is shown here.

Note: When event logging is enabled, all RSTP controlled ports will log events about their status whether or not the modular based port is currently installed.

Note: When operating in a VLAN with legacy STP devices, set the Auto Edge field to Disabled for Bridge Ports.

To make changes to a Bridge port, click on the *Port No hyperlink* and the following window will appear:



Make the required modifications to the following parameters: Path Cost, Priority, Admin Edge, Auto Edge and Point to Point fields, then click on the *Update* button.

Security

Local Security

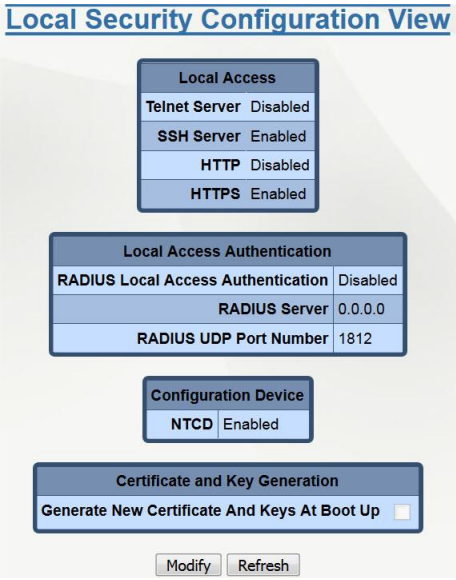
The Local Security feature allows an administrator to control local access (logins) to the switch.

Local Security Configuration View

The Local Security Configuration page displays the status of the Telnet server, SSH Server, HTTP protocol, and HTTPS protocol. The administrator can disable or enable these protocols, as desired. A RADIUS server can be configured to authenticate the user name and password entered for local access.

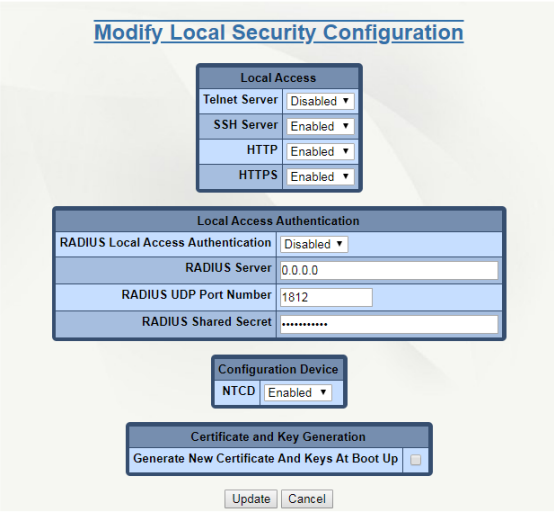
The N-Tron® Configuration Device (NTCD) SD card slot can be enabled or disabled, allowing an administrator to block and unblock reading and writing settings from the SD card as desired. A new certificate and keys can also be generated at boot up by selecting the *Generate New Certificate and Keys At Boot Up* option.

WARNING: If the NTCD device slot is disabled and the switch password is forgotten, access to the switch can only be recovered by sending it back to the factory to be unlocked.



Modify Local Security Configuration

Click on the *Modify* button and the page below will appear. Make the desired changes, and then click on the *Update* button. To save changes, navigate to the Configuration menu and click on the *Save* button.



These settings address local access to the switch. For better security, keep the Telnet Server and HTTP disabled.

Telnet Server: This field indicates whether the Telnet Server is enabled or disabled. Disabling the Telnet Server does not impact SSH. The default is disabled.

SSH Server: This field indicates whether the SSH Server is enabled or disabled. Disabling the SSH Server does not impact Telnet. The default is disabled.

HTTP: This field indicates whether HTTP is enabled or disabled. Disabling HTTP does not affect HTTPS secure connections. The default is disabled. HTTP users are not authenticated by the RADUIS server. If Radius authentication is exclusively required, then HTTP should be disabled.

HTTPS: This field indicates whether HTTPS is enabled or disabled. Disabling HTTPS requires HTTP to be enabled. The default is enabled.

A RADIUS server may be used to manage user accounts that have access to the switches.

RADIUS Local Access Authentication: This field indicates whether RADIUS Local Access Authentication is enabled or disabled. RADIUS authentication is not supported on HTTP connections. The default is disabled.

RADIUS Server: This field is the IP address of the RADIUS server used when RADIUS Local Access Authentication is enabled.

RADIUS UDP Port Number: The UDP port number of the RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

RADIUS Shared Secret: The shared secret for the local access authentication server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

NTCD: This field indicates whether the Configuration Device is enabled or disabled. The default is enabled. Disabling the NTCD SD card slot allows an administrator to block and unblock reading and writing settings to and from the SD card.

Generate New Certificate and Keys at Boot Up: This field indicates whether certificate and keys will be generated when the switch boots up. *A change to this setting requires that settings be saved and that the switch be rebooted before changes take effect*. The value will reset to be unchecked when the switch boots up. The default is no.

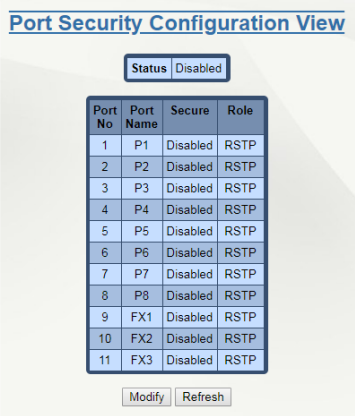
Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the port(s) that the address is authorized on. A non-authorized MAC address will be discarded and will be shown on the intruder log.

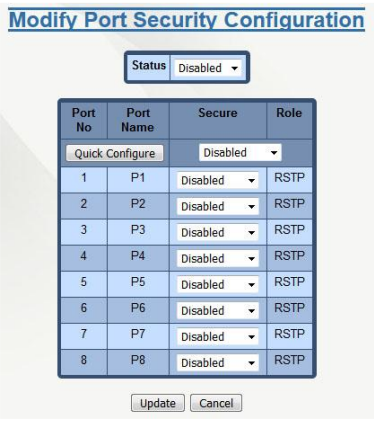
Port security allows secured ports to run with RSTP enabled on the port. Port security also allows the same MAC address to be authorized on multiple ports. When setting up authorization lists for RSTP ports, any MAC address that could migrate to other secured ports should also be placed, by the user, in the authorization list for those ports.

Port Security – Configuration

The Port Security Configuration View displays the status of Port Security and all the ports with their current settings. When Status is 'Locked' it is in secure mode. When Status is 'Learning' it builds an internal list of authorized MAC addresses and no ports are secured during this time.



The Modify button allows the administrator to change the Status of Port Security and Secure mode for all ports.



Status: The current status of Port Security. It can be Disabled, Learning, or Locked. Transitioning from Locked to Learning clears the Authorization List table on all ports. Transitioning from Locked to Disabled retains the current Authorization List. When transitioning from Learning to Locked, the Authorization List represents the authorized MAC addresses. The default value is Disabled.

Port No: The number of the port.

Port Name: The descriptive name of the port.

Secure: Displays Secure mode for the associated port. It can be Disabled, Enabled, or Single Mac.

- **Disabled:** Port Security is not active on the port regardless of the current Port Security Status.
- **Enabled:** Port Security is active when the current Port Security Status is Learning or Locked.
- **Single MAC:** Port Security will take the first learned MAC address and lock the port when current Port Security Status is Learning or Locked.

The default value is Disabled.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, N-Link Coupler, 802.1X, and Trunk.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Note: Security is not configurable on N-Ring or N-Link interconnecting ports. These ports must be linked to adjacent switches that have the protocol enabled. This link is considered to be a

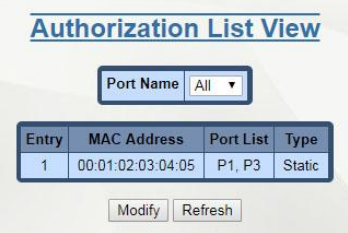
closed proprietary connection/segment that is not directly accessible. If both switches are otherwise properly secured then the proprietary connection/segment requires no additional security.

Note: It is recommended that the Bridging Aging Time be 300 seconds (the default) or longer while Port Security is Learning.

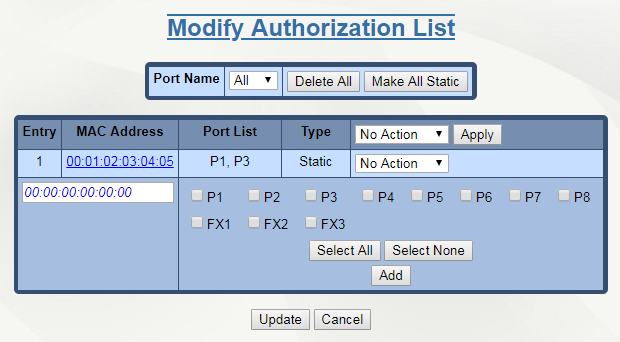
Ports Security – Authorization List

The Authorization List View displays a drop-down list of the available ports that is used to filter the authorization list. Below the drop-down list is the table of authorized Static and Learned MAC addresses and ports.

Note: Multicast Source Addresses will not show up in the Authorization List.



The Modify button allows the administrator to add new MAC addresses, and to modify and remove existing MAC addresses. The last row is used to add new MAC addresses and to change the ports of an existing MAC address.



Port Name: The descriptive name of the port.

MAC Address: The authorized host MAC address.

Port List: The port(s) that are authorized for the associated MAC address.

Type: The type of the authorized MAC Address. It can be either Learned, Static, or Single MAC.

Action: Action for the authorized MAC address. It can be No Action, Make Static from Learning mode, or Delete from the Authorization List. The maximum number of actions that may be performed on the Authorization List in a single update is 100.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Delete All Authorization List

To delete the complete authorization list associated with the selected port(s), click on *Delete All* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

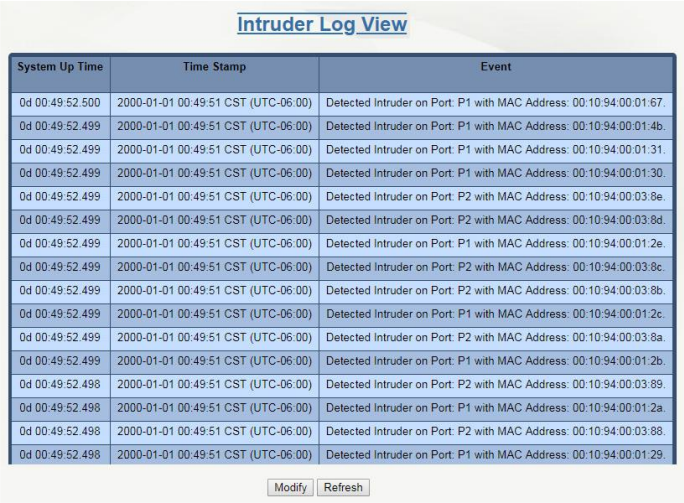
Make All Learned Authorization Entries Static

To make all learned authorization entries associated with the selected port(s) as Static, click on *Make All Static* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

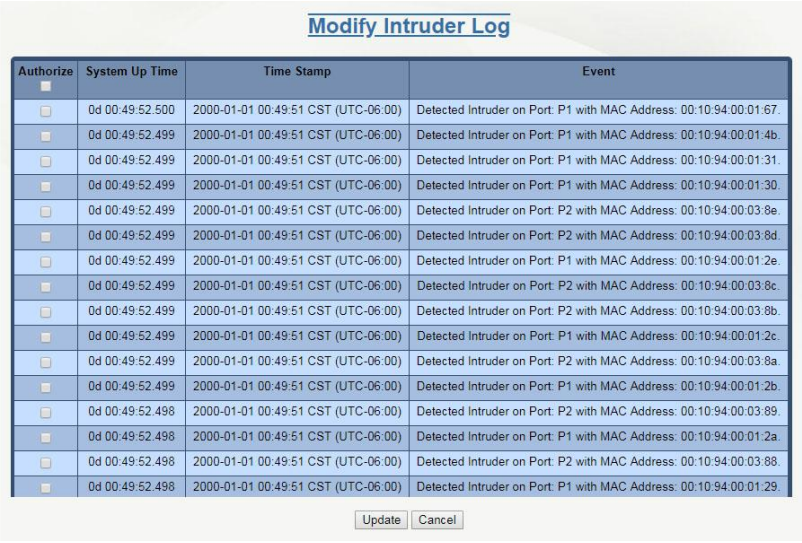
Note: Ports that are set to Single MAC cannot be included in static entries in the Authorization List.

Ports Security – Intruder Log

The Intruder Log page displays a list of unauthorized MAC addresses that attempted to access the secured device. Each intruder entry in the log is based on MAC address and Port. Multicast source MAC addresses will not be displayed in the Intruder Log table. The log is ordered by most recent first, based on the system up time and time stamp. The maximum number of entries is 100. If more than 100 intruders are detected, the oldest entries are deleted. The log is not saved through a power cycle.



To authorize a particular MAC Address from the Intruder Log, click on the Modify button and an "Authorize" field will be added as a checkbox as shown below:



Displays the most recent 100 intruders since the latest system startup. To review a complete list, please see the Event Log page.

FIELD	DESCRIPTION
Authorize	This is the selection to Authorize MAC Address(es) from the Intruder Log.
System Up Time	The elapsed time since the switch was powered on or rebooted.
Time Stamp	The date/time when the event was logged.
Event	The description of the intrusion.

Make the required modifications and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

An authorized entry will be displayed as green text color for that particular row in the Intruder Log table. The corresponding checkbox in the Authorize column will be checked and cannot be modified.

Port Security – Single MAC

Single MAC is a port security mode that allows a port to lock on a dynamically learned MAC address. The first MAC address to be learned and processed by the port will be locked in and any further traffic will be blocked as an intruder. The locking of the address is not dependent on switching the port security status to Locked. This feature helps in providing security for ports that may only have a single device plugged into the switch. The Single MAC address is not persistent following a reboot. The Single MAC will remain locked until a reboot upon which time a new MAC address will be learned and assigned as the new Single MAC entry.

Single MAC can be configured per port from the Port Security Configuration page. Manually added MAC addresses are not allowed to be assigned to a port designated as Single MAC. If a port is enabled under port security and then changed to Single MAC all learned addresses will be cleared and the next MAC address that comes in will be the new Single MAC address.

Single MAC addresses reset anytime the port security status is changed to Learning. Single MAC addresses are persistent when port security status is changed from Learning or Locked to Disabled and then back to Locked.

Single MAC limitations include: intruders on the Single MAC port cannot be manually authorized, and new addresses cannot be manually added to a Single MAC port.

Radius Server Configuration Information

The NT24k® takes advantage of Vendor Specific Attributes (VSA) as defined in section 5.26 of RFC 2865 so that multiple user levels can be authenticated using a Radius server. The VSA is defined as follows:

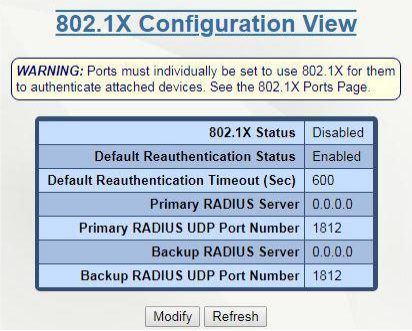
VENDOR ID	28381
Vendor ID	28381
Attribute Number	1
Attribute Format	string
Attribute Value	"AccessLevel:admin" or "AccessLevel:user"

The server and access list will need to be configured accordingly.

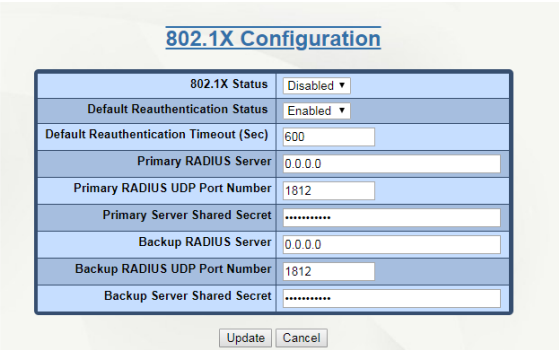
802.1X/Configuration

The Configuration dialog window displays the 802.1X status, reauthentication information, and RADIUS server information.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



To make changes to the Security settings, click on the *Modify* button and the fields shown below will become editable:



802.1X Status: This field indicates whether the 802.1X feature is enabled or disabled. At least one RADIUS server must be specified for 802.1X to be enabled. Ports must also be individually enabled on the ports configuration page.

Default Reauthentication Status: Select whether the 802.1X Reauthentication option is enabled or disabled. With reauthentication enabled, a device will be required to reauthenticate itself based on the time period specified by the reauthentication timeout field. 802.1X must be disabled to change this value.

Default Reauthentication Timeout (Sec): Enter the time period, in seconds, between 802.1X reauthentication. This value cannot be zero (0). 802.1X must be disabled in order to change this value.

Primary RADIUS Server: This field indicates the IP address of the primary RADIUS server. If contact with this server is lost, then contact with the backup server will be attempted.

Primary RADIUS UDP Port Number: The UDP port number of the Primary RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Primary Server Shared Secret: This field displays the shared secret for the primary server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Backup RADIUS Server: This field indicates the IP address of the backup RADIUS server. If contact with the primary server is lost, contact with the backup server will then be attempted.

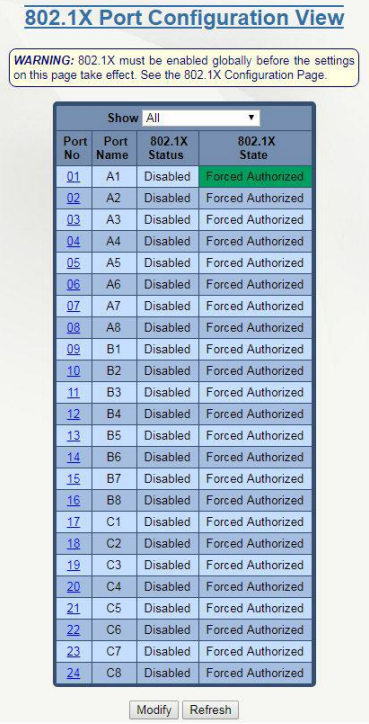
Backup RADIUS UDP Port Number: The UDP port number of the Backup RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Backup Server Shared Secret: This field displays the shared secret for the backup server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Make the required modifications and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

802.1X/Ports

The 802.1X Port Configuration View dialog window displays all the ports and their current settings. To modify this information, click on the *Modify* button.



Port No: This column shows the number of the port.

Port Name: This column displays the port's descriptive name.

802.1X Status: This column indicates whether the existing 802.1X port is enabled or disabled. Ports only require 802.1X authentication if they are enabled and 802.1X is globally enabled on the configuration page.

802.1X State: This column shows the current state of the port. This option is only valid when the port is enabled and 802.1X is globally enabled.

Link Down: There is no link detected on the port.
Initialize: The port is being setup for 802.1X authentication.
Disconnected: A valid 802.1X client has not been detected.
Connecting: A valid 802.1X client has been detected, but authentication has not begun.
Authenticating: The 802.1X client is being authenticated.
Authenticated: The 802.1X client has been authenticated.

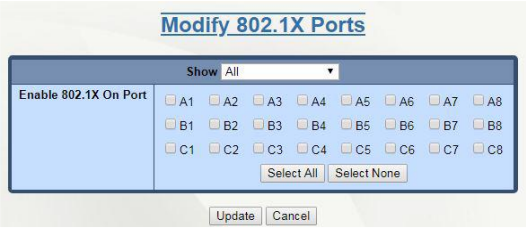
Aborting: The port is no longer authorized and is preparing to move back to the Disconnected state.

Held: The 802.1X client failed authentication and the switch is preventing new authentication attempts for a defined period of time. Default: 60 seconds.

Forced Authorized: Occurs when a port has had 802.1X disabled. The result is all traffic is allowed to pass through that port.

Forced Unauthorized: Occurs when a port is administratively disabled through the port configuration. The result is no traffic is allowed to pass through that port.

Click on the *Modify* button and the page below will appear. Select the required ports, and then click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



IEEE 802.1X MIB

The IEEE 802.1X MIB, IEEE 8021-PAE-MIB, is supported by the NT24k®. Since the NT24k does not support the supplicant features of 802.1X, the MIB tables pertaining to the supplicant behavior will not be populated and will be blank when queried.

With this release, the IEEE 802.1X MIB support is limited. Ports are only tracked when an 802.1X aware supplicant is attached. This means that not all 802.1X enabled ports will be visible, only those with valid supplicants. The statistics available through the MIB only pertain to the device since it either passed or failed authentication. Once the link goes down on the port, the statistics will be reset. Furthermore, any configuration items accessed through the IEEE 802.1X MIB can be set to modify the behavior of the port, but these changes will not persist across link events or power cycles.

Configuration changes that occur through the NT24k MIB will be persisted across link events and power cycles. Support for persisted statistics and configuration settings in the IEEE 802.1X MIB will be added to the NT24k in a future release.

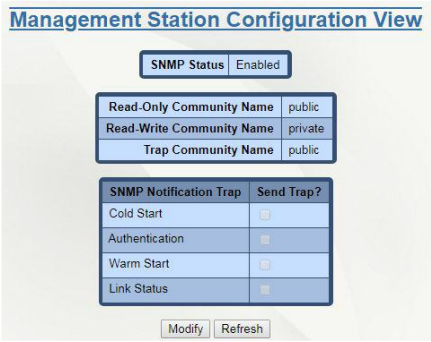
The IEEE 802.1X MIB allows for the writing to dot1xPaeSystemAuthControl. This is not supported in the current release of the NT24k firmware. dot1xPaeSystemAuthControl is considered a read-only attribute. The functionality for this is located in the NT24k MIB as ntronSecurityDot1xConfigStatus.

The IEEE 802.1X MIB allows for the writing to dot1xAuthAdminControlledDirections. Controlling the direction of the port traffic is not currently supported in the NT24k firmware and writing to dot1xAuthAdminControlledDirections will not have an effect on the system.

SNMP

Configuration

The SNMP Configuration displays the SNMP status and allows the administrator to disable or enable the protocol. The Read-Only, Read-Write and Trap Community Names are also displayed in this dialog window.



SNMP Status: This field indicates whether SNMP is enabled or disabled.

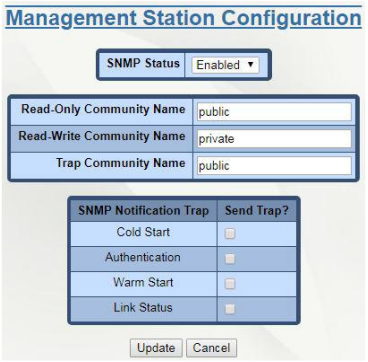
Read-Only Community Name: This configurable field represents the Authorized Community Name for SNMP Get requests. Only alphanumeric characters are allowed. The default value for this field is public.

Read-Write Community Name: This configurable field represents the Authorized Community Name for SNMP Set requests. Only alphanumeric characters are allowed. The default is for this field is private. Only administrators can view or modify this field.

Trap Community Name: This configurable field represents the Authorized Community Name for SNMP Traps. Only alphanumeric characters are allowed. The default is for this field is public.

SNMP Notification Traps: This section allows for control of which SNMP traps will be sent by this switch. Each of the four available traps can be enabled or disabled individually. The traps are: Cold Start, Authentication, Warm Start and Link Status.

Click on the *Modify* button to make changes to the SNMP Configuration. This will enable all configurable fields. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



Trap Stations

The Trap Stations dialog window displays the SNMP Trap Stations.

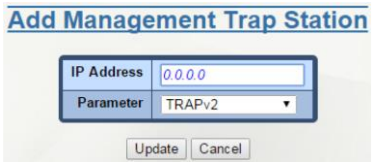


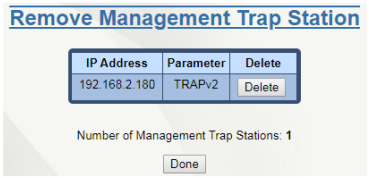
IP Address: This field represents the IP address of the Management Station to be sent SNMP Traps.

Parameter: This field displays the Target Parameters entry (TRAPv1, TRAPv2, etc) to be used for sending traps to the Management Station.

Adding Management Trap Stations

To add trap stations, click on the *Add* button and the following will appear:





Enter the required IP address and select the parameter to be used. Click on the *Update* button and the Display Management Trap Stations screen will appear.

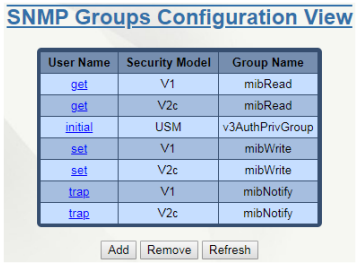
***SNMP V3 Default Security Parameters*:** The SNMP V3 default user parameters are shown here for reference only, as they are necessary for connecting to the switch securely using an SNMP V3 client when in defaults.The default user and other users can be added, deleted or modified by an administrator via either an SNMP V3 client or web browser, and the values below may be invalid if they are changed by an SNMP administrator.

Username: initial
Authentication Password: authpass
Authentication Protocol: MD5
Privacy Password: privpass
Privacy Protocol: DES

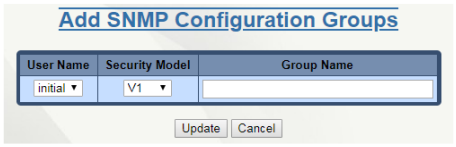
To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

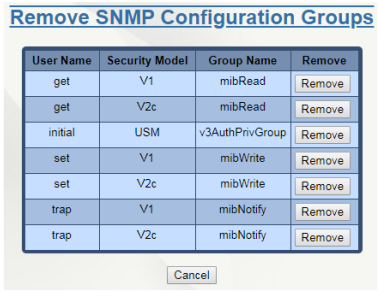
Groups

The SNMP Groups page allows the customer to configure SNMP group settings for specific SNMP users.



Click on the *Add* button to create a new SNMP group, or click the hyperlink under User Name to modify existing group settings for a user. Click the *Remove* button to display a list of current configured group and user settings, with an option to remove specific ones.





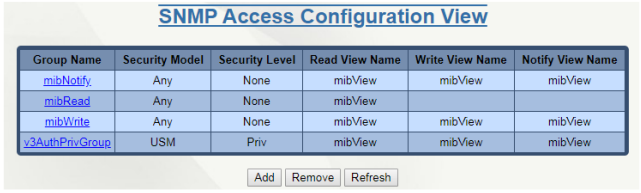
User Name: This field represents the SNMP User Name. It is a drop down list with an option for every SNMP user defined on the **Users** page.

Security Model: This field represents the security model the SNMP protocol will use for the defined group. The default is Any, while V1, V2c and USM (User-based Security) are the other available options.

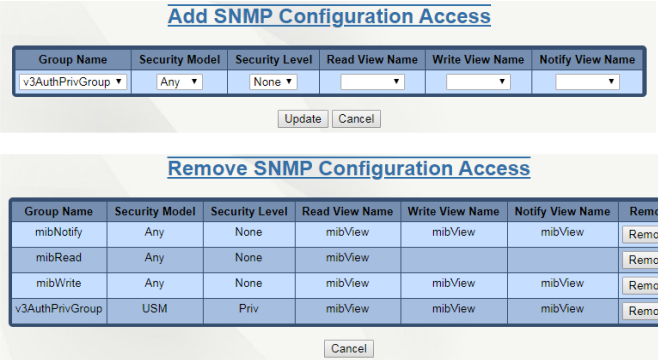
Group Name: This field represents the SNMP Group to which the SNMP user belongs.

Access

The SNMP Access page allows the customer to define various types of MIB access based on the defined view settings for each SNMP group.



Click on the *Add* button to define new access settings for a group, or click the hyperlink under Group Name to modify existing access for a group. Click the *Remove* button to display a list of current configured group and access settings, with an option to remove specific ones.



Group Name: This field represents the name of the group the user defines access settings for. It is a drop down list with an option for every SNMP group defined on the **Groups** page.

Security Model: This field represents the security model used to validate group access to views. The options are V1, V2c and USM (User-based Security).

Security Level: This field represents the security level of SNMP communications for the defined group. The options are None, Auth, and Priv.

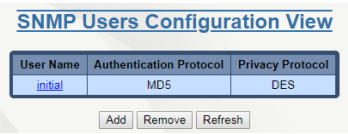
Read View Name: The name of the view that the defined group has read access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Write View Name: The name of the view that the defined group has write access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

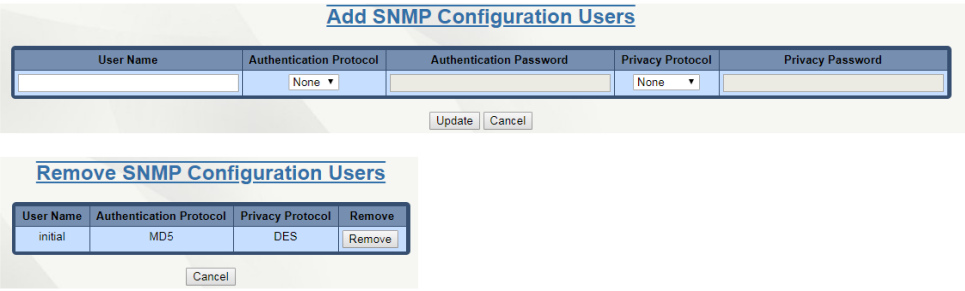
Notify View Name: The name of the view that the defined group has notify access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Users

The SNMP Users page allows a customer to create custom user names for group access and set the authentication and privacy protocols for that user. It is important to note that authorization and privacy passwords, when created, are hashed internally for security and will not be able to be retrieved.



Click on the *Add* button to create a new SNMP user, or click on a hyperlink in the *User Name* column to edit the information for that user. Click the *Remove* button to display a list of current configured users, with an option to remove specific ones.



User Name: This field represents the SNMP User Name.

Authentication Protocol: This field represents the authentication protocol utilized by the SNMP user. The options are None, MD5, and SHA1.

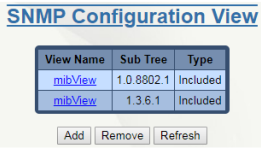
Authentication Password: The defined authentication password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

Privacy Protocol: This field represents the privacy protocol utilized by the SNMP user. The options are None, DES, and AES-128.

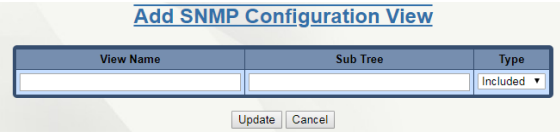
Privacy Password: The defined privacy password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

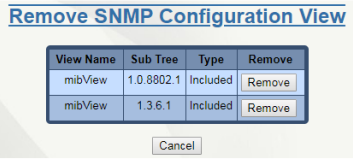
View

The SNMP View page allows a customer to define different view groups, which either include or exclude specific sub trees from the MIB tree based on the configuration.



Click on the *Add* button to create a new SNMP view, or click on a hyperlink in the *View Name* column to edit the information for that view. Click the *Remove* button to display a list of current configured views, with an option to remove specific ones.





View Name: This field represents the name of the SNMP view.

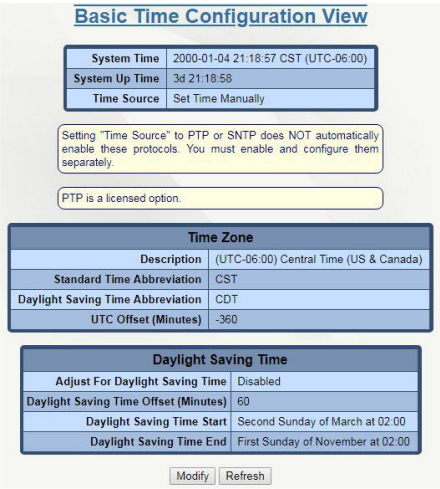
Sub Tree: This field allows the user to enter an OID string representing the sub tree being included or excluded from the view, based on the **Type** setting.

Type: This field allows the user to configure what the SNMP view does with the sub tree defined in the *Sub Tree* field. The options are Included and Excluded.

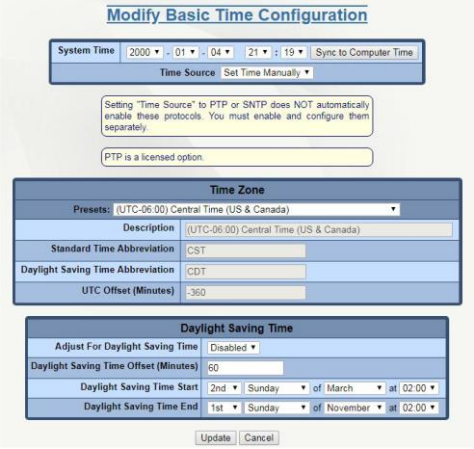
Time

Basic

From the Basic Time Configuration View dialog, the administrator can define the system time, time zone, daylight savings time and time source settings for the unit.



Click on the *Modify* button to make modifications to the unit's time settings.



System Time: This field displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start. The system date/time can be set manually but in the event of a power cycle or reboot it will revert to the default value.

Time Source: This field controls how the switch will automatically set its clock. The default value of "Set Time Manually" means that the time the switch uses can only be set manually. Setting this field to either "SNTP" or "PTP" causes the protocol to continuously update the system clock. Note that these must be enabled and configured separately from the basic time configuration. PTP is a licensed option and is unavailable otherwise.

Time Zone

Presets: This field provides a list of global time zones and cities within the time zones. Selecting from this list provides easy local time configuration and automatically populates the fields below. Choosing the "Custom..." option allows for editing of the below fields to satisfy specific requirements that are not met by one of the preset time zones.

Description: This field provides a description of the time zone selected. It contains the city and the offset from UTC for the selected location. If a custom preset is selected the description may be edited.

Standard Time Abbreviation: The common abbreviation for the selected time zone during standard daylight time is shown in this field. If a custom preset is selected the abbreviation may be edited.

Daylight Saving Time Abbreviation: This field represents the common abbreviation for the selected time zone during daylight saving time or summertime. If a custom preset is selected the abbreviation may be edited.

UTC Offset (Minutes): This field displays the offset, in minutes, from UTC. This is used to determine the local time. If a custom preset is selected the offset may be edited. Any change to the offset will affect the time calculation.

Daylight Saving Time

Adjust For Daylight Saving Time: This field indicates whether automatic adjustment for daylight saving time is made. The settings for this adjustment are defined below.

Daylight Saving Time Offset (Minutes): This field defines how much, in minutes, to adjust the time when daylight saving time starts and ends.

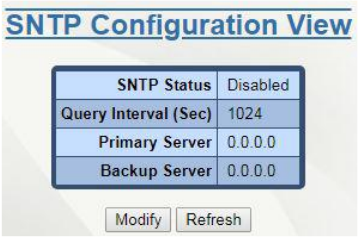
Daylight Saving Time Start: The week, the day of the week, the month, and the time at which daylight saving time should start.

Daylight Saving Time End: The week, the day of the week, the month, and the time at which daylight saving time should end.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

SNTP

From the SNTP Configuration View, the SNTP status can be changed, and the primary and back-up servers can be defined. Click on the *Modify* button to enable or modify the current settings.



SNTP Status: Indicates whether the SNTP client has been enabled. In order to enable SNTP, at least one SNTP or NTP server must be specified.

Query Interval (Sec): The periodic query interval used to request the time from the server(s). The valid range is between 4 and 129600. The default value is 1024.

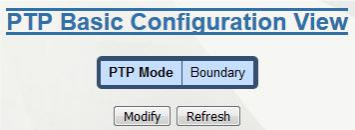
Primary Server: The address of the server to query first and most often. If contact with this server is lost, then contact with the backup server will be attempted. Either an SNTP or an NTP server may be specified.

Backup Server: The address of the backup server to query in the event that access is lost to the primary server. Either an SNTP or an NTP server may be specified. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Precision Time Protocol (PTP)

PTP Basic Configuration

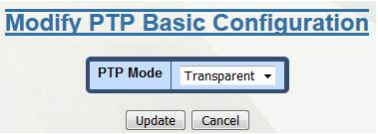
The PTP Basic Configuration View displays the PTP Mode and allows the administrator to disable the protocol, or enable one of two clock modes, Boundary or Transparent.



PTP Mode: This field indicates whether PTP is disabled, operating as a Boundary clock, or operating as a Transparent clock. When PTP is disabled, PTP traffic will route through the switch like any other multicast traffic.

Transparent Clock mode generally provides the most accurate time to a PTP client when the network is lightly loaded and there are only a few PTP clients connected to the switch. Boundary Clock mode is a better choice for a congested network. Boundary Clock mode also becomes a better choice as more PTP clients are connected to the switch.

Click on the *Modify* button to change the PTP Mode. When the desired mode has been selected, click *Update*.

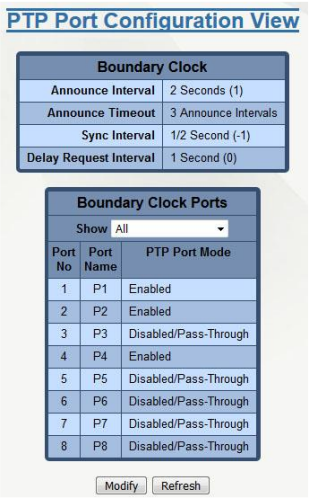


Note: When switching between PTP modes, it will be necessary to save the configuration and reboot the switch for the change to take effect.

PTP Port Configuration

The PTP Port Configuration View displays global and per port settings that relate to PTP.

The settings in the **Boundary Clock** table are applied to every port of a switch in Boundary Clock mode. The **Boundary Clock Ports** or **Transparent Clock Ports** table displays the PTP Port Mode for every port on the switch.



Global Boundary Clock Settings

Announce Interval: This is the log2 value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Announce Timeout: This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Sync Interval: This log2 value determines how often a sync message will be sent. The default value of "- 1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Delay Request Interval: This log2 value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

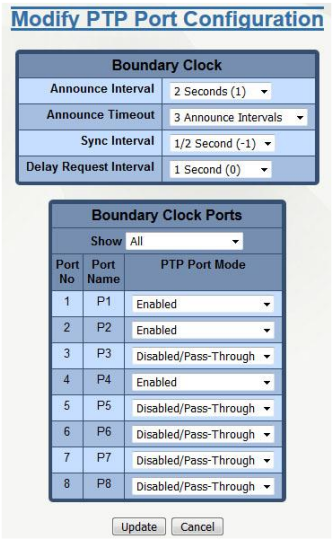
Boundary Clock Ports or Transparent Clock Ports Settings

Port No: Indicates the number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked". When Enabled, PTP packets will be processed by the switch PTP software. When Disabled/Blocked, PTP packets will be discarded as they enter the port. When Disabled/Pass- Through, PTP packets will be forwarded to other pass-through ports (within VLAN restrictions) with no PTP processing.

Click the *Modify* button to change any of the global settings or to change the PTP Port Mode of specific ports.

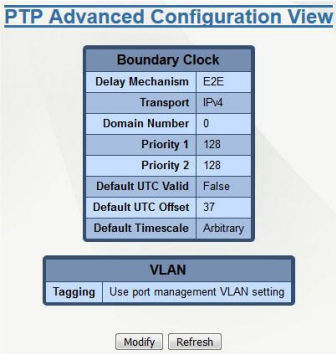


Once modifications to Announce Interval, Announce Timeout, Sync Interval, Delay Request Interval or PTP Port Mode have been made, click on the *Update* button.

Note: The settings on the PTP Port Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

PTP Advanced Configuration

The PTP Advanced Configuration View displays common advanced PTP settings and advanced settings that relate specifically to the Boundary Clock mode of operation. The Common values are read-only and only some values can be modified.



Boundary Clock

Delay Mechanism: The Delay Mechanism specifies the method used by PTP to handle delay correction values. E2E is the only delay mechanism currently supported.

Transport: IPv4/UDP is the only network transport method currently supported.

Domain Number: The Domain Number selects a PTP Domain. Only PTP packets in the same domain will be received and processed, and all sent PTP packets will be tagged with the same Domain Number. The range is 0-127. The default is 0.

Priority1: This value sets the priority of this switch as a Master clock. It is the most important value used by the Best Master Clock (BMC) algorithm of other PTP devices when selecting a Master clock. The range is 0-255, with 0 being most important. The default is 128.

Priority2: This value is used to break ties in the BMC algorithm. The range is 0-255, with 0 being most important. The default is 128.

Default UTC Valid: Current UTC Valid is a field in PTP packets that tells other devices whether the UTC Offset field that is also being sent in the packet should be considered valid. The Current UTC Valid value is set to this default at boot time, until it is updated by making a connection to a PTP Master. The default is "False" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

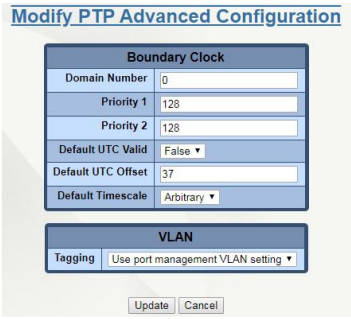
Default UTC Offset: The Current UTC Offset value is set to this default at boot time. The range is 0-127. The default is 36.

Default Timescale: The Current Timescale value is set to this default at boot time. All times exchanged in the PTP protocol are either "Arbitrary" or "PTP". Times that are "Arbitrary" cannot be converted to calendar time correctly and may have no connection to external accurate time. Times that are "PTP" can be converted to accurate calendar time using the UTC offset. The default is "Arbitrary" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

VLAN Tagging: PTP frames that egress a PTP port may have a VLAN tag or may be untagged. When "Use port Management VLAN setting" is selected, the PTP frame is untagged if the Management VLAN is set to 'Untag on Egress'. Otherwise, the frame is tagged with the Management VLAN ID. This is the default setting. When "Use port PVID setting" is selected, the PTP frame is untagged if the VLAN used as the PVID is set to 'Untag on Egress'. Otherwise, the frame is tagged with the port's PVID.

Note: When PTP Mode is "Transparent Clock", PTP frames will obey VLAN restrictions and will not cross VLAN boundaries.

To make changes, click on the *Modify* button. Once the desired changes have been made, click on the *Update* button to apply changes to settings.

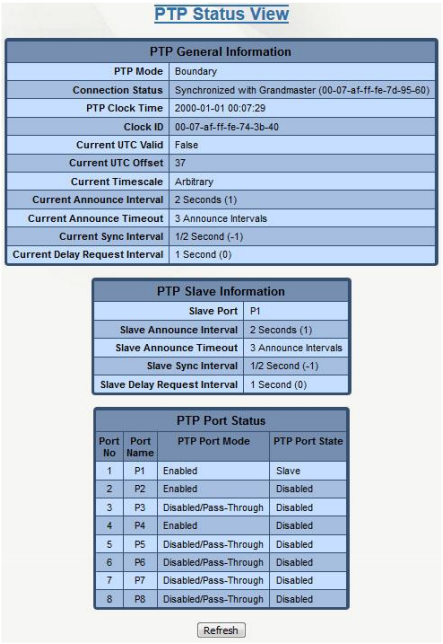


Note: The settings on the PTP Advanced Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

Note: The Current UTC Valid, Current UTC Offset and Current Timescale values are not displayed on the View or Modify pages when PTP is currently disabled or in Transparent Clock mode because they do not apply.

Status

The PTP Status and Information page displays read only information about a device's PTP configuration. General and per port information is displayed on this page.



Note: When PTP is disabled, the only information displayed on this page is PTP Mode and Clock ID, because nothing else applies when PTP is disabled.

PTP General Information

PTP Mode: The PTP mode of the switch. Options include "Disabled", "Boundary Clock", and "Transparent Clock". The default is "Disabled". If the PTP protocol is disabled on the switch, all ports behave as Disabled/Pass-Through. Changes to this setting require a reboot of the switch.

Connection Status: This only applies to Boundary Clock mode. This is the current PTP Master clock of the switch. If this switch is the Master clock, then the connection status indicates that PTP is not synchronized with a Grandmaster.

PTP Clock Time: This only applies to Boundary Clock mode. This displays the date/time of the PTP Clock. The PTP Clock defaults to the system clock when not synchronized to a PTP Master clock.

Clock ID: The unique Clock ID of this PTP device. It is constructed automatically based on the switch MAC address.

Current UTC Valid: A field in exchanged PTP packets that says whether the UTC Offset field that is also being sent in the packet should be considered valid. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current UTC Offset: A field in exchanged PTP packets that provides the current offset to UTC. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current Timescale: A field in exchanged PTP packets that provides the most recently received Timescale value from the Master. This is a run-time value that is dynamically updated based on the most recently connected PTP Master. If this value is "PTP", the internal PTP time can be converted to a calendar time using the Current UTC offset.

Current Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Slave Information

Slave Port: This only applies to Boundary Clock mode. This is the port that is connected to and inheriting configuration values from a PTP Master. If no port is acting as a PTP Slave this field will have a value of “N/A”.

Slave Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Port Status

Port No: The number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked".

PTP Port State: The current PTP state of a port. It should be noted that when PTP is in Transparent Clock mode the port state is not applicable and will not be displayed.

User Management

Authorized Users

The User Management screen allows users to view, add, modify and remove system user accounts. The display includes a list of all the users who have access to the management features of the switch and their access permissions.

Note: Up to 5 web users may be logged into the Web Management tool at once.



Adding Users

The system administrator can add users, change passwords and define access permissions for each user. Click on the *Add* button and the following dialog window will appear:



User Name: User names may include all alphanumerical characters, as well as the following 2 characters: _ - , and must be 3 to 15 characters long.

Password: Passwords can include all printable characters, except for the colon (:) and spaces, and the password length must be in the range specified by the "Password Length Min" and "Password Length

Max" fields. These fields are configurable under the User Management Configuration screen. The background print in the Password entry field will specify the currently configured range.

Access Permission: This field determines whether a user has standard *User* rights or *Admin* access.

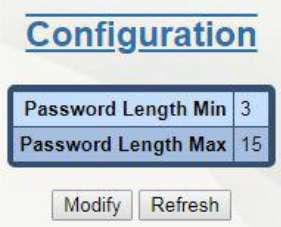
- *User* permission gives the right to view switch configurations and to view current port settings.
- *Admin* permission gives the right to change and view any switch configuration and to change and view any current port settings.

Removing Users

Users can be removed by a user with Admin access. Click on the *Remove* button, enter the User Name to be deleted and click on the *Remove* button.

Configuration

The User Management Configuration screen allows for the switch to be configured with a user password length minimum and user password length maximum.



Password Length Min: The minimum number of characters allowed in a user password. The default is 3 characters.

Password Length Max: The maximum number of characters allowed in a user password. The default is 15 characters.

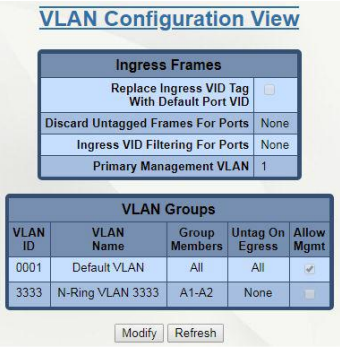
The Configuration screen allows modification of the minimum user password length and the maximum user password length. Both fields, 'Password Length Min' and 'Password Length Max' must be within the overall range of 3 to 15 characters, inclusive.

A configuration change, min or max, will not be allowed if an existing user password will fall out of the desired range (or become non-compliant). Each of the users preventing the change will be listed in the error message. In this case, each of the users that would become non-compliant would need to have their password lengths changed to fall into the new desired range before the configuration change can be applied.

VLAN

The VLAN Configuration View dialog window shows information about the existing VLANs.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Ingress Frames

Replaces Ingress VID Tag With Default Port VID: Specifies whether or not to replace the VID tag of ingress frames with the port's default VID (PVID).

Discard Untagged Frames For Ports: Specifies whether or not untagged ingress frames are dropped by the selected ports.

Ingress VID Filtering for Ports: Specifies whether or not to filter out ingress frames when a VID violation is detected on the selected ports.

Primary Management VLAN: The default egress VLAN used for communications initiated by the switch i.e. DHCP requests.

VLAN Groups

VLAN ID: Displays the VLAN identification for the group members. The range should be 1 - 4094.

VLAN Name: This field displays the VLAN name, which accepts alphanumeric and only the following special characters (including the period)**: # _ - .**

Group Members: This field specifies which ports are members of the VLAN group.

Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Allow Mgmt: Specifies whether or not all ports in this VLAN are management ports.

VLAN Group Members

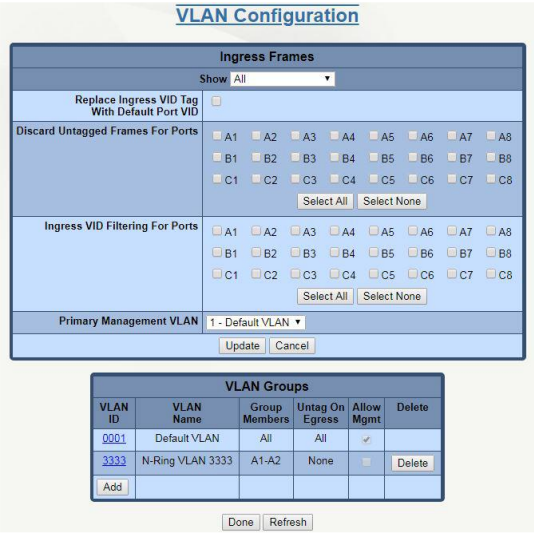
Port No.: The number of the port.

Port Name: The descriptive name of the port.

Group Member: Specifies whether or not the port is a member of the VLAN group.

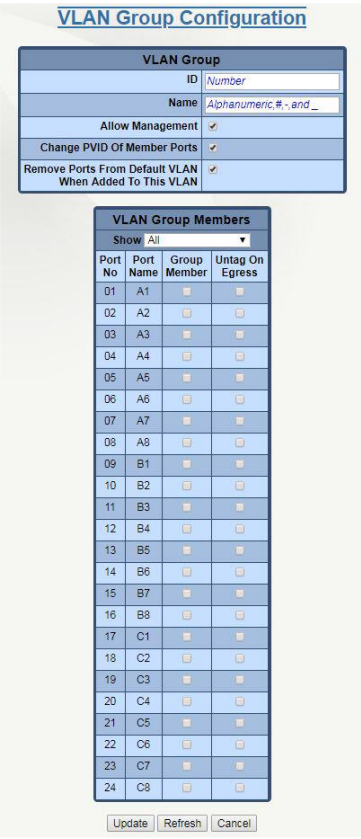
Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Click on the *Modify* button and the following VLAN Configuration page will appear:



The top table is used for general VLAN changes. Once the required changes have been made, click on the *Update* button and then go to the Configuration menu and click on the *Save* button to ensure all changes are saved.

The bottom table is where new VLANs are added and existing ones are modified or deleted.Click on the *Add* button in the bottom table and the following dialog window will appear:



Note: The system is limited to a maximum of 60 configured VLAN groups.

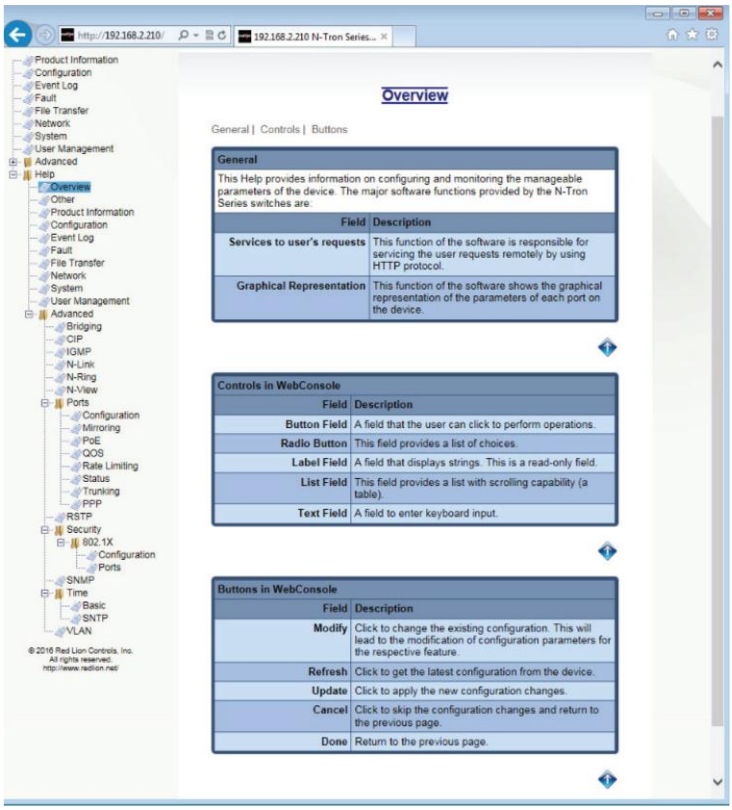
Note: The total number of configured VLAN groups is constrained by system resource usage which varies depending upon network configuration, with VLAN port membership count being the most significant factor.

Note: A port is automatically moved to the Default VLAN if no other VLAN contains that port.

Once the required changes have been made, click on the *Update* button and then go to the *Configuration* menu and click on the *Save* button to ensure all changes are saved.

Help

The Help menu provides information on monitoring and configuring the manageable parameters of the device. Specific help can be found by using the left-hand navigation menu or clicking on the Help link in the top menu.



Appendix A

Command Line Interface

The Command Line Interface (CLI) can be accessed by connecting a host device to the USB connector on the switch. Once connected, the switch will appear as a serial connection. A standard terminal application may be used to communicate to the switch through the serial connection. For serial port settings, see the “USB INTERFACE” section of the NT24k® Series Hardware Manual.

There are two additional methods for connecting to the CLI, Telnet and SSH. Using any standard Telnet client, sim-ply enter the IP address of the switch to start a connection to the CLI. SSH, the secure alternative to Telnet, can also be used with any standard SSH client by simply entering the IP address of the switch to start a secure connection to the CLI.

The CLI contains some status and configuration capability. To interact with the CLI, a login is required. The default username and password is 'admin'. Once logged in, a listing of available commands can be obtained through the help interface. This is accessible by typing either “?” or “help?”. The following commands are available:

NT24k CLI Commands

COMMAND	ARGUMENTS	DESCRIPTION
?		Show system commands. This command is the same as 'help commands' which is shown below.
admin		Administration settings, including IP settings and DHCP mode.
admin system set		Set general system settings.
admin system set contact	<contactname>	The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set location	<locationname>	The physical location of the switch. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set name	<switchname>	Contains the name assigned to the device, which allows alphanumeric and special characters '#', '_', '-', and ':' only. When IP Configuration is DHCP, this may be used as the Client ID (Option 61) of the DHCP Request.
admin system set upper Threshold	<upperThreshold> - An integer from -60 to 120.	The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system set lower Threshold	<lowerThreshold> - An integer from -60 to 120.	The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system show		Show general system information.
admin ip set		Set Internet protocol settings.
admin ip set clientid	<type> - A client ID type: [0-switch name, 1-switch MAC, 2-other text, 3-other hex] <value>	This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters.

COMMAND	ARGUMENTS	DESCRIPTION
	- A string when the type is 2 or a hex string when the type is 3.	• Usage: admin ip set clientid 0 • Usage: admin ip set clientid 2 "Switch53"
admin ip set dhcp admin ip set no dhcp		Determines the method used to obtain an IP address, Subnet Mask, and Gateway. When DHCP is enabled, DHCP protocols are used to obtain these values. When DHCP is disabled, Static is selected, and the statically configured values are used. • Usage: "admin ip set dhcp" to enable DHCP mode. • Usage: "admin ip set no dhcp" to disable DHCP and return back to Static.
admin ip set ip	[address <ipaddress>] - The IP address of the device. [mask <subnetmask>] - The Subnet mask of the device. [gateway <gateway>] - The Gateway address of the device.	Set the Static IP address, subnet mask, and/or gateway. • Usage: admin ip set ip [address (IP address)] [mask (Subnet mask)] [gateway (Gateway address)] **Example:** CLI> admin ip set ip address 192.168.2.212 mask 255.255.255.0 gateway 192.168.2.1
admin ip show		Show Internet protocol settings. **Example:** CLI> admin ip show
arl		Show ARL Configuration.
arl show		Show ARL Configuration. Example: CLI> arl show Arl Settings Src MAC Address Vlan Sta Drop Blk Loc Destination Ports Applies only to Ports ================== ==== === ==== === === ========== 00:07:af:7d:37:e0 1 Y N N FDB CPU All 01:00:5e:00:00:fb 1 Y N N FDB C7 All 01:00:5e:00:00:fc 1 Y N N FDB C7 All 01:00:5e:7f:ff:fa 1 Y N N FDB C7 All 01:07:af:00:de:d1 ANY Y N N POL CPU A1-A2 01:07:af:00:de:d2 ANY Y N N POL Drop All 01:07:af:00:de:f0 ANY Y N N POL Drop All 01:07:af:00:de:f1 ANY Y N N POL Drop All 01:07:af:00:de:f2 ANY Y N N POL Drop All 01:07:af:00:df:48 ANY Y N N POL Drop All 01:07:af:01:3d:1b ANY Y N N POL CPU All 01:07:af:7d:37:e0 ANY Y N N POL Drop All 01:80:c2:00:00:00 1 Y N Y POL CPU All a0:36:9f:3b:6c:b2 1 N N N FDB C7

COMMAND	ARGUMENTS	DESCRIPTION
		All ff:ff:ff:ff:ff:ff ANY Y N N POL CPU All
arp		Address Resolution display and control.
arp	[<arguments>]	Use arp without arguments to get help. Example: CLI> arp <arp>arguments> - Use arp without arguments to get help. Surround multiple arguments with double quotes. EX: arp "-r 192.168.2.117" CLI> arp NAME arp - address resolution display and control SYNOPSIS arp [-silent] [-V <routetab>] [-i <ifname>] –a arp [-silent] [-V <routetab>] [-i <ifname>] –A arp [-silent] [-V <routetab>] [-i <ifname>] -d <hostaddress> arp [-silent] [-V <routetab>] [-i <ifname>] [-p] [-t] -s <hostaddress> <ether_addr> arp [-silent] [-V <routetab>] [-i <ifname>] -r <hostaddress> DESCRIPTION The arp program displays and modifies the Internet-to-Ethernet address translation tables used by the address resolution protocol. Options: -silent Suppress output. MUST be the first argument. -i <ifname> Specify interface. First one if not specified. -t Temporary ARP entry. -p Public ARP entry (i.e. proxy ARP entry). -r Send an ARP request to the host address. -V <routetab> Specify route table. 0 if not specified. Commands: -a Display the currently existing ARP entries. -A Delete all the ARP entries. -d Delete specified ARP entry. -s Register a ARP entry for a node.
clear		Clear the screen.
config		Save changes to the configuration or reset the configuration to factory defaults.
config reset		Reset configuration settings to factory defaults.
config save		Save current running configuration settings.
dhcpServer		DHCP Server.
dhcpServer status set	<statusValue>	Set DHCP Server status (disabled or enabled).
dhcpServer status show		Show DHCP Server status.
exit		Exit immediate mode. **Example:** CLI> admin ip CLI(admin-ip)> exit CLI>
fileTransfer	tftp server <ip address> transferType	Transfer files to or from the switch.

COMMAND	ARGUMENTS	DESCRIPTION
	<UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]	
help		Show command help.
help commands		Show system commands. Example: CLI> help commands admin - Administration settings, including IP settings and DHCP mode. arl - Arl Settings arp - Address Resolution Protocol (ARP) clear - Clear the screen config - Save changes to the configuration, or reset switch to factory defaults. dhcpServer - DHCP Server exit - Exit immediate mode fileTransfer - Transfer files help - Show command help history - Show command history lldp - Link Layer Discovery Protocol logout - Log off this system ping - Ping a host. port - Port settings portSecurity - Port Security ppp - Start PPP server (use from serial console only). reboot - Reboot the switch and load the most recently saved configuration. who - Display users currently logged in whoami - Show current user info
help edit		Show editing keys. **Example:** CLI> help edit Available editing keystrokes: Delete current character.....Ctrl-d Delete text up to cursor.....Ctrl-u Delete from cursor to end of line.....Ctrl-k Move to beginning of line..... Ctrl-a Move to end of line.....Ctrl-e Get prior command from history.....Ctrl-p Get next command from history.....Ctrl-n Move cursor left..... Ctrl-b

COMMAND	ARGUMENTS	DESCRIPTION
		Move cursor right.....Ctrl-f Move back one word.....Esc-b Move forward one word.....Esc-f Convert rest of word to uppercase.....Esc-c Convert rest of word to lowercase.....Esc-l Delete remainder of word.....Esc-d Delete word up to cursor.....Ctrl-w Transpose current and previous character..... Ctrl-t Enter command and return to root prompt..... Ctrl-z Refresh input line..... Ctrl-l
help help		Show command help. **Example:** CLI> help help help - Show command help commands - show system commands edit - Show editing keys
history		Show command history. **Example:** CLI> history 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history
history clear		Reset all history.
history enable		Turn history capture on.
history filter		Do not capture repeated input into history.
history info		Information **Example:** CLI> history info 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history 3 history info History filter: off History modal : off History ring : on
lldp		Link Layer Discovery Protocol.
lldp mode show		Show LLDP mode.
lldp mode set	disable, enabled, auto	Set LLDP mode.
lldp wakeTime show		Show remaining wake time in auto LLDP mode.
lldp wakeTime send	hours <hours> minutes <minutes>	Send wake time in auto LLDP mode to all switches.
logout		Log off this system.
ping		Ping a host.
ping	[<arguments>]	Use ping without arguments to get help. Surround multiple arguments with double quotes. **Example:** ping "-c 3 192.168.2.121"
port		Port Mirroring configuration display and control.

COMMAND	ARGUMENTS	DESCRIPTION
port config show	<portlist>	Show all port configuration information for the specified ports.
port config show all		Show all port configuration information for all ports on the switch.
port config show basic	[<portlist>]	Show basic port configuration information for the specified ports.
port mirror set		Set Port Mirroring configuration.
port mirror set enable port mirror set no enable		Enable or disable Port Mirroring. Use "no enable" to disable.
port mirror set destination	<port>	Set the destination port for Port Mirroring. For example, "A4".
port mirror set txsource	<portlist>	Set the transmit source ports that are mirrored to the destination port. For example, "A1,A2".
port mirror set rxsource	<portlist>	Set the receive source ports that are mirrored to the destination port. For example, "A1-A3,A6".
port mirror set dataonly port mirror set no dataonly		Set mirrored data only. Use "no dataonly" to disable.
port mirror show		Show Port Mirroring configuration. **Example:** CLI> port mirror show Port Mirroring Settings Mirror Status : Enabled Destination Port : A1 Mirrored Data Only : Enabled Tx Source Ports : None Rx Source Ports : A4
portSecurity		Port Security
portSecurity status set	disabled, learning, locked	Set port security status
portSecurity status show		Show port security status.
portSecurity intruderLog show		Show the contents of the intruder log
portSecurity authList show	[<portlist>]	Show the contents of the authorization list
ppp		Start PPP server (available from the serial console only).
reboot		Reboot the switch and load the most recently saved configuration.
who		Display users currently logged in. **Example:** CLI> who Line User Host(s) Idle Location 00:00:00 admin Console
whoami		Show current user information. **Example:** CLI> whoami

COMMAND	ARGUMENTS	DESCRIPTION
		User name: admin

System Information

Command: admin system show
Description: Show general system information

```
CLI>    admin system show

System Settings

Name                              : NT24k-DR16-DC

Model Name                        : NT24k-DR16

Family Name                       : NT24k

Software Version                  : 2.2.3

Build Date                        : Oct 25 2019. 16:36:28

Boot Loader                       : 2.0.7

Copyright                         : Copyright <c> 2013-2019

URL                          : http://www.redlion.net/

Ram Size                     : 128 MB

Flash Size                   : 64 MB

Internet Protocol (IP) Settings

IP Configuration             : DHCP

DHCP Client ID Type          : Switch Name

DHCP Client ID Data          : N-Tron Series 77:fd:00

Fallback IP Enable           : Enabled

Fallback IP Address          : 192.168.1.201

Fallback IP Subnet           : 255.255.255.0

Fallback IP Gateway          : 0.0.0.0

Current IP Address           : 0.0.0.0

Current Subnet Mask          : 0.0.0.0

Current Gateway Address      : 0.0.0.0

MAC Address                  : 00:07:af:77:fd:00

--------

System Up Time               : 0d 04:05:42

System Time                  : 2000-01-01 04:05:41 CST (UTC-06:00)

Switch Name                  : N-Tron Series 77:fd:00

Switch Contact               : Admin
```

```
Switch Location            : Mobile, AL 36606

--------

Device Temperature         : 50 C, 122 F

Upper Temperature Limit    : 120

Lower Temperature Limit    : -60

CLI>
```

Displaying Port Information

Command: port config show <all|basic> <port-list>

Description: Show general port configuration, similar to what is displayed in the Web Software. The first parameter ("all" or "basic") specifies how much information to show and the port-list parameter can be used to filter the displayed ports. This can be a single port, a range of ports (ex. 1-3) or multiple ranges of ports, separated by a comma. Ports can also be selected by name or by number.

Note: If you want all information for a specific port, or set of ports, simply call **port config show <port-list>**. If you want only basic information, you will need to include "basic" before **<port-list>**.

```
CLI> port config show basic

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
3    P3   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
4    P4   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
6    P6   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
7    P7   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
8    P8   10/100/1000 Mbps TX Enabled  Up     1000  RSTP Forwarding    1
9    DM1  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
10   DM2  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
11   DM3  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
12   DM4  Not Installed        Enabled  Down   1000  RSTP Not Installed 1

CLI> port config show P1

Port Configuration View

Port Number:            1
Port Name:              P1
Port Description:       10/100/1000 Mbps TX
Admin Status:           Enabled
Link Status:            Down
Auto Nego:              Enabled
Port Speed:             Auto
Duplex Mode:            Auto
Flow Control:           Disabled
Cross Over:             Auto
Role:                   RSTP
Port State:             Discarding
PVID:                   1
Trunk ID:               0
Usage Alarm Low:        0
Usage Alarm High:       100

CLI> port config show basic P1-P2,P5

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1

CLI>
```

Setting a Static IP Address

By default, the switch will use the DHCP protocol for IP address assignment. The switch may also be configured to use a static IP address.

Command: admin ip set

Description: Moves the CLI to the IP address settings immediate mode. Typing "?" will provide the command options available here.

Once in the IP immediate mode, it is easy to change the address configuration. Once set, the new configuration must be saved for this change to be retained after a reboot.

```
CLI(admin-ip-set)> ip address 192.168.2.209 mask 255.255.255.0 gateway 0.0.0.0
CLI(admin-ip-set)> no dhcp

        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       Static Settings
        +               IP Address:     192.168.2.209
        +               Subnet Mask:    255.255.255.0
        +               Gateway:        0.0.0.0
        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
CLI(admin-ip-set)> exit
CLI>
```

Performing a File Transfer

File transfers can be initiated through the CLI by using TFTP Protocol.

Command: fileTransfer tftp server <ip address> transferType <UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]

Description: Initiates the file transfer from the CLI.

```
CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType Upgrade System

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed

Processing '/ram0/xfr/NT24k_image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done reading contents


Extracting from /ram0.xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

extracting file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done extracting tar.

file NT24k_image.xml, size 1287 bytes, 3 blocks

moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image


Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.247 (130370
bytes/second)

Done Processing '/ram0/xfr/NT24k_image.tar'. Elapsed time: 1:25.996

File Transfer: Completed

CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType UpgradeSystem file
NT24k_Image.tar

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed
```

```
Processing '/ram0/xfr/NT24k_Image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done reading contents.

Extracting from/ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done extracting tar.
file NT24k_image.xml, size 1287 bytes, 3 blocks
moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image

Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.595 (130370
bytes/second)
Done Processing '/ram0/xfr/NT24k_Image.tar'. Elapsed time: 1:26.333
File Transfer: Completed
```

Saving the Configuration

When configuration changes are made, they are not automatically saved to NVRAM and will be discarded at the next power cycle. Configuration changes must be saved to be retained across power cycles.

Command: config save

Description: Save all current changes to the configuration for use after the next power cycle. If a Configuration Device is installed, the configuration will also be saved to the device.

```
CLI>
CLI> config save
CLI>
```

Appendix B

Working with Configuration Files

Importing a Subset of an XML Configuration File

The XML configuration file may be used to set all of the configurable parameters on a NT24k® switch or to configure a subset of parameters. Setting common parameters across multiple switches can be easily accomplished by creating and importing an abridged configuration file for this purpose.

Appendix C contains an example XML Configuration file. A simple way to start an XML configuration file is to export the existing saved configuration file from the switch and modifying it to meet your new configuration needs.

When creating a configuration file for a subset of available parameters, setting the system configuration mode to *Keep* will maintain the current settings for all parameters other than those explicitly set by the new file being imported. If the system configuration mode is not set to *Keep*, all parameters other than those being set by the configuration file, will be reset to their default setting.

In the example below, the mode is set to Keep so that other switch settings are not reset to defaults. Additional information about the content of the configuration file can be found at the top of any exported configuration file.

```
<SystemConfiguration Mode="Keep"?
  <SystemGroup>
    <SystemConfig>
      <SwitchContact>IT Department Manager</SwitchContact>
      <SwitchLocation>Factory Floor B</SwitchLocation>
    </SystemConfig>
  </SystemGroup>
</SystemConfiguration>
```

Using Port Numbers instead of Port Names

In a configuration file, it is valid to use port numbers instead of names to simplify the sharing of configuration settings. Ports are numbered starting at 1.

Port names may differ between switch models. For example, the NT24k-DR24 uses A1-A8, B1-B8, and C1-C8 and the NT24k-14FX6 uses P1-P8 and FX1-FX6. However the configuration files can reference ports 1-24 for an NT24k and ports 1-14 for an NT24k-14FX6.

In the following example, VLAN 1 is configured for ports 1 through 8 and VLAN 2 is configured for ports 9 through 16. This settings file can be imported into any NT24k switch that supports 16 or more ports. Note that the configuration file must also set the appropriate port PVIDs.

```
<SystemConfiguration Mode="Keep">
  "VlanGroup>
    <IngressDiscardUntagged>None</IngressDisgardUntagged>
    <IngressReplaceVID>Disabled</IngressReplaceVID>
    <IngressVidFilter>None</IngressVidFilter>
    <PrimaryMgmtVlanId>1</PrimaryMgmtVlanId>
    <RemoveportsFromDefaultVlan>Enabled</RemovePortsFromDefaultVlan>
    <TaggedVlans>
      <Vlan>
            <AllowManagement>Enabled</AllowManagement?
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
```

```
            <VlanId>1</VlanId>
        </Vlan>
        <Vlan>
            <AllowManagement>Enabled</AllowManagement>
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
            <VlanId>1</VlanId>
        </Vlan>
    </TaggedVlans>
    <Type>Tagged</Type>
```

Importing an Incompatible XML Configuration File

Errors related to invalid port names or numbers may occur when importing a configuration file from one model of an NT24k® switch into a different model of an NT24k switch.

Field	Description
Destination	XML line:(216) - Could not set '/SystemConfiguration/MirrorGroup/MirrorConfig/Destination' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
ControlPort	XML line:(226) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort' to value 'P3'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
CouplerPort	XML line:(227) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort' to value 'P4'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Portx	XML line:(244) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Portx' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Porty	XML line:(245) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Porty' to value 'P2'

Resolving Invalid Port Mappings

If the number of ports in the XML configuration file is greater than on the target model, then the following sections should be removed for each of the extra ports.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/Port (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port

Notice that if the target switch has additional ports whose settings are not specified in the imported configuration file, then these additional ports will have their settings set to default values if the mode has not been set to “Keep”.

Ports on the target switch that do not exist in the configuration file will be added to Default VLAN 1. If the configuration file has extra VLANs with ports that do not exist, an error will be generated for each non-existent port.

Resolving Invalid Port Names

If the port names in the XML configuration file are different than on the target model, then rename the ports for the following sections so that the new names correspond to the intended ports on the target model.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port/PortNumber
- SystemConfiguration/MirrorGroup/MirrorConfig/Destination

- SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort
- SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Portx
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Porty
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/PortNumber (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port/PortNumber
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry/PortNumber
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit/PortNumber
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port/PortNumber

Depending on the exported values, some of the following sections in the XML configuration file may also need to have their ports renamed.

- SystemConfiguration/BridgingGroup/BridgingConfig/MulticastFilters/PortList
- SystemConfiguration/BridgingGroup/BridgingConfig/UnicastFilters/PortNumber
- SystemConfiguration/IgmpGroup/IgmpConfig/ManualRouterPorts
- SystemConfiguration/IgmpGroup/IgmpConfig/RFilterPorts
- SystemConfiguration/MirrorGroup/MirrorConfig/RxSourcePorts
- SystemConfiguration/MirrorGroup/MirrorConfig/TxSourcePorts
- SystemConfiguration/NViewGroup/NViewConfig/SendAutocastPorts
- SystemConfiguration/NViewGroup/NViewConfig/SendMibStatsPorts
- SystemConfiguration/SecurityDot1xGroup/SecurityDot1xConfig/EnabledPorts
- SystemConfiguration/TrunkGroup/TrunkConfig/Trunks
- SystemConfiguration/VlanGroup/VlanConfig/IngressDiscardUntagged
- SystemConfiguration/VlanGroup/VlanConfig/IngressVidFilterf
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/MemberPorts
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/UntagEgressPorts

Example Scenarios

MODEL OF EXPORTED CONFIGURATION FILE	TARGET MODEL	EXPECTED RESULTS OF IMPORTING XML CONFIGURATION FILE
NT24k-DR16	NT24k-DR24	Import successful; Last 8 ports on target model will reset to default values if the mode has not been set to “Keep”.
NT24k-DR24	NT24k-DR16	Invalid port mappings
NT24k-DR16	NT24k-16TX	Invalid port names
NT24k-DR16	NT24k-8TX	Invalid port mappings and names

Appendix C

XML Configuration File

Factory Defaults

The following is a shortened example of an XML configuration file:

```
<!-- ************************************************************************
    Overview of XML settings for the N-Tron NT24k series switches
    XML settings can be downloaded to a switch to configure the switch.
    There are several top level configuration sections. Each section is optional.
    Common Attributes:
    ******************
    The following attributes are common to all sections. If omitted from a section,
      then the value from the parent section is used. If completely omitted, a
      system default value is used.

     Crc            Optional. This is not used in this release, but may be
                    used in a future release.
     CurSwVer       Optional. String representation of switch version that the
                    settings were exported from.
     Version        Optional. If present, represents the version of the
                    section. If not present, the default value is used instead
                    of being inherited from the parent section.
                    Default = "1".
     MinSwVer       Optional. String representation of switch version. If
                    present, ignore settings for the section if switch
                    software version does not meet minimum requirement.
                    Default = "1.0".
     Mode           Optional. If present, determines the type of action to
                    take on existing data in the section. In the event of a
                    conflict, precedence goes to the deepest level that is
                    explicitly expressed.
                    Possible values:
                    Delete   (Default) Delete all existing data for the
                    section and replace it with the values in this section.
                    Any missing data gets set to factory default values.
                    Keep   Keep existing data, unless new values are specified
                    in this section. A factory default value is used if there
                    is no previously existing data.
     Convert        Optional. If present, determines whether data conversion
                    is performed when necessary.
                    Possible values:
                    Auto   (Default) When a data conversion is determined to
                    be necessary it will be done automatically, without any
                    user intervention.
                    No   Data conversion is not performed, but settings are
                    validated.
     ValidatePorts  Optional. If present, determines if port names or numbers,
                    within lists, that are not valid on this device should be
                    ignored or generate an error.
```

```
                    Possible values:
                    Yes   (Default) Ports are validated.
                    No   Invalid ports are ignored.
      Model         Optional. If present, represents the switch model that the
                    settings were exported from.

  Notes:
  ******
  Comments added to this file will not be preserved.
  ************************************************************************ -->
  <!-- ************************************************************************
  SystemConfiguration ******************************************************
************************************************************************** -->
  <SystemConfiguration Model="NT24k-DR16" ValidatePorts="Yes" Convert="Auto"
Mode="Delete" MinSwVer="1.0" Version="2" CurSwVer="1.9.2">
  <BridgingGroup>
       <BridgingConfig>
             <AgingTime>300</AgingTime>
             <EnableIpProbe>Disabled</EnableIpProbe>
             <MulticastFilters></MulticastFilters>
             <UnicastFilters></UnicastFilters>
       </BridgingConfig> </BridgingGroup>
  [ content intentionally omitted ]
  </SystemConfiguration>
```

For a complete example of an XML configuration file, click on the following link: http://www.redlion.net/resources/software/n-tron-software and refer to section NT24k® Industrial Ethernet Switches.

RED LION™
a spectris company

▶▶▶ Puggable Mini-GBIC Transceivers

Gigabit Transceivers

Mini-GBIC SFP transceivers for
N-Tron's Gigabit Network Products



Gigabit SFP Fiber Transceiver Characteristics

Fiber Length	*550m for 50/125µm 275m for 62.5/125µm*	*10km*	*40km*	*80km*
TX Power Min	*-9.5dBm*	*-9.5dBm*	*-2dBm*	*0dBm*
RX Sensitivity Max	*-17dBm*	*-20dBm*	*-22dBm*	*-24dBm*
Wavelength	*850nm*	*1310nm*	*1310nm*	*1550nm*
Assumed Fiber Loss	*3.5 to 3.75 dB/km*	*0.45 dB/km*	*0.35 dB/km*	*0.25 dB/km*
Laser Type	*VCSEL*	*FP*	*DFB*	*DFB*

Variety and Flexibility

Pluggable mini-GBIC transceivers from N-Tron® fully comply with strict industry standards to ensure robust functionality in fiber optic networks. All modules are designed with high-performance industrial features, including expanded temperature ranges, to operate reliably under harsh conditions. N-Tron's SFPs may be used in combination on each switch. Varieties include 1000Base-T, 1000Base-SX and 1000Base-LX.

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
NTSFP-TX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseT GB Copper Port (up to 100 meters)
NTSFP-SX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseSX Multimode GB Fiber Optic Port
NTSFP-LX-ZZ ZZ = 10, 40, or 80 km	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseLX Singlemode GB Fiber Optic Port

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Product brochure

1.5 – 6 kVA



Eaton 9PX lithium-ion UPS

Double-conversion UPS that offers a set it and forget it deployment

The 9PX lithium-ion UPS is part of the Eaton 9 series single-phase double-conversion UPS line, best applied to mission-critical equipment for constant power conditioning. The 9PX lithium-ion UPS provides 8 to 10 years of life expectancy for UPS and its batteries, and has power ratings ranging from 1–6 kVA, while also offering up to four external battery modules (EBM) for extra runtime. The 9PX lithium-ion UPS has the same reliable features as the 9PX lead-acid UPS, including load segments for prioritized shutdowns, remote power on (RPO), remote on/off (ROO) and output relay ports that increase control capabilities. For connectivity, the 9PX is compatible with the Gigabit Network Card (NETWORK-M2), which is the first UPS connectivity device to meet both UL and IEC cybersecurity standards. This network interface card improves power system reliability by providing warnings of pending issues and helping to perform orderly graceful shutdown of servers and storage.



2U UPS with 1U EBM in 4-post rack

Key features and benefits

Save money

- **2-3X longer battery life:** minimize battery maintenance expense—ideal for large deployments and edge applications
- **Runtime:** UPS provides up to 2–3X more runtime at full load compared to lead-acid batteries
- **Warranty:** 5-year all-inclusive (electronics and battery) warranty

Save space

- **1U lithium EBM vs 2U lead-acid EBM** (1–3 kVA models)
- **2U lithium EBM vs. 3U lead-acid EBM** (6 kVA model)
- **Lightweight design** up to 40% less weight than a comparable lead-acid UPS allowing easier installation and saving time

Reduce risk

- **24/7 monitoring:** battery management system (BMS) improves reliability and performance by actively monitoring temperature and charge
- **Cybersecure:** remote monitoring service and network connectivity card options provide cybersecurity protection and keeps you connected with your UPS status updates
- **On-board BMS monitoring** in combination with proven Lithium Iron Phosphate (LFP) chemistry provides a reliable and safe offering, giving you peace of mind

Powering Business Worldwide

Remotely automate and monitor your UPS with Brightlayer Data Centers suite software

The power of automation.

With our Disaster Avoidance software, also known as Intelligent Power Manager (IPM), you can create triggering alerts and automate resolutions to keep applications running. This software enables you to:

- **Leverage** Eaton's integrations with industry leaders such as VMware, Microsoft and VirtualBox
- **Migrate** workloads to increase system uptime and minimize generator load by suspending non-critical virtual machines
- **Power cap** servers to keep critical loads running longer by limiting server power consumption

Learn more at Eaton.com/IPM

The power of monitoring.

With our Distributed IT Performance Management (DITPM) software, you can remotely monitor up to thousands of PDUs and UPSs – no matter where they're located. This software enables you to:

- **Know** what's happening with real-time reports, trend charts, dashboards and alerts that are prioritized by severity and escalated when unacknowledged to speed resolution
- **Troubleshoot** and resolve issues
- **Remotely control** UPS load segments regardless of vendor, automating device response and diagnosing equipment performance
- **Update** firmware remotely to improve cybersecurity and eliminate the need for in-person firmware updates

Learn more at Eaton.com/DITPM

The power of predictability.

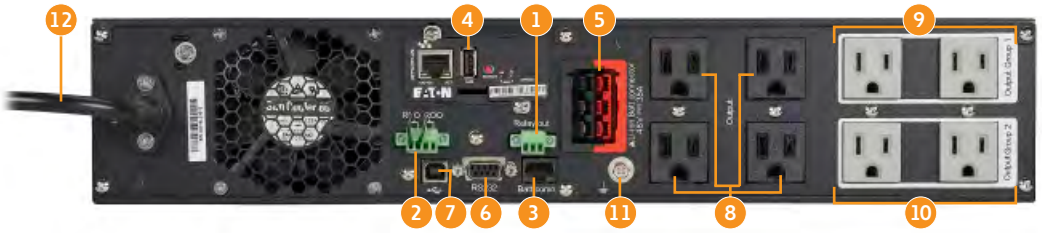
Our Remote Monitoring Service, also known as PredictPulse, is the industry's first cloud-based 24x7 remote monitoring and predictive analytics subscription service to forecast data center power component failure and proactively replace components before failure. This software enables you to:

- **Focus** on other critical IT tasks while our experts remotely monitor your IT infrastructure power quality equipment around the clock and dispatch field service technicians when needed
- **Eliminate** surprise maintenance expenses— this subscription-based service includes parts, labor, on-going preventive maintenance and expedited repairs
- **Propriety algorithms**, based on data from thousands of installed devices, predict UPS component failure so we can proactively replace parts before issues arise

Learn more at Eaton.com/RemoteMonitoringService

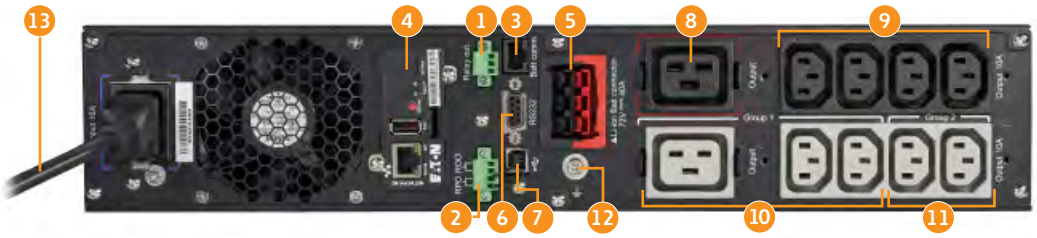
Rear panel overview

Model 9PX1500RT-L



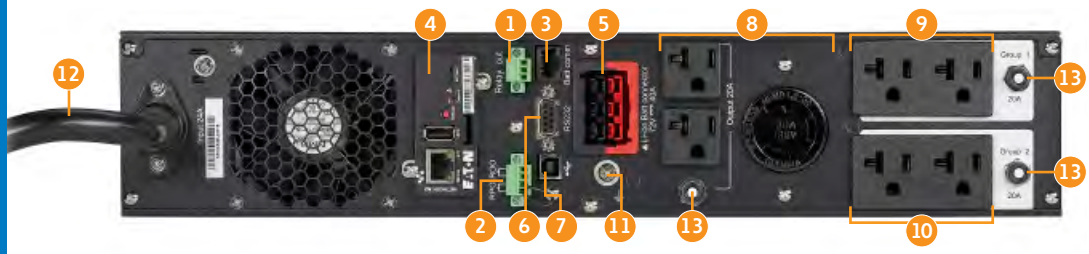
1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-15R managed outlets (primary group)
9. (2) 5-15R (load segment group 1)
10. (2) 5-15R (load segment group 2)
11. Ground bonding screw
12. 8-feet line cord with 5-15P

Model 9PX2200GRT-L and 9PX3000GRT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (1) C19 outlet
9. (4) C13 managed outlets (primary group)
10. (1) C19 and (2) C13 managed outlets (load segment group 1)
11. (2) C13 managed outlets (load segment group 2)
12. Ground bonding screw
13. C20/L6-20P input connection (detachable L6-20P to C19 input cord is 6-feet long)

Model 9PX3000RT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-20R and (1) L5-30R managed outlets (primary group)
9. (2) 5-20R managed outlets (load segment group 1)
10. (2) 5-20R managed outlets (load segment group 2)
11. Ground bonding screw
12. L5-30P input cord (8-feet long)
13. AC output branch protector

For additional rear panel views, please visit **Eaton.com/9PX.**

9PX 1 to 3 kVA lithium-ion rackmount and tower model selection guide

The 9PX lithium-ion comes as a stand-alone UPS or as part of a network bundle for easy configuration and deployment. For complete specifications, including interactive battery runtime graphs, visit **Eaton.com/9PX.**

120V (default), 100V, 110V, 115V, 125V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RT-L	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	35.5
9PX2000RT-L	2000 / 1800	5-20P, 8 ft.	(1) L5-20R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	50.6
9PX3000RT-L	3000 / 2700	L5-30P, 8 ft.	(1) L5-30R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	52.7

Global UPS, 208V (default), 230V, 240V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500GRT-L	1500 / 1350	C14	(8) C13	3.41 (2U) x 17.32 x 17.72	34.8
9PX2200GRT-L	2200 / 2000	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	48.6
9PX3000GRT-L	3000 / 2700	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	50.2

120V (default), 100V, 110V, 115V, 125V RT network card bundles

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RTN-L (includes NETWORK-M2 network card)	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	36.5
9PX2000RTN-L (includes NETWORK-M2 network card)	2000 / 1800	5-20P, 8 ft.	(6) 5-20R, (1) L5-20R	3.41 (2U) x 17.32 x 23.83	51.6
9PX3000RTN-L (includes NETWORK-M2 network card)	3000 / 2700	L5-30P, 8 ft.	(6) 5-20R, (1) L5-30R	3.41 (2U) x 17.32 x 23.84	53.7

9PX 1 to 3 kVA lithium-ion extended battery module (EBM) options

Catalog number	Description	Rack size	Weight, lb.
9PXEBM48RT-L	Extended battery module for 9PX1500RT-L and 9PX1500GRT-L	1U	36.5
9PXEBM72RT-L	Extended battery module for 9PX2000RT-L, 9PX2200GRT-L, 9PX3000RT-L and 9PX3000GRT-L	1U	46.6

Power distribution (PDU) and maintenance bypass (MBP) options

Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.
EHBPL1500R-PDU1U	HotSwap MBP for use with 9PX1500RT-L, 9PX1500GRT-L	5-15P	(6) 5-15R	2.1 (2U) x 17.3 x 3.8
EHBPL2000R-PDU1U	HotSwap MBP for use with 9PX2000RT-L, 9PX2200GRT-L	5-20P	(6) 5-20R	2.1 (2U) x 17.3 x 3.8
EHBPL3000R-PDU1U	HotSwap MBP for use with 9PX3000RT-L, 9PX3000GRT-L	L5-30P	(5) 5-20R	2.1 (2U) x 17.3 x 3.8
PDUV20-72	Basic PDU	L5-20P	(36) 5-15/20R	72.47 x 1.50 x 1.64
PDU2430	Basic PDU	L5-30P	(24) 5-15R	1.75 x 17.25 x 4.50
PDUV20HVL6-72	Basic PDU	L6-20P	(32) C13, (6) C19	63.75 x 3.50 x 2.25
EATS115	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-15P	(10) 5-15R	1.7 (1U) x 17.25 x 9.94
EATS120	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-20P	(10) 5-20R	1.7 (1U) x 17.25 x 9.84

* For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2*	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PA	1U two-post rail kit (optional for EBM)
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

* Included with N and 6K models

What's in the box

- 9PX UPS
- RS-232 communication cable
- USB communication cable
- Software leaflet
- Safety instructions
- Quick start guide
- 4-post mounting rail kit for 19-inch enclosures
- 2 pedestals for tower position
- Gigabit Network Card (NETWORK-M2) – included with N and 9PX6K-L models

Lithium-ion vs lead-acid

Characteristic	VRLA (lead-acid) battery	Lithium-ion battery	Lithium-ion benefit
Average battery lifespan	3–5 years	8-10 years	**2–3X longer life**
Weight	43–150 lb.	34.8–79 lb.	**20% lighter UPS, 40% lighter EBM**
EBM footprint	2U 3U	1U (1–3 kVA models) 2U (6 kVA model)	**Increased U space for critical equipment**
Warranty	2 years	5 years	**2.5X warranty coverage**
Battery replacement cost	$650*	$0	**Reduced TCO**

* Battery and labor cost for one replacement



Eaton's Gigabit Network Card adds advanced control with IPM software allows for remote management and integration into leading virtualization platforms **Eaton.com/Network-M2**

9PX 6 kVA lithium-ion rackmount and tower model selection guide

Global UPS, 208V (default) 200V, 208V, 220V, 230V, 240V models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX6K-L	6000 / 5400*	L6-30P, 10 ft. Hardwire	(2) L6-30R (2) L6-20R Hardwire	5.12 x 17.33 x 28.43	81.2

* Derated at 200, 208, 220V. See 9PX6K-L technical specifications for full information.

9PX 6 kVA lithium-ion extended battery module (EBM) and accessories

Catalog number	Description	Rack size	Weight, lb.
9PXEBM192RT-L	Extended battery module for 9PX6K-L	2U	79
EBMCBL192-L	EBM cable extension, 6 feet (1.8 meters)		

Power distribution (PDU), maintenance bypass (MBP), PowerPass distribution (PPDM) and transformer options

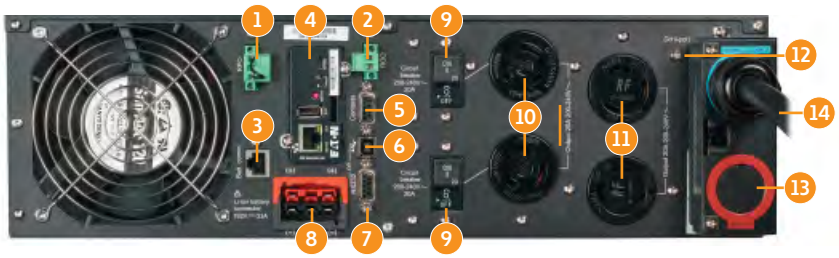
Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
MBP6K208	208V maintenance bypass module	L6-30P*	(2) L6-30R Hardwired	5.1 (3U) x 7.0 x 4.3	5.5
PDUV30HV	Basic PDU	L6-30P	(32) C13, (6) C19	63.75 x 3.5 x 2.25	8
PDU1230	Basic PDU	L6-30P	(16) C13, (4) C19	1.75 (1U) x 17.5 x 5.2	7.5
9PXTFMR5	9PX stepdown transformer	L6-30P	(18) 5-20R	5.1 (3U) x 17.3 x 25.4	95
9PXPPDM1	9PX PowerPass distribution module	L6-30P	(1) L6-30R, (1) L14-30R, (6) 5-20R outlets	5.1 (3U) x 17.3 x 25.4	97
9PXPPDM2	9PX PowerPass distribution module	Hardwired	Hardwired	5.1 (3U) x 17.3 x 25.4	95

* Terminal block with L6-30P cord (included with UPS)
For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

Rear panel overview

Model 9PX 6 kVA lithium-ion UPS



1. Remote power off (RPO) port
2. Remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card
5. Output relay contact – DB-9 dry contact
6. USB port (cable included)
7. RS-232 serial communication port (cable included)
8. EBM connector
9. Output circuit breaker protection
10. (2) L6-20R
11. (2) L6-30R
12. Ground bonding screw
13. Output terminal block for hardwired applications
14. 10-foot line cord with L6-30P

To view battery runtimes and interact with the Eaton 9PX lithium-ion UPS, please visit: **Eaton.com/9PX**

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Eaton 9PX Li-Ion UPS technical specifications (1500-3000 VA 2U models[1])

Model overview

Catalog number	Power rating (VA/ watts)	Input connection	Output receptacles	Dimensions (HxWxD, in.)[2]	Weigh t (lb.)
120V output, 50/60 Hz					
9PX1500RT-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	35.5
9PX1500RTN-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	36.5
9PX2000RT-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	50.6
9PX2000RTN-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	51.6
9PX3000RT-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	52.7
9PX3000RTN-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	53.7
208V output, 50/60 Hz bundles					
9PX1500GRT-L	1500/1350[4]	C14	(8) C13	3.4 (2U) x 17.3 x 17.7	34.8
9PX2200GRT-L	2200/2000[5]	C20 / L6-20P[5]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	48.6
9PX3000GRT-L	3000/2700[6]	C20 / L6-20P[4]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	50.2

Additional specifications

General	
Topology	Double-conversion, online
Configuration	Rack/tower
Color	Black and silver
Diagnostics	Full system self-test at power up
Warranty	5 years electronics and battery
Rail kit	4-post rail kit included; Max length:30.0in, Min length:17.4in Tower ped estals includ ed *Optional 2-post rail kit available, part number: RK2PC(UPS) and RK2PA(EBM)*
Remote power off	Remote On/Off (ROO) and Remote Power Off (RPO) rear terminal blocks
Contents (Ships with the following items)	UPS 4-post rail kit Safety manual Output cables (for G models) Input cables (for G models) Cable lockers (for G models) Tower pedestals RS-232 serial cable USB cable

1. Due to continuing product improvement programs, specifications are subject to change without notice.
2. Each 9PX and EBM ships with a 4-post rail kit.
3. Input line cord is 8 feet long.
4. 1500 VA Global model wattage: 200V, 208V: input limited to 1350 watts; 220V, 230V, 240V: 1500 watts
5. C19 to L6-20P input cord is 6 feet long.
6. Models derated at lower voltag es due to input cord limitations. See Power ratings table below for further details.

	Communication card (optional)	
Electrical input	208V	120V
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Input voltage range	Full load: 176-276V, <40% load: 100-276V	Full load: 100-144V, <30% load: 60-144V
Freq uency	50/60 Hz	
Freq uency range	60 Hz: 50–70 Hz, 50 Hz: 40–60 Hz	
Input power factor	≥.99	
Input current distortion	≤5% (≤10% frequency converter mode)	
Circuit breaker	1500VA: None 2200VA: None 3000VA: None	1500VA: None 2000VA: None 3000VA: (3) 20A for (2) 5-20R each
Electrical output	208V	120V
Power ratings	9PX1500GRT-L 220/230/240V: 1500VA / 1500W 200/208V: 1500VA / 1350 9PX2200GRT-L: 220/230/240V: 2200VA / 2200W 208/200V: 2200VA / 2000W 9PX3000GRT-L: 220/230/240V: 3000VA / 3000W 208/200V: 3000VA / 2700W	9PX1500RT-L: 120/125V: 1500VA / 1350W 110V: 1350VA / 1215W 100V: 1200VA / 1080W 9PX2000RT-L: 120/125V: 2000VA / 1800W 110V: 1800VA / 1620W 100V: 1600VA / 1440W 9PX3000RT-L: 120/125V: 3000VA / 2700W 110V: 2700VA / 2430W 100V: 2400VA / 2160W
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Output voltage regulation, steady state	±1% normal mode ±2% battery mode	
Voltage THD (online)	Linear: 3% Non-linear: 5%	
Power factor	0.9	
Efficiency	9PX1500GRT-L: 92% online 9PX2200GRT-L: 93% online 9PX3000GRT-L: 93.7% online	9PX1500RT-L: 90% online 9PX2000RT-L: 91.4% online 9PX3000RT-L: 91.6% online
Transfer time	0 ms	
Battery		
Optional extended battery module (EBM)	9PXEBM48RT-L: 1500 VA models (1U form factor) 9PXEBM72RT-L: 2000-3000 models (1U form factor)	
Maximum number of EBMs	Add up to 4 EBMs	
Battery description	Lithium Ion, LiFePO4 chemistry	
Battery management	BMS: Advanced battery man ag ement with health monitoring and prediction features	
Battery replacement	Hot-swappable internal batteries and EBMs	
Start on battery	Cold-start en abled; first cold start is always forbidden	
Communications		
User interface	Graphical display. UPS status in a single view.	
LEDs	4 status-indicating LEDs	
Communication ports	RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables includ ed	

Communications card	Network Card-M2 optional, stan dard on network bundles (bun dled models include an N)	
Power management software	Integrates with Eaton Intelligent Power Manager software	
Environmental & standards		
RoHS compliance	Yes	
Surge protection	MOV: 510V, 296Joules	MOV ratings : 271Volt (from L-N) and 510 Volt (from L-G and N-G), 190 Joules
EMC markings	IEC 62040-2 Class B Cat C2 / CISPR22 Class B / FCC part 15 Class B / VCCI Class B	IEC 62040-2 Cat C1 / CISPR22 / FCC part 15 Class B / VCCI Class B
Heat dissipation (BTU)	9PX1500GRT: 494 online, 731 battery 9PX2200GRT: 513 online, 741 battery 9PX3000GRT: 619 online, 1150 battery	9PX1500RT: 512 online, 897 battery 9PX2000RT: 578 online, 974 battery 9PX3000RT: 844 online, 1462 battery
Audible noise	≤47 dB at 1 meter	
Operating temperature	0 to 40°C (32°F to 104°F)	
Altitude operating temperature range	0-1500m @ 0°C - 40°C 1500m-3000m @ 0°C - 35°C	
Safety conformance	CE / cULus	CE / cULus / NOM
Storage temperature	-20 to 35°C (-4°F to 95°F); without batteries: -13 to 55°C (5°F to 131°F)	
Relative humidity	0 to 96% non-condensing	

9PX Li-Ion 1-3kVA Battery Backup Times (in minutes)**

Load(Watts)	Internal batteries	+1 EBM	+2 EBMs	+3 EBMs	+4 EBMs
9PX1500RT-L					
1350	11.2	30.0	47.1	64.3	81.4
1215	12.6	33.5	52.7	71.9	91.0
1080	14.2	38.0	59.7	81.4	103.0
945	16.3	43.5	68.4	93.3	118.1
810	19.1	50.8	79.8	108.9	137.9
675	22.9	61.0	95.9	130.7	165.6
540	28.1	74.8	117.6	160.3	203.1
405	37.0	98.6	154.9	211.2	267.5
270	54.4	145.2	228.1	311.0	394.0
9PX1500GRT-L					
1350	12.0	31.9	50.2	68.4	86.7
1215	13.3	35.5	55.8	76.0	96.3
1080	15.0	39.9	62.7	85.4	108.2
945	17.0	45.2	71.0	96.9	122.7
810	19.7	52.5	82.5	112.5	142.5
675	23.4	62.5	98.2	133.9	169.6
540	28.7	76.4	120.1	163.8	207.5
405	37.1	99.0	155.6	212.1	268.7
270	52.0	138.7	218.0	297.3	376.6
9PX2000RT-L					
1800	13.6	36.3	57.0	77.8	98.5
1620	15.2	40.4	63.5	86.6	109.7
1440	17.1	45.5	71.6	97.6	123.6

1260	19.5	52.0	81.7	111.4	141.1
1080	22.6	60.3	94.8	129.3	163.8
900	27.1	72.3	113.6	154.8	196.1
720	33.5	89.3	140.3	191.4	242.4
540	43.8	116.7	183.4	250.1	316.8
360	62.6	167.0	262.4	357.8	453.2
9PX2200GRT-L					
2000	12.3	32.8	51.5	70.2	88.9
1800	13.6	36.3	57.1	77.8	98.6
1600	15.2	40.6	63.8	87.0	110.2
1400	17.3	46.2	72.6	99.0	125.4
1200	20.2	53.8	84.5	115.3	146.0
1000	23.9	63.8	100.3	136.7	173.2
800	29.4	78.4	123.1	167.9	212.7
600	38.2	101.8	159.9	218.1	276.2
400	54.3	144.7	227.4	310.1	392.9
9PX3000RT-L					
2700	9.1	24.1	37.9	51.7	65.5
2400	10.2	26.9	42.2	57.6	72.9
2160	11.3	30.3	47.7	65.0	82.3
1890	12.9	34.7	54.5	74.3	94.1
1620	14.8	40.4	63.5	86.5	109.6
1350	18.0	48.3	75.9	103.5	131.1
1080	23.0	59.9	94.2	128.4	162.6
810	28.0	79.1	124.3	169.5	214.7
540	43.0	114.3	179.5	244.8	310.1
9PX3000GRT-L					
2700	9.1	24.2	38.0	51.8	65.6
2400	10.5	26.9	42.2	57.5	72.9
2160	11.3	30.2	47.5	64.7	82.0
1890	12.8	34.6	54.4	74.2	94.0
1620	14.9	40.3	63.3	86.3	109.4
1350	18.0	47.9	75.3	102.7	130.0
1080	23.0	59.4	93.4	127.4	161.4
810	30.0	77.6	121.9	166.3	210.6

**Runtimes shown at full load with maximum power factor, are approximate and may vary with equipment, configuration, battery age, temperature, etc. View interactive graphs at www.eaton.com/9PX

Product specifications

Eaton 9PX1500RT-L

Catalog Number: 9PX1500RT-L

Eaton 9PX lithium ion UPS, 2U, 1500 VA, 1350 W, 5-15P input, Outputs: (8) 5-15R, 120V

General specifications

Product Name	**Catalog Number**
Eaton 9PX UPS	9PX1500RT-L
UPC	**Product Length/Depth**
743172105455	17.72 in
Product Height	**Product Width**
3.41 in	17.32 in
Product Weight	**Warranty**
35.6 lb	5 year limited
Compliances	**Certifications**
CE Marked FCC part 15 Class B IEC 62040-2 Cat C1	cULus Listed NOM

Product specifications

Battery management

Integrated battery management system (BMS) for temperature regulation and life cycle monitoring

Output waveform

True sine wave

VA rating

1500 VA

Max number of battery packs

4

Wattage

1350 W

Output power factor

0.9

Form factor

Rack/tower

Receptacle

(8) 5-15R, 120V

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 5 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Package contents

UPS
Quick start guide
Safety instructions
USB communciation cable
RS-232 serial communication cable
4-post rail for 19-inch enclosures
Software leaflet
Software leaflet
2 pedestals for tower poition

Input connection

5-15P

Noise level

<47 dB at 1 meter

Runtime graph

Resources

Application notes

9PX1500RT-L runtime graph

Brochures

Eaton 9PX lithium-ion UPS brochure

Competitive comparisons

9PX Lithium-ion UPS Competitive Comparison Battlecard

Drawings

Eaton 9PX lithium-ion 1.5 kVA 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

Eaton 9PX lithium-ion UPS guide specification: 1-3 kVA

Eaton Specification Sheet - 9PX1500RT-L

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide

Warranty guides

Eaton 9PX lithium-ion UPS warranty

View runtime graph

Software compatibility

Intelligent Power Software Suite

User interface

Graphical display, 5-button programmable menu

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Efficiency

90 %

Rack size

2U

Number of Outputs 5-15R

8

Voltage

120V

Input cord length

8 ft

Temperature range

0° to 40°C (32° to 104°F)

Communication

RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables included

Relative humidity

0-96% non-condensing

Color

Black/silver

Rack mounting kit

Yes

Extended battery capability

Add up to 4 extended battery modules (EBM). Part number 9PXEBM48RT-L

Output voltage range

±1% steady-state

Topology

Online/Double-conversion

BTU Rating

Online: 512, Battery: 897

Output frequency

50/60 Hz

Runtime at full load

11.2 min

Type

UPS

Output nominal voltage

120V default (100/110/120/125V)

Input nominal voltage

120V default (100/110/120/125V)

Input power factor

>0.99 typical

Expansion slots

(1) Mini-Slot (MS) expansion port. The following optional connectivity cards may be ordered separately.
Gigabit Network Card part number: NETWORK-M2
Modbus card part number: INDGW-M2
Relay card part number: RELAY-MS

Input frequency range

60 Hz: 50-70 Hz, 50 Hz: 40-60 Hz

Internal bypass

Yes

Altitude

0-1500m (0° to 40°C), 1500-3000m (0° to 35°C)

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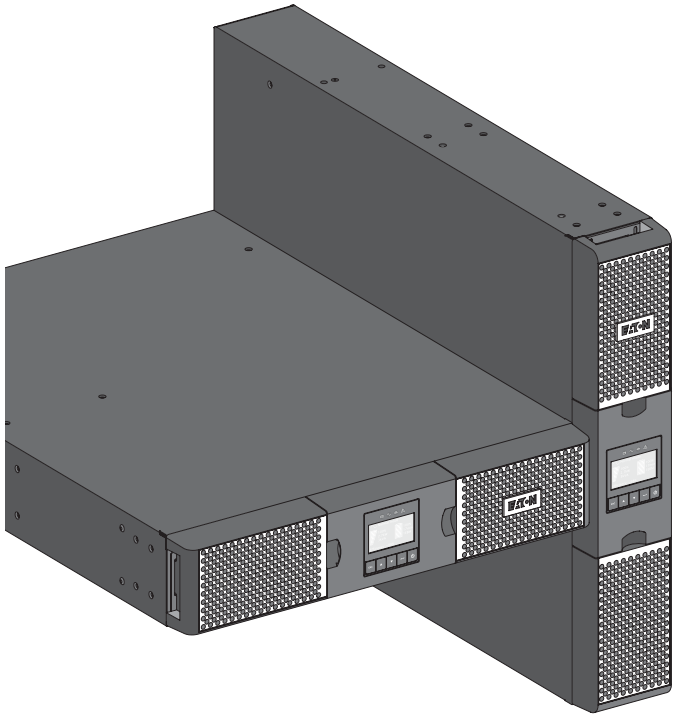
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Eaton 9PX Lithium-Ion

Advanced Users Guide



9PX1500RT-L
9PX2000RT-L
9PX3000RT-L
9PX1500GRT-L
9PX2200GRT-L
9PX3000GRT-L
9PXEBM48RT-L
9PXEBM72RT-L

Powering Business Worldwide

p/n: P-164001006
Revision 06

Safety Instructions

SAVE THESE INSTRUCTIONS.

This manual contains important instructions **that should be followed during installation and maintenance of the UPS and batteries.**

The 9PX models that are covered in this manual are intended for installation n an environment within 0 to 40°C, free of conductive contaminant.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to IEC62040-2 & FCC standards. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Special Symbols

The following are examples of symbols used on the product to alert you to important information:



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



CAUTION: REFER TO OPERATOR'S MANUAL - Refer to your operator's manual for additional information, such as important operating and maintenance instructions.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

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Safety of Persons

- The system has its own power source (the battery). Consequently, the power outlets may be energized ven if the systems is disconnected from the AC power source. Dangerous voltage levels are resent within the system. It should be opened exclusively by qualified service personnel.
- The system must be properly grounded at all times.
- The battery supplied with the system contains small amounts of toxic materials. To avoid accidents, the directives listed below must be observed:
  - Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
  - When replacing batteries, replace with the same type and number of batteries or battery packs.
  - Do not dispose of batteries in a fire. The batteries may explode.
  - Batteries constitute a danger (electrical shock, burns). The short-circuit current may be very high.
- Precautions must be taken for all handling:
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries.
  - Disconnect charging source prior to connecting or disconnecting battery terminals.
  - Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

Product Safety

- To connect the UPS, instructions and operation described in the manual must be followed in the indicated order.
- CAUTION - To reduce the risk of fire, the unit connects only to a circuit provided with 20 or 30 amperes maximum branch circuit overcurrent protection in accordance with the National Electric Code, ANSI/NFPA 70 (US installations only).
- Check that the indications on the rating plate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the system.
- For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible
- Never install the system near liquids or in an excessively damp environment.
- Never let a foreign body penetrate inside the system.
- Never block the ventilation grates of the system.
- Never expose the system to direct sunlight or source of heat.
- If the system must be stored prior to installation, storage must be in a dry place.
- The admissible storage temperature range is -25ºC to +55ºC without batteries, 0°C to 40°C with batteries.
- The system is not for use in a computer room AS DEFINED IN the standard for the Protection of Information Technology Equipment, ANSI/NFPA 75 (US installations only).

Special Precautions

- The unit is heavy: wear safety shoes and use vacuum lifter preferentially for handling operations.
- All handling operations will require at least two people (unpacking, lifting, installation in rack system).
- Before and after the installation, if the UPS remains de-energized for a long period, the UPS must be energized for a period of 24 hours, at least once every 6 months (for a normal storage temperature less than 25°C). This charges the battery, thus avoiding possible irreversible damage.
- During the replacement of the Battery Module, it is imperative to use the same type and number of element as the original Battery Module provided with the UPS to maintain an identical level of performance and safety. If there are any questions, don't hesitate to contact your local EATON representative.
- All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the UPS.
- For potential safety issue on defective UPS : DISCONNECT INTERNAL BATTERY for storage and transportation.

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Chapter 1 Introduction

1.1 Overview

1.2 Environmental Protection

EATON has implemented an environmental-protection policy.

Products are developed according to an eco-design approach.

Substances

This product does not contain CFCs, HCFCs, or asbestos.

Packing

To improve waste treatment and facilitate recycling, separate the various packing components.

- The cardboard we use comprises over 50% of recycled cardboard.
- Sacks and bags are made of polyethylene.
- Packing materials are recyclable and bear the appropriate identification symbol 

Table 1. Packing Material Symbols

Materials	Abbreviations	Number in the symbols
Polyethylene terephthalat	PET	01
High-density polyethylene	HDPE	02
Polyvinyl chloride	PVC	03
Low-density polyethylene	LDPE	04
Polypropylene	PP	05
Polystyrene	PS	06

Follow all local regulations for the disposal of packing materials.

End of Life

Eaton will process products at the end of their service life in compliance with local regulations. Eaton works with companies in charge of collecting and eliminating our products at the end of their service life.

Product

The product is made up of recyclable materials.

Dismantling and destruction must take place in compliance with all local regulations concerning waste. At the end of its service life, the product must be transported to a processing center for electrical and electronic waste.

Battery

The product contains lithium-ion (LFP) batteries that must be processed according to applicable local regulations concerning batteries.

The battery may be removed to comply with regulations and in view of correct disposal.

The Eaton® 9PX uninterruptible power system (UPS) protects your sensitive electronic equipment from the most common power problems, including power failures, power sags, power surges, brownouts, line noise, high voltage spikes, frequency variations, switching transients, and harmonic distortion.

Power outages can occur when you least expect it and power quality can be erratic. These power problems have the potential to corrupt critical data, destroy unsaved work sessions, and damage hardware causing hours of lost productivity and expensive repairs.

With the Eaton 9PX, you can safely eliminate the effects of power disturbances and guard the integrity of your equipment. Providing outstanding performance and reliability, the Eaton 9PX's unique benefits include:

- True online double-conversion technology with high power density, utility frequency independence, and generator compatibility.
- Constant mode battery charger with a integrated battery management system (BMS) for temperature regulation and life cycle monitoring.
- Selectable High Efficiency mode of operation.
- Standard communication options: one RS-232 communication port, one USB communication port, and relay output contacts.
- Optional connectivity cards with enhanced communication capabilities.
- Extended runtime with up to four Extended Battery Modules (EBMs) per UPS.
- Remote On/Off control through Remote On/Off (ROO) and Remote Power Off (RPO) ports.
- Backed by worldwide agency approvals.

Chapter 2 Presentation

2.1 Standard Installations

Figure 1. Tower Installation

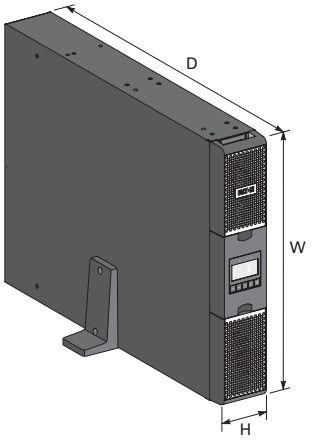


Figure 2. Rack Installation

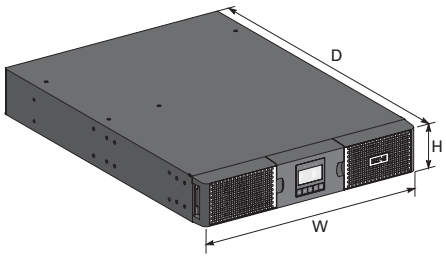
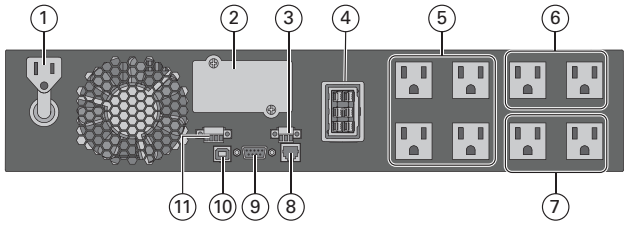


Table 2. Weights and Dimensions

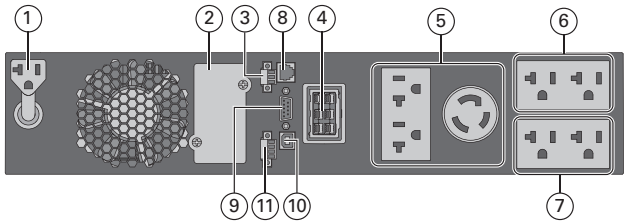
Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

2.2 Rear Panels

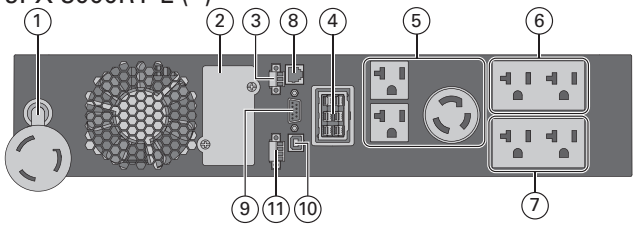
9PX 1500RT-L



9PX 2000RT-L



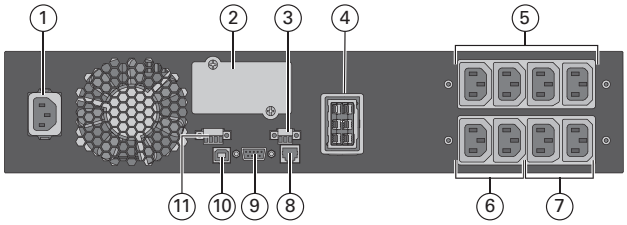
9PX 3000RT-L (*)



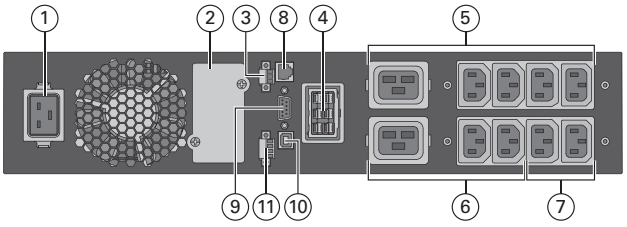
① Socket for connection to AC power source
② Slot for optional communication card
③ Relay output contact
④ Connector for additional battery module
⑤ Primary group: outlets for connection of critical equipment
⑥ Group 1: programmable outlets for connection of equipment
⑦ Group 2: programmable outlets for connection of equipment
⑧ Connector for automatic recognition of an additional battery module
⑨ RS232 communication port
⑩ USB communication port
⑪ Connector for ROO (Remote On/Off) control and RPO (Remote Power Off)

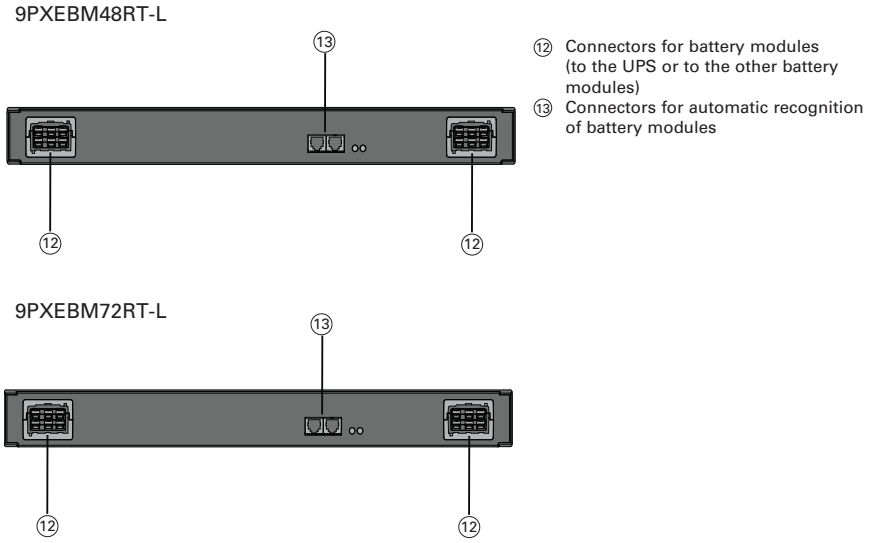
(*) Primary and Grouped outlets (⑤, ⑥, ⑦) are protected by 20A circuit breakers.

9PX 1500GRT-L



9PX 2000GRT-L & 9PX 3000GRT-L





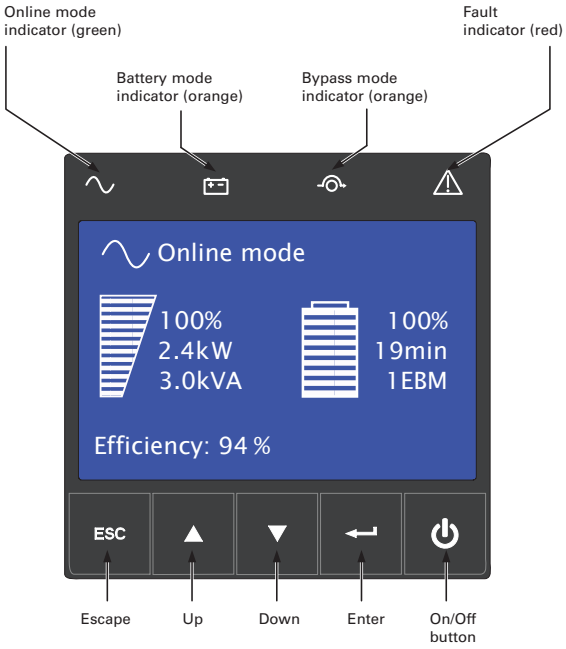
2.3 Accessories

Table 3. UPS Accessories

Part number	Description
9PXEBM48RT-L 9PXEBM72RT-L	Extended Battery Module
9RK	Rack Kit 9PX
Network-M2 / Network-M3	Network Card
INDGW-M2	Industrial Gateway Card (Modbus TCP / RTU)
Relay-MS	Relay Card

2.4 Control Panel

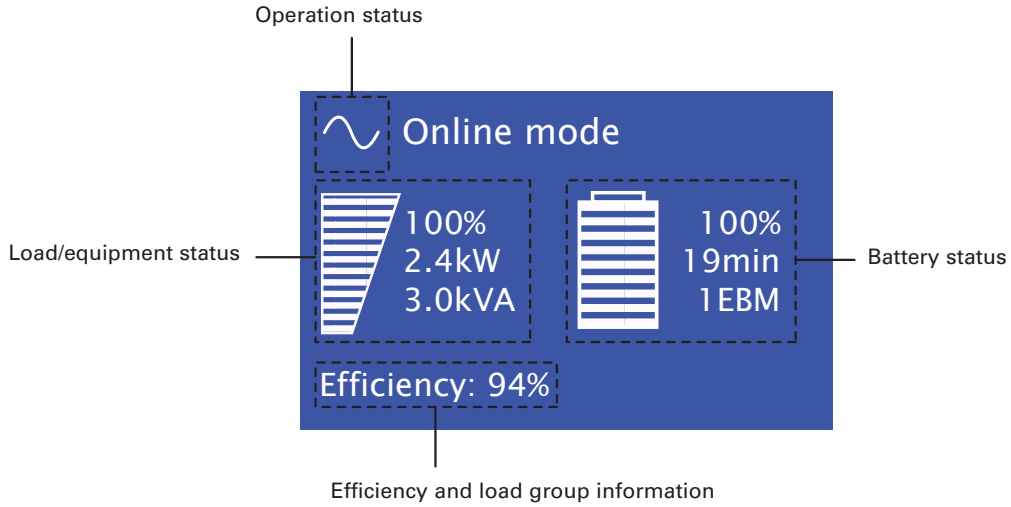
The UPS has a five-button graphical LCD. It provides useful information about the UPS itself, load status, events, measurements and settings.



Indicator	Status	Description
Green	On	The UPS is operating normally on Online or on High Efficiency mode.
Orange	On	The UPS is on Battery mode.
Orange	On	The UPS is on Bypass mode.
Red	On	The UPS has an active alarm or fault.

2.5 LCD Description

Figure 3. LCD Description



The following table describes the status information provided by the UPS

Note: If other indicator appears, see the troubleshooting for additional information.

Table 4. LCD Operating Status

Operation status	Cause	Description
Standby mode 	The UPS is Off, waiting for startup command from user.	Equipment is not powered until ⏻ button is pressed.
Online mode 	The UPS is operating normally.	The UPS is powering and protecting the equipment.
Battery mode 	A utility failure has occured and the UPS is on Battery mode.	The UPS is powering the equipment with the battery power. Prepare your equipment for shutdown.
End of backup time 	The UPS is on Battery mode and the battery is running low.	Low Battery Warning settings: [Capacity] [0%] ... [100%] [Runtime] [0mn] ... [60mn] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.

Table 4. LCD Operating Status (Continued)

Operation status	Cause	Description
High Efficiency mode 	The UPS is operating on High Efficiency mode.	The UPS is powering and protecting the equipment
Bypass mode 	An overload or a fault has occurred, or a command has been received, and the UPS is in Bypass mode.	Equipment is powered but not protected by the UPS.

2.6 Display Functions

Press the (⏎) button to activate the menu options. use the two middle buttons (▲and ▼) to scroll through the menu structure. Press the (⏎) button to select an option. Press the ESC button to cancel or return to the previous menu.

Table 5. Display Functions

Main menu	Submenu	Display information or Menu function
Measurements		[Load] W VA A pf / [Input/Output] V Hz / [Efficiency] % / [Battery] % min V n° EBM / [Battery remaining life] months / [Average power usage] Wh / [Cumulated power] Wh / BMS Information
Control	Go to Bypass	Transfers the UPS on Bypass mode
	Load segments On/Off	Commands the load segments
	Start battery test	Starts a manual battery test
	Connectivity test	Tests dry contact relay outputs and relay card contacts. Simulates line failure and battery low
	Function reset	Clears active fault, power usage, battery remaining life, reset NMC, Restore factory settings.
Settings	Local settings	Sets product general parameters
	In/out settings	Sets Input and Output parameters
	On/Off settings	Sets On/Off conditions
	Battery settings	Sets battery configuration
	Com settings	Sets communication parameters
Event Log	Event filter	Selects faults, alarms and/or events to display
	Event list	Displays the events stored
	Reset fault list	Clears events

Table 5. Display Functions (Continued)

Main menu	Submenu	Display information or Menu function
Fault log	Fault list	Displays the faults stored
	Reset fault list	Clears faults
Identification		[Product type/model] / [Part/Serial number] / [UPS/NMC firmware] / [Com card IPv4], [Com card IPv6], [Com card MAC]
Registration		Links to Eaton registration website

2.7 User Settings

The following table displays the options that can be changed by the user.

Table 6. User Settings

	Submenu	Available Settings	Default settings
Local Settings	Language	[English] [Français] [Deutsch] [Español] [Русский] [Português] [Italiano] [Simplified Chinese] [Japanese] Menus, status, notices and alarms, UPS fault, Event Log data and settings are in all supported languages.	[English] User selectable when UPS is powered for the first time.
	Date/ time	Format: [International] [US]	[US]
	LCD	Modify LCD screen brightness and contrast to be adapted to room light conditions.	
	Audible alarm	Mode: [Enabled] [Disabled on battery] [Always disabled] Enable or disable the buzzer if an alarm occurs. Level: [High] [Low]	[Enabled] [High]
	Protected access	[Enabled] [Disabled] Password is: 0577	[Disabled]
In/Out settings	Output voltage	100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V]	[120V] [208V]
	Output frequency	Mode: [Normal] [Converter] [Marine] Frequency can be changed in Frequency [Converter] mode In [Marine] mode output frequency follows input frequency	[Normal]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
	Output mode	Mode: [Industrial] [IT] [Custom] Overload: [Inv>Stop] [Inv>BP] [Inv>BP>Inv] Short-circuit: [Inv>Stop] [Inv>BP] [Inv>BP>Inv]	[IT] [Inv>BP>Inv] [Inv>Stop]
	Input volt hysteresis	Sets input voltage hysteresis from [1] to |10V]	[10V]
	High Efficiency mode	[Enabled] [Disabled] Power the output from Bypass for high efficiency	[Disabled]
	Bypass settings	[Volt low] [Volt high] [Qualify] [Hz synch] [Unsynch]	[80V] LV; [160V] HV; [144V] LV; [276V] HV; [In spec]; [5%]; [Half cycle]
	Load segments	[Auto start delay] [Auto shutdown delay]	UPS: [0s]; Group1: [3s]; Group2: [6s] UPS: [Disabled]; Group1: [Disabled]; Group2: [Disabled]
	Overload prealarm	[10%] … [102%] Load % when overload alarm occurs	[102%]
On/Off Settings	Start/Restart	[Cold start] [Auto restart] [Auto start] [Start on bypass]	[Cold start] [Auto restart] are Enabled [Auto start] [Start on bypass] are Disabled
	Forced reboot	[Enabled] [Disabled] [Timer] [10s] … [180s] When mains recover during a shutdown sequence: If set to Enabled, shutdown sequence will complete and wait 10 seconds prior to restart, If set to Disabled, shutdown sequence will not complete, UPS stays on.	[Enabled] [10s]
	Energy saving	[Enabled] [Disabled] [Timer] [1min] … [15min] [Level] [100W] … [1000W]	[Disabled] [5min] [100W]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		If Enabled, UPS will shut-down after defined duration. of back-up time, if load is less than set value.	
	Sleep mode	[Enabled] [Disabled] [Timer] [10min] … [120min] If Disabled, LCD and communication will turn OFF immediately after UPS is OFF. If Enabled, LCD and communication stays ON 1h30 min after UPS is OFF.	[Enabled] [90min]
	Site wiring fault	[Enabled] [Disabled] Prevents from starting the UPS in case of phase vs neutral wires swapping.	[Disabled]
	Power Off alert	[Enabled] [Disabled] If Enabled, activates a confirmation screen that requires user confirmation after pressing the power button, before the UPS shutdown occurs.	[Enabled]
Battery settings	Low battery warning	[Capacity] [0%] … [100%] [Runtime] [0min] … [60min] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.	[0%] [3min]
	Restart bat. level	[0%] ... [100%] If set, automatic restart will occur only when percentage of battery charge is reached.	[0%]
Com settings	Input signals	Sets Input signals parameters (function, delay, operation) through external contact connectors or RS232. ROO port: - [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	[No]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Closed]
		RPO port:	
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	No
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Open]
		DB9-4 port:	No
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [High] [Low]	[High]
	Output signals	[Relay] [DB9-1] [DB9-7] [DB9-8] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232	
		[Relay]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[Relay] [Bypass]
		[DB9-1]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-1] [Low bat]
		[DB9-7]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-7] [UPS OK]
		[DB9-8]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-8] [On bat]
Com settings (cont)	Remote command	[Enabled] [Disabled] If Enabled, shutdown or restart	[Enabled]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		commands from software are authorized.	
	Shutdown commands	[Send CMD] [Output OFF] [OFF delay] [restart] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232 port	
		[Send CMD]: [Yes] [No]	Send CMD: [No]
		[Output OFF]: [No] [UPS] [Group 1]	Output OFF: [No]
		[Group 2] [Group 1 + Group 2]	
		[OFF delay]: [0s] …[999s]	OFF delay: [0s]
		[Restart]: [Yes] [No]	Restart: [Yes]
	On battery notice delay	Sets delay before noticing on battery information to software.	[0s]
	General alarm	[On battery] [Battery fault]	[Internal fault]
		[Overload pre-alarm] [Internal fault]	
		[Ambient temp.] [Fan lock]	
		[Bypass overload] [Current limit]	
		[Short circuit] [Inverter overload]	
		[Power overload] [Low battery]	
		[On bypass] [UPS OK] [Load protected]	
		[Load powered] [Ext. charger ON]	
		Defines which event or fault generate	
		a general alarm through Output signal screen.	

Chapter 3 Installation

3.1 Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping cartons and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage:

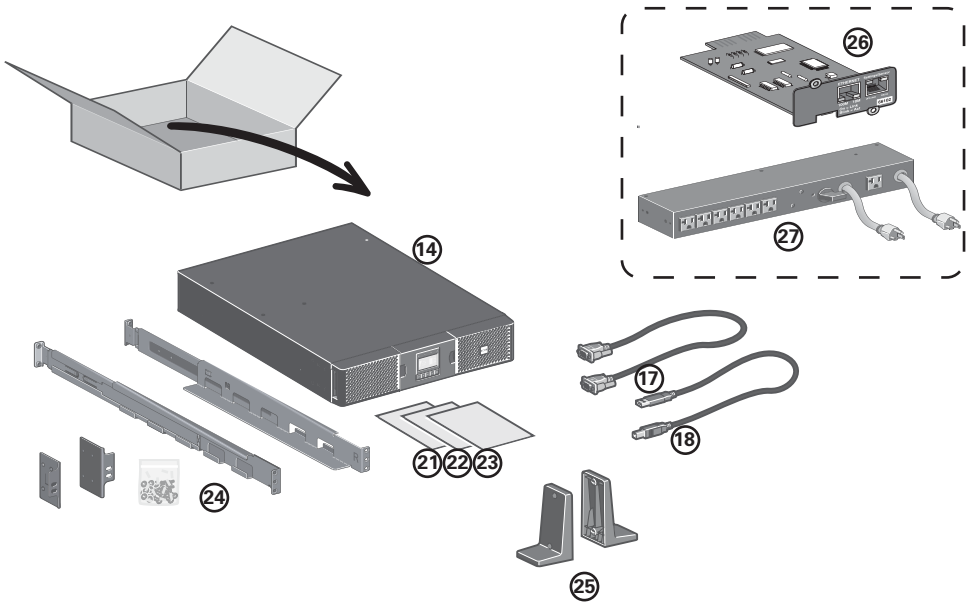
1. File with the carrier within 15 days of receipt of the equipment;
2. Send a copy of the damage claim within 15 days to your service representative.

⚠ IMPORTANT

Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use the UPS. Contact your service representative.

3.2 Checking the Accessory Kit

Figure 4. 9PX1500RT-L / 9PX2000RT-L / 9PX3000RT-L



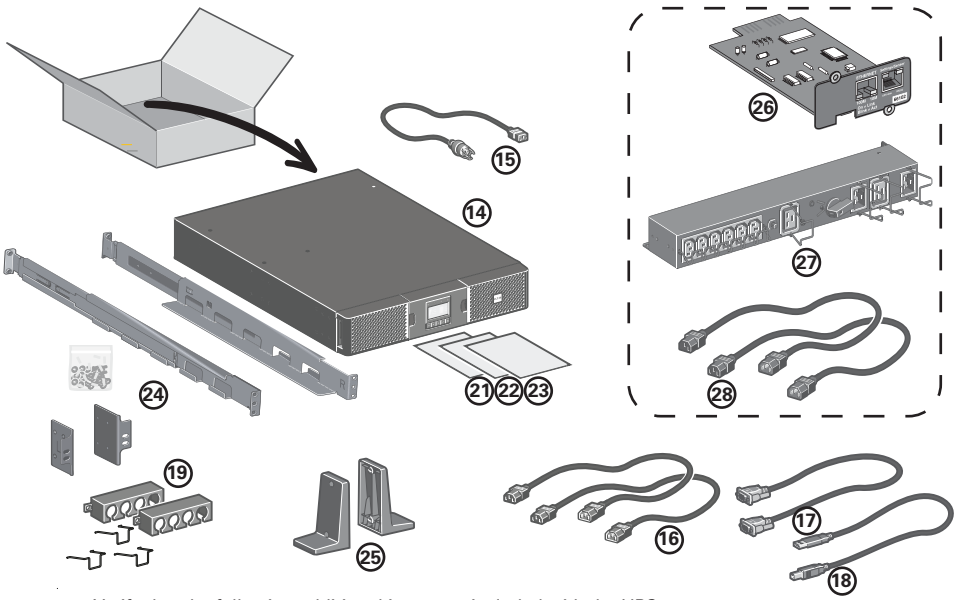
Verify that the following additional items are included with the UPS:

⑭ 9PX UPS
⑰ RS232 communication cable
⑱ USB communication cable
㉑ Software leaflet
㉒ Safety instructions
㉓ Quick start
㉔ Mounting kit for 19-inch enclosures
㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card (optional, standard on Network Bundle models)
㉗ MBP-115 module for 9PX 1500RT (optional)
MBP-120 module for 9PX 2000RT (optional)
MBP-130 module for 9PX 3000RT(optional)

Figure 5. 9PX1500GRT-L / 9PX2200GRT-L / 9PX3000GRT-L



Verify that the following additional items are included with the UPS:

⑭ 9PX UPS

⑮ Connection cable to AC-power source

⑯ 2 connection cables for the protected equipment

⑰ RS232 communication cable

⑱ USB communication cable

⑲ 3 cable locking systems

㉑ Software leaflet

㉒ Safety instructions

㉓ Quick start

㉔ Mounting kit for 19-inch enclosures

㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card(optional,standard on Network Bundle options

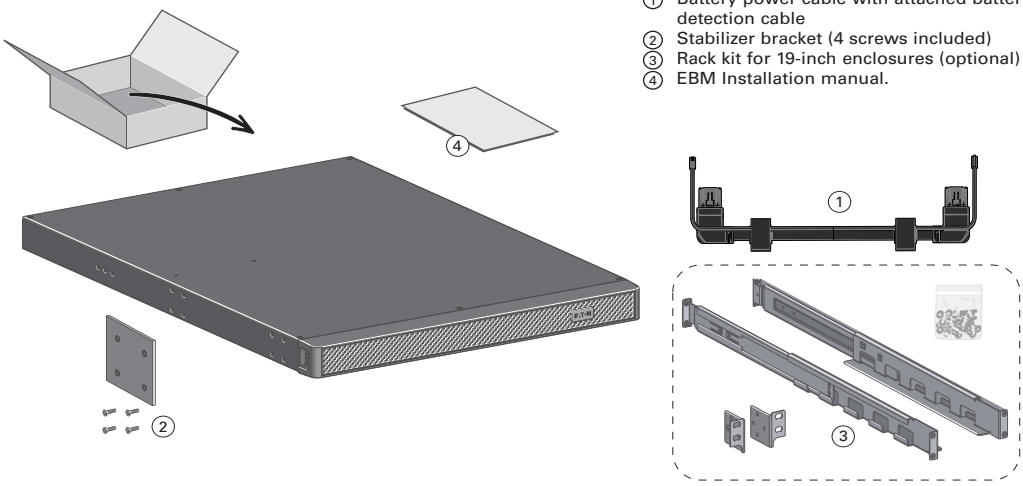
㉗ HotSwap MBP module (optional)

㉘ Connection cables between Hotswap MBP module and UPS

Figure 6. 9PXEBM48RT-L / 9PXEBM72RT-L

- If you ordered an optional Extended Battery Module (EBM), verify that the following additional items are included with the EBM:

① Battery power cable with attached battery detection cable
② Stabilizer bracket (4 screws included)
③ Rack kit for 19-inch enclosures (optional)
④ EBM Installation manual.



NOTE 1 Discard the EBM user's guide if you are installing the EBM with a new UPS at the same time.

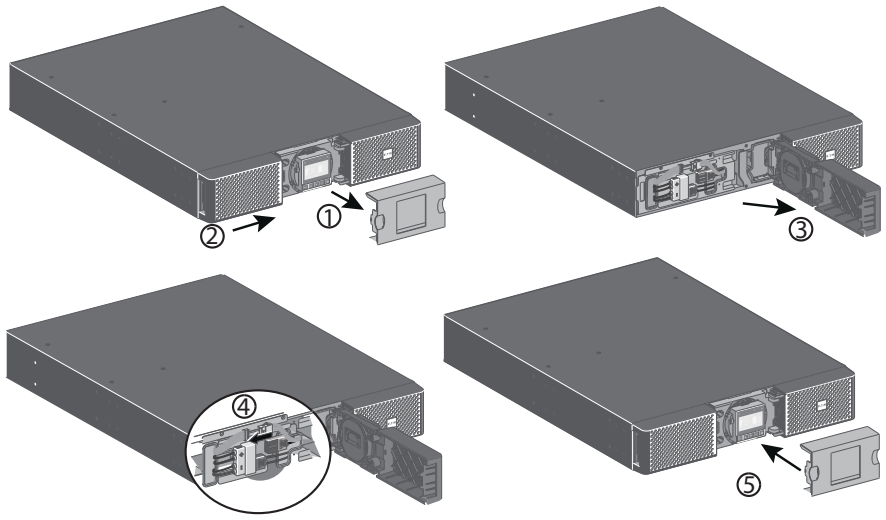
NOTE 2 Use the UPS user's guide to install both the UPS and the EBM.

Remember If you ordered other UPS accessories, refer to specific user manuals to check the packing contents.

3.3 Connecting the Internal Battery

NOTE Do not connect the UPS to the utility until installation is complete.

Figure 7. Internal Battery Connection



To connect to the UPS:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the left side of the front panel.

NOTE A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.

⚠CAUTION

A small amount of arcing may occur when connecting the internal batteries. This is normal and will not harm personnel. Connect the cables quickly and firmly.

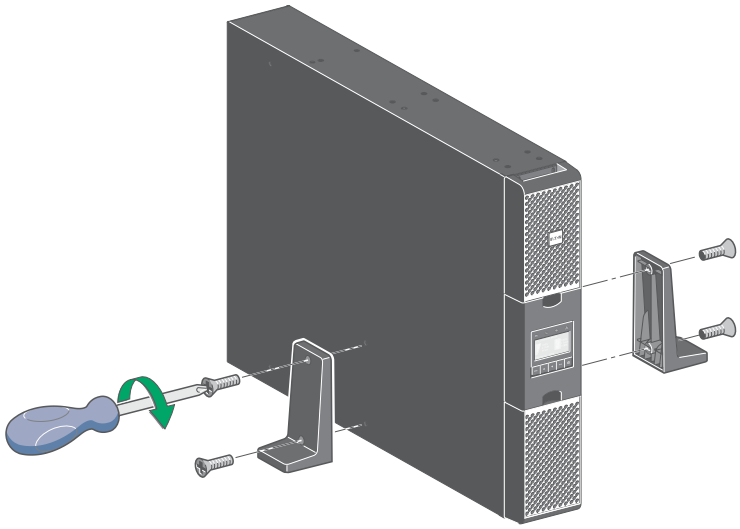
4. Connect the two battery connectors together.
5. Put back the front panel, then clip the center cover.

3.4 Tower Installation

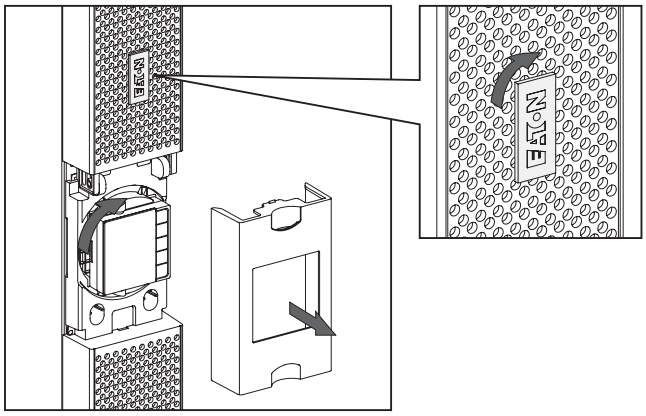
Tip If you ordered other UPS accessories, refer to specific user manuals to check the tower installation with the UPS.

To install the cabinet:

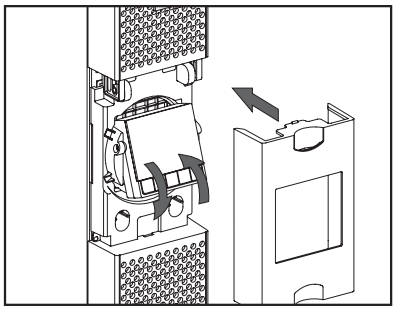
1. Place the UPS on a flat, stable surface in its final location.
2. Always keep 6" or 150 mm of free space behind the UPS rear panel for ventilation.
3. If installing additional cabinets, place them next to the UPS in their final location.



- Adjustment of the orientation of the LCD panel and of the logo.



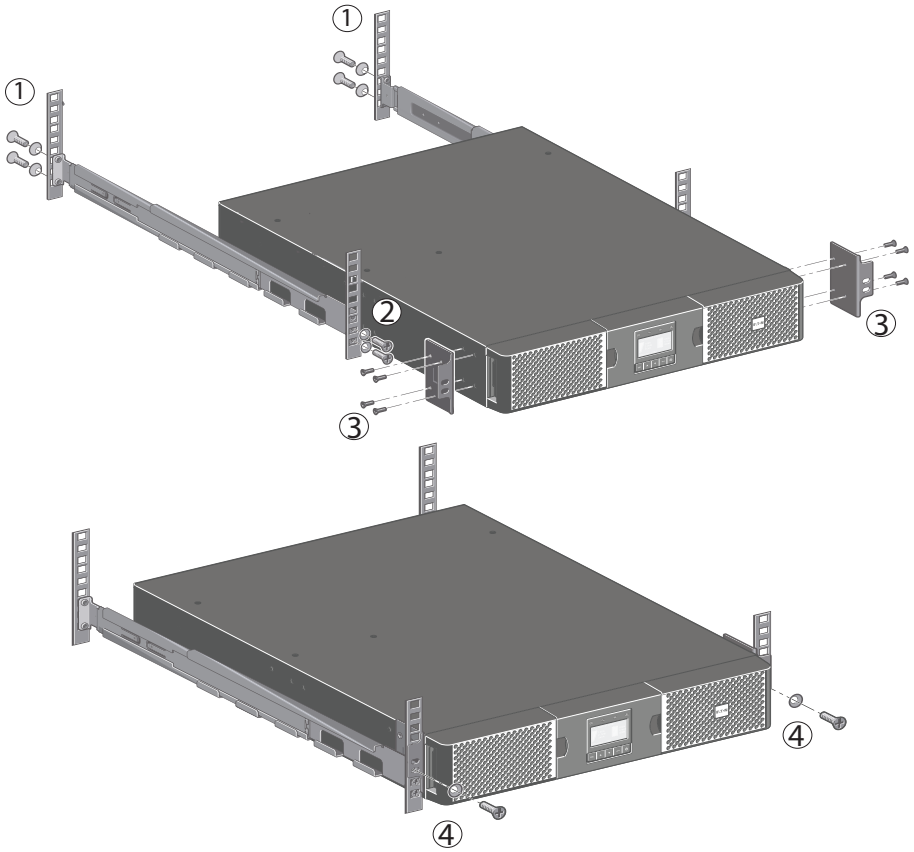
- Adjustment of the angle of vision of the LCD panel.



3.5 Rack Installation

- Rack mounting of UPS, EBM, and accessory modules.

Follow steps 1 to 4 for module mounting on the rails.



The rails and necessary hardware are supplied by EATON.

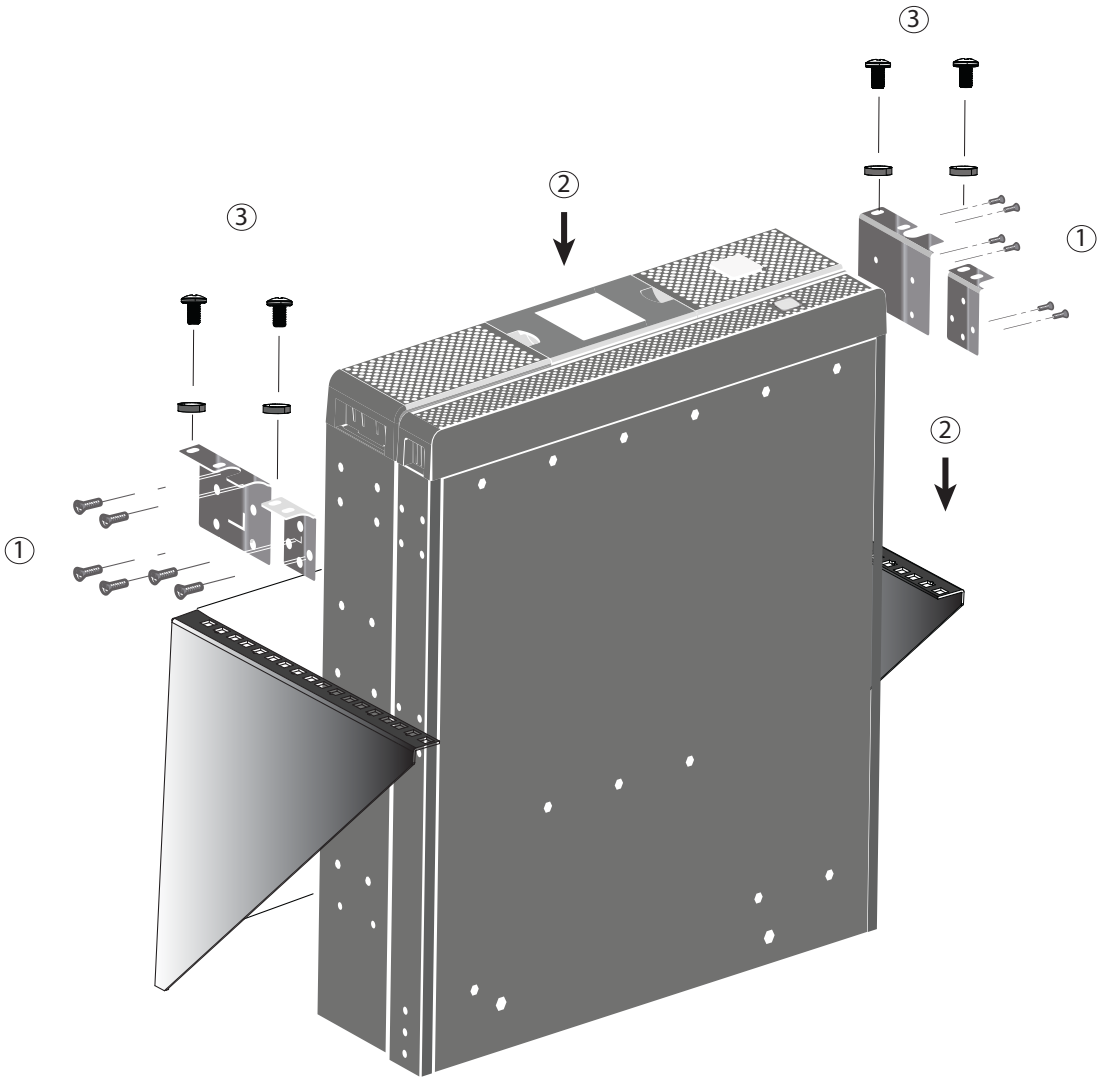
3.6 Vertical Installation

NOTE 1 This vertical installation is available only for UL/cTUVus.

NOTE 2 Suitable for mounting on concrete or other noncombustible surfaces only.

- The UPS, EBM, and accessory modules can be installed vertically in a rack or on a wall.

Follow steps 1 to 3 for module mounting on the rails.



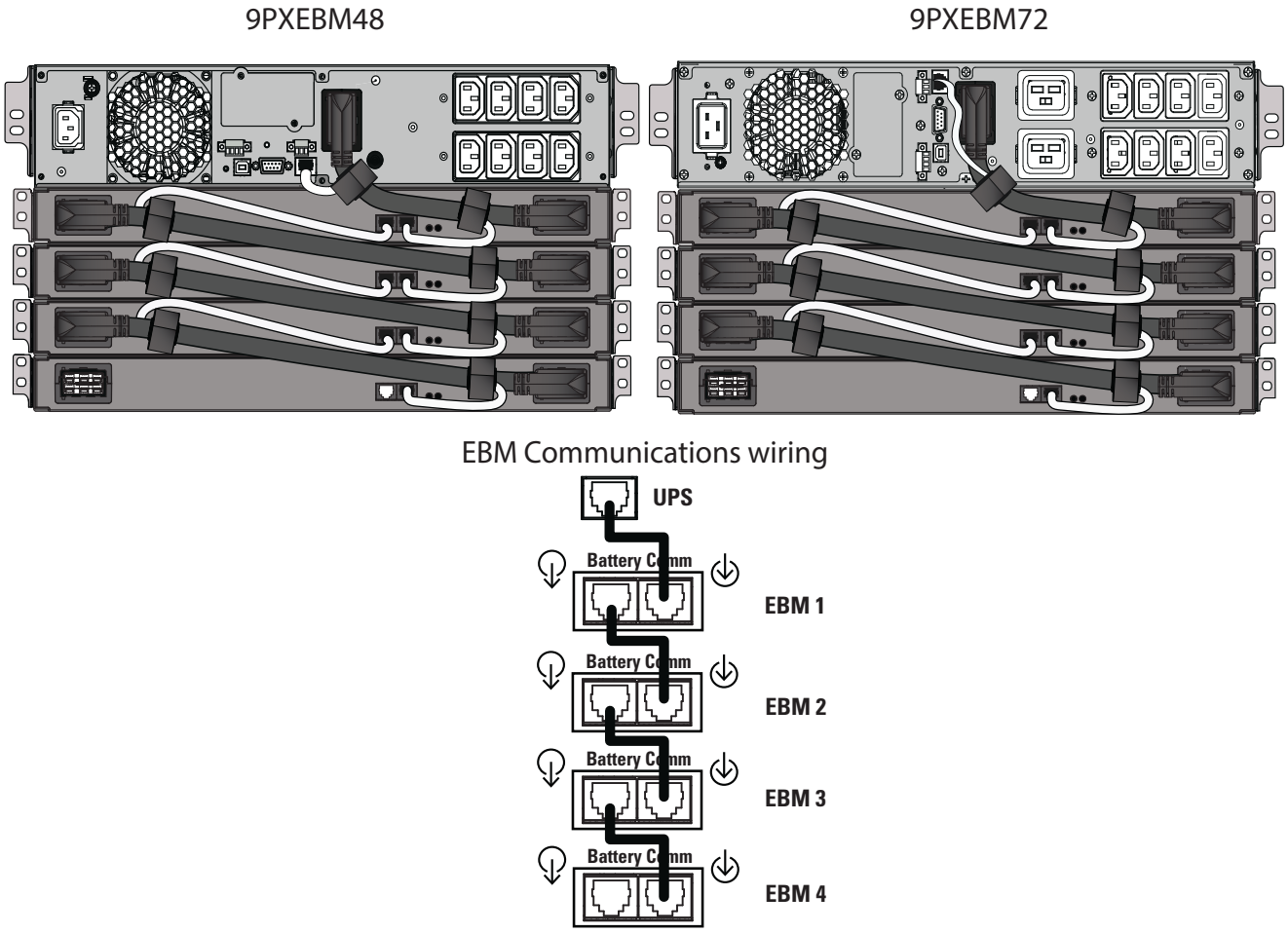
3.7 Connecting the EBM(s)

⚠CAUTION

A small amount of arching may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.

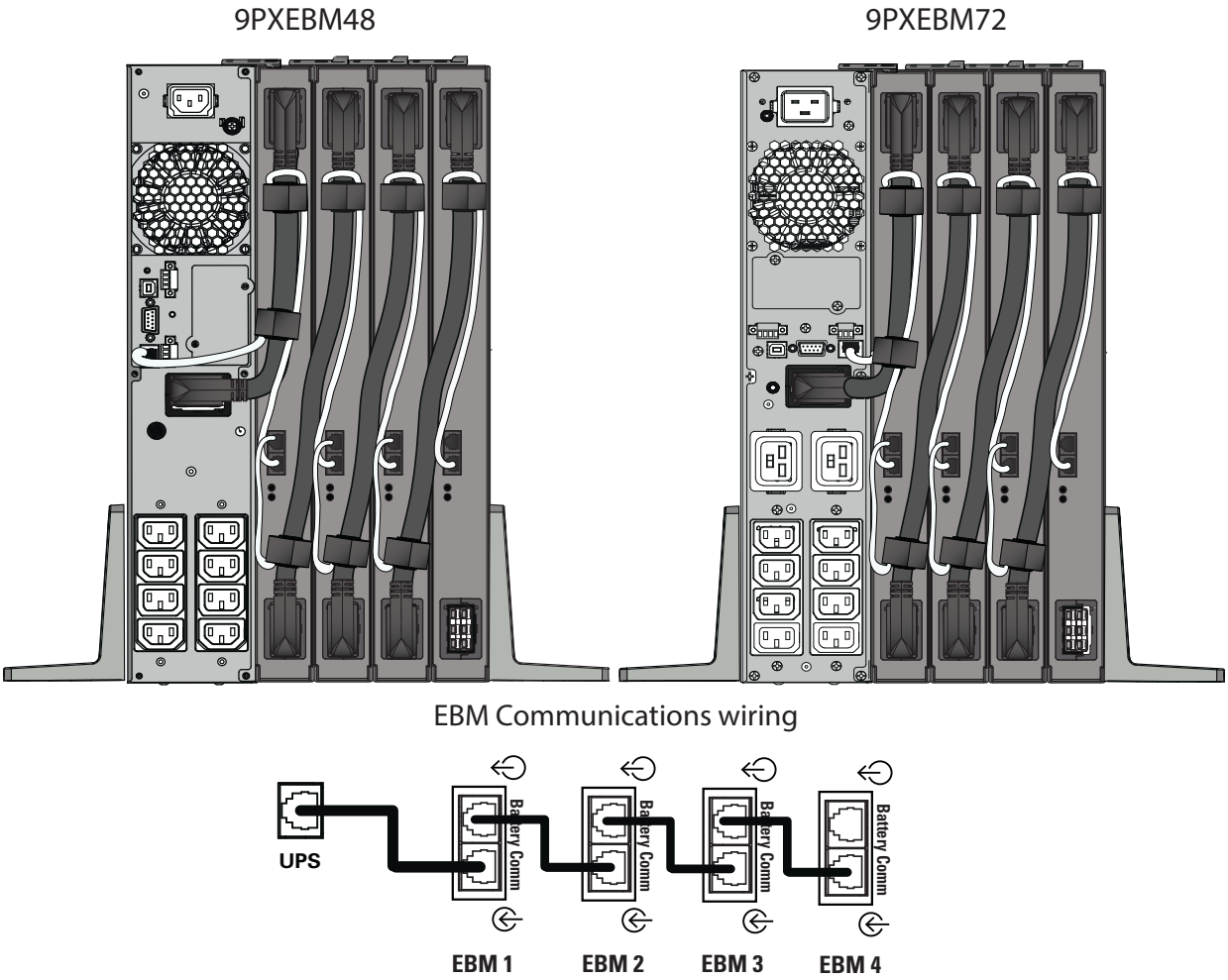
1. Plug the EBM power cable(s) into the battery connector(s). Up to 4 EBMs may be connected to the UPS.
2. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
3. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).

Figure 8. 9PXEBM Rack Mount Connections



NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

Figure 9. 9PXEBM Tower Mount Connections



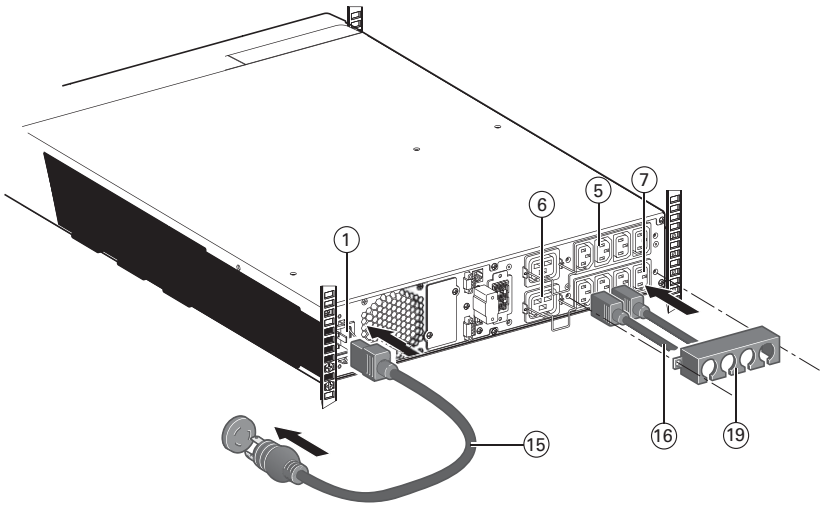
NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

3.8 Detecting other Accessories

Tip If you ordered other UPS accessories, refer to specific user manuals to check the connection to the UPS.

3.9 UPS Connection without Hotswap MBP Module

Check that the indications on the name plate located on the back of the UPS correspond to the AC-power source and the true electrical consumption of the total load.

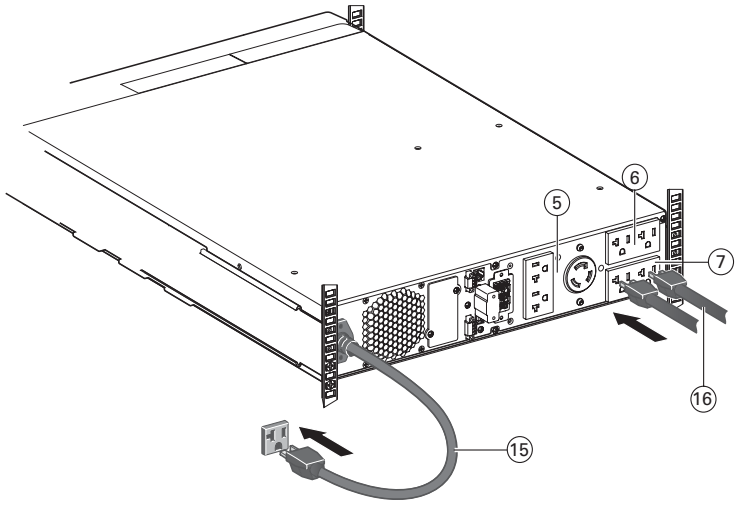


1. 9PX 2000RT-L / 3000RT-L connect the UPS input socket ① to the AC-power source.
   9PX 2200GRT-L / 3000GRT-L / 3000GLRT-L: connect the supplied cable ⑮ (250 V - 16 A) to the socket ①, then to the AC-power source.

2. Connect the loads to the UPS using the cables ⑯.
   It is preferable to connect the priority loads to the outlets marked ⑤ and the non-priority loads to the outlets marked ⑥ ⑦ that can be programmed.
   Connect any high-power devices to the 16 A outlet.

To program shutdown of outlets ⑥ ⑦ during operation on battery power and thus optimise the available backup time, please check the in/out settings.

3. For G models, fit the cable locking system ⑲ that prevents the plugs from being pulled out accidentally.

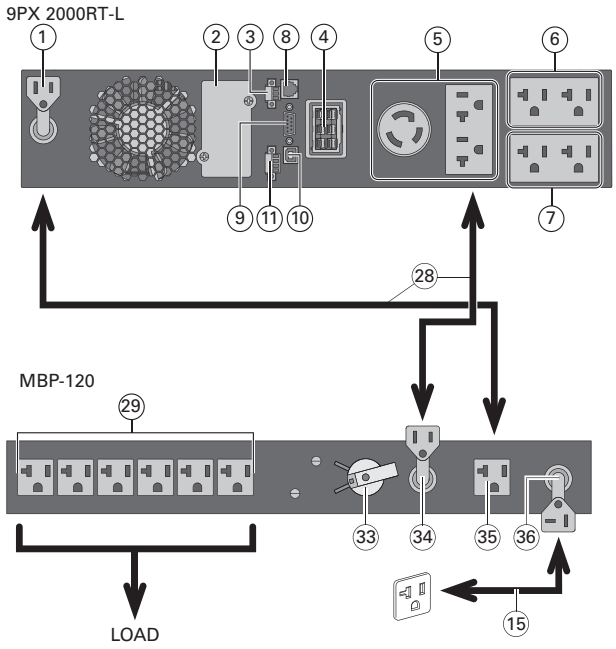


Note. The UPS charges the battery as soon as it is connected to the AC-power source, even if ⏻ button is not pressed

Once the UPS is connected to the AC-power source, eight hours of charging are required before the battery can supply the rated backup time.

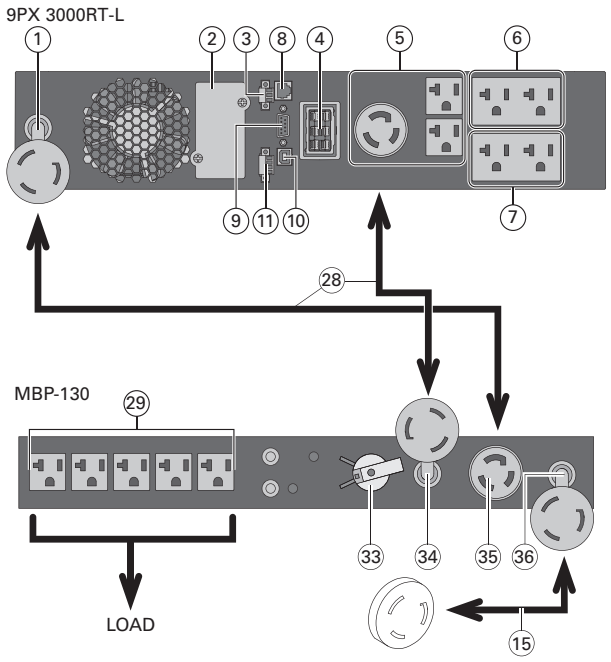
3.10 Connection with a Hotswap MBP Module (Optional Accessory)

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads.



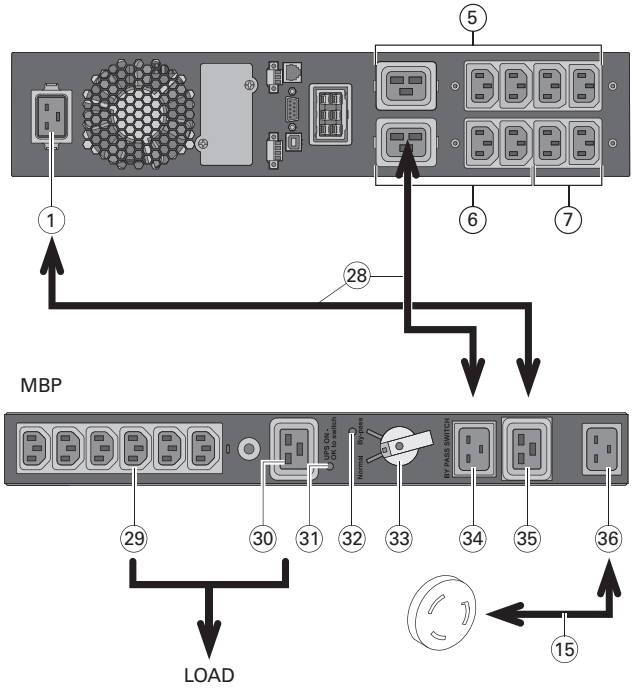
1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the “UPS Input socket” ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the “UPS Output” ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.



* 9PX 1500RT-L: To connect to MBP-115, follow the same procedure as for the 9PX 2000RT / 9PX 3000RT.

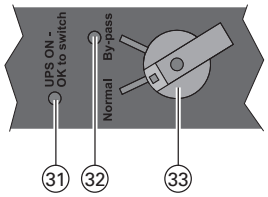
9PX 2200GRT-L & 9PX 3000GRT-L



1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the "UPS Input socket" ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the "UPS Output" ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.

HotSwap MBP module operation



The HotSwap MBP module has a rotary switch ㉝ with two positions:

Normal	the load is supplied by the UPS, LED ㉛ is on.
Bypass	the load is supplied directly by the AC-power source. LED ㉜ is on.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch ㉝ to Normal position.
3. Start the UPS by pressing the ON/OFF button ⏻ on the UPS control panel.

The load is supplied by the UPS.
LED ㉛ "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

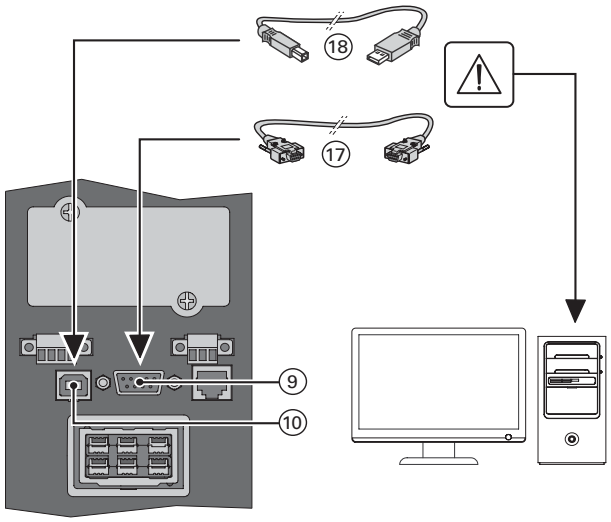
HotSwap MBP module test

1. Set switch ㉝ to Bypass position and check that the load is still supplied.
2. Set switch ㉝ back to Normal position.

Chapter 4 Communication

4.1 Communication Ports

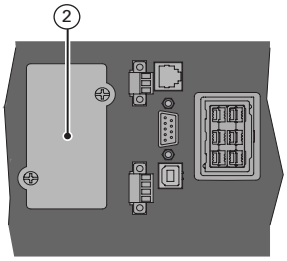
The RS232 and USB communication ports cannot operate simultaneously.



1. Connect the RS232 ⑰ or USB ⑱ communication cable to the serial or USB port on the computer equipment.
2. Connect the other end of the communication cable ⑰ or ⑱ to the USB ⑩ or RS232 ⑨ communication port on the UPS.

The UPS can now communicate with EATON power management software.

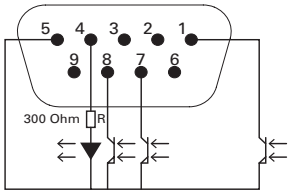
Installation of the communication cards



It is not necessary to shutdown the UPS before installing a communication card.

1. Remove the slot cover ② secured by screws.
2. Insert the communication card in the slot.
3. Secure the card cover with the 2 screws.

Characteristics of the contact RS232 communication port



Pin	Signal	Direction	Function
1	Bat Low	Output	Low Battery Output
2	TxD	Output	Transmit to external device
3	RxD	Input	Receive from external device
4	I/P SIG	Input	-
5	GNDS	-	Signal Common tied to chassis
6	PNP	Input	Plug and Play
7	UPS ON	Output	UPS ON
8	BAT Mode	Output	-
9	+5V	Output	Power supply for external signals or options

Contact characteristics (optocoupler)

- Voltage: 48 V DC max
- Current: 25 mA max

4.2 UPS Remote Control Functions

Programmable Signal Inputs

The 9PX incorporates 3 programmable signal inputs: one Remote Power Off (RPO) input terminal, one Remote On/Off (ROO) input terminal, one RS-232 input (pin-4). Signal inputs can be configured see Settings > Com settings > Signal Input in to have one of the following functions:

Function	Description
No	No function, please choose a function if you want to use input signal
RPO	Remote Power Off (RPO) is used to shutdown the UPS remotely
ROO	Remote On/Off allows remote action of button to switch On/Off the UPS. (Cold start is prohibited while using the ROO function)
Forced bypass	If feeding the load the unit goes to bypass operation and stays there regardless of the bypass state until the input is inactivated
Building alarm	Active input generates an alarm "building alarm"
On generator	Active input disables synchronization and transfers to bypass
Remote shutdown	Active input turns UPS output (or outlet groups) off after a user defined shutdown delay but keeps on charging batteries according to a selected charging scheme, inactive input does not abort shutdown countdown. Depending on the "Restart" parameter (see Settings > Com Settings > Shutdown commands on page 16) the unit may startup automatically.

IMPORTANT

Warning Signal inputs have no function by default please choose a function through the LCD **(Settings > Com settings > Input signals).**

See below 2 examples of configuration with RPO terminal used as RPO function and ROO terminal use as ROO function:

Remote Power Off (RPO)

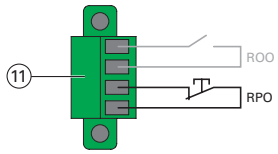
RPO is used to shutdown the UPS remotely when the contact is open. This feature can be used for shutting down the load and the UPS by thermal relay, for instance in the event of room over temperature. When RPO is activated, the UPS shuts down the output and all its power converters immediately. The UPS remains on to alarm the fault. The RPO circuit is an IEC 60950 safety extra low voltage (SELV) circuit. This circuit must be separated from any hazardous voltage circuits by reinforced insulation.

- The RPO must not be connected to any utility connected circuits. Reinforced insulation to the utility is required. The RPO switch must be a dedicated latching-type switch not tied into any other circuit. The RPO signal must remain active for at least 250 ms for proper operation.
- To ensure the UPS stops supplying power to the load during any mode of operation, the input power must be disconnected from the UPS when the Remote Power Off function is activated.

Leave the RPO connector installed in the RPO port on the UPS even if the RPO function is not needed.

RPO connections:

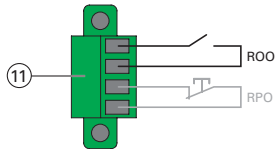
RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote On/Off (ROO)

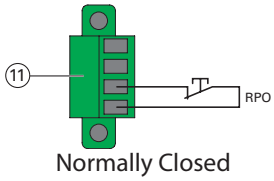
- Remote On/Off allows remote action of button to switch On/Off the UPS.
- When contact changes from open to closed, the UPS is switched-on (or stays On).
- When contact changes from closed to open, the UPS is switched-off (or stays Off).
- On/Off control via button has priority over the remote control.

RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote Control Connection and Test

1. Check the UPS is shut down and the electrical supply network disconnected.
2. Remove RPO connector from the UPS by unfitting the screws.
3. Connect a normally closed volt-free contact between the two pins of connector.

 Normally Closed	Contact open: shut down of UPS To return to normal operation, deactivate the external remote shut down contact and restart the UPS from the front panel.

4. Plug the RPO connector into the back of the UPS and fix the screws.
5. Connect and restart the UPS according to the previously described procedures.

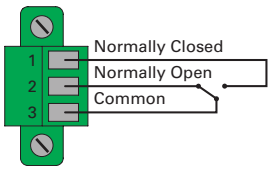
6. Activate the external remote shut down contact to test the function. Always test the RPO function before applying your critical load to avoid accidental load loss.

Programmable Signal Outputs

The 9PX incorporates 4 programmable signal outputs: one relay output, three optocouplers outputs (pin- 1/7/8). Signal outputs can be configured (see Settings > Com settings > Output Signals in to report the following information:

Signal	Default Assignment	Description
On battery (On bat)	DB9-Pin 8	UPS is in battery mode
Low battery (Low bat)	DB9-Pin 1	Battery is nearly empty
Battery fault (Bat fault)	-	Battery fault
Bypass	Relay output **(1)**	UPS is operating in Bypass mode
UPS OK	DB9-Pin 7	Load is powered (from inverter or bypass), with no alarm
Load powered	-	Load is powered (from inverter or bypass)
Load protected	-	UPS is on inverter, with no alarm and ready to go to battery
General alarm	-	• Choose events that will trigger this alarm trough the LCD • (Settings > Com settings > General alarm) for more information on possible events please look at page 16.
Ext charger ON	-	Control an optional external battery charger on and off.
OVL pre-alarm	-	Overload pre-alarm

(1) Relay output:



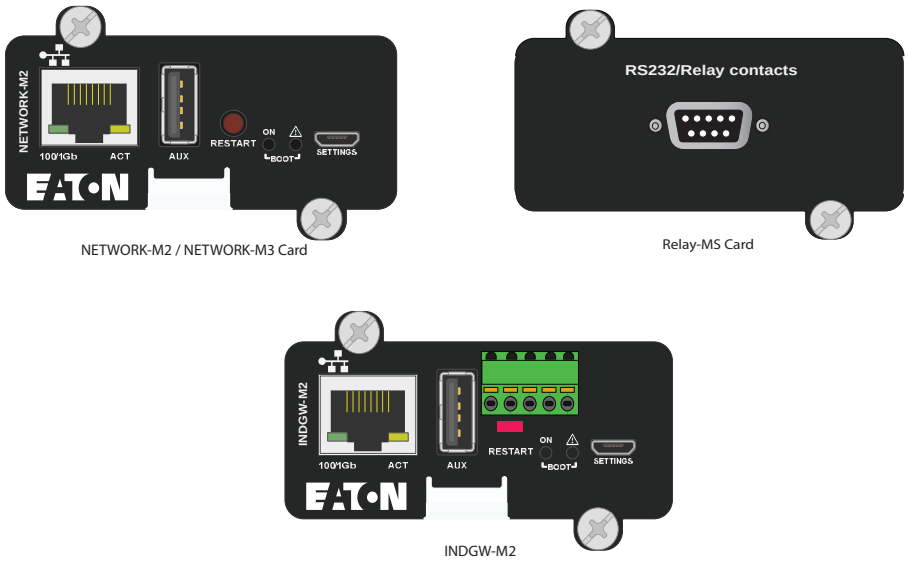
Connectivity Cards

Connectivity cards allow the UPS to communicate in a variety of networking environments and with different types of devices. The 9PX models have one available communication bay for the following connectivity cards:

- **Network-M2 card** — has SNMP and HTTP capabilities as well as monitoring through a Web browser interface; connects to a Gigabit Ethernet network. In addition, a Environmental Monitoring Probe can be attached to obtain humidity, temperature, smoke alarm, and security information.
- **INDGW-M2 card**- has SNMP and HTTP capabilities and a Modbus to facilitate remote monitoring of the UPS system through any Building Management System.

- **Relay-MS card**- has isolated dry contact (Form-C) relay outputs for UPS status: Utility failure, Battery low, UPS alarm/OK, or on Bypass.

Figure 10. Connectivity Card Options



NETWORK-M2 / NETWORK-M3 Card

Relay-MS Card

INDGW-M2

Eaton Intelligent Power Software suite

Eaton Intelligent Power Software suite is available from eaton.com/download. Eaton Software suite provides up-to-date graphics of UPS power and system data and power flow. It also gives you a complete record of critical power events, and it notifies you of important UPS or power information. If there is a power outage and the 9PX UPS battery power becomes low, Eaton Software suite can automatically shut down your computer system to protect your data before the UPS shutdown occurs.

Chapter 5 Operation

5.1 Start-up and Normal Operation

To start the UPS:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. Verify that the UPS power cord is plugged in.
4. The UPS front panel display illuminates and shows EATON logo.
5. Verify that the UPS status screen shows ⏻
6. Press the ⏻ button on the UPS front panel for at least 2 seconds.
7. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear. Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.
8. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode.

5.2 Starting the UPS on Battery

Before using this feature, the UPS must have been powered by utility power with output enabled at least once. Battery start can be disabled. See the "Cold start" setting in "ON/OFF Settings" in .

To start the UPS on battery:

1. Press the ⏻ button on the UPS front panel until the UPS front panel display illuminates and shows a status of "UPS starting...". The UPS transfers from Standby mode to Battery mode. The 🔋 indicator illuminates solid. The UPS supplies power to your equipment.
2. Check the UPS front panel display for active alarms or notices besides the "Battery mode" notice and notices that indicate missing utility power. Resolve any active alarms before continuing. See the "Troubleshooting" section . Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.

5.3 UPS Shutdown

To shut down the UPS:

1. Press the ⏻ button on the front panel for three seconds. A confirmation message will appear. When confirmed, the UPS starts to beep and shows a status of "UPS shutting OFF...". The UPS then transfers to Standby mode, and the ∿ indicator turns off.

5.4 Operating Modes

The Eaton 9PX front panel indicates the UPS status through the UPS indicators, see section 2.4 *Control Panel* .

Online Mode ∿

During Online mode, the ∿ indicator illuminates solid and the UPS is powered from the utility. The UPS monitors and charges the batteries as needed and provides filtered power protection to your equipment.

Optional High Efficiency and Energy Saving settings minimize heat contribution to the rack environment. See section 2.7 *User Settings* .

