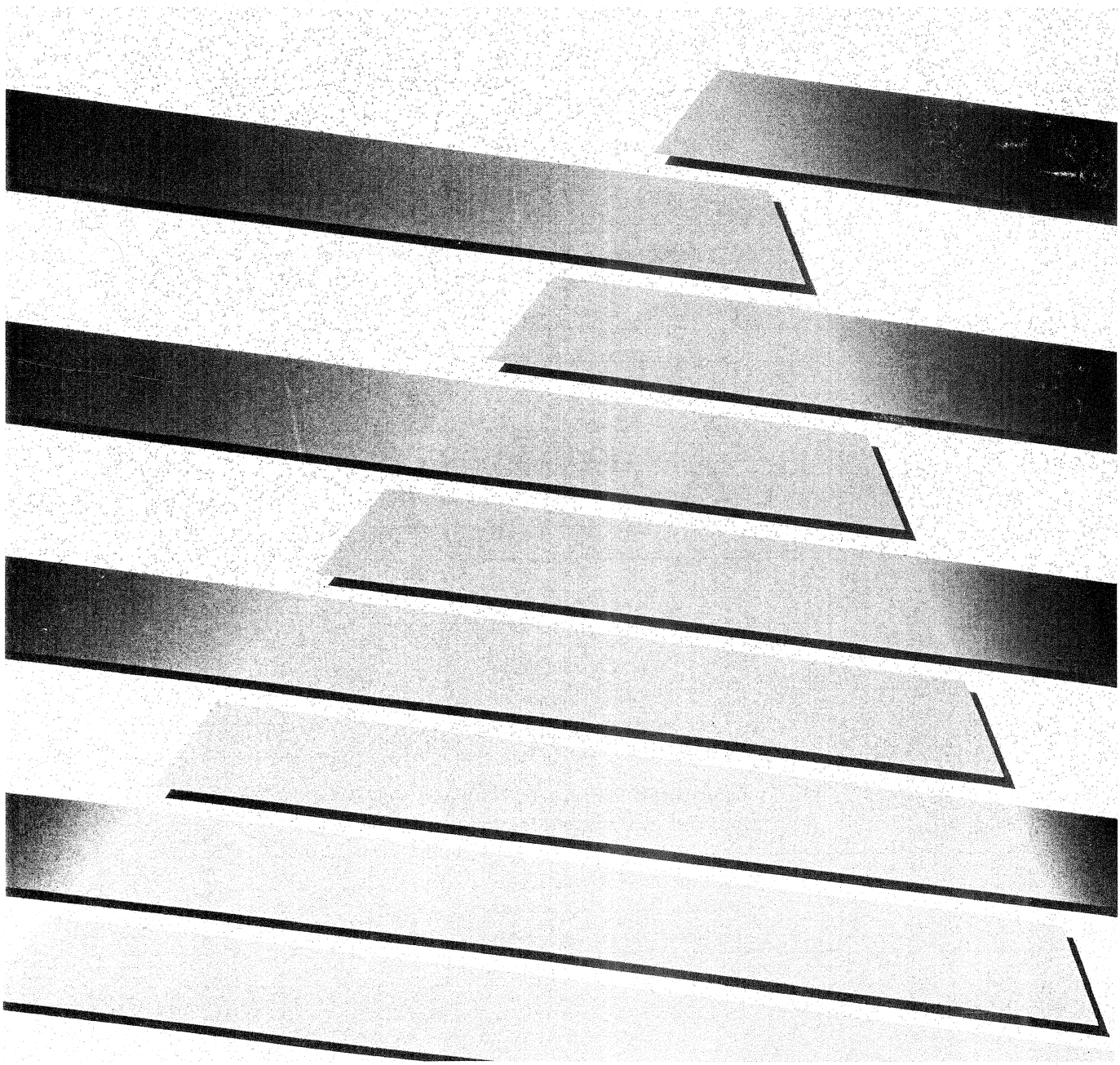
ALLEN-BRADLEY

1785 PLC-5 Programmable Controllers

System Overview



Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is critical for successful application and understanding of the product.