Battery Mode

When the UPS is operating during a power outage, the alarm beeps once every ten seconds and the indicator illuminates solid. The necessary energy is provided by the battery. When the utility power returns, the UPS transfers to Online mode operation while the battery recharges. If battery capacity becomes low while on Battery mode, the audible alarm beeps once every 3 seconds. This warning is approximate, and the actual time to shutdown may vary significantly. Shutdown all applications on the connected equipment because automatic UPS shutdown is imminent. When utility power is restored after the UPS shuts down, the UPS automatically restarts.

Low-Battery Warning

- The indicator illuminates solid.
- The audio alarm beeps every three seconds.

The remaining battery power is low. Shut down all applications on the connected equipment because automatic UPS shutdown is imminent.

End of battery backup time

- LCD displays "End of backup time".
- All the LEDs go OFF.
- The audio alarms stops.

Bypass Mode

In the event of a UPS overload or internal failure, the UPS transfers your equipment to utility power. Battery mode is not available and your equipment is not protected; however, the utility power continues to be passively filtered by the UPS. The indicator illuminates. Depending on overload conditions, the UPS remains in Bypass mode for at least 5 seconds and will stay in this mode if three transfers to Bypass occur within 20 minutes.

The UPS transfers to Bypass mode when:

- the user activates Bypass mode through the front panel.
- the UPS detects an internal failure.
- the UPS has an overtemperature condition.
- the UPS has an overload condition listed in Table 12 .

The UPS shuts down after a specified delay for overload conditions listed in Table 12 . The UPS remains on to alarm the fault.

5.5 Return of AC Power

Following an outage, the UPS restarts automatically when AC input power returns (unless the restart function has been disabled) and the load is supplied again.

5.6 Setting High Efficiency Mode

In High Efficiency mode, the UPS operates normally on Bypass and transfers to Online (or Battery) mode in less than 10 ms when utility fails. Transfers to High Efficiency mode will be active after 5 minutes of Bypass voltage monitoring: if Bypass quality is not in tolerance, then the UPS will remain in Online mode.

Eaton recommends to use the HE mode only to protect IT equipment.

To set the High Efficiency mode:

1. Select Settings, In/Out settings, and High Efficiency mode.
2. Select Enabled and Enter to confirm.
3. The UPS transfers to High Efficiency mode after 5 minutes.

5.7 Configuring Bypass Settings

The following settings are available for configuring Bypass operation.

Changing the settings changes UPS behavior and may result in decreased protection.

Bypass Voltage Low Limit

The default disables a transfer to Bypass if the measured bypass voltage level is below the nominal output voltage minus 20%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Bypass Voltage High Limit

The default disables a transfer to Bypass if the measured bypass voltage level is above the nominal output voltage plus 15%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Qualify Bypass

The default setting ("In spec") allows a transfer to Bypass only when Bypass is within the following specifications:

- Bypass voltage is between the "Bypass Voltage Low Limit" and "Bypass Voltage High Limit" settings
- Bypass frequency is within nominal frequency 5%.

You can prohibit Bypass ("Never") or always allow Bypass with no specification checking ("Always"). For "Always on UPS Fault," transfer to Bypass is always made on UPS fault; otherwise, operation proceeds as with the default setting.

Synchronization Window

The UPS tries to synchronize with Bypass when the Bypass frequency is less than the value set for the "Synchronization Window" setting. When the Bypass frequency is more than the set value, the UPS goes to nominal frequency.

Unsynchronized Transfers

When Qualify Bypass is set to "Always" or "Always on Fault" you can select the interruption time when transferring to bypass, default setting is "Half Cycle" but can be changed to "Full cycle".

5.8 Configuring Battery Settings

Low battery warning

During discharge, the low battery alarm is activated if the remaining runtime goes below 3 minutes or less than the setting capacity threshold (0 % by default). This threshold can be modified.

Restart battery level

This setting is used to define the battery restart level. The battery level must reach this threshold to enable UPS start.

5.9 Retrieving the Event Log

To retrieve the Event log through the display:

1. Press any button to activate the menu options, then select Event log.
2. Scroll through the listed events.

5.10 Retrieving the Fault Log

To retrieve the Fault log through the display:

1. Press any button to activate the menu options, then select Fault log.
2. Scroll through the listed faults.

Chapter 6 UPS Maintenance

6.1 Storing the Equipment

If you store the equipment for a long period, recharge the battery every 6 months by connecting the UPS to utility power. The internal batteries charge to 90% capacity in less than 3 hours. However, Eaton recommends that the batteries charge for 48 hours after long-term storage. Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use them. Contact your service representative.

6.2 Replacing Batteries

IMPORTANT

DO NOT DISCONNECT the batteries while the UPS is in Battery mode.

Batteries can be replaced easily without turning off the UPS or disconnecting the load. If you prefer to remove input power to change the batteries, see "UPS Shutdown".

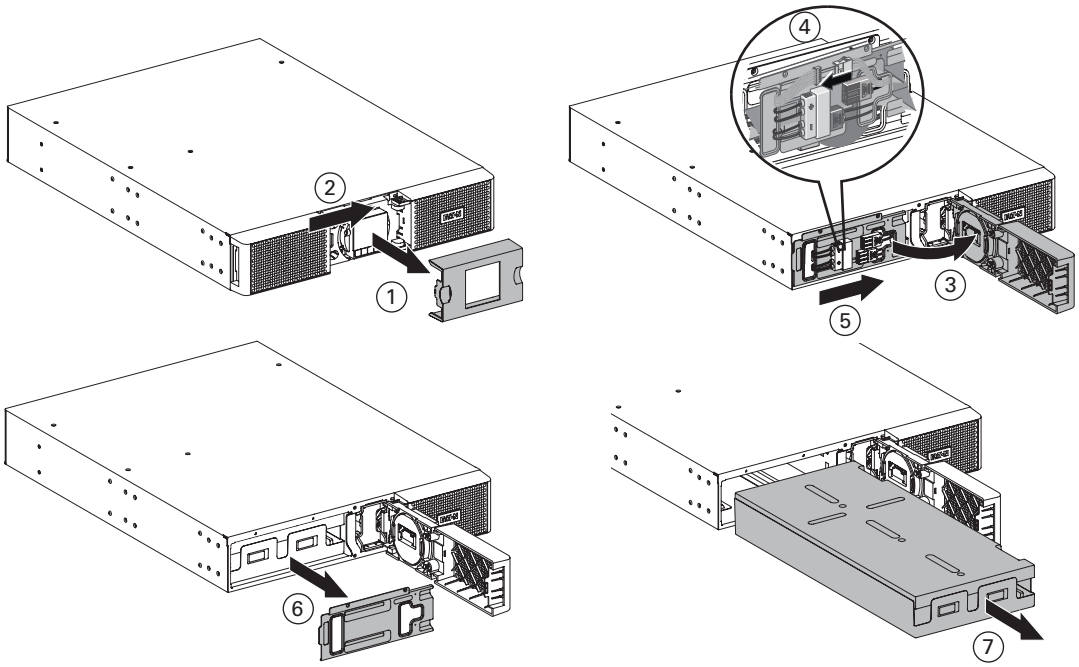
Consider all warnings, cautions, and notes before replacing batteries.

- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
- Batteries can present a risk of electrical shock or burn from high short circuit current. Observe the following precautions:
    1. Remove watches, rings, or other metal objects,
    2. Use tools with insulated handles,
    3. Do not lay tools or metal parts on top of batteries,
    4. Wear rubber gloves and boots.
- When replacing batteries, replace with the same type and number of batteries or battery packs. Contact your service representative to order new batteries.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire. Batteries may explode when exposed to flame.
- Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes and may be extremely toxic.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).
- ELECTRIC ENERGY HAZARD. Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.
- Disconnect charging source prior to connecting or disconnecting battery terminals.

Replacing the internal battery

The internal battery is heavy. Use caution when handling the heavy batteries.

Figure 11. Internal Battery Pack Replacement



To replace the battery pack:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the battery door.
4. Disconnect the battery connectors.

   A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.
5. Remove the two screws to pull out the metal protection cover of the battery.
6. Pull out the plastic handle of the battery pack, and slide the pack out slowly on to a flat and stable surface. Use two hands to support the battery pack. See "Recycling the used equipment" on page 38 for proper disposal.
7. Verify that the replacement batteries have the same rating as the batteries being replaced.
8. Put the new battery pack into the UPS. Push the battery pack firmly, reconnect the red and black battery connectors then reconnect the BMS communication cable.
9. Verify that all of the alarms have cleared on the display.
10. Screw back the metal protection cover and the front panel, then clip the center cover.
11. If there are no EBM modules that need to be replaced continue to the 6.3 *Battery Settings Reset* .
12. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

Replacing the EBM(s)

The EBM is heavy. Lifting the cabinet into a rack requires a minimum of two people.

To replace the EBM(s):

1. Unplug the EBM power cable and battery detection cable from the UPS. If additional EBM(s) are installed, unplug the EBM power cable and battery detection cable from each EBM.
2. Replace the EBM(s). See "Recycling the used equipment" for proper disposal.

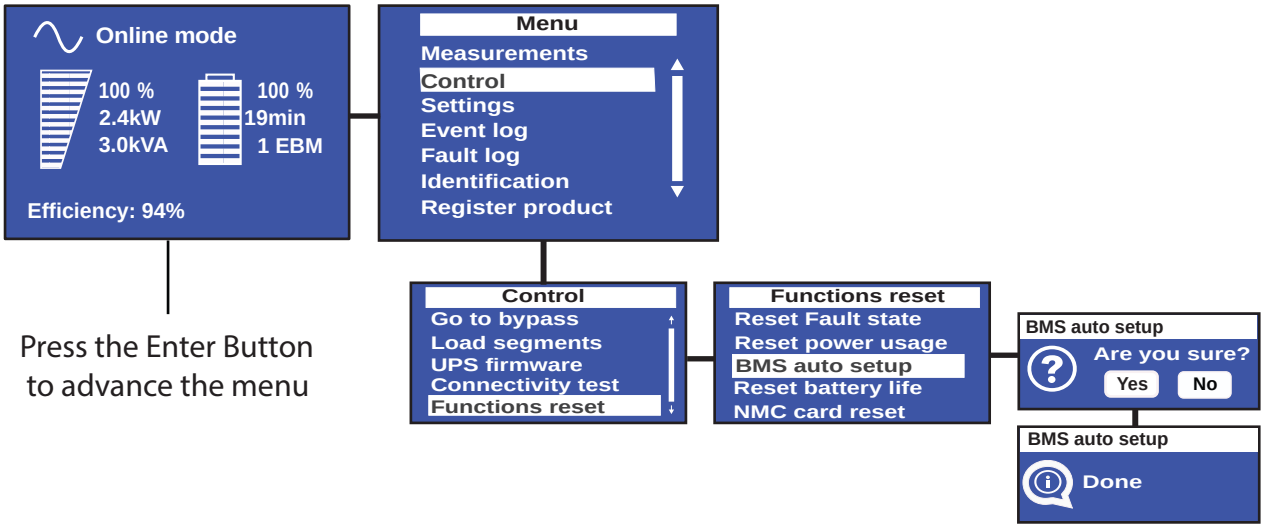
   A small amount of arcing may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.
3. Plug the EBM cable(s) into the battery connector(s). Up to four EBMs may be connected to the UPS.
4. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
5. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).
6. Continue to the 6.3 *Battery Settings Reset*.
7. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

6.3 Battery Settings Reset

After replacement of the internal UPS batteries and extended battery modules the BMS auto setup and battery life settings will need to be reset in the "*Control*" menu of the display.

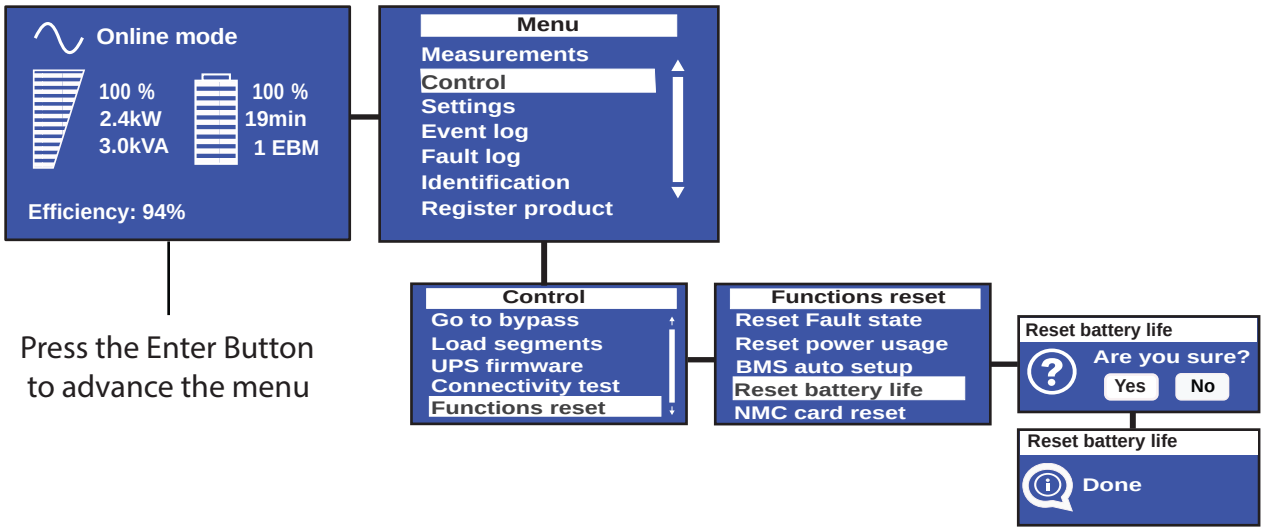
1. Reset the BMS auto setup function in the "Functions Reset" option of the control menu.

Figure 12. BMS Auto Setup Reset



2. Reset the battery life counter in the "Functions Reset" option of the control menu.

Figure 13. Battery Life Reset



Return the UPS to Normal Operation

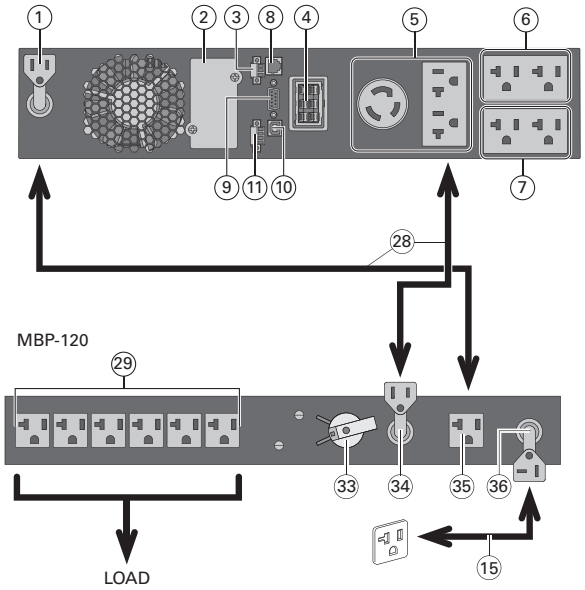
If the UPS internal batteries and external battery packs were replaced without powering down the UPS:

1. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear.
2. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode. See 5.1 *Start-up and Normal Operation* .

If the UPS internal batteries and external battery packs were replaced and the UPS was powered off:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. See section 5.1 *Start-up and Normal Operation* for powering the UPS back to normal operation.
4. If the UPS has a MBP module attached see 3.8 *Detecting other Accessories* for the correct startup procedure.

6.4 Replacing the UPS Equipped with a HotSwap MBP



The **HotSwap MBP** module makes it possible to service or even replace the UPS without affecting the connected loads.

Maintenance

1. Set switch (33) to Bypass position. The red LED on the **HotSwap MBP** module goes ON, indicating that the load is supplied directly with AC input source power.
2. Stop the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation

1. Check that the UPS is correctly connected to the **HotSwap MBP** module.
2. Start the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" on the **HotSwap MBP** module goes ON (otherwise, there is a connection error between the **HotSwap MBP** module and the UPS).
3. Set switch (33) to Normal position. The red LED on the **HotSwap MBP** module goes OFF.

6.5 Recycling The Used Equipment

Contact your local recycling or hazardous waste center for information on proper disposal of the used equipment.



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

Chapter 7 Troubleshooting

7.1 Typical Alarms and Faults

The Eaton 9PX are designed for durable, automatic operation and also alert you whenever potential operating problems may occur. Usually the alarms shown by the control panel do not mean that the output power is affected. Instead, they are preventive alarms intended to alert the user.

- Events are silent status information that are recorded into the Event log. Example = "AC freq in range".
- Alarms are recorded into the Event log and displayed on the LCD status screen with the logo blinking. Some alarms may be announced by a beep every 3 seconds. Example = "Battery low".
- Faults are announced by a continuous beep and red LED, recorded into the Fault log and displayed on the LCD with a specific message box. Example = Out. short circuit.

Use the following troubleshooting chart to determine the UPS alarm condition.

Checking the Alarms and Faults

To check the Event log or Fault log :

1. Press any button on the front panel display to activate the menu options.
2. Press the button to select Event log or Fault log.
3. Scroll through the listed events or faults.

The following table describes typical conditions.

Conditions	Possible cause	Action
Battery mode  LED is On. 1 beep every 10 seconds	A utility failure has occurred and the UPS is in battery mode.	The UPS is powering the equipment with battery power. Prepare your equipment for shutdown.
Battery mode  LED is On. 1 beep every 3 seconds	The UPS is in Battery mode and the battery is running low.	This warning is approximate, and the actual time to shutdown may vary significantly. Depending on the UPS load and number of Extended Battery Modules (EBMs), the "Battery Low" warning may occur before the batteries reach 20% capacity.
No battery  LED is On Beep continuous	The batteries are disconnected.	Verify that all batteries are properly connected. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.
Battery fault  LED is On Beep continuous	The battery test is failed due to bad or disconnected batteries.	Verify that all batteries are properly connected. If the condition persists, contact your service representative. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.

Conditions	Possible cause	Action
The UPS does not provide the expected backup time.	The batteries need charging or service.	Apply utility power for 48 hours to charge the batteries. If the condition persists, contact your service representative.
Bypass mode  LED is on.	An overload or a fault has occurred, or a command has been received and the UPS is in Bypass	Equipment is powered but not protected by the UPS. Check for one of the following alarms: overtemperature, overload or UPS LED is on. failure.
Power Overload  LED is on.	Power requirements exceed the UPS capacity (greater than 100% of nominal; see “User Settings” on page 8 for specific output overload ranges).	Remove some of the equipment from the UPS. The UPS continues to operate, but may switch to Bypass mode or shut down if the load increases. The alarm resets when the condition becomes inactive.
UPS Overtemperature  LED is on. 1 beep every 3 seconds	The UPS internal temperature is too high or a fan has failed. At the warning level, the UPS generates the alarm but remains in the current operating state. If the temperature rises another 10°C, the UPS transfers to Bypass mode or shuts down if Bypass is unusable.	If the UPS transferred to Bypass mode, the UPS will return to normal operation when the temperature drops 5°C below the warning level. If the condition persists, shut down the UPS. Clear vents and remove any heat sources. Allow the UPS to cool. Ensure the airflow around the UPS is not restricted. Restart the UPS. If the condition continues to persist, contact your service representative.
The UPS does not start	The input source is not connected correctly.	Check the input connections.
	The Remote Power Off (RPO) switch is active or the RPO connector is missing.	If the UPS Status menu displays the "Remote Power Off" notice, inactivate the RPO input.

7.2 Silencing the Alarm

Press the ESC (Escape) button on the front panel display to silence the alarm. Check the alarm condition and perform the applicable action to resolve the condition. If the alarm status changes, the alarm beeps again, overriding the previous alarm silencing.

7.3 Service and Support

If you have any questions or problems with the UPS, call your **Local Distributor** or your local service representative and ask for a UPS technical representative. Please have the following information ready when you call for service:

- Model number
- Serial number
- Firmware version number
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

If repair is required, you will be given a Returned Material Authorization (RMA) number. This number must appear on the outside of the package and on the Bill Of Lading (if applicable). Use the original packaging or request packaging from the Help Desk or distributor. Units damaged in shipment as a result of improper packaging are not covered under warranty. A replacement or repair unit will be shipped, freight prepaid for all warrantied units.

IMPORTANT

For critical applications, immediate replacement may be available. Call the Help Desk for the dealer or distributor nearest you.

7.4 CE Compliance Contact

- Eaton I.F. SAS - 110 Rue Blaise Pascal - 38330 Montbonnot St Martin – France.

Chapter 8 Specifications

8.1 Model Specifications

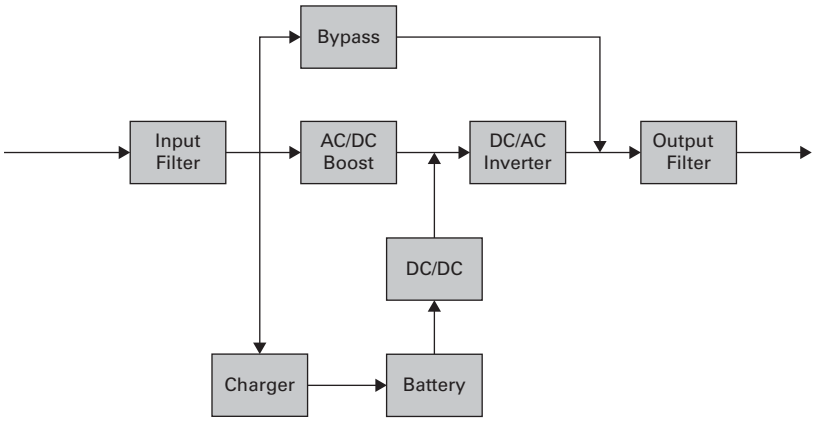


Table 7. Power Module List

Model	Power ratings
9PX1500RT-L	1500VA / 1350W
9PX2000RT-L	2000VA / 1800W
9PX3000RT-L	3000VA / 2700W
9PX1500GRT-L	1500VA / 1350W
9PX2200GRT-L	2200VA / 2000W
9PX3000GRT-L	3000VA / 2700W

Table 8. Extended Battery Module List

Model	Configuration	Battery Voltage	For Power Module
9PXEBM48RT-L	Rack / Tower	48Vdc	1500VA
9PXEBM72RT-L	Rack / Tower	72Vdc	2000 – 2200 – 3000VA

Table 9. Weights and Dimensions

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8

Table 9. Weights and Dimensions (Continued)

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

Table 10. Electrical Input

Model	Default Input (Voltage/Max Current)	Input Nominal Voltages	Input Voltage Window at Rated Load
9PX1500RT-L	120V / 12.5A	100V, 110V, 120V, 125V	100–138V
9PX2000RT-L	120V / 16A		
9PX3000RT-L	120V / 24A		
9PX1500GRT-L	208V / 7.2A	200V, 208V, 220V, 230V, 240V	176V-276V
9PX2200GRT-L	208V / 10.57A		
9PX3000GRT-L	208V / 14.42A		
Nominal Frequency		50/60Hz auto-sensing	
Frequency Range		40-70Hz before transfer to battery	
Bypass Voltage Range		-20% / +15% of nominal value (default)	
Noise Filtering		Input EMC filter	

Table 11. Electrical Input Connections

Model	Input Connection	Input cable
9PX1500RT-L	5–15P	8ft / 2.4m
9PX2000RT-L	5–20P	8ft / 2.4m
9PX3000RT-L	L5–30P	8ft / 2.4m
9PX1500GRT-L	IEC-C14, IEC 10A	6ft / 1.8m
9PX2200GRT-L	IEC-C20, 16 A inlet L6-20P to C19 jumper provided	6ft / 1.8m
9PX3000GRT-L		

Table 12. Electrical Output

All Models	Normal Mode	Efficiency Mode	Battery Mode
Voltage Regulation	±1%		±2%
Efficiency	90.0% for 1.5K LV models 91% for 1.5K G models 91.4% for 2K LV models 93% for 2K G models 94% for 3K G models	95.8% for 1K5 LV models 96.5% for 1.5K G models 96.8% for 2K LV models 98% for 2K G models 97.2% for 3K LV models 98% for 3K G models	84% for 1.5K LV models 87.5% for 1.5K G models 86% for 2K LV models 90% fo r 2K G models 86% for 3K LV models 89% for 3K G models

Table 12. Electrical Output (Continued)

All Models	Normal Mode	Efficiency Mode	Battery Mode
Frequency Regulation	Sync with line ±5% of nominal line frequency (outside this range: ±0.5% of auto-selected nominal frequency)		±0.5% of auto-selected nominal frequency
Nominal Output	[100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V] (G models)		
Frequency	50 or 60 Hz, autosensing or configurable as a frequency converter		
Output Overload	Online mode: 102%~130% :12s 130%~150% :2s >150% :shutdown after 300ms Percent is based on nominal Watt/VA. Transfer behavior can change (see output mode setting on page 14) Battery mode: 102%~130% :12s >130% :2s Overload warning then transfer to stop output		
Output Overload (Bypass Mode)	102%~110% :Overload warning 110%~130% :shutdown after 5mins 130%~150% :shutdown after 15s >150% :shutdown after 300ms Percent is based on nominal current in bypass mode		
Voltage Waveform	Sinewave		
Harmonic Distortion	< 3% THDV on linear load < 5% THDV on non-linear load		
Transfer Time	Online Mode: 0ms High Efficiency mode: 10ms maximum (due to loss of utility)		
Power Factor	Up to 1.0		
Load Crest Ratio	Up to 3:1		

Table 13. Electrical Output Connections

Model	Output Connection	Output Cable
9PX1500RT-L	5-15R (8)	No
9PX2000RT-L	5-20R(2) + L5-20R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX3000RT-L	5-20R(2) + L5-30R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX1500GRT-L	(4) IEC10A (2) IEC10A (2) IEC10A (2) IEC 10A	No

Table 13. Electrical Output Connections (Continued)

Model	Output Connection	Output Cable
9PX2200GRT-L	(4) IEC10A + (1) IEC16A (2) IEC10A + (1) IEC16A group 1 (2) IEC10A group 2	(2) IEC 10A
9PX3000GRT-L		

Table 14. Environmental and Safety

Certifications	IEC/EN 62040-1 IEC/EN 62040-2 : Cat. C1 IEC/EN 62040-3 UL1778 5th edition CSA 22.2
EMC (Emissions)*	CISPR22 Class B FCC part 15 Class B / ICES-003
EMC (Immunity)*	IEC 61000-4-2, (ESD): 8 kV Contact Discharge / 15 kV Air Discharge IEC 61000-4-3, (Radiated field): 10 V/m IEC 61000-4-4, (EFT): Power (Coupling network) 4 kV / Ethernet (Coupling clamp) 2 kV IEC 61000-4-5, (Surges): 2 kV Differentiel Mode / 4 kV Common Mode / 1 kV Ethernet IEC 61000-4-6, (Electromagnetic field): 10 V IEC 61000-4-8, (Conducted magnetic field): 30 A/m
* for output cable < 10m.	
Agency Markings*	cULus / NOM / Energy Star / BSMI
Operating Temperatures	0 to 40°C (32 to 104°F) in Online mode, with linear derating for altitude **Note:** thermal protection switches load to Bypass in case of overheating.
Storage Temperatures	0 to 40°C (32 to 104°F) with batteries -25 to 55°C (-13 to 130°F) without batteries
Transit Temperature	-25 to 55°C (-13 to 130°F)
Relative Humidity	0 to 96% no condensing
Operating Altitude	Up to 3,000 meters (9,843 ft) above sea level, no derating for 35°c (95°F) room temperature
Transit Altitude	Up to 10,000 meters (32,808 ft) above sea level
Audible Noise	< 47 dBA at 1 meter typical for 2K et 3K models < 40 dBA at 1 meter typical for 70, 1K et 1K5 models
***** 9PX1500RT-L, 9PX2000RT-L, 9PX3000RT-L, 9PX1500GRT-L, 9PX2200GRT-L, 9PX3000GRT-L have cULus/Energy Star/ BSMI. 9PXEBM48RT-L, 9PXEBM72RT-L have cULus / NOM.	

Table 15. Battery

	Internal Batteries	EBM
Rack / Tower configuration	1500VA: 48Vdc 2200VA: 72Vdc 3000VA: 72Vdc	9PXEBM48RT: 48Vdc 9PXEBM72RT: 72Vdc
Type	Lithium Iron Phosphate (LFP) battery module Lithium-Ion float service life 8 years /25°C	
Monitoring	Integrated battery management system (BMS) for temperature regulation and life cycle monitoring.	
EBM Battery Cable Length	350 mm / 13.78 in	

P-164001006 06

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Five-Year Limited Warranty (US and Canada)

Eaton UPS Models: 9PX Lithium-ion

WARRANTOR: The warrantor for the limited warranties set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED WARRANTY: This limited warranty (this "Warranty") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") purchased on or after March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Company for resale to an End-User.

LIMITED WARRANTY PERIOD: The period covered by this Warranty for Product installed [and currently located] in the fifty (50) United States, the District of Columbia, and Canada is sixty (60) months from the date of purchase, or sixty six (66) months from the date of shipment.

WHAT THIS LIMITED WARRANTY COVERS: The warrantor warrants that the Product and battery (individually and collectively, the "Warranted Items") are free from defects in material and workmanship. If, in the opinion of Company, a Warranted Item is defective and the defect is within the terms of this Warranty, Company's sole obligation will be to repair or replace such defective Warranted Item (including by providing service, parts and labor, as applicable), at the option of Company.

PROCEDURES FOR REPAIR OR REPLACEMENT OF WARRANTED ITEMS: The Warranted Item will be repaired or replaced at a Company site or such other location as determined by Company.

If the Warranted Item is to be replaced by Company, and the End-User supplies a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives notice of the warranty claim. In such case, the End-User must return (at Company's expense) the defective Warranted Item to Company in the same packaging as the replacement Warranted Item received by the End-User or as otherwise instructed by Company. If Company does not receive the defective Warranted Item, Company will either charge the End-User's credit card, or send the End-User an invoice (which the End-User agrees to pay), for the value of the replacement Product.

If the Warranted Item is to be replaced by Company, but the End-User is unwilling or unable to supply a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives the defective Product from the End-User.

In any case, Company will provide shipping instructions and will pay its designated carrier for all shipping charges for return of defective equipment and replacement of Warranted Items. Any returned Warranted Item or parts that are replaced may be new or reconditioned. All Warranted Items returned to Company and all parts replaced by Company shall become the property of Company.

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.

This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.

Company shall not be responsible for any charges for testing, checking, removal, or installation of Warranted Items.

COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.

COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.

THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON-CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY), OR OTHERWISE.

LIMITATION OF LIABILITY: The remedies of the End-User set forth herein are exclusive and are the sole remedies for any failure of Company to comply with its obligations hereunder. In no event shall Company be liable in contract, in tort (including negligence or strict liability) or otherwise for damage to property or equipment other than the Products, including loss of profits or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of Company hereunder whether the claims are based in contract (including indemnity), in tort (including negligence or strict liability), or otherwise, shall not exceed the price of the Product on which such liability is based.

Company shall not be responsible for failure to provide service or parts due to causes beyond Company's reasonable control.

END-USER'S OBLIGATIONS: In order to receive the benefits of this Warranty, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.

OTHER LIMITATIONS: Company's obligations under this Warranty are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Warranty. Also during such time, the period of this Warranty shall continue to run and the expiration of this Warranty shall not be extended upon payment of any overdue or unpaid amounts.

COSTS NOT RELATED TO WARRANTY: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Warranty, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Warranty will be borne by the End-User.

OBTAINING WARRANTY SERVICE: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, call your local Eaton product sales or service representative. For comments or questions about this Warranty, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.

Load Protection Guarantee (US and Canada)

Eaton UPS Models 9PX Lithium-ion

GUARANTOR: The Guarantor for the load protection guarantee set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED GUARANTEE: This load protection guarantee (this "Guarantee") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") and cannot be transferred. This Guarantee applies even in the event that the Product is initially sold by Company for resale to an End-User.

WHAT THIS GUARANTEE COVERS: For the lifetime of the Product, Guarantor promises to repair or replace, at Guarantor's option, the equipment (valued up to the limits shown below*) that is damaged by an AC power line surge, spike, or other transient when properly connected to Guarantor's uninterruptible power system ("UPS"). Reimbursement for or restoration of data loss excluded. This Guarantee applies only if all of the following circumstances arise:

1. The UPS is plugged into properly grounded and wired outlets, using no extension cords, adapters, other ground wires, or other electrical connectors;
2. The installation of the UPS complies with all applicable electrical and safety codes described by the National Electrical Code® (NEC®);
3. The UPS was used under normal operating conditions and in accordance with all labels and instructions; and
4. The UPS was not damaged by accident (other than AC power line transient), misuse, or abuse.

***Cumulative Limits to be paid by Guarantor under this Load Protection Guarantee:**

$150,000 for Eaton UPS Models 9PX Lithium-ion

WHAT THIS GUARANTEE DOES NOT COVER: Any reimbursement or repair to End-User's equipment does not include reimbursement for or restoration of any data loss. This Guarantee does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation of Product; (d) repair or alteration of Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind to the Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Guarantee is not valid: if the Product's serial numbers have been removed or are illegible.
Company shall not be responsible for any charges for testing, checking, removal, or installation of any items.

LIMITATION OF LIABILITY: The remedies of the END-USER set forth HEREIN are exclusive and are THE sole remedies for any failure of COMPANY to comply with its obligations hereunder. EXCEPT AS OTHERWISE PROVIDED FOR IN THIS GUARANTEE, in no event shall COMPANY be liable in contract, in tort (including negligence or strict liability), or otherwise for damage to property or equipment other than THE products, INCLUDING loss of profits or revenue, loss of use of products, LOSS OF DATA, cost of capital, claims of customers of the END-USER or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of COMPANY HEREUNDER whether the claims are based in contract (INCLUDING INDEMNITY), in tort (including negligence or strict liability), or otherwise, shall not exceed THOSE SET FORTH ABOVE.
Company shall not be responsible for failure to provide repair or replacement under this Guarantee due to causes beyond Company's reasonable control.
END-USER'S OBLIGATIONS: In order to receive the benefits of this Guarantee, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.
OTHER LIMITATIONS: Company's obligations under this Guarantee are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Guarantee.
COSTS NOT RELATED TO GUARANTEE: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Guarantee, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Guarantee will be borne by the End-User.
TO MAKE A CLAIM: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, contact your local Eaton product sales or service representative. For comments or questions about this Load Protection Guarantee, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.
WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.
Company shall not be responsible for any charges for testing, checking, removal or installation of Warranted Items.
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Product specifications

Eaton 9PXEBM48RT-L

Catalog Number: 9PXEBM48RT-L

Eaton 9PX lithium ion extended battery module (EBM), 1U, used with 9PX1500RT-L, 9PX1500RTN-L, 9PX1500GRT-L

General specifications

Product Name
Eaton 9PX extended battery module (EBM)

Catalog Number
9PXEBM48RT-L

UPC
743172105592

Product Length/Depth
17.6 in

Product Height
1.7 in

Product Width
17.2 in

Product Weight
36.5 lb

Compliances
CE Marked
FCC part 15 Class B
IEC 62040-2 Cat C1

Certifications
NOM
cTUVus

Product specifications

Type

Extended Battery Module (EBM)

Runtime graph

View runtime graph

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Used with

9PX1500RT-L, 9PX1500GRT-L, 9PX1000GRT-L

Rack size

1U

Color

Black/silver

Rack mounting kit

Yes

Form factor

Rack/tower

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 2 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Temperature range

0° to 40°C (32° to 104°F)

Relative humidity

0-96% non-condensing

Resources

Brochures

Eaton 9PX lithium-ion UPS brochure

Drawings

Eaton 9PXEBM4RT-L 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide



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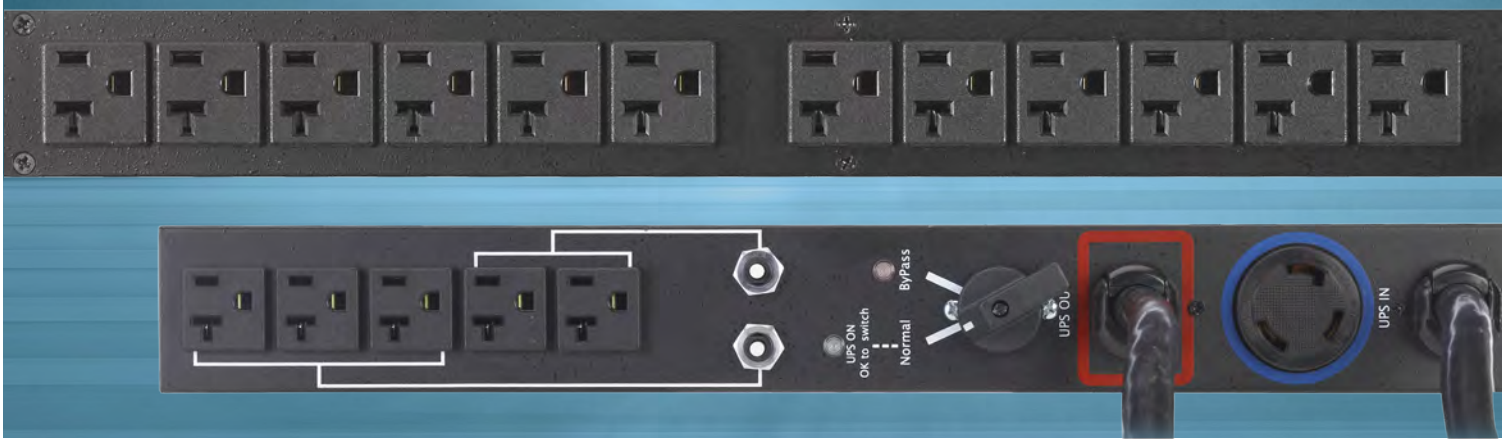
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Product brochure



Eaton FlexPDU and Maintenance Bypass PDU

Eaton provides five different functions for rack power distribution solutions. Two of these functions, FlexPDU and Maintenances Bypass PDU, were created as accessories specific to some of our UPSs. Both of these units offer the flexibility of connections to meet the demanding requirements of today's data center architects.

The HotSwap Maintenance Bypass (MBP) unit enables easy UPS replacement without interruption of the load. The HotSwap MBP is ideal when exchanging a unit or servicing a UPS. For added convenience, the HotSwap MBP offers two types of receptacles: 5-15R or 5-20R.

The FlexPDU is a basic function power distribution unit with a short power cord for easy, close mounting. FlexPDUs are available with 5-15R, 5-20R or L5-20R output receptacles, for connection to a wide range of equipment.

Both of these options allow for easy deployment, even in space-constrained environments. You have a variety of mounting options, including top and side mounting.

Features

- HotSwap MBP provides service continuity during UPS maintenance or upgrade
- Both units offer connections to all types of equipment
- Eases installation with flexible mounting options
- Minimal depth accommodates most space constraints



Side mounting Flex PDU with Tower UPS



Top mounting horizontal FlexPDU with 2U UPS

HotSwap MBPs rackmounted horizontally in rack



Top mounting vertical FlexPDU



Powering Business Worldwide

FLEXPDU MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EFLXL1500R-PDU1U	58015	5-15P	None	1.44	BA	3	1U	(12) 5-15R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1U	58020	5-20P	None	1.92	BA	3	1U	(12) 5-20R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1UL	58021	5-20P	None	1.92	BA	3	1U	(5) L5-20R	1.7 x 19.0 x 3.0
EFLXI3000R-PDU1UIEC	68438	C20 Inlet	(2) 20A	3.33	BA	3	1U	(12) C13, (1) C19	1.7 x 19.0 x 2.4

HOTSWAP MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EHBPL1500R-PDU1U	58115	5-15P	None	1.44	BA	8	2U	(6) 5-15R	2.1 x 17.3 x 3.8
EHBPL2000R-PDU1U	58120	5-20P	None	1.92	BA	8	2U	(6) 5-20R	2.1 x 17.3 x 3.8
EHBPL3000R-PDU1U	58130	L5-30P	(2) 20A	2.88	BA	3.3	2U	(5) 5-20R	2.1 x 17.3 x 3.8

COMPATIBILITY MATRIX FOR RACKMOUNT UPSs*

FlexPDU plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P 1U UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5) 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓

*For tower models, all FlexPDUs can be wall-mounted. ** Rear mounting available on 3U models only.

HotSwap MBP plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5P 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓
30A	Eaton 5PX UPS, 3000 VA	✓
	Eaton 9PX UPS, 3000 VA	✓

*For tower models, all HotSwap MBPs can be wall-mounted. **Rear mounting available on 3U models only.

To interact with the FlexPDU and Maintenance Bypass PDF, please visit: **Eaton.com/epdu**

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Product specifications

Eaton EHBPL1500R-PDU1U

Catalog Number: EHBPL1500R-PDU1U

Eaton Basic rack PDU, 1U - EHBPL1500R-PDU1U



General specifications

Product Name	**Catalog Number**
Eaton HotSwap MBP	EHBPL1500R-PDU1U
UPC	**Product Length/Depth**
743172067340	17.3 in
Product Height	**Product Width**
2.1 in	3.8 in
Product Weight	**Warranty**
0.0001 lb	3 year
Compliances	**Certifications**
Contact Manufacturer	UL Listed

Powering Business Worldwide

Product specifications

Outlet control
No

Cord length
8 ft

Phase
Single-phase

Input voltage
110-125V

Color
Black

Wattage
1.44 kW max

Form factor
2U

Mounting direction
Horizontal

Amperage Rating
12A

Input connection
5-15P

Outlets
(6) 5-15R

Type
PDU

Frequency rating
50-60 Hz

Operating Temperature
0° to 60°C (32° to 140°F)

Number of Outputs 5-15R
6

Circuit breaker
None

Resources

Brochures

Eaton Flex and Hotswap MBP ePDU brochure

Drawings

Eaton ePDU visio stencils

Eaton FlexPDU EHBPL 1500R-PDU1U technical drawing

Specifications and datasheets

Eaton Specification Sheet - EHBPL1500R-PDU1U

User guides

Eaton FlexPDUs and HotSwap MBP installation and user manual



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HotSwap

Maintenance ByPass

MBP - 115 / EHBPL1500R-PDU1U

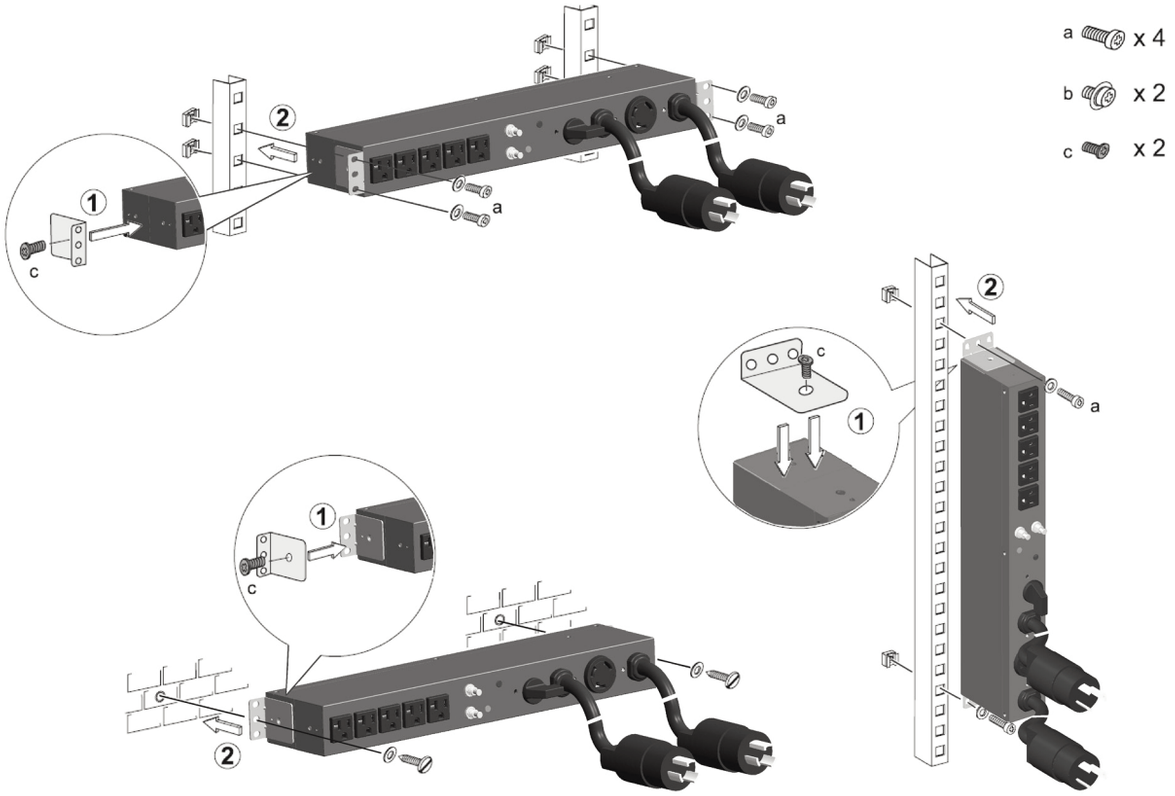
MBP - 120 / EHBPL2000R-PDU1U

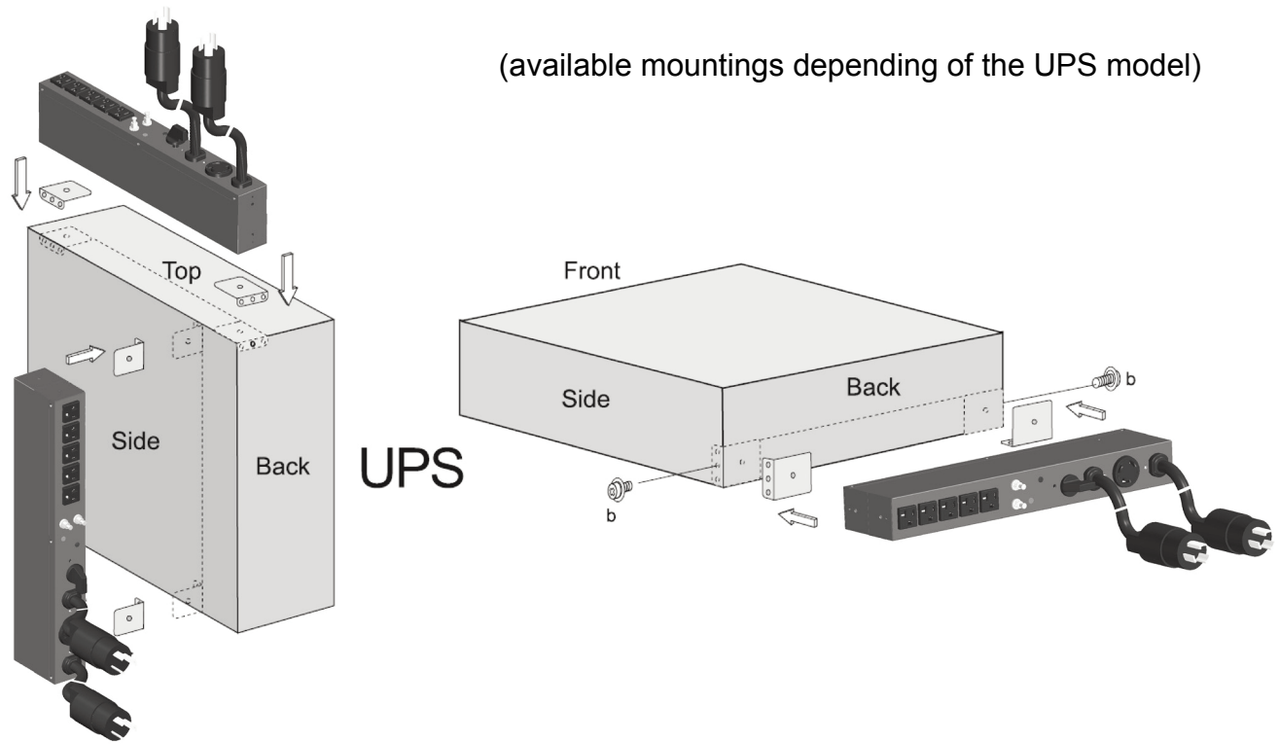
MBP - 130 / EHBPL3000R-PDU1U

Installation and User Manual

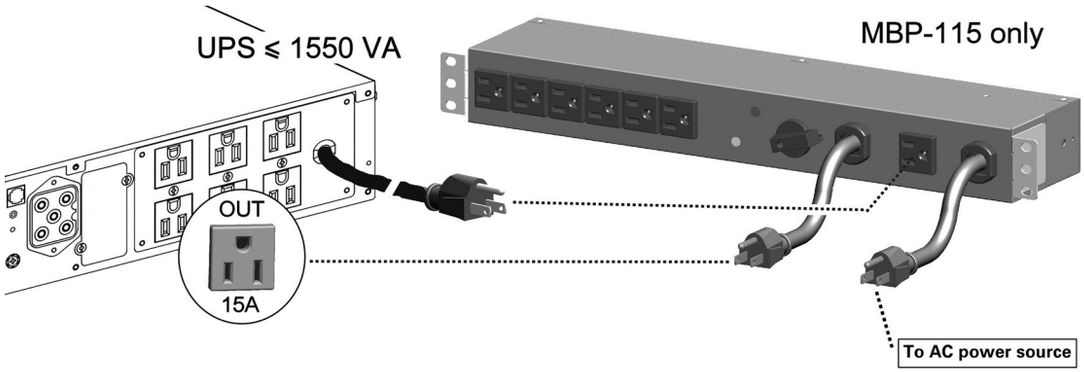
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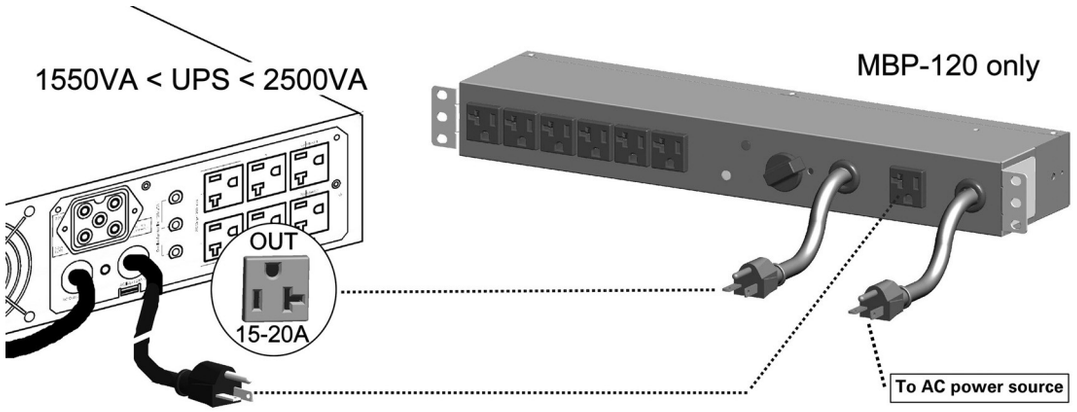
HotSwap Connections

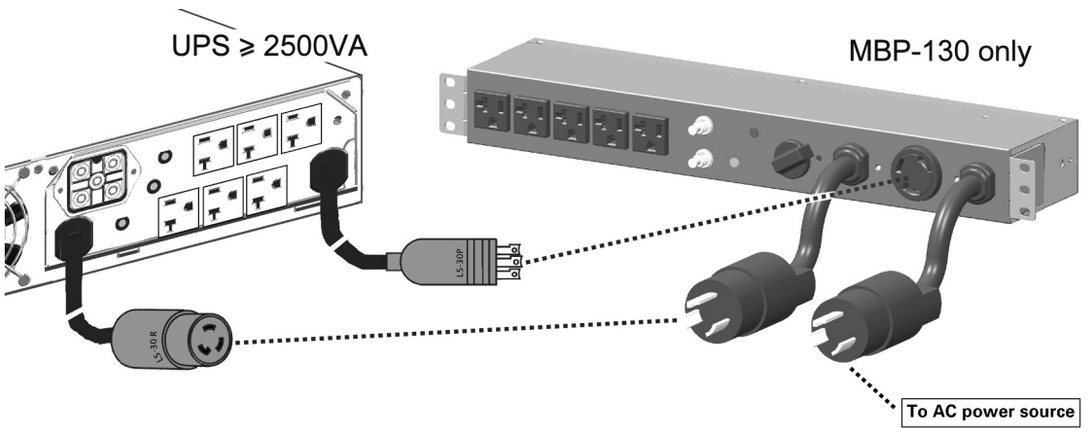


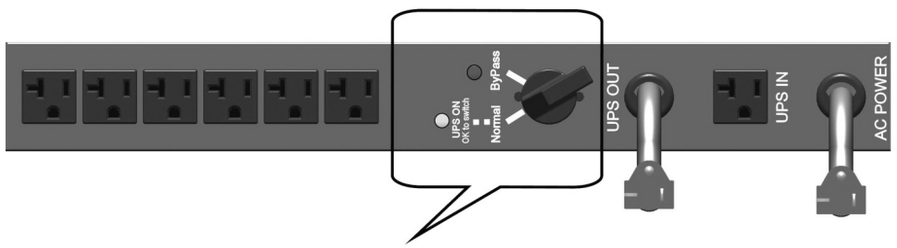


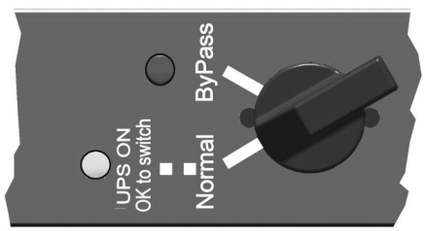
(available mountings depending of the UPS model)


UPS ≤ 1550 VA
MBP-115 only
OUT
15A
To AC power source


1550VA < UPS < 2500VA
MBP-120 only
OUT
15-20A
To AC power source


UPS ≥ 2500VA
MBP-130 only
L5-30P
L5-30R
To AC power source


UPS ON
OK to switch
Normal
ByPass
UPS OUT
UPS IN
AC POWER


UPS ON
OK to switch
Normal
ByPass

English

Safety guidelines to read before installing the product

- The product must be used indoors only.
- Do not place the product near liquid or in an excessively damp environment.
- Do not place the product directly in the sun or near a heat source.
- Do not let liquid or foreign objects enter the product.
- Ground the product using a 2 poles + ground socket (2P + G).
- When installing the product, ensure that the sum of the leakage currents of the product and the devices it supplies does not exceed 3.5 mA.
- The AC-power input must be connected to an appropriate electrical network protection or tap-off circuit (fuse or circuit-breaker).

Use

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function). Refer to the illustrations.

Installation

Refer to the UPS installation and user manual.

HotSwap MBP module operation

The HotSwap MBP module has a rotary switch with two positions:

- Normal - the load is supplied by the UPS,
- Bypass - the load is supplied directly by the AC-power source.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch to the Normal position.
3. Start the UPS by pressing the ON/OFF button on the UPS control panel:

- The load is supplied by the UPS.
- Green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

HotSwap MBP module test

1. Set switch to the Bypass position and check that the load is still supplied.
2. Set switch back to the Normal position.

Maintenance on a UPS equipped with the HotSwap MBP module

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function).

Maintenance:

1. Set switch to the Bypass position. The red LED on the HotSwap MBP module goes ON, indicating that the load is supplied directly with AC power.
2. Stop the UPS: green LED "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation:

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Start the UPS: green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON (otherwise, there is a connection error between the HotSwap MBP module and the UPS).
3. Set switch to the Normal position. The red LED on the HotSwap MBP module goes OFF.

Français

Consignes de sécurité, à lire avant l'installation du produit

- Le produit doit être utilisé à l'intérieur seulement.
- Ne pas placer le produit à proximité de liquide, ou dans un environnement d'humidité excessive.
- Ne pas placer le produit directement au soleil ou à proximité d'une source de chaleur.
- Ne pas laisser pénétrer de liquide ou d'objet étranger à l'intérieur du produit.
- Relier impérativement le produit à la terre à l'aide d'une prise de courant 2 pôles + terre (2P+T).
- S'assurer lors de l'installation du produit que la somme des courants de fuite du produit et des appareils qu'il alimente ne dépasse pas 3.5 mA.
- La fiche d'alimentation doit être connectée à un circuit de dérivation ou de protection du réseau électrique (fusible ou disjoncteur) approprié.

Utilisation

Le Module HotSwap MBP permet la maintenance et éventuellement le remplacement de l'ASI sans affecter l'alimentation électrique des équipements connectés (fonction HotSwap).

Installation

Se reporter au manuel d'installation et d'utilisation de l'ASI.

Fonctionnement du module HotSwap MBP

Le module HotSwap MBP utilise un commutateur rotatif à 2 positions :

- Normal : les équipements sont alimentés par l'ASI.
- By-pass : les équipements sont alimentés par le réseau électrique.

Mise en service de l'ASI avec le module HotSwap MBP :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Placer le commutateur en position Normal.
3. Mettre en marche l'ASI :

- Les équipements sont alors alimentés par l'ASI.
- Le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP.

Test du module HotSwap MBP

1. Placer le commutateur en position By-pass et vérifier que les équipements sont toujours alimentés.
2. Remettre le commutateur en position Normal.

Maintenance d'une ASI équipée d'un module HotSwap MBP

Remplacement de l'ASI sans interrompre l'alimentation électrique des équipements connectés :

1. Placer le commutateur en position By-pass : le voyant rouge du module HotSwap MBP s'allume pour indiquer que les équipements sont alimentés directement par le réseau électrique.
2. Arrêter l'ASI : le voyant vert "UPS ON - OK to switch" s'éteint, l'ASI peut alors être déconnectée et remplacée.

Retour en fonctionnement normal :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Mettre en marche l'ASI : le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP (sinon il y a erreur de raccordement du module HotSwap MBP avec l'ASI).
3. Mettre le commutateur en position Normal : le voyant rouge du module HotSwap MBP s'éteint.

Español

Consignas de seguridad leer antes de instalar el producto

- El producto debe utilizarse únicamente al interior.
- No colocar el producto cerca de líquidos o en un entorno de humedad excesiva.
- No colocar el producto directamente bajo los rayos del sol ni cerca de una fuente de calor.
- No dejar que penetre líquido u objeto ajeno al interior del producto.
- Conectar imperativamente el producto a tierra utilizando una toma de corriente de 2 polos + tierra (2P+T).
- Cerciorarse durante la instalación del producto que la suma de las corrientes de fuga del producto y de los aparatos que alimenta no excede 3.5 mA.
- La toma de la red debe estar conectada a un circuito de derivación o de protección de la red eléctrica (fusible o interruptor automático) apropiado.

Utilización

La función del módulo HotSwap MBP es permitir el mantenimiento y, eventualmente, la sustitución del SAI sin que ello afecte a la alimentación eléctrica de los equipos conectados (función HotSwap).

Instalación

Véase el manual de instalación y empleo del SAI.

Funcionamiento del módulo HotSwap MBP

El módulo HotSwap MBP utiliza un conmutador rotativo de 2 posiciones:

- Normal: los equipos están siendo alimentados por el SAI.
- Bypass: los equipos están siendo alimentados por la red eléctrica.

Puesta en servicio del SAI con el módulo HotSwap MBP:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Colocar el conmutador en posición Normal.
3. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI.

- Los equipos están siendo alimentados ya por el SAI.
- El indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP.

Test del módulo HotSwap MBP

1. Colocar el conmutador en posición Bypass y comprobar que los equipos sigan estando alimentados.
2. Volver a poner el conmutador en posición Normal.

Mantenimiento de un SAI equipado con un módulo HotSwap MBP

Mantenimiento:

1. Colocar el conmutador en posición Bypass: el indicador luminoso rojo del módulo HotSwap MBP se enciende para indicar que los equipos están siendo alimentados directamente por la red eléctrica.
2. Parar el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI:

El indicador luminoso verde "UPS ON - OK to switch" se apaga, ya se puede desconectar el SAI y sustituirlo.

Vuelta a funcionamiento normal:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI: el indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP (en caso contrario, hay un error en la conexión entre el módulo HotSwap MBP y el SAI).
3. Poner el conmutador en posición Normal: el indicador luminoso rojo del módulo HotSwap MBP se apaga.

Português

Instruções de segurança: ler antes da instalação do produto

- O produto deve ser unicamente utilizado no interior.
- Não coloque o produto na proximidade de líquidos, ou num ambiente de humidade excessiva.
- Não coloque o produto directamente ao sol ou na proximidade de uma fonte de calor.
- Não deixe penetrar líquido ou objecto estranho dentro do produto.
- Ligue imperativamente o produto à terra graças a uma ficha de corrente 2 pólos + terra (2P+T).
- Verifique durante a instalação do produto que a soma das correntes de fuga do produto e dos aparelhos que o mesmo alimenta não ultrapassa 3.5 mA.
- A tomada sector deve estar ligada a um circuito de derivação ou de protecção da rede eléctrica (fusível ou disjuntor) apropriado.

HotSwap MBP models: MBP - 115, MBP - 120, MBP - 130

Input	MBP - 115 MBP - 120 MBP - 130	NEMA 5-15P 15A cord (3.3 ft length) NEMA 5-20P 20A cord (3.3 ft length) NEMA L5-30P 30A cord (3.3 ft length)
Output	MBP - 115 MBP - 120 MBP - 130	6 NEMA 5-15R 15A socket outlets 6 NEMA 5-20R 20A socket outlets 5 NEMA 5-20R 20A socket outlets
Dimensions (HxLxD)	2.1 x 17.3 x 3.8 inches	
Performances Nominal voltage Frequency	100/104/110/120/127 50/60 Hz	
Input nominal current	MBP - 115 MBP - 120 MBP - 130	12 A 16 A 24 A
Maximal power	MBP - 115 MBP - 120 MBP - 130	1440 VA 1920 VA 2880 VA
Standards Product	MBP - 115 MBP - 120 MBP - 130	UL 1778
Marking	C UL US LISTED CE	
Environment Temperature Humidity Altitude	 Storage -25°C to 55°C (-77°F to 131°F), operation 0°C to 45°C (32°F to 113°F) Storage 10% to 90%, operation 20% to 90% Transportation up to 12000 m (39370 ft), operation up to 1500 m (4921 ft)	

8609 Six Forks Road
Raleigh, NC 27615 U.S.A
1-800-356-5794 or 919-872-3020

www.eaton.com/powerquality

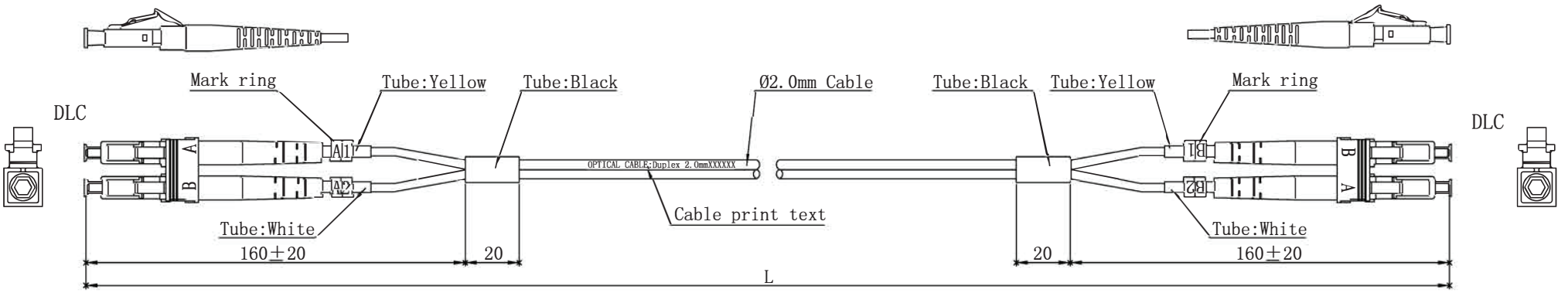
Powering Business Worldwide

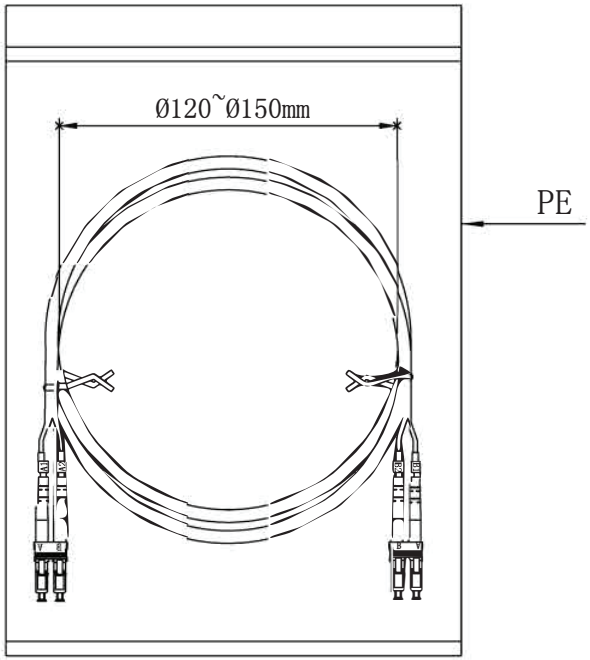
86-58100-00 A03

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NOTE:ALL MATERIAL COMPLIANT ROHS STANDARD

REVISION INFORMATION			
Rev.	Rev. Date	Modified By	Brief Description





Specifications:

Type	DLC/UPC-DLC/UPC
Fiber Mode	SM
Core Diameter(um)	9/125
Operating Wavelength(nm)	1310/1550
Cable Color	Yellow
Cable Diameter(mm)	Ø2.0
Operating Temperature(° C)	-40~+75
Storage Temperature(° C)	-40~+85
Insertion loss(dB)	≤0.3dB
Return loss(dB)	≥50dB

L≤5m, TOLERANCES:0≤ΔL≤5cm
L>5m, TOLERANCES:0≤ΔL≤1%*L

NO.	PART NAME	SPECIFICATION DESCRIPTION	QT'Y	UNIT
①				
②				
③				

Unless specified on the drawing, tolerances are per the follows:

. +1
.x +0.2
.xx +0.05

LANshack
Sales@LANshack.com | 888-568-1230

DRAWN BY	DATE: 2015/05/14	DESCRIPTION: LC-LC-DX SM Patchcord	
CHECKED BY	SHEET 1of1	ITEM NO. SFPC-SM-LCLC-XX	
APPROVED BY	SCALE 1:1	REV. 00	UNIT:mm

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PLACEHOLDER

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

☐ Installed in accordance with Manufacturer's recommendations.

☐ Inspected, checked, and adjusted.

☐ Serviced with proper initial lubricants.

☐ Electrical and mechanical connections meet quality and safety standards.

☐ All applicable safety equipment has been properly installed.

☐ Functional tests.

☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer:_____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

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PLACEHOLDER

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO.:_____

1. EQUIPMENT ITEM_____
2. MANUFACTURER _____
3. EQUIPMENT/TAG NUMBER(S) _____
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____
5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____
6. MANUFACTURER'S LOCAL REPRESENTATIVE _____
   a. Name_____ Telephone No. _____
   b. Address _____
7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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PLACEHOLDER

8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

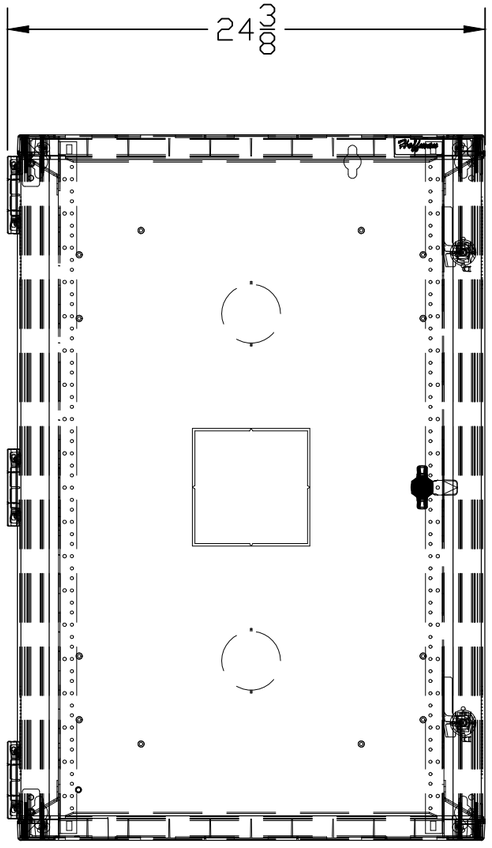
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Bill of Materials

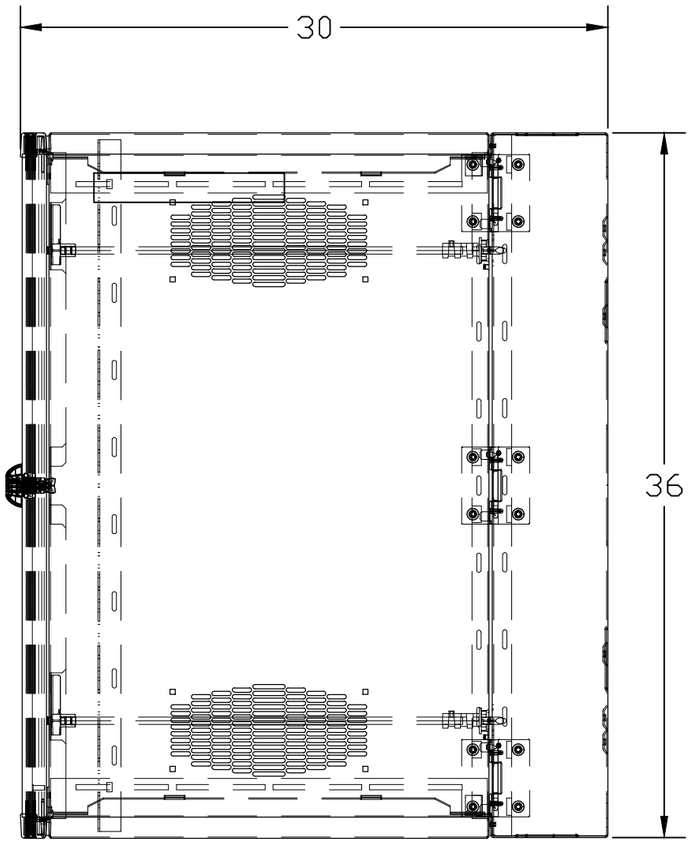
Project: Coos Bay Wastewater Treatment Plant 1 Phase 1A Improvements
Specification Section(s): Section 40 95 80 – Fiber Optic Communication System
Date: September 2025

Item No.	Qty.	Network Interface Panel	Description	Manufacturer	Manufacturer Part Number	Specification Section	Drawing
001	1	C60NIP0001	AccessPlus, Double-Hinge, Window, NEMA 1, 36.02" H x 23.62" W x 30.01" D	Hoffman	EWMW362430	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
002	1	C60NIP0001	CableTek Horizontal Cable Manager, 2U, Double-Sided	Hoffman	DCHD2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
003	1	C60NIP0001	Power Distribution Unit, 10 Receptacle, 20 Amp	Hoffman	DP1N191020	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
004	1	C60NIP0001	Adjustable Vented Shelf	Hoffman	ESHVA19	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
005	1	C60NIP0001	Q-Series Rackmount Enclosure, 2U	Ortronics	EQ02U-CHC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
006	6	C60NIP0001	6-LC Single-Mode Adapters w/ Ceramic Alignment Sleeves	Ortronics	OFP-LCD12AC	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
007	1	C60NIP0001	Modular Managed Ethernet Switch, Dual AC	Red Lion	NT24K-AC2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
008	1	C60NIP0001	Module 8 Port 10/100/1000BaseT	Red Lion	NT24K-TX8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
009	2	C60NIP0001	Module-8 SFP Expansion Slots 1000Base Only	Red Lion	NT24K-SFP8	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
010	2	C60NIP0001	SFP Transceiver, Singlemode Gigabit Fiber, 10km	Red Lion	NTSFP-LX-10	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
011	1	C60NIP0001	9PX Lithium Ion Uninterruptible Power Supply, 1500 VA	Eaton	9PX1500RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
012	1	C60NIP0001	9PX Lithium Ion Extended Battery Module	Eaton	9PXEBM48RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
013	1	C60NIP0001	HotSwap Maintenance Bypass PDU	Eaton	EHBPL1500R-PDU1U	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
014	2	C60NIP0001	Fiber Optic Patch Cable, 2 Meter, LC UPC to LC UPC Singlemode Duplex	LANshack	SFPC-SMLCLC-2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
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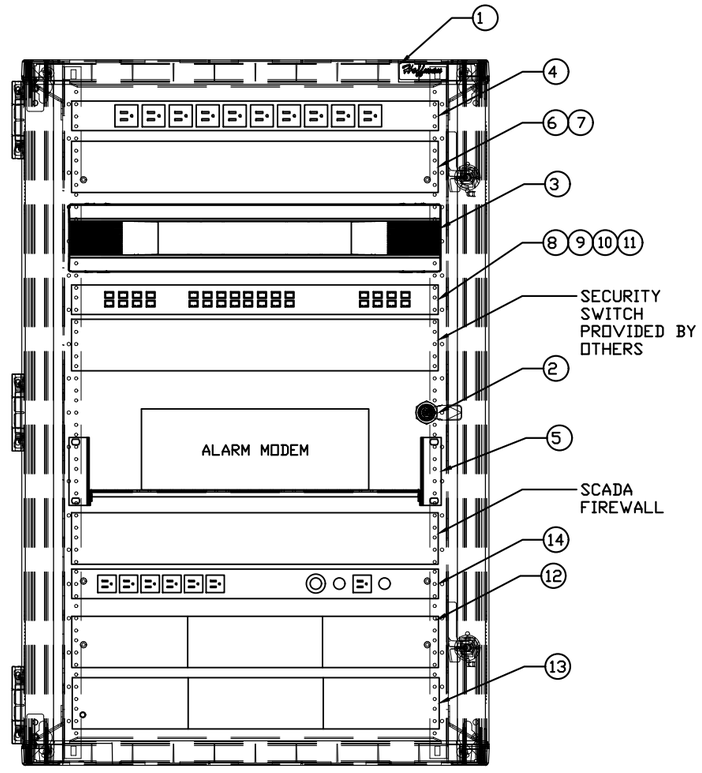
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FRONT VIEW



SIDE VIEW



INTERNAL VIEW

NAMEPLATE SCHEDULE			
PANEL	ITEM	SIZE	DESCRIPTION
C60NIP0001	A	2"x6"x5/16"	C60NIP0001

PARTS LIST		
ITEM	DSECRIPTION	PART #
1	ENCLSOURE, NEMA 1, 36.02Hx23.62Wx30.01D	EWMW362420
2	KEYLOCKING QUARTER-TURN WING KNOB BLK/STL	PTWK
3	CABLE TEK HORIZ. CABLE MANAGER 2U, DBL SIDED	DCHD2
4	POWER DIST. UNIT, 10 RECEPTACLE, 20 AMP	DP1N191020
5	ADJUSTABLE VENTED SHELF	ESHVA19
6	Q-SERIES RACKMOUNT ENCLOSURE, 2U	EQ02U-CHC
7	6-LC SINGLE MODE ADAPTERS W/CERAMIC SLVS.	OFP-LCD12AC
8	MODULAR MANAGED ETHERNET SWITCH, DUAL AC	NT24K-AC2
9	MODULE 8 PORT, 10/100/1000 BASE ONLY	NT24K-TX8
10	MODULE 8 SFP EXPANSION SLOTS 1000 BASE ONLY	NT24K-SFP8
11	SFP TRANSCEIVER, SINGLE MODE GIGABIT FIBER, 10KM	NTSFP-LX-10
12	9PX LITHIUM ION UNINTERRUPTIBLE PS, 1500 VA	9PX1500RT-L
13	9PX LITHIUM ION EXTENDED BATTERY MODULE	9PXEBM48RT-L
14	HOT SWAP MAINTENANCE BYPASS PDU	EHBPL1500R-PDU1U

REVISIONS			
REV	DATE	DESCRIPTION	INIT
H			
G			
F			
E			
D			
C			
B	2024.3.5	SCADA FIREWALL	HAD
A	2023.12.13	Original Draft	KCD

OPTIMAL CONTROL SYSTEMS
2324 THREE LAKES RD / PO BOX 462
ALBANY, OR 97321
PHONE (541) 967-9323 FAX (541) 967-9485

CLIENT McCLURE & SONS

TITLE COOS BAY WASTE WATER TREATMENT PLANT
C60NIP0001 LAYOUT DRAWING

DRAWN KCD	ISSUED	JOB NO. 0723-08MSI	
CHECKED ME	DATE 2023.10.23	DWG NO. 0723-08MSI-C60	
APPROVED HAD	SCALE NONE	SHEET 1 OF 1	

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ACCESSPLUS DOUBLE-HINGE, TYPE 1



INDUSTRY STANDARDS

UL 2416; Type 1; File No. E230874
cUL Listed per CSA C22.2 No. 182.4

EIA 310-D
NEMA/EEMAC Type 1
EIC 60529 IP20
Per BICSI TDMM Tenth edition, Chapter 7, Telecommunication Enclosures (TE)

APPLICATION

AccessPlus Cabinets provide security, equipment access, cooling and support for network and other 19-in. rack-mount equipment. The cabinet has three components: front door, center section and wall section.

FEATURES

- Double-hinged for easy equipment access; center section provides 19-in. rack mounting per EIA universal spacing and is accessed through the front door or swing the center section away from the wall section for rear access
- Round corners; no sharp edges
- Front door has either a solid steel or hardened, tinted safety-glass window door for superior scratch resistance
- Center section easily removed from rear section; tool-less one-person installation possible
- Self-grounding, plated steel rack angles fully adjustable within center section
- Wall section provides cable entry and cable management with knockouts or gland plates
- Gland plate model provides easy retrofit and fast installation and allows for pre-terminated cables or pre-wired patch panels; no need to re-terminate and test
- Self-locking center-to-wall section latches in two locations
- Front access to all latches (no exposed side latches); cabinet can be installed tightly in corners
- Vented sides provide cross flow ventilation to improve heat dissipation
- Vertical cable manager included in 28-in.-wide models
- A full line of accessories is available
- One set of plated, self-grounding, tapped 10-32 rack angles per EIA universal spacing standards, which can be adjusted front-to-back, is provided with each center section of the cabinet; additional tapped- or square-hole rack angles can be added to the cabinet to provide additional mounting

SPECIFICATIONS

Front Door (window or solid steel)
- Composite frame (injection molded top and bottom with extruded composite sides)
- 140-degree opening door
- Field-reversible (left or right) hinge
- Quarter-turn key lock, two keys included
- Window door is scratch-resistant 1/4-in. tinted safety glass
- Solid door has 16 gauge steel insert with matching black finish

Center Section
- Welded 14 gauge steel
- Solid top of center sections provides protection against falling debris
- Ventilated sides (to which fans can be added)
- Self-latching closure connects center section to wall section
- Self-alignment ramp supports center section to wall section
- Heavy duty center-to-rear section hinge with quick-release self-retained hinge pin eases wall installation

Rack-Mounting Angles
- 12 gauge, plated steel
- EIA universal spaced 19-in. rack-mounting holes
- RU marked from bottom to top
- Tapped 10-32 holes, 20 mounting screws included

Rear Wall Section
- Welded 14 gauge steel
- Radius corners; no sharp edges
- Available with knockouts or gland plates
- Raised pads for accessory mounting
- Cable tie-down points for cable management
- Keyhole mounting holes allow wall section to be mounted over fasteners and eases installation
- Three cable-entry grommets

FINISH

Pretreated steel coated with RAL 9005 black light-textured, low-gloss polyester powder paint. Other finishes available—contact nVent HOFFMAN Customer Service.

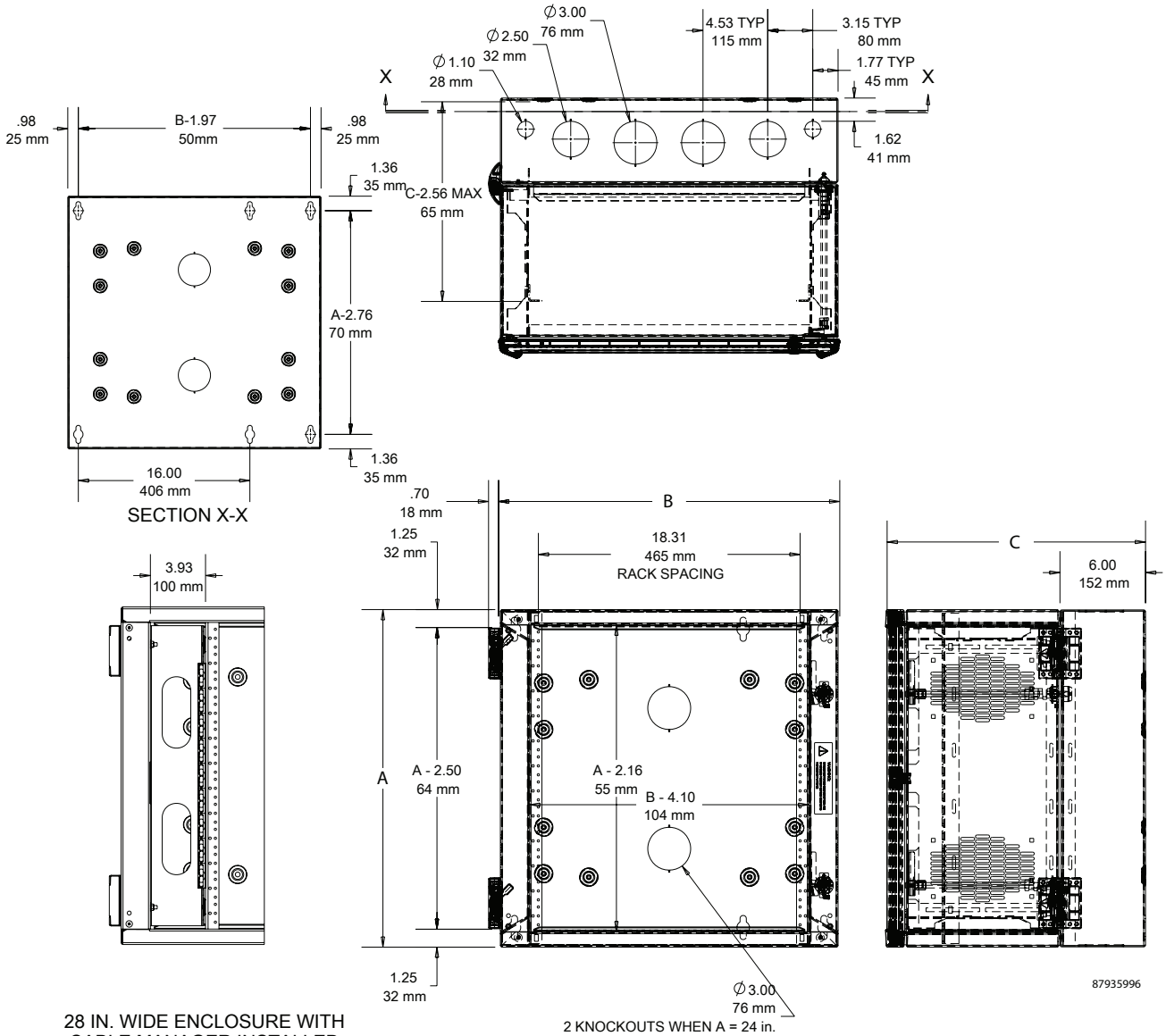
BULLETIN: DWDH1

Standard Product **Window Door**

Catalog Number	AxBxC in.	AxBxC mm	Rack Units	Additional Rack Angles*
EWMW162418	16.75 x 24.41 x 18.20	425 x 620 x 462	8	EWMR16T or EWMR16S
EWMW242418	23.60 x 23.62 x 18.20	600 x 600 x 462	12	EWMR24T or EWMR24S
EWMW362418	36.02 x 23.62 x 18.20	915 x 600 x 462	19	EWMR36T or EWMR36S
EWMW482418	48.03 x 23.62 x 18.20	1220 x 600 x 462	26	EWMR48T or EWMR48S
EWMW602418	60.04 x 23.62 x 18.20	1525 x 600 x 462	32	EWMR60T or EWMR60S
EWMW722418	72.05 x 23.62 x 18.20	1830 x 600 x 462	39	EWMR72T or EWMR72S
EWMW162425	16.75 x 24.41 x 25.10	425 x 620 x 638	8	EWMR16T or EWMR16S
EWMW362425	36.02 x 23.62 x 25.09	915 x 600 x 637	19	EWMR36T or EWMR36S
EWMW242425	23.62 x 23.62 x 25.09	600 x 600 x 637	12	EWMR24T or EWMR24S
EWMW482425	48.03 x 23.62 x 25.09	1220 x 600 x 637	26	EWMR48T or EWMR48S
EWMW602425	60.04 x 23.62 x 25.09	1525 x 600 x 637	32	EWMR60T or EWMR60S
EWMW722425	72.05 x 23.62 x 25.09	1830 x 600 x 637	39	EWMR72T or EWMR72S
EWMW242430	23.62 x 23.62 x 30.01	600 x 600 x 762	12	EWMR24T or EWMR24S
EWMW362430	36.02 x 23.62 x 30.01	915 x 600 x 762	19	EWMR36T or EWMR36S
EWMW482430	48.03 x 23.62 x 30.01	1220 x 600 x 762	26	EWMR48T or EWMR48S
EWMW242436	23.60 x 24.41 x 37.50	599 x 620 x 953	12	EWMR24T or EWMR24S
EWMW362436	36.00 x 24.41 x 37.50	914 x 620 x 953	19	EWMR36T or EWMR36S
EWMW482436	48.00 x 24.41 x 37.50	1219 x 620 x 953	26	EWMR48T or EWMR48S

B dimension does not include wall-to-center section hinge.

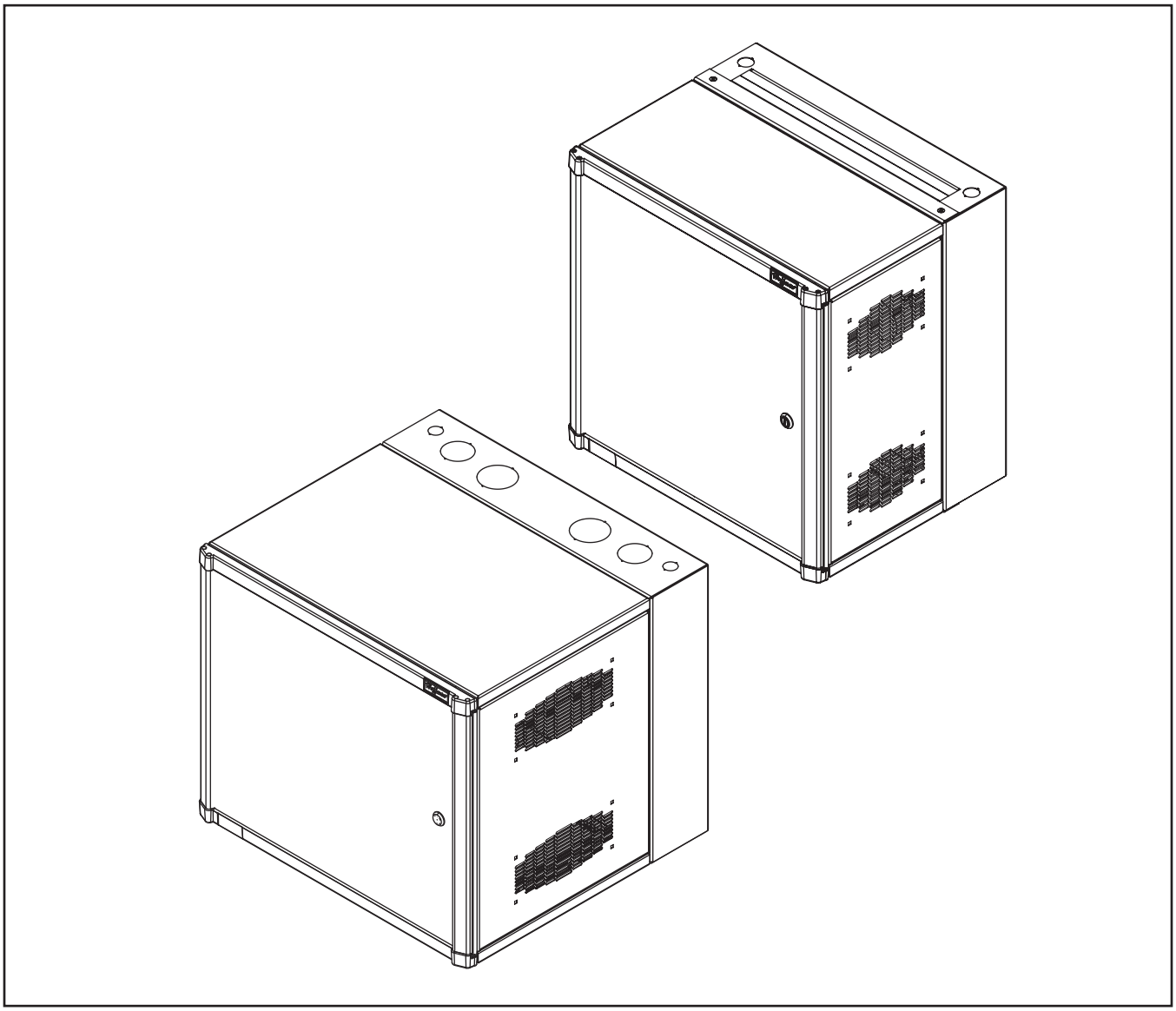
*Catalog numbers ending in S are square hole and numbers ending in T are tapped holes.



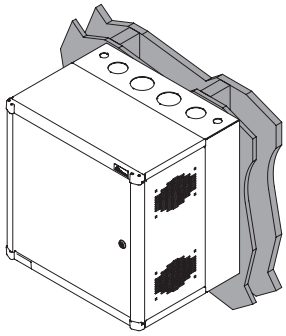
28 IN. WIDE ENCLOSURE WITH CABLE MANAGER INSTALLED (SHOWN WITH DOOR REMOVED)

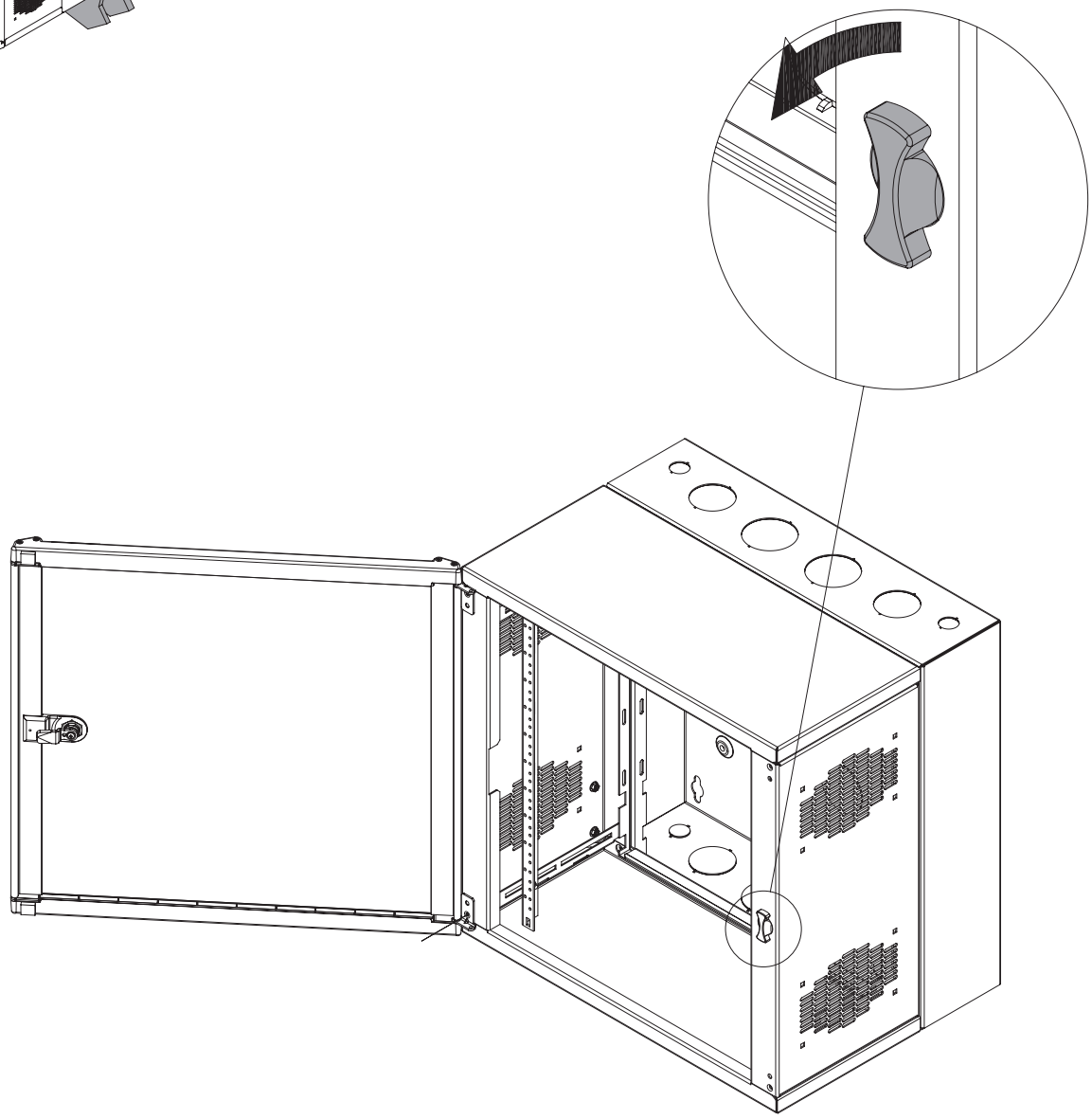
2 KNOCKOUTS WHEN A = 24 in.
3 KNOCKOUTS FOR ALL OTHER ENCLOSURES
(SHOWN WITH DOOR REMOVED)

AccessPlus



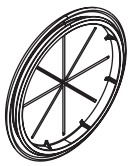
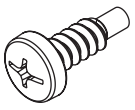
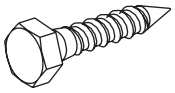
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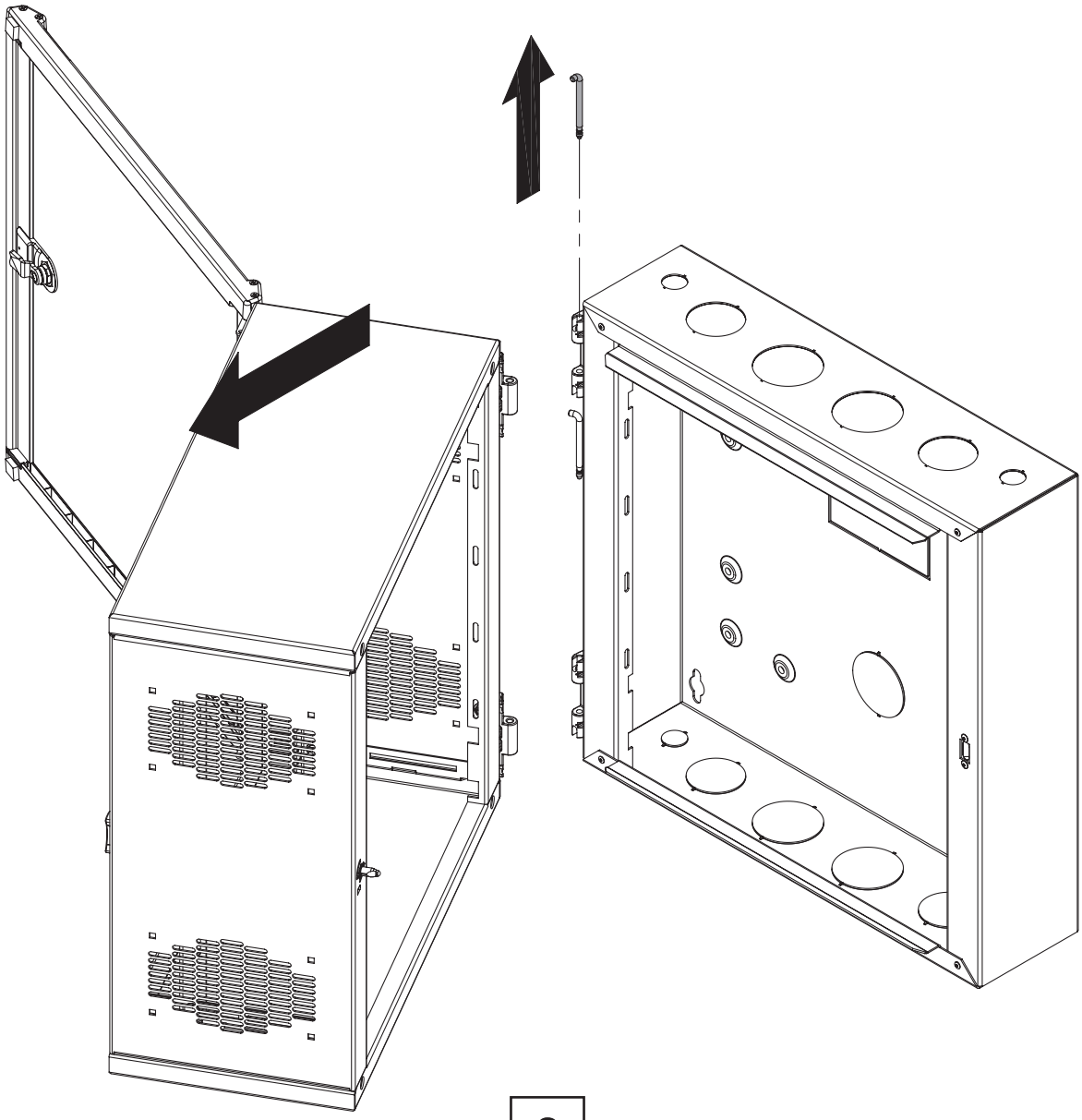




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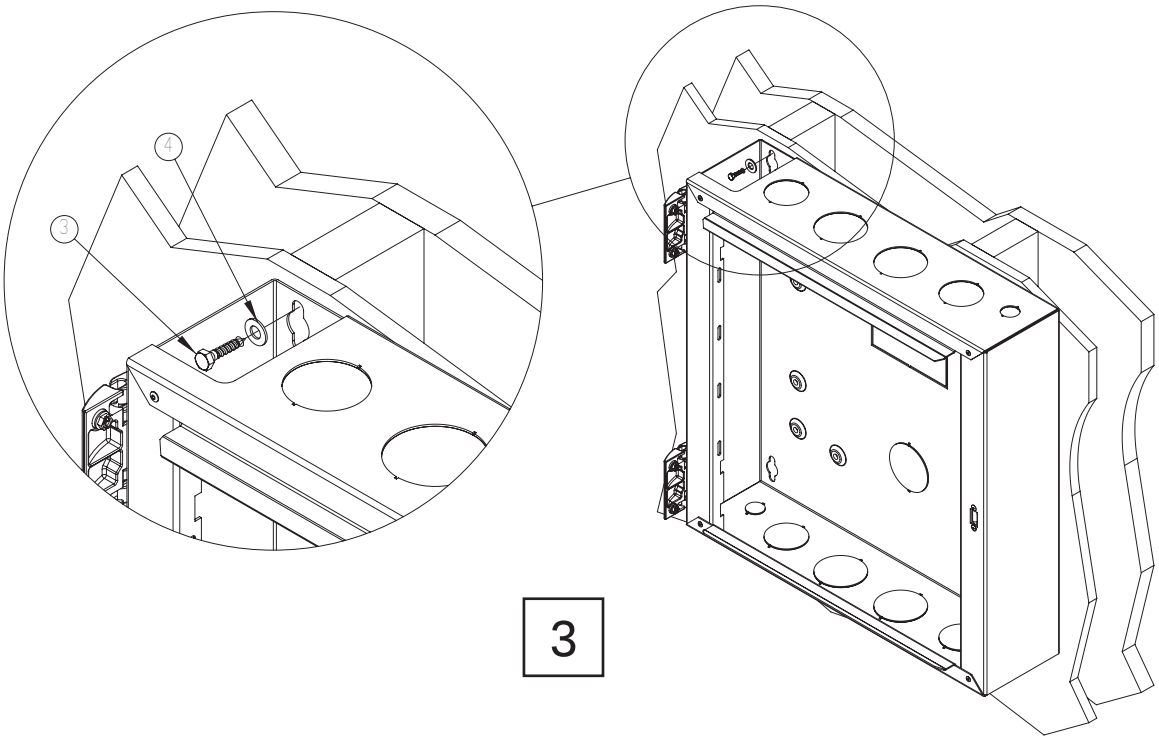
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1  (3X)	2 10-32X5/8  (20X)
3 3/8 (10mm)  Customer Supplied Suministrado al cliente Fourni par le client (0X)	4 3/8 (10mm)  Customer Supplied Suministrado al cliente Fourni par le client (0X)

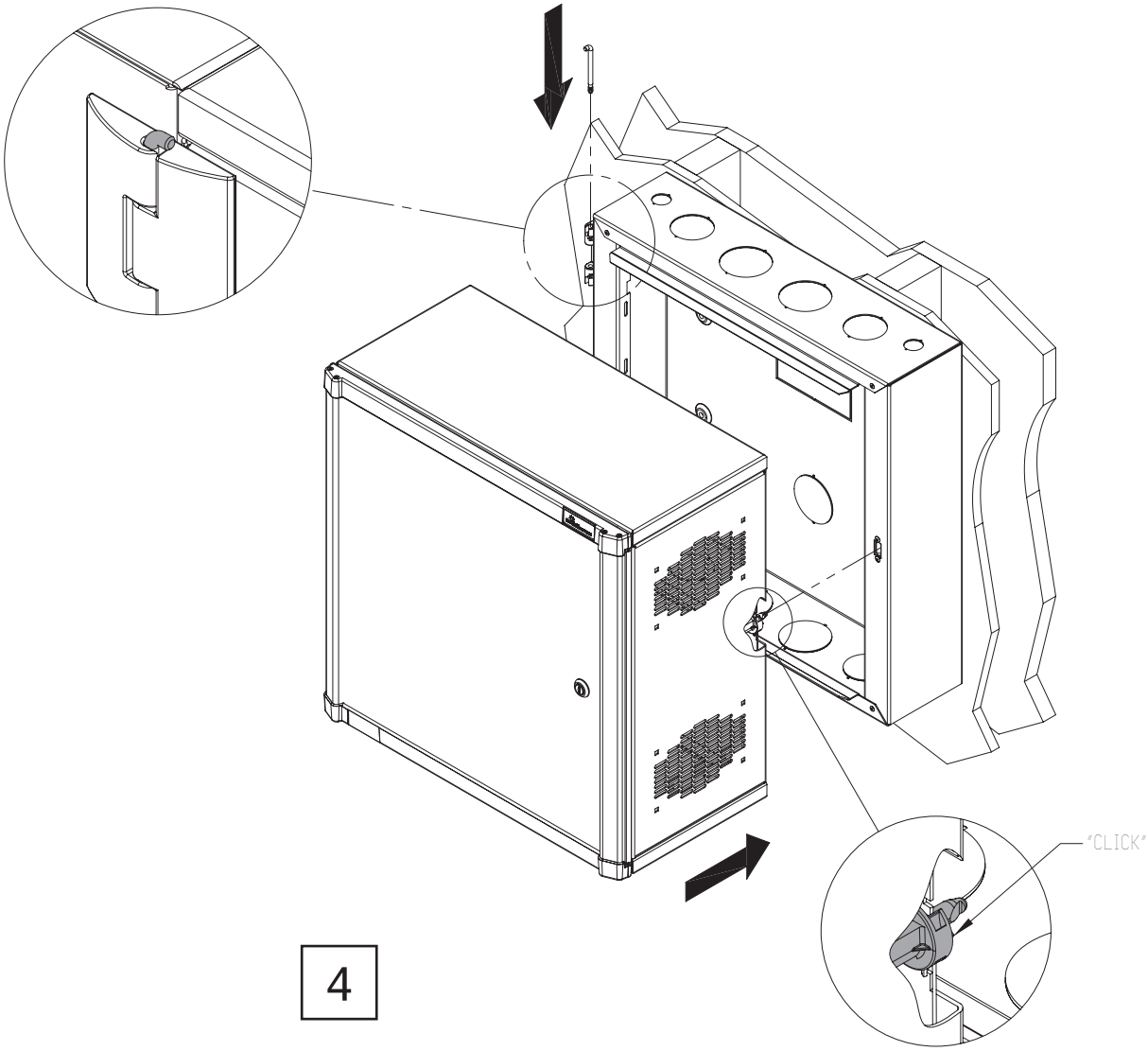


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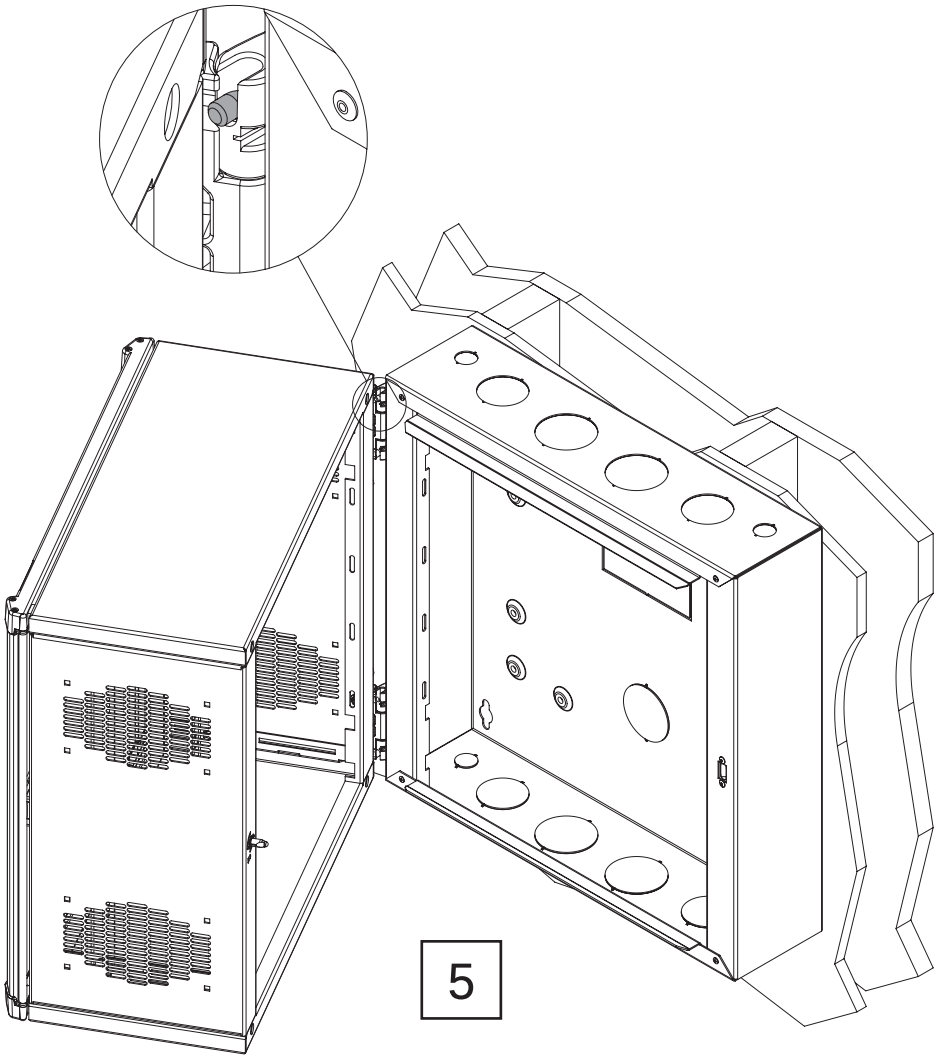


3



4

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Load Rating
Capacité de charge
Clasificación de carga

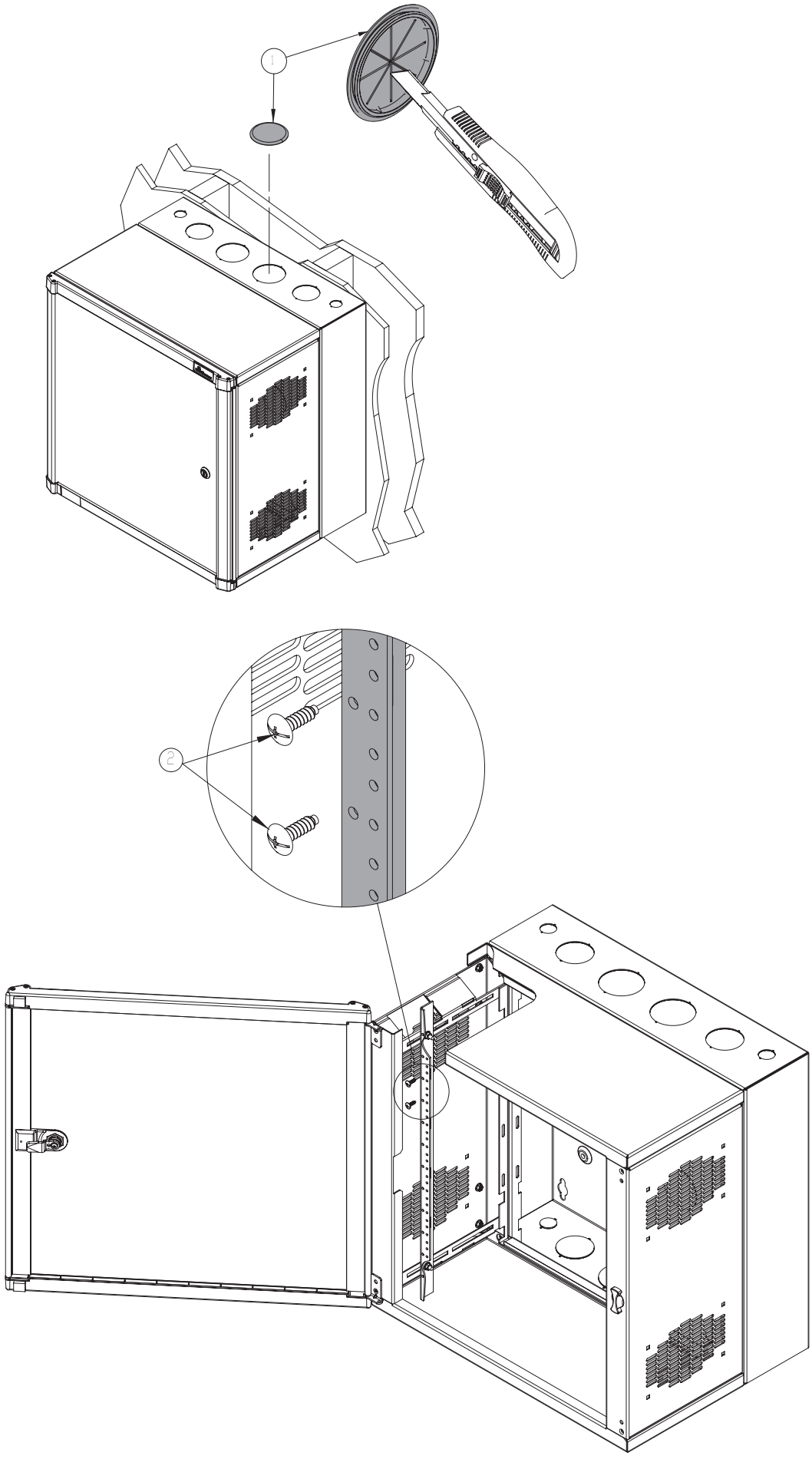
Height Hauteur Altura	Load Capacity Capacité nominale Capacidad de carga
16 in. [406 mm]	250 lbs. [114 kg]
24 in. [610 mm]	250 lbs. [114 kg]
36 in. [914 mm]	300 lbs. [136 kg]
48 in. [1219 mm]	350 lbs. [159 kg]
60 in. [1524 mm]	400 lbs. [181 kg]
72 in. [1829 mm]	500 lbs. [227 kg]

Cabinets were tested to 2X the above load capacities without failure. Contact nVent HOFFMAN if other loading specifications are required.

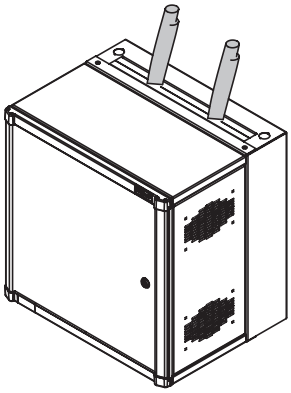
Les armoires ont été testées à deux fois leur capacité nominale sans défaillance.
Communiquez avec nVent HOFFMAN si d'autres caractéristiques techniques de charge sont requises.

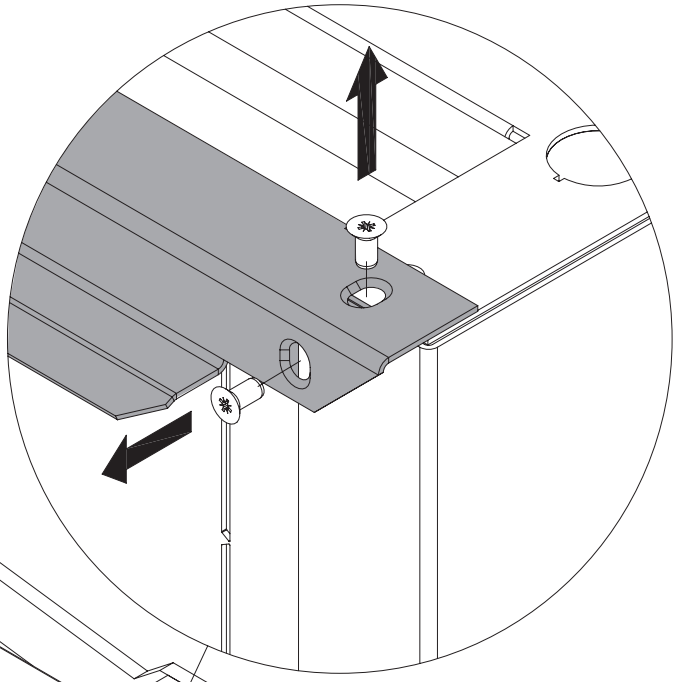
Los gabinetes se sometieron a una prueba dos veces superior a las capacidades de carga que se indican en la tabla y no arrojaron ninguna falla.
Si necesita información sobre cualquier otra especificación de carga, comuníquese con nVent HOFFMAN.

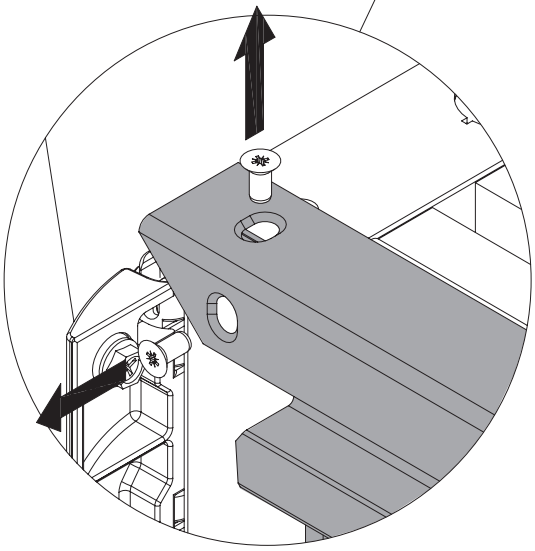
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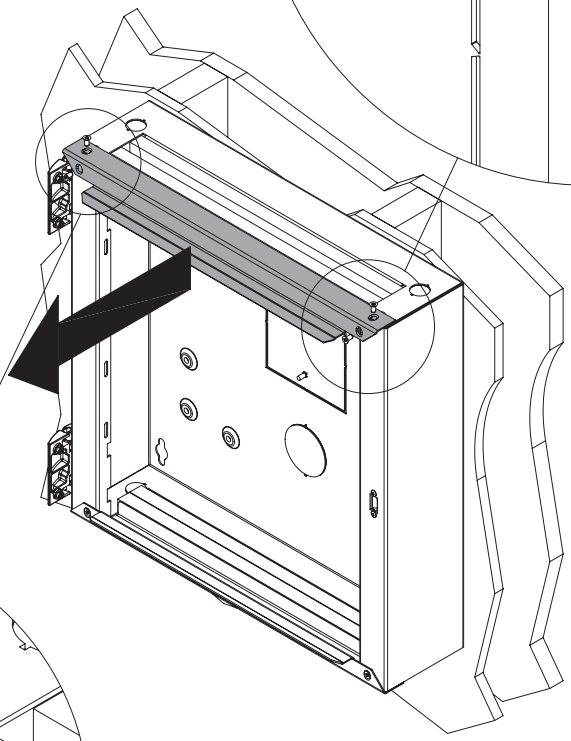


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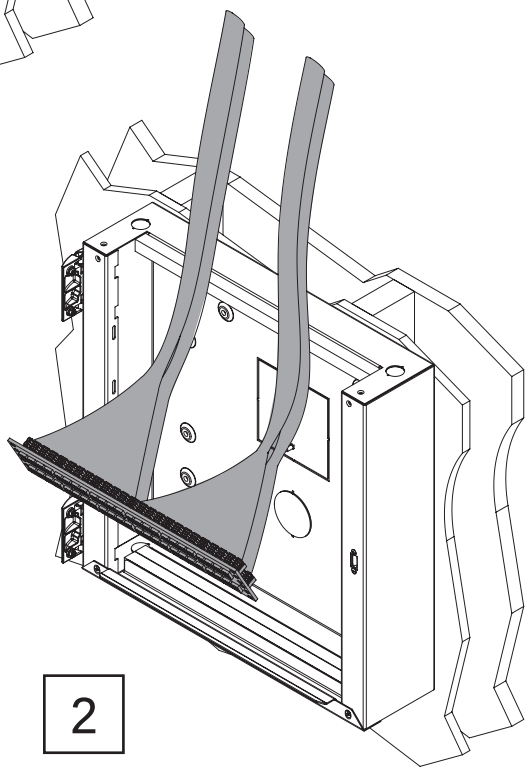






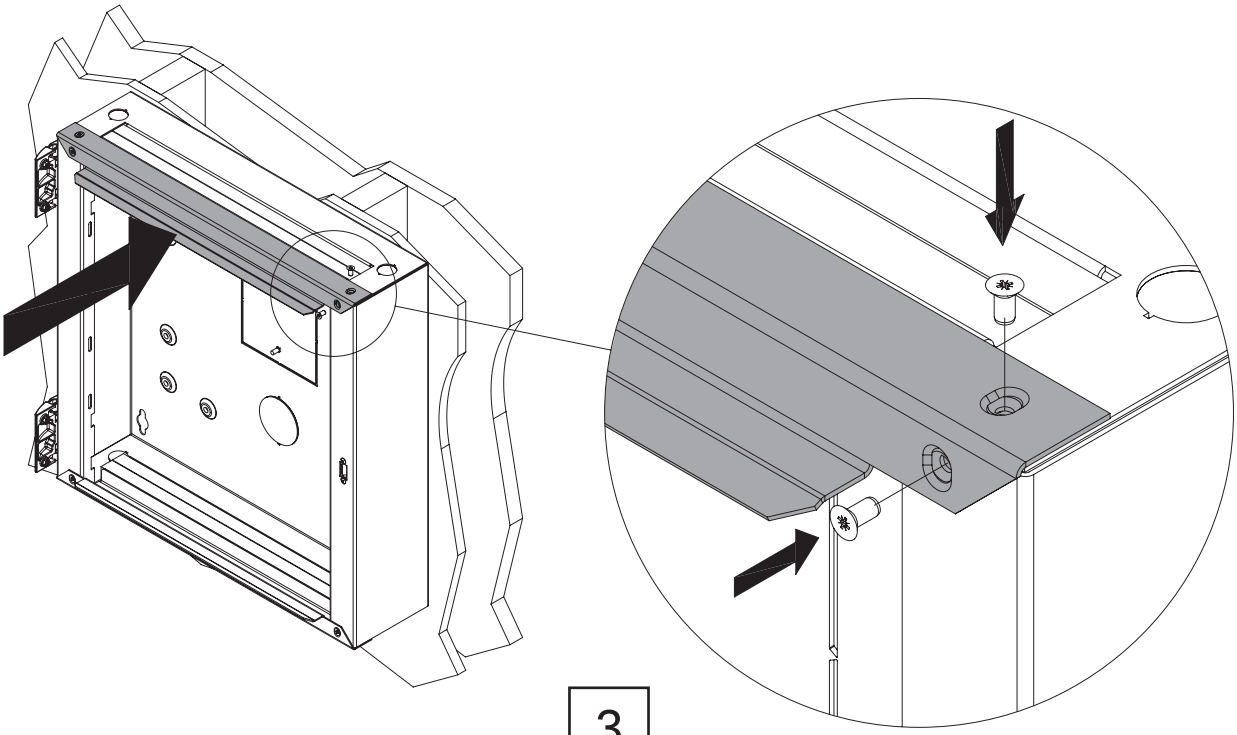


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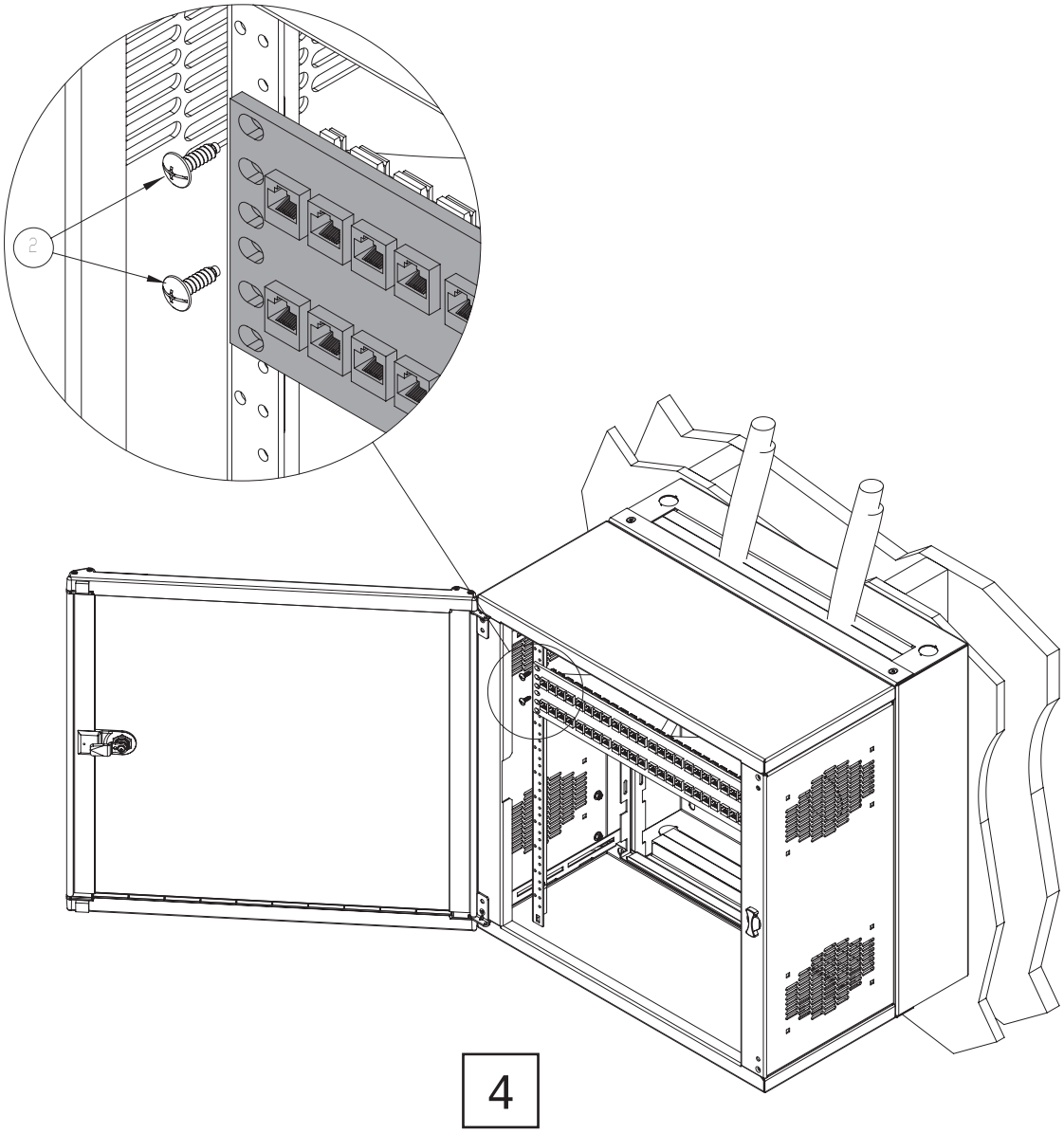


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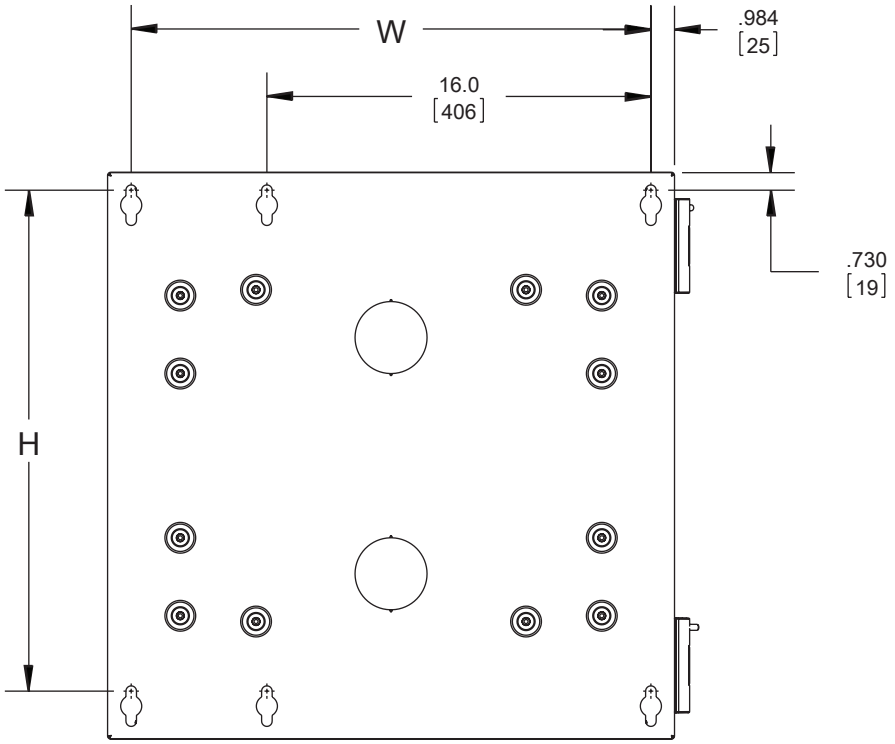
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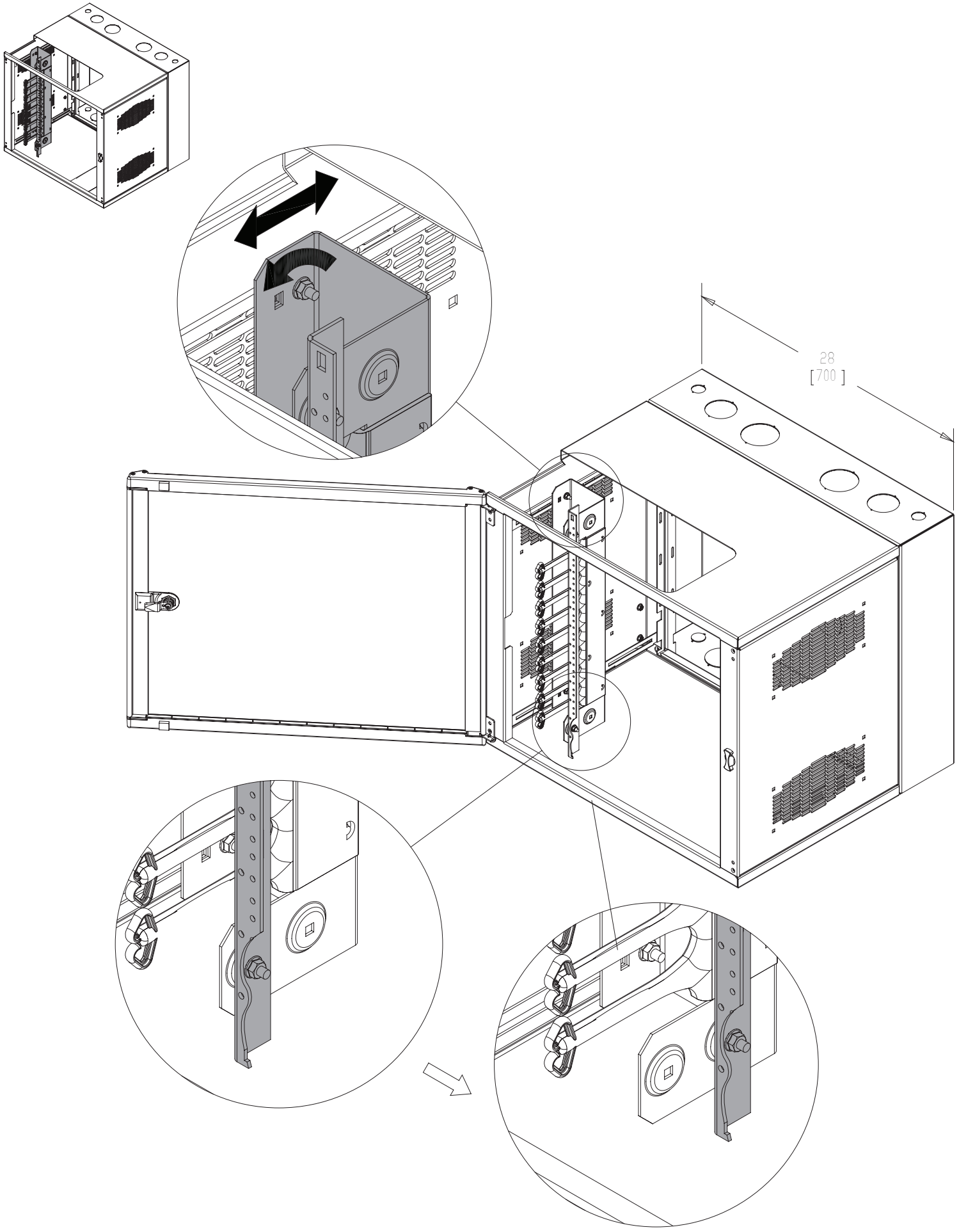
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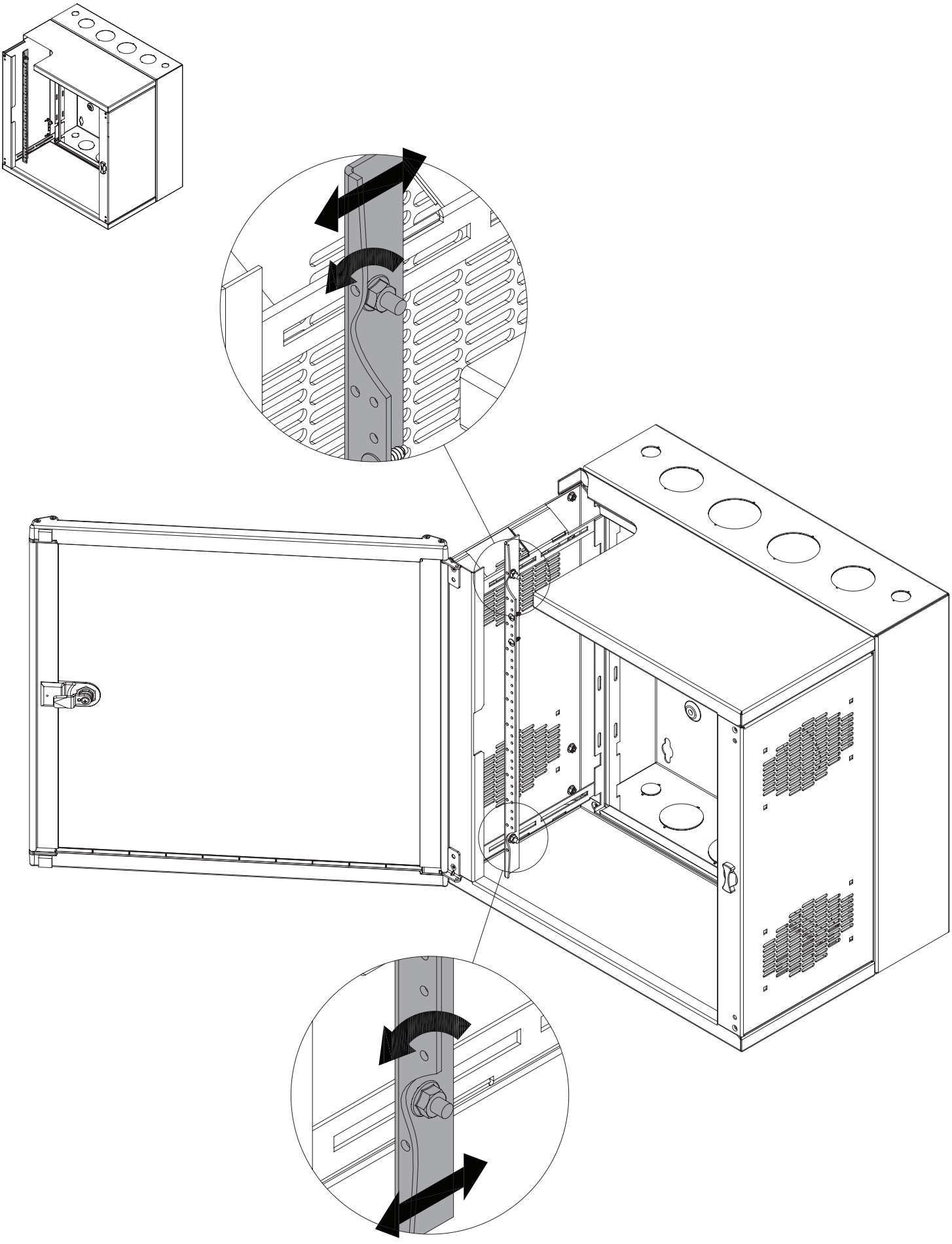
Catalog Number Référence Catalogue Número de Catálogo			Enclosure Size Taille De Clôture Tamaño del Recinto	H	W
EWMW162418	----	----	16 X 24 X 18	13.00 (330)	21.65 (550)
EWMW242418	EWMS242418	EWMWG242418	24 X 24 X 18	20.87 (530)	21.65 (550)
EWMW362418	EWMS362418	EWMWG362418	36 X 24 X 18	33.27 (845)	21.65 (550)
EWMW482418	EWMS482418	EWMWG482418	48 X 24 X 18	45.28 (1150)	21.65 (550)
EWMW602418	----	----	60 X 24 X 18	57.29 (1455)	21.65 (550)
EWMW722418	----	----	72 X 24 X 18	69.30 (1760)	21.65 (550)
EWMW162425	----	----	16 X 24 X 25	13.00 (330)	21.65 (550)
EWMW242425	EWMS242425	EWMWG242425	24 X 24 X 25	20.87 (530)	21.65 (550)
EWMW362425	EWMS362425	EWMWG362425	36 X 24 X 25	33.27 (845)	21.65 (550)
EWMW482425	EWMS482425	EWMWG482425	48 X 24 X 25	45.28 (1150)	21.65 (550)
EWMW602425	----	----	60 X 24 X 25	57.29 (1455)	21.65 (550)
EWMW722425	----	----	72 X 24 X 25	69.30 (1760)	21.65 (550)
EWMW242825	----	----	24 X 28 X 25	20.87 (530)	25.29 (650)
EWMW362825	----	----	36 X 28 X 25	33.27 (845)	25.29 (650)
EWMW482825	----	----	48 X 28 X 25	45.28 (1150)	25.29 (650)
EWMW242430	EWMS242430	----	24 X 24 X 30	20.87 (530)	21.65 (550)
EWMW362430	EWMS362430	----	36 X 24 X 30	33.27 (845)	21.65 (550)
EWMW482430	----	----	48 X 24 X 30	45.28 (1150)	21.65 (550)
EWMW242436	EWMS242436	EWMWG242436	24 X 24 X 36	20.87 (530)	21.65 (550)
EWMW362436	EWMS362436	EWMWG362436	36 X 24 X 36	33.27 (845)	21.65 (550)
EWMW482436	EWMS482436	----	48 X 24 X 36	45.28 (1150)	21.65 (550)
----	----	EWMWG242825	24 X 28 X 25	20.87 (530)	25.60 (650)
----	----	EWMWG362825	36 X 28 X25	33.27 (845)	25.60 (650)
----	----	EWMWG482825	48 X 28 X 25	45.28 (1150)	25.60 (650)



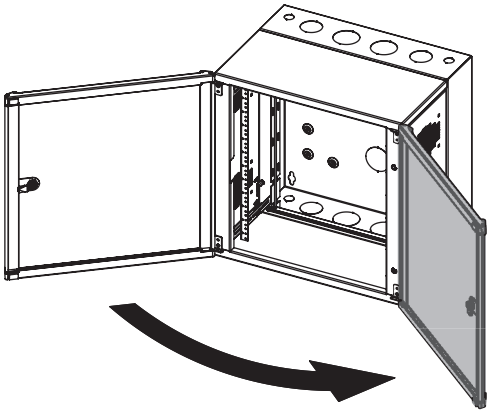
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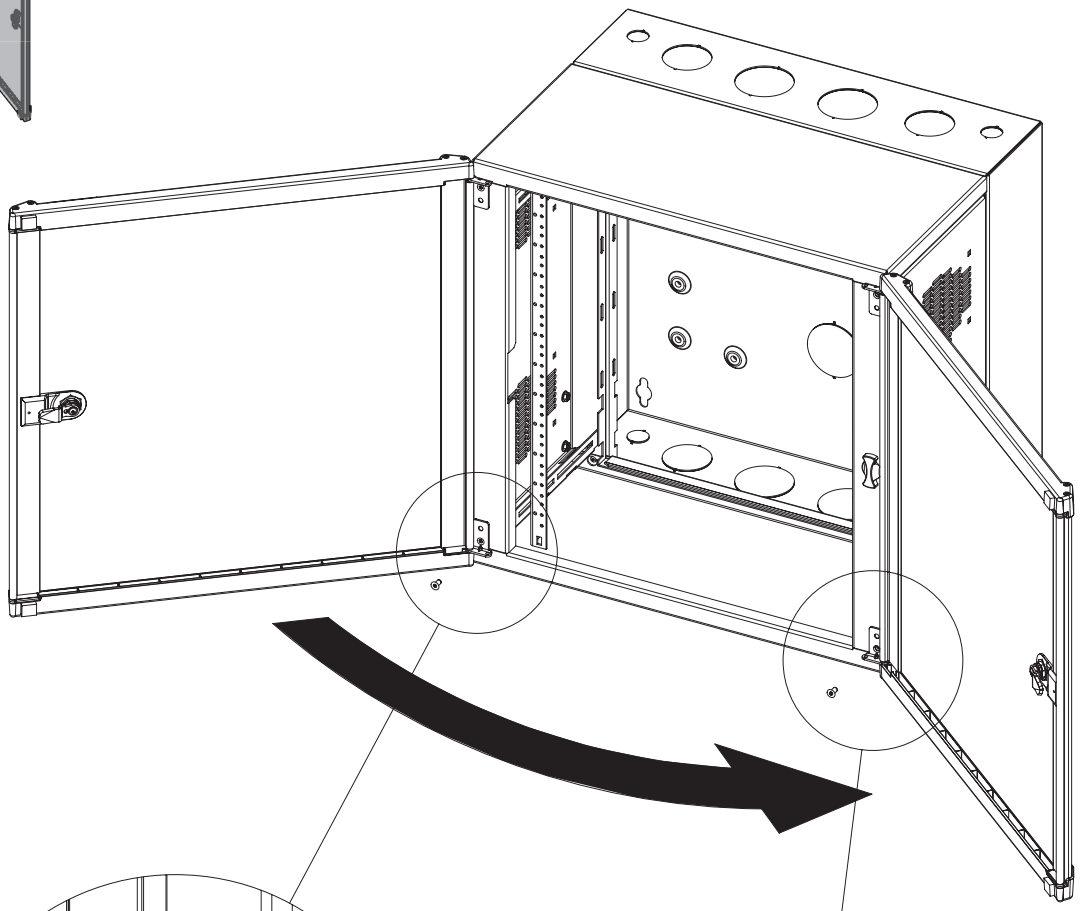


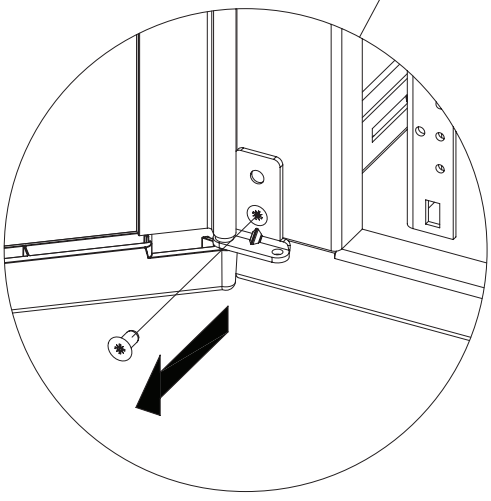
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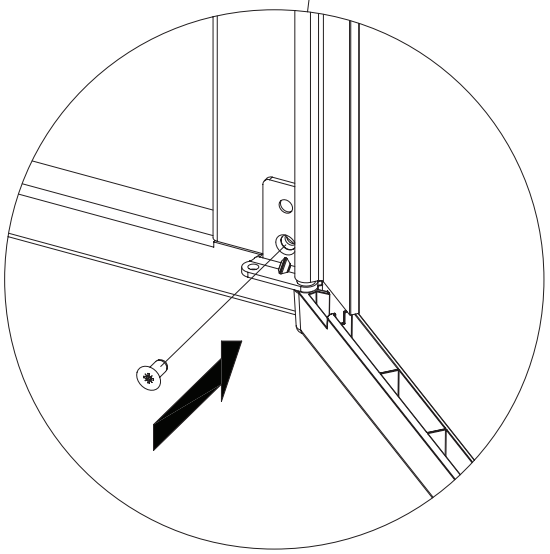
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2X



2X

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Guide to Mounting and Squaring Enclosures

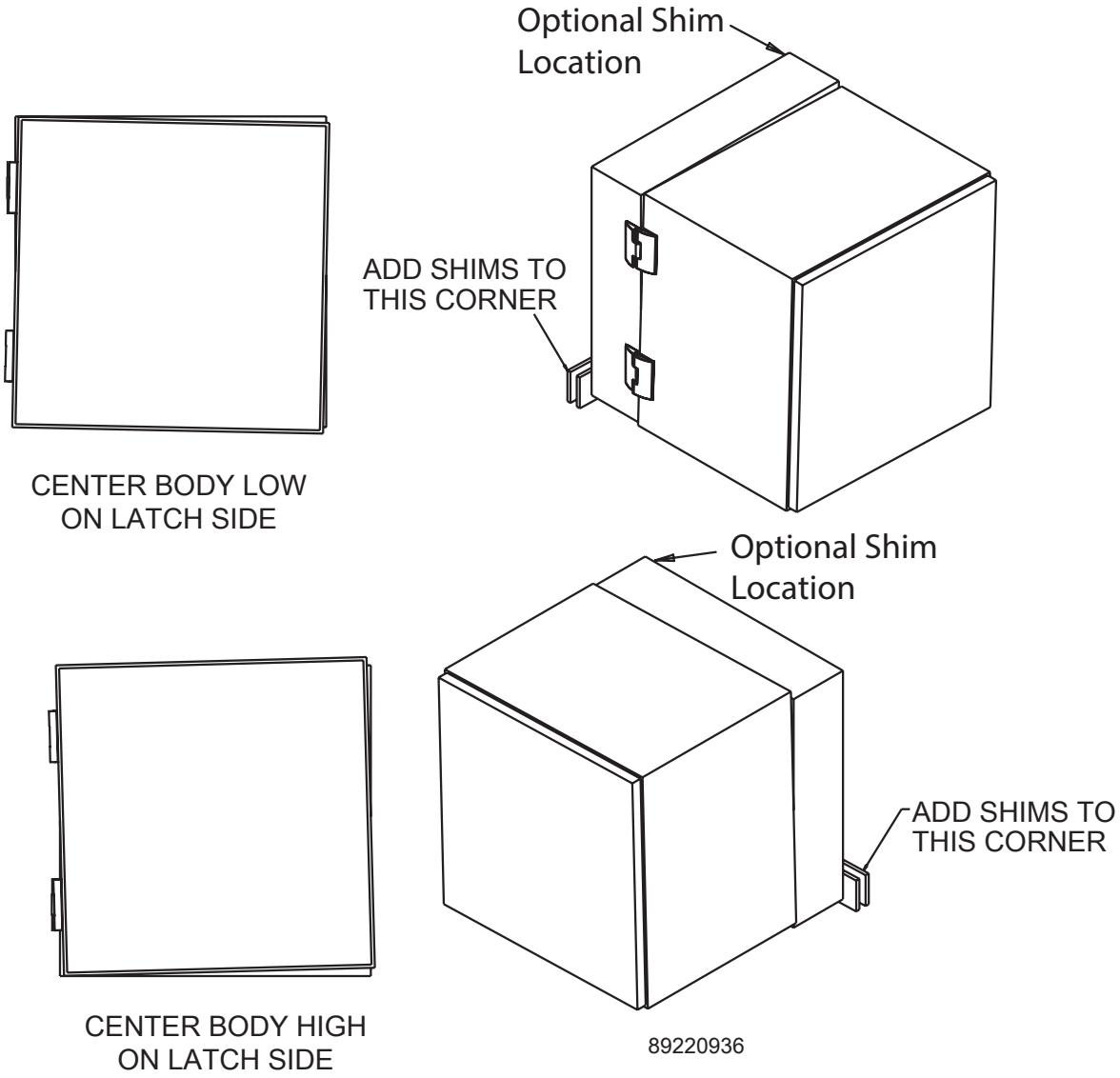
nVent HOFFMAN'S industry-leading enclosures are designed to provide years of reliable service when properly mounted, leveled and maintained. The following recommendations will help ensure that Hoffman enclosures are installed correctly.

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Double-Hinge Mounting

Double-Hinge Enclosure Mounted on Walls or Unistrut Frames

Hoffman double-hinge enclosures are designed for mounting on rigid, flat surfaces or walls. After mounting, add shims to enclosures as required to ensure the sealing contact surface and the enclosure are square. This is necessary for the door to close correctly and provide a reliable seal. To square enclosures mounted on a wall or Unistrut frame, add shims as shown below. Shims should be made of a material such as stainless steel, aluminum, nylon, or plastic to reduce corrosion.



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CABLETEK HORIZONTAL CABLE MANAGER



DCHD2 shown



Arrowhead fingers funnel cable into base and hold it securely



DCHS4 shown



Vertical and horizontal cable manager system installed on a 2-post rack. Vertical and horizontal cable managers work together to make an orderly installation.

INDUSTRY STANDARDS
EIA 310-D

APPLICATION
This cable manager features heavy-duty endposts, arrowhead fingers and tool-less mounting to easily route copper and fiber data cables horizontally in standard 19-in. cabinets or on 2- or 4-post open frame racks.

FEATURES
- Snap-in mounting provision holds cable manager in place while mounting screws are installed
- Robust arrowhead fingers are shaped to funnel cables into base and are made of black composite material
- Robust rounded end posts support cable as it enters and leaves cable manager and maintains proper cable bend radius
- Deep cable compartments allow maximum cable density
- Rounded edges throughout protect cable jackets from damage
- Pass-through holes on double-sided models protect cable while facilitating routing between front and back sides
- Single- and double-sided units provide high cable capacity, including fiber and copper category cables
- 1 RU and 2 RU heights allow greater flexibility in optimizing rack capacity
- Removable hinged cover opens top or bottom, snaps closed for assured cable protection and professional appearance
- Double-sided model has covers on both front and back
- Covers stay open during installation and maintenance procedures
- Horizontal and vertical cable managers designed as a system for streamlined appearance and improved functionality
- Combination head 10-32 and 12-24 screws included for mounting

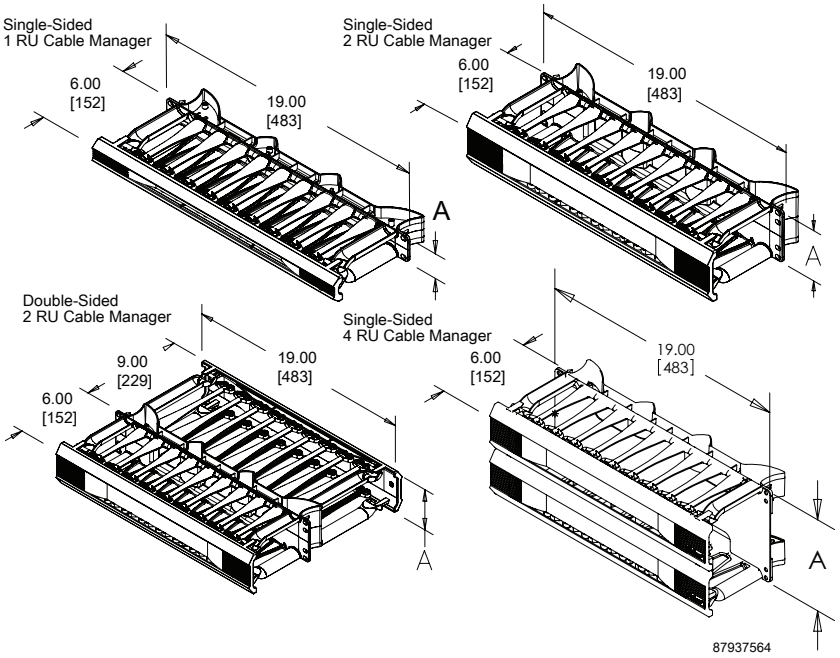
SPECIFICATIONS
- Made of UL listed black composite material

FINISH
Low gloss, matches look of RAL 9005 textured paint

BULLETIN: DACCY

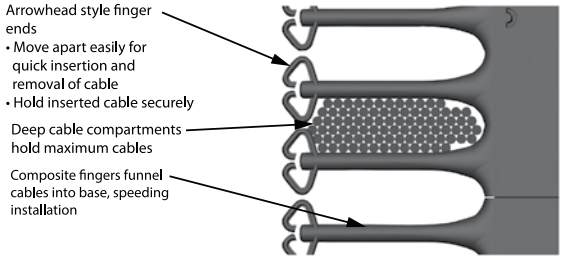
Standard Product **CABLETEK Horizontal Cable Managers; 60% Cable Manager Fill Rate**

Catalog Number	Description	Rack Units	A in./mm	Front Cross-Section Area (in.^{2})	Front Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Front Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Front Cable Fill Rate 60% 6A Cable (0.30-in. dia.)	Back Cross-Section Area (in.^{2})	Back Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Back Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Back Cable Fill Rate 60% 6A Cable (0.30-in. dia.)
DCHS1	Single-Sided	1	1.75 44	4.2	66	57	35	–	–	–	–
DCHS2	Single-Sided	2	3.50 89	13.2	208	161	112	–	–	–	–
DCHD2	Double-Sided	2	3.50 89	13.2	208	161	112	14.1	223	172	119
DCHS4	Single-Sided	4	7.0 178	26.9	416	322	224	–	–	–	–



Arrowhead Cable Capacity; 60% Fill Rate

Location	Cross-Section Area (in.^{2})	5e Cable (0.22-in. dia.)	6 Cable (0.25-in. dia.)	6A Cable (0.30-in. dia.)
Front	5.52	90	67	46
Back	9.27	145	113	78



RACK- AND PANEL-MOUNT POWER DISTRIBUTION UNITS (PDUS)



FEATURES

- Power on/off LED indicates whether power is available at the PDU
- External ground stud provided on single-phase models for secure grounding
- Circuit breakers provide additional equipment protection
- Circuits are isolated on dual circuit model; each has its own circuit breaker
- Reset button provides easy access to circuit breaker reset
- Surge protector models have an indicator LED to verify surge circuitry protection
- Rack-mount models mount directly to rack or with adapter bracket
- Rack-mount models designed for single-phase applications
- Panel-mount models can be mounted flush or with hanging bracket

SPECIFICATIONS

- Steel housing
- Power cord with molded-on plug:
  - 12-in. (305-mm) long single-phase model: 6 ft. (1.8 m)
  - Other single-phase models: 15 ft. (4.6 m)

Contact Hoffman for custom modifications and non-standard offerings.

FINISH

Black, low-gloss textured paint.

BULLETIN: DPS

INDUSTRY STANDARDS

UL/cUL 60950 listed
UL 1449 (Surge protector models only)

EIA 310-D (19-in. rack-mount models only)

APPLICATION

Rack- and Panel-Mount PDUs not only provide convenient, reliable power to equipment mounted in cabinets or on open frame racks, they can also be configured to meet a wide range of design specifications.

Standard Product **Single-Phase Rack-Mount**

Catalog Number	Surge Protection	Amp Meter	Load Rating	Voltage (VAC)	Joule Rating	Receptacle Location	No. of Receptacles	Receptacle Style	Power Cord Plug	Rack Units
DP1N190615	No	No	15A	120	–	Front	6	NEMA 5-15R	NEMA 5-15P	1
DP1N191415	No	No	15A	120	–	6 front, 8 back	14	NEMA 5-15R	NEMA 5-15P	1
DP1N191015S	Yes	No	15A	120	2000	2 front, 8 back	10	NEMA 5-15R	NEMA 5-15P	1
DP1N191020	No	No	20A	120	–	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020S	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020ST	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA L5-20P Twist Lock	1

Isolated circuits on dual-circuit models with separate circuit breakers.

Plugs and Receptacles

NEMA Type	Plug	Receptacle
NEMA 15 Amp, 120V, Duplex	5-15P	5-15R
NEMA 20 Amp, 120V, Duplex	5-20P	5-20R
NEMA 20 Amp, 120V, Twist Lock	L5-20P	L5-20R
30 Amp, 120/208V Wye, Twist Lock	L21-30P	L21-30R

IEC Type	Inlet	Outlet
IEC 15 Amp, 125/250V	C-14	C-13
IEC 20 Amp, 125/250V	C-20	C-19

87922518

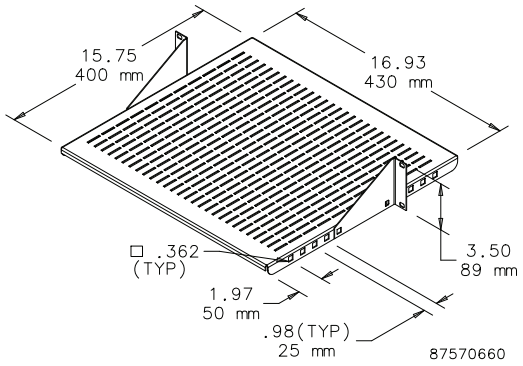
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ADJUSTABLE STEEL VENTED SHELF

Vented shelf adjustable front to back in 25-mm increments. Shelf mounts to either front or rear flange of open frame rack. Steel with textured black polyester powder paint finish.
Load rating: 60 lb. (27.2 kg)

BULLETIN: DACCY

Catalog Number	H x W x D in./mm	Fits Rack	Rack Units
ESHVA19	3.50 x 16.93 x 15.75 89 x 430 x 400	19 in.	2
ESHVA23	3.50 x 19.93 x 15.75 89 x 506 x 400	23 in.	2



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DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure



Overview

The Q-Series fiber enclosure system is designed to support standard density applications in building networks. The all steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 LC fibers in per RU, accepting OFP adapter panels, M2 pre-terminated cassettes, and splice cassettes.

Features

- **Highly Accessible:** Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables
- **Simplified Installation:** The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation
- **Versatile Installation:** Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes
- Max number of fibers per RU (SC) - 36
- Max number of fibers per RU (LC) - 72
- Max number of fibers per RU (12F MPO) - 288
- Max number of fibers per RU (24F MPO) - 576
- Cassette / Adapter panels per RU - 3

Part Number	Description
EQ01U-CHC	Q-Series 1U Standard Density (SD) Rackmount Fiber Enclosure
EQ02U-CHC	Q-Series 2U Standard Density (SD) Rackmount Fiber Enclosure
EQ04U-CVC	Q-Series 4U Standard Density (SD) Rackmount Fiber Enclosure

Dimensions

Part Number	Depth (Metric)	Depth (US)	Height (Metric)	Height (US)	Width (Metric)
EQ01U-CHC	485.90mm	19.13 in.	44.45mm	1.75 in.	434.85mm
EQ02U-CHC	485.90mm	19.13 in.	88.90mm	3.50 in.	434.85mm
EQ04U-CVC	485.90mm	19.13 in.	177.80mm	7.00 in.	434.85mm

DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure

General Information

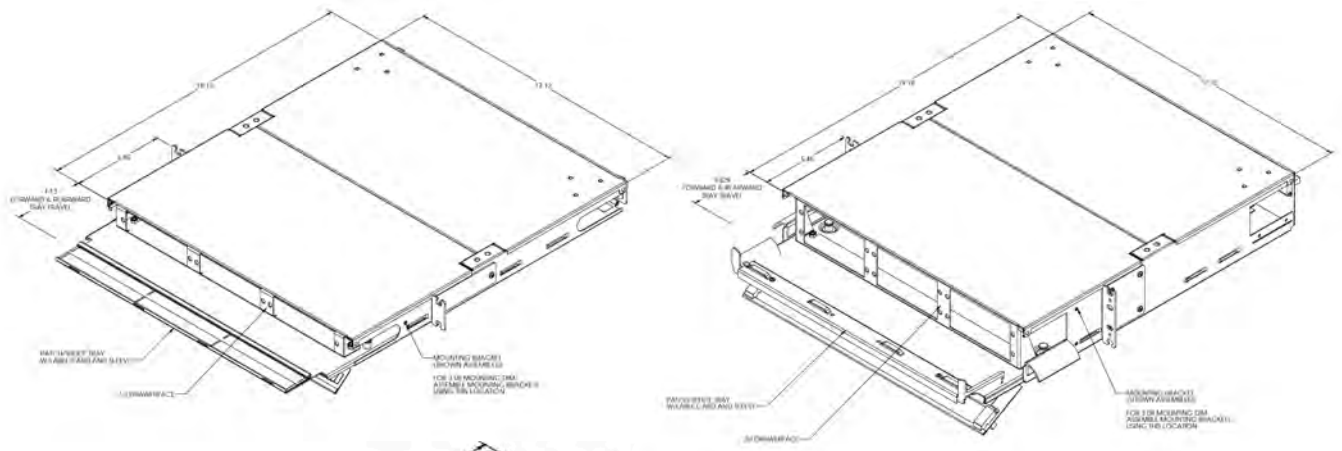
- Color: Black
- Installation: Rack or Cabinet
- Product Series: Q-Series
- Type: Standard Density Fiber Enclosure

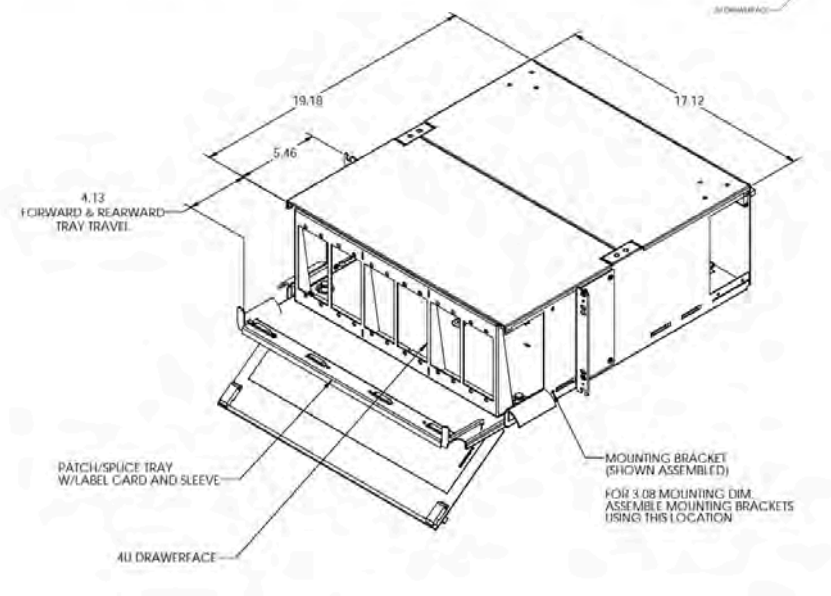
Listing Agencies/Third Party Certifications

- RoHS: Yes

Technical Information

- Mounting Hardware Included: Yes
- Cassette / Adapter Panel Capacity per RU: 3
- SC - Fiber Capacity Per RU: 36
- LC - Fiber Capacity Per RU: 72
- 12F MPO - Fiber Capacity Per RU: 216
- 24F MPO - Fiber Capacity Per RU: 432





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Legrand, North and Central America

60 Woodlawn Street
West Hartford, CT 06110
1.877.BY.LEGRAND (295.3472)
www.legrand.us

Ortronics

2 RU Q-Series Standard Density Rack-Mount Fiber Enclosure

Part No. EQ02U-CHC



The 2U Q-Series Standard Density (SD) footprint fiber enclosure system is designed to support standard density applications in building networks. The all-steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 fibers with LC connectivity and 144 fibers with MDC per Rack Unit (RU), or a maximum capacity of 144 fibers LC and 288 MDC (VSFF), utilizing OFP adapter panels, LM2 pre-terminated cassettes, and M2 splice cassettes.

Features & Benefits

Highly Accessible: Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables

Simplified Installation: The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation

Versatile Installation: Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes - Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Max number of fibers per RU (SC): 36

Max number of fibers per RU (LC): 72

Max number of fibers per RU (12F MPO): 288

Max number of fibers per RU (24F MPO): 576

Cassette / Adapter panels per RU: 3

Specifications

General Info

Product Line	Ortronics	Color	Black
UPC Number	662875019978	Country Of Origin	Mexico
Features	Drawer Slide, Removable Cover	Application Sector	Commercial, Data Center, Industrial
Standard	RoHS;REACH Compliant	Type	Enclosure

Dimensions

Product Width US	17.12 in	Product Depth US	19.13 in

Product Height US	3.5 in

Technical Information

Fiber Optic Cable Type	OM3, OM4, OM5	Compatibility	OFP, M2, LM2
Rack Units	2	Capacity	6 Adapter Panels, 6 Cassettes
Mounting	Rack Mount		

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3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE
4.0 ACCESSORIES PURCHASED SEPERATELY
5.0 ENCLOSURE ASSEMBLY
6.0 INSTALLATION OF ACCESSORIES
7.0 CABLE ROUTING AND INSTALLATION

1.0 GENERAL

This document describes the assembly procedure for the LEGRAND Patch and Splice Rack Mount Enclosures. Part numbers EQ02U-CHC (2 Rack Unit), EQ04U-CVC (4 Rack Unit), EQ02U-KHC (2 Rack Unit HD), EQ04U-KHC (4 Rack Unit HD), EQ02U-KHL-M (2 Magnesium Rack Unit HD), EQ04U-KHL-M (4 Magnesium Rack Unit HD). Hardware is provided for mounting 19" racks.

2.0 TOOLS REQUIRED FOR ASSEMBLY

2.1) #2 Phillips Head Screwdriver – required for enclosure assembly
2.2) #3 Phillips Head Screwdriver – required to mount the enclosure to the rack

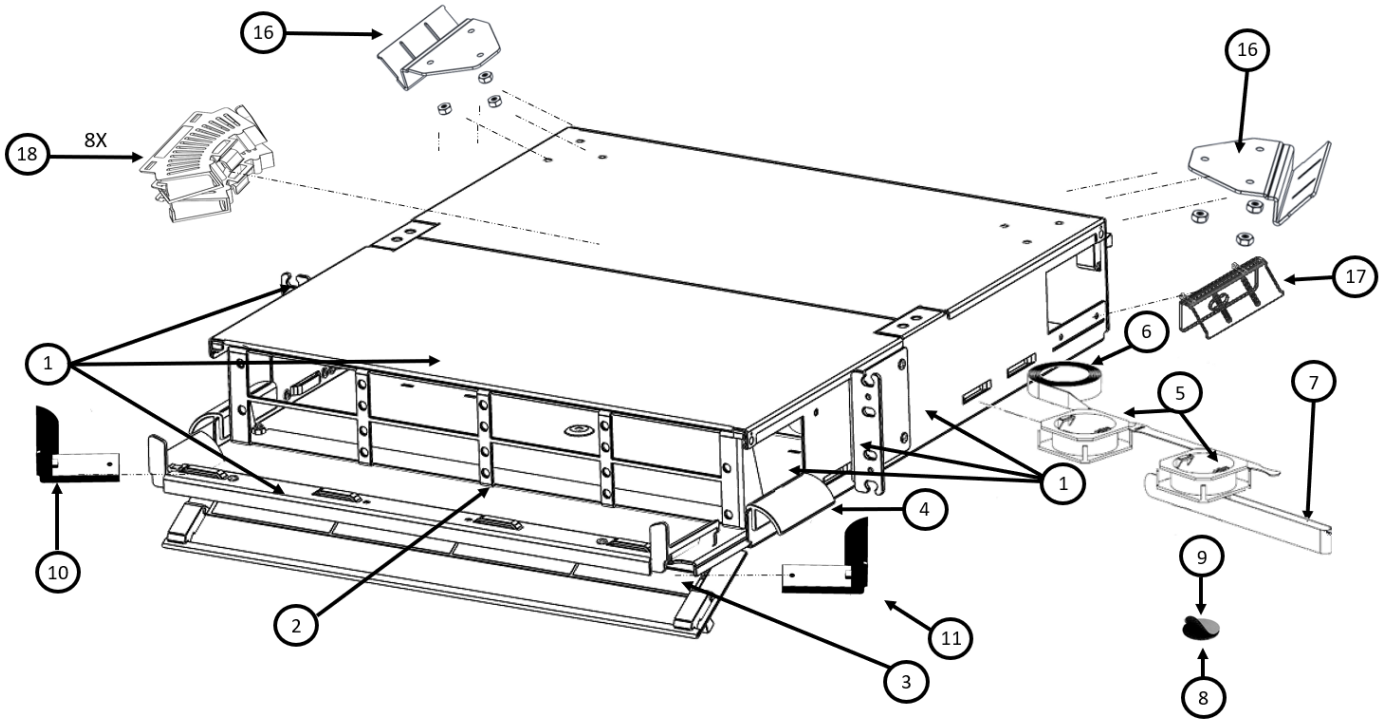
3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
1	Enclosure, Tray and Mounting Brackets, 2 Rack Unit	EQ02U-CHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit	EQ04U-CVC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD	EQ02U-KHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD	EQ04U-KHC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD, Magnesium	EQ02U-KHL-M	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD, Magnesium	EQ04U-KHL-M	-	1
2*	Drawer Face, 2 Rack Unit	41400024-00	1	-
	Drawer Face, 4 Rack Unit	41400007-00	-	1
	Drawer Face, 2 Rack Unit, HD	41400931	1	-
	Drawer Face, 4 Rack Unit, HD	41400932	-	1
3*	Port Identification Card, 2 Rack Unit	70400879	1	-
	Port Identification Card, 4 Rack Unit	70400902	-	1
	Port Identification Card, 2 Rack Unit, HD	70401094	1	-
	Port Identification Card, 4 Rack Unit, HD	70401095	-	1
4	Bend Limiter	71200061	2	2
5	Cable Manager, Fiber Spool.	70800327	4	8
6	Straps, Hooks/Loops, Cable Mgt.	70700145	8	8
7	Straps, D-Ring, Hooks/Loops, 18" Long, Cable Mgt.	70700199-00	4	4
8	Loop, Dot, .50 Dia.	70700077	3	3
9	Hook, Dot, .50 Dia.	70700078	3	3

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
10	Cable Manager, Left	71200062-001	1	1
11	Cable Manager, Right	71200062-002	1	1
12	Washer, lock, #12, External star, phosphor bronze	70100090	1	1
13	Screw 12-24 x .625, PN HD, CMB DRV, ZNC PLT	70100070 / 70100070-59	4	4
14	Screw, machine, #6-32 Unc X .31, Pan HD, CR, Black	70100425	2	2
15	#6-32 screws for Mounting Brackets.		8	8
(*) If item 1 is a 2 or 4 Rack Unit, then items 2 & 3 will be for 2 or 4 Rack Units, etc.				

4.0 ACCESSORIES PURCHASED SEPARATELY

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
16	Strain Relief Bracket, Upper	ECQ-BR	2	2
17	Strain Relief Bracket, Lower	FCBR-003	2	2
18	Kit, Fiber Spool, 8 Pieces	60401185	2	4



5.0 ENCLOSURE ASSEMBLY

5.1) Inspect the package contents before assembling to ensure conformance with the parts listed in Section **3.0**, then determine if the accessories listed in Section **4.0,** are required.

5.2) The Drawer Face (Item 2) is pre-assembled to the tray at the factory (Figure 1).

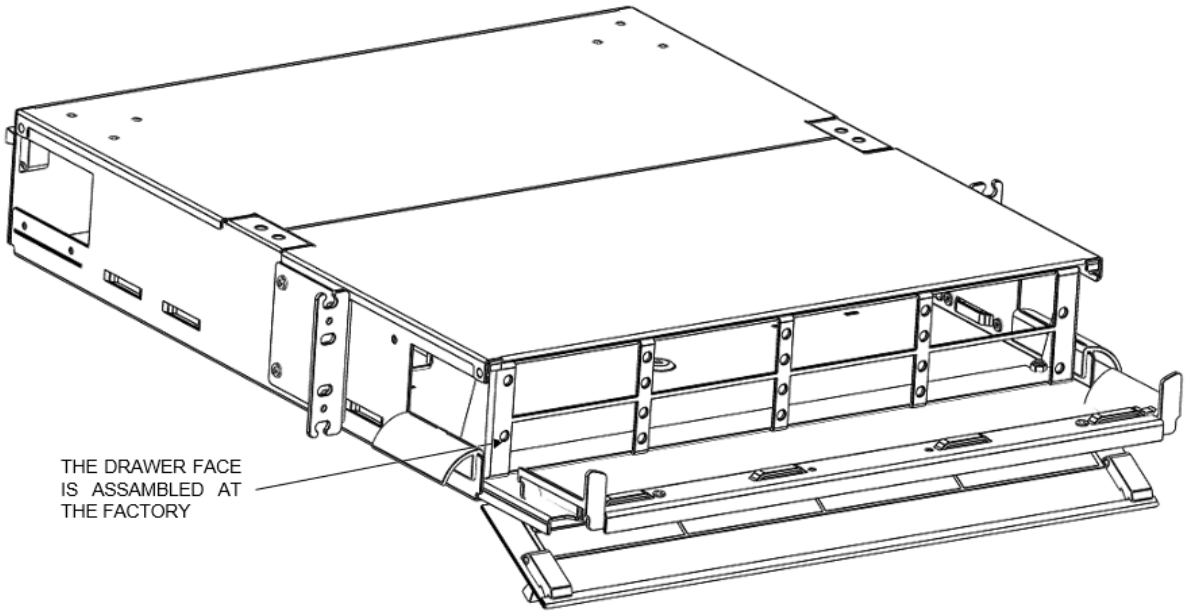


Figure 1

5.3) If your enclosure does not have the mounting brackets factory installed, use a #2 Phillips Head Screwdriver and the screws provided with the enclosure to attach one mounting bracket to each side of the enclosure using the holes provided. Figure 2 illustrates the mounting scheme. An alternate mounting position (Figure 2a) is available for 19" enclosures. To have an enclosure that installs more rearward in racks use the 4-hole pattern closest to the front side of the enclosure.

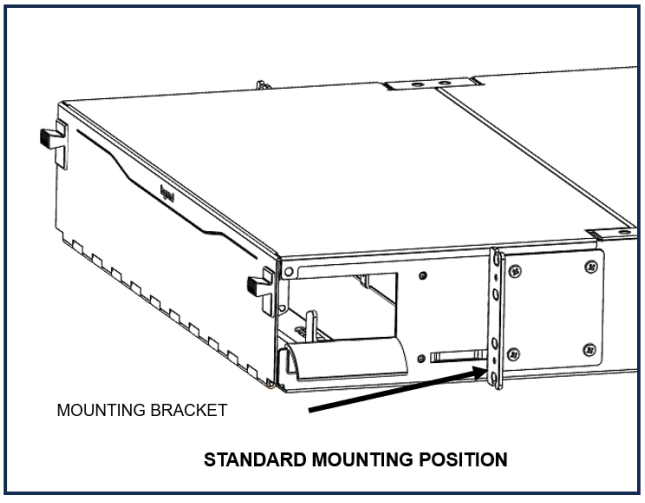


Figure 2

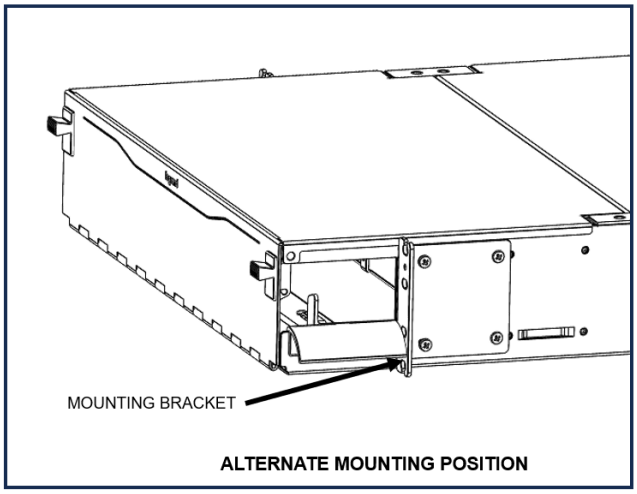


Figure 2a

5.4) Mate each Hook with a Loop dot. Remove protective backing from Hook or Loop and attach to underside of identification label, as required. Remove backing from the remaining side. Put label into place and press against the door to secure, approximately where shown (Figure 3).

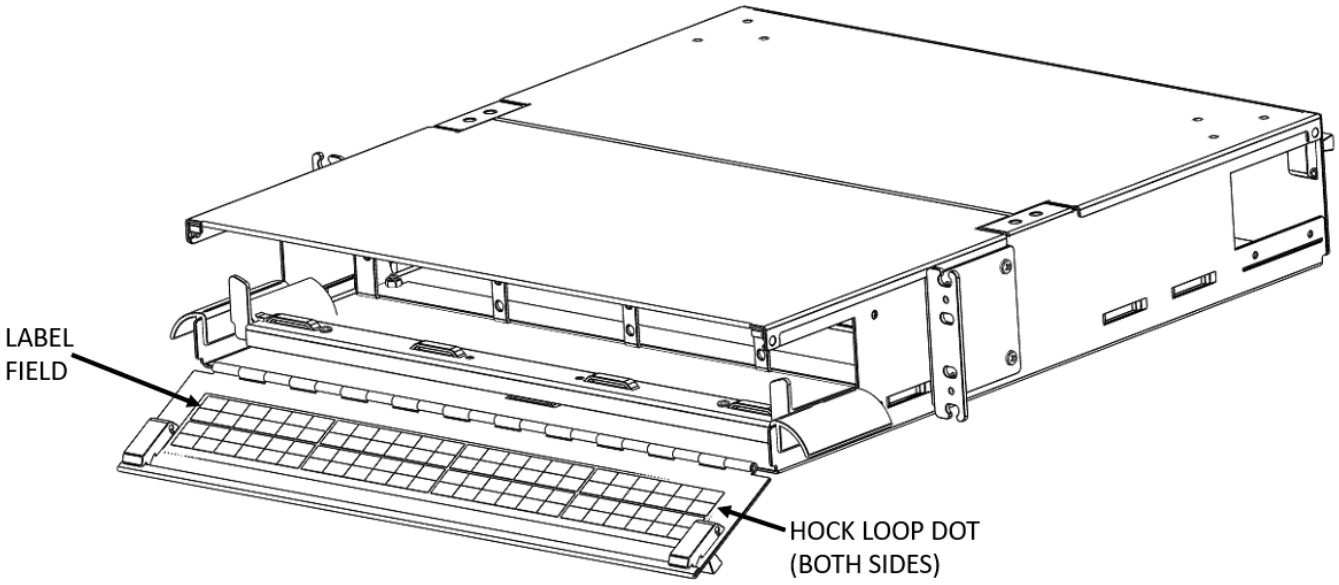


Figure 3

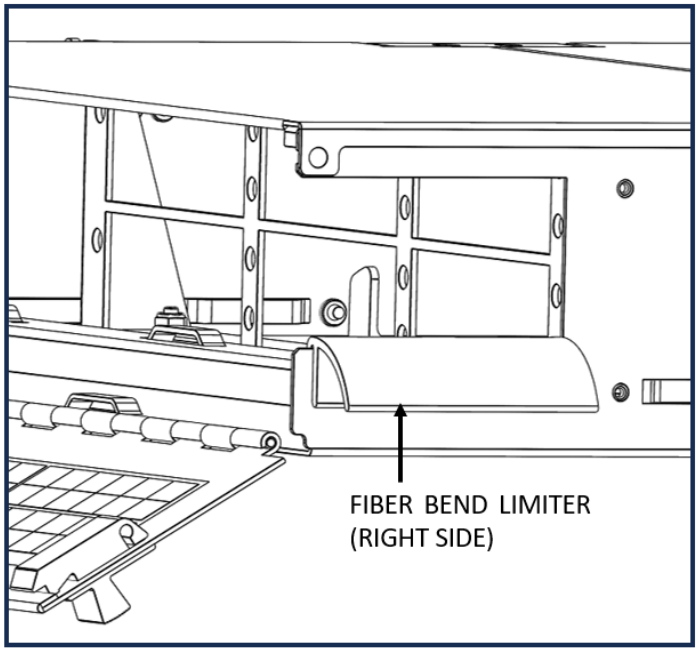


Figure 4

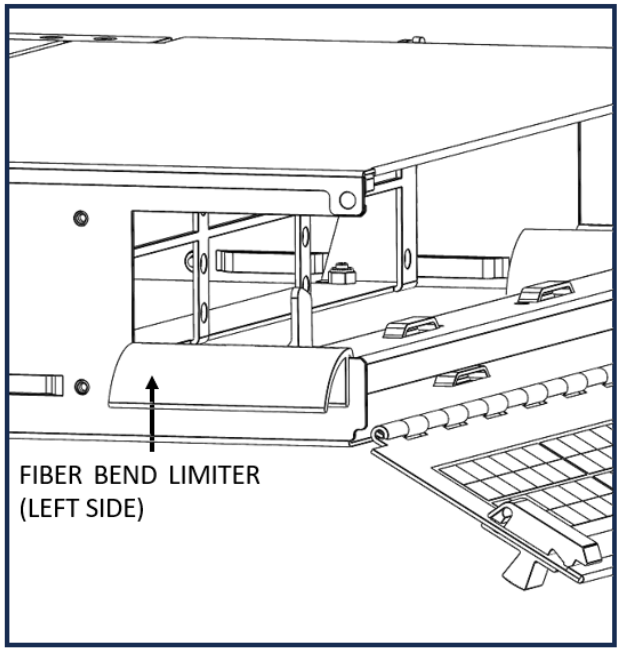


Figure 4a

5.5) Attach bend limiters to the enclosure as shown in Figures 4 & 4a (will be provided in black but shown in white for clarity).
5.6) The enclosure is ready to be mounted to the rack using the screws provided, and a #3 Phillips Head Screwdriver.

6.0 INSTALLATION OF ACCESSORIES

The fiber enclosures can support different styles of fiber bend radius control. The 2U & 4U enclosure trays can accept both styles. Figure 5a illustrates the current style and Figure 5b illustrates an alternate style.

6.1) To assemble the fiber manager provided with this enclosure: Attach Fiber Spool Cable Managers to the tray by inserting the (2) snap hook tabs into their mating tray slots then push the part down towards the tray until the snap hooks engage. An audible click will indicate a locked-in position. Follow the same procedure for additional assemblies. The fiber manager is capable of stacking although the enclosure will limit the number of fiber managers in a stack.
6.2) Figure 5a depicts the fiber spools secured to the tray (rear section).
6.3) When required, attach the Upper and/or Lower strain relief brackets to the rear of the enclosure as shown in Figure 6. Threaded studs are provided on the inside surface of the enclosure to accommodate the brackets.
6.4) To install the cable managers (item 10, 11), orient the curved sides to face each other. Place the short tab up and facing towards you as depicted in figure 8. Item 11 is the right-side cable manager. Item 10 is the left side cable manager. To attach them to the tray, place the long tab under the tray and align the holes to the threaded feature. Use the #6-32 screws provided (1) each, to fasten each cable manager. Do not overtighten.
6.5) Repeat steps **5.0** through **5.6** to assemble additional enclosures, and steps **6.0** through **6.4** for installation of accessories.

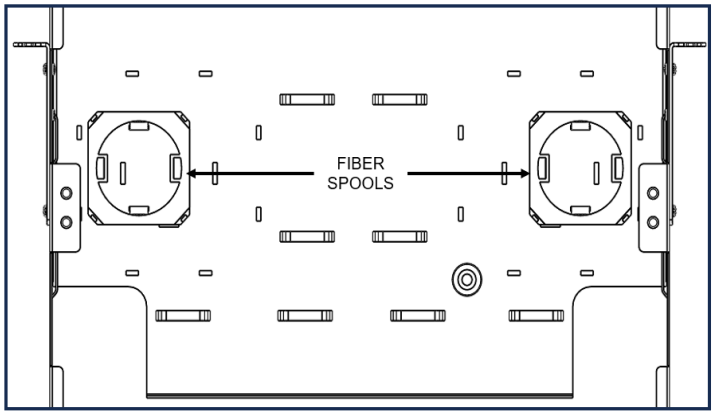


Figure 5a

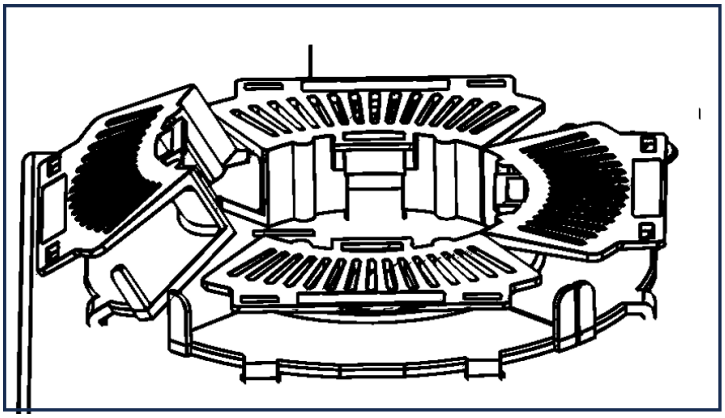


Figure 5b

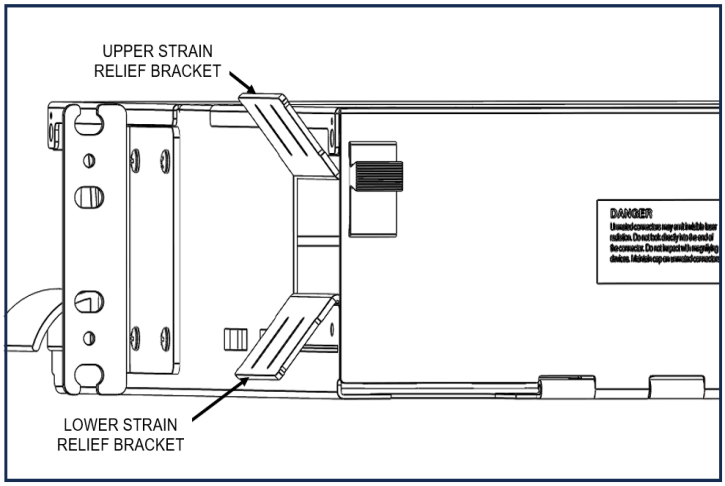


Figure 6

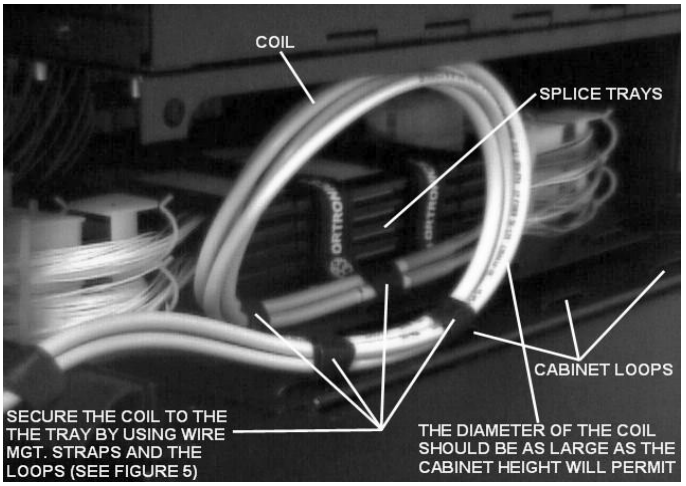


Figure 7

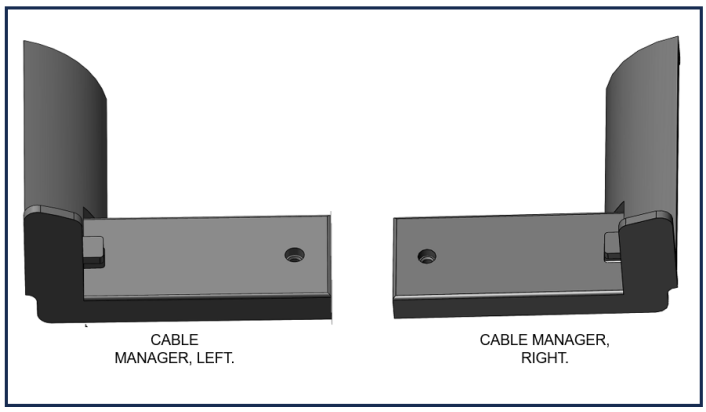


Figure 8

7.0 CABLE ROUTING AND INSTALLATION

7.1) Strip off approximately 1 meter (39 inches) of cable jacket. Trim the central strength member and/or the aramid yarn back to the cable jacket. Terminate connectors (if required) per the manufacturer's instructions.

7.2) With the jacketed portion of the fiber, make a service coil as large as the cabinet height will permit, as shown in Figure 7. The service coil is required to allow the tray to slide out the front of the cabinet freely.

7.3) Secure the outside coil to the cabinet utilizing management straps and the loops provided. Secure the inside coil to the tray utilizing wire management straps and the loops provided.

7.4) An example of a Patch and Splice wiring scheme is depicted in Figure 9.

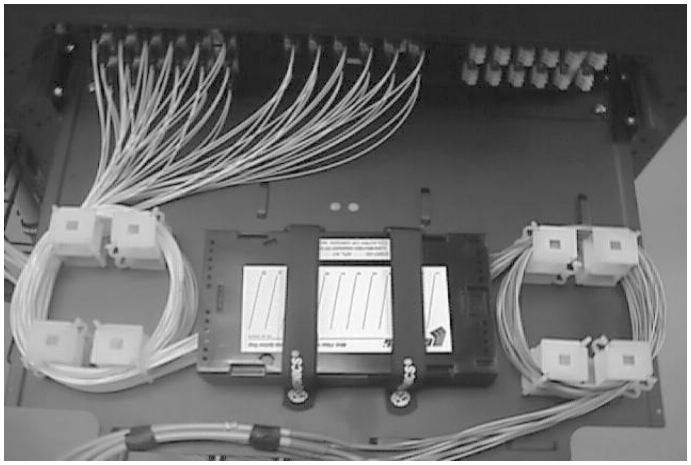


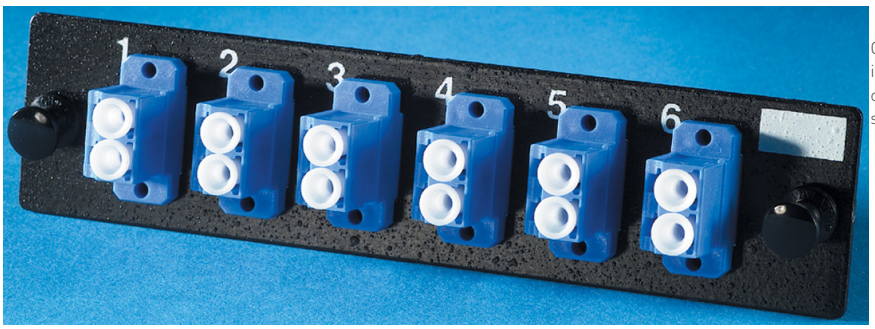
Figure 9

FOR QUESTIONS AND/OR ADDITIONAL INFORMATION, CONTACT LEGRAND AT THE FOLLOWING WEB ADDRESS, OR YOUR MANUFACTURER'S REPRESENTATIVE.

WWW.LEGRAND.US

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Ortronics
6-LC (12 fibers) single mode adapters with ceramic alignment sleeves
Part No. OFP-LCD12AC



Ortronics fiber adapter panel allows for flexibility and expansion with an industry accepted style. The adapter panel snaps in for installation and can be removed easily for future changes. The adapter panel is silkscreened for easy port identification.

Features & Benefits

- Up to 72 LC fibers per RU
- Made of durable polycarbonate
- 6, 8, 12 & 24 port panels
- Available in, LC, SC, ST and blank styles
- Zirconia ceramic sleeves for optimal performance
- Color options available

Specifications

General Info

Product Line	Ortronics	Color	Blue
UPC Number	662875593799	Country Of Origin	Mexico
Features	Shuttered	Included	Cover
Application Sector	Commercial, Data Center	Standard	RoHS compliant. Meets or exceeds TIA/EIA-568-C.3 requirements.
Warranty Type	5-Year	Type	Adapter Panel

Dimensions

Product Width US	5.12 in	Product Depth US	1.15 in
Product Height US	1.19 in		

Additional Information

Product Environmental Profile	Yes

Technical Information

Fiber Optic Cable Type	OS2	Operating Temperature Min	-10 °C
Compatibility	OFP	Number of Ports	12
Simplex/Duplex	Duplex	Operating Temperature Max	60 °C
Shuttered Adapters	No	Single/Multimode	Single-Mode
Number of Fibers	12	Fiber Type	Single-Mode
Form Factor	LC Duplex	Operating Temperature	-10°-60°C
Durability	500 matings	Operating Humidity	0-80% RH (Non-Condensing)
Storage Temperature	-40° - 75° C		

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NT24k® Modular Industrial Switch

N-Tron® Networking Series

RED LION®
a spectris company

Managed Gigabit Industrial Ethernet Switch

The N-Tron® series NT24k® is a modular managed switch designed for factory automation, utilities, SCADA, security surveillance and other industrial applications.



The Red Lion N-Tron series NT24k managed industrial Ethernet switch features connectivity for up to 24 Gigabit ports and offers a wide range of connectivity options—including 100Base, Gigabit, fiber optic and copper options—in a rugged 1U 19" rackmount enclosure. Designed to handle the most demanding environments, the NT24k delivers wire-speed throughput and includes dual power inputs, expanded shock and vibration tolerances, extreme operating temperature range and three slots to accommodate mix-and-match port modules. N-Ring™ technology restores network communication within ~30ms of fault detection. Robust remote monitoring capabilities make management easy.

APPLICATIONS

- Factory Automation
- Utilities
- SCADA
- Security Surveillance
- Transportation
- Alternative Energy

PRODUCT HIGHLIGHTS

- All Gigabit Modular Design
- Up to 24 Port Connections
- High Environmental Specifications
- N-Ring™ Advanced Ring Technology
- Robust Remote Monitoring
- Smart Plug-and-Play Operation

IEEE 1588v2 PTP OPTIONS

- Boundary Clock
- Transparent Clock

IEEE 1588v2 applications include

- Coordinated motion control
- Time-stamped data logging
- Time-stamped fault detection

PTP Models & Upgrade Kit Available

FEATURES & BENEFITS

- Supports up to three of the following port modules:
  - 8-port 10/100/1000BaseT(X) module
  - 8-port 100Base fiber module
  - 8-port 1000Base fiber module
  - 8-port Gigabit SFP module
  - 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- -40°C to 85°C operating temperature
- Dual power input options:
  - Low Voltage: 18-49 VDC
  - High Voltage: 90-264 VAC or 90-300 VDC
- Onboard temperature sensor
- ESD and surge protection diodes on all copper ports
- Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
- USB configuration port
- Configurable alarm contact
- Optional backup/restore configuration device
- Fully managed features include:
  - SSH/SSL/HTTPS
  - SNMP v1, v2, v3
  - Web browser management
  - Detailed ring map and fault location charting
  - RSTP - 802.1d, 802.1w, 802.1D
  - Trunking and port mirroring
  - 802.1Q tag VLAN and port VLAN
  - IEEE 802.1x with RADIUS remote server authentication
  - DHCP Server, Option 82 relay, Option 61, IP fallback
  - Port Security – MAC address based
  - 802.1p QoS, port QoS and DSCP
  - Event Log/Syslog
  - SNTP (Simple Network Time Protocol)
  - IEEE 1588v2 (PTP) models available
  - Multi-Member N-Ring™ technology with ~30ms healing
  - N-Link redundant ring technology
  - N-View™ monitoring technology
  - EtherNet/IP™ CIP™ messaging
  - 802.1AB-2005 LLDP (Link Layer Discovery Protocol)

FC c UL us LISTED 65SN CE UKCA ABS TYPE APPROVED PRODUCT RoHS compliant EtherNet/IP

Managed Gigabit Industrial Ethernet Switch Specifications

SWITCH PROPERTIES

Number of MAC Addresses: 16K
IEEE 1588v2 Software-Based Option
Aging Time: Programmable
Latency (typical): 1.6 µs
Switching Method: Store & Forward
MTBF: >1 million hours
Jumbo Frame Support

POWER INPUT

Input Voltages:
Low Voltage: 18-49 VDC
High Voltage: 90-264 VAC or 90-300 VDC
Input Current (max): 2.26A @ 24VDC
Input Current (max): 790mA @120 VAC/450mA @ 124VDC
BTU/hr: 185 @ 24VDC
BTU/hr: 365 @ 120VAC/190 @ 124VDC

CONNECTORS

10/100/1000BaseT(X): Up to 24 RJ45 copper ports
100BaseFX: Up to 24 SC or ST fiber ports
1000BaseFX: Up to 24 SC fiber ports
100BaseSX/LX SFP: Up to 24 LC fiber ports
1000BaseGX SFP: Up to 24 LC fiber ports

RELIABILITY

MTBF: >1 million hours

NETWORK MEDIA

10BaseT: ≥Cat3 cable
100BaseTX: ≥Cat5 cable
1000BaseT: ≥Cat5 cable
100BaseFX, 1000BaseSX Multimode: 50-62.5/125µm
100BaseFX, 1000BaseLX Singlemode: 7-10/125µm

RECOMMENDED WIRING CLEARANCE

Front and Back: 4" (10.2 cm)

CERTIFICATION & COMPLIANCE

Product Safety:
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions:
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009; Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity:
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Other:
ABS Type Approval for Shipboard Applications; EMC Directive 2014/30/EU; LV Directive 2014/35/EU, RoHS Compliant

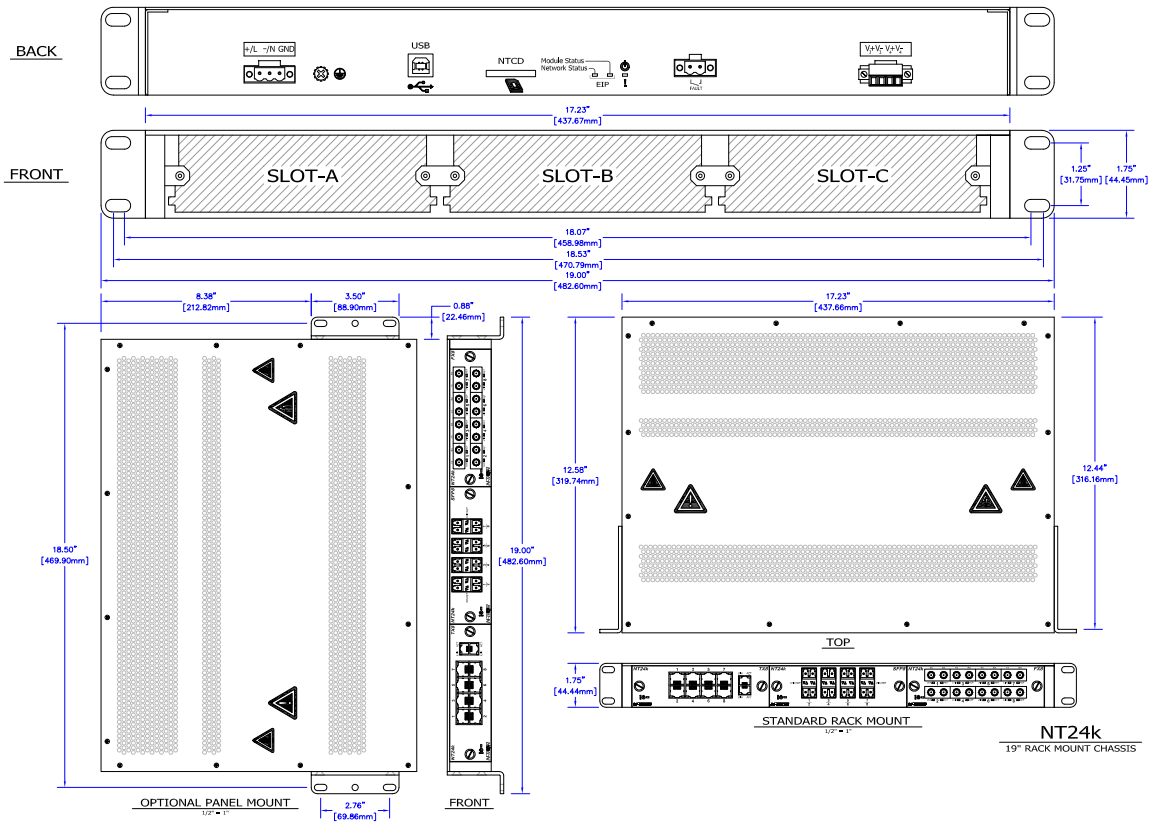
ENVIRONMENTAL

Operating Temperature: -40° C to 85° C
Operating Humidity: 5% to 95% (Non Condensing)
Operating Altitude: 0 to 10,000 ft.
Shock: 50g @ 10ms
Vibration/Seismic: 30g, 10-200 Hz, triaxial

MECHANICAL

Case Dimensions
Height: 1.9" (4.8 cm)
Width: 17.5" (44.5 cm)
Depth: 12.7" (32.0 cm)
Weight (maximum): 12.85 lbs (5.83 kg)
Mount: Rackmount 1U

DIMENSIONS



Specifications are subject to change. Visit www.redlion.net for more information.

Managed Gigabit Industrial Ethernet Switch Specifications

NT24K-FX8 MODULE - 100 MB FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24K-GX8 MODULE - GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 300m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24K-SFP-DM8 MODULE - SFP 100BASE FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24K-SFP-DM8 OR NT24K-SFP8 MODULES- SFP GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 275m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance.
Link budgets should be evaluated based on specific application conditions.

ORDERING GUIDE

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input PTP Enabled
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-DC2-PT	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs PTP Enabled
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input
NT24K-AC1-PT	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input
NT24K-AC2-PT	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs
NT24K-AC1-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs PTP Enabled
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device
NTPC-AC-US	AC power cord
NTPS-24-3	DIN rail power supply 3.0 Amp@24 VDC
NT24K-KIT-PTP	NT24k Upgrade License to Enable IEEE 1588/PTP on Non-PT NT24k Switches
PORT MODULES & TRANSCEIVERS	
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*
NTSFP-FX	100BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2km)**
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP pluggable mini-GBIC transceiver (LC style connector)**
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode. *SFP transceivers sold separately. **For use with SFP DM8 module only

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N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches

Hardware Guide | January 2023
LP0982 | Revision C

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(UTC/GMT +1 hour)

Website: www.redlion.net
Support: support.redlion.net

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Preface

Disclaimer

This hardware guide provides an overview of installation, maintenance and operation of the N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls, Inc. is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Users of this document are urged to heed warnings and cautions used throughout the document.

Compliance Information

It is recommended that the owner of this equipment determine and ensure conformance with any specific and applicable local regulations.

FCC Statement

This product complies with Part 15 of the FCC-A Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful Interference
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Déclaration de conformité FCC

Ce produit est conforme à la partie 15 des règles de la FCC–A

Utilisation est soumise aux conditions suivantes:

1. Ce dispositif ne doit pas causer des interférences nuisibles
2. Cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent causer un mauvais fonctionnement.

Note: Cet équipement a été testé et jugé conforme aux limites de la classe A des appareils numériques, conformément à la partie 15 des règles de la FCC . Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie radiofréquence et, si il n'est pas installé et utilize conformément aux instructions, peut causer des interférences nuisibles aux communications radio. L'utilisation de cet appareil dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur sera tenu de corriger les interférences à ses propres frais.

Industry Canada

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe A répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

Environmental Impact Statement

Red Lion equipment contains no hazardous materials as defined by the United States Environmental Protection Agency (USEPA). Red Lion recommends that all failed product be returned to Red Lion for failure analysis and proper disposal.

Toxic Emissions

Red Lion equipment releases no toxic emissions.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- Ethernet is a registered trademark of Xerox Corporation.
- EtherNet/IP and CIP are registered trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at

www.redlion.net/support/documentation.

Additional Product Information

Additional product information can be obtained by contacting the local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Cautions and Warnings / Mises en Garde et Avertissements

Warnings apply to situations where personal injury or death may result.

Cautions apply to where reduced function or damage to equipment may result.

General Safety Cautions and Warnings / Précautions et Avertissements de Sécurité Générale

	**CAUTION:** If the equipment is used in the manner not specified by Red Lion, the protection provided by the equipment may be impaired. **ATTENTION:** Si l' équipement est utilisé d'une manière non spécifiée par Red Lion, la protection fournie par l'équipement peut être compromise.

	**CAUTION:** Do not remove any of the covers. There are no serviceable parts within the unit. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne retirez aucun des couvercles. Il n'y a pas des pieces utilisables à l'intérieur de l'appareil. Ne pas remplacer les pièces non-autorisées ou effectuer des modifications non-autorisées de l'appareil.

	**CAUTION:** Do not block any air vents on the unit. **ATTENTION:** N'obstruez pas les fentes d'aération de l'unité.

	**CAUTION:** Do not operate the equipment in a manner not specified by this manual. **ATTENTION:** Ne pas faire fonctionner l'équipement d'une manière non spécifiée par ce manuel.

	**WARNING:** Install only in accordance with Local and National Codes of authorities having jurisdiction. **AVERTISSEMENT:** Installer uniquement, conformément aux codes locaux et nationaux des autorités ayant compétence.

Electrical Safety Warnings / Avertissements de Sécurité Électrique

	**WARNING:** Never install or work on electrical equipment or cabling during periods of lightning activity. **AVERTISSEMENT:** Ne jamais installer ou travailler sur équipement électrique ou de câblage pendant les périodes d'activité de la foudre.

	**CAUTION:** Do not perform any services on the unit unless qualified to do so. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne pas effectuer de services sur l'appareil s'il n'est pas qualifié pour le faire. Ne pas substituer pièces non autorisées ou de modifications non autorisées de l'appareil.

	**WARNING:** Properly ground the unit before connecting anything else to the unit. Units not properly grounded may result in a safety risk and could be hazardous and may void the warranty. See the grounding technique section of this manual for proper ways to ground the unit. **AVERTISSEMENT:** L'unité doit être correctement mise à la terre avant tout raccordement à l'unité. Unités pas correctement mise à la terre peuvent causer un risque de sécurité et pourraient être dangereuses et peuvent annuler la garantie. Voir la section technique de mise à la terre dans ce mode d'emploi pour des moyens appropriés à la masse de l'appareil.

	**WARNING:** Device must be supplied by a Class 2 power source (except for POE models). **AVERTISSEMENT:** l'appareil doit être alimenté par une source d'alimentation de classe 2 (sauf pour les modèles POE).

	**WARNING:** Do not operate the unit with the top cover removed, as this could create a shock or fire hazard. **AVERTISSEMENT:** Ne pas faire fonctionner l'unité avec le couvercle retiré, ceci pourrait créer une décharge électrique ou un incendie.

	**CAUTION:** Observe proper DC Voltage polarity when installing power input cables. Reversing voltage polarity can cause permanent damage to the unit and void the warranty. **ATTENTION:** Respectez la polarité correcte de tension DC lors de l'installation des câbles d'alimentation d'entrée. Inversion de polarité de tension peut causer des dommages permanents à l'appareil et annule la garantie.

Environmental Safety Cautions and Warnings / Sécurité Environnementale Mises en Garde et Avertissements



WARNING: Do not operate the equipment in the presence of flammable gases or fumes. Operating electrical equipment in such an environment constitutes a definite safety hazard.

AVERTISSEMENT: Ne pas utiliser le matériel en présence de gaz ou de vapeurs inflammables. L'utilisation de matériel électrique dans un tel environnement constitue un danger certain.



WARNING: Disconnect the power and allow to cool 5 minutes before touching.

AVERTISSEMENT: Déconnectez le câble d'alimentation et laisser refroidir 5 minutes avant de la toucher.

Hazardous Location Warnings / Les Avertissements d'Emplacement Dangereux



CAUTION: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

ATTENTION: Cet appareil est adapté pour utilisation en Classe I, Division 2, Groupes A, B, C, D ou endroits non-dangereux seulement.



WARNING: Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.

AVERTISSEMENT - Risque d'explosion - La substitution de tout composant peut nuire à la conformité de Classe 1, Division 2.



WARNING: Explosion Hazard – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux.



WARNING: Exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relay U40.

AVERTISSEMENT: L'exposition à certains produits chimiques peut dégrader les propriétés d'étanchéité des matériaux utilisés dans les dispositifs suivants: relais par U40.



WARNING: Explosion Hazard – Do not replace the device unless power has been switched off or the area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas remplacer l'appareil à moins que l'alimentation a été coupée ou que la zone est connue pour être non-dangereuse.



WARNING: Never connect or disconnect power when hazardous gases are present.

AVERTISSEMENT: Ne jamais brancher ou débrancher l'alimentation lorsqu'en presence de gaz dangereux.

Surrounding Air Temperature / Temperature Ambiante

NT24k-DC and NT24k-AC rackmount models: -40°C to 85°C

NT24k-DR16 and NT24k-DR24 models: -40°C to 75°C

Note: Use 105 °C or higher rated copper wire, (0.22NM) 2lb/in tightening torque for field installed conductors.
Remarque: Utilisez fil de cuivre classé 105 °C ou plus, (0.22Nm) 2 pouces/livres couple de serrage pour les connecteurs installés sur le terrain.

Laser Safety Warnings / Avertissements de Sécurité Laser

(Options: NTSFP-FX, NTSFP-FXE, NTSFP-SX, NTSFP-LX)



CAUTION: CLASS 1 LASER PRODUCT. Do not stare into the laser.
ATTENTION: PRODUIT LASER CLASSE 1. Ne pas regarder dans le laser.

Regulatory Information

Product Safety
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009
Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Marine
ABS Type Approval for Shipboard Applications
Other
EMC Directive 2014/30/EU
LV Directive 2014/35/EU GOST-R
RoHS compliant

KC Mark (Korea)

A 급 기기 (업무용 방송통신 기자재)	이기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외 지역에서 사용하는 것을 목적으로 합니다.
Class A device (Broadcasting and communication equipments for office work)	This equipment is office use (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

Chapter 1 Product Overview

NT24k® Modular Series Common Features

Red Lion's N-Tron® series NT24k modular switches are available in rackmount or 35mm DIN rail mountable configurations with high density Gigabit ports. The NT24k offers a wide array of port configurations and power input options that include Fast Ethernet and Gigabit speeds in copper or fiber. The hot-swappable port modules are auto-detected and configured by the switch, adding new definition to plug-and-play performance. Housed in rugged hardened enclosures, the NT24k series features extended shock and vibration specifications (bulkhead mount required to meet requirements), wide operating temperature ratings and best-in-class technology.

Connectivity

The NT24k series switches feature hot-swappable connectivity modules. These modules are available in Fast or Gigabit Ethernet, and are optionally available with copper, fiber or SFP ports. The NT24k accepts up to three modules for a maximum of 24 Ethernet ports, and can be changed without removing power from the switch.

Performance

The NT24k line of managed switches provide uncompromising performance in harsh environments including network features like N-Ring™, VLAN, Quality of Service (QoS), port mirroring, IGMP and SNMP.

Environmental

The NT24k series of managed switches are available in rackmount or 35mm DIN rail mountable configurations with operating temperatures up to -40° to 85°C. With UL Class I, Division 2 listing and CE certifications, these switches are built to last in the most demanding environments.

Monitoring

The NT24k Series includes N-View™ monitoring technology. N-View combines switch based technology with a Windows based OPC server and client monitoring tool. When N-View is enabled, the switch periodically autocasts a small Ethernet packet containing switch and port statistics. The data is captured by the N-View OPC server software and can be displayed by the provided N-View client or third party OPC client application running in the same Windows environment. For more information, please reference the N-View Installation and User's Guide.

Security

The NT24k series provides a high level of security utilizing IEEE 802.1x port-based network access control with RADIUS remote server authentication and SNMPv3 communication protocol to ensure the safest connections.

Available Models

PART #	TOTAL PORTS	MOUNTING	OPERATING TEMPERATURE	10/100/1000 COPPER	100 FIBER	GIG FIBER	SFP'S	18-49 VDC REDUNDANT POWER INPUT*	90-264 VAC/90-300 VDC POWER INPUT
NT24k-DR16-AC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	-	1
NT24k-DR16-DC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	1	-
NT24k-DR24-AC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-DR24-DC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-AC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-AC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	2
NT24k-AC1-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	1
NT24k-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-DC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	2	-

* Each 18-49VDC power input option includes redundant (2) power connections.

NT24k® Rackmount

The NT24k Rackmount Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 1U 19" rack mount enclosure. Designed to handle the most demanding environments, the NT24k supports up to two power inputs, extreme operating temperature range and three slots to accommodate mix-and-match port modules.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- Easily transitions to Gigabit network requirements

-40°C to 85°C operating temperature
Dual power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

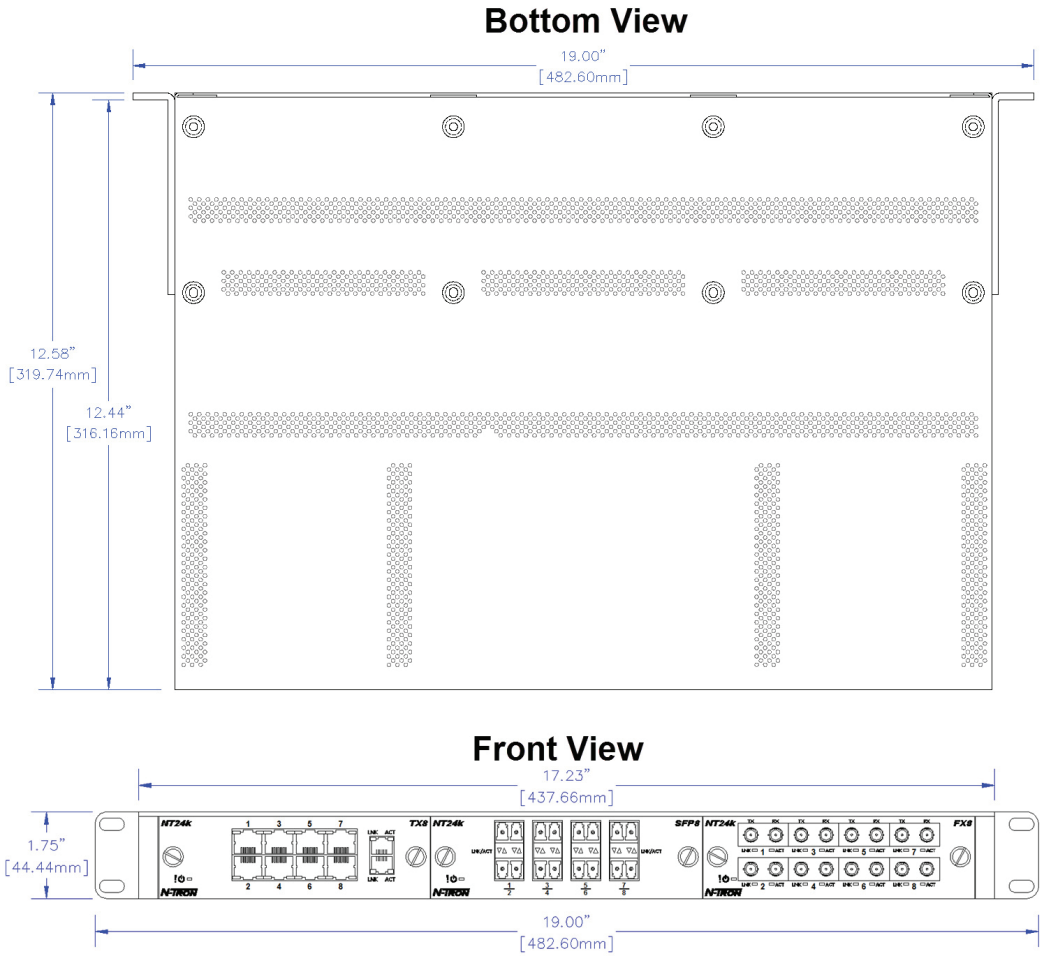
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- Trunking and port mirroring
- 802.1Q VLAN Tagging and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k® Rackmount Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
1.9" (4.8 cm)	17.5" (44.5 cm)	12.7" (32.0 cm)	12.85 lbs (5.83 kg)	Rackmount 1U
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.26 A @ 24 VDC Max: 790 mA @ 120 VAC/450 mA @ 124 VDC	185 @ 24 VDC 365 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 85 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k® Rackmount Dimensions



All specifications are subject to change. Consult the company website for more information.

NT24k-DR16

The NT24k-DR16 Managed Industrial Ethernet Switch features connectivity for up to 16 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to two of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

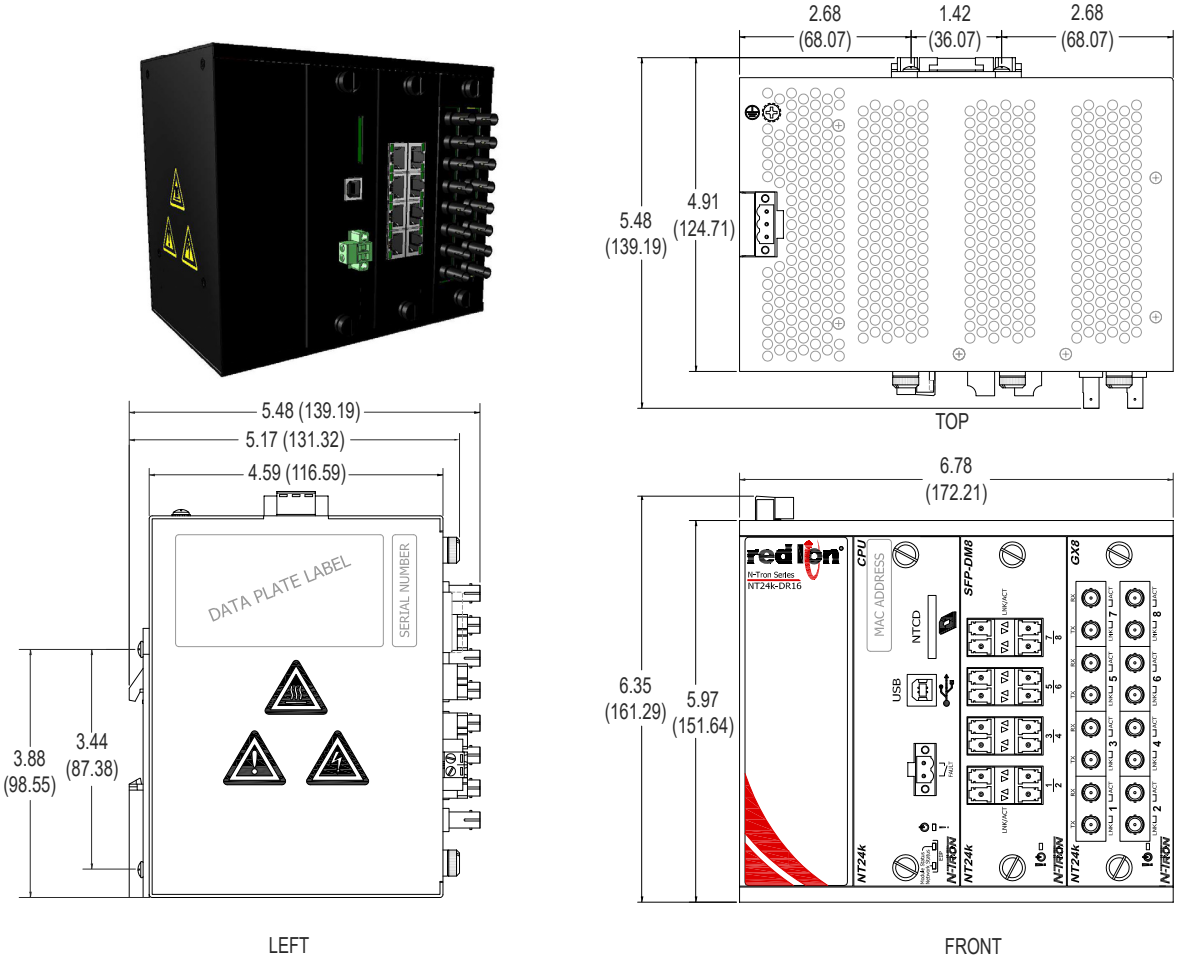
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x. with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k-DR16 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	6.78" (17.22 cm)	4.59" (11.65 cm)	6.4 lbs (2.9 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 1.52 A @ 24 VDC Max: 580 mA @ 120 VAC/300 mA @ 124 VDC	125 @ 24 VDC 268 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**		**Note**	
50g @ 10ms	30g, 10-200Hz, Triaxial		Unit must be bulkhead mounted to achieve these levels.	
CONNECTORS				
10/100/1000BaseT:(X): Up to 16 RJ45 ports				
100BaseFX: Up to 16 SC or ST fiber ports				
1000BaseSX/LX: Up to 16 SC fiber ports				
100BaseSX/LX SFP: Up to 16 LC fiber ports				
1000BaseGX SFP: Up to 16 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR16 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k-DR24

The NT24k-DR24 Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

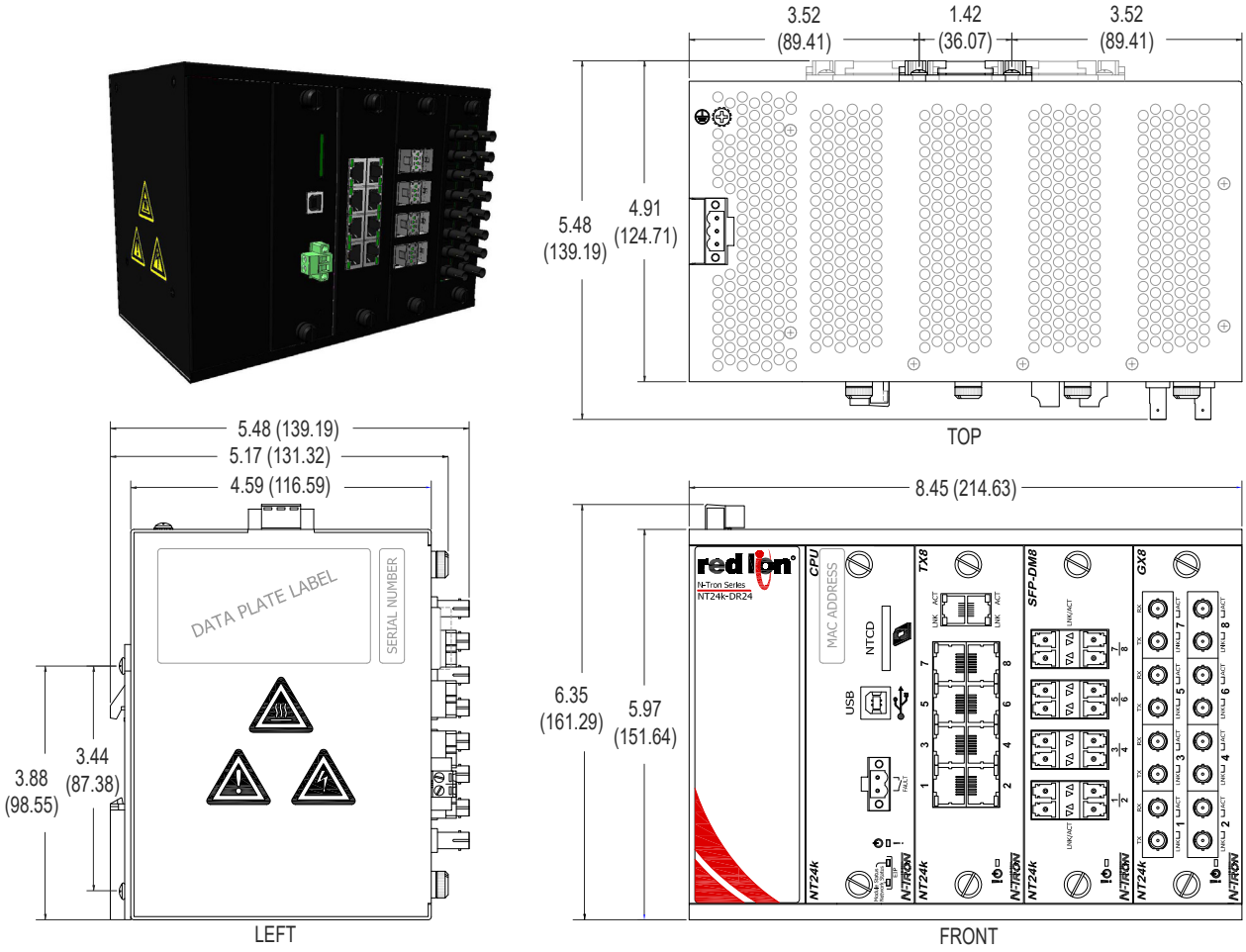
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™ CIP™ messaging

NT24k-DR24 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	8.45" (21.46 cm)	4.59" (11.65 cm)	7.8 lbs (3.54 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.14 A @ 24 VDC Max: 780 mA @ 120 VAC/430 mA @ 124 VDC	175 @ 24 VDC 360 @ 120 VAC/182 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR24 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k Views

NT24k Rackmount Unit Front View



NT24k Rackmount Unit View (Module Slots Identified)

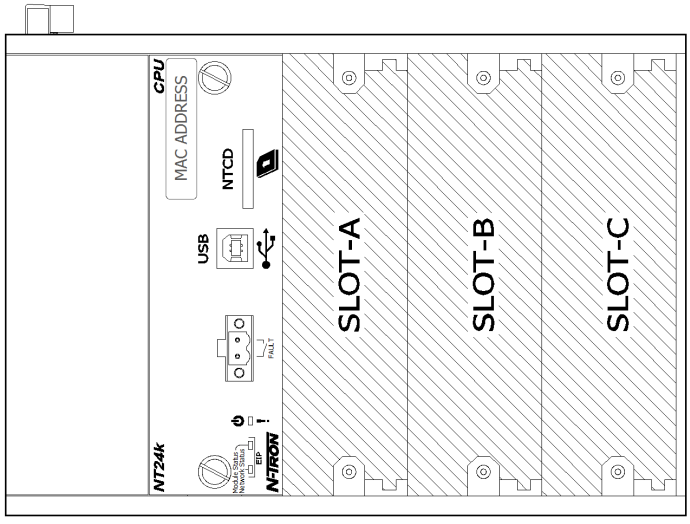


See “Ordering Information” for available module(s).

NT24k-DR16 Front View



NT24k DR Unit View (Module Slots Identified)



LEDs

The RJ45 data ports have two LEDs located on each connector. The left LED indicates link status and the right LED indicates activity.



The table below describes the operating modes:

LED	COLOR	DESCRIPTION
⏻	Green	Power is On
	Red	Power is On and a fault condition exists
	Off	Power is Off
LNK	Green	10/100/1000 Mb Link between ports
	Off	No link between ports
ACT	Green	Data is active between ports. Activity light blink rate indicates activity, not necessarily the volume of activity
	Off	Data is inactive between ports

EIP Indicators

The EIP Indicators are located either on the back of the rackmount version, or on the front of the CPU module of the DIN rail versions of the switch. The Module Status indicator shows the status of the switch. The Network Status indicator shows the status of the network interface.

MODULE STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up
Steady Green	The switch is operating normally
Flashing Green	The switch has not been configured
Flashing Red	A recoverable minor fault has occurred
Steady Red	A non-recoverable major fault has occurred
NETWORK STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up, or an IP address has not been configured
Flashing Green	An IP address is configured, but no connections have been established
Steady Green	A connection has been established
Flashing Red	A connection has timed out

Transceiver Characteristics

NT24k-FX8 Module - 100 MB Fiber Transceiver Characteristics

Fiber Length*	2 km	15 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24k-GX8 Module - Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 300 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24k-SFP-DM8 Module - SFP 100Base Fiber Transceiver Characteristics

Fiber Length*	2 km	10 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24k-SFP-DM8 or NT24k-SFP8 Modules - SFP Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 275 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance. Link budgets should be evaluated based on specific application conditions.

Chapter 2 Hardware Installation

Unpacking

Remove all the equipment from the packaging and store the packaging in a safe place. File any damage claims with the carrier.

Make certain the NT24k® Ethernet Switch package contains the following items:

1. NT24k switch
2. Product CD

Module Installation

Technicians performing the following steps should wear proper anti-static equipment to protect the circuit boards. Before removing the module from the ESD bag, touch a known grounded piece of metal to discharge any possible static electricity from the body.

1. Remove the faceplate from the slot in which the module will be inserted by turning the thumb screws counter clockwise.
2. Remove the module from the anti-static bag and insert into the slot aligning the board with the guide rails on either side. The module should slide smoothly into the slot.
3. Press the module firmly in place until the faceplate is flush against the front of the enclosure.
4. Align the threads of the thumb screws with the threads in the enclosure and screw them down until they are finger tight.

Ensure that all empty slots are covered with a faceplate to meet both emissions and safety requirements.

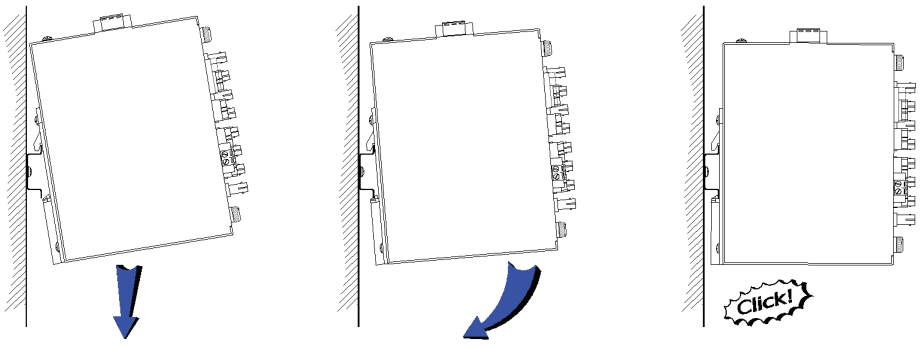
Mounting the NT24k

Rackmount Installation Instructions

The NT24k Rackmount unit comes configured with standard rack mount brackets which may be used to mount our products to standard 19" racks. As an alternative, Red Lion offers its NT24k Panel Mount Assembly (P/N: NT24k-PMK) used to securely mount the NT24k products to a panel or other flat surface.

A clearance of one inch should be observed on the sides, back, top and bottom to allow proper ventilation. Also a cable bend radius of 4 inches should be observed for the front and back of the unit.

DIN Rail Mounting Instructions

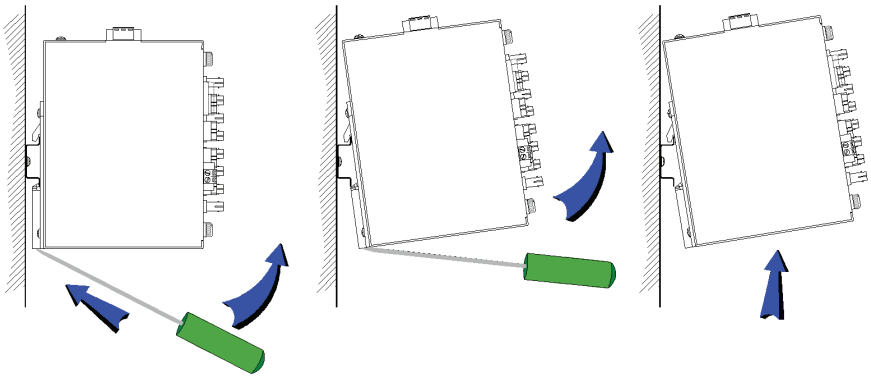


Install the switch to standard 35mm DIN rail as shown in the diagram above.

1. First, hook the top of the 35mm DIN rail clip on the back of the switch to the rail.
2. Then, gently rotate the front of the switch downward, towards the panel.
3. Push the bottom of the switch towards the rail until it locks into place.
4. Apply upward force to verify the switch is securely installed.

5. Connect any communications cables to the switch.
6. Install the power and ground wires.
7. Apply power to the power supply.

DIN Rail Removal Instructions



Remove the switch from standard 35mm DIN rail as shown in the diagram above.

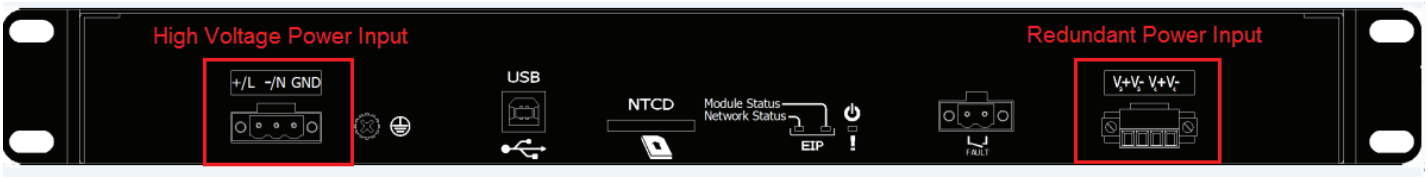
1. Ensure power from the power source is off.
2. Disconnect power and ground wires.
3. Disconnect any communications cables from the unit.
4. Insert a standard flat/slotted screwdriver into the slot provided on the DIN rail clip.
5. Using the base of the switch as a pivot point, apply upward force on the screwdriver to release the DIN rail clip.
6. With the DIN rail clip latching mechanism released, continue to rotate the switch upward and away from the panel.
7. Once the switch has been rotated upward, remove the screwdriver.
8. Carefully lift the switch upward and away from the DIN rail and panel.

Power Source

The NT24k-DR16 and NT24k-DR24 series operate with one power supply, either AC or DC.

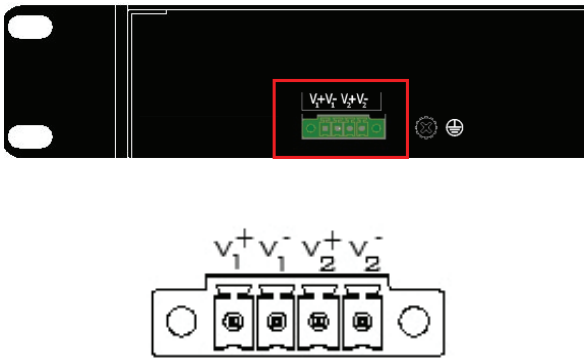
The Rack Mount NT24k® can be ordered with one or two power input options.

Each power supply can be AC or DC. Each low voltage DC Power supply includes redundancy (two DC supplies). The NT24k-AC1-DC1 model shown below comes with a high voltage power input on the left (90-264VAC / 90-300VDC) and a redundant 18-49VDC power input on the right.



Note: LEDs are described in detail in “LEDs”.

NT24k® Rack Mount with DC Power Input Installed

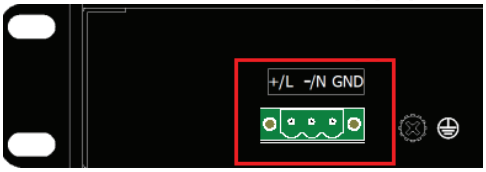


1. Unscrew and remove the DC voltage input plug from the power input header.
2. Install the DC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

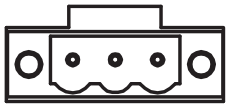
Note: When a DC power supply is installed, only one power supply must be connected to power for minimal operation. For redundant power operation, V1 and V2 inputs must be connected to separate DC voltage sources. This device will draw current from both sources simultaneously. Use 16-28 gauge wire when connecting to the power supply.

Recommended 24 VDC power supply, similar to Red Lion's P/N NTPS-24-3.

NT24k with AC Power Supply Installed



+/L -/N GND



1. Unscrew and remove the AC voltage input plug from the power input header.
2. Install the AC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

Note: When an AC power supply is installed (i.e. the -AC option), use 12-24 gauge wire when connecting to the power supply.

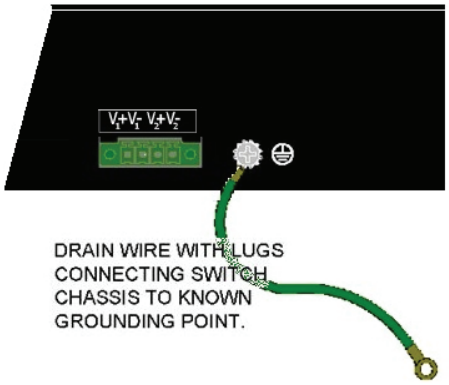
Grounding the Unit

The grounding of any control system is an integral part of the design. The optimum noise immunity and emissions are obtained when the NT24k® chassis is connected to earth ground via a 14-18 gauge drain wire. The NT24k units provide a ground lug (see illustration) that is used to provide a safe grounding path of the device. For the NT24k-AC power supplies, the chassis may also be connected to earth ground using the input power plug labeled “GND.”

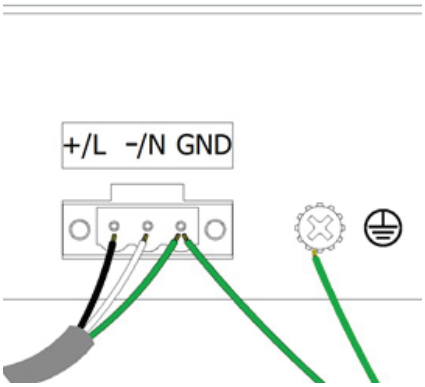
Note: The NT24k power input (V-) pins are isolated from chassis ground. Do not attempt to ground the switch to earth ground via the power input pins (V-).

Remarque: La NT24k puissance d’entrée (V-) broches sont isolés de la masse du châssis. Ne pas essayer pour mettre le commutateur à la terre via les broches d’entrée d’alimentation (V-).

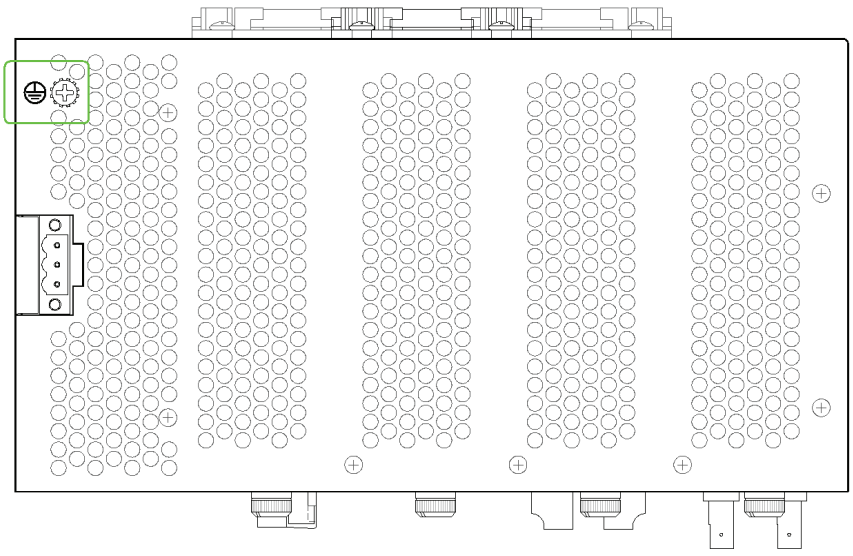
NT24k DC Power



NT24k AC Power



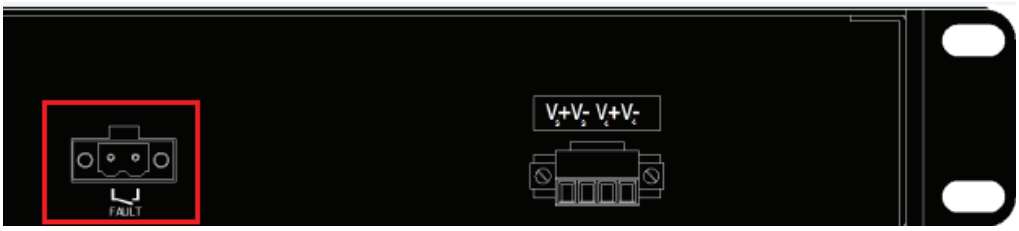
For the DIN rail models, see the illustration below for grounding:



Configurable Alarm Contact

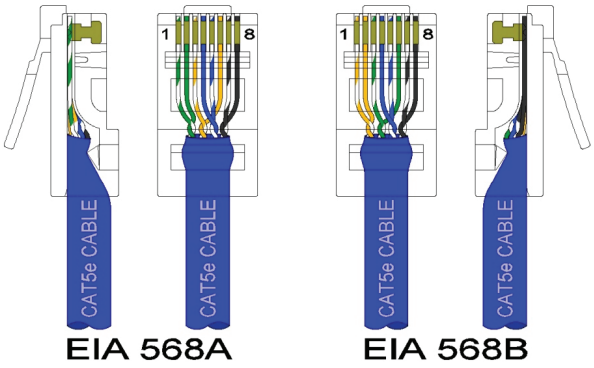
The alarm contact located on the back of the NT24k® rack mount unit or on the front of the NT24k-DR16 and NT24k-DR24 models, can be used to control an external warning device based on an event. The current carrying capacity is 1A at 24VDC. It is normally open and the relay closes when a fault condition occurs, though this can be reversed via configuration. These pins can be used to connect an external warning device such as a light in order to provide an external alarm. The conditions for generating a fault condition (closing the relay) can be configured through software.

Refer to the NT24k Software User's Guide for more information.



Connecting the Unit

For 10/100/1000/T(x) ports, plug a Category 5E twisted pair cable into the RJ45 connector. Connect the other end to the far end station. Verify that the LNK LEDs are ON once the connection has been completed. To connect any port to another device, use a standard CAT5E straight through or crossover cable with a minimum length of one meter and a maximum length of 100 meters.



Red Lion recommends the use of pre-manufactured CAT5E cables to ensure the best performance. If this is not an option and users must terminate their own ends on the CAT5E cables; one of the two color coded standards shown to the right should be utilized. If a user does not follow one of these standards then the performance and maximum cable distance will be reduced significantly, and may prevent the switch from establishing a link.

For FX/FXE/GX/GXE units, remove the dust cap from the fiber optic connectors and connect the fiber optic cables. The TX port on the FX/FXE/GX/GXE models should be connected to the RX port of the far end station. The RX port on the FX/FXE/GX/GXE versions should be connected to the TX port of the far end station.

⚠	**WARNING –** Creating a network loop without employing a network path protocol such as N-Ring™, N-Link, or RSTP is an illegal operation that can create a network storm which will crash the network. **Avertissement -** La création d'un réseau sans boucle employant un chemin réseau protocole tels que N-Ring, N-Link, ou RSTP est une opération illégale que peut créer une tempête du réseau qui va planter le réseau.

Ethernet Cable

If you are connecting to the unit via the copper port, you will need a straight or crossover cable with two 8-pin RJ45 connectors on each end.

To visually confirm that Ethernet cabling was done properly, check the LED indication on the Ethernet port of the unit. The link LED should be on when the correct cable is used.

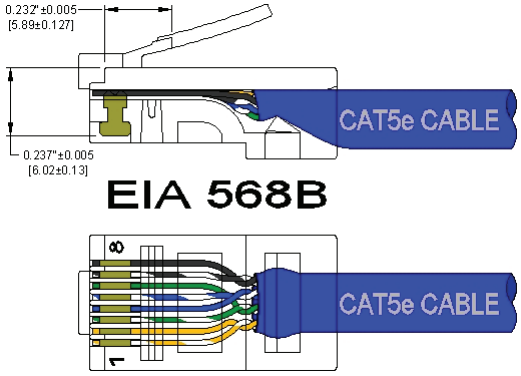
Note: A shielded cable is required to fully meet EMC standards.

When using shielded cables, it is generally recommended to only connect the shield at one end to prevent ground loops and interference with low level signals (i.e. thermocouples, RTD, etc.). CAT5e cables manufactured to EIA-568A or 568B specifications are required for use with Red Lion series switches.



In the event all CAT5e patch cables are short (i.e. All Ethernet devices are located in the same local cabinet and/or referenced to the same earth ground), it is permissible to use fully shielded cables terminated to chassis ground at both ends in systems avoid low level analog signals.

RJ45 Connector Crimp Specifications



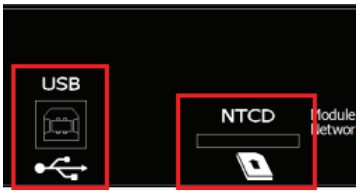
NTCD

NTCD-CFG Configuration Device

NTCD-CFG Configuration Device



Ideal for saving, or restoring switch configuration parameters quickly without the need for a computer or software. One configuration device per switch is recommended.



The USB configuration slot is located on the back of the NT24k® rackmount models and on the front of the NT24k-DR16 and NT24k-DR24 models.

The unit could be configured with multiple power supply configurations.

⚠	**WARNING – Explosion Hazard** – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion** - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

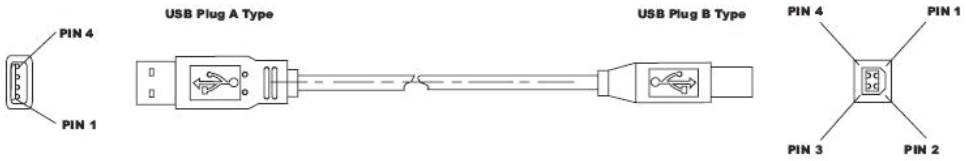
USB Interface

The NT24k switches provide a USB interface accessed via the USB connector labeled as "USB" on the back of the NT24k rackmount models and the front of the NT24k-DR16 and NT24k-DR24 models. The USB connection is used to access the Command Line Interpreter (CLI) or PPP (Point-to-Point Protocol).



USB Cable

Connect the USB port of your PC and the Switch using a standard USB cable. A cable with a Type A connector for the PC end, and a Type B connector for the switch end must be used.



Standard USB cables are readily available from a variety of computer stores.

Terminal

The following configuration should be used in HyperTerminal:

Port Settings: 115200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

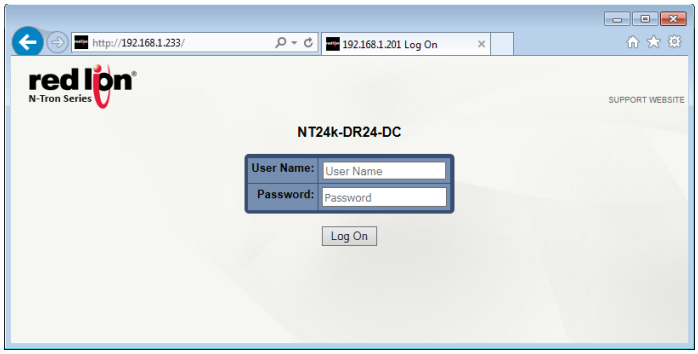
⚠	**WARNING – Explosion Hazard –** The USB connection is for temporary connection only. Do not use, connect, or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion -** La connection USB est pour la connexion temporaire seulement. Ne pas utiliser, connecter ou déconnecter sauf si la zone est connue pour être non dangereuse. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

Cleaning

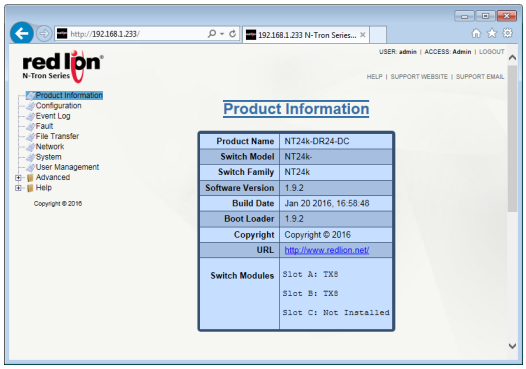
Clean only with a damp cloth. Excess moisture or harsh chemicals can cause damage to the unit.

Chapter 3 Accessing the Web Software Interface

1. Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default by entering 192.168.1.201 as the fallback address.
2. The following login screen will appear.



3. For the User Name, enter: **admin** (all lowercase).
4. For the Password, enter: **admin** (all lowercase).
   Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.
5. Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Please consult the NT24k® Software Guide for configuration options.

Service and Support Information

Service Information

We sincerely hope that you never experience a problem with any of our products. If you do need service, call Red Lion at 1-877-432-9908 for Technical Support. A trained specialist will help you determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RO (Repair Order) can be obtained on the Red Lion website.

Red Lion tracks the flow of returned material with our RO system to ensure speedy service. You must include this RO number on the outside of the box so that your return can be processed immediately.

Be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RO form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Repairs are completed as soon as possible. If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your Red Lion system for future reference.

P.O. #: _____ Date Purchased: _____
Purchased From: _____
Serial Number: _____

Product Support

Technical Support:
Inside US: +1 (877) 432-9908
Outside US: +1 (717) 767-6511
Support: support.redlion.net
Hours: 8:00 am to 6:00 pm EST

Red Lion Controls
35 Willow Springs Circle
York, PA 17406
Website: www.redlion.net

Ordering Information

NT24k® Rackmount

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC / 90-300 VDC power input
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC / 90-300 VDC power inputs
NT24K AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC / 90-300 VDC and 18-49 VDC power inputs
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR16

PART NUMBER	DESCRIPTION
NT24K-DR16-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; redundant 18-49 VDC power input
NT24K-DR16-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR24

PART NUMBER	DESCRIPTION
NT24K-DR24-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; redundant 18-49 VDC power input
NT24K-DR24-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

Port Modules

PART NUMBER	DESCRIPTION
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2 km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550 m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

SFP Transceivers

PART NUMBER	DESCRIPTION	MAXIMUM CAPACITY PER SWITCH	MODULE REQUIRED
NTSFP-FX	100 BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2 km)	Up to 24	NT24k-SFP-DM8
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP luggable mini-GBIC transceiver (LC style connector)	Up to 24	NT24k-SFP-DM8
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver	Up to 16	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

LIMITED WARRANTY

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N-Tron® Series
NT24k® Gigabit Ethernet Switches

Software Guide | February 2024

LP0991 | Revision H

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Preface

Disclaimer

This software guide provides guidance on how to use the NT24k®. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

This guide is intended to be used by personnel responsible for configuring and commissioning NT24k devices for use in visualization, monitoring, and control applications. Users of this document are urged to heed warnings and cautions used throughout the document.

Trademark Acknowledgments

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Certifications

Red Lion Controls ensures that this device meets all the ODVA technology and standards guidelines for the Common Industrial Protocol (CIP) for industrial automation.

ODVA CONFORMANT

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at: https://www.redlion.net/support/documentation/user-manuals.

Additional Product Information

Additional product information can be obtained by contacting your local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Chapter 1 Security Best Practices

Introduction

It is more important than ever to secure network devices from unauthorized access, both within and outside of your organization. Red Lion strongly recommends installing managed layer-2 switches behind a secure network firewall in access controlled locations, and immediately changing all default user accounts and passwords, as well as disabling protocols that are not needed in your application.

Protocols and user names with their default passwords are listed in the table below.

PROTOCOLS/USERS	DEFAULT NAME	DEFAULT PASSWORD
User Login	admin	Admin
SNMPv3 User Authentication	initial	Authpass
SNMPv3 User Privacy	initial	Privpass
SNMP v1/v2	read community	Public
SNMP v1/v2	write community	Private
SNMP v1/v2	trap community	public

Some protocols and special devices are enabled by default for the best overall out of the box experience. However, if any in this group will not be used or needed in your network, then these should be disabled to prevent unexpected behavior, unauthorized access or usage. These protocols and special devices are listed in the table below:

PROTOCOLS OR SPECIAL DEVICES
CIP™
SNMP
NTCD
DHCP Client
RSTP
LLDP
N-View™

Managing Local and Remote Access Using 802.1X

Red Lion strongly recommends using 802.1X to manage local and remote access as a best practice for larger installations. 802.1X allows for the management of users, devices, profiles, certificates, and so forth from a single location which also provides a high degree of security.

Default Passwords

User Passwords

The NT24k® ships from the factory with a default ***admin*** user account. Red Lion strongly recommends creating a new user with administrative privileges and then deleting the default ***admin*** user before the unit is deployed.

At a minimum, the default password for the ***admin*** user should be changed.

SNMPv3 Users

The NT24k® ships from the factory with SNMP enabled and a default SNMPv3 user. If SNMP will be used, then Red Lion strongly recommends creating a new SNMPv3 user and then deleting the default ***initial*** SNMPv3 credentials. At a minimum, the default password for the ***default*** user should be changed.

It is strongly recommended that both authentication and privacy protocols are enabled for all v3 users. Setting the option to ***None*** for either protocol is discouraged.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

SNMP v1/v2 Community Names

The NT24k ships with default Community Names for SNMP v1/v2 operation. SNMP v1/v2 traffic per the standard is neither hashed nor encrypted. Therefore, it is Red Lion's recommendation that customers requiring SNMP use SNMPv3, which offers more secure SNMP communication.

If SNMP v1/v2 is required in your application, Red Lion strongly recommends changing the default SNMP credentials before deployment.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

Legacy Protocols

When multiple revisions of a protocol are supported, Red Lion enables the most secure version by default and disables legacy (unsecure) versions of the protocol. We strongly recommend leaving the older revisions disabled.

LEGACY PROTOCOL	SECURE PROTOCOL EQUIPMENT
HTTP	HTTPS
Telnet	SSH

Disabling Unused Protocols and Special Devices

Certain network protocols and special devices are enabled by default for the best overall out of the box experience. However, some of these protocols and devices have the capability of configuring and/or reading network settings or causing unexpected network behavior. These protocols and devices should be disabled when they are not being utilized in your network to prevent unexpected behavior, unauthorized access and/or control of your network and individual network devices.

The following protocols or special devices meet these criteria:

- CIP™
- SNMP
- NTCD (Configuration Device)
- DHCP Client
- RSTP
- LLDP
- N-View™

Chapter 2 Features and Specifications

NT24k® Series Common Features

Red Lion's N-Tron® Series NT24k all-Gigabit managed industrial Ethernet switches are available in rack or DIN-rail mountable configurations. The NT24k platform offers a wide array of port configurations, media types and Power over Ethernet Plus (PoE+) models including Fast Ethernet, Gigabit copper and fiber options. All NT24k switches are plug-and-play installable with Internet Group Management Protocol (IGMP) auto-configuration, media/port auto-detection and simple ring configuration, making the NT24k platform one of the easiest to deploy managed switches in the industry. Housed in rugged hardened enclosures, NT24k switches feature extended shock and vibration specifications, wide operating temperature ratings, and best-in-class ring technology.

Connectivity

The modular NT24k switches are available in 2 or 3 slot configurations. Port modules are hot-swappable. Available modules include 10/100/1000Base Copper, 100Base Fiber, 1000Base Fiber, Gigabit Small Form-factor Pluggable (SFP) Ports and Dual Mode (100Base/1000Base) SFP ports. Modules and SFP transceivers are sold separately. Please reference the N-Tron Series “NT24k Modular Series Hardware & Installation Manual” for available configuration options.

The compact series offers a wide variety of copper and fiber configurations, including all Gigabit copper, Gigabit fiber or SFP ports. IEEE 802.3af/at Power over Ethernet (PoE) models are also available. Please reference the N-Tron Series “NT24k Compact Industrial Managed Gigabit Ethernet Switches Hardware Manual” for more information.

Performance

NT24k-managed switches provide uncompromising performance in harsh environments, including network features like N-Ring™, Virtual Local Area Network (VLAN), Quality of Service (QoS), port mirroring, IGMP, Simple Network Time Protocol (SNTP) and Simple Network Management Protocol (SNMP). IEEE 1588v2 (Precision Time Protocol, or simply PTP) models are also available. Additionally, the NT24k offers IEEE 802.1X with RADIUS remote server authentication to ensure port security. These network management features provide best-in-class visibility, security, and uptime performance.

Environmental

The ultra-reliable NT24k switches are available in rackmount or DIN-rail mountable configurations with operating temperatures from -40 to 85°C. With UL Class I, Division 2 listing and CE certifications, these industrial switches are built to last in the most demanding and hazardous environments.

Monitoring

The N-View™ monitoring technology software provides 47 different status points on switch and port conditions and displays that information on any networked computer.

Security

The NT24k series provides a high level of security by utilizing IEEE 802.1X with RADIUS remote server authentication, MAC address based port security, Hyper Text Transfer Protocol Secure (HTTPS), Secure Shell or Secure Socket Shell (SSH), and SNMPv3 communication protocol to ensure the safest networks.

Refer to the NT24k Hardware Manuals for more information on our Modular and Compact Series.

Overview of Advanced Features

Mode of Operation

Each port on the switch can be configured to support different modes of operation as shown below:

Copper Ports:
- Half-Duplex
- Full-Duplex
- Auto-Negotiation

1000Base Copper or any Fiber Ports:
- Full-Duplex

Half-Duplex

In half-duplex mode, the CSMA/CD media access ports share a common transmission medium. To transmit, a port waits (defers) for a quiet period on the medium (that is, no other port is transmitting) and then sends the intended message in bit-serial form. If, after initiating a transmission, the message collides with that of another port, then each transmitting port intentionally transmits for an additional predefined period to ensure propagation of the collision throughout the system. The port remains silent for a random amount of time (back-off) before attempting to transmit again.

Full-Duplex

Full-duplex operation allows simultaneous communication between a pair of ports using point-to-point media (dedicated channel). Full-duplex operation does not require that transmitters defer, nor do they monitor or react to receive activity, as there is no contention for a shared medium in this mode.

However, a receiving endpoint may request that the transmitting endpoint pause transmission to prevent receive buffer overflow. When the receiving buffer capacity becomes sufficient again, the receiving endpoint will notify the transmitting endpoint that transmission may resume.

Auto-Negotiation

In Auto-Negotiation mode, the port/hardware detects the mode of operation of the port that it is connected to and sets its mode to match.

Port Mirroring

A Mirroring Port is a dedicated port that is configured to forward copies of Ethernet frames that are being sent or received from a monitored port. This is normally only used during troubleshooting and debug of the network. Under normal operation, Port Mirroring is disabled.

Port Trunking

Port Trunking is the ability to group network ports to increase the bandwidth between two machines (e.g., switch or any work station). This feature allows grouping of high-speed connectivity and provides a redundant connection between switches, so that a trunk can act as a single link between the switches.

Quality of Service (QoS)

QoS refers to resource reservation control mechanisms. QoS is the ability to provide different priorities to different applications, users, or data flows. QoS guarantees are important if the network capacity is insufficient, especially for real-time streaming multimedia applications such as Voice over IP, high resolution images, online games and IP-TV, since these often require fixed bit rate and are delay sensitive, and in networks where the capacity is a limited resource, for example in cellular data communication. In the absence of network congestion, QoS mechanisms are not required.

The QoS of an egressing frame can be set based on the three QoS mechanisms listed below:

1. IEEE 802.1p (Tagged QOS)

2. DSCP (differentiated services code points) (RFC 2474)
3. Port (Default Priority)

Virtual Local Area Network (VLAN)

The switch provides support for setting up tagged VLANs. A port may belong to any number of VLANs. The VLAN membership of an end device is determined by the VLAN(s) defined for the port to which the device is connected. If a device should move from one port to another, it loses its current VLAN membership and inherits that of its new port.

VLANs facilitate easy administration of logical groups of devices that can communicate as if they were physically on the same LAN. Traffic between VLANs is restricted unless the ports are explicitly configured as overlapping VLANs. Switches forward unicast, multicast, and broadcast traffic only on LAN segments that serve the VLAN to which the traffic belongs.

A default Virtual LAN (VID=1) exists so if a port is not a member of any other VLAN, it will default back to VLAN 1. This allows the switch to operate as a 'normal' switch when it is used in a network. A port may be automatically removed from the default VLAN when it is reconfigured to belong to another VLAN. By default, the switch will automatically remove a port from the default VLAN when it is reconfigured to another VLAN. See the VLAN configuration section in Chapter 2 for additional information.

If switch ports are configured to transmit and receive untagged frames, then their connected devices are able to communicate throughout the LAN. Using Tagged VLANs, the switch has the ability to take non-tagged packets in some ports, add a VLAN tag to the packet and send it out to tagged ports on the switch. VLANs can also be configured to accept tagged packets in tagged ports, strip the tags off the packets, and then send the packets back out to other untagged ports. This allows a network administrator to set up the switch to support devices on the network that do not support VLAN tagged packets. The administrator can also set up the ports to discard any packets that are tagged or to discard any packets that are untagged, based on a hybrid VLAN of both tagged and untagged ports and by using the VLAN Ingress Filter on the switch.

For each switch port there is one and only one PVID (port VLAN ID) setting. If an incoming frame is untagged and untagged frames are being accepted, then that frame will inherit the tag of the PVID value for that port. Subsequent switch routing and treatment will be in accordance with that VLAN switch map. By configuring PVIDs properly and configuring for all frames to exit untagged, the switch can achieve a 'port VLAN' configuration in which all frames in and out can be untagged, thus not requiring external devices to be VLAN cognizant.

To understand how a VLAN configuration will perform, first look at the port on which the frame enters the switch, then the VLAN ID (VID) (if the frame is tagged) or the PVID (if the frame is untagged). The VLAN defined by the VID or PVID defines a VLAN group with a membership of ports. This membership determines whether a port is included or excluded as to frame egress from the switch.

The NT24k® switch also has the ability to allow overlapping VLANs. Overlapping VLANs give the user the ability to have one or more ports share two or more VLAN groups. For more information and examples on how this could be implemented, refer to the 'VLAN Configuration Examples' in this document, and/or our website's technical documents.

Note: RSTP is only supported on one VLAN.

Rapid Spanning Tree Protocol (RSTP)

Rapid Spanning Tree Protocol as specified in IEEE 802.1D-2004, is supported. One Spanning Tree on one VLAN is supported. (RSTP supersedes the Spanning Tree Protocol (STP) described in IEEE 802.1D-1998.) RSTP establishes a simply connected active network topology from the arbitrarily connected bridges of a bridged network. Bridges effectively connect just the LANs to which their forwarding ports are attached. Ports that are in a blocking state do not forward frames. The bridges in the network exchange sufficient information to automatically derive a spanning tree.

RSTP provides quicker learning of network topology changes than the older STP. RSTP supports new and improved features such as the rapid transition of ports to the forwarding state. While STP transmits BPDUs (Bridge Protocol Data Units) from only the root bridge, RSTP transmits BPDUs from every bridge. RSTP inter-operates with older STP switches by falling back to STP when the older BPDUs are detected on bridge ports. The user can also manually configure bridge ports to use STP, if desired.

SNMP Traps

The NT24k® Series switch supports SNMP Trap Stations to which SNMP Traps will be sent. Four standard SNMP traps are supported: Link Status (Link Up / Link Down), Cold Start, Warm Start, and Authentication Errors. SNMP Traps are sent to all trap stations configured on a given switch when the corresponding trap is enabled.

IGMP Snooping

IGMP Snooping is enabled by default. The switch provides automatic (Plug and Play) IGMP configuration. IGMP snooping provides intelligent network support for multicast applications, reducing unneeded network traffic. IGMP Snooping is configured via the web console and if enabled, operates dynamically upon each power up. Also, there can be manual only or manual and dynamic operation. Note that “static multicast group address” can be used whether IGMP Snooping is enabled or not.

The Internet Group Management Protocol (IGMP) is a protocol that provides a way for a device to report its multicast group membership to adjacent 'routers'. In this case NT24k switches provide router-like functionality. Multicasting allows one computer to send content to multiple other computers that have identified themselves as interested in receiving the originating computer's content. Multicasting can be used to transmit only to an audience that has joined (and not left) a multicast group membership. IGMP version 2 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 2236. IGMP version 1 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 1112. The NT24k series supports v1 and v2.

IGMP Snooping will function dynamically without user intervention. If some of the devices in the LAN do not understand IGMP, then manual settings are provided to accommodate them.

N-Link

The purpose of N-Link is to provide a way to redundantly couple an N-Ring topology to another topology, typically another N-Ring topology. Each N-Link configuration requires 4 switches, two on each network. On the N-Ring network, one switch is the N-Link Master and an adjacent switch is the N-Link Slave. On the connected network, one switch is the N-Link Primary Coupler and another switch is the N-Link Standby Coupler.

N-Link monitors the link status of the Primary and Standby Coupler links. As long as the Primary Coupler link is healthy, N-Link forwards network traffic and the Standby Coupler link blocks network traffic. When a problem is detected on the Primary Coupler link, the Primary Coupler link blocks network traffic and the Standby Coupler forwards network traffic. While the N-Link Master and Slave are in communication via the Control link, only one Coupler link (Primary or Standby) forwards network traffic, while the other Coupler link blocks network traffic.

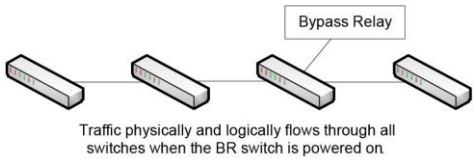
N-Ring™

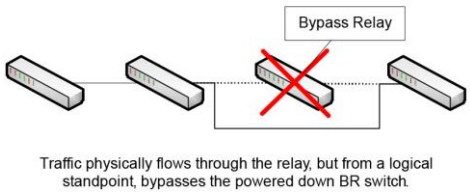
N-Ring is designed for easy setup. Switches are configured for N-Ring membership, by default. Setting a switch as the N-Ring Manager is the only required step for enabling the ring as long as preset ports are used to connect ring members. Subsequently, N-Ring operates dynamically upon each power up. N-Ring technology offers expanded ring size capacity, detailed fault diagnostics, and a standard healing time of 30ms. The N-Ring Manager periodically checks the health of the N-Ring via health check packets. If the N-Ring Manager stops receiving the health check packets, it times-out and converts the N-Ring to a

backbone within 30ms. When using all N-Ring enabled switches in the ring, a detailed ring map and fault location chart is also provided on the N-Ring Manager's web browser. N-Ring status is also sent from the N-Ring Manager to the N-View™ OLE for Process Control (OPC) Server to identify the health status of the ring. Up to 250 N-Ring enabled switches can participate in one N-Ring topology. Switches that do not have N-Ring capability may be used in an N-Ring, however the ring map and fault location chart cannot be as detailed at these locations.

Bypass Relay (BR)

BR ports have an internal hardware technology that forces paired BR ports to create a physical connection when the switch powers down. The BR switch is in bypass mode when it is powered down. This feature allows devices connected via these ports to continue communicating despite the BR switch being powered down.





Note: BR ports are only supported on select NT24k® models. BR-capable equipment is denoted by a "-R" in the model name. Likewise, BR capable ports are denoted by a "-R" in the port description.

Note: Some port protocols and port properties are not supported or may be affected by BR ports.

Affected Port Protocols

802.1X

802.1X security cannot be enabled on BR ports. Allowing this protocol on BR ports will lead to network security issues when the switch enters bypass mode. Therefore, 802.1X security is not allowed.

N-Link

N-Link Coupler and Control ports cannot be selected on BR ports. If BR ports were utilized for these links, there would be connection issues upon the switch entering bypass mode. It is also a best practice to ensure that neither the Master nor Slave Partner ports are connected to a BR port. Unlike the Coupler and Control ports, these ports are not user configured, but are auto-detected by the N-Link protocol. Use extra care when introducing BR equipment into an N-Link topology and avoid using BR ports for the N-Link connections.

N-Ring™

N-Ring Manager, Auto Member, and Multi Member cannot be enabled on BR port sets. N-Ring port sets exclude BR-capable ports.

RSTP

RSTP is disabled on BR ports to prevent unacceptable performance within an RSTP topology.

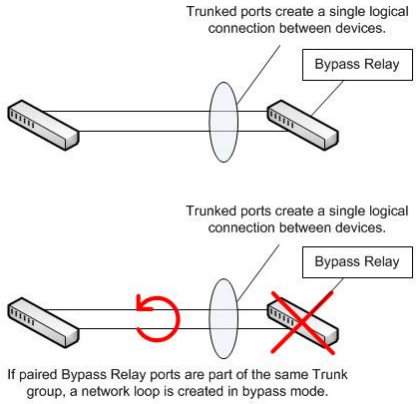
IGMP

Caution must be taken when IGMP is enabled. Devices connected to BR ports must be able to accommodate higher traffic rates. Test your network conditions with the BR switch both powered on and off if IGMP is to be enabled on a BR port.

Affected Port Properties

Port Trunking

BR port pairs cannot be members of the same trunk group to prevent a network loop being created in bypass mode.



VLAN

VLAN group membership must be identical between BR port pairs to ensure proper flow of traffic when the switch enters bypass mode. Caution must also be taken when modifying VLAN tags or filtering VLAN traffic on BR ports to ensure that all devices connected to BR ports can accommodate VLAN traffic whether the BR switch is powered on or powered off.

Note: The VLAN(s) associated with RSTP may contain BR ports, however RSTP will be disabled on the BR ports.

Port Compatibility

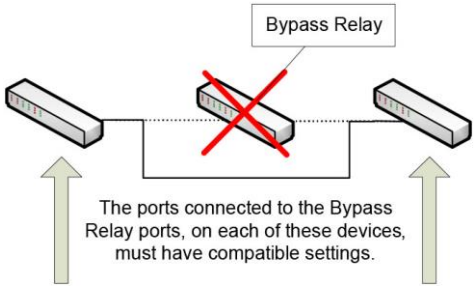
Care should be taken to ensure port characteristics of devices connected via BR ports are compatible, so that there are no interruptions in traffic when a BR switch enters bypass mode.

Ports and/or devices connected to the BR ports must be configured with compatible settings.

The following characteristics should be compatible for devices connected via BR ports:

- Auto-Negotiation
- Port Speed
- Duplex Mode
- Flow Control
- Flow Control
- PVID
- QoS
- Rate Limiting

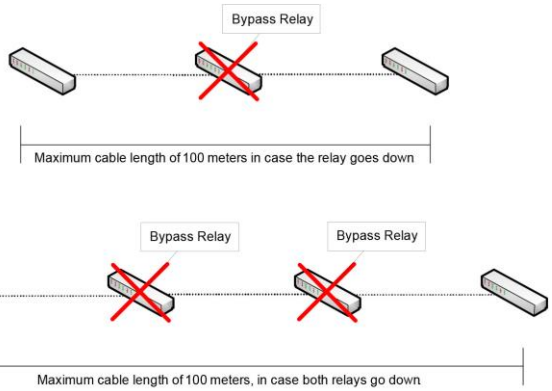
For example, if switches A and B are connected via a BR switch, the connecting port on switch A should have the same configured port speed as the connecting port on switch B. If these ports have incompatible speeds, they may have issues communicating once the switch enters bypass mode.



Note: It is still possible to customize port settings in any configuration desired, based on network requirements. Network testing must be performed to ensure correct network operation whether the switch is powered on or powered off.

Segment Length

Based on IEEE specifications, the maximum segment length for 10/100/1000BaseT(X) is 100 meters (328 ft). This requirement applies to combined segment lengths between all devices connected via BR port pairs. Staying within the IEEE specified segment length ensures proper operation.



CIP™

The CIP (Common Industrial Protocol) feature allows N-Tron® Series switches to directly provide switch information and configuration access to Programmable Logic Controller (PLC) and Human Machine Interface (HMI) applications via a standardized communication protocol. For example, a PLC may be programmed to monitor port links or N-Ring™ status and trigger a status indicator to turn red on an HMI if a port goes link down or if N-Ring has a fault. CIP is formally described in ODVA Publication Number PUB00001 (Volume 1: Common Industrial Protocol (CIP)), and Publication Number: PUB00002 (Volume 2: Ethernet/IP™ Adaptation of CIP). Red Lion created EDS and ICO files are provided with the NT24k® switch series.

Note: Information about using CIP with the NT24k can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family.

PTP

Precision Time Protocol (PTP), IEEE 1588v2, is supported on licensed NT24k models. PTP allows users to configure a network with very accurate, coordinated timing among devices. NT24k models with software implementations of PTP are capable of achieving accuracy in the low microseconds range. PTP is disabled by default and can be enabled as a Boundary or Transparent clock through the Web Browser interface. The switch must have a valid PTP license installed before PTP can be enabled.

Point-to-Point Protocol (PPP)

PPP allows a browser-like interface over the CLI port.

Dynamic Host Configuration Protocol (DHCP)

DHCP (Dynamic Host Configuration Protocol) simplifies network configuration by automatically assigning IP addresses from a DHCP server to connected DHCP capable devices (DHCP clients). NT24k® switch configuration options include:

- DHCP Server
- DHCP Relay Agent
- DHCP Client

DHCP Server

DHCP Server allows DHCP Client devices to automatically obtain an IP assignment. IP assignments can be set up as a dynamic range of IP addresses available to any client device; or specific IP addresses based on the client's Client ID (Option 61), or Relay Agent connection (Option 82). It also allows for a device on a specific port to receive a specific IP address and if the device is replaced, the replacement receives the same IP address as the original device.

DHCP Relay Agent

DHCP Relay Agent (Option 82) allows communication between the client and server to cross subnet and VLAN boundaries.

DHCP Client

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

Event Logging

The switch can be configured to log certain system events as they occur. Event Logging is enabled by default for critical events. Event log options are easily changed through a Web browser.

Even Logging includes:

- System startup and shutdown
- Logon and logout from the Web or Console
- Ports becoming enabled or disabled
- Port link up or link down changes
- N-Ring™ status changes

The most recent log information is visible via the web interface and the complete log file may be exported for external analysis.

Event Log Filter

The Event Log Filter enables the user to define which events are logged, based on severity level. Events that do not meet the minimum severity level for that component are not logged.

Syslog

The Syslog protocol, as specified in RFC-3164 and RFC-5424, are supported. The Syslog allows users to configure the switch so that certain system events (see Event Logging) are transmitted to a remote

logging device, known as a Syslog Collector. The Syslog is disabled by default but can be enabled/disabled through the Web Browser interface.

Local Security

The switch is configured for secure access by the SSH and HTTPS. The Telnet Server and Hypertext Transfer Protocol (HTTP) may be enabled to provide backwards compatibility with less secure clients.

Secure Shell

SSH, is a secure alternative to Telnet. A maximum of two concurrent SSH / Telnet connections are allowed.

The commands SFTP (SSH File Transfer Protocol or Secure File Transfer Protocol) and SCP (Secure Copy) are not supported.

Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the ports that the address is authorized on. A non-authorized MAC address will be discarded and will be listed in the intruder log.

Port security supports RSTP provided the MAC address(es) are manually authorized on the RSTP ports.

LLDP

The Link Layer Discovery Protocol (LLDP), as specified in IEEE 802.1AB and IEEE 802.3-2012, is used by networking devices to advertise there identity and capabilities and to discover their network neighbors. LLDP can be configured in one of three modes: Enabled, Auto and Disabled. The "Auto" mode is an enhancement to the LLDP protocol.

When in Auto mode, LLDP is inactive until a switch sends a wake up packet. At this point, all switches set to Auto mode will become active until the Wake Time interval expires.

Troubleshooting

1. Make sure the Power LED is ON.
2. Make sure sufficient current is supplied to the switch (per model specifications).
   Note: The Inrush current will exceed the steady state current by ~ 2X.
3. Verify that Link LEDs are ON for connected ports.
4. Verify integrity of cabling between stations.
5. Verify that cabling is Category 5E or greater for 100Mbit and Gigabit operation.

Chapter 3 Web Software Configuration

Accessing the Web Software Interface

Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default with 192.168.1.201 as the fallback address.

The following login screen will appear:



- For the User Name, enter: **admin** (all lowercase)
- For the password, enter: **admin** (all lowercase)

Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.

Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Organization

After logging onto a NT24k® switch, the Product Information page will be displayed. On the left-hand side of the screen is a list of configurable settings supported by the NT24k switch. Below is a list of these settings with a description of their purpose.



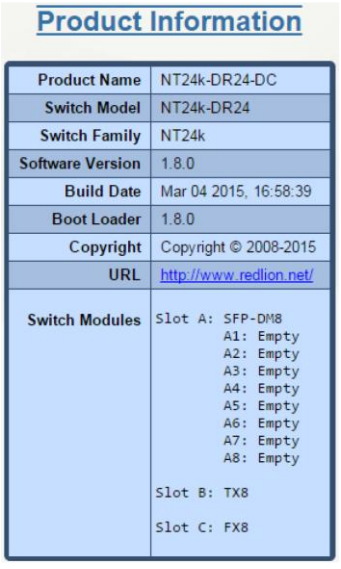
- **Product Information:** Basic information about the switch is provided in this menu.

- **Configuration:** The Configuration page is used to save or reset a running configuration.
- **Event Log:** The Event Log page is used for modifying and viewing the internal event logs.
- **Fault:** A fault is a notification of a destabilizing event. Which events are watched for and how notifications occur are configured on the Fault page.
- **File Transfer:** The File Transfer page provides the administrator the ability to upgrade the firmware or to import or export a configuration file, and export the Event Log to a file.
- **Network:** The network page is used to setup the device's IP and IP Fallback addresses, as well as Client ID and IP Configuration.
- **System:** The System page provides information pertaining to the whole system.
- **User Management:** The User Management page is used to view, add, modify and remove system user accounts, and set permissions.
- **Advanced:** The Advanced section is used to setup advanced features of the system.
- **Help:** The Help section is used to display information on configuring and monitoring the manageable parameters of the device. Specific help can be found by using the left navigation menu.

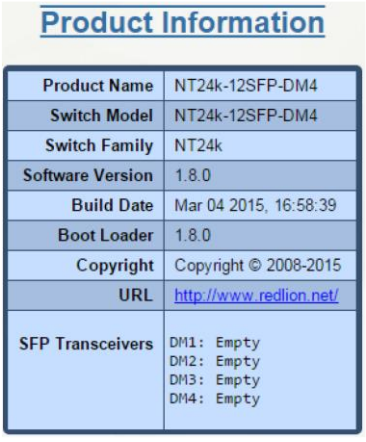
Product Information

Once a user logs onto an NT24k® switch, the Product Information page is displayed. This page shows basic information about the switch and can also be accessed by selecting the Product Information menu item on the left-hand menu.

Modular Models



Compact Series



Product Name: The full name of the switch, including any factory configured options will be displayed in this field.

For example, the product name will show NT24K-AC1 if there is one AC power unit in either location and NT24K-AC2 if there are two AC power units. If the product name ends with DC1 or DC2, this indicates that there is either one or two DC power units.

Switch Model: The base model of the switch.

Switch Family: The switch family this model and similar models belong to.

Software Version: The current firmware software version.

Build Date: The build date of the firmware.

Boot Loader: The boot loader version.

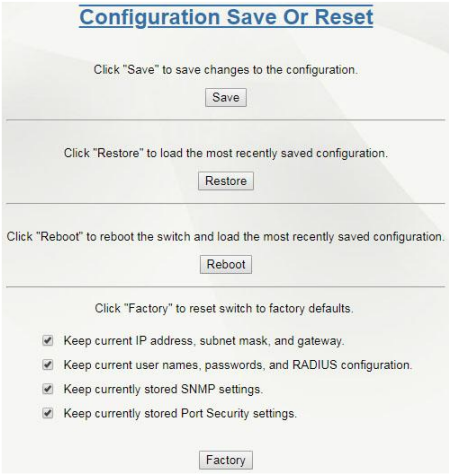
URL: This field links to Red Lion's website.

Switch Modules: The modules currently installed, including installed SFP transceivers. This option may not be present on models where modules or SFPs are not supported.

SFP Transceivers: On models where SFP transceivers are supported, the currently installed SFP transceivers will be shown in this field.

Configuration

The Configuration page allows the Administrator to save a running configuration in the switches non-volatile memory. This step is required if the switch is to remember any configuration changes after a power cycle or reboot. From this page, the Administrator can also restore a previously saved configuration, restore factory defaults or force a system reboot.



Save: Click on the *Save* button to save all current changes to the configuration stored in non-volatile memory for use after the next power cycle or reboot. If a configuration device is installed and enabled, the configuration will also be saved to the device. This option is only available when there is no misconfiguration.

Restore: Click on the *Restore* button to discard all unsaved changes and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Reboot: Click on the *Reboot* button to reboot the switch and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Factory: Click on the *Factory* button to reset the switch's configuration to factory defaults except for any of the selected items. Selecting the Factory option will only affect the current configuration. A *Save* must be performed in order to retain these changes after a power cycle or reboot.

- **Keep current IP address, subnet mask, and gateway:** Retains the existing IP address, subnet mask and gateway if desired.
- **Keep current user names, passwords, and RADIUS configuration:** Retain the existing user names, passwords, and RADIUS configuration if desired.

- **Keep currently stored SNMP settings:** Retains the existing SNMP settings if desired.
- **Keep currently stored Port Security settings:** Retain the existing Port Security settings if desired.
- **Keep current PoE Settings:** Retains the existing PoE settings if desired (PoE models only).

Note: When the configuration is loaded from the Configuration Device, it must be saved for it to be available if the Configuration Device is removed.

Note: When the switch is shipped, it does not have a "configuration file" since the unit is using the factory defaults. Before a configuration can be customized, click on the Save button in order to create the file.

Configuration Fault

When the switch is booted and misconfigured settings are detected, a Configuration Fault will be triggered and the configuration may not be saved. This can occur when updating system firmware where settings permitted in the previous release may no longer be permitted. In this case, the *Save* button will be replaced with a *Show Errors* button (as seen below) and the misconfigured settings must be fixed before the configuration may be saved.

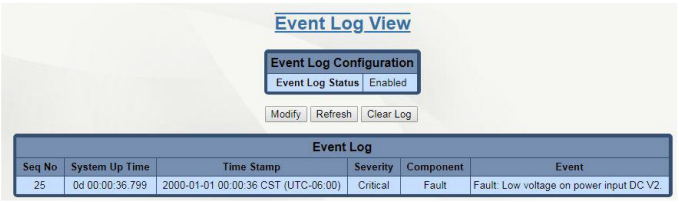


Show Errors: Click on the Show Errors button to view the current configuration and display any detected errors. This button is only visible when there is a settings misconfiguration.

Event Log

The Event Log View page displays the most recent 200 events that have occurred since the latest system startup or since the log was cleared. Event logging is enabled by default for critical events. Only events that occur while the Event Log was enabled will be displayed and saved with the exception of the Clear Log message which will always be displayed. Therefore, previously enabled events are still displayed when Event Logging is disabled albeit they may not be recent events.

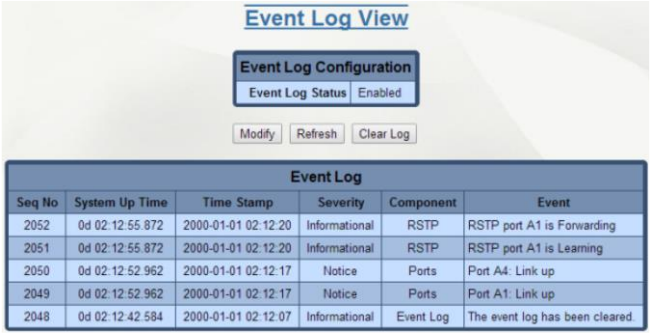
If the Event Log was disabled when the latest Startup event occurred, no events will be displayed as shown below.



When the Event Log is cleared, an informational event will be displayed.

Note: All enabled events since the last Clear Log event, including multiple Startup and Shutdown events, are stored on the system and may be exported as a CSV file from the switch for additional analysis.

Note: The event log can contain 2000 or more entries depending on individual message size. If the event log becomes full, new entries will overwrite the oldest entries.



A normal startup or reboot will show startup, RSTP status, N-Ring™ and logon events. An example reboot is shown below.

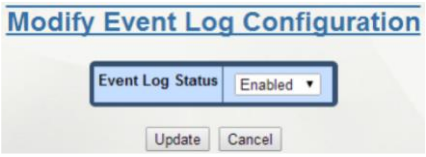


Modify: Display the Modify Event Log Configuration page.

Refresh: Refresh the current Event Log display.

Clear Log: Remove all entries from the event log and then add “The event log has been cleared.” message.

The Modify Event Log Configuration page controls whether Event Logging is Enabled or Disabled.

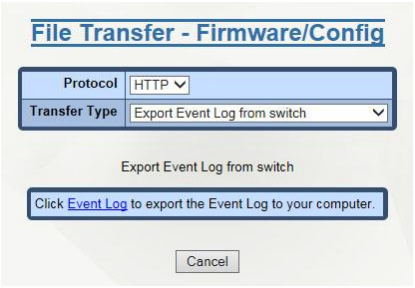


Event Log Status: Select Enabled/Disabled.

Update: Set the new Event Log Status.

Cancel: Return to Event Log View without modifying Event Log Status.

The entire Event Log may be exported to the host PC for further analysis and archiving purposes. It will contain all events that occurred while Event Log was enabled since the last Clear Log event.



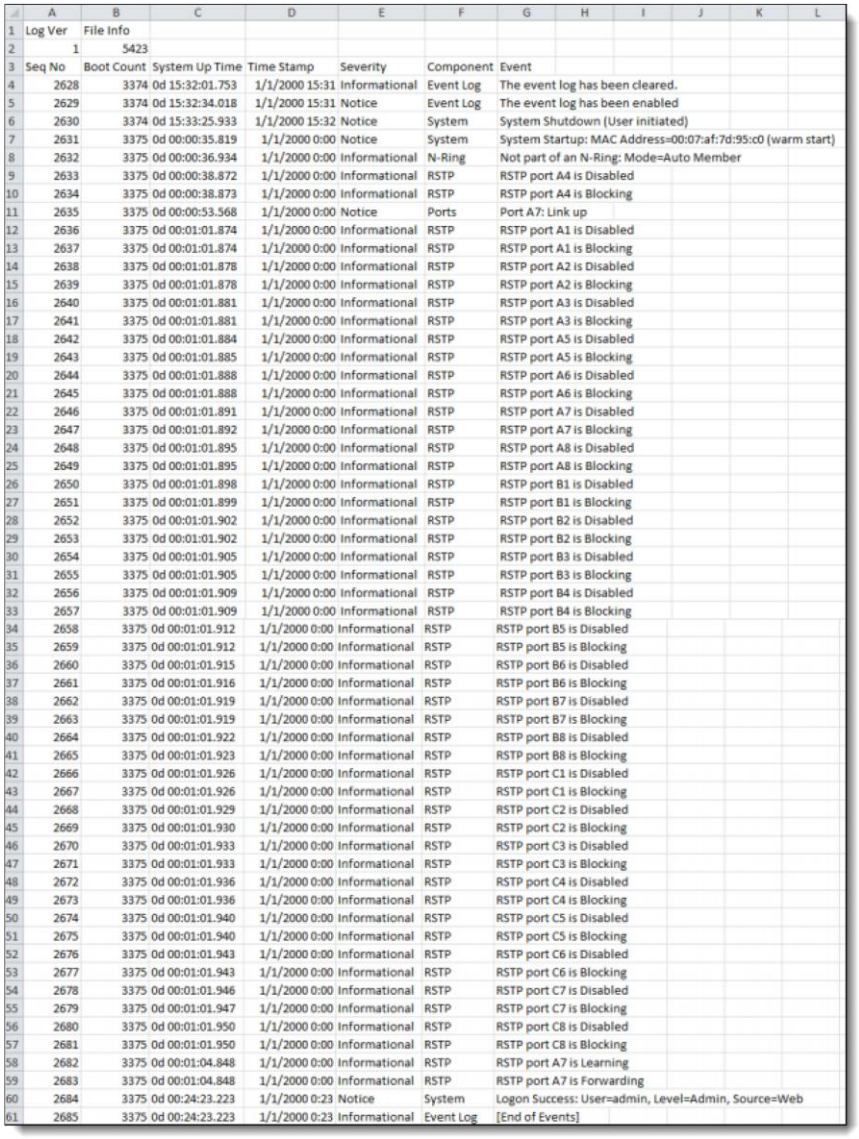
On the File Transfer - Firmware/Config page, select Transfer Type: Export Event Log from switch.

Click on Event Log in the Export Event Log from switch panel, and select the storage location for the exported file on the PC.

The default file name is “eventlog.csv”, which outputs each line in the Event Log as comma separated fields with the final text field surrounded by quotation marks. This file can be viewed with a spreadsheet application or a simple text file viewer.

The Cancel button selection will return to the Product Information page without executing any transfers.

Example Event Log CSV in Microsoft Excel:



	A	B	C	D	E	F	G
1	Log Ver	File Info					
2	1	5423					
3	Seq No	Boot Count	System Up Time	Time Stamp	Severity	Component	Event
4	2628	3374	0d 15:32:01.753	1/1/2000 15:31	Informational	Event Log	The event log has been cleared.
5	2629	3374	0d 15:32:34.018	1/1/2000 15:31	Notice	Event Log	The event log has been enabled
6	2630	3374	0d 15:33:25.933	1/1/2000 15:32	Notice	System	System Shutdown (User initiated)
7	2631	3375	0d 00:00:35.819	1/1/2000 0:00	Notice	System	System Startup: MAC Address=00:07:af:7d:95:c0 (warm start)
8	2632	3375	0d 00:00:36.934	1/1/2000 0:00	Informational	N-Ring	Not part of an N-Ring: Mode=Auto Member
9	2633	3375	0d 00:00:38.872	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Disabled
10	2634	3375	0d 00:00:38.873	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Blocking
11	2635	3375	0d 00:00:53.568	1/1/2000 0:00	Notice	Ports	Port A7: Link up
12	2636	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Disabled
13	2637	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Blocking
14	2638	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Disabled
15	2639	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Blocking
16	2640	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Disabled
17	2641	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Blocking
18	2642	3375	0d 00:01:01.884	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Disabled
19	2643	3375	0d 00:01:01.885	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Blocking
20	2644	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Disabled
21	2645	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Blocking
22	2646	3375	0d 00:01:01.891	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Disabled
23	2647	3375	0d 00:01:01.892	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Blocking
24	2648	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Disabled
25	2649	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Blocking
26	2650	3375	0d 00:01:01.898	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Disabled
27	2651	3375	0d 00:01:01.899	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Blocking
28	2652	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Disabled
29	2653	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Blocking
30	2654	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Disabled
31	2655	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Blocking
32	2656	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Disabled
33	2657	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Blocking
34	2658	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Disabled
35	2659	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Blocking
36	2660	3375	0d 00:01:01.915	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Disabled
37	2661	3375	0d 00:01:01.916	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Blocking
38	2662	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Disabled
39	2663	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Blocking
40	2664	3375	0d 00:01:01.922	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Disabled
41	2665	3375	0d 00:01:01.923	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Blocking
42	2666	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Disabled
43	2667	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Blocking
44	2668	3375	0d 00:01:01.929	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Disabled
45	2669	3375	0d 00:01:01.930	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Blocking
46	2670	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Disabled
47	2671	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Blocking
48	2672	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Disabled
49	2673	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Blocking
50	2674	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Disabled
51	2675	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Blocking
52	2676	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Disabled
53	2677	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Blocking
54	2678	3375	0d 00:01:01.946	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Disabled
55	2679	3375	0d 00:01:01.947	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Blocking
56	2680	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Disabled
57	2681	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Blocking
58	2682	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Learning
59	2683	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Forwarding
60	2684	3375	0d 00:24:23.223	1/1/2000 0:23	Notice	System	Logon Success: User=admin, Level=Admin, Source=Web
61	2685	3375	0d 00:24:23.223	1/1/2000 0:23	Informational	Event Log	[End of Events]

Where the fields are:

Sequence Number: Each entry is assigned the next sequence number – these may not always be listed in numerical order due to the priority of the internal tasks which generate the events.

Note: The "[End of Events]" message at the end of the file will contain the next sequence number, but that number will be reused for the next system event on the switch when it occurs.

Boot Count: A count of how many times the switch has been powered up or restarted.

System Up Time: The amount of time since the system was started in days, hours, minutes, seconds, milliseconds.

Time Stamp: Corresponding date, hours, minutes, seconds, based on the initial value of Current System Time as defined in the System Configuration View.

Severity: (most severe to least severe):

Emergency: Major failure, Immediate intervention required

Alert: Failure of a component, Immediate corrective steps should be taken
Critical: Partial failure of a component, Immediate corrective action should be taken
Error: Non-urgent failure
Warning: Not an error, but may lead to an error if action is not taken
Notice: Unusual event, but not an error
Informational: General Information
Debug: Information useful to a support technician for debugging the switch operation.

Component: Internal component that generated the event entry.

Event Description: Description of the event entry.

Fault

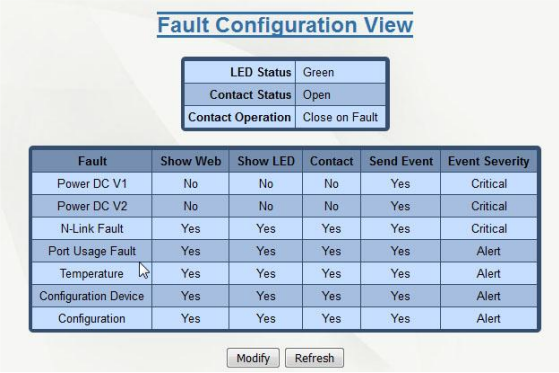
The Fault page provides configurable selections indicating the different ways to notify an administrator when a fault occurs. In each case, the notification may consist of any combination: Show Web, Show LED and/or Contact. Some fault configurations are only available under specific conditions. For example, Power AC is only available when an AC power supply is installed in the switch. N-Ring™ faults are only available when the switch is set to N-Ring Manager mode. The page below is an example of what may be seen on the Fault dialog window.

Additionally, when a fault is triggered, an event may be generated at the severity selected by the user. The event will be logged unless it is filtered by the Event Log Filter.

The event's severity can be set to any of the following values.

Note: These are based on the Event Log's Severity:

Emergency
Alert
Critical
Error
Warning
Notice
Informational
Debug



LED Status: This field shows the current color of the Power/Fault LED. Green indicates there is no fault and Red indicates a fault condition exists.

Contact Status: This field shows the current open/closed status of the fault relay.*

Contact Operation: This field determines if the fault relay is normally open (Close on Fault) or normally closed (Open on Fault).*

Show Web: If the *Show Web* option is enabled, the fault is displayed on the browser pages.

Show LED: If the *Show LED* option is enabled, the fault is indicated on the Power LED as red.

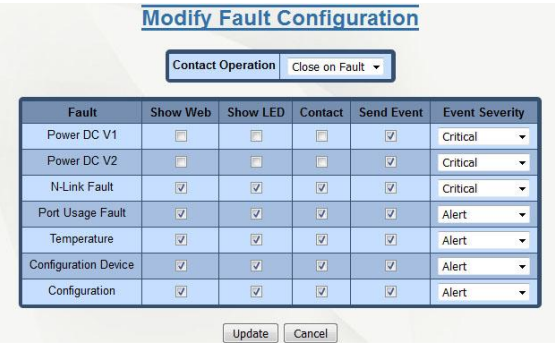
Contact: If *Contact* is enabled, the fault is indicated by opening or closing the contact switch.

Send Event: The fault is sent to the configured log(s). See the Event Log and Syslog configuration.

Event Severity: The fault will generate an event based on the configured severity level.

To make changes to the *Fault Configuration* settings, click on the *Modify* button.

* **Note:** Fault's contact is only supported on certain NT24k® switches.



Select the desired notification settings and click on the *Update* button to save any changes. Once the save is complete, the dialog window will change to Fault Configuration.

Power Fault Descriptions

The location of a power input is clearly marked on the device. Depending on the specific device configuration, some of the faults listed below may not be shown.

Note: Power Fault notifications are disabled in factory defaults on a low voltage power supply.

Power AC1: Indicates a low voltage on power input AC1.
Power AC2: Indicates a low voltage on power input AC2.
Power DC V1: Indicates a low voltage on power input DC V_1.
Power DC V2: Indicates a low voltage on power input DC V_2.
Power DC V3: Indicates a low voltage on power input DC V_3.
Power DC V4: Indicates a low voltage on power input DC V_4.

N-Ring™ Manager Fault Descriptions

The faults listed below appear when the switch is configured as an N-Ring manager.

N-Ring Broken: Indicates that an N-Ring connection is completely broken.
N-Ring Partial Break (High): Indicates that an N-Ring connection is only broken in the direction of the higher port.
N-Ring Partial Break (Low): Indicates than an N-Ring connection is only broken in the direction of the lower port.
N-Ring Multiple Managers: Indicates that more than one N-Ring Manager exists on an N-Ring.

Miscellaneous Fault Descriptions

N-Link Fault: Indicates a problem with the N-Link configuration.
Port Usage Fault: Indicates that the port usage, for one or more ports, is below the Usage Alarm Low setting, or above the Usage Alarm High setting (see Port Configuration View and Port Utilization View).
Temperature: Indicates that the temperature of the switch is outside of the configured limits.
Configuration Device: Indicates that the configuration on an installed configuration device is invalid.
Configuration: Indicates that a setting misconfiguration needs to be resolved.

File Transfer

File Transfer gives the administrator the ability to import files to the switch or export files from the switch.

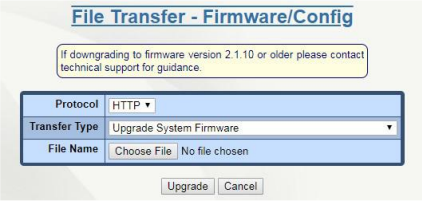
Note: Do not cycle power on the switch or interrupt the data connection between the PC and the switch while a file is being transferred.

Protocol: Select whether HTTP, HTTPS, or TFTP protocol is to be used for transfers.

Transfer Type: The different types of transfer that can be used are listed in the drop-down list. The options are: Upgrade System Firmware, Upgrade BootLoader Firmware, Import Configuration to Switch, Import Port Security Authorization List to Switch, Import License to Switch, Export Saved Configuration from Switch, Export Saved Port Security Authorization List from Switch, and Export Event Log from Switch.

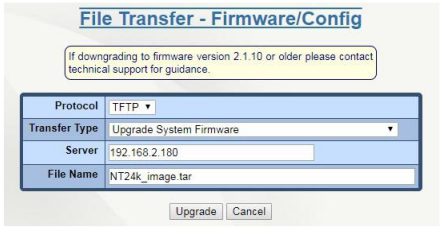
Upgrade System Firmware: Select this option to install the system firmware to the switch.

HTTP/HTTPS Protocol



File Name: Click on the *Browse* button to browse to the desired location and select an image file (typically called NT24k_image.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server. It is automatically populated with the IP address of the PC which is connected to the switch.
File Name: This field displays the name of the file to be imported (typically NT24k_image.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

WARNING: Due to security enhancements, downgrading the system firmware to 2.1.10 or older will reset all passwords to “password” (users and administrators). The Administrator should immediately change each user’s password and notify the user.

Upgrade BootLoader Firmware: Select this option to install the bootloader firmware.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select an image file (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



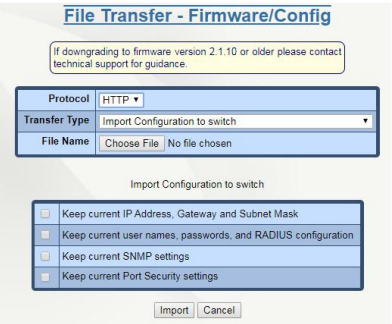
Server: This field displays the IP address of the TFTP server.
File Name: This field displays the name of the file to be imported (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

Import Configuration to Switch: Select this option to change the switch configuration by importing a configuration file.

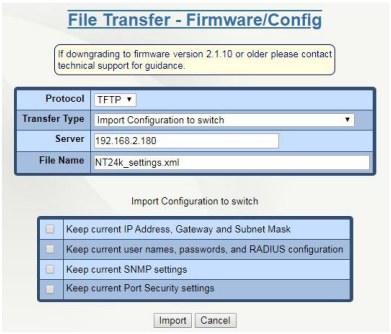
HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a configuration file (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

Import Port Security Authorization List to Switch: Select this option to change the Port Security Authorization List by importing a configuration file.

HTTP/HTTPS Protocol



File Name: Click on the Choose File button to browse to the desired location and select a configuration file (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

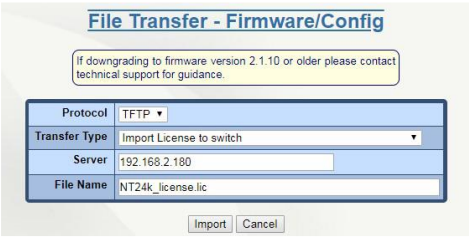
Import License to Switch: Select this option to install a license to the switch by importing a license file.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the license.

*The same file transfer dialog box is used for both HTTP and HTTPS.

Import Security Certificate to Switch:

HTTP/HTTPS Protocol



Certificate File Name: Click on the Choose File button to browse to the desired location and select a certificate file (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: Click on the Choose File button to browse to the desired location and select a key file (typically key.pem). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

Certificate File Name: This field displays the name of the file to be imported (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: This field displays the name of the file to be imported (typically key.pem). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the Security Certificate.
*The same file transfer dialog box is used for both HTTP and HTTPS.

Note: After successfully transferring a new Security Certificate to the switch, the switch must be rebooted.

Export Saved Configuration from Switch: Select Export Saved Configuration from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Configuration Settings* link to export the settings to your computer. This option allows administrators to back up their configurations to an offsite server in case a custom configuration must be reloaded at a later time.

A download dialog pop-up will appear, prompting the user to open or save the configuration file. The file is called *NT24k_settings.xml* per default.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_settings.xml). File names are limited to 63 characters maximum.

Click on the *Export* button to export the settings to the specified TFTP server.

Export Saved Port Security Authorization List from Switch: Select Export Saved Port Security Authorization List from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Port Security Authorization List* link to export the authorization list to your computer. This option allows administrators to back up their Port Security Authorization List.

A download dialog pop-up will appear, prompting the user to open or save the authorization file. The file is called *NT24k_portsecurity.auth* per default.

TFTP Protocol



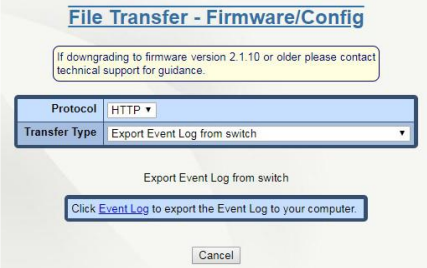
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_portsecurity.auth). File names are limited to 63 characters maximum.

Click on the *Export* button to export the configuration file to the specified TFTP server.

Export Event Log from switch: The entire Event Log may be exported to the host PC for further analysis and archiving purposes. The log file lists all events that occurred while event logging was enabled and since the last Clear Log event was performed.

HTTP/HTTPS Protocol



Click on the *Event Log* link to export the log file to your computer. A download dialog pop-up will appear, prompting the user to open or save the configuration file.

TFTP Protocol



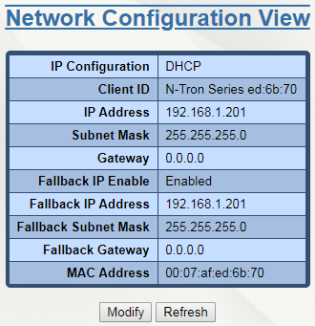
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically eventlog.csv). File names are limited to a maximum length of 63 characters.

Click on the *Export* button to export the log file to the specified TFTP server.

Network

Setting the IP Configuration to DHCP will use the Primary Management VLAN ports to receive an IP address from the DHCP Server. Changes to the Primary Management VLAN are made in the VLAN section. If no changes are made, the default VLAN will be used as the default Primary Management VLAN.



IP Configuration: Determines the method used to obtain an IP address, Subnet Mask, and Gateway address. When Static is selected, the statically configured values are used. When DHCP is selected, DHCP protocols are used to obtain these values.

Client ID: This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters. (Only shown in DHCP Mode) The DHCP option 61 client identifier will be sent with a preceding type-byte as listed below:

MAC Address = 0x01
Switch Name = 0x00 (Default)
Other String = 0x00
Other HEX = 0x00

IP Address: Contains the current IP Address of the device.

Subnet Mask: Contains the current Subnet Mask of the device.

Gateway: Contains the current Gateway of the device.

Fallback IP Enable: Enables/disables the use of the Fallback IP address.

Fallback IP Address: Contains the configured Fallback IP address of the device. This address will be used if the switch fails to obtain a DHCP address from the DHCP Server. This option is only shown in DHCP Mode and if Fallback IP is enabled.

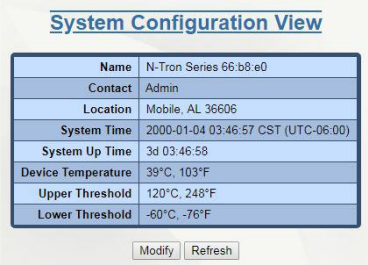
Fallback Subnet Mask: Contains the configured Fallback Subnet Mask of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

Fallback Gateway: Contains the configured Fallback Gateway of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

MAC Address: MAC Address of the device.

To modify any of the fields, click on Modify. Enter the desired system settings and click on the *Update* button.

System



The System page presents the user with current system information.

Name: Contains the name assigned to the device, which allows alphanumeric and special characters (,#_-:) only. When IP Configuration is DHCP, then this may be used as the Client ID (Option 61) of the DHCP Request.

Contact: The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters (,#_-) are allowed.

Location: The physical location of the switch. Only alphanumeric and special characters (,#_-) are allowed.

System Time: Displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start.

System Up Time: Parameter represents the total time elapsed since the switch was turned on or rebooted.

Device Temperature: The device temperature reported by the on-board digital temperature sensor. This option is only shown on devices with temperature sensors.

Upper Threshold: The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in degrees Celsius. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Lower Threshold: The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in Celsius degrees. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Power DC V1: The voltage measurement on power input DC V1. This option is only shown on devices with a voltage sensor.

Power DC V2: The voltage measurement on power input DC V2. This option is only shown on devices with a voltage sensor.

Total Current: The total input current measurement in Amps. This option is only shown on devices with a current sensor.

Total Power: The calculated power in Watts obtained from voltage and current measurements. This option is only shown on devices with a voltage and current sensor.

To make modifications to the fields above, click on the Modify button. Enter the desired settings and click on the *Update* button.

Bridging

Aging Time

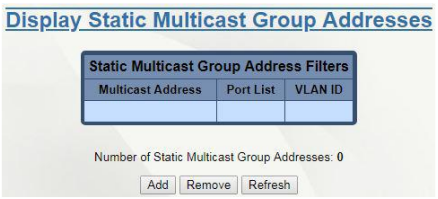
The Aging menu item under the Bridging category displays the currently configured Aging Time. This configurable field shows the desired aging time for dynamically learned MAC addresses. Inactive MAC addresses will be removed from the Hardware Address Entry Table after the aging time period has expired. The internal aging time period will be between 1 and 2 times the selected aging time value.



To modify the Aging Time field, click on the Modify button. Enter the desired Aging Time (value must be between 10 - 630 seconds) and click on the *Update* button. The default value for this field is 300 seconds. To save the changes made, return to the Configuration menu and click on the *Save* button.

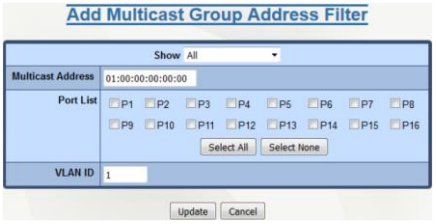
Multicast Addresses

The Multicast Addresses page displays a list of Multicast Group Addresses that are associated with respective port numbers.



Adding a Multicast Group Address

To add a Multicast Address, click on the Add button and the following dialog window will appear:



Enter a valid Multicast Group Address and VLAN ID, then select the port(s) to which matching packets will be directed.

Click on the *Update* button to return to the Display Static Multicast Group Addresses page.

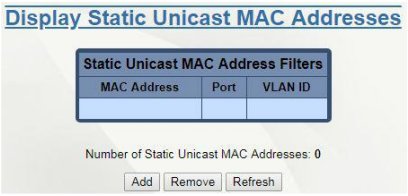
To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Multicast Group Address

To remove a Multicast Address, click on the *Remove* button. A listing of available Multicast Group Addresses will appear. Click on the *Delete* button to remove an address.

Unicast Addresses

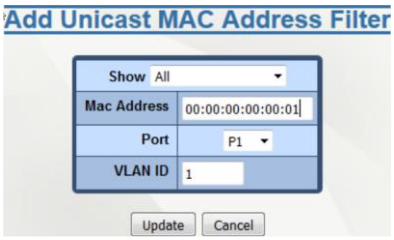
The Unicast Addresses dialog window displays a list of MAC addresses that are associated with each respective port number. This can be used to statically assign a MAC address access to a single port on the switch.



Adding a Unicast Address

To add a Unicast Address, click on the Add button and the following dialog window will appear:

Enter a valid MAC address and VLAN ID, then select the port to which matching packets will be directed.



Click on the Update button to add the unicast address and return to the Display Static Unicast MAC Addresses dialog window.

To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Unicast MAC Address

To remove a Unicast Address, click on the *Remove* button and a dialog window with a listing of available Unicast MAC Addresses will appear. Click on the *Delete* button to remove the MAC Address and return to the *Display Static Unicast MAC Addresses* dialog window.

CIP™

EtherNet/IP™, better known as the Common Industrial Protocol (CIP), was designed for use in process control and industrial automation applications. CIP was designed to provide consistent device access to eliminate the need for vendor specific software for configuration and monitoring of their devices.

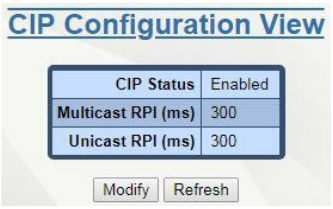
N-Tron® switches with CIP support can be used to communicate with other industrial devices.

Note: Information about using CIP with the NT24k® can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family. This manual can be found on the Red Lion website.

Configuration

The CIP Configuration View dialog window displays the CIP status as well as the Multicast and Unicast RPIs (Requested Packet Interval).

Click on the *Modify* button to make changes to the CIP Configuration:



CIP Status: This field determines whether CIP is enabled or disabled on the NT24k switch. The default setting is Enabled.

Multicast RPI: The minimum Requested Packet Interval for Class 1 (multicast) connections in milliseconds is shown in this field. Requests for less than this value will be rejected. The default value for this option is 300 ms. The available range is 300 - 300,000.

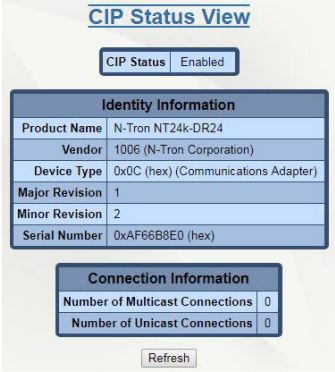
Unicast RPI: This field shows the minimum Request Packet Interval for Class 3 (unicast) connections in milliseconds. Requests for less than this value will be rejected. The default value for this field is 300ms. The available range is 300 - 300,000.

Click on the *Update* button once the desired information is entered and to return to the *CIP Configuration View* dialog window. To save the changes made, return to the Configuration menu and click on the *Save* button.

Status

The Status menu item displays the CIP status. The switch status and partner status information will be shown.

Example CIP™ Status View showing a Connection Summary table with one Multicast connection:



Identity Information

Product Name: This field displays the Switch Model Number.

Vendor: This field shows N-Tron®'s ODVA Ethernet/IP™ Vendor ID (1006).

Device Type: This field displays that the ODVA device type is Communications Adapter (0x0C hex).

Major Revision: This field displays the major revision of the CIP implementation.

Minor Revision: This field shows the minor revision of the CIP implementation.

Serial Number (hex): This field shows the CIP serial number, which is unique across all N-Tron CIP devices. The number shown is the last 4 octets of the base switch MAC address.

Connection Information

Number of Multicast Connections: This field shows the current number of CIP Ethernet/IP class 1 (multicast) connections.

Number of Unicast Connections: This field displays the current number of CIP Ethernet/IP class 3 (unicast) connections.

Connection Summary

Transport Class: This field displays the Transport class for the connection, such as class 1 (multicast) or class 3 (unicast).

Connection State: This field indicates the state of the connection (established, timed out, closing or configuring).

RPI: The field displays the Requested Packet Interval in milliseconds.

Config Assembly: This field shows the configuration assembly number.

Output Assembly: This field displays the Output assembly number (the assembly that is sent out from the switch).

Input Assembly: This field displays the input assembly number (the assembly that is received into the switch).

Peer Address: This field shows the peer IP address of the device connected to the switch.

EIP Indicators

The module status indicator shows the current status of the switch. The network status indicator shows the status of the EtherNet/IP™ network interface. These indicators are located on the back of the rack mount version of the switch or on the front of the CPU module on the DIN-Rail versions of the switch.

Module Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	No power	The switch is not powered up.
Steady Green	Device operational	The switch is operating normally.
Flashing Green	Standby	The switch has not been configured for CIP™ operations.
Flashing Red	Minor fault	A recoverable minor fault has occurred.
Steady Red	Major fault	A non-recoverable major fault has occurred.

Network Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	Not powered, no IP address	The switch is not powered up, or an IP address has not been configured.
Flashing Green	No connections	An IP address is configured, but no connections have been established.
Steady Green	Connected	A connection has been established
Flashing Red	Connection timeout	A connection has timed out.

DHCP Client Configuration

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

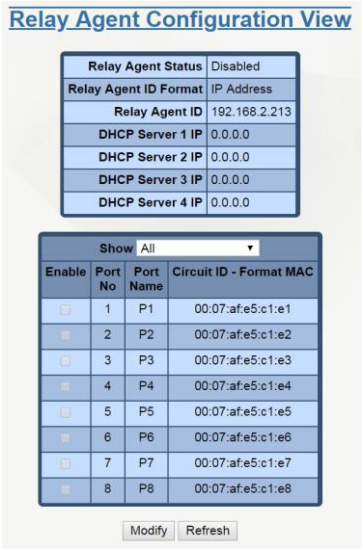
Refer to Network for enabling DHCP Client mode.

DHCP Relay Agent Configuration

A relay agent, configured via the Relay Agent Configuration View, provides a way for DHCP client requests to reach DHCP servers, including those that reside on a different subnet and/or VLAN.

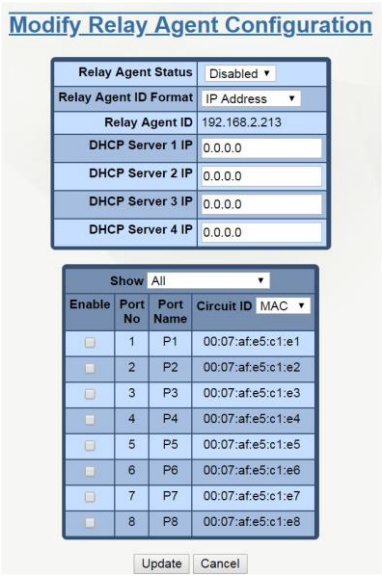
Note: DHCP traffic is sent and received only on Management VLANs.

View Page



Click on the *Modify* button to open the DHCP Server Configuration Modification page.

Modify Page



Click on the *Update* button to apply the changes.

Relay Agent Status: Indicates whether the DHCP relay agent is active. The default is Disabled.

Relay Agent ID Format: The format selector with options for IP address, MAC address, Client ID, Other String, or Other Hex characters.

Relay Agent ID: A unique identifier that designates this relay agent switch.

DHCP Server 1-4 IP: The configured IP address of the DHCP servers.

Enable: Indicates whether relay agent functionality is enabled for the port.

Port No: The number of the port. This field is read-only.

Port Name: The descriptive name of the port. This field is read-only.

Circuit ID: When enabled, the Circuit ID for the port can be specified. By default, the Circuit ID is set to the MAC Address of the port. Circuit IDs must be unique for each port.

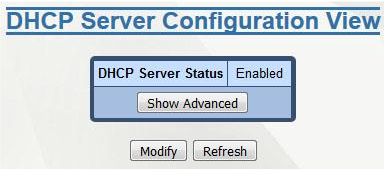
Circuit ID Format: The format selector with options for MAC, Hex, and String.

DHCP Server Configuration

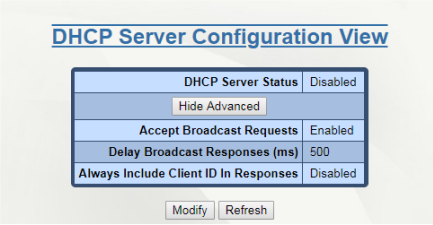
The DHCP Server provides IP addresses to DHCP clients on the same subnet or VLAN. DHCP traffic is sent and received only on Management LANs.

Note: A DHCP Relay Agent is required, to provide an IP address to clients on a different subnet or VLAN.

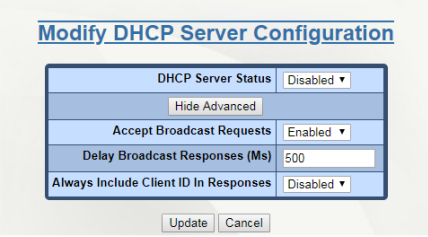
The following screen shows the Advanced configuration hidden:



The following screen shows the Advanced configuration unhidden:



Click on the *Modify* button to open the DHCP Server Configuration Modification page.
Click on the *Update* button to apply the changes.



DHCP Server Status: Indicates whether the DHCP server is active. The default is Disabled.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Accept Broadcast Requests: Indicates whether the DHCP server will process broadcast messages. Typically, client requests are broadcast and relay agent requests are unicast. When enabled, the server will respond to broadcast requests. When disabled, the server will ignore broadcast requests. The default is Enabled.

Delay Broadcast Responses (Ms): The amount of time (in milliseconds) that the DHCP server will delay the processing of a broadcast message. This setting is used when clients and relay agents are on the same subnet and/or VLAN. A delay provides the opportunity for relay agent requests to be honored before client requests. This setting only applies when Allow Broadcast is Enabled. The range is 0-2500 and the default is 500.

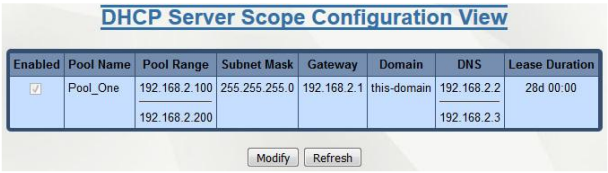
Always Include Client ID In Responses: Indicates whether the DHCP Server will always respond to the client with the Client ID in the frame. This should be disabled for a network that is non-compliant to the RFC- 6842(2013). The default is Disabled.

DHCP Server Scope Configuration

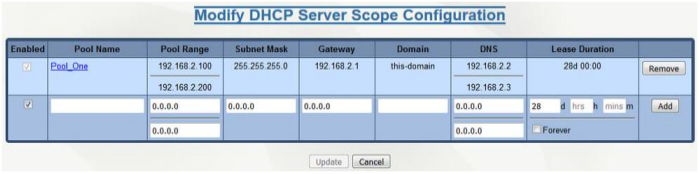
Scope Configuration Pools

The DHCP Server Scope Configuration contains vital network configuration options, called scope configuration pools, for potential clients. At least one scope configuration pool is necessary to create static assignments.

View Page



Modify Page



On the Modify page, the last column contains various buttons. The *Remove* button removes the corresponding scope configuration pool along with all static assignment and bindings associated with the pool. The *Add* button is used to add a new scope configuration pool.

Click on the *Add* button to add the new scope.
Click on the *Remove* button to remove an existing or new scope.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled.

Pool Name: Descriptive name of the scope configuration pool. This field is required and must be unique.

Pool Range: Starting and ending IP addresses for the pool of addresses.

Subnet Mask: The subnet mask for the IP address pool.

Gateway: The gateway IP address offered to the client. This field is optional.

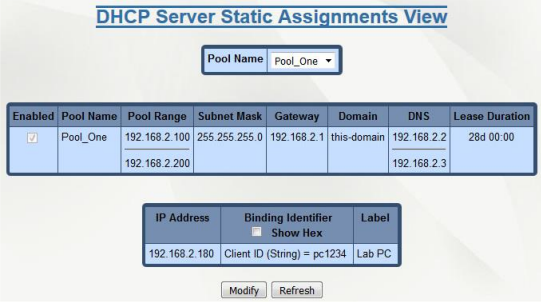
Domain: The domain name offered to the client. This field is optional.

DNS: The DNS server IP addresses offered to the client. These fields are optional.

Lease Duration: The lease time (in days, hours and minutes) offered to the client. The range is 1 minute to 1000 days. The default is 28 days. If the Forever checkbox is checked, the lease does not expire.

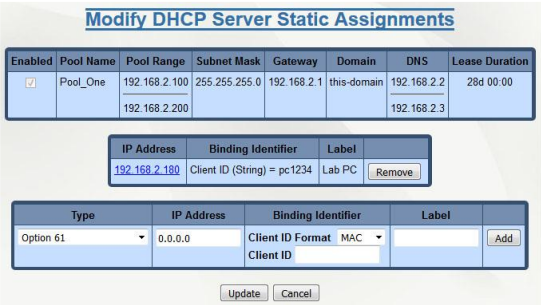
DHCP Server Static Assignments

View Page



Select the Pool Name drop-down list to filter on a specified pool.
Click on the *Modify* button to open the Modify DHCP Server Static Assignments page.

Modify Page



Click on the IP address hyperlink to modify the corresponding static assignment.
Click on the *Add* button to add the new static assignment.
Click on the *Remove* button to remove an existing or new static assignment.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled. This field is read-only.

Pool Name: Descriptive name of the scope configuration pool. This field is read-only.

Pool Range: Starting and ending IP addresses of a pool of addresses. This field is read-only.

Subnet Mask: The subnet mask offered to the client. This field is read-only.

Gateway: The gateway IP address offered to the client. This field is read-only.

Domain: The domain name offered to the client. This field is read-only.

DNS: The DNS server IP addresses offered to the client. This field is read-only.

Lease Duration: The lease time (in days, hours and minutes) that will be offered to a client. This field is read-only.

Type: The type of binding identifier for the static assignment. The options are Option 61 and Relay Agent (Option 82).

IP Address: The static IP address offered to the DHCP client.

Binding Identifier: The binding identifier of the static IP address assignment. For Option 61, the binding identifier requires a Client ID, the identifier of the desired client. The identifier formats are MAC, HEX, and String. A type-byte is assumed to precede the identifier and does not have to be entered here. The type-byte value is assumed to be as follows:

MAC = 0x01
String = 0x00
HEX = 0x00

For Option 82, the binding identifier requires a Remote Agent ID and Circuit ID. These identifiers must match the relay agent's Remote ID and Circuit ID. The identifier formats are IP (for a Remote ID), MAC, Hex, and String.

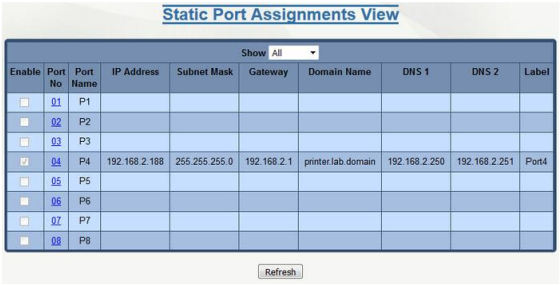
Label: The descriptive name of the static assignment. The field is optional.

DHCP Static Port Assignments

When a static port assignment is enabled on the port, the port will act as a DHCP server and provide a static IP address to the client connected to the port.

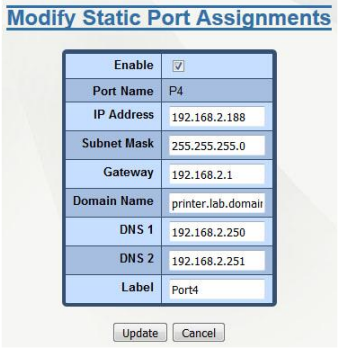
Note: Only one DHCP client can be connected per port.

View Page



Select the Show drop-down list to show only enabled ports or all ports. Click on the port number hyperlink to modify the port's static port assignment.

Modify Page



Click on the *Update* button to apply the changes.

Enable: Indicates whether Static Port Assignment is enabled on the port.

Port No: The number of the port.

Port Name: The descriptive name of the port. This field is read-only.

IP Address: The IP address offer to the DHCP client connected to the port.

Subnet Mask: The subnet mask offer to the DHCP client connected to the port.

Gateway: The gateway offer to the DHCP client connected to the port.

Domain Name: The domain name offer to the DHCP client connected to the port. The field is optional.

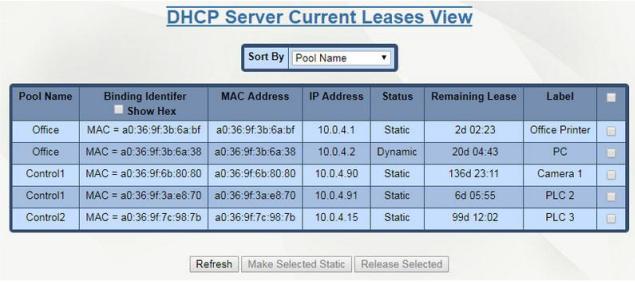
DNS 1: The primary DNS offer to the DHCP client connected to the port. The field is optional.

DNS 2: The secondary DNS offer to the DHCP client connected to the port. The field is optional.

Label: The descriptive name of the DHCP client connected to the port. The field is optional.

DHCP Server Current Leases

The Current Leases table shows the IP addresses that have been leased, or offered, to devices.



Sort By: Sort the current leases by Pool Name, Binding Identifier, MAC Address, IP Address, Status, Remaining Lease, or Label.

Pool Name: The pool from which the lease was obtained.

Binding Identifier: The client associated with the lease entry. If Show Hex checkbox is checked, then detailed hex data about the Binding Identifier is displayed.

MAC Address: Indicates the MAC address of the client associated with the lease.

IP Address: Indicates the IP address assigned to the lease entry.

Status: Indicates the current status of the lease entry.

- Dynamic = Assigned dynamic IP.
- Static = Assigned static IP.

Remaining Lease: The client's remaining lease time.

Label: The descriptive name of the client.

Check Box: Click the individual checkbox to either make the clients static or release its lease.

Note: Only clients with a dynamic lease can be made static.

Make Selected Static: Make the selected client dynamic IP address static.

Release Selected: Release selected client lease.

Event Notification

Event Notification is a combination of features that deal with filtering and routing system and fault events to different destinations.

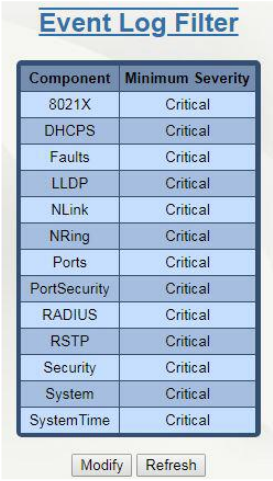
Event Log Filter

The Event Log Filter allows the user to define which events will be logged based on the severity level of the event.

Note: The event log is enabled by default for critical events.

Event Log Filter View

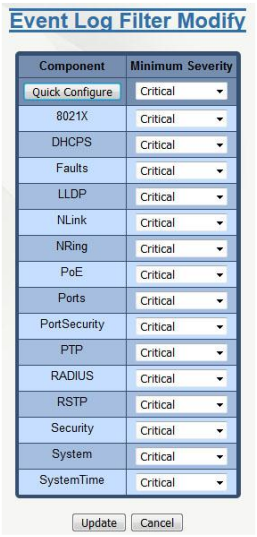
The Event Log Filter page displays the current minimum severity settings for each component. Events below the minimum severity level will not be logged.



Click on the Modify button to make changes to the Event Log Filter.

Event Log Filter Modify

The Event Log Filter configuration can be changed by clicking on the Modify button.



Quick Configure: Use Quick Configure to change all components to the same severity level.

Component: The feature, protocol, or system service of the switch that generates events. The component list is model dependent.

Minimum Severity: Events below the minimum severity level will not be logged. A severity of None will disable events for that component. For more information, see Severity under the section Event Log.

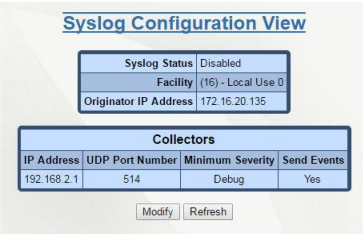
Syslog

The Syslog feature allows certain system events (see Event Log) to be sent as messages to remote hosts for monitoring and analysis.

The messages can be sent to up to 5 different remote hosts, known as Syslog Collectors. A minimum severity level is associated with each Syslog Collector. Events below the minimum severity level will not be sent out from the switch. Syslog is disabled by default and can be enabled through the Web Browser interface.

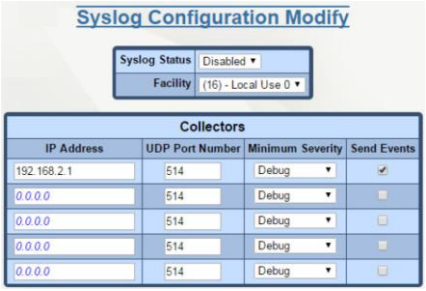
Syslog Configuration View

The Syslog Configuration View is accessible under Event Notification within the Advanced section. Below is an example of the current configuration status of Syslog, the configuration of each Syslog Collector, and a list of the Syslog Collectors.



Syslog Configuration Modify

The Syslog configuration may be changed by an admin level user by clicking on the Modify button. In this section the settings of each Syslog Collector can be updated and the Syslog Distributor itself can be disabled or enabled.



Syslog Status: This field indicates whether the Syslog Distributor (client) has been enabled or disabled. To enable Syslog at least one Syslog Collector (server) must be specified.

Facility: This is used to identify which process is logging the message. This is a global setting for the switch and will be used for all messages. Available Facility values as defined per RFC-5424 are 1 (user level) and 16 - 23 (local use).

Originator IP Address: The field displays the configured IP address of the switch.

Collector: The Syslog server to which the messages are sent.

IP Address: The IP address of the Collector (server) to receive a log message.

UDP Port Number: The UDP port on the Collector (server) to receive the message. The default port number is 514, per RFC-5424, but can be changed to meet installation requirements. Allowed port numbers are 1 - 65535.

Minimum Severity: The minimum Severity level of the messages that will be sent to the specified Collector (server). Values range from Debug (7) to Emergency (0). For example, a Collector configured with a value of Warning (4) will receive all messages from 4 to 0. The importance of a message increases with a lower severity level setting value. These are the same Severity level setting values as the Event Log and Event Log Filter. For more information, see Severity under the section Event Log.

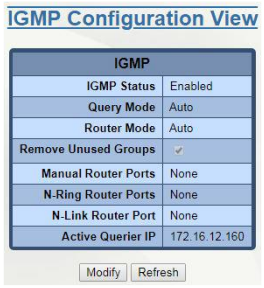
Send Events: This setting can be enabled or disabled, per Collector, to control the distribution of Event Log messages.

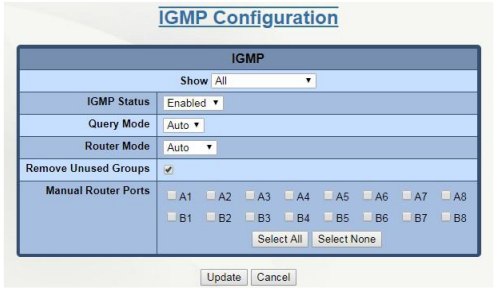
IGMP

Configuration

The Configuration dialog window displays the IGMP basic configuration settings. If an active N-Ring™ participant, the ring ports are informatively shown as N-Ring router ports. On an N-Link Master, Slave or Coupler switch, the coupler port is shown as an N-Link router port.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).





IGMP Status: This field indicates whether the IGMP is enabled or disabled. The default value for this field is *Enabled*.

Query Mode: The default value for this option is Auto. Available options are:

Auto: Multiple switches will ensure that only one switch is the active querier.
On: This switch is always an active querier.
Off: This switch never queries.

Router Mode: The available options for this field are:

Auto: This option allows for dynamically detected and manually set router ports. This is the default value.
None: This option allows for no router ports.
Manual: This option allows for manually set router ports.

Remove Unused Groups: If this option is checked, unused IGMP Groups will be removed and traffic with those multicast addresses will be treated as normal multicast. If this option is unchecked, unused IGMP Groups will remain and traffic with those multicast addresses will be limited. The default value for this field is checked.

Note: IGMP Groups are not retained through a power cycle.

Manual Router Ports: Manually specify the used ports.

N-Ring™ Router Ports: This field displays the N-Ring ports designated as active IGMP Router ports.

N-Link Router Port: This field indicates the N-Link ports that have been designated as active IGMP Router ports.

Active Querier IP: This field shows the IP address of the Active Querier.

Click on the *Modify* button to make changes to the IGMP Status, Query Mode, Router Mode and Manual Router Ports.

Groups

The Groups dialog window displays a list of IGMP groups based on the Group IP and the port that it is associated with.



Total Number of Active IP Group Memberships: The total number of active group IP memberships based on the dotted quad view (aaa.bbb.ccc.ddd) counting each joined port are displayed here.

Group IP: This field shows the dynamically created multicast group IP address.

Port Name: The descriptive name of the port is shown here.

VLAN ID: This field indicates the VLAN in which the Group IP is assigned. The available range is 1-4094.

RFilter Ports

From the RFilter (Router Multicast Data Filter) option, the user can choose whether or not data frames with known group multicast addresses are sent to the router ports. Control packets will be sent to the router(s) regardless of this setting.



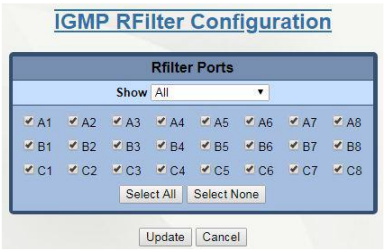
Known group multicast addresses are learned from dynamic IGMP Snooping operations. If IGMP is enabled and a port is a router port, then having RFilter enabled will stop IGMP group data from egressing on the port unless a join to that specific IGMP group has come into the port. IGMP controls (Join, Leave, Query) are still sent.

The Router Multicast Data Filter is enabled for all ports by default. Router ports do not get data frames with known multicast destination addresses unless a join for that specific multicast address has been received on that port. Join overrides an RFilter.

If RFilter is disabled, the router ports get data frames with known multicast destination addresses.

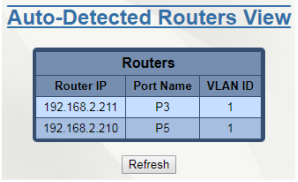
RFilter can be set for individual ports: any, all or none. For each port, RFilter will have an impact only if that port is manually or dynamically chosen as a router port.

Click on the *Modify* button to make changes to the IGMP RFilter Configuration. The following dialog window will appear:



From this dialog window, the administrator selects which ports to identify as RFilter ports and can view all possible ports (Modules), currently installed ports or currently linked up ports. Click on the *Update* button when done with required changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Routers



The Routers dialog window displays a list of the following:

Router IP: Auto-detected router IP address.

Port Name: The descriptive name of the port.

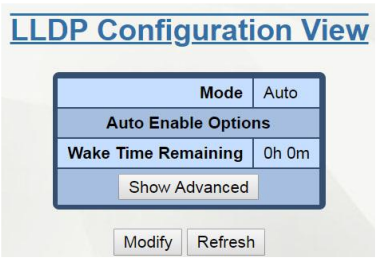
VLAN ID: VLAN in which the Router IP is assigned. The range is 1 - 4094.

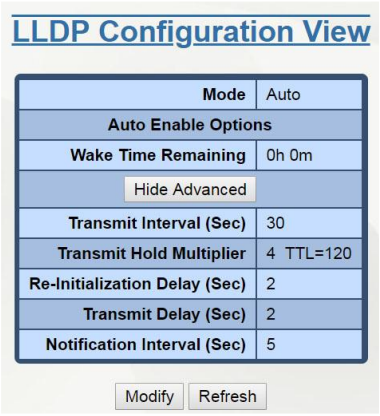
LLDP

LLDP Configuration

The LLDP Configuration Page can be used to view or configure LLDP operation on the switch. The default mode for LLDP is Auto. Other configurable options are revealed by clicking on the "Show Advanced" button.

To enable LLDP on all switches that are in Auto mode, set the mode to Auto, set the Wake Time to a non-zero time, and click the "Send" button.





Mode: The LLDP mode can be Enabled, Disabled, or Auto. In Auto mode, LLDP is inactive until a switch sends a wake-up packet. The default is Auto.

Wake Time: The length of time LLDP will be active on switches that are in Auto mode. A value of 0 hours and 0 minutes will deactivate LLDP. Modify this value and click the "Send" button to set the wake time on all switches that are in Auto mode. The default is 0 hours and 0 minutes.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Transmit Interval (Sec): The interval at which periodic LLDP frames are transmitted. The default is 30 seconds.

Transmit Hold Multiplier: A multiplier on the Transmit Interval when calculating a Time-to-Live value. The default is 4.

Re-Initialization Delay (Sec): The minimum time an LLDP port will wait before re-initializing after its setting has changed from disabled to Tx-Only or Tx/Rx. This prevents excessive notifications when LLDP Port settings are changed. The default is 2 seconds.

Transmit Delay (Sec): When LLDP information is changing on the switch, the time to wait before sending an LLDP frame with the updated information. The default is 2 seconds.

Notification Interval (Sec): The interval between notifications sent by the switch. If a port sends out a notification and another port tries to send out a notification, then the subsequent notification will not be sent until the interval expires. The default is 5 seconds.

LLDP Ports Configuration

The LLDP Ports Configuration Page displays and configures LLDP options for each port.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

Port No: The number of the port.

Mode: The port mode can be Tx Only, Rx Only, Tx/Rx, or Disabled. This configures whether or not LLDP frames are transmitted or received. The default is Tx/Rx.

Allow Management Data: Allows the transmission of management type information. Example: IP address of the switch. The default is checked.

Allow Notification: Allows an SNMP notification to be transmitted when local or remote data changes. The default is unchecked. Note: SNMP Notification Traps must be enabled under SNMP.

Port Description: Indicates whether or not to send the descriptive name of the port in the transmitted LLDP frame. The default is unchecked.

System Name: Indicates whether or not to send the name assigned to the device on the System page in the transmitted LLDP frame. The default is unchecked.

System Description: Indicates whether or not to send the switch model and current firmware version in the transmitted LLDP frame. The default is unchecked.

System Capabilities: Indicates whether or not to send the primary function(s) of the system in the transmitted LLDP frame. The default is unchecked.

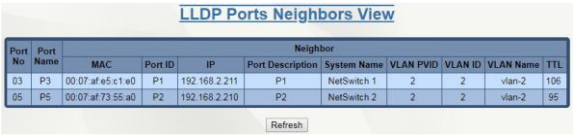
VLAN PVID: Indicates whether or not to send the Port VLAN identifier (PVID) associated with the port in the transmitted LLDP frame. The default is unchecked.

VLAN Name: Indicates whether or not to send the VLAN IDs and Names associated with the port in the trans-mitted LLDP frame. The default is unchecked.

LLDP Ports Neighbors

The LLDP Ports Neighbors shows the results of LLDP discovery. The LLDP Ethernet frames received from neighboring ports are composed of collections of data units called Type Length Value (TLV). Each TLV contains a defined type of information such as the Chassis ID described below, which contains the

MAC address of the device sending the frame. The maximum number of six neighbors can be displayed per each port.



Port No: The port the neighbor information was received from.

MAC: MAC address of neighbor device. Corresponds to the LLDP Chassis ID TLV.

Port ID: Identifier of the neighbor port from which the LLDP frame was sent.

IP: IP address of neighbor device. Corresponds to the LLDP Management Address TLV.

Port Description: Description of the neighbor port from which the LLDP frame was sent.

System Name: The system's administratively assigned name on the neighbor device.

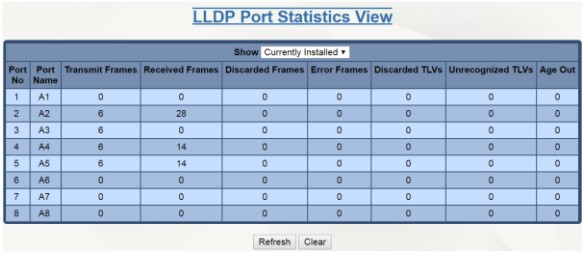
VLAN PVID: The Port VLAN identifier (PVID) associated with the neighbor port.

VLAN ID: A list of all VLAN IDs associated with the neighbor port.

VLAN Name: A list of all VLAN Names associated with the neighbor port.

TTL: Indicates the number of seconds that the information associated with this neighbor will be valid. Time to Live (TTL)

LLDP Port Statistics



Port No: The number of the port.

Port Name: The descriptive name of the port.

Transmit Frames: The total number of LLDP frames transmitted by the local switch.

Received Frames: Total number of LLDP frames received by the local switch.

Discarded Frames: The total number of frames discarded due to incorrect Type Length Values (TLVs) in the frames.

Errors Frames: Total count of all LLDP frames received with one or more errors.

Discarded TLVs: The count of all TLVs discarded for any reason.

Unrecognized TLVs: The count of all TLVs received on the port that are not recognized by LLDP.

Age Out: The count of times that a neighbor's information has been deleted because its Time To Live (TTL) has expired.

N-Link

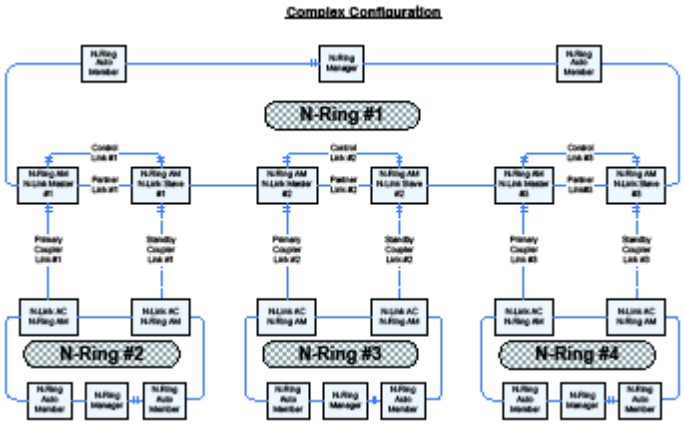
N-Link provides a way to couple an N-Ring topology to one or more other topologies, usually other N-Ring topologies. Each N-Link configuration requires 4 switches: N-Link Master, N-Link Slave, N-Link Primary Coupler and N-Link Standby Coupler.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).

Example of a standard N-Link configuration



Example of a complex N-Link configuration



Configuration steps to redundantly couple 2 N-Ring™ networks:

1. Ensure the Coupler and Control cables are disconnected at this point.
2. Get Both N-Rings working with a status of OK.
3. Configure N-Link Slave: Ensure that the N-Link Slave is set to Auto Configure and select a Default Coupler Port. Save Configuration.
4. Configure N-Link Master: Select the Control and Coupler ports. Save the Configuration.
5. Connect the Control Link cable. Ensure that the Slave switch status now shows a state of “Slave”.
6. Connect the Coupler Link cables.
7. Check N-Link status on the Master by selecting the N-Link Status View page.

Configuration Requirements:

- The Master and Slave must be part of the N-Ring topology.

- If using default configuration choices, the administrator only needs to configure the N-Link Master. The N-Link Slave and both Coupler switches will auto-detect any needed configuration.
- If not using default configuration choices, the administrator may also need to configure the Default Coupler port on the N-Link Slave.
- There must be a direct link between the Master and Slave Control ports. Use of media converters or other switches is not supported.
- There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported.
- There must be an N-Link aware switch on each side of the Master.
- N-Link will only support a single point of failure. Multiple points of failure and misconfiguration are not supported and may cause a network storm under some circumstances.
- Control and Partner connections should be either fiber or 10/100Base-TX copper.

  The use of copper SFP transceivers for N-Link control and partner connections is not recommended due to the variances of link performance between SFP manufacturers.

  Per the IEEE 802.3 standard (Clause 40), a 1000Base-T PHY is required to wait 350-750 milliseconds before reporting a link down condition; and is therefore unsuitable for use as an N-Link control or partner connection.
- For optimal performance:

  The speed of the Partner segment must match the speed of the other N-Ring™ segments. Therefore, the Partner connection must be 1 gigabit fiber when the other N-Ring segments have a 1 gigabit speed.

  When using a 700/7000 Series N-Link Slave, the control port should use a fiber connection.

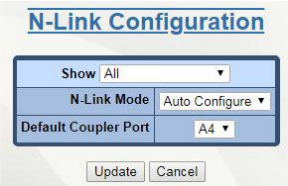
Configuration/Basic

The Basic tab under the N-Link Configuration category will display the basic configuration settings. By default, N-Link is in Auto-Configuration mode and will use A4 as the Default Coupler port.

The port configured as the Default Coupler Port will be used as the Standby Coupler port if the switch detects an N-Link Master and becomes an N-Link Slave.



Click on the *Modify* button to make changes. Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

N-Link Mode: Select the required N-Link mode from the drop-down list. The available options are:

Disabled: N-Link is disabled and will not operate as an N-Link capable switch.
Auto Configure: In this mode, the switch will automatically detect whether it is a slave or a coupler.
Master: If this option is selected, then the administrator must configure the Control Port (default: A3) and the Primary Coupler Port (default: A4).

Default Coupler Port: The Coupler Port is used to establish a redundant path for Ethernet data. If the role of the switch is Slave the port will be a Standby Coupler. The default is A4.

Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Configuration/Advanced

The Advanced dialog window displays the advanced configuration settings. If N-Link is set to *Auto Configure*, the following configuration data will be used. The selected Auto Configure detection timeout value range is 2-180 seconds. The default Auto Configure detection time is 4 seconds.



Click on the *Modify* button to change the detection timeout. Click on the *Update* button once the field has been updated with the required information. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Status

The Status dialog window displays the N-Link status. If the switch is an N-Link Master or Slave, the following switch status and partner status information will be shown. Fields with a red background designate a fault condition.

N-Link Master or Slave

The following switch status and partner status information are shown.

State: This field displays the current N-Link mode of the switch.

Partner Port: This field shows the port being used for normal communication between the N-Link Master and N-Link Slave switches. There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported. This port will be detected automatically.

Coupler Port: The port being used to establish a redundant path for Ethernet data transmission is displayed in this field.

Coupler Port State: Blocking, Forwarding.

Status: If there are no errors, the status shows OK. Otherwise, a description of the faults detected is shown.

N-Link Partner Information

The following switch statuses are shown.

State: Current N-Link mode of switch.

MAC: The MAC address of the N-Link Partner switch.

Coupler Port State: Blocking or Forwarding.

Status: If there are no errors, the status will show OK. Otherwise, a description of the faults detected will be shown.

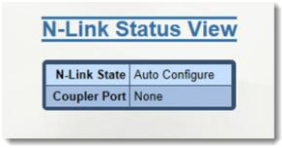
N-Link Auto Configure

N-Link State: Current N-Link mode of switch.

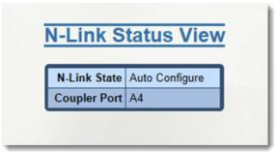
Coupler State: The port used to establish a redundant path for Ethernet data transmission. This port will be detected automatically.

Status Examples

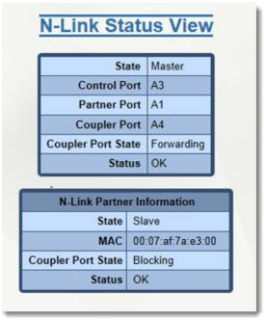
N-Link Auto Configure that is not an N-Link Master and has not become an N-Link Slave or an N-Link Coupler:



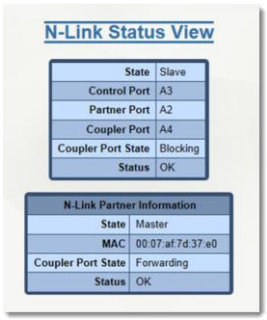
N-Link Coupler Switch:



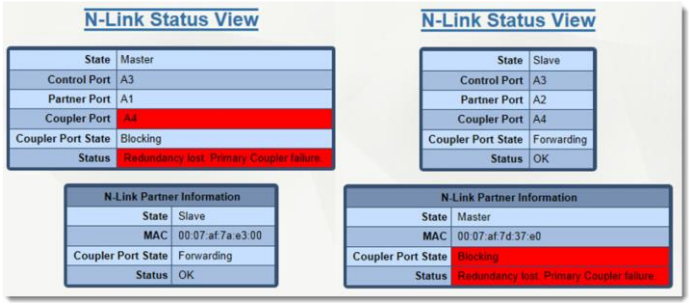
N-Link Master Switch:



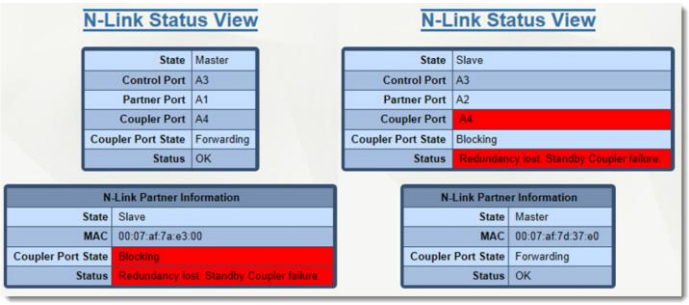
N-Link Slave Switch:



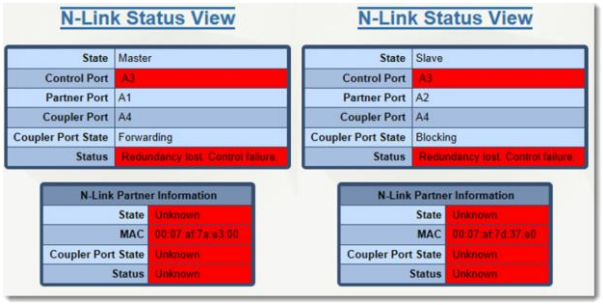
N-Link Status Master and Slave where the Primary Coupler is broken:



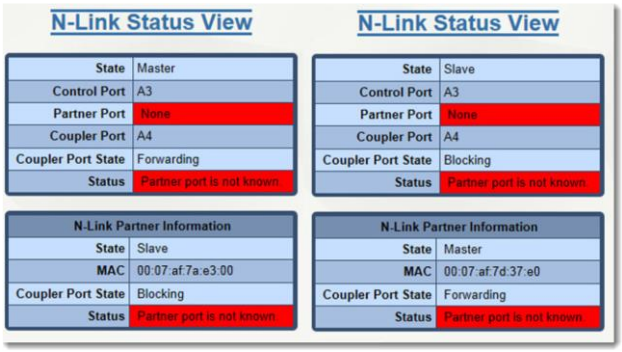
N-Link Master and Slave where the Standby Coupler link is broken:



N-Link Master and Slave where the Control link is broken:



N-Link Master and Slave where the Partner link is broken:



N-Ring™

Configuration/Basic

The Basic dialog window displays the N-Ring basic configuration settings. By default, N-Ring is in Auto Member mode.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Click on the *Modify* button to make changes to the N-Ring Basic Configuration:



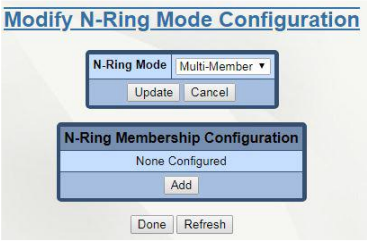
Disabled: If selected, this option disables the N-Ring capabilities on the switch.

Auto Member: When set to auto member, the switch automatically detects when it is a part of an N-Ring for participation in the ring.

Manager: When in Manager mode, the administrator may select different Port Sets as N-Ring ports. (See the Port Set Configuration section for information on adding and deleting port sets.)

N-Ring Ports: Defines the two ports that are used to connect to the N-Ring.
N-Ring™ Number: The N-Ring number can be selected from a range of 1 - 16 or a custom N-Ring number can also be chosen. The selected N-Ring number determines the VLAN ID. See table below for N-Ring numbers and corresponding VLAN IDs.
VLAN ID: This field is auto-generated based on the selected N-Ring number. See table for N-Ring numbers and corresponding VLAN IDs.
Tagging: The type of VLAN tagging used. Currently, tagged mode is the only supported mode.

Multi-Member: When in Multi-Member mode, a switch can be a member of multiple rings. If selected, then N-Ring Membership Configurations can be added for each N-Ring to which the switch will be connected. The image below shows one configured N-Ring.



To delete an existing N-Ring Membership, click on the *Delete* button.

To add a new N-Ring Membership, click on the *Add* button. The screen below will appear.



Select the N-Ring Ports and N-Ring Number to be used for the N-Ring. The VLAN ID for each N-Ring Membership must match that of the N-Ring Manager on each specific N-Ring to which the N-Ring Multi- Member will be connected.

Click on the *Update* button once the required selection has been made. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

List of available N-Ring Numbers and their corresponding VLAN ID:

N-RING NUMBER	VLAN ID	N-RING NUMER	VLAN ID
1	3333	9	3341
2	3334	10	3342

3	3335	11	3343
4	3336	12	3344
5	3337	13	3345
6	3338	14	3346
7	3339	15	3347
8	3340	16	3348

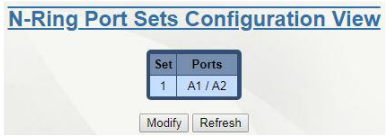
Configuration Requirements:

1. N-Ring requires tagged frames to optimize frame prioritization.
2. Do not create redundant links unless either RSTP or N-Ring is enabled.
3. The Default VLAN and any active N-Ring VLAN cannot be deleted.
4. RSTP and N-Ring™ are different modes and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then RSTP will be disabled for that port. Other ports may have RSTP enabled.
5. Do not connect the N-Ring to actively Trunking ports on an Auto Member or Multi-Member configured switch.
6. An NT24k® switch can only participate in one N-Ring unless in Multi-Member mode.
7. Since VLANs are implemented for security reasons as well as traffic flow, N-Ring only makes minimal VLAN changes. It is up to the administrator to ensure that VLANs are configured correctly on the N-Ring manager and all N-Ring members.
8. For optimal performance, all N-Ring segments must be configured for the same speed.

> **WARNING:** To prevent a network storm, multiple segments between N-Ring members on one or more N-Rings must not occur. N-Ring members should only be connected to each other by the N-Ring ports.

Configuration/Port Sets

A port set is a group of two ports that may be used for an N-Ring. The default N-Ring Port Set is A1/A2. Click on the *Modify* button to make changes to the Port Sets.



Set: This field displays the Port set table index.

Ports: This field indicates the designated pair of N-Ring ports. To reassign different pairs, the Port sets containing those ports, if any, must be deleted before the ports can be reassigned (a port can only belong to one port set).

Delete: To delete a port set, check the box next to the line item to be deleted and click on the *Delete* button.

Click on the *Add* button below the Set column.



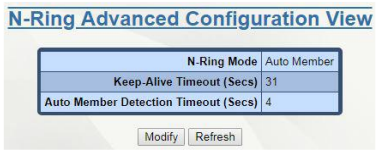
N-Ring Ports: A new port set can be added by selecting the N-Ring ports from the N-Ring Ports pull-down lists and clicking on the *Add* button.

Port Sets: Port Sets can be removed by selecting the port set from the Port Sets pull-down and pressing the *Remove* button.

Click on the *Update* button when port set configuration is complete. The N-Ring Port Sets Entry dialog window will appear. Click on the *Done* button. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Configuration/Advanced

Auto Member Mode



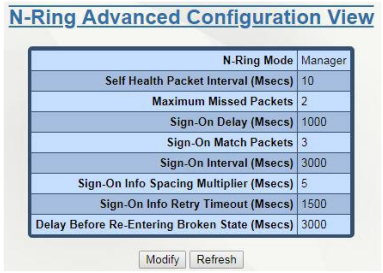
N-Ring™ Mode: This field is defined in the N-Ring/Configuration/Basic dialog window.

Keep-Alive Timeout (Sec): This field displays the amount of time to wait (in seconds) to receive a keep-alive request before switching from active member back to auto member. The default value is 31 seconds and the available range is 15 to 300 seconds. A entry of 0 will disable the feature.

Auto Member Detection Timeout (Sec): This field shows the amount of time to wait in seconds to receive N-Ring frames on any auto member port (at boot up) before assuming the switch is not part of an N-Ring. The default value is 4 seconds and the available range is 2 to 180 seconds.

Click on the *Modify* button and enter the required changes. When entries are complete, click on the *Update* button. To save the changes, return to the *Configuration* menu and click on the *Save* button.

Manager Mode



When in Manager mode, the following advanced configuration data are displayed in their respective fields:

Self Health Packet Interval (Msecs): The amount of time to wait in milliseconds before sending Self-Health packets. The default value for this field is 10.