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Chapter 1

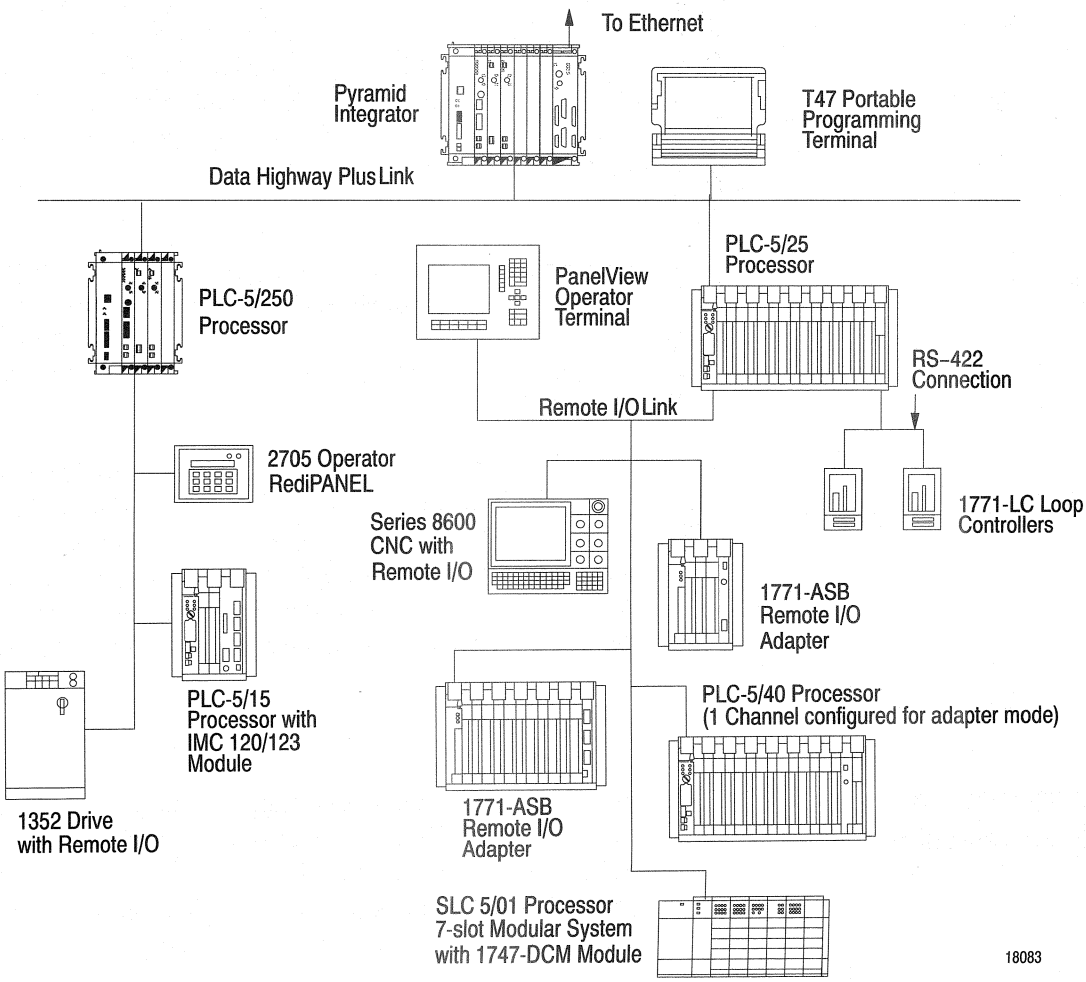
Introducing 1785 PLC-5 Programmable Controllers

1785 PLC-5 Programmable Controllers

The PLC-5 family of programmable controllers consists of SLC 500, 1785 PLC-5, PLC-5/VME, and PLC-5/250 processors. This document describes the 1785 PLC-5 processors and compatible system components.

The 1785 PLC-5 programmable controllers (hereafter refered to as processors) are high-speed processors used for control and information processing. They are single-slot processors that mount in 1771 I/O chassis. These processors have built-in access for communication across a DH+ link and use the same base set of instructions. Figure 1.1 shows a sample system configuration with PLC-5 processors.

Figure 1.1
Example System Configuration with PLC-5 Programmable Controllers



Extensive Instruction Set

Handle and control information processing with one processor.
All 1785 PLC-5 processors perform sequential logic functions and closed-loop processor control functions. These processors integrate sequential control, process control, and data handling by using instructions for relay-type ladder logic, closed-loop PID control, floating-point and integer calculations, data-file management, and time- and event-based interrupts.

Process Control Instructions

Closely monitor and control processes.
The PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, and -5/60L processors support complex expressions in compare and compute instructions, statistical instructions, floating-point calculations in PID instructions and ASCII string-handling instructions.