Maximum Missed Packets: The number of consecutive missed Self-Health packets that constitute a fault. The default value for this field is 2 packets.

Sign-On Delay (Msecs): The amount of time to wait in milliseconds before requesting initial sign-on information from ring members. The default value is 1000 Msecs.

Sign-On Match Packets: The number of times the switch count must match before starting the sign-on process. The default value is 3.

Sign-On Interval (Msecs): The interval of time to wait in milliseconds before requesting subsequent sign-on information from ring members when the ring is broken. The default value for this field is 3000 Msecs.

Sign-On Info Spacing Multiplier (Msecs): The amount of time to wait in milliseconds, scaled by switch number, before sending information to the ring manager. The default value is 5 Msecs.

Sign-On Info Retry Timeout (Msecs): The amount of time the ring member will wait in milliseconds for the ring manager to acknowledge receipt of the member's information before the member tries to resend the information. The default value for this field is 1500 Msecs.

Delay Before Re-entering Broken State (Msecs): The amount of time, in milliseconds, that must elapse before the ring is allowed to go back into the broken state. The default is 3000 Msecs.

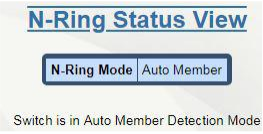
Click on the *Modify* button and make the required changes. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Multi-Member mode

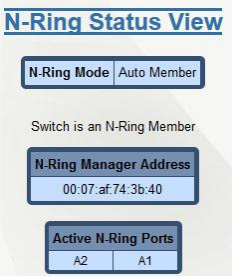
There are no advanced options when operating in Multi-Member mode.

Configuration Status

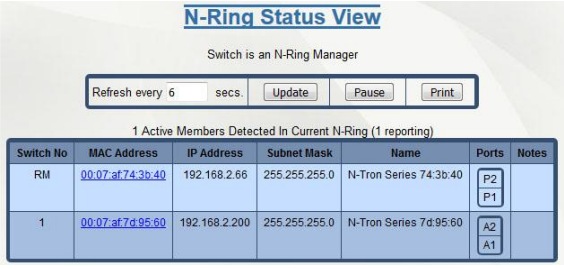
When an N-Ring™ Auto Member is not participating in an N-Ring, the following information is shown:



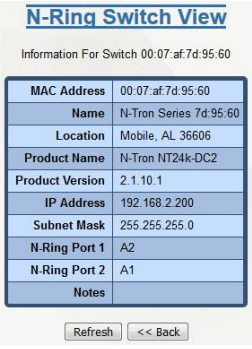
When an N-Ring Auto Member is participating in an N-Ring, the following information is shown:



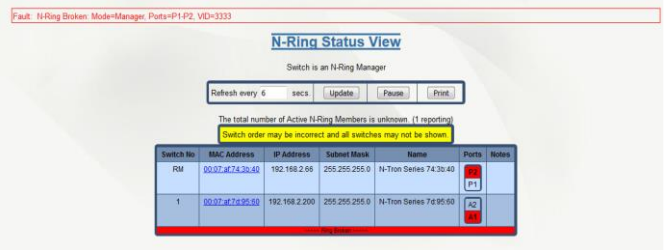
When N-Ring is in Manager Mode, the following data will be as shown below.



If the MAC is selected, more data is retrieved and shown about the N-Ring Member switch.



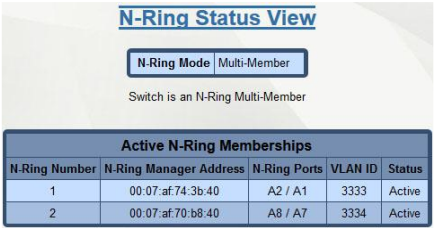
N-Ring™ Manager View for a faulted N-Ring:



A fault warning *Fault: N-Ring Fault* in red will show at the top of the dialog window.

The break is identified in red. In this case, N-Ring manager A2 to N-Ring active member Switch Number 1 TX2 is broken. A warning *Switch order may be incorrect and all switches may not be shown* is displayed in yellow. This indicates that the Sign On frames cannot get around the N-Ring and the data may not have been updated since the last successful update.

N-Ring Multi-Member Status View



N-Ring Number: N-Ring number to which the N-Ring Membership is associated.

N-Ring Manager Address: Show the MAC address of the switch acting as the N-Ring Manager.

N-Ring Ports: The port set linked to this N-Ring.

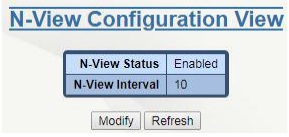
VLAN ID: The VLAN ID tag to be used with this N-Ring. The VLAN ID is associated with the N-Ring, and can be changed by switching the N-Ring number.

Status: Current status of the N-Ring Membership. The values are:

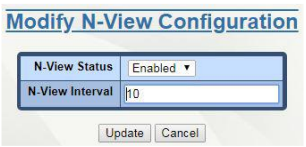
Active: The N-Ring Membership is connected and operating normally.
Inactive: The N-Ring Membership is not responding and not functioning correctly.

N-View™

The N-View Configuration dialog window displays the basic configuration for N-View. The status (enabled or disabled) and the interval between packets.



Click on the *Modify* button to make changes to the N-View Configuration.



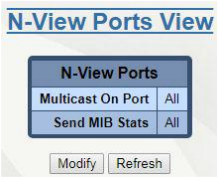
N-View™ Status: This field determines whether the N-Ring™ is enabled or disabled.

N-View Interval: This field determines the frequency in which N-View reports its information. Increasing the interval slows the update rate and decreasing it allows N-View to report more frequently. The available range is 10-500 seconds. Interval values are converted to increments of 10 seconds. The default value is 10 seconds.

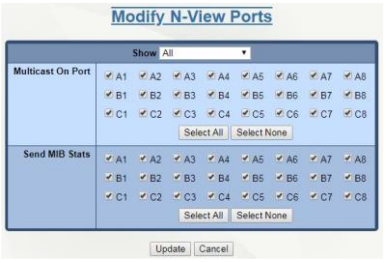
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Ports

The Ports dialog window displays a list of the configured ports on the NT24k® unit, along with the ports transmitting N-View related multicast packets and MIB stats respectively.



Click on the *Modify* button to make changes to the N-View Ports.



The user can modify these two variables to enable or disable N-View related multicast out of the port and if MIB stats are sent out for those ports. The ports that can be installed (Modules), currently installed or currently linked up can also be viewed.

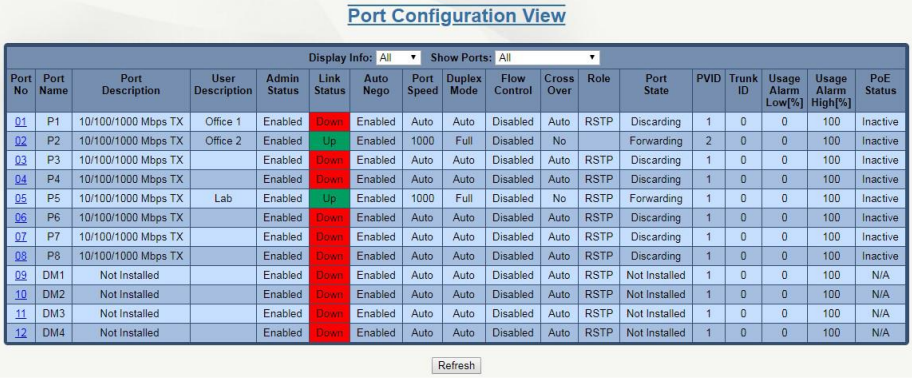
Click on the *Update* button after required changes have been made. To save the settings, navigate to the *Configuration* menu and click on the *Save* button.

Ports

Configuration

The Ports Configuration dialog window shows a detailed overview of all the ports on the switch. The administrator can view the ports that are available to install (Modules), currently installed or currently linked up.

The information displayed on the page can be changed by changing the *Display Info* from *Basic* to *All*. *Basic* shows the most commonly used information while *All* shows all of the available information.



Port Configuration View

Display Info: All Show Ports: All

Port No	Port Name	Port Description	User Description	Admin Status	Link Status	Auto Nego	Port Speed	Duplex Mode	Flow Control	Cross Over	Role	Port State	PVID	Trunk ID	Usage Alarm Low[%]	Usage Alarm High[%]	PoE Status
01	P1	10/100/1000 Mbps TX	Office 1	Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
02	P2	10/100/1000 Mbps TX	Office 2	Enabled	Up	Enabled	1000	Full	Disabled	No		Forwarding	2	0	0	100	Inactive
03	P3	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
04	P4	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
05	P5	10/100/1000 Mbps TX	Lab	Enabled	Up	Enabled	1000	Full	Disabled	No	RSTP	Forwarding	1	0	0	100	Inactive
06	P6	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
07	P7	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
08	P8	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
09	DM1	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
10	DM2	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
11	DM3	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
12	DM4	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A

Refresh

The screen above represents the Port Configuration View for a PoE model. If not using a PoE model, the page will be similar except the PoE Status column will not be present.

Port No: This field indicates the port number.

Port Name: This field displays the descriptive name of the port.

Port Description: This column provides a brief description of the port. Ports with "-R" in their description are Bypass Relay capable ports. Refer to the section Bypass Relay (BR) for more information on Bypass Relay devices and ports.

User Description: Description of the port set by a user.

Admin Status: This configurable field displays the existing status of the port. The two options are *Enabled* or *Disabled*.

Link Status: Shows the current state of the port. The two options are *Up* or *Down*.

Auto Nego: This configurable field displays the current auto-negotiation state whether it is *Enabled* or *Disabled*. Auto-negotiation cannot be disabled on a port connected to a gigabit device.

Port Speed: This configurable field displays the speed of each port. The available values are 10/100/1000 Mbps.

Duplex Mode: The existing mode of the port, whether it is *Full Duplex* or *Half Duplex*, is shown in this configurable field.

Flow Control: This configurable field displays the existing flow control status of each port.

Cross Over: This configurable field displays the existing crossover mode of the port. This can be indicated with a *Yes*, *No* or *Auto*. The default value for this field is Auto.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, and N-Link Coupler. For example, if a port is actively participating in an N-Ring and as an N-Link Partner, the role would be: N-Ring, N-Link Partner.

Port State: This column displays the current RSTP status of a port. It may contain *Disable*, *Discarding*, *Learning* or *Forwarding*.

PVID: This configurable field displays the existing port VLAN ID setting. The allowable range is 1-4094.

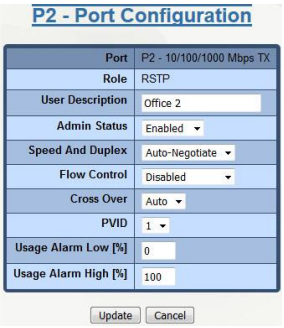
Trunk ID: When the port is an active member of a trunk group, the trunk's ID value is shown. A zero value indicates that the port is not an active trunk member.

Usage Alarm Low [%]: This field indicates the bandwidth utilization percentage below which a fault is triggered if enabled. For the half-duplex option, the bandwidth utilization percentage is the sum of both RX and TX bandwidth utilization. For the full-duplex option, this is the higher of TX or RX bandwidth utilization.

Usage Alarm High [%]: This field displays the bandwidth utilization percentage above which a fault is triggered if enabled. For half duplex the bandwidth utilization percentage is the sum of both RX and TX band-width utilization, and for full duplex this is the lower of TX or RX bandwidth utilization.

PoE Status: The current status of the PoE will be displayed in this column. It may show *Inactive*, *Active*, *Disabled* or *N/A*.

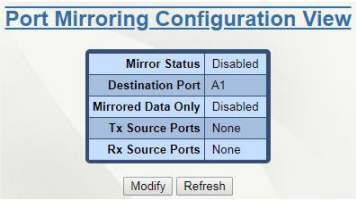
Click on the *Port Number* to configure each port individually. This will allow the user to change the port's settings.



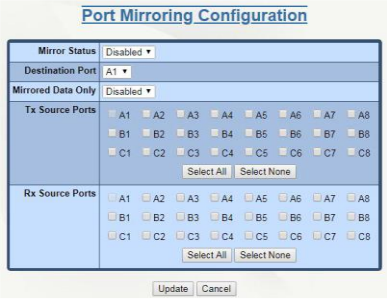
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Mirroring

A Mirroring Port is a dedicated port that is configured to receive copies of Ethernet frames that are sent or received from a monitored port. The Mirroring dialog window displays the status including the list of Source Ports and the Destination Port that the Sources are being mirrored to.



Click on the *Modify* button to make changes to the *Port Mirroring Configuration*.



Mirror Status: Enable or Disable the Mirroring functionality by selecting the option in the drop-down menu.

Destination Port: Select the destination ports that the source ports will be mirrored to.

Mirrored Data Only: Select the mirrored data to be transmitted to the destination port.

Tx Source Ports: Select the transmitting ports to be mirrored by checking on the desired ports or the *Select All* button.

Rx Source Ports: Select the receiving ports to be mirrored by checking on the desired ports or the *Select All* button.

Configuration Notes:

1. Non-mirrored frames take priority over mirrored frames. Mirrored frames may be discarded under rare instances when resource contention occurs.
2. The mirroring destination port is not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, Trunking.

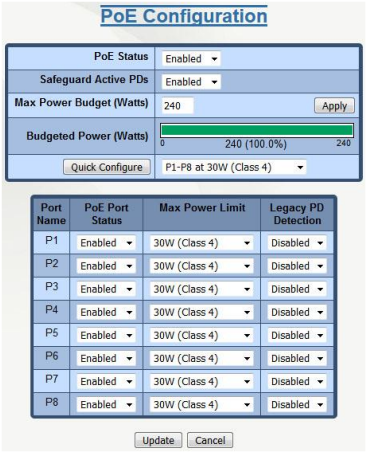
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

PoE

PoE (Power Over Ethernet) is an internal hardware capability that outputs power and data on Ethernet cabling to Powered Devices (PDs) such as VoIP phones, IP camera, and industrial devices. PoE eliminates the need to run separate data and power cables between the PSE (PoE Source Equipment) and the PoE powered device.

PoE Management on the NT24k® provides the ability to set the PoE power budget, enable/disable PoE on specific ports, and set power limits per port.

Note: PoE is only supported on certain NT24k switches.



PoE Configuration: Table 1

PoE Status: This configurable field indicates whether the global PoE is enabled or disabled. PoE ports must also be individually enabled on the PoE configuration page. The default value for this field is Enabled.

Safeguard Active PDs: This configurable field indicates whether an active PD is safeguarded from losing power because of a configuration change. If enabled, the Max Power Limit cannot be changed if it can cause a power loss to the active PD. Similarly, Legacy PD Detection cannot be disabled on an active legacy powered device. The default value for this field is Enabled.

Max Power Budget (Watts): The maximum amount of power available for PoE. The value can range from 4 to the max power supply support for the switch.

Quick Configure: The quick configure selection menu updates the PoE port table with the desired settings based on the quick configuration option selected.The following values for 8 PoE Ports are:

- P1-P8 at 30W (Class 4) (default)
- P1-P8 at 15.4W (Class 3/0)
- P1-P8 at 7W (Class 2)
- P1-P8 at 4W (Class 1)
- All ports disabled.

For 16 PoE Ports the values are:

- P1-P8 at 30W (Class 4) (default)
- P9-P16 at 30W (Class 4)
- P1-P16 at 15.4W (Class 3/0)
- P1-P16 at 7W (Class 2)
- P1-P16 at 4W (Class 1)
- All ports disabled.

PoE Configuration: Table 2

PoE Port Status: This configurable field indicates whether PoE is enabled or disabled on the port.The default value is enabled on the first 8 PoE ports.

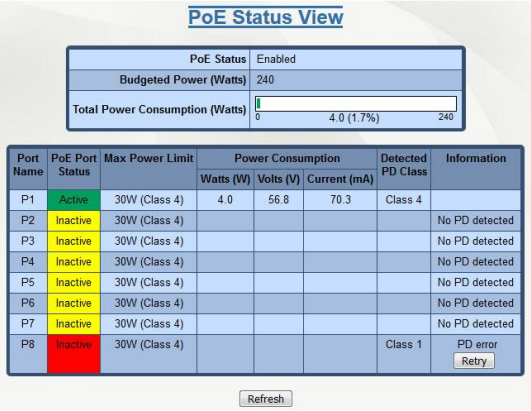
Max Power Limit: This configurable field indicates the maximum budgeted power for the port. The values are:

- 4W (Class 1)
- 7W (Class 2)
- 15.4W (Class 3/0)
- 30W (Class 4)

Legacy PD Detection: This field indicates whether legacy PD detection is enabled or disabled on the port. If enabled, legacy powered devices will be recognized. The default value is disabled.

Note: The sum of the Port Max Power Limit should not exceed the MaxBudgeted Power.

PoE Status: Table 3



Port Name: This field displays the descriptive name of the port.

PoE Port Status: Current status of the PoE port. The values are:

- Active: PoE power is outputted on the specific port
- Inactive: PoE power is not outputted on the specific port
- Disabled: PoE functionality is disabled on the specific port

Max Power Limit: The maximum budgeted power for the port.

Power Consumption: The actual power consumption of the port.

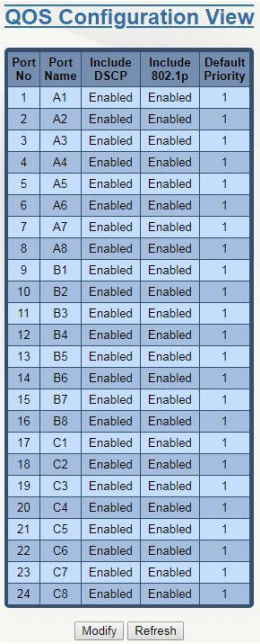
Detected PD Class: The classification of the connected device, which can range from Class 0-4.

Information: Details about the port's current state. If a Powered Device attempts to negotiate more power than the allocated maximum, PoE will be turned off on the port and a re-negotiation period will start. If re-negotiation is unsuccessful, a Retry button will be displayed below the PD error message. Select the retry button to restart negotiation after the cause of the overload is resolved.

QOS (Quality of Service)

The QOS decision tree chooses a frame's output port priority and the egress frame's IEEE 802.1p User Priority value (if needed) based on the QOS settings and the User Priority value (if any) in the ingress frame. Both the internal port priority setting and the egress frame User Priority value are always assigned the same value. The available values are 0 through 7 where 7 is the highest priority. If the ingress frame is an IP packet, the RFC 2474 DSCP field in the packet will be passed unchanged to the egress frame.

Click on the *Modify* button to make changes to the QOS Configuration.



Include DSCP: This configurable field displays the status of whether or not to include the ingress frame's RFC 2474 DSCP value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. If the ingress frame type is IP (IPv4 or IPv6) and Include DSCP is enabled, DSCP processing will override all other settings. (see QOS SELECTION CHART below). The default value is enabled.

Include 802.1p: This configurable field displays the status of whether or not to include the ingress frame's IEEE 802.1p User Priority value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. This setting is used only if the frame type is not IP (IPv4 or IPv6) or the Include DSCP setting is disabled. (see QOS SELECTION CHART below). The default value is enabled.

Default Priority: This configurable field displays the default QOS priority for the transmit priority value and the egress frame's IEEE 802.1p User Priority value if not otherwise assigned by DSCP or IEEE 802.1p processing. The range is 0-7, highest priority=7. The default value is 1.

QOS Selection Chart:

INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Enabled	N.A.	IP	N.A.	Ingress DSCP Value
N.A.	Enabled	Not IP	Yes	Ingress IEEE 802.1p UP
N.A.	Enabled	Not IP	No	Default Priority Setting
N.A.	Disabled	Not IP	N.A.	Default Priority Setting
Disabled	Enabled	N.A.	Yes	Ingress IEEE 802.1p UP
Disabled	Enabled	N.A.	No	Default Priority Setting
Disabled	Disabled	N.A.	N.A.	Default Priority Setting
Legend				
IP	Ingress packet type is IPv4 or IPv6.			
Ingress DSCP Value	Use the high order three bits of the ingress frame’s IP DSCP value.			

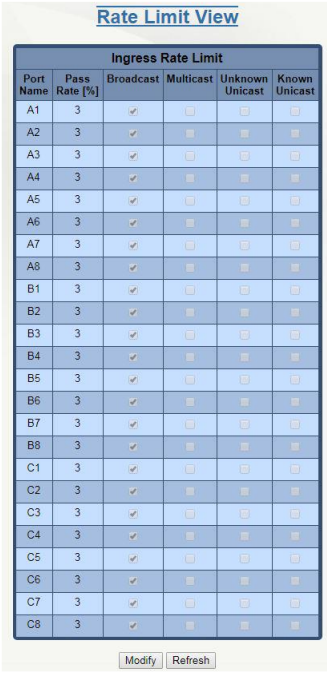
INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Ingress IEEE 802.1p UP	Use the ingress packet's IEEE 802.1p User Priority value.			
N.A.	Not applicable			

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

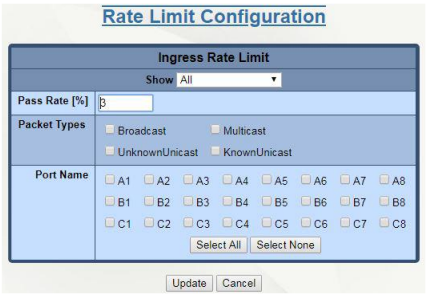
Rate Limiting

The Rate Limiting dialog window shows the NT24k® installed ports and the Pass Rate Percentage per port for each of the following: Broadcast, Multicast, Unknown Unicast and Known Unicast.

A packet type will be affected by the rate limit setting if the check box is selected and it exceeds the total number of packets established by the ingress rate limit within an assigned time period. The time periods are: 1 Gbps = 10 ms, 100 Mbps = 100 ms and 10 Mbps = 1 sec.



Click on the *Modify* button to make changes to the Rate Limiting settings.



Show: View the ports that are available to install (Modules), currently installed or currently linked up.

Pass Rate [%]: Modify the pass rate percentage for each and every port by entering the desired value.

Packet Types: Select what Packet Types are to be passed: Broadcast, Multicast, Unknown Unicast and Known Unicast.

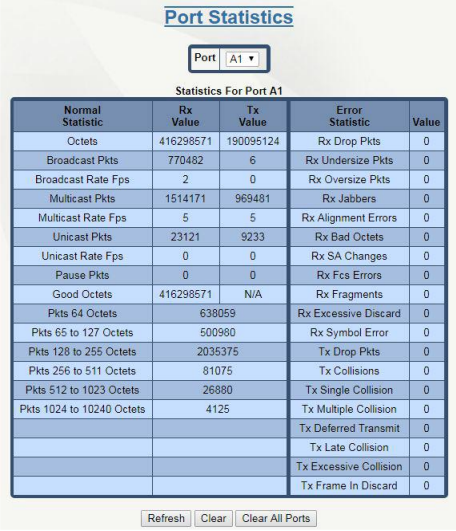
Port Name: Select which ports are affected by the changes made.

Note: Unicast packets with destinations not in the ARL table can be rate limited rather than all being flooded. This is known as “Unknown Unicast”.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Status/Statistics

This dialog window displays the MIB counters for the selected port, specified by the Port pull-down menu.

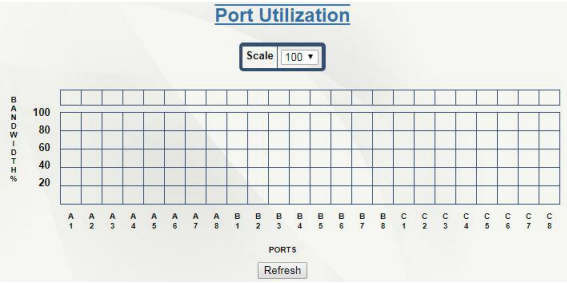


Normal Statistic	Rx Value	Tx Value	Error Statistic	Value
Octets	416298571	190095124	Rx Drop Pkts	0
Broadcast Pkts	770482	6	Rx Undersize Pkts	0
Broadcast Rate Fps	2	0	Rx Oversize Pkts	0
Multicast Pkts	1514171	969481	Rx Jabbers	0
Multicast Rate Fps	5	5	Rx Alignment Errors	0
Unicast Pkts	23121	9233	Rx Bad Octets	0
Unicast Rate Fps	0	0	Rx SA Changes	0
Pause Pkts	0	0	Rx Fcs Errors	0
Good Octets	416298571	N/A	Rx Fragments	0
Pkts 64 Octets	638059		Rx Excessive Discard	0
Pkts 65 to 127 Octets	500980		Rx Symbol Error	0
Pkts 128 to 255 Octets	2035375		Tx Drop Pkts	0
Pkts 256 to 511 Octets	81075		Tx Collisions	0
Pkts 512 to 1023 Octets	26880		Tx Single Collision	0
Pkts 1024 to 10240 Octets	4125		Tx Multiple Collision	0
			Tx Deferred Transmit	0
			Tx Late Collision	0
			Tx Excessive Collision	0
			Tx Frame In Discard	0

Pressing the *Clear* button resets all counters for the selected port. The *Clear All Ports* button resets all counters for all ports, including the selected port. The *Refresh* button reloads the dialog window.

Status/Utilization

This dialog window displays the bandwidth percentage graph of all the ports. The graph is scaled based on the “*Scale*” drop-down list.



Trunking

The Trunking dialog window displays trunking information.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Trunk ID: This column displays the trunk identifier number. The valid range is 1-127.

Trunk Name: This column shows the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

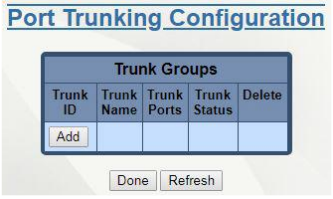
Trunk Ports: This column displays the ports associated with the trunk.

Trunk Status: The existing status of the trunk is shown in this column. Available trunk status options are *Enabled* or *Disabled*.

Configuration Note:

Note: The trunk ports are not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, 802.1X, Mirroring.

Click on the *Modify* button to add, modify or delete ports.



Click on the Add button and the following dialog window will appear:



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

ID: Enter the desired Trunk ID. Valid range is 1- 127. There can be no duplicate Trunk IDs.

Name: Enter the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

Ports: Select the required ports from the Ports list. The list of ports shown will vary depending on the selection in the *Show* field.

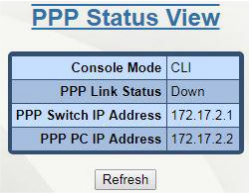
Status: Select the status of the port that is being added. Options are *Enabled* or *Disabled*.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

To modify an existing Trunk Group, click on the *Trunk ID* and make the required changes. To Delete an existing Trunk Group, click on the *Delete* button associated with the Trunk ID to be deleted.

PPP

The console can be either in CLI mode or PPP mode. The PPP mode provides a TCP/IP connection over the serial port. A browser may then be used to view switch information or make configuration changes. PPP mode is entered by using the PPP command on the console. To change from PPP to CLI mode, you must reboot the switch.



Console Mode: When CLI is shown, the console is in the command mode, which is the default mode. When PPP is shown, the console is in PPP mode.

PPP Link Status: This field indicates the current PPP link state.

PPP Switch IP Address: This field displays the IP address for the switch side of the PPP link.

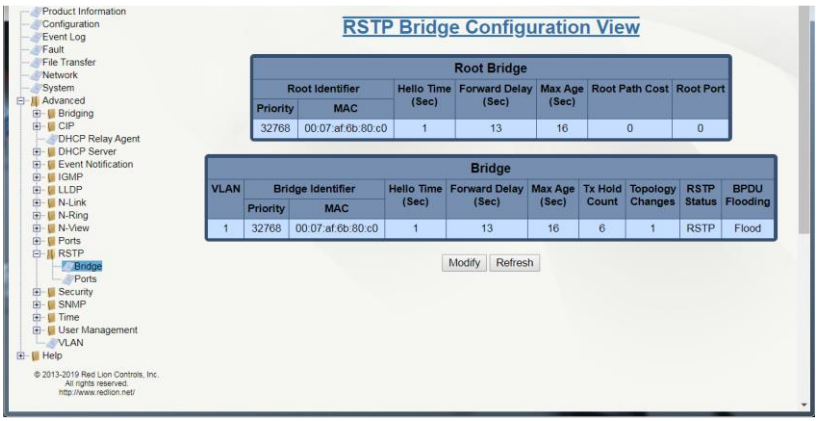
PPP PC IP Address: This field indicates the IP address for the PC side of the PPP link.

RSTP

Bridge

The Bridge dialog window displays the RSTP information for the RSTP Root Bridge and for the RSTP Bridge on this switch.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Root Bridge: This is the identity and parameters of the RSTP Root Bridge.

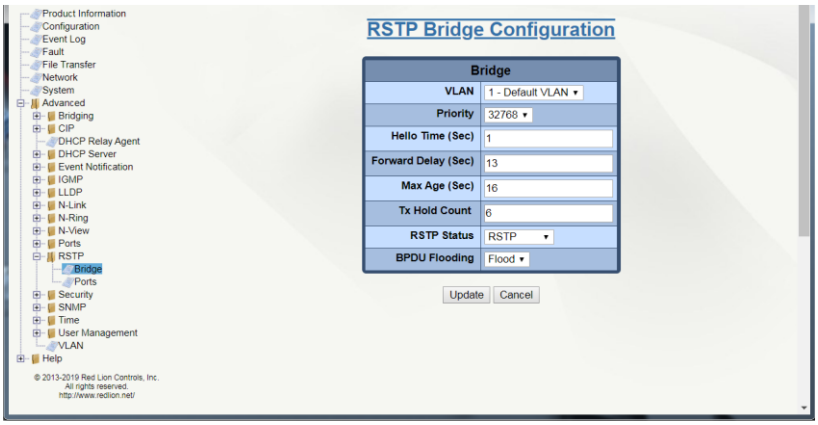
Root Identifier - Priority: This field indicates the priority of the Root Bridge.
Root Identifier - MAC: The unique MAC address of the Root Bridge is shown here.
Hello Time (Sec): This field indicates the time interval, in seconds, between the transmission of configuration BPDUs by designated ports.
Forward Delay (Sec): This field shows the time spent, in seconds, by legacy STP Bridges in transitioning Root and designated ports to forwarding. This delays port transitions until other bridges have received spanning tree information.

Max Age (Sec): For RSTP, this is the maximum time, in seconds, that a bridge will wait for configuration BPDUs before deciding it is no longer connected to the root bridge.
Root Path Cost: The cost of the path to the Root Bridge via the Root Port of this bridge.
Root Port: The Root Port of this Bridge. The Root Port provides the lowest cost path from this bridge to the Root Bridge.

Bridge: This is the configuration of the RSTP bridge on this switch.

VLAN: RSTP will operate on all ports of this VLAN. BPDUs will be transmitted with or without VLAN tags depending on the settings for this VLAN. This should be a valid VLAN ID. The default value for this field is VLAN 1.
Bridge Identifier Priority: This field indicates the Bridge priority. The range is 0 - 61440. The default value is 32768.
Bridge Identifier MAC: The unique MAC address of the Bridge is displayed in this field. This is possibly a different network device.
Hello Time (Sec): This field indicates the Hello time, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time interval, in seconds, between the transmission of Configuration BPDUs by Designated Ports. The range is 1 - 10. The default value is 1.
Forward Delay (Sec): This field displays the Forward Delay, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time spent, in seconds, by legacy STP Bridges in transitioning Root and Designated Ports to Forwarding. This delays Port transitions until other bridges have received spanning tree information. The range is 4 - 30. The default value is 13 seconds.
Max Age (Sec): This field displays the Max Age when this bridge is the Root Bridge or is attempting to become the Root Bridge. For RSTP, this is the maximum hops allowed for any protocol message before it is discarded and no longer retransmitted. For STP, this is the maximum time, in seconds, that a bridge will wait for Configuration BPDUs before deciding it is no longer connected to the root bridge. The range is 6 - 40. The default value is 16 seconds.
Tx Hold Count: This is the maximum number of configuration BPDUs that can be transmitted in one second from a port on this Bridge before transmission is throttled. The range is 1 to 10. The default value for this field is 6.
Topology Changes: This is the number of RSTP topology changes since the switch has been powered on or rebooted.
RSTP Status: This is the current status of the RSTP protocol on this bridge. The available options for this field are RSTP, Force STP or Disabled.
Note: RSTP & N-Ring™ are different network topology protocols and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then the port will be disabled for RSTP.
Note: Do not create redundant network paths unless either RSTP or N-Ring is enabled.
Note: If a port is both an RSTP port and an enabled trunk group member, then the port will be disabled for RSTP. The RSTP port status can be seen under advanced RSTP ports.
Note: It is recommended that an RSTP network consist of RSTP capable switches.
Note: RSTP is supported on only one VLAN.
Note: When operating in a VLAN with legacy STP devices, use these values for the Bridge: Hello Time (Sec) = 2, Forward Delay (Sec) = 15 and Max Age (Sec) = 20.
BPDU Flooding: This value allows for flooding or blocking of BPDUs to other ports when the global spanning tree is disabled or when spanning tree is disabled on a specific port. If Flood is selected, BPDUs are flooded to all other ports based on the VLAN assignment. The options are Flood or Block. The default is Flood.

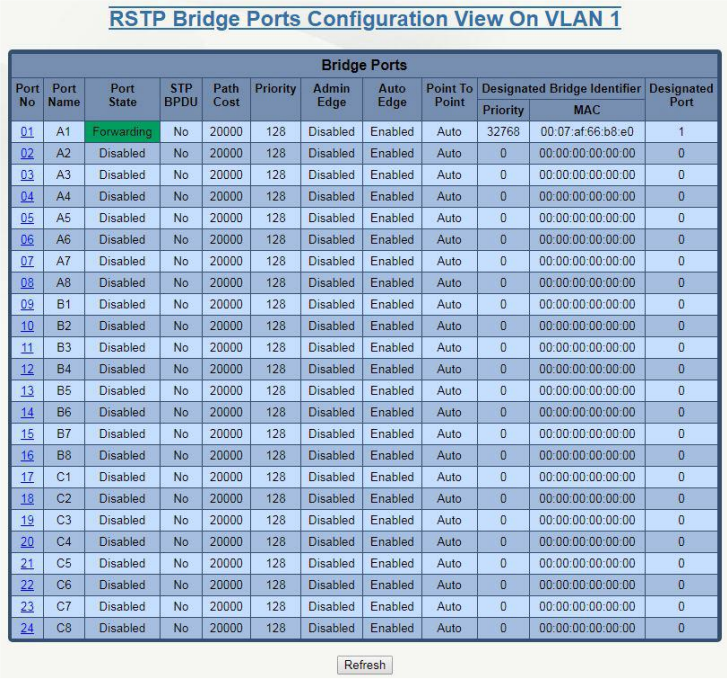
Click on the *Modify* button and the following dialog window will appear:



Make the required modifications, and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

The RSTP Ports dialog window displays information such as the path cost and the port state. If the switch sees a redundant network path, it will put the port with the highest path cost into the Blocking port state where it will discard packets coming in on that port.

In the example shown below, A2 is a redundant port with port A1, therefore A1 is forwarding and A2 is discarding.



Port No	Port Name	Port State	STP BPDU	Path Cost	Priority	Admin Edge	Auto Edge	Point To Point	Designated Bridge Identifier		Designated Port
									Priority	MAC	
01	A1	Forwarding	No	20000	128	Disabled	Enabled	Auto	32768	00:07:af:66:b8:e0	1
02	A2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
03	A3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
04	A4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
05	A5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
06	A6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
07	A7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
08	A8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
09	B1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
10	B2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
11	B3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
12	B4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
13	B5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
14	B6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
15	B7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
16	B8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
17	C1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
18	C2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
19	C3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
20	C4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
21	C5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
22	C6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
23	C7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
24	C8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0

Port No: Indicates the number of the port.

Port Name: Displays the descriptive name of the port.

Port State: The current RSTP state of the port is shown here. This state may be seen as "Forwarding, No STP, Disabled, Listening, Learning, and Discarding.

STP BPDU: Shows whether or not a legacy STP BPDU has been received or not.

Path Cost: Displays the current path cost of the port. The range is 0 - 200,000,000. If configured to 0 or Auto, the path cost will be calculated automatically using the actual speed of the port; otherwise the configured value will be used. The default value for this field is Auto.

Priority: The priority of the port is displayed in this column. The available range is 0 - 255. The default value for this field is 128.

Admin Edge: Indicates whether or not this port is treated as an Edge Port and can immediately enter the forwarding state. If set to Enabled, no BPDUs are expected to be received at the port. Set this option to Enable only when an end device is linked to this port. The default value is Disabled.

Auto Edge: Indicates whether or not to use a short timeout when waiting for BPDUs before determining that this is an Edge Port (if no BPDUs are received). It may have to be disabled for a very large network. The default value is Enabled.

Point to Point: Displays whether at most one other network port is attached to the port's LAN segment. The port may transition to Forwarding very quickly on a point-to-point MAC link. Values may be Auto (full-duplex links are assumed to be point-to-point, half duplex are not), and Force True or Force False (if the automatic determination would be wrong). The default value is Auto.

Designated Bridge Identifier Priority: The priority of the designated bridge associated with the port's LAN segment is shown in this field. The designated bridge provides the lowest cost path from this bridge port's LAN segment, through the designated bridge, to the root bridge.

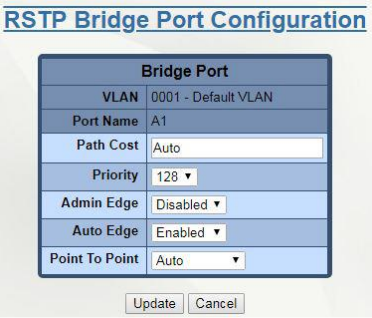
Designated Bridge Identifier MAC: Indicates the unique MAC of the designated bridge associated with the port's LAN segment.

Designated Port: The designated port of the designated bridge is shown here.

Note: When event logging is enabled, all RSTP controlled ports will log events about their status whether or not the modular based port is currently installed.

Note: When operating in a VLAN with legacy STP devices, set the Auto Edge field to Disabled for Bridge Ports.

To make changes to a Bridge port, click on the *Port No hyperlink* and the following window will appear:



Make the required modifications to the following parameters: Path Cost, Priority, Admin Edge, Auto Edge and Point to Point fields, then click on the *Update* button.

Security

Local Security

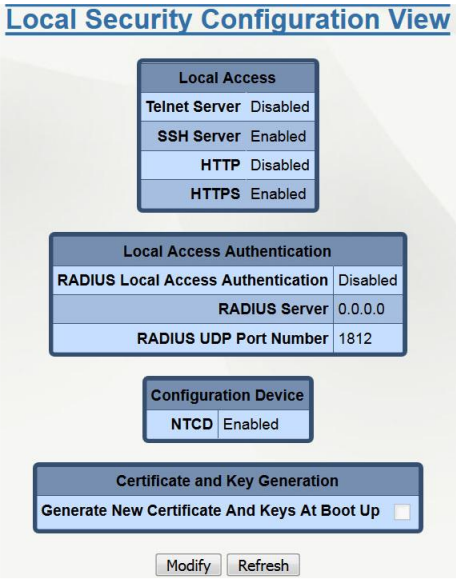
The Local Security feature allows an administrator to control local access (logins) to the switch.

Local Security Configuration View

The Local Security Configuration page displays the status of the Telnet server, SSH Server, HTTP protocol, and HTTPS protocol. The administrator can disable or enable these protocols, as desired. A RADIUS server can be configured to authenticate the user name and password entered for local access.

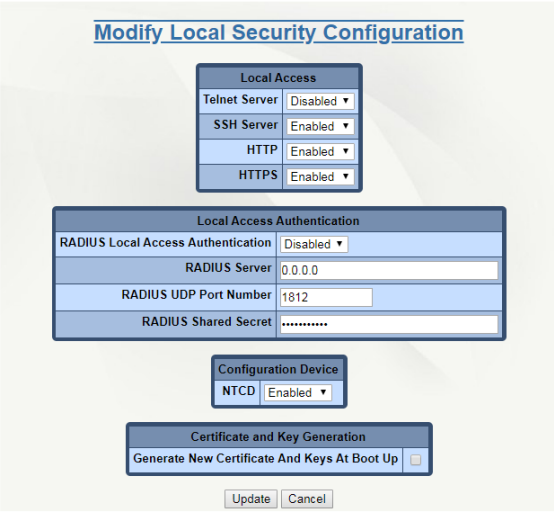
The N-Tron® Configuration Device (NTCD) SD card slot can be enabled or disabled, allowing an administrator to block and unblock reading and writing settings from the SD card as desired. A new certificate and keys can also be generated at boot up by selecting the *Generate New Certificate and Keys At Boot Up* option.

WARNING: If the NTCD device slot is disabled and the switch password is forgotten, access to the switch can only be recovered by sending it back to the factory to be unlocked.



Modify Local Security Configuration

Click on the *Modify* button and the page below will appear. Make the desired changes, and then click on the *Update* button. To save changes, navigate to the Configuration menu and click on the *Save* button.



These settings address local access to the switch. For better security, keep the Telnet Server and HTTP disabled.

Telnet Server: This field indicates whether the Telnet Server is enabled or disabled. Disabling the Telnet Server does not impact SSH. The default is disabled.

SSH Server: This field indicates whether the SSH Server is enabled or disabled. Disabling the SSH Server does not impact Telnet. The default is disabled.

HTTP: This field indicates whether HTTP is enabled or disabled. Disabling HTTP does not affect HTTPS secure connections. The default is disabled. HTTP users are not authenticated by the RADUIS server. If Radius authentication is exclusively required, then HTTP should be disabled.

HTTPS: This field indicates whether HTTPS is enabled or disabled. Disabling HTTPS requires HTTP to be enabled. The default is enabled.

A RADIUS server may be used to manage user accounts that have access to the switches.

RADIUS Local Access Authentication: This field indicates whether RADIUS Local Access Authentication is enabled or disabled. RADIUS authentication is not supported on HTTP connections. The default is disabled.

RADIUS Server: This field is the IP address of the RADIUS server used when RADIUS Local Access Authentication is enabled.

RADIUS UDP Port Number: The UDP port number of the RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

RADIUS Shared Secret: The shared secret for the local access authentication server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

NTCD: This field indicates whether the Configuration Device is enabled or disabled. The default is enabled. Disabling the NTCD SD card slot allows an administrator to block and unblock reading and writing settings to and from the SD card.

Generate New Certificate and Keys at Boot Up: This field indicates whether certificate and keys will be generated when the switch boots up. *A change to this setting requires that settings be saved and that the switch be rebooted before changes take effect*. The value will reset to be unchecked when the switch boots up. The default is no.

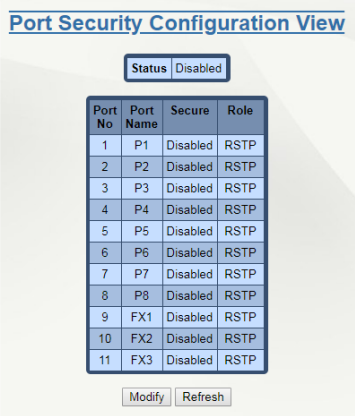
Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the port(s) that the address is authorized on. A non-authorized MAC address will be discarded and will be shown on the intruder log.

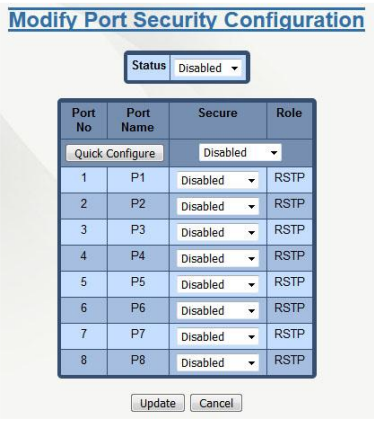
Port security allows secured ports to run with RSTP enabled on the port. Port security also allows the same MAC address to be authorized on multiple ports. When setting up authorization lists for RSTP ports, any MAC address that could migrate to other secured ports should also be placed, by the user, in the authorization list for those ports.

Port Security – Configuration

The Port Security Configuration View displays the status of Port Security and all the ports with their current settings. When Status is 'Locked' it is in secure mode. When Status is 'Learning' it builds an internal list of authorized MAC addresses and no ports are secured during this time.



The Modify button allows the administrator to change the Status of Port Security and Secure mode for all ports.



Status: The current status of Port Security. It can be Disabled, Learning, or Locked. Transitioning from Locked to Learning clears the Authorization List table on all ports. Transitioning from Locked to Disabled retains the current Authorization List. When transitioning from Learning to Locked, the Authorization List represents the authorized MAC addresses. The default value is Disabled.

Port No: The number of the port.

Port Name: The descriptive name of the port.

Secure: Displays Secure mode for the associated port. It can be Disabled, Enabled, or Single Mac.

- **Disabled:** Port Security is not active on the port regardless of the current Port Security Status.
- **Enabled:** Port Security is active when the current Port Security Status is Learning or Locked.
- **Single MAC:** Port Security will take the first learned MAC address and lock the port when current Port Security Status is Learning or Locked.

The default value is Disabled.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, N-Link Coupler, 802.1X, and Trunk.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Note: Security is not configurable on N-Ring or N-Link interconnecting ports. These ports must be linked to adjacent switches that have the protocol enabled. This link is considered to be a

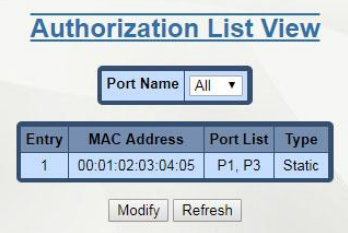
closed proprietary connection/segment that is not directly accessible. If both switches are otherwise properly secured then the proprietary connection/segment requires no additional security.

Note: It is recommended that the Bridging Aging Time be 300 seconds (the default) or longer while Port Security is Learning.

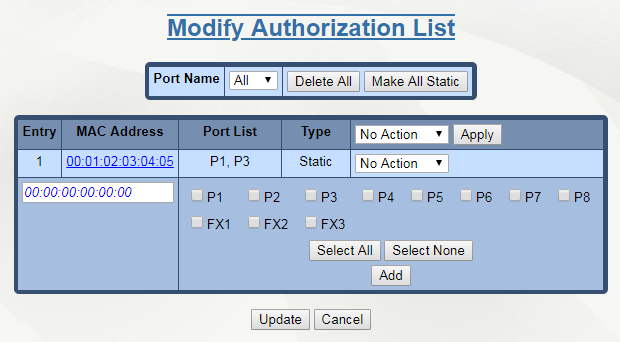
Ports Security – Authorization List

The Authorization List View displays a drop-down list of the available ports that is used to filter the authorization list. Below the drop-down list is the table of authorized Static and Learned MAC addresses and ports.

Note: Multicast Source Addresses will not show up in the Authorization List.



The Modify button allows the administrator to add new MAC addresses, and to modify and remove existing MAC addresses. The last row is used to add new MAC addresses and to change the ports of an existing MAC address.



Port Name: The descriptive name of the port.

MAC Address: The authorized host MAC address.

Port List: The port(s) that are authorized for the associated MAC address.

Type: The type of the authorized MAC Address. It can be either Learned, Static, or Single MAC.

Action: Action for the authorized MAC address. It can be No Action, Make Static from Learning mode, or Delete from the Authorization List. The maximum number of actions that may be performed on the Authorization List in a single update is 100.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Delete All Authorization List

To delete the complete authorization list associated with the selected port(s), click on *Delete All* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

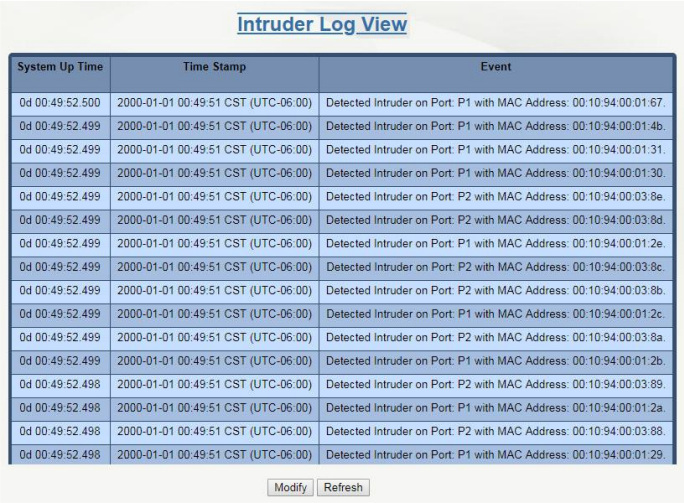
Make All Learned Authorization Entries Static

To make all learned authorization entries associated with the selected port(s) as Static, click on *Make All Static* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

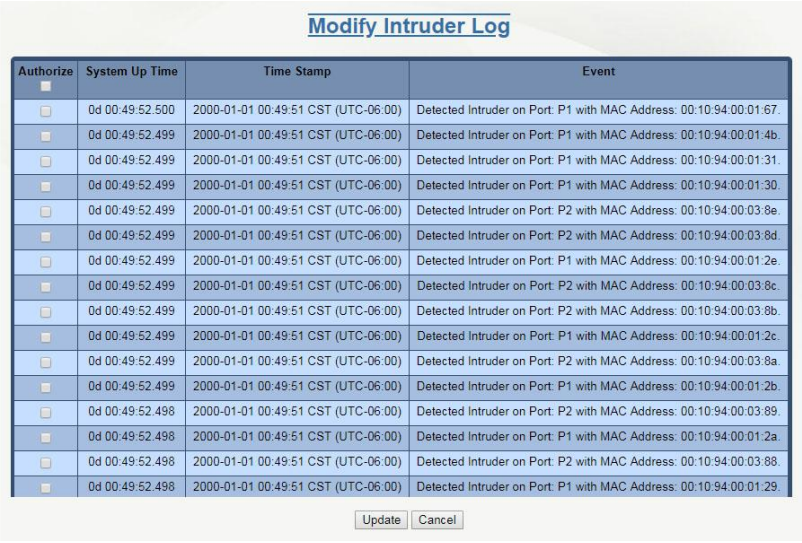
Note: Ports that are set to Single MAC cannot be included in static entries in the Authorization List.

Ports Security – Intruder Log

The Intruder Log page displays a list of unauthorized MAC addresses that attempted to access the secured device. Each intruder entry in the log is based on MAC address and Port. Multicast source MAC addresses will not be displayed in the Intruder Log table. The log is ordered by most recent first, based on the system up time and time stamp. The maximum number of entries is 100. If more than 100 intruders are detected, the oldest entries are deleted. The log is not saved through a power cycle.



To authorize a particular MAC Address from the Intruder Log, click on the Modify button and an "Authorize" field will be added as a checkbox as shown below:



Displays the most recent 100 intruders since the latest system startup. To review a complete list, please see the Event Log page.

FIELD	DESCRIPTION
Authorize	This is the selection to Authorize MAC Address(es) from the Intruder Log.
System Up Time	The elapsed time since the switch was powered on or rebooted.
Time Stamp	The date/time when the event was logged.
Event	The description of the intrusion.

Make the required modifications and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

An authorized entry will be displayed as green text color for that particular row in the Intruder Log table. The corresponding checkbox in the Authorize column will be checked and cannot be modified.

Port Security – Single MAC

Single MAC is a port security mode that allows a port to lock on a dynamically learned MAC address. The first MAC address to be learned and processed by the port will be locked in and any further traffic will be blocked as an intruder. The locking of the address is not dependent on switching the port security status to Locked. This feature helps in providing security for ports that may only have a single device plugged into the switch. The Single MAC address is not persistent following a reboot. The Single MAC will remain locked until a reboot upon which time a new MAC address will be learned and assigned as the new Single MAC entry.

Single MAC can be configured per port from the Port Security Configuration page. Manually added MAC addresses are not allowed to be assigned to a port designated as Single MAC. If a port is enabled under port security and then changed to Single MAC all learned addresses will be cleared and the next MAC address that comes in will be the new Single MAC address.

Single MAC addresses reset anytime the port security status is changed to Learning. Single MAC addresses are persistent when port security status is changed from Learning or Locked to Disabled and then back to Locked.

Single MAC limitations include: intruders on the Single MAC port cannot be manually authorized, and new addresses cannot be manually added to a Single MAC port.

Radius Server Configuration Information

The NT24k® takes advantage of Vendor Specific Attributes (VSA) as defined in section 5.26 of RFC 2865 so that multiple user levels can be authenticated using a Radius server. The VSA is defined as follows:

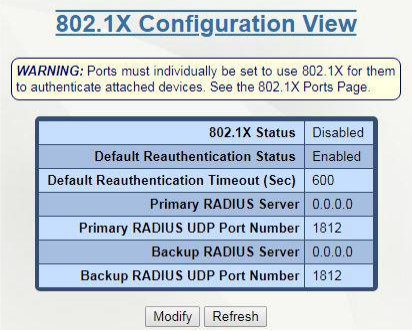
VENDOR ID	28381
Vendor ID	28381
Attribute Number	1
Attribute Format	string
Attribute Value	"AccessLevel:admin" or "AccessLevel:user"

The server and access list will need to be configured accordingly.

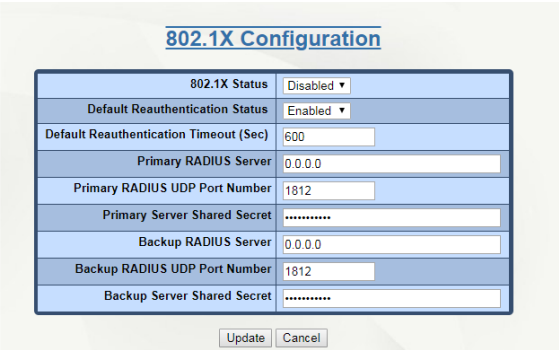
802.1X/Configuration

The Configuration dialog window displays the 802.1X status, reauthentication information, and RADIUS server information.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



To make changes to the Security settings, click on the *Modify* button and the fields shown below will become editable:



802.1X Status: This field indicates whether the 802.1X feature is enabled or disabled. At least one RADIUS server must be specified for 802.1X to be enabled. Ports must also be individually enabled on the ports configuration page.

Default Reauthentication Status: Select whether the 802.1X Reauthentication option is enabled or disabled. With reauthentication enabled, a device will be required to reauthenticate itself based on the time period specified by the reauthentication timeout field. 802.1X must be disabled to change this value.

Default Reauthentication Timeout (Sec): Enter the time period, in seconds, between 802.1X reauthentication. This value cannot be zero (0). 802.1X must be disabled in order to change this value.

Primary RADIUS Server: This field indicates the IP address of the primary RADIUS server. If contact with this server is lost, then contact with the backup server will be attempted.

Primary RADIUS UDP Port Number: The UDP port number of the Primary RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Primary Server Shared Secret: This field displays the shared secret for the primary server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Backup RADIUS Server: This field indicates the IP address of the backup RADIUS server. If contact with the primary server is lost, contact with the backup server will then be attempted.

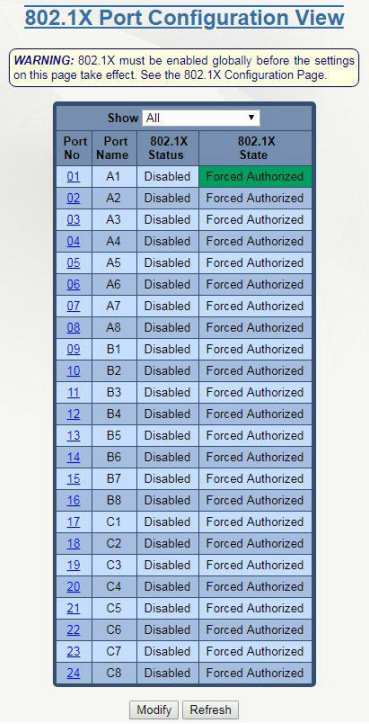
Backup RADIUS UDP Port Number: The UDP port number of the Backup RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Backup Server Shared Secret: This field displays the shared secret for the backup server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Make the required modifications and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

802.1X/Ports

The 802.1X Port Configuration View dialog window displays all the ports and their current settings. To modify this information, click on the *Modify* button.



Port No: This column shows the number of the port.

Port Name: This column displays the port's descriptive name.

802.1X Status: This column indicates whether the existing 802.1X port is enabled or disabled. Ports only require 802.1X authentication if they are enabled and 802.1X is globally enabled on the configuration page.

802.1X State: This column shows the current state of the port. This option is only valid when the port is enabled and 802.1X is globally enabled.

Link Down: There is no link detected on the port.
Initialize: The port is being setup for 802.1X authentication.
Disconnected: A valid 802.1X client has not been detected.
Connecting: A valid 802.1X client has been detected, but authentication has not begun.
Authenticating: The 802.1X client is being authenticated.
Authenticated: The 802.1X client has been authenticated.

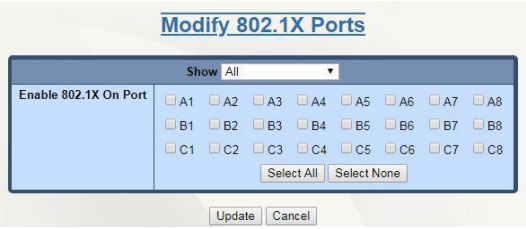
Aborting: The port is no longer authorized and is preparing to move back to the Disconnected state.

Held: The 802.1X client failed authentication and the switch is preventing new authentication attempts for a defined period of time. Default: 60 seconds.

Forced Authorized: Occurs when a port has had 802.1X disabled. The result is all traffic is allowed to pass through that port.

Forced Unauthorized: Occurs when a port is administratively disabled through the port configuration. The result is no traffic is allowed to pass through that port.

Click on the *Modify* button and the page below will appear. Select the required ports, and then click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



IEEE 802.1X MIB

The IEEE 802.1X MIB, IEEE 8021-PAE-MIB, is supported by the NT24k®. Since the NT24k does not support the supplicant features of 802.1X, the MIB tables pertaining to the supplicant behavior will not be populated and will be blank when queried.

With this release, the IEEE 802.1X MIB support is limited. Ports are only tracked when an 802.1X aware supplicant is attached. This means that not all 802.1X enabled ports will be visible, only those with valid supplicants. The statistics available through the MIB only pertain to the device since it either passed or failed authentication. Once the link goes down on the port, the statistics will be reset. Furthermore, any configuration items accessed through the IEEE 802.1X MIB can be set to modify the behavior of the port, but these changes will not persist across link events or power cycles.

Configuration changes that occur through the NT24k MIB will be persisted across link events and power cycles. Support for persisted statistics and configuration settings in the IEEE 802.1X MIB will be added to the NT24k in a future release.

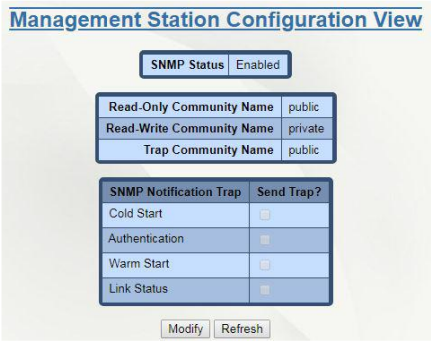
The IEEE 802.1X MIB allows for the writing to dot1xPaeSystemAuthControl. This is not supported in the current release of the NT24k firmware. dot1xPaeSystemAuthControl is considered a read-only attribute. The functionality for this is located in the NT24k MIB as ntronSecurityDot1xConfigStatus.

The IEEE 802.1X MIB allows for the writing to dot1xAuthAdminControlledDirections. Controlling the direction of the port traffic is not currently supported in the NT24k firmware and writing to dot1xAuthAdminControlledDirections will not have an effect on the system.

SNMP

Configuration

The SNMP Configuration displays the SNMP status and allows the administrator to disable or enable the protocol. The Read-Only, Read-Write and Trap Community Names are also displayed in this dialog window.



SNMP Status: This field indicates whether SNMP is enabled or disabled.

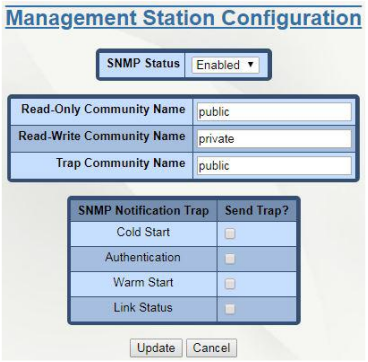
Read-Only Community Name: This configurable field represents the Authorized Community Name for SNMP Get requests. Only alphanumeric characters are allowed. The default value for this field is public.

Read-Write Community Name: This configurable field represents the Authorized Community Name for SNMP Set requests. Only alphanumeric characters are allowed. The default is for this field is private. Only administrators can view or modify this field.

Trap Community Name: This configurable field represents the Authorized Community Name for SNMP Traps. Only alphanumeric characters are allowed. The default is for this field is public.

SNMP Notification Traps: This section allows for control of which SNMP traps will be sent by this switch. Each of the four available traps can be enabled or disabled individually. The traps are: Cold Start, Authentication, Warm Start and Link Status.

Click on the *Modify* button to make changes to the SNMP Configuration. This will enable all configurable fields. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



Trap Stations

The Trap Stations dialog window displays the SNMP Trap Stations.

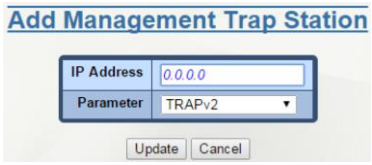


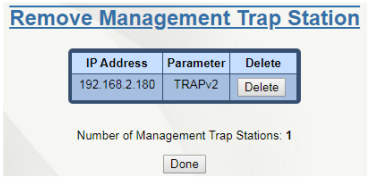
IP Address: This field represents the IP address of the Management Station to be sent SNMP Traps.

Parameter: This field displays the Target Parameters entry (TRAPv1, TRAPv2, etc) to be used for sending traps to the Management Station.

Adding Management Trap Stations

To add trap stations, click on the *Add* button and the following will appear:





Enter the required IP address and select the parameter to be used. Click on the *Update* button and the Display Management Trap Stations screen will appear.

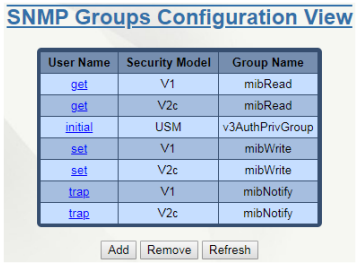
***SNMP V3 Default Security Parameters*:** The SNMP V3 default user parameters are shown here for reference only, as they are necessary for connecting to the switch securely using an SNMP V3 client when in defaults.The default user and other users can be added, deleted or modified by an administrator via either an SNMP V3 client or web browser, and the values below may be invalid if they are changed by an SNMP administrator.

Username: initial
Authentication Password: authpass
Authentication Protocol: MD5
Privacy Password: privpass
Privacy Protocol: DES

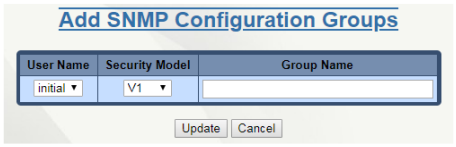
To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

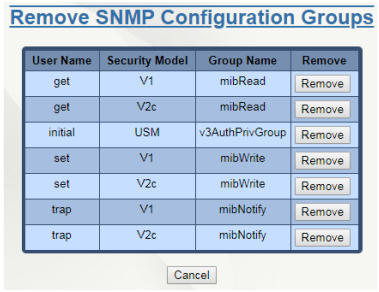
Groups

The SNMP Groups page allows the customer to configure SNMP group settings for specific SNMP users.



Click on the *Add* button to create a new SNMP group, or click the hyperlink under User Name to modify existing group settings for a user. Click the *Remove* button to display a list of current configured group and user settings, with an option to remove specific ones.





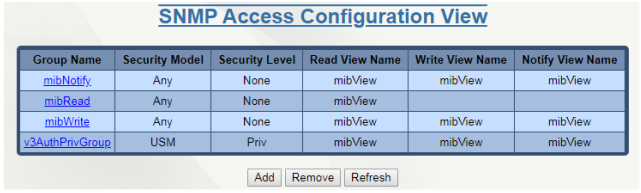
User Name: This field represents the SNMP User Name. It is a drop down list with an option for every SNMP user defined on the **Users** page.

Security Model: This field represents the security model the SNMP protocol will use for the defined group. The default is Any, while V1, V2c and USM (User-based Security) are the other available options.

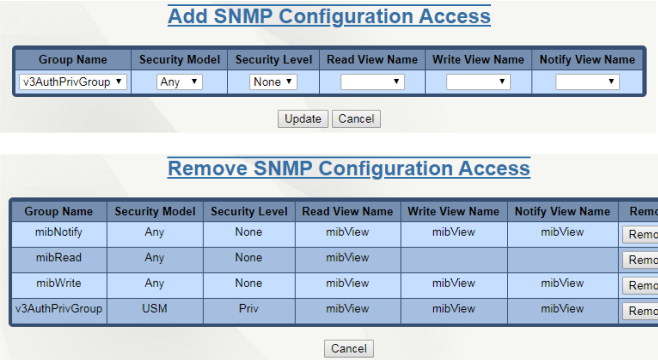
Group Name: This field represents the SNMP Group to which the SNMP user belongs.

Access

The SNMP Access page allows the customer to define various types of MIB access based on the defined view settings for each SNMP group.



Click on the *Add* button to define new access settings for a group, or click the hyperlink under Group Name to modify existing access for a group. Click the *Remove* button to display a list of current configured group and access settings, with an option to remove specific ones.



Group Name: This field represents the name of the group the user defines access settings for. It is a drop down list with an option for every SNMP group defined on the **Groups** page.

Security Model: This field represents the security model used to validate group access to views. The options are V1, V2c and USM (User-based Security).

Security Level: This field represents the security level of SNMP communications for the defined group. The options are None, Auth, and Priv.

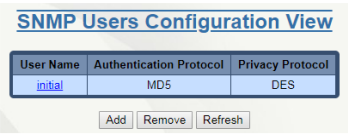
Read View Name: The name of the view that the defined group has read access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Write View Name: The name of the view that the defined group has write access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

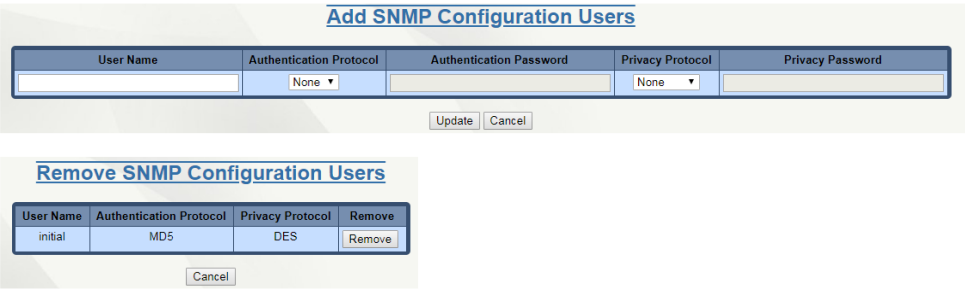
Notify View Name: The name of the view that the defined group has notify access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Users

The SNMP Users page allows a customer to create custom user names for group access and set the authentication and privacy protocols for that user. It is important to note that authorization and privacy passwords, when created, are hashed internally for security and will not be able to be retrieved.



Click on the *Add* button to create a new SNMP user, or click on a hyperlink in the *User Name* column to edit the information for that user. Click the *Remove* button to display a list of current configured users, with an option to remove specific ones.



User Name: This field represents the SNMP User Name.

Authentication Protocol: This field represents the authentication protocol utilized by the SNMP user. The options are None, MD5, and SHA1.

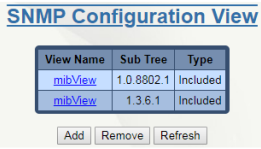
Authentication Password: The defined authentication password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

Privacy Protocol: This field represents the privacy protocol utilized by the SNMP user. The options are None, DES, and AES-128.

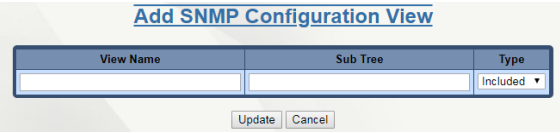
Privacy Password: The defined privacy password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

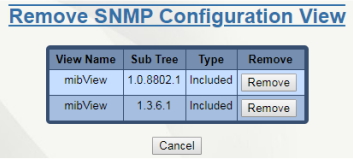
View

The SNMP View page allows a customer to define different view groups, which either include or exclude specific sub trees from the MIB tree based on the configuration.



Click on the *Add* button to create a new SNMP view, or click on a hyperlink in the *View Name* column to edit the information for that view. Click the *Remove* button to display a list of current configured views, with an option to remove specific ones.





View Name: This field represents the name of the SNMP view.

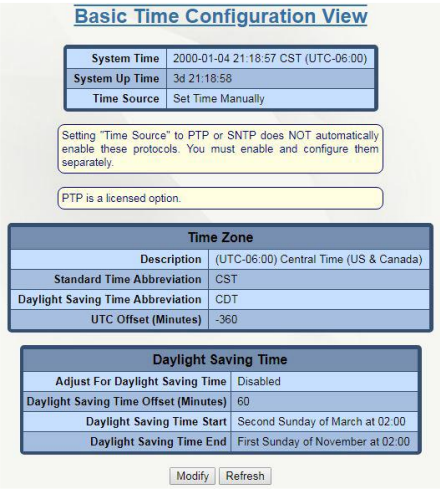
Sub Tree: This field allows the user to enter an OID string representing the sub tree being included or excluded from the view, based on the **Type** setting.

Type: This field allows the user to configure what the SNMP view does with the sub tree defined in the *Sub Tree* field. The options are Included and Excluded.

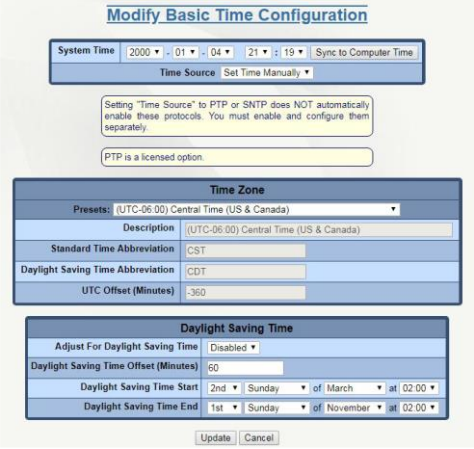
Time

Basic

From the Basic Time Configuration View dialog, the administrator can define the system time, time zone, daylight savings time and time source settings for the unit.



Click on the *Modify* button to make modifications to the unit's time settings.



System Time: This field displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start. The system date/time can be set manually but in the event of a power cycle or reboot it will revert to the default value.

Time Source: This field controls how the switch will automatically set its clock. The default value of "Set Time Manually" means that the time the switch uses can only be set manually. Setting this field to either "SNTP" or "PTP" causes the protocol to continuously update the system clock. Note that these must be enabled and configured separately from the basic time configuration. PTP is a licensed option and is unavailable otherwise.

Time Zone

Presets: This field provides a list of global time zones and cities within the time zones. Selecting from this list provides easy local time configuration and automatically populates the fields below. Choosing the "Custom..." option allows for editing of the below fields to satisfy specific requirements that are not met by one of the preset time zones.

Description: This field provides a description of the time zone selected. It contains the city and the offset from UTC for the selected location. If a custom preset is selected the description may be edited.

Standard Time Abbreviation: The common abbreviation for the selected time zone during standard daylight time is shown in this field. If a custom preset is selected the abbreviation may be edited.

Daylight Saving Time Abbreviation: This field represents the common abbreviation for the selected time zone during daylight saving time or summertime. If a custom preset is selected the abbreviation may be edited.

UTC Offset (Minutes): This field displays the offset, in minutes, from UTC. This is used to determine the local time. If a custom preset is selected the offset may be edited. Any change to the offset will affect the time calculation.

Daylight Saving Time

Adjust For Daylight Saving Time: This field indicates whether automatic adjustment for daylight saving time is made. The settings for this adjustment are defined below.

Daylight Saving Time Offset (Minutes): This field defines how much, in minutes, to adjust the time when daylight saving time starts and ends.

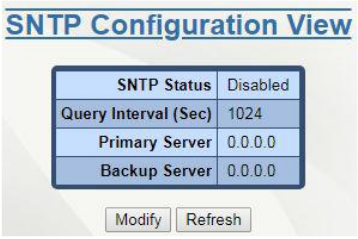
Daylight Saving Time Start: The week, the day of the week, the month, and the time at which daylight saving time should start.

Daylight Saving Time End: The week, the day of the week, the month, and the time at which daylight saving time should end.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

SNTP

From the SNTP Configuration View, the SNTP status can be changed, and the primary and back-up servers can be defined. Click on the *Modify* button to enable or modify the current settings.



SNTP Status: Indicates whether the SNTP client has been enabled. In order to enable SNTP, at least one SNTP or NTP server must be specified.

Query Interval (Sec): The periodic query interval used to request the time from the server(s). The valid range is between 4 and 129600. The default value is 1024.

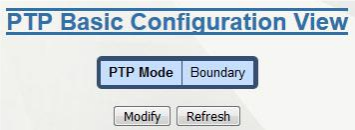
Primary Server: The address of the server to query first and most often. If contact with this server is lost, then contact with the backup server will be attempted. Either an SNTP or an NTP server may be specified.

Backup Server: The address of the backup server to query in the event that access is lost to the primary server. Either an SNTP or an NTP server may be specified. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Precision Time Protocol (PTP)

PTP Basic Configuration

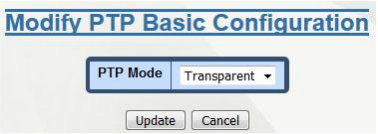
The PTP Basic Configuration View displays the PTP Mode and allows the administrator to disable the protocol, or enable one of two clock modes, Boundary or Transparent.



PTP Mode: This field indicates whether PTP is disabled, operating as a Boundary clock, or operating as a Transparent clock. When PTP is disabled, PTP traffic will route through the switch like any other multicast traffic.

Transparent Clock mode generally provides the most accurate time to a PTP client when the network is lightly loaded and there are only a few PTP clients connected to the switch. Boundary Clock mode is a better choice for a congested network. Boundary Clock mode also becomes a better choice as more PTP clients are connected to the switch.

Click on the *Modify* button to change the PTP Mode. When the desired mode has been selected, click *Update*.

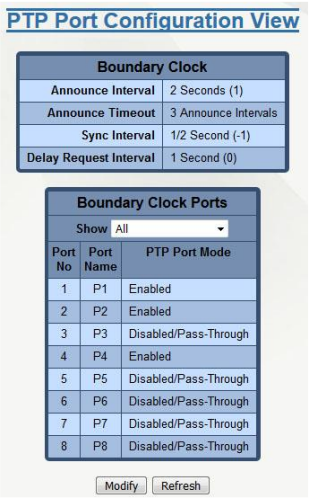


Note: When switching between PTP modes, it will be necessary to save the configuration and reboot the switch for the change to take effect.

PTP Port Configuration

The PTP Port Configuration View displays global and per port settings that relate to PTP.

The settings in the **Boundary Clock** table are applied to every port of a switch in Boundary Clock mode. The **Boundary Clock Ports** or **Transparent Clock Ports** table displays the PTP Port Mode for every port on the switch.



Global Boundary Clock Settings

Announce Interval: This is the log2 value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Announce Timeout: This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Sync Interval: This log2 value determines how often a sync message will be sent. The default value of "- 1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Delay Request Interval: This log2 value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

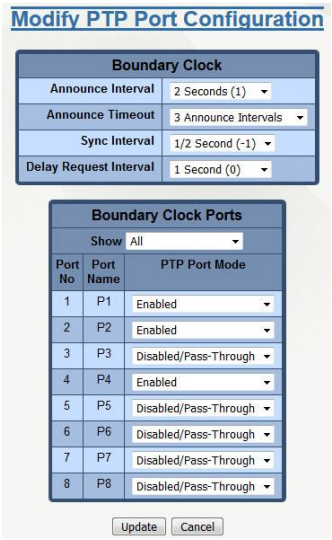
Boundary Clock Ports or Transparent Clock Ports Settings

Port No: Indicates the number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked". When Enabled, PTP packets will be processed by the switch PTP software. When Disabled/Blocked, PTP packets will be discarded as they enter the port. When Disabled/Pass- Through, PTP packets will be forwarded to other pass-through ports (within VLAN restrictions) with no PTP processing.

Click the *Modify* button to change any of the global settings or to change the PTP Port Mode of specific ports.

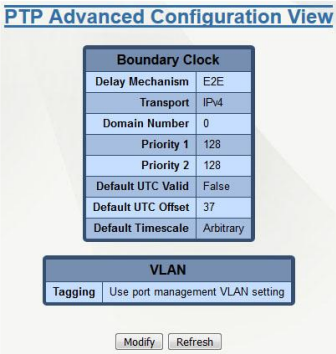


Once modifications to Announce Interval, Announce Timeout, Sync Interval, Delay Request Interval or PTP Port Mode have been made, click on the *Update* button.

Note: The settings on the PTP Port Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

PTP Advanced Configuration

The PTP Advanced Configuration View displays common advanced PTP settings and advanced settings that relate specifically to the Boundary Clock mode of operation. The Common values are read-only and only some values can be modified.



Boundary Clock

Delay Mechanism: The Delay Mechanism specifies the method used by PTP to handle delay correction values. E2E is the only delay mechanism currently supported.

Transport: IPv4/UDP is the only network transport method currently supported.

Domain Number: The Domain Number selects a PTP Domain. Only PTP packets in the same domain will be received and processed, and all sent PTP packets will be tagged with the same Domain Number. The range is 0-127. The default is 0.

Priority1: This value sets the priority of this switch as a Master clock. It is the most important value used by the Best Master Clock (BMC) algorithm of other PTP devices when selecting a Master clock. The range is 0-255, with 0 being most important. The default is 128.

Priority2: This value is used to break ties in the BMC algorithm. The range is 0-255, with 0 being most important. The default is 128.

Default UTC Valid: Current UTC Valid is a field in PTP packets that tells other devices whether the UTC Offset field that is also being sent in the packet should be considered valid. The Current UTC Valid value is set to this default at boot time, until it is updated by making a connection to a PTP Master. The default is "False" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

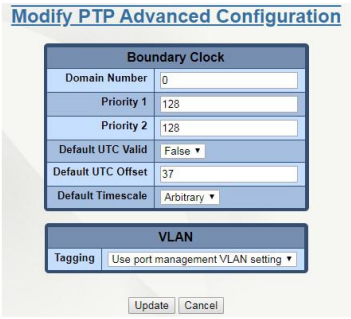
Default UTC Offset: The Current UTC Offset value is set to this default at boot time. The range is 0-127. The default is 36.

Default Timescale: The Current Timescale value is set to this default at boot time. All times exchanged in the PTP protocol are either "Arbitrary" or "PTP". Times that are "Arbitrary" cannot be converted to calendar time correctly and may have no connection to external accurate time. Times that are "PTP" can be converted to accurate calendar time using the UTC offset. The default is "Arbitrary" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

VLAN Tagging: PTP frames that egress a PTP port may have a VLAN tag or may be untagged. When "Use port Management VLAN setting" is selected, the PTP frame is untagged if the Management VLAN is set to 'Untag on Egress'. Otherwise, the frame is tagged with the Management VLAN ID. This is the default setting. When "Use port PVID setting" is selected, the PTP frame is untagged if the VLAN used as the PVID is set to 'Untag on Egress'. Otherwise, the frame is tagged with the port's PVID.

Note: When PTP Mode is "Transparent Clock", PTP frames will obey VLAN restrictions and will not cross VLAN boundaries.

To make changes, click on the *Modify* button. Once the desired changes have been made, click on the *Update* button to apply changes to settings.

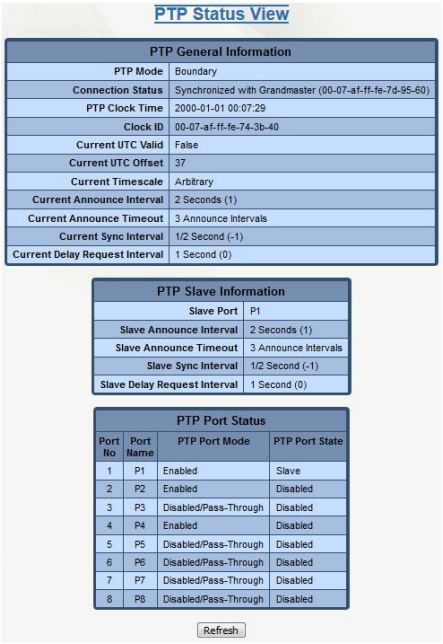


Note: The settings on the PTP Advanced Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

Note: The Current UTC Valid, Current UTC Offset and Current Timescale values are not displayed on the View or Modify pages when PTP is currently disabled or in Transparent Clock mode because they do not apply.

Status

The PTP Status and Information page displays read only information about a device's PTP configuration. General and per port information is displayed on this page.



Note: When PTP is disabled, the only information displayed on this page is PTP Mode and Clock ID, because nothing else applies when PTP is disabled.

PTP General Information

PTP Mode: The PTP mode of the switch. Options include "Disabled", "Boundary Clock", and "Transparent Clock". The default is "Disabled". If the PTP protocol is disabled on the switch, all ports behave as Disabled/Pass-Through. Changes to this setting require a reboot of the switch.

Connection Status: This only applies to Boundary Clock mode. This is the current PTP Master clock of the switch. If this switch is the Master clock, then the connection status indicates that PTP is not synchronized with a Grandmaster.

PTP Clock Time: This only applies to Boundary Clock mode. This displays the date/time of the PTP Clock. The PTP Clock defaults to the system clock when not synchronized to a PTP Master clock.

Clock ID: The unique Clock ID of this PTP device. It is constructed automatically based on the switch MAC address.

Current UTC Valid: A field in exchanged PTP packets that says whether the UTC Offset field that is also being sent in the packet should be considered valid. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current UTC Offset: A field in exchanged PTP packets that provides the current offset to UTC. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current Timescale: A field in exchanged PTP packets that provides the most recently received Timescale value from the Master. This is a run-time value that is dynamically updated based on the most recently connected PTP Master. If this value is "PTP", the internal PTP time can be converted to a calendar time using the Current UTC offset.

Current Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Slave Information

Slave Port: This only applies to Boundary Clock mode. This is the port that is connected to and inheriting configuration values from a PTP Master. If no port is acting as a PTP Slave this field will have a value of “N/A”.

Slave Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Port Status

Port No: The number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked".

PTP Port State: The current PTP state of a port. It should be noted that when PTP is in Transparent Clock mode the port state is not applicable and will not be displayed.

User Management

Authorized Users

The User Management screen allows users to view, add, modify and remove system user accounts. The display includes a list of all the users who have access to the management features of the switch and their access permissions.

Note: Up to 5 web users may be logged into the Web Management tool at once.



Adding Users

The system administrator can add users, change passwords and define access permissions for each user. Click on the *Add* button and the following dialog window will appear:



User Name: User names may include all alphanumerical characters, as well as the following 2 characters: _ - , and must be 3 to 15 characters long.

Password: Passwords can include all printable characters, except for the colon (:) and spaces, and the password length must be in the range specified by the "Password Length Min" and "Password Length

Max" fields. These fields are configurable under the User Management Configuration screen. The background print in the Password entry field will specify the currently configured range.

Access Permission: This field determines whether a user has standard *User* rights or *Admin* access.

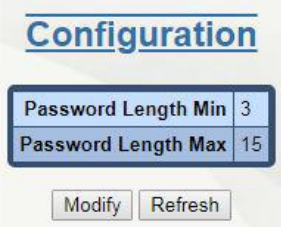
- *User* permission gives the right to view switch configurations and to view current port settings.
- *Admin* permission gives the right to change and view any switch configuration and to change and view any current port settings.

Removing Users

Users can be removed by a user with Admin access. Click on the *Remove* button, enter the User Name to be deleted and click on the *Remove* button.

Configuration

The User Management Configuration screen allows for the switch to be configured with a user password length minimum and user password length maximum.



Password Length Min: The minimum number of characters allowed in a user password. The default is 3 characters.

Password Length Max: The maximum number of characters allowed in a user password. The default is 15 characters.

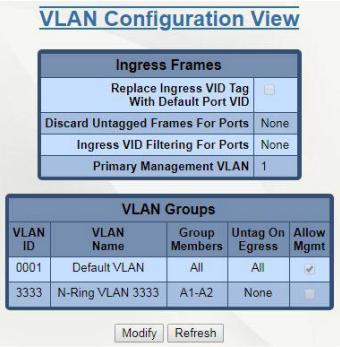
The Configuration screen allows modification of the minimum user password length and the maximum user password length. Both fields, 'Password Length Min' and 'Password Length Max' must be within the overall range of 3 to 15 characters, inclusive.

A configuration change, min or max, will not be allowed if an existing user password will fall out of the desired range (or become non-compliant). Each of the users preventing the change will be listed in the error message. In this case, each of the users that would become non-compliant would need to have their password lengths changed to fall into the new desired range before the configuration change can be applied.

VLAN

The VLAN Configuration View dialog window shows information about the existing VLANs.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Ingress Frames

Replaces Ingress VID Tag With Default Port VID: Specifies whether or not to replace the VID tag of ingress frames with the port's default VID (PVID).

Discard Untagged Frames For Ports: Specifies whether or not untagged ingress frames are dropped by the selected ports.

Ingress VID Filtering for Ports: Specifies whether or not to filter out ingress frames when a VID violation is detected on the selected ports.

Primary Management VLAN: The default egress VLAN used for communications initiated by the switch i.e. DHCP requests.

VLAN Groups

VLAN ID: Displays the VLAN identification for the group members. The range should be 1 - 4094.

VLAN Name: This field displays the VLAN name, which accepts alphanumeric and only the following special characters (including the period)**: # _ - .**

Group Members: This field specifies which ports are members of the VLAN group.

Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Allow Mgmt: Specifies whether or not all ports in this VLAN are management ports.

VLAN Group Members

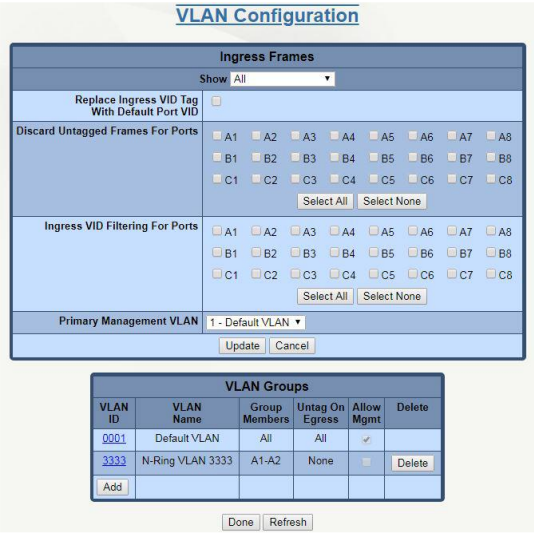
Port No.: The number of the port.

Port Name: The descriptive name of the port.

Group Member: Specifies whether or not the port is a member of the VLAN group.

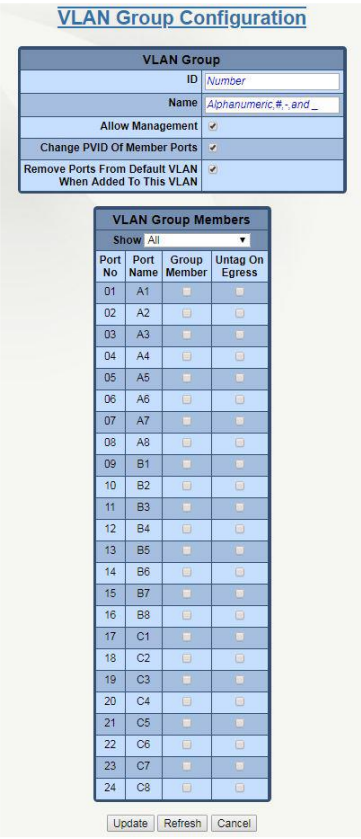
Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Click on the *Modify* button and the following VLAN Configuration page will appear:



The top table is used for general VLAN changes. Once the required changes have been made, click on the *Update* button and then go to the Configuration menu and click on the *Save* button to ensure all changes are saved.

The bottom table is where new VLANs are added and existing ones are modified or deleted.Click on the *Add* button in the bottom table and the following dialog window will appear:



Note: The system is limited to a maximum of 60 configured VLAN groups.

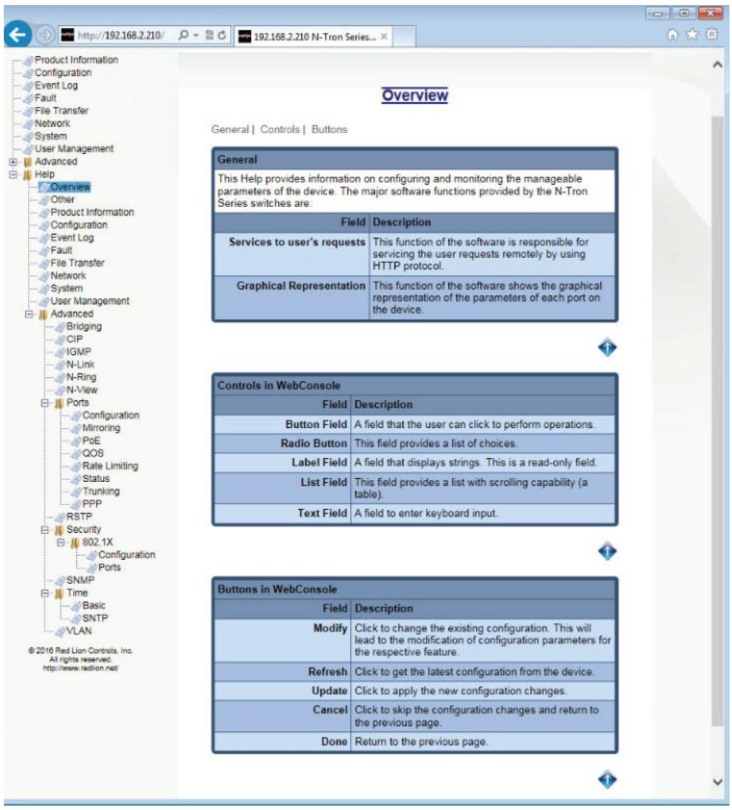
Note: The total number of configured VLAN groups is constrained by system resource usage which varies depending upon network configuration, with VLAN port membership count being the most significant factor.

Note: A port is automatically moved to the Default VLAN if no other VLAN contains that port.

Once the required changes have been made, click on the *Update* button and then go to the *Configuration* menu and click on the *Save* button to ensure all changes are saved.

Help

The Help menu provides information on monitoring and configuring the manageable parameters of the device. Specific help can be found by using the left-hand navigation menu or clicking on the Help link in the top menu.



Appendix A

Command Line Interface

The Command Line Interface (CLI) can be accessed by connecting a host device to the USB connector on the switch. Once connected, the switch will appear as a serial connection. A standard terminal application may be used to communicate to the switch through the serial connection. For serial port settings, see the “USB INTERFACE” section of the NT24k® Series Hardware Manual.

There are two additional methods for connecting to the CLI, Telnet and SSH. Using any standard Telnet client, sim-ply enter the IP address of the switch to start a connection to the CLI. SSH, the secure alternative to Telnet, can also be used with any standard SSH client by simply entering the IP address of the switch to start a secure connection to the CLI.

The CLI contains some status and configuration capability. To interact with the CLI, a login is required. The default username and password is 'admin'. Once logged in, a listing of available commands can be obtained through the help interface. This is accessible by typing either “?” or “help?”. The following commands are available:

NT24k CLI Commands

COMMAND	ARGUMENTS	DESCRIPTION
?		Show system commands. This command is the same as 'help commands' which is shown below.
admin		Administration settings, including IP settings and DHCP mode.
admin system set		Set general system settings.
admin system set contact	<contactname>	The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set location	<locationname>	The physical location of the switch. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set name	<switchname>	Contains the name assigned to the device, which allows alphanumeric and special characters '#', '_', '-', and ':' only. When IP Configuration is DHCP, this may be used as the Client ID (Option 61) of the DHCP Request.
admin system set upper Threshold	<upperThreshold> - An integer from -60 to 120.	The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system set lower Threshold	<lowerThreshold> - An integer from -60 to 120.	The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system show		Show general system information.
admin ip set		Set Internet protocol settings.
admin ip set clientid	<type> - A client ID type: [0-switch name, 1-switch MAC, 2-other text, 3-other hex] <value>	This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters.

COMMAND	ARGUMENTS	DESCRIPTION
	- A string when the type is 2 or a hex string when the type is 3.	• Usage: admin ip set clientid 0 • Usage: admin ip set clientid 2 "Switch53"
admin ip set dhcp admin ip set no dhcp		Determines the method used to obtain an IP address, Subnet Mask, and Gateway. When DHCP is enabled, DHCP protocols are used to obtain these values. When DHCP is disabled, Static is selected, and the statically configured values are used. • Usage: "admin ip set dhcp" to enable DHCP mode. • Usage: "admin ip set no dhcp" to disable DHCP and return back to Static.
admin ip set ip	[address <ipaddress>] - The IP address of the device. [mask <subnetmask>] - The Subnet mask of the device. [gateway <gateway>] - The Gateway address of the device.	Set the Static IP address, subnet mask, and/or gateway. • Usage: admin ip set ip [address (IP address)] [mask (Subnet mask)] [gateway (Gateway address)] **Example:** CLI> admin ip set ip address 192.168.2.212 mask 255.255.255.0 gateway 192.168.2.1
admin ip show		Show Internet protocol settings. **Example:** CLI> admin ip show
arl		Show ARL Configuration.
arl show		Show ARL Configuration. Example: CLI> arl show Arl Settings Src MAC Address Vlan Sta Drop Blk Loc Destination Ports Applies only to Ports ================== ==== === ==== === === ========== 00:07:af:7d:37:e0 1 Y N N FDB CPU All 01:00:5e:00:00:fb 1 Y N N FDB C7 All 01:00:5e:00:00:fc 1 Y N N FDB C7 All 01:00:5e:7f:ff:fa 1 Y N N FDB C7 All 01:07:af:00:de:d1 ANY Y N N POL CPU A1-A2 01:07:af:00:de:d2 ANY Y N N POL Drop All 01:07:af:00:de:f0 ANY Y N N POL Drop All 01:07:af:00:de:f1 ANY Y N N POL Drop All 01:07:af:00:de:f2 ANY Y N N POL Drop All 01:07:af:00:df:48 ANY Y N N POL Drop All 01:07:af:01:3d:1b ANY Y N N POL CPU All 01:07:af:7d:37:e0 ANY Y N N POL Drop All 01:80:c2:00:00:00 1 Y N Y POL CPU All a0:36:9f:3b:6c:b2 1 N N N FDB C7

COMMAND	ARGUMENTS	DESCRIPTION
		All ff:ff:ff:ff:ff:ff ANY Y N N POL CPU All
arp		Address Resolution display and control.
arp	[<arguments>]	Use arp without arguments to get help. Example: CLI> arp <arp>arguments> - Use arp without arguments to get help. Surround multiple arguments with double quotes. EX: arp "-r 192.168.2.117" CLI> arp NAME arp - address resolution display and control SYNOPSIS arp [-silent] [-V <routetab>] [-i <ifname>] –a arp [-silent] [-V <routetab>] [-i <ifname>] –A arp [-silent] [-V <routetab>] [-i <ifname>] -d <hostaddress> arp [-silent] [-V <routetab>] [-i <ifname>] [-p] [-t] -s <hostaddress> <ether_addr> arp [-silent] [-V <routetab>] [-i <ifname>] -r <hostaddress> DESCRIPTION The arp program displays and modifies the Internet-to-Ethernet address translation tables used by the address resolution protocol. Options: -silent Suppress output. MUST be the first argument. -i <ifname> Specify interface. First one if not specified. -t Temporary ARP entry. -p Public ARP entry (i.e. proxy ARP entry). -r Send an ARP request to the host address. -V <routetab> Specify route table. 0 if not specified. Commands: -a Display the currently existing ARP entries. -A Delete all the ARP entries. -d Delete specified ARP entry. -s Register a ARP entry for a node.
clear		Clear the screen.
config		Save changes to the configuration or reset the configuration to factory defaults.
config reset		Reset configuration settings to factory defaults.
config save		Save current running configuration settings.
dhcpServer		DHCP Server.
dhcpServer status set	<statusValue>	Set DHCP Server status (disabled or enabled).
dhcpServer status show		Show DHCP Server status.
exit		Exit immediate mode. **Example:** CLI> admin ip CLI(admin-ip)> exit CLI>
fileTransfer	tftp server <ip address> transferType	Transfer files to or from the switch.

COMMAND	ARGUMENTS	DESCRIPTION
	<UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]	
help		Show command help.
help commands		Show system commands. Example: CLI> help commands admin - Administration settings, including IP settings and DHCP mode. arl - Arl Settings arp - Address Resolution Protocol (ARP) clear - Clear the screen config - Save changes to the configuration, or reset switch to factory defaults. dhcpServer - DHCP Server exit - Exit immediate mode fileTransfer - Transfer files help - Show command help history - Show command history lldp - Link Layer Discovery Protocol logout - Log off this system ping - Ping a host. port - Port settings portSecurity - Port Security ppp - Start PPP server (use from serial console only). reboot - Reboot the switch and load the most recently saved configuration. who - Display users currently logged in whoami - Show current user info
help edit		Show editing keys. **Example:** CLI> help edit Available editing keystrokes: Delete current character.....Ctrl-d Delete text up to cursor.....Ctrl-u Delete from cursor to end of line.....Ctrl-k Move to beginning of line..... Ctrl-a Move to end of line.....Ctrl-e Get prior command from history.....Ctrl-p Get next command from history.....Ctrl-n Move cursor left..... Ctrl-b

COMMAND	ARGUMENTS	DESCRIPTION
		Move cursor right.....Ctrl-f Move back one word.....Esc-b Move forward one word.....Esc-f Convert rest of word to uppercase.....Esc-c Convert rest of word to lowercase.....Esc-l Delete remainder of word.....Esc-d Delete word up to cursor.....Ctrl-w Transpose current and previous character..... Ctrl-t Enter command and return to root prompt..... Ctrl-z Refresh input line..... Ctrl-l
help help		Show command help. **Example:** CLI> help help help - Show command help commands - show system commands edit - Show editing keys
history		Show command history. **Example:** CLI> history 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history
history clear		Reset all history.
history enable		Turn history capture on.
history filter		Do not capture repeated input into history.
history info		Information **Example:** CLI> history info 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history 3 history info History filter: off History modal : off History ring : on
lldp		Link Layer Discovery Protocol.
lldp mode show		Show LLDP mode.
lldp mode set	disable, enabled, auto	Set LLDP mode.
lldp wakeTime show		Show remaining wake time in auto LLDP mode.
lldp wakeTime send	hours <hours> minutes <minutes>	Send wake time in auto LLDP mode to all switches.
logout		Log off this system.
ping		Ping a host.
ping	[<arguments>]	Use ping without arguments to get help. Surround multiple arguments with double quotes. **Example:** ping "-c 3 192.168.2.121"
port		Port Mirroring configuration display and control.

COMMAND	ARGUMENTS	DESCRIPTION
port config show	<portlist>	Show all port configuration information for the specified ports.
port config show all		Show all port configuration information for all ports on the switch.
port config show basic	[<portlist>]	Show basic port configuration information for the specified ports.
port mirror set		Set Port Mirroring configuration.
port mirror set enable port mirror set no enable		Enable or disable Port Mirroring. Use "no enable" to disable.
port mirror set destination	<port>	Set the destination port for Port Mirroring. For example, "A4".
port mirror set txsource	<portlist>	Set the transmit source ports that are mirrored to the destination port. For example, "A1,A2".
port mirror set rxsource	<portlist>	Set the receive source ports that are mirrored to the destination port. For example, "A1-A3,A6".
port mirror set dataonly port mirror set no dataonly		Set mirrored data only. Use "no dataonly" to disable.
port mirror show		Show Port Mirroring configuration. **Example:** CLI> port mirror show Port Mirroring Settings Mirror Status : Enabled Destination Port : A1 Mirrored Data Only : Enabled Tx Source Ports : None Rx Source Ports : A4
portSecurity		Port Security
portSecurity status set	disabled, learning, locked	Set port security status
portSecurity status show		Show port security status.
portSecurity intruderLog show		Show the contents of the intruder log
portSecurity authList show	[<portlist>]	Show the contents of the authorization list
ppp		Start PPP server (available from the serial console only).
reboot		Reboot the switch and load the most recently saved configuration.
who		Display users currently logged in. **Example:** CLI> who Line User Host(s) Idle Location 00:00:00 admin Console
whoami		Show current user information. **Example:** CLI> whoami

COMMAND	ARGUMENTS	DESCRIPTION
		User name: admin

System Information

Command: admin system show
Description: Show general system information

```
CLI>    admin system show

System Settings

Name                              : NT24k-DR16-DC

Model Name                        : NT24k-DR16

Family Name                       : NT24k

Software Version                  : 2.2.3

Build Date                        : Oct 25 2019. 16:36:28

Boot Loader                       : 2.0.7

Copyright                         : Copyright <c> 2013-2019

URL                          : http://www.redlion.net/

Ram Size                     : 128 MB

Flash Size                   : 64 MB

Internet Protocol (IP) Settings

IP Configuration             : DHCP

DHCP Client ID Type          : Switch Name

DHCP Client ID Data          : N-Tron Series 77:fd:00

Fallback IP Enable           : Enabled

Fallback IP Address          : 192.168.1.201

Fallback IP Subnet           : 255.255.255.0

Fallback IP Gateway          : 0.0.0.0

Current IP Address           : 0.0.0.0

Current Subnet Mask          : 0.0.0.0

Current Gateway Address      : 0.0.0.0

MAC Address                  : 00:07:af:77:fd:00

--------

System Up Time               : 0d 04:05:42

System Time                  : 2000-01-01 04:05:41 CST (UTC-06:00)

Switch Name                  : N-Tron Series 77:fd:00

Switch Contact               : Admin
```

```
Switch Location            : Mobile, AL 36606

--------

Device Temperature         : 50 C, 122 F

Upper Temperature Limit    : 120

Lower Temperature Limit    : -60

CLI>
```

Displaying Port Information

Command: port config show <all|basic> <port-list>

Description: Show general port configuration, similar to what is displayed in the Web Software. The first parameter ("all" or "basic") specifies how much information to show and the port-list parameter can be used to filter the displayed ports. This can be a single port, a range of ports (ex. 1-3) or multiple ranges of ports, separated by a comma. Ports can also be selected by name or by number.

Note: If you want all information for a specific port, or set of ports, simply call **port config show <port-list>**. If you want only basic information, you will need to include "basic" before **<port-list>**.

```
CLI> port config show basic

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
3    P3   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
4    P4   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
6    P6   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
7    P7   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
8    P8   10/100/1000 Mbps TX Enabled  Up     1000  RSTP Forwarding    1
9    DM1  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
10   DM2  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
11   DM3  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
12   DM4  Not Installed        Enabled  Down   1000  RSTP Not Installed 1

CLI> port config show P1

Port Configuration View

Port Number:            1
Port Name:              P1
Port Description:       10/100/1000 Mbps TX
Admin Status:           Enabled
Link Status:            Down
Auto Nego:              Enabled
Port Speed:             Auto
Duplex Mode:            Auto
Flow Control:           Disabled
Cross Over:             Auto
Role:                   RSTP
Port State:             Discarding
PVID:                   1
Trunk ID:               0
Usage Alarm Low:        0
Usage Alarm High:       100

CLI> port config show basic P1-P2,P5

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1

CLI>
```

Setting a Static IP Address

By default, the switch will use the DHCP protocol for IP address assignment. The switch may also be configured to use a static IP address.

Command: admin ip set

Description: Moves the CLI to the IP address settings immediate mode. Typing "?" will provide the command options available here.

Once in the IP immediate mode, it is easy to change the address configuration. Once set, the new configuration must be saved for this change to be retained after a reboot.

```
CLI(admin-ip-set)> ip address 192.168.2.209 mask 255.255.255.0 gateway 0.0.0.0
CLI(admin-ip-set)> no dhcp

        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       Static Settings
        +               IP Address:     192.168.2.209
        +               Subnet Mask:    255.255.255.0
        +               Gateway:        0.0.0.0
        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
CLI(admin-ip-set)> exit
CLI>
```

Performing a File Transfer

File transfers can be initiated through the CLI by using TFTP Protocol.

Command: fileTransfer tftp server <ip address> transferType <UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]

Description: Initiates the file transfer from the CLI.

```
CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType Upgrade System

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed

Processing '/ram0/xfr/NT24k_image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done reading contents


Extracting from /ram0.xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

extracting file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done extracting tar.

file NT24k_image.xml, size 1287 bytes, 3 blocks

moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image


Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.247 (130370
bytes/second)

Done Processing '/ram0/xfr/NT24k_image.tar'. Elapsed time: 1:25.996

File Transfer: Completed

CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType UpgradeSystem file
NT24k_Image.tar

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed
```

```
Processing '/ram0/xfr/NT24k_Image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done reading contents.

Extracting from/ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done extracting tar.
file NT24k_image.xml, size 1287 bytes, 3 blocks
moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image

Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.595 (130370
bytes/second)
Done Processing '/ram0/xfr/NT24k_Image.tar'. Elapsed time: 1:26.333
File Transfer: Completed
```

Saving the Configuration

When configuration changes are made, they are not automatically saved to NVRAM and will be discarded at the next power cycle. Configuration changes must be saved to be retained across power cycles.

Command: config save

Description: Save all current changes to the configuration for use after the next power cycle. If a Configuration Device is installed, the configuration will also be saved to the device.

```
CLI>
CLI> config save
CLI>
```

Appendix B

Working with Configuration Files

Importing a Subset of an XML Configuration File

The XML configuration file may be used to set all of the configurable parameters on a NT24k® switch or to configure a subset of parameters. Setting common parameters across multiple switches can be easily accomplished by creating and importing an abridged configuration file for this purpose.

Appendix C contains an example XML Configuration file. A simple way to start an XML configuration file is to export the existing saved configuration file from the switch and modifying it to meet your new configuration needs.

When creating a configuration file for a subset of available parameters, setting the system configuration mode to *Keep* will maintain the current settings for all parameters other than those explicitly set by the new file being imported. If the system configuration mode is not set to *Keep*, all parameters other than those being set by the configuration file, will be reset to their default setting.

In the example below, the mode is set to Keep so that other switch settings are not reset to defaults. Additional information about the content of the configuration file can be found at the top of any exported configuration file.

```
<SystemConfiguration Mode="Keep"?
  <SystemGroup>
    <SystemConfig>
      <SwitchContact>IT Department Manager</SwitchContact>
      <SwitchLocation>Factory Floor B</SwitchLocation>
    </SystemConfig>
  </SystemGroup>
</SystemConfiguration>
```

Using Port Numbers instead of Port Names

In a configuration file, it is valid to use port numbers instead of names to simplify the sharing of configuration settings. Ports are numbered starting at 1.

Port names may differ between switch models. For example, the NT24k-DR24 uses A1-A8, B1-B8, and C1-C8 and the NT24k-14FX6 uses P1-P8 and FX1-FX6. However the configuration files can reference ports 1-24 for an NT24k and ports 1-14 for an NT24k-14FX6.

In the following example, VLAN 1 is configured for ports 1 through 8 and VLAN 2 is configured for ports 9 through 16. This settings file can be imported into any NT24k switch that supports 16 or more ports. Note that the configuration file must also set the appropriate port PVIDs.

```
<SystemConfiguration Mode="Keep">
  "VlanGroup>
    <IngressDiscardUntagged>None</IngressDisgardUntagged>
    <IngressReplaceVID>Disabled</IngressReplaceVID>
    <IngressVidFilter>None</IngressVidFilter>
    <PrimaryMgmtVlanId>1</PrimaryMgmtVlanId>
    <RemoveportsFromDefaultVlan>Enabled</RemovePortsFromDefaultVlan>
    <TaggedVlans>
      <Vlan>
            <AllowManagement>Enabled</AllowManagement?
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
```

```
            <VlanId>1</VlanId>
        </Vlan>
        <Vlan>
            <AllowManagement>Enabled</AllowManagement>
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
            <VlanId>1</VlanId>
        </Vlan>
    </TaggedVlans>
    <Type>Tagged</Type>
```

Importing an Incompatible XML Configuration File

Errors related to invalid port names or numbers may occur when importing a configuration file from one model of an NT24k® switch into a different model of an NT24k switch.

Field	Description
Destination	XML line:(216) - Could not set '/SystemConfiguration/MirrorGroup/MirrorConfig/Destination' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
ControlPort	XML line:(226) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort' to value 'P3'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
CouplerPort	XML line:(227) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort' to value 'P4'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Portx	XML line:(244) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Portx' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Porty	XML line:(245) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Porty' to value 'P2'

Resolving Invalid Port Mappings

If the number of ports in the XML configuration file is greater than on the target model, then the following sections should be removed for each of the extra ports.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/Port (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port

Notice that if the target switch has additional ports whose settings are not specified in the imported configuration file, then these additional ports will have their settings set to default values if the mode has not been set to “Keep”.

Ports on the target switch that do not exist in the configuration file will be added to Default VLAN 1. If the configuration file has extra VLANs with ports that do not exist, an error will be generated for each non-existent port.

Resolving Invalid Port Names

If the port names in the XML configuration file are different than on the target model, then rename the ports for the following sections so that the new names correspond to the intended ports on the target model.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port/PortNumber
- SystemConfiguration/MirrorGroup/MirrorConfig/Destination

- SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort
- SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Portx
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Porty
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/PortNumber (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port/PortNumber
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry/PortNumber
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit/PortNumber
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port/PortNumber

Depending on the exported values, some of the following sections in the XML configuration file may also need to have their ports renamed.

- SystemConfiguration/BridgingGroup/BridgingConfig/MulticastFilters/PortList
- SystemConfiguration/BridgingGroup/BridgingConfig/UnicastFilters/PortNumber
- SystemConfiguration/IgmpGroup/IgmpConfig/ManualRouterPorts
- SystemConfiguration/IgmpGroup/IgmpConfig/RFilterPorts
- SystemConfiguration/MirrorGroup/MirrorConfig/RxSourcePorts
- SystemConfiguration/MirrorGroup/MirrorConfig/TxSourcePorts
- SystemConfiguration/NViewGroup/NViewConfig/SendAutocastPorts
- SystemConfiguration/NViewGroup/NViewConfig/SendMibStatsPorts
- SystemConfiguration/SecurityDot1xGroup/SecurityDot1xConfig/EnabledPorts
- SystemConfiguration/TrunkGroup/TrunkConfig/Trunks
- SystemConfiguration/VlanGroup/VlanConfig/IngressDiscardUntagged
- SystemConfiguration/VlanGroup/VlanConfig/IngressVidFilterf
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/MemberPorts
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/UntagEgressPorts

Example Scenarios

MODEL OF EXPORTED CONFIGURATION FILE	TARGET MODEL	EXPECTED RESULTS OF IMPORTING XML CONFIGURATION FILE
NT24k-DR16	NT24k-DR24	Import successful; Last 8 ports on target model will reset to default values if the mode has not been set to “Keep”.
NT24k-DR24	NT24k-DR16	Invalid port mappings
NT24k-DR16	NT24k-16TX	Invalid port names
NT24k-DR16	NT24k-8TX	Invalid port mappings and names

Appendix C

XML Configuration File

Factory Defaults

The following is a shortened example of an XML configuration file:

```
<!-- ************************************************************************
    Overview of XML settings for the N-Tron NT24k series switches
    XML settings can be downloaded to a switch to configure the switch.
    There are several top level configuration sections. Each section is optional.
    Common Attributes:
    ******************
    The following attributes are common to all sections. If omitted from a section,
      then the value from the parent section is used. If completely omitted, a
      system default value is used.

     Crc            Optional. This is not used in this release, but may be
                    used in a future release.
     CurSwVer       Optional. String representation of switch version that the
                    settings were exported from.
     Version        Optional. If present, represents the version of the
                    section. If not present, the default value is used instead
                    of being inherited from the parent section.
                    Default = "1".
     MinSwVer       Optional. String representation of switch version. If
                    present, ignore settings for the section if switch
                    software version does not meet minimum requirement.
                    Default = "1.0".
     Mode           Optional. If present, determines the type of action to
                    take on existing data in the section. In the event of a
                    conflict, precedence goes to the deepest level that is
                    explicitly expressed.
                    Possible values:
                    Delete   (Default) Delete all existing data for the
                    section and replace it with the values in this section.
                    Any missing data gets set to factory default values.
                    Keep   Keep existing data, unless new values are specified
                    in this section. A factory default value is used if there
                    is no previously existing data.
     Convert        Optional. If present, determines whether data conversion
                    is performed when necessary.
                    Possible values:
                    Auto   (Default) When a data conversion is determined to
                    be necessary it will be done automatically, without any
                    user intervention.
                    No   Data conversion is not performed, but settings are
                    validated.
     ValidatePorts  Optional. If present, determines if port names or numbers,
                    within lists, that are not valid on this device should be
                    ignored or generate an error.
```

```
                    Possible values:
                    Yes   (Default) Ports are validated.
                    No   Invalid ports are ignored.
      Model         Optional. If present, represents the switch model that the
                    settings were exported from.

  Notes:
  ******
  Comments added to this file will not be preserved.
  ************************************************************************ -->
  <!-- ************************************************************************
  SystemConfiguration ******************************************************
************************************************************************** -->
  <SystemConfiguration Model="NT24k-DR16" ValidatePorts="Yes" Convert="Auto"
Mode="Delete" MinSwVer="1.0" Version="2" CurSwVer="1.9.2">
  <BridgingGroup>
       <BridgingConfig>
             <AgingTime>300</AgingTime>
             <EnableIpProbe>Disabled</EnableIpProbe>
             <MulticastFilters></MulticastFilters>
             <UnicastFilters></UnicastFilters>
       </BridgingConfig> </BridgingGroup>
  [ content intentionally omitted ]
  </SystemConfiguration>
```

For a complete example of an XML configuration file, click on the following link: http://www.redlion.net/resources/software/n-tron-software and refer to section NT24k® Industrial Ethernet Switches.

RED LION™
a spectris company

▶▶▶ Puggable Mini-GBIC Transceivers

Gigabit Transceivers

Mini-GBIC SFP transceivers for
N-Tron's Gigabit Network Products



Gigabit SFP Fiber Transceiver Characteristics

Fiber Length	*550m for 50/125µm 275m for 62.5/125µm*	*10km*	*40km*	*80km*
TX Power Min	*-9.5dBm*	*-9.5dBm*	*-2dBm*	*0dBm*
RX Sensitivity Max	*-17dBm*	*-20dBm*	*-22dBm*	*-24dBm*
Wavelength	*850nm*	*1310nm*	*1310nm*	*1550nm*
Assumed Fiber Loss	*3.5 to 3.75 dB/km*	*0.45 dB/km*	*0.35 dB/km*	*0.25 dB/km*
Laser Type	*VCSEL*	*FP*	*DFB*	*DFB*

Variety and Flexibility

Pluggable mini-GBIC transceivers from N-Tron® fully comply with strict industry standards to ensure robust functionality in fiber optic networks. All modules are designed with high-performance industrial features, including expanded temperature ranges, to operate reliably under harsh conditions. N-Tron's SFPs may be used in combination on each switch. Varieties include 1000Base-T, 1000Base-SX and 1000Base-LX.

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
NTSFP-TX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseT GB Copper Port (up to 100 meters)
NTSFP-SX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseSX Multimode GB Fiber Optic Port
NTSFP-LX-ZZ ZZ = 10, 40, or 80 km	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseLX Singlemode GB Fiber Optic Port

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Product brochure

1.5 – 6 kVA



Eaton 9PX lithium-ion UPS

Double-conversion UPS that offers a set it and forget it deployment

The 9PX lithium-ion UPS is part of the Eaton 9 series single-phase double-conversion UPS line, best applied to mission-critical equipment for constant power conditioning. The 9PX lithium-ion UPS provides 8 to 10 years of life expectancy for UPS and its batteries, and has power ratings ranging from 1–6 kVA, while also offering up to four external battery modules (EBM) for extra runtime. The 9PX lithium-ion UPS has the same reliable features as the 9PX lead-acid UPS, including load segments for prioritized shutdowns, remote power on (RPO), remote on/off (ROO) and output relay ports that increase control capabilities. For connectivity, the 9PX is compatible with the Gigabit Network Card (NETWORK-M2), which is the first UPS connectivity device to meet both UL and IEC cybersecurity standards. This network interface card improves power system reliability by providing warnings of pending issues and helping to perform orderly graceful shutdown of servers and storage.



2U UPS with 1U EBM in 4-post rack

Key features and benefits

Save money

- **2-3X longer battery life:** minimize battery maintenance expense—ideal for large deployments and edge applications
- **Runtime:** UPS provides up to 2–3X more runtime at full load compared to lead-acid batteries
- **Warranty:** 5-year all-inclusive (electronics and battery) warranty

Save space

- **1U lithium EBM vs 2U lead-acid EBM** (1–3 kVA models)
- **2U lithium EBM vs. 3U lead-acid EBM** (6 kVA model)
- **Lightweight design** up to 40% less weight than a comparable lead-acid UPS allowing easier installation and saving time

Reduce risk

- **24/7 monitoring:** battery management system (BMS) improves reliability and performance by actively monitoring temperature and charge
- **Cybersecure:** remote monitoring service and network connectivity card options provide cybersecurity protection and keeps you connected with your UPS status updates
- **On-board BMS monitoring** in combination with proven Lithium Iron Phosphate (LFP) chemistry provides a reliable and safe offering, giving you peace of mind

Powering Business Worldwide

Remotely automate and monitor your UPS with Brightlayer Data Centers suite software

The power of automation.

With our Disaster Avoidance software, also known as Intelligent Power Manager (IPM), you can create triggering alerts and automate resolutions to keep applications running. This software enables you to:

- **Leverage** Eaton's integrations with industry leaders such as VMware, Microsoft and VirtualBox
- **Migrate** workloads to increase system uptime and minimize generator load by suspending non-critical virtual machines
- **Power cap** servers to keep critical loads running longer by limiting server power consumption

Learn more at Eaton.com/IPM

The power of monitoring.

With our Distributed IT Performance Management (DITPM) software, you can remotely monitor up to thousands of PDUs and UPSs – no matter where they're located. This software enables you to:

- **Know** what's happening with real-time reports, trend charts, dashboards and alerts that are prioritized by severity and escalated when unacknowledged to speed resolution
- **Troubleshoot** and resolve issues
- **Remotely control** UPS load segments regardless of vendor, automating device response and diagnosing equipment performance
- **Update** firmware remotely to improve cybersecurity and eliminate the need for in-person firmware updates

Learn more at Eaton.com/DITPM

The power of predictability.

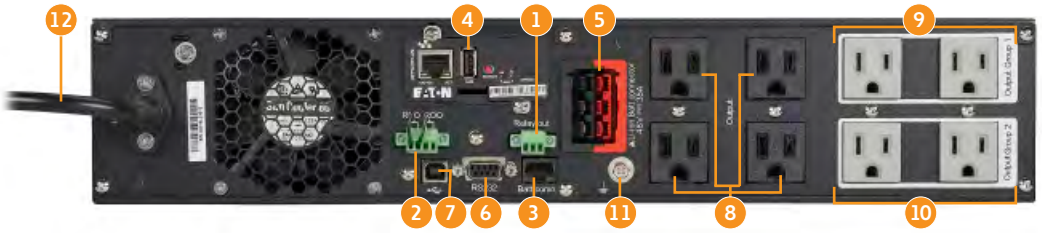
Our Remote Monitoring Service, also known as PredictPulse, is the industry's first cloud-based 24x7 remote monitoring and predictive analytics subscription service to forecast data center power component failure and proactively replace components before failure. This software enables you to:

- **Focus** on other critical IT tasks while our experts remotely monitor your IT infrastructure power quality equipment around the clock and dispatch field service technicians when needed
- **Eliminate** surprise maintenance expenses— this subscription-based service includes parts, labor, on-going preventive maintenance and expedited repairs
- **Propriety algorithms**, based on data from thousands of installed devices, predict UPS component failure so we can proactively replace parts before issues arise

Learn more at Eaton.com/RemoteMonitoringService

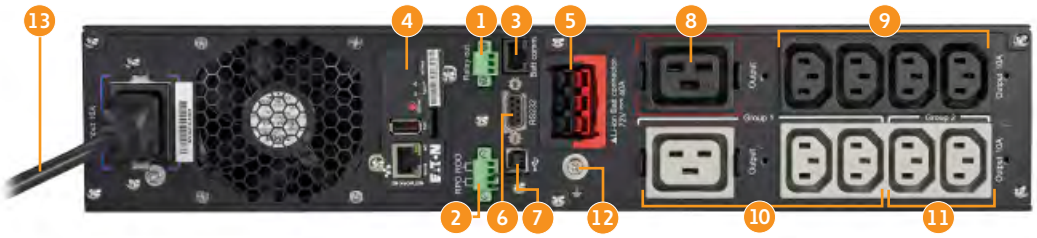
Rear panel overview

Model 9PX1500RT-L



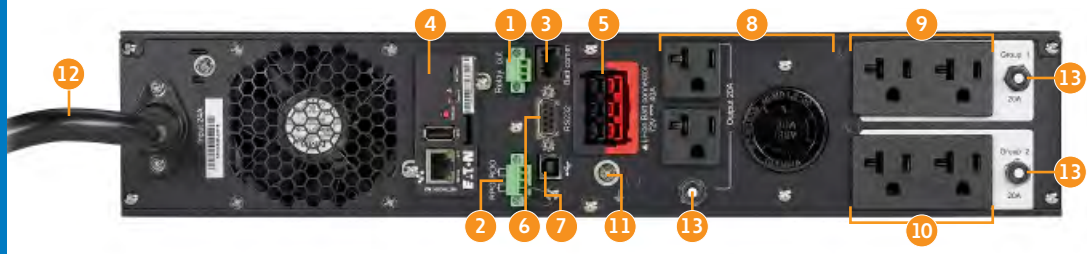
1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-15R managed outlets (primary group)
9. (2) 5-15R (load segment group 1)
10. (2) 5-15R (load segment group 2)
11. Ground bonding screw
12. 8-feet line cord with 5-15P

Model 9PX2200GRT-L and 9PX3000GRT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (1) C19 outlet
9. (4) C13 managed outlets (primary group)
10. (1) C19 and (2) C13 managed outlets (load segment group 1)
11. (2) C13 managed outlets (load segment group 2)
12. Ground bonding screw
13. C20/L6-20P input connection (detachable L6-20P to C19 input cord is 6-feet long)

Model 9PX3000RT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-20R and (1) L5-30R managed outlets (primary group)
9. (2) 5-20R managed outlets (load segment group 1)
10. (2) 5-20R managed outlets (load segment group 2)
11. Ground bonding screw
12. L5-30P input cord (8-feet long)
13. AC output branch protector

For additional rear panel views, please visit **Eaton.com/9PX.**

9PX 1 to 3 kVA lithium-ion rackmount and tower model selection guide

The 9PX lithium-ion comes as a stand-alone UPS or as part of a network bundle for easy configuration and deployment. For complete specifications, including interactive battery runtime graphs, visit **Eaton.com/9PX.**

120V (default), 100V, 110V, 115V, 125V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RT-L	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	35.5
9PX2000RT-L	2000 / 1800	5-20P, 8 ft.	(1) L5-20R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	50.6
9PX3000RT-L	3000 / 2700	L5-30P, 8 ft.	(1) L5-30R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	52.7

Global UPS, 208V (default), 230V, 240V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500GRT-L	1500 / 1350	C14	(8) C13	3.41 (2U) x 17.32 x 17.72	34.8
9PX2200GRT-L	2200 / 2000	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	48.6
9PX3000GRT-L	3000 / 2700	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	50.2

120V (default), 100V, 110V, 115V, 125V RT network card bundles

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RTN-L (includes NETWORK-M2 network card)	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	36.5
9PX2000RTN-L (includes NETWORK-M2 network card)	2000 / 1800	5-20P, 8 ft.	(6) 5-20R, (1) L5-20R	3.41 (2U) x 17.32 x 23.83	51.6
9PX3000RTN-L (includes NETWORK-M2 network card)	3000 / 2700	L5-30P, 8 ft.	(6) 5-20R, (1) L5-30R	3.41 (2U) x 17.32 x 23.84	53.7

9PX 1 to 3 kVA lithium-ion extended battery module (EBM) options

Catalog number	Description	Rack size	Weight, lb.
9PXEBM48RT-L	Extended battery module for 9PX1500RT-L and 9PX1500GRT-L	1U	36.5
9PXEBM72RT-L	Extended battery module for 9PX2000RT-L, 9PX2200GRT-L, 9PX3000RT-L and 9PX3000GRT-L	1U	46.6

Power distribution (PDU) and maintenance bypass (MBP) options

Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.
EHBPL1500R-PDU1U	HotSwap MBP for use with 9PX1500RT-L, 9PX1500GRT-L	5-15P	(6) 5-15R	2.1 (2U) x 17.3 x 3.8
EHBPL2000R-PDU1U	HotSwap MBP for use with 9PX2000RT-L, 9PX2200GRT-L	5-20P	(6) 5-20R	2.1 (2U) x 17.3 x 3.8
EHBPL3000R-PDU1U	HotSwap MBP for use with 9PX3000RT-L, 9PX3000GRT-L	L5-30P	(5) 5-20R	2.1 (2U) x 17.3 x 3.8
PDUV20-72	Basic PDU	L5-20P	(36) 5-15/20R	72.47 x 1.50 x 1.64
PDU2430	Basic PDU	L5-30P	(24) 5-15R	1.75 x 17.25 x 4.50
PDUV20HVL6-72	Basic PDU	L6-20P	(32) C13, (6) C19	63.75 x 3.50 x 2.25
EATS115	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-15P	(10) 5-15R	1.7 (1U) x 17.25 x 9.94
EATS120	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-20P	(10) 5-20R	1.7 (1U) x 17.25 x 9.84

* For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2*	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PA	1U two-post rail kit (optional for EBM)
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

* Included with N and 6K models

What's in the box

- 9PX UPS
- RS-232 communication cable
- USB communication cable
- Software leaflet
- Safety instructions
- Quick start guide
- 4-post mounting rail kit for 19-inch enclosures
- 2 pedestals for tower position
- Gigabit Network Card (NETWORK-M2) – included with N and 9PX6K-L models

Lithium-ion vs lead-acid

Characteristic	VRLA (lead-acid) battery	Lithium-ion battery	Lithium-ion benefit
Average battery lifespan	3–5 years	8-10 years	**2–3X longer life**
Weight	43–150 lb.	34.8–79 lb.	**20% lighter UPS, 40% lighter EBM**
EBM footprint	2U 3U	1U (1–3 kVA models) 2U (6 kVA model)	**Increased U space for critical equipment**
Warranty	2 years	5 years	**2.5X warranty coverage**
Battery replacement cost	$650*	$0	**Reduced TCO**

* Battery and labor cost for one replacement



Eaton's Gigabit Network Card adds advanced control with IPM software allows for remote management and integration into leading virtualization platforms **Eaton.com/Network-M2**

9PX 6 kVA lithium-ion rackmount and tower model selection guide

Global UPS, 208V (default) 200V, 208V, 220V, 230V, 240V models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX6K-L	6000 / 5400*	L6-30P, 10 ft. Hardwire	(2) L6-30R (2) L6-20R Hardwire	5.12 x 17.33 x 28.43	81.2

* Derated at 200, 208, 220V. See 9PX6K-L technical specifications for full information.

9PX 6 kVA lithium-ion extended battery module (EBM) and accessories

Catalog number	Description	Rack size	Weight, lb.
9PXEBM192RT-L	Extended battery module for 9PX6K-L	2U	79
EBMCBL192-L	EBM cable extension, 6 feet (1.8 meters)		

Power distribution (PDU), maintenance bypass (MBP), PowerPass distribution (PPDM) and transformer options

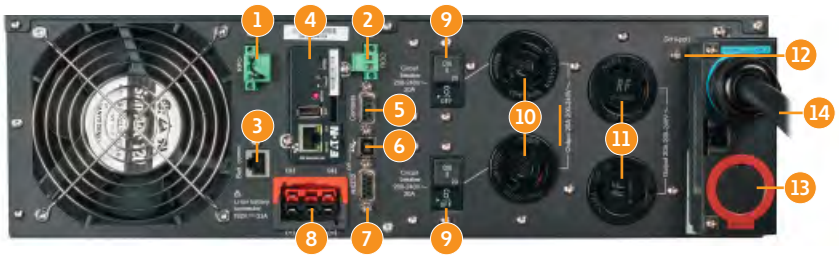
Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
MBP6K208	208V maintenance bypass module	L6-30P*	(2) L6-30R Hardwired	5.1 (3U) x 7.0 x 4.3	5.5
PDUV30HV	Basic PDU	L6-30P	(32) C13, (6) C19	63.75 x 3.5 x 2.25	8
PDU1230	Basic PDU	L6-30P	(16) C13, (4) C19	1.75 (1U) x 17.5 x 5.2	7.5
9PXTFMR5	9PX stepdown transformer	L6-30P	(18) 5-20R	5.1 (3U) x 17.3 x 25.4	95
9PXPPDM1	9PX PowerPass distribution module	L6-30P	(1) L6-30R, (1) L14-30R, (6) 5-20R outlets	5.1 (3U) x 17.3 x 25.4	97
9PXPPDM2	9PX PowerPass distribution module	Hardwired	Hardwired	5.1 (3U) x 17.3 x 25.4	95

* Terminal block with L6-30P cord (included with UPS)
For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

Rear panel overview

Model 9PX 6 kVA lithium-ion UPS



1. Remote power off (RPO) port
2. Remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card
5. Output relay contact – DB-9 dry contact
6. USB port (cable included)
7. RS-232 serial communication port (cable included)
8. EBM connector
9. Output circuit breaker protection
10. (2) L6-20R
11. (2) L6-30R
12. Ground bonding screw
13. Output terminal block for hardwired applications
14. 10-foot line cord with L6-30P

To view battery runtimes and interact with the Eaton 9PX lithium-ion UPS, please visit: **Eaton.com/9PX**

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Eaton.com

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September 2023

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Powering Business Worldwide

Eaton 9PX Li-Ion UPS technical specifications (1500-3000 VA 2U models[1])

Model overview

Catalog number	Power rating (VA/ watts)	Input connection	Output receptacles	Dimensions (HxWxD, in.)[2]	Weigh t (lb.)
120V output, 50/60 Hz					
9PX1500RT-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	35.5
9PX1500RTN-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	36.5
9PX2000RT-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	50.6
9PX2000RTN-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	51.6
9PX3000RT-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	52.7
9PX3000RTN-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	53.7
208V output, 50/60 Hz bundles					
9PX1500GRT-L	1500/1350[4]	C14	(8) C13	3.4 (2U) x 17.3 x 17.7	34.8
9PX2200GRT-L	2200/2000[5]	C20 / L6-20P[5]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	48.6
9PX3000GRT-L	3000/2700[6]	C20 / L6-20P[4]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	50.2

Additional specifications

General	
Topology	Double-conversion, online
Configuration	Rack/tower
Color	Black and silver
Diagnostics	Full system self-test at power up
Warranty	5 years electronics and battery
Rail kit	4-post rail kit included; Max length:30.0in, Min length:17.4in Tower ped estals includ ed *Optional 2-post rail kit available, part number: RK2PC(UPS) and RK2PA(EBM)*
Remote power off	Remote On/Off (ROO) and Remote Power Off (RPO) rear terminal blocks
Contents (Ships with the following items)	UPS 4-post rail kit Safety manual Output cables (for G models) Input cables (for G models) Cable lockers (for G models) Tower pedestals RS-232 serial cable USB cable

1. Due to continuing product improvement programs, specifications are subject to change without notice.
2. Each 9PX and EBM ships with a 4-post rail kit.
3. Input line cord is 8 feet long.
4. 1500 VA Global model wattage: 200V, 208V: input limited to 1350 watts; 220V, 230V, 240V: 1500 watts
5. C19 to L6-20P input cord is 6 feet long.
6. Models derated at lower voltag es due to input cord limitations. See Power ratings table below for further details.

	Communication card (optional)	
Electrical input	208V	120V
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Input voltage range	Full load: 176-276V, <40% load: 100-276V	Full load: 100-144V, <30% load: 60-144V
Freq uency	50/60 Hz	
Freq uency range	60 Hz: 50–70 Hz, 50 Hz: 40–60 Hz	
Input power factor	≥.99	
Input current distortion	≤5% (≤10% frequency converter mode)	
Circuit breaker	1500VA: None 2200VA: None 3000VA: None	1500VA: None 2000VA: None 3000VA: (3) 20A for (2) 5-20R each
Electrical output	208V	120V
Power ratings	9PX1500GRT-L 220/230/240V: 1500VA / 1500W 200/208V: 1500VA / 1350 9PX2200GRT-L: 220/230/240V: 2200VA / 2200W 208/200V: 2200VA / 2000W 9PX3000GRT-L: 220/230/240V: 3000VA / 3000W 208/200V: 3000VA / 2700W	9PX1500RT-L: 120/125V: 1500VA / 1350W 110V: 1350VA / 1215W 100V: 1200VA / 1080W 9PX2000RT-L: 120/125V: 2000VA / 1800W 110V: 1800VA / 1620W 100V: 1600VA / 1440W 9PX3000RT-L: 120/125V: 3000VA / 2700W 110V: 2700VA / 2430W 100V: 2400VA / 2160W
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Output voltage regulation, steady state	±1% normal mode ±2% battery mode	
Voltage THD (online)	Linear: 3% Non-linear: 5%	
Power factor	0.9	
Efficiency	9PX1500GRT-L: 92% online 9PX2200GRT-L: 93% online 9PX3000GRT-L: 93.7% online	9PX1500RT-L: 90% online 9PX2000RT-L: 91.4% online 9PX3000RT-L: 91.6% online
Transfer time	0 ms	
Battery		
Optional extended battery module (EBM)	9PXEBM48RT-L: 1500 VA models (1U form factor) 9PXEBM72RT-L: 2000-3000 models (1U form factor)	
Maximum number of EBMs	Add up to 4 EBMs	
Battery description	Lithium Ion, LiFePO4 chemistry	
Battery management	BMS: Advanced battery man ag ement with health monitoring and prediction features	
Battery replacement	Hot-swappable internal batteries and EBMs	
Start on battery	Cold-start en abled; first cold start is always forbidden	
Communications		
User interface	Graphical display. UPS status in a single view.	
LEDs	4 status-indicating LEDs	
Communication ports	RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables includ ed	

Communications card	Network Card-M2 optional, stan dard on network bundles (bun dled models include an N)	
Power management software	Integrates with Eaton Intelligent Power Manager software	
Environmental & standards		
RoHS compliance	Yes	
Surge protection	MOV: 510V, 296Joules	MOV ratings : 271Volt (from L-N) and 510 Volt (from L-G and N-G), 190 Joules
EMC markings	IEC 62040-2 Class B Cat C2 / CISPR22 Class B / FCC part 15 Class B / VCCI Class B	IEC 62040-2 Cat C1 / CISPR22 / FCC part 15 Class B / VCCI Class B
Heat dissipation (BTU)	9PX1500GRT: 494 online, 731 battery 9PX2200GRT: 513 online, 741 battery 9PX3000GRT: 619 online, 1150 battery	9PX1500RT: 512 online, 897 battery 9PX2000RT: 578 online, 974 battery 9PX3000RT: 844 online, 1462 battery
Audible noise	≤47 dB at 1 meter	
Operating temperature	0 to 40°C (32°F to 104°F)	
Altitude operating temperature range	0-1500m @ 0°C - 40°C 1500m-3000m @ 0°C - 35°C	
Safety conformance	CE / cULus	CE / cULus / NOM
Storage temperature	-20 to 35°C (-4°F to 95°F); without batteries: -13 to 55°C (5°F to 131°F)	
Relative humidity	0 to 96% non-condensing	

9PX Li-Ion 1-3kVA Battery Backup Times (in minutes)**

Load(Watts)	Internal batteries	+1 EBM	+2 EBMs	+3 EBMs	+4 EBMs
9PX1500RT-L					
1350	11.2	30.0	47.1	64.3	81.4
1215	12.6	33.5	52.7	71.9	91.0
1080	14.2	38.0	59.7	81.4	103.0
945	16.3	43.5	68.4	93.3	118.1
810	19.1	50.8	79.8	108.9	137.9
675	22.9	61.0	95.9	130.7	165.6
540	28.1	74.8	117.6	160.3	203.1
405	37.0	98.6	154.9	211.2	267.5
270	54.4	145.2	228.1	311.0	394.0
9PX1500GRT-L					
1350	12.0	31.9	50.2	68.4	86.7
1215	13.3	35.5	55.8	76.0	96.3
1080	15.0	39.9	62.7	85.4	108.2
945	17.0	45.2	71.0	96.9	122.7
810	19.7	52.5	82.5	112.5	142.5
675	23.4	62.5	98.2	133.9	169.6
540	28.7	76.4	120.1	163.8	207.5
405	37.1	99.0	155.6	212.1	268.7
270	52.0	138.7	218.0	297.3	376.6
9PX2000RT-L					
1800	13.6	36.3	57.0	77.8	98.5
1620	15.2	40.4	63.5	86.6	109.7
1440	17.1	45.5	71.6	97.6	123.6

1260	19.5	52.0	81.7	111.4	141.1
1080	22.6	60.3	94.8	129.3	163.8
900	27.1	72.3	113.6	154.8	196.1
720	33.5	89.3	140.3	191.4	242.4
540	43.8	116.7	183.4	250.1	316.8
360	62.6	167.0	262.4	357.8	453.2
9PX2200GRT-L					
2000	12.3	32.8	51.5	70.2	88.9
1800	13.6	36.3	57.1	77.8	98.6
1600	15.2	40.6	63.8	87.0	110.2
1400	17.3	46.2	72.6	99.0	125.4
1200	20.2	53.8	84.5	115.3	146.0
1000	23.9	63.8	100.3	136.7	173.2
800	29.4	78.4	123.1	167.9	212.7
600	38.2	101.8	159.9	218.1	276.2
400	54.3	144.7	227.4	310.1	392.9
9PX3000RT-L					
2700	9.1	24.1	37.9	51.7	65.5
2400	10.2	26.9	42.2	57.6	72.9
2160	11.3	30.3	47.7	65.0	82.3
1890	12.9	34.7	54.5	74.3	94.1
1620	14.8	40.4	63.5	86.5	109.6
1350	18.0	48.3	75.9	103.5	131.1
1080	23.0	59.9	94.2	128.4	162.6
810	28.0	79.1	124.3	169.5	214.7
540	43.0	114.3	179.5	244.8	310.1
9PX3000GRT-L					
2700	9.1	24.2	38.0	51.8	65.6
2400	10.5	26.9	42.2	57.5	72.9
2160	11.3	30.2	47.5	64.7	82.0
1890	12.8	34.6	54.4	74.2	94.0
1620	14.9	40.3	63.3	86.3	109.4
1350	18.0	47.9	75.3	102.7	130.0
1080	23.0	59.4	93.4	127.4	161.4
810	30.0	77.6	121.9	166.3	210.6

**Runtimes shown at full load with maximum power factor, are approximate and may vary with equipment, configuration, battery age, temperature, etc. View interactive graphs at www.eaton.com/9PX

Product specifications

Eaton 9PX1500RT-L

Catalog Number: 9PX1500RT-L

Eaton 9PX lithium ion UPS, 2U, 1500 VA, 1350 W, 5-15P input, Outputs: (8) 5-15R, 120V

General specifications

Product Name	**Catalog Number**
Eaton 9PX UPS	9PX1500RT-L
UPC	**Product Length/Depth**
743172105455	17.72 in
Product Height	**Product Width**
3.41 in	17.32 in
Product Weight	**Warranty**
35.6 lb	5 year limited
Compliances	**Certifications**
CE Marked FCC part 15 Class B IEC 62040-2 Cat C1	cULus Listed NOM

Product specifications

Battery management

Integrated battery management system (BMS) for temperature regulation and life cycle monitoring

Output waveform

True sine wave

VA rating

1500 VA

Max number of battery packs

4

Wattage

1350 W

Output power factor

0.9

Form factor

Rack/tower

Receptacle

(8) 5-15R, 120V

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 5 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Package contents

UPS
Quick start guide
Safety instructions
USB communciation cable
RS-232 serial communication cable
4-post rail for 19-inch enclosures
Software leaflet
Software leaflet
2 pedestals for tower poition

Input connection

5-15P

Noise level

<47 dB at 1 meter

Runtime graph

Resources

Application notes

9PX1500RT-L runtime graph

Brochures

Eaton 9PX lithium-ion UPS brochure

Competitive comparisons

9PX Lithium-ion UPS Competitive Comparison Battlecard

Drawings

Eaton 9PX lithium-ion 1.5 kVA 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

Eaton 9PX lithium-ion UPS guide specification: 1-3 kVA

Eaton Specification Sheet - 9PX1500RT-L

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide

Warranty guides

Eaton 9PX lithium-ion UPS warranty

View runtime graph

Software compatibility

Intelligent Power Software Suite

User interface

Graphical display, 5-button programmable menu

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Efficiency

90 %

Rack size

2U

Number of Outputs 5-15R

8

Voltage

120V

Input cord length

8 ft

Temperature range

0° to 40°C (32° to 104°F)

Communication

RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables included

Relative humidity

0-96% non-condensing

Color

Black/silver

Rack mounting kit

Yes

Extended battery capability

Add up to 4 extended battery modules (EBM). Part number 9PXEBM48RT-L

Output voltage range

±1% steady-state

Topology

Online/Double-conversion

BTU Rating

Online: 512, Battery: 897

Output frequency

50/60 Hz

Runtime at full load

11.2 min

Type

UPS

Output nominal voltage

120V default (100/110/120/125V)

Input nominal voltage

120V default (100/110/120/125V)

Input power factor

>0.99 typical

Expansion slots

(1) Mini-Slot (MS) expansion port. The following optional connectivity cards may be ordered separately.
Gigabit Network Card part number: NETWORK-M2
Modbus card part number: INDGW-M2
Relay card part number: RELAY-MS

Input frequency range

60 Hz: 50-70 Hz, 50 Hz: 40-60 Hz

Internal bypass

Yes

Altitude

0-1500m (0° to 40°C), 1500-3000m (0° to 35°C)

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Eaton.com

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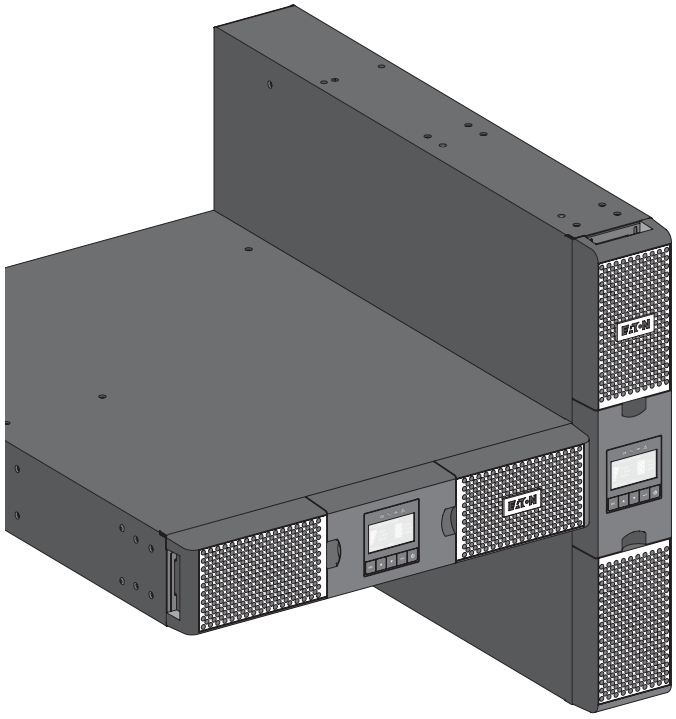
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Eaton 9PX Lithium-Ion

Advanced Users Guide



9PX1500RT-L
9PX2000RT-L
9PX3000RT-L
9PX1500GRT-L
9PX2200GRT-L
9PX3000GRT-L
9PXEBM48RT-L
9PXEBM72RT-L

Powering Business Worldwide

p/n: P-164001006
Revision 06

Safety Instructions

SAVE THESE INSTRUCTIONS.

This manual contains important instructions **that should be followed during installation and maintenance of the UPS and batteries.**

The 9PX models that are covered in this manual are intended for installation n an environment within 0 to 40°C, free of conductive contaminant.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to IEC62040-2 & FCC standards. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Special Symbols

The following are examples of symbols used on the product to alert you to important information:



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



CAUTION: REFER TO OPERATOR'S MANUAL - Refer to your operator's manual for additional information, such as important operating and maintenance instructions.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

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Safety of Persons

- The system has its own power source (the battery). Consequently, the power outlets may be energized ven if the systems is disconnected from the AC power source. Dangerous voltage levels are resent within the system. It should be opened exclusively by qualified service personnel.
- The system must be properly grounded at all times.
- The battery supplied with the system contains small amounts of toxic materials. To avoid accidents, the directives listed below must be observed:
  - Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
  - When replacing batteries, replace with the same type and number of batteries or battery packs.
  - Do not dispose of batteries in a fire. The batteries may explode.
  - Batteries constitute a danger (electrical shock, burns). The short-circuit current may be very high.
- Precautions must be taken for all handling:
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries.
  - Disconnect charging source prior to connecting or disconnecting battery terminals.
  - Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

Product Safety

- To connect the UPS, instructions and operation described in the manual must be followed in the indicated order.
- CAUTION - To reduce the risk of fire, the unit connects only to a circuit provided with 20 or 30 amperes maximum branch circuit overcurrent protection in accordance with the National Electric Code, ANSI/NFPA 70 (US installations only).
- Check that the indications on the rating plate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the system.
- For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible
- Never install the system near liquids or in an excessively damp environment.
- Never let a foreign body penetrate inside the system.
- Never block the ventilation grates of the system.
- Never expose the system to direct sunlight or source of heat.
- If the system must be stored prior to installation, storage must be in a dry place.
- The admissible storage temperature range is -25ºC to +55ºC without batteries, 0°C to 40°C with batteries.
- The system is not for use in a computer room AS DEFINED IN the standard for the Protection of Information Technology Equipment, ANSI/NFPA 75 (US installations only).

Special Precautions

- The unit is heavy: wear safety shoes and use vacuum lifter preferentially for handling operations.
- All handling operations will require at least two people (unpacking, lifting, installation in rack system).
- Before and after the installation, if the UPS remains de-energized for a long period, the UPS must be energized for a period of 24 hours, at least once every 6 months (for a normal storage temperature less than 25°C). This charges the battery, thus avoiding possible irreversible damage.
- During the replacement of the Battery Module, it is imperative to use the same type and number of element as the original Battery Module provided with the UPS to maintain an identical level of performance and safety. If there are any questions, don't hesitate to contact your local EATON representative.
- All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the UPS.
- For potential safety issue on defective UPS : DISCONNECT INTERNAL BATTERY for storage and transportation.

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Chapter 1 Introduction

1.1 Overview

1.2 Environmental Protection

EATON has implemented an environmental-protection policy.

Products are developed according to an eco-design approach.

Substances

This product does not contain CFCs, HCFCs, or asbestos.

Packing

To improve waste treatment and facilitate recycling, separate the various packing components.

- The cardboard we use comprises over 50% of recycled cardboard.
- Sacks and bags are made of polyethylene.
- Packing materials are recyclable and bear the appropriate identification symbol 

Table 1. Packing Material Symbols

Materials	Abbreviations	Number in the symbols
Polyethylene terephthalat	PET	01
High-density polyethylene	HDPE	02
Polyvinyl chloride	PVC	03
Low-density polyethylene	LDPE	04
Polypropylene	PP	05
Polystyrene	PS	06

Follow all local regulations for the disposal of packing materials.

End of Life

Eaton will process products at the end of their service life in compliance with local regulations. Eaton works with companies in charge of collecting and eliminating our products at the end of their service life.

Product

The product is made up of recyclable materials.

Dismantling and destruction must take place in compliance with all local regulations concerning waste. At the end of its service life, the product must be transported to a processing center for electrical and electronic waste.

Battery

The product contains lithium-ion (LFP) batteries that must be processed according to applicable local regulations concerning batteries.

The battery may be removed to comply with regulations and in view of correct disposal.

The Eaton® 9PX uninterruptible power system (UPS) protects your sensitive electronic equipment from the most common power problems, including power failures, power sags, power surges, brownouts, line noise, high voltage spikes, frequency variations, switching transients, and harmonic distortion.

Power outages can occur when you least expect it and power quality can be erratic. These power problems have the potential to corrupt critical data, destroy unsaved work sessions, and damage hardware causing hours of lost productivity and expensive repairs.

With the Eaton 9PX, you can safely eliminate the effects of power disturbances and guard the integrity of your equipment. Providing outstanding performance and reliability, the Eaton 9PX's unique benefits include:

- True online double-conversion technology with high power density, utility frequency independence, and generator compatibility.
- Constant mode battery charger with a integrated battery management system (BMS) for temperature regulation and life cycle monitoring.
- Selectable High Efficiency mode of operation.
- Standard communication options: one RS-232 communication port, one USB communication port, and relay output contacts.
- Optional connectivity cards with enhanced communication capabilities.
- Extended runtime with up to four Extended Battery Modules (EBMs) per UPS.
- Remote On/Off control through Remote On/Off (ROO) and Remote Power Off (RPO) ports.
- Backed by worldwide agency approvals.

Chapter 2 Presentation

2.1 Standard Installations

Figure 1. Tower Installation

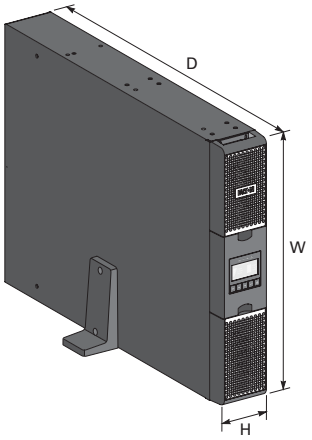


Figure 2. Rack Installation

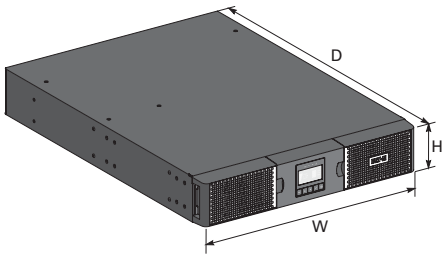
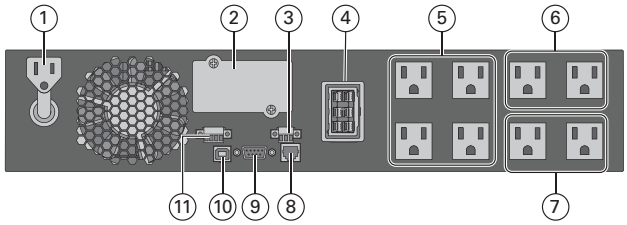


Table 2. Weights and Dimensions

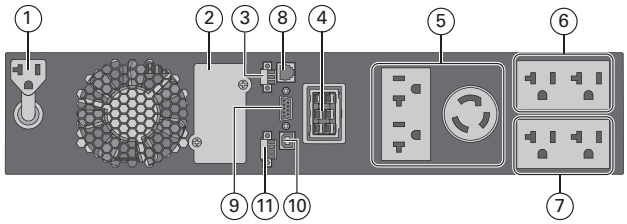
Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

2.2 Rear Panels

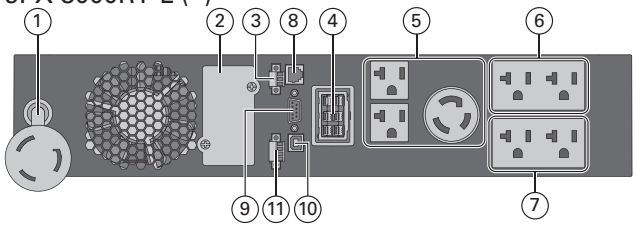
9PX 1500RT-L



9PX 2000RT-L



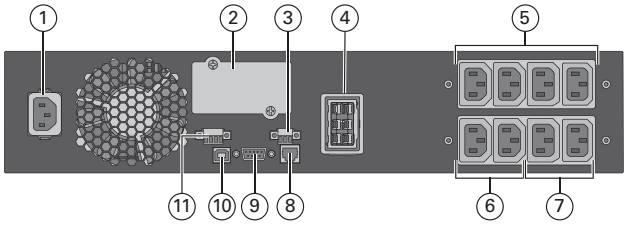
9PX 3000RT-L (*)



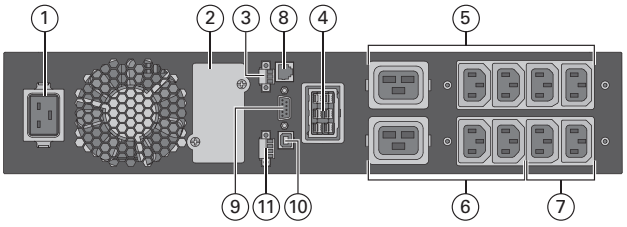
① Socket for connection to AC power source
② Slot for optional communication card
③ Relay output contact
④ Connector for additional battery module
⑤ Primary group: outlets for connection of critical equipment
⑥ Group 1: programmable outlets for connection of equipment
⑦ Group 2: programmable outlets for connection of equipment
⑧ Connector for automatic recognition of an additional battery module
⑨ RS232 communication port
⑩ USB communication port
⑪ Connector for ROO (Remote On/Off) control and RPO (Remote Power Off)

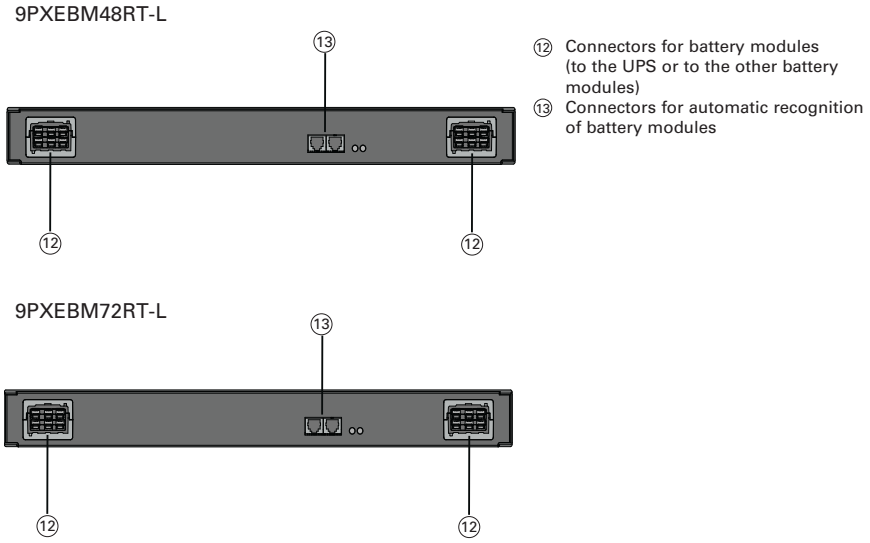
(*) Primary and Grouped outlets (⑤, ⑥, ⑦) are protected by 20A circuit breakers.

9PX 1500GRT-L



9PX 2000GRT-L & 9PX 3000GRT-L





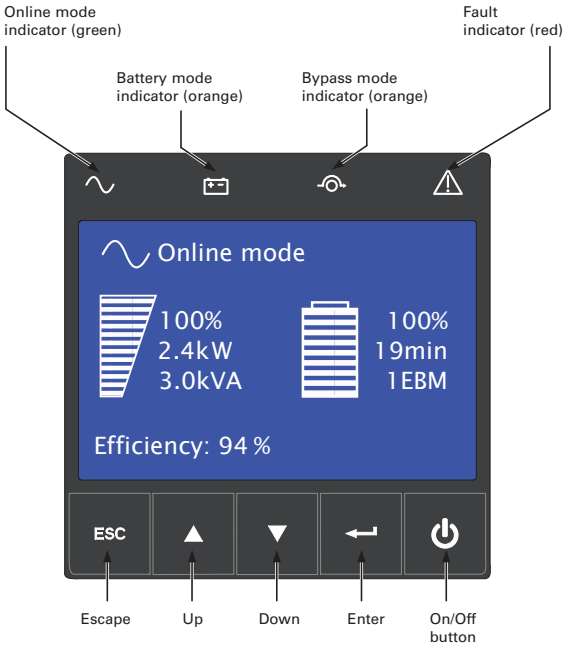
2.3 Accessories

Table 3. UPS Accessories

Part number	Description
9PXEBM48RT-L 9PXEBM72RT-L	Extended Battery Module
9RK	Rack Kit 9PX
Network-M2 / Network-M3	Network Card
INDGW-M2	Industrial Gateway Card (Modbus TCP / RTU)
Relay-MS	Relay Card

2.4 Control Panel

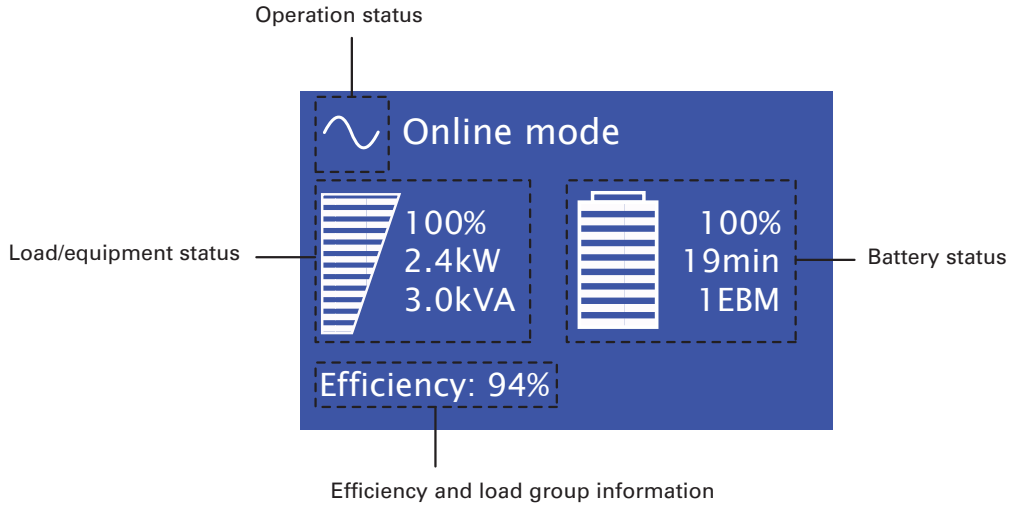
The UPS has a five-button graphical LCD. It provides useful information about the UPS itself, load status, events, measurements and settings.



Indicator	Status	Description
Green	On	The UPS is operating normally on Online or on High Efficiency mode.
Orange	On	The UPS is on Battery mode.
Orange	On	The UPS is on Bypass mode.
Red	On	The UPS has an active alarm or fault.

2.5 LCD Description

Figure 3. LCD Description



The following table describes the status information provided by the UPS

Note: If other indicator appears, see the troubleshooting for additional information.

Table 4. LCD Operating Status

Operation status	Cause	Description
Standby mode 	The UPS is Off, waiting for startup command from user.	Equipment is not powered until ⏻ button is pressed.
Online mode 	The UPS is operating normally.	The UPS is powering and protecting the equipment.
Battery mode 	A utility failure has occured and the UPS is on Battery mode.	The UPS is powering the equipment with the battery power. Prepare your equipment for shutdown.
End of backup time 	The UPS is on Battery mode and the battery is running low.	Low Battery Warning settings: [Capacity] [0%] ... [100%] [Runtime] [0mn] ... [60mn] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.

Table 4. LCD Operating Status (Continued)

Operation status	Cause	Description
High Efficiency mode 	The UPS is operating on High Efficiency mode.	The UPS is powering and protecting the equipment
Bypass mode 	An overload or a fault has occurred, or a command has been received, and the UPS is in Bypass mode.	Equipment is powered but not protected by the UPS.

2.6 Display Functions

Press the (⏎) button to activate the menu options. use the two middle buttons (▲and ▼) to scroll through the menu structure. Press the (⏎) button to select an option. Press the ESC button to cancel or return to the previous menu.

Table 5. Display Functions

Main menu	Submenu	Display information or Menu function
Measurements		[Load] W VA A pf / [Input/Output] V Hz / [Efficiency] % / [Battery] % min V n° EBM / [Battery remaining life] months / [Average power usage] Wh / [Cumulated power] Wh / BMS Information
Control	Go to Bypass	Transfers the UPS on Bypass mode
	Load segments On/Off	Commands the load segments
	Start battery test	Starts a manual battery test
	Connectivity test	Tests dry contact relay outputs and relay card contacts. Simulates line failure and battery low
	Function reset	Clears active fault, power usage, battery remaining life, reset NMC, Restore factory settings.
Settings	Local settings	Sets product general parameters
	In/out settings	Sets Input and Output parameters
	On/Off settings	Sets On/Off conditions
	Battery settings	Sets battery configuration
	Com settings	Sets communication parameters
Event Log	Event filter	Selects faults, alarms and/or events to display
	Event list	Displays the events stored
	Reset fault list	Clears events

Table 5. Display Functions (Continued)

Main menu	Submenu	Display information or Menu function
Fault log	Fault list	Displays the faults stored
	Reset fault list	Clears faults
Identification		[Product type/model] / [Part/Serial number] / [UPS/NMC firmware] / [Com card IPv4], [Com card IPv6], [Com card MAC]
Registration		Links to Eaton registration website

2.7 User Settings

The following table displays the options that can be changed by the user.

Table 6. User Settings

	Submenu	Available Settings	Default settings
Local Settings	Language	[English] [Français] [Deutsch] [Español] [Русский] [Português] [Italiano] [Simplified Chinese] [Japanese] Menus, status, notices and alarms, UPS fault, Event Log data and settings are in all supported languages.	[English] User selectable when UPS is powered for the first time.
	Date/ time	Format: [International] [US]	[US]
	LCD	Modify LCD screen brightness and contrast to be adapted to room light conditions.	
	Audible alarm	Mode: [Enabled] [Disabled on battery] [Always disabled] Enable or disable the buzzer if an alarm occurs. Level: [High] [Low]	[Enabled] [High]
	Protected access	[Enabled] [Disabled] Password is: 0577	[Disabled]
In/Out settings	Output voltage	100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V]	[120V] [208V]
	Output frequency	Mode: [Normal] [Converter] [Marine] Frequency can be changed in Frequency [Converter] mode In [Marine] mode output frequency follows input frequency	[Normal]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
	Output mode	Mode: [Industrial] [IT] [Custom] Overload: [Inv>Stop] [Inv>BP] [Inv>BP>Inv] Short-circuit: [Inv>Stop] [Inv>BP] [Inv>BP>Inv]	[IT] [Inv>BP>Inv] [Inv>Stop]
	Input volt hysteresis	Sets input voltage hysteresis from [1] to |10V]	[10V]
	High Efficiency mode	[Enabled] [Disabled] Power the output from Bypass for high efficiency	[Disabled]
	Bypass settings	[Volt low] [Volt high] [Qualify] [Hz synch] [Unsynch]	[80V] LV; [160V] HV; [144V] LV; [276V] HV; [In spec]; [5%]; [Half cycle]
	Load segments	[Auto start delay] [Auto shutdown delay]	UPS: [0s]; Group1: [3s]; Group2: [6s] UPS: [Disabled]; Group1: [Disabled]; Group2: [Disabled]
	Overload prealarm	[10%] … [102%] Load % when overload alarm occurs	[102%]
On/Off Settings	Start/Restart	[Cold start] [Auto restart] [Auto start] [Start on bypass]	[Cold start] [Auto restart] are Enabled [Auto start] [Start on bypass] are Disabled
	Forced reboot	[Enabled] [Disabled] [Timer] [10s] … [180s] When mains recover during a shutdown sequence: If set to Enabled, shutdown sequence will complete and wait 10 seconds prior to restart, If set to Disabled, shutdown sequence will not complete, UPS stays on.	[Enabled] [10s]
	Energy saving	[Enabled] [Disabled] [Timer] [1min] … [15min] [Level] [100W] … [1000W]	[Disabled] [5min] [100W]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		If Enabled, UPS will shut-down after defined duration. of back-up time, if load is less than set value.	
	Sleep mode	[Enabled] [Disabled] [Timer] [10min] … [120min] If Disabled, LCD and communication will turn OFF immediately after UPS is OFF. If Enabled, LCD and communication stays ON 1h30 min after UPS is OFF.	[Enabled] [90min]
	Site wiring fault	[Enabled] [Disabled] Prevents from starting the UPS in case of phase vs neutral wires swapping.	[Disabled]
	Power Off alert	[Enabled] [Disabled] If Enabled, activates a confirmation screen that requires user confirmation after pressing the power button, before the UPS shutdown occurs.	[Enabled]
Battery settings	Low battery warning	[Capacity] [0%] … [100%] [Runtime] [0min] … [60min] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.	[0%] [3min]
	Restart bat. level	[0%] ... [100%] If set, automatic restart will occur only when percentage of battery charge is reached.	[0%]
Com settings	Input signals	Sets Input signals parameters (function, delay, operation) through external contact connectors or RS232. ROO port: - [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	[No]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Closed]
		RPO port:	
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	No
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Open]
		DB9-4 port:	No
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [High] [Low]	[High]
	Output signals	[Relay] [DB9-1] [DB9-7] [DB9-8] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232	
		[Relay]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[Relay] [Bypass]
		[DB9-1]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-1] [Low bat]
		[DB9-7]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-7] [UPS OK]
		[DB9-8]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-8] [On bat]
Com settings (cont)	Remote command	[Enabled] [Disabled] If Enabled, shutdown or restart	[Enabled]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		commands from software are authorized.	
	Shutdown commands	[Send CMD] [Output OFF] [OFF delay] [restart] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232 port	
		[Send CMD]: [Yes] [No]	Send CMD: [No]
		[Output OFF]: [No] [UPS] [Group 1]	Output OFF: [No]
		[Group 2] [Group 1 + Group 2]	
		[OFF delay]: [0s] …[999s]	OFF delay: [0s]
		[Restart]: [Yes] [No]	Restart: [Yes]
	On battery notice delay	Sets delay before noticing on battery information to software.	[0s]
	General alarm	[On battery] [Battery fault]	[Internal fault]
		[Overload pre-alarm] [Internal fault]	
		[Ambient temp.] [Fan lock]	
		[Bypass overload] [Current limit]	
		[Short circuit] [Inverter overload]	
		[Power overload] [Low battery]	
		[On bypass] [UPS OK] [Load protected]	
		[Load powered] [Ext. charger ON]	
		Defines which event or fault generate	
		a general alarm through Output signal screen.	

Chapter 3 Installation

3.1 Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping cartons and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage:

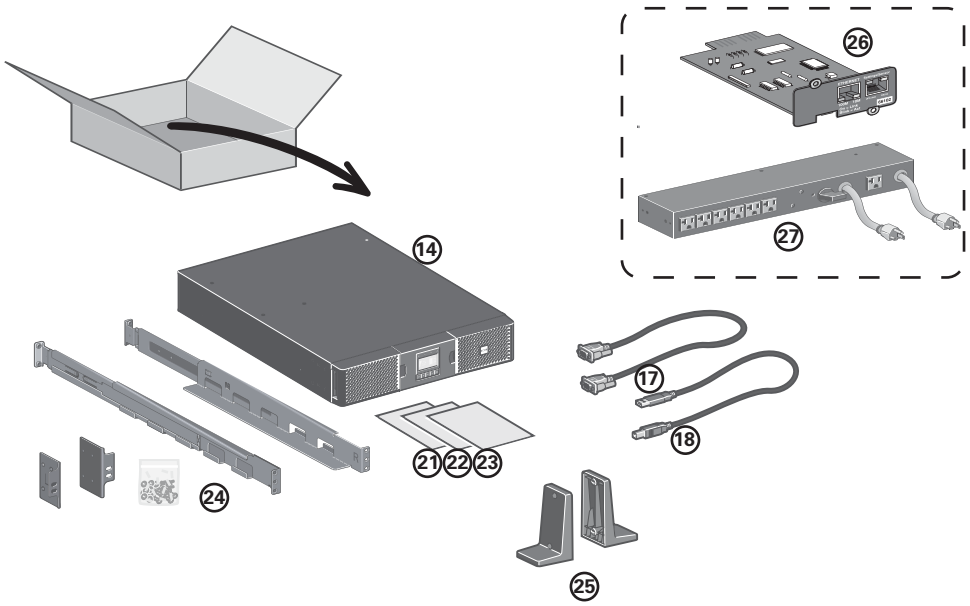
1. File with the carrier within 15 days of receipt of the equipment;
2. Send a copy of the damage claim within 15 days to your service representative.

⚠ IMPORTANT

Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use the UPS. Contact your service representative.

3.2 Checking the Accessory Kit

Figure 4. 9PX1500RT-L / 9PX2000RT-L / 9PX3000RT-L



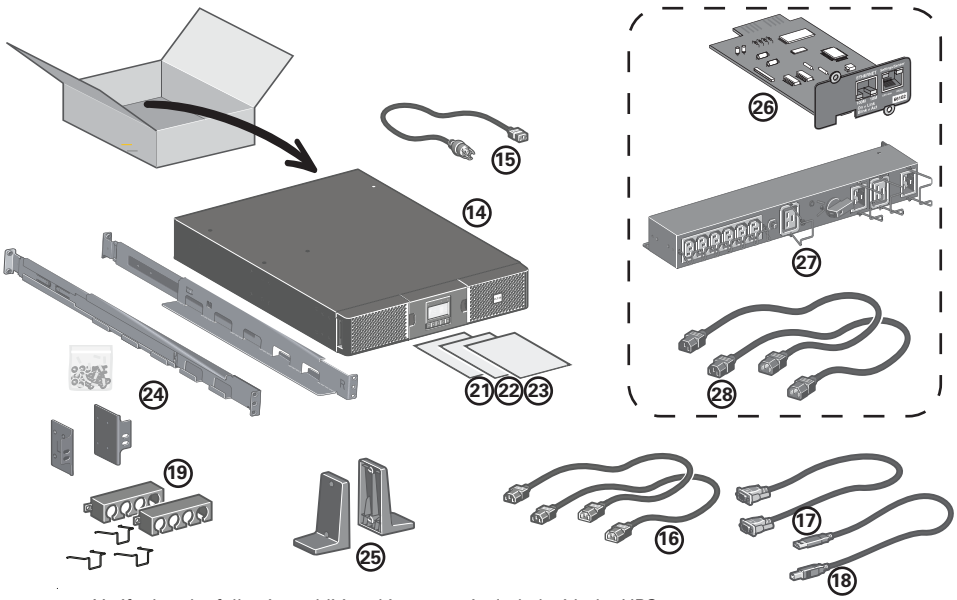
Verify that the following additional items are included with the UPS:

⑭ 9PX UPS
⑰ RS232 communication cable
⑱ USB communication cable
㉑ Software leaflet
㉒ Safety instructions
㉓ Quick start
㉔ Mounting kit for 19-inch enclosures
㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card (optional, standard on Network Bundle models)
㉗ MBP-115 module for 9PX 1500RT (optional)
MBP-120 module for 9PX 2000RT (optional)
MBP-130 module for 9PX 3000RT(optional)

Figure 5. 9PX1500GRT-L / 9PX2200GRT-L / 9PX3000GRT-L



Verify that the following additional items are included with the UPS:

⑭ 9PX UPS

⑮ Connection cable to AC-power source

⑯ 2 connection cables for the protected equipment

⑰ RS232 communication cable

⑱ USB communication cable

⑲ 3 cable locking systems

㉑ Software leaflet

㉒ Safety instructions

㉓ Quick start

㉔ Mounting kit for 19-inch enclosures

㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card(optional,standard on Network Bundle options

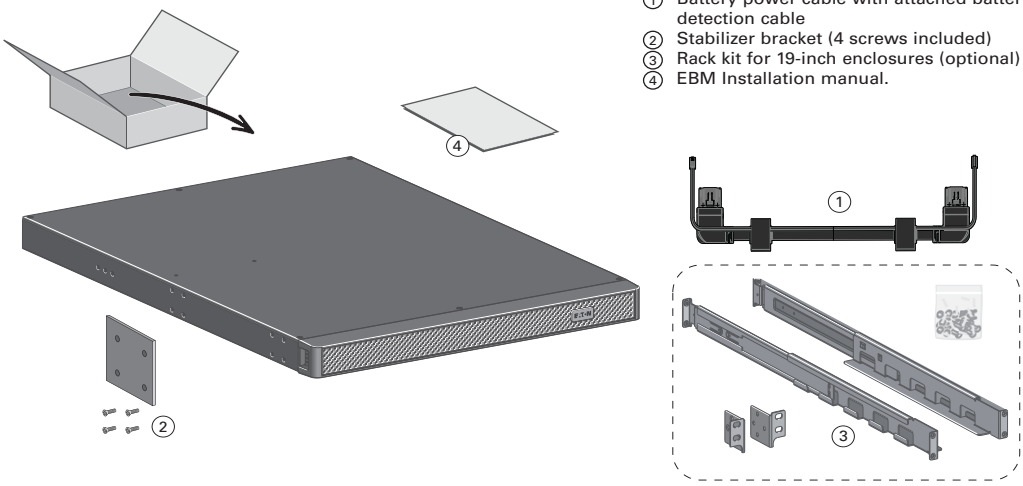
㉗ HotSwap MBP module (optional)

㉘ Connection cables between Hotswap MBP module and UPS

Figure 6. 9PXEBM48RT-L / 9PXEBM72RT-L

- If you ordered an optional Extended Battery Module (EBM), verify that the following additional items are included with the EBM:

① Battery power cable with attached battery detection cable
② Stabilizer bracket (4 screws included)
③ Rack kit for 19-inch enclosures (optional)
④ EBM Installation manual.



NOTE 1 Discard the EBM user's guide if you are installing the EBM with a new UPS at the same time.

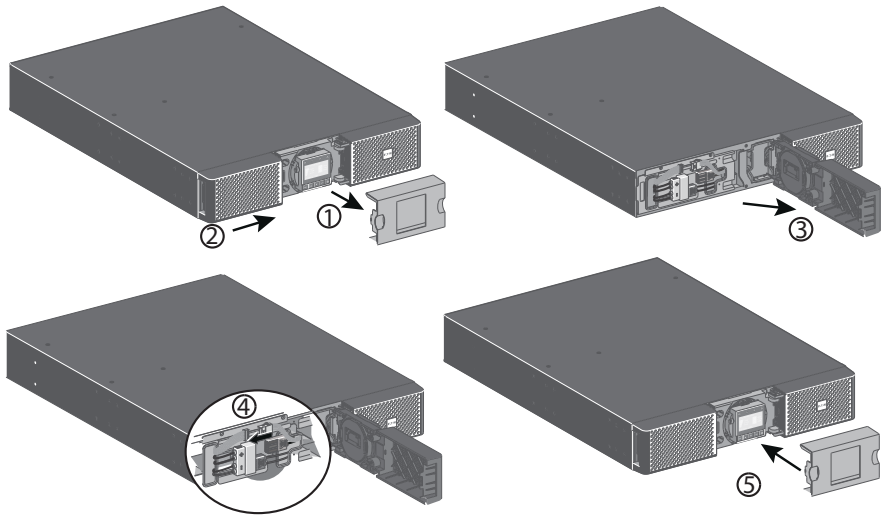
NOTE 2 Use the UPS user's guide to install both the UPS and the EBM.

Remember If you ordered other UPS accessories, refer to specific user manuals to check the packing contents.

3.3 Connecting the Internal Battery

NOTE Do not connect the UPS to the utility until installation is complete.

Figure 7. Internal Battery Connection



To connect to the UPS:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the left side of the front panel.

NOTE A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.

⚠CAUTION

A small amount of arcing may occur when connecting the internal batteries. This is normal and will not harm personnel. Connect the cables quickly and firmly.

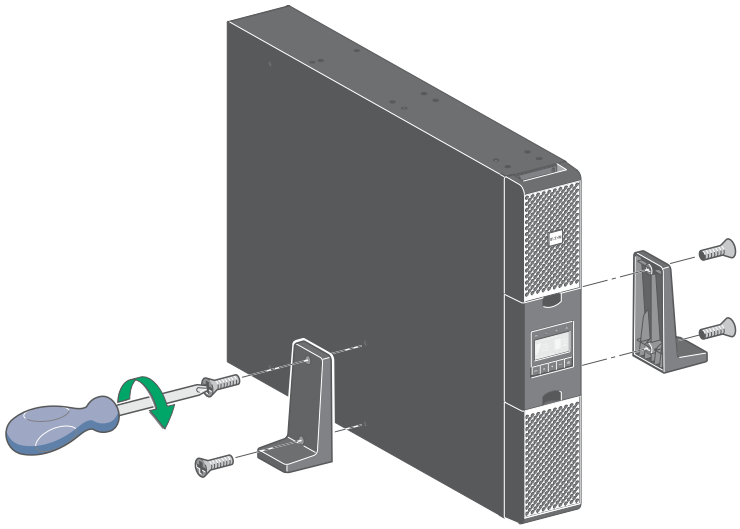
4. Connect the two battery connectors together.
5. Put back the front panel, then clip the center cover.

3.4 Tower Installation

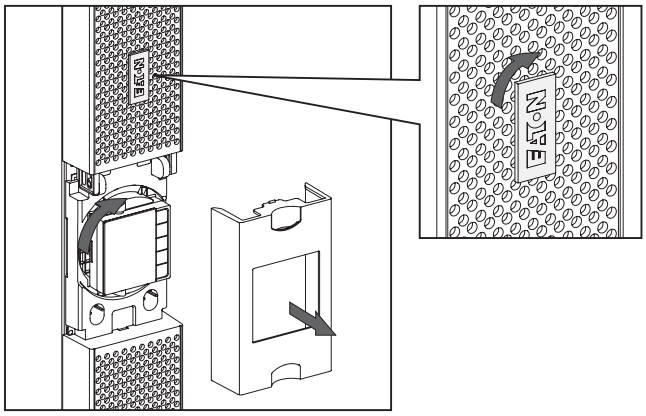
Tip If you ordered other UPS accessories, refer to specific user manuals to check the tower installation with the UPS.

To install the cabinet:

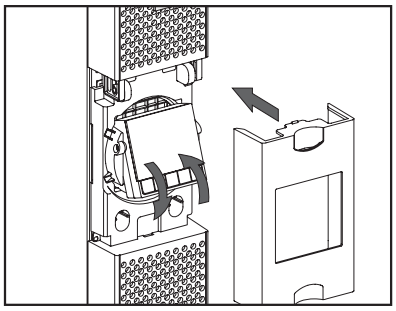
1. Place the UPS on a flat, stable surface in its final location.
2. Always keep 6" or 150 mm of free space behind the UPS rear panel for ventilation.
3. If installing additional cabinets, place them next to the UPS in their final location.



- Adjustment of the orientation of the LCD panel and of the logo.



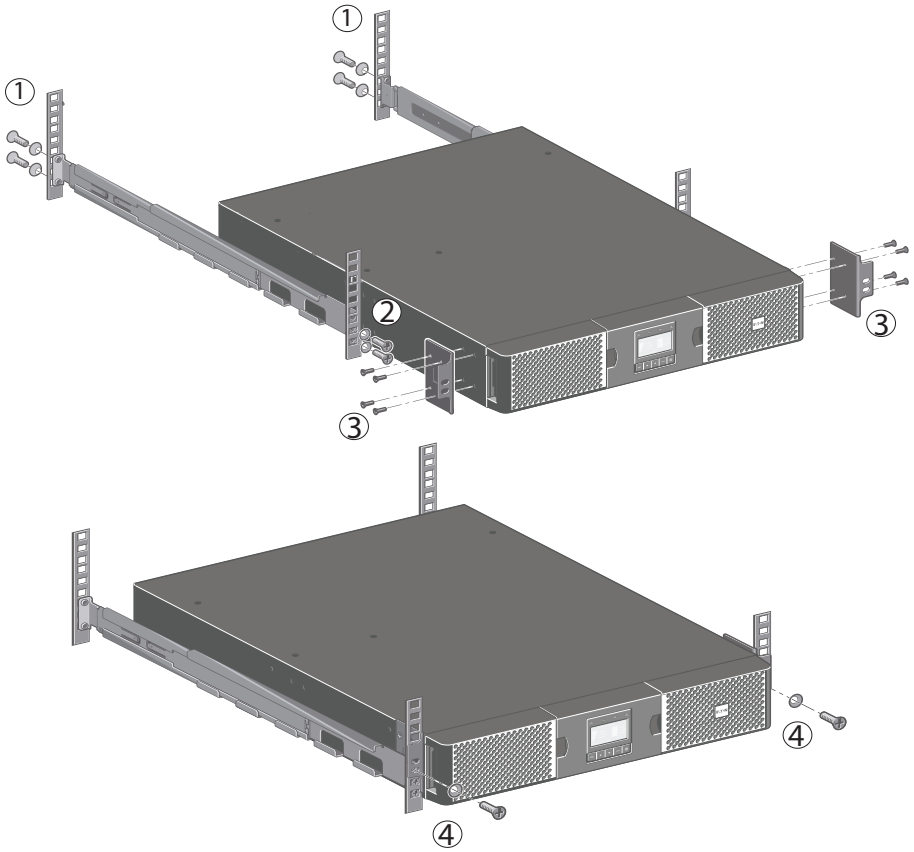
- Adjustment of the angle of vision of the LCD panel.



3.5 Rack Installation

- Rack mounting of UPS, EBM, and accessory modules.

Follow steps 1 to 4 for module mounting on the rails.



The rails and necessary hardware are supplied by EATON.

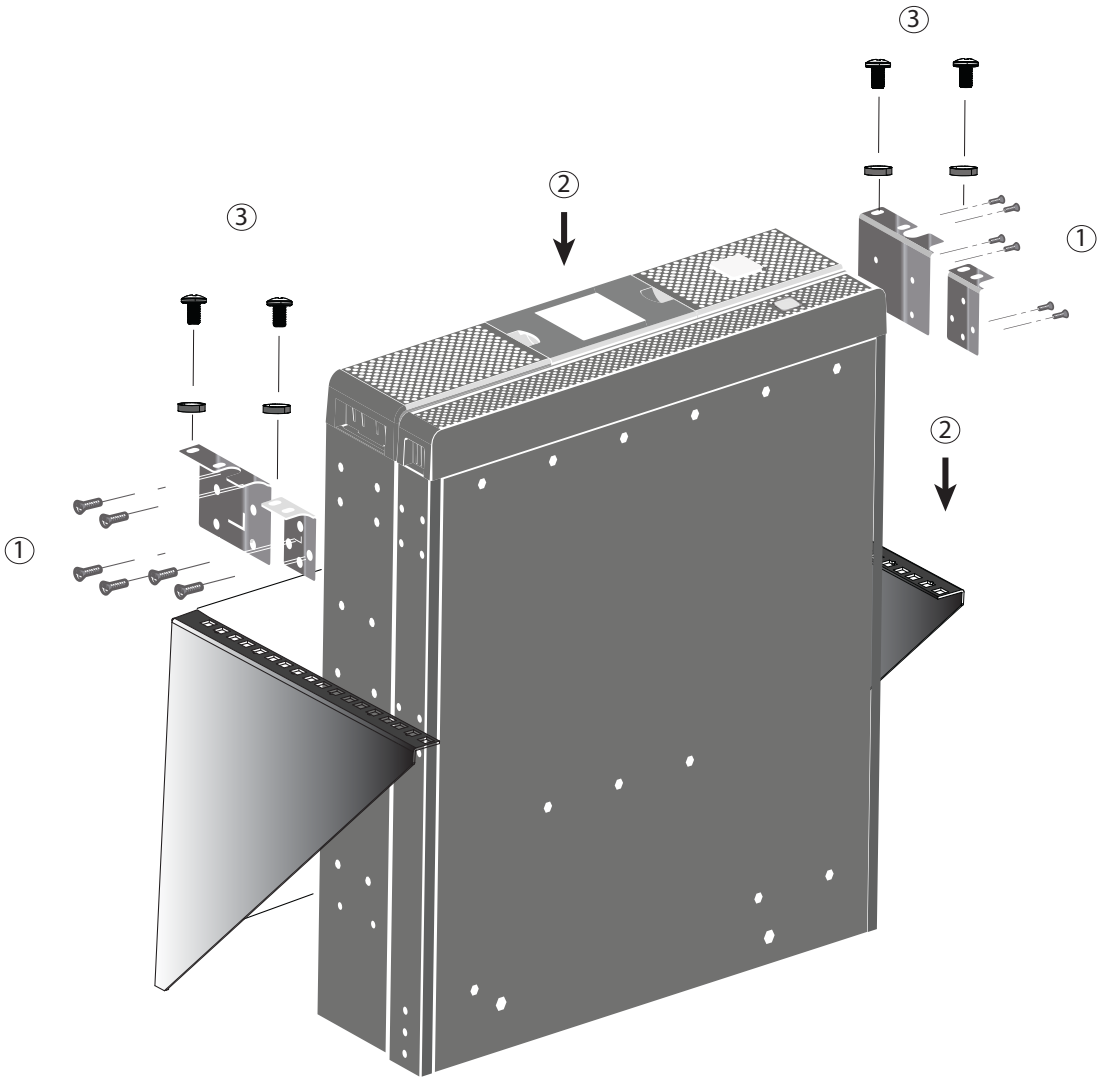
3.6 Vertical Installation

NOTE 1 This vertical installation is available only for UL/cTUVus.

NOTE 2 Suitable for mounting on concrete or other noncombustible surfaces only.

- The UPS, EBM, and accessory modules can be installed vertically in a rack or on a wall.

Follow steps 1 to 3 for module mounting on the rails.



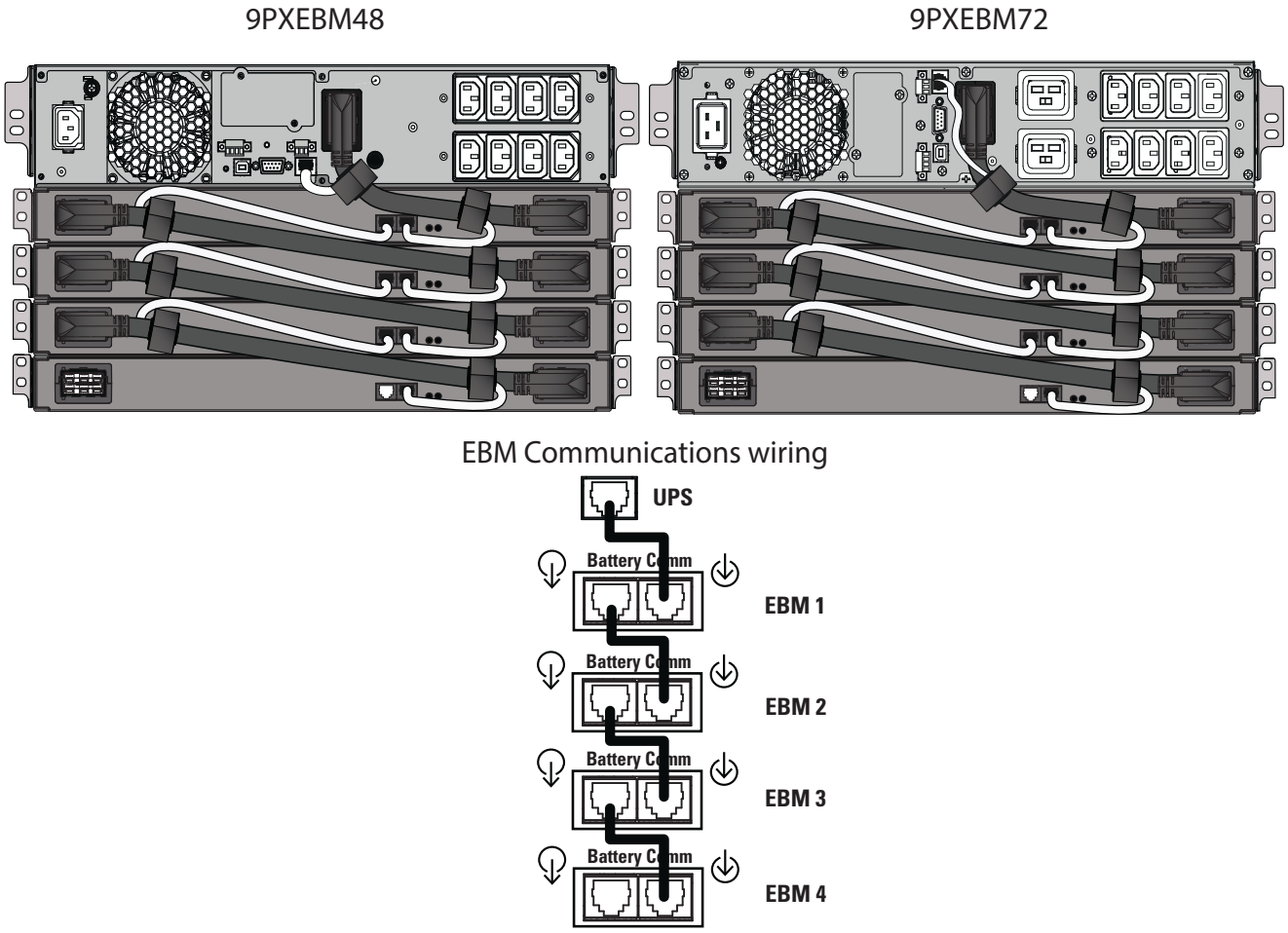
3.7 Connecting the EBM(s)

⚠CAUTION

A small amount of arching may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.

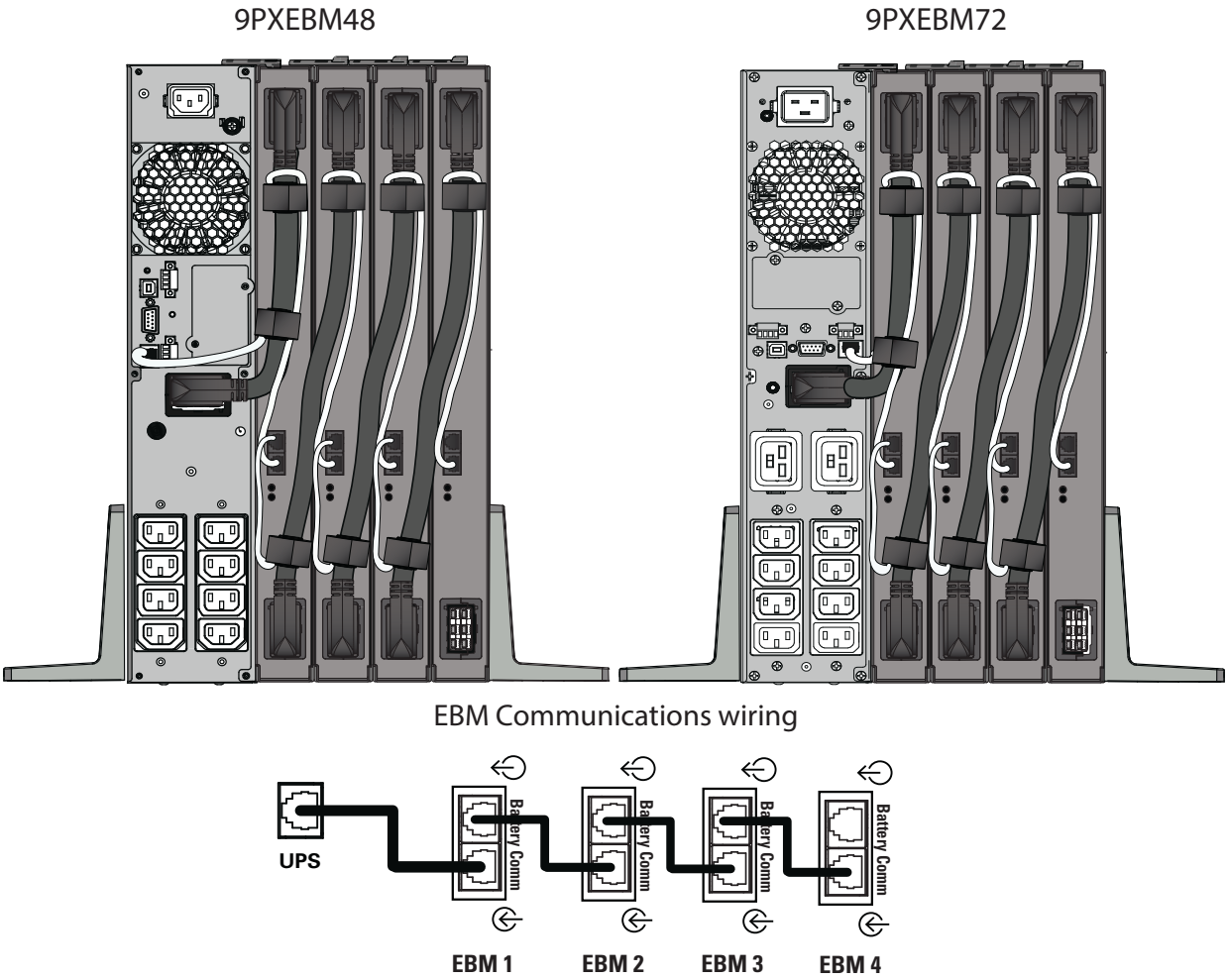
1. Plug the EBM power cable(s) into the battery connector(s). Up to 4 EBMs may be connected to the UPS.
2. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
3. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).

Figure 8. 9PXEBM Rack Mount Connections



NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

Figure 9. 9PXEBM Tower Mount Connections



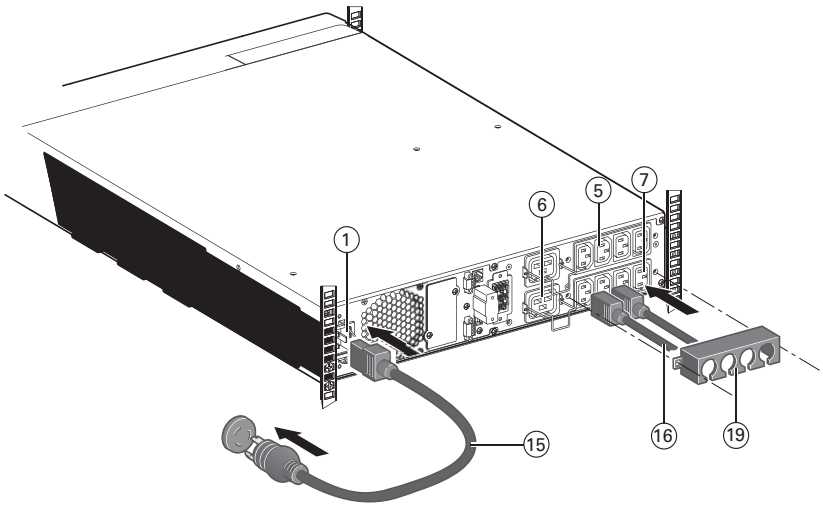
NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

3.8 Detecting other Accessories

Tip If you ordered other UPS accessories, refer to specific user manuals to check the connection to the UPS.

3.9 UPS Connection without Hotswap MBP Module

Check that the indications on the name plate located on the back of the UPS correspond to the AC-power source and the true electrical consumption of the total load.

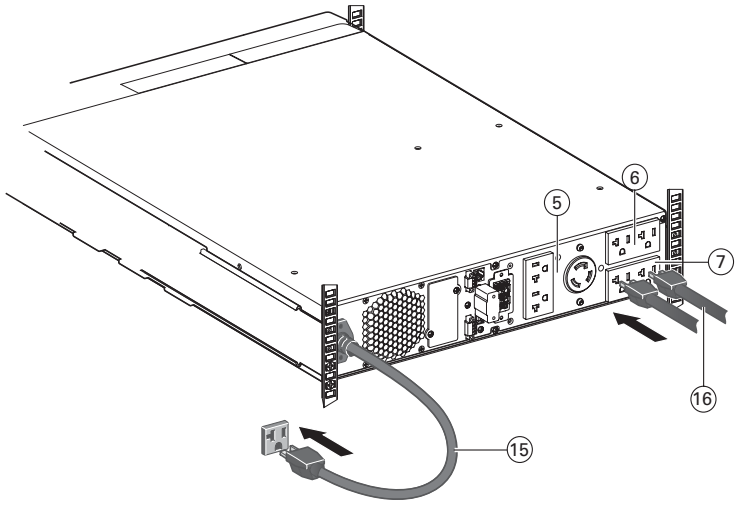


1. 9PX 2000RT-L / 3000RT-L connect the UPS input socket ① to the AC-power source.
   9PX 2200GRT-L / 3000GRT-L / 3000GLRT-L: connect the supplied cable ⑮ (250 V - 16 A) to the socket ①, then to the AC-power source.

2. Connect the loads to the UPS using the cables ⑯.
   It is preferable to connect the priority loads to the outlets marked ⑤ and the non-priority loads to the outlets marked ⑥ ⑦ that can be programmed.
   Connect any high-power devices to the 16 A outlet.

To program shutdown of outlets ⑥ ⑦ during operation on battery power and thus optimise the available backup time, please check the in/out settings.

3. For G models, fit the cable locking system ⑲ that prevents the plugs from being pulled out accidentally.

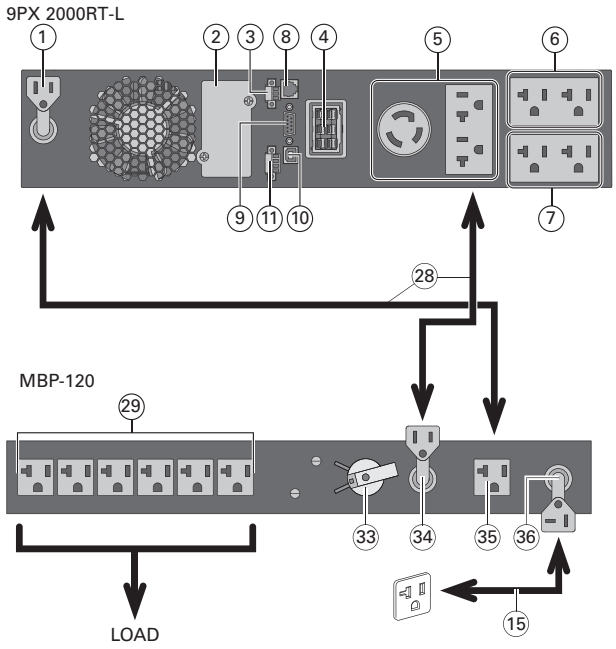


Note. The UPS charges the battery as soon as it is connected to the AC-power source, even if ⏻ button is not pressed

Once the UPS is connected to the AC-power source, eight hours of charging are required before the battery can supply the rated backup time.

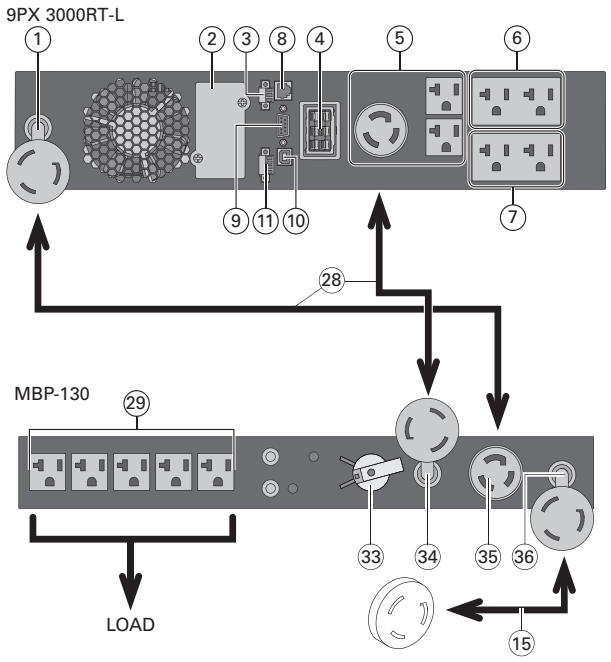
3.10 Connection with a Hotswap MBP Module (Optional Accessory)

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads.



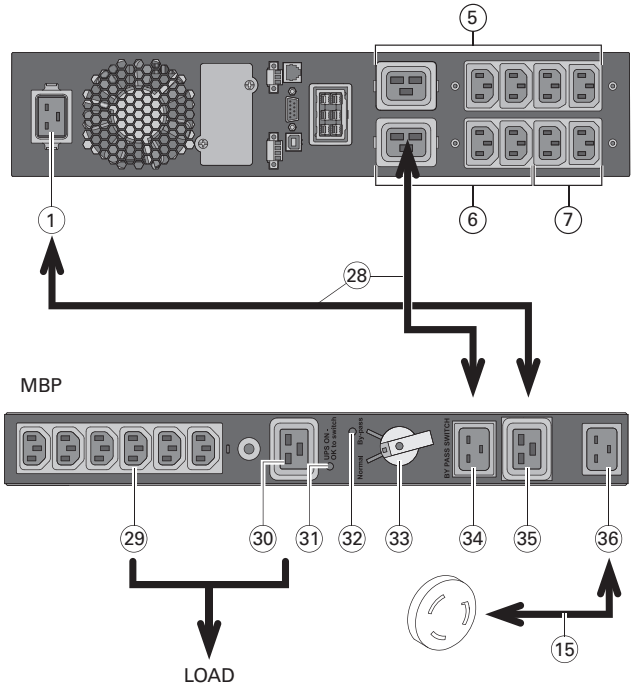
1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the “UPS Input socket” ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the “UPS Output” ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.



* 9PX 1500RT-L: To connect to MBP-115, follow the same procedure as for the 9PX 2000RT / 9PX 3000RT.

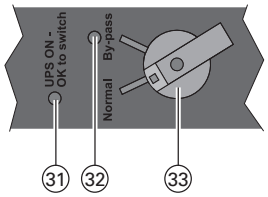
9PX 2200GRT-L & 9PX 3000GRT-L



1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the "UPS Input socket" ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the "UPS Output" ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.

HotSwap MBP module operation



The HotSwap MBP module has a rotary switch ㉝ with two positions:

Normal	the load is supplied by the UPS, LED ㉛ is on.
Bypass	the load is supplied directly by the AC-power source. LED ㉜ is on.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch ㉝ to Normal position.
3. Start the UPS by pressing the ON/OFF button ⏻ on the UPS control panel.

The load is supplied by the UPS.
LED ㉛ "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

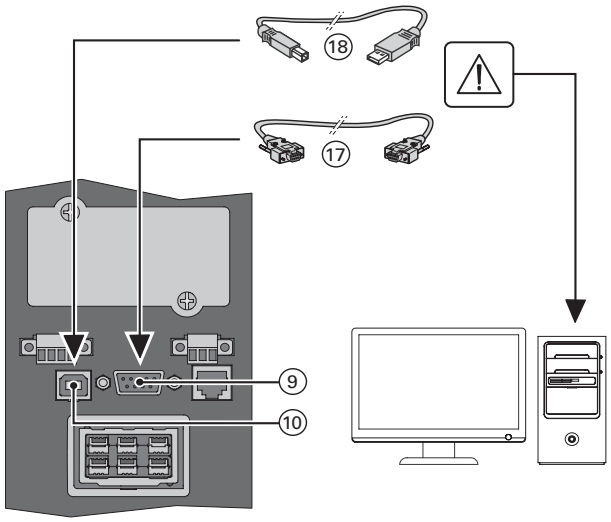
HotSwap MBP module test

1. Set switch ㉝ to Bypass position and check that the load is still supplied.
2. Set switch ㉝ back to Normal position.

Chapter 4 Communication

4.1 Communication Ports

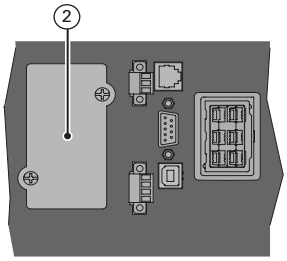
The RS232 and USB communication ports cannot operate simultaneously.



1. Connect the RS232 ⑰ or USB ⑱ communication cable to the serial or USB port on the computer equipment.
2. Connect the other end of the communication cable ⑰ or ⑱ to the USB ⑩ or RS232 ⑨ communication port on the UPS.

The UPS can now communicate with EATON power management software.

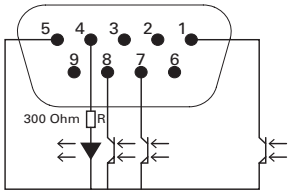
Installation of the communication cards



It is not necessary to shutdown the UPS before installing a communication card.

1. Remove the slot cover ② secured by screws.
2. Insert the communication card in the slot.
3. Secure the card cover with the 2 screws.

Characteristics of the contact RS232 communication port



Pin	Signal	Direction	Function
1	Bat Low	Output	Low Battery Output
2	TxD	Output	Transmit to external device
3	RxD	Input	Receive from external device
4	I/P SIG	Input	-
5	GNDS	-	Signal Common tied to chassis
6	PNP	Input	Plug and Play
7	UPS ON	Output	UPS ON
8	BAT Mode	Output	-
9	+5V	Output	Power supply for external signals or options

Contact characteristics (optocoupler)

- Voltage: 48 V DC max
- Current: 25 mA max

4.2 UPS Remote Control Functions

Programmable Signal Inputs

The 9PX incorporates 3 programmable signal inputs: one Remote Power Off (RPO) input terminal, one Remote On/Off (ROO) input terminal, one RS-232 input (pin-4). Signal inputs can be configured see Settings > Com settings > Signal Input in to have one of the following functions:

Function	Description
No	No function, please choose a function if you want to use input signal
RPO	Remote Power Off (RPO) is used to shutdown the UPS remotely
ROO	Remote On/Off allows remote action of button to switch On/Off the UPS. (Cold start is prohibited while using the ROO function)
Forced bypass	If feeding the load the unit goes to bypass operation and stays there regardless of the bypass state until the input is inactivated
Building alarm	Active input generates an alarm "building alarm"
On generator	Active input disables synchronization and transfers to bypass
Remote shutdown	Active input turns UPS output (or outlet groups) off after a user defined shutdown delay but keeps on charging batteries according to a selected charging scheme, inactive input does not abort shutdown countdown. Depending on the "Restart" parameter (see Settings > Com Settings > Shutdown commands on page 16) the unit may startup automatically.

IMPORTANT

Warning Signal inputs have no function by default please choose a function through the LCD **(Settings > Com settings > Input signals).**

See below 2 examples of configuration with RPO terminal used as RPO function and ROO terminal use as ROO function:

Remote Power Off (RPO)

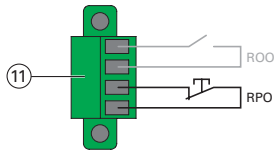
RPO is used to shutdown the UPS remotely when the contact is open. This feature can be used for shutting down the load and the UPS by thermal relay, for instance in the event of room over temperature. When RPO is activated, the UPS shuts down the output and all its power converters immediately. The UPS remains on to alarm the fault. The RPO circuit is an IEC 60950 safety extra low voltage (SELV) circuit. This circuit must be separated from any hazardous voltage circuits by reinforced insulation.

- The RPO must not be connected to any utility connected circuits. Reinforced insulation to the utility is required. The RPO switch must be a dedicated latching-type switch not tied into any other circuit. The RPO signal must remain active for at least 250 ms for proper operation.
- To ensure the UPS stops supplying power to the load during any mode of operation, the input power must be disconnected from the UPS when the Remote Power Off function is activated.

Leave the RPO connector installed in the RPO port on the UPS even if the RPO function is not needed.

RPO connections:

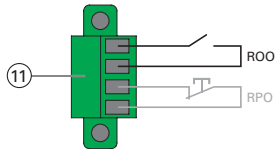
RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote On/Off (ROO)

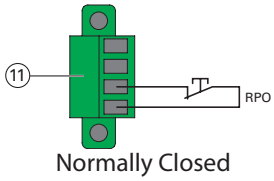
- Remote On/Off allows remote action of button to switch On/Off the UPS.
- When contact changes from open to closed, the UPS is switched-on (or stays On).
- When contact changes from closed to open, the UPS is switched-off (or stays Off).
- On/Off control via button has priority over the remote control.

RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote Control Connection and Test

1. Check the UPS is shut down and the electrical supply network disconnected.
2. Remove RPO connector from the UPS by unfitting the screws.
3. Connect a normally closed volt-free contact between the two pins of connector.

 Normally Closed	Contact open: shut down of UPS To return to normal operation, deactivate the external remote shut down contact and restart the UPS from the front panel.

4. Plug the RPO connector into the back of the UPS and fix the screws.
5. Connect and restart the UPS according to the previously described procedures.

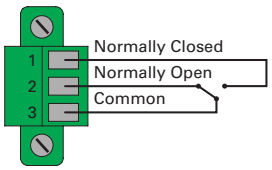
6. Activate the external remote shut down contact to test the function. Always test the RPO function before applying your critical load to avoid accidental load loss.

Programmable Signal Outputs

The 9PX incorporates 4 programmable signal outputs: one relay output, three optocouplers outputs (pin- 1/7/8). Signal outputs can be configured (see Settings > Com settings > Output Signals in to report the following information:

Signal	Default Assignment	Description
On battery (On bat)	DB9-Pin 8	UPS is in battery mode
Low battery (Low bat)	DB9-Pin 1	Battery is nearly empty
Battery fault (Bat fault)	-	Battery fault
Bypass	Relay output **(1)**	UPS is operating in Bypass mode
UPS OK	DB9-Pin 7	Load is powered (from inverter or bypass), with no alarm
Load powered	-	Load is powered (from inverter or bypass)
Load protected	-	UPS is on inverter, with no alarm and ready to go to battery
General alarm	-	• Choose events that will trigger this alarm trough the LCD • (Settings > Com settings > General alarm) for more information on possible events please look at page 16.
Ext charger ON	-	Control an optional external battery charger on and off.
OVL pre-alarm	-	Overload pre-alarm

(1) Relay output:



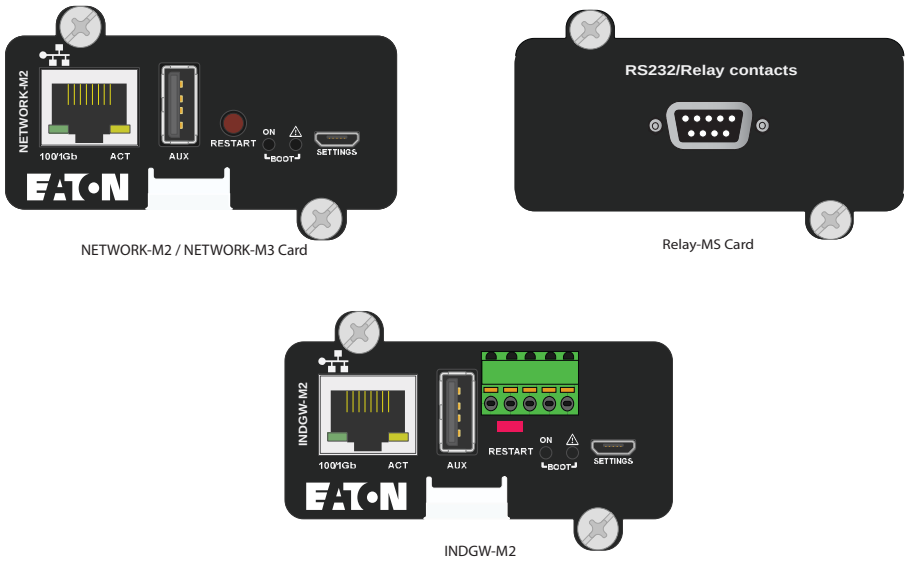
Connectivity Cards

Connectivity cards allow the UPS to communicate in a variety of networking environments and with different types of devices. The 9PX models have one available communication bay for the following connectivity cards:

- **Network-M2 card** — has SNMP and HTTP capabilities as well as monitoring through a Web browser interface; connects to a Gigabit Ethernet network. In addition, a Environmental Monitoring Probe can be attached to obtain humidity, temperature, smoke alarm, and security information.
- **INDGW-M2 card**- has SNMP and HTTP capabilities and a Modbus to facilitate remote monitoring of the UPS system through any Building Management System.

- **Relay-MS card**- has isolated dry contact (Form-C) relay outputs for UPS status: Utility failure, Battery low, UPS alarm/OK, or on Bypass.

Figure 10. Connectivity Card Options



NETWORK-M2 / NETWORK-M3 Card

Relay-MS Card

INDGW-M2

Eaton Intelligent Power Software suite

Eaton Intelligent Power Software suite is available from eaton.com/download. Eaton Software suite provides up-to-date graphics of UPS power and system data and power flow. It also gives you a complete record of critical power events, and it notifies you of important UPS or power information. If there is a power outage and the 9PX UPS battery power becomes low, Eaton Software suite can automatically shut down your computer system to protect your data before the UPS shutdown occurs.

Chapter 5 Operation

5.1 Start-up and Normal Operation

To start the UPS:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. Verify that the UPS power cord is plugged in.
4. The UPS front panel display illuminates and shows EATON logo.
5. Verify that the UPS status screen shows ⏻
6. Press the ⏻ button on the UPS front panel for at least 2 seconds.
7. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear. Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.
8. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode.

5.2 Starting the UPS on Battery

Before using this feature, the UPS must have been powered by utility power with output enabled at least once. Battery start can be disabled. See the "Cold start" setting in "ON/OFF Settings" in .

To start the UPS on battery:

1. Press the ⏻ button on the UPS front panel until the UPS front panel display illuminates and shows a status of "UPS starting...". The UPS transfers from Standby mode to Battery mode. The 🔋 indicator illuminates solid. The UPS supplies power to your equipment.
2. Check the UPS front panel display for active alarms or notices besides the "Battery mode" notice and notices that indicate missing utility power. Resolve any active alarms before continuing. See the "Troubleshooting" section . Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.

5.3 UPS Shutdown

To shut down the UPS:

1. Press the ⏻ button on the front panel for three seconds. A confirmation message will appear. When confirmed, the UPS starts to beep and shows a status of "UPS shutting OFF...". The UPS then transfers to Standby mode, and the ∿ indicator turns off.

5.4 Operating Modes

The Eaton 9PX front panel indicates the UPS status through the UPS indicators, see section 2.4 *Control Panel* .

Online Mode ∿

During Online mode, the ∿ indicator illuminates solid and the UPS is powered from the utility. The UPS monitors and charges the batteries as needed and provides filtered power protection to your equipment.

Optional High Efficiency and Energy Saving settings minimize heat contribution to the rack environment. See section 2.7 *User Settings* .

Battery Mode

When the UPS is operating during a power outage, the alarm beeps once every ten seconds and the indicator illuminates solid. The necessary energy is provided by the battery. When the utility power returns, the UPS transfers to Online mode operation while the battery recharges. If battery capacity becomes low while on Battery mode, the audible alarm beeps once every 3 seconds. This warning is approximate, and the actual time to shutdown may vary significantly. Shutdown all applications on the connected equipment because automatic UPS shutdown is imminent. When utility power is restored after the UPS shuts down, the UPS automatically restarts.

Low-Battery Warning

- The indicator illuminates solid.
- The audio alarm beeps every three seconds.

The remaining battery power is low. Shut down all applications on the connected equipment because automatic UPS shutdown is imminent.

End of battery backup time

- LCD displays "End of backup time".
- All the LEDs go OFF.
- The audio alarms stops.

Bypass Mode

In the event of a UPS overload or internal failure, the UPS transfers your equipment to utility power. Battery mode is not available and your equipment is not protected; however, the utility power continues to be passively filtered by the UPS. The indicator illuminates. Depending on overload conditions, the UPS remains in Bypass mode for at least 5 seconds and will stay in this mode if three transfers to Bypass occur within 20 minutes.

The UPS transfers to Bypass mode when:

- the user activates Bypass mode through the front panel.
- the UPS detects an internal failure.
- the UPS has an overtemperature condition.
- the UPS has an overload condition listed in Table 12 .

The UPS shuts down after a specified delay for overload conditions listed in Table 12 . The UPS remains on to alarm the fault.

5.5 Return of AC Power

Following an outage, the UPS restarts automatically when AC input power returns (unless the restart function has been disabled) and the load is supplied again.

5.6 Setting High Efficiency Mode

In High Efficiency mode, the UPS operates normally on Bypass and transfers to Online (or Battery) mode in less than 10 ms when utility fails. Transfers to High Efficiency mode will be active after 5 minutes of Bypass voltage monitoring: if Bypass quality is not in tolerance, then the UPS will remain in Online mode.

Eaton recommends to use the HE mode only to protect IT equipment.

To set the High Efficiency mode:

1. Select Settings, In/Out settings, and High Efficiency mode.
2. Select Enabled and Enter to confirm.
3. The UPS transfers to High Efficiency mode after 5 minutes.

5.7 Configuring Bypass Settings

The following settings are available for configuring Bypass operation.

Changing the settings changes UPS behavior and may result in decreased protection.

Bypass Voltage Low Limit

The default disables a transfer to Bypass if the measured bypass voltage level is below the nominal output voltage minus 20%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Bypass Voltage High Limit

The default disables a transfer to Bypass if the measured bypass voltage level is above the nominal output voltage plus 15%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Qualify Bypass

The default setting ("In spec") allows a transfer to Bypass only when Bypass is within the following specifications:

- Bypass voltage is between the "Bypass Voltage Low Limit" and "Bypass Voltage High Limit" settings
- Bypass frequency is within nominal frequency 5%.

You can prohibit Bypass ("Never") or always allow Bypass with no specification checking ("Always"). For "Always on UPS Fault," transfer to Bypass is always made on UPS fault; otherwise, operation proceeds as with the default setting.

Synchronization Window

The UPS tries to synchronize with Bypass when the Bypass frequency is less than the value set for the "Synchronization Window" setting. When the Bypass frequency is more than the set value, the UPS goes to nominal frequency.

Unsynchronized Transfers

When Qualify Bypass is set to "Always" or "Always on Fault" you can select the interruption time when transferring to bypass, default setting is "Half Cycle" but can be changed to "Full cycle".

5.8 Configuring Battery Settings

Low battery warning

During discharge, the low battery alarm is activated if the remaining runtime goes below 3 minutes or less than the setting capacity threshold (0 % by default). This threshold can be modified.

Restart battery level

This setting is used to define the battery restart level. The battery level must reach this threshold to enable UPS start.

5.9 Retrieving the Event Log

To retrieve the Event log through the display:

1. Press any button to activate the menu options, then select Event log.
2. Scroll through the listed events.

5.10 Retrieving the Fault Log

To retrieve the Fault log through the display:

1. Press any button to activate the menu options, then select Fault log.
2. Scroll through the listed faults.

Chapter 6 UPS Maintenance

6.1 Storing the Equipment

If you store the equipment for a long period, recharge the battery every 6 months by connecting the UPS to utility power. The internal batteries charge to 90% capacity in less than 3 hours. However, Eaton recommends that the batteries charge for 48 hours after long-term storage. Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use them. Contact your service representative.

6.2 Replacing Batteries

IMPORTANT

DO NOT DISCONNECT the batteries while the UPS is in Battery mode.

Batteries can be replaced easily without turning off the UPS or disconnecting the load. If you prefer to remove input power to change the batteries, see "UPS Shutdown".

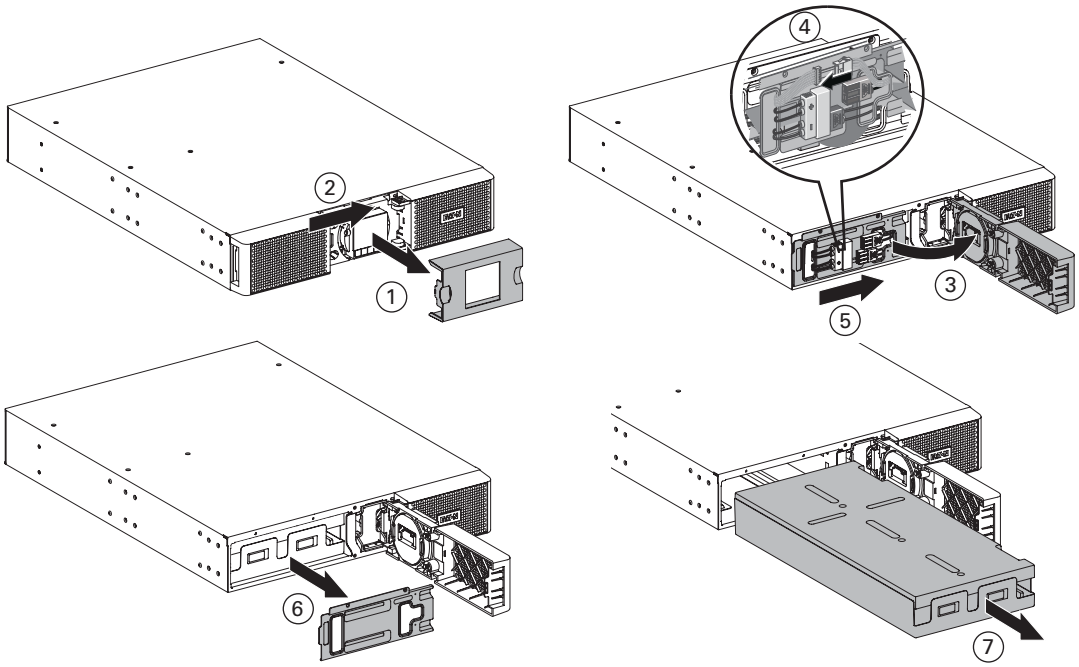
Consider all warnings, cautions, and notes before replacing batteries.

- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
- Batteries can present a risk of electrical shock or burn from high short circuit current. Observe the following precautions:
    1. Remove watches, rings, or other metal objects,
    2. Use tools with insulated handles,
    3. Do not lay tools or metal parts on top of batteries,
    4. Wear rubber gloves and boots.
- When replacing batteries, replace with the same type and number of batteries or battery packs. Contact your service representative to order new batteries.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire. Batteries may explode when exposed to flame.
- Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes and may be extremely toxic.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).
- ELECTRIC ENERGY HAZARD. Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.
- Disconnect charging source prior to connecting or disconnecting battery terminals.

Replacing the internal battery

The internal battery is heavy. Use caution when handling the heavy batteries.

Figure 11. Internal Battery Pack Replacement



To replace the battery pack:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the battery door.
4. Disconnect the battery connectors.

   A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.
5. Remove the two screws to pull out the metal protection cover of the battery.
6. Pull out the plastic handle of the battery pack, and slide the pack out slowly on to a flat and stable surface. Use two hands to support the battery pack. See "Recycling the used equipment" on page 38 for proper disposal.
7. Verify that the replacement batteries have the same rating as the batteries being replaced.
8. Put the new battery pack into the UPS. Push the battery pack firmly, reconnect the red and black battery connectors then reconnect the BMS communication cable.
9. Verify that all of the alarms have cleared on the display.
10. Screw back the metal protection cover and the front panel, then clip the center cover.
11. If there are no EBM modules that need to be replaced continue to the 6.3 *Battery Settings Reset* .
12. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

Replacing the EBM(s)

The EBM is heavy. Lifting the cabinet into a rack requires a minimum of two people.

To replace the EBM(s):

1. Unplug the EBM power cable and battery detection cable from the UPS. If additional EBM(s) are installed, unplug the EBM power cable and battery detection cable from each EBM.
2. Replace the EBM(s). See "Recycling the used equipment" for proper disposal.

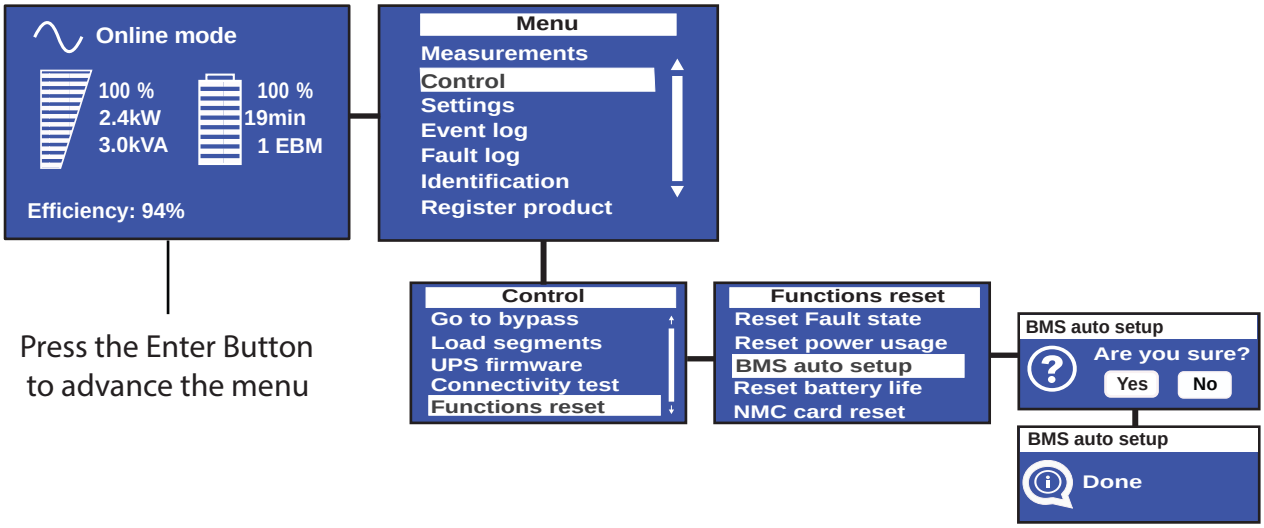
   A small amount of arcing may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.
3. Plug the EBM cable(s) into the battery connector(s). Up to four EBMs may be connected to the UPS.
4. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
5. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).
6. Continue to the 6.3 *Battery Settings Reset*.
7. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

6.3 Battery Settings Reset

After replacement of the internal UPS batteries and extended battery modules the BMS auto setup and battery life settings will need to be reset in the "*Control*" menu of the display.

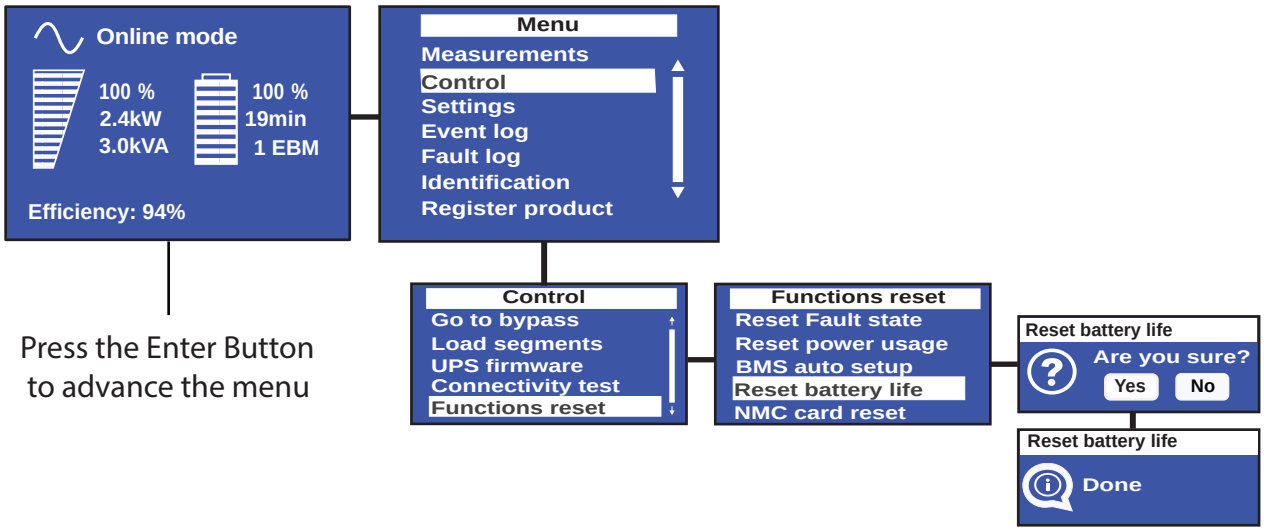
1. Reset the BMS auto setup function in the "Functions Reset" option of the control menu.

Figure 12. BMS Auto Setup Reset



2. Reset the battery life counter in the "Functions Reset" option of the control menu.

Figure 13. Battery Life Reset



Return the UPS to Normal Operation

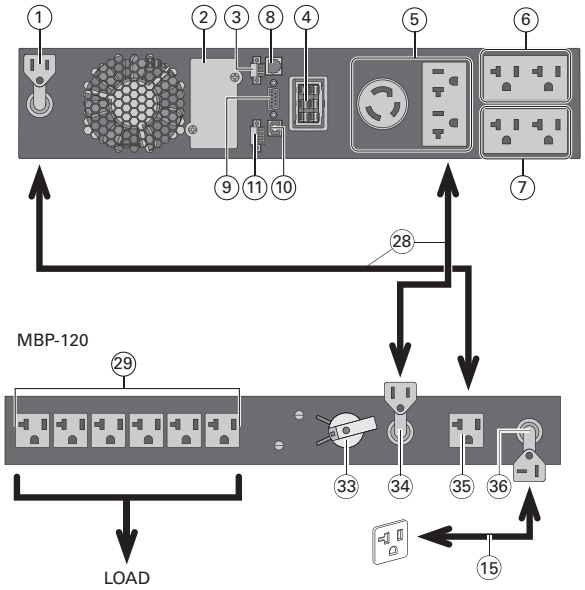
If the UPS internal batteries and external battery packs were replaced without powering down the UPS:

1. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear.
2. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode. See 5.1 *Start-up and Normal Operation* .

If the UPS internal batteries and external battery packs were replaced and the UPS was powered off:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. See section 5.1 *Start-up and Normal Operation* for powering the UPS back to normal operation.
4. If the UPS has a MBP module attached see 3.8 *Detecting other Accessories* for the correct startup procedure.

6.4 Replacing the UPS Equipped with a HotSwap MBP



The **HotSwap MBP** module makes it possible to service or even replace the UPS without affecting the connected loads.

Maintenance

1. Set switch (33) to Bypass position. The red LED on the **HotSwap MBP** module goes ON, indicating that the load is supplied directly with AC input source power.
2. Stop the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation

1. Check that the UPS is correctly connected to the **HotSwap MBP** module.
2. Start the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" on the **HotSwap MBP** module goes ON (otherwise, there is a connection error between the **HotSwap MBP** module and the UPS).
3. Set switch (33) to Normal position. The red LED on the **HotSwap MBP** module goes OFF.

6.5 Recycling The Used Equipment

Contact your local recycling or hazardous waste center for information on proper disposal of the used equipment.



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

Chapter 7 Troubleshooting

7.1 Typical Alarms and Faults

The Eaton 9PX are designed for durable, automatic operation and also alert you whenever potential operating problems may occur. Usually the alarms shown by the control panel do not mean that the output power is affected. Instead, they are preventive alarms intended to alert the user.

- Events are silent status information that are recorded into the Event log. Example = "AC freq in range".
- Alarms are recorded into the Event log and displayed on the LCD status screen with the logo blinking. Some alarms may be announced by a beep every 3 seconds. Example = "Battery low".
- Faults are announced by a continuous beep and red LED, recorded into the Fault log and displayed on the LCD with a specific message box. Example = Out. short circuit.

Use the following troubleshooting chart to determine the UPS alarm condition.

Checking the Alarms and Faults

To check the Event log or Fault log :

1. Press any button on the front panel display to activate the menu options.
2. Press the button to select Event log or Fault log.
3. Scroll through the listed events or faults.

The following table describes typical conditions.

Conditions	Possible cause	Action
Battery mode  LED is On. 1 beep every 10 seconds	A utility failure has occurred and the UPS is in battery mode.	The UPS is powering the equipment with battery power. Prepare your equipment for shutdown.
Battery mode  LED is On. 1 beep every 3 seconds	The UPS is in Battery mode and the battery is running low.	This warning is approximate, and the actual time to shutdown may vary significantly. Depending on the UPS load and number of Extended Battery Modules (EBMs), the "Battery Low" warning may occur before the batteries reach 20% capacity.
No battery  LED is On Beep continuous	The batteries are disconnected.	Verify that all batteries are properly connected. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.
Battery fault  LED is On Beep continuous	The battery test is failed due to bad or disconnected batteries.	Verify that all batteries are properly connected. If the condition persists, contact your service representative. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.

Conditions	Possible cause	Action
The UPS does not provide the expected backup time.	The batteries need charging or service.	Apply utility power for 48 hours to charge the batteries. If the condition persists, contact your service representative.
Bypass mode  LED is on.	An overload or a fault has occurred, or a command has been received and the UPS is in Bypass	Equipment is powered but not protected by the UPS. Check for one of the following alarms: overtemperature, overload or UPS LED is on. failure.
Power Overload  LED is on.	Power requirements exceed the UPS capacity (greater than 100% of nominal; see “User Settings” on page 8 for specific output overload ranges).	Remove some of the equipment from the UPS. The UPS continues to operate, but may switch to Bypass mode or shut down if the load increases. The alarm resets when the condition becomes inactive.
UPS Overtemperature  LED is on. 1 beep every 3 seconds	The UPS internal temperature is too high or a fan has failed. At the warning level, the UPS generates the alarm but remains in the current operating state. If the temperature rises another 10°C, the UPS transfers to Bypass mode or shuts down if Bypass is unusable.	If the UPS transferred to Bypass mode, the UPS will return to normal operation when the temperature drops 5°C below the warning level. If the condition persists, shut down the UPS. Clear vents and remove any heat sources. Allow the UPS to cool. Ensure the airflow around the UPS is not restricted. Restart the UPS. If the condition continues to persist, contact your service representative.
The UPS does not start	The input source is not connected correctly.	Check the input connections.
	The Remote Power Off (RPO) switch is active or the RPO connector is missing.	If the UPS Status menu displays the "Remote Power Off" notice, inactivate the RPO input.

7.2 Silencing the Alarm

Press the ESC (Escape) button on the front panel display to silence the alarm. Check the alarm condition and perform the applicable action to resolve the condition. If the alarm status changes, the alarm beeps again, overriding the previous alarm silencing.

7.3 Service and Support

If you have any questions or problems with the UPS, call your **Local Distributor** or your local service representative and ask for a UPS technical representative. Please have the following information ready when you call for service:

- Model number
- Serial number
- Firmware version number
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

If repair is required, you will be given a Returned Material Authorization (RMA) number. This number must appear on the outside of the package and on the Bill Of Lading (if applicable). Use the original packaging or request packaging from the Help Desk or distributor. Units damaged in shipment as a result of improper packaging are not covered under warranty. A replacement or repair unit will be shipped, freight prepaid for all warrantied units.

IMPORTANT

For critical applications, immediate replacement may be available. Call the Help Desk for the dealer or distributor nearest you.

7.4 CE Compliance Contact

- Eaton I.F. SAS - 110 Rue Blaise Pascal - 38330 Montbonnot St Martin – France.

Chapter 8 Specifications

8.1 Model Specifications

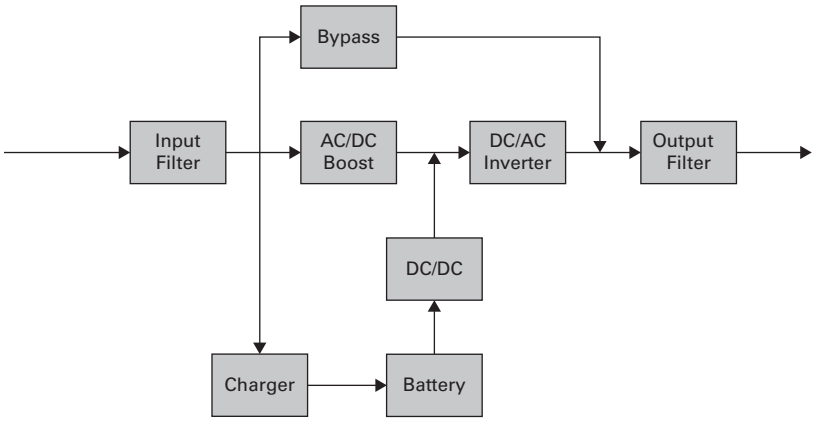


Table 7. Power Module List

Model	Power ratings
9PX1500RT-L	1500VA / 1350W
9PX2000RT-L	2000VA / 1800W
9PX3000RT-L	3000VA / 2700W
9PX1500GRT-L	1500VA / 1350W
9PX2200GRT-L	2200VA / 2000W
9PX3000GRT-L	3000VA / 2700W

Table 8. Extended Battery Module List

Model	Configuration	Battery Voltage	For Power Module
9PXEBM48RT-L	Rack / Tower	48Vdc	1500VA
9PXEBM72RT-L	Rack / Tower	72Vdc	2000 – 2200 – 3000VA

Table 9. Weights and Dimensions

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8

Table 9. Weights and Dimensions (Continued)

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

Table 10. Electrical Input

Model	Default Input (Voltage/Max Current)	Input Nominal Voltages	Input Voltage Window at Rated Load
9PX1500RT-L	120V / 12.5A	100V, 110V, 120V, 125V	100–138V
9PX2000RT-L	120V / 16A		
9PX3000RT-L	120V / 24A		
9PX1500GRT-L	208V / 7.2A	200V, 208V, 220V, 230V, 240V	176V-276V
9PX2200GRT-L	208V / 10.57A		
9PX3000GRT-L	208V / 14.42A		
Nominal Frequency		50/60Hz auto-sensing	
Frequency Range		40-70Hz before transfer to battery	
Bypass Voltage Range		-20% / +15% of nominal value (default)	
Noise Filtering		Input EMC filter	

Table 11. Electrical Input Connections

Model	Input Connection	Input cable
9PX1500RT-L	5–15P	8ft / 2.4m
9PX2000RT-L	5–20P	8ft / 2.4m
9PX3000RT-L	L5–30P	8ft / 2.4m
9PX1500GRT-L	IEC-C14, IEC 10A	6ft / 1.8m
9PX2200GRT-L	IEC-C20, 16 A inlet L6-20P to C19 jumper provided	6ft / 1.8m
9PX3000GRT-L		

Table 12. Electrical Output

All Models	Normal Mode	Efficiency Mode	Battery Mode
Voltage Regulation	±1%		±2%
Efficiency	90.0% for 1.5K LV models 91% for 1.5K G models 91.4% for 2K LV models 93% for 2K G models 94% for 3K G models	95.8% for 1K5 LV models 96.5% for 1.5K G models 96.8% for 2K LV models 98% for 2K G models 97.2% for 3K LV models 98% for 3K G models	84% for 1.5K LV models 87.5% for 1.5K G models 86% for 2K LV models 90% fo r 2K G models 86% for 3K LV models 89% for 3K G models

Table 12. Electrical Output (Continued)

All Models	Normal Mode	Efficiency Mode	Battery Mode
Frequency Regulation	Sync with line ±5% of nominal line frequency (outside this range: ±0.5% of auto-selected nominal frequency)		±0.5% of auto-selected nominal frequency
Nominal Output	[100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V] (G models)		
Frequency	50 or 60 Hz, autosensing or configurable as a frequency converter		
Output Overload	Online mode: 102%~130% :12s 130%~150% :2s >150% :shutdown after 300ms Percent is based on nominal Watt/VA. Transfer behavior can change (see output mode setting on page 14) Battery mode: 102%~130% :12s >130% :2s Overload warning then transfer to stop output		
Output Overload (Bypass Mode)	102%~110% :Overload warning 110%~130% :shutdown after 5mins 130%~150% :shutdown after 15s >150% :shutdown after 300ms Percent is based on nominal current in bypass mode		
Voltage Waveform	Sinewave		
Harmonic Distortion	< 3% THDV on linear load < 5% THDV on non-linear load		
Transfer Time	Online Mode: 0ms High Efficiency mode: 10ms maximum (due to loss of utility)		
Power Factor	Up to 1.0		
Load Crest Ratio	Up to 3:1		

Table 13. Electrical Output Connections

Model	Output Connection	Output Cable
9PX1500RT-L	5-15R (8)	No
9PX2000RT-L	5-20R(2) + L5-20R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX3000RT-L	5-20R(2) + L5-30R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX1500GRT-L	(4) IEC10A (2) IEC10A (2) IEC10A (2) IEC 10A	No

Table 13. Electrical Output Connections (Continued)

Model	Output Connection	Output Cable
9PX2200GRT-L	(4) IEC10A + (1) IEC16A (2) IEC10A + (1) IEC16A group 1 (2) IEC10A group 2	(2) IEC 10A
9PX3000GRT-L		

Table 14. Environmental and Safety

Certifications	IEC/EN 62040-1 IEC/EN 62040-2 : Cat. C1 IEC/EN 62040-3 UL1778 5th edition CSA 22.2
EMC (Emissions)*	CISPR22 Class B FCC part 15 Class B / ICES-003
EMC (Immunity)*	IEC 61000-4-2, (ESD): 8 kV Contact Discharge / 15 kV Air Discharge IEC 61000-4-3, (Radiated field): 10 V/m IEC 61000-4-4, (EFT): Power (Coupling network) 4 kV / Ethernet (Coupling clamp) 2 kV IEC 61000-4-5, (Surges): 2 kV Differentiel Mode / 4 kV Common Mode / 1 kV Ethernet IEC 61000-4-6, (Electromagnetic field): 10 V IEC 61000-4-8, (Conducted magnetic field): 30 A/m
* for output cable < 10m.	
Agency Markings*	cULus / NOM / Energy Star / BSMI
Operating Temperatures	0 to 40°C (32 to 104°F) in Online mode, with linear derating for altitude **Note:** thermal protection switches load to Bypass in case of overheating.
Storage Temperatures	0 to 40°C (32 to 104°F) with batteries -25 to 55°C (-13 to 130°F) without batteries
Transit Temperature	-25 to 55°C (-13 to 130°F)
Relative Humidity	0 to 96% no condensing
Operating Altitude	Up to 3,000 meters (9,843 ft) above sea level, no derating for 35°c (95°F) room temperature
Transit Altitude	Up to 10,000 meters (32,808 ft) above sea level
Audible Noise	< 47 dBA at 1 meter typical for 2K et 3K models < 40 dBA at 1 meter typical for 70, 1K et 1K5 models
***** 9PX1500RT-L, 9PX2000RT-L, 9PX3000RT-L, 9PX1500GRT-L, 9PX2200GRT-L, 9PX3000GRT-L have cULus/Energy Star/ BSMI. 9PXEBM48RT-L, 9PXEBM72RT-L have cULus / NOM.	

Table 15. Battery

	Internal Batteries	EBM
Rack / Tower configuration	1500VA: 48Vdc 2200VA: 72Vdc 3000VA: 72Vdc	9PXEBM48RT: 48Vdc 9PXEBM72RT: 72Vdc
Type	Lithium Iron Phosphate (LFP) battery module Lithium-Ion float service life 8 years /25°C	
Monitoring	Integrated battery management system (BMS) for temperature regulation and life cycle monitoring.	
EBM Battery Cable Length	350 mm / 13.78 in	

P-164001006 06

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Five-Year Limited Warranty (US and Canada)

Eaton UPS Models: 9PX Lithium-ion

WARRANTOR: The warrantor for the limited warranties set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED WARRANTY: This limited warranty (this "Warranty") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") purchased on or after March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Company for resale to an End-User.

LIMITED WARRANTY PERIOD: The period covered by this Warranty for Product installed [and currently located] in the fifty (50) United States, the District of Columbia, and Canada is sixty (60) months from the date of purchase, or sixty six (66) months from the date of shipment.

WHAT THIS LIMITED WARRANTY COVERS: The warrantor warrants that the Product and battery (individually and collectively, the "Warranted Items") are free from defects in material and workmanship. If, in the opinion of Company, a Warranted Item is defective and the defect is within the terms of this Warranty, Company's sole obligation will be to repair or replace such defective Warranted Item (including by providing service, parts and labor, as applicable), at the option of Company.

PROCEDURES FOR REPAIR OR REPLACEMENT OF WARRANTED ITEMS: The Warranted Item will be repaired or replaced at a Company site or such other location as determined by Company.

If the Warranted Item is to be replaced by Company, and the End-User supplies a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives notice of the warranty claim. In such case, the End-User must return (at Company's expense) the defective Warranted Item to Company in the same packaging as the replacement Warranted Item received by the End-User or as otherwise instructed by Company. If Company does not receive the defective Warranted Item, Company will either charge the End-User's credit card, or send the End-User an invoice (which the End-User agrees to pay), for the value of the replacement Product.

If the Warranted Item is to be replaced by Company, but the End-User is unwilling or unable to supply a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives the defective Product from the End-User.

In any case, Company will provide shipping instructions and will pay its designated carrier for all shipping charges for return of defective equipment and replacement of Warranted Items. Any returned Warranted Item or parts that are replaced may be new or reconditioned. All Warranted Items returned to Company and all parts replaced by Company shall become the property of Company.

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.

This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.

Company shall not be responsible for any charges for testing, checking, removal, or installation of Warranted Items.

COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.

COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.

THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON-CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY), OR OTHERWISE.

LIMITATION OF LIABILITY: The remedies of the End-User set forth herein are exclusive and are the sole remedies for any failure of Company to comply with its obligations hereunder. In no event shall Company be liable in contract, in tort (including negligence or strict liability) or otherwise for damage to property or equipment other than the Products, including loss of profits or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of Company hereunder whether the claims are based in contract (including indemnity), in tort (including negligence or strict liability), or otherwise, shall not exceed the price of the Product on which such liability is based.

Company shall not be responsible for failure to provide service or parts due to causes beyond Company's reasonable control.

END-USER'S OBLIGATIONS: In order to receive the benefits of this Warranty, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.

OTHER LIMITATIONS: Company's obligations under this Warranty are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Warranty. Also during such time, the period of this Warranty shall continue to run and the expiration of this Warranty shall not be extended upon payment of any overdue or unpaid amounts.

COSTS NOT RELATED TO WARRANTY: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Warranty, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Warranty will be borne by the End-User.

OBTAINING WARRANTY SERVICE: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, call your local Eaton product sales or service representative. For comments or questions about this Warranty, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.

Load Protection Guarantee (US and Canada)

Eaton UPS Models 9PX Lithium-ion

GUARANTOR: The Guarantor for the load protection guarantee set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED GUARANTEE: This load protection guarantee (this "Guarantee") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") and cannot be transferred. This Guarantee applies even in the event that the Product is initially sold by Company for resale to an End-User.

WHAT THIS GUARANTEE COVERS: For the lifetime of the Product, Guarantor promises to repair or replace, at Guarantor's option, the equipment (valued up to the limits shown below*) that is damaged by an AC power line surge, spike, or other transient when properly connected to Guarantor's uninterruptible power system ("UPS"). Reimbursement for or restoration of data loss excluded. This Guarantee applies only if all of the following circumstances arise:

1. The UPS is plugged into properly grounded and wired outlets, using no extension cords, adapters, other ground wires, or other electrical connectors;
2. The installation of the UPS complies with all applicable electrical and safety codes described by the National Electrical Code® (NEC®);
3. The UPS was used under normal operating conditions and in accordance with all labels and instructions; and
4. The UPS was not damaged by accident (other than AC power line transient), misuse, or abuse.

***Cumulative Limits to be paid by Guarantor under this Load Protection Guarantee:**

$150,000 for Eaton UPS Models 9PX Lithium-ion

WHAT THIS GUARANTEE DOES NOT COVER: Any reimbursement or repair to End-User's equipment does not include reimbursement for or restoration of any data loss. This Guarantee does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation of Product; (d) repair or alteration of Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind to the Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Guarantee is not valid: if the Product's serial numbers have been removed or are illegible.
Company shall not be responsible for any charges for testing, checking, removal, or installation of any items.

LIMITATION OF LIABILITY: The remedies of the END-USER set forth HEREIN are exclusive and are THE sole remedies for any failure of COMPANY to comply with its obligations hereunder. EXCEPT AS OTHERWISE PROVIDED FOR IN THIS GUARANTEE, in no event shall COMPANY be liable in contract, in tort (including negligence or strict liability), or otherwise for damage to property or equipment other than THE products, INCLUDING loss of profits or revenue, loss of use of products, LOSS OF DATA, cost of capital, claims of customers of the END-USER or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of COMPANY HEREUNDER whether the claims are based in contract (INCLUDING INDEMNITY), in tort (including negligence or strict liability), or otherwise, shall not exceed THOSE SET FORTH ABOVE.
Company shall not be responsible for failure to provide repair or replacement under this Guarantee due to causes beyond Company's reasonable control.
END-USER'S OBLIGATIONS: In order to receive the benefits of this Guarantee, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.
OTHER LIMITATIONS: Company's obligations under this Guarantee are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Guarantee.
COSTS NOT RELATED TO GUARANTEE: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Guarantee, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Guarantee will be borne by the End-User.
TO MAKE A CLAIM: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, contact your local Eaton product sales or service representative. For comments or questions about this Load Protection Guarantee, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.
WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.
Company shall not be responsible for any charges for testing, checking, removal or installation of Warranted Items.
COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.
COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.
THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON- CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE

Product specifications

Eaton 9PXEBM48RT-L

Catalog Number: 9PXEBM48RT-L

Eaton 9PX lithium ion extended battery module (EBM), 1U, used with 9PX1500RT-L, 9PX1500RTN-L, 9PX1500GRT-L

General specifications

Product Name
Eaton 9PX extended battery module (EBM)

Catalog Number
9PXEBM48RT-L

UPC
743172105592

Product Length/Depth
17.6 in

Product Height
1.7 in

Product Width
17.2 in

Product Weight
36.5 lb

Compliances
CE Marked
FCC part 15 Class B
IEC 62040-2 Cat C1

Certifications
NOM
cTUVus

Product specifications

Type

Extended Battery Module (EBM)

Runtime graph

View runtime graph

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Used with

9PX1500RT-L, 9PX1500GRT-L, 9PX1000GRT-L

Rack size

1U

Color

Black/silver

Rack mounting kit

Yes

Form factor

Rack/tower

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 2 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Temperature range

0° to 40°C (32° to 104°F)

Relative humidity

0-96% non-condensing

Resources

Brochures

Eaton 9PX lithium-ion UPS brochure

Drawings

Eaton 9PXEBM4RT-L 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide



Eaton Corporation plc
Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com

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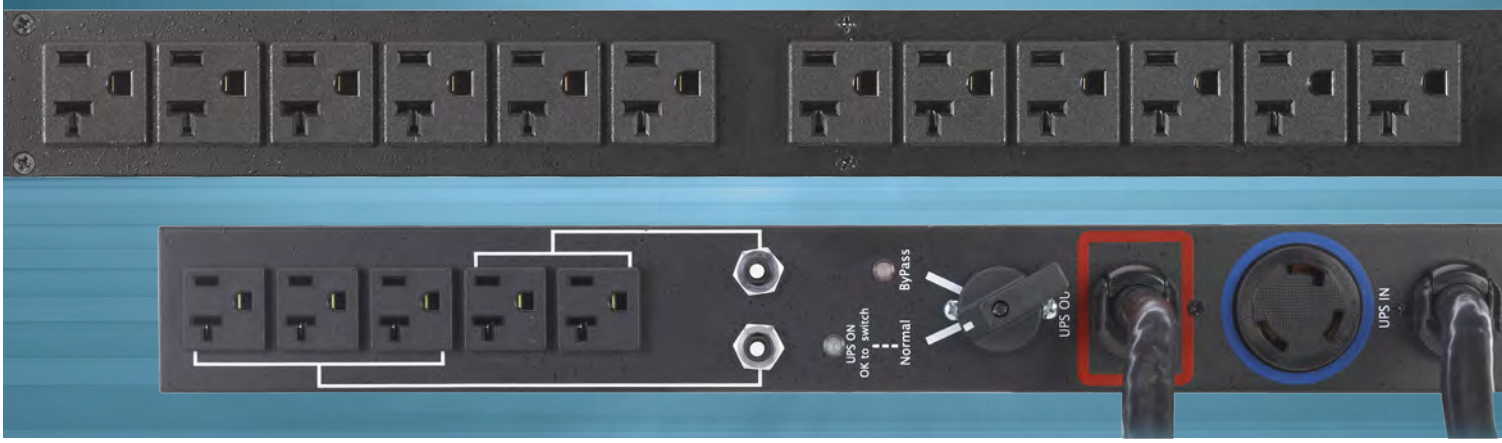
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Product brochure



Eaton FlexPDU and Maintenance Bypass PDU

Eaton provides five different functions for rack power distribution solutions. Two of these functions, FlexPDU and Maintenances Bypass PDU, were created as accessories specific to some of our UPSs. Both of these units offer the flexibility of connections to meet the demanding requirements of today's data center architects.

The HotSwap Maintenance Bypass (MBP) unit enables easy UPS replacement without interruption of the load. The HotSwap MBP is ideal when exchanging a unit or servicing a UPS. For added convenience, the HotSwap MBP offers two types of receptacles: 5-15R or 5-20R.

The FlexPDU is a basic function power distribution unit with a short power cord for easy, close mounting. FlexPDUs are available with 5-15R, 5-20R or L5-20R output receptacles, for connection to a wide range of equipment.

Both of these options allow for easy deployment, even in space-constrained environments. You have a variety of mounting options, including top and side mounting.

Features

- HotSwap MBP provides service continuity during UPS maintenance or upgrade
- Both units offer connections to all types of equipment
- Eases installation with flexible mounting options
- Minimal depth accommodates most space constraints



Side mounting Flex PDU with Tower UPS



Top mounting horizontal FlexPDU with 2U UPS

HotSwap MBPs rackmounted horizontally in rack



Top mounting vertical FlexPDU



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FLEXPDU MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EFLXL1500R-PDU1U	58015	5-15P	None	1.44	BA	3	1U	(12) 5-15R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1U	58020	5-20P	None	1.92	BA	3	1U	(12) 5-20R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1UL	58021	5-20P	None	1.92	BA	3	1U	(5) L5-20R	1.7 x 19.0 x 3.0
EFLXI3000R-PDU1UIEC	68438	C20 Inlet	(2) 20A	3.33	BA	3	1U	(12) C13, (1) C19	1.7 x 19.0 x 2.4

HOTSWAP MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EHBPL1500R-PDU1U	58115	5-15P	None	1.44	BA	8	2U	(6) 5-15R	2.1 x 17.3 x 3.8
EHBPL2000R-PDU1U	58120	5-20P	None	1.92	BA	8	2U	(6) 5-20R	2.1 x 17.3 x 3.8
EHBPL3000R-PDU1U	58130	L5-30P	(2) 20A	2.88	BA	3.3	2U	(5) 5-20R	2.1 x 17.3 x 3.8

COMPATIBILITY MATRIX FOR RACKMOUNT UPSs*

FlexPDU plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P 1U UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5) 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓

*For tower models, all FlexPDUs can be wall-mounted. ** Rear mounting available on 3U models only.

HotSwap MBP plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5P 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓
30A	Eaton 5PX UPS, 3000 VA	✓
	Eaton 9PX UPS, 3000 VA	✓

*For tower models, all HotSwap MBPs can be wall-mounted. **Rear mounting available on 3U models only.

To interact with the FlexPDU and Maintenance Bypass PDF, please visit: **Eaton.com/epdu**

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Cleveland, OH 44122
United States
Eaton.com

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August 2017

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Product specifications

Eaton EHBPL1500R-PDU1U

Catalog Number: EHBPL1500R-PDU1U

Eaton Basic rack PDU, 1U - EHBPL1500R-PDU1U



General specifications

Product Name	**Catalog Number**
Eaton HotSwap MBP	EHBPL1500R-PDU1U
UPC	**Product Length/Depth**
743172067340	17.3 in
Product Height	**Product Width**
2.1 in	3.8 in
Product Weight	**Warranty**
0.0001 lb	3 year
Compliances	**Certifications**
Contact Manufacturer	UL Listed

Powering Business Worldwide

Product specifications

Outlet control
No

Cord length
8 ft

Phase
Single-phase

Input voltage
110-125V

Color
Black

Wattage
1.44 kW max

Form factor
2U

Mounting direction
Horizontal

Amperage Rating
12A

Input connection
5-15P

Outlets
(6) 5-15R

Type
PDU

Frequency rating
50-60 Hz

Operating Temperature
0° to 60°C (32° to 140°F)

Number of Outputs 5-15R
6

Circuit breaker
None

Resources

Brochures

Eaton Flex and Hotswap MBP ePDU brochure

Drawings

Eaton ePDU visio stencils

Eaton FlexPDU EHBPL 1500R-PDU1U technical drawing

Specifications and datasheets

Eaton Specification Sheet - EHBPL1500R-PDU1U

User guides

Eaton FlexPDUs and HotSwap MBP installation and user manual



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HotSwap

Maintenance ByPass

MBP - 115 / EHBPL1500R-PDU1U

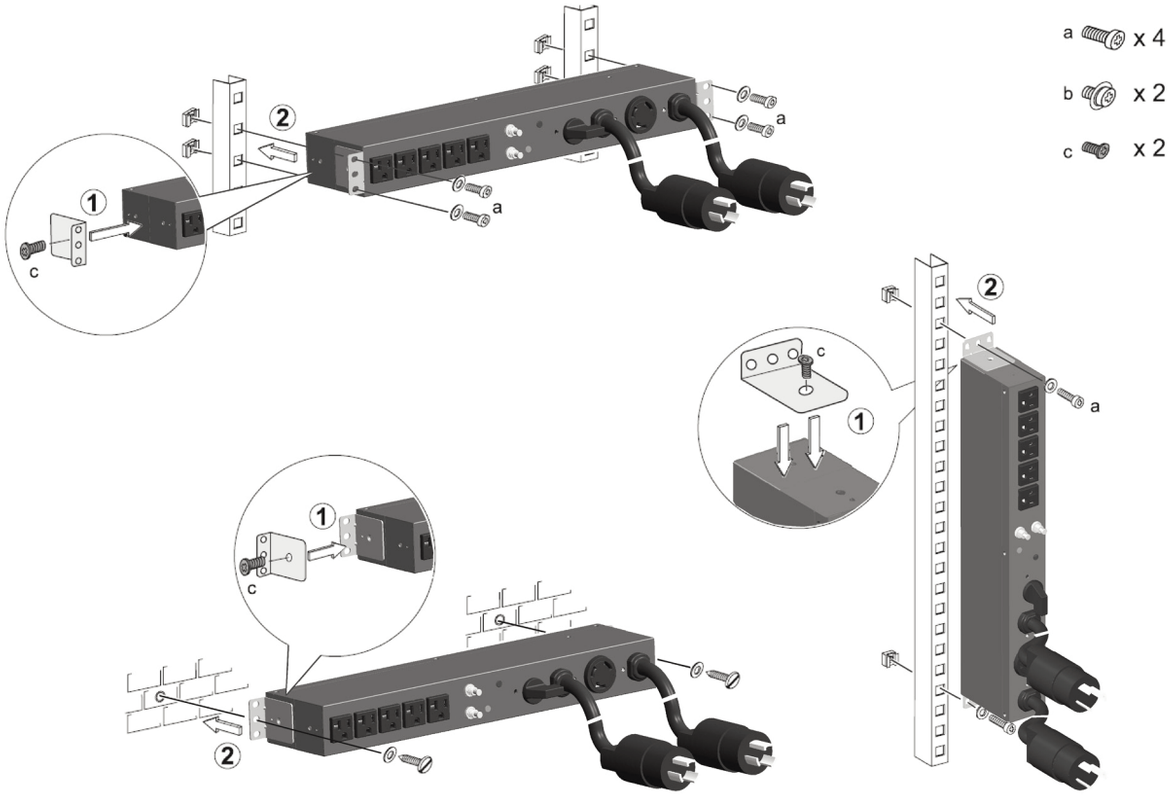
MBP - 120 / EHBPL2000R-PDU1U

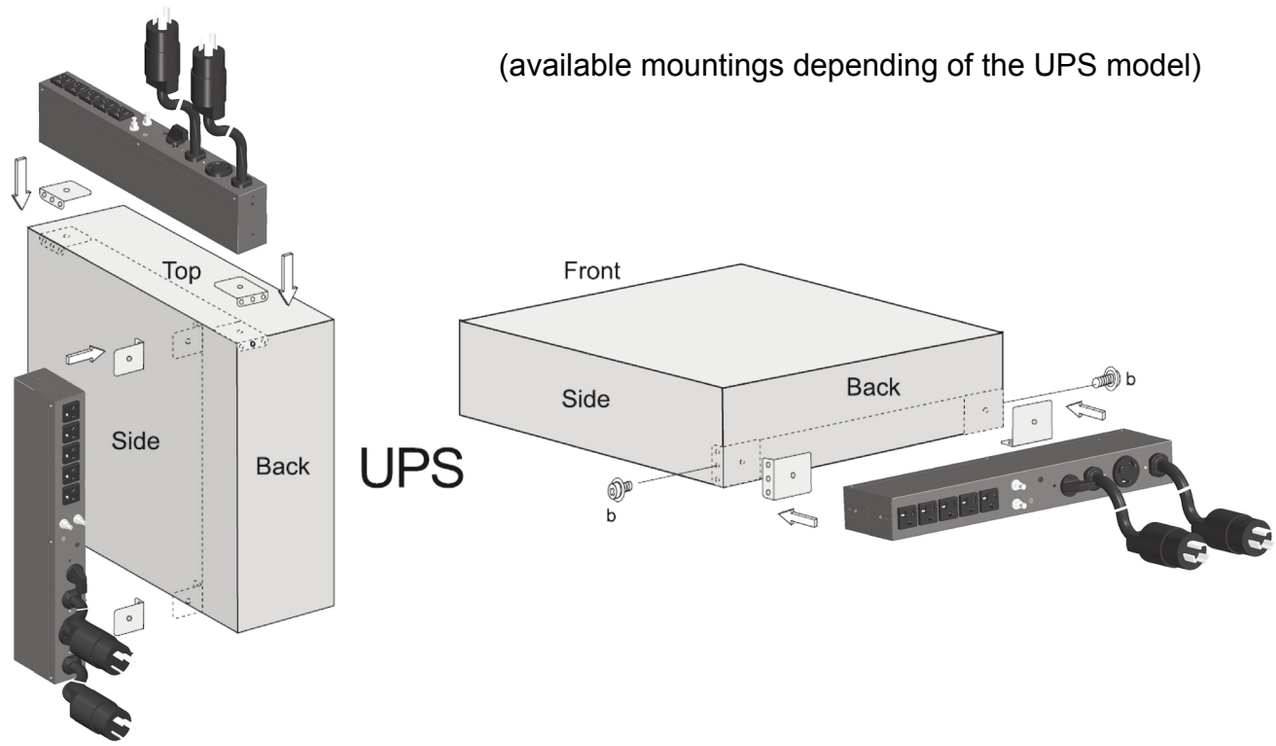
MBP - 130 / EHBPL3000R-PDU1U

Installation and User Manual

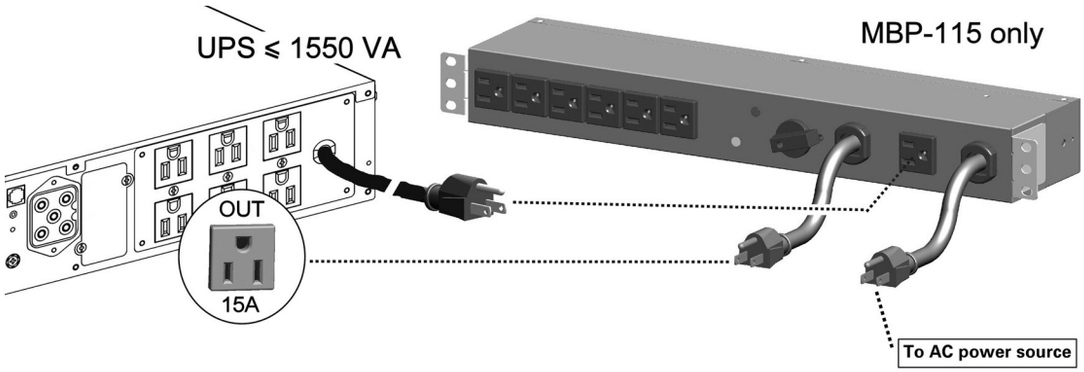
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Français
Español
Português

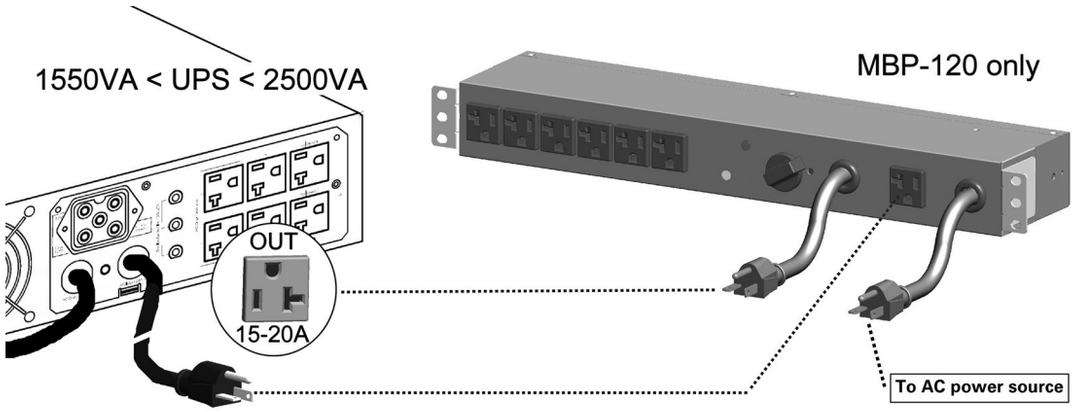
HotSwap Connections

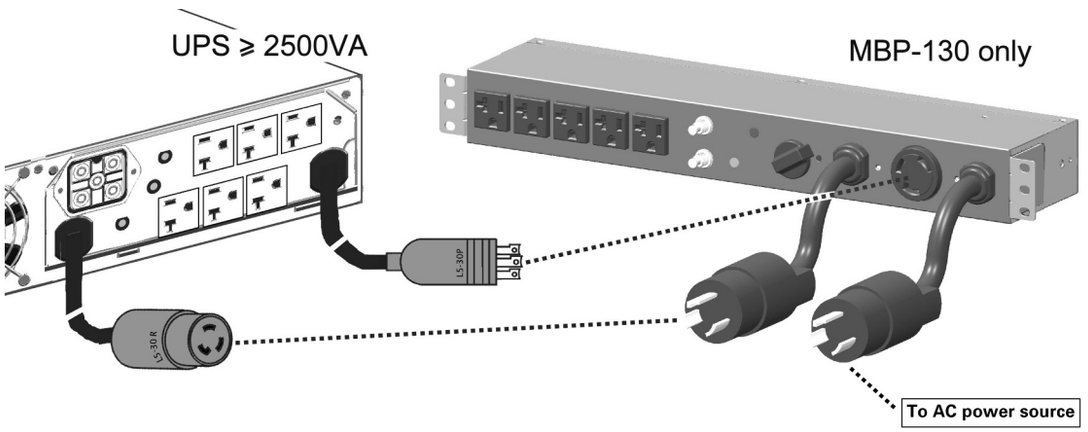


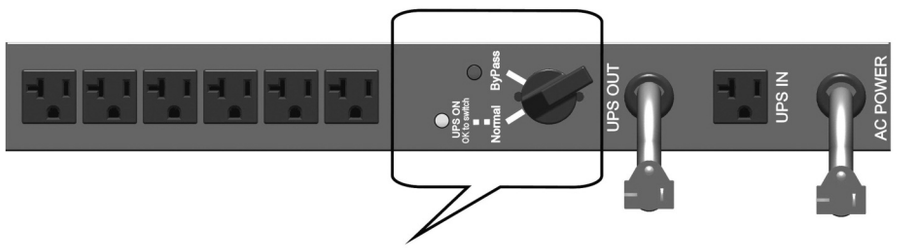


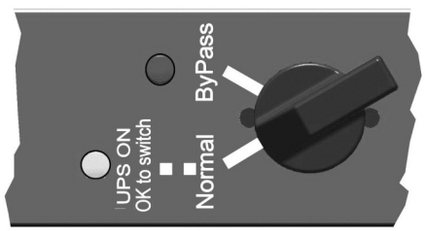
(available mountings depending of the UPS model)


UPS ≤ 1550 VA
MBP-115 only
OUT
15A
To AC power source


1550VA < UPS < 2500VA
MBP-120 only
OUT
15-20A
To AC power source


UPS ≥ 2500VA
MBP-130 only
L5-30P
L5-30R
To AC power source


UPS ON
OK to switch
Normal
ByPass
UPS OUT
UPS IN
AC POWER


UPS ON
OK to switch
Normal
ByPass

English

Safety guidelines to read before installing the product

- The product must be used indoors only.
- Do not place the product near liquid or in an excessively damp environment.
- Do not place the product directly in the sun or near a heat source.
- Do not let liquid or foreign objects enter the product.
- Ground the product using a 2 poles + ground socket (2P + G).
- When installing the product, ensure that the sum of the leakage currents of the product and the devices it supplies does not exceed 3.5 mA.
- The AC-power input must be connected to an appropriate electrical network protection or tap-off circuit (fuse or circuit-breaker).

Use

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function). Refer to the illustrations.

Installation

Refer to the UPS installation and user manual.

HotSwap MBP module operation

The HotSwap MBP module has a rotary switch with two positions:

- Normal - the load is supplied by the UPS,
- Bypass - the load is supplied directly by the AC-power source.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch to the Normal position.
3. Start the UPS by pressing the ON/OFF button on the UPS control panel:

- The load is supplied by the UPS.
- Green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

HotSwap MBP module test

1. Set switch to the Bypass position and check that the load is still supplied.
2. Set switch back to the Normal position.

Maintenance on a UPS equipped with the HotSwap MBP module

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function).

Maintenance:

1. Set switch to the Bypass position. The red LED on the HotSwap MBP module goes ON, indicating that the load is supplied directly with AC power.
2. Stop the UPS: green LED "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation:

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Start the UPS: green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON (otherwise, there is a connection error between the HotSwap MBP module and the UPS).
3. Set switch to the Normal position. The red LED on the HotSwap MBP module goes OFF.

Français

Consignes de sécurité, à lire avant l'installation du produit

- Le produit doit être utilisé à l'intérieur seulement.
- Ne pas placer le produit à proximité de liquide, ou dans un environnement d'humidité excessive.
- Ne pas placer le produit directement au soleil ou à proximité d'une source de chaleur.
- Ne pas laisser pénétrer de liquide ou d'objet étranger à l'intérieur du produit.
- Relier impérativement le produit à la terre à l'aide d'une prise de courant 2 pôles + terre (2P+T).
- S'assurer lors de l'installation du produit que la somme des courants de fuite du produit et des appareils qu'il alimente ne dépasse pas 3.5 mA.
- La fiche d'alimentation doit être connectée à un circuit de dérivation ou de protection du réseau électrique (fusible ou disjoncteur) approprié.

Utilisation

Le Module HotSwap MBP permet la maintenance et éventuellement le remplacement de l'ASI sans affecter l'alimentation électrique des équipements connectés (fonction HotSwap).

Installation

Se reporter au manuel d'installation et d'utilisation de l'ASI.

Fonctionnement du module HotSwap MBP

Le module HotSwap MBP utilise un commutateur rotatif à 2 positions :

- Normal : les équipements sont alimentés par l'ASI.
- By-pass : les équipements sont alimentés par le réseau électrique.

Mise en service de l'ASI avec le module HotSwap MBP :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Placer le commutateur en position Normal.
3. Mettre en marche l'ASI :

- Les équipements sont alors alimentés par l'ASI.
- Le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP.

Test du module HotSwap MBP

1. Placer le commutateur en position By-pass et vérifier que les équipements sont toujours alimentés.
2. Remettre le commutateur en position Normal.

Maintenance d'une ASI équipée d'un module HotSwap MBP

Remplacement de l'ASI sans interrompre l'alimentation électrique des équipements connectés :

1. Placer le commutateur en position By-pass : le voyant rouge du module HotSwap MBP s'allume pour indiquer que les équipements sont alimentés directement par le réseau électrique.
2. Arrêter l'ASI : le voyant vert "UPS ON - OK to switch" s'éteint, l'ASI peut alors être déconnectée et remplacée.

Retour en fonctionnement normal :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Mettre en marche l'ASI : le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP (sinon il y a erreur de raccordement du module HotSwap MBP avec l'ASI).
3. Mettre le commutateur en position Normal : le voyant rouge du module HotSwap MBP s'éteint.

Español

Consignas de seguridad leer antes de instalar el producto

- El producto debe utilizarse únicamente al interior.
- No colocar el producto cerca de líquidos o en un entorno de humedad excesiva.
- No colocar el producto directamente bajo los rayos del sol ni cerca de una fuente de calor.
- No dejar que penetre líquido u objeto ajeno al interior del producto.
- Conectar imperativamente el producto a tierra utilizando una toma de corriente de 2 polos + tierra (2P+T).
- Cerciorarse durante la instalación del producto que la suma de las corrientes de fuga del producto y de los aparatos que alimenta no excede 3.5 mA.
- La toma de la red debe estar conectada a un circuito de derivación o de protección de la red eléctrica (fusible o interruptor automático) apropiado.

Utilización

La función del módulo HotSwap MBP es permitir el mantenimiento y, eventualmente, la sustitución del SAI sin que ello afecte a la alimentación eléctrica de los equipos conectados (función HotSwap).

Instalación

Véase el manual de instalación y empleo del SAI.

Funcionamiento del módulo HotSwap MBP

El módulo HotSwap MBP utiliza un conmutador rotativo de 2 posiciones:

- Normal: los equipos están siendo alimentados por el SAI.
- Bypass: los equipos están siendo alimentados por la red eléctrica.

Puesta en servicio del SAI con el módulo HotSwap MBP:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Colocar el conmutador en posición Normal.
3. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI.

- Los equipos están siendo alimentados ya por el SAI.
- El indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP.

Test del módulo HotSwap MBP

1. Colocar el conmutador en posición Bypass y comprobar que los equipos sigan estando alimentados.
2. Volver a poner el conmutador en posición Normal.

Mantenimiento de un SAI equipado con un módulo HotSwap MBP

Mantenimiento:

1. Colocar el conmutador en posición Bypass: el indicador luminoso rojo del módulo HotSwap MBP se enciende para indicar que los equipos están siendo alimentados directamente por la red eléctrica.
2. Parar el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI:

El indicador luminoso verde "UPS ON - OK to switch" se apaga, ya se puede desconectar el SAI y sustituirlo.

Vuelta a funcionamiento normal:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI: el indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP (en caso contrario, hay un error en la conexión entre el módulo HotSwap MBP y el SAI).
3. Poner el conmutador en posición Normal: el indicador luminoso rojo del módulo HotSwap MBP se apaga.

Português

Instruções de segurança: ler antes da instalação do produto

- O produto deve ser unicamente utilizado no interior.
- Não coloque o produto na proximidade de líquidos, ou num ambiente de humidade excessiva.
- Não coloque o produto directamente ao sol ou na proximidade de uma fonte de calor.
- Não deixe penetrar líquido ou objecto estranho dentro do produto.
- Ligue imperativamente o produto à terra graças a uma ficha de corrente 2 pólos + terra (2P+T).
- Verifique durante a instalação do produto que a soma das correntes de fuga do produto e dos aparelhos que o mesmo alimenta não ultrapassa 3.5 mA.
- A tomada sector deve estar ligada a um circuito de derivação ou de protecção da rede eléctrica (fusível ou disjuntor) apropriado.

HotSwap MBP models: MBP - 115, MBP - 120, MBP - 130

Input	MBP - 115 MBP - 120 MBP - 130	NEMA 5-15P 15A cord (3.3 ft length) NEMA 5-20P 20A cord (3.3 ft length) NEMA L5-30P 30A cord (3.3 ft length)
Output	MBP - 115 MBP - 120 MBP - 130	6 NEMA 5-15R 15A socket outlets 6 NEMA 5-20R 20A socket outlets 5 NEMA 5-20R 20A socket outlets
Dimensions (HxLxD)	2.1 x 17.3 x 3.8 inches	
Performances Nominal voltage Frequency	100/104/110/120/127 50/60 Hz	
Input nominal current	MBP - 115 MBP - 120 MBP - 130	12 A 16 A 24 A
Maximal power	MBP - 115 MBP - 120 MBP - 130	1440 VA 1920 VA 2880 VA
Standards Product	MBP - 115 MBP - 120 MBP - 130	UL 1778
Marking	C UL US LISTED CE	
Environment Temperature Humidity Altitude	 Storage -25°C to 55°C (-77°F to 131°F), operation 0°C to 45°C (32°F to 113°F) Storage 10% to 90%, operation 20% to 90% Transportation up to 12000 m (39370 ft), operation up to 1500 m (4921 ft)	

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Raleigh, NC 27615 U.S.A
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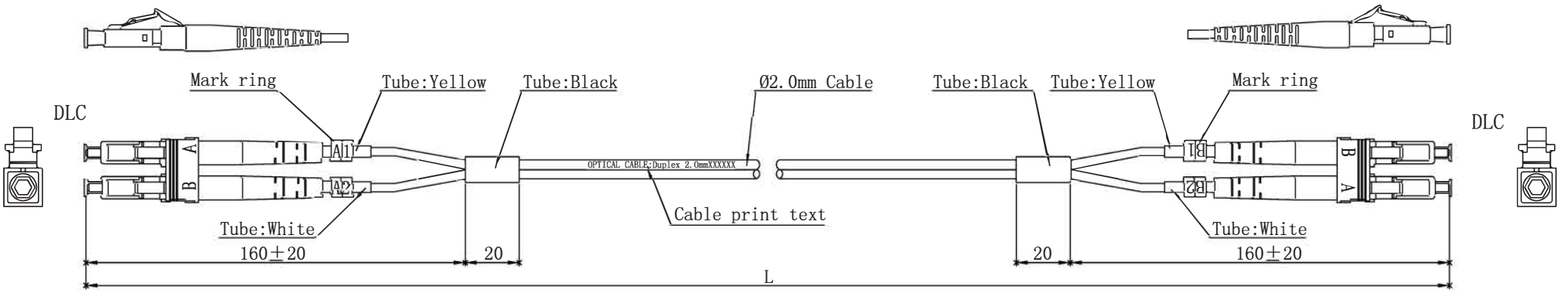
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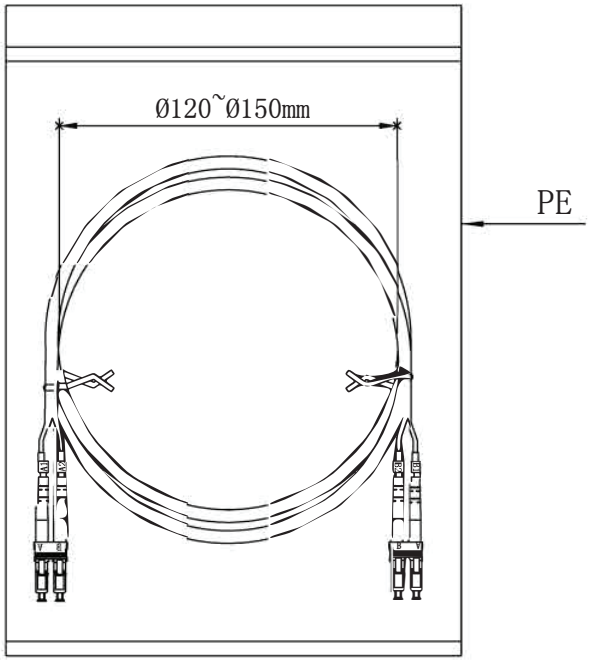
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NOTE:ALL MATERIAL COMPLIANT ROHS STANDARD

REVISION INFORMATION			
Rev.	Rev. Date	Modified By	Brief Description





Specifications:

Type	DLC/UPC-DLC/UPC
Fiber Mode	SM
Core Diameter(um)	9/125
Operating Wavelength(nm)	1310/1550
Cable Color	Yellow
Cable Diameter(mm)	Ø2.0
Operating Temperature(° C)	-40~+75
Storage Temperature(° C)	-40~+85
Insertion loss(dB)	≤0.3dB
Return loss(dB)	≥50dB

L≤5m, TOLERANCES:0≤ΔL≤5cm
L>5m, TOLERANCES:0≤ΔL≤1%*L

NO.	PART NAME	SPECIFICATION DESCRIPTION	QT'Y	UNIT
①				
②				
③				

Unless specified on the drawing, tolerances are per the follows:

. +1
.x +0.2
.xx +0.05

LANshack
Sales@LANshack.com | 888-568-1230

DRAWN BY	DATE: 2015/05/14	DESCRIPTION: LC-LC-DX SM Patchcord	
CHECKED BY	SHEET 1of1	ITEM NO. SFPC-SM-LCLC-XX	
APPROVED BY	SCALE 1:1	REV. 00	UNIT:mm

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PLACEHOLDER

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER _____ EQPT SERIAL NO: _____

EQPT TAG NO: _____ EQPT/SYSTEM: _____

PROJECT NO: _____ SPEC. SECTION: _____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

☐ Installed in accordance with Manufacturer's recommendations.

☐ Inspected, checked, and adjusted.

☐ Serviced with proper initial lubricants.

☐ Electrical and mechanical connections meet quality and safety standards.

☐ All applicable safety equipment has been properly installed.

☐ Functional tests.

☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: _____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate their equipment and (iii) authorized to make recommendations required to ensure equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____, 20___

Manufacturer:_____

By Manufacturer's Authorized Representative: _____

(Authorized Signature)

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PLACEHOLDER

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO.:_____

1. EQUIPMENT ITEM_____
2. MANUFACTURER _____
3. EQUIPMENT/TAG NUMBER(S) _____
4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____
5. NAMEPLATE DATA (hp, voltage, speed, etc.) _____
6. MANUFACTURER'S LOCAL REPRESENTATIVE _____
   a. Name_____ Telephone No. _____
   b. Address _____
7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Frequency**	**Lubricant (If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant required.

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PLACEHOLDER

8. LUBRICANT LIST

Reference Symbol	Shell	Exxon Mobile	Chevron Texaco	BP Amoco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY.

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this Contract with two asterisks.				

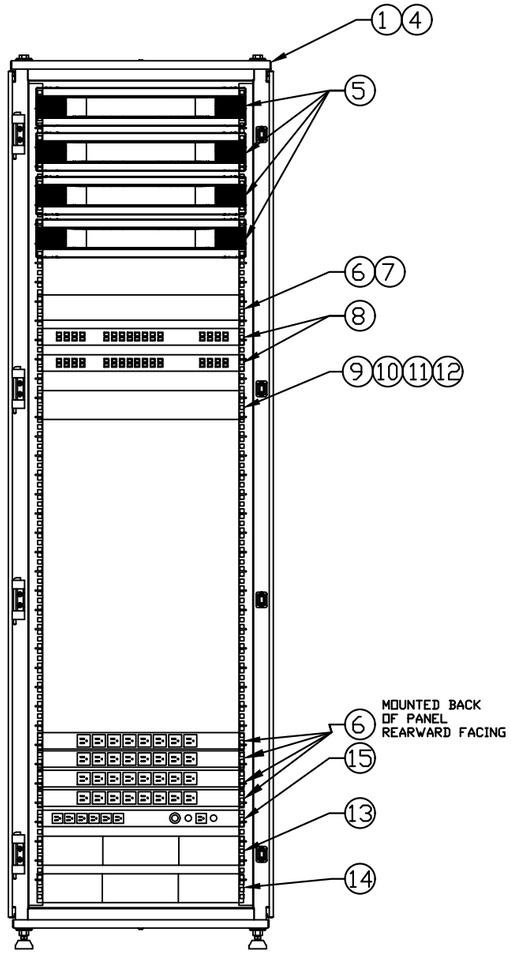
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Bill of Materials

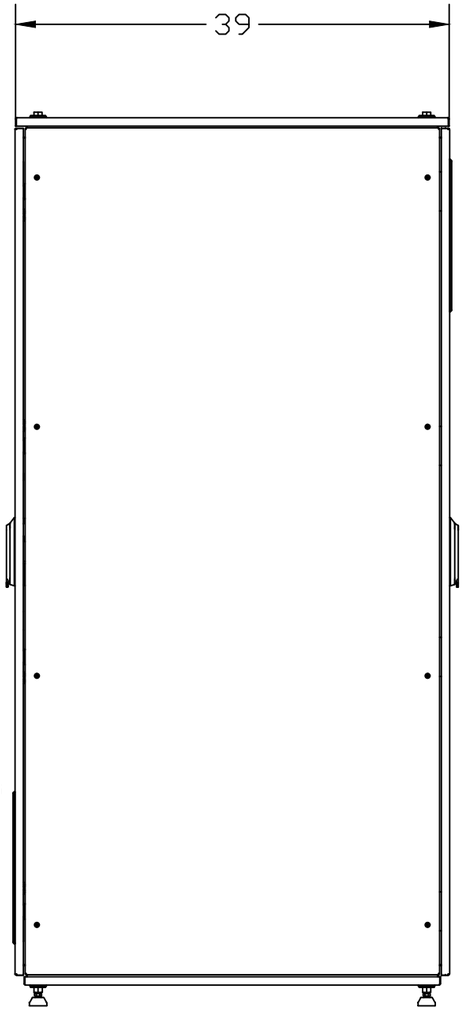
Project: Coos Bay Wastewater Treatment Plant 1 Phase 1A Improvements
Specification Section(s): Section 40 95 80 – Fiber Optic Communication System
Date: September 2025

Item No.	Qty.	Network Interface Panel	Description	Manufacturer	Manufacturer Part Number	Specification Section	Drawing
001	1	C92NIP0001	HDME Series NEMA-Rated Dust-Tight Cabinet, 81.14" H x 23.62" W x 39.37" D	Hammond	HDME20610BK	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
002	1	C92NIP0001	PF GEN4 Series CFM Filter Fan	Hammond	PF67000T12BK	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
003	1	C92NIP0001	PF GEN4 Series Exhaust Filter	Hammond	PFA60000BK	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
004	1	C92NIP0001	SKT Series Thermostat, NO	Hammond	SKT011419NO	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
005	4	C92NIP0001	CableTek Horizontal Cable Manager, 2U, Double-Sided	Hoffman	DCHD2	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
006	4	C92NIP0001	Power Distribution Unit, 10 Receptacle, 20 Amp	Hoffman	DP1N191020	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
007	1	C92NIP0001	Q-Series Rackmount Enclosure, 2U	Ortronics	EQ02U-CHC	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
008	6	C92NIP0001	6-LC Single-Mode Adapters w/ Ceramic Alignment Sleeves	Ortronics	OFP-LCD12AC	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
009	2	C92NIP0001	Modular Managed Ethernet Switch, Dual AC	Red Lion	NT24K-AC2	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
010	2	C92NIP0001	Module 8 Port 10/100/1000BaseT	Red Lion	NT24K-TX8	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
011	4	C92NIP0001	Module-8 SFP Expansion Slots 1000Base Only	Red Lion	NT24K-SFP8	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
012	4	C92NIP0001	SFP Transceiver, Singlemode Gigabit Fiber, 10km	Red Lion	NTSFP-LX-10	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
013	1	C92NIP0001	9PX Lithium Ion Uninterruptible Power Supply, 3000 VA	Eaton	9PX3000RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
014	2	C92NIP0001	9PX Lithium Ion Extended Battery Module	Eaton	9PXEBM72RT-L	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
015	1	C92NIP0001	HotSwap Maintenance Bypass PDU	Eaton	EHBPL3000R-PDU1U	Section 40 915 80	09-I-101, 09-I-102, 09-I-103
016	3	C92NIP0001	Fiber Optic Patch Cable, 2 Meter, LC UPC to LC UPC Singlemode Duplex	LANshack	SFPC-SMLCLC-2	Section 40 915 80	09-I-101, 09-I-102, 09-I-104
017							
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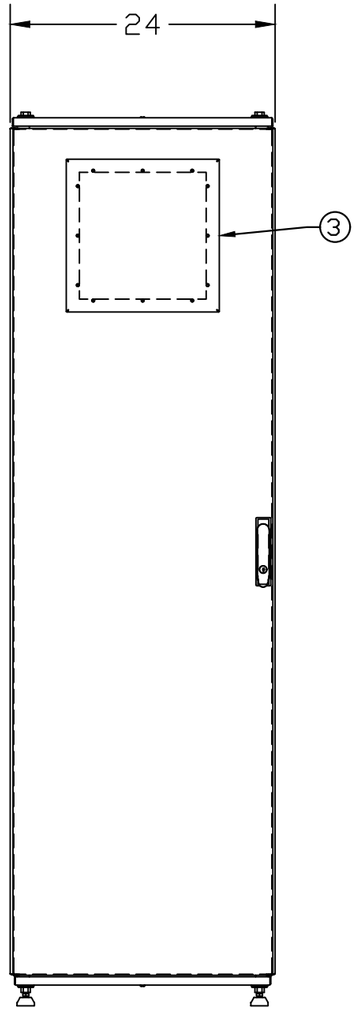
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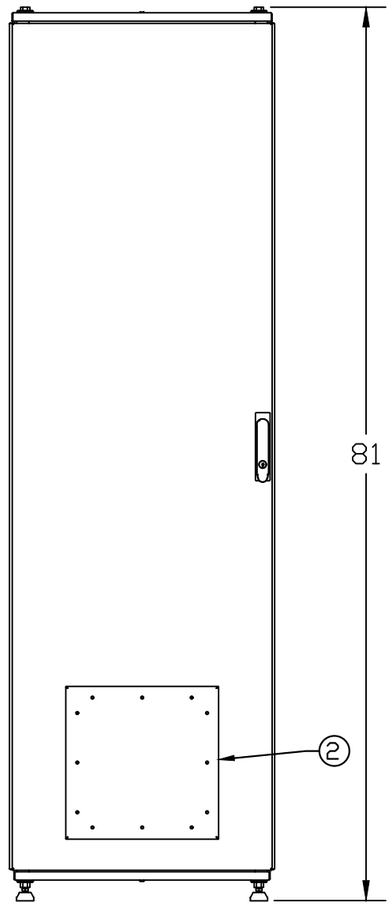
FRONT VIEW
DOORS REMOVED



RIGHT SIDE VIEW

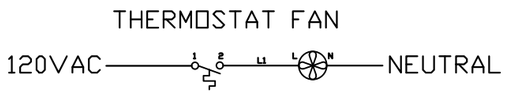


REAR VIEW



FRONT VIEW

THERMOSTAT FAN



FAN & THERMOSTAT
WIRING

NETWORK RACK PARTS LIST		
ITEM	DSECRIPTION	PART NUMBER
1	HDME NEMA DUST TIGHT CABINET 81.14Hx23.62Wx39.37D	HDME20610BK
2	PF GEN4 SERIES CFM FILTER FAN	PF67000T12BK
3	PF GEN4 SERIES EXHAUST FILTER	PFA60000BK
4	SKT SERIES THERMOSTAT, NO	SKT011419NO
5	CABLE TEK HORIZONTAL CABLE MNGR. 2U DBL SIDED	DCHD2
6	POWER DISTRIBUTION UNIT, 10 RECEPTACLE, 20 AMP	DP1N191020
7	Q-SERIES RACK MOUNT ENCLOSURE, 2U	EQ02U-CHC
8	6-LC SINGLE MODE ADAPTERS WITH CERAMIC SLEEVES	DFP-LCD12AC
9	MODULAR ETHERNET SWITCH, DUAL AC	NT24K-AC2
10	MODULE 8 PORT 10/100/1000BASE T	NT24K-TX8
11	MODULE 8 SFP EXPANSION SLOTS 1000 BASE ONLY	NT24K-SFP8
12	SFP TRANSCEIVER, SINGLEMODE, GIGABIT FIBER, 10KM	NTSFP-LX-10
13	9PX LITHIUM UNINTERRUPTIBLE POWER SUPPLY 3000VA	9PX3000RT-L
14	9PX LITHIUM ION EXTENDED BATTERY MODULE	9PXEBM72RT-L
15	HOTSWAP MAINTENANCE BYPASS PDU	EHBPL3000R-PDU1U

REV	DATE	DESCRIPTION	INIT
H			
G			
F			
E			
D			
C			
B	2024.3.5	WIRING & ITEMS	HAD
A	2023.12.13	Original Draft	KCD

REVISIONS

OPTIMAL CONTROL SYSTEMS
2324 THREE LAKES RD / PO BOX 462
ALBANY, OR 97321
PHONE (541) 967-9323 FAX (541) 967-9485

CLIENT McCLURE & SONS

TITLE COOS BAY WASTE WATER TREATMENT PLANT
C92NIP0001 PANEL LAYOUT DRAWING

DRAWN KCD	ISSUED	JOB NO. 0723-08MSI	
CHECKED ME	DATE 2023.10.23	DWG NO. 0723-08MSI-NWR	
APPROVED HAD	SCALE NONE	SHEET 1 OF 1	

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HAMMOND MANUFACTURING

Quality Products. Service Excellence.

NEMA Rated Dust-Tight Server Cabinet *HDME Series*

1,500 lbs (680 kg) Weight Capacity



The HDME is ideal for housing network access equipment in harsh environments such as a factory floor. The HDME features a sealed cabinet with included gland plates for the installation o filter fans. The UL and CSA tested NEMA ratings provide outstanding protection against dust and air contaminants.

Features

- Front and rear solid doors include an installed gland plate for cooling options. Doors open to 135°. Window door option available.
- Reinforced top panel with provisions for optional **HDMELB** lifting eye bolts.
- Frames can be joined together with an optional joining kit.
- A black, cellular neoprene gasket provides tight and secure seal protection from moisture dust and air contaminants.
- Available in 42U and 47U mounting heights.
- Available 24" wide. 31.5" is available as a special order.
- Available in 31.5" and 39.37" overall depths.
- Includes adjustable depth mount rails.

Specifications

- The cabinet frame, doors and side panels are constructed in 14-gauge mild steel.
- Square hole 19" mounting rails are constructed of 12-gauge mild steel, include rack unit indicators, and are Zinc-plated to provide superior surface areas for equipment grounding
- Tested to 1,500 lbs (680 kg).
- NEMA Rated for UL 508A Type 12 and CSA Type 12. Complies with NEMA Type 12 and IEC 60529 IP54.
- Lift-tested to 900 lbs (408 kg) of equipment load when used with our **HDMELB** lifting eye bolts.
- Grounding studs are provided on the frame, side panels, and doors. The front and rear studs on the cabinet frame conform to PET.
- Finished in textured RAL9005 black powder paint. Also, available in textured light gray upon request.
- Meets PCI DSS (Payment Card Industry Data Security Standard) compliance requirements.
- TAA-compliant for GSA Schedule purchases.
- RoHS Compliant.
- Manufactured in North America within an ISO 9001:2015 certified facility.

Included Components

- Welded steel frame with factory-installed nylon levelling feet, ground studs, and mounting points for optional casters.
- Two (2) pairs of adjustable depth EIA-compliant square hole punched mounting rails.
- Two (2) solid removable side panels.
- Two (2) solid doors with
  - One (1) installed gland plate
  - One (1) die-cast locking swing handle

- Two (2) door keys
- One (1) solid top panel.
- Two (2) bottom panels with gland plates
- Four (4) levelling feet
- Starter pack of **CAGKIT1032-50** screws

We looking at adding a NEMA 4 and 4X version of the HDME. Click here to provide your input.

Accessories

- Climate Control
- Grid System
- Frame Joining Kit
- 10-32 Mounting Hardware
- Rack Mount Locking Storage Drawer
- Power Distribution Units (PDUs)
- 10 AWG Bonding Wire Kits
- Rack Panels
- Tamper Resistant Screws
- Grid Strap Spacer
- Rack and Cabinet Stem Casters
- Universal Rack Shelf
- Adjustable Depth Shelf
- Vertical Cable Tray
- Copper Bonding Busbar
- Liquid-Tight Cordgrips (Nylon)

	Overall Dimensions			Rack	Usable Mounting Dimensions		
Part No.	Height	Width	Depth	Units	Height	Width	Depth
HDME2068BK	81.14	23.62	31.50	42U	75.04	19.00	25.12
HDME20610BK	81.14	23.62	39.37	42U	75.04	19.00	32.99
HDME2268BK	89.02	23.62	31.50	47U	82.91	19.00	25.12
HDME22610BK	89.02	23.62	39.37	47U	82.91	19.00	32.99

Overall height includes leveling feet.

Compatible Filter Fan Specifications

Filter Fan Part No.	Exhaust Filter Part No.	Cutout Dimensions Height	Width	Colour	Voltage	Power	Airflow (CFM)	Max. Static Pressure (Airflow = 0)
PF65000T12BK	PFA60000BK	12.00	12.00	Black	115V	90W	230	74 Pa
PF65000T12BK230	PFA60000BK	12.00	12.00	Black	230V	150W	230	74 Pa
PF66000T12BK	PFA60000BK	12.00	12.00	Black	115V	160W	295	134 Pa
PF66000T12BK230	PFA60000BK	12.00	12.00	Black	230V	150W	295	134 Pa
PF67000T12BK	PFA60000BK	12.00	12.00	Black	115V	195W	368	187 Pa
PF67000T12BK230	PFA60000LG	12.00	12.00	Black	230V	214W	368	187 Pa

Tags: **Edge Computing**

Data subject to change without notice

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HAMMOND MANUFACTURING

Quality Products. Service Excellence.

297-560 CFM Filterfans *PF GEN4 Series*

Type 12





Features

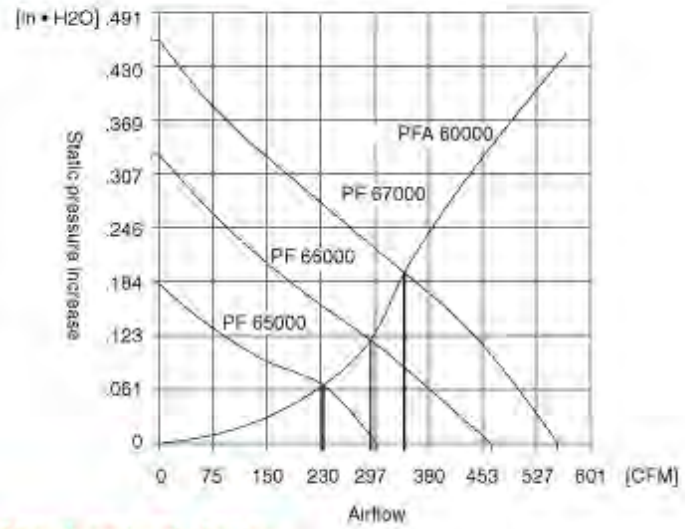
- Maintains a UL Tested NEMA Type 12 seal against enclosure
- UL Recognized to UL 508A, category NITW2/8, UL File #E175229
- Patented “Click & Fit” design provides a hardware-free installation
- Plastic made from strong, heat resistant ABS-FR, UL 94 V0 fire approved material
- Fan ships with one filter. Additional filters can be purchased separately
- Fan Motor is CSA Approved

Accessories

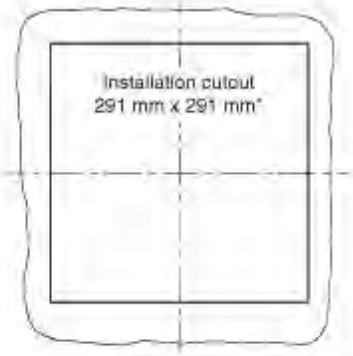
- Exhaust Filters
- Filterfan Rainhoods - 4/4X
- Thermostats
- Replacement Filters
- Filterfan Rainhoods - 3R

Airflow data:

PF 65000 / PF 66000 / PF 67000

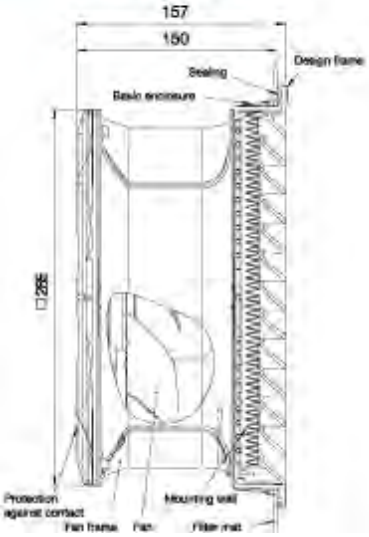


PF 65000, PF 66000, PF 67000 + PFA 60000

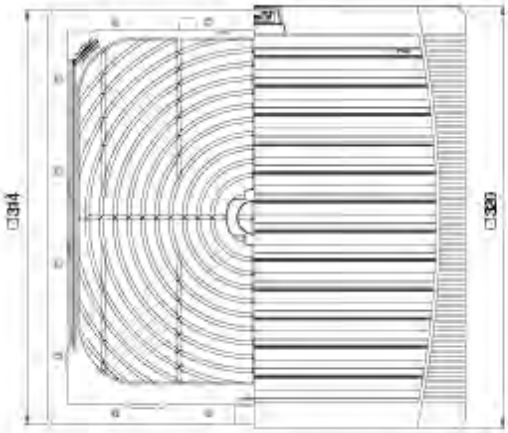


Mechanical data:

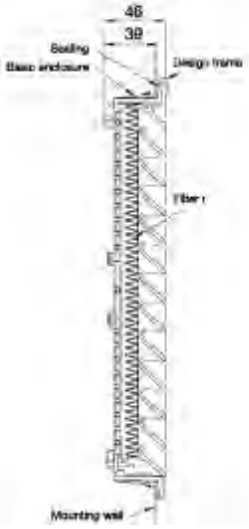
PF 65000, PF 66000, PF 67000



PF 65000, PF 66000, PF 67000 + PFA 60000



PFA 60000



Part No. RAL7035 Light Gray	Part No RAL9011 Black	Voltage	Power	Exhaust Filter RAL7035 Light Gray	Exhaust Filter RAL9011 Black
PF65000T12LG	PF65000T12BK	115V	90W	PFA60000LG	PFA60000BK
PF65000T12LG230	PF65000T12BK230	230V	80W	PFA60000LG	PFA60000BK
PF66000T12LG	PF66000T12BK	115V	160W	PFA60000LG	PFA60000BK
PF66000T12LG230	PF66000T12BK230	230V	155W	PFA60000LG	PFA60000BK
PF67000T12LG	PF67000T12BK	115V	195W	PFA60000LG	PFA60000BK
PF67000T12LG230	PF67000T12BK230	230V	200W	PFA60000LG	PFA60000BK
PF67000T12LG460	PF67000T12BK460	460V	170W	PFA60000LG	PFA60000BK

Airflow data	PF 65000	PF 66000	PF 67000	PFA 60000
Filter material	Type 12 Filtermat	Type 12 Filtermat	Type 12 Filtermat	Type 12 Filtermat
Unimpeded airflow	297 CFM	462 CFM	560 CFM	-
Capacity free-flow	IP 54: 160 W/K / 160 W/K	IP 54: 213 W/K / 218 W/K	IP 54: 282 W/K / 292 W/K	-
	IP 55: 168 W/K / 168 W/K	IP 55: 257 W/K / 262 W/K	IP 55: 308 W/K / 317 W/K	-
Airflow in combination	230 CFM	295 CFM	368 CFM	-
(Filterfan + Exhaust Filter)	(PF 65000 + PFA 60000)	(PF 66000 + PFA 60000)	(PF 67000 + PFA 60000)	-

Airflow data	PF 65000	PF 66000	PF 67000	PFA 60000
Capacity in combination	127 W/K	167 W/K	208 W/K	-
(Filterfan + Exhaust Filter)	(PF 65000 + PFA 60000)	(PF 66000 + PFA 60000)	(PF 67000 + PFA 60000)	-
Max. static pressure (Airflow = 0)	74 Pa	134 Pa	187 Pa	-
Filtration efficiency	0.91	0.91	0.91	0.91
Filter material grade	G 4 (DIN EN 779)	G 4 (DIN EN 779)	G 4 (DIN EN 779)	G 4 (DIN EN 779)
Duty cycle	1	1	1	-

Technical data	PF 65000	PF 66000	PF 67000	PFA 60000
Outside dimensions in mm	320 x 320 x 150	320 x 320 x 150	320 x 320 x 150	320 x 320 x 39
(height x width x installation depth)				
Bearing type	ball bearings	ball bearings	ball bearings	-
Fitting position	any, horizontal airflow preferred		any	-
Construction	housing and guard of sprayed thermoplastic, self-extinguishing, UL 94 VO			
Weight	3.2 kg	3.2 kg	3.7 kg	0.7 kg
Safety protection	in accordance with DIN 31 001			-
Color	RAL 7035, Light Grey			
Connections	cage clamp	cage clamp	cage clamp	-
Noise Level (EN ISO 3741)	52 dB (A)	64 dB (A)	69 db (A)	

Supplementary data	PF 65000	PF 66000	PF 67000
Operating temperature	– 15 °C (- 5 °F) to / bis + 55 °C (+ 131 °F)		
Storage temperature	– 20 °C (- 4 °F) to / bis + 70 °C (+ 158 °F)		
Max. relative humidity	0.9		
System of protection	NEMA Type 12, IP 55 (EN 60 529), when installed as specified		
Basic Accessories	parts kit filter mat, user manual radiant heater, fan heater, thermostat, hygrostat		
Approvals	UL Recognized		
* Tolerance installation cutout	291 + 1/-0 thickness of material to 2 mm		
	292 + 1/-0 thickness of material > 2 mm < 3 mm		

Tags: **Type 12**, **filterfan**, **fan**, **grill**, **CFM**, **airflow**, **filtration**, **filter**

Data subject to change without notice

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Pfannenberg Filterfan 4th Generation

(D) **Montage- und Betriebsanleitung**
Filterlüfter für Schaltschränke und Gehäuse

(GB) **Installation- and operating instructions**
Filter fans for switch cabinets and housings

(F) **Notice de montage et d´utilisation**
Ventilateur à filtre pour armoires de distribution et boîtiers

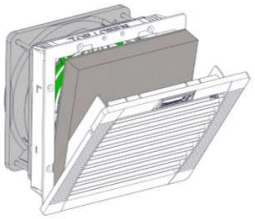
(NL) **Montage- en gebruikshandleiding**
Filterventilator voor schakelkasten en behuizingen

(S) **Installations och bruksanvisning**
Filterfläkt för elskåp och kapslingar

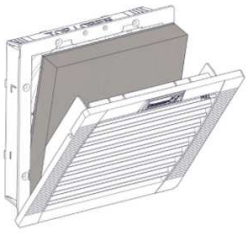
(I) **Istruzioni di montaggio e per l´uso**
Ventilatore con filtro per quadri elettrici e alloggiamenti

(E) **Instrucciones de montaje y para uso**
Ventilador con filtro para armarios eléctricos y carcasas

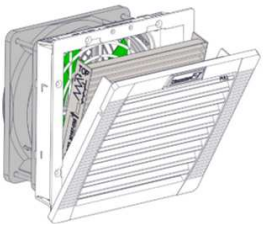
(RUS) **Инструкция по установке и эксплуатации**
Вентилятор с фильтром для распределительных шкафов и корпусов приборов



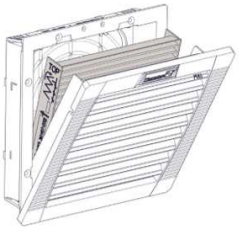
IP54 / TYPE PF / PF EMC



IP54 / TYPE PFA / PFA EMC



IP55 / TYPE PF / PF EMC



IP55 / TYPE PFA / PFA EMC

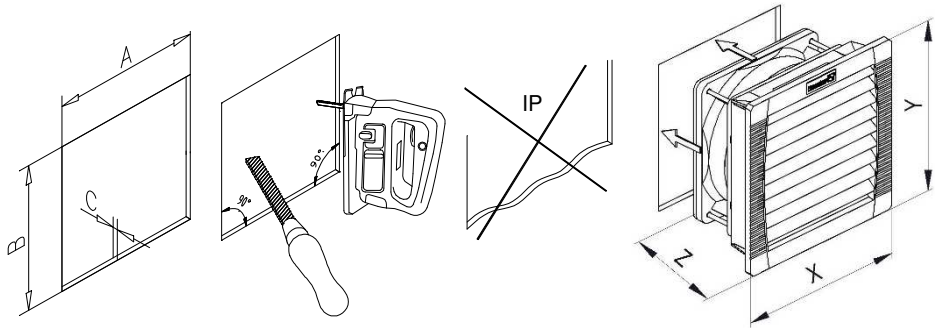
(D) Lesen Sie diese Anweisung und bewahren Sie diese auf.
(GB) Read and save these instruction.
(F) Lisez et sauvegardez ces instructions.
(NL) Deze instructies lezen en bewaren.
(S) Läs och spara dessa anvisningar.
(I) Legga e salvi queste istruzioni.
(E) Lea y salve estas instrucciones.
(RUS) Прочитайте, пожалуйста, данную инструкцию и сохраните ее

Stand 07.2024
085408082aq

Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY

www.pfannenberg.com

(D) Ausschnitte und Abmessungen
(GB) Cut outs and dimensions
(F) Découpes de montage et dimensions
(NL) Uitsparingen en afmetingen
(S) Urklipp och dimensioner
(I) Dima di foratura e dimensioni
(E) Plantillas y dimensiones
(RUS) Монтажные вырезы и габаритные размеры



		A = B mm(inch)		X = Y mm(inch)	Z mm(inch)		
		Standard	EMC		PF		PFA
		$C \le 2(0,08) = A\ ^{+1(0,04)}_{0}$	±0,5 (0,02)		DC	AC	
		$C > 2(0,08) \le 3(0,12) = A\ ^{+2(0,08)}_{+1(0,04)}$					
PF 11000	PFA 10000	92(3,62)	93(3,66)	109(4,29)	53(2,09)	66(2,6)	23(0,91)
PF 22000	PFA 20000	125(4,92)	126,5(4,98)	145(5,71)	69(2,72)	75(2,95)	31(1,22)
PF 32000	PFA 30000	177(6,97)	178(7,01)	202(7,95)	87(3,42)	93(3,66)	40(1,57)
PF 42500	PFA 40000	223(8,78)	224(8,82)	252(9,92)	103(4,06)		44(1,73)
PF 43000					103(4,06)	119(4,68)	
PF 65000	PFA 60000	292(11,5)	292(11,5)	320(12,6)	157(6,18)		46(1,81)
PF 65000 SL					131(5,16)		
PF 66000					157(6,18)		
PF 67000					157(6,18)		
PF 67000 SL					134(5,28)		

(D) ACHTUNG: Nur in vertikaler Einbaulage und bei Nicht-Zerstören der Dichtung ist die Schutzart IP54/ IP55/ Type 12 gewährleistet.
EMC Funktionsgewährleistung nur bei elektrisch leitfähiger Verbindung zwischen EMV- Schirmblech und Montageausschnitt.

(GB) CAUTION: The degree of protection IP54/ IP55/ Type 12 cannot be guaranteed unless the vertical installation position and a non-destroyed foam gasket are ensured.
EMC Function cannot be guaranteed unless there is a conductive connection between the EMC-shield and the mounting cut out.

(F) ATTENTION: Le degré de protection IP54 / IP55 / Type 12 n'est garanti qu'en position de montage verticale et si le joint n'est pas détruit.
CEM La fonction n'est garantie que dans le cas d'un contact électro conducteur entre la tôle de protection CEM et la découpe pour le montage.

(NL) OPPASSEN: Beschermingsgraad IP54 / IP55 / Type 12 is alleen gegarandeerd in een verticale inbouwpositie en als de afdichting niet wordt vernietigd.
EMC De functiegarantie geldt uitsluitend als er tussen de EMC-afscherming en de montage-uitsnijding een elektrisch geleidende verbinding bestaat.

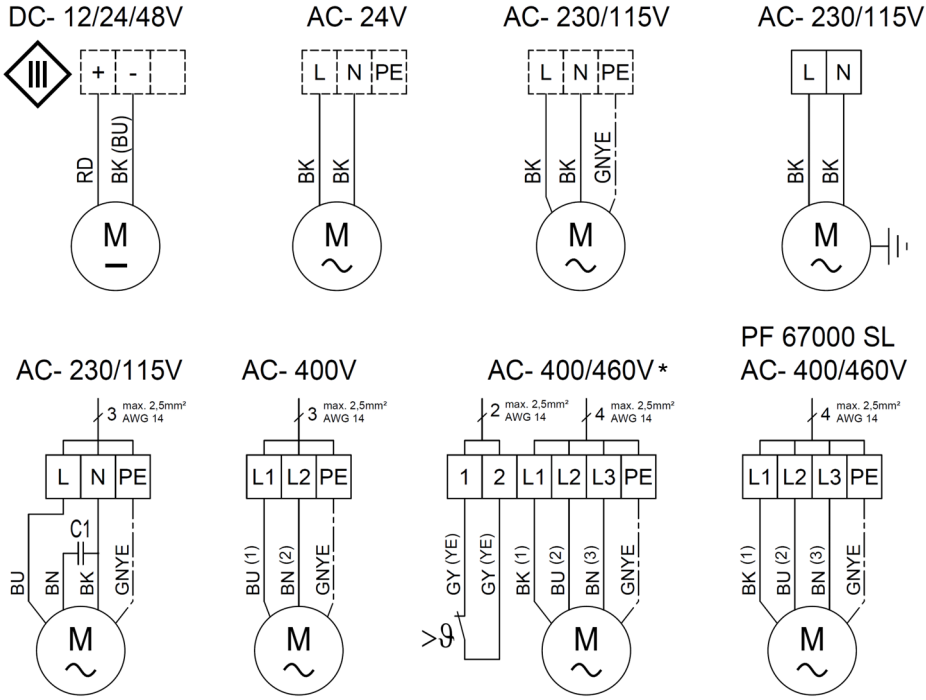
(S) VARNING: Skyddsklass IP54/ IP55/ Type 12 gäller endast vid vertical monteringdläge och om tätningen inte förstörs.
EMC Funktionsgarantin gäller endast under förutsättning att det finns en elektriskt ledande förbindelse mellan EMC-skärmplåten och monteringsutskärningen.

(I) ATTENZIONE: Il grado di protezione IP54/ IP55/ Type 12 può essere garantito esclusivamente tramite una posizione di montaggio verticale e non interferendo con la guarnizione die tenuta.
EMC Il funzionamento è garantito solo in caso di possibilità di collegamento elettricamente conducibile fra lo schermo in lamiera EMC e l'apertura di montaggio.

(E) PRECAUCION: El grado de protección IP54 / IP55 / Tipo 12 solo se garantiza en una posición de instalación vertical y si la junta no está destruida.
EMC Sólo se garantiza el funcionamiento con una conexión eléctrica conductiva entre la chapa de protección EMC y el recorte de montaje.

(RUS) Внимание: Степень защиты IP54/ IP55/ Тип 12 гарантируется только в вертикальном монтажном положении и в том случае, если уплотнение не нарушено.
EMC Функционирование возможно при наличии токопроводящего соединения между уплотнительной лентой EMC и монтажной стеной.

Ⓓ Elektrischer Anschluss
ⒼⒷ Power connection
Ⓕ Branchement électrique
ⓃⓁ Elektrische aansluiting
Ⓢ Elanslutning
Ⓘ Allacciamento elettrico
Ⓔ Conexión de energía
ⓇⓊⓈ Электрическое подключение



Ⓓ Mindestabstand zwischen Lichtbogen bildenden Bauteilen und Filter: 30,5cm (12'') (UL508A sec. 22)
Der Anschluss darf nur durch eine Elektrofachkraft erfolgen!
* HINWEIS: Schließen Sie den in die Wicklung eingebauten Temperaturwächter an einem Motorschutzschalter an.

ⒼⒷ Minimum distance of 30,5cm (12") between arcing parts and filters (acc. UL508A sec. 22)
The connection may only be carried out by a qualified electrician!
* NOTE: Connect the built-in temperature monitor in the winding to a motor circuit breaker.

Ⓕ Distance minimale entre les pièces formant un arc et les filtres: 30,5 cm (12'') (UL508A sec. 22)
Le raccordement ne doit être effectué que par un électricien qualifié!
* REMARQUE : raccordez le contrôleur de température intégré à la bobine à un disjoncteur-protecteur.

ⓃⓁ Minimum afstand tussen lichtbogen vormende componenten en filters: 30,5cm (12'') (UL508A sec. 22)
De aansluiting mag alleen worden uitgevoerd door een gekwalificeerde elektricien!
* AANWIJZING: Sluit de in de wikkeling ingebouwde temperatuurbewaking op een motorbeveiligingsschakelaar aan.

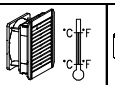
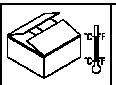
Ⓢ Minsta avstånd mellan de ljusbågsbildande delar och filtret: 30,5 cm (12'') (UL508A sec. 22)
Anslutningen får endast utföras av behörig elektriker!
* ANVISNING: Anslut temperaturvakten som är monterad i lindningen till ett motorskydd.

Ⓘ Distanza minima fra gli elementi che formano l'arco e il filtro: 30,5 cm (12'') (UL508A sec. 22)
Il collegamento può essere effettuato solo da un elettricista qualificato!
* NOTA: Collegare il termostato integrato nell'avvolgimento a un salvamotore.

Ⓔ Distancia mínima entre los componentes del arco eléctrico y los filtros: 30,5 cm (12'') (UL508A sec. 22)
¡La conexión solo puede ser realizada por un electricista calificado!
* NOTA: Conecte el controlador de temperatura montado en el devanado en un interruptor protector de motor.

ⓇⓊⓈ Минимальное расстояние между деталями, образующими электродугу, и фильтром: 30,5 см (12") (UL508A sec. 22)
Подключение может выполняться только квалифицированным электриком!
* УКАЗАНИЕ: Подсоедините встроенное в обмотку реле температуры к защитному выключателю двигателя.

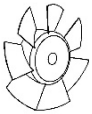
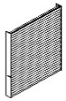
Ⓓ Technische Daten
ⒼⒷ Technical data
Ⓕ Caractéristiques Techniques
ⓃⓁ Technische gegevens
Ⓢ Tekniska data
Ⓘ Dati tecnici
Ⓔ Datos técnicos
ⓇⓊⓈ Технические данные

	U +/- DC	U ~ 50/60 Hz * 60Hz	P	I				
	V	V	W	A				standard (EMC)
PF 11.000	12	--	2,4	0,2	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	0,16 (0,19)
PF 11.000	24	--	2,4	0,1				
PF 11.000	48	--	2,6	0,05				
PF 11.000	--	24	12/11	0,5/0,5				0,55 (0,58)
PF 11.000	--	115	12/11	0,15/0,15				
PF 11.000	--	230	12/11	0,07/0,06				
PF22.000	12	--	5	0,42	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	0,44 (0,49)
PF22.000	24	--	5	0,21				
PF22.000	48	--	5	0,1				
PF22.000	--	24	20/20	1,05/1,02				0,7 (0,76)
PF22.000	--	115	20/20	0,235/0,23				
PF22.000	--	230	19/18	0,12/0,18				
PF 32.000	12	--	5	0,42	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	0,61 (0,7)
PF 32.000	24	--	5	0,21				
PF 32.000	48	--	5	0,1				
PF 32.000	--	115	20/20	0,235/0,23				0,87 (0,96)
PF 32.000	--	230	19/18	0,12/0,18				
PF 42.500	12	--	6	0,5	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	0,92 (1,08)
PF 42.500	24	--	4,7	0,2				
PF 42.500	48	--	4,6	0,1				
PF 42.500	--	230	28/29	0,12/0,13	-20.. + 55°C -4.. +131°F			1,35 (1,51)
PF 42.500	--	115	31	0,27				
PF 43.000	12	--	12	1	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	1,51 (1,77)
PF 43.000	24	--	12	0,5				
PF 43.000	48	--	11	0,23				
PF 43.000	--	115	41/38	0,56/0,47				1,67 (1,83)
PF 43.000	--	230	45/39	0,31/0,25				
PF 43.000	--	400	41/38	0,16/0,13				
PF 65.000	--	115	79/95	0,69/0,84	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	3,2 (3,43)
PF 65.000	--	230	80/100	0,35/0,45				
PF 65.000 SL	--	115	64/80	0,58/0,7	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	3,3 (3,53)
PF 65.000 SL	--	230	64/80	0,29/0,35				
PF 66.000	--	115	125/172	1,1/1,5	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	3,2 (3,43)
PF 66.000	--	230	120/160	0,53/0,72				
PF 66.000	--	400/460	110/160	0,19/0,23				
PF 67.000	--	115	135/196	1,18/1,71	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	3,7 (3,93)
PF 67.000	--	230	140/197	0,62/0,86				
PF 67.000	--	400/460	113/160	0,25/0,27				
PF 67.000 SL	24	--	120	5	-40.. + 55°C -40.. +131°F	-40.. + 60°C -40.. +140°F	10A	3,45 (3,68)
PF 67.000 SL	--	115	124/166	1,1/1,45	-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	6A	3,9 (4,13)
PF 67.000 SL	--	230	115/165	0,51/0,70				
PF 67.000 SL	--	400/460	110/165	0,2/0,23				

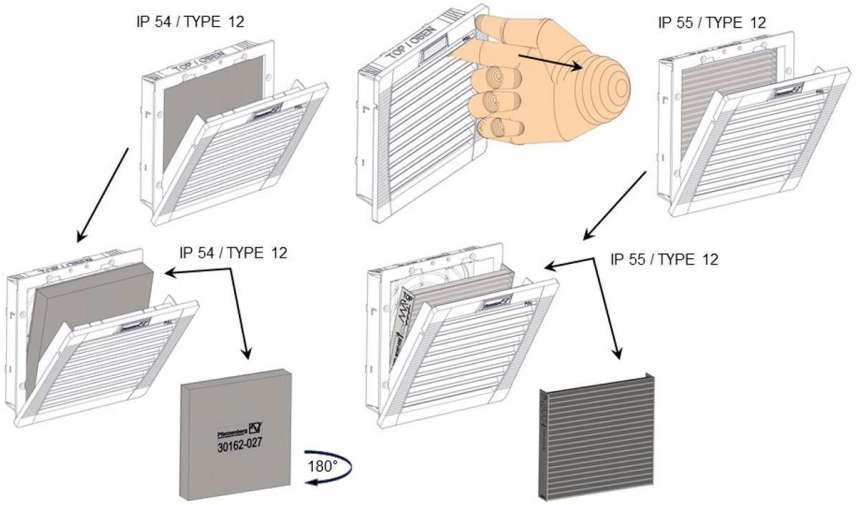
PFA 10.000	--		--		-40.. + 55°C -40.. +131°F	-40.. + 70°C -40.. +158°F	--	0,06 (0,09)
PFA 20.000								0,12 (0,18)
PFA 30.000								0,26 (0,35)
PFA 40.000								0,46 (0,62)
PFA 60.000								0,7 (0,93)

Ⓓ Ersatzteilbeschaffung
ⒼⒷ Ordering spare parts
Ⓕ Approvisionnement en pièces détachées
Ⓝⓛ Bestelling van onderdelen
Ⓢ Beställning av reservdelar
Ⓘ Fornitura delle parti di ricambio
Ⓔ Adquisición de repuestos
Ⓡⓤⓢ Приобретение запасных деталей

www.pfannenberg.com · spareparts@pfannenberg.com

	U +/- DC	U ~ 50/60 Hz		IP54/ TYPE 12  5x	IP 55/ TYPE 12  5x
PF 11.000	12V	-	18611000036	18611600029	--
	24V	-	18611000039		
	48V	-	18611000042		
	-	24V	18611000005		
	-	115V	18611000028		
	-	230V	18611000032		
PFA 10.000	--	--	--		
PF 22.000	12V	-	18611000025	18611600030	18611600034
	24V	-	18611000026		
	48V	-	18611000027		
	-	24V	18611000006		
	-	115V	18611000009		
	-	230V	18611000016		
PFA 20.000	--	--	--		
PF 32.000	12V	-	18611000025	18611600031	18611600035
	24V	-	18611000026		
	48V	-	18611000027		
	-	24V	18611000006		
	-	115V	18611000009		
	-	230V	18611000016		
PFA 30.000	--	--	--		
PF 42.500	12V	-	18611000037	18611600032	18611600036
	24V	-	18611000040		
	48V	-	18611000054		
	-	115V	18611000075		
	-	230V	18811000004		
PF 43.000	12V	-	18611000055		
	24V	-	18611000056		
	48V	-	18611000057		
	-	115V	18611000012		
	-	230V	18611000019		
	-	400V	18611000022		
PFA 40.000	--	--	--		
PF 65.000	-	115V	18611000047	18611600033	18611600037
	-	230V	18611000044		
PF 66.000	-	115V	18611000048		
	-	230V	18611000045		
	-	400/460V	18611000050		
PF 67.000	-	115V	18611000049		
	-	230V	18611000046		
	-	400/460V	18611000051		
PFA 60.000	--	--	--		
PF 65.000 SL	-	115V	18611000004	18611600033	18611600037
	-	230V	18611000001		
PF 67.000 SL	24V	-	18611000076		
	-	115V	18611000003		
	-	230V	18611000000		
	-	400/460V	18611000065		

Ⓓ Filterwechsel / Wartung
ⒼⒷ Filter change / Maintenance
Ⓕ Remplacement de la cartouche Filtrante / Entretien
ⓃⓁ Filter vervanging / Onderhoud
Ⓢ Filterbyte / Underhåll
Ⓘ Filtri di ricambio / Manutenzione
Ⓔ Cambio de filtro / Mantenimiento
ⓇⓊⓈ Замена фильтра/ Техническое обслуживание



Ⓓ IP 54/ 55/ TYPE 12: Auf korrekte Einbaulage des Filters achten
Empfohlene Austauschintervalle unter www.pfannenberg.com/manuals.

ⒼⒷ IP 54/ 55/ TYPE 12: Make sure that the filter is installed in the proper position.
Recommended replacement intervals can be found at www.pfannenberg.com/manuals.

Ⓕ IP 54/ 55/ TYPE 12: Veillez à insérer correctement le filtre
Les intervalles de remplacement recommandés se trouvent sur www.pfannenberg.com/manuals.

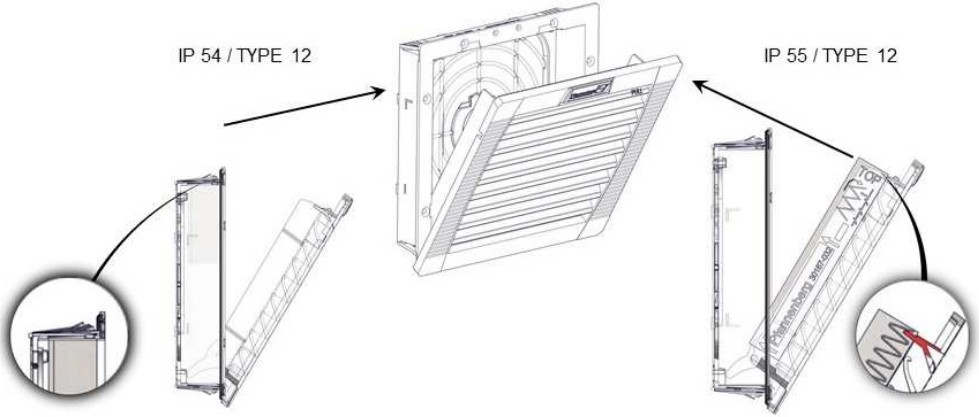
ⓃⓁ IP 54/ 55/ TYPE 12: Op correcte inbouwpositie van het filter letten
Aanbevolen vervangintervallen op www.pfannenberg.com/manuals.

Ⓢ IP 54/ 55/ ZYPE 12: Beakta korrekt monteringsläge för filtret
För rekommenderade bytesintervall se www.pfannenberg.com/manuals.

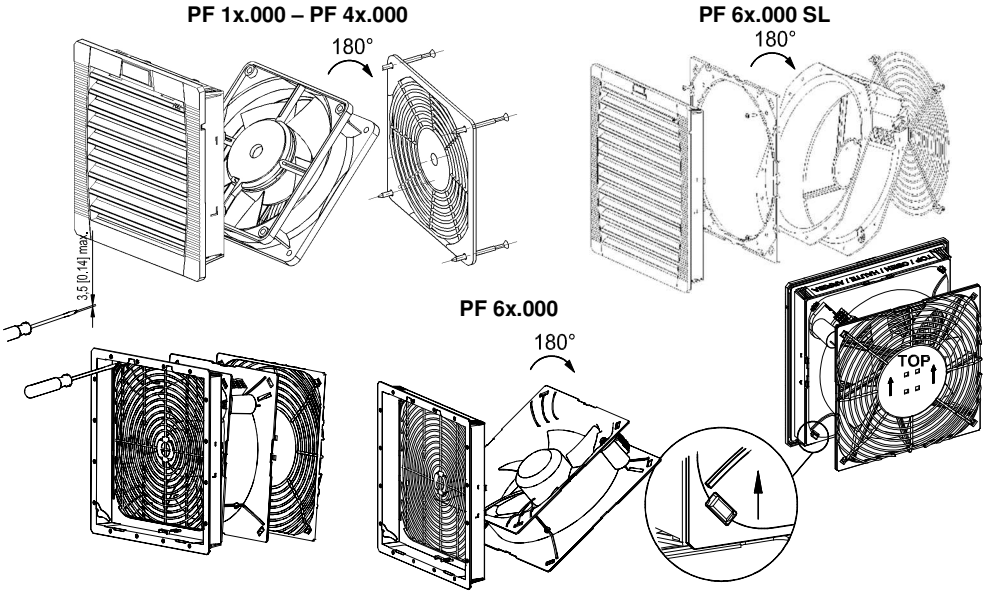
Ⓘ IP 54/ 55 /TYPE 12: Rispettare la corretta posizione di montaggio del filtro.
Gli intervalli di sostituzione consigliati sono indicati su www.pfannenberg.com/manuals.

Ⓔ IP 54/ 55 /TYPE 12: Procure que la posición de montaje del filtro sea la correcta
Intervalos de cambio recomendados en www.pfannenberg.com/manuals.

ⓇⓊⓈ IP 54/ 55/ TYPE 12: Следите за правильным положением фильтра
Рекомендуемые интервалы замены можно найти на сайте www.pfannenberg.com/manuals.



Ⓓ Wechsel der Luftförderrichtung
ⒼⒷ Changing the air flow direction
Ⓕ Changement de la direction de l'air
Ⓝⓛ Omwisselen van de luchttransportrichting
Ⓢ Ändring av riktning för luftmatning
Ⓘ Cambio di direzione del flusso d'aria
Ⓔ Cambio de dirección del flujo de aire
Ⓡⓤⓢ Изменение направления движения воздуха



Ⓓ Verwenden Sie **ausschließlich Original Pfannenberg Ersatzteile**, anderenfalls erlöschen Gewährleistung und Zulassungen. Weiterhin sind bei Nichtverwendung der Original Ersatzteile Schutzarten und Leistungsdaten nicht mehr sichergestellt, die Schutzart reduziert sich dann auf Type 1.

ⒼⒷ Warranty and licenses **are limited to original Pfannenberg spare parts** and become void if other spare parts are used. Furthermore, ingress protection and capacity levels are no longer ensured if original Pfannenberg spare parts are not used. As a result the ingress protection will be reduced to Type 1.

Ⓕ Veuillez utiliser **exclusivement les pièces détachées d'origine de Pfannenberg**, sinon la garantie et les homologations ne sont plus applicables. Il en va de même pour les types de protection et les caractéristiques de performance, la protection se réduit alors à type 1.

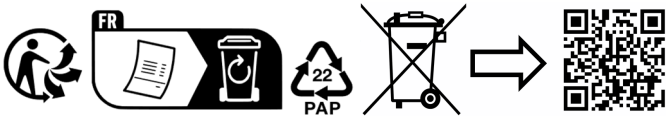
Ⓝⓛ Gebruik **uitsluitend originele onderdelen van Pfannenberg**, omdat anders garantiewaarborgen en certificeringen vervallen. Tevens zijn bij het niet gebruiken van originele onderdelen beveiligingsgraden en prestatiespecificaties niet langer gewaarborgd. In dit geval vermindert de beveiligingsgraden tot type 1.

Ⓢ Använd **uteslutande Pfannenbergs original reservdelar**, annars upphör garantin att gälla. Vidare kan eventuella fel eller reparationer som beror på att inte original Pfannenberg reservdelar används leda till att skyddsklass och effektdata inte längre säkerställas. I det tillfället skyddsklassen vilja reducera till på maskin 1.

Ⓘ Utilizzare **esclusivamente parti di ricambio originali Pfannenberg**, pena l'estinzione della garanzia e delle autorizzazioni. Inoltre, in caso di mancato utilizzo delle parti di ricambio originali, non sono più garantiti i tipi di protezione e le caratteristiche di funzionamento. Di conseguenza il grado di protezione sarà ridotto a tipo 1.

Ⓔ Utilice **únicamente repuestos originales de Pfannenberg**; de lo contrario, quedarán sin validez la garantía y las licencias. Además, en caso de no usar dichos repuestos originales, no se podrán garantizar la seguridad ni los datos de rendimiento. En este caso el tipo de protección se reduce al tipo 1.

Ⓡⓤⓢ Используйте **только оригинальные запасные части от фирмы Pfannenberg**, в противном случае прекращается действие гарантии и допуска к эксплуатации. Кроме того, мы не гарантируем при использовании неоригинальных деталей соблюдение требований по категории защиты и рабочих характеристик. Вид защиты в этом случае снижается до категории 1.



www.pfannenberg.com/disposal

CE

Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY

EU Konformitätserklärung / EU Declaration of Conformity

gemäß den EU Harmonisierungsrechtsvorschriften / according to EU harmonisation legislation

Maschinenrichtlinie / Maschinery directive 2006/42/EG

Elektromagnetische Verträglichkeit / Electromagnetic compatibility 2014/30/EU

RoHS 2011/65/EU incl. (EU) 2015/863

Die Geräte/The devices:

Hersteller/Manufacturer: **Pfannenberg GmbH**

Produkt/Product: **Filterlüfter, Austrittsfilter / Filter Fan, Exhaust Filter**

Type: **PF 11.000, PF 22.000, PF 32.000, PF 33.000, PF 33.000-SL, PF 42.500, PF 43.000, PF 65.000, PF 65.000-SL, PF 66.000, PF 67.000, PF 67.000-SL, PFA 10.000, PFA 20.000, PFA 30.000, PFA 40.000, PFA 60.000**

wurden entwickelt, konstruiert und gefertigt in Übereinstimmung mit den o.g. EU Harmonisierungsrechtsvorschriften, in alleiniger Verantwortung von / were developed, designed and manufactured to comply with the above-mentioned EU harmonisation legislation, under the sole responsibility of:

Pfannenberg GmbH
Werner-Witt-Str. 1
D-21035 Hamburg

Angewendete harmonisierte Normen / Applied harmonized standards:

EN ISO 12100:2010	Sicherheit von Maschinen - Allgemeine Gestaltungsleitsatze Risikobeurteilung und Risikominderung / Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60335-1 2012 + AC 2014 + A11 2014 + A13 2017 + A15 2021	Sicherheit elektrischer Gerate fur den Hausgebrauch und ahnliche Zwecke - Teil 1 Allgemeine Anforderungen / Household and similar electrical appliances - Safety - Part 1 General requirements
EN 60204-1 2018	Sicherheit von Maschinen - Elektrische Ausrustung von Maschinen - Teil 1: Allgemeine Anforderungen / Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 61000-3-2 2014	Elektromagnetische Vertraglichkeit (EMV) - Teil 3-2: Grenzwerte - Grenzwerte fur Oberschwingungsstrome (Gerate-Eingangsstrom <= 16 A je Leiter) / Electromagnetic compatibility (EMC) - Part 3-2 Limits - Limits for harmonic current emissions (equipment input current <= 16 A per phase)
EN 61000-3-3 2013	Elektromagnetische Vertraglichkeit (EMV) - Teil 3-3 Grenzwerte - Begrenzung von Spannungsanderungen, Spannungsschwankungen und Flicker in offentlichen Niederspannungs-Versorgungsnetzen fur Gerate mit einem Bemessungsstrom <= 16 A je Leiter, die keiner Sonderanschlussbedingung unterliegen / Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current <= 16 A per phase and not subject to conditional connection
EN 61000-6-2 2005 + AC 2005	Elektromagnetische Vertraglichkeit (EMV) - Teil 6-2: Fachgrundnormen - Storfestigkeit fur Industriebereiche / Electromagnetic compatibility (EMC) - Part 6-2 Generic standards - Immunity for industrial environments
EN 61000-6-3 2007 + A1:2011+ AC 2012	Elektromagnetische Vertraglichkeit (EMV) - Teil 6-3 Fachgrundnormen - Störaussendung fur Wohnbereich, Geschafts- und Gewerbebereiche sowie Kleinbetriebe / Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
EN IEC 63000.2018	Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschrankung gefahrlicher Stoffe / Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Angewendetete sonstige technische Normen und Spezifikationen / Other technical standards and specifications applied:

EN 60335-2-80 2003 + A1 2004 + A2 2009	Sicherheit elektrischer Geräte fur den Hausgebrauch und ahnliche Zwecke - Teil 2-80 Besondere Anforderungen fur Ventilatoren / Household and similar electrical appliances - Safety - Part 2-80. Particular requirements for fans

Hamburg, 2024-03-01
Rev No: 19
DoC No.: 085506618

Nils P. Halm

Nils-Peter Halm
Technischer Leiter / Technical Director

HAMMOND MANUFACTURING

Quality Products. Service Excellence.

Thermostats *SKT Series*





Features

- Designed to provide air temperature control and monitoring in cabinets.
- Thermostat NC (Normally Closed) for the control of heaters and heater fans.
- Thermostat NO (Normally Open) for the control of cooling units, or for switching signal transmitters in case of overheating.
- Available in Fahrenheit or Celsius.

NC - Normally Closed (Red)

- Used in conjunction with heaters.
- Contact opens when rising temperatures reach the set point temperature, shutting heater off.

NO - Normally open (Blue)

- Used in conjunction with fans.
- Contact closes when rising temperatures reach the set point temperature, turning fan on.





Part No.	Scale	Contact Type	Dimensions Height x Width x Depth	Switching Capacity
SKT011409NC	F°	Normally Closed	2.8 x 1.5 x 1.4	15A @ 120VAC, 10A @ 240VAC, 30W @ DC
SKT011409NC-C	C°	Normally Closed	2.8 x 1.5 x 1.4	15A @ 120VAC, 10A @ 240VAC, 30W @ DC
SKT011419NO	F°	Normally Open	2.8 x 1.5 x 1.4	15A @ 120VAC, 10A @ 240VAC, 30W @ DC

Part No.	Scale	Contact Type	Dimensions Height x Width x Depth	Switching Capacity
SKT011419NO-C	C°	Normally Open	2.8 x 1.5 x 1.4	15A @ 120VAC, 10A @ 240VAC, 30W @ DC

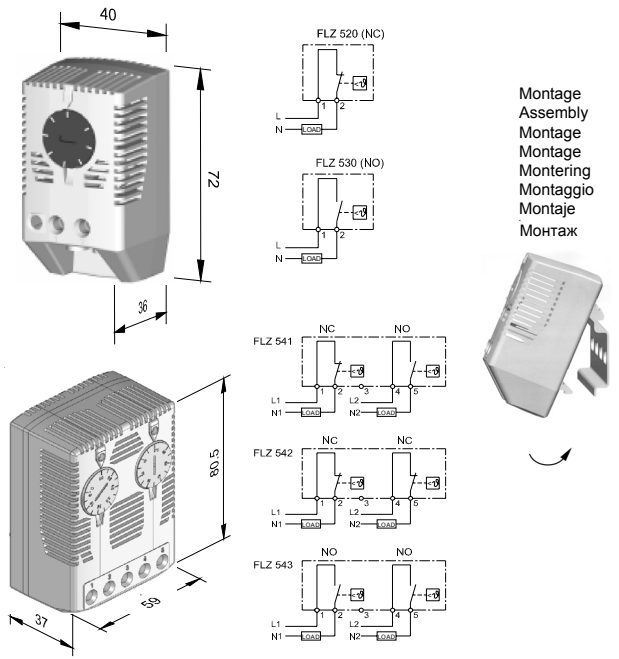
Sensor Element:	Thermostatic bi-metal
Switching difference (hysteresis):	+ or - 4°F (+or- 3°K)
Adjustment Range:	30 - 140°F / 0 - 60°C
Noise Suppression:	N (according to VDE 0875)
Connection:	2 pole terminal for AWG 14 (2.5 mm²)
Mounting:	Easily installed by clip mounting on 35 or 38mm DIN rail (included)
Housing:	Flame retardant plastic UL94VO
Color:	Gray (SB)
Protection:	IP20
Approval:	UL Recognized Component, cUL Recognized Component, CE

Tags: **thermostat**, **temperature**, **climate**, **monitoring**, **Fahrenheit**, **Celsius**, **normally open**, **normally closed**, **heater**, **fan**

Data subject to change without notice

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Thermostat FLZ 520/530 FLZ 541/ 542/ 543



Montage
Assembly
Montage
Montage
Montering
Montaggio
Montaje
Монтаж

GB Thermostat FLZ 520/530, FLZ 54x Instructions for Use

NC: Opener (Contact opens with rising temperature – Setting knob with red imprint)			
NO: Shutter (Contact closes with rising temperature – Setting knob with blue imprint)			
Setting ranges	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Working temperature range	-20°C..+80°C / -5°F..+180°F		
Max. breaking capacity	240V AC, 10 (2)A / 120V AC, 15 (2)A Value in brackets: inductive load at cos.φ=0.6 DC: max. 30W		
Temperature difference	< 7K		
Tolerance for switching point	+/- 4K		
Type of contact	Opener – NC / Shutter – NO (snap-action contact)		
Type of connection	2-pole / 5-pole clamp, 2,5mm²		
Colour	RAL 7035 – grey		
Protection category	IP 20		
Assembly	Snap fastening for - 35mm profile bars in accordance with EN 60715 - Pfannenberg exhaust filter PFA 3000		

Application:
The thermostats are used for the temperature regulation of cooling units, heating appliances, filter ventilators and heat exchangers inside switch cabinets.
Moreover, they can be used as signal transmitters for reporting excess or insufficient temperatures.
Safety instructions
The thermostats may only be installed by qualified staff.
The protective measures and the protection against contact are to be ensured by the installation.
The information on the name plate (voltage and current) is to be heeded.
The operational reliability of the thermostat is to be ensured by an operating test.
Installation instructions:
- The thermostat should be assembled in the upper part of the switch cabinet at the maximum possible distance from heat creating components.
- The ventilation slots of the thermostat should not be covered.
- For the temperature setting of the opener the highest possible hysteresis must be added to the required minimum temperature.

For example:
- required minimum temperature inside switch cabinet: 9°C (46°F)
- temperature to be set: 20°C (66°F)
- resulting from: 20°C (66°F) = required temperature 9°C + highest possible hysteresis 11K (7K+4K)

NL Gebruikershandleiding thermostaat FLZ 520/530, FLZ 54x

NC: opener (contact opent bij stijgende temperatuur - Instelknop met rode opdruk)			
NO: sluiter (contact sluit bij stijgende temperatuur - Instelknop met blauwe opdruk)			
instelbereik	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
gebruikstemperatuur	-20°C..+80°C / -5°F..+180°F		
max. afschakelvermogen	240V AC, 10 (2)A / 120V AC, 15 (2)A voorlopige waarde: inductieve belasting bij cos.φ=0,6 DC: max. 30W		
schakeltemperatuurverschil	<7K		
schakelpunttollerantie	+/- 4K		
contacttype	Opener – NC / sluiter – NO (schakelbeveiliging)		
aansluitingstype	2-polige/ 5polige klemmen, 2,5mm²		
kleur	RAL 7035 – grijs		
beveiliging	IP 20		
montage	Klikbevestiging voor - 35mm profielrail conform EN 60715 - Pfannenberg voorzetfilter PFA 3000		

Toepassing:
De thermostaten worden gebruikt voor de temperatuurregeling van koelapparaten, verwarmingstoestellen, filterventilatoren en warmtewisselaars binnen in de schakelkast.
Bovendien kunnen ze als aansturing voor signaleringssystemen voor temperatuurafwijkingen gebruikt worden.
Veiligheidsaanwijzingen:
De thermostaten mogen alleen door gekwalificeerd personeel worden geïnstalleerd.
Bij de installatie dienen alle maatregelen met betrekking tot veiligheid in acht genomen te worden (ook beveiliging tegen direct contact).
De gegevens op het typeplaatje (spanning en stroom) moeten in acht genomen worden.
Het veilige gebruik van de thermostaat dient door middel van een functietest vastgesteld te worden.
Montageaanwijzingen:
- De thermostaat dient gemonteerd te worden in het bovenste gedeelte van de schakelkast op zo groot mogelijke afstand van warmteproducerende onderdelen.
- De ventilatiegleuven van de thermostaat niet afdekken.
- Voor de instelling van de temperatuur van de opener dient de grootst mogelijke hysteresis opgeteld te worden bij de minimale temperatuur.

Voorbeeld:
- aanbevolen minimale temperatuur binnen in de schakelkast: 9°C (46°F)
- in te stellen temperatuur: 20°C (66°F)
- resulterend uit:
20°C (66°F)= in te stellen temperatur 9°C + grootst mogelijke hysteresis 11K (7K+4K)

D Betriebsanleitung Thermostat FLZ 520/530, FLZ 54x

NC: Öffner (Kontakt öffnet bei steigender Temperatur - Einstellknopf mit roter Bedruckung)			
NO: Schließer (Kontakt schließt bei steigender Temperatur - Einstellknopf mit blauer Bedruckung)			
Einstellbereiche	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Einsatztemperaturbereich	-20°C..+80°C / -5°F..+180°F		
max. Schaltleistung	240V AC, 10 (2)A / 120V AC, 15 (2)A Wert in Klammern: induktive Last bei cos.φ=0,6 DC: max. 30W		
Schalttemperaturdifferenz	< 7K		
Schaltpunkttoleranz	+/- 4K		
Kontaktart	Öffner - NC / Schließer - NO (Sprungkontakt)		
Anschlussart	2polige/ 5polige Klemme, 2,5mm²		
Farbe	RAL 7035 – grau		
Schutzart	IP 20		
Montage	Schnappbefestigung für - 35mm Profil-Schiene nach EN 60715 - Pfannenberg Austrittsfilter PFA 3000		

Anwendung:
Die Thermostate werden zur Temperaturregelung von Kühlgeräten, Heizgeräten, Filterlüftern u. Wärmetauscher innerhalb von Schaltschränken eingesetzt.
Außerdem können sie als Ansteuerung für Signalgeber zur Meldung von Über- oder Untertemperatur verwendet werden.
Sicherheitshinweise:
Die Thermostate dürfen nur von qualifiziertem Fachpersonal installiert werden.
Die Schutzmaßnahmen und der Berührungsschutz sind durch den Einbau sicherzustellen.
Die Angaben auf dem Typschild (Spannung und Strom) sind zu beachten.
Die Funktionssicherheit des Thermostates ist durch einen Funktionstest sicherzustellen.
Einbauhinweise:
- Der Thermostat sollte im oberen Bereich des Schaltschrankes mit dem größtmöglichen Abstand zu wärmeerzeugenden Bauteilen montiert werden.
- Die Lüftungsschlitze des Thermostates dürfen nicht abgedeckt werden.
- Bei der Temperatureinstellung des Öffners muß die größtmögliche Hysterese zu der geforderten Mindesttemperatur hinzuaddiert werden.

Beispiel:
- erforderliche Mindest-Schaltschrankinnentemperatur: 9°C (46°F)
- einzustellende Temperatur: 20°C (66°F)
- resultierend aus:
20°C (66°F)= erforderliche Temperatur 9°C + größtmögliche Hysterese 11K (7K+4K)

F Mode d'emploi Thermostat FLZ 520/530, FLZ 54x

NC: Contact de repos (le contact s'ouvre lorsque la température augmente - Bouton de réglage avec inscription rouge)			
NO: Contact de travail (le contact se ferme lorsque la température augmente - Bouton de réglage avec inscription bleue)			
Plages de réglage	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Plage de température de fonctionnement	de -20°C à +80°C / de -5°F à +180°F		
Puissance de coupure max.	240V CA, 10 (2)A / 120V CA, 15 (2)A valeur entre parenthèses : charge inductive pour cos.φ=0,6 CC : max. 30W		
Différence de température à la commutation	<7K		
Tolérance du point de commutation	+/- 4K		
Type de contact	Contact de repos – NC / contact de travail - NO (contact à ressort)		
Type de connexion	Borne bipolaire/ à 5 pôles, 2,5mm²		
Couleur	RAL 7035 – gris		
Degré de protection	IP 20		
Montage	Clipsage pour - rail profilé de 35mm conformément à EN 60715 - filtre de sortie Pfannenberg PFA 3000		

Application :
Les thermostats sont utilisés pour réguler la température des appareils de refroidissement, de chauffage, des ventilateurs filtrants et des échangeurs de chaleur installés dans des armoires de distribution. Ils peuvent servir également de commande pour les détecteurs de température insuffisante ou excessive.
Conseils de sécurité :
Les thermostats doivent être installés uniquement par un technicien qualifié.
Les mesures de protection générale et contre les contacts accidentels doivent être assurées par le montage.
Les données de la plaque signalétique (tension et courant) doivent être prises en compte.
La sécurité de fonctionnement du thermostat doit être établie par un test de fonctionnement.
Instructions de montage :
- Le thermostat doit être monté dans la partie supérieure de l'armoire de distribution en l'éloignant le plus possible des composants générateurs de chaleur.
- Les fentes d'aération du thermostat ne doivent pas être obstruées.
- Lors du réglage de température du contact de repos, il faut ajouter la plus grande hystérésis possible à la température minimale requise.

Exemple :
- Température minimale requise à l'intérieur de l'armoire : 9°C (46°F)
- température à régler : 20°C (66°F)
- ce qui donne :
20°C (66°F)= température nécessaire 9°C + hystérésis la plus grande possible 11K (7K+4K)

S Bruksanvisning Termostat FLZ 520/530, FLZ 54x

NC: Öppnare (Kontakten öppnas vid stigande temperatur - Inställningsknapp med röd markering)			
NO: Slutare (Kontakten stängs vid stigande temperatur - Inställningsknapp med blå markering)			
Inställningsområde	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Användningsområde	-20 °C..+80 °C / -5 °F..+180 °F		
Max utlösningseffekt	240 V AC, 10 (2) A/120 V AC, 15 (2) A Värde i klammer: induktiv belastning vid cos φ=0,6 DC: max. 30W		
Bryttemperaturs skillnad	<7 K		
Brytpunktstolerans	+/- 4 K		
Kontakttyp	Öppnare – NC /slutare – NO (vippkontakt)		
Typ av anslutning	2-polig/ 5polig klämma, 2,5 mm²		
Färg	RAL 7035 – grå		
Skyddstyp	IP 20		
Montering	Snäppfäste för - 35 mm profilskena enligt EN 60715 - Pfannenberg försättsfilter PFA 3000		

Användning:
Termostaten används för temperaturstyrning av kylaggregat, värmeapparater, filterfläktar och värmeväxlare i kopplingsskåp.
Dessutom kan de användas som styrning av signalgivare för att meddela över- eller undertemperatur.
Säkerhetsanvisningar:
Termostaterna får endast installeras av kvalificerad fackpersonal.
Skyddsåtgärderna och beröringsskyddet ska säkerställas vid monteringen.
Uppgifterna på märkplåten (spänning och ström) ska beaktas.
Termostatens funktionssäkerhet säkerställs genom en funktionstest.
Monteringsanvisningar:
- Termostaten ska monteras i den övre delen av kopplingsskåpet med största möjliga avstånd till värmealstrande komponenter.
- Termostatens ventilationsöppning får inte övertäckas.
- Vid temperaturinställning av öppnaren måste största möjliga hysteres läggas till den krävda lägsta temperaturen.

Exempel:
- krävd lägsta temperatur inuti kopplingsskåpet: 9 °C (46 °F)
- temperatur som ska ställas in: 20 °C (66 °F)
- härlett från:
20 °C (66 °F)= krävd temperatur 9°C + största möjliga hysteres 11 K (7 K+4 K)

(I) Istruzioni termostato FLZ 520/530, FLZ 54x

NC: Contatto di apertura	(il contatto si apre con l'aumentare della temperatura - Manopola di regolazione con stampa rosso)		
NO: Contatto di chiusura	(il contatto si chiude con l'aumentare della temperatura – Manopola di regolazione con stampa blu)		
Campo di regolazione	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Campo temperatura di impiego	-20°C..+80°C / -5°F..+180°F		
Potere di interruzione max.	240V AC, 10 (2)A / 120V AC, 15 (2)A valore fra parentesi: carico induttivo a cos.φ=0,6 DC: max. 30W		
Differenziale di commutazione	<7K		
tolleranza del punto di commutazione	+/- 4K		
Tipo di contatto	Contatto di apertura – NC / chiusura – NO (contatto ad azione rapida)		
Tipo di collegamento	Terminale bipolare/ 5 poli, 2,5mm²		
Colore	RAL 7035 – grigio		
Tipo di protezione	IP 20		
Montaggio	Fissaggio ad innesto per - guida 35 mm secondo EN 60715 - griglie con filtro Pfannenberg PFA 3000		

Impiego:
I termostati sono impiegati per la termoregolazione di apparecchi di raffreddamento, riscaldamento, ventilatori con filtro e scambiatori di calore all'interno di armadi elettrici.
Possono essere inoltre utilizzati in qualità di trasduttori per la segnalazione di sovra- o sottotemperature.
Istruzioni di sicurezza:
Fare installare i termostati esclusivamente da personale specializzato qualificato.
Le misure di protezione e la messa a terra protettiva devono essere assicurate in sede di installazione.
Attenersi ai dati riportati sulla targhetta dati (tensione e corrente).
Verificare la sicurezza di funzionamento a mezzo di un test di funzionamento.
Istruzioni di montaggio:
- Montare il termostato nel comparto superiore dell'armadio elettrico mantenendo la distanza più ampia possibile rispetto ai componenti generatori di calore.
- Non coprire le feritoie di ventilazione del termostato.
- In sede di regolazione della temperatura del contatto di apertura, aggiungere l'isteresi più elevata possibile alla temperatura minima richiesta.