Communication Options

Integrate communication alternatives.
All 1785 PLC-5 processors have built-in access for DH+ link communication. The 1785 PLC-5 processors (except the PLC-5/10) can communicate in adapter mode (slave) with a supervisory processor. The PLC-5/12 operates in adapter mode only. The PLC-5/11, -5/15, -5/20, -5/25, -5/30, -5/40, -5/40L, -5/60, and -5/60L processors also have built-in access to the remote I/O link and can operate in a remote I/O scanner mode (supervisor).

The PLC-5/20, -5/30, -5/40, and -5/60 processors integrate communication even further by offering an integral remote I/O port and multiple communication channels and protocols. Because each channel operates independently, the processor can operate simultaneously as a remote I/O scanner on one remote I/O link and as a remote I/O adapter on another remote I/O link.

The PLC-5/40L and -5/60L processors also offer an integral remote I/O port and two user configurable ports. In addition, the PLC-5/40L and -5/60L processors offer an extended-local I/O link port for high-speed applications. Extended-local I/O link is a parallel I/O communication link that provides faster scan and update times than a remote I/O link. Extended-local I/O communication is a complement to remote I/O communication.

Multi-Platform Development Software

Reduce time from process design to manufacturing.
Allen-Bradley offers 6200 multi-platform development software on DOS and VMS for programming 1785 PLC-5 processors. With this software, you can create and document re-usable programs that can substantially reduce troubleshooting and start-up time.

Configure ASCII interfaces to connect to programming terminals and other devices.
The built-in ASCII interfaces on the PLC-5/11, -5/20, -5/30, -5/40 and -5/60 processors are user configurable for connections to programming terminals and ASCII devices such as weight scales, bar code readers, Dataliners, and modem communications.

Fault Handlers

Use faults, time intervals, and events to interrupt the processor.
You can configure any PLC-5 processor to run a fault routine when the processor encounters a major fault. You can configure the processor to run a selectable timed interrupt (STI) on a specific, millisecond time interval. You can configure PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, and -5/60L processors to run a processor-input interrupt (PII) based on an event or counter value.

IEC 1131 SFCs

Diagnose problems based on system functions rather than ladder-program files.
All 1785 PLC-5 processors support sequential function charts (SFCs), which you can use to structure your ladder program files. In addition, the PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, and -5/60L processors support main control programs (MCPs), which let you structure your application into functional units. Each MCP can be either a ladder program file or SFC program file, making troubleshooting and segmentation of systems easier.

EEPROM Memory

Expand and back up memory.
The PLC-5 processors have options for EEPROM modules that give you alternative storage or backup for your program files. The PLC-5/15 and PLC-5/25 processors also have CMOS RAM options that expand system memory.

Backup Module

Expand system security.
The 1785-BCM series B backup communication module provides high-speed communication and switchover to a secondary PLC-5/15, -5/20, -5/25, -5/30, -5/40, or -5/60 processor system when a fault or power failure occurs in the primary PLC-5 processor system.

Built-in Diagnostics

Reduce processor down time and troubleshooting time.
The PLC-5 processors have built-in diagnostic instructions and routines. In addition to the internal diagnostics, you can use the editing, documentation, and processor status features of the programming software

Co-Processing Options

Extend PLC Capabilities.
Each PLC-5/11, -5/20, -5/30, -5/40, and -5/60 processor contains a built-in side connection that allows for direct connection to a control co-processor or a MAP/OSI co-processor. This connection also provides processor access to Ethernet or MAP networks.

Passwords and Privileges

Protect Your PLC-5 System
You can set up to four privilege classes (user accounts), each with access to different software operations. You can also set privileges limiting access to each channel in your processor, the nodes attached to your DH+ link, program files, and data files. You can generate a report that lists your privileges configuration.

The passwords/privileges function is an optional feature that you can choose to enable when you are installing your software. (If you do not want to manage passwords and privileges, answer NO when installing this release.) For more information on how to install this feature, refer to Chapter 1 in the Software Configuration and Maintenance module.

Remote Software Support

This support tool consists of a help utility (ABHELP) and a HOST communications software package. With this support software, the Allen-Bradley System Support Center (REMOTE) computer can connect directly with your (HOST) computer to validate your computer setup and run diagnostics first-hand to better answer your questions and reduce support time.