Esempio: - temperatura interna minima necessaria nell'armadio elettrico: 9°C (46°F)
- temperatura da impostare: 20°C (66°F)
- risultante da:
20°C (66°F)= temperatura necessaria 9°C + isteresi più ampia possibile 11K (7K+4K)

(E) Instrucciones del termostato FLZ 520/530, FLZ 54x

NC: Contacto de apertura	(el contacto se abre en caso de producirse un incremento de la temperatura - Mando de ajuste con indicaciones impresas de color rojo)		
NO: Contacto de cierre	(el contacto se cierra en caso de producirse un incremento de la temperatura -) Mando de ajuste con indicaciones impresas de color azul)		
Ámbito de regulación	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Ámbito de temperatura de regulación	-20° C... +80° C / -5° F... +180° F		
Potencia de conmutación máx.	240V CA, 10 (2)A / 120V CA, 15 (2)A Valor entre paréntesis: carga inductiva a cos.φ=0,6 CC: máx. 30W		
Diferencia de temperatura de conmutación	<7K		
tolerancia del punto de conmutación	+/- 4K		
Tipo de contacto	Contacto de apertura – NC / cierre – NO (contacto de acción rápida)		
Tipo de conexión	Borne bipolar/ 5 polos, 2,5 mm²		
Color	RAL 7035 – gris		
Tipo de protección	IP 20		
Montaje	Fijación por resorte para un - carril de perfil de 35mm conforme a EN 60715 - filtro antepuesto Pfannenberg PFA 3000		

Aplicación:
Los termostatos se aplican a la regulación de la temperatura de refrigeradores, calefactores, ventiladores de filtro y calentadores situados en el interior de armarios de distribución.
Aparte, pueden emplearse como dispositivos de direccionamiento de señalizadores de exceso o defecto de temperatura.
Instrucciones de seguridad:
La instalación de los termostatos será responsabilidad exclusiva de operarios especializados.
Las medidas de seguridad y la protección frente al contacto deberán quedar garantizadas en el momento de la instalación.
Se deberá respetar los datos (tensión y corriente) que figuran en la placa de tipo.
La seguridad operativa del termostato deberá garantizarse mediante una prueba de funcionamiento.
Instrucciones de montaje:
- El termostato debería montarse en la parte superior del armario de distribución, guardando la mayor distancia posible con los componentes que desprenden calor.
- No deberían obturarse las ranuras de ventilación del termostato.
- Al fijar la temperatura de contacto de apertura debería añadirse la mayor histéresis posible a la temperatura mínima necesaria.

Ejemplo: - Temperatura mínima necesaria en el interior del armario de distribución: 9° C (46° F)
- temperatura de ajuste: 9° C (46° F)
- resultante de:
20° C (66° F)= temperatura necesaria 9° C + máxima histéresis posible 11K (7K+4K)

(RUS) Руководство по эксплуатации Термостат FLZ 520/530, FLZ 54x

NC: размыкающий контакт	(контакт открывается при возрастающей температуре - Ручка настройки с красной маркировкой)		
NO: замыкающий контакт	(контакт закрывается при возрастающей температуре - Ручка настройки с синей маркировкой)		
Диапазон настройки	-20°C .. +40°C / -5°F .. +105°F	0°C .. +60°C / +30°F .. +140°F	+20°C .. +80°C / +70°F .. +180°F
Температурный диапазон использования	-20°C.+80°C / -5°F..+180°F		
Макс. коммутационная способность	240В AC, 10 (2)A / 120В AC, 15 (2)A Значение в скобках: индуктивная нагрузка при cos.φ=0,6 DC: макс. 30Вт/		
Разница температуры переключения	<7K		
допуск положения точки переключения	+/- 4K		
Тип контакта	Размыкающий – NC /замыкающий контакт – NO (щелчковый контакт)		
Вид подсоединения	2-полюсная/ 5-полюсная клемма, 2,5 мм2		
Цвет	RAL 7035 – серый		
Класс защиты	IP 20		
Монтаж	Защёлкивающееся крепление для - 35мм профильной шины по EN 60715 - Pfannenberg PFA 3000		

Применение:
Термостаты используются для регулирования температуры охлаждающих, отопительных приборов, вентиляторов фильтров и теплообменников внутри шкафов с приборами управления.
Кроме того, они могут использоваться для управления датчиками сигналов для сообщения о слишком высоком или низком значении температуры.
Указания по технике безопасности:
Настройку термостатов может проводить только квалифицированный обученный персонал.
При монтаже следует обеспечить меры защиты и защиту от касаний.
Следует соблюдать указания на типовой табличке (напряжение и ток).
Следует обеспечить надежность работы термостата посредством функционального теста.
Указания по монтажу
- Термостат следует устанавливать в верхней части шкафа с приборами управления с максимально возможным расстоянием относительно конструктивных деталей, выделяющих тепло.
- вентиляционные шлицы термостата закрывать нельзя.
- при установке термостата размыкающего контакта следует прибавить максимально возможный гистерезис к необходимой минимальной температуре.

Пример: - необходимая минимальная температура в шкафу с приборами управления: 9°C (46°F)
- устанавливаемая температура: 20°C (66°F)
- получаемая из:
20°C (66°F)= необходимая температура 9°C + максимально возможный гистерезис 11K (7K+4K)

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CABLETEK HORIZONTAL CABLE MANAGER



DCHD2 shown



Arrowhead fingers funnel cable into base and hold it securely



DCHS4 shown



Vertical and horizontal cable manager system installed on a 2-post rack. Vertical and horizontal cable managers work together to make an orderly installation.

INDUSTRY STANDARDS
EIA 310-D

APPLICATION
This cable manager features heavy-duty endposts, arrowhead fingers and tool-less mounting to easily route copper and fiber data cables horizontally in standard 19-in. cabinets or on 2- or 4-post open frame racks.

FEATURES
- Snap-in mounting provision holds cable manager in place while mounting screws are installed
- Robust arrowhead fingers are shaped to funnel cables into base and are made of black composite material
- Robust rounded end posts support cable as it enters and leaves cable manager and maintains proper cable bend radius
- Deep cable compartments allow maximum cable density
- Rounded edges throughout protect cable jackets from damage
- Pass-through holes on double-sided models protect cable while facilitating routing between front and back sides
- Single- and double-sided units provide high cable capacity, including fiber and copper category cables
- 1 RU and 2 RU heights allow greater flexibility in optimizing rack capacity
- Removable hinged cover opens top or bottom, snaps closed for assured cable protection and professional appearance
- Double-sided model has covers on both front and back
- Covers stay open during installation and maintenance procedures
- Horizontal and vertical cable managers designed as a system for streamlined appearance and improved functionality
- Combination head 10-32 and 12-24 screws included for mounting

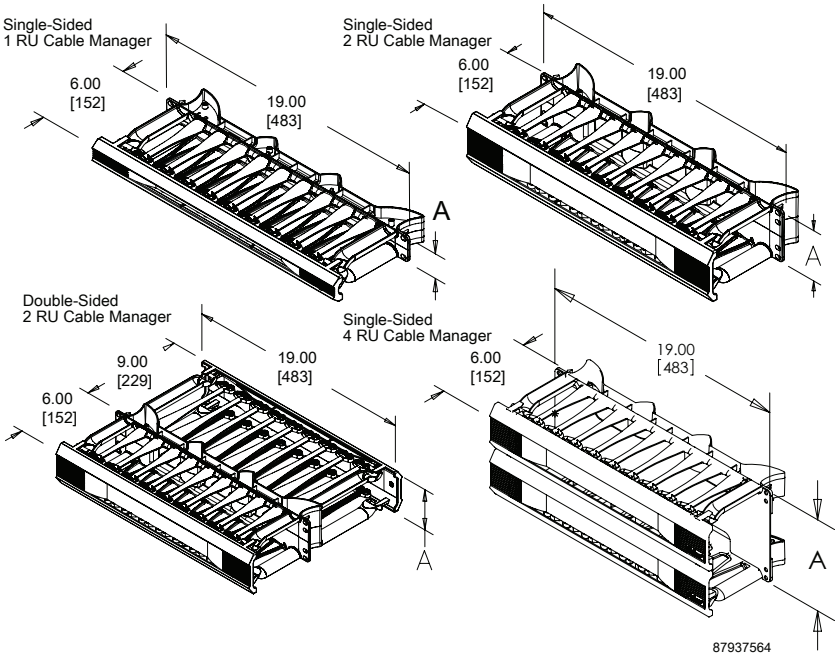
SPECIFICATIONS
- Made of UL listed black composite material

FINISH
Low gloss, matches look of RAL 9005 textured paint

BULLETIN: DACCY

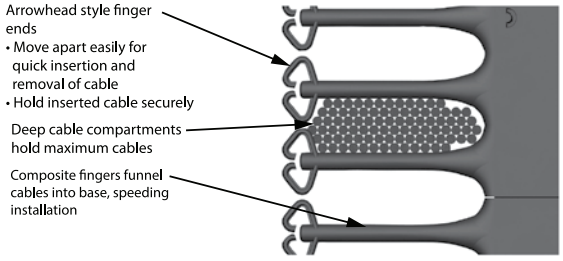
Standard Product **CABLETEK Horizontal Cable Managers; 60% Cable Manager Fill Rate**

Catalog Number	Description	Rack Units	A in./mm	Front Cross-Section Area (in.^{2})	Front Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Front Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Front Cable Fill Rate 60% 6A Cable (0.30-in. dia.)	Back Cross-Section Area (in.^{2})	Back Cable Fill Rate 60% 5e Cable (0.22-in. dia.)	Back Cable Fill Rate 60% 6 Cable (0.25-in. dia.)	Back Cable Fill Rate 60% 6A Cable (0.30-in. dia.)
DCHS1	Single-Sided	1	1.75 44	4.2	66	57	35	–	–	–	–
DCHS2	Single-Sided	2	3.50 89	13.2	208	161	112	–	–	–	–
DCHD2	Double-Sided	2	3.50 89	13.2	208	161	112	14.1	223	172	119
DCHS4	Single-Sided	4	7.0 178	26.9	416	322	224	–	–	–	–



Arrowhead Cable Capacity; 60% Fill Rate

Location	Cross-Section Area (in.^{2})	5e Cable (0.22-in. dia.)	6 Cable (0.25-in. dia.)	6A Cable (0.30-in. dia.)
Front	5.52	90	67	46
Back	9.27	145	113	78



RACK- AND PANEL-MOUNT POWER DISTRIBUTION UNITS (PDUS)



FEATURES

- Power on/off LED indicates whether power is available at the PDU
- External ground stud provided on single-phase models for secure grounding
- Circuit breakers provide additional equipment protection
- Circuits are isolated on dual circuit model; each has its own circuit breaker
- Reset button provides easy access to circuit breaker reset
- Surge protector models have an indicator LED to verify surge circuitry protection
- Rack-mount models mount directly to rack or with adapter bracket
- Rack-mount models designed for single-phase applications
- Panel-mount models can be mounted flush or with hanging bracket

SPECIFICATIONS

- Steel housing
- Power cord with molded-on plug:
  - 12-in. (305-mm) long single-phase model: 6 ft. (1.8 m)
  - Other single-phase models: 15 ft. (4.6 m)

Contact Hoffman for custom modifications and non-standard offerings.

FINISH

Black, low-gloss textured paint.

BULLETIN: DPS

INDUSTRY STANDARDS

UL/cUL 60950 listed
UL 1449 (Surge protector models only)

EIA 310-D (19-in. rack-mount models only)

APPLICATION

Rack- and Panel-Mount PDUs not only provide convenient, reliable power to equipment mounted in cabinets or on open frame racks, they can also be configured to meet a wide range of design specifications.

Standard Product **Single-Phase Rack-Mount**

Catalog Number	Surge Protection	Amp Meter	Load Rating	Voltage (VAC)	Joule Rating	Receptacle Location	No. of Receptacles	Receptacle Style	Power Cord Plug	Rack Units
DP1N190615	No	No	15A	120	–	Front	6	NEMA 5-15R	NEMA 5-15P	1
DP1N191415	No	No	15A	120	–	6 front, 8 back	14	NEMA 5-15R	NEMA 5-15P	1
DP1N191015S	Yes	No	15A	120	2000	2 front, 8 back	10	NEMA 5-15R	NEMA 5-15P	1
DP1N191020	No	No	20A	120	–	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020S	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA 5-20P	1
DP1N191020ST	Yes	No	20A	120	2000	2 front, 8 back	10	NEMA 5-20R	NEMA L5-20P Twist Lock	1

Isolated circuits on dual-circuit models with separate circuit breakers.

Plugs and Receptacles

NEMA Type	Plug	Receptacle
NEMA 15 Amp, 120V, Duplex	5-15P	5-15R
NEMA 20 Amp, 120V, Duplex	5-20P	5-20R
NEMA 20 Amp, 120V, Twist Lock	L5-20P	L5-20R
30 Amp, 120/208V Wye, Twist Lock	L21-30P	L21-30R

IEC Type	Inlet	Outlet
IEC 15 Amp, 125/250V	C-14	C-13
IEC 20 Amp, 125/250V	C-20	C-19

87922518

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DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure



Overview

The Q-Series fiber enclosure system is designed to support standard density applications in building networks. The all steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 LC fibers in per RU, accepting OFP adapter panels, M2 pre-terminated cassettes, and splice cassettes.

Features

- **Highly Accessible:** Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables
- **Simplified Installation:** The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation
- **Versatile Installation:** Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes
- Max number of fibers per RU (SC) - 36
- Max number of fibers per RU (LC) - 72
- Max number of fibers per RU (12F MPO) - 288
- Max number of fibers per RU (24F MPO) - 576
- Cassette / Adapter panels per RU - 3

Part Number	Description
EQ01U-CHC	Q-Series 1U Standard Density (SD) Rackmount Fiber Enclosure
EQ02U-CHC	Q-Series 2U Standard Density (SD) Rackmount Fiber Enclosure
EQ04U-CVC	Q-Series 4U Standard Density (SD) Rackmount Fiber Enclosure

Dimensions

Part Number	Depth (Metric)	Depth (US)	Height (Metric)	Height (US)	Width (Metric)
EQ01U-CHC	485.90mm	19.13 in.	44.45mm	1.75 in.	434.85mm
EQ02U-CHC	485.90mm	19.13 in.	88.90mm	3.50 in.	434.85mm
EQ04U-CVC	485.90mm	19.13 in.	177.80mm	7.00 in.	434.85mm

DATA SHEET

Q-Series Standard Density Rackmount Fiber Enclosure

General Information

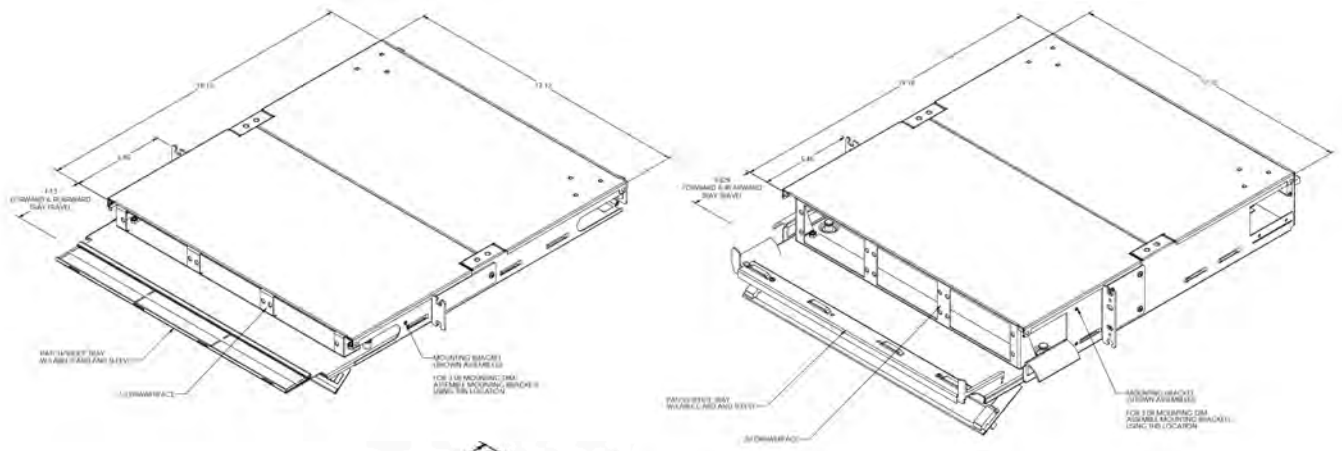
- Color: Black
- Installation: Rack or Cabinet
- Product Series: Q-Series
- Type: Standard Density Fiber Enclosure

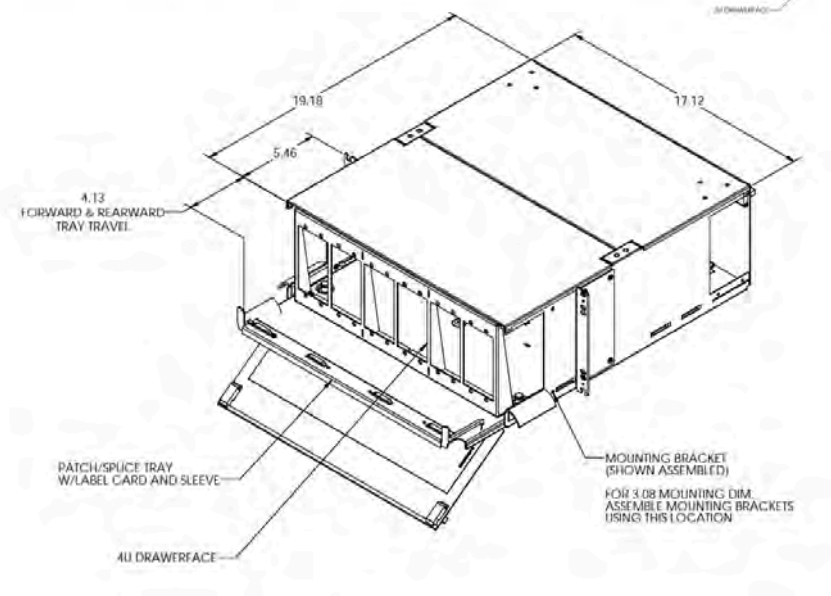
Listing Agencies/Third Party Certifications

- RoHS: Yes

Technical Information

- Mounting Hardware Included: Yes
- Cassette / Adapter Panel Capacity per RU: 3
- SC - Fiber Capacity Per RU: 36
- LC - Fiber Capacity Per RU: 72
- 12F MPO - Fiber Capacity Per RU: 216
- 24F MPO - Fiber Capacity Per RU: 432





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Legrand, North and Central America

60 Woodlawn Street
West Hartford, CT 06110
1.877.BY.LEGRAND (295.3472)
www.legrand.us

Ortronics

2 RU Q-Series Standard Density Rack-Mount Fiber Enclosure

Part No. EQ02U-CHC



The 2U Q-Series Standard Density (SD) footprint fiber enclosure system is designed to support standard density applications in building networks. The all-steel chassis enables reliable protection and management of fiber optic cable patching, splicing, and connecting. The enclosure also enables distribution of backbone cabling to active equipment, switching, or cross/interconnect horizontal area. The footprint accommodates up to 72 fibers with LC connectivity and 144 fibers with MDC per Rack Unit (RU), or a maximum capacity of 144 fibers LC and 288 MDC (VSFF), utilizing OFP adapter panels, LM2 pre-terminated cassettes, and M2 splice cassettes.

Features & Benefits

Highly Accessible: Front and rear doors along with removable top panels give appreciable access to the enclosure when patching and dressing cables

Simplified Installation: The rack-mount brackets feature an open-ended ear design to allow the enclosure to rest on pre-mounted screws in the rack for a one-person installation

Versatile Installation: Compatible with OFP adapter panels, M2 pre-terminated cassettes and M2 splice cassettes - Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Removable Top Covers: Tool-less, 60/40 split-top design allows for easy access from above

Max number of fibers per RU (SC): 36

Max number of fibers per RU (LC): 72

Max number of fibers per RU (12F MPO): 288

Max number of fibers per RU (24F MPO): 576

Cassette / Adapter panels per RU: 3

Specifications

General Info

Product Line	Ortronics	Color	Black
UPC Number	662875019978	Country Of Origin	Mexico
Features	Drawer Slide, Removable Cover	Application Sector	Commercial, Data Center, Industrial
Standard	RoHS;REACH Compliant	Type	Enclosure

Dimensions

Product Width US	17.12 in	Product Depth US	19.13 in

Product Height US	3.5 in

Technical Information

Fiber Optic Cable Type	OM3, OM4, OM5	Compatibility	OFP, M2, LM2
Rack Units	2	Capacity	6 Adapter Panels, 6 Cassettes
Mounting	Rack Mount		

TABLE OF CONTENTS

1.0 GENERAL
2.0 TOOLS REQUIRED FOR ASSEMBLY
3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE
4.0 ACCESSORIES PURCHASED SEPERATELY
5.0 ENCLOSURE ASSEMBLY
6.0 INSTALLATION OF ACCESSORIES
7.0 CABLE ROUTING AND INSTALLATION

1.0 GENERAL

This document describes the assembly procedure for the LEGRAND Patch and Splice Rack Mount Enclosures. Part numbers EQ02U-CHC (2 Rack Unit), EQ04U-CVC (4 Rack Unit), EQ02U-KHC (2 Rack Unit HD), EQ04U-KHC (4 Rack Unit HD), EQ02U-KHL-M (2 Magnesium Rack Unit HD), EQ04U-KHL-M (4 Magnesium Rack Unit HD). Hardware is provided for mounting 19" racks.

2.0 TOOLS REQUIRED FOR ASSEMBLY

2.1) #2 Phillips Head Screwdriver – required for enclosure assembly
2.2) #3 Phillips Head Screwdriver – required to mount the enclosure to the rack

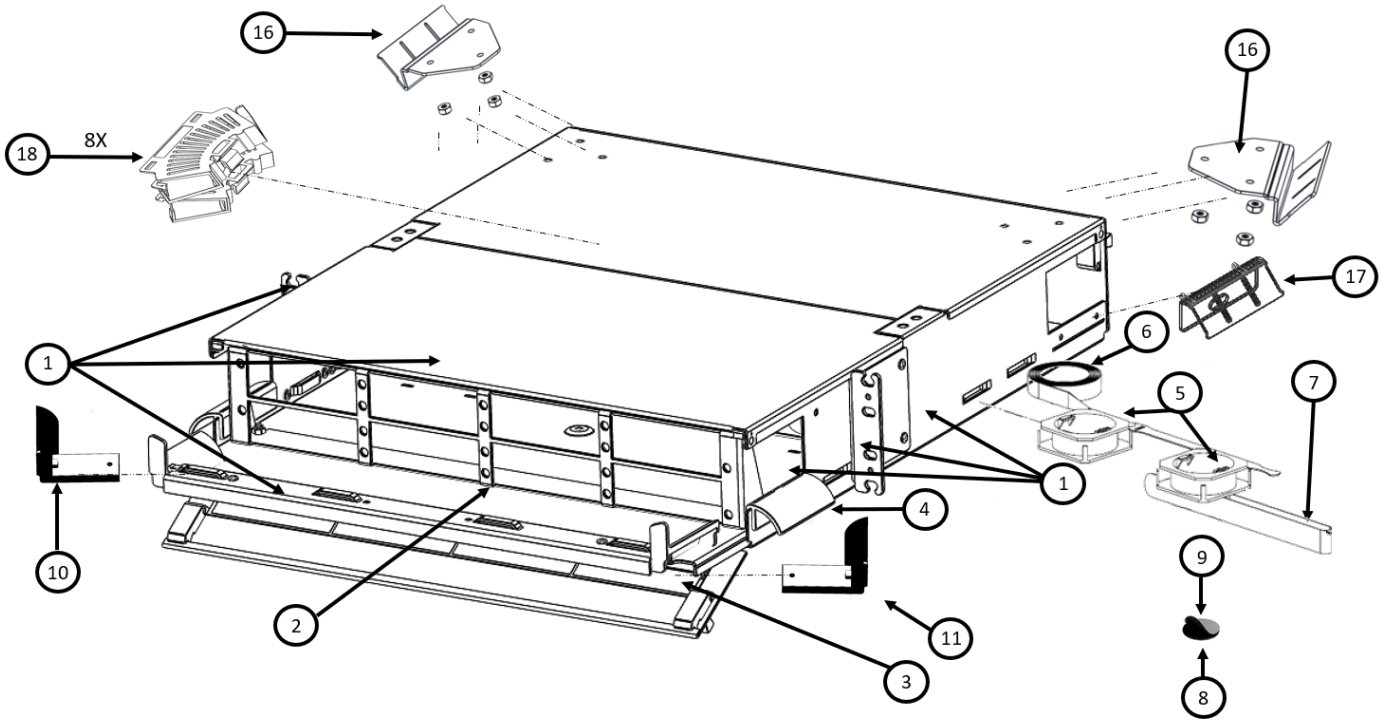
3.0 COMPONENTS AND HARDWARE PROVIDED WITH THE RACK MOUNT FIBER ENCLOSURE

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
1	Enclosure, Tray and Mounting Brackets, 2 Rack Unit	EQ02U-CHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit	EQ04U-CVC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD	EQ02U-KHC	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD	EQ04U-KHC	-	1
	Enclosure, Tray and Mounting Brackets, 2 Rack Unit, HD, Magnesium	EQ02U-KHL-M	1	-
	Enclosure, Tray and Mounting Brackets, 4 Rack Unit, HD, Magnesium	EQ04U-KHL-M	-	1
2*	Drawer Face, 2 Rack Unit	41400024-00	1	-
	Drawer Face, 4 Rack Unit	41400007-00	-	1
	Drawer Face, 2 Rack Unit, HD	41400931	1	-
	Drawer Face, 4 Rack Unit, HD	41400932	-	1
3*	Port Identification Card, 2 Rack Unit	70400879	1	-
	Port Identification Card, 4 Rack Unit	70400902	-	1
	Port Identification Card, 2 Rack Unit, HD	70401094	1	-
	Port Identification Card, 4 Rack Unit, HD	70401095	-	1
4	Bend Limiter	71200061	2	2
5	Cable Manager, Fiber Spool.	70800327	4	8
6	Straps, Hooks/Loops, Cable Mgt.	70700145	8	8
7	Straps, D-Ring, Hooks/Loops, 18" Long, Cable Mgt.	70700199-00	4	4
8	Loop, Dot, .50 Dia.	70700077	3	3
9	Hook, Dot, .50 Dia.	70700078	3	3

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
10	Cable Manager, Left	71200062-001	1	1
11	Cable Manager, Right	71200062-002	1	1
12	Washer, lock, #12, External star, phosphor bronze	70100090	1	1
13	Screw 12-24 x .625, PN HD, CMB DRV, ZNC PLT	70100070 / 70100070-59	4	4
14	Screw, machine, #6-32 Unc X .31, Pan HD, CR, Black	70100425	2	2
15	#6-32 screws for Mounting Brackets.		8	8
(*) If item 1 is a 2 or 4 Rack Unit, then items 2 & 3 will be for 2 or 4 Rack Units, etc.				

4.0 ACCESSORIES PURCHASED SEPARATELY

ITEM #	DESCRIPTION	PART NUMBER	QTY. 2U	QTY. 4U
16	Strain Relief Bracket, Upper	ECQ-BR	2	2
17	Strain Relief Bracket, Lower	FCBR-003	2	2
18	Kit, Fiber Spool, 8 Pieces	60401185	2	4



5.0 ENCLOSURE ASSEMBLY

5.1) Inspect the package contents before assembling to ensure conformance with the parts listed in Section **3.0**, then determine if the accessories listed in Section **4.0,** are required.

5.2) The Drawer Face (Item 2) is pre-assembled to the tray at the factory (Figure 1).

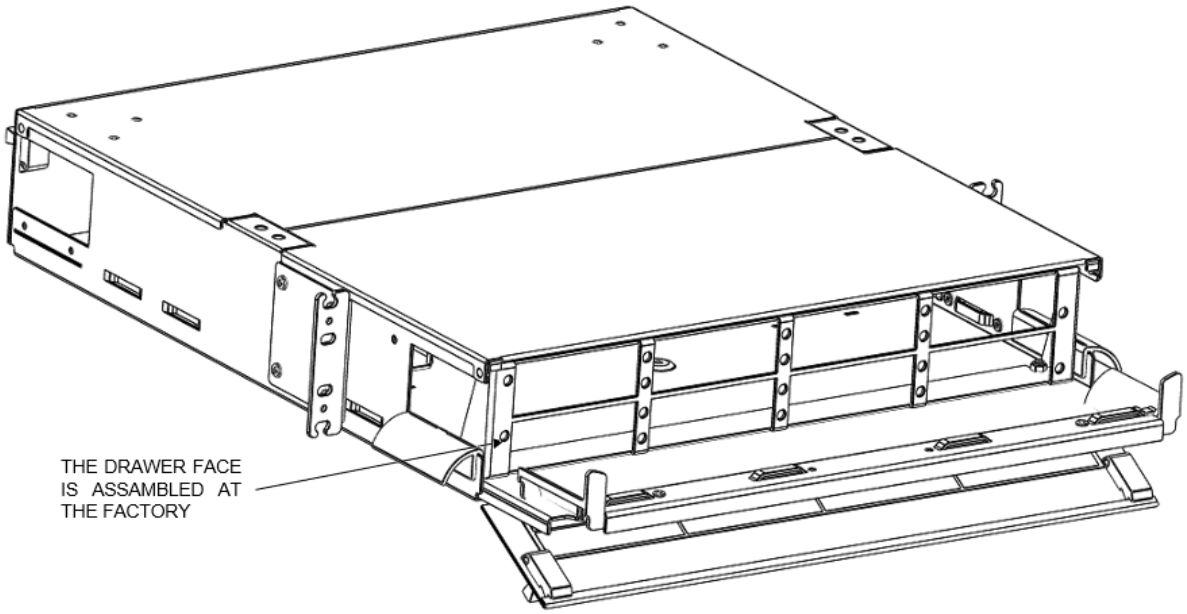


Figure 1

5.3) If your enclosure does not have the mounting brackets factory installed, use a #2 Phillips Head Screwdriver and the screws provided with the enclosure to attach one mounting bracket to each side of the enclosure using the holes provided. Figure 2 illustrates the mounting scheme. An alternate mounting position (Figure 2a) is available for 19" enclosures. To have an enclosure that installs more rearward in racks use the 4-hole pattern closest to the front side of the enclosure.

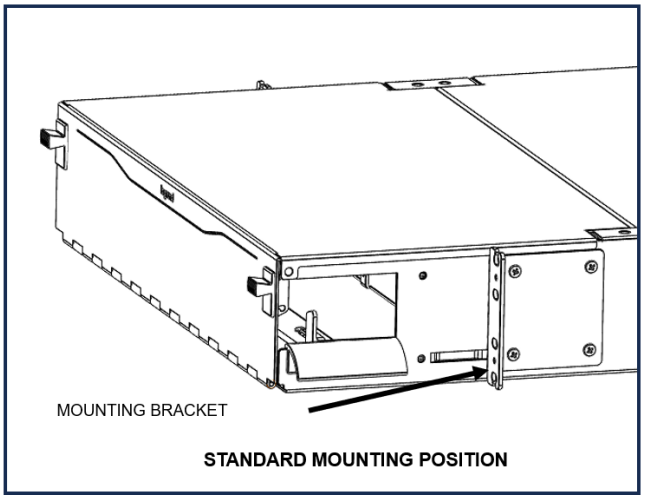


Figure 2

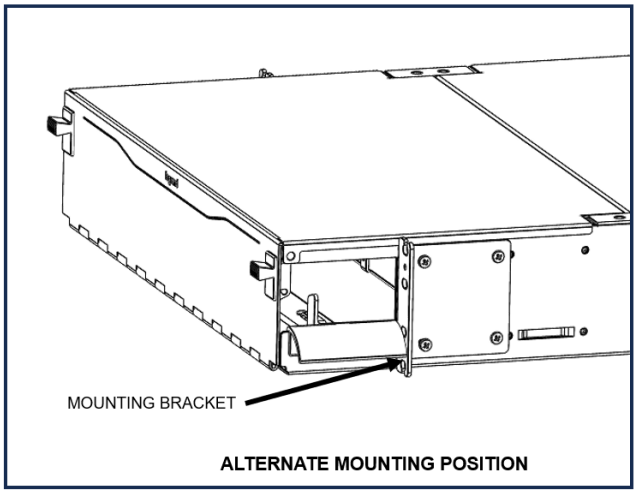


Figure 2a

5.4) Mate each Hook with a Loop dot. Remove protective backing from Hook or Loop and attach to underside of identification label, as required. Remove backing from the remaining side. Put label into place and press against the door to secure, approximately where shown (Figure 3).

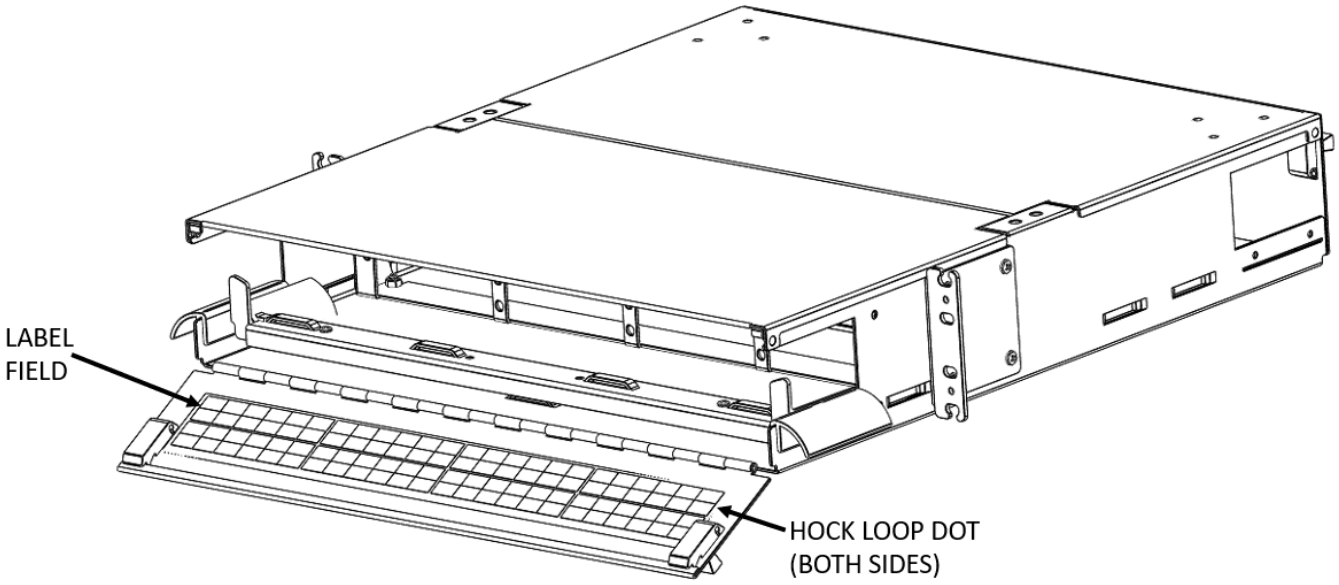


Figure 3

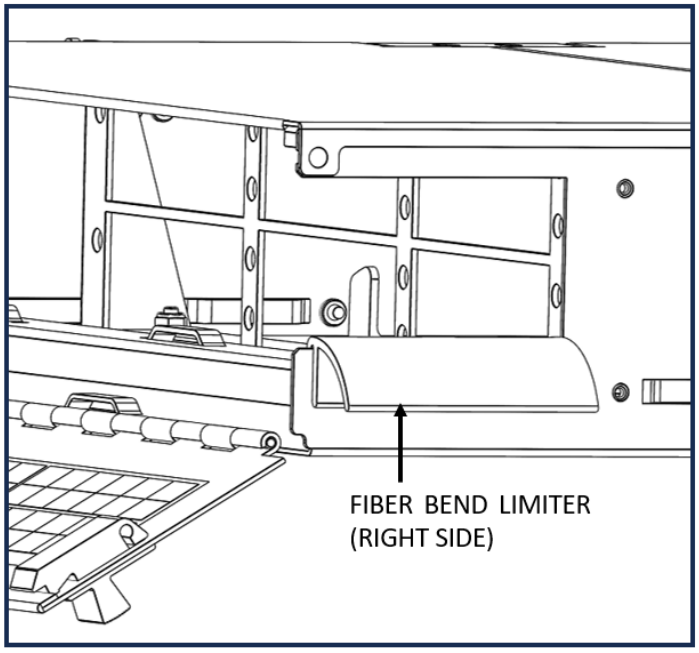


Figure 4

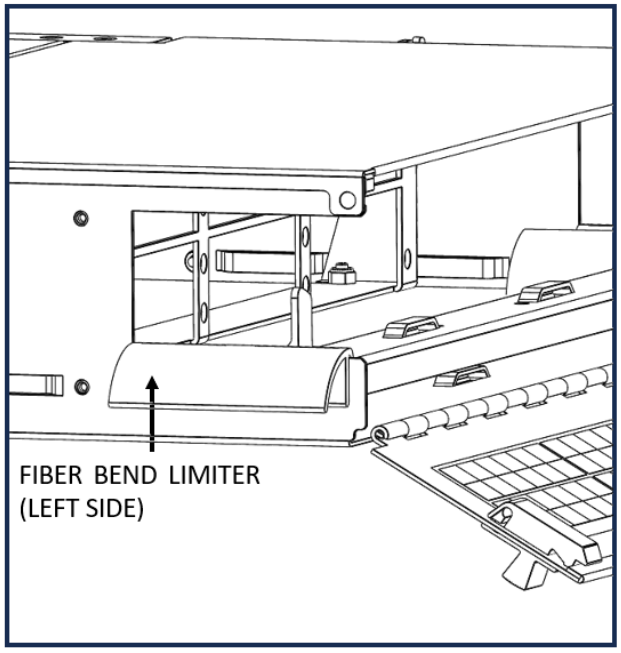


Figure 4a

5.5) Attach bend limiters to the enclosure as shown in Figures 4 & 4a (will be provided in black but shown in white for clarity).
5.6) The enclosure is ready to be mounted to the rack using the screws provided, and a #3 Phillips Head Screwdriver.

6.0 INSTALLATION OF ACCESSORIES

The fiber enclosures can support different styles of fiber bend radius control. The 2U & 4U enclosure trays can accept both styles. Figure 5a illustrates the current style and Figure 5b illustrates an alternate style.

6.1) To assemble the fiber manager provided with this enclosure: Attach Fiber Spool Cable Managers to the tray by inserting the (2) snap hook tabs into their mating tray slots then push the part down towards the tray until the snap hooks engage. An audible click will indicate a locked-in position. Follow the same procedure for additional assemblies. The fiber manager is capable of stacking although the enclosure will limit the number of fiber managers in a stack.
6.2) Figure 5a depicts the fiber spools secured to the tray (rear section).
6.3) When required, attach the Upper and/or Lower strain relief brackets to the rear of the enclosure as shown in Figure 6. Threaded studs are provided on the inside surface of the enclosure to accommodate the brackets.
6.4) To install the cable managers (item 10, 11), orient the curved sides to face each other. Place the short tab up and facing towards you as depicted in figure 8. Item 11 is the right-side cable manager. Item 10 is the left side cable manager. To attach them to the tray, place the long tab under the tray and align the holes to the threaded feature. Use the #6-32 screws provided (1) each, to fasten each cable manager. Do not overtighten.
6.5) Repeat steps **5.0** through **5.6** to assemble additional enclosures, and steps **6.0** through **6.4** for installation of accessories.

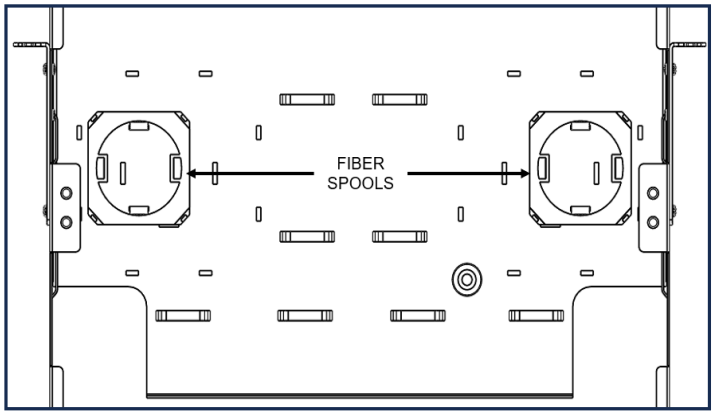


Figure 5a

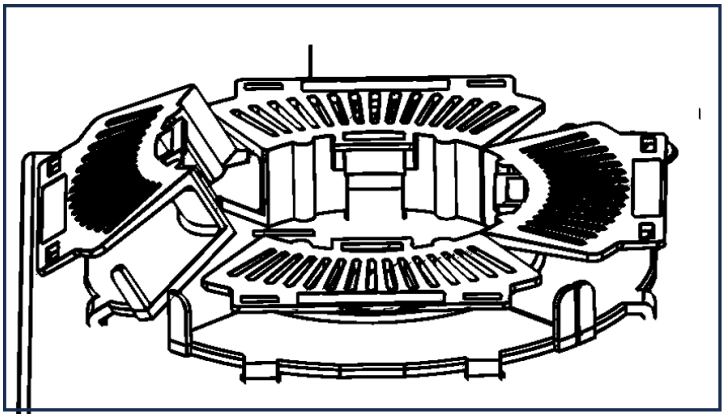


Figure 5b

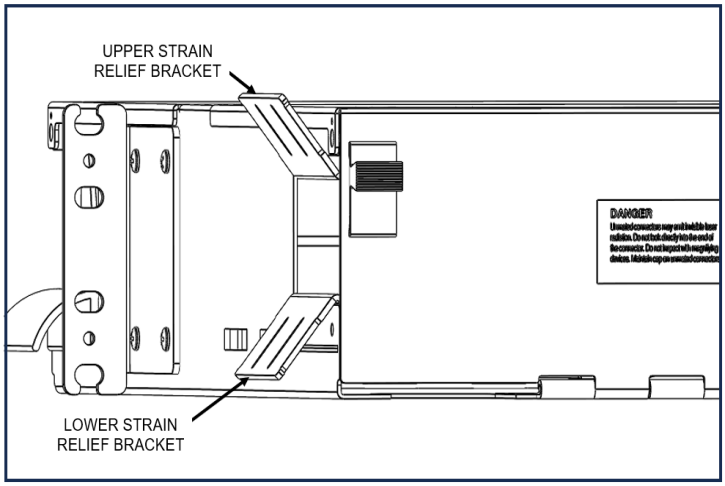


Figure 6

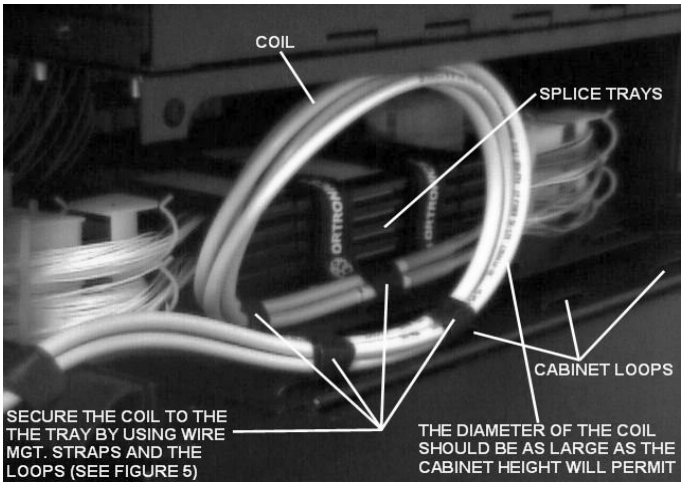


Figure 7

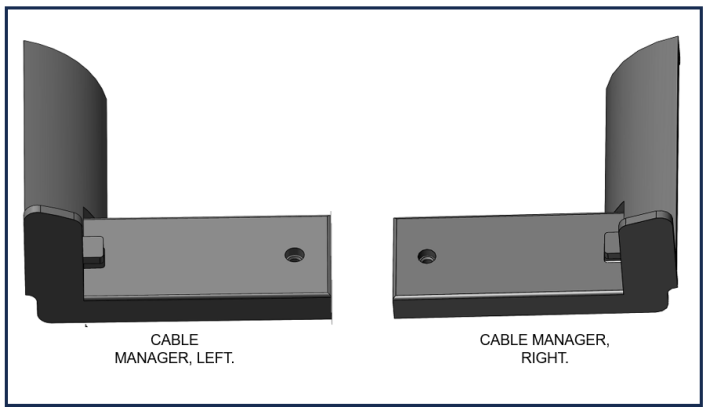


Figure 8

7.0 CABLE ROUTING AND INSTALLATION

7.1) Strip off approximately 1 meter (39 inches) of cable jacket. Trim the central strength member and/or the aramid yarn back to the cable jacket. Terminate connectors (if required) per the manufacturer's instructions.

7.2) With the jacketed portion of the fiber, make a service coil as large as the cabinet height will permit, as shown in Figure 7. The service coil is required to allow the tray to slide out the front of the cabinet freely.

7.3) Secure the outside coil to the cabinet utilizing management straps and the loops provided. Secure the inside coil to the tray utilizing wire management straps and the loops provided.

7.4) An example of a Patch and Splice wiring scheme is depicted in Figure 9.

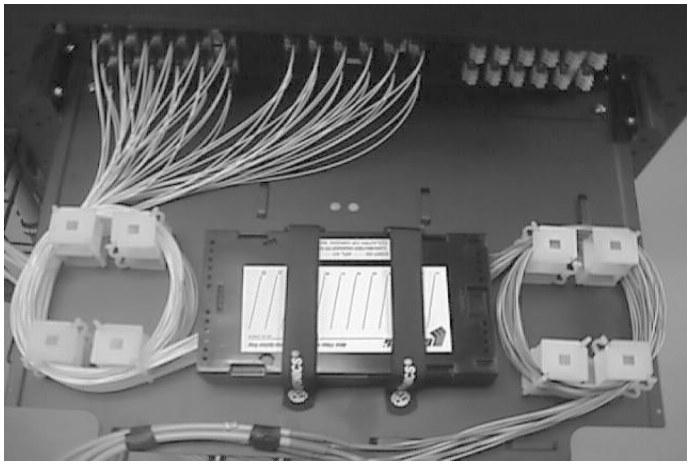


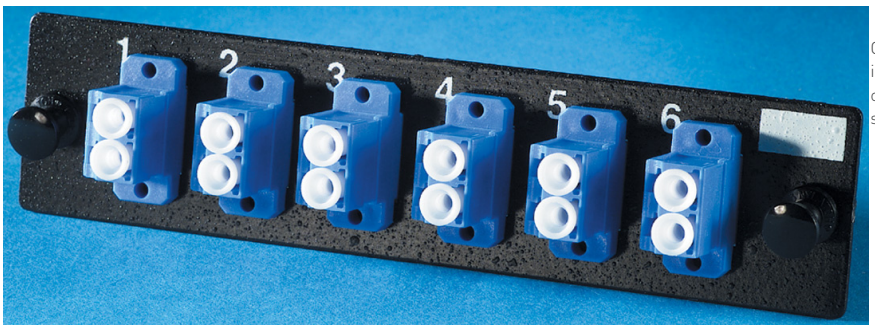
Figure 9

FOR QUESTIONS AND/OR ADDITIONAL INFORMATION, CONTACT LEGRAND AT THE FOLLOWING WEB ADDRESS, OR YOUR MANUFACTURER'S REPRESENTATIVE.

WWW.LEGRAND.US

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Ortronics
6-LC (12 fibers) single mode adapters with ceramic alignment sleeves
Part No. OFP-LCD12AC



Ortronics fiber adapter panel allows for flexibility and expansion with an industry accepted style. The adapter panel snaps in for installation and can be removed easily for future changes. The adapter panel is silkscreened for easy port identification.

Features & Benefits

- Up to 72 LC fibers per RU
- Made of durable polycarbonate
- 6, 8, 12 & 24 port panels
- Available in, LC, SC, ST and blank styles
- Zirconia ceramic sleeves for optimal performance
- Color options available

Specifications

General Info

Product Line	Ortronics	Color	Blue
UPC Number	662875593799	Country Of Origin	Mexico
Features	Shuttered	Included	Cover
Application Sector	Commercial, Data Center	Standard	RoHS compliant. Meets or exceeds TIA/EIA-568-C.3 requirements.
Warranty Type	5-Year	Type	Adapter Panel

Dimensions

Product Width US	5.12 in	Product Depth US	1.15 in
Product Height US	1.19 in		

Additional Information

Product Environmental Profile	Yes

Technical Information

Fiber Optic Cable Type	OS2	Operating Temperature Min	-10 °C
Compatibility	OFP	Number of Ports	12
Simplex/Duplex	Duplex	Operating Temperature Max	60 °C
Shuttered Adapters	No	Single/Multimode	Single-Mode
Number of Fibers	12	Fiber Type	Single-Mode
Form Factor	LC Duplex	Operating Temperature	-10°-60°C
Durability	500 matings	Operating Humidity	0-80% RH (Non-Condensing)
Storage Temperature	-40° - 75° C		

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NT24k® Modular Industrial Switch

N-Tron® Networking Series

RED LION®
a spectris company

Managed Gigabit Industrial Ethernet Switch

The N-Tron® series NT24k® is a modular managed switch designed for factory automation, utilities, SCADA, security surveillance and other industrial applications.



The Red Lion N-Tron series NT24k managed industrial Ethernet switch features connectivity for up to 24 Gigabit ports and offers a wide range of connectivity options—including 100Base, Gigabit, fiber optic and copper options—in a rugged 1U 19" rackmount enclosure. Designed to handle the most demanding environments, the NT24k delivers wire-speed throughput and includes dual power inputs, expanded shock and vibration tolerances, extreme operating temperature range and three slots to accommodate mix-and-match port modules. N-Ring™ technology restores network communication within ~30ms of fault detection. Robust remote monitoring capabilities make management easy.

APPLICATIONS

- Factory Automation
- Utilities
- SCADA
- Security Surveillance
- Transportation
- Alternative Energy

PRODUCT HIGHLIGHTS

- All Gigabit Modular Design
- Up to 24 Port Connections
- High Environmental Specifications
- N-Ring™ Advanced Ring Technology
- Robust Remote Monitoring
- Smart Plug-and-Play Operation

IEEE 1588v2 PTP OPTIONS

- Boundary Clock
- Transparent Clock

IEEE 1588v2 applications include

- Coordinated motion control
- Time-stamped data logging
- Time-stamped fault detection

PTP Models & Upgrade Kit Available

FEATURES & BENEFITS

- Supports up to three of the following port modules:
  - 8-port 10/100/1000BaseT(X) module
  - 8-port 100Base fiber module
  - 8-port 1000Base fiber module
  - 8-port Gigabit SFP module
  - 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- -40°C to 85°C operating temperature
- Dual power input options:
  - Low Voltage: 18-49 VDC
  - High Voltage: 90-264 VAC or 90-300 VDC
- Onboard temperature sensor
- ESD and surge protection diodes on all copper ports
- Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
- USB configuration port
- Configurable alarm contact
- Optional backup/restore configuration device
- Fully managed features include:
  - SSH/SSL/HTTPS
  - SNMP v1, v2, v3
  - Web browser management
  - Detailed ring map and fault location charting
  - RSTP - 802.1d, 802.1w, 802.1D
  - Trunking and port mirroring
  - 802.1Q tag VLAN and port VLAN
  - IEEE 802.1x with RADIUS remote server authentication
  - DHCP Server, Option 82 relay, Option 61, IP fallback
  - Port Security – MAC address based
  - 802.1p QoS, port QoS and DSCP
  - Event Log/Syslog
  - SNTP (Simple Network Time Protocol)
  - IEEE 1588v2 (PTP) models available
  - Multi-Member N-Ring™ technology with ~30ms healing
  - N-Link redundant ring technology
  - N-View™ monitoring technology
  - EtherNet/IP™ CIP™ messaging
  - 802.1AB-2005 LLDP (Link Layer Discovery Protocol)

FC c UL us LISTED 65SN CE UKCA ABS TYPE APPROVED PRODUCT RoHS compliant EtherNet/IP

Managed Gigabit Industrial Ethernet Switch Specifications

SWITCH PROPERTIES

Number of MAC Addresses: 16K
IEEE 1588v2 Software-Based Option
Aging Time: Programmable
Latency (typical): 1.6 µs
Switching Method: Store & Forward
MTBF: >1 million hours
Jumbo Frame Support

POWER INPUT

Input Voltages:
Low Voltage: 18-49 VDC
High Voltage: 90-264 VAC or 90-300 VDC
Input Current (max): 2.26A @ 24VDC
Input Current (max): 790mA @120 VAC/450mA @ 124VDC
BTU/hr: 185 @ 24VDC
BTU/hr: 365 @ 120VAC/190 @ 124VDC

CONNECTORS

10/100/1000BaseT(X): Up to 24 RJ45 copper ports
100BaseFX: Up to 24 SC or ST fiber ports
1000BaseFX: Up to 24 SC fiber ports
100BaseSX/LX SFP: Up to 24 LC fiber ports
1000BaseGX SFP: Up to 24 LC fiber ports

RELIABILITY

MTBF: >1 million hours

NETWORK MEDIA

10BaseT: ≥Cat3 cable
100BaseTX: ≥Cat5 cable
1000BaseT: ≥Cat5 cable
100BaseFX, 1000BaseSX Multimode: 50-62.5/125µm
100BaseFX, 1000BaseLX Singlemode: 7-10/125µm

RECOMMENDED WIRING CLEARANCE

Front and Back: 4" (10.2 cm)

CERTIFICATION & COMPLIANCE

Product Safety:
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions:
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009; Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity:
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Other:
ABS Type Approval for Shipboard Applications; EMC Directive 2014/30/EU; LV Directive 2014/35/EU, RoHS Compliant

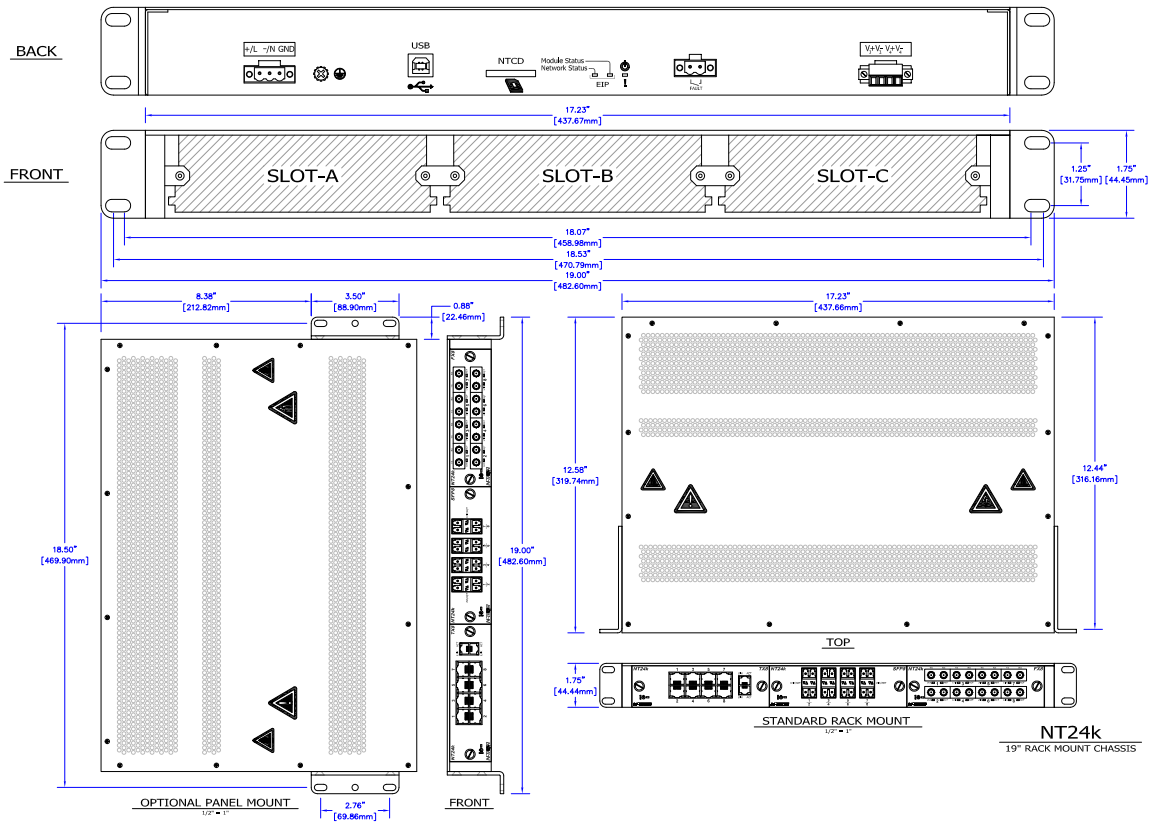
ENVIRONMENTAL

Operating Temperature: -40° C to 85° C
Operating Humidity: 5% to 95% (Non Condensing)
Operating Altitude: 0 to 10,000 ft.
Shock: 50g @ 10ms
Vibration/Seismic: 30g, 10-200 Hz, triaxial

MECHANICAL

Case Dimensions
Height: 1.9" (4.8 cm)
Width: 17.5" (44.5 cm)
Depth: 12.7" (32.0 cm)
Weight (maximum): 12.85 lbs (5.83 kg)
Mount: Rackmount 1U

DIMENSIONS



Specifications are subject to change. Visit www.redlion.net for more information.

Managed Gigabit Industrial Ethernet Switch Specifications

NT24K-FX8 MODULE - 100 MB FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24K-GX8 MODULE - GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 300m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24K-SFP-DM8 MODULE - SFP 100BASE FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	2km	15km	40km	80km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24K-SFP-DM8 OR NT24K-SFP8 MODULES- SFP GIGABIT FIBER TRANSCEIVER CHARACTERISTICS

Fiber Mode	MM	SM	SM	SM
Fiber Length*	550m @ 50/125µm 275m @ 62.5/125µm	10km	40km	80km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance.
Link budgets should be evaluated based on specific application conditions.

ORDERING GUIDE

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input PTP Enabled
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-DC2-PT	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs PTP Enabled
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input
NT24K-AC1-PT	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input
NT24K-AC2-PT	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC/90-300 VDC power input PTP Enabled
NT24K-AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs
NT24K-AC1-DC1-PT	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC/90-300 VDC and 18-49 VDC power inputs PTP Enabled
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device
NTPC-AC-US	AC power cord
NTPS-24-3	DIN rail power supply 3.0 Amp@24 VDC
NT24K-KIT-PTP	NT24k Upgrade License to Enable IEEE 1588/PTP on Non-PT NT24k Switches
PORT MODULES & TRANSCEIVERS	
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*
NTSFP-FX	100BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2km)**
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP pluggable mini-GBIC transceiver (LC style connector)**
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode. *SFP transceivers sold separately. **For use with SFP DM8 module only

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For over 50 years, Red Lion has strived to be THE Industrial Data Company™. The company empowers industrial organizations around the world to unlock the value of data by developing and manufacturing innovative solutions to access, connect and visualize their information. Red Lion products make it easy for companies to gain real-time data visibility that drives productivity. Red Lion is part of Spectris plc, the experts in providing insight through precision measurement. For more information, please visit www.redlion.net.

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N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches

Hardware Guide | January 2023
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Support: support.redlion.net

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Preface

Disclaimer

This hardware guide provides an overview of installation, maintenance and operation of the N-Tron® Series NT24k® Modular Series Managed Gigabit Ethernet Switches equipment. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls, Inc. is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

Users of this document are urged to heed warnings and cautions used throughout the document.

Compliance Information

It is recommended that the owner of this equipment determine and ensure conformance with any specific and applicable local regulations.

FCC Statement

This product complies with Part 15 of the FCC-A Rules.

Operation is subject to the following conditions:

1. This device may not cause harmful Interference
2. This device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Déclaration de conformité FCC

Ce produit est conforme à la partie 15 des règles de la FCC–A

Utilisation est soumise aux conditions suivantes:

1. Ce dispositif ne doit pas causer des interférences nuisibles
2. Cet appareil doit accepter toute interférence reçue, y compris les interférences qui peuvent causer un mauvais fonctionnement.

Note: Cet équipement a été testé et jugé conforme aux limites de la classe A des appareils numériques, conformément à la partie 15 des règles de la FCC . Ces limites sont conçues pour fournir une protection raisonnable contre les interférences nuisibles dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie radiofréquence et, si il n'est pas installé et utilize conformément aux instructions, peut causer des interférences nuisibles aux communications radio. L'utilisation de cet appareil dans une zone résidentielle est susceptible de provoquer des interférences nuisibles, auquel cas l'utilisateur sera tenu de corriger les interférences à ses propres frais.

Industry Canada

This Class A digital apparatus meets all requirements of the Canadian Interference Causing Equipment Regulations. Operation is subject to the following two conditions; (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Cet appareillage numérique de la classe A répond à toutes les exigences de l'interférence canadienne causant des règlements d'équipement. L'opération est sujette aux deux conditions suivantes: (1) ce dispositif peut ne pas causer l'interférence nocive, et (2) ce dispositif doit accepter n'importe quelle interférence reçue, y compris l'interférence qui peut causer l'opération peu désirée.

Environmental Impact Statement

Red Lion equipment contains no hazardous materials as defined by the United States Environmental Protection Agency (USEPA). Red Lion recommends that all failed product be returned to Red Lion for failure analysis and proper disposal.

Toxic Emissions

Red Lion equipment releases no toxic emissions.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- Ethernet is a registered trademark of Xerox Corporation.
- EtherNet/IP and CIP are registered trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at

www.redlion.net/support/documentation.

Additional Product Information

Additional product information can be obtained by contacting the local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Cautions and Warnings / Mises en Garde et Avertissements

Warnings apply to situations where personal injury or death may result.

Cautions apply to where reduced function or damage to equipment may result.

General Safety Cautions and Warnings / Précautions et Avertissements de Sécurité Générale

	**CAUTION:** If the equipment is used in the manner not specified by Red Lion, the protection provided by the equipment may be impaired. **ATTENTION:** Si l' équipement est utilisé d'une manière non spécifiée par Red Lion, la protection fournie par l'équipement peut être compromise.

	**CAUTION:** Do not remove any of the covers. There are no serviceable parts within the unit. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne retirez aucun des couvercles. Il n'y a pas des pieces utilisables à l'intérieur de l'appareil. Ne pas remplacer les pièces non-autorisées ou effectuer des modifications non-autorisées de l'appareil.

	**CAUTION:** Do not block any air vents on the unit. **ATTENTION:** N'obstruez pas les fentes d'aération de l'unité.

	**CAUTION:** Do not operate the equipment in a manner not specified by this manual. **ATTENTION:** Ne pas faire fonctionner l'équipement d'une manière non spécifiée par ce manuel.

	**WARNING:** Install only in accordance with Local and National Codes of authorities having jurisdiction. **AVERTISSEMENT:** Installer uniquement, conformément aux codes locaux et nationaux des autorités ayant compétence.

Electrical Safety Warnings / Avertissements de Sécurité Électrique

	**WARNING:** Never install or work on electrical equipment or cabling during periods of lightning activity. **AVERTISSEMENT:** Ne jamais installer ou travailler sur équipement électrique ou de câblage pendant les périodes d'activité de la foudre.

	**CAUTION:** Do not perform any services on the unit unless qualified to do so. Do not substitute unauthorized parts or make unauthorized modifications to the unit. **ATTENTION:** Ne pas effectuer de services sur l'appareil s'il n'est pas qualifié pour le faire. Ne pas substituer pièces non autorisées ou de modifications non autorisées de l'appareil.

	**WARNING:** Properly ground the unit before connecting anything else to the unit. Units not properly grounded may result in a safety risk and could be hazardous and may void the warranty. See the grounding technique section of this manual for proper ways to ground the unit. **AVERTISSEMENT:** L'unité doit être correctement mise à la terre avant tout raccordement à l'unité. Unités pas correctement mise à la terre peuvent causer un risque de sécurité et pourraient être dangereuses et peuvent annuler la garantie. Voir la section technique de mise à la terre dans ce mode d'emploi pour des moyens appropriés à la masse de l'appareil.

	**WARNING:** Device must be supplied by a Class 2 power source (except for POE models). **AVERTISSEMENT:** l'appareil doit être alimenté par une source d'alimentation de classe 2 (sauf pour les modèles POE).

	**WARNING:** Do not operate the unit with the top cover removed, as this could create a shock or fire hazard. **AVERTISSEMENT:** Ne pas faire fonctionner l'unité avec le couvercle retiré, ceci pourrait créer une décharge électrique ou un incendie.

	**CAUTION:** Observe proper DC Voltage polarity when installing power input cables. Reversing voltage polarity can cause permanent damage to the unit and void the warranty. **ATTENTION:** Respectez la polarité correcte de tension DC lors de l'installation des câbles d'alimentation d'entrée. Inversion de polarité de tension peut causer des dommages permanents à l'appareil et annule la garantie.

Environmental Safety Cautions and Warnings / Sécurité Environnementale Mises en Garde et Avertissements



WARNING: Do not operate the equipment in the presence of flammable gases or fumes. Operating electrical equipment in such an environment constitutes a definite safety hazard.

AVERTISSEMENT: Ne pas utiliser le matériel en présence de gaz ou de vapeurs inflammables. L'utilisation de matériel électrique dans un tel environnement constitue un danger certain.



WARNING: Disconnect the power and allow to cool 5 minutes before touching.

AVERTISSEMENT: Déconnectez le câble d'alimentation et laisser refroidir 5 minutes avant de la toucher.

Hazardous Location Warnings / Les Avertissements d'Emplacement Dangereux



CAUTION: This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

ATTENTION: Cet appareil est adapté pour utilisation en Classe I, Division 2, Groupes A, B, C, D ou endroits non-dangereux seulement.



WARNING: Explosion Hazard – Substitution of components may impair suitability for Class I, Division 2.

AVERTISSEMENT - Risque d'explosion - La substitution de tout composant peut nuire à la conformité de Classe 1, Division 2.



WARNING: Explosion Hazard – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux.



WARNING: Exposure to some chemicals may degrade the sealing properties of materials used in the following devices: Relay U40.

AVERTISSEMENT: L'exposition à certains produits chimiques peut dégrader les propriétés d'étanchéité des matériaux utilisés dans les dispositifs suivants: relais par U40.



WARNING: Explosion Hazard – Do not replace the device unless power has been switched off or the area is known to be non-hazardous.

AVERTISSEMENT: Risque d'explosion - Ne pas remplacer l'appareil à moins que l'alimentation a été coupée ou que la zone est connue pour être non-dangereuse.



WARNING: Never connect or disconnect power when hazardous gases are present.

AVERTISSEMENT: Ne jamais brancher ou débrancher l'alimentation lorsqu'en presence de gaz dangereux.

Surrounding Air Temperature / Temperature Ambiante

NT24k-DC and NT24k-AC rackmount models: -40°C to 85°C

NT24k-DR16 and NT24k-DR24 models: -40°C to 75°C

Note: Use 105 °C or higher rated copper wire, (0.22NM) 2lb/in tightening torque for field installed conductors.
Remarque: Utilisez fil de cuivre classé 105 °C ou plus, (0.22Nm) 2 pouces/livres couple de serrage pour les connecteurs installés sur le terrain.

Laser Safety Warnings / Avertissements de Sécurité Laser

(Options: NTSFP-FX, NTSFP-FXE, NTSFP-SX, NTSFP-LX)



CAUTION: CLASS 1 LASER PRODUCT. Do not stare into the laser.
ATTENTION: PRODUIT LASER CLASSE 1. Ne pas regarder dans le laser.

Regulatory Information

Product Safety
ANSI/ISA 12.12.01-2013 Class I and II, Div. 2 and Class III, Div. 1 and 2, Groups A, B, C and D Hazardous Locations
UL508 Industrial Control Equipment
CAN/CSA-C22.2 No. 213-M1987 Class I Div. 2 Hazardous Locations
CAN/CSA-C22.2 No. 14-M1987 Industrial Control Equipment
Emissions
FCC Title 47, Part 15, Radio Frequency Devices, Subpart B ANSI C63.4-2009
Industry Canada ICES-003, EN 55011; EN 61000-6-4, EN 61000-3-2, EN61000-3-3, EN 55032
Immunity
EN 55024, EN 61000-6-2; IEC 61000-4-2 (ESD); IEC 61000-4-3 (RFAM); IEC 61000-4-4 (EFT); IEC 61000-4-5 (SURGE); IEC 61000-4-6 (RFCM); IEC 61000-4-8 (PFMF); IEC 61000-4-11 (VDI)
Marine
ABS Type Approval for Shipboard Applications
Other
EMC Directive 2014/30/EU
LV Directive 2014/35/EU GOST-R
RoHS compliant

KC Mark (Korea)

A 급 기기 (업무용 방송통신 기자재)	이기기는 업무용(A급) 전자파 적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정 외 지역에서 사용하는 것을 목적으로 합니다.
Class A device (Broadcasting and communication equipments for office work)	This equipment is office use (Class A) electromagnetic wave suitability equipment and seller or user should take notice of it, and this equipment is to be used in the places except for home.

Chapter 1 Product Overview

NT24k® Modular Series Common Features

Red Lion's N-Tron® series NT24k modular switches are available in rackmount or 35mm DIN rail mountable configurations with high density Gigabit ports. The NT24k offers a wide array of port configurations and power input options that include Fast Ethernet and Gigabit speeds in copper or fiber. The hot-swappable port modules are auto-detected and configured by the switch, adding new definition to plug-and-play performance. Housed in rugged hardened enclosures, the NT24k series features extended shock and vibration specifications (bulkhead mount required to meet requirements), wide operating temperature ratings and best-in-class technology.

Connectivity

The NT24k series switches feature hot-swappable connectivity modules. These modules are available in Fast or Gigabit Ethernet, and are optionally available with copper, fiber or SFP ports. The NT24k accepts up to three modules for a maximum of 24 Ethernet ports, and can be changed without removing power from the switch.

Performance

The NT24k line of managed switches provide uncompromising performance in harsh environments including network features like N-Ring™, VLAN, Quality of Service (QoS), port mirroring, IGMP and SNMP.

Environmental

The NT24k series of managed switches are available in rackmount or 35mm DIN rail mountable configurations with operating temperatures up to -40° to 85°C. With UL Class I, Division 2 listing and CE certifications, these switches are built to last in the most demanding environments.

Monitoring

The NT24k Series includes N-View™ monitoring technology. N-View combines switch based technology with a Windows based OPC server and client monitoring tool. When N-View is enabled, the switch periodically autocasts a small Ethernet packet containing switch and port statistics. The data is captured by the N-View OPC server software and can be displayed by the provided N-View client or third party OPC client application running in the same Windows environment. For more information, please reference the N-View Installation and User's Guide.

Security

The NT24k series provides a high level of security utilizing IEEE 802.1x port-based network access control with RADIUS remote server authentication and SNMPv3 communication protocol to ensure the safest connections.

Available Models

PART #	TOTAL PORTS	MOUNTING	OPERATING TEMPERATURE	10/100/1000 COPPER	100 FIBER	GIG FIBER	SFP'S	18-49 VDC REDUNDANT POWER INPUT*	90-264 VAC/90-300 VDC POWER INPUT
NT24k-DR16-AC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	-	1
NT24k-DR16-DC	16	35mm DIN rail	-40 °C to 75 °C	Up to 16	Up to 16	Up to 16	Up to 16	1	-
NT24k-DR24-AC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-DR24-DC	24	35mm DIN rail	-40 °C to 75 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-AC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	1
NT24k-AC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	-	2
NT24k-AC1-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	1
NT24k-DC1	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	1	-
NT24k-DC2	24	19" Rackmount	-40 °C to 85 °C	Up to 24	Up to 24	Up to 24	Up to 24	2	-

* Each 18-49VDC power input option includes redundant (2) power connections.

NT24k® Rackmount

The NT24k Rackmount Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 1U 19" rack mount enclosure. Designed to handle the most demanding environments, the NT24k supports up to two power inputs, extreme operating temperature range and three slots to accommodate mix-and-match port modules.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)
- Easily transitions to Gigabit network requirements

-40°C to 85°C operating temperature
Dual power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

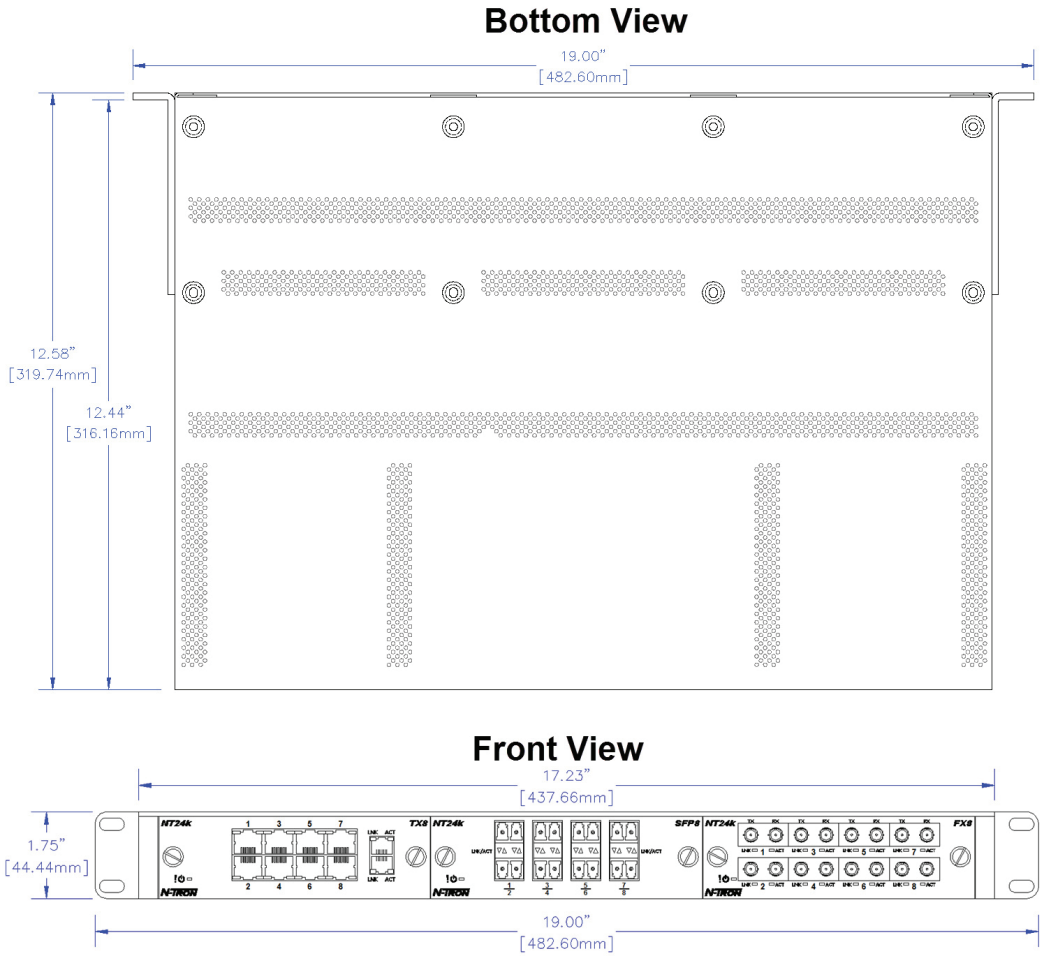
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- Trunking and port mirroring
- 802.1Q VLAN Tagging and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k® Rackmount Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
1.9" (4.8 cm)	17.5" (44.5 cm)	12.7" (32.0 cm)	12.85 lbs (5.83 kg)	Rackmount 1U
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.26 A @ 24 VDC Max: 790 mA @ 120 VAC/450 mA @ 124 VDC	185 @ 24 VDC 365 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 85 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k® Rackmount Dimensions



All specifications are subject to change. Consult the company website for more information.

NT24k-DR16

The NT24k-DR16 Managed Industrial Ethernet Switch features connectivity for up to 16 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to two of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

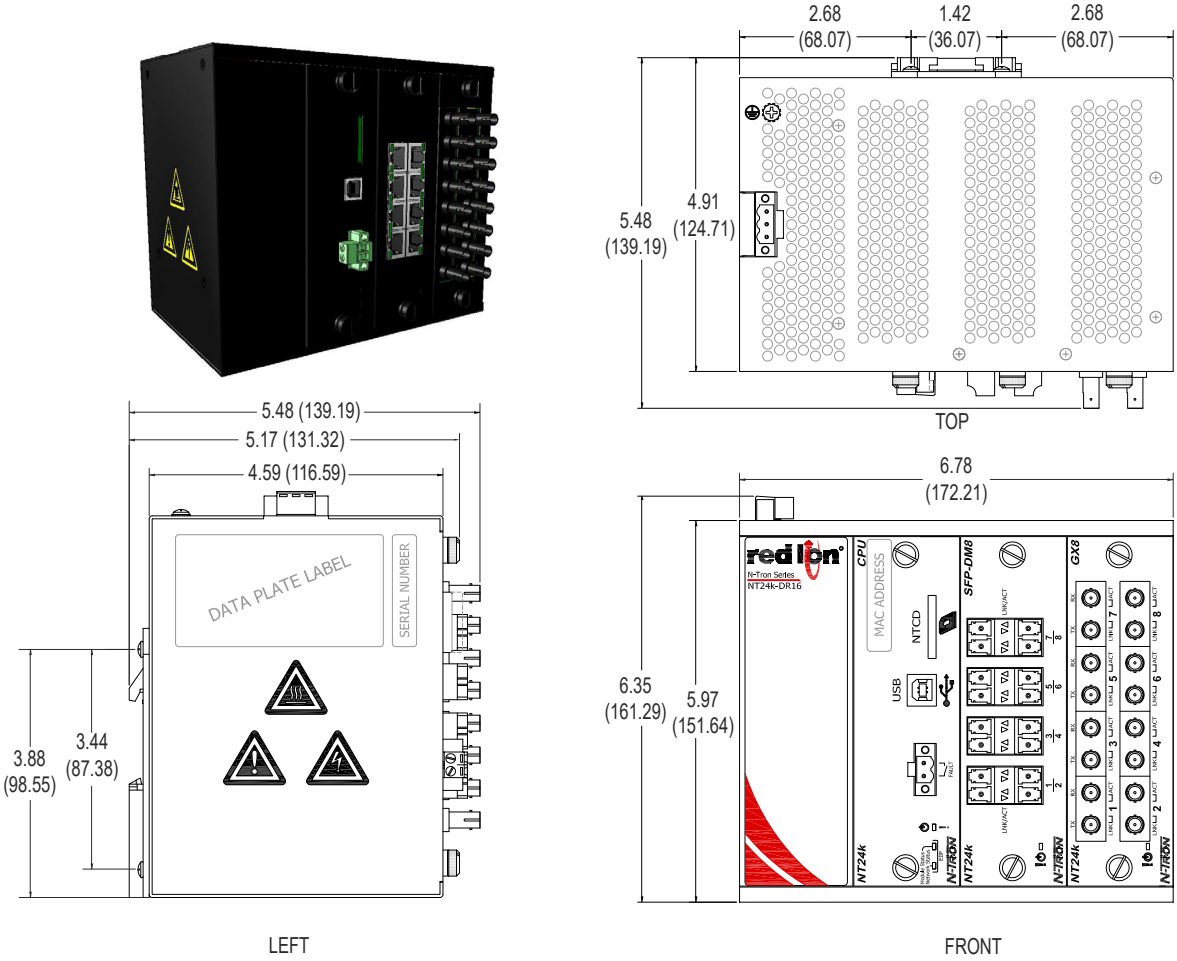
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x. with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™
- CIP™ messaging

NT24k-DR16 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	6.78" (17.22 cm)	4.59" (11.65 cm)	6.4 lbs (2.9 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 1.52 A @ 24 VDC Max: 580 mA @ 120 VAC/300 mA @ 124 VDC	125 @ 24 VDC 268 @ 120 VAC/190 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**		**Note**	
50g @ 10ms	30g, 10-200Hz, Triaxial		Unit must be bulkhead mounted to achieve these levels.	
CONNECTORS				
10/100/1000BaseT:(X): Up to 16 RJ45 ports				
100BaseFX: Up to 16 SC or ST fiber ports				
1000BaseSX/LX: Up to 16 SC fiber ports				
100BaseSX/LX SFP: Up to 16 LC fiber ports				
1000BaseGX SFP: Up to 16 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR16 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k-DR24

The NT24k-DR24 Managed Industrial Ethernet Switch features connectivity for up to 24 Gigabit ports in a rugged 35mm DIN rail enclosure.

Features and Benefits

Features and Benefits

Supports up to three of the following port modules:

- 8-port 10/100/1000BaseT(X) module
- 8-port 100Base fiber module
- 8-port 1000Base fiber module
- 8-port Gigabit SFP module
- 8-port dual mode SFP module (100Base or 1000Base SFP transceivers)

-40°C to 75°C operating temperature
Power input options:

- Low Voltage: 18-49 VDC
- High Voltage: 90-264 VAC or 90-300 VDC

Onboard temperature sensor
ESD and surge protecting diodes on all copper ports
Auto-sensing 10/100/1000BaseT(X), duplex and MDIX
USB configuration port
Configurable alarm contact

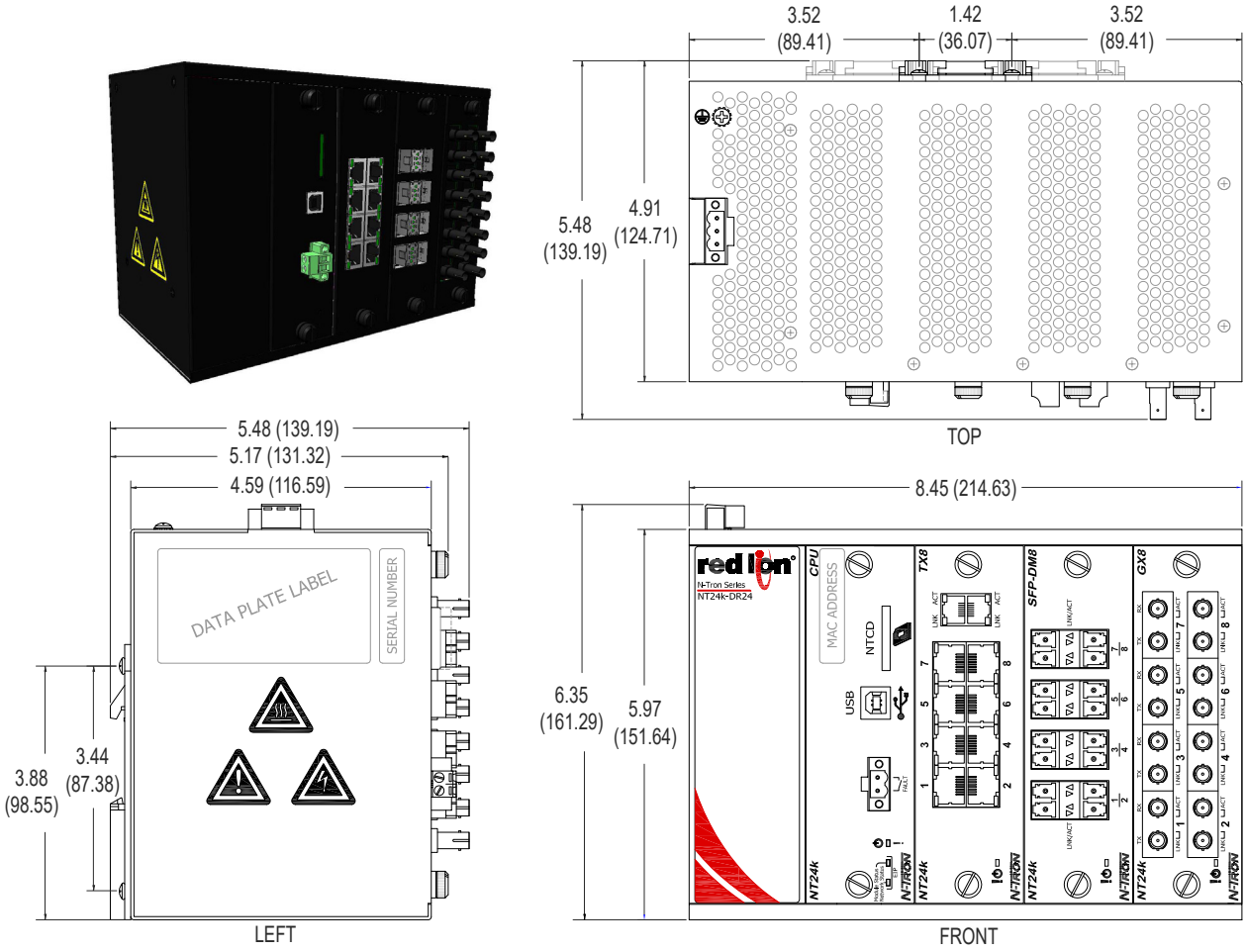
Optional backup/restore configuration device
Fully managed features include:

- Jumbo frame support
- SNMP v1, v2, v3
- Web browser management
- Detailed ring map and fault location charting
- RSTP - 802.1d, 802.1w, 802.1D
- IGMP auto-configuration
- Trunking and port mirroring
- 802.1Q tag VLAN and port VLAN
- 802.1p QoS, port QoS and DSCP
- SNTP (Simple Network Time Protocol)
- IEEE 802.1x with RADIUS remote server authentication
- DHCP client
- N-Ring™ technology with ~30ms healing
- N-Link redundant ring technology
- N-View™ monitoring technology
- Ethernet/IP™ CIP™ messaging

NT24k-DR24 Specifications

MECHANICAL				
Height	**Width**	**Depth**	**Weight**	**Mount**
5.97" (15.20 cm)	8.45" (21.46 cm)	4.59" (11.65 cm)	7.8 lbs (3.54 kg)	35mm DIN rail
POWER INPUT				
Input Voltage	**Steady Input Current**	**BTU/HR**		
Low: 18-49 VDC High: 90 - 264 VAC or 90 - 300 VDC	Max: 2.14 A @ 24 VDC Max: 780 mA @ 120 VAC/430 mA @ 124 VDC	175 @ 24 VDC 360 @ 120 VAC/182 @ 124 VDC		
ENVIRONMENTAL				
Operating Temperature	**Storage Temperature**	**Operating Humidity**		**Operating Altitude**
-40 to 75 °C	-40 to 85 °C	5% to 95% (non condensing)		0 to 10,000 ft.
SHOCK AND VIBRATION				
Shock	**Vibration**	**Note**		
50g @ 10ms	30g, 10-200Hz, Triaxial	Unit must be bulkhead mounted to achieve these levels.		
CONNECTORS				
10/100/1000BaseT:(X): Up to 24 RJ45 ports				
100BaseFX: Up to 24 SC or ST fiber ports				
1000BaseSX/LX: Up to 24 SC fiber ports				
100BaseSX/LX SFP: Up to 24 LC fiber ports				
1000BaseGX SFP: Up to 24 LC fiber ports				
RECOMMENDED MINIMUM WIRING CLEARANCE				
Top	4" (10.16 cm)			
Front	4" (10.16 cm)			

NT24k-DR24 DIMENSIONS In inches (mm)



All specifications are subject to change. Consult the company website for more information.

NT24k Views

NT24k Rackmount Unit Front View



NT24k Rackmount Unit View (Module Slots Identified)

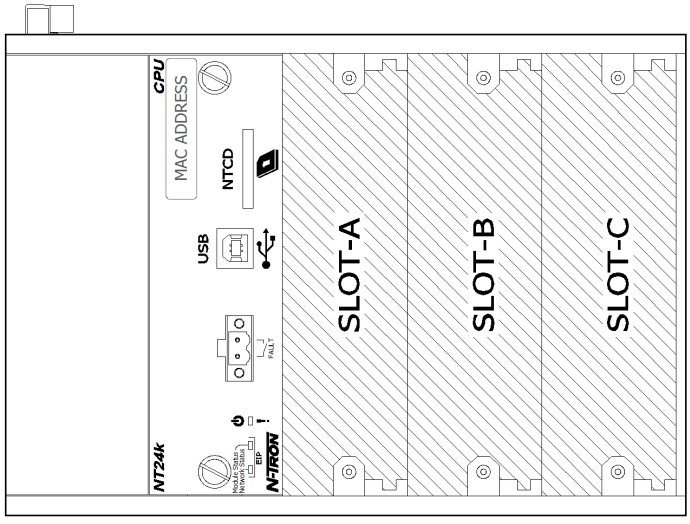


See “Ordering Information” for available module(s).

NT24k-DR16 Front View



NT24k DR Unit View (Module Slots Identified)



LEDs

The RJ45 data ports have two LEDs located on each connector. The left LED indicates link status and the right LED indicates activity.



The table below describes the operating modes:

LED	COLOR	DESCRIPTION
⏻	Green	Power is On
	Red	Power is On and a fault condition exists
	Off	Power is Off
LNK	Green	10/100/1000 Mb Link between ports
	Off	No link between ports
ACT	Green	Data is active between ports. Activity light blink rate indicates activity, not necessarily the volume of activity
	Off	Data is inactive between ports

EIP Indicators

The EIP Indicators are located either on the back of the rackmount version, or on the front of the CPU module of the DIN rail versions of the switch. The Module Status indicator shows the status of the switch. The Network Status indicator shows the status of the network interface.

MODULE STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up
Steady Green	The switch is operating normally
Flashing Green	The switch has not been configured
Flashing Red	A recoverable minor fault has occurred
Steady Red	A non-recoverable major fault has occurred
NETWORK STATUS	
INDICATOR STATE	DESCRIPTION
Steady Off	The switch is not powered up, or an IP address has not been configured
Flashing Green	An IP address is configured, but no connections have been established
Steady Green	A connection has been established
Flashing Red	A connection has timed out

Transceiver Characteristics

NT24k-FX8 Module - 100 MB Fiber Transceiver Characteristics

Fiber Length*	2 km	15 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-31 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm

NT24k-GX8 Module - Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 300 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-5 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-23 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

NT24k-SFP-DM8 Module - SFP 100Base Fiber Transceiver Characteristics

Fiber Length*	2 km	10 km	40 km	80 km
TX Power Min	-19 dBm	-15 dBm	-5 dBm	-5 dBm
RX Sensitivity Max	-31 dBm	-34 dBm	-34 dBm	-34 dBm
Wavelength	1310 nm	1310 nm	1310 nm	1550 nm
Laser Type	FP	FP	FP	DFB

NT24k-SFP-DM8 or NT24k-SFP8 Modules - SFP Gigabit Fiber Transceiver Characteristics

Fiber Length*	550 m @ 50/125 µm 275 m @ 62.5/125 µm	10 km	40 km	80 km
TX Power Min	-9.5 dBm	-9.5 dBm	-2 dBm	0 dBm
RX Sensitivity Max	-17 dBm	-20 dBm	-22 dBm	-24 dBm
Wavelength	850 nm	1310 nm	1310 nm	1550 nm
Laser Type	VCSEL	FP	DFB	DFB

* Fiber Length distances represent typical performance. Link budgets should be evaluated based on specific application conditions.

Chapter 2 Hardware Installation

Unpacking

Remove all the equipment from the packaging and store the packaging in a safe place. File any damage claims with the carrier.

Make certain the NT24k® Ethernet Switch package contains the following items:

1. NT24k switch
2. Product CD

Module Installation

Technicians performing the following steps should wear proper anti-static equipment to protect the circuit boards. Before removing the module from the ESD bag, touch a known grounded piece of metal to discharge any possible static electricity from the body.

1. Remove the faceplate from the slot in which the module will be inserted by turning the thumb screws counter clockwise.
2. Remove the module from the anti-static bag and insert into the slot aligning the board with the guide rails on either side. The module should slide smoothly into the slot.
3. Press the module firmly in place until the faceplate is flush against the front of the enclosure.
4. Align the threads of the thumb screws with the threads in the enclosure and screw them down until they are finger tight.

Ensure that all empty slots are covered with a faceplate to meet both emissions and safety requirements.

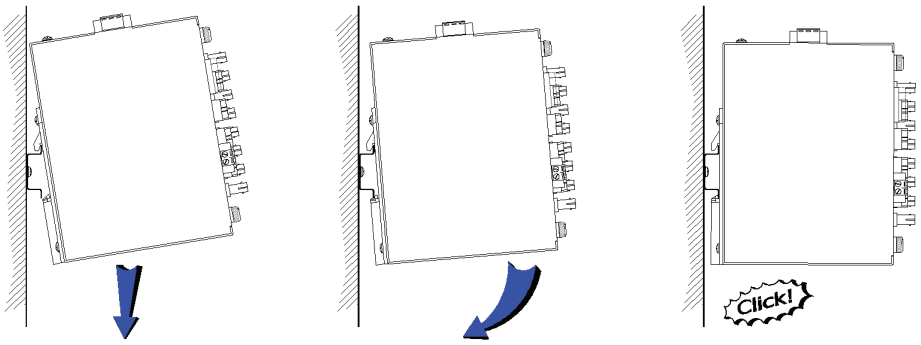
Mounting the NT24k

Rackmount Installation Instructions

The NT24k Rackmount unit comes configured with standard rack mount brackets which may be used to mount our products to standard 19" racks. As an alternative, Red Lion offers its NT24k Panel Mount Assembly (P/N: NT24k-PMK) used to securely mount the NT24k products to a panel or other flat surface.

A clearance of one inch should be observed on the sides, back, top and bottom to allow proper ventilation. Also a cable bend radius of 4 inches should be observed for the front and back of the unit.

DIN Rail Mounting Instructions

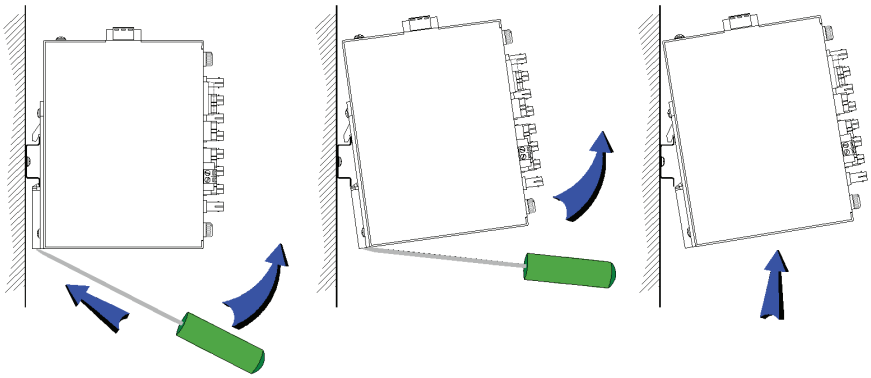


Install the switch to standard 35mm DIN rail as shown in the diagram above.

1. First, hook the top of the 35mm DIN rail clip on the back of the switch to the rail.
2. Then, gently rotate the front of the switch downward, towards the panel.
3. Push the bottom of the switch towards the rail until it locks into place.
4. Apply upward force to verify the switch is securely installed.

5. Connect any communications cables to the switch.
6. Install the power and ground wires.
7. Apply power to the power supply.

DIN Rail Removal Instructions



Remove the switch from standard 35mm DIN rail as shown in the diagram above.

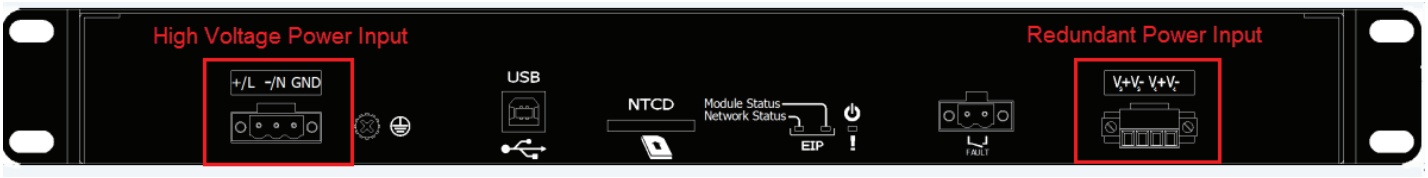
1. Ensure power from the power source is off.
2. Disconnect power and ground wires.
3. Disconnect any communications cables from the unit.
4. Insert a standard flat/slotted screwdriver into the slot provided on the DIN rail clip.
5. Using the base of the switch as a pivot point, apply upward force on the screwdriver to release the DIN rail clip.
6. With the DIN rail clip latching mechanism released, continue to rotate the switch upward and away from the panel.
7. Once the switch has been rotated upward, remove the screwdriver.
8. Carefully lift the switch upward and away from the DIN rail and panel.

Power Source

The NT24k-DR16 and NT24k-DR24 series operate with one power supply, either AC or DC.

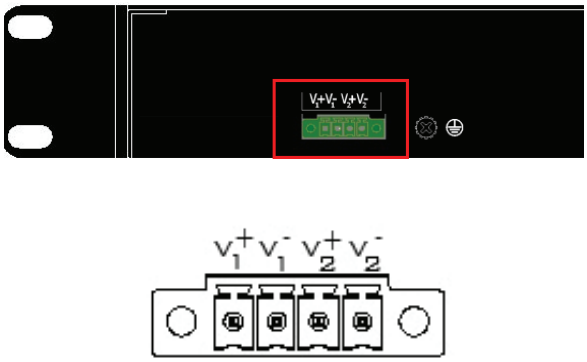
The Rack Mount NT24k® can be ordered with one or two power input options.

Each power supply can be AC or DC. Each low voltage DC Power supply includes redundancy (two DC supplies). The NT24k-AC1-DC1 model shown below comes with a high voltage power input on the left (90-264VAC / 90-300VDC) and a redundant 18-49VDC power input on the right.



Note: LEDs are described in detail in “LEDs”.

NT24k® Rack Mount with DC Power Input Installed

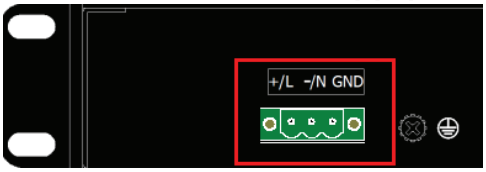


1. Unscrew and remove the DC voltage input plug from the power input header.
2. Install the DC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

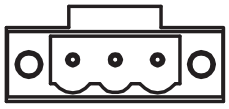
Note: When a DC power supply is installed, only one power supply must be connected to power for minimal operation. For redundant power operation, V1 and V2 inputs must be connected to separate DC voltage sources. This device will draw current from both sources simultaneously. Use 16-28 gauge wire when connecting to the power supply.

Recommended 24 VDC power supply, similar to Red Lion's P/N NTPS-24-3.

NT24k with AC Power Supply Installed



+/L -/N GND



1. Unscrew and remove the AC voltage input plug from the power input header.
2. Install the AC power cables into the plug (observing polarity).
3. Plug the voltage input plug back into the power input header.
4. Tightening torque for the terminal block power plug is 0.5 Nm/0.368 lb/ft.
5. Verify that the power LED is on.

Note: When an AC power supply is installed (i.e. the -AC option), use 12-24 gauge wire when connecting to the power supply.

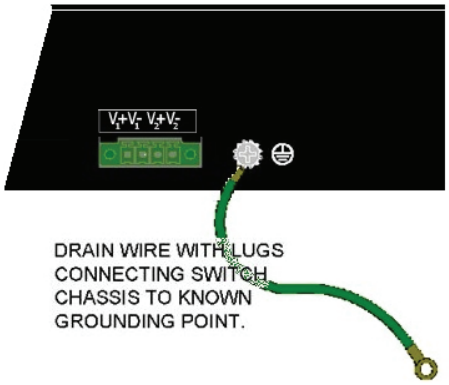
Grounding the Unit

The grounding of any control system is an integral part of the design. The optimum noise immunity and emissions are obtained when the NT24k® chassis is connected to earth ground via a 14-18 gauge drain wire. The NT24k units provide a ground lug (see illustration) that is used to provide a safe grounding path of the device. For the NT24k-AC power supplies, the chassis may also be connected to earth ground using the input power plug labeled “GND.”

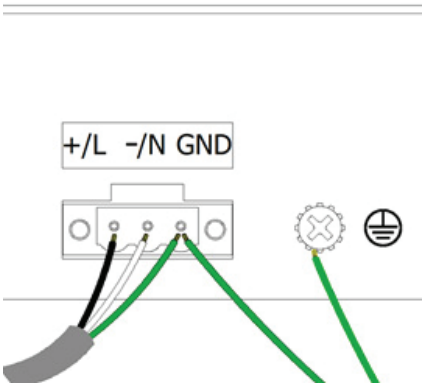
Note: The NT24k power input (V-) pins are isolated from chassis ground. Do not attempt to ground the switch to earth ground via the power input pins (V-).

Remarque: La NT24k puissance d’entrée (V-) broches sont isolés de la masse du châssis. Ne pas essayer pour mettre le commutateur à la terre via les broches d’entrée d’alimentation (V-).

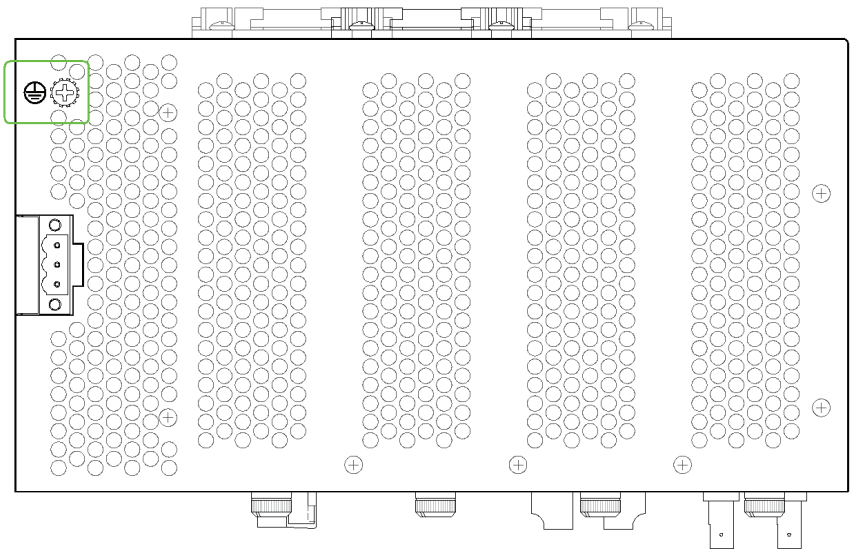
NT24k DC Power



NT24k AC Power



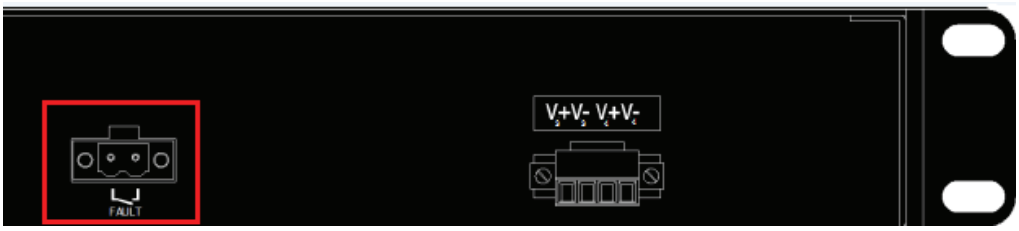
For the DIN rail models, see the illustration below for grounding:



Configurable Alarm Contact

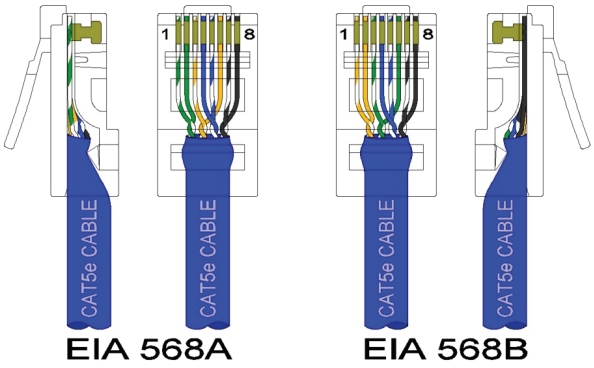
The alarm contact located on the back of the NT24k® rack mount unit or on the front of the NT24k-DR16 and NT24k-DR24 models, can be used to control an external warning device based on an event. The current carrying capacity is 1A at 24VDC. It is normally open and the relay closes when a fault condition occurs, though this can be reversed via configuration. These pins can be used to connect an external warning device such as a light in order to provide an external alarm. The conditions for generating a fault condition (closing the relay) can be configured through software.

Refer to the NT24k Software User's Guide for more information.



Connecting the Unit

For 10/100/1000/T(x) ports, plug a Category 5E twisted pair cable into the RJ45 connector. Connect the other end to the far end station. Verify that the LNK LEDs are ON once the connection has been completed. To connect any port to another device, use a standard CAT5E straight through or crossover cable with a minimum length of one meter and a maximum length of 100 meters.



Red Lion recommends the use of pre-manufactured CAT5E cables to ensure the best performance. If this is not an option and users must terminate their own ends on the CAT5E cables; one of the two color coded standards shown to the right should be utilized. If a user does not follow one of these standards then the performance and maximum cable distance will be reduced significantly, and may prevent the switch from establishing a link.

For FX/FXE/GX/GXE units, remove the dust cap from the fiber optic connectors and connect the fiber optic cables. The TX port on the FX/FXE/GX/GXE models should be connected to the RX port of the far end station. The RX port on the FX/FXE/GX/GXE versions should be connected to the TX port of the far end station.

⚠	**WARNING –** Creating a network loop without employing a network path protocol such as N-Ring™, N-Link, or RSTP is an illegal operation that can create a network storm which will crash the network. **Avertissement -** La création d'un réseau sans boucle employant un chemin réseau protocole tels que N-Ring, N-Link, ou RSTP est une opération illégale que peut créer une tempête du réseau qui va planter le réseau.

Ethernet Cable

If you are connecting to the unit via the copper port, you will need a straight or crossover cable with two 8-pin RJ45 connectors on each end.

To visually confirm that Ethernet cabling was done properly, check the LED indication on the Ethernet port of the unit. The link LED should be on when the correct cable is used.

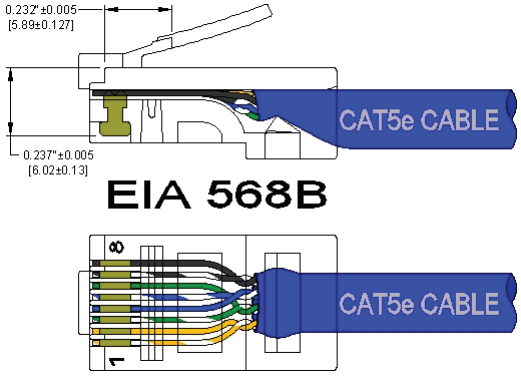
Note: A shielded cable is required to fully meet EMC standards.

When using shielded cables, it is generally recommended to only connect the shield at one end to prevent ground loops and interference with low level signals (i.e. thermocouples, RTD, etc.). CAT5e cables manufactured to EIA-568A or 568B specifications are required for use with Red Lion series switches.



In the event all CAT5e patch cables are short (i.e. All Ethernet devices are located in the same local cabinet and/or referenced to the same earth ground), it is permissible to use fully shielded cables terminated to chassis ground at both ends in systems avoid low level analog signals.

RJ45 Connector Crimp Specifications



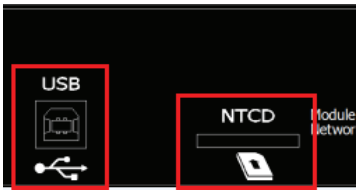
NTCD

NTCD-CFG Configuration Device

NTCD-CFG Configuration Device



Ideal for saving, or restoring switch configuration parameters quickly without the need for a computer or software. One configuration device per switch is recommended.



The USB configuration slot is located on the back of the NT24k® rackmount models and on the front of the NT24k-DR16 and NT24k-DR24 models.

The unit could be configured with multiple power supply configurations.

⚠	**WARNING – Explosion Hazard** – Do not connect or disconnect any connections while circuit is live unless area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion** - Ne pas brancher ou débrancher les connexions lorsque le circuit est sous tension sauf si la zone est connue pour être non dangereux. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

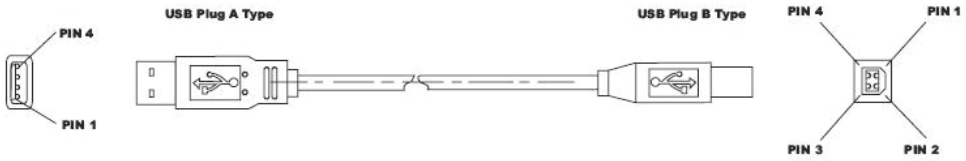
USB Interface

The NT24k switches provide a USB interface accessed via the USB connector labeled as "USB" on the back of the NT24k rackmount models and the front of the NT24k-DR16 and NT24k-DR24 models. The USB connection is used to access the Command Line Interpreter (CLI) or PPP (Point-to-Point Protocol).



USB Cable

Connect the USB port of your PC and the Switch using a standard USB cable. A cable with a Type A connector for the PC end, and a Type B connector for the switch end must be used.



Standard USB cables are readily available from a variety of computer stores.

Terminal

The following configuration should be used in HyperTerminal:

Port Settings: 115200
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

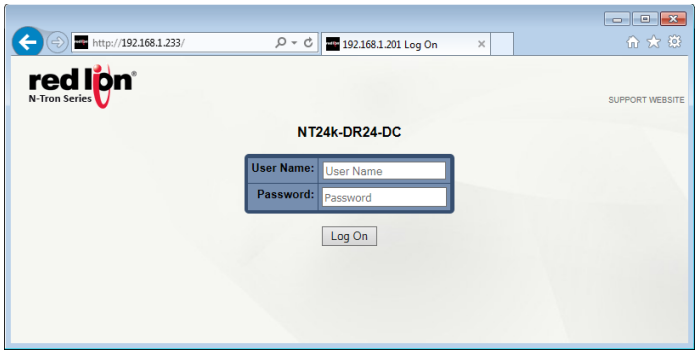
⚠	**WARNING – Explosion Hazard –** The USB connection is for temporary connection only. Do not use, connect, or disconnect unless the area is known to be non-hazardous. Connection or disconnection in an explosive atmosphere could result in an explosion. **AVERTISSEMENT - Risque d'explosion -** La connection USB est pour la connexion temporaire seulement. Ne pas utiliser, connecter ou déconnecter sauf si la zone est connue pour être non dangereuse. Connexion ou la déconnexion dans une atmosphère explosive pourrait entraîner une explosion.

Cleaning

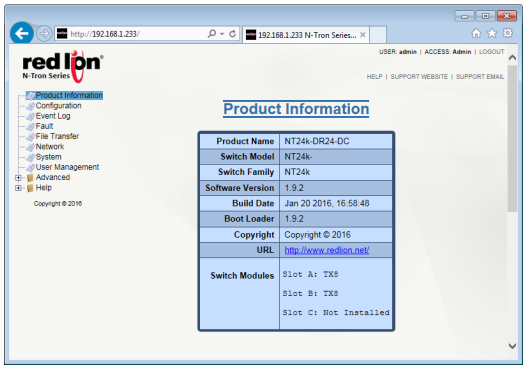
Clean only with a damp cloth. Excess moisture or harsh chemicals can cause damage to the unit.

Chapter 3 Accessing the Web Software Interface

1. Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default by entering 192.168.1.201 as the fallback address.
2. The following login screen will appear.



3. For the User Name, enter: **admin** (all lowercase).
4. For the Password, enter: **admin** (all lowercase).
   Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.
5. Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Please consult the NT24k® Software Guide for configuration options.

Service and Support Information

Service Information

We sincerely hope that you never experience a problem with any of our products. If you do need service, call Red Lion at 1-877-432-9908 for Technical Support. A trained specialist will help you determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RO (Repair Order) can be obtained on the Red Lion website.

Red Lion tracks the flow of returned material with our RO system to ensure speedy service. You must include this RO number on the outside of the box so that your return can be processed immediately.

Be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RO form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Repairs are completed as soon as possible. If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:

Please fill in the following and keep this manual with your Red Lion system for future reference.

P.O. #: _____ Date Purchased: _____
Purchased From: _____
Serial Number: _____

Product Support

Technical Support:
Inside US: +1 (877) 432-9908
Outside US: +1 (717) 767-6511
Support: support.redlion.net
Hours: 8:00 am to 6:00 pm EST

Red Lion Controls
35 Willow Springs Circle
York, PA 17406
Website: www.redlion.net

Ordering Information

NT24k® Rackmount

PART NUMBER	DESCRIPTION
NT24K-DC1	1U rackmount 3-slot modular Gigabit switch with one redundant 18-49 VDC power input
NT24K-DC2	1U rackmount 3-slot modular Gigabit switch with two redundant 18-49 VDC power inputs
NT24K-AC1	1U rackmount 3-slot modular Gigabit switch with one 90-264 VAC / 90-300 VDC power input
NT24K-AC2	1U rackmount 3-slot modular Gigabit switch with two 90-264 VAC / 90-300 VDC power inputs
NT24K AC1-DC1	1U rackmount 3-slot modular Gigabit switch with one each 90-264 VAC / 90-300 VDC and 18-49 VDC power inputs
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24-PMK	Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR16

PART NUMBER	DESCRIPTION
NT24K-DR16-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; redundant 18-49 VDC power input
NT24K-DR16-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 2 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

NT24K-DR24

PART NUMBER	DESCRIPTION
NT24K-DR24-DC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; redundant 18-49 VDC power input
NT24K-DR24-AC	Managed Industrial Ethernet Switch; modular 35mm DIN rail design with 3 expansion slots; 90-264 VAC / 90-300 VDC power input
NT24K-FP	Filler panel (required to fill vacant module slots)
NT24K-DR-PMK	NT24K DR Panel mount kit
NTCD-CFG	Configuration recovery device for use with NT24k series products
NTPC-AC-US	US Industrial High-Temp Power Cord Assembly for use with the 7026TX-AC and NT24k (Cord Length: 7 Ft., Gauge/Conductor: 18/3, Temp. Rating: 105°C, Plug: NEMA 5-15, Voltage Rating: 300V)
NTPS-24-3	35mm DIN rail power supply 3.0 Amp @ 24 VDC

Port Modules

PART NUMBER	DESCRIPTION
NT24K-TX8	8-port 10/100/1000BaseT module
NT24K-FX8-XX	Slide-in module with 8 100BaseFX multimode fiber ports, 2 km (SC or ST)
NT24K-FXE8-XX-YY	Slide-in module with 8 100BaseFX singlemode fiber ports (SC or ST)
NT24K-GX8-SC	Slide-in module with 8 1000BaseFX multimode fiber ports, 550 m (SC)
NT24K-GXE8-SC-ZZ	Slide-in module with 8 1000BaseFX singlemode fiber ports (SC)
NT24K-SFP8	Slide-in module with 8 SFP expansion slots; supports 1000Base SFP transceivers*
NT24K-SFP-DM8	Slide-in module with 8 dual mode SFP expansion slots; supports 100Base or 1000Base SFP transceivers*

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

SFP Transceivers

PART NUMBER	DESCRIPTION	MAXIMUM CAPACITY PER SWITCH	MODULE REQUIRED
NTSFP-FX	100 BaseFX multimode fiber SFP pluggable mini-GBIC transceiver (LC style connector, 2 km)	Up to 24	NT24k-SFP-DM8
NTSFP-FXE-YY	100BaseFX singlemode fiber SFP luggable mini-GBIC transceiver (LC style connector)	Up to 24	NT24k-SFP-DM8
NTSFP-TX	1000BaseT copper SFP pluggable mini-GBIC transceiver	Up to 16	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-SX	1000BaseSX multimode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8
NTSFP-LX-ZZ	1000BaseLX singlemode fiber SFP pluggable mini-GBIC transceiver	Up to 24	NT24k-SFP8 or NT24k-SFP-DM8

Where: XX = ST or SC connector (ST not available on some GX modules); YY = 15, 40, or 80 for FX singlemode, blank for multimode; ZZ = 10, 40, or 80 for GX singlemode.
*SFP transceivers sold separately.

LIMITED WARRANTY

(a) Red Lion Controls Inc. (the "Company") warrants that all Products shall be free from defects in material and workmanship under normal use for the period of time provided in "Statement of Warranty Periods" (available at www.redlion.net) current at the time of shipment of the Products (the "Warranty Period"). **EXCEPT FOR THE ABOVE-STATED WARRANTY, COMPANY MAKES NO WARRANTY WHATSOEVER WITH RESPECT TO THE PRODUCTS, INCLUDING ANY (A) WARRANTY OF MERCHANTABILITY; (B) WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE; OR (C) WARRANTY AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF A THIRD PARTY; WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE.** Customer shall be responsible for determining that a Product is suitable for Customer's use and that such use complies with any applicable local, state or federal law.

(b) The Company shall not be liable for a breach of the warranty set forth in paragraph (a) if (i) the defect is a result of Customer's failure to store, install, commission or maintain the Product according to specifications; (ii) Customer alters or repairs such Product without the prior written consent of Company.

(c) Subject to paragraph (b), with respect to any such Product during the Warranty Period, Company shall, in its sole discretion, either (i) repair or replace the Product; or (ii) credit or refund the price of Product provided that, if Company so requests, Customer shall, at Company's expense, return such Product to Company.

(d) **THE REMEDIES SET FORTH IN PARAGRAPH (c) SHALL BE THE CUSTOMER'S SOLE AND EXCLUSIVE REMEDY AND COMPANY'S ENTIRE LIABILITY FOR ANY BREACH OF THE LIMITED WARRANTY SET FORTH IN PARAGRAPH (a).**

BY INSTALLING THIS PRODUCT, YOU AGREE TO THE TERMS OF THIS WARRANTY, AS WELL AS ALL OTHER DISCLAIMERS AND WARRANTIES IN THIS DOCUMENT.

N-Tron® Series
NT24k® Gigabit Ethernet Switches

Software Guide | February 2024

LP0991 | Revision H

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Website: www.redlion.net
Support: support.redlion.net

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Preface

Disclaimer

This software guide provides guidance on how to use the NT24k®. It is not intended as a step-by-step guide or a complete set of all procedures necessary and sufficient to complete all operations.

While every effort has been made to ensure that this document is complete and accurate at the time of release, the information that it contains is subject to change. Red Lion Controls is not responsible for any additions to or alterations of the original document. Industrial networks vary widely in their configurations, topologies, and traffic conditions. This document is intended as a general guide only. It has not been tested for all possible applications, and it may not be complete or accurate for some situations.

This guide is intended to be used by personnel responsible for configuring and commissioning NT24k devices for use in visualization, monitoring, and control applications. Users of this document are urged to heed warnings and cautions used throughout the document.

Trademark Acknowledgments

Red Lion Controls acknowledges and recognizes ownership of the following trademarked terms used in this document.

- EtherNet/IP™and CIP™ are trademarks of ODVA.

All other company and product names are trademarks of their respective owners.

Certifications

Red Lion Controls ensures that this device meets all the ODVA technology and standards guidelines for the Common Industrial Protocol (CIP) for industrial automation.

ODVA CONFORMANT

Document History and Related Publications

The hard copy and electronic media versions of this document are revised only at major releases and therefore, may not always contain the latest product information. Tech Notes and/or product addendums will be provided as needed between major releases to describe any new information or document changes.

The latest online version of this document can be accessed through the Red Lion website at: https://www.redlion.net/support/documentation/user-manuals.

Additional Product Information

Additional product information can be obtained by contacting your local sales representative or Red Lion through the contact numbers and/or support website address listed on the inside of the front cover.

Chapter 1 Security Best Practices

Introduction

It is more important than ever to secure network devices from unauthorized access, both within and outside of your organization. Red Lion strongly recommends installing managed layer-2 switches behind a secure network firewall in access controlled locations, and immediately changing all default user accounts and passwords, as well as disabling protocols that are not needed in your application.

Protocols and user names with their default passwords are listed in the table below.

PROTOCOLS/USERS	DEFAULT NAME	DEFAULT PASSWORD
User Login	admin	Admin
SNMPv3 User Authentication	initial	Authpass
SNMPv3 User Privacy	initial	Privpass
SNMP v1/v2	read community	Public
SNMP v1/v2	write community	Private
SNMP v1/v2	trap community	public

Some protocols and special devices are enabled by default for the best overall out of the box experience. However, if any in this group will not be used or needed in your network, then these should be disabled to prevent unexpected behavior, unauthorized access or usage. These protocols and special devices are listed in the table below:

PROTOCOLS OR SPECIAL DEVICES
CIP™
SNMP
NTCD
DHCP Client
RSTP
LLDP
N-View™

Managing Local and Remote Access Using 802.1X

Red Lion strongly recommends using 802.1X to manage local and remote access as a best practice for larger installations. 802.1X allows for the management of users, devices, profiles, certificates, and so forth from a single location which also provides a high degree of security.

Default Passwords

User Passwords

The NT24k® ships from the factory with a default ***admin*** user account. Red Lion strongly recommends creating a new user with administrative privileges and then deleting the default ***admin*** user before the unit is deployed.

At a minimum, the default password for the ***admin*** user should be changed.

SNMPv3 Users

The NT24k® ships from the factory with SNMP enabled and a default SNMPv3 user. If SNMP will be used, then Red Lion strongly recommends creating a new SNMPv3 user and then deleting the default ***initial*** SNMPv3 credentials. At a minimum, the default password for the ***default*** user should be changed.

It is strongly recommended that both authentication and privacy protocols are enabled for all v3 users. Setting the option to ***None*** for either protocol is discouraged.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

SNMP v1/v2 Community Names

The NT24k ships with default Community Names for SNMP v1/v2 operation. SNMP v1/v2 traffic per the standard is neither hashed nor encrypted. Therefore, it is Red Lion's recommendation that customers requiring SNMP use SNMPv3, which offers more secure SNMP communication.

If SNMP v1/v2 is required in your application, Red Lion strongly recommends changing the default SNMP credentials before deployment.

See the Disabling Unused Protocols and Special Devices section if SNMP will not be used.

Legacy Protocols

When multiple revisions of a protocol are supported, Red Lion enables the most secure version by default and disables legacy (unsecure) versions of the protocol. We strongly recommend leaving the older revisions disabled.

LEGACY PROTOCOL	SECURE PROTOCOL EQUIPMENT
HTTP	HTTPS
Telnet	SSH

Disabling Unused Protocols and Special Devices

Certain network protocols and special devices are enabled by default for the best overall out of the box experience. However, some of these protocols and devices have the capability of configuring and/or reading network settings or causing unexpected network behavior. These protocols and devices should be disabled when they are not being utilized in your network to prevent unexpected behavior, unauthorized access and/or control of your network and individual network devices.

The following protocols or special devices meet these criteria:

- CIP™
- SNMP
- NTCD (Configuration Device)
- DHCP Client
- RSTP
- LLDP
- N-View™

Chapter 2 Features and Specifications

NT24k® Series Common Features

Red Lion's N-Tron® Series NT24k all-Gigabit managed industrial Ethernet switches are available in rack or DIN-rail mountable configurations. The NT24k platform offers a wide array of port configurations, media types and Power over Ethernet Plus (PoE+) models including Fast Ethernet, Gigabit copper and fiber options. All NT24k switches are plug-and-play installable with Internet Group Management Protocol (IGMP) auto-configuration, media/port auto-detection and simple ring configuration, making the NT24k platform one of the easiest to deploy managed switches in the industry. Housed in rugged hardened enclosures, NT24k switches feature extended shock and vibration specifications, wide operating temperature ratings, and best-in-class ring technology.

Connectivity

The modular NT24k switches are available in 2 or 3 slot configurations. Port modules are hot-swappable. Available modules include 10/100/1000Base Copper, 100Base Fiber, 1000Base Fiber, Gigabit Small Form-factor Pluggable (SFP) Ports and Dual Mode (100Base/1000Base) SFP ports. Modules and SFP transceivers are sold separately. Please reference the N-Tron Series “NT24k Modular Series Hardware & Installation Manual” for available configuration options.

The compact series offers a wide variety of copper and fiber configurations, including all Gigabit copper, Gigabit fiber or SFP ports. IEEE 802.3af/at Power over Ethernet (PoE) models are also available. Please reference the N-Tron Series “NT24k Compact Industrial Managed Gigabit Ethernet Switches Hardware Manual” for more information.

Performance

NT24k-managed switches provide uncompromising performance in harsh environments, including network features like N-Ring™, Virtual Local Area Network (VLAN), Quality of Service (QoS), port mirroring, IGMP, Simple Network Time Protocol (SNTP) and Simple Network Management Protocol (SNMP). IEEE 1588v2 (Precision Time Protocol, or simply PTP) models are also available. Additionally, the NT24k offers IEEE 802.1X with RADIUS remote server authentication to ensure port security. These network management features provide best-in-class visibility, security, and uptime performance.

Environmental

The ultra-reliable NT24k switches are available in rackmount or DIN-rail mountable configurations with operating temperatures from -40 to 85°C. With UL Class I, Division 2 listing and CE certifications, these industrial switches are built to last in the most demanding and hazardous environments.

Monitoring

The N-View™ monitoring technology software provides 47 different status points on switch and port conditions and displays that information on any networked computer.

Security

The NT24k series provides a high level of security by utilizing IEEE 802.1X with RADIUS remote server authentication, MAC address based port security, Hyper Text Transfer Protocol Secure (HTTPS), Secure Shell or Secure Socket Shell (SSH), and SNMPv3 communication protocol to ensure the safest networks.

Refer to the NT24k Hardware Manuals for more information on our Modular and Compact Series.

Overview of Advanced Features

Mode of Operation

Each port on the switch can be configured to support different modes of operation as shown below:

Copper Ports:
- Half-Duplex
- Full-Duplex
- Auto-Negotiation

1000Base Copper or any Fiber Ports:
- Full-Duplex

Half-Duplex

In half-duplex mode, the CSMA/CD media access ports share a common transmission medium. To transmit, a port waits (defers) for a quiet period on the medium (that is, no other port is transmitting) and then sends the intended message in bit-serial form. If, after initiating a transmission, the message collides with that of another port, then each transmitting port intentionally transmits for an additional predefined period to ensure propagation of the collision throughout the system. The port remains silent for a random amount of time (back-off) before attempting to transmit again.

Full-Duplex

Full-duplex operation allows simultaneous communication between a pair of ports using point-to-point media (dedicated channel). Full-duplex operation does not require that transmitters defer, nor do they monitor or react to receive activity, as there is no contention for a shared medium in this mode.

However, a receiving endpoint may request that the transmitting endpoint pause transmission to prevent receive buffer overflow. When the receiving buffer capacity becomes sufficient again, the receiving endpoint will notify the transmitting endpoint that transmission may resume.

Auto-Negotiation

In Auto-Negotiation mode, the port/hardware detects the mode of operation of the port that it is connected to and sets its mode to match.

Port Mirroring

A Mirroring Port is a dedicated port that is configured to forward copies of Ethernet frames that are being sent or received from a monitored port. This is normally only used during troubleshooting and debug of the network. Under normal operation, Port Mirroring is disabled.

Port Trunking

Port Trunking is the ability to group network ports to increase the bandwidth between two machines (e.g., switch or any work station). This feature allows grouping of high-speed connectivity and provides a redundant connection between switches, so that a trunk can act as a single link between the switches.

Quality of Service (QoS)

QoS refers to resource reservation control mechanisms. QoS is the ability to provide different priorities to different applications, users, or data flows. QoS guarantees are important if the network capacity is insufficient, especially for real-time streaming multimedia applications such as Voice over IP, high resolution images, online games and IP-TV, since these often require fixed bit rate and are delay sensitive, and in networks where the capacity is a limited resource, for example in cellular data communication. In the absence of network congestion, QoS mechanisms are not required.

The QoS of an egressing frame can be set based on the three QoS mechanisms listed below:

1. IEEE 802.1p (Tagged QOS)

2. DSCP (differentiated services code points) (RFC 2474)
3. Port (Default Priority)

Virtual Local Area Network (VLAN)

The switch provides support for setting up tagged VLANs. A port may belong to any number of VLANs. The VLAN membership of an end device is determined by the VLAN(s) defined for the port to which the device is connected. If a device should move from one port to another, it loses its current VLAN membership and inherits that of its new port.

VLANs facilitate easy administration of logical groups of devices that can communicate as if they were physically on the same LAN. Traffic between VLANs is restricted unless the ports are explicitly configured as overlapping VLANs. Switches forward unicast, multicast, and broadcast traffic only on LAN segments that serve the VLAN to which the traffic belongs.

A default Virtual LAN (VID=1) exists so if a port is not a member of any other VLAN, it will default back to VLAN 1. This allows the switch to operate as a 'normal' switch when it is used in a network. A port may be automatically removed from the default VLAN when it is reconfigured to belong to another VLAN. By default, the switch will automatically remove a port from the default VLAN when it is reconfigured to another VLAN. See the VLAN configuration section in Chapter 2 for additional information.

If switch ports are configured to transmit and receive untagged frames, then their connected devices are able to communicate throughout the LAN. Using Tagged VLANs, the switch has the ability to take non-tagged packets in some ports, add a VLAN tag to the packet and send it out to tagged ports on the switch. VLANs can also be configured to accept tagged packets in tagged ports, strip the tags off the packets, and then send the packets back out to other untagged ports. This allows a network administrator to set up the switch to support devices on the network that do not support VLAN tagged packets. The administrator can also set up the ports to discard any packets that are tagged or to discard any packets that are untagged, based on a hybrid VLAN of both tagged and untagged ports and by using the VLAN Ingress Filter on the switch.

For each switch port there is one and only one PVID (port VLAN ID) setting. If an incoming frame is untagged and untagged frames are being accepted, then that frame will inherit the tag of the PVID value for that port. Subsequent switch routing and treatment will be in accordance with that VLAN switch map. By configuring PVIDs properly and configuring for all frames to exit untagged, the switch can achieve a 'port VLAN' configuration in which all frames in and out can be untagged, thus not requiring external devices to be VLAN cognizant.

To understand how a VLAN configuration will perform, first look at the port on which the frame enters the switch, then the VLAN ID (VID) (if the frame is tagged) or the PVID (if the frame is untagged). The VLAN defined by the VID or PVID defines a VLAN group with a membership of ports. This membership determines whether a port is included or excluded as to frame egress from the switch.

The NT24k® switch also has the ability to allow overlapping VLANs. Overlapping VLANs give the user the ability to have one or more ports share two or more VLAN groups. For more information and examples on how this could be implemented, refer to the 'VLAN Configuration Examples' in this document, and/or our website's technical documents.

Note: RSTP is only supported on one VLAN.

Rapid Spanning Tree Protocol (RSTP)

Rapid Spanning Tree Protocol as specified in IEEE 802.1D-2004, is supported. One Spanning Tree on one VLAN is supported. (RSTP supersedes the Spanning Tree Protocol (STP) described in IEEE 802.1D-1998.) RSTP establishes a simply connected active network topology from the arbitrarily connected bridges of a bridged network. Bridges effectively connect just the LANs to which their forwarding ports are attached. Ports that are in a blocking state do not forward frames. The bridges in the network exchange sufficient information to automatically derive a spanning tree.

RSTP provides quicker learning of network topology changes than the older STP. RSTP supports new and improved features such as the rapid transition of ports to the forwarding state. While STP transmits BPDUs (Bridge Protocol Data Units) from only the root bridge, RSTP transmits BPDUs from every bridge. RSTP inter-operates with older STP switches by falling back to STP when the older BPDUs are detected on bridge ports. The user can also manually configure bridge ports to use STP, if desired.

SNMP Traps

The NT24k® Series switch supports SNMP Trap Stations to which SNMP Traps will be sent. Four standard SNMP traps are supported: Link Status (Link Up / Link Down), Cold Start, Warm Start, and Authentication Errors. SNMP Traps are sent to all trap stations configured on a given switch when the corresponding trap is enabled.

IGMP Snooping

IGMP Snooping is enabled by default. The switch provides automatic (Plug and Play) IGMP configuration. IGMP snooping provides intelligent network support for multicast applications, reducing unneeded network traffic. IGMP Snooping is configured via the web console and if enabled, operates dynamically upon each power up. Also, there can be manual only or manual and dynamic operation. Note that “static multicast group address” can be used whether IGMP Snooping is enabled or not.

The Internet Group Management Protocol (IGMP) is a protocol that provides a way for a device to report its multicast group membership to adjacent 'routers'. In this case NT24k switches provide router-like functionality. Multicasting allows one computer to send content to multiple other computers that have identified themselves as interested in receiving the originating computer's content. Multicasting can be used to transmit only to an audience that has joined (and not left) a multicast group membership. IGMP version 2 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 2236. IGMP version 1 is formally described in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 1112. The NT24k series supports v1 and v2.

IGMP Snooping will function dynamically without user intervention. If some of the devices in the LAN do not understand IGMP, then manual settings are provided to accommodate them.

N-Link

The purpose of N-Link is to provide a way to redundantly couple an N-Ring topology to another topology, typically another N-Ring topology. Each N-Link configuration requires 4 switches, two on each network. On the N-Ring network, one switch is the N-Link Master and an adjacent switch is the N-Link Slave. On the connected network, one switch is the N-Link Primary Coupler and another switch is the N-Link Standby Coupler.

N-Link monitors the link status of the Primary and Standby Coupler links. As long as the Primary Coupler link is healthy, N-Link forwards network traffic and the Standby Coupler link blocks network traffic. When a problem is detected on the Primary Coupler link, the Primary Coupler link blocks network traffic and the Standby Coupler forwards network traffic. While the N-Link Master and Slave are in communication via the Control link, only one Coupler link (Primary or Standby) forwards network traffic, while the other Coupler link blocks network traffic.

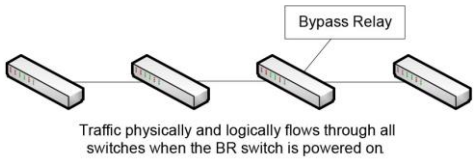
N-Ring™

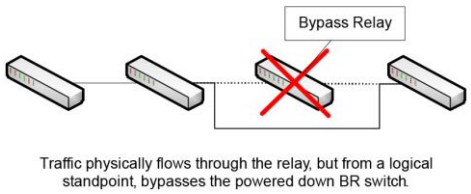
N-Ring is designed for easy setup. Switches are configured for N-Ring membership, by default. Setting a switch as the N-Ring Manager is the only required step for enabling the ring as long as preset ports are used to connect ring members. Subsequently, N-Ring operates dynamically upon each power up. N-Ring technology offers expanded ring size capacity, detailed fault diagnostics, and a standard healing time of 30ms. The N-Ring Manager periodically checks the health of the N-Ring via health check packets. If the N-Ring Manager stops receiving the health check packets, it times-out and converts the N-Ring to a

backbone within 30ms. When using all N-Ring enabled switches in the ring, a detailed ring map and fault location chart is also provided on the N-Ring Manager's web browser. N-Ring status is also sent from the N-Ring Manager to the N-View™ OLE for Process Control (OPC) Server to identify the health status of the ring. Up to 250 N-Ring enabled switches can participate in one N-Ring topology. Switches that do not have N-Ring capability may be used in an N-Ring, however the ring map and fault location chart cannot be as detailed at these locations.

Bypass Relay (BR)

BR ports have an internal hardware technology that forces paired BR ports to create a physical connection when the switch powers down. The BR switch is in bypass mode when it is powered down. This feature allows devices connected via these ports to continue communicating despite the BR switch being powered down.





Note: BR ports are only supported on select NT24k® models. BR-capable equipment is denoted by a "-R" in the model name. Likewise, BR capable ports are denoted by a "-R" in the port description.

Note: Some port protocols and port properties are not supported or may be affected by BR ports.

Affected Port Protocols

802.1X

802.1X security cannot be enabled on BR ports. Allowing this protocol on BR ports will lead to network security issues when the switch enters bypass mode. Therefore, 802.1X security is not allowed.

N-Link

N-Link Coupler and Control ports cannot be selected on BR ports. If BR ports were utilized for these links, there would be connection issues upon the switch entering bypass mode. It is also a best practice to ensure that neither the Master nor Slave Partner ports are connected to a BR port. Unlike the Coupler and Control ports, these ports are not user configured, but are auto-detected by the N-Link protocol. Use extra care when introducing BR equipment into an N-Link topology and avoid using BR ports for the N-Link connections.

N-Ring™

N-Ring Manager, Auto Member, and Multi Member cannot be enabled on BR port sets. N-Ring port sets exclude BR-capable ports.

RSTP

RSTP is disabled on BR ports to prevent unacceptable performance within an RSTP topology.

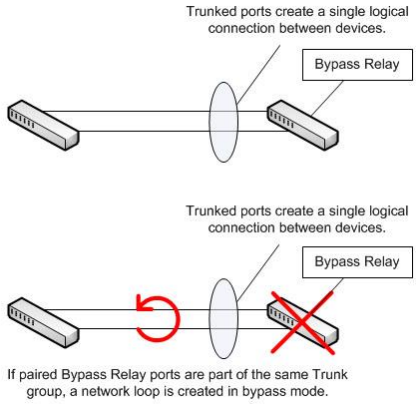
IGMP

Caution must be taken when IGMP is enabled. Devices connected to BR ports must be able to accommodate higher traffic rates. Test your network conditions with the BR switch both powered on and off if IGMP is to be enabled on a BR port.

Affected Port Properties

Port Trunking

BR port pairs cannot be members of the same trunk group to prevent a network loop being created in bypass mode.



VLAN

VLAN group membership must be identical between BR port pairs to ensure proper flow of traffic when the switch enters bypass mode. Caution must also be taken when modifying VLAN tags or filtering VLAN traffic on BR ports to ensure that all devices connected to BR ports can accommodate VLAN traffic whether the BR switch is powered on or powered off.

Note: The VLAN(s) associated with RSTP may contain BR ports, however RSTP will be disabled on the BR ports.

Port Compatibility

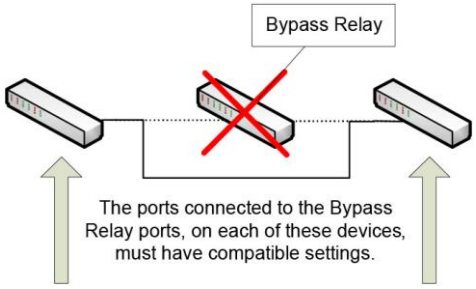
Care should be taken to ensure port characteristics of devices connected via BR ports are compatible, so that there are no interruptions in traffic when a BR switch enters bypass mode.

Ports and/or devices connected to the BR ports must be configured with compatible settings.

The following characteristics should be compatible for devices connected via BR ports:

- Auto-Negotiation
- Port Speed
- Duplex Mode
- Flow Control
- Flow Control
- PVID
- QoS
- Rate Limiting

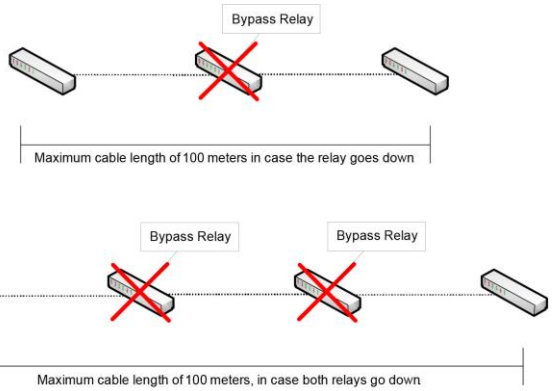
For example, if switches A and B are connected via a BR switch, the connecting port on switch A should have the same configured port speed as the connecting port on switch B. If these ports have incompatible speeds, they may have issues communicating once the switch enters bypass mode.



Note: It is still possible to customize port settings in any configuration desired, based on network requirements. Network testing must be performed to ensure correct network operation whether the switch is powered on or powered off.

Segment Length

Based on IEEE specifications, the maximum segment length for 10/100/1000BaseT(X) is 100 meters (328 ft). This requirement applies to combined segment lengths between all devices connected via BR port pairs. Staying within the IEEE specified segment length ensures proper operation.



CIP™

The CIP (Common Industrial Protocol) feature allows N-Tron® Series switches to directly provide switch information and configuration access to Programmable Logic Controller (PLC) and Human Machine Interface (HMI) applications via a standardized communication protocol. For example, a PLC may be programmed to monitor port links or N-Ring™ status and trigger a status indicator to turn red on an HMI if a port goes link down or if N-Ring has a fault. CIP is formally described in ODVA Publication Number PUB00001 (Volume 1: Common Industrial Protocol (CIP)), and Publication Number: PUB00002 (Volume 2: Ethernet/IP™ Adaptation of CIP). Red Lion created EDS and ICO files are provided with the NT24k® switch series.

Note: Information about using CIP with the NT24k can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family.

PTP

Precision Time Protocol (PTP), IEEE 1588v2, is supported on licensed NT24k models. PTP allows users to configure a network with very accurate, coordinated timing among devices. NT24k models with software implementations of PTP are capable of achieving accuracy in the low microseconds range. PTP is disabled by default and can be enabled as a Boundary or Transparent clock through the Web Browser interface. The switch must have a valid PTP license installed before PTP can be enabled.

Point-to-Point Protocol (PPP)

PPP allows a browser-like interface over the CLI port.

Dynamic Host Configuration Protocol (DHCP)

DHCP (Dynamic Host Configuration Protocol) simplifies network configuration by automatically assigning IP addresses from a DHCP server to connected DHCP capable devices (DHCP clients). NT24k® switch configuration options include:

- DHCP Server
- DHCP Relay Agent
- DHCP Client

DHCP Server

DHCP Server allows DHCP Client devices to automatically obtain an IP assignment. IP assignments can be set up as a dynamic range of IP addresses available to any client device; or specific IP addresses based on the client's Client ID (Option 61), or Relay Agent connection (Option 82). It also allows for a device on a specific port to receive a specific IP address and if the device is replaced, the replacement receives the same IP address as the original device.

DHCP Relay Agent

DHCP Relay Agent (Option 82) allows communication between the client and server to cross subnet and VLAN boundaries.

DHCP Client

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

Event Logging

The switch can be configured to log certain system events as they occur. Event Logging is enabled by default for critical events. Event log options are easily changed through a Web browser.

Even Logging includes:

- System startup and shutdown
- Logon and logout from the Web or Console
- Ports becoming enabled or disabled
- Port link up or link down changes
- N-Ring™ status changes

The most recent log information is visible via the web interface and the complete log file may be exported for external analysis.

Event Log Filter

The Event Log Filter enables the user to define which events are logged, based on severity level. Events that do not meet the minimum severity level for that component are not logged.

Syslog

The Syslog protocol, as specified in RFC-3164 and RFC-5424, are supported. The Syslog allows users to configure the switch so that certain system events (see Event Logging) are transmitted to a remote

logging device, known as a Syslog Collector. The Syslog is disabled by default but can be enabled/disabled through the Web Browser interface.

Local Security

The switch is configured for secure access by the SSH and HTTPS. The Telnet Server and Hypertext Transfer Protocol (HTTP) may be enabled to provide backwards compatibility with less secure clients.

Secure Shell

SSH, is a secure alternative to Telnet. A maximum of two concurrent SSH / Telnet connections are allowed.

The commands SFTP (SSH File Transfer Protocol or Secure File Transfer Protocol) and SCP (Secure Copy) are not supported.

Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the ports that the address is authorized on. A non-authorized MAC address will be discarded and will be listed in the intruder log.

Port security supports RSTP provided the MAC address(es) are manually authorized on the RSTP ports.

LLDP

The Link Layer Discovery Protocol (LLDP), as specified in IEEE 802.1AB and IEEE 802.3-2012, is used by networking devices to advertise there identity and capabilities and to discover their network neighbors. LLDP can be configured in one of three modes: Enabled, Auto and Disabled. The "Auto" mode is an enhancement to the LLDP protocol.

When in Auto mode, LLDP is inactive until a switch sends a wake up packet. At this point, all switches set to Auto mode will become active until the Wake Time interval expires.

Troubleshooting

1. Make sure the Power LED is ON.
2. Make sure sufficient current is supplied to the switch (per model specifications).
   Note: The Inrush current will exceed the steady state current by ~ 2X.
3. Verify that Link LEDs are ON for connected ports.
4. Verify integrity of cabling between stations.
5. Verify that cabling is Category 5E or greater for 100Mbit and Gigabit operation.

Chapter 3 Web Software Configuration

Accessing the Web Software Interface

Launch a web browser and enter the IP address of the device into the address bar. The DHCP Client is enabled by default with 192.168.1.201 as the fallback address.

The following login screen will appear:



- For the User Name, enter: **admin** (all lowercase)
- For the password, enter: **admin** (all lowercase)

Note: For security purposes, it is recommended that the password be changed according to your internal policies. Login credentials can be changed on the **User Management** page.

Upon successfully logging in, depending on the unit used, a screen similar to the one below will appear:



Organization

After logging onto a NT24k® switch, the Product Information page will be displayed. On the left-hand side of the screen is a list of configurable settings supported by the NT24k switch. Below is a list of these settings with a description of their purpose.



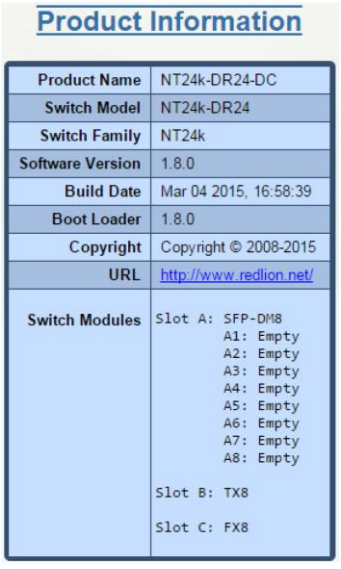
- **Product Information:** Basic information about the switch is provided in this menu.

- **Configuration:** The Configuration page is used to save or reset a running configuration.
- **Event Log:** The Event Log page is used for modifying and viewing the internal event logs.
- **Fault:** A fault is a notification of a destabilizing event. Which events are watched for and how notifications occur are configured on the Fault page.
- **File Transfer:** The File Transfer page provides the administrator the ability to upgrade the firmware or to import or export a configuration file, and export the Event Log to a file.
- **Network:** The network page is used to setup the device's IP and IP Fallback addresses, as well as Client ID and IP Configuration.
- **System:** The System page provides information pertaining to the whole system.
- **User Management:** The User Management page is used to view, add, modify and remove system user accounts, and set permissions.
- **Advanced:** The Advanced section is used to setup advanced features of the system.
- **Help:** The Help section is used to display information on configuring and monitoring the manageable parameters of the device. Specific help can be found by using the left navigation menu.

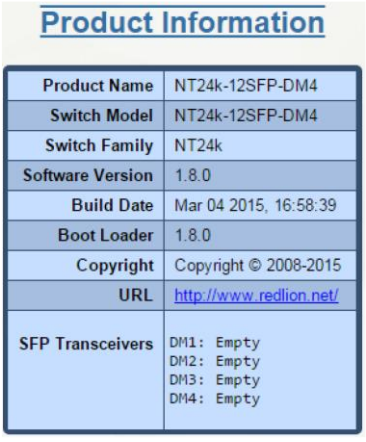
Product Information

Once a user logs onto an NT24k® switch, the Product Information page is displayed. This page shows basic information about the switch and can also be accessed by selecting the Product Information menu item on the left-hand menu.

Modular Models



Compact Series



Product Name: The full name of the switch, including any factory configured options will be displayed in this field.

For example, the product name will show NT24K-AC1 if there is one AC power unit in either location and NT24K-AC2 if there are two AC power units. If the product name ends with DC1 or DC2, this indicates that there is either one or two DC power units.

Switch Model: The base model of the switch.

Switch Family: The switch family this model and similar models belong to.

Software Version: The current firmware software version.

Build Date: The build date of the firmware.

Boot Loader: The boot loader version.

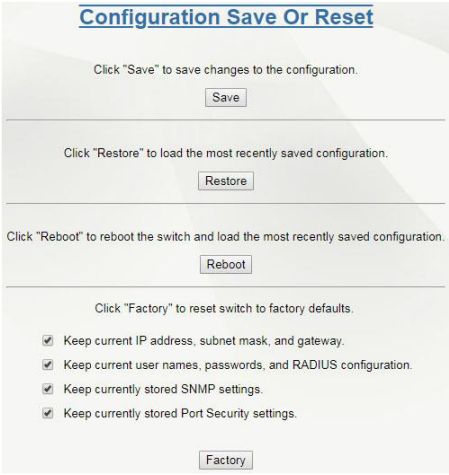
URL: This field links to Red Lion's website.

Switch Modules: The modules currently installed, including installed SFP transceivers. This option may not be present on models where modules or SFPs are not supported.

SFP Transceivers: On models where SFP transceivers are supported, the currently installed SFP transceivers will be shown in this field.

Configuration

The Configuration page allows the Administrator to save a running configuration in the switches non-volatile memory. This step is required if the switch is to remember any configuration changes after a power cycle or reboot. From this page, the Administrator can also restore a previously saved configuration, restore factory defaults or force a system reboot.



Save: Click on the *Save* button to save all current changes to the configuration stored in non-volatile memory for use after the next power cycle or reboot. If a configuration device is installed and enabled, the configuration will also be saved to the device. This option is only available when there is no misconfiguration.

Restore: Click on the *Restore* button to discard all unsaved changes and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Reboot: Click on the *Reboot* button to reboot the switch and load the most recently saved configuration. If a configuration device is installed and enabled, the configuration stored on the device will be loaded and used. *See notes below*.

Factory: Click on the *Factory* button to reset the switch's configuration to factory defaults except for any of the selected items. Selecting the Factory option will only affect the current configuration. A *Save* must be performed in order to retain these changes after a power cycle or reboot.

- **Keep current IP address, subnet mask, and gateway:** Retains the existing IP address, subnet mask and gateway if desired.
- **Keep current user names, passwords, and RADIUS configuration:** Retain the existing user names, passwords, and RADIUS configuration if desired.

- **Keep currently stored SNMP settings:** Retains the existing SNMP settings if desired.
- **Keep currently stored Port Security settings:** Retain the existing Port Security settings if desired.
- **Keep current PoE Settings:** Retains the existing PoE settings if desired (PoE models only).

Note: When the configuration is loaded from the Configuration Device, it must be saved for it to be available if the Configuration Device is removed.

Note: When the switch is shipped, it does not have a "configuration file" since the unit is using the factory defaults. Before a configuration can be customized, click on the Save button in order to create the file.

Configuration Fault

When the switch is booted and misconfigured settings are detected, a Configuration Fault will be triggered and the configuration may not be saved. This can occur when updating system firmware where settings permitted in the previous release may no longer be permitted. In this case, the *Save* button will be replaced with a *Show Errors* button (as seen below) and the misconfigured settings must be fixed before the configuration may be saved.

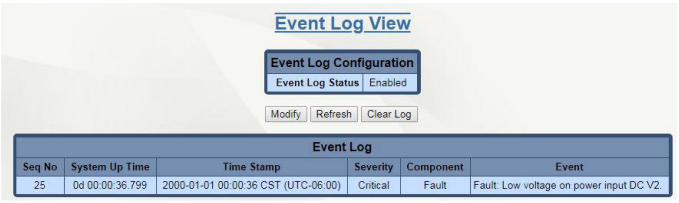


Show Errors: Click on the Show Errors button to view the current configuration and display any detected errors. This button is only visible when there is a settings misconfiguration.

Event Log

The Event Log View page displays the most recent 200 events that have occurred since the latest system startup or since the log was cleared. Event logging is enabled by default for critical events. Only events that occur while the Event Log was enabled will be displayed and saved with the exception of the Clear Log message which will always be displayed. Therefore, previously enabled events are still displayed when Event Logging is disabled albeit they may not be recent events.

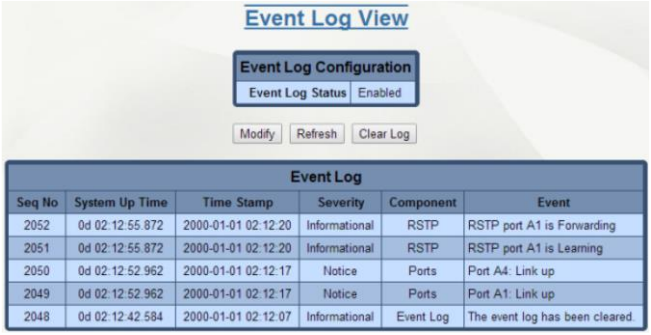
If the Event Log was disabled when the latest Startup event occurred, no events will be displayed as shown below.



When the Event Log is cleared, an informational event will be displayed.

Note: All enabled events since the last Clear Log event, including multiple Startup and Shutdown events, are stored on the system and may be exported as a CSV file from the switch for additional analysis.

Note: The event log can contain 2000 or more entries depending on individual message size. If the event log becomes full, new entries will overwrite the oldest entries.



A normal startup or reboot will show startup, RSTP status, N-Ring™ and logon events. An example reboot is shown below.

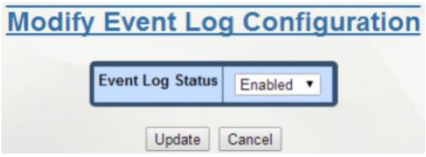


Modify: Display the Modify Event Log Configuration page.

Refresh: Refresh the current Event Log display.

Clear Log: Remove all entries from the event log and then add “The event log has been cleared.” message.

The Modify Event Log Configuration page controls whether Event Logging is Enabled or Disabled.

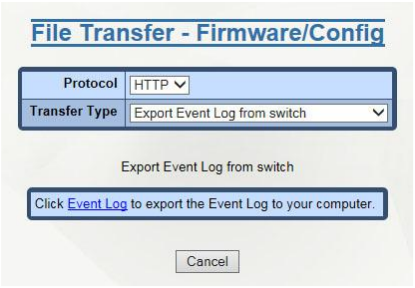


Event Log Status: Select Enabled/Disabled.

Update: Set the new Event Log Status.

Cancel: Return to Event Log View without modifying Event Log Status.

The entire Event Log may be exported to the host PC for further analysis and archiving purposes. It will contain all events that occurred while Event Log was enabled since the last Clear Log event.



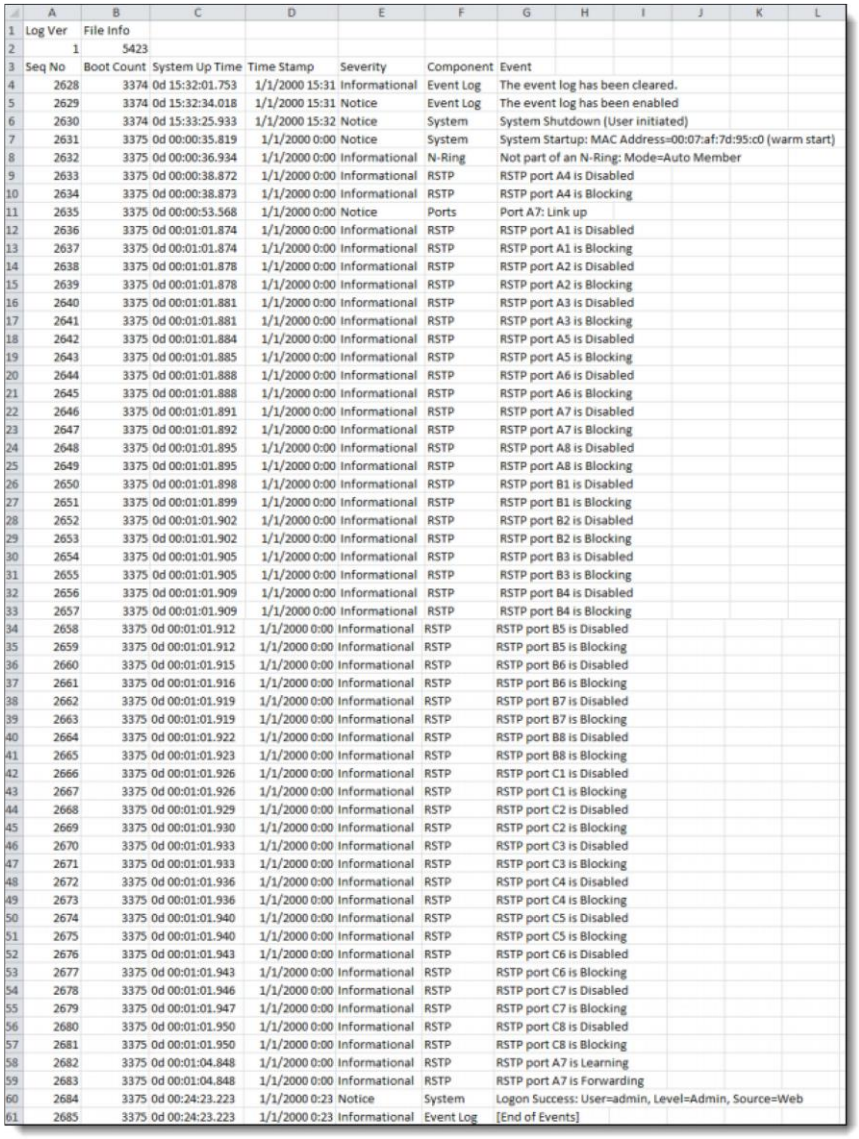
On the File Transfer - Firmware/Config page, select Transfer Type: Export Event Log from switch.

Click on Event Log in the Export Event Log from switch panel, and select the storage location for the exported file on the PC.

The default file name is “eventlog.csv”, which outputs each line in the Event Log as comma separated fields with the final text field surrounded by quotation marks. This file can be viewed with a spreadsheet application or a simple text file viewer.

The Cancel button selection will return to the Product Information page without executing any transfers.

Example Event Log CSV in Microsoft Excel:



	A	B	C	D	E	F	G
1	Log Ver	File Info					
2	1	5423					
3	Seq No	Boot Count	System Up Time	Time Stamp	Severity	Component	Event
4	2628	3374	0d 15:32:01.753	1/1/2000 15:31	Informational	Event Log	The event log has been cleared.
5	2629	3374	0d 15:32:34.018	1/1/2000 15:31	Notice	Event Log	The event log has been enabled
6	2630	3374	0d 15:33:25.933	1/1/2000 15:32	Notice	System	System Shutdown (User initiated)
7	2631	3375	0d 00:00:35.819	1/1/2000 0:00	Notice	System	System Startup: MAC Address=00:07:af:7d:95:c0 (warm start)
8	2632	3375	0d 00:00:36.934	1/1/2000 0:00	Informational	N-Ring	Not part of an N-Ring: Mode=Auto Member
9	2633	3375	0d 00:00:38.872	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Disabled
10	2634	3375	0d 00:00:38.873	1/1/2000 0:00	Informational	RSTP	RSTP port A4 is Blocking
11	2635	3375	0d 00:00:53.568	1/1/2000 0:00	Notice	Ports	Port A7: Link up
12	2636	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Disabled
13	2637	3375	0d 00:01:01.874	1/1/2000 0:00	Informational	RSTP	RSTP port A1 is Blocking
14	2638	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Disabled
15	2639	3375	0d 00:01:01.878	1/1/2000 0:00	Informational	RSTP	RSTP port A2 is Blocking
16	2640	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Disabled
17	2641	3375	0d 00:01:01.881	1/1/2000 0:00	Informational	RSTP	RSTP port A3 is Blocking
18	2642	3375	0d 00:01:01.884	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Disabled
19	2643	3375	0d 00:01:01.885	1/1/2000 0:00	Informational	RSTP	RSTP port A5 is Blocking
20	2644	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Disabled
21	2645	3375	0d 00:01:01.888	1/1/2000 0:00	Informational	RSTP	RSTP port A6 is Blocking
22	2646	3375	0d 00:01:01.891	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Disabled
23	2647	3375	0d 00:01:01.892	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Blocking
24	2648	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Disabled
25	2649	3375	0d 00:01:01.895	1/1/2000 0:00	Informational	RSTP	RSTP port A8 is Blocking
26	2650	3375	0d 00:01:01.898	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Disabled
27	2651	3375	0d 00:01:01.899	1/1/2000 0:00	Informational	RSTP	RSTP port B1 is Blocking
28	2652	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Disabled
29	2653	3375	0d 00:01:01.902	1/1/2000 0:00	Informational	RSTP	RSTP port B2 is Blocking
30	2654	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Disabled
31	2655	3375	0d 00:01:01.905	1/1/2000 0:00	Informational	RSTP	RSTP port B3 is Blocking
32	2656	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Disabled
33	2657	3375	0d 00:01:01.909	1/1/2000 0:00	Informational	RSTP	RSTP port B4 is Blocking
34	2658	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Disabled
35	2659	3375	0d 00:01:01.912	1/1/2000 0:00	Informational	RSTP	RSTP port B5 is Blocking
36	2660	3375	0d 00:01:01.915	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Disabled
37	2661	3375	0d 00:01:01.916	1/1/2000 0:00	Informational	RSTP	RSTP port B6 is Blocking
38	2662	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Disabled
39	2663	3375	0d 00:01:01.919	1/1/2000 0:00	Informational	RSTP	RSTP port B7 is Blocking
40	2664	3375	0d 00:01:01.922	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Disabled
41	2665	3375	0d 00:01:01.923	1/1/2000 0:00	Informational	RSTP	RSTP port B8 is Blocking
42	2666	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Disabled
43	2667	3375	0d 00:01:01.926	1/1/2000 0:00	Informational	RSTP	RSTP port C1 is Blocking
44	2668	3375	0d 00:01:01.929	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Disabled
45	2669	3375	0d 00:01:01.930	1/1/2000 0:00	Informational	RSTP	RSTP port C2 is Blocking
46	2670	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Disabled
47	2671	3375	0d 00:01:01.933	1/1/2000 0:00	Informational	RSTP	RSTP port C3 is Blocking
48	2672	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Disabled
49	2673	3375	0d 00:01:01.936	1/1/2000 0:00	Informational	RSTP	RSTP port C4 is Blocking
50	2674	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Disabled
51	2675	3375	0d 00:01:01.940	1/1/2000 0:00	Informational	RSTP	RSTP port C5 is Blocking
52	2676	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Disabled
53	2677	3375	0d 00:01:01.943	1/1/2000 0:00	Informational	RSTP	RSTP port C6 is Blocking
54	2678	3375	0d 00:01:01.946	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Disabled
55	2679	3375	0d 00:01:01.947	1/1/2000 0:00	Informational	RSTP	RSTP port C7 is Blocking
56	2680	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Disabled
57	2681	3375	0d 00:01:01.950	1/1/2000 0:00	Informational	RSTP	RSTP port C8 is Blocking
58	2682	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Learning
59	2683	3375	0d 00:01:04.848	1/1/2000 0:00	Informational	RSTP	RSTP port A7 is Forwarding
60	2684	3375	0d 00:24:23.223	1/1/2000 0:23	Notice	System	Logon Success: User=admin, Level=Admin, Source=Web
61	2685	3375	0d 00:24:23.223	1/1/2000 0:23	Informational	Event Log	[End of Events]

Where the fields are:

Sequence Number: Each entry is assigned the next sequence number – these may not always be listed in numerical order due to the priority of the internal tasks which generate the events.

Note: The "[End of Events]" message at the end of the file will contain the next sequence number, but that number will be reused for the next system event on the switch when it occurs.

Boot Count: A count of how many times the switch has been powered up or restarted.

System Up Time: The amount of time since the system was started in days, hours, minutes, seconds, milliseconds.

Time Stamp: Corresponding date, hours, minutes, seconds, based on the initial value of Current System Time as defined in the System Configuration View.

Severity: (most severe to least severe):

Emergency: Major failure, Immediate intervention required

Alert: Failure of a component, Immediate corrective steps should be taken
Critical: Partial failure of a component, Immediate corrective action should be taken
Error: Non-urgent failure
Warning: Not an error, but may lead to an error if action is not taken
Notice: Unusual event, but not an error
Informational: General Information
Debug: Information useful to a support technician for debugging the switch operation.

Component: Internal component that generated the event entry.

Event Description: Description of the event entry.

Fault

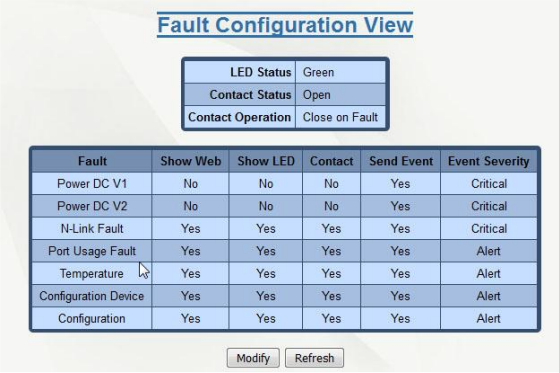
The Fault page provides configurable selections indicating the different ways to notify an administrator when a fault occurs. In each case, the notification may consist of any combination: Show Web, Show LED and/or Contact. Some fault configurations are only available under specific conditions. For example, Power AC is only available when an AC power supply is installed in the switch. N-Ring™ faults are only available when the switch is set to N-Ring Manager mode. The page below is an example of what may be seen on the Fault dialog window.

Additionally, when a fault is triggered, an event may be generated at the severity selected by the user. The event will be logged unless it is filtered by the Event Log Filter.

The event's severity can be set to any of the following values.

Note: These are based on the Event Log's Severity:

Emergency
Alert
Critical
Error
Warning
Notice
Informational
Debug



LED Status: This field shows the current color of the Power/Fault LED. Green indicates there is no fault and Red indicates a fault condition exists.

Contact Status: This field shows the current open/closed status of the fault relay.*

Contact Operation: This field determines if the fault relay is normally open (Close on Fault) or normally closed (Open on Fault).*

Show Web: If the *Show Web* option is enabled, the fault is displayed on the browser pages.

Show LED: If the *Show LED* option is enabled, the fault is indicated on the Power LED as red.

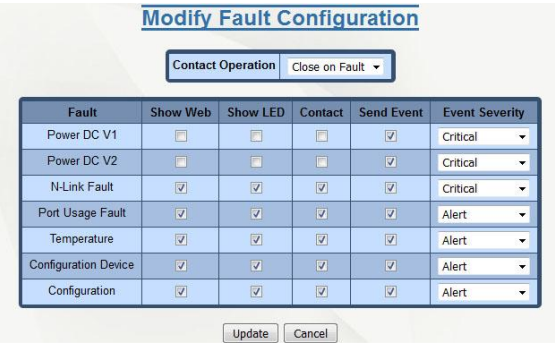
Contact: If *Contact* is enabled, the fault is indicated by opening or closing the contact switch.

Send Event: The fault is sent to the configured log(s). See the Event Log and Syslog configuration.

Event Severity: The fault will generate an event based on the configured severity level.

To make changes to the *Fault Configuration* settings, click on the *Modify* button.

* **Note:** Fault's contact is only supported on certain NT24k® switches.



Select the desired notification settings and click on the *Update* button to save any changes. Once the save is complete, the dialog window will change to Fault Configuration.

Power Fault Descriptions

The location of a power input is clearly marked on the device. Depending on the specific device configuration, some of the faults listed below may not be shown.

Note: Power Fault notifications are disabled in factory defaults on a low voltage power supply.

Power AC1: Indicates a low voltage on power input AC1.
Power AC2: Indicates a low voltage on power input AC2.
Power DC V1: Indicates a low voltage on power input DC V_1.
Power DC V2: Indicates a low voltage on power input DC V_2.
Power DC V3: Indicates a low voltage on power input DC V_3.
Power DC V4: Indicates a low voltage on power input DC V_4.

N-Ring™ Manager Fault Descriptions

The faults listed below appear when the switch is configured as an N-Ring manager.

N-Ring Broken: Indicates that an N-Ring connection is completely broken.
N-Ring Partial Break (High): Indicates that an N-Ring connection is only broken in the direction of the higher port.
N-Ring Partial Break (Low): Indicates than an N-Ring connection is only broken in the direction of the lower port.
N-Ring Multiple Managers: Indicates that more than one N-Ring Manager exists on an N-Ring.

Miscellaneous Fault Descriptions

N-Link Fault: Indicates a problem with the N-Link configuration.
Port Usage Fault: Indicates that the port usage, for one or more ports, is below the Usage Alarm Low setting, or above the Usage Alarm High setting (see Port Configuration View and Port Utilization View).
Temperature: Indicates that the temperature of the switch is outside of the configured limits.
Configuration Device: Indicates that the configuration on an installed configuration device is invalid.
Configuration: Indicates that a setting misconfiguration needs to be resolved.

File Transfer

File Transfer gives the administrator the ability to import files to the switch or export files from the switch.

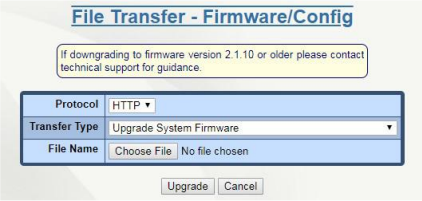
Note: Do not cycle power on the switch or interrupt the data connection between the PC and the switch while a file is being transferred.

Protocol: Select whether HTTP, HTTPS, or TFTP protocol is to be used for transfers.

Transfer Type: The different types of transfer that can be used are listed in the drop-down list. The options are: Upgrade System Firmware, Upgrade BootLoader Firmware, Import Configuration to Switch, Import Port Security Authorization List to Switch, Import License to Switch, Export Saved Configuration from Switch, Export Saved Port Security Authorization List from Switch, and Export Event Log from Switch.

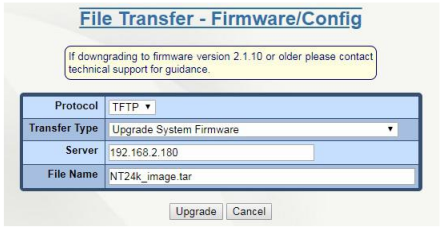
Upgrade System Firmware: Select this option to install the system firmware to the switch.

HTTP/HTTPS Protocol



File Name: Click on the *Browse* button to browse to the desired location and select an image file (typically called NT24k_image.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server. It is automatically populated with the IP address of the PC which is connected to the switch.
File Name: This field displays the name of the file to be imported (typically NT24k_image.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

WARNING: Due to security enhancements, downgrading the system firmware to 2.1.10 or older will reset all passwords to “password” (users and administrators). The Administrator should immediately change each user’s password and notify the user.

Upgrade BootLoader Firmware: Select this option to install the bootloader firmware.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select an image file (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

TFTP Protocol



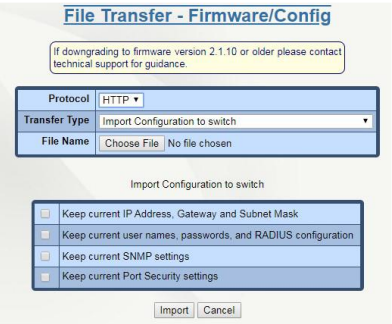
Server: This field displays the IP address of the TFTP server.
File Name: This field displays the name of the file to be imported (typically NT24k_bootloader.tar). File names are limited to a maximum length of 63 characters.

Click on the *Upgrade* button to upgrade the system.

Note: After successfully transferring new firmware to the switch, the switch must be rebooted.

Import Configuration to Switch: Select this option to change the switch configuration by importing a configuration file.

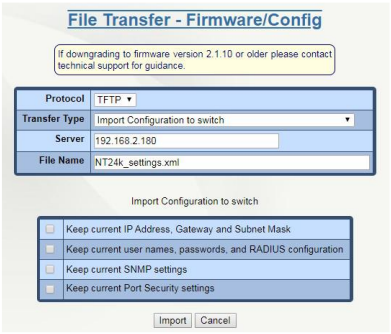
HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a configuration file (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_settings.xml). File names are limited to a maximum length of 63 characters.

Import Configuration to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

Import Port Security Authorization List to Switch: Select this option to change the Port Security Authorization List by importing a configuration file.

HTTP/HTTPS Protocol



File Name: Click on the Choose File button to browse to the desired location and select a configuration file (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically NT24k_portsecurity.auth). File names are limited to a maximum length of 63 characters.

Import Port Security Authorization List to switch: Select which configuration settings to keep when the new configuration file is imported by checking on the relevant checkbox.

Click on the *Import* button to upgrade the system.

Note: Find out more on working with Configuration Files in **Appendix B Working with Configuration Files.**

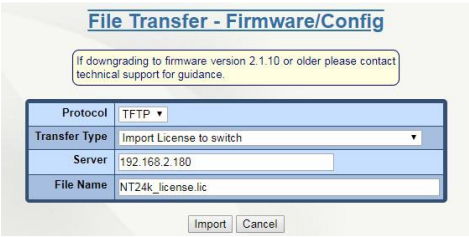
Import License to Switch: Select this option to install a license to the switch by importing a license file.

HTTP/HTTPS Protocol



File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: Click on the Browse button to browse to the desired location and select a license file (typically NT24k_license.lic). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the license.

*The same file transfer dialog box is used for both HTTP and HTTPS.

Import Security Certificate to Switch:

HTTP/HTTPS Protocol



Certificate File Name: Click on the Choose File button to browse to the desired location and select a certificate file (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: Click on the Choose File button to browse to the desired location and select a key file (typically key.pem). File names are limited to a maximum length of 63 characters.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

Certificate File Name: This field displays the name of the file to be imported (typically cert.pem). File names are limited to a maximum length of 63 characters.

Key File Name: This field displays the name of the file to be imported (typically key.pem). File names are limited to a maximum length of 63 characters.

Click on the *Import* button to import the Security Certificate.
*The same file transfer dialog box is used for both HTTP and HTTPS.

Note: After successfully transferring a new Security Certificate to the switch, the switch must be rebooted.

Export Saved Configuration from Switch: Select Export Saved Configuration from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Configuration Settings* link to export the settings to your computer. This option allows administrators to back up their configurations to an offsite server in case a custom configuration must be reloaded at a later time.

A download dialog pop-up will appear, prompting the user to open or save the configuration file. The file is called *NT24k_settings.xml* per default.

TFTP Protocol



Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_settings.xml). File names are limited to 63 characters maximum.

Click on the *Export* button to export the settings to the specified TFTP server.

Export Saved Port Security Authorization List from Switch: Select Export Saved Port Security Authorization List from switch in the Transfer Type field.

HTTP/HTTPS Protocol



Click on the *Port Security Authorization List* link to export the authorization list to your computer. This option allows administrators to back up their Port Security Authorization List.

A download dialog pop-up will appear, prompting the user to open or save the authorization file. The file is called *NT24k_portsecurity.auth* per default.

TFTP Protocol



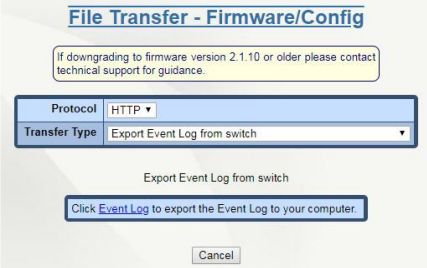
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be exported (typically NT24k_portsecurity.auth). File names are limited to 63 characters maximum.

Click on the *Export* button to export the configuration file to the specified TFTP server.

Export Event Log from switch: The entire Event Log may be exported to the host PC for further analysis and archiving purposes. The log file lists all events that occurred while event logging was enabled and since the last Clear Log event was performed.

HTTP/HTTPS Protocol



Click on the *Event Log* link to export the log file to your computer. A download dialog pop-up will appear, prompting the user to open or save the configuration file.

TFTP Protocol



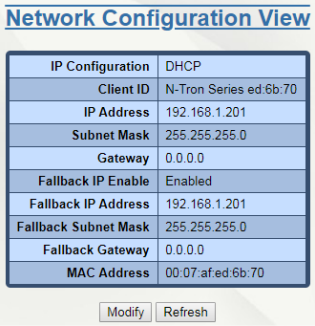
Server: This field displays the IP address of the TFTP server.

File Name: This field displays the name of the file to be imported (typically eventlog.csv). File names are limited to a maximum length of 63 characters.

Click on the *Export* button to export the log file to the specified TFTP server.

Network

Setting the IP Configuration to DHCP will use the Primary Management VLAN ports to receive an IP address from the DHCP Server. Changes to the Primary Management VLAN are made in the VLAN section. If no changes are made, the default VLAN will be used as the default Primary Management VLAN.



IP Configuration: Determines the method used to obtain an IP address, Subnet Mask, and Gateway address. When Static is selected, the statically configured values are used. When DHCP is selected, DHCP protocols are used to obtain these values.

Client ID: This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters. (Only shown in DHCP Mode) The DHCP option 61 client identifier will be sent with a preceding type-byte as listed below:

MAC Address = 0x01
Switch Name = 0x00 (Default)
Other String = 0x00
Other HEX = 0x00

IP Address: Contains the current IP Address of the device.

Subnet Mask: Contains the current Subnet Mask of the device.

Gateway: Contains the current Gateway of the device.

Fallback IP Enable: Enables/disables the use of the Fallback IP address.

Fallback IP Address: Contains the configured Fallback IP address of the device. This address will be used if the switch fails to obtain a DHCP address from the DHCP Server. This option is only shown in DHCP Mode and if Fallback IP is enabled.

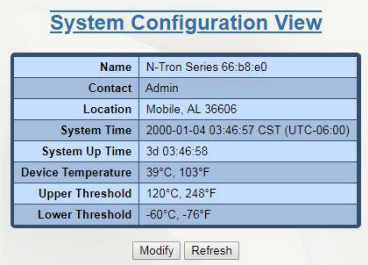
Fallback Subnet Mask: Contains the configured Fallback Subnet Mask of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

Fallback Gateway: Contains the configured Fallback Gateway of the device. This option is only shown in DHCP Mode and if Fallback IP is enabled.

MAC Address: MAC Address of the device.

To modify any of the fields, click on Modify. Enter the desired system settings and click on the *Update* button.

System



The System page presents the user with current system information.

Name: Contains the name assigned to the device, which allows alphanumeric and special characters (,#_-:) only. When IP Configuration is DHCP, then this may be used as the Client ID (Option 61) of the DHCP Request.

Contact: The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters (,#_-) are allowed.

Location: The physical location of the switch. Only alphanumeric and special characters (,#_-) are allowed.

System Time: Displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start.

System Up Time: Parameter represents the total time elapsed since the switch was turned on or rebooted.

Device Temperature: The device temperature reported by the on-board digital temperature sensor. This option is only shown on devices with temperature sensors.

Upper Threshold: The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in degrees Celsius. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Lower Threshold: The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in Celsius degrees. The range is from -60 °C to 120 °C, and the default is product dependent. This option is only shown on devices with temperature sensors.

Power DC V1: The voltage measurement on power input DC V1. This option is only shown on devices with a voltage sensor.

Power DC V2: The voltage measurement on power input DC V2. This option is only shown on devices with a voltage sensor.

Total Current: The total input current measurement in Amps. This option is only shown on devices with a current sensor.

Total Power: The calculated power in Watts obtained from voltage and current measurements. This option is only shown on devices with a voltage and current sensor.

To make modifications to the fields above, click on the Modify button. Enter the desired settings and click on the *Update* button.

Bridging

Aging Time

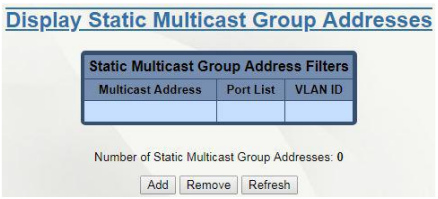
The Aging menu item under the Bridging category displays the currently configured Aging Time. This configurable field shows the desired aging time for dynamically learned MAC addresses. Inactive MAC addresses will be removed from the Hardware Address Entry Table after the aging time period has expired. The internal aging time period will be between 1 and 2 times the selected aging time value.



To modify the Aging Time field, click on the Modify button. Enter the desired Aging Time (value must be between 10 - 630 seconds) and click on the *Update* button. The default value for this field is 300 seconds. To save the changes made, return to the Configuration menu and click on the *Save* button.

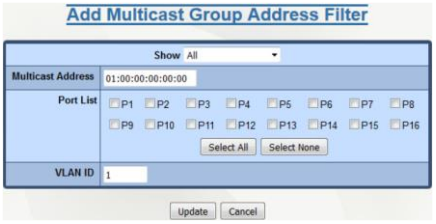
Multicast Addresses

The Multicast Addresses page displays a list of Multicast Group Addresses that are associated with respective port numbers.



Adding a Multicast Group Address

To add a Multicast Address, click on the Add button and the following dialog window will appear:



Enter a valid Multicast Group Address and VLAN ID, then select the port(s) to which matching packets will be directed.

Click on the *Update* button to return to the Display Static Multicast Group Addresses page.

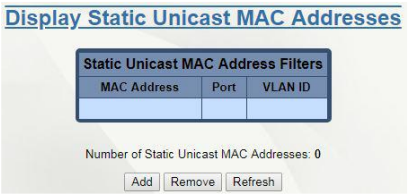
To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Multicast Group Address

To remove a Multicast Address, click on the *Remove* button. A listing of available Multicast Group Addresses will appear. Click on the *Delete* button to remove an address.

Unicast Addresses

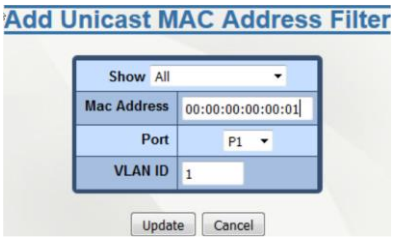
The Unicast Addresses dialog window displays a list of MAC addresses that are associated with each respective port number. This can be used to statically assign a MAC address access to a single port on the switch.



Adding a Unicast Address

To add a Unicast Address, click on the Add button and the following dialog window will appear:

Enter a valid MAC address and VLAN ID, then select the port to which matching packets will be directed.



Click on the Update button to add the unicast address and return to the Display Static Unicast MAC Addresses dialog window.

To save the changes go to the Configuration menu and click on the *Save* button.

Removing a Unicast MAC Address

To remove a Unicast Address, click on the *Remove* button and a dialog window with a listing of available Unicast MAC Addresses will appear. Click on the *Delete* button to remove the MAC Address and return to the *Display Static Unicast MAC Addresses* dialog window.

CIP™

EtherNet/IP™, better known as the Common Industrial Protocol (CIP), was designed for use in process control and industrial automation applications. CIP was designed to provide consistent device access to eliminate the need for vendor specific software for configuration and monitoring of their devices.

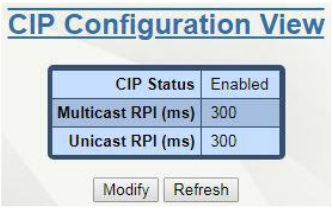
N-Tron® switches with CIP support can be used to communicate with other industrial devices.

Note: Information about using CIP with the NT24k® can be found in the CIP User Manual & Installation Guide and the CIP Installation Kit for the NT24k switch family. This manual can be found on the Red Lion website.

Configuration

The CIP Configuration View dialog window displays the CIP status as well as the Multicast and Unicast RPIs (Requested Packet Interval).

Click on the *Modify* button to make changes to the CIP Configuration:



CIP Status: This field determines whether CIP is enabled or disabled on the NT24k switch. The default setting is Enabled.

Multicast RPI: The minimum Requested Packet Interval for Class 1 (multicast) connections in milliseconds is shown in this field. Requests for less than this value will be rejected. The default value for this option is 300 ms. The available range is 300 - 300,000.

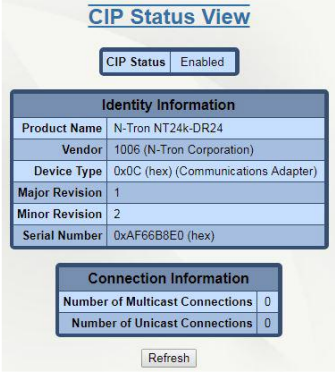
Unicast RPI: This field shows the minimum Request Packet Interval for Class 3 (unicast) connections in milliseconds. Requests for less than this value will be rejected. The default value for this field is 300ms. The available range is 300 - 300,000.

Click on the *Update* button once the desired information is entered and to return to the *CIP Configuration View* dialog window. To save the changes made, return to the Configuration menu and click on the *Save* button.

Status

The Status menu item displays the CIP status. The switch status and partner status information will be shown.

Example CIP™ Status View showing a Connection Summary table with one Multicast connection:



Identity Information

Product Name: This field displays the Switch Model Number.

Vendor: This field shows N-Tron®'s ODVA Ethernet/IP™ Vendor ID (1006).

Device Type: This field displays that the ODVA device type is Communications Adapter (0x0C hex).

Major Revision: This field displays the major revision of the CIP implementation.

Minor Revision: This field shows the minor revision of the CIP implementation.

Serial Number (hex): This field shows the CIP serial number, which is unique across all N-Tron CIP devices. The number shown is the last 4 octets of the base switch MAC address.

Connection Information

Number of Multicast Connections: This field shows the current number of CIP Ethernet/IP class 1 (multicast) connections.

Number of Unicast Connections: This field displays the current number of CIP Ethernet/IP class 3 (unicast) connections.

Connection Summary

Transport Class: This field displays the Transport class for the connection, such as class 1 (multicast) or class 3 (unicast).

Connection State: This field indicates the state of the connection (established, timed out, closing or configuring).

RPI: The field displays the Requested Packet Interval in milliseconds.

Config Assembly: This field shows the configuration assembly number.

Output Assembly: This field displays the Output assembly number (the assembly that is sent out from the switch).

Input Assembly: This field displays the input assembly number (the assembly that is received into the switch).

Peer Address: This field shows the peer IP address of the device connected to the switch.

EIP Indicators

The module status indicator shows the current status of the switch. The network status indicator shows the status of the EtherNet/IP™ network interface. These indicators are located on the back of the rack mount version of the switch or on the front of the CPU module on the DIN-Rail versions of the switch.

Module Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	No power	The switch is not powered up.
Steady Green	Device operational	The switch is operating normally.
Flashing Green	Standby	The switch has not been configured for CIP™ operations.
Flashing Red	Minor fault	A recoverable minor fault has occurred.
Steady Red	Major fault	A non-recoverable major fault has occurred.

Network Status

INDICATOR STATE	SUMMARY	DESCRIPTION
Steady Off	Not powered, no IP address	The switch is not powered up, or an IP address has not been configured.
Flashing Green	No connections	An IP address is configured, but no connections have been established.
Steady Green	Connected	A connection has been established
Flashing Red	Connection timeout	A connection has timed out.

DHCP Client Configuration

The switch will automatically obtain an IP assignment from a DHCP server, or optionally Fallback to a configured IP assignment if unable to get an IP assignment from a DHCP server. Communication between the client and server can optionally go through a DHCP Relay Agent.

DHCP Client is enabled by default, with 192.168.1.201 as the factory fallback address.

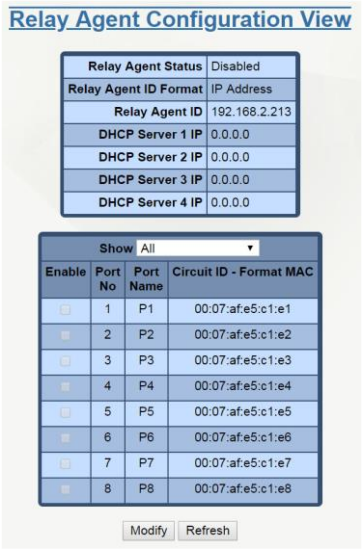
Refer to Network for enabling DHCP Client mode.

DHCP Relay Agent Configuration

A relay agent, configured via the Relay Agent Configuration View, provides a way for DHCP client requests to reach DHCP servers, including those that reside on a different subnet and/or VLAN.

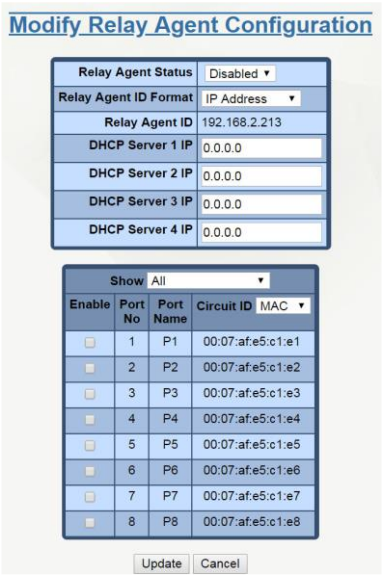
Note: DHCP traffic is sent and received only on Management VLANs.

View Page



Click on the *Modify* button to open the DHCP Server Configuration Modification page.

Modify Page



Click on the *Update* button to apply the changes.

Relay Agent Status: Indicates whether the DHCP relay agent is active. The default is Disabled.

Relay Agent ID Format: The format selector with options for IP address, MAC address, Client ID, Other String, or Other Hex characters.

Relay Agent ID: A unique identifier that designates this relay agent switch.

DHCP Server 1-4 IP: The configured IP address of the DHCP servers.

Enable: Indicates whether relay agent functionality is enabled for the port.

Port No: The number of the port. This field is read-only.

Port Name: The descriptive name of the port. This field is read-only.

Circuit ID: When enabled, the Circuit ID for the port can be specified. By default, the Circuit ID is set to the MAC Address of the port. Circuit IDs must be unique for each port.

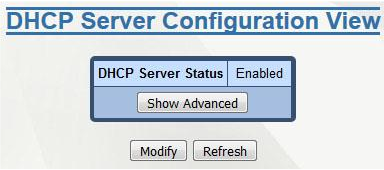
Circuit ID Format: The format selector with options for MAC, Hex, and String.

DHCP Server Configuration

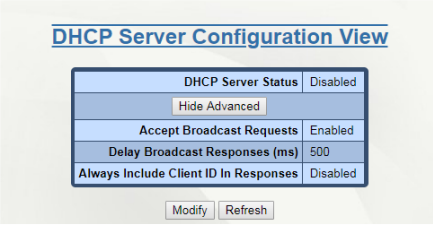
The DHCP Server provides IP addresses to DHCP clients on the same subnet or VLAN. DHCP traffic is sent and received only on Management LANs.

Note: A DHCP Relay Agent is required, to provide an IP address to clients on a different subnet or VLAN.

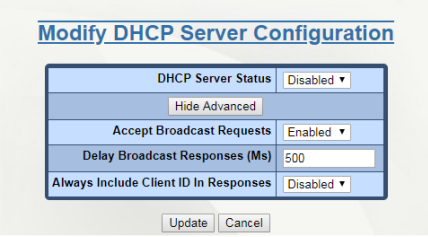
The following screen shows the Advanced configuration hidden:



The following screen shows the Advanced configuration unhidden:



Click on the *Modify* button to open the DHCP Server Configuration Modification page.
Click on the *Update* button to apply the changes.



DHCP Server Status: Indicates whether the DHCP server is active. The default is Disabled.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Accept Broadcast Requests: Indicates whether the DHCP server will process broadcast messages. Typically, client requests are broadcast and relay agent requests are unicast. When enabled, the server will respond to broadcast requests. When disabled, the server will ignore broadcast requests. The default is Enabled.

Delay Broadcast Responses (Ms): The amount of time (in milliseconds) that the DHCP server will delay the processing of a broadcast message. This setting is used when clients and relay agents are on the same subnet and/or VLAN. A delay provides the opportunity for relay agent requests to be honored before client requests. This setting only applies when Allow Broadcast is Enabled. The range is 0-2500 and the default is 500.

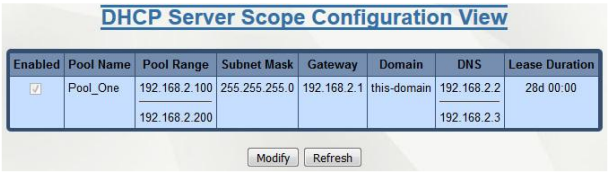
Always Include Client ID In Responses: Indicates whether the DHCP Server will always respond to the client with the Client ID in the frame. This should be disabled for a network that is non-compliant to the RFC- 6842(2013). The default is Disabled.

DHCP Server Scope Configuration

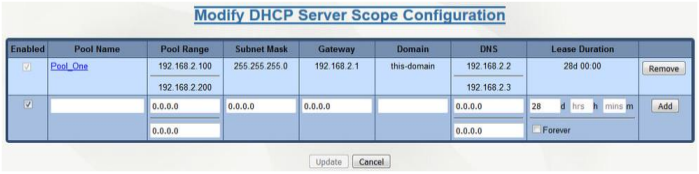
Scope Configuration Pools

The DHCP Server Scope Configuration contains vital network configuration options, called scope configuration pools, for potential clients. At least one scope configuration pool is necessary to create static assignments.

View Page



Modify Page



On the Modify page, the last column contains various buttons. The *Remove* button removes the corresponding scope configuration pool along with all static assignment and bindings associated with the pool. The *Add* button is used to add a new scope configuration pool.

Click on the *Add* button to add the new scope.
Click on the *Remove* button to remove an existing or new scope.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled.

Pool Name: Descriptive name of the scope configuration pool. This field is required and must be unique.

Pool Range: Starting and ending IP addresses for the pool of addresses.

Subnet Mask: The subnet mask for the IP address pool.

Gateway: The gateway IP address offered to the client. This field is optional.

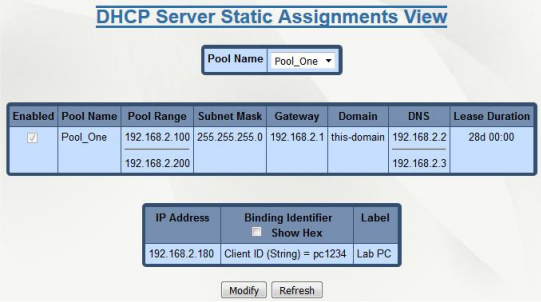
Domain: The domain name offered to the client. This field is optional.

DNS: The DNS server IP addresses offered to the client. These fields are optional.

Lease Duration: The lease time (in days, hours and minutes) offered to the client. The range is 1 minute to 1000 days. The default is 28 days. If the Forever checkbox is checked, the lease does not expire.

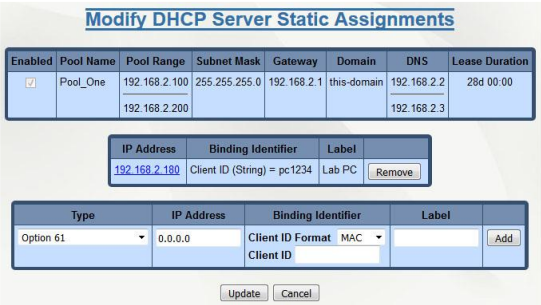
DHCP Server Static Assignments

View Page



Select the Pool Name drop-down list to filter on a specified pool.
Click on the *Modify* button to open the Modify DHCP Server Static Assignments page.

Modify Page



Click on the IP address hyperlink to modify the corresponding static assignment.
Click on the *Add* button to add the new static assignment.
Click on the *Remove* button to remove an existing or new static assignment.
Click on the *Update* button to apply the changes.

Enabled: Indicates whether the pool is enabled or disabled. This field is read-only.

Pool Name: Descriptive name of the scope configuration pool. This field is read-only.

Pool Range: Starting and ending IP addresses of a pool of addresses. This field is read-only.

Subnet Mask: The subnet mask offered to the client. This field is read-only.

Gateway: The gateway IP address offered to the client. This field is read-only.

Domain: The domain name offered to the client. This field is read-only.

DNS: The DNS server IP addresses offered to the client. This field is read-only.

Lease Duration: The lease time (in days, hours and minutes) that will be offered to a client. This field is read-only.

Type: The type of binding identifier for the static assignment. The options are Option 61 and Relay Agent (Option 82).

IP Address: The static IP address offered to the DHCP client.

Binding Identifier: The binding identifier of the static IP address assignment. For Option 61, the binding identifier requires a Client ID, the identifier of the desired client. The identifier formats are MAC, HEX, and String. A type-byte is assumed to precede the identifier and does not have to be entered here. The type-byte value is assumed to be as follows:

MAC = 0x01
String = 0x00
HEX = 0x00

For Option 82, the binding identifier requires a Remote Agent ID and Circuit ID. These identifiers must match the relay agent's Remote ID and Circuit ID. The identifier formats are IP (for a Remote ID), MAC, Hex, and String.

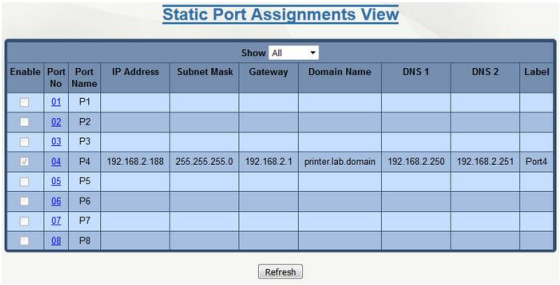
Label: The descriptive name of the static assignment. The field is optional.

DHCP Static Port Assignments

When a static port assignment is enabled on the port, the port will act as a DHCP server and provide a static IP address to the client connected to the port.

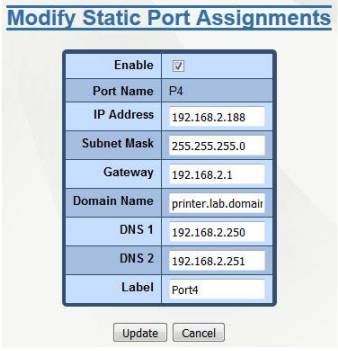
Note: Only one DHCP client can be connected per port.

View Page



Select the Show drop-down list to show only enabled ports or all ports. Click on the port number hyperlink to modify the port's static port assignment.

Modify Page



Click on the *Update* button to apply the changes.

Enable: Indicates whether Static Port Assignment is enabled on the port.

Port No: The number of the port.

Port Name: The descriptive name of the port. This field is read-only.

IP Address: The IP address offer to the DHCP client connected to the port.

Subnet Mask: The subnet mask offer to the DHCP client connected to the port.

Gateway: The gateway offer to the DHCP client connected to the port.

Domain Name: The domain name offer to the DHCP client connected to the port. The field is optional.

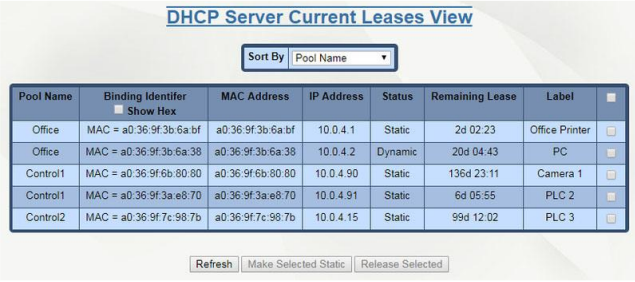
DNS 1: The primary DNS offer to the DHCP client connected to the port. The field is optional.

DNS 2: The secondary DNS offer to the DHCP client connected to the port. The field is optional.

Label: The descriptive name of the DHCP client connected to the port. The field is optional.

DHCP Server Current Leases

The Current Leases table shows the IP addresses that have been leased, or offered, to devices.



Sort By: Sort the current leases by Pool Name, Binding Identifier, MAC Address, IP Address, Status, Remaining Lease, or Label.

Pool Name: The pool from which the lease was obtained.

Binding Identifier: The client associated with the lease entry. If Show Hex checkbox is checked, then detailed hex data about the Binding Identifier is displayed.

MAC Address: Indicates the MAC address of the client associated with the lease.

IP Address: Indicates the IP address assigned to the lease entry.

Status: Indicates the current status of the lease entry.

- Dynamic = Assigned dynamic IP.
- Static = Assigned static IP.

Remaining Lease: The client's remaining lease time.

Label: The descriptive name of the client.

Check Box: Click the individual checkbox to either make the clients static or release its lease.

Note: Only clients with a dynamic lease can be made static.

Make Selected Static: Make the selected client dynamic IP address static.

Release Selected: Release selected client lease.

Event Notification

Event Notification is a combination of features that deal with filtering and routing system and fault events to different destinations.

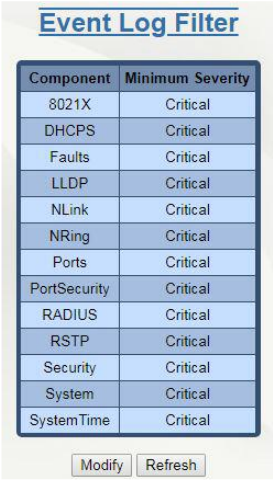
Event Log Filter

The Event Log Filter allows the user to define which events will be logged based on the severity level of the event.

Note: The event log is enabled by default for critical events.

Event Log Filter View

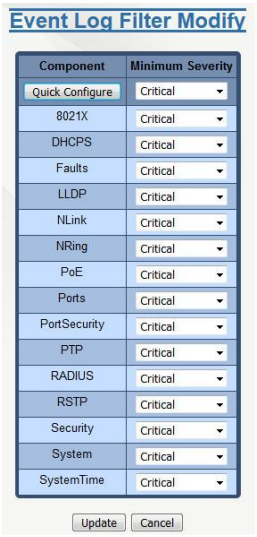
The Event Log Filter page displays the current minimum severity settings for each component. Events below the minimum severity level will not be logged.



Click on the Modify button to make changes to the Event Log Filter.

Event Log Filter Modify

The Event Log Filter configuration can be changed by clicking on the Modify button.



Quick Configure: Use Quick Configure to change all components to the same severity level.

Component: The feature, protocol, or system service of the switch that generates events. The component list is model dependent.

Minimum Severity: Events below the minimum severity level will not be logged. A severity of None will disable events for that component. For more information, see Severity under the section Event Log.

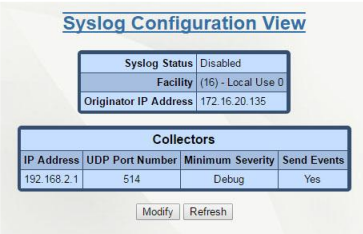
Syslog

The Syslog feature allows certain system events (see Event Log) to be sent as messages to remote hosts for monitoring and analysis.

The messages can be sent to up to 5 different remote hosts, known as Syslog Collectors. A minimum severity level is associated with each Syslog Collector. Events below the minimum severity level will not be sent out from the switch. Syslog is disabled by default and can be enabled through the Web Browser interface.

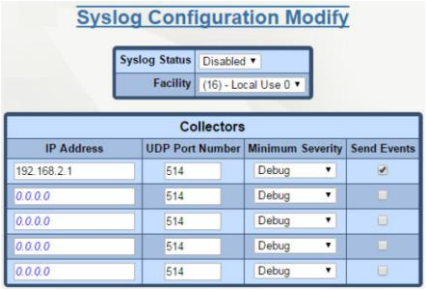
Syslog Configuration View

The Syslog Configuration View is accessible under Event Notification within the Advanced section. Below is an example of the current configuration status of Syslog, the configuration of each Syslog Collector, and a list of the Syslog Collectors.



Syslog Configuration Modify

The Syslog configuration may be changed by an admin level user by clicking on the Modify button. In this section the settings of each Syslog Collector can be updated and the Syslog Distributor itself can be disabled or enabled.



Syslog Status: This field indicates whether the Syslog Distributor (client) has been enabled or disabled. To enable Syslog at least one Syslog Collector (server) must be specified.

Facility: This is used to identify which process is logging the message. This is a global setting for the switch and will be used for all messages. Available Facility values as defined per RFC-5424 are 1 (user level) and 16 - 23 (local use).

Originator IP Address: The field displays the configured IP address of the switch.

Collector: The Syslog server to which the messages are sent.

IP Address: The IP address of the Collector (server) to receive a log message.

UDP Port Number: The UDP port on the Collector (server) to receive the message. The default port number is 514, per RFC-5424, but can be changed to meet installation requirements. Allowed port numbers are 1 - 65535.

Minimum Severity: The minimum Severity level of the messages that will be sent to the specified Collector (server). Values range from Debug (7) to Emergency (0). For example, a Collector configured with a value of Warning (4) will receive all messages from 4 to 0. The importance of a message increases with a lower severity level setting value. These are the same Severity level setting values as the Event Log and Event Log Filter. For more information, see Severity under the section Event Log.

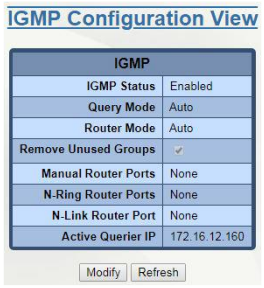
Send Events: This setting can be enabled or disabled, per Collector, to control the distribution of Event Log messages.

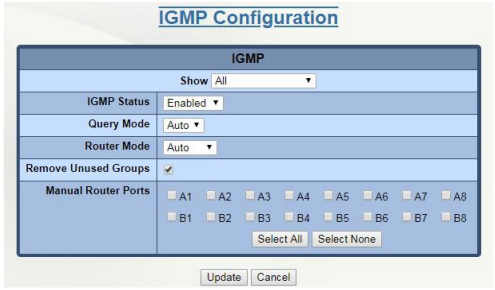
IGMP

Configuration

The Configuration dialog window displays the IGMP basic configuration settings. If an active N-Ring™ participant, the ring ports are informatively shown as N-Ring router ports. On an N-Link Master, Slave or Coupler switch, the coupler port is shown as an N-Link router port.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).





IGMP Status: This field indicates whether the IGMP is enabled or disabled. The default value for this field is *Enabled*.

Query Mode: The default value for this option is Auto. Available options are:

Auto: Multiple switches will ensure that only one switch is the active querier.
On: This switch is always an active querier.
Off: This switch never queries.

Router Mode: The available options for this field are:

Auto: This option allows for dynamically detected and manually set router ports. This is the default value.
None: This option allows for no router ports.
Manual: This option allows for manually set router ports.

Remove Unused Groups: If this option is checked, unused IGMP Groups will be removed and traffic with those multicast addresses will be treated as normal multicast. If this option is unchecked, unused IGMP Groups will remain and traffic with those multicast addresses will be limited. The default value for this field is checked.

Note: IGMP Groups are not retained through a power cycle.

Manual Router Ports: Manually specify the used ports.

N-Ring™ Router Ports: This field displays the N-Ring ports designated as active IGMP Router ports.

N-Link Router Port: This field indicates the N-Link ports that have been designated as active IGMP Router ports.

Active Querier IP: This field shows the IP address of the Active Querier.

Click on the *Modify* button to make changes to the IGMP Status, Query Mode, Router Mode and Manual Router Ports.

Groups

The Groups dialog window displays a list of IGMP groups based on the Group IP and the port that it is associated with.



Total Number of Active IP Group Memberships: The total number of active group IP memberships based on the dotted quad view (aaa.bbb.ccc.ddd) counting each joined port are displayed here.

Group IP: This field shows the dynamically created multicast group IP address.

Port Name: The descriptive name of the port is shown here.

VLAN ID: This field indicates the VLAN in which the Group IP is assigned. The available range is 1-4094.

RFilter Ports

From the RFilter (Router Multicast Data Filter) option, the user can choose whether or not data frames with known group multicast addresses are sent to the router ports. Control packets will be sent to the router(s) regardless of this setting.



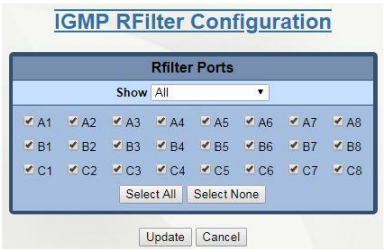
Known group multicast addresses are learned from dynamic IGMP Snooping operations. If IGMP is enabled and a port is a router port, then having RFilter enabled will stop IGMP group data from egressing on the port unless a join to that specific IGMP group has come into the port. IGMP controls (Join, Leave, Query) are still sent.

The Router Multicast Data Filter is enabled for all ports by default. Router ports do not get data frames with known multicast destination addresses unless a join for that specific multicast address has been received on that port. Join overrides an RFilter.

If RFilter is disabled, the router ports get data frames with known multicast destination addresses.

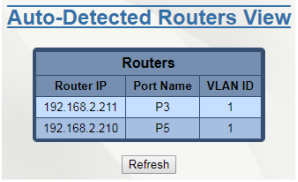
RFilter can be set for individual ports: any, all or none. For each port, RFilter will have an impact only if that port is manually or dynamically chosen as a router port.

Click on the *Modify* button to make changes to the IGMP RFilter Configuration. The following dialog window will appear:



From this dialog window, the administrator selects which ports to identify as RFilter ports and can view all possible ports (Modules), currently installed ports or currently linked up ports. Click on the *Update* button when done with required changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Routers



The Routers dialog window displays a list of the following:

Router IP: Auto-detected router IP address.

Port Name: The descriptive name of the port.

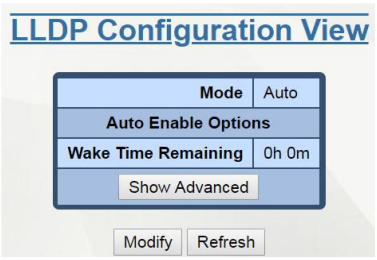
VLAN ID: VLAN in which the Router IP is assigned. The range is 1 - 4094.

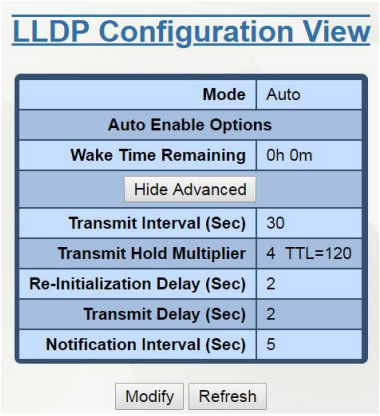
LLDP

LLDP Configuration

The LLDP Configuration Page can be used to view or configure LLDP operation on the switch. The default mode for LLDP is Auto. Other configurable options are revealed by clicking on the "Show Advanced" button.

To enable LLDP on all switches that are in Auto mode, set the mode to Auto, set the Wake Time to a non-zero time, and click the "Send" button.





Mode: The LLDP mode can be Enabled, Disabled, or Auto. In Auto mode, LLDP is inactive until a switch sends a wake-up packet. The default is Auto.

Wake Time: The length of time LLDP will be active on switches that are in Auto mode. A value of 0 hours and 0 minutes will deactivate LLDP. Modify this value and click the "Send" button to set the wake time on all switches that are in Auto mode. The default is 0 hours and 0 minutes.

Show/Hide Advanced: Button used to toggle whether or not to show advanced settings.

Transmit Interval (Sec): The interval at which periodic LLDP frames are transmitted. The default is 30 seconds.

Transmit Hold Multiplier: A multiplier on the Transmit Interval when calculating a Time-to-Live value. The default is 4.

Re-Initialization Delay (Sec): The minimum time an LLDP port will wait before re-initializing after its setting has changed from disabled to Tx-Only or Tx/Rx. This prevents excessive notifications when LLDP Port settings are changed. The default is 2 seconds.

Transmit Delay (Sec): When LLDP information is changing on the switch, the time to wait before sending an LLDP frame with the updated information. The default is 2 seconds.

Notification Interval (Sec): The interval between notifications sent by the switch. If a port sends out a notification and another port tries to send out a notification, then the subsequent notification will not be sent until the interval expires. The default is 5 seconds.

LLDP Ports Configuration

The LLDP Ports Configuration Page displays and configures LLDP options for each port.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

Port No: The number of the port.

Mode: The port mode can be Tx Only, Rx Only, Tx/Rx, or Disabled. This configures whether or not LLDP frames are transmitted or received. The default is Tx/Rx.

Allow Management Data: Allows the transmission of management type information. Example: IP address of the switch. The default is checked.

Allow Notification: Allows an SNMP notification to be transmitted when local or remote data changes. The default is unchecked. Note: SNMP Notification Traps must be enabled under SNMP.

Port Description: Indicates whether or not to send the descriptive name of the port in the transmitted LLDP frame. The default is unchecked.

System Name: Indicates whether or not to send the name assigned to the device on the System page in the transmitted LLDP frame. The default is unchecked.

System Description: Indicates whether or not to send the switch model and current firmware version in the transmitted LLDP frame. The default is unchecked.

System Capabilities: Indicates whether or not to send the primary function(s) of the system in the transmitted LLDP frame. The default is unchecked.

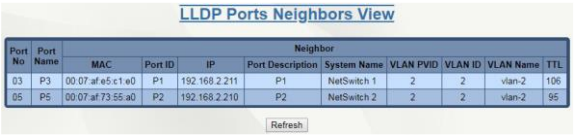
VLAN PVID: Indicates whether or not to send the Port VLAN identifier (PVID) associated with the port in the transmitted LLDP frame. The default is unchecked.

VLAN Name: Indicates whether or not to send the VLAN IDs and Names associated with the port in the trans-mitted LLDP frame. The default is unchecked.

LLDP Ports Neighbors

The LLDP Ports Neighbors shows the results of LLDP discovery. The LLDP Ethernet frames received from neighboring ports are composed of collections of data units called Type Length Value (TLV). Each TLV contains a defined type of information such as the Chassis ID described below, which contains the

MAC address of the device sending the frame. The maximum number of six neighbors can be displayed per each port.



Port No: The port the neighbor information was received from.

MAC: MAC address of neighbor device. Corresponds to the LLDP Chassis ID TLV.

Port ID: Identifier of the neighbor port from which the LLDP frame was sent.

IP: IP address of neighbor device. Corresponds to the LLDP Management Address TLV.

Port Description: Description of the neighbor port from which the LLDP frame was sent.

System Name: The system's administratively assigned name on the neighbor device.

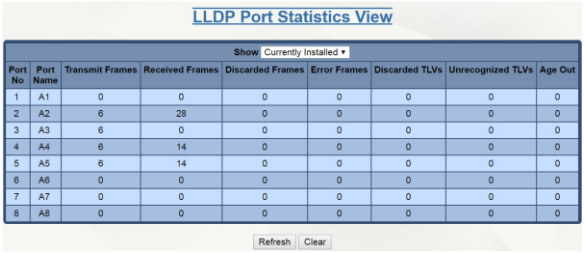
VLAN PVID: The Port VLAN identifier (PVID) associated with the neighbor port.

VLAN ID: A list of all VLAN IDs associated with the neighbor port.

VLAN Name: A list of all VLAN Names associated with the neighbor port.

TTL: Indicates the number of seconds that the information associated with this neighbor will be valid. Time to Live (TTL)

LLDP Port Statistics



Port No: The number of the port.

Port Name: The descriptive name of the port.

Transmit Frames: The total number of LLDP frames transmitted by the local switch.

Received Frames: Total number of LLDP frames received by the local switch.

Discarded Frames: The total number of frames discarded due to incorrect Type Length Values (TLVs) in the frames.

Errors Frames: Total count of all LLDP frames received with one or more errors.

Discarded TLVs: The count of all TLVs discarded for any reason.

Unrecognized TLVs: The count of all TLVs received on the port that are not recognized by LLDP.

Age Out: The count of times that a neighbor's information has been deleted because its Time To Live (TTL) has expired.

N-Link

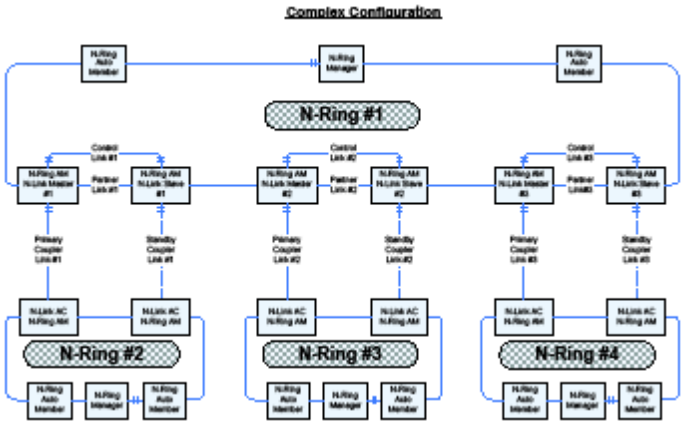
N-Link provides a way to couple an N-Ring topology to one or more other topologies, usually other N-Ring topologies. Each N-Link configuration requires 4 switches: N-Link Master, N-Link Slave, N-Link Primary Coupler and N-Link Standby Coupler.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).

Example of a standard N-Link configuration



Example of a complex N-Link configuration



Configuration steps to redundantly couple 2 N-Ring™ networks:

1. Ensure the Coupler and Control cables are disconnected at this point.
2. Get Both N-Rings working with a status of OK.
3. Configure N-Link Slave: Ensure that the N-Link Slave is set to Auto Configure and select a Default Coupler Port. Save Configuration.
4. Configure N-Link Master: Select the Control and Coupler ports. Save the Configuration.
5. Connect the Control Link cable. Ensure that the Slave switch status now shows a state of “Slave”.
6. Connect the Coupler Link cables.
7. Check N-Link status on the Master by selecting the N-Link Status View page.

Configuration Requirements:

- The Master and Slave must be part of the N-Ring topology.

- If using default configuration choices, the administrator only needs to configure the N-Link Master. The N-Link Slave and both Coupler switches will auto-detect any needed configuration.
- If not using default configuration choices, the administrator may also need to configure the Default Coupler port on the N-Link Slave.
- There must be a direct link between the Master and Slave Control ports. Use of media converters or other switches is not supported.
- There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported.
- There must be an N-Link aware switch on each side of the Master.
- N-Link will only support a single point of failure. Multiple points of failure and misconfiguration are not supported and may cause a network storm under some circumstances.
- Control and Partner connections should be either fiber or 10/100Base-TX copper.

  The use of copper SFP transceivers for N-Link control and partner connections is not recommended due to the variances of link performance between SFP manufacturers.

  Per the IEEE 802.3 standard (Clause 40), a 1000Base-T PHY is required to wait 350-750 milliseconds before reporting a link down condition; and is therefore unsuitable for use as an N-Link control or partner connection.
- For optimal performance:

  The speed of the Partner segment must match the speed of the other N-Ring™ segments. Therefore, the Partner connection must be 1 gigabit fiber when the other N-Ring segments have a 1 gigabit speed.

  When using a 700/7000 Series N-Link Slave, the control port should use a fiber connection.

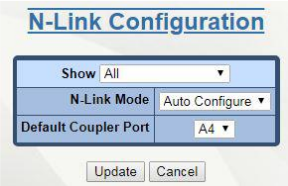
Configuration/Basic

The Basic tab under the N-Link Configuration category will display the basic configuration settings. By default, N-Link is in Auto-Configuration mode and will use A4 as the Default Coupler port.

The port configured as the Default Coupler Port will be used as the Standby Coupler port if the switch detects an N-Link Master and becomes an N-Link Slave.



Click on the *Modify* button to make changes. Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

N-Link Mode: Select the required N-Link mode from the drop-down list. The available options are:

Disabled: N-Link is disabled and will not operate as an N-Link capable switch.
Auto Configure: In this mode, the switch will automatically detect whether it is a slave or a coupler.
Master: If this option is selected, then the administrator must configure the Control Port (default: A3) and the Primary Coupler Port (default: A4).

Default Coupler Port: The Coupler Port is used to establish a redundant path for Ethernet data. If the role of the switch is Slave the port will be a Standby Coupler. The default is A4.

Click on the *Update* button to retain the changes. To save the changes made, return to the Configuration menu and click on the *Save* button.

Configuration/Advanced

The Advanced dialog window displays the advanced configuration settings. If N-Link is set to *Auto Configure*, the following configuration data will be used. The selected Auto Configure detection timeout value range is 2-180 seconds. The default Auto Configure detection time is 4 seconds.



Click on the *Modify* button to change the detection timeout. Click on the *Update* button once the field has been updated with the required information. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Status

The Status dialog window displays the N-Link status. If the switch is an N-Link Master or Slave, the following switch status and partner status information will be shown. Fields with a red background designate a fault condition.

N-Link Master or Slave

The following switch status and partner status information are shown.

State: This field displays the current N-Link mode of the switch.

Partner Port: This field shows the port being used for normal communication between the N-Link Master and N-Link Slave switches. There must be a direct link between the Master and Slave Partner ports. Use of media converters or other switches is not supported. This port will be detected automatically.

Coupler Port: The port being used to establish a redundant path for Ethernet data transmission is displayed in this field.

Coupler Port State: Blocking, Forwarding.

Status: If there are no errors, the status shows OK. Otherwise, a description of the faults detected is shown.

N-Link Partner Information

The following switch statuses are shown.

State: Current N-Link mode of switch.

MAC: The MAC address of the N-Link Partner switch.

Coupler Port State: Blocking or Forwarding.

Status: If there are no errors, the status will show OK. Otherwise, a description of the faults detected will be shown.

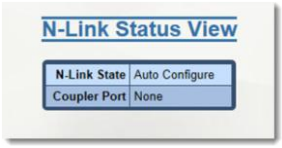
N-Link Auto Configure

N-Link State: Current N-Link mode of switch.

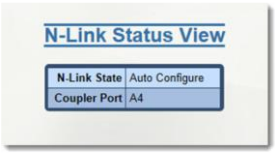
Coupler State: The port used to establish a redundant path for Ethernet data transmission. This port will be detected automatically.

Status Examples

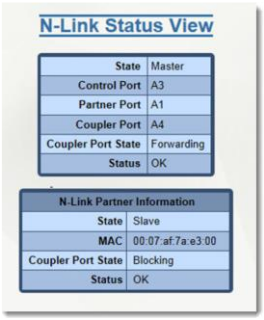
N-Link Auto Configure that is not an N-Link Master and has not become an N-Link Slave or an N-Link Coupler:



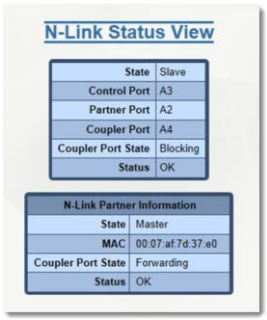
N-Link Coupler Switch:



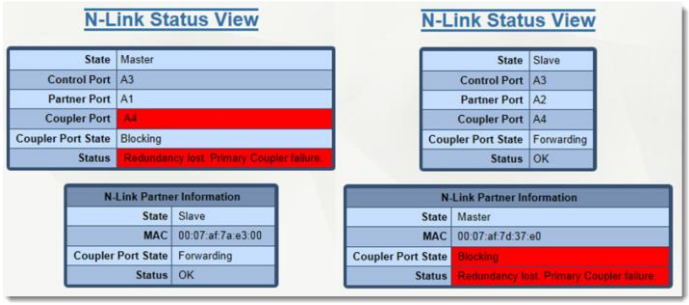
N-Link Master Switch:



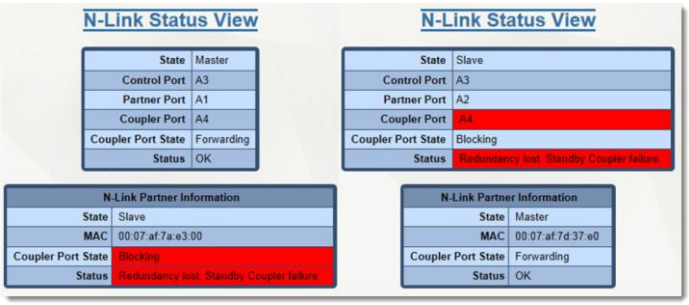
N-Link Slave Switch:



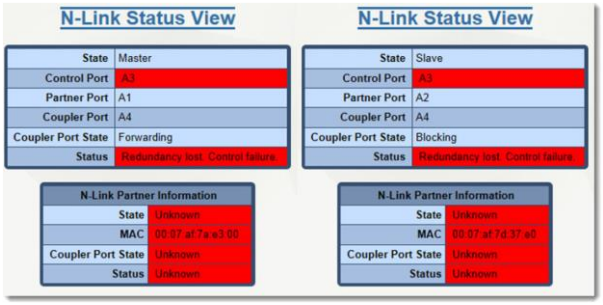
N-Link Status Master and Slave where the Primary Coupler is broken:



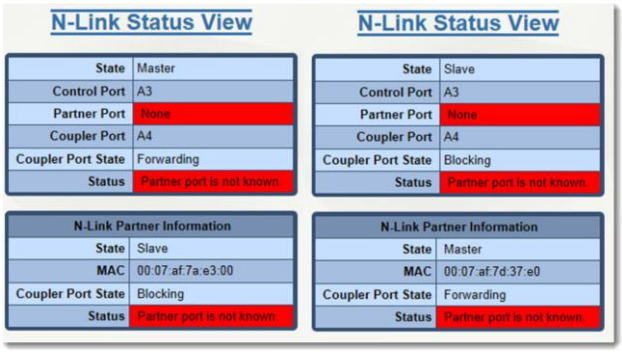
N-Link Master and Slave where the Standby Coupler link is broken:



N-Link Master and Slave where the Control link is broken:



N-Link Master and Slave where the Partner link is broken:



N-Ring™

Configuration/Basic

The Basic dialog window displays the N-Ring basic configuration settings. By default, N-Ring is in Auto Member mode.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Click on the *Modify* button to make changes to the N-Ring Basic Configuration:



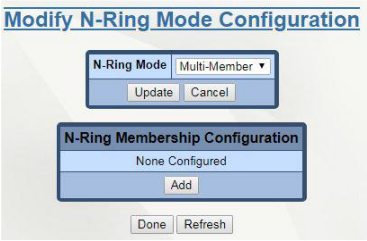
Disabled: If selected, this option disables the N-Ring capabilities on the switch.

Auto Member: When set to auto member, the switch automatically detects when it is a part of an N-Ring for participation in the ring.

Manager: When in Manager mode, the administrator may select different Port Sets as N-Ring ports. (See the Port Set Configuration section for information on adding and deleting port sets.)

N-Ring Ports: Defines the two ports that are used to connect to the N-Ring.
N-Ring™ Number: The N-Ring number can be selected from a range of 1 - 16 or a custom N-Ring number can also be chosen. The selected N-Ring number determines the VLAN ID. See table below for N-Ring numbers and corresponding VLAN IDs.
VLAN ID: This field is auto-generated based on the selected N-Ring number. See table for N-Ring numbers and corresponding VLAN IDs.
Tagging: The type of VLAN tagging used. Currently, tagged mode is the only supported mode.

Multi-Member: When in Multi-Member mode, a switch can be a member of multiple rings. If selected, then N-Ring Membership Configurations can be added for each N-Ring to which the switch will be connected. The image below shows one configured N-Ring.



To delete an existing N-Ring Membership, click on the *Delete* button.

To add a new N-Ring Membership, click on the *Add* button. The screen below will appear.



Select the N-Ring Ports and N-Ring Number to be used for the N-Ring. The VLAN ID for each N-Ring Membership must match that of the N-Ring Manager on each specific N-Ring to which the N-Ring Multi- Member will be connected.

Click on the *Update* button once the required selection has been made. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

List of available N-Ring Numbers and their corresponding VLAN ID:

N-RING NUMBER	VLAN ID	N-RING NUMER	VLAN ID
1	3333	9	3341
2	3334	10	3342

3	3335	11	3343
4	3336	12	3344
5	3337	13	3345
6	3338	14	3346
7	3339	15	3347
8	3340	16	3348

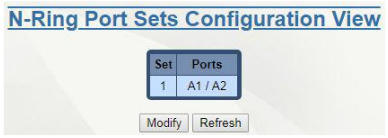
Configuration Requirements:

1. N-Ring requires tagged frames to optimize frame prioritization.
2. Do not create redundant links unless either RSTP or N-Ring is enabled.
3. The Default VLAN and any active N-Ring VLAN cannot be deleted.
4. RSTP and N-Ring™ are different modes and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then RSTP will be disabled for that port. Other ports may have RSTP enabled.
5. Do not connect the N-Ring to actively Trunking ports on an Auto Member or Multi-Member configured switch.
6. An NT24k® switch can only participate in one N-Ring unless in Multi-Member mode.
7. Since VLANs are implemented for security reasons as well as traffic flow, N-Ring only makes minimal VLAN changes. It is up to the administrator to ensure that VLANs are configured correctly on the N-Ring manager and all N-Ring members.
8. For optimal performance, all N-Ring segments must be configured for the same speed.

> **WARNING:** To prevent a network storm, multiple segments between N-Ring members on one or more N-Rings must not occur. N-Ring members should only be connected to each other by the N-Ring ports.

Configuration/Port Sets

A port set is a group of two ports that may be used for an N-Ring. The default N-Ring Port Set is A1/A2. Click on the *Modify* button to make changes to the Port Sets.



Set: This field displays the Port set table index.

Ports: This field indicates the designated pair of N-Ring ports. To reassign different pairs, the Port sets containing those ports, if any, must be deleted before the ports can be reassigned (a port can only belong to one port set).

Delete: To delete a port set, check the box next to the line item to be deleted and click on the *Delete* button.

Click on the *Add* button below the Set column.



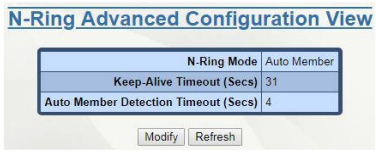
N-Ring Ports: A new port set can be added by selecting the N-Ring ports from the N-Ring Ports pull-down lists and clicking on the *Add* button.

Port Sets: Port Sets can be removed by selecting the port set from the Port Sets pull-down and pressing the *Remove* button.

Click on the *Update* button when port set configuration is complete. The N-Ring Port Sets Entry dialog window will appear. Click on the *Done* button. To save the changes made, return to the *Configuration* menu and click on the *Save* button.

Configuration/Advanced

Auto Member Mode



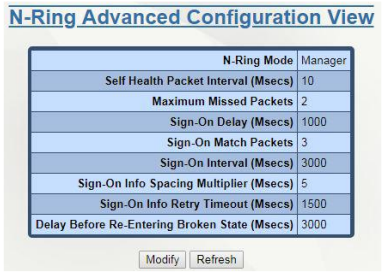
N-Ring™ Mode: This field is defined in the N-Ring/Configuration/Basic dialog window.

Keep-Alive Timeout (Sec): This field displays the amount of time to wait (in seconds) to receive a keep-alive request before switching from active member back to auto member. The default value is 31 seconds and the available range is 15 to 300 seconds. A entry of 0 will disable the feature.

Auto Member Detection Timeout (Sec): This field shows the amount of time to wait in seconds to receive N-Ring frames on any auto member port (at boot up) before assuming the switch is not part of an N-Ring. The default value is 4 seconds and the available range is 2 to 180 seconds.

Click on the *Modify* button and enter the required changes. When entries are complete, click on the *Update* button. To save the changes, return to the *Configuration* menu and click on the *Save* button.

Manager Mode



When in Manager mode, the following advanced configuration data are displayed in their respective fields:

Self Health Packet Interval (Msecs): The amount of time to wait in milliseconds before sending Self-Health packets. The default value for this field is 10.

Maximum Missed Packets: The number of consecutive missed Self-Health packets that constitute a fault. The default value for this field is 2 packets.

Sign-On Delay (Msecs): The amount of time to wait in milliseconds before requesting initial sign-on information from ring members. The default value is 1000 Msecs.

Sign-On Match Packets: The number of times the switch count must match before starting the sign-on process. The default value is 3.

Sign-On Interval (Msecs): The interval of time to wait in milliseconds before requesting subsequent sign-on information from ring members when the ring is broken. The default value for this field is 3000 Msecs.

Sign-On Info Spacing Multiplier (Msecs): The amount of time to wait in milliseconds, scaled by switch number, before sending information to the ring manager. The default value is 5 Msecs.

Sign-On Info Retry Timeout (Msecs): The amount of time the ring member will wait in milliseconds for the ring manager to acknowledge receipt of the member's information before the member tries to resend the information. The default value for this field is 1500 Msecs.

Delay Before Re-entering Broken State (Msecs): The amount of time, in milliseconds, that must elapse before the ring is allowed to go back into the broken state. The default is 3000 Msecs.

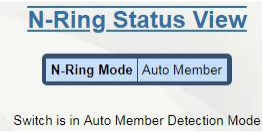
Click on the *Modify* button and make the required changes. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Multi-Member mode

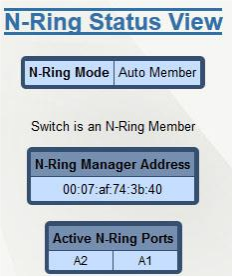
There are no advanced options when operating in Multi-Member mode.

Configuration Status

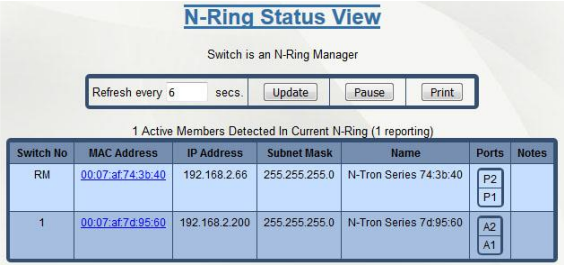
When an N-Ring™ Auto Member is not participating in an N-Ring, the following information is shown:



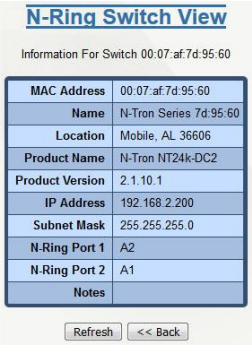
When an N-Ring Auto Member is participating in an N-Ring, the following information is shown:



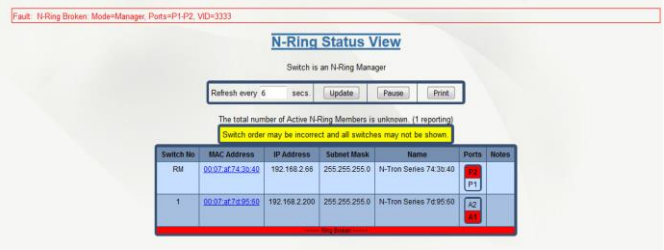
When N-Ring is in Manager Mode, the following data will be as shown below.



If the MAC is selected, more data is retrieved and shown about the N-Ring Member switch.



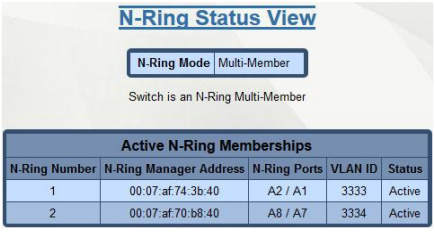
N-Ring™ Manager View for a faulted N-Ring:



A fault warning *Fault: N-Ring Fault* in red will show at the top of the dialog window.

The break is identified in red. In this case, N-Ring manager A2 to N-Ring active member Switch Number 1 TX2 is broken. A warning *Switch order may be incorrect and all switches may not be shown* is displayed in yellow. This indicates that the Sign On frames cannot get around the N-Ring and the data may not have been updated since the last successful update.

N-Ring Multi-Member Status View



N-Ring Number: N-Ring number to which the N-Ring Membership is associated.

N-Ring Manager Address: Show the MAC address of the switch acting as the N-Ring Manager.

N-Ring Ports: The port set linked to this N-Ring.

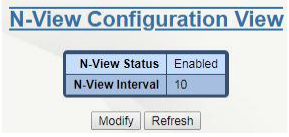
VLAN ID: The VLAN ID tag to be used with this N-Ring. The VLAN ID is associated with the N-Ring, and can be changed by switching the N-Ring number.

Status: Current status of the N-Ring Membership. The values are:

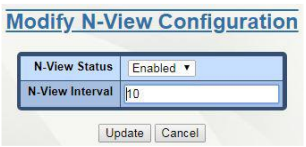
Active: The N-Ring Membership is connected and operating normally.
Inactive: The N-Ring Membership is not responding and not functioning correctly.

N-View™

The N-View Configuration dialog window displays the basic configuration for N-View. The status (enabled or disabled) and the interval between packets.



Click on the *Modify* button to make changes to the N-View Configuration.



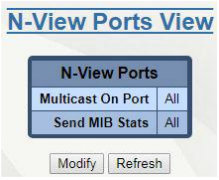
N-View™ Status: This field determines whether the N-Ring™ is enabled or disabled.

N-View Interval: This field determines the frequency in which N-View reports its information. Increasing the interval slows the update rate and decreasing it allows N-View to report more frequently. The available range is 10-500 seconds. Interval values are converted to increments of 10 seconds. The default value is 10 seconds.

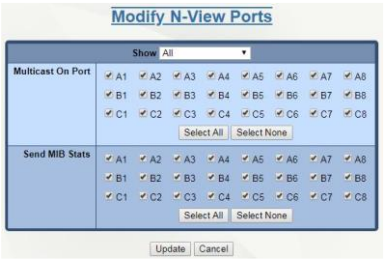
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Ports

The Ports dialog window displays a list of the configured ports on the NT24k® unit, along with the ports transmitting N-View related multicast packets and MIB stats respectively.



Click on the *Modify* button to make changes to the N-View Ports.



The user can modify these two variables to enable or disable N-View related multicast out of the port and if MIB stats are sent out for those ports. The ports that can be installed (Modules), currently installed or currently linked up can also be viewed.

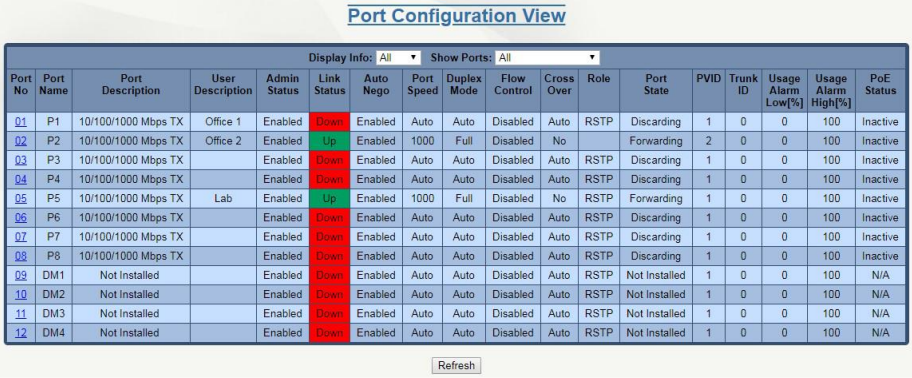
Click on the *Update* button after required changes have been made. To save the settings, navigate to the *Configuration* menu and click on the *Save* button.

Ports

Configuration

The Ports Configuration dialog window shows a detailed overview of all the ports on the switch. The administrator can view the ports that are available to install (Modules), currently installed or currently linked up.

The information displayed on the page can be changed by changing the *Display Info* from *Basic* to *All*. *Basic* shows the most commonly used information while *All* shows all of the available information.



Port Configuration View

Display Info: All Show Ports: All

Port No	Port Name	Port Description	User Description	Admin Status	Link Status	Auto Nego	Port Speed	Duplex Mode	Flow Control	Cross Over	Role	Port State	PVID	Trunk ID	Usage Alarm Low[%]	Usage Alarm High[%]	PoE Status
01	P1	10/100/1000 Mbps TX	Office 1	Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
02	P2	10/100/1000 Mbps TX	Office 2	Enabled	Up	Enabled	1000	Full	Disabled	No		Forwarding	2	0	0	100	Inactive
03	P3	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
04	P4	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
05	P5	10/100/1000 Mbps TX	Lab	Enabled	Up	Enabled	1000	Full	Disabled	No	RSTP	Forwarding	1	0	0	100	Inactive
06	P6	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
07	P7	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
08	P8	10/100/1000 Mbps TX		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Discarding	1	0	0	100	Inactive
09	DM1	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
10	DM2	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
11	DM3	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A
12	DM4	Not Installed		Enabled	Down	Enabled	Auto	Auto	Disabled	Auto	RSTP	Not Installed	1	0	0	100	N/A

Refresh

The screen above represents the Port Configuration View for a PoE model. If not using a PoE model, the page will be similar except the PoE Status column will not be present.

Port No: This field indicates the port number.

Port Name: This field displays the descriptive name of the port.

Port Description: This column provides a brief description of the port. Ports with "-R" in their description are Bypass Relay capable ports. Refer to the section Bypass Relay (BR) for more information on Bypass Relay devices and ports.

User Description: Description of the port set by a user.

Admin Status: This configurable field displays the existing status of the port. The two options are *Enabled* or *Disabled*.

Link Status: Shows the current state of the port. The two options are *Up* or *Down*.

Auto Nego: This configurable field displays the current auto-negotiation state whether it is *Enabled* or *Disabled*. Auto-negotiation cannot be disabled on a port connected to a gigabit device.

Port Speed: This configurable field displays the speed of each port. The available values are 10/100/1000 Mbps.

Duplex Mode: The existing mode of the port, whether it is *Full Duplex* or *Half Duplex*, is shown in this configurable field.

Flow Control: This configurable field displays the existing flow control status of each port.

Cross Over: This configurable field displays the existing crossover mode of the port. This can be indicated with a *Yes*, *No* or *Auto*. The default value for this field is Auto.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, and N-Link Coupler. For example, if a port is actively participating in an N-Ring and as an N-Link Partner, the role would be: N-Ring, N-Link Partner.

Port State: This column displays the current RSTP status of a port. It may contain *Disable*, *Discarding*, *Learning* or *Forwarding*.

PVID: This configurable field displays the existing port VLAN ID setting. The allowable range is 1-4094.

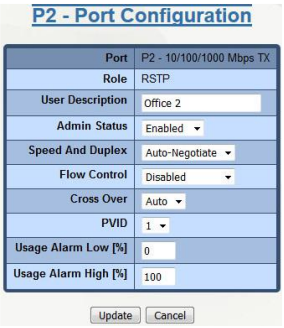
Trunk ID: When the port is an active member of a trunk group, the trunk's ID value is shown. A zero value indicates that the port is not an active trunk member.

Usage Alarm Low [%]: This field indicates the bandwidth utilization percentage below which a fault is triggered if enabled. For the half-duplex option, the bandwidth utilization percentage is the sum of both RX and TX bandwidth utilization. For the full-duplex option, this is the higher of TX or RX bandwidth utilization.

Usage Alarm High [%]: This field displays the bandwidth utilization percentage above which a fault is triggered if enabled. For half duplex the bandwidth utilization percentage is the sum of both RX and TX band-width utilization, and for full duplex this is the lower of TX or RX bandwidth utilization.

PoE Status: The current status of the PoE will be displayed in this column. It may show *Inactive*, *Active*, *Disabled* or *N/A*.

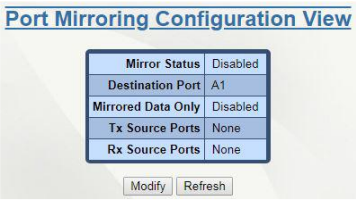
Click on the *Port Number* to configure each port individually. This will allow the user to change the port's settings.



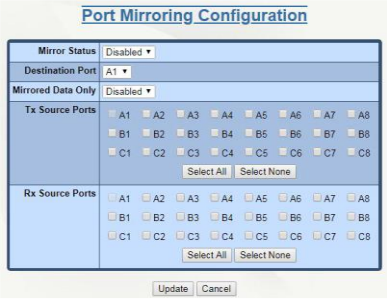
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Mirroring

A Mirroring Port is a dedicated port that is configured to receive copies of Ethernet frames that are sent or received from a monitored port. The Mirroring dialog window displays the status including the list of Source Ports and the Destination Port that the Sources are being mirrored to.



Click on the *Modify* button to make changes to the *Port Mirroring Configuration*.



Mirror Status: Enable or Disable the Mirroring functionality by selecting the option in the drop-down menu.

Destination Port: Select the destination ports that the source ports will be mirrored to.

Mirrored Data Only: Select the mirrored data to be transmitted to the destination port.

Tx Source Ports: Select the transmitting ports to be mirrored by checking on the desired ports or the *Select All* button.

Rx Source Ports: Select the receiving ports to be mirrored by checking on the desired ports or the *Select All* button.

Configuration Notes:

1. Non-mirrored frames take priority over mirrored frames. Mirrored frames may be discarded under rare instances when resource contention occurs.
2. The mirroring destination port is not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, Trunking.

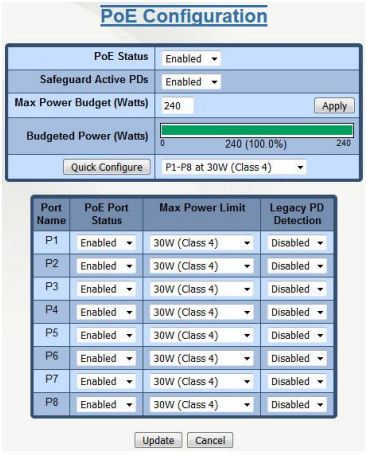
Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

PoE

PoE (Power Over Ethernet) is an internal hardware capability that outputs power and data on Ethernet cabling to Powered Devices (PDs) such as VoIP phones, IP camera, and industrial devices. PoE eliminates the need to run separate data and power cables between the PSE (PoE Source Equipment) and the PoE powered device.

PoE Management on the NT24k® provides the ability to set the PoE power budget, enable/disable PoE on specific ports, and set power limits per port.

Note: PoE is only supported on certain NT24k switches.



PoE Configuration: Table 1

PoE Status: This configurable field indicates whether the global PoE is enabled or disabled. PoE ports must also be individually enabled on the PoE configuration page. The default value for this field is Enabled.

Safeguard Active PDs: This configurable field indicates whether an active PD is safeguarded from losing power because of a configuration change. If enabled, the Max Power Limit cannot be changed if it can cause a power loss to the active PD. Similarly, Legacy PD Detection cannot be disabled on an active legacy powered device. The default value for this field is Enabled.

Max Power Budget (Watts): The maximum amount of power available for PoE. The value can range from 4 to the max power supply support for the switch.

Quick Configure: The quick configure selection menu updates the PoE port table with the desired settings based on the quick configuration option selected.The following values for 8 PoE Ports are:

- P1-P8 at 30W (Class 4) (default)
- P1-P8 at 15.4W (Class 3/0)
- P1-P8 at 7W (Class 2)
- P1-P8 at 4W (Class 1)
- All ports disabled.

For 16 PoE Ports the values are:

- P1-P8 at 30W (Class 4) (default)
- P9-P16 at 30W (Class 4)
- P1-P16 at 15.4W (Class 3/0)
- P1-P16 at 7W (Class 2)
- P1-P16 at 4W (Class 1)
- All ports disabled.

PoE Configuration: Table 2

PoE Port Status: This configurable field indicates whether PoE is enabled or disabled on the port.The default value is enabled on the first 8 PoE ports.

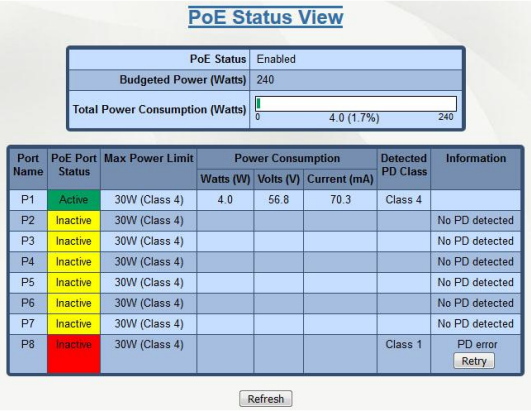
Max Power Limit: This configurable field indicates the maximum budgeted power for the port. The values are:

- 4W (Class 1)
- 7W (Class 2)
- 15.4W (Class 3/0)
- 30W (Class 4)

Legacy PD Detection: This field indicates whether legacy PD detection is enabled or disabled on the port. If enabled, legacy powered devices will be recognized. The default value is disabled.

Note: The sum of the Port Max Power Limit should not exceed the MaxBudgeted Power.

PoE Status: Table 3



Port Name: This field displays the descriptive name of the port.

PoE Port Status: Current status of the PoE port. The values are:

- Active: PoE power is outputted on the specific port
- Inactive: PoE power is not outputted on the specific port
- Disabled: PoE functionality is disabled on the specific port

Max Power Limit: The maximum budgeted power for the port.

Power Consumption: The actual power consumption of the port.

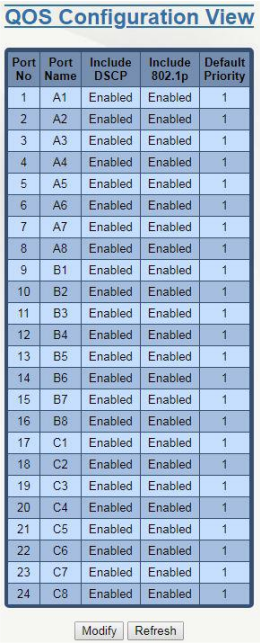
Detected PD Class: The classification of the connected device, which can range from Class 0-4.

Information: Details about the port's current state. If a Powered Device attempts to negotiate more power than the allocated maximum, PoE will be turned off on the port and a re-negotiation period will start. If re-negotiation is unsuccessful, a Retry button will be displayed below the PD error message. Select the retry button to restart negotiation after the cause of the overload is resolved.

QOS (Quality of Service)

The QOS decision tree chooses a frame's output port priority and the egress frame's IEEE 802.1p User Priority value (if needed) based on the QOS settings and the User Priority value (if any) in the ingress frame. Both the internal port priority setting and the egress frame User Priority value are always assigned the same value. The available values are 0 through 7 where 7 is the highest priority. If the ingress frame is an IP packet, the RFC 2474 DSCP field in the packet will be passed unchanged to the egress frame.

Click on the *Modify* button to make changes to the QOS Configuration.



Include DSCP: This configurable field displays the status of whether or not to include the ingress frame's RFC 2474 DSCP value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. If the ingress frame type is IP (IPv4 or IPv6) and Include DSCP is enabled, DSCP processing will override all other settings. (see QOS SELECTION CHART below). The default value is enabled.

Include 802.1p: This configurable field displays the status of whether or not to include the ingress frame's IEEE 802.1p User Priority value in determining the transmit priority and egress frame's IEEE 802.1p User Priority value. This setting is used only if the frame type is not IP (IPv4 or IPv6) or the Include DSCP setting is disabled. (see QOS SELECTION CHART below). The default value is enabled.

Default Priority: This configurable field displays the default QOS priority for the transmit priority value and the egress frame's IEEE 802.1p User Priority value if not otherwise assigned by DSCP or IEEE 802.1p processing. The range is 0-7, highest priority=7. The default value is 1.

QOS Selection Chart:

INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Enabled	N.A.	IP	N.A.	Ingress DSCP Value
N.A.	Enabled	Not IP	Yes	Ingress IEEE 802.1p UP
N.A.	Enabled	Not IP	No	Default Priority Setting
N.A.	Disabled	Not IP	N.A.	Default Priority Setting
Disabled	Enabled	N.A.	Yes	Ingress IEEE 802.1p UP
Disabled	Enabled	N.A.	No	Default Priority Setting
Disabled	Disabled	N.A.	N.A.	Default Priority Setting
Legend				
IP	Ingress packet type is IPv4 or IPv6.			
Ingress DSCP Value	Use the high order three bits of the ingress frame’s IP DSCP value.			

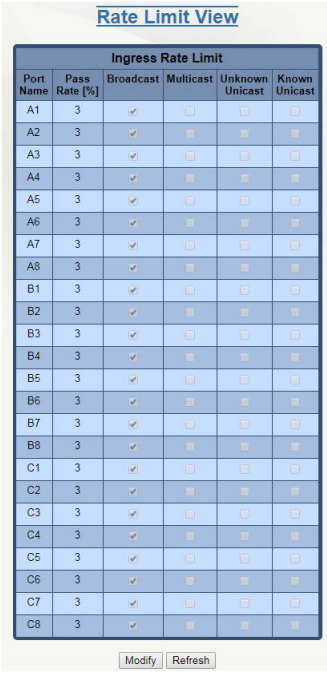
INCLUDE DSCP SETTING	INCLUDE 802.1p SETTING	INGRESS FRAME TYPE	INGRESS FRAME HAS VLAN	OUTPUT PORT PRIORITY AND EGRESS IEEE 802.1p USER PRIORITY
Ingress IEEE 802.1p UP	Use the ingress packet's IEEE 802.1p User Priority value.			
N.A.	Not applicable			

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

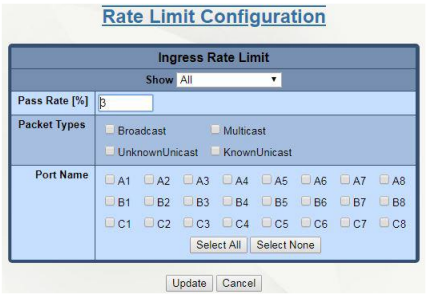
Rate Limiting

The Rate Limiting dialog window shows the NT24k® installed ports and the Pass Rate Percentage per port for each of the following: Broadcast, Multicast, Unknown Unicast and Known Unicast.

A packet type will be affected by the rate limit setting if the check box is selected and it exceeds the total number of packets established by the ingress rate limit within an assigned time period. The time periods are: 1 Gbps = 10 ms, 100 Mbps = 100 ms and 10 Mbps = 1 sec.



Click on the *Modify* button to make changes to the Rate Limiting settings.



Show: View the ports that are available to install (Modules), currently installed or currently linked up.

Pass Rate [%]: Modify the pass rate percentage for each and every port by entering the desired value.

Packet Types: Select what Packet Types are to be passed: Broadcast, Multicast, Unknown Unicast and Known Unicast.

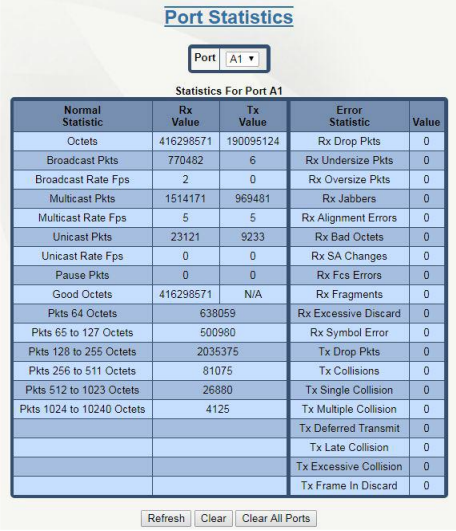
Port Name: Select which ports are affected by the changes made.

Note: Unicast packets with destinations not in the ARL table can be rate limited rather than all being flooded. This is known as “Unknown Unicast”.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Status/Statistics

This dialog window displays the MIB counters for the selected port, specified by the Port pull-down menu.

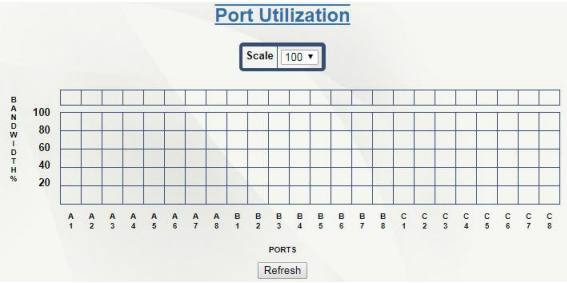


Normal Statistic	Rx Value	Tx Value	Error Statistic	Value
Octets	416298571	190095124	Rx Drop Pkts	0
Broadcast Pkts	770482	6	Rx Undersize Pkts	0
Broadcast Rate Fps	2	0	Rx Oversize Pkts	0
Multicast Pkts	1514171	969481	Rx Jabbers	0
Multicast Rate Fps	5	5	Rx Alignment Errors	0
Unicast Pkts	23121	9233	Rx Bad Octets	0
Unicast Rate Fps	0	0	Rx SA Changes	0
Pause Pkts	0	0	Rx Fcs Errors	0
Good Octets	416298571	N/A	Rx Fragments	0
Pkts 64 Octets	638059		Rx Excessive Discard	0
Pkts 65 to 127 Octets	500980		Rx Symbol Error	0
Pkts 128 to 255 Octets	2035375		Tx Drop Pkts	0
Pkts 256 to 511 Octets	81075		Tx Collisions	0
Pkts 512 to 1023 Octets	26880		Tx Single Collision	0
Pkts 1024 to 10240 Octets	4125		Tx Multiple Collision	0
			Tx Deferred Transmit	0
			Tx Late Collision	0
			Tx Excessive Collision	0
			Tx Frame In Discard	0

Pressing the *Clear* button resets all counters for the selected port. The *Clear All Ports* button resets all counters for all ports, including the selected port. The *Refresh* button reloads the dialog window.

Status/Utilization

This dialog window displays the bandwidth percentage graph of all the ports. The graph is scaled based on the “*Scale*” drop-down list.



Trunking

The Trunking dialog window displays trunking information.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Trunk ID: This column displays the trunk identifier number. The valid range is 1-127.

Trunk Name: This column shows the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

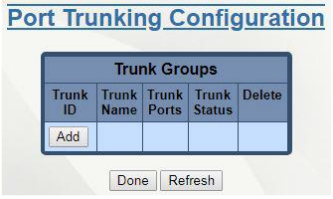
Trunk Ports: This column displays the ports associated with the trunk.

Trunk Status: The existing status of the trunk is shown in this column. Available trunk status options are *Enabled* or *Disabled*.

Configuration Note:

Note: The trunk ports are not allowed to overlap with the following features. Care should be taken to avoid configuration conflicts: N-Ring™, N-Link, 802.1X, Mirroring.

Click on the *Modify* button to add, modify or delete ports.



Click on the Add button and the following dialog window will appear:



Show: View the ports that are available to install (Modules) currently installed or currently linked up.

ID: Enter the desired Trunk ID. Valid range is 1- 127. There can be no duplicate Trunk IDs.

Name: Enter the descriptive name of the trunk. The name can consist of alphanumeric characters and the following special characters (including the period): **# _ - .**

Ports: Select the required ports from the Ports list. The list of ports shown will vary depending on the selection in the *Show* field.

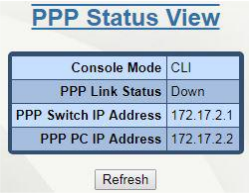
Status: Select the status of the port that is being added. Options are *Enabled* or *Disabled*.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

To modify an existing Trunk Group, click on the *Trunk ID* and make the required changes. To Delete an existing Trunk Group, click on the *Delete* button associated with the Trunk ID to be deleted.

PPP

The console can be either in CLI mode or PPP mode. The PPP mode provides a TCP/IP connection over the serial port. A browser may then be used to view switch information or make configuration changes. PPP mode is entered by using the PPP command on the console. To change from PPP to CLI mode, you must reboot the switch.



Console Mode: When CLI is shown, the console is in the command mode, which is the default mode. When PPP is shown, the console is in PPP mode.

PPP Link Status: This field indicates the current PPP link state.

PPP Switch IP Address: This field displays the IP address for the switch side of the PPP link.

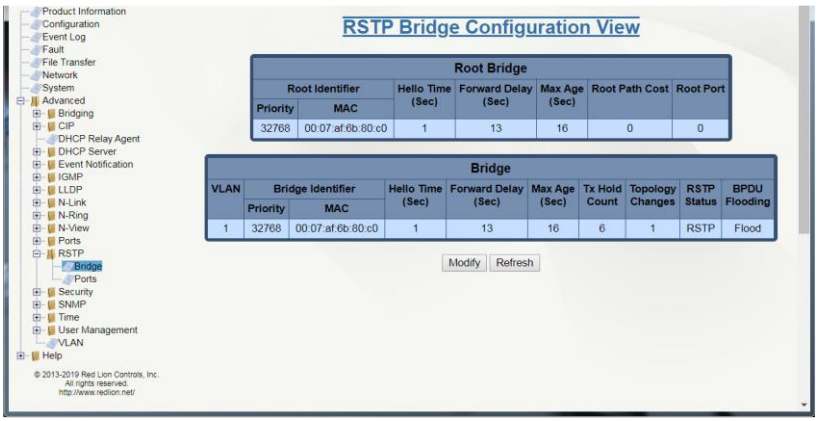
PPP PC IP Address: This field indicates the IP address for the PC side of the PPP link.

RSTP

Bridge

The Bridge dialog window displays the RSTP information for the RSTP Root Bridge and for the RSTP Bridge on this switch.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



Root Bridge: This is the identity and parameters of the RSTP Root Bridge.

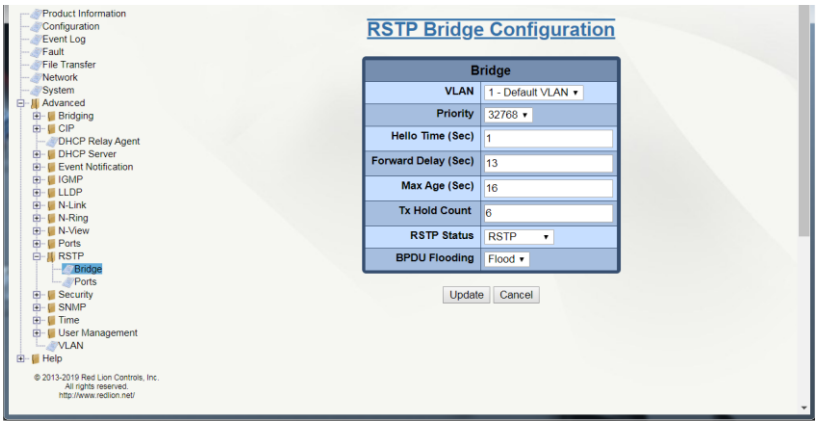
Root Identifier - Priority: This field indicates the priority of the Root Bridge.
Root Identifier - MAC: The unique MAC address of the Root Bridge is shown here.
Hello Time (Sec): This field indicates the time interval, in seconds, between the transmission of configuration BPDUs by designated ports.
Forward Delay (Sec): This field shows the time spent, in seconds, by legacy STP Bridges in transitioning Root and designated ports to forwarding. This delays port transitions until other bridges have received spanning tree information.

Max Age (Sec): For RSTP, this is the maximum time, in seconds, that a bridge will wait for configuration BPDUs before deciding it is no longer connected to the root bridge.
Root Path Cost: The cost of the path to the Root Bridge via the Root Port of this bridge.
Root Port: The Root Port of this Bridge. The Root Port provides the lowest cost path from this bridge to the Root Bridge.

Bridge: This is the configuration of the RSTP bridge on this switch.

VLAN: RSTP will operate on all ports of this VLAN. BPDUs will be transmitted with or without VLAN tags depending on the settings for this VLAN. This should be a valid VLAN ID. The default value for this field is VLAN 1.
Bridge Identifier Priority: This field indicates the Bridge priority. The range is 0 - 61440. The default value is 32768.
Bridge Identifier MAC: The unique MAC address of the Bridge is displayed in this field. This is possibly a different network device.
Hello Time (Sec): This field indicates the Hello time, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time interval, in seconds, between the transmission of Configuration BPDUs by Designated Ports. The range is 1 - 10. The default value is 1.
Forward Delay (Sec): This field displays the Forward Delay, when this bridge is the Root Bridge or is attempting to become the Root Bridge. This is the time spent, in seconds, by legacy STP Bridges in transitioning Root and Designated Ports to Forwarding. This delays Port transitions until other bridges have received spanning tree information. The range is 4 - 30. The default value is 13 seconds.
Max Age (Sec): This field displays the Max Age when this bridge is the Root Bridge or is attempting to become the Root Bridge. For RSTP, this is the maximum hops allowed for any protocol message before it is discarded and no longer retransmitted. For STP, this is the maximum time, in seconds, that a bridge will wait for Configuration BPDUs before deciding it is no longer connected to the root bridge. The range is 6 - 40. The default value is 16 seconds.
Tx Hold Count: This is the maximum number of configuration BPDUs that can be transmitted in one second from a port on this Bridge before transmission is throttled. The range is 1 to 10. The default value for this field is 6.
Topology Changes: This is the number of RSTP topology changes since the switch has been powered on or rebooted.
RSTP Status: This is the current status of the RSTP protocol on this bridge. The available options for this field are RSTP, Force STP or Disabled.
Note: RSTP & N-Ring™ are different network topology protocols and cannot share links or segments. If a port is both an RSTP port and an active N-Ring port, then the port will be disabled for RSTP.
Note: Do not create redundant network paths unless either RSTP or N-Ring is enabled.
Note: If a port is both an RSTP port and an enabled trunk group member, then the port will be disabled for RSTP. The RSTP port status can be seen under advanced RSTP ports.
Note: It is recommended that an RSTP network consist of RSTP capable switches.
Note: RSTP is supported on only one VLAN.
Note: When operating in a VLAN with legacy STP devices, use these values for the Bridge: Hello Time (Sec) = 2, Forward Delay (Sec) = 15 and Max Age (Sec) = 20.
BPDU Flooding: This value allows for flooding or blocking of BPDUs to other ports when the global spanning tree is disabled or when spanning tree is disabled on a specific port. If Flood is selected, BPDUs are flooded to all other ports based on the VLAN assignment. The options are Flood or Block. The default is Flood.

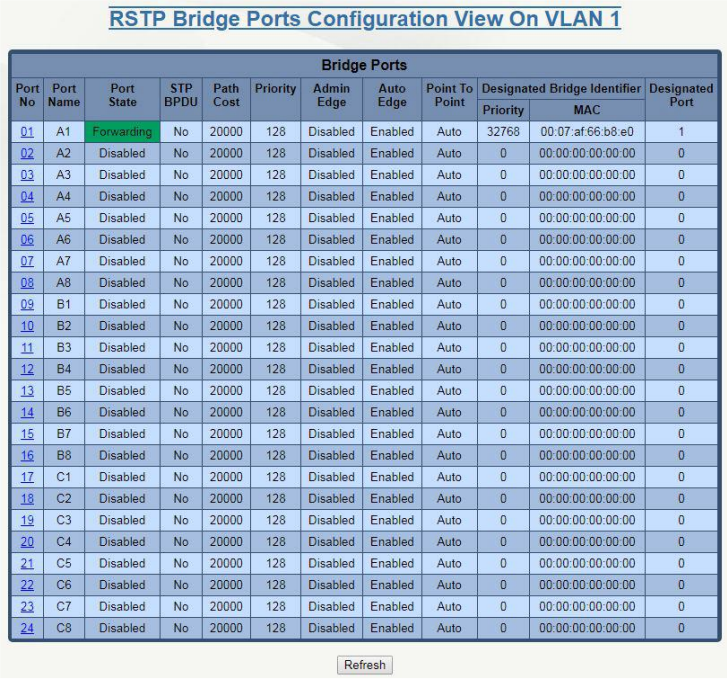
Click on the *Modify* button and the following dialog window will appear:



Make the required modifications, and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

The RSTP Ports dialog window displays information such as the path cost and the port state. If the switch sees a redundant network path, it will put the port with the highest path cost into the Blocking port state where it will discard packets coming in on that port.

In the example shown below, A2 is a redundant port with port A1, therefore A1 is forwarding and A2 is discarding.



Port No	Port Name	Port State	STP BPDU	Path Cost	Priority	Admin Edge	Auto Edge	Point To Point	Designated Bridge Identifier		Designated Port
									Priority	MAC	
01	A1	Forwarding	No	20000	128	Disabled	Enabled	Auto	32768	00:07:af:66:b8:e0	1
02	A2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
03	A3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
04	A4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
05	A5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
06	A6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
07	A7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
08	A8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
09	B1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
10	B2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
11	B3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
12	B4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
13	B5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
14	B6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
15	B7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
16	B8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
17	C1	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
18	C2	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
19	C3	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
20	C4	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
21	C5	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
22	C6	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
23	C7	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0
24	C8	Disabled	No	20000	128	Disabled	Enabled	Auto	0	00:00:00:00:00:00	0

Port No: Indicates the number of the port.

Port Name: Displays the descriptive name of the port.

Port State: The current RSTP state of the port is shown here. This state may be seen as "Forwarding, No STP, Disabled, Listening, Learning, and Discarding.

STP BPDU: Shows whether or not a legacy STP BPDU has been received or not.

Path Cost: Displays the current path cost of the port. The range is 0 - 200,000,000. If configured to 0 or Auto, the path cost will be calculated automatically using the actual speed of the port; otherwise the configured value will be used. The default value for this field is Auto.

Priority: The priority of the port is displayed in this column. The available range is 0 - 255. The default value for this field is 128.

Admin Edge: Indicates whether or not this port is treated as an Edge Port and can immediately enter the forwarding state. If set to Enabled, no BPDUs are expected to be received at the port. Set this option to Enable only when an end device is linked to this port. The default value is Disabled.

Auto Edge: Indicates whether or not to use a short timeout when waiting for BPDUs before determining that this is an Edge Port (if no BPDUs are received). It may have to be disabled for a very large network. The default value is Enabled.

Point to Point: Displays whether at most one other network port is attached to the port's LAN segment. The port may transition to Forwarding very quickly on a point-to-point MAC link. Values may be Auto (full-duplex links are assumed to be point-to-point, half duplex are not), and Force True or Force False (if the automatic determination would be wrong). The default value is Auto.

Designated Bridge Identifier Priority: The priority of the designated bridge associated with the port's LAN segment is shown in this field. The designated bridge provides the lowest cost path from this bridge port's LAN segment, through the designated bridge, to the root bridge.

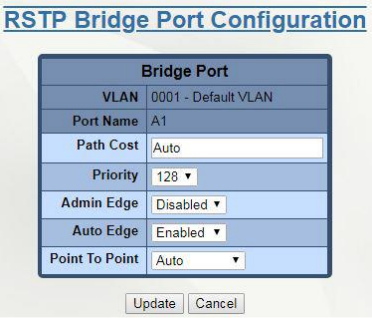
Designated Bridge Identifier MAC: Indicates the unique MAC of the designated bridge associated with the port's LAN segment.

Designated Port: The designated port of the designated bridge is shown here.

Note: When event logging is enabled, all RSTP controlled ports will log events about their status whether or not the modular based port is currently installed.

Note: When operating in a VLAN with legacy STP devices, set the Auto Edge field to Disabled for Bridge Ports.

To make changes to a Bridge port, click on the *Port No hyperlink* and the following window will appear:



Make the required modifications to the following parameters: Path Cost, Priority, Admin Edge, Auto Edge and Point to Point fields, then click on the *Update* button.

Security

Local Security

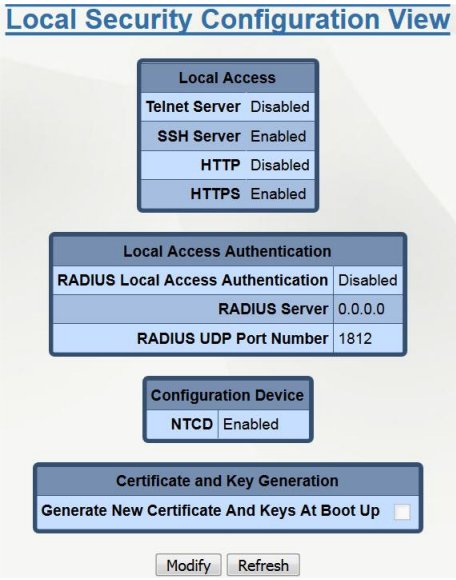
The Local Security feature allows an administrator to control local access (logins) to the switch.

Local Security Configuration View

The Local Security Configuration page displays the status of the Telnet server, SSH Server, HTTP protocol, and HTTPS protocol. The administrator can disable or enable these protocols, as desired. A RADIUS server can be configured to authenticate the user name and password entered for local access.

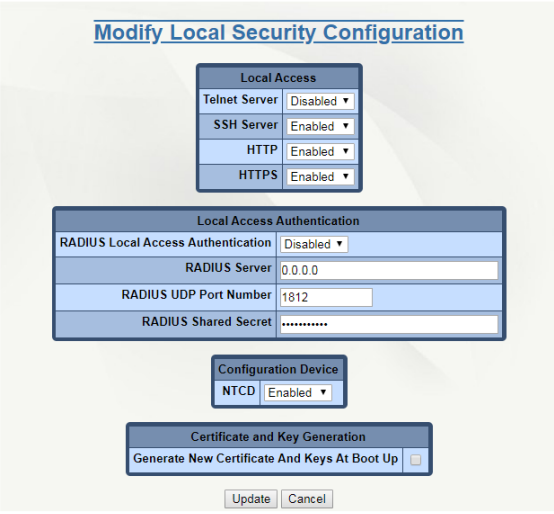
The N-Tron® Configuration Device (NTCD) SD card slot can be enabled or disabled, allowing an administrator to block and unblock reading and writing settings from the SD card as desired. A new certificate and keys can also be generated at boot up by selecting the *Generate New Certificate and Keys At Boot Up* option.

WARNING: If the NTCD device slot is disabled and the switch password is forgotten, access to the switch can only be recovered by sending it back to the factory to be unlocked.



Modify Local Security Configuration

Click on the *Modify* button and the page below will appear. Make the desired changes, and then click on the *Update* button. To save changes, navigate to the Configuration menu and click on the *Save* button.



These settings address local access to the switch. For better security, keep the Telnet Server and HTTP disabled.

Telnet Server: This field indicates whether the Telnet Server is enabled or disabled. Disabling the Telnet Server does not impact SSH. The default is disabled.

SSH Server: This field indicates whether the SSH Server is enabled or disabled. Disabling the SSH Server does not impact Telnet. The default is disabled.

HTTP: This field indicates whether HTTP is enabled or disabled. Disabling HTTP does not affect HTTPS secure connections. The default is disabled. HTTP users are not authenticated by the RADUIS server. If Radius authentication is exclusively required, then HTTP should be disabled.

HTTPS: This field indicates whether HTTPS is enabled or disabled. Disabling HTTPS requires HTTP to be enabled. The default is enabled.

A RADIUS server may be used to manage user accounts that have access to the switches.

RADIUS Local Access Authentication: This field indicates whether RADIUS Local Access Authentication is enabled or disabled. RADIUS authentication is not supported on HTTP connections. The default is disabled.

RADIUS Server: This field is the IP address of the RADIUS server used when RADIUS Local Access Authentication is enabled.

RADIUS UDP Port Number: The UDP port number of the RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

RADIUS Shared Secret: The shared secret for the local access authentication server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

NTCD: This field indicates whether the Configuration Device is enabled or disabled. The default is enabled. Disabling the NTCD SD card slot allows an administrator to block and unblock reading and writing settings to and from the SD card.

Generate New Certificate and Keys at Boot Up: This field indicates whether certificate and keys will be generated when the switch boots up. *A change to this setting requires that settings be saved and that the switch be rebooted before changes take effect*. The value will reset to be unchecked when the switch boots up. The default is no.

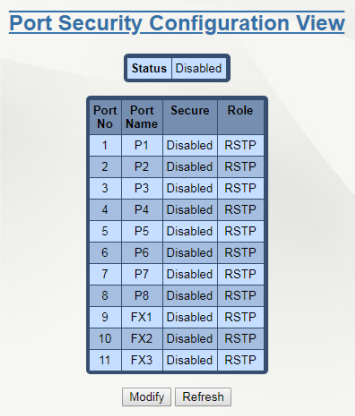
Port Security

Port Security can be enabled on the MAC address level for additional security. The Port Security feature restricts access to the switch by only accepting dynamically learned MAC addresses and manually entered MAC addresses as authorized. Dynamically learned MAC addresses are those that the switch detects on any port while in 'Learning' mode. A manually entered MAC address must designate the port(s) that the address is authorized on. A non-authorized MAC address will be discarded and will be shown on the intruder log.

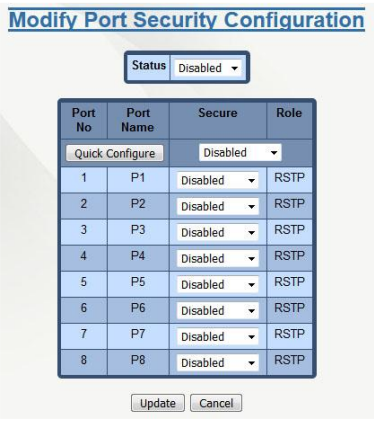
Port security allows secured ports to run with RSTP enabled on the port. Port security also allows the same MAC address to be authorized on multiple ports. When setting up authorization lists for RSTP ports, any MAC address that could migrate to other secured ports should also be placed, by the user, in the authorization list for those ports.

Port Security – Configuration

The Port Security Configuration View displays the status of Port Security and all the ports with their current settings. When Status is 'Locked' it is in secure mode. When Status is 'Learning' it builds an internal list of authorized MAC addresses and no ports are secured during this time.



The Modify button allows the administrator to change the Status of Port Security and Secure mode for all ports.



Status: The current status of Port Security. It can be Disabled, Learning, or Locked. Transitioning from Locked to Learning clears the Authorization List table on all ports. Transitioning from Locked to Disabled retains the current Authorization List. When transitioning from Learning to Locked, the Authorization List represents the authorized MAC addresses. The default value is Disabled.

Port No: The number of the port.

Port Name: The descriptive name of the port.

Secure: Displays Secure mode for the associated port. It can be Disabled, Enabled, or Single Mac.

- **Disabled:** Port Security is not active on the port regardless of the current Port Security Status.
- **Enabled:** Port Security is active when the current Port Security Status is Learning or Locked.
- **Single MAC:** Port Security will take the first learned MAC address and lock the port when current Port Security Status is Learning or Locked.

The default value is Disabled.

Role: A comma separated list of all the active roles for the port, which are based on the switch configuration. The possible roles are RSTP, N-Ring™, N-Link Control, N-Link Partner, N-Link Coupler, 802.1X, and Trunk.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Note: Security is not configurable on N-Ring or N-Link interconnecting ports. These ports must be linked to adjacent switches that have the protocol enabled. This link is considered to be a

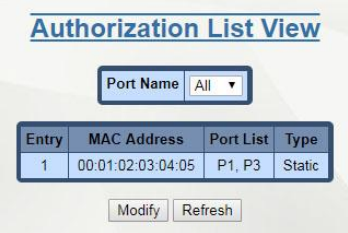
closed proprietary connection/segment that is not directly accessible. If both switches are otherwise properly secured then the proprietary connection/segment requires no additional security.

Note: It is recommended that the Bridging Aging Time be 300 seconds (the default) or longer while Port Security is Learning.

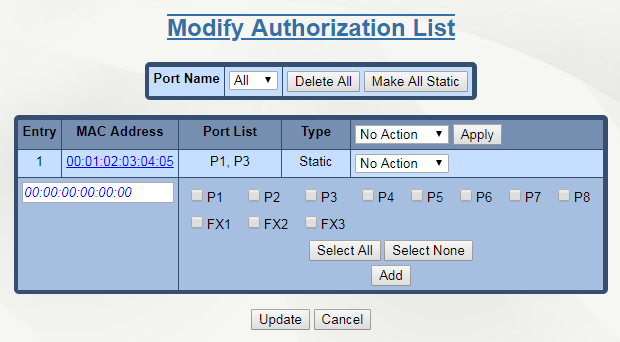
Ports Security – Authorization List

The Authorization List View displays a drop-down list of the available ports that is used to filter the authorization list. Below the drop-down list is the table of authorized Static and Learned MAC addresses and ports.

Note: Multicast Source Addresses will not show up in the Authorization List.



The Modify button allows the administrator to add new MAC addresses, and to modify and remove existing MAC addresses. The last row is used to add new MAC addresses and to change the ports of an existing MAC address.



Port Name: The descriptive name of the port.

MAC Address: The authorized host MAC address.

Port List: The port(s) that are authorized for the associated MAC address.

Type: The type of the authorized MAC Address. It can be either Learned, Static, or Single MAC.

Action: Action for the authorized MAC address. It can be No Action, Make Static from Learning mode, or Delete from the Authorization List. The maximum number of actions that may be performed on the Authorization List in a single update is 100.

Make the required modifications, and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

Delete All Authorization List

To delete the complete authorization list associated with the selected port(s), click on *Delete All* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

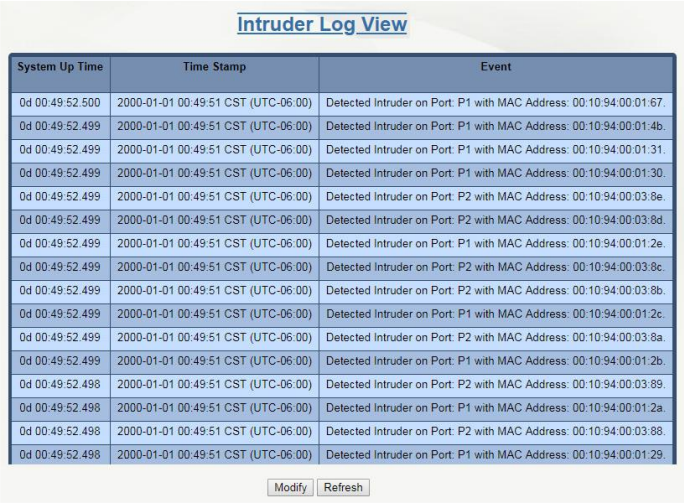
Make All Learned Authorization Entries Static

To make all learned authorization entries associated with the selected port(s) as Static, click on *Make All Static* button. A confirmation dialog pop-up will appear, prompting the user to confirm the action.

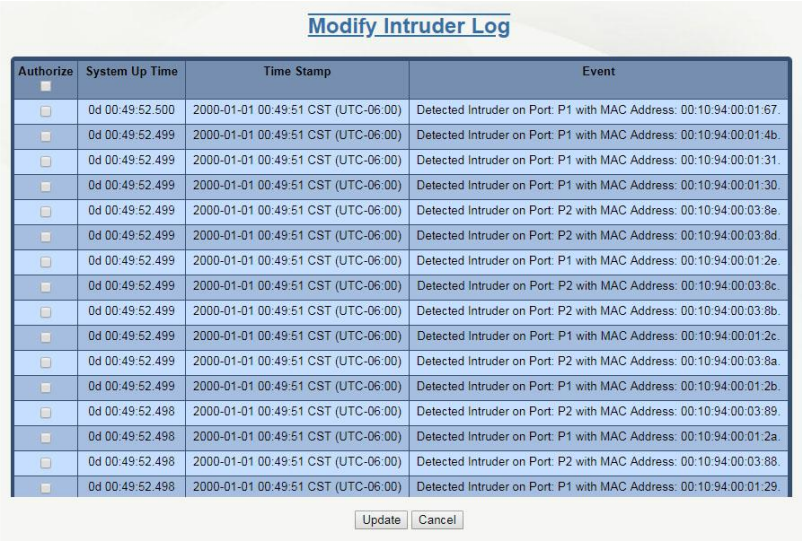
Note: Ports that are set to Single MAC cannot be included in static entries in the Authorization List.

Ports Security – Intruder Log

The Intruder Log page displays a list of unauthorized MAC addresses that attempted to access the secured device. Each intruder entry in the log is based on MAC address and Port. Multicast source MAC addresses will not be displayed in the Intruder Log table. The log is ordered by most recent first, based on the system up time and time stamp. The maximum number of entries is 100. If more than 100 intruders are detected, the oldest entries are deleted. The log is not saved through a power cycle.



To authorize a particular MAC Address from the Intruder Log, click on the Modify button and an "Authorize" field will be added as a checkbox as shown below:



Displays the most recent 100 intruders since the latest system startup. To review a complete list, please see the Event Log page.

FIELD	DESCRIPTION
Authorize	This is the selection to Authorize MAC Address(es) from the Intruder Log.
System Up Time	The elapsed time since the switch was powered on or rebooted.
Time Stamp	The date/time when the event was logged.
Event	The description of the intrusion.

Make the required modifications and click on the Update button. To save the changes made, navigate to the Configuration menu and click on the Save button.

An authorized entry will be displayed as green text color for that particular row in the Intruder Log table. The corresponding checkbox in the Authorize column will be checked and cannot be modified.

Port Security – Single MAC

Single MAC is a port security mode that allows a port to lock on a dynamically learned MAC address. The first MAC address to be learned and processed by the port will be locked in and any further traffic will be blocked as an intruder. The locking of the address is not dependent on switching the port security status to Locked. This feature helps in providing security for ports that may only have a single device plugged into the switch. The Single MAC address is not persistent following a reboot. The Single MAC will remain locked until a reboot upon which time a new MAC address will be learned and assigned as the new Single MAC entry.

Single MAC can be configured per port from the Port Security Configuration page. Manually added MAC addresses are not allowed to be assigned to a port designated as Single MAC. If a port is enabled under port security and then changed to Single MAC all learned addresses will be cleared and the next MAC address that comes in will be the new Single MAC address.

Single MAC addresses reset anytime the port security status is changed to Learning. Single MAC addresses are persistent when port security status is changed from Learning or Locked to Disabled and then back to Locked.

Single MAC limitations include: intruders on the Single MAC port cannot be manually authorized, and new addresses cannot be manually added to a Single MAC port.

Radius Server Configuration Information

The NT24k® takes advantage of Vendor Specific Attributes (VSA) as defined in section 5.26 of RFC 2865 so that multiple user levels can be authenticated using a Radius server. The VSA is defined as follows:

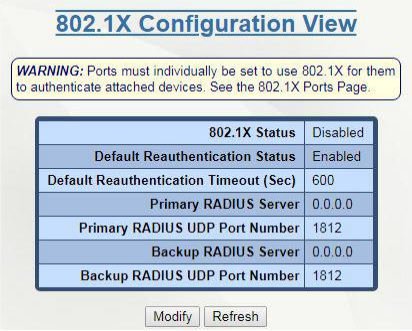
VENDOR ID	28381
Vendor ID	28381
Attribute Number	1
Attribute Format	string
Attribute Value	"AccessLevel:admin" or "AccessLevel:user"

The server and access list will need to be configured accordingly.

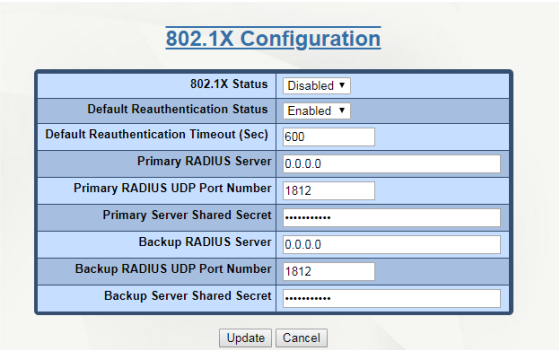
802.1X/Configuration

The Configuration dialog window displays the 802.1X status, reauthentication information, and RADIUS server information.

Note: Bypass Relay models affect the implementation of this protocol. For more information, see the section Bypass Relay (BR).



To make changes to the Security settings, click on the *Modify* button and the fields shown below will become editable:



802.1X Status: This field indicates whether the 802.1X feature is enabled or disabled. At least one RADIUS server must be specified for 802.1X to be enabled. Ports must also be individually enabled on the ports configuration page.

Default Reauthentication Status: Select whether the 802.1X Reauthentication option is enabled or disabled. With reauthentication enabled, a device will be required to reauthenticate itself based on the time period specified by the reauthentication timeout field. 802.1X must be disabled to change this value.

Default Reauthentication Timeout (Sec): Enter the time period, in seconds, between 802.1X reauthentication. This value cannot be zero (0). 802.1X must be disabled in order to change this value.

Primary RADIUS Server: This field indicates the IP address of the primary RADIUS server. If contact with this server is lost, then contact with the backup server will be attempted.

Primary RADIUS UDP Port Number: The UDP port number of the Primary RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Primary Server Shared Secret: This field displays the shared secret for the primary server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Backup RADIUS Server: This field indicates the IP address of the backup RADIUS server. If contact with the primary server is lost, contact with the backup server will then be attempted.

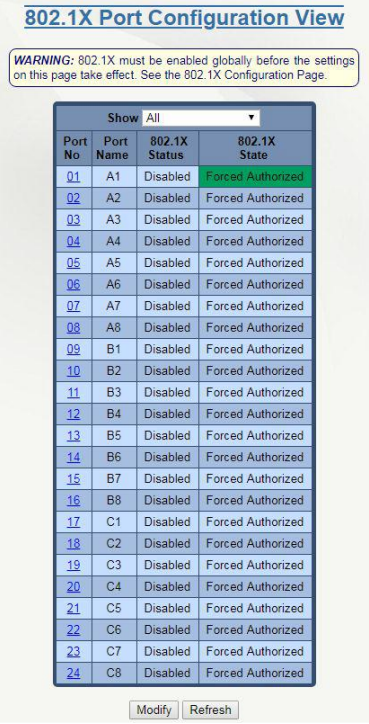
Backup RADIUS UDP Port Number: The UDP port number of the Backup RADIUS Server. The default port number is 1812, per RFC-2865. Allowed port numbers are 1 - 65535.

Backup Server Shared Secret: This field displays the shared secret for the backup server. The shared secret authenticates the switch to the RADIUS server and must match the shared secret value on the RADIUS server.

Make the required modifications and click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

802.1X/Ports

The 802.1X Port Configuration View dialog window displays all the ports and their current settings. To modify this information, click on the *Modify* button.



Port No: This column shows the number of the port.

Port Name: This column displays the port's descriptive name.

802.1X Status: This column indicates whether the existing 802.1X port is enabled or disabled. Ports only require 802.1X authentication if they are enabled and 802.1X is globally enabled on the configuration page.

802.1X State: This column shows the current state of the port. This option is only valid when the port is enabled and 802.1X is globally enabled.

Link Down: There is no link detected on the port.
Initialize: The port is being setup for 802.1X authentication.
Disconnected: A valid 802.1X client has not been detected.
Connecting: A valid 802.1X client has been detected, but authentication has not begun.
Authenticating: The 802.1X client is being authenticated.
Authenticated: The 802.1X client has been authenticated.

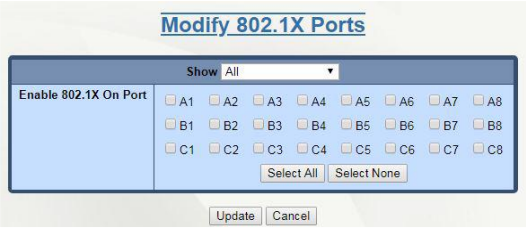
Aborting: The port is no longer authorized and is preparing to move back to the Disconnected state.

Held: The 802.1X client failed authentication and the switch is preventing new authentication attempts for a defined period of time. Default: 60 seconds.

Forced Authorized: Occurs when a port has had 802.1X disabled. The result is all traffic is allowed to pass through that port.

Forced Unauthorized: Occurs when a port is administratively disabled through the port configuration. The result is no traffic is allowed to pass through that port.

Click on the *Modify* button and the page below will appear. Select the required ports, and then click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



IEEE 802.1X MIB

The IEEE 802.1X MIB, IEEE 8021-PAE-MIB, is supported by the NT24k®. Since the NT24k does not support the supplicant features of 802.1X, the MIB tables pertaining to the supplicant behavior will not be populated and will be blank when queried.

With this release, the IEEE 802.1X MIB support is limited. Ports are only tracked when an 802.1X aware supplicant is attached. This means that not all 802.1X enabled ports will be visible, only those with valid supplicants. The statistics available through the MIB only pertain to the device since it either passed or failed authentication. Once the link goes down on the port, the statistics will be reset. Furthermore, any configuration items accessed through the IEEE 802.1X MIB can be set to modify the behavior of the port, but these changes will not persist across link events or power cycles.

Configuration changes that occur through the NT24k MIB will be persisted across link events and power cycles. Support for persisted statistics and configuration settings in the IEEE 802.1X MIB will be added to the NT24k in a future release.

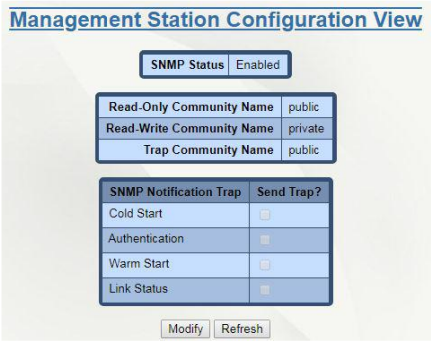
The IEEE 802.1X MIB allows for the writing to dot1xPaeSystemAuthControl. This is not supported in the current release of the NT24k firmware. dot1xPaeSystemAuthControl is considered a read-only attribute. The functionality for this is located in the NT24k MIB as ntronSecurityDot1xConfigStatus.

The IEEE 802.1X MIB allows for the writing to dot1xAuthAdminControlledDirections. Controlling the direction of the port traffic is not currently supported in the NT24k firmware and writing to dot1xAuthAdminControlledDirections will not have an effect on the system.

SNMP

Configuration

The SNMP Configuration displays the SNMP status and allows the administrator to disable or enable the protocol. The Read-Only, Read-Write and Trap Community Names are also displayed in this dialog window.



SNMP Status: This field indicates whether SNMP is enabled or disabled.

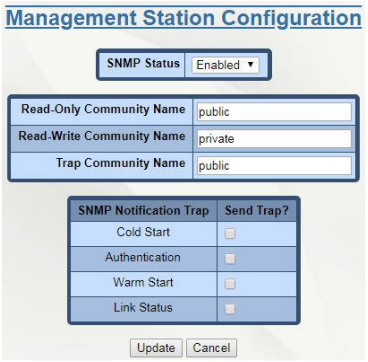
Read-Only Community Name: This configurable field represents the Authorized Community Name for SNMP Get requests. Only alphanumeric characters are allowed. The default value for this field is public.

Read-Write Community Name: This configurable field represents the Authorized Community Name for SNMP Set requests. Only alphanumeric characters are allowed. The default is for this field is private. Only administrators can view or modify this field.

Trap Community Name: This configurable field represents the Authorized Community Name for SNMP Traps. Only alphanumeric characters are allowed. The default is for this field is public.

SNMP Notification Traps: This section allows for control of which SNMP traps will be sent by this switch. Each of the four available traps can be enabled or disabled individually. The traps are: Cold Start, Authentication, Warm Start and Link Status.

Click on the *Modify* button to make changes to the SNMP Configuration. This will enable all configurable fields. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.



Trap Stations

The Trap Stations dialog window displays the SNMP Trap Stations.

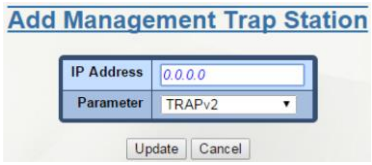


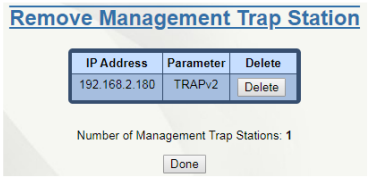
IP Address: This field represents the IP address of the Management Station to be sent SNMP Traps.

Parameter: This field displays the Target Parameters entry (TRAPv1, TRAPv2, etc) to be used for sending traps to the Management Station.

Adding Management Trap Stations

To add trap stations, click on the *Add* button and the following will appear:





Enter the required IP address and select the parameter to be used. Click on the *Update* button and the Display Management Trap Stations screen will appear.

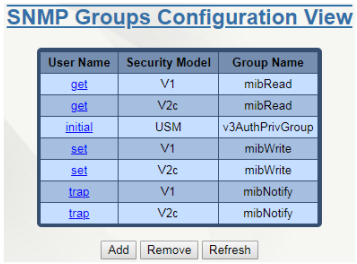
***SNMP V3 Default Security Parameters*:** The SNMP V3 default user parameters are shown here for reference only, as they are necessary for connecting to the switch securely using an SNMP V3 client when in defaults.The default user and other users can be added, deleted or modified by an administrator via either an SNMP V3 client or web browser, and the values below may be invalid if they are changed by an SNMP administrator.

Username: initial
Authentication Password: authpass
Authentication Protocol: MD5
Privacy Password: privpass
Privacy Protocol: DES

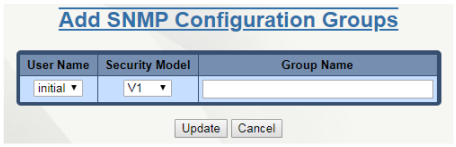
To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

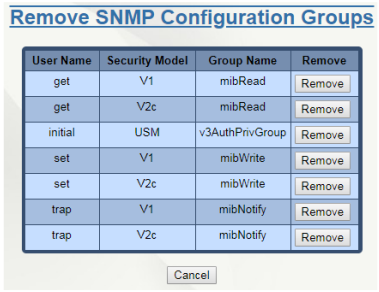
Groups

The SNMP Groups page allows the customer to configure SNMP group settings for specific SNMP users.



Click on the *Add* button to create a new SNMP group, or click the hyperlink under User Name to modify existing group settings for a user. Click the *Remove* button to display a list of current configured group and user settings, with an option to remove specific ones.





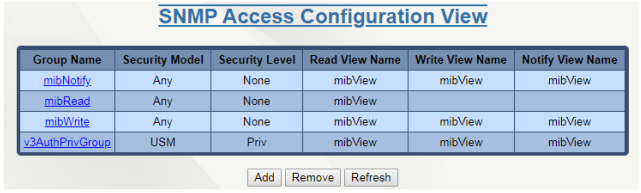
User Name: This field represents the SNMP User Name. It is a drop down list with an option for every SNMP user defined on the **Users** page.

Security Model: This field represents the security model the SNMP protocol will use for the defined group. The default is Any, while V1, V2c and USM (User-based Security) are the other available options.

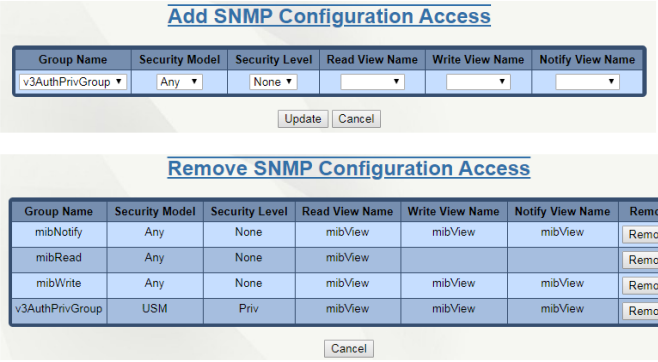
Group Name: This field represents the SNMP Group to which the SNMP user belongs.

Access

The SNMP Access page allows the customer to define various types of MIB access based on the defined view settings for each SNMP group.



Click on the *Add* button to define new access settings for a group, or click the hyperlink under Group Name to modify existing access for a group. Click the *Remove* button to display a list of current configured group and access settings, with an option to remove specific ones.



Group Name: This field represents the name of the group the user defines access settings for. It is a drop down list with an option for every SNMP group defined on the **Groups** page.

Security Model: This field represents the security model used to validate group access to views. The options are V1, V2c and USM (User-based Security).

Security Level: This field represents the security level of SNMP communications for the defined group. The options are None, Auth, and Priv.

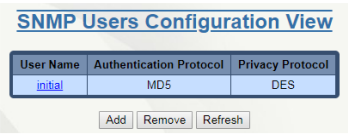
Read View Name: The name of the view that the defined group has read access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Write View Name: The name of the view that the defined group has write access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

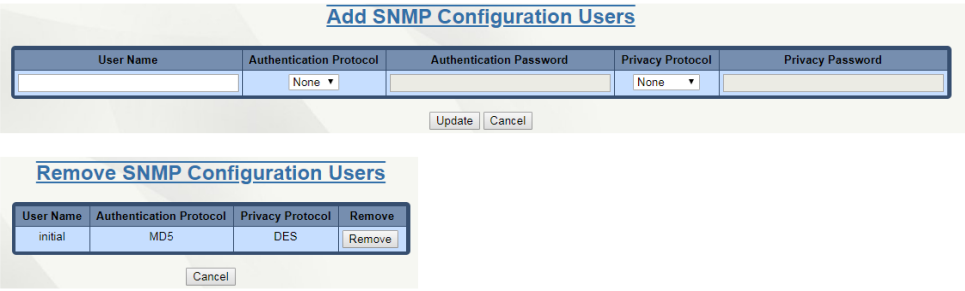
Notify View Name: The name of the view that the defined group has notify access to. It is a drop down list with an option for every SNMP view defined on the **View** page.

Users

The SNMP Users page allows a customer to create custom user names for group access and set the authentication and privacy protocols for that user. It is important to note that authorization and privacy passwords, when created, are hashed internally for security and will not be able to be retrieved.



Click on the *Add* button to create a new SNMP user, or click on a hyperlink in the *User Name* column to edit the information for that user. Click the *Remove* button to display a list of current configured users, with an option to remove specific ones.



User Name: This field represents the SNMP User Name.

Authentication Protocol: This field represents the authentication protocol utilized by the SNMP user. The options are None, MD5, and SHA1.

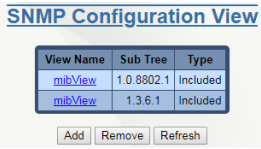
Authentication Password: The defined authentication password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

Privacy Protocol: This field represents the privacy protocol utilized by the SNMP user. The options are None, DES, and AES-128.

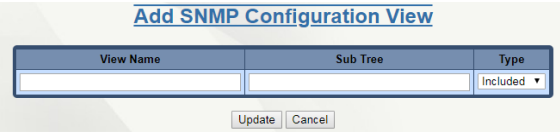
Privacy Password: The defined privacy password for the SNMP user. The password can be between 1 and 32 characters in length, but it is recommended that it is at least 8 characters in length. Alphanumeric and special characters are accepted.

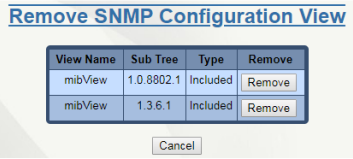
View

The SNMP View page allows a customer to define different view groups, which either include or exclude specific sub trees from the MIB tree based on the configuration.



Click on the *Add* button to create a new SNMP view, or click on a hyperlink in the *View Name* column to edit the information for that view. Click the *Remove* button to display a list of current configured views, with an option to remove specific ones.





View Name: This field represents the name of the SNMP view.

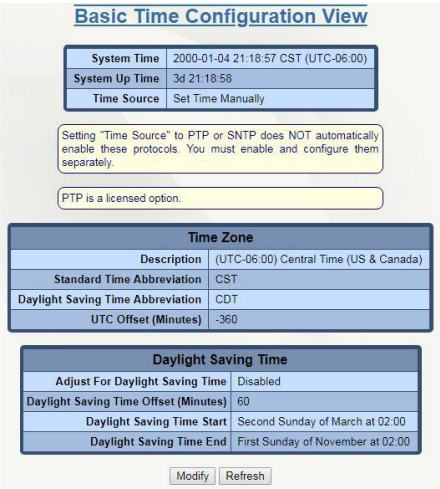
Sub Tree: This field allows the user to enter an OID string representing the sub tree being included or excluded from the view, based on the **Type** setting.

Type: This field allows the user to configure what the SNMP view does with the sub tree defined in the *Sub Tree* field. The options are Included and Excluded.

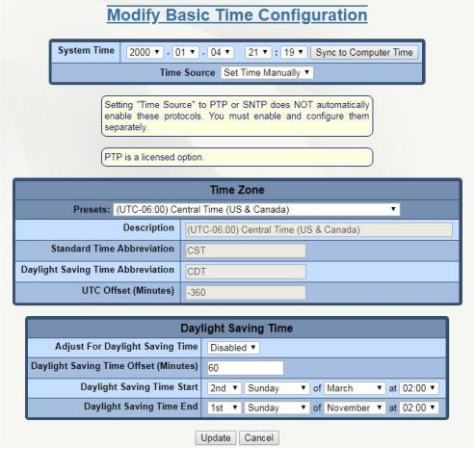
Time

Basic

From the Basic Time Configuration View dialog, the administrator can define the system time, time zone, daylight savings time and time source settings for the unit.



Click on the *Modify* button to make modifications to the unit's time settings.



System Time: This field displays the date/time of the system. The system date/time defaults to 2000-01-01 00:00:00 CST (UTC-06:00) at system start. The system date/time can be set manually but in the event of a power cycle or reboot it will revert to the default value.

Time Source: This field controls how the switch will automatically set its clock. The default value of "Set Time Manually" means that the time the switch uses can only be set manually. Setting this field to either "SNTP" or "PTP" causes the protocol to continuously update the system clock. Note that these must be enabled and configured separately from the basic time configuration. PTP is a licensed option and is unavailable otherwise.

Time Zone

Presets: This field provides a list of global time zones and cities within the time zones. Selecting from this list provides easy local time configuration and automatically populates the fields below. Choosing the "Custom..." option allows for editing of the below fields to satisfy specific requirements that are not met by one of the preset time zones.

Description: This field provides a description of the time zone selected. It contains the city and the offset from UTC for the selected location. If a custom preset is selected the description may be edited.

Standard Time Abbreviation: The common abbreviation for the selected time zone during standard daylight time is shown in this field. If a custom preset is selected the abbreviation may be edited.

Daylight Saving Time Abbreviation: This field represents the common abbreviation for the selected time zone during daylight saving time or summertime. If a custom preset is selected the abbreviation may be edited.

UTC Offset (Minutes): This field displays the offset, in minutes, from UTC. This is used to determine the local time. If a custom preset is selected the offset may be edited. Any change to the offset will affect the time calculation.

Daylight Saving Time

Adjust For Daylight Saving Time: This field indicates whether automatic adjustment for daylight saving time is made. The settings for this adjustment are defined below.

Daylight Saving Time Offset (Minutes): This field defines how much, in minutes, to adjust the time when daylight saving time starts and ends.

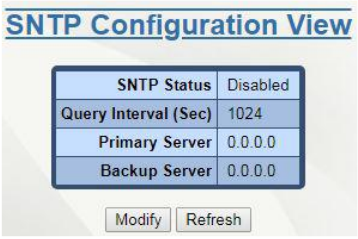
Daylight Saving Time Start: The week, the day of the week, the month, and the time at which daylight saving time should start.

Daylight Saving Time End: The week, the day of the week, the month, and the time at which daylight saving time should end.

Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

SNTP

From the SNTP Configuration View, the SNTP status can be changed, and the primary and back-up servers can be defined. Click on the *Modify* button to enable or modify the current settings.



SNTP Status: Indicates whether the SNTP client has been enabled. In order to enable SNTP, at least one SNTP or NTP server must be specified.

Query Interval (Sec): The periodic query interval used to request the time from the server(s). The valid range is between 4 and 129600. The default value is 1024.

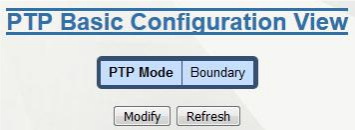
Primary Server: The address of the server to query first and most often. If contact with this server is lost, then contact with the backup server will be attempted. Either an SNTP or an NTP server may be specified.

Backup Server: The address of the backup server to query in the event that access is lost to the primary server. Either an SNTP or an NTP server may be specified. Click on the *Update* button. To save the changes made, navigate to the *Configuration* menu and click on the *Save* button.

Precision Time Protocol (PTP)

PTP Basic Configuration

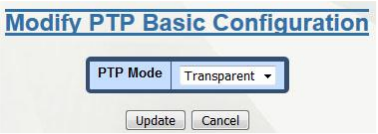
The PTP Basic Configuration View displays the PTP Mode and allows the administrator to disable the protocol, or enable one of two clock modes, Boundary or Transparent.



PTP Mode: This field indicates whether PTP is disabled, operating as a Boundary clock, or operating as a Transparent clock. When PTP is disabled, PTP traffic will route through the switch like any other multicast traffic.

Transparent Clock mode generally provides the most accurate time to a PTP client when the network is lightly loaded and there are only a few PTP clients connected to the switch. Boundary Clock mode is a better choice for a congested network. Boundary Clock mode also becomes a better choice as more PTP clients are connected to the switch.

Click on the *Modify* button to change the PTP Mode. When the desired mode has been selected, click *Update*.

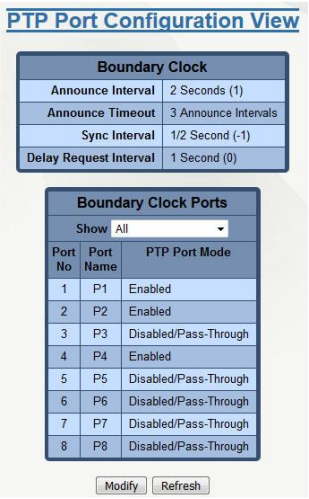


Note: When switching between PTP modes, it will be necessary to save the configuration and reboot the switch for the change to take effect.

PTP Port Configuration

The PTP Port Configuration View displays global and per port settings that relate to PTP.

The settings in the **Boundary Clock** table are applied to every port of a switch in Boundary Clock mode. The **Boundary Clock Ports** or **Transparent Clock Ports** table displays the PTP Port Mode for every port on the switch.



Global Boundary Clock Settings

Announce Interval: This is the log2 value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Announce Timeout: This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Sync Interval: This log2 value determines how often a sync message will be sent. The default value of "- 1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Delay Request Interval: This log2 value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

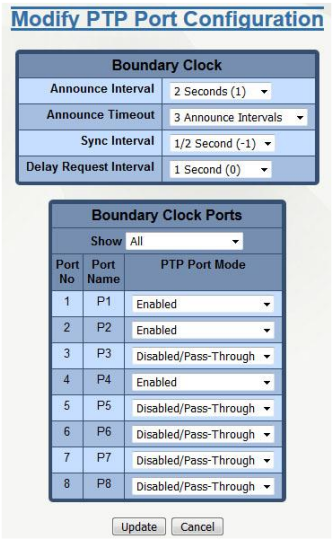
Boundary Clock Ports or Transparent Clock Ports Settings

Port No: Indicates the number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked". When Enabled, PTP packets will be processed by the switch PTP software. When Disabled/Blocked, PTP packets will be discarded as they enter the port. When Disabled/Pass- Through, PTP packets will be forwarded to other pass-through ports (within VLAN restrictions) with no PTP processing.

Click the *Modify* button to change any of the global settings or to change the PTP Port Mode of specific ports.

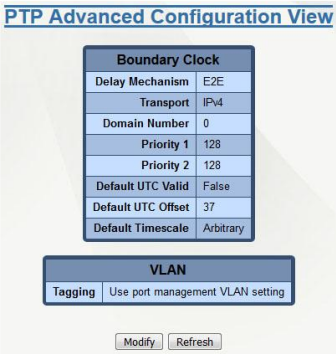


Once modifications to Announce Interval, Announce Timeout, Sync Interval, Delay Request Interval or PTP Port Mode have been made, click on the *Update* button.

Note: The settings on the PTP Port Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

PTP Advanced Configuration

The PTP Advanced Configuration View displays common advanced PTP settings and advanced settings that relate specifically to the Boundary Clock mode of operation. The Common values are read-only and only some values can be modified.



Boundary Clock

Delay Mechanism: The Delay Mechanism specifies the method used by PTP to handle delay correction values. E2E is the only delay mechanism currently supported.

Transport: IPv4/UDP is the only network transport method currently supported.

Domain Number: The Domain Number selects a PTP Domain. Only PTP packets in the same domain will be received and processed, and all sent PTP packets will be tagged with the same Domain Number. The range is 0-127. The default is 0.

Priority1: This value sets the priority of this switch as a Master clock. It is the most important value used by the Best Master Clock (BMC) algorithm of other PTP devices when selecting a Master clock. The range is 0-255, with 0 being most important. The default is 128.

Priority2: This value is used to break ties in the BMC algorithm. The range is 0-255, with 0 being most important. The default is 128.

Default UTC Valid: Current UTC Valid is a field in PTP packets that tells other devices whether the UTC Offset field that is also being sent in the packet should be considered valid. The Current UTC Valid value is set to this default at boot time, until it is updated by making a connection to a PTP Master. The default is "False" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

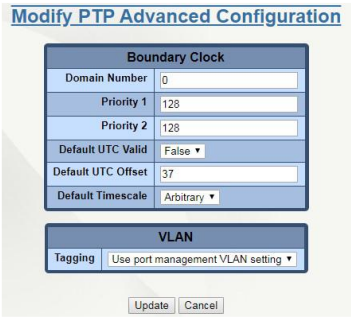
Default UTC Offset: The Current UTC Offset value is set to this default at boot time. The range is 0-127. The default is 36.

Default Timescale: The Current Timescale value is set to this default at boot time. All times exchanged in the PTP protocol are either "Arbitrary" or "PTP". Times that are "Arbitrary" cannot be converted to calendar time correctly and may have no connection to external accurate time. Times that are "PTP" can be converted to accurate calendar time using the UTC offset. The default is "Arbitrary" because the switch does not boot with a valid calendar time. It can be changed for interoperability reasons.

VLAN Tagging: PTP frames that egress a PTP port may have a VLAN tag or may be untagged. When "Use port Management VLAN setting" is selected, the PTP frame is untagged if the Management VLAN is set to 'Untag on Egress'. Otherwise, the frame is tagged with the Management VLAN ID. This is the default setting. When "Use port PVID setting" is selected, the PTP frame is untagged if the VLAN used as the PVID is set to 'Untag on Egress'. Otherwise, the frame is tagged with the port's PVID.

Note: When PTP Mode is "Transparent Clock", PTP frames will obey VLAN restrictions and will not cross VLAN boundaries.

To make changes, click on the *Modify* button. Once the desired changes have been made, click on the *Update* button to apply changes to settings.

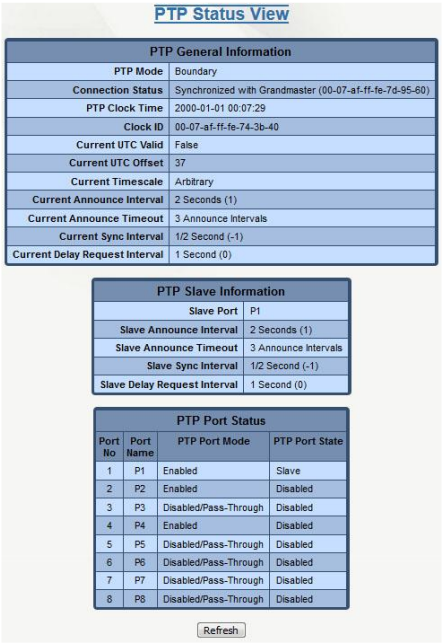


Note: The settings on the PTP Advanced Configuration View page are associated with the mode set on the PTP Basic Configuration View page.

Note: The Current UTC Valid, Current UTC Offset and Current Timescale values are not displayed on the View or Modify pages when PTP is currently disabled or in Transparent Clock mode because they do not apply.

Status

The PTP Status and Information page displays read only information about a device's PTP configuration. General and per port information is displayed on this page.



Note: When PTP is disabled, the only information displayed on this page is PTP Mode and Clock ID, because nothing else applies when PTP is disabled.

PTP General Information

PTP Mode: The PTP mode of the switch. Options include "Disabled", "Boundary Clock", and "Transparent Clock". The default is "Disabled". If the PTP protocol is disabled on the switch, all ports behave as Disabled/Pass-Through. Changes to this setting require a reboot of the switch.

Connection Status: This only applies to Boundary Clock mode. This is the current PTP Master clock of the switch. If this switch is the Master clock, then the connection status indicates that PTP is not synchronized with a Grandmaster.

PTP Clock Time: This only applies to Boundary Clock mode. This displays the date/time of the PTP Clock. The PTP Clock defaults to the system clock when not synchronized to a PTP Master clock.

Clock ID: The unique Clock ID of this PTP device. It is constructed automatically based on the switch MAC address.

Current UTC Valid: A field in exchanged PTP packets that says whether the UTC Offset field that is also being sent in the packet should be considered valid. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current UTC Offset: A field in exchanged PTP packets that provides the current offset to UTC. This is a run-time value that is dynamically updated based on the most recently connected PTP Master.

Current Timescale: A field in exchanged PTP packets that provides the most recently received Timescale value from the Master. This is a run-time value that is dynamically updated based on the most recently connected PTP Master. If this value is "PTP", the internal PTP time can be converted to a calendar time using the Current UTC offset.

Current Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

Current Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The current value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Slave Information

Slave Port: This only applies to Boundary Clock mode. This is the port that is connected to and inheriting configuration values from a PTP Master. If no port is acting as a PTP Slave this field will have a value of “N/A”.

Slave Announce Interval: This only applies to Boundary Clock mode. This is the $\log_2$ value that sets the interval for how often to announce the switch as an eligible PTP Master. The default value of "1" is every 2 seconds. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Announce Timeout: This only applies to Boundary Clock mode. This value determines the number of announce intervals that must elapse without receipt of an announce message before a non-communicating Master is marked as unavailable. The default value is 3 intervals. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Sync Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often a sync message will be sent. The default value of "-1" is twice per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

Slave Delay Request Interval: This only applies to Boundary Clock mode. This $\log_2$ value determines how often the switch will request a path delay measurement from its Master. The default value of "0" is once per second. The slave value is dynamically updated by the PTP protocol and may differ from the setting.

PTP Port Status

Port No: The number of the port.

Port Name: The descriptive name of the port.

PTP Port Mode: The operation mode of the PTP port. Values are "Enabled", "Disabled/Pass-Through" (default), or "Disabled/Blocked".

PTP Port State: The current PTP state of a port. It should be noted that when PTP is in Transparent Clock mode the port state is not applicable and will not be displayed.

User Management

Authorized Users

The User Management screen allows users to view, add, modify and remove system user accounts. The display includes a list of all the users who have access to the management features of the switch and their access permissions.

Note: Up to 5 web users may be logged into the Web Management tool at once.



Adding Users

The system administrator can add users, change passwords and define access permissions for each user. Click on the *Add* button and the following dialog window will appear:



User Name: User names may include all alphanumerical characters, as well as the following 2 characters: _ - , and must be 3 to 15 characters long.

Password: Passwords can include all printable characters, except for the colon (:) and spaces, and the password length must be in the range specified by the "Password Length Min" and "Password Length

Max" fields. These fields are configurable under the User Management Configuration screen. The background print in the Password entry field will specify the currently configured range.

Access Permission: This field determines whether a user has standard *User* rights or *Admin* access.

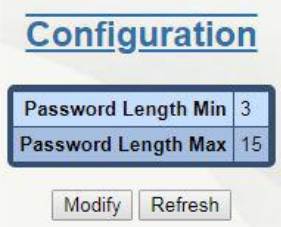
- *User* permission gives the right to view switch configurations and to view current port settings.
- *Admin* permission gives the right to change and view any switch configuration and to change and view any current port settings.

Removing Users

Users can be removed by a user with Admin access. Click on the *Remove* button, enter the User Name to be deleted and click on the *Remove* button.

Configuration

The User Management Configuration screen allows for the switch to be configured with a user password length minimum and user password length maximum.



Password Length Min: The minimum number of characters allowed in a user password. The default is 3 characters.

Password Length Max: The maximum number of characters allowed in a user password. The default is 15 characters.

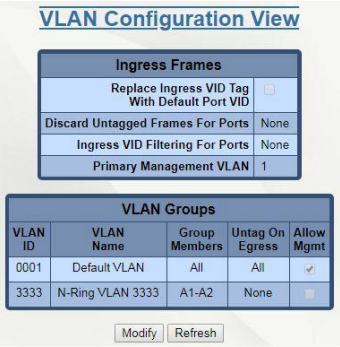
The Configuration screen allows modification of the minimum user password length and the maximum user password length. Both fields, 'Password Length Min' and 'Password Length Max' must be within the overall range of 3 to 15 characters, inclusive.

A configuration change, min or max, will not be allowed if an existing user password will fall out of the desired range (or become non-compliant). Each of the users preventing the change will be listed in the error message. In this case, each of the users that would become non-compliant would need to have their password lengths changed to fall into the new desired range before the configuration change can be applied.

VLAN

The VLAN Configuration View dialog window shows information about the existing VLANs.

Note: Bypass Relay models affect this feature. For more information, see the section Bypass Relay (BR).



Ingress Frames

Replaces Ingress VID Tag With Default Port VID: Specifies whether or not to replace the VID tag of ingress frames with the port's default VID (PVID).

Discard Untagged Frames For Ports: Specifies whether or not untagged ingress frames are dropped by the selected ports.

Ingress VID Filtering for Ports: Specifies whether or not to filter out ingress frames when a VID violation is detected on the selected ports.

Primary Management VLAN: The default egress VLAN used for communications initiated by the switch i.e. DHCP requests.

VLAN Groups

VLAN ID: Displays the VLAN identification for the group members. The range should be 1 - 4094.

VLAN Name: This field displays the VLAN name, which accepts alphanumeric and only the following special characters (including the period)**: # _ - .**

Group Members: This field specifies which ports are members of the VLAN group.

Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Allow Mgmt: Specifies whether or not all ports in this VLAN are management ports.

VLAN Group Members

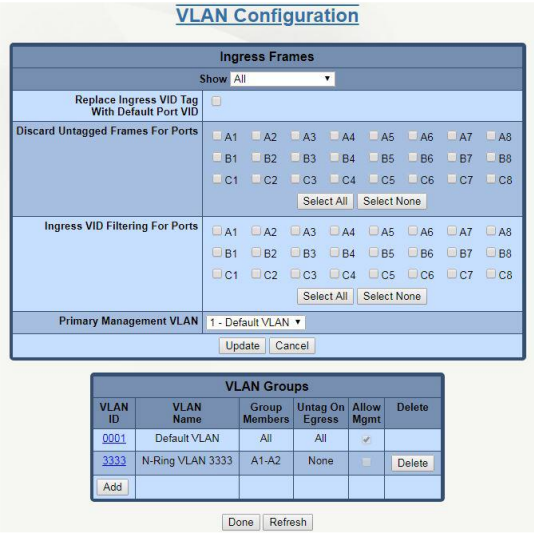
Port No.: The number of the port.

Port Name: The descriptive name of the port.

Group Member: Specifies whether or not the port is a member of the VLAN group.

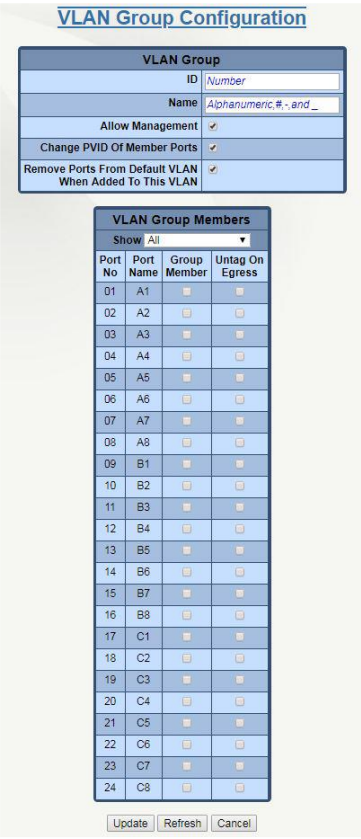
Untag on Egress: Specifies whether or not egress frames are tagged by the port.

Click on the *Modify* button and the following VLAN Configuration page will appear:



The top table is used for general VLAN changes. Once the required changes have been made, click on the *Update* button and then go to the Configuration menu and click on the *Save* button to ensure all changes are saved.

The bottom table is where new VLANs are added and existing ones are modified or deleted.Click on the *Add* button in the bottom table and the following dialog window will appear:



Note: The system is limited to a maximum of 60 configured VLAN groups.

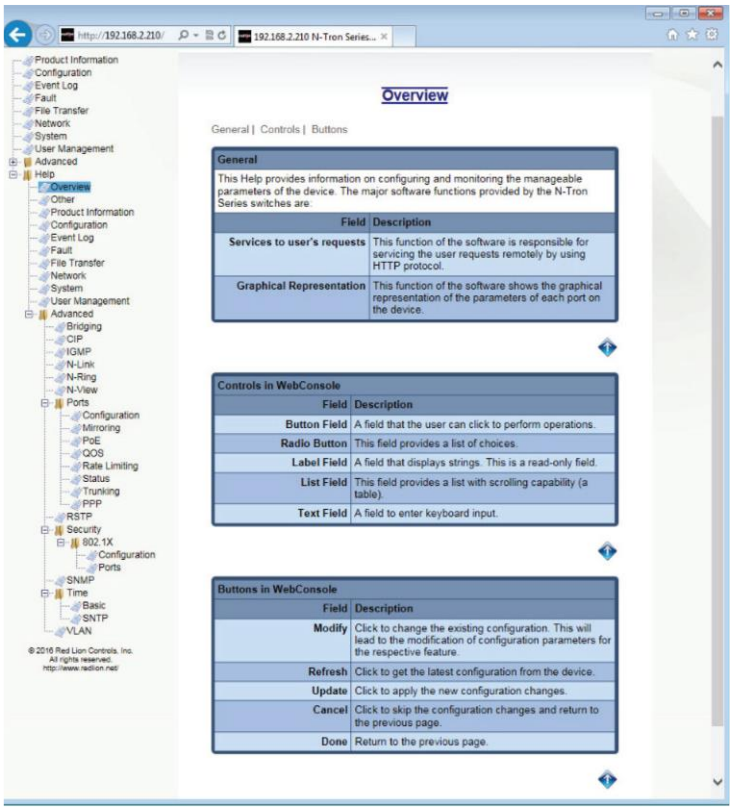
Note: The total number of configured VLAN groups is constrained by system resource usage which varies depending upon network configuration, with VLAN port membership count being the most significant factor.

Note: A port is automatically moved to the Default VLAN if no other VLAN contains that port.

Once the required changes have been made, click on the *Update* button and then go to the *Configuration* menu and click on the *Save* button to ensure all changes are saved.

Help

The Help menu provides information on monitoring and configuring the manageable parameters of the device. Specific help can be found by using the left-hand navigation menu or clicking on the Help link in the top menu.



Appendix A

Command Line Interface

The Command Line Interface (CLI) can be accessed by connecting a host device to the USB connector on the switch. Once connected, the switch will appear as a serial connection. A standard terminal application may be used to communicate to the switch through the serial connection. For serial port settings, see the “USB INTERFACE” section of the NT24k® Series Hardware Manual.

There are two additional methods for connecting to the CLI, Telnet and SSH. Using any standard Telnet client, sim-ply enter the IP address of the switch to start a connection to the CLI. SSH, the secure alternative to Telnet, can also be used with any standard SSH client by simply entering the IP address of the switch to start a secure connection to the CLI.

The CLI contains some status and configuration capability. To interact with the CLI, a login is required. The default username and password is 'admin'. Once logged in, a listing of available commands can be obtained through the help interface. This is accessible by typing either “?” or “help?”. The following commands are available:

NT24k CLI Commands

COMMAND	ARGUMENTS	DESCRIPTION
?		Show system commands. This command is the same as 'help commands' which is shown below.
admin		Administration settings, including IP settings and DHCP mode.
admin system set		Set general system settings.
admin system set contact	<contactname>	The person to contact for system issues, which should be someone within your organization. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set location	<locationname>	The physical location of the switch. Only alphanumeric and special characters '#', '_', and '-' are allowed.
admin system set name	<switchname>	Contains the name assigned to the device, which allows alphanumeric and special characters '#', '_', '-', and ':' only. When IP Configuration is DHCP, this may be used as the Client ID (Option 61) of the DHCP Request.
admin system set upper Threshold	<upperThreshold> - An integer from -60 to 120.	The highest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system set lower Threshold	<lowerThreshold> - An integer from -60 to 120.	The lowest temperature for the switch without causing a fault to occur. The threshold is specified as an integer in C degrees. The range is from -60 C to 120 C, and the default is product dependent (shown only on switches with temperature sensors).
admin system show		Show general system information.
admin ip set		Set Internet protocol settings.
admin ip set clientid	<type> - A client ID type: [0-switch name, 1-switch MAC, 2-other text, 3-other hex] <value>	This option is used by DHCP clients to specify their unique identifier. DHCP servers use this value to index their database of address bindings. This value is expected to be unique for all clients in an administrative domain. The identifier may be the MAC address, switch name, or entered as a text string or hex characters.

COMMAND	ARGUMENTS	DESCRIPTION
	- A string when the type is 2 or a hex string when the type is 3.	• Usage: admin ip set clientid 0 • Usage: admin ip set clientid 2 "Switch53"
admin ip set dhcp admin ip set no dhcp		Determines the method used to obtain an IP address, Subnet Mask, and Gateway. When DHCP is enabled, DHCP protocols are used to obtain these values. When DHCP is disabled, Static is selected, and the statically configured values are used. • Usage: "admin ip set dhcp" to enable DHCP mode. • Usage: "admin ip set no dhcp" to disable DHCP and return back to Static.
admin ip set ip	[address <ipaddress>] - The IP address of the device. [mask <subnetmask>] - The Subnet mask of the device. [gateway <gateway>] - The Gateway address of the device.	Set the Static IP address, subnet mask, and/or gateway. • Usage: admin ip set ip [address (IP address)] [mask (Subnet mask)] [gateway (Gateway address)] **Example:** CLI> admin ip set ip address 192.168.2.212 mask 255.255.255.0 gateway 192.168.2.1
admin ip show		Show Internet protocol settings. **Example:** CLI> admin ip show
arl		Show ARL Configuration.
arl show		Show ARL Configuration. Example: CLI> arl show Arl Settings Src MAC Address Vlan Sta Drop Blk Loc Destination Ports Applies only to Ports ================== ==== === ==== === === ========== 00:07:af:7d:37:e0 1 Y N N FDB CPU All 01:00:5e:00:00:fb 1 Y N N FDB C7 All 01:00:5e:00:00:fc 1 Y N N FDB C7 All 01:00:5e:7f:ff:fa 1 Y N N FDB C7 All 01:07:af:00:de:d1 ANY Y N N POL CPU A1-A2 01:07:af:00:de:d2 ANY Y N N POL Drop All 01:07:af:00:de:f0 ANY Y N N POL Drop All 01:07:af:00:de:f1 ANY Y N N POL Drop All 01:07:af:00:de:f2 ANY Y N N POL Drop All 01:07:af:00:df:48 ANY Y N N POL Drop All 01:07:af:01:3d:1b ANY Y N N POL CPU All 01:07:af:7d:37:e0 ANY Y N N POL Drop All 01:80:c2:00:00:00 1 Y N Y POL CPU All a0:36:9f:3b:6c:b2 1 N N N FDB C7

COMMAND	ARGUMENTS	DESCRIPTION
		All ff:ff:ff:ff:ff:ff ANY Y N N POL CPU All
arp		Address Resolution display and control.
arp	[<arguments>]	Use arp without arguments to get help. Example: CLI> arp <arp>arguments> - Use arp without arguments to get help. Surround multiple arguments with double quotes. EX: arp "-r 192.168.2.117" CLI> arp NAME arp - address resolution display and control SYNOPSIS arp [-silent] [-V <routetab>] [-i <ifname>] –a arp [-silent] [-V <routetab>] [-i <ifname>] –A arp [-silent] [-V <routetab>] [-i <ifname>] -d <hostaddress> arp [-silent] [-V <routetab>] [-i <ifname>] [-p] [-t] -s <hostaddress> <ether_addr> arp [-silent] [-V <routetab>] [-i <ifname>] -r <hostaddress> DESCRIPTION The arp program displays and modifies the Internet-to-Ethernet address translation tables used by the address resolution protocol. Options: -silent Suppress output. MUST be the first argument. -i <ifname> Specify interface. First one if not specified. -t Temporary ARP entry. -p Public ARP entry (i.e. proxy ARP entry). -r Send an ARP request to the host address. -V <routetab> Specify route table. 0 if not specified. Commands: -a Display the currently existing ARP entries. -A Delete all the ARP entries. -d Delete specified ARP entry. -s Register a ARP entry for a node.
clear		Clear the screen.
config		Save changes to the configuration or reset the configuration to factory defaults.
config reset		Reset configuration settings to factory defaults.
config save		Save current running configuration settings.
dhcpServer		DHCP Server.
dhcpServer status set	<statusValue>	Set DHCP Server status (disabled or enabled).
dhcpServer status show		Show DHCP Server status.
exit		Exit immediate mode. **Example:** CLI> admin ip CLI(admin-ip)> exit CLI>
fileTransfer	tftp server <ip address> transferType	Transfer files to or from the switch.

COMMAND	ARGUMENTS	DESCRIPTION
	<UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]	
help		Show command help.
help commands		Show system commands. Example: CLI> help commands admin - Administration settings, including IP settings and DHCP mode. arl - Arl Settings arp - Address Resolution Protocol (ARP) clear - Clear the screen config - Save changes to the configuration, or reset switch to factory defaults. dhcpServer - DHCP Server exit - Exit immediate mode fileTransfer - Transfer files help - Show command help history - Show command history lldp - Link Layer Discovery Protocol logout - Log off this system ping - Ping a host. port - Port settings portSecurity - Port Security ppp - Start PPP server (use from serial console only). reboot - Reboot the switch and load the most recently saved configuration. who - Display users currently logged in whoami - Show current user info
help edit		Show editing keys. **Example:** CLI> help edit Available editing keystrokes: Delete current character.....Ctrl-d Delete text up to cursor.....Ctrl-u Delete from cursor to end of line.....Ctrl-k Move to beginning of line..... Ctrl-a Move to end of line.....Ctrl-e Get prior command from history.....Ctrl-p Get next command from history.....Ctrl-n Move cursor left..... Ctrl-b

COMMAND	ARGUMENTS	DESCRIPTION
		Move cursor right.....Ctrl-f Move back one word.....Esc-b Move forward one word.....Esc-f Convert rest of word to uppercase.....Esc-c Convert rest of word to lowercase.....Esc-l Delete remainder of word.....Esc-d Delete word up to cursor.....Ctrl-w Transpose current and previous character..... Ctrl-t Enter command and return to root prompt..... Ctrl-z Refresh input line..... Ctrl-l
help help		Show command help. **Example:** CLI> help help help - Show command help commands - show system commands edit - Show editing keys
history		Show command history. **Example:** CLI> history 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history
history clear		Reset all history.
history enable		Turn history capture on.
history filter		Do not capture repeated input into history.
history info		Information **Example:** CLI> history info 1 admin ip set no dhcp 2 admin ip set ip 192.168.2.212 3 history 3 history info History filter: off History modal : off History ring : on
lldp		Link Layer Discovery Protocol.
lldp mode show		Show LLDP mode.
lldp mode set	disable, enabled, auto	Set LLDP mode.
lldp wakeTime show		Show remaining wake time in auto LLDP mode.
lldp wakeTime send	hours <hours> minutes <minutes>	Send wake time in auto LLDP mode to all switches.
logout		Log off this system.
ping		Ping a host.
ping	[<arguments>]	Use ping without arguments to get help. Surround multiple arguments with double quotes. **Example:** ping "-c 3 192.168.2.121"
port		Port Mirroring configuration display and control.

COMMAND	ARGUMENTS	DESCRIPTION
port config show	<portlist>	Show all port configuration information for the specified ports.
port config show all		Show all port configuration information for all ports on the switch.
port config show basic	[<portlist>]	Show basic port configuration information for the specified ports.
port mirror set		Set Port Mirroring configuration.
port mirror set enable port mirror set no enable		Enable or disable Port Mirroring. Use "no enable" to disable.
port mirror set destination	<port>	Set the destination port for Port Mirroring. For example, "A4".
port mirror set txsource	<portlist>	Set the transmit source ports that are mirrored to the destination port. For example, "A1,A2".
port mirror set rxsource	<portlist>	Set the receive source ports that are mirrored to the destination port. For example, "A1-A3,A6".
port mirror set dataonly port mirror set no dataonly		Set mirrored data only. Use "no dataonly" to disable.
port mirror show		Show Port Mirroring configuration. **Example:** CLI> port mirror show Port Mirroring Settings Mirror Status : Enabled Destination Port : A1 Mirrored Data Only : Enabled Tx Source Ports : None Rx Source Ports : A4
portSecurity		Port Security
portSecurity status set	disabled, learning, locked	Set port security status
portSecurity status show		Show port security status.
portSecurity intruderLog show		Show the contents of the intruder log
portSecurity authList show	[<portlist>]	Show the contents of the authorization list
ppp		Start PPP server (available from the serial console only).
reboot		Reboot the switch and load the most recently saved configuration.
who		Display users currently logged in. **Example:** CLI> who Line User Host(s) Idle Location 00:00:00 admin Console
whoami		Show current user information. **Example:** CLI> whoami

COMMAND	ARGUMENTS	DESCRIPTION
		User name: admin

System Information

Command: admin system show
Description: Show general system information

```
CLI>    admin system show

System Settings

Name                              : NT24k-DR16-DC

Model Name                        : NT24k-DR16

Family Name                       : NT24k

Software Version                  : 2.2.3

Build Date                        : Oct 25 2019. 16:36:28

Boot Loader                       : 2.0.7

Copyright                         : Copyright <c> 2013-2019

URL                          : http://www.redlion.net/

Ram Size                     : 128 MB

Flash Size                   : 64 MB

Internet Protocol (IP) Settings

IP Configuration             : DHCP

DHCP Client ID Type          : Switch Name

DHCP Client ID Data          : N-Tron Series 77:fd:00

Fallback IP Enable           : Enabled

Fallback IP Address          : 192.168.1.201

Fallback IP Subnet           : 255.255.255.0

Fallback IP Gateway          : 0.0.0.0

Current IP Address           : 0.0.0.0

Current Subnet Mask          : 0.0.0.0

Current Gateway Address      : 0.0.0.0

MAC Address                  : 00:07:af:77:fd:00

--------

System Up Time               : 0d 04:05:42

System Time                  : 2000-01-01 04:05:41 CST (UTC-06:00)

Switch Name                  : N-Tron Series 77:fd:00

Switch Contact               : Admin
```

```
Switch Location            : Mobile, AL 36606

--------

Device Temperature         : 50 C, 122 F

Upper Temperature Limit    : 120

Lower Temperature Limit    : -60

CLI>
```

Displaying Port Information

Command: port config show <all|basic> <port-list>

Description: Show general port configuration, similar to what is displayed in the Web Software. The first parameter ("all" or "basic") specifies how much information to show and the port-list parameter can be used to filter the displayed ports. This can be a single port, a range of ports (ex. 1-3) or multiple ranges of ports, separated by a comma. Ports can also be selected by name or by number.

Note: If you want all information for a specific port, or set of ports, simply call **port config show <port-list>**. If you want only basic information, you will need to include "basic" before **<port-list>**.

```
CLI> port config show basic

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
3    P3   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
4    P4   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
6    P6   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
7    P7   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
8    P8   10/100/1000 Mbps TX Enabled  Up     1000  RSTP Forwarding    1
9    DM1  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
10   DM2  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
11   DM3  Not Installed        Enabled  Down   1000  RSTP Not Installed 1
12   DM4  Not Installed        Enabled  Down   1000  RSTP Not Installed 1

CLI> port config show P1

Port Configuration View

Port Number:            1
Port Name:              P1
Port Description:       10/100/1000 Mbps TX
Admin Status:           Enabled
Link Status:            Down
Auto Nego:              Enabled
Port Speed:             Auto
Duplex Mode:            Auto
Flow Control:           Disabled
Cross Over:             Auto
Role:                   RSTP
Port State:             Discarding
PVID:                   1
Trunk ID:               0
Usage Alarm Low:        0
Usage Alarm High:       100

CLI> port config show basic P1-P2,P5

Port Configuration View

Port Port Port                 Admin    Link   Port  Role Port          PVID
No   Name Description          Status   Status Speed      State
---- ---- ---------------------- -------- ------ -----  ---- ------------ ----
1    P1   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
2    P2   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1
5    P5   10/100/1000 Mbps TX Enabled  Down   Auto  RSTP Discarding    1

CLI>
```

Setting a Static IP Address

By default, the switch will use the DHCP protocol for IP address assignment. The switch may also be configured to use a static IP address.

Command: admin ip set

Description: Moves the CLI to the IP address settings immediate mode. Typing "?" will provide the command options available here.

Once in the IP immediate mode, it is easy to change the address configuration. Once set, the new configuration must be saved for this change to be retained after a reboot.

```
CLI(admin-ip-set)> ip address 192.168.2.209 mask 255.255.255.0 gateway 0.0.0.0
CLI(admin-ip-set)> no dhcp

        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
        +       Static Settings
        +               IP Address:     192.168.2.209
        +               Subnet Mask:    255.255.255.0
        +               Gateway:        0.0.0.0
        ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
CLI(admin-ip-set)> exit
CLI>
```

Performing a File Transfer

File transfers can be initiated through the CLI by using TFTP Protocol.

Command: fileTransfer tftp server <ip address> transferType <UpgradeSystem, UpgradeBootLoader, ImportConfig, ExportSavedConfig, ExportEventLog> [file <string>]

Description: Initiates the file transfer from the CLI.

```
CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType Upgrade System

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed

Processing '/ram0/xfr/NT24k_image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done reading contents


Extracting from /ram0.xfr/NT24k_image.tar

file NT24k.image, size 10299280 bytes, 20116 blocks

extracting file NT24k_image.xml, size 1287 bytes, 3 blocks

end of tape encountered, read until eof…

done extracting tar.

file NT24k_image.xml, size 1287 bytes, 3 blocks

moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image


Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.247 (130370
bytes/second)

Done Processing '/ram0/xfr/NT24k_image.tar'. Elapsed time: 1:25.996

File Transfer: Completed

CLI>

CLI> fileTransfer tftp server 192.168.2.1 transferType UpgradeSystem file
NT24k_Image.tar

CLI> File Transfer: Starting in the background

File Transfer: Please do not turn off power until it's completed
```

```
Processing '/ram0/xfr/NT24k_Image.tar' will take about 1 minute.

Contents from /ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done reading contents.

Extracting from/ram0/xfr/NT24k_Image.tar
file NT24k.image, size 10299280 bytes, 20116 blocks
file NT24k_image.xml, size 1287 bytes, 3 blocks
end of tape encountered, read until eof…
done extracting tar.
file NT24k_image.xml, size 1287 bytes, 3 blocks
moving file /sffs0/temp/NT24k.image → /sffs0/image/NT24k.image

Stored /sffs0/image/NT24k.image (10299280 bytes) in 1:19.595 (130370
bytes/second)
Done Processing '/ram0/xfr/NT24k_Image.tar'. Elapsed time: 1:26.333
File Transfer: Completed
```

Saving the Configuration

When configuration changes are made, they are not automatically saved to NVRAM and will be discarded at the next power cycle. Configuration changes must be saved to be retained across power cycles.

Command: config save

Description: Save all current changes to the configuration for use after the next power cycle. If a Configuration Device is installed, the configuration will also be saved to the device.

```
CLI>
CLI> config save
CLI>
```

Appendix B

Working with Configuration Files

Importing a Subset of an XML Configuration File

The XML configuration file may be used to set all of the configurable parameters on a NT24k® switch or to configure a subset of parameters. Setting common parameters across multiple switches can be easily accomplished by creating and importing an abridged configuration file for this purpose.

Appendix C contains an example XML Configuration file. A simple way to start an XML configuration file is to export the existing saved configuration file from the switch and modifying it to meet your new configuration needs.

When creating a configuration file for a subset of available parameters, setting the system configuration mode to *Keep* will maintain the current settings for all parameters other than those explicitly set by the new file being imported. If the system configuration mode is not set to *Keep*, all parameters other than those being set by the configuration file, will be reset to their default setting.

In the example below, the mode is set to Keep so that other switch settings are not reset to defaults. Additional information about the content of the configuration file can be found at the top of any exported configuration file.

```
<SystemConfiguration Mode="Keep"?
  <SystemGroup>
    <SystemConfig>
      <SwitchContact>IT Department Manager</SwitchContact>
      <SwitchLocation>Factory Floor B</SwitchLocation>
    </SystemConfig>
  </SystemGroup>
</SystemConfiguration>
```

Using Port Numbers instead of Port Names

In a configuration file, it is valid to use port numbers instead of names to simplify the sharing of configuration settings. Ports are numbered starting at 1.

Port names may differ between switch models. For example, the NT24k-DR24 uses A1-A8, B1-B8, and C1-C8 and the NT24k-14FX6 uses P1-P8 and FX1-FX6. However the configuration files can reference ports 1-24 for an NT24k and ports 1-14 for an NT24k-14FX6.

In the following example, VLAN 1 is configured for ports 1 through 8 and VLAN 2 is configured for ports 9 through 16. This settings file can be imported into any NT24k switch that supports 16 or more ports. Note that the configuration file must also set the appropriate port PVIDs.

```
<SystemConfiguration Mode="Keep">
  "VlanGroup>
    <IngressDiscardUntagged>None</IngressDisgardUntagged>
    <IngressReplaceVID>Disabled</IngressReplaceVID>
    <IngressVidFilter>None</IngressVidFilter>
    <PrimaryMgmtVlanId>1</PrimaryMgmtVlanId>
    <RemoveportsFromDefaultVlan>Enabled</RemovePortsFromDefaultVlan>
    <TaggedVlans>
      <Vlan>
            <AllowManagement>Enabled</AllowManagement?
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
```

```
            <VlanId>1</VlanId>
        </Vlan>
        <Vlan>
            <AllowManagement>Enabled</AllowManagement>
            <MemberPorts>1-8</MemberPorts>
            <Name>Default VLAN</Name>
            <UntagEgressPorts>1-8</UntagEgressPorts>
            <VlanId>1</VlanId>
        </Vlan>
    </TaggedVlans>
    <Type>Tagged</Type>
```

Importing an Incompatible XML Configuration File

Errors related to invalid port names or numbers may occur when importing a configuration file from one model of an NT24k® switch into a different model of an NT24k switch.

Field	Description
Destination	XML line:(216) - Could not set '/SystemConfiguration/MirrorGroup/MirrorConfig/Destination' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
ControlPort	XML line:(226) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort' to value 'P3'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
CouplerPort	XML line:(227) - Could not set '/SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort' to value 'P4'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Portx	XML line:(244) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Portx' to value 'P1'
Error Cause	0x80010008 - Invalid Port (ERR_InvalidPort)
Porty	XML line:(245) - Could not set '/SystemConfiguration/NringGroup/NringConfig/NringPortSets/PortSet/Porty' to value 'P2'

Resolving Invalid Port Mappings

If the number of ports in the XML configuration file is greater than on the target model, then the following sections should be removed for each of the extra ports.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/Port (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port

Notice that if the target switch has additional ports whose settings are not specified in the imported configuration file, then these additional ports will have their settings set to default values if the mode has not been set to “Keep”.

Ports on the target switch that do not exist in the configuration file will be added to Default VLAN 1. If the configuration file has extra VLANs with ports that do not exist, an error will be generated for each non-existent port.

Resolving Invalid Port Names

If the port names in the XML configuration file are different than on the target model, then rename the ports for the following sections so that the new names correspond to the intended ports on the target model.

- SystemConfiguration/LldpGroup/LldpConfig/LldpPorts/Port/PortNumber
- SystemConfiguration/MirrorGroup/MirrorConfig/Destination

- SystemConfiguration/NLinkGroup/NLinkConfig/ControlPort
- SystemConfiguration/NLinkGroup/NLinkConfig/CouplerPort
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Portx
- SystemConfiguration/NringGroup/NringConfig/NringPortSets/Porty
- SystemConfiguration/PoeMgmtGroup/PoeMgmtConfig/PoePorts/PortNumber (PoE models only)
- SystemConfiguration/PortGroup/PortConfig/Ports/Port/PortNumber
- SystemConfiguration/PortSecGroup/PortSecConfig/PortSecList/PortSecEntry/PortNumber
- SystemConfiguration/PtpGroup/PtpConfig/BoundaryClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/PtpGroup/PtpConfig/TransparentClock/PtpPorts/Port/PortNumber (when PTP is licensed)
- SystemConfiguration/RateLimitGroup/RateLimitConfig/RateLimits/Limit/PortNumber
- SystemConfiguration/RstpGroup/RstpConfig/RstpPorts/Port/PortNumber

Depending on the exported values, some of the following sections in the XML configuration file may also need to have their ports renamed.

- SystemConfiguration/BridgingGroup/BridgingConfig/MulticastFilters/PortList
- SystemConfiguration/BridgingGroup/BridgingConfig/UnicastFilters/PortNumber
- SystemConfiguration/IgmpGroup/IgmpConfig/ManualRouterPorts
- SystemConfiguration/IgmpGroup/IgmpConfig/RFilterPorts
- SystemConfiguration/MirrorGroup/MirrorConfig/RxSourcePorts
- SystemConfiguration/MirrorGroup/MirrorConfig/TxSourcePorts
- SystemConfiguration/NViewGroup/NViewConfig/SendAutocastPorts
- SystemConfiguration/NViewGroup/NViewConfig/SendMibStatsPorts
- SystemConfiguration/SecurityDot1xGroup/SecurityDot1xConfig/EnabledPorts
- SystemConfiguration/TrunkGroup/TrunkConfig/Trunks
- SystemConfiguration/VlanGroup/VlanConfig/IngressDiscardUntagged
- SystemConfiguration/VlanGroup/VlanConfig/IngressVidFilterf
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/MemberPorts
- SystemConfiguration/VlanGroup/VlanConfig/TaggedVlans/Vlan/UntagEgressPorts

Example Scenarios

MODEL OF EXPORTED CONFIGURATION FILE	TARGET MODEL	EXPECTED RESULTS OF IMPORTING XML CONFIGURATION FILE
NT24k-DR16	NT24k-DR24	Import successful; Last 8 ports on target model will reset to default values if the mode has not been set to “Keep”.
NT24k-DR24	NT24k-DR16	Invalid port mappings
NT24k-DR16	NT24k-16TX	Invalid port names
NT24k-DR16	NT24k-8TX	Invalid port mappings and names

Appendix C

XML Configuration File

Factory Defaults

The following is a shortened example of an XML configuration file:

```
<!-- ************************************************************************
    Overview of XML settings for the N-Tron NT24k series switches
    XML settings can be downloaded to a switch to configure the switch.
    There are several top level configuration sections. Each section is optional.
    Common Attributes:
    ******************
    The following attributes are common to all sections. If omitted from a section,
      then the value from the parent section is used. If completely omitted, a
      system default value is used.

     Crc            Optional. This is not used in this release, but may be
                    used in a future release.
     CurSwVer       Optional. String representation of switch version that the
                    settings were exported from.
     Version        Optional. If present, represents the version of the
                    section. If not present, the default value is used instead
                    of being inherited from the parent section.
                    Default = "1".
     MinSwVer       Optional. String representation of switch version. If
                    present, ignore settings for the section if switch
                    software version does not meet minimum requirement.
                    Default = "1.0".
     Mode           Optional. If present, determines the type of action to
                    take on existing data in the section. In the event of a
                    conflict, precedence goes to the deepest level that is
                    explicitly expressed.
                    Possible values:
                    Delete   (Default) Delete all existing data for the
                    section and replace it with the values in this section.
                    Any missing data gets set to factory default values.
                    Keep   Keep existing data, unless new values are specified
                    in this section. A factory default value is used if there
                    is no previously existing data.
     Convert        Optional. If present, determines whether data conversion
                    is performed when necessary.
                    Possible values:
                    Auto   (Default) When a data conversion is determined to
                    be necessary it will be done automatically, without any
                    user intervention.
                    No   Data conversion is not performed, but settings are
                    validated.
     ValidatePorts  Optional. If present, determines if port names or numbers,
                    within lists, that are not valid on this device should be
                    ignored or generate an error.
```

```
                    Possible values:
                    Yes   (Default) Ports are validated.
                    No   Invalid ports are ignored.
      Model         Optional. If present, represents the switch model that the
                    settings were exported from.

  Notes:
  ******
  Comments added to this file will not be preserved.
  ************************************************************************ -->
  <!-- ************************************************************************
  SystemConfiguration ******************************************************
************************************************************************** -->
  <SystemConfiguration Model="NT24k-DR16" ValidatePorts="Yes" Convert="Auto"
Mode="Delete" MinSwVer="1.0" Version="2" CurSwVer="1.9.2">
  <BridgingGroup>
       <BridgingConfig>
             <AgingTime>300</AgingTime>
             <EnableIpProbe>Disabled</EnableIpProbe>
             <MulticastFilters></MulticastFilters>
             <UnicastFilters></UnicastFilters>
       </BridgingConfig> </BridgingGroup>
  [ content intentionally omitted ]
  </SystemConfiguration>
```

For a complete example of an XML configuration file, click on the following link: http://www.redlion.net/resources/software/n-tron-software and refer to section NT24k® Industrial Ethernet Switches.

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▶▶▶ Puggable Mini-GBIC Transceivers

Gigabit Transceivers

Mini-GBIC SFP transceivers for
N-Tron's Gigabit Network Products



Gigabit SFP Fiber Transceiver Characteristics

Fiber Length	*550m for 50/125µm 275m for 62.5/125µm*	*10km*	*40km*	*80km*
TX Power Min	*-9.5dBm*	*-9.5dBm*	*-2dBm*	*0dBm*
RX Sensitivity Max	*-17dBm*	*-20dBm*	*-22dBm*	*-24dBm*
Wavelength	*850nm*	*1310nm*	*1310nm*	*1550nm*
Assumed Fiber Loss	*3.5 to 3.75 dB/km*	*0.45 dB/km*	*0.35 dB/km*	*0.25 dB/km*
Laser Type	*VCSEL*	*FP*	*DFB*	*DFB*

Variety and Flexibility

Pluggable mini-GBIC transceivers from N-Tron® fully comply with strict industry standards to ensure robust functionality in fiber optic networks. All modules are designed with high-performance industrial features, including expanded temperature ranges, to operate reliably under harsh conditions. N-Tron's SFPs may be used in combination on each switch. Varieties include 1000Base-T, 1000Base-SX and 1000Base-LX.

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
NTSFP-TX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseT GB Copper Port (up to 100 meters)
NTSFP-SX	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseSX Multimode GB Fiber Optic Port
NTSFP-LX-ZZ ZZ = 10, 40, or 80 km	Optional SFP (Mini-GBIC) Transceiver with One 1000BaseLX Singlemode GB Fiber Optic Port

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Product brochure

1.5 – 6 kVA



Eaton 9PX lithium-ion UPS

Double-conversion UPS that offers a set it and forget it deployment

The 9PX lithium-ion UPS is part of the Eaton 9 series single-phase double-conversion UPS line, best applied to mission-critical equipment for constant power conditioning. The 9PX lithium-ion UPS provides 8 to 10 years of life expectancy for UPS and its batteries, and has power ratings ranging from 1–6 kVA, while also offering up to four external battery modules (EBM) for extra runtime. The 9PX lithium-ion UPS has the same reliable features as the 9PX lead-acid UPS, including load segments for prioritized shutdowns, remote power on (RPO), remote on/off (ROO) and output relay ports that increase control capabilities. For connectivity, the 9PX is compatible with the Gigabit Network Card (NETWORK-M2), which is the first UPS connectivity device to meet both UL and IEC cybersecurity standards. This network interface card improves power system reliability by providing warnings of pending issues and helping to perform orderly graceful shutdown of servers and storage.