Family Features

The PLC-5 processors include:

Processor:	Catalog Number:	Operating Features:
PLC-5/60	1785-L60B	simultaneously as scanner and adapter
PLC-5/60L	1785-L60L	accesses local I/O
PLC-5/40	1785-L40B	simultaneously as scanner and adapter
PLC-5/40L	1785-L40L	access local I/O
PLC-5/30	1785-L30B	simultaneously as scanner and adapter
PLC-5/20	1785-L20B	either scanner or adapter
PLC-5/25	1785-LT2	either scanner or adapter
PLC-5/15	1785-LT	either scanner or adapter
PLC-5/12	1785-LT3	either local or adapter
PLC-5/11	1785-L11B	either scanner or adapter
PLC-5/10	1785-LT4	local only

From the family of PLC-5 processors, choose the processor you need for your application. Features common to PLC-5 processors are:

- same physical dimensions and use of the left-most slot in the 1771 I/O chassis
- any 1771 I/O modules, with up to 32 I/O per module
- the same programming software and programming terminals
- the same base set of instructions
- sequential function charts developed on the PLC-5/10, -5/12, -5/15, or -5/25 processors can be used by any of the PLC-5 processors
- communication with other Allen-Bradley devices, processors and programming terminals on the DH+ link
- communication with processors and programming terminals on remote DH+ links that are in the same network with the local DH+ link through a connection to a common Data Highway link

Figures 1.2 through 1.5 show PLC-5 processor front panels.