2U UPS with 1U EBM in 4-post rack

Key features and benefits

Save money

- **2-3X longer battery life:** minimize battery maintenance expense—ideal for large deployments and edge applications
- **Runtime:** UPS provides up to 2–3X more runtime at full load compared to lead-acid batteries
- **Warranty:** 5-year all-inclusive (electronics and battery) warranty

Save space

- **1U lithium EBM vs 2U lead-acid EBM** (1–3 kVA models)
- **2U lithium EBM vs. 3U lead-acid EBM** (6 kVA model)
- **Lightweight design** up to 40% less weight than a comparable lead-acid UPS allowing easier installation and saving time

Reduce risk

- **24/7 monitoring:** battery management system (BMS) improves reliability and performance by actively monitoring temperature and charge
- **Cybersecure:** remote monitoring service and network connectivity card options provide cybersecurity protection and keeps you connected with your UPS status updates
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The power of predictability.

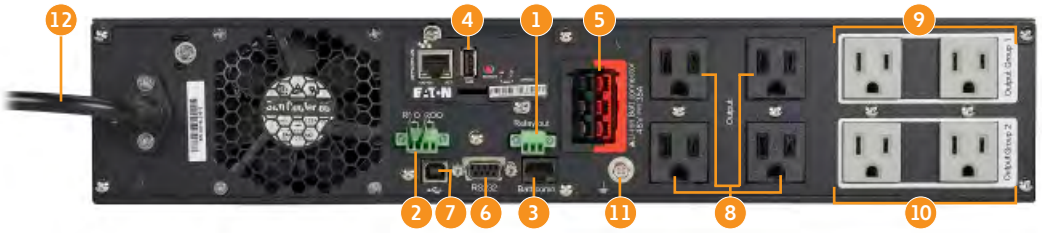
Our Remote Monitoring Service, also known as PredictPulse, is the industry's first cloud-based 24x7 remote monitoring and predictive analytics subscription service to forecast data center power component failure and proactively replace components before failure. This software enables you to:

- **Focus** on other critical IT tasks while our experts remotely monitor your IT infrastructure power quality equipment around the clock and dispatch field service technicians when needed
- **Eliminate** surprise maintenance expenses— this subscription-based service includes parts, labor, on-going preventive maintenance and expedited repairs
- **Propriety algorithms**, based on data from thousands of installed devices, predict UPS component failure so we can proactively replace parts before issues arise

Learn more at Eaton.com/RemoteMonitoringService

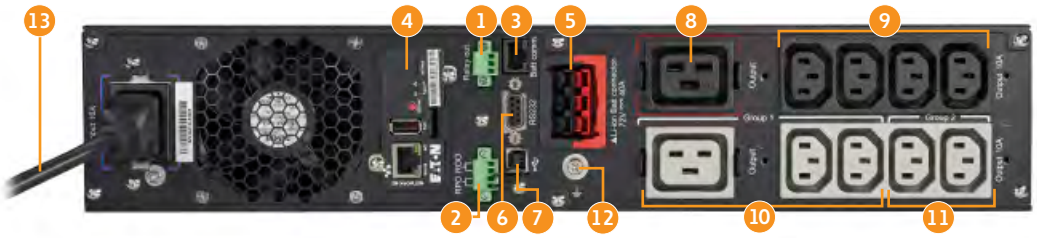
Rear panel overview

Model 9PX1500RT-L



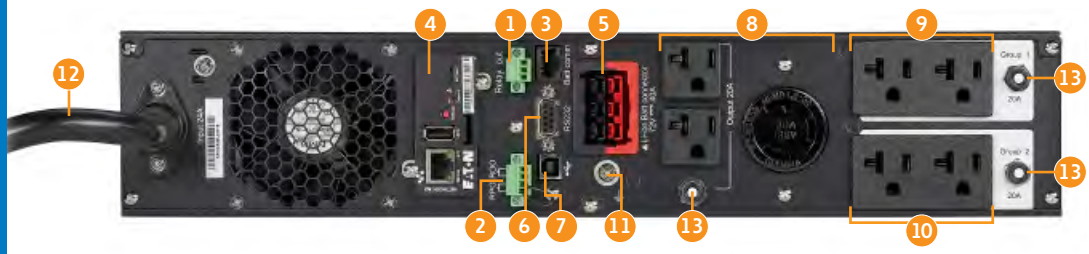
1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-15R managed outlets (primary group)
9. (2) 5-15R (load segment group 1)
10. (2) 5-15R (load segment group 2)
11. Ground bonding screw
12. 8-feet line cord with 5-15P

Model 9PX2200GRT-L and 9PX3000GRT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (1) C19 outlet
9. (4) C13 managed outlets (primary group)
10. (1) C19 and (2) C13 managed outlets (load segment group 1)
11. (2) C13 managed outlets (load segment group 2)
12. Ground bonding screw
13. C20/L6-20P input connection (detachable L6-20P to C19 input cord is 6-feet long)

Model 9PX3000RT-L



1. Output relay port
2. Remote power off (RPO) and remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card (optional)
5. EBM connector
6. RS-232 serial communication port (cable included)
7. USB port (cable included)
8. (2) 5-20R and (1) L5-30R managed outlets (primary group)
9. (2) 5-20R managed outlets (load segment group 1)
10. (2) 5-20R managed outlets (load segment group 2)
11. Ground bonding screw
12. L5-30P input cord (8-feet long)
13. AC output branch protector

For additional rear panel views, please visit **Eaton.com/9PX.**

9PX 1 to 3 kVA lithium-ion rackmount and tower model selection guide

The 9PX lithium-ion comes as a stand-alone UPS or as part of a network bundle for easy configuration and deployment. For complete specifications, including interactive battery runtime graphs, visit **Eaton.com/9PX.**

120V (default), 100V, 110V, 115V, 125V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RT-L	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	35.5
9PX2000RT-L	2000 / 1800	5-20P, 8 ft.	(1) L5-20R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	50.6
9PX3000RT-L	3000 / 2700	L5-30P, 8 ft.	(1) L5-30R, (6) 5-20R	3.41 (2U) x 17.32 x 23.83	52.7

Global UPS, 208V (default), 230V, 240V RT models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500GRT-L	1500 / 1350	C14	(8) C13	3.41 (2U) x 17.32 x 17.72	34.8
9PX2200GRT-L	2200 / 2000	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	48.6
9PX3000GRT-L	3000 / 2700	C20 / L6-20P	(8) C13, (2) C19	3.41 (2U) x 17.32 x 23.83	50.2

120V (default), 100V, 110V, 115V, 125V RT network card bundles

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX1500RTN-L (includes NETWORK-M2 network card)	1500 / 1350	5-15P, 8 ft.	(8) 5-15R	3.41 (2U) x 17.32 x 17.72	36.5
9PX2000RTN-L (includes NETWORK-M2 network card)	2000 / 1800	5-20P, 8 ft.	(6) 5-20R, (1) L5-20R	3.41 (2U) x 17.32 x 23.83	51.6
9PX3000RTN-L (includes NETWORK-M2 network card)	3000 / 2700	L5-30P, 8 ft.	(6) 5-20R, (1) L5-30R	3.41 (2U) x 17.32 x 23.84	53.7

9PX 1 to 3 kVA lithium-ion extended battery module (EBM) options

Catalog number	Description	Rack size	Weight, lb.
9PXEBM48RT-L	Extended battery module for 9PX1500RT-L and 9PX1500GRT-L	1U	36.5
9PXEBM72RT-L	Extended battery module for 9PX2000RT-L, 9PX2200GRT-L, 9PX3000RT-L and 9PX3000GRT-L	1U	46.6

Power distribution (PDU) and maintenance bypass (MBP) options

Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.
EHBPL1500R-PDU1U	HotSwap MBP for use with 9PX1500RT-L, 9PX1500GRT-L	5-15P	(6) 5-15R	2.1 (2U) x 17.3 x 3.8
EHBPL2000R-PDU1U	HotSwap MBP for use with 9PX2000RT-L, 9PX2200GRT-L	5-20P	(6) 5-20R	2.1 (2U) x 17.3 x 3.8
EHBPL3000R-PDU1U	HotSwap MBP for use with 9PX3000RT-L, 9PX3000GRT-L	L5-30P	(5) 5-20R	2.1 (2U) x 17.3 x 3.8
PDUV20-72	Basic PDU	L5-20P	(36) 5-15/20R	72.47 x 1.50 x 1.64
PDU2430	Basic PDU	L5-30P	(24) 5-15R	1.75 x 17.25 x 4.50
PDUV20HVL6-72	Basic PDU	L6-20P	(32) C13, (6) C19	63.75 x 3.50 x 2.25
EATS115	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-15P	(10) 5-15R	1.7 (1U) x 17.25 x 9.94
EATS120	Eaton ATS, 120V, 1U rackmount PDU	(2) 5-20P	(10) 5-20R	1.7 (1U) x 17.25 x 9.84

* For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2*	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PA	1U two-post rail kit (optional for EBM)
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

* Included with N and 6K models

What's in the box

- 9PX UPS
- RS-232 communication cable
- USB communication cable
- Software leaflet
- Safety instructions
- Quick start guide
- 4-post mounting rail kit for 19-inch enclosures
- 2 pedestals for tower position
- Gigabit Network Card (NETWORK-M2) – included with N and 9PX6K-L models

Lithium-ion vs lead-acid

Characteristic	VRLA (lead-acid) battery	Lithium-ion battery	Lithium-ion benefit
Average battery lifespan	3–5 years	8-10 years	**2–3X longer life**
Weight	43–150 lb.	34.8–79 lb.	**20% lighter UPS, 40% lighter EBM**
EBM footprint	2U 3U	1U (1–3 kVA models) 2U (6 kVA model)	**Increased U space for critical equipment**
Warranty	2 years	5 years	**2.5X warranty coverage**
Battery replacement cost	$650*	$0	**Reduced TCO**

* Battery and labor cost for one replacement



Eaton's Gigabit Network Card adds advanced control with IPM software allows for remote management and integration into leading virtualization platforms **Eaton.com/Network-M2**

9PX 6 kVA lithium-ion rackmount and tower model selection guide

Global UPS, 208V (default) 200V, 208V, 220V, 230V, 240V models

Catalog number	Rating (VA/Watts)	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
9PX6K-L	6000 / 5400*	L6-30P, 10 ft. Hardwire	(2) L6-30R (2) L6-20R Hardwire	5.12 x 17.33 x 28.43	81.2

* Derated at 200, 208, 220V. See 9PX6K-L technical specifications for full information.

9PX 6 kVA lithium-ion extended battery module (EBM) and accessories

Catalog number	Description	Rack size	Weight, lb.
9PXEBM192RT-L	Extended battery module for 9PX6K-L	2U	79
EBMCBL192-L	EBM cable extension, 6 feet (1.8 meters)		

Power distribution (PDU), maintenance bypass (MBP), PowerPass distribution (PPDM) and transformer options

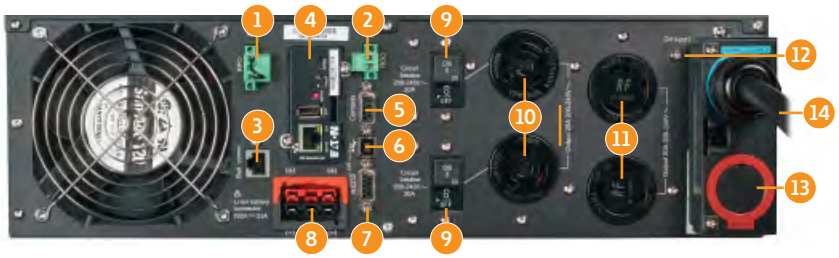
Catalog number	Description	Input connection	Output connections	Dimensions (H x W x D), in.	Weight, lb.
MBP6K208	208V maintenance bypass module	L6-30P*	(2) L6-30R Hardwired	5.1 (3U) x 7.0 x 4.3	5.5
PDUV30HV	Basic PDU	L6-30P	(32) C13, (6) C19	63.75 x 3.5 x 2.25	8
PDU1230	Basic PDU	L6-30P	(16) C13, (4) C19	1.75 (1U) x 17.5 x 5.2	7.5
9PXTFMR5	9PX stepdown transformer	L6-30P	(18) 5-20R	5.1 (3U) x 17.3 x 25.4	95
9PXPPDM1	9PX PowerPass distribution module	L6-30P	(1) L6-30R, (1) L14-30R, (6) 5-20R outlets	5.1 (3U) x 17.3 x 25.4	97
9PXPPDM2	9PX PowerPass distribution module	Hardwired	Hardwired	5.1 (3U) x 17.3 x 25.4	95

* Terminal block with L6-30P cord (included with UPS)
For additional Eaton PDU options, please visit **Eaton.com/RackPDUSelector**

Catalog number	Description
NETWORK-M2	Gigabit Network Card (with UL 2900-1 and IEC 62443-4-2 cybersecurity certifications)
EMPDT1H1C2	Environmental Monitoring Probe (EMP) Gen 2 for use with NETWORK-M2
RELAY-MS	Relay / Serial Interface Card
Mounting hardware	
RK2PC	2-post rack mounting rail kit (one kit required for each UPS)
BINTSYS	Battery integration – vertical mounting platform with wheels

Rear panel overview

Model 9PX 6 kVA lithium-ion UPS



1. Remote power off (RPO) port
2. Remote on/off (ROO) port
3. External battery module (EBM) detection port
4. NETWORK-M2 card
5. Output relay contact – DB-9 dry contact
6. USB port (cable included)
7. RS-232 serial communication port (cable included)
8. EBM connector
9. Output circuit breaker protection
10. (2) L6-20R
11. (2) L6-30R
12. Ground bonding screw
13. Output terminal block for hardwired applications
14. 10-foot line cord with L6-30P

To view battery runtimes and interact with the Eaton 9PX lithium-ion UPS, please visit: **Eaton.com/9PX**

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Powering Business Worldwide

Eaton 9PX Li-Ion UPS technical specifications (1500-3000 VA 2U models[1])

Model overview

Catalog number	Power rating (VA/ watts)	Input connection	Output receptacles	Dimensions (HxWxD, in.)[2]	Weigh t (lb.)
120V output, 50/60 Hz					
9PX1500RT-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	35.5
9PX1500RTN-L	1500/1350	5-15P[3]	(8) 5-15R	3.4 (2U) x 17.3 x 17.7	36.5
9PX2000RT-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	50.6
9PX2000RTN-L	2000/1800[5]	5-20P[3]	(6) 5-20R, (1) L5-20R	3.4 (2U) x 17.3 x 23.8	51.6
9PX3000RT-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	52.7
9PX3000RTN-L	3000/2700[5]	L5-30P[3]	(6) 5-20R, (1) L5-30R	3.4 (2U) x 17.3 x 23.8	53.7
208V output, 50/60 Hz bundles					
9PX1500GRT-L	1500/1350[4]	C14	(8) C13	3.4 (2U) x 17.3 x 17.7	34.8
9PX2200GRT-L	2200/2000[5]	C20 / L6-20P[5]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	48.6
9PX3000GRT-L	3000/2700[6]	C20 / L6-20P[4]	(8) C13, (2) C19	3.4 (2U) x 17.3 x 23.8	50.2

Additional specifications

General	
Topology	Double-conversion, online
Configuration	Rack/tower
Color	Black and silver
Diagnostics	Full system self-test at power up
Warranty	5 years electronics and battery
Rail kit	4-post rail kit included; Max length:30.0in, Min length:17.4in Tower ped estals includ ed *Optional 2-post rail kit available, part number: RK2PC(UPS) and RK2PA(EBM)*
Remote power off	Remote On/Off (ROO) and Remote Power Off (RPO) rear terminal blocks
Contents (Ships with the following items)	UPS 4-post rail kit Safety manual Output cables (for G models) Input cables (for G models) Cable lockers (for G models) Tower pedestals RS-232 serial cable USB cable

1. Due to continuing product improvement programs, specifications are subject to change without notice.
2. Each 9PX and EBM ships with a 4-post rail kit.
3. Input line cord is 8 feet long.
4. 1500 VA Global model wattage: 200V, 208V: input limited to 1350 watts; 220V, 230V, 240V: 1500 watts
5. C19 to L6-20P input cord is 6 feet long.
6. Models derated at lower voltag es due to input cord limitations. See Power ratings table below for further details.

	Communication card (optional)	
Electrical input	208V	120V
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Input voltage range	Full load: 176-276V, <40% load: 100-276V	Full load: 100-144V, <30% load: 60-144V
Freq uency	50/60 Hz	
Freq uency range	60 Hz: 50–70 Hz, 50 Hz: 40–60 Hz	
Input power factor	≥.99	
Input current distortion	≤5% (≤10% frequency converter mode)	
Circuit breaker	1500VA: None 2200VA: None 3000VA: None	1500VA: None 2000VA: None 3000VA: (3) 20A for (2) 5-20R each
Electrical output	208V	120V
Power ratings	9PX1500GRT-L 220/230/240V: 1500VA / 1500W 200/208V: 1500VA / 1350 9PX2200GRT-L: 220/230/240V: 2200VA / 2200W 208/200V: 2200VA / 2000W 9PX3000GRT-L: 220/230/240V: 3000VA / 3000W 208/200V: 3000VA / 2700W	9PX1500RT-L: 120/125V: 1500VA / 1350W 110V: 1350VA / 1215W 100V: 1200VA / 1080W 9PX2000RT-L: 120/125V: 2000VA / 1800W 110V: 1800VA / 1620W 100V: 1600VA / 1440W 9PX3000RT-L: 120/125V: 3000VA / 2700W 110V: 2700VA / 2430W 100V: 2400VA / 2160W
Nominal voltage	208V default (200/208/220/230/240V)	120V default (100/110/120/125V)
Output voltage regulation, steady state	±1% normal mode ±2% battery mode	
Voltage THD (online)	Linear: 3% Non-linear: 5%	
Power factor	0.9	
Efficiency	9PX1500GRT-L: 92% online 9PX2200GRT-L: 93% online 9PX3000GRT-L: 93.7% online	9PX1500RT-L: 90% online 9PX2000RT-L: 91.4% online 9PX3000RT-L: 91.6% online
Transfer time	0 ms	
Battery		
Optional extended battery module (EBM)	9PXEBM48RT-L: 1500 VA models (1U form factor) 9PXEBM72RT-L: 2000-3000 models (1U form factor)	
Maximum number of EBMs	Add up to 4 EBMs	
Battery description	Lithium Ion, LiFePO4 chemistry	
Battery management	BMS: Advanced battery man ag ement with health monitoring and prediction features	
Battery replacement	Hot-swappable internal batteries and EBMs	
Start on battery	Cold-start en abled; first cold start is always forbidden	
Communications		
User interface	Graphical display. UPS status in a single view.	
LEDs	4 status-indicating LEDs	
Communication ports	RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables includ ed	

Communications card	Network Card-M2 optional, stan dard on network bundles (bun dled models include an N)	
Power management software	Integrates with Eaton Intelligent Power Manager software	
Environmental & standards		
RoHS compliance	Yes	
Surge protection	MOV: 510V, 296Joules	MOV ratings : 271Volt (from L-N) and 510 Volt (from L-G and N-G), 190 Joules
EMC markings	IEC 62040-2 Class B Cat C2 / CISPR22 Class B / FCC part 15 Class B / VCCI Class B	IEC 62040-2 Cat C1 / CISPR22 / FCC part 15 Class B / VCCI Class B
Heat dissipation (BTU)	9PX1500GRT: 494 online, 731 battery 9PX2200GRT: 513 online, 741 battery 9PX3000GRT: 619 online, 1150 battery	9PX1500RT: 512 online, 897 battery 9PX2000RT: 578 online, 974 battery 9PX3000RT: 844 online, 1462 battery
Audible noise	≤47 dB at 1 meter	
Operating temperature	0 to 40°C (32°F to 104°F)	
Altitude operating temperature range	0-1500m @ 0°C - 40°C 1500m-3000m @ 0°C - 35°C	
Safety conformance	CE / cULus	CE / cULus / NOM
Storage temperature	-20 to 35°C (-4°F to 95°F); without batteries: -13 to 55°C (5°F to 131°F)	
Relative humidity	0 to 96% non-condensing	

9PX Li-Ion 1-3kVA Battery Backup Times (in minutes)**

Load(Watts)	Internal batteries	+1 EBM	+2 EBMs	+3 EBMs	+4 EBMs
9PX1500RT-L					
1350	11.2	30.0	47.1	64.3	81.4
1215	12.6	33.5	52.7	71.9	91.0
1080	14.2	38.0	59.7	81.4	103.0
945	16.3	43.5	68.4	93.3	118.1
810	19.1	50.8	79.8	108.9	137.9
675	22.9	61.0	95.9	130.7	165.6
540	28.1	74.8	117.6	160.3	203.1
405	37.0	98.6	154.9	211.2	267.5
270	54.4	145.2	228.1	311.0	394.0
9PX1500GRT-L					
1350	12.0	31.9	50.2	68.4	86.7
1215	13.3	35.5	55.8	76.0	96.3
1080	15.0	39.9	62.7	85.4	108.2
945	17.0	45.2	71.0	96.9	122.7
810	19.7	52.5	82.5	112.5	142.5
675	23.4	62.5	98.2	133.9	169.6
540	28.7	76.4	120.1	163.8	207.5
405	37.1	99.0	155.6	212.1	268.7
270	52.0	138.7	218.0	297.3	376.6
9PX2000RT-L					
1800	13.6	36.3	57.0	77.8	98.5
1620	15.2	40.4	63.5	86.6	109.7
1440	17.1	45.5	71.6	97.6	123.6

1260	19.5	52.0	81.7	111.4	141.1
1080	22.6	60.3	94.8	129.3	163.8
900	27.1	72.3	113.6	154.8	196.1
720	33.5	89.3	140.3	191.4	242.4
540	43.8	116.7	183.4	250.1	316.8
360	62.6	167.0	262.4	357.8	453.2
9PX2200GRT-L					
2000	12.3	32.8	51.5	70.2	88.9
1800	13.6	36.3	57.1	77.8	98.6
1600	15.2	40.6	63.8	87.0	110.2
1400	17.3	46.2	72.6	99.0	125.4
1200	20.2	53.8	84.5	115.3	146.0
1000	23.9	63.8	100.3	136.7	173.2
800	29.4	78.4	123.1	167.9	212.7
600	38.2	101.8	159.9	218.1	276.2
400	54.3	144.7	227.4	310.1	392.9
9PX3000RT-L					
2700	9.1	24.1	37.9	51.7	65.5
2400	10.2	26.9	42.2	57.6	72.9
2160	11.3	30.3	47.7	65.0	82.3
1890	12.9	34.7	54.5	74.3	94.1
1620	14.8	40.4	63.5	86.5	109.6
1350	18.0	48.3	75.9	103.5	131.1
1080	23.0	59.9	94.2	128.4	162.6
810	28.0	79.1	124.3	169.5	214.7
540	43.0	114.3	179.5	244.8	310.1
9PX3000GRT-L					
2700	9.1	24.2	38.0	51.8	65.6
2400	10.5	26.9	42.2	57.5	72.9
2160	11.3	30.2	47.5	64.7	82.0
1890	12.8	34.6	54.4	74.2	94.0
1620	14.9	40.3	63.3	86.3	109.4
1350	18.0	47.9	75.3	102.7	130.0
1080	23.0	59.4	93.4	127.4	161.4
810	30.0	77.6	121.9	166.3	210.6

**Runtimes shown at full load with maximum power factor, are approximate and may vary with equipment, configuration, battery age, temperature, etc. View interactive graphs at www.eaton.com/9PX

Product specifications

Eaton 9PX3000RT-L

Catalog Number: 9PX3000RT-L

Eaton 9PX lithium ion UPS, 2U, 3000 VA, 2700 W, L5-30P input, Outputs: (6) 5-20R, (1) L5-30R, 120 V

General specifications

Product Name	**Catalog Number**
Eaton 9PX UPS	9PX3000RT-L
UPC	**Product Length/Depth**
743172105387	23.82 in
Product Height	**Product Width**
3.41 in	17.32 in
Product Weight	**Warranty**
52.8 lb	5 year limited
Compliances	**Certifications**
CE Marked FCC part 15 Class B IEC 62040-2 Cat C1	cULus Listed NOM

Battery

Runtime graph

View runtime graph

Battery management

Integrated battery management system (BMS) for temperature regulation and life cycle monitoring

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Extended battery capability

Add up to 4 extended battery modules (EBM). Part number 9PXEBM72RT-L

Electrical output

Receptacle

(6) 5-20R, (1) L5-30R, 120V

Topology

Online/Double-conversion

Wattage

2700 W

VA rating

3000 VA

Output waveform

True sine wave

Voltage

120V

Output power factor

0.9

Output nominal voltage

120V default (100/110/120/125V)

Output voltage range

±1% steady-state

Output frequency

50/60 Hz

Electrical input

Input connection

L5-30P

Input cord length

8 ft

Input nominal voltage

120V default (100/110/120/125V)

Input frequency range

60 Hz: 50-70 Hz, 50 Hz: 40-60 Hz

Input power factor

>0.99 typical

Communications

Communication

RS-232 (RJ45) ports; USB port as standard (HID). 6-foot RS-232 and USB cables included

Expansion slots

(1) Mini-Slot (MS) expansion port. The following optional connectivity cards may be ordered separately.
Gigabit Network Card part number: NETWORK-M2
Modbus card part number: INDGW-M2
Relay card part number: RELAY-MS

Software compatibility

Intelligent Power Software Suite

User interface

Graphical display, 5-button programmable menu

Environmental

Altitude

0-1500m (0° to 40°C), 1500-3000m (0° to 35°C)

BTU Rating

Online: 844, Battery: 1462

Noise level

<47 dB at 1 meter

Relative humidity

0-96% non-condensing

Temperature range

0° to 40°C (32° to 104°F)

Additional specifications

Form factor

Rack/tower

Rack size

2U

Rack mounting kit

Yes

Efficiency

91 %

Package contents

UPS
Quick start guide
Safety instructions
USB communciation cable
RS-232 serial communication cable
4-post rail for 19-inch enclosures
Software leaflet
Software leaflet
2 pedestals for tower poition

Internal bypass

Yes

Warranty and support

Standard factory warranty

5-YEAR FACTORY WARRANTY
- 5 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Resources

Application notes

9PX3000RT-L runtime graph

Brochures

Eaton 9PX lithium-ion UPS brochure

Competitive comparisons

9PX Lithium-ion UPS Competitive Comparison Battlecard

Drawings

Eaton 9PX lithium-ion 2-3 kVA 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

Eaton Specification Sheet - 9PX3000RT-L

Eaton 9PX lithium-ion UPS guide specification: 1-3 kVA

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide



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Eaton House
30 Pembroke Road
Dublin 4, Ireland
Eaton.com

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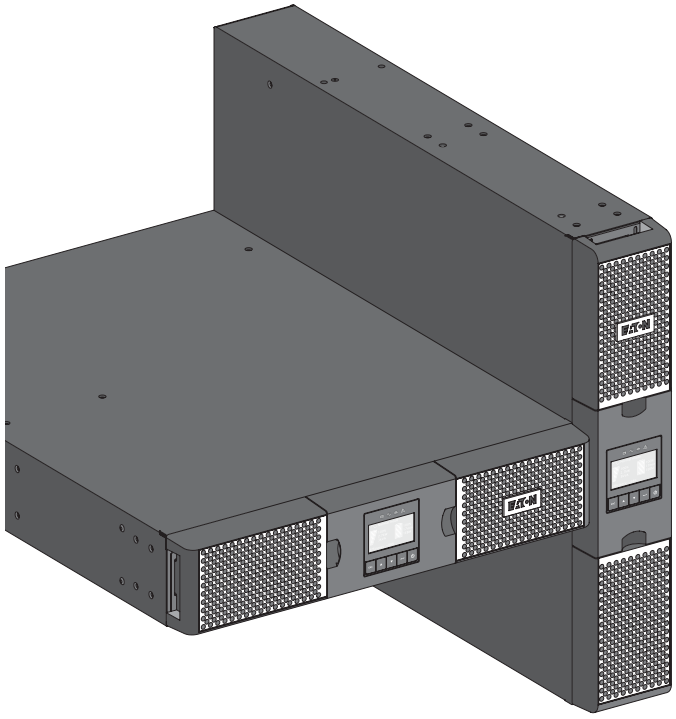
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Eaton 9PX Lithium-Ion

Advanced Users Guide



9PX1500RT-L
9PX2000RT-L
9PX3000RT-L
9PX1500GRT-L
9PX2200GRT-L
9PX3000GRT-L
9PXEBM48RT-L
9PXEBM72RT-L

Powering Business Worldwide

p/n: P-164001006
Revision 06

Safety Instructions

SAVE THESE INSTRUCTIONS.

This manual contains important instructions **that should be followed during installation and maintenance of the UPS and batteries.**

The 9PX models that are covered in this manual are intended for installation n an environment within 0 to 40°C, free of conductive contaminant.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to IEC62040-2 & FCC standards. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Special Symbols

The following are examples of symbols used on the product to alert you to important information:



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



CAUTION: REFER TO OPERATOR'S MANUAL - Refer to your operator's manual for additional information, such as important operating and maintenance instructions.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

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Safety of Persons

- The system has its own power source (the battery). Consequently, the power outlets may be energized ven if the systems is disconnected from the AC power source. Dangerous voltage levels are resent within the system. It should be opened exclusively by qualified service personnel.
- The system must be properly grounded at all times.
- The battery supplied with the system contains small amounts of toxic materials. To avoid accidents, the directives listed below must be observed:
  - Servicing of batteries should be performed or supervised by personnel knowledgeable about batteries and the required precautions.
  - When replacing batteries, replace with the same type and number of batteries or battery packs.
  - Do not dispose of batteries in a fire. The batteries may explode.
  - Batteries constitute a danger (electrical shock, burns). The short-circuit current may be very high.
- Precautions must be taken for all handling:
  - Wear rubber gloves and boots.
  - Do not lay tools or metal parts on top of batteries.
  - Disconnect charging source prior to connecting or disconnecting battery terminals.
  - Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).

Product Safety

- To connect the UPS, instructions and operation described in the manual must be followed in the indicated order.
- CAUTION - To reduce the risk of fire, the unit connects only to a circuit provided with 20 or 30 amperes maximum branch circuit overcurrent protection in accordance with the National Electric Code, ANSI/NFPA 70 (US installations only).
- Check that the indications on the rating plate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the system.
- For PLUGGABLE EQUIPMENT, the socket-outlet shall be installed near the equipment and shall be easily accessible
- Never install the system near liquids or in an excessively damp environment.
- Never let a foreign body penetrate inside the system.
- Never block the ventilation grates of the system.
- Never expose the system to direct sunlight or source of heat.
- If the system must be stored prior to installation, storage must be in a dry place.
- The admissible storage temperature range is -25ºC to +55ºC without batteries, 0°C to 40°C with batteries.
- The system is not for use in a computer room AS DEFINED IN the standard for the Protection of Information Technology Equipment, ANSI/NFPA 75 (US installations only).

Special Precautions

- The unit is heavy: wear safety shoes and use vacuum lifter preferentially for handling operations.
- All handling operations will require at least two people (unpacking, lifting, installation in rack system).
- Before and after the installation, if the UPS remains de-energized for a long period, the UPS must be energized for a period of 24 hours, at least once every 6 months (for a normal storage temperature less than 25°C). This charges the battery, thus avoiding possible irreversible damage.
- During the replacement of the Battery Module, it is imperative to use the same type and number of element as the original Battery Module provided with the UPS to maintain an identical level of performance and safety. If there are any questions, don't hesitate to contact your local EATON representative.
- All repairs and service should be performed by AUTHORIZED SERVICE PERSONNEL ONLY. There are NO USER SERVICEABLE PARTS inside the UPS.
- For potential safety issue on defective UPS : DISCONNECT INTERNAL BATTERY for storage and transportation.

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Chapter 1 Introduction

1.1 Overview

1.2 Environmental Protection

EATON has implemented an environmental-protection policy.

Products are developed according to an eco-design approach.

Substances

This product does not contain CFCs, HCFCs, or asbestos.

Packing

To improve waste treatment and facilitate recycling, separate the various packing components.

- The cardboard we use comprises over 50% of recycled cardboard.
- Sacks and bags are made of polyethylene.
- Packing materials are recyclable and bear the appropriate identification symbol 

Table 1. Packing Material Symbols

Materials	Abbreviations	Number in the symbols
Polyethylene terephthalat	PET	01
High-density polyethylene	HDPE	02
Polyvinyl chloride	PVC	03
Low-density polyethylene	LDPE	04
Polypropylene	PP	05
Polystyrene	PS	06

Follow all local regulations for the disposal of packing materials.

End of Life

Eaton will process products at the end of their service life in compliance with local regulations. Eaton works with companies in charge of collecting and eliminating our products at the end of their service life.

Product

The product is made up of recyclable materials.

Dismantling and destruction must take place in compliance with all local regulations concerning waste. At the end of its service life, the product must be transported to a processing center for electrical and electronic waste.

Battery

The product contains lithium-ion (LFP) batteries that must be processed according to applicable local regulations concerning batteries.

The battery may be removed to comply with regulations and in view of correct disposal.

The Eaton® 9PX uninterruptible power system (UPS) protects your sensitive electronic equipment from the most common power problems, including power failures, power sags, power surges, brownouts, line noise, high voltage spikes, frequency variations, switching transients, and harmonic distortion.

Power outages can occur when you least expect it and power quality can be erratic. These power problems have the potential to corrupt critical data, destroy unsaved work sessions, and damage hardware causing hours of lost productivity and expensive repairs.

With the Eaton 9PX, you can safely eliminate the effects of power disturbances and guard the integrity of your equipment. Providing outstanding performance and reliability, the Eaton 9PX's unique benefits include:

- True online double-conversion technology with high power density, utility frequency independence, and generator compatibility.
- Constant mode battery charger with a integrated battery management system (BMS) for temperature regulation and life cycle monitoring.
- Selectable High Efficiency mode of operation.
- Standard communication options: one RS-232 communication port, one USB communication port, and relay output contacts.
- Optional connectivity cards with enhanced communication capabilities.
- Extended runtime with up to four Extended Battery Modules (EBMs) per UPS.
- Remote On/Off control through Remote On/Off (ROO) and Remote Power Off (RPO) ports.
- Backed by worldwide agency approvals.

Chapter 2 Presentation

2.1 Standard Installations

Figure 1. Tower Installation

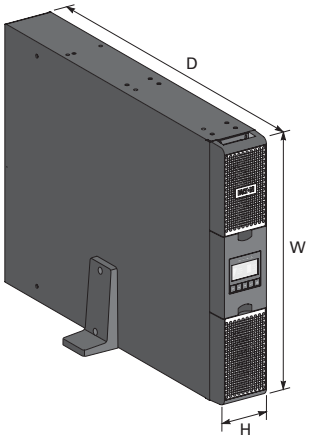


Figure 2. Rack Installation

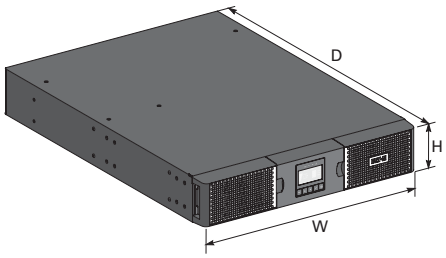
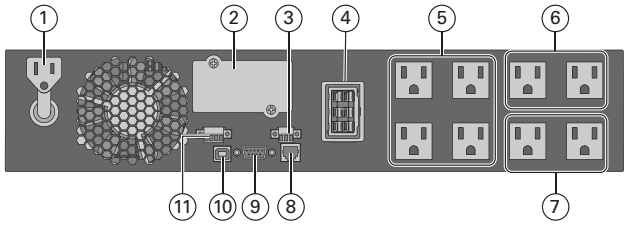


Table 2. Weights and Dimensions

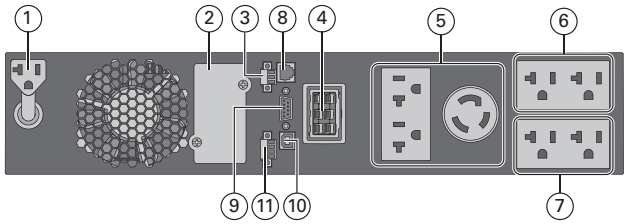
Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

2.2 Rear Panels

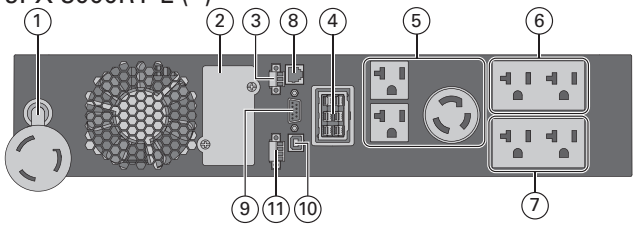
9PX 1500RT-L



9PX 2000RT-L



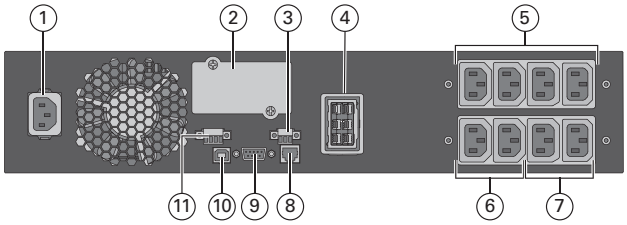
9PX 3000RT-L (*)



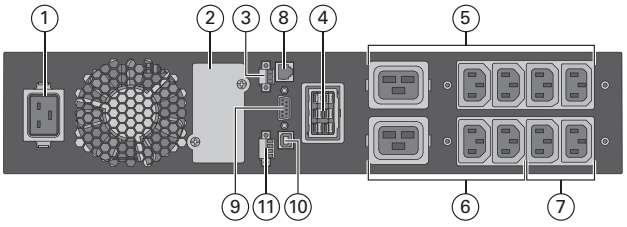
① Socket for connection to AC power source
② Slot for optional communication card
③ Relay output contact
④ Connector for additional battery module
⑤ Primary group: outlets for connection of critical equipment
⑥ Group 1: programmable outlets for connection of equipment
⑦ Group 2: programmable outlets for connection of equipment
⑧ Connector for automatic recognition of an additional battery module
⑨ RS232 communication port
⑩ USB communication port
⑪ Connector for ROO (Remote On/Off) control and RPO (Remote Power Off)

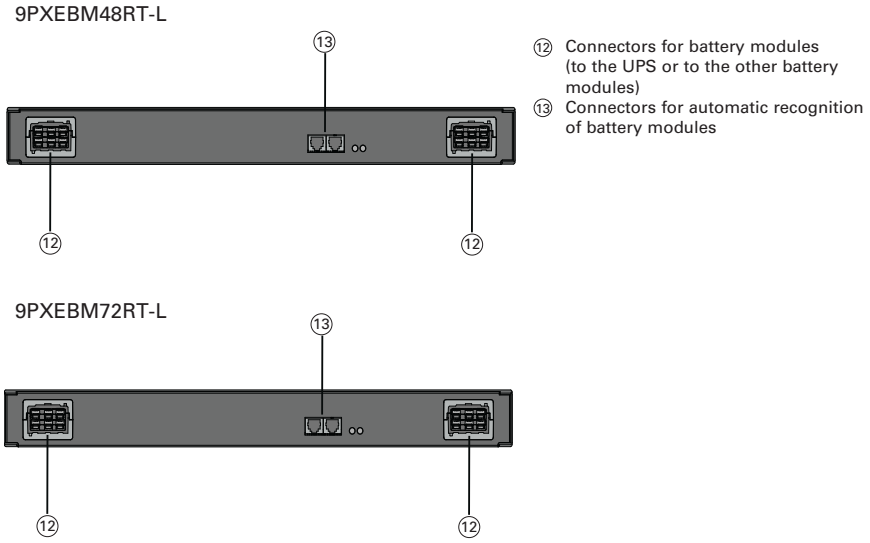
(*) Primary and Grouped outlets (⑤, ⑥, ⑦) are protected by 20A circuit breakers.

9PX 1500GRT-L



9PX 2000GRT-L & 9PX 3000GRT-L





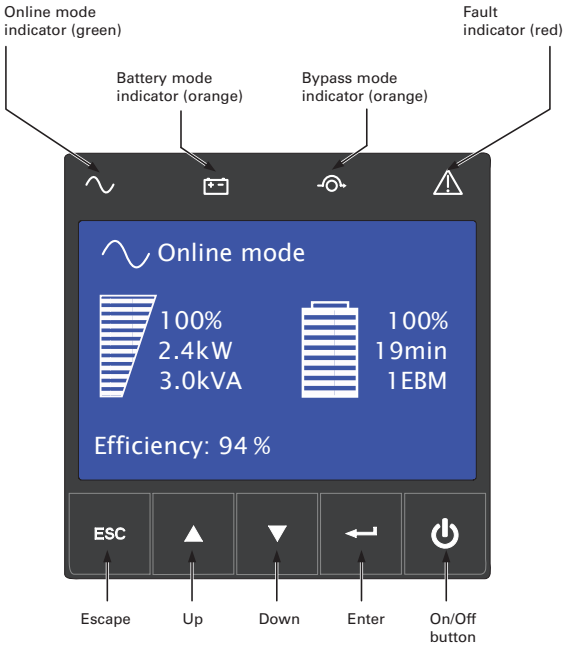
2.3 Accessories

Table 3. UPS Accessories

Part number	Description
9PXEBM48RT-L 9PXEBM72RT-L	Extended Battery Module
9RK	Rack Kit 9PX
Network-M2 / Network-M3	Network Card
INDGW-M2	Industrial Gateway Card (Modbus TCP / RTU)
Relay-MS	Relay Card

2.4 Control Panel

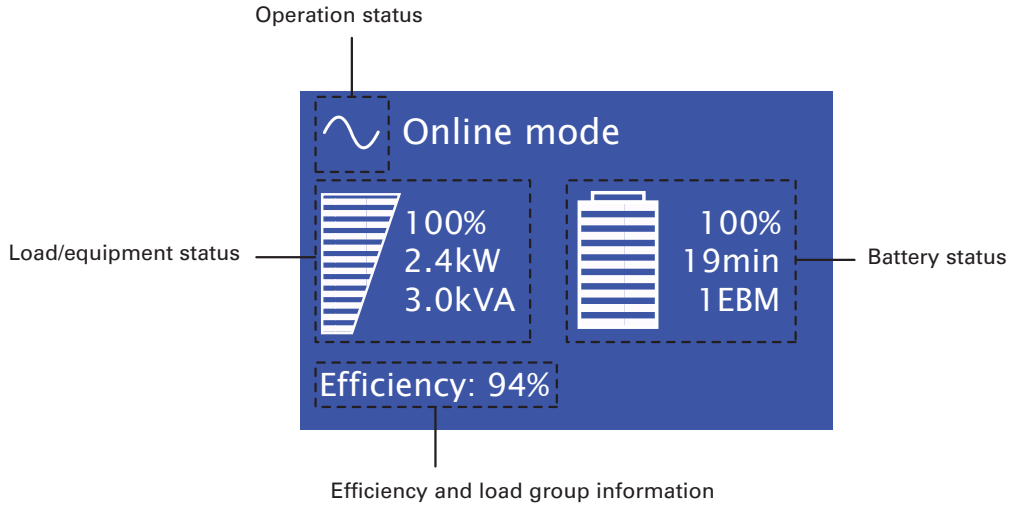
The UPS has a five-button graphical LCD. It provides useful information about the UPS itself, load status, events, measurements and settings.



Indicator	Status	Description
Green	On	The UPS is operating normally on Online or on High Efficiency mode.
Orange	On	The UPS is on Battery mode.
Orange	On	The UPS is on Bypass mode.
Red	On	The UPS has an active alarm or fault.

2.5 LCD Description

Figure 3. LCD Description



The following table describes the status information provided by the UPS

Note: If other indicator appears, see the troubleshooting for additional information.

Table 4. LCD Operating Status

Operation status	Cause	Description
Standby mode 	The UPS is Off, waiting for startup command from user.	Equipment is not powered until ⏻ button is pressed.
Online mode 	The UPS is operating normally.	The UPS is powering and protecting the equipment.
Battery mode 	A utility failure has occured and the UPS is on Battery mode.	The UPS is powering the equipment with the battery power. Prepare your equipment for shutdown.
End of backup time 	The UPS is on Battery mode and the battery is running low.	Low Battery Warning settings: [Capacity] [0%] ... [100%] [Runtime] [0mn] ... [60mn] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.

Table 4. LCD Operating Status (Continued)

Operation status	Cause	Description
High Efficiency mode 	The UPS is operating on High Efficiency mode.	The UPS is powering and protecting the equipment
Bypass mode 	An overload or a fault has occurred, or a command has been received, and the UPS is in Bypass mode.	Equipment is powered but not protected by the UPS.

2.6 Display Functions

Press the (⏎) button to activate the menu options. use the two middle buttons (▲and ▼) to scroll through the menu structure. Press the (⏎) button to select an option. Press the ESC button to cancel or return to the previous menu.

Table 5. Display Functions

Main menu	Submenu	Display information or Menu function
Measurements		[Load] W VA A pf / [Input/Output] V Hz / [Efficiency] % / [Battery] % min V n° EBM / [Battery remaining life] months / [Average power usage] Wh / [Cumulated power] Wh / BMS Information
Control	Go to Bypass	Transfers the UPS on Bypass mode
	Load segments On/Off	Commands the load segments
	Start battery test	Starts a manual battery test
	Connectivity test	Tests dry contact relay outputs and relay card contacts. Simulates line failure and battery low
	Function reset	Clears active fault, power usage, battery remaining life, reset NMC, Restore factory settings.
Settings	Local settings	Sets product general parameters
	In/out settings	Sets Input and Output parameters
	On/Off settings	Sets On/Off conditions
	Battery settings	Sets battery configuration
	Com settings	Sets communication parameters
Event Log	Event filter	Selects faults, alarms and/or events to display
	Event list	Displays the events stored
	Reset fault list	Clears events

Table 5. Display Functions (Continued)

Main menu	Submenu	Display information or Menu function
Fault log	Fault list	Displays the faults stored
	Reset fault list	Clears faults
Identification		[Product type/model] / [Part/Serial number] / [UPS/NMC firmware] / [Com card IPv4], [Com card IPv6], [Com card MAC]
Registration		Links to Eaton registration website

2.7 User Settings

The following table displays the options that can be changed by the user.

Table 6. User Settings

	Submenu	Available Settings	Default settings
Local Settings	Language	[English] [Français] [Deutsch] [Español] [Русский] [Português] [Italiano] [Simplified Chinese] [Japanese] Menus, status, notices and alarms, UPS fault, Event Log data and settings are in all supported languages.	[English] User selectable when UPS is powered for the first time.
	Date/ time	Format: [International] [US]	[US]
	LCD	Modify LCD screen brightness and contrast to be adapted to room light conditions.	
	Audible alarm	Mode: [Enabled] [Disabled on battery] [Always disabled] Enable or disable the buzzer if an alarm occurs. Level: [High] [Low]	[Enabled] [High]
	Protected access	[Enabled] [Disabled] Password is: 0577	[Disabled]
In/Out settings	Output voltage	100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V]	[120V] [208V]
	Output frequency	Mode: [Normal] [Converter] [Marine] Frequency can be changed in Frequency [Converter] mode In [Marine] mode output frequency follows input frequency	[Normal]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
	Output mode	Mode: [Industrial] [IT] [Custom] Overload: [Inv>Stop] [Inv>BP] [Inv>BP>Inv] Short-circuit: [Inv>Stop] [Inv>BP] [Inv>BP>Inv]	[IT] [Inv>BP>Inv] [Inv>Stop]
	Input volt hysteresis	Sets input voltage hysteresis from [1] to |10V]	[10V]
	High Efficiency mode	[Enabled] [Disabled] Power the output from Bypass for high efficiency	[Disabled]
	Bypass settings	[Volt low] [Volt high] [Qualify] [Hz synch] [Unsynch]	[80V] LV; [160V] HV; [144V] LV; [276V] HV; [In spec]; [5%]; [Half cycle]
	Load segments	[Auto start delay] [Auto shutdown delay]	UPS: [0s]; Group1: [3s]; Group2: [6s] UPS: [Disabled]; Group1: [Disabled]; Group2: [Disabled]
	Overload prealarm	[10%] … [102%] Load % when overload alarm occurs	[102%]
On/Off Settings	Start/Restart	[Cold start] [Auto restart] [Auto start] [Start on bypass]	[Cold start] [Auto restart] are Enabled [Auto start] [Start on bypass] are Disabled
	Forced reboot	[Enabled] [Disabled] [Timer] [10s] … [180s] When mains recover during a shutdown sequence: If set to Enabled, shutdown sequence will complete and wait 10 seconds prior to restart, If set to Disabled, shutdown sequence will not complete, UPS stays on.	[Enabled] [10s]
	Energy saving	[Enabled] [Disabled] [Timer] [1min] … [15min] [Level] [100W] … [1000W]	[Disabled] [5min] [100W]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		If Enabled, UPS will shut-down after defined duration. of back-up time, if load is less than set value.	
	Sleep mode	[Enabled] [Disabled] [Timer] [10min] … [120min] If Disabled, LCD and communication will turn OFF immediately after UPS is OFF. If Enabled, LCD and communication stays ON 1h30 min after UPS is OFF.	[Enabled] [90min]
	Site wiring fault	[Enabled] [Disabled] Prevents from starting the UPS in case of phase vs neutral wires swapping.	[Disabled]
	Power Off alert	[Enabled] [Disabled] If Enabled, activates a confirmation screen that requires user confirmation after pressing the power button, before the UPS shutdown occurs.	[Enabled]
Battery settings	Low battery warning	[Capacity] [0%] … [100%] [Runtime] [0min] … [60min] The alarm triggers when the set percentage of battery capacity or remaining back-up time is reached.	[0%] [3min]
	Restart bat. level	[0%] ... [100%] If set, automatic restart will occur only when percentage of battery charge is reached.	[0%]
Com settings	Input signals	Sets Input signals parameters (function, delay, operation) through external contact connectors or RS232. ROO port: - [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	[No]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Closed]
		RPO port:	
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	No
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [Open] [Closed]	[Open]
		DB9-4 port:	No
		- [Function]: [No] [ROO] [RPO] [Building alarm] [Forced bypass] [On generator] [Remote shutdown]	
		- [Delay]: [0s] … [999s]	[0s]
		- [Active]: [High] [Low]	[High]
	Output signals	[Relay] [DB9-1] [DB9-7] [DB9-8] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232	
		[Relay]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[Relay] [Bypass]
		[DB9-1]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-1] [Low bat]
		[DB9-7]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-7] [UPS OK]
		[DB9-8]: [On bat] [Low bat] [Bat fault] [Bypass] [UPS OK] [Load protected] [Load powered] [General alarm] [Ext. charger ON] [OVL pre-alarm]	[DB9-8] [On bat]
Com settings (cont)	Remote command	[Enabled] [Disabled] If Enabled, shutdown or restart	[Enabled]

Table 6. User Settings (Continued)

	Submenu	Available Settings	Default settings
		commands from software are authorized.	
	Shutdown commands	[Send CMD] [Output OFF] [OFF delay] [restart] Sets events or fault that will actuate Output signal parameters through external contact connector or RS232 port	
		[Send CMD]: [Yes] [No]	Send CMD: [No]
		[Output OFF]: [No] [UPS] [Group 1]	Output OFF: [No]
		[Group 2] [Group 1 + Group 2]	
		[OFF delay]: [0s] …[999s]	OFF delay: [0s]
		[Restart]: [Yes] [No]	Restart: [Yes]
	On battery notice delay	Sets delay before noticing on battery information to software.	[0s]
	General alarm	[On battery] [Battery fault]	[Internal fault]
		[Overload pre-alarm] [Internal fault]	
		[Ambient temp.] [Fan lock]	
		[Bypass overload] [Current limit]	
		[Short circuit] [Inverter overload]	
		[Power overload] [Low battery]	
		[On bypass] [UPS OK] [Load protected]	
		[Load powered] [Ext. charger ON]	
		Defines which event or fault generate	
		a general alarm through Output signal screen.	

Chapter 3 Installation

3.1 Inspecting the Equipment

If any equipment has been damaged during shipment, keep the shipping cartons and packing materials for the carrier or place of purchase and file a claim for shipping damage. If you discover damage after acceptance, file a claim for concealed damage.

To file a claim for shipping damage or concealed damage:

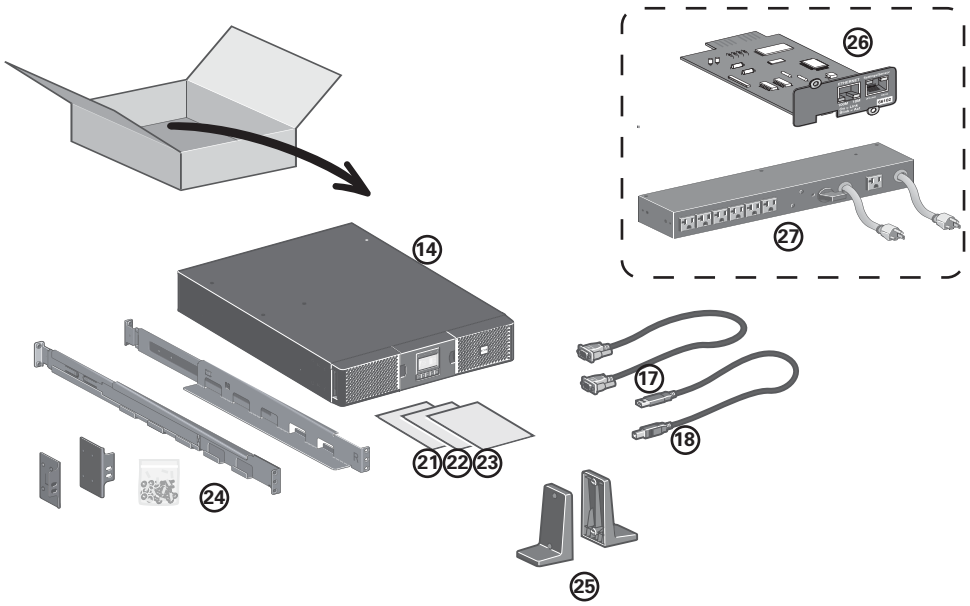
1. File with the carrier within 15 days of receipt of the equipment;
2. Send a copy of the damage claim within 15 days to your service representative.

⚠ IMPORTANT

Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use the UPS. Contact your service representative.

3.2 Checking the Accessory Kit

Figure 4. 9PX1500RT-L / 9PX2000RT-L / 9PX3000RT-L



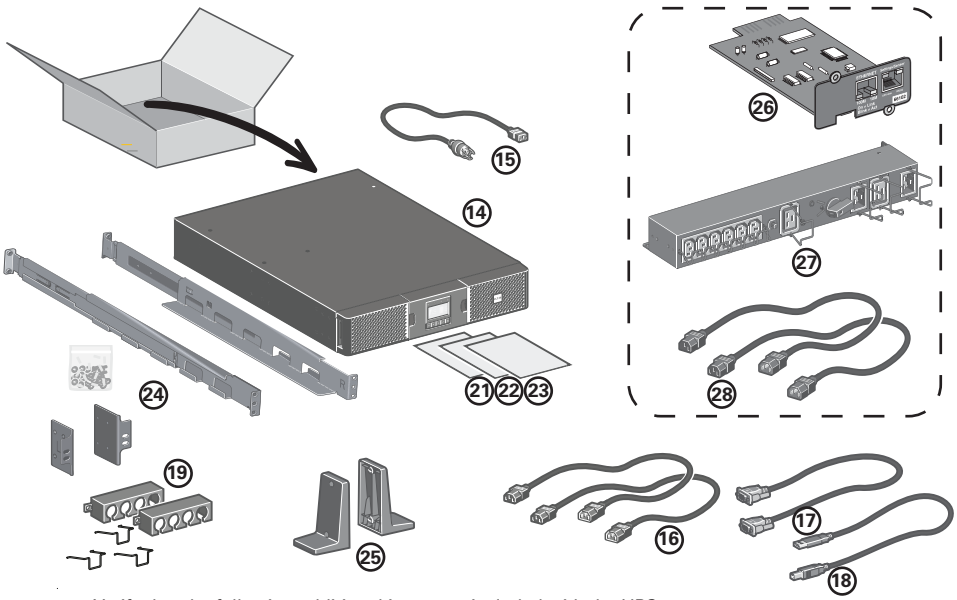
Verify that the following additional items are included with the UPS:

⑭ 9PX UPS
⑰ RS232 communication cable
⑱ USB communication cable
㉑ Software leaflet
㉒ Safety instructions
㉓ Quick start
㉔ Mounting kit for 19-inch enclosures
㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card (optional, standard on Network Bundle models)
㉗ MBP-115 module for 9PX 1500RT (optional)
MBP-120 module for 9PX 2000RT (optional)
MBP-130 module for 9PX 3000RT(optional)

Figure 5. 9PX1500GRT-L / 9PX2200GRT-L / 9PX3000GRT-L



Verify that the following additional items are included with the UPS:

⑭ 9PX UPS

⑮ Connection cable to AC-power source

⑯ 2 connection cables for the protected equipment

⑰ RS232 communication cable

⑱ USB communication cable

⑲ 3 cable locking systems

㉑ Software leaflet

㉒ Safety instructions

㉓ Quick start

㉔ Mounting kit for 19-inch enclosures

㉕ 2 supports for tower position

Elements supplied depending on the version or optional

㉖ NMC communication card(optional,standard on Network Bundle options

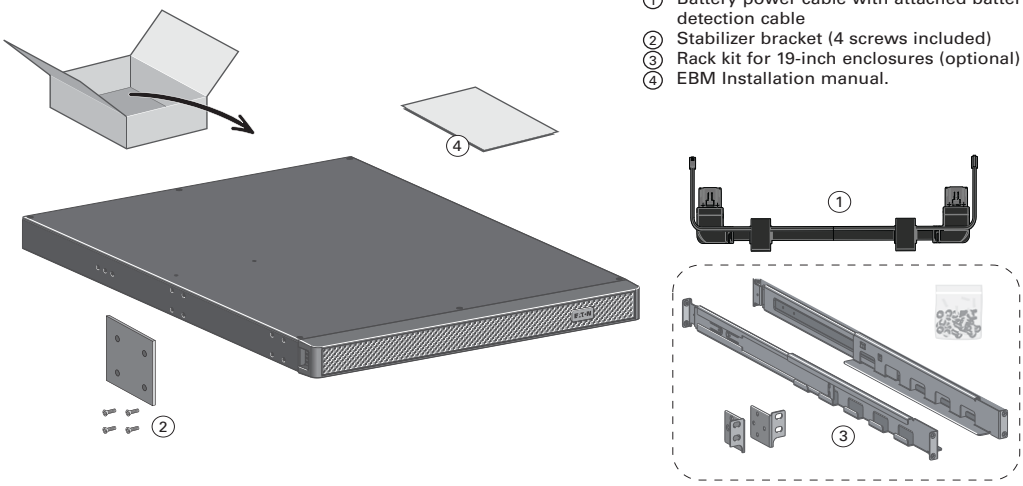
㉗ HotSwap MBP module (optional)

㉘ Connection cables between Hotswap MBP module and UPS

Figure 6. 9PXEBM48RT-L / 9PXEBM72RT-L

- If you ordered an optional Extended Battery Module (EBM), verify that the following additional items are included with the EBM:

① Battery power cable with attached battery detection cable
② Stabilizer bracket (4 screws included)
③ Rack kit for 19-inch enclosures (optional)
④ EBM Installation manual.



NOTE 1 Discard the EBM user's guide if you are installing the EBM with a new UPS at the same time.

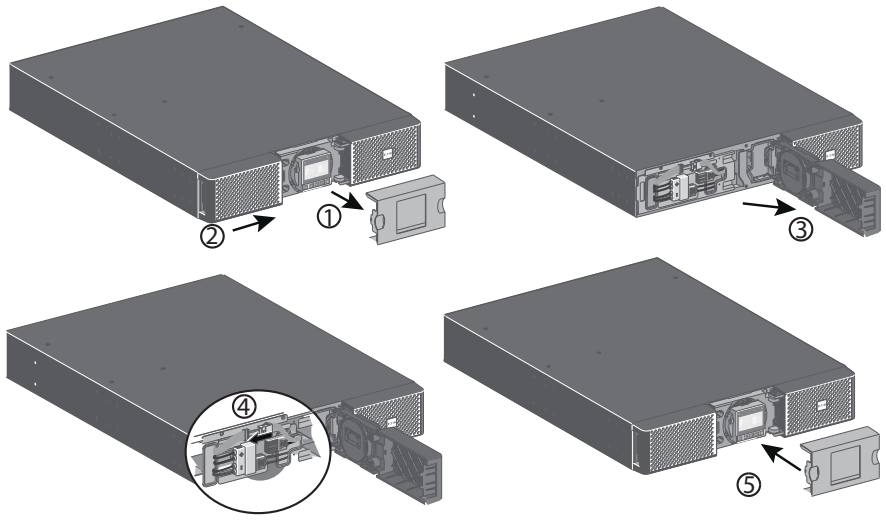
NOTE 2 Use the UPS user's guide to install both the UPS and the EBM.

Remember If you ordered other UPS accessories, refer to specific user manuals to check the packing contents.

3.3 Connecting the Internal Battery

NOTE Do not connect the UPS to the utility until installation is complete.

Figure 7. Internal Battery Connection



To connect to the UPS:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the left side of the front panel.

NOTE A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.

⚠CAUTION

A small amount of arcing may occur when connecting the internal batteries. This is normal and will not harm personnel. Connect the cables quickly and firmly.

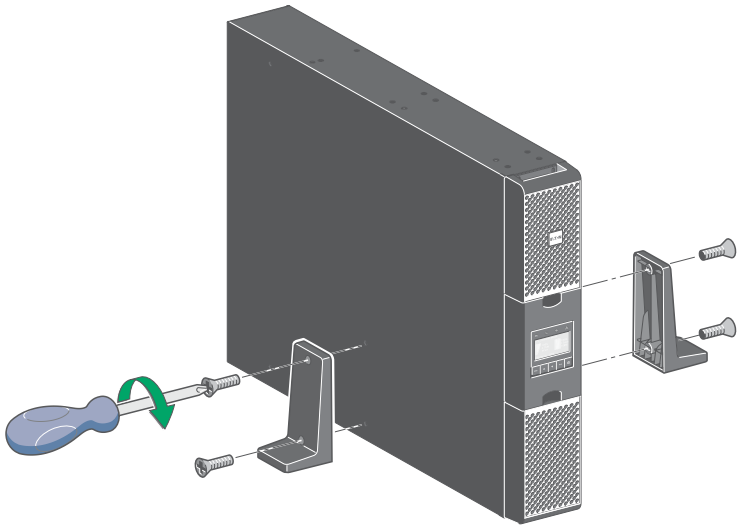
4. Connect the two battery connectors together.
5. Put back the front panel, then clip the center cover.

3.4 Tower Installation

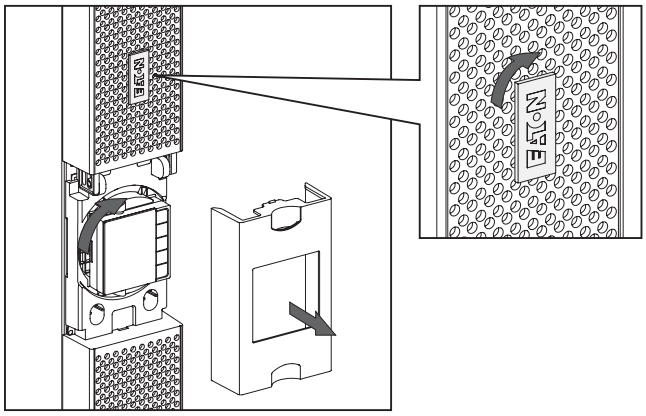
Tip If you ordered other UPS accessories, refer to specific user manuals to check the tower installation with the UPS.

To install the cabinet:

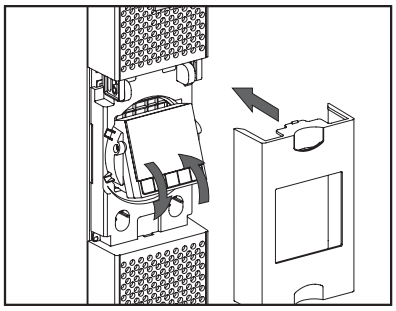
1. Place the UPS on a flat, stable surface in its final location.
2. Always keep 6" or 150 mm of free space behind the UPS rear panel for ventilation.
3. If installing additional cabinets, place them next to the UPS in their final location.



- Adjustment of the orientation of the LCD panel and of the logo.



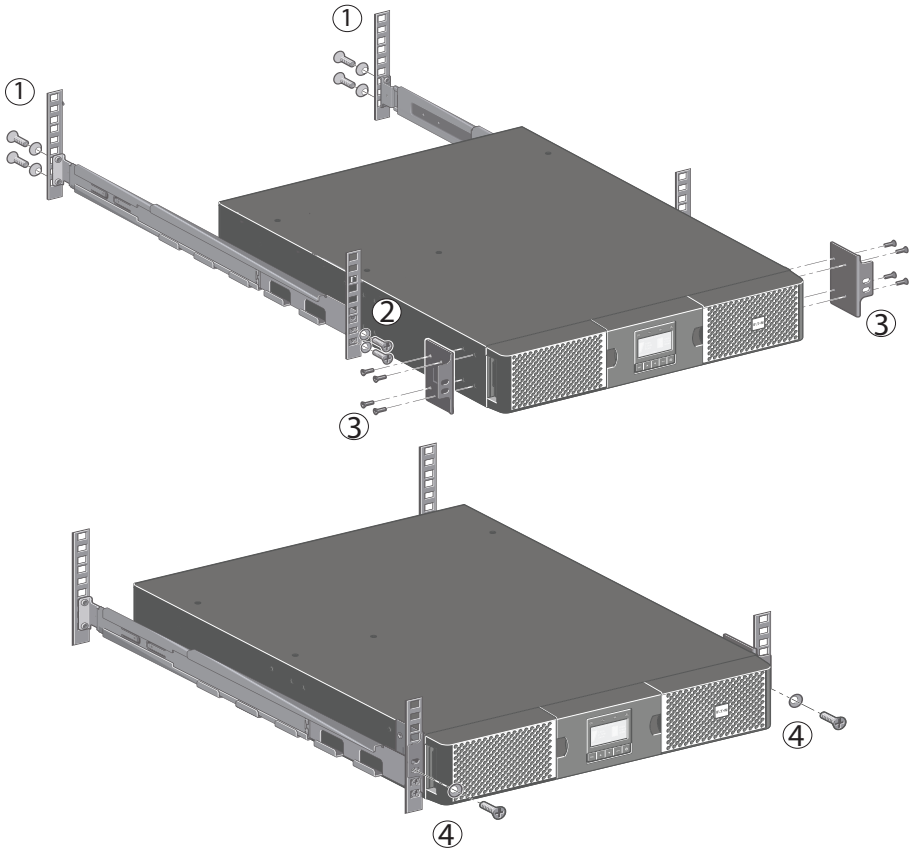
- Adjustment of the angle of vision of the LCD panel.



3.5 Rack Installation

- Rack mounting of UPS, EBM, and accessory modules.

Follow steps 1 to 4 for module mounting on the rails.



The rails and necessary hardware are supplied by EATON.

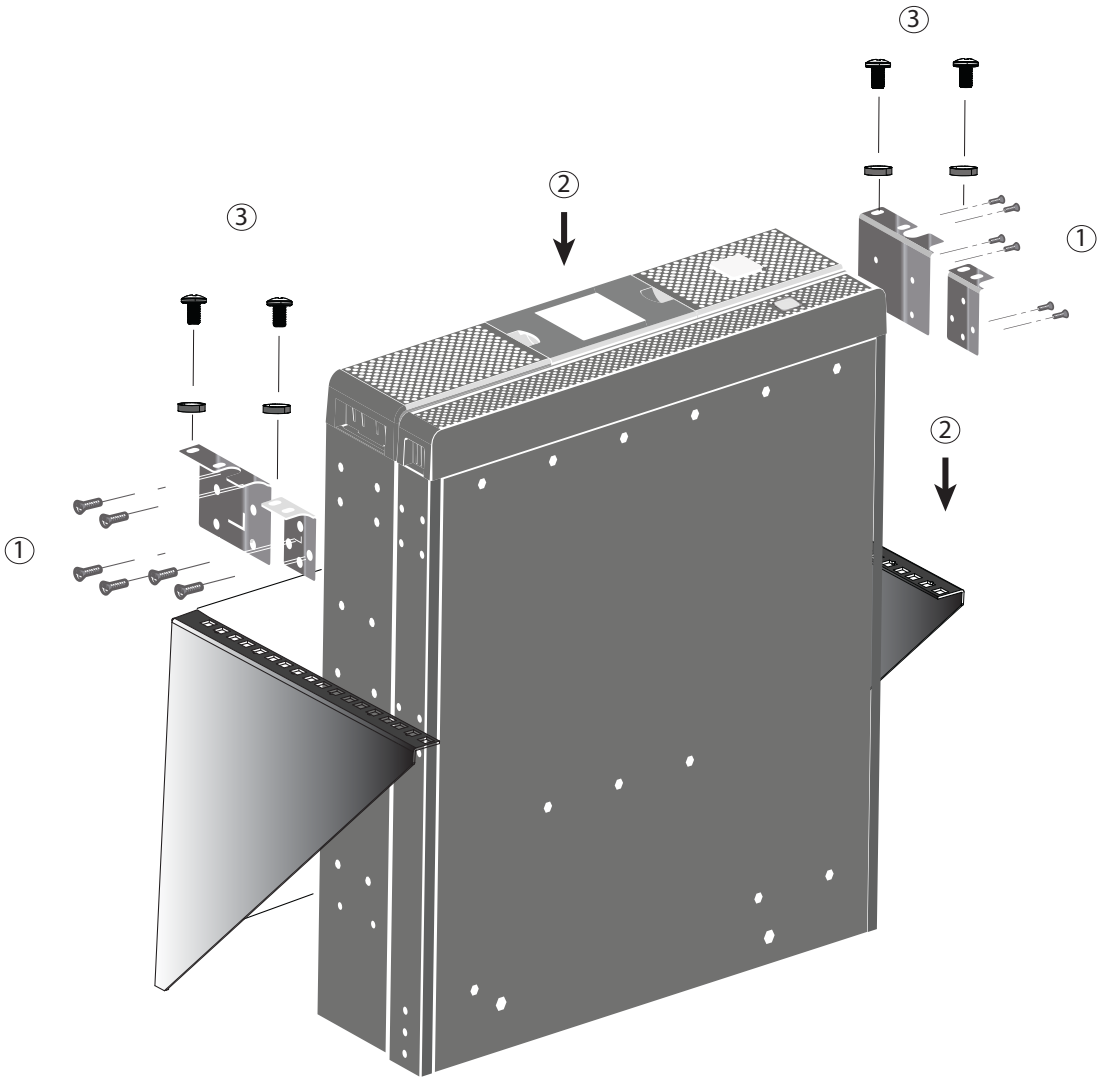
3.6 Vertical Installation

NOTE 1 This vertical installation is available only for UL/cTUVus.

NOTE 2 Suitable for mounting on concrete or other noncombustible surfaces only.

- The UPS, EBM, and accessory modules can be installed vertically in a rack or on a wall.

Follow steps 1 to 3 for module mounting on the rails.



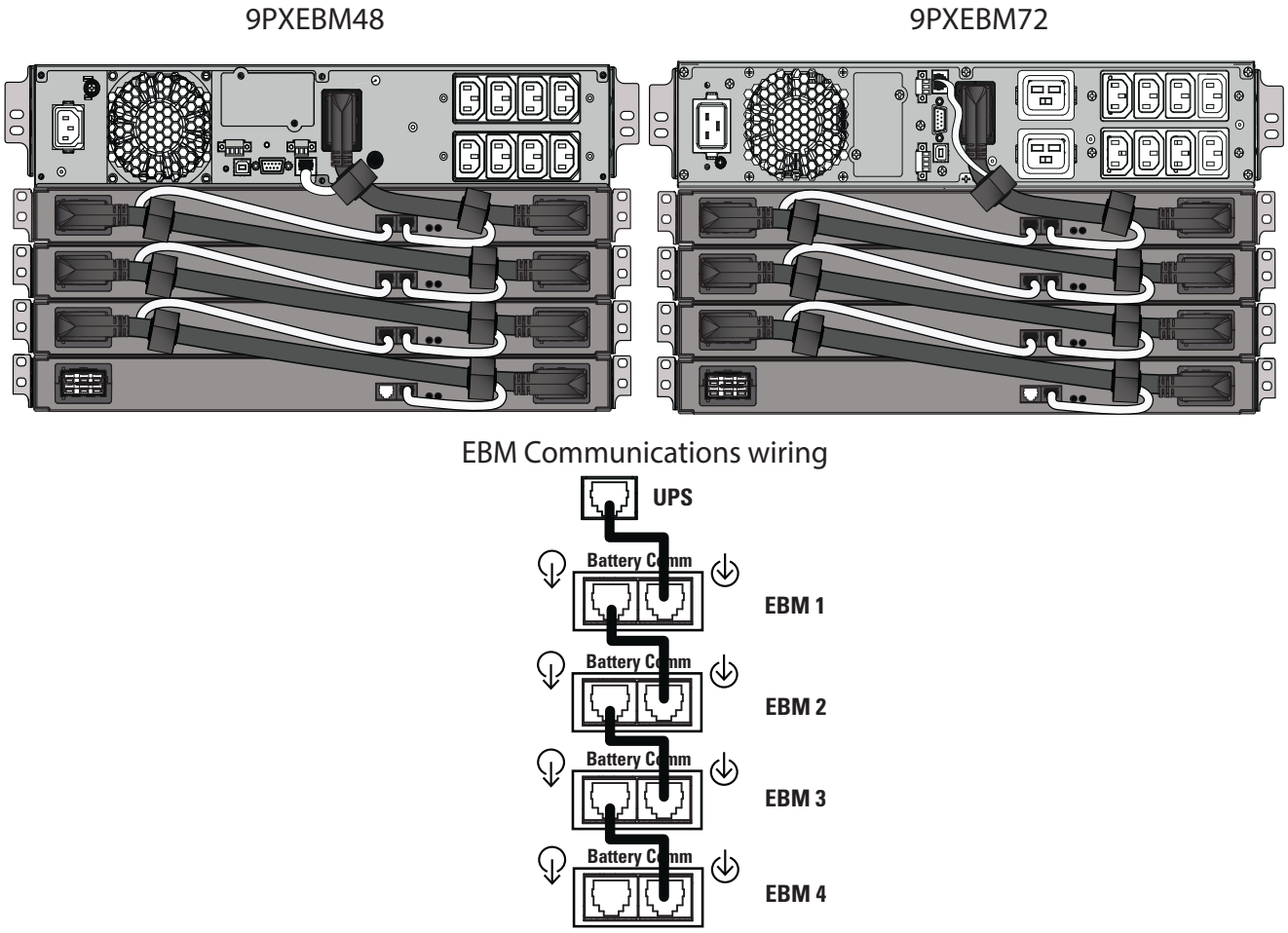
3.7 Connecting the EBM(s)

⚠CAUTION

A small amount of arching may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.

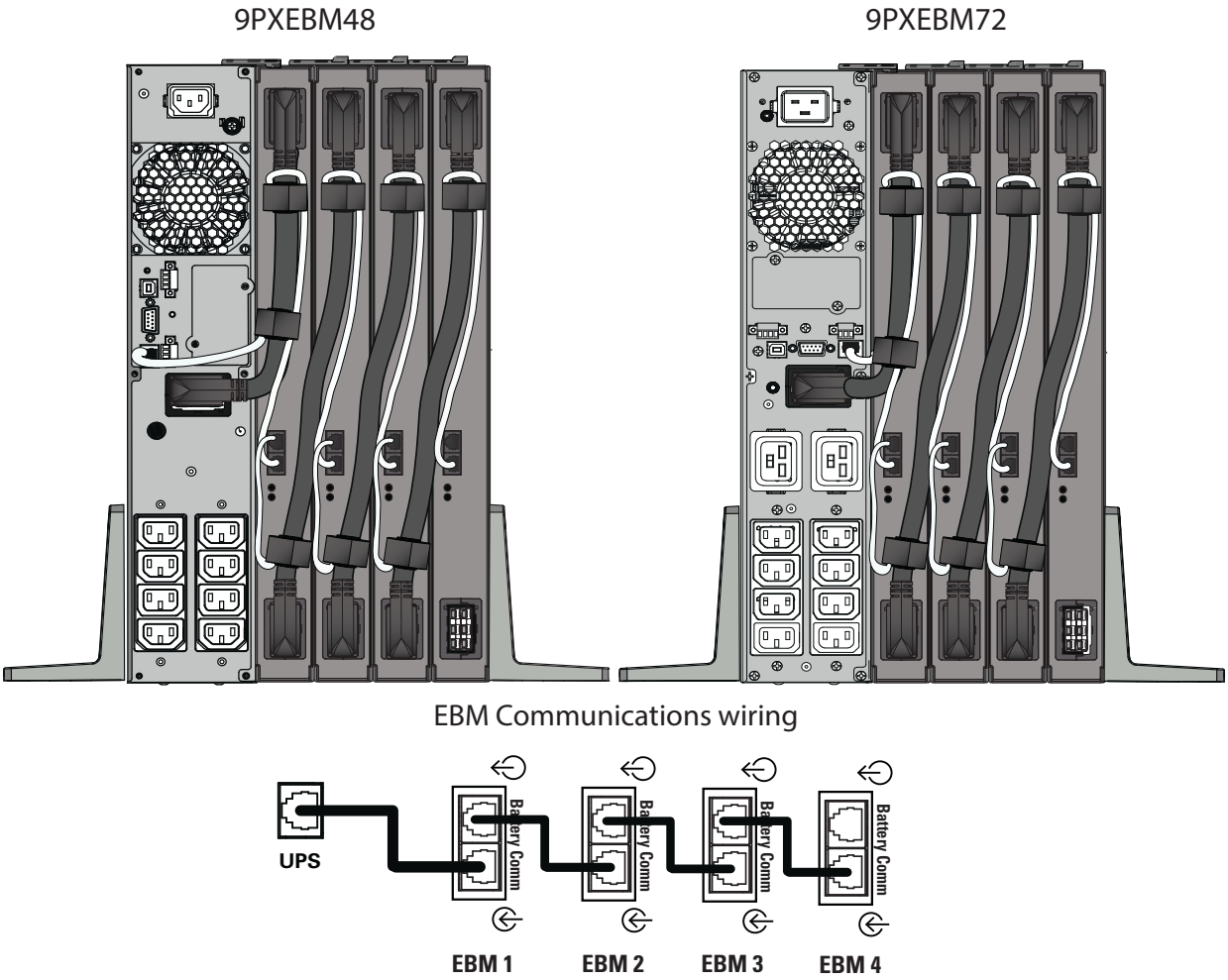
1. Plug the EBM power cable(s) into the battery connector(s). Up to 4 EBMs may be connected to the UPS.
2. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
3. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).

Figure 8. 9PXEBM Rack Mount Connections



NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

Figure 9. 9PXEBM Tower Mount Connections



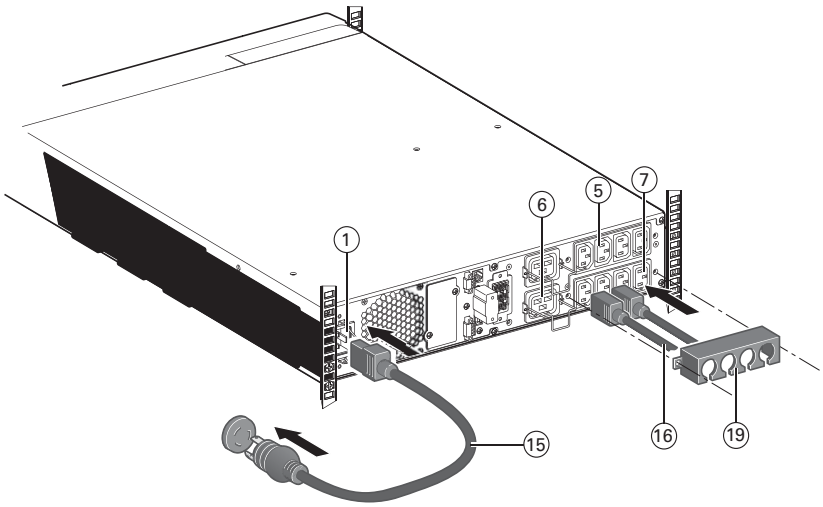
NOTE The EBM communication wiring connections are directional and must be connected in the correct sequence to ensure proper detection, regulation and lifecycle monitoring of the integrated battery management system (BMS).

3.8 Detecting other Accessories

Tip If you ordered other UPS accessories, refer to specific user manuals to check the connection to the UPS.

3.9 UPS Connection without Hotswap MBP Module

Check that the indications on the name plate located on the back of the UPS correspond to the AC-power source and the true electrical consumption of the total load.

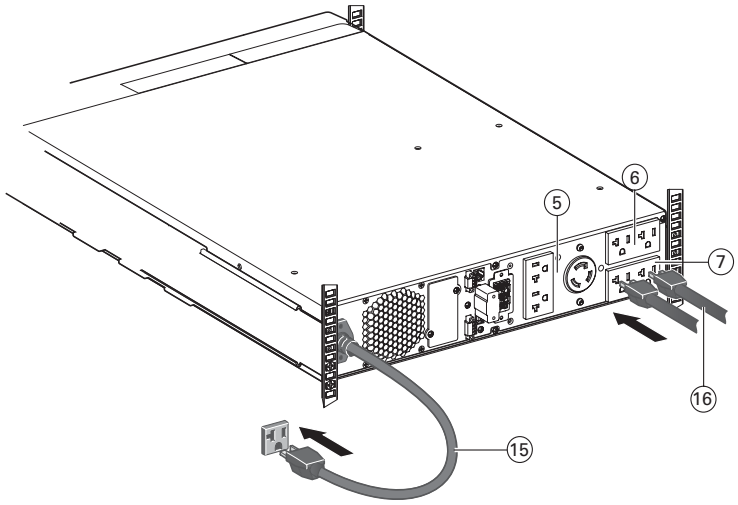


1. 9PX 2000RT-L / 3000RT-L connect the UPS input socket ① to the AC-power source.
   9PX 2200GRT-L / 3000GRT-L / 3000GLRT-L: connect the supplied cable ⑮ (250 V - 16 A) to the socket ①, then to the AC-power source.

2. Connect the loads to the UPS using the cables ⑯.
   It is preferable to connect the priority loads to the outlets marked ⑤ and the non-priority loads to the outlets marked ⑥ ⑦ that can be programmed.
   Connect any high-power devices to the 16 A outlet.

To program shutdown of outlets ⑥ ⑦ during operation on battery power and thus optimise the available backup time, please check the in/out settings.

3. For G models, fit the cable locking system ⑲ that prevents the plugs from being pulled out accidentally.

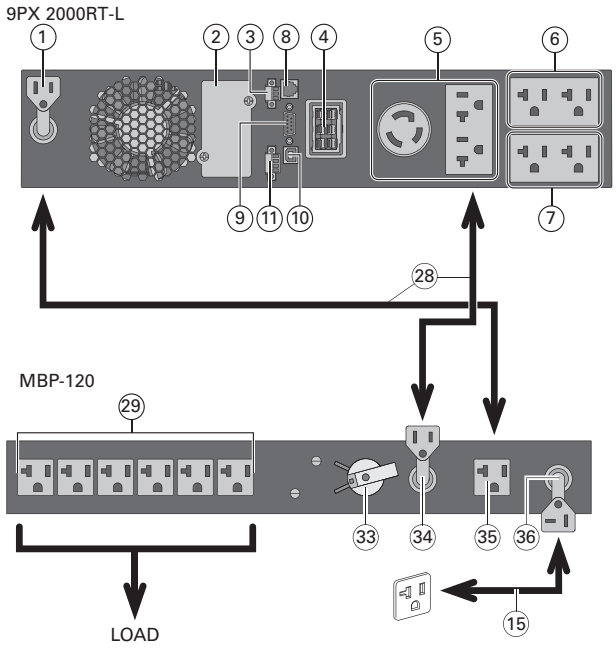


Note. The UPS charges the battery as soon as it is connected to the AC-power source, even if ⏻ button is not pressed

Once the UPS is connected to the AC-power source, eight hours of charging are required before the battery can supply the rated backup time.

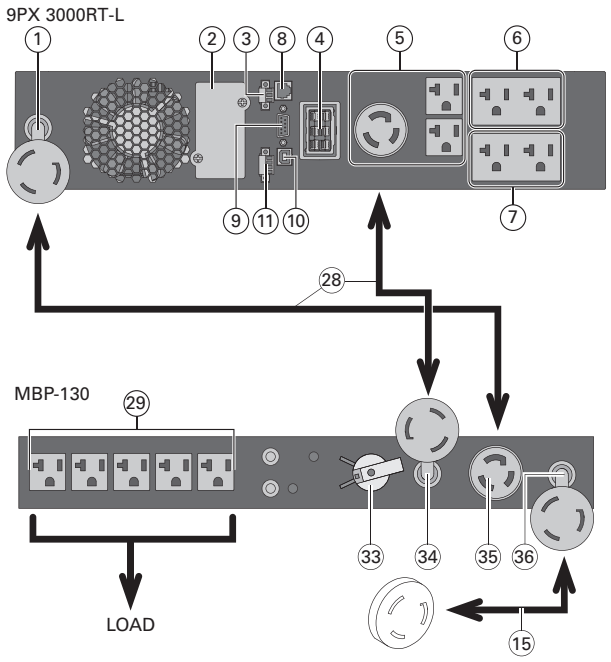
3.10 Connection with a Hotswap MBP Module (Optional Accessory)

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads.



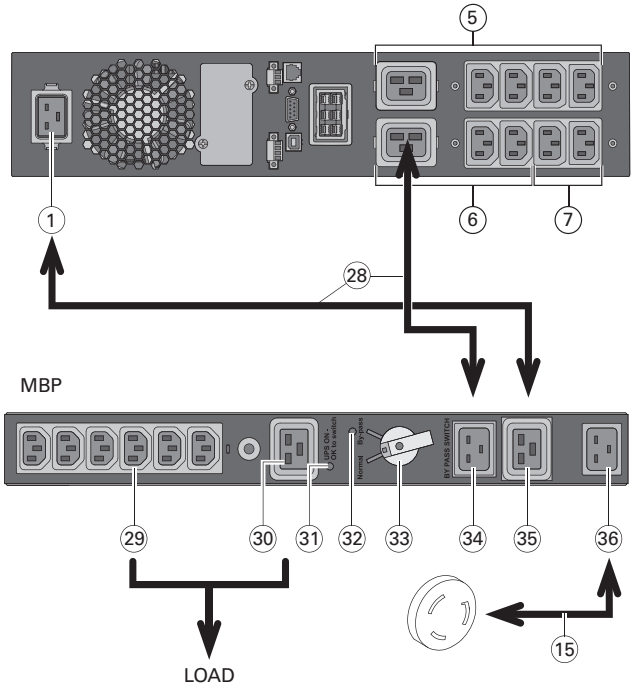
1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the “UPS Input socket” ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the “UPS Output” ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.



* 9PX 1500RT-L: To connect to MBP-115, follow the same procedure as for the 9PX 2000RT / 9PX 3000RT.

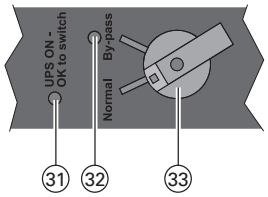
9PX 2200GRT-L & 9PX 3000GRT-L



1. Connect the input ㊱ on the HotSwap MBP module to the AC-power source.
2. Connect the UPS input cable ① to the "UPS Input socket" ㉟ on the HotSwap MBP module.
3. Connect the UPS outlet ⑤ to the "UPS Output" ㉞ on the HotSwap MBP module (using the cable ㉘ supplied for G models). These cables and the connectors are marked in red.
4. Connect the equipment to the outlets ㉙ on the HotSwap MBP module. These outlets differ, depending on the version of the HotSwap MBP module.

   Caution: when using HotSwap MBP, do not use UPS outlets to directly power equipment. As operating the bypass switch ㉝ will cut supply voltage to the equipment.

HotSwap MBP module operation



The HotSwap MBP module has a rotary switch ㉝ with two positions:

Normal	the load is supplied by the UPS, LED ㉛ is on.
Bypass	the load is supplied directly by the AC-power source. LED ㉜ is on.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch ㉝ to Normal position.
3. Start the UPS by pressing the ON/OFF button ⏻ on the UPS control panel.

The load is supplied by the UPS.
LED ㉛ "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

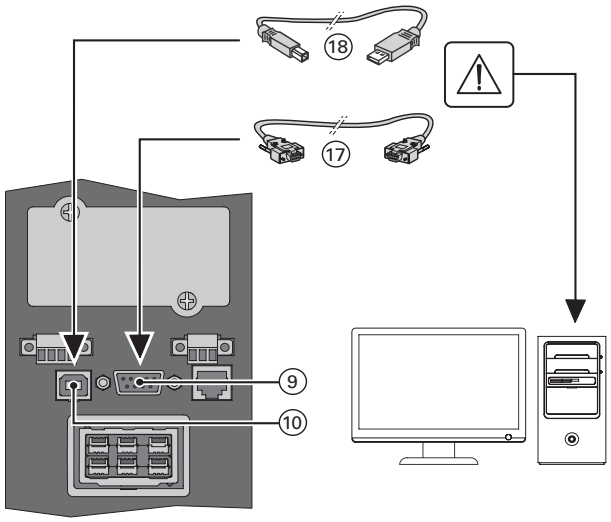
HotSwap MBP module test

1. Set switch ㉝ to Bypass position and check that the load is still supplied.
2. Set switch ㉝ back to Normal position.

Chapter 4 Communication

4.1 Communication Ports

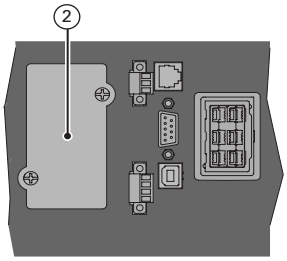
The RS232 and USB communication ports cannot operate simultaneously.



1. Connect the RS232 ⑰ or USB ⑱ communication cable to the serial or USB port on the computer equipment.
2. Connect the other end of the communication cable ⑰ or ⑱ to the USB ⑩ or RS232 ⑨ communication port on the UPS.

The UPS can now communicate with EATON power management software.

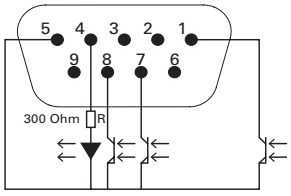
Installation of the communication cards



It is not necessary to shutdown the UPS before installing a communication card.

1. Remove the slot cover ② secured by screws.
2. Insert the communication card in the slot.
3. Secure the card cover with the 2 screws.

Characteristics of the contact RS232 communication port



Pin	Signal	Direction	Function
1	Bat Low	Output	Low Battery Output
2	TxD	Output	Transmit to external device
3	RxD	Input	Receive from external device
4	I/P SIG	Input	-
5	GNDS	-	Signal Common tied to chassis
6	PNP	Input	Plug and Play
7	UPS ON	Output	UPS ON
8	BAT Mode	Output	-
9	+5V	Output	Power supply for external signals or options

Contact characteristics (optocoupler)

- Voltage: 48 V DC max
- Current: 25 mA max

4.2 UPS Remote Control Functions

Programmable Signal Inputs

The 9PX incorporates 3 programmable signal inputs: one Remote Power Off (RPO) input terminal, one Remote On/Off (ROO) input terminal, one RS-232 input (pin-4). Signal inputs can be configured see Settings > Com settings > Signal Input in to have one of the following functions:

Function	Description
No	No function, please choose a function if you want to use input signal
RPO	Remote Power Off (RPO) is used to shutdown the UPS remotely
ROO	Remote On/Off allows remote action of button to switch On/Off the UPS. (Cold start is prohibited while using the ROO function)
Forced bypass	If feeding the load the unit goes to bypass operation and stays there regardless of the bypass state until the input is inactivated
Building alarm	Active input generates an alarm "building alarm"
On generator	Active input disables synchronization and transfers to bypass
Remote shutdown	Active input turns UPS output (or outlet groups) off after a user defined shutdown delay but keeps on charging batteries according to a selected charging scheme, inactive input does not abort shutdown countdown. Depending on the "Restart" parameter (see Settings > Com Settings > Shutdown commands on page 16) the unit may startup automatically.

IMPORTANT

Warning Signal inputs have no function by default please choose a function through the LCD **(Settings > Com settings > Input signals).**

See below 2 examples of configuration with RPO terminal used as RPO function and ROO terminal use as ROO function:

Remote Power Off (RPO)

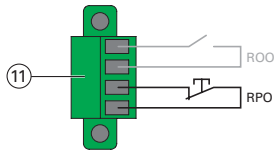
RPO is used to shutdown the UPS remotely when the contact is open. This feature can be used for shutting down the load and the UPS by thermal relay, for instance in the event of room over temperature. When RPO is activated, the UPS shuts down the output and all its power converters immediately. The UPS remains on to alarm the fault. The RPO circuit is an IEC 60950 safety extra low voltage (SELV) circuit. This circuit must be separated from any hazardous voltage circuits by reinforced insulation.

- The RPO must not be connected to any utility connected circuits. Reinforced insulation to the utility is required. The RPO switch must be a dedicated latching-type switch not tied into any other circuit. The RPO signal must remain active for at least 250 ms for proper operation.
- To ensure the UPS stops supplying power to the load during any mode of operation, the input power must be disconnected from the UPS when the Remote Power Off function is activated.

Leave the RPO connector installed in the RPO port on the UPS even if the RPO function is not needed.

RPO connections:

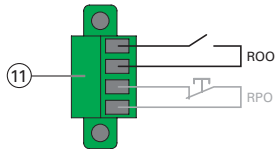
RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote On/Off (ROO)

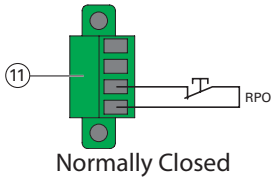
- Remote On/Off allows remote action of button to switch On/Off the UPS.
- When contact changes from open to closed, the UPS is switched-on (or stays On).
- When contact changes from closed to open, the UPS is switched-off (or stays Off).
- On/Off control via button has priority over the remote control.

RPO	Comments
Connector type	Terminal, 14 AWG maximum wires
External breaker specification	60 V DC/30V AC 20mA max



Remote Control Connection and Test

1. Check the UPS is shut down and the electrical supply network disconnected.
2. Remove RPO connector from the UPS by unfitting the screws.
3. Connect a normally closed volt-free contact between the two pins of connector.

 Normally Closed	Contact open: shut down of UPS To return to normal operation, deactivate the external remote shut down contact and restart the UPS from the front panel.

4. Plug the RPO connector into the back of the UPS and fix the screws.
5. Connect and restart the UPS according to the previously described procedures.

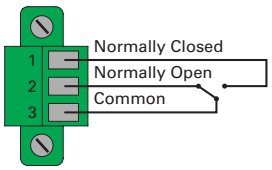
6. Activate the external remote shut down contact to test the function. Always test the RPO function before applying your critical load to avoid accidental load loss.

Programmable Signal Outputs

The 9PX incorporates 4 programmable signal outputs: one relay output, three optocouplers outputs (pin- 1/7/8). Signal outputs can be configured (see Settings > Com settings > Output Signals in to report the following information:

Signal	Default Assignment	Description
On battery (On bat)	DB9-Pin 8	UPS is in battery mode
Low battery (Low bat)	DB9-Pin 1	Battery is nearly empty
Battery fault (Bat fault)	-	Battery fault
Bypass	Relay output **(1)**	UPS is operating in Bypass mode
UPS OK	DB9-Pin 7	Load is powered (from inverter or bypass), with no alarm
Load powered	-	Load is powered (from inverter or bypass)
Load protected	-	UPS is on inverter, with no alarm and ready to go to battery
General alarm	-	• Choose events that will trigger this alarm trough the LCD • (Settings > Com settings > General alarm) for more information on possible events please look at page 16.
Ext charger ON	-	Control an optional external battery charger on and off.
OVL pre-alarm	-	Overload pre-alarm

(1) Relay output:



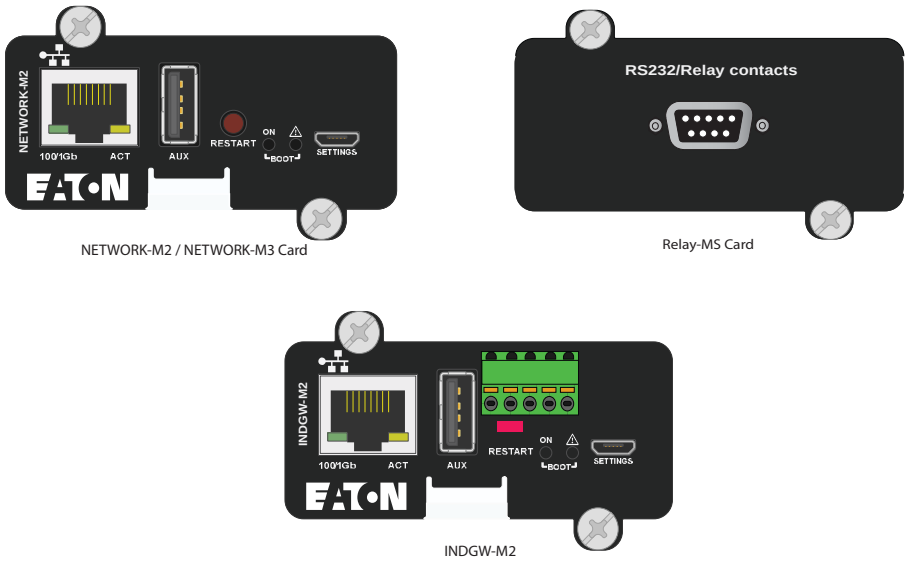
Connectivity Cards

Connectivity cards allow the UPS to communicate in a variety of networking environments and with different types of devices. The 9PX models have one available communication bay for the following connectivity cards:

- **Network-M2 card** — has SNMP and HTTP capabilities as well as monitoring through a Web browser interface; connects to a Gigabit Ethernet network. In addition, a Environmental Monitoring Probe can be attached to obtain humidity, temperature, smoke alarm, and security information.
- **INDGW-M2 card**- has SNMP and HTTP capabilities and a Modbus to facilitate remote monitoring of the UPS system through any Building Management System.

- **Relay-MS card**- has isolated dry contact (Form-C) relay outputs for UPS status: Utility failure, Battery low, UPS alarm/OK, or on Bypass.

Figure 10. Connectivity Card Options



NETWORK-M2 / NETWORK-M3 Card

Relay-MS Card

INDGW-M2

Eaton Intelligent Power Software suite

Eaton Intelligent Power Software suite is available from eaton.com/download. Eaton Software suite provides up-to-date graphics of UPS power and system data and power flow. It also gives you a complete record of critical power events, and it notifies you of important UPS or power information. If there is a power outage and the 9PX UPS battery power becomes low, Eaton Software suite can automatically shut down your computer system to protect your data before the UPS shutdown occurs.

Chapter 5 Operation

5.1 Start-up and Normal Operation

To start the UPS:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. Verify that the UPS power cord is plugged in.
4. The UPS front panel display illuminates and shows EATON logo.
5. Verify that the UPS status screen shows ⏻
6. Press the ⏻ button on the UPS front panel for at least 2 seconds.
7. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear. Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.
8. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode.

5.2 Starting the UPS on Battery

Before using this feature, the UPS must have been powered by utility power with output enabled at least once. Battery start can be disabled. See the "Cold start" setting in "ON/OFF Settings" in .

To start the UPS on battery:

1. Press the ⏻ button on the UPS front panel until the UPS front panel display illuminates and shows a status of "UPS starting...". The UPS transfers from Standby mode to Battery mode. The 🔋 indicator illuminates solid. The UPS supplies power to your equipment.
2. Check the UPS front panel display for active alarms or notices besides the "Battery mode" notice and notices that indicate missing utility power. Resolve any active alarms before continuing. See the "Troubleshooting" section . Check the UPS status from the front panel to view the active alarms. Correct the alarms and restart if necessary.

5.3 UPS Shutdown

To shut down the UPS:

1. Press the ⏻ button on the front panel for three seconds. A confirmation message will appear. When confirmed, the UPS starts to beep and shows a status of "UPS shutting OFF...". The UPS then transfers to Standby mode, and the ∿ indicator turns off.

5.4 Operating Modes

The Eaton 9PX front panel indicates the UPS status through the UPS indicators, see section 2.4 *Control Panel* .

Online Mode ∿

During Online mode, the ∿ indicator illuminates solid and the UPS is powered from the utility. The UPS monitors and charges the batteries as needed and provides filtered power protection to your equipment.

Optional High Efficiency and Energy Saving settings minimize heat contribution to the rack environment. See section 2.7 *User Settings* .

Battery Mode

When the UPS is operating during a power outage, the alarm beeps once every ten seconds and the indicator illuminates solid. The necessary energy is provided by the battery. When the utility power returns, the UPS transfers to Online mode operation while the battery recharges. If battery capacity becomes low while on Battery mode, the audible alarm beeps once every 3 seconds. This warning is approximate, and the actual time to shutdown may vary significantly. Shutdown all applications on the connected equipment because automatic UPS shutdown is imminent. When utility power is restored after the UPS shuts down, the UPS automatically restarts.

Low-Battery Warning

- The indicator illuminates solid.
- The audio alarm beeps every three seconds.

The remaining battery power is low. Shut down all applications on the connected equipment because automatic UPS shutdown is imminent.

End of battery backup time

- LCD displays "End of backup time".
- All the LEDs go OFF.
- The audio alarms stops.

Bypass Mode

In the event of a UPS overload or internal failure, the UPS transfers your equipment to utility power. Battery mode is not available and your equipment is not protected; however, the utility power continues to be passively filtered by the UPS. The indicator illuminates. Depending on overload conditions, the UPS remains in Bypass mode for at least 5 seconds and will stay in this mode if three transfers to Bypass occur within 20 minutes.

The UPS transfers to Bypass mode when:

- the user activates Bypass mode through the front panel.
- the UPS detects an internal failure.
- the UPS has an overtemperature condition.
- the UPS has an overload condition listed in Table 12 .

The UPS shuts down after a specified delay for overload conditions listed in Table 12 . The UPS remains on to alarm the fault.

5.5 Return of AC Power

Following an outage, the UPS restarts automatically when AC input power returns (unless the restart function has been disabled) and the load is supplied again.

5.6 Setting High Efficiency Mode

In High Efficiency mode, the UPS operates normally on Bypass and transfers to Online (or Battery) mode in less than 10 ms when utility fails. Transfers to High Efficiency mode will be active after 5 minutes of Bypass voltage monitoring: if Bypass quality is not in tolerance, then the UPS will remain in Online mode.

Eaton recommends to use the HE mode only to protect IT equipment.

To set the High Efficiency mode:

1. Select Settings, In/Out settings, and High Efficiency mode.
2. Select Enabled and Enter to confirm.
3. The UPS transfers to High Efficiency mode after 5 minutes.

5.7 Configuring Bypass Settings

The following settings are available for configuring Bypass operation.

Changing the settings changes UPS behavior and may result in decreased protection.

Bypass Voltage Low Limit

The default disables a transfer to Bypass if the measured bypass voltage level is below the nominal output voltage minus 20%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Bypass Voltage High Limit

The default disables a transfer to Bypass if the measured bypass voltage level is above the nominal output voltage plus 15%. You can configure the setting for another voltage value. This setting can be overruled by the "Qualify Bypass" setting.

Qualify Bypass

The default setting ("In spec") allows a transfer to Bypass only when Bypass is within the following specifications:

- Bypass voltage is between the "Bypass Voltage Low Limit" and "Bypass Voltage High Limit" settings
- Bypass frequency is within nominal frequency 5%.

You can prohibit Bypass ("Never") or always allow Bypass with no specification checking ("Always"). For "Always on UPS Fault," transfer to Bypass is always made on UPS fault; otherwise, operation proceeds as with the default setting.

Synchronization Window

The UPS tries to synchronize with Bypass when the Bypass frequency is less than the value set for the "Synchronization Window" setting. When the Bypass frequency is more than the set value, the UPS goes to nominal frequency.

Unsynchronized Transfers

When Qualify Bypass is set to "Always" or "Always on Fault" you can select the interruption time when transferring to bypass, default setting is "Half Cycle" but can be changed to "Full cycle".

5.8 Configuring Battery Settings

Low battery warning

During discharge, the low battery alarm is activated if the remaining runtime goes below 3 minutes or less than the setting capacity threshold (0 % by default). This threshold can be modified.

Restart battery level

This setting is used to define the battery restart level. The battery level must reach this threshold to enable UPS start.

5.9 Retrieving the Event Log

To retrieve the Event log through the display:

1. Press any button to activate the menu options, then select Event log.
2. Scroll through the listed events.

5.10 Retrieving the Fault Log

To retrieve the Fault log through the display:

1. Press any button to activate the menu options, then select Fault log.
2. Scroll through the listed faults.

Chapter 6 UPS Maintenance

6.1 Storing the Equipment

If you store the equipment for a long period, recharge the battery every 6 months by connecting the UPS to utility power. The internal batteries charge to 90% capacity in less than 3 hours. However, Eaton recommends that the batteries charge for 48 hours after long-term storage. Check the battery recharge date on the shipping carton label. If the date has passed and the batteries were never recharged, do not use them. Contact your service representative.

6.2 Replacing Batteries

IMPORTANT

DO NOT DISCONNECT the batteries while the UPS is in Battery mode.

Batteries can be replaced easily without turning off the UPS or disconnecting the load. If you prefer to remove input power to change the batteries, see "UPS Shutdown".

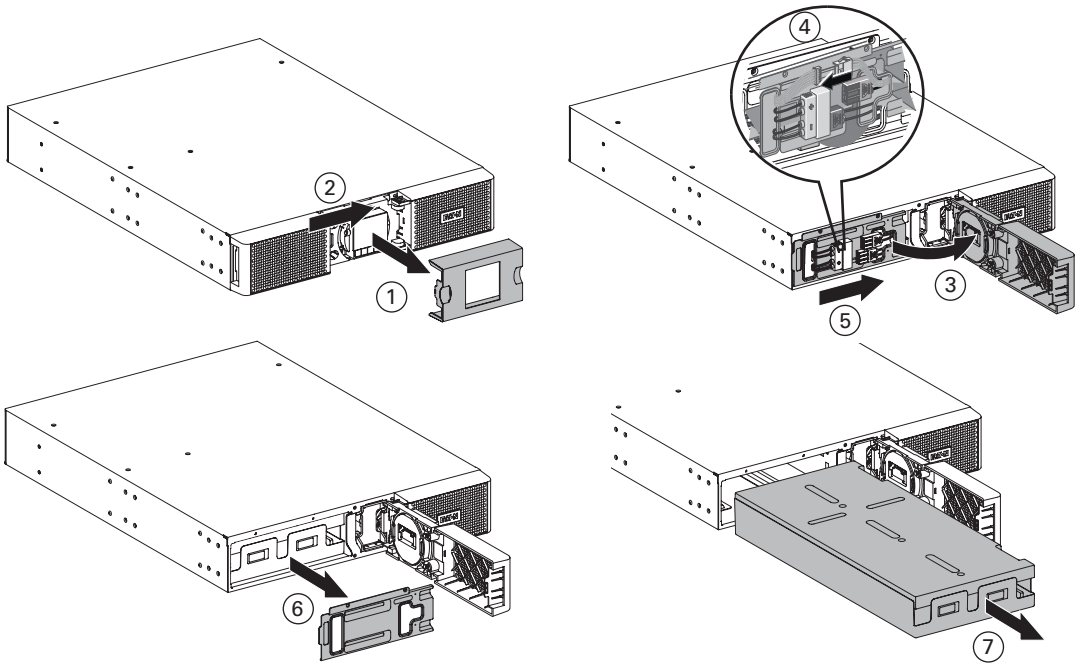
Consider all warnings, cautions, and notes before replacing batteries.

- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions. Keep unauthorized personnel away from batteries.
- Batteries can present a risk of electrical shock or burn from high short circuit current. Observe the following precautions:
    1. Remove watches, rings, or other metal objects,
    2. Use tools with insulated handles,
    3. Do not lay tools or metal parts on top of batteries,
    4. Wear rubber gloves and boots.
- When replacing batteries, replace with the same type and number of batteries or battery packs. Contact your service representative to order new batteries.
- Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
- Never dispose of batteries in a fire. Batteries may explode when exposed to flame.
- Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes and may be extremely toxic.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance (applicable to equipment and remote battery supplies not having a grounded supply circuit).
- ELECTRIC ENERGY HAZARD. Do not attempt to alter any battery wiring or connectors. Attempting to alter wiring can cause injury.
- Disconnect charging source prior to connecting or disconnecting battery terminals.

Replacing the internal battery

The internal battery is heavy. Use caution when handling the heavy batteries.

Figure 11. Internal Battery Pack Replacement



To replace the battery pack:

1. Remove the center cover of the front panel.
2. Push left cover toward to right direction.
3. Open the battery door.
4. Disconnect the battery connectors.

   A ribbon cable connects the LCD control panel to the UPS. Do not pull on the cable or disconnect it.
5. Remove the two screws to pull out the metal protection cover of the battery.
6. Pull out the plastic handle of the battery pack, and slide the pack out slowly on to a flat and stable surface. Use two hands to support the battery pack. See "Recycling the used equipment" on page 38 for proper disposal.
7. Verify that the replacement batteries have the same rating as the batteries being replaced.
8. Put the new battery pack into the UPS. Push the battery pack firmly, reconnect the red and black battery connectors then reconnect the BMS communication cable.
9. Verify that all of the alarms have cleared on the display.
10. Screw back the metal protection cover and the front panel, then clip the center cover.
11. If there are no EBM modules that need to be replaced continue to the 6.3 *Battery Settings Reset* .
12. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

Replacing the EBM(s)

The EBM is heavy. Lifting the cabinet into a rack requires a minimum of two people.

To replace the EBM(s):

1. Unplug the EBM power cable and battery detection cable from the UPS. If additional EBM(s) are installed, unplug the EBM power cable and battery detection cable from each EBM.
2. Replace the EBM(s). See "Recycling the used equipment" for proper disposal.

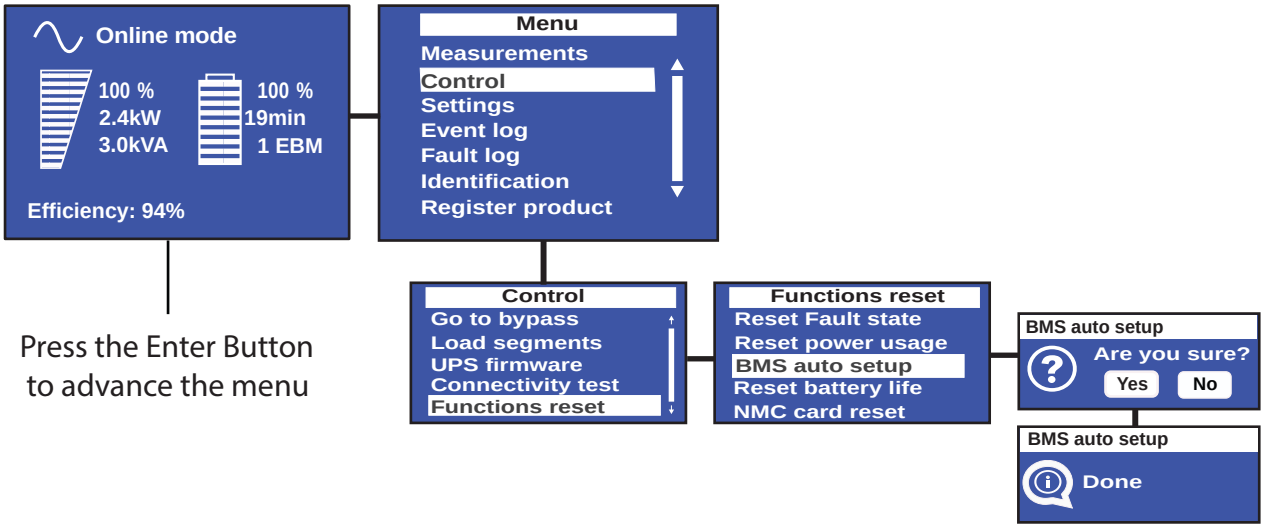
   A small amount of arcing may occur when connecting an EBM to the UPS. This is normal and will not harm personnel. Insert the EBM cable into the UPS battery connector quickly and firmly.
3. Plug the EBM cable(s) into the battery connector(s). Up to four EBMs may be connected to the UPS.
4. Verify that the EBM connections are tight and that adequate bend radius and strain relief exist for each cable.
5. Connect the battery detection cable(s) to the connector of the UPS and of the EBM(s).
6. Continue to the 6.3 *Battery Settings Reset*.
7. If the UPS was shut down during the battery replacement process see 5.1 *Start-up and Normal Operation* .

6.3 Battery Settings Reset

After replacement of the internal UPS batteries and extended battery modules the BMS auto setup and battery life settings will need to be reset in the "*Control*" menu of the display.

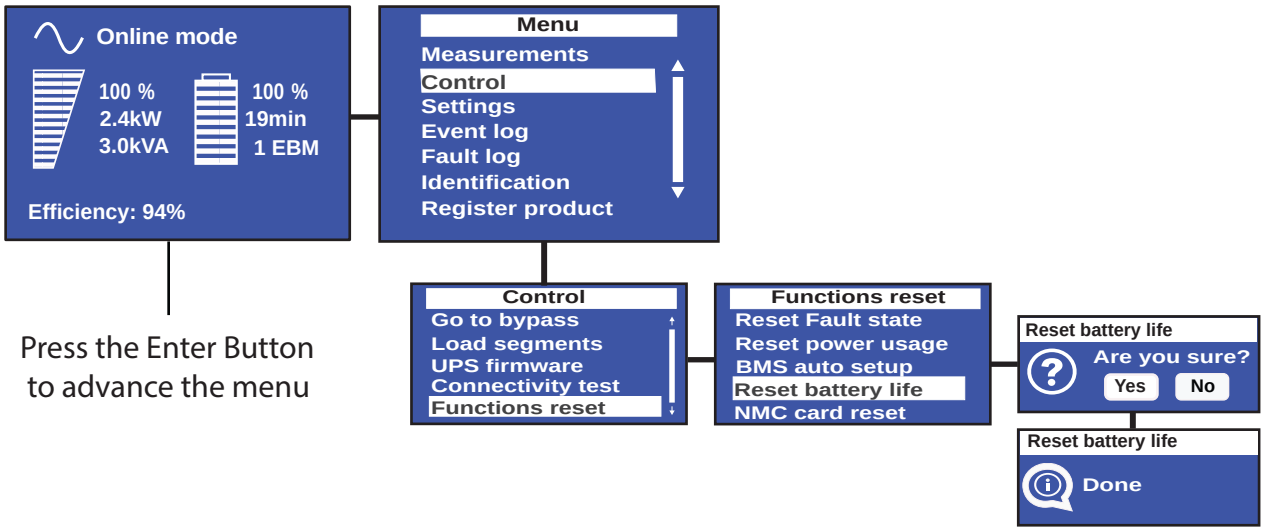
1. Reset the BMS auto setup function in the "Functions Reset" option of the control menu.

Figure 12. BMS Auto Setup Reset



2. Reset the battery life counter in the "Functions Reset" option of the control menu.

Figure 13. Battery Life Reset



Return the UPS to Normal Operation

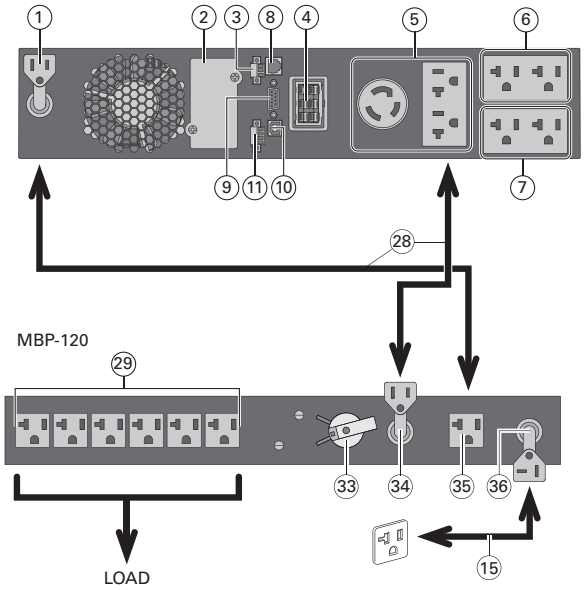
If the UPS internal batteries and external battery packs were replaced without powering down the UPS:

1. Check the UPS front panel display for active alarms or notices. Resolve any active alarms before continuing. See section 7.1 *Typical Alarms and Faults* . If the ⚠ indicator is on, do not proceed until all alarms are clear.
2. Verify that the ∿ indicator illuminates solid, indicating that the UPS is operating normally and any loads are powered and protected. The UPS should be in normal mode. See 5.1 *Start-up and Normal Operation* .

If the UPS internal batteries and external battery packs were replaced and the UPS was powered off:

1. Verify that the internal batteries are connected. See section 3.3 *Connecting the Internal Battery* .
2. If optional EBMs are installed, verify that the EBM are connected to the UPS. See section 3.7 *Connecting the EBM(s)* .
3. See section 5.1 *Start-up and Normal Operation* for powering the UPS back to normal operation.
4. If the UPS has a MBP module attached see 3.8 *Detecting other Accessories* for the correct startup procedure.

6.4 Replacing the UPS Equipped with a HotSwap MBP



The **HotSwap MBP** module makes it possible to service or even replace the UPS without affecting the connected loads.

Maintenance

1. Set switch (33) to Bypass position. The red LED on the **HotSwap MBP** module goes ON, indicating that the load is supplied directly with AC input source power.
2. Stop the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation

1. Check that the UPS is correctly connected to the **HotSwap MBP** module.
2. Start the UPS by pressing the ⏻ button on the UPS control panel. LED (31) "UPS ON - OK to switch" on the **HotSwap MBP** module goes ON (otherwise, there is a connection error between the **HotSwap MBP** module and the UPS).
3. Set switch (33) to Normal position. The red LED on the **HotSwap MBP** module goes OFF.

6.5 Recycling The Used Equipment

Contact your local recycling or hazardous waste center for information on proper disposal of the used equipment.



RISK OF ELECTRIC SHOCK - Observe the warning associated with the risk of electric shock symbol.



This symbol indicates that you should not discard the UPS or the UPS batteries in the trash. This product contains sealed, Lithium-Ion batteries and must be disposed of properly. For more information, contact your local recycling/reuse or hazardous waste center.



This symbol indicates that you should not discard waste electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.

Chapter 7 Troubleshooting

7.1 Typical Alarms and Faults

The Eaton 9PX are designed for durable, automatic operation and also alert you whenever potential operating problems may occur. Usually the alarms shown by the control panel do not mean that the output power is affected. Instead, they are preventive alarms intended to alert the user.

- Events are silent status information that are recorded into the Event log. Example = "AC freq in range".
- Alarms are recorded into the Event log and displayed on the LCD status screen with the logo blinking. Some alarms may be announced by a beep every 3 seconds. Example = "Battery low".
- Faults are announced by a continuous beep and red LED, recorded into the Fault log and displayed on the LCD with a specific message box. Example = Out. short circuit.

Use the following troubleshooting chart to determine the UPS alarm condition.

Checking the Alarms and Faults

To check the Event log or Fault log :

1. Press any button on the front panel display to activate the menu options.
2. Press the button to select Event log or Fault log.
3. Scroll through the listed events or faults.

The following table describes typical conditions.

Conditions	Possible cause	Action
Battery mode  LED is On. 1 beep every 10 seconds	A utility failure has occurred and the UPS is in battery mode.	The UPS is powering the equipment with battery power. Prepare your equipment for shutdown.
Battery mode  LED is On. 1 beep every 3 seconds	The UPS is in Battery mode and the battery is running low.	This warning is approximate, and the actual time to shutdown may vary significantly. Depending on the UPS load and number of Extended Battery Modules (EBMs), the "Battery Low" warning may occur before the batteries reach 20% capacity.
No battery  LED is On Beep continuous	The batteries are disconnected.	Verify that all batteries are properly connected. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.
Battery fault  LED is On Beep continuous	The battery test is failed due to bad or disconnected batteries.	Verify that all batteries are properly connected. If the condition persists, contact your service representative. To clear a battery disconnected alarm a battery test must be initiated. See Table 5. If the condition persists, contact your service representative.

Conditions	Possible cause	Action
The UPS does not provide the expected backup time.	The batteries need charging or service.	Apply utility power for 48 hours to charge the batteries. If the condition persists, contact your service representative.
Bypass mode  LED is on.	An overload or a fault has occurred, or a command has been received and the UPS is in Bypass	Equipment is powered but not protected by the UPS. Check for one of the following alarms: overtemperature, overload or UPS LED is on. failure.
Power Overload  LED is on.	Power requirements exceed the UPS capacity (greater than 100% of nominal; see “User Settings” on page 8 for specific output overload ranges).	Remove some of the equipment from the UPS. The UPS continues to operate, but may switch to Bypass mode or shut down if the load increases. The alarm resets when the condition becomes inactive.
UPS Overtemperature  LED is on. 1 beep every 3 seconds	The UPS internal temperature is too high or a fan has failed. At the warning level, the UPS generates the alarm but remains in the current operating state. If the temperature rises another 10°C, the UPS transfers to Bypass mode or shuts down if Bypass is unusable.	If the UPS transferred to Bypass mode, the UPS will return to normal operation when the temperature drops 5°C below the warning level. If the condition persists, shut down the UPS. Clear vents and remove any heat sources. Allow the UPS to cool. Ensure the airflow around the UPS is not restricted. Restart the UPS. If the condition continues to persist, contact your service representative.
The UPS does not start	The input source is not connected correctly.	Check the input connections.
	The Remote Power Off (RPO) switch is active or the RPO connector is missing.	If the UPS Status menu displays the "Remote Power Off" notice, inactivate the RPO input.

7.2 Silencing the Alarm

Press the ESC (Escape) button on the front panel display to silence the alarm. Check the alarm condition and perform the applicable action to resolve the condition. If the alarm status changes, the alarm beeps again, overriding the previous alarm silencing.

7.3 Service and Support

If you have any questions or problems with the UPS, call your **Local Distributor** or your local service representative and ask for a UPS technical representative. Please have the following information ready when you call for service:

- Model number
- Serial number
- Firmware version number
- Date of failure or problem
- Symptoms of failure or problem
- Customer return address and contact information

If repair is required, you will be given a Returned Material Authorization (RMA) number. This number must appear on the outside of the package and on the Bill Of Lading (if applicable). Use the original packaging or request packaging from the Help Desk or distributor. Units damaged in shipment as a result of improper packaging are not covered under warranty. A replacement or repair unit will be shipped, freight prepaid for all warrantied units.

IMPORTANT

For critical applications, immediate replacement may be available. Call the Help Desk for the dealer or distributor nearest you.

7.4 CE Compliance Contact

- Eaton I.F. SAS - 110 Rue Blaise Pascal - 38330 Montbonnot St Martin – France.

Chapter 8 Specifications

8.1 Model Specifications

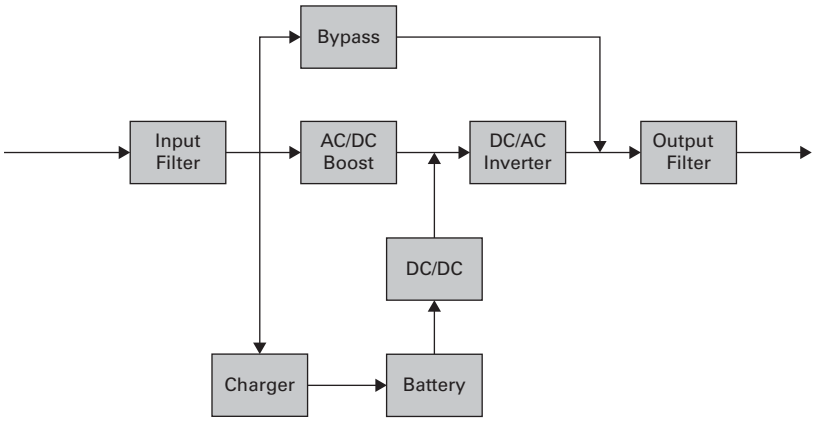


Table 7. Power Module List

Model	Power ratings
9PX1500RT-L	1500VA / 1350W
9PX2000RT-L	2000VA / 1800W
9PX3000RT-L	3000VA / 2700W
9PX1500GRT-L	1500VA / 1350W
9PX2200GRT-L	2200VA / 2000W
9PX3000GRT-L	3000VA / 2700W

Table 8. Extended Battery Module List

Model	Configuration	Battery Voltage	For Power Module
9PXEBM48RT-L	Rack / Tower	48Vdc	1500VA
9PXEBM72RT-L	Rack / Tower	72Vdc	2000 – 2200 – 3000VA

Table 9. Weights and Dimensions

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PX1500RT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	35.5 / 16.2
9PX2000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.6 / 23.0
9PX3000RT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	52.7 / 24.0
9PX1500GRT-L	17.7 x 17.3 x 3.4 / 450 x 440 x 86.5	34.8 / 15.8
9PX2200GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	48.6 / 22.1
9PX3000GRT-L	23.8 x 17.3 x 3.4 / 605 x 440 x 86.5	50.2 / 22.8

Table 9. Weights and Dimensions (Continued)

Model	Dimensions D x W x H(inch/mm)	Weight (lb / kg)
9PXEBM48RT-L	17.6 x 17.2 x 1.7 / 448 x 438 x 42.9	36.5 / 16.6
9PXEBM72RT-L	23.7 x 17.2 x 1.7 / 603 x 438 x 42.9	46.6 / 21.2

Table 10. Electrical Input

Model	Default Input (Voltage/Max Current)	Input Nominal Voltages	Input Voltage Window at Rated Load
9PX1500RT-L	120V / 12.5A	100V, 110V, 120V, 125V	100–138V
9PX2000RT-L	120V / 16A		
9PX3000RT-L	120V / 24A		
9PX1500GRT-L	208V / 7.2A	200V, 208V, 220V, 230V, 240V	176V-276V
9PX2200GRT-L	208V / 10.57A		
9PX3000GRT-L	208V / 14.42A		
Nominal Frequency		50/60Hz auto-sensing	
Frequency Range		40-70Hz before transfer to battery	
Bypass Voltage Range		-20% / +15% of nominal value (default)	
Noise Filtering		Input EMC filter	

Table 11. Electrical Input Connections

Model	Input Connection	Input cable
9PX1500RT-L	5–15P	8ft / 2.4m
9PX2000RT-L	5–20P	8ft / 2.4m
9PX3000RT-L	L5–30P	8ft / 2.4m
9PX1500GRT-L	IEC-C14, IEC 10A	6ft / 1.8m
9PX2200GRT-L	IEC-C20, 16 A inlet L6-20P to C19 jumper provided	6ft / 1.8m
9PX3000GRT-L		

Table 12. Electrical Output

All Models	Normal Mode	Efficiency Mode	Battery Mode
Voltage Regulation	±1%		±2%
Efficiency	90.0% for 1.5K LV models 91% for 1.5K G models 91.4% for 2K LV models 93% for 2K G models 94% for 3K G models	95.8% for 1K5 LV models 96.5% for 1.5K G models 96.8% for 2K LV models 98% for 2K G models 97.2% for 3K LV models 98% for 3K G models	84% for 1.5K LV models 87.5% for 1.5K G models 86% for 2K LV models 90% fo r 2K G models 86% for 3K LV models 89% for 3K G models

Table 12. Electrical Output (Continued)

All Models	Normal Mode	Efficiency Mode	Battery Mode
Frequency Regulation	Sync with line ±5% of nominal line frequency (outside this range: ±0.5% of auto-selected nominal frequency)		±0.5% of auto-selected nominal frequency
Nominal Output	[100V] [110V] [120V] [125V] [200V] [208V] [220V] [230V] [240V] (G models)		
Frequency	50 or 60 Hz, autosensing or configurable as a frequency converter		
Output Overload	Online mode: 102%~130% :12s 130%~150% :2s >150% :shutdown after 300ms Percent is based on nominal Watt/VA. Transfer behavior can change (see output mode setting on page 14) Battery mode: 102%~130% :12s >130% :2s Overload warning then transfer to stop output		
Output Overload (Bypass Mode)	102%~110% :Overload warning 110%~130% :shutdown after 5mins 130%~150% :shutdown after 15s >150% :shutdown after 300ms Percent is based on nominal current in bypass mode		
Voltage Waveform	Sinewave		
Harmonic Distortion	< 3% THDV on linear load < 5% THDV on non-linear load		
Transfer Time	Online Mode: 0ms High Efficiency mode: 10ms maximum (due to loss of utility)		
Power Factor	Up to 1.0		
Load Crest Ratio	Up to 3:1		

Table 13. Electrical Output Connections

Model	Output Connection	Output Cable
9PX1500RT-L	5-15R (8)	No
9PX2000RT-L	5-20R(2) + L5-20R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX3000RT-L	5-20R(2) + L5-30R(1) 5-20R(2) Group1 5-20R(2) Group2	No
9PX1500GRT-L	(4) IEC10A (2) IEC10A (2) IEC10A (2) IEC 10A	No

Table 13. Electrical Output Connections (Continued)

Model	Output Connection	Output Cable
9PX2200GRT-L	(4) IEC10A + (1) IEC16A (2) IEC10A + (1) IEC16A group 1 (2) IEC10A group 2	(2) IEC 10A
9PX3000GRT-L		

Table 14. Environmental and Safety

Certifications	IEC/EN 62040-1 IEC/EN 62040-2 : Cat. C1 IEC/EN 62040-3 UL1778 5th edition CSA 22.2
EMC (Emissions)*	CISPR22 Class B FCC part 15 Class B / ICES-003
EMC (Immunity)*	IEC 61000-4-2, (ESD): 8 kV Contact Discharge / 15 kV Air Discharge IEC 61000-4-3, (Radiated field): 10 V/m IEC 61000-4-4, (EFT): Power (Coupling network) 4 kV / Ethernet (Coupling clamp) 2 kV IEC 61000-4-5, (Surges): 2 kV Differentiel Mode / 4 kV Common Mode / 1 kV Ethernet IEC 61000-4-6, (Electromagnetic field): 10 V IEC 61000-4-8, (Conducted magnetic field): 30 A/m
* for output cable < 10m.	
Agency Markings*	cULus / NOM / Energy Star / BSMI
Operating Temperatures	0 to 40°C (32 to 104°F) in Online mode, with linear derating for altitude **Note:** thermal protection switches load to Bypass in case of overheating.
Storage Temperatures	0 to 40°C (32 to 104°F) with batteries -25 to 55°C (-13 to 130°F) without batteries
Transit Temperature	-25 to 55°C (-13 to 130°F)
Relative Humidity	0 to 96% no condensing
Operating Altitude	Up to 3,000 meters (9,843 ft) above sea level, no derating for 35°c (95°F) room temperature
Transit Altitude	Up to 10,000 meters (32,808 ft) above sea level
Audible Noise	< 47 dBA at 1 meter typical for 2K et 3K models < 40 dBA at 1 meter typical for 70, 1K et 1K5 models
***** 9PX1500RT-L, 9PX2000RT-L, 9PX3000RT-L, 9PX1500GRT-L, 9PX2200GRT-L, 9PX3000GRT-L have cULus/Energy Star/ BSMI. 9PXEBM48RT-L, 9PXEBM72RT-L have cULus / NOM.	

Table 15. Battery

	Internal Batteries	EBM
Rack / Tower configuration	1500VA: 48Vdc 2200VA: 72Vdc 3000VA: 72Vdc	9PXEBM48RT: 48Vdc 9PXEBM72RT: 72Vdc
Type	Lithium Iron Phosphate (LFP) battery module Lithium-Ion float service life 8 years /25°C	
Monitoring	Integrated battery management system (BMS) for temperature regulation and life cycle monitoring.	
EBM Battery Cable Length	350 mm / 13.78 in	

P-164001006 06

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Five-Year Limited Warranty (US and Canada)

Eaton UPS Models: 9PX Lithium-ion

WARRANTOR: The warrantor for the limited warranties set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED WARRANTY: This limited warranty (this "Warranty") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") purchased on or after March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by March 1, 2021 and cannot be transferred. This Warranty applies even in the event that the Product is initially sold by Company for resale to an End-User.

LIMITED WARRANTY PERIOD: The period covered by this Warranty for Product installed [and currently located] in the fifty (50) United States, the District of Columbia, and Canada is sixty (60) months from the date of purchase, or sixty six (66) months from the date of shipment.

WHAT THIS LIMITED WARRANTY COVERS: The warrantor warrants that the Product and battery (individually and collectively, the "Warranted Items") are free from defects in material and workmanship. If, in the opinion of Company, a Warranted Item is defective and the defect is within the terms of this Warranty, Company's sole obligation will be to repair or replace such defective Warranted Item (including by providing service, parts and labor, as applicable), at the option of Company.

PROCEDURES FOR REPAIR OR REPLACEMENT OF WARRANTED ITEMS: The Warranted Item will be repaired or replaced at a Company site or such other location as determined by Company.

If the Warranted Item is to be replaced by Company, and the End-User supplies a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives notice of the warranty claim. In such case, the End-User must return (at Company's expense) the defective Warranted Item to Company in the same packaging as the replacement Warranted Item received by the End-User or as otherwise instructed by Company. If Company does not receive the defective Warranted Item, Company will either charge the End-User's credit card, or send the End-User an invoice (which the End-User agrees to pay), for the value of the replacement Product.

If the Warranted Item is to be replaced by Company, but the End-User is unwilling or unable to supply a credit card number or purchase order for the value of the replacement Product, Company will use commercially reasonable business efforts to ship (via standard ground shipment and at no cost to the End-User) the replacement Warranted Item to the End-User within one (1) business day after Company receives the defective Product from the End-User.

In any case, Company will provide shipping instructions and will pay its designated carrier for all shipping charges for return of defective equipment and replacement of Warranted Items. Any returned Warranted Item or parts that are replaced may be new or reconditioned. All Warranted Items returned to Company and all parts replaced by Company shall become the property of Company.

WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.

This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.

Company shall not be responsible for any charges for testing, checking, removal, or installation of Warranted Items.

COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.

COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.

THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON-CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY), OR OTHERWISE.

LIMITATION OF LIABILITY: The remedies of the End-User set forth herein are exclusive and are the sole remedies for any failure of Company to comply with its obligations hereunder. In no event shall Company be liable in contract, in tort (including negligence or strict liability) or otherwise for damage to property or equipment other than the Products, including loss of profits or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, or revenue, loss of use of Products, loss of data, cost of capital, claims of customers of the End-User, or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of Company hereunder whether the claims are based in contract (including indemnity), in tort (including negligence or strict liability), or otherwise, shall not exceed the price of the Product on which such liability is based.

Company shall not be responsible for failure to provide service or parts due to causes beyond Company's reasonable control.

END-USER'S OBLIGATIONS: In order to receive the benefits of this Warranty, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.

OTHER LIMITATIONS: Company's obligations under this Warranty are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Warranty. Also during such time, the period of this Warranty shall continue to run and the expiration of this Warranty shall not be extended upon payment of any overdue or unpaid amounts.

COSTS NOT RELATED TO WARRANTY: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Warranty, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Warranty will be borne by the End-User.

OBTAINING WARRANTY SERVICE: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, call your local Eaton product sales or service representative. For comments or questions about this Warranty, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.

Load Protection Guarantee (US and Canada)

Eaton UPS Models 9PX Lithium-ion

GUARANTOR: The Guarantor for the load protection guarantee set forth herein is Eaton Corporation, an Ohio Corporation company ("Company").

LIMITED GUARANTEE: This load protection guarantee (this "Guarantee") applies only to the original End-User (the "End-User") of any Eaton 9PX Lithium-ion Products (individually and collectively, the "Product") and cannot be transferred. This Guarantee applies even in the event that the Product is initially sold by Company for resale to an End-User.

WHAT THIS GUARANTEE COVERS: For the lifetime of the Product, Guarantor promises to repair or replace, at Guarantor's option, the equipment (valued up to the limits shown below*) that is damaged by an AC power line surge, spike, or other transient when properly connected to Guarantor's uninterruptible power system ("UPS"). Reimbursement for or restoration of data loss excluded. This Guarantee applies only if all of the following circumstances arise:

1. The UPS is plugged into properly grounded and wired outlets, using no extension cords, adapters, other ground wires, or other electrical connectors;
2. The installation of the UPS complies with all applicable electrical and safety codes described by the National Electrical Code® (NEC®);
3. The UPS was used under normal operating conditions and in accordance with all labels and instructions; and
4. The UPS was not damaged by accident (other than AC power line transient), misuse, or abuse.

***Cumulative Limits to be paid by Guarantor under this Load Protection Guarantee:**

$150,000 for Eaton UPS Models 9PX Lithium-ion

WHAT THIS GUARANTEE DOES NOT COVER: Any reimbursement or repair to End-User's equipment does not include reimbursement for or restoration of any data loss. This Guarantee does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication, or incorrect installation of Product; (d) repair or alteration of Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment, or modification of any kind to the Product not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Guarantee is not valid: if the Product's serial numbers have been removed or are illegible.
Company shall not be responsible for any charges for testing, checking, removal, or installation of any items.

LIMITATION OF LIABILITY: The remedies of the END-USER set forth HEREIN are exclusive and are THE sole remedies for any failure of COMPANY to comply with its obligations hereunder. EXCEPT AS OTHERWISE PROVIDED FOR IN THIS GUARANTEE, in no event shall COMPANY be liable in contract, in tort (including negligence or strict liability), or otherwise for damage to property or equipment other than THE products, INCLUDING loss of profits or revenue, loss of use of products, LOSS OF DATA, cost of capital, claims of customers of the END-USER or any special, indirect, incidental, or consequential damages whatsoever. The total cumulative liability of COMPANY HEREUNDER whether the claims are based in contract (INCLUDING INDEMNITY), in tort (including negligence or strict liability), or otherwise, shall not exceed THOSE SET FORTH ABOVE.
Company shall not be responsible for failure to provide repair or replacement under this Guarantee due to causes beyond Company's reasonable control.
END-USER'S OBLIGATIONS: In order to receive the benefits of this Guarantee, the End-User must use the Product in a normal way; follow the Product's user's guide; and protect against further damage to the Product if there is a covered defect.
OTHER LIMITATIONS: Company's obligations under this Guarantee are expressly conditioned upon receipt by Company of all payments due to it (including interest charges, if any). During such time as Company has not received payment of any amount due to it for the Product, in accordance with the contract terms under which the Product is sold, Company shall have no obligation under this Guarantee.
COSTS NOT RELATED TO GUARANTEE: The End-User shall be invoiced for, and shall pay for, all services not expressly provided for by the terms of this Guarantee, including without limitation, site calls involving an inspection that determines no corrective maintenance is required. Any costs for replacement equipment, installation, materials, freight charges, travel expenses, or labor of Company representatives outside the terms of this Guarantee will be borne by the End-User.
TO MAKE A CLAIM: In the USA, call the Customer Reliability Center 7x24 at 800-356-5737. Outside of the USA, contact your local Eaton product sales or service representative. For comments or questions about this Load Protection Guarantee, write to the Customer Quality Representative, 3301 Spring Forest Road, Raleigh, North Carolina 27616 USA.
WHAT THIS LIMITED WARRANTY DOES NOT COVER: This Warranty does not cover any defects or damages caused by: (a) failure to properly store the Product before installation, including the charge of batteries no later than the date indicated on the packaging; (b) shipping and delivery of the Product if shipping is FOB Factory; (c) neglect, accident, abuse, misuse, misapplication or incorrect installation; (d) repair or alteration not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; (e) improper testing, operation, maintenance, adjustment or modification of any kind not authorized in writing by Company personnel or performed by an authorized Company Customer Service Engineer or Agent; or (f) use of the Product under other than normal operating conditions or in a manner inconsistent with the Product's labels or instructions.
This Warranty is not valid if the Product's serial numbers have been removed or are illegible. Any Warranted Items repaired or replaced pursuant to this Warranty will be warranted for the remaining portion of the original Warranty subject to all the terms thereof.
Company shall not be responsible for any charges for testing, checking, removal or installation of Warranted Items.
COMPANY DOES NOT WARRANT EQUIPMENT NOT MANUFACTURED BY COMPANY. IF PERMITTED BY THE APPLICABLE MANUFACTURER, COMPANY SHALL PASS THROUGH SUCH MANUFACTURER'S WARRANTIES TO END-USER.
COMPANY DOES NOT WARRANT SOFTWARE, INCLUDING SOFTWARE EMBEDDED IN PRODUCTS, THAT IS NOT CREATED BY COMPANY. WITHOUT LIMITING THE FOREGOING, COMPANY SPECIFICALLY DOES NOT WARRANT SOFTWARE (SUCH AS LINUX) THAT WAS CREATED USING AN "OPEN SOURCE" MODEL OR IS DISTRIBUTED PURSUANT TO AN OPEN SOURCE LICENSE.
THIS WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY OFFERED BY COMPANY WITH RESPECT TO THE PRODUCTS AND SERVICES AND, EXCEPT FOR SUCH FOREGOING WARRANTY COMPANY DISCLAIMS ALL OTHER WARRANTIES INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE. CORRECTION OF NON- CONFORMITIES IN THE MANNER AND FOR THE PERIOD OF TIME PROVIDED ABOVE SHALL CONSTITUTE COMPANY'S SOLE LIABILITY AND END-USER'S EXCLUSIVE REMEDY FOR FAILURE OF COMPANY TO MEET ITS WARRANTY OBLIGATIONS, WHETHER CLAIMS OF THE END-USER ARE BASED IN CONTRACT, IN TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE

Product specifications

Eaton 9PXEBM72RT-L

Catalog Number: 9PXEBM72RT-L

Eaton 9PX lithium ion extended battery module (EBM), 1U, used with 9PX2000RT-L, 9PX2000RTN-L, 9PX2200GRT-L, 9PX3000RT-L, 9PX3000RTN-L, 9PX3000GRT-L

General specifications

Product Name
Eaton 9PX extended battery module (EBM)

Catalog Number
9PXEBM72RT-L

UPC
743172105608

Product Length/Depth
23.7 in

Product Height
1.7 in

Product Width
17.2 in

Product Weight
46.6 lb

Compliances
CE Marked
FCC part 15 Class B
IEC 62040-2 Cat C1

Certifications
NOM
cTUVus

Battery

Runtime graph

View runtime graph

Battery replacement

Hot-swappable internal batteries and extended battery modules (EBMs)

Battery type

Lithium-ion

Environmental

Relative humidity

0-96% non-condensing

Temperature range

0° to 40°C (32° to 104°F)

Additional specifications

Form factor

Rack/tower

Rack size

1U

Rack mounting kit

Yes

Used with

9PX3000RT-L, 9PX3000GRT-L, 9PX3000GLRT-L, 9PX2000RT-L, 9PX2200GRT-I

Warranty and support

Standard factory warranty

5-YEAR FACTORY WARRANTY

- 2 years
- Parts, electronics and batteries coverage
- Standard ground shipping
- Technical support

Resources

Brochures

Eaton 9PX lithium-ion UPS brochure

Drawings

Eaton 9PXEBM72RT-L 2D drawing

Specifications and datasheets

Eaton 9PX lithium-ion UPS technical specifications

User guides

Eaton 9PX lithium-ion UPS (1-3 kVA) user guide



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30 Pembroke Road
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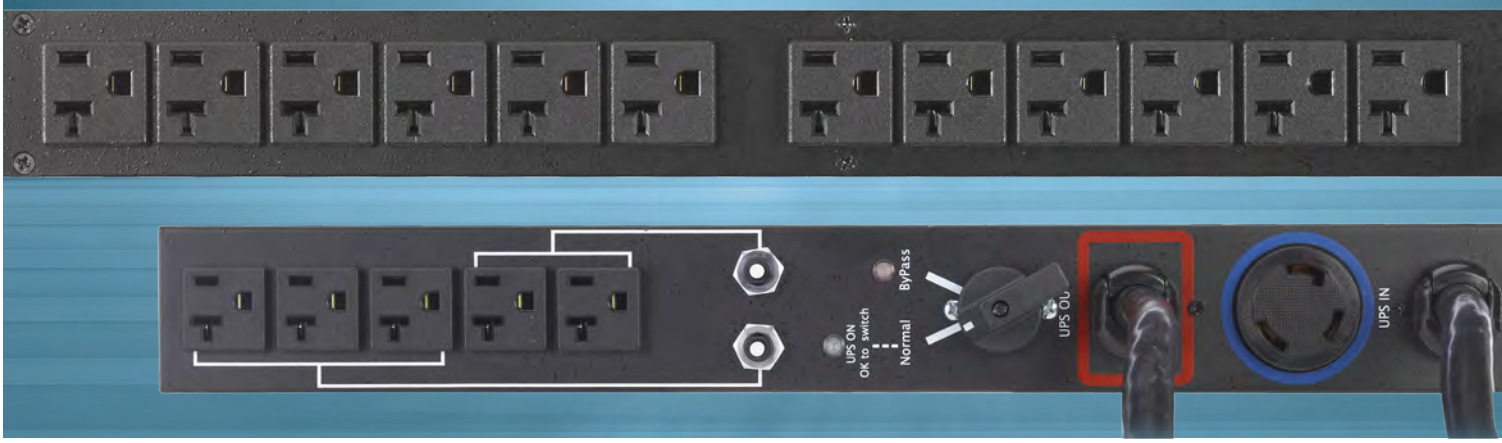
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Product brochure



Eaton FlexPDU and Maintenance Bypass PDU

Eaton provides five different functions for rack power distribution solutions. Two of these functions, FlexPDU and Maintenances Bypass PDU, were created as accessories specific to some of our UPSs. Both of these units offer the flexibility of connections to meet the demanding requirements of today's data center architects.

The HotSwap Maintenance Bypass (MBP) unit enables easy UPS replacement without interruption of the load. The HotSwap MBP is ideal when exchanging a unit or servicing a UPS. For added convenience, the HotSwap MBP offers two types of receptacles: 5-15R or 5-20R.

The FlexPDU is a basic function power distribution unit with a short power cord for easy, close mounting. FlexPDUs are available with 5-15R, 5-20R or L5-20R output receptacles, for connection to a wide range of equipment.

Both of these options allow for easy deployment, even in space-constrained environments. You have a variety of mounting options, including top and side mounting.

Features

- HotSwap MBP provides service continuity during UPS maintenance or upgrade
- Both units offer connections to all types of equipment
- Eases installation with flexible mounting options
- Minimal depth accommodates most space constraints



Side mounting Flex PDU with Tower UPS



Top mounting horizontal FlexPDU with 2U UPS

HotSwap MBPs rackmounted horizontally in rack



Top mounting vertical FlexPDU



Powering Business Worldwide

FLEXPDU MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EFLXL1500R-PDU1U	58015	5-15P	None	1.44	BA	3	1U	(12) 5-15R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1U	58020	5-20P	None	1.92	BA	3	1U	(12) 5-20R	1.7 x 19.0 x 2.4
EFLXL2000R-PDU1UL	58021	5-20P	None	1.92	BA	3	1U	(5) L5-20R	1.7 x 19.0 x 3.0
EFLXI3000R-PDU1UIEC	68438	C20 Inlet	(2) 20A	3.33	BA	3	1U	(12) C13, (1) C19	1.7 x 19.0 x 2.4

HOTSWAP MODELS

Catalog number	Style Number	Input Plug	Breaker	Max kW	Function	Cord (ft)	Orientation	Receptacles	Dimensions (H x W x D, in)
EHBPL1500R-PDU1U	58115	5-15P	None	1.44	BA	8	2U	(6) 5-15R	2.1 x 17.3 x 3.8
EHBPL2000R-PDU1U	58120	5-20P	None	1.92	BA	8	2U	(6) 5-20R	2.1 x 17.3 x 3.8
EHBPL3000R-PDU1U	58130	L5-30P	(2) 20A	2.88	BA	3.3	2U	(5) 5-20R	2.1 x 17.3 x 3.8

COMPATIBILITY MATRIX FOR RACKMOUNT UPSs*

FlexPDU plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P 1U UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5) 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓

*For tower models, all FlexPDUs can be wall-mounted. ** Rear mounting available on 3U models only.

HotSwap MBP plug/amp rating	UPS model (North American only)	Rack mounting
15A	Eaton 5P UPS, 550, 750, 1000 and 1500 VA	✓
	Eaton 5P 2U UPS, 1500, 2200 and 3000 VA	✓
	Eaton 5P 2U Compact UPS, 750, 1000 and 1500 VA	✓
	Eaton 5PX UPS, 1000 and 1500 VA	✓
	Eaton 9PX UPS, 700, 1000 and 1500 VA	✓
20A	Eaton 5PX UPS, 2200 VA	✓
	Eaton 9PX UPS, 2000 VA	✓
30A	Eaton 5PX UPS, 3000 VA	✓
	Eaton 9PX UPS, 3000 VA	✓

*For tower models, all HotSwap MBPs can be wall-mounted. **Rear mounting available on 3U models only.

To interact with the FlexPDU and Maintenance Bypass PDF, please visit: **Eaton.com/epdu**

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Powering Business Worldwide

Product specifications

Eaton EHBPL3000R-PDU1U



Catalog Number: EHBPL3000R-PDU1U

Eaton Basic rack PDU, 1U - EHBPL3000R-PDU1U

General specifications

Product Name	**Catalog Number**
Eaton HotSwap MBP	EHBPL3000R-PDU1U
UPC	**Product Length/Depth**
743172067364	17.3 in
Product Height	**Product Width**
2.1 in	3.8 in
Product Weight	**Warranty**
0.0001 lb	3 year
Compliances	**Certifications**
Contact Manufacturer	UL Listed

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Product specifications

Outlet control

No

Cord length

1m

Phase

Single-phase

Input voltage

110-125V

Color

Black

Wattage

2.88 kW max

Form factor

2U

Mounting direction

Horizontal

Amperage Rating

24A

Input connection

L5-30P

Outlets

(5) 5-20R

Type

PDU

Frequency rating

50-60 Hz

Number of Outputs 5-20R

5

Operating Temperature

0° to 60°C (32° to 140°F)

Circuit breaker

(2) 20A

Resources

Brochures

Eaton Flex and Hotswap MBP ePDU brochure

Drawings

Eaton FlexPDU EHBPL 3000R-PDU1U technical drawing

Eaton ePDU visio stencils

Specifications and datasheets

Eaton Specification Sheet - EHBPL3000R-PDU1U

User guides

Eaton FlexPDUs and HotSwap MBP installation and user manual



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HotSwap

Maintenance ByPass

MBP - 115 / EHBPL1500R-PDU1U

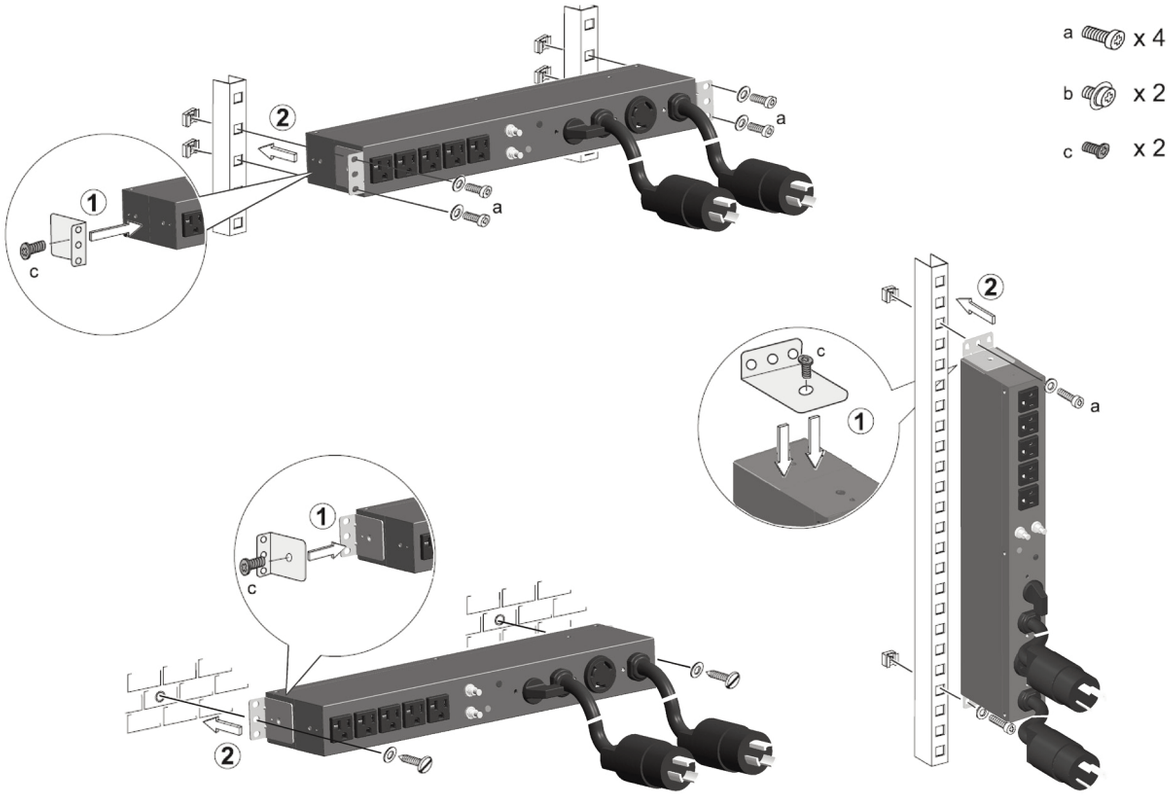
MBP - 120 / EHBPL2000R-PDU1U

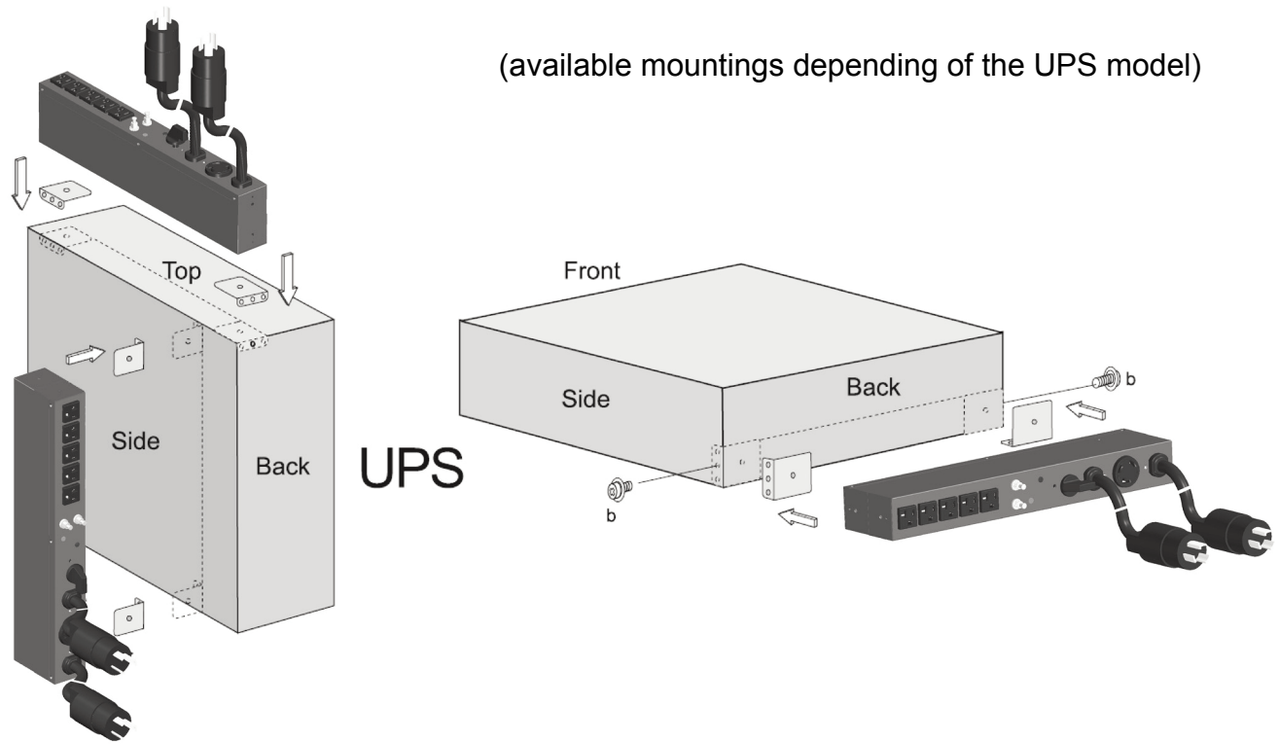
MBP - 130 / EHBPL3000R-PDU1U

Installation and User Manual

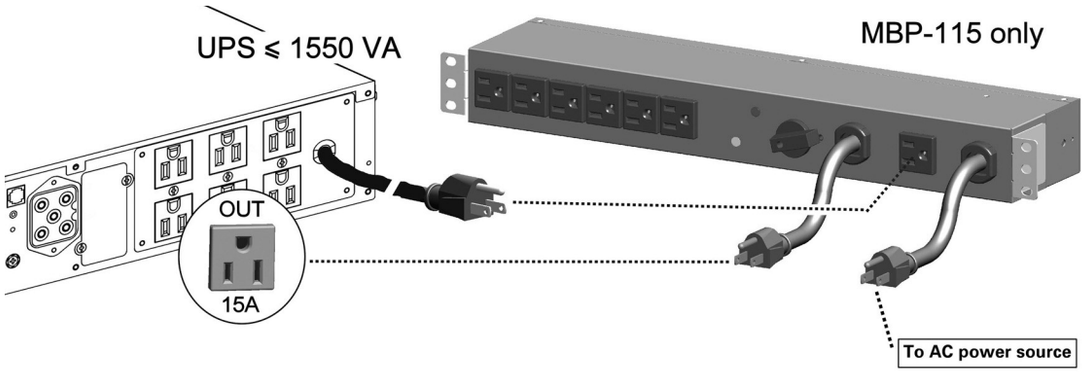
English
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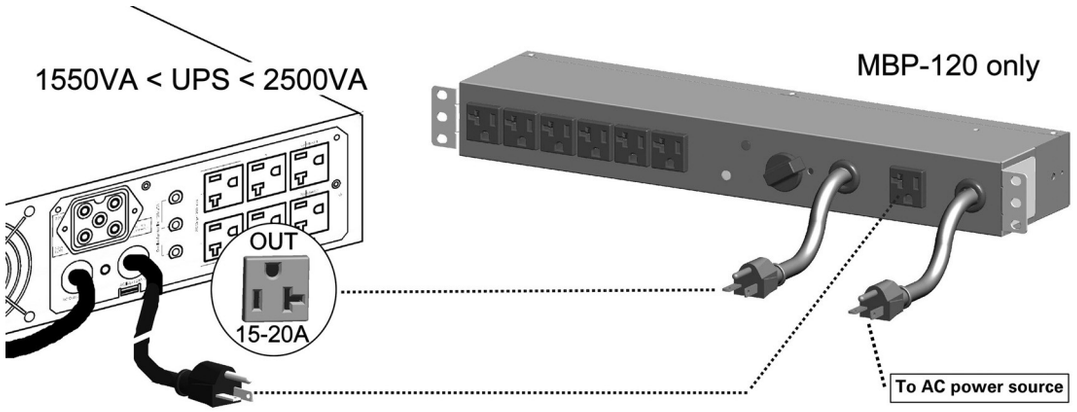
HotSwap Connections

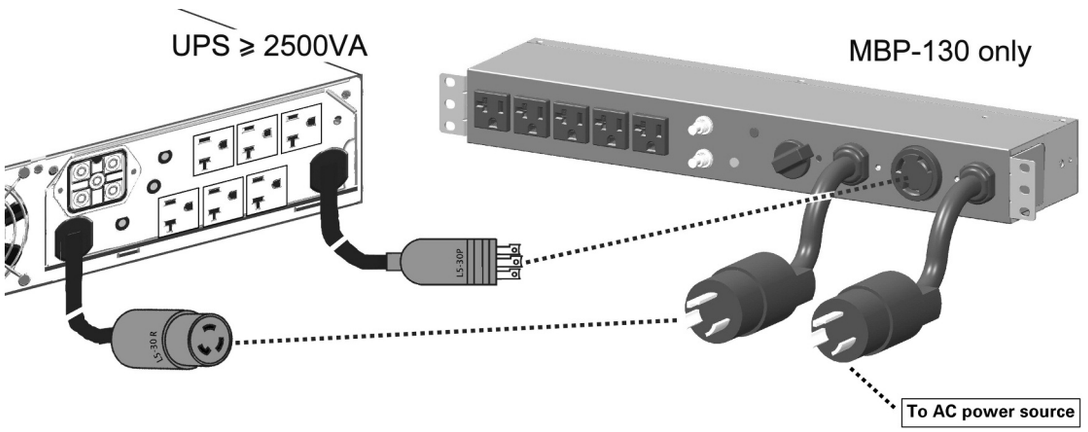


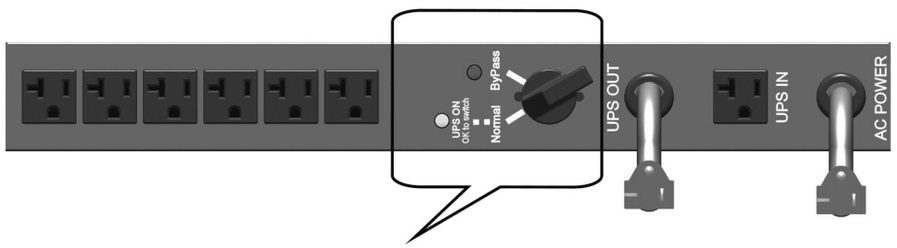


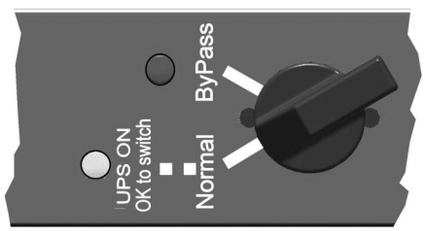
(available mountings depending of the UPS model)


UPS ≤ 1550 VA
MBP-115 only
OUT
15A
To AC power source


1550VA < UPS < 2500VA
MBP-120 only
OUT
15-20A
To AC power source


UPS ≥ 2500VA
MBP-130 only
L5-30P
L5-30R
To AC power source


UPS ON
OK to switch
Normal
ByPass
UPS OUT
UPS IN
AC POWER


UPS ON
OK to switch
Normal
ByPass

English

Safety guidelines to read before installing the product

- The product must be used indoors only.
- Do not place the product near liquid or in an excessively damp environment.
- Do not place the product directly in the sun or near a heat source.
- Do not let liquid or foreign objects enter the product.
- Ground the product using a 2 poles + ground socket (2P + G).
- When installing the product, ensure that the sum of the leakage currents of the product and the devices it supplies does not exceed 3.5 mA.
- The AC-power input must be connected to an appropriate electrical network protection or tap-off circuit (fuse or circuit-breaker).

Use

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function). Refer to the illustrations.

Installation

Refer to the UPS installation and user manual.

HotSwap MBP module operation

The HotSwap MBP module has a rotary switch with two positions:

- Normal - the load is supplied by the UPS,
- Bypass - the load is supplied directly by the AC-power source.

UPS start-up with the HotSwap MBP module

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Set switch to the Normal position.
3. Start the UPS by pressing the ON/OFF button on the UPS control panel:

- The load is supplied by the UPS.
- Green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON.

HotSwap MBP module test

1. Set switch to the Bypass position and check that the load is still supplied.
2. Set switch back to the Normal position.

Maintenance on a UPS equipped with the HotSwap MBP module

The HotSwap MBP module makes it possible to service or even replace the UPS without affecting the connected loads (HotSwap function).

Maintenance:

1. Set switch to the Bypass position. The red LED on the HotSwap MBP module goes ON, indicating that the load is supplied directly with AC power.
2. Stop the UPS: green LED "UPS ON - OK to switch" goes OFF, the UPS can now be disconnected and replaced.

Return to normal operation:

1. Check that the UPS is correctly connected to the HotSwap MBP module.
2. Start the UPS: green LED "UPS ON - OK to switch" on the HotSwap MBP module goes ON (otherwise, there is a connection error between the HotSwap MBP module and the UPS).
3. Set switch to the Normal position. The red LED on the HotSwap MBP module goes OFF.

Français

Consignes de sécurité, à lire avant l'installation du produit

- Le produit doit être utilisé à l'intérieur seulement.
- Ne pas placer le produit à proximité de liquide, ou dans un environnement d'humidité excessive.
- Ne pas placer le produit directement au soleil ou à proximité d'une source de chaleur.
- Ne pas laisser pénétrer de liquide ou d'objet étranger à l'intérieur du produit.
- Relier impérativement le produit à la terre à l'aide d'une prise de courant 2 pôles + terre (2P+T).
- S'assurer lors de l'installation du produit que la somme des courants de fuite du produit et des appareils qu'il alimente ne dépasse pas 3.5 mA.
- La fiche d'alimentation doit être connectée à un circuit de dérivation ou de protection du réseau électrique (fusible ou disjoncteur) approprié.

Utilisation

Le Module HotSwap MBP permet la maintenance et éventuellement le remplacement de l'ASI sans affecter l'alimentation électrique des équipements connectés (fonction HotSwap).

Installation

Se reporter au manuel d'installation et d'utilisation de l'ASI.

Fonctionnement du module HotSwap MBP

Le module HotSwap MBP utilise un commutateur rotatif à 2 positions :

- Normal : les équipements sont alimentés par l'ASI.
- By-pass : les équipements sont alimentés par le réseau électrique.

Mise en service de l'ASI avec le module HotSwap MBP :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Placer le commutateur en position Normal.
3. Mettre en marche l'ASI :

- Les équipements sont alors alimentés par l'ASI.
- Le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP.

Test du module HotSwap MBP

1. Placer le commutateur en position By-pass et vérifier que les équipements sont toujours alimentés.
2. Remettre le commutateur en position Normal.

Maintenance d'une ASI équipée d'un module HotSwap MBP

Remplacement de l'ASI sans interrompre l'alimentation électrique des équipements connectés :

1. Placer le commutateur en position By-pass : le voyant rouge du module HotSwap MBP s'allume pour indiquer que les équipements sont alimentés directement par le réseau électrique.
2. Arrêter l'ASI : le voyant vert "UPS ON - OK to switch" s'éteint, l'ASI peut alors être déconnectée et remplacée.

Retour en fonctionnement normal :

1. Vérifier que l'ASI est raccordée correctement au module HotSwap MBP.
2. Mettre en marche l'ASI : le voyant vert "UPS ON - OK to switch" s'allume sur le module HotSwap MBP (sinon il y a erreur de raccordement du module HotSwap MBP avec l'ASI).
3. Mettre le commutateur en position Normal : le voyant rouge du module HotSwap MBP s'éteint.

Español

Consignas de seguridad leer antes de instalar el producto

- El producto debe utilizarse únicamente al interior.
- No colocar el producto cerca de líquidos o en un entorno de humedad excesiva.
- No colocar el producto directamente bajo los rayos del sol ni cerca de una fuente de calor.
- No dejar que penetre líquido u objeto ajeno al interior del producto.
- Conectar imperativamente el producto a tierra utilizando una toma de corriente de 2 polos + tierra (2P+T).
- Cerciorarse durante la instalación del producto que la suma de las corrientes de fuga del producto y de los aparatos que alimenta no excede 3.5 mA.
- La toma de la red debe estar conectada a un circuito de derivación o de protección de la red eléctrica (fusible o interruptor automático) apropiado.

Utilización

La función del módulo HotSwap MBP es permitir el mantenimiento y, eventualmente, la sustitución del SAI sin que ello afecte a la alimentación eléctrica de los equipos conectados (función HotSwap).

Instalación

Véase el manual de instalación y empleo del SAI.

Funcionamiento del módulo HotSwap MBP

El módulo HotSwap MBP utiliza un conmutador rotativo de 2 posiciones:

- Normal: los equipos están siendo alimentados por el SAI.
- Bypass: los equipos están siendo alimentados por la red eléctrica.

Puesta en servicio del SAI con el módulo HotSwap MBP:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Colocar el conmutador en posición Normal.
3. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI.

- Los equipos están siendo alimentados ya por el SAI.
- El indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP.

Test del módulo HotSwap MBP

1. Colocar el conmutador en posición Bypass y comprobar que los equipos sigan estando alimentados.
2. Volver a poner el conmutador en posición Normal.

Mantenimiento de un SAI equipado con un módulo HotSwap MBP

Mantenimiento:

1. Colocar el conmutador en posición Bypass: el indicador luminoso rojo del módulo HotSwap MBP se enciende para indicar que los equipos están siendo alimentados directamente por la red eléctrica.
2. Parar el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI:

El indicador luminoso verde "UPS ON - OK to switch" se apaga, ya se puede desconectar el SAI y sustituirlo.

Vuelta a funcionamiento normal:

1. Comprobar que el SAI esté correctamente conectado al módulo HotSwap MBP.
2. Poner en marcha el SAI pulsando el botón Marcha/Parada en la cara delantera del SAI: el indicador luminoso verde "UPS ON - OK to switch" se enciende en el módulo HotSwap MBP (en caso contrario, hay un error en la conexión entre el módulo HotSwap MBP y el SAI).
3. Poner el conmutador en posición Normal: el indicador luminoso rojo del módulo HotSwap MBP se apaga.

Português

Instruções de segurança: ler antes da instalação do produto

- O produto deve ser unicamente utilizado no interior.
- Não coloque o produto na proximidade de líquidos, ou num ambiente de humidade excessiva.
- Não coloque o produto directamente ao sol ou na proximidade de uma fonte de calor.
- Não deixe penetrar líquido ou objecto estranho dentro do produto.
- Ligue imperativamente o produto à terra graças a uma ficha de corrente 2 pólos + terra (2P+T).
- Verifique durante a instalação do produto que a soma das correntes de fuga do produto e dos aparelhos que o mesmo alimenta não ultrapassa 3.5 mA.
- A tomada sector deve estar ligada a um circuito de derivação ou de protecção da rede eléctrica (fusível ou disjuntor) apropriado.

HotSwap MBP models: MBP - 115, MBP - 120, MBP - 130

Input	MBP - 115 MBP - 120 MBP - 130	NEMA 5-15P 15A cord (3.3 ft length) NEMA 5-20P 20A cord (3.3 ft length) NEMA L5-30P 30A cord (3.3 ft length)
Output	MBP - 115 MBP - 120 MBP - 130	6 NEMA 5-15R 15A socket outlets 6 NEMA 5-20R 20A socket outlets 5 NEMA 5-20R 20A socket outlets
Dimensions (HxLxD)	2.1 x 17.3 x 3.8 inches	
Performances Nominal voltage Frequency	100/104/110/120/127 50/60 Hz	
Input nominal current	MBP - 115 MBP - 120 MBP - 130	12 A 16 A 24 A
Maximal power	MBP - 115 MBP - 120 MBP - 130	1440 VA 1920 VA 2880 VA
Standards Product	MBP - 115 MBP - 120 MBP - 130	UL 1778
Marking	C UL US LISTED CE	
Environment Temperature Humidity Altitude	 Storage -25°C to 55°C (-77°F to 131°F), operation 0°C to 45°C (32°F to 113°F) Storage 10% to 90%, operation 20% to 90% Transportation up to 12000 m (39370 ft), operation up to 1500 m (4921 ft)	

8609 Six Forks Road
Raleigh, NC 27615 U.S.A
1-800-356-5794 or 919-872-3020

www.eaton.com/powerquality

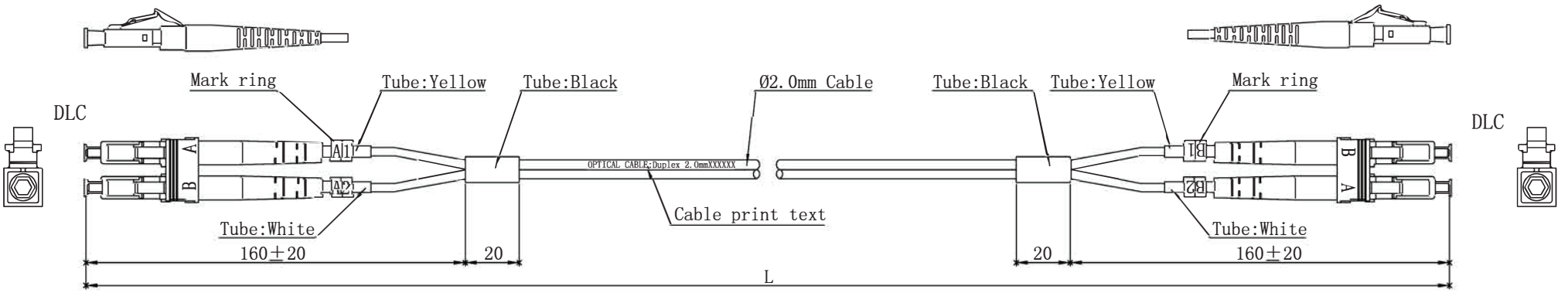
Powering Business Worldwide

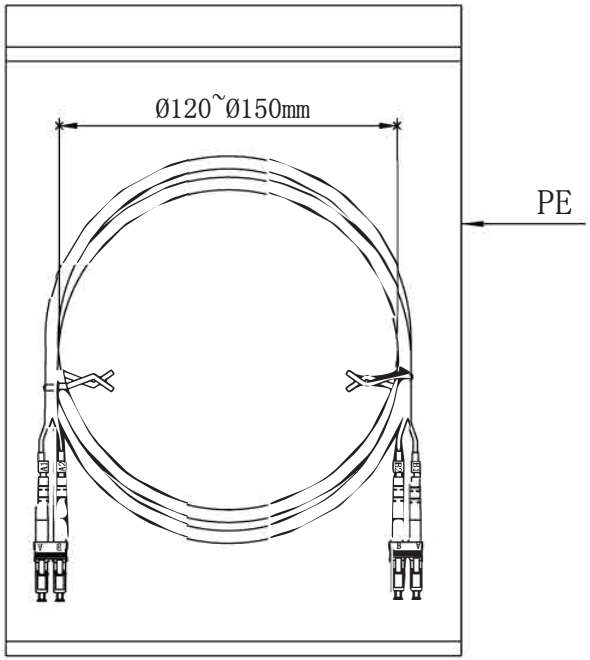
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NOTE:ALL MATERIAL COMPLIANT ROHS STANDARD

REVISION INFORMATION			
Rev.	Rev. Date	Modified By	Brief Description





Specifications:

Type	DLC/UPC-DLC/UPC
Fiber Mode	SM
Core Diameter(um)	9/125
Operating Wavelength(nm)	1310/1550
Cable Color	Yellow
Cable Diameter(mm)	Ø2.0
Operating Temperature(° C)	-40~+75
Storage Temperature(° C)	-40~+85
Insertion loss(dB)	≤0.3dB
Return loss(dB)	≥50dB

L≤5m, TOLERANCES:0≤ΔL≤5cm
L>5m, TOLERANCES:0≤ΔL≤1%*L

NO.	PART NAME	SPECIFICATION DESCRIPTION	QT'Y	UNIT
①				
②				
③				

Unless specified on the drawing, tolerances are per the follows:

. +1
.x +0.2
.xx +0.05

LANshack
Sales@LANshack.com | 888-568-1230

DRAWN BY	DATE: 2015/05/14	DESCRIPTION: LC-LC-DX SM Patchcord	
CHECKED BY	SHEET 1of1	ITEM NO. SFPC-SM-LCLC-XX	
APPROVED BY	SCALE 1:1	REV. 00	UNIT:mm

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Bill of Materials

Project: Coos Bay Wastewater Treatment Plant 1 Phase 1A Improvements
Specification Section(s): Section 40 95 80 – Fiber Optic Communication System
Date: September 2025

Item No.	Qty.	Network Interface Panel	Description	Manufacturer	Manufacturer Part Number	Specification Section	Drawing
001	12	SPARE PARTS	SFP Transceiver, Singlemode Gigabit Fiber, 10km	Red Lion	NTSFP-LX-10	Section 40 915 80	—
002							
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