Figure 1.2
PLC-5/30, -5/40, and -5/60 Processor Front Panel

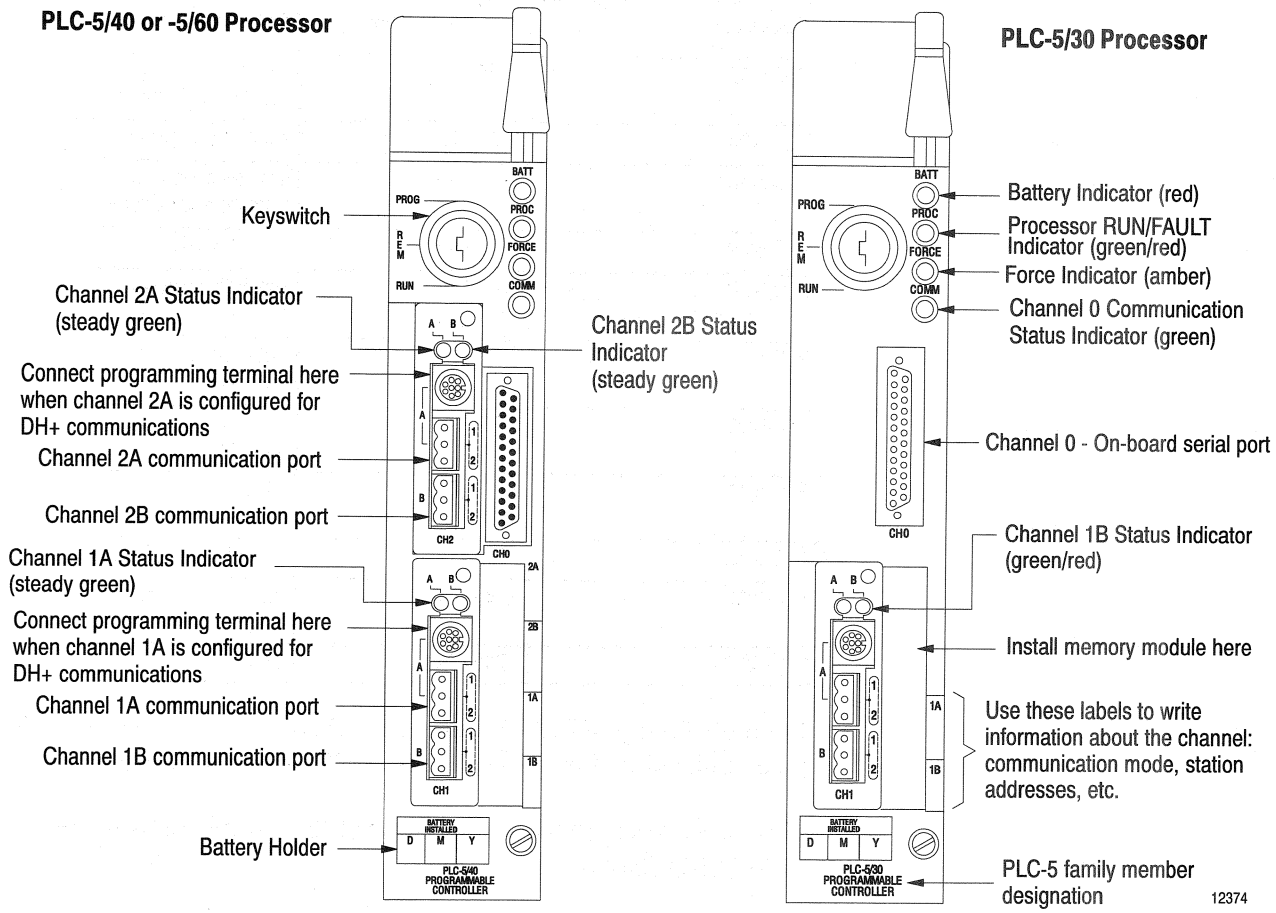


Figure 1.3
PLC-5/40L and PLC-5/60L Front Panel

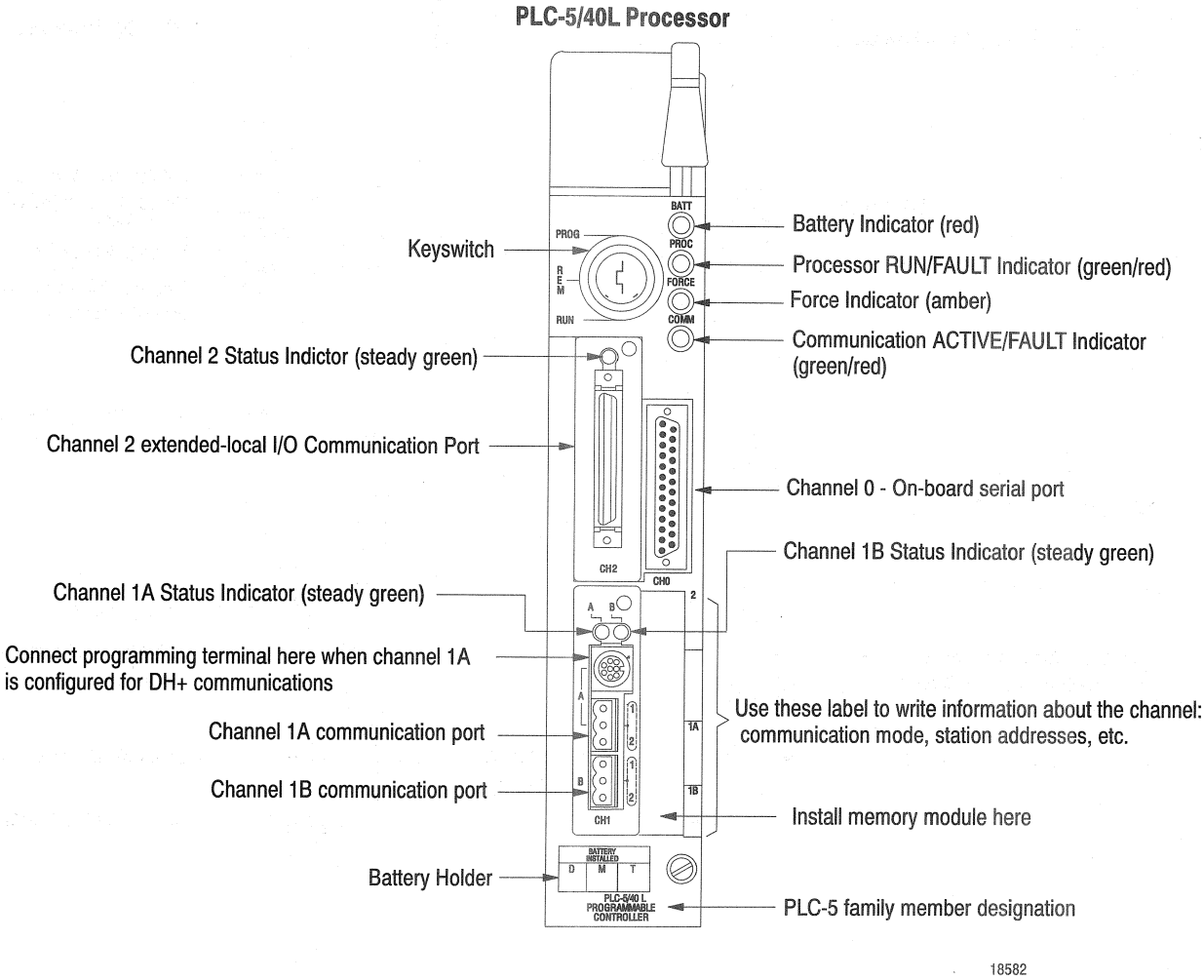


Figure 1.4
PLC-5/11, -5/20 Processor Front Panels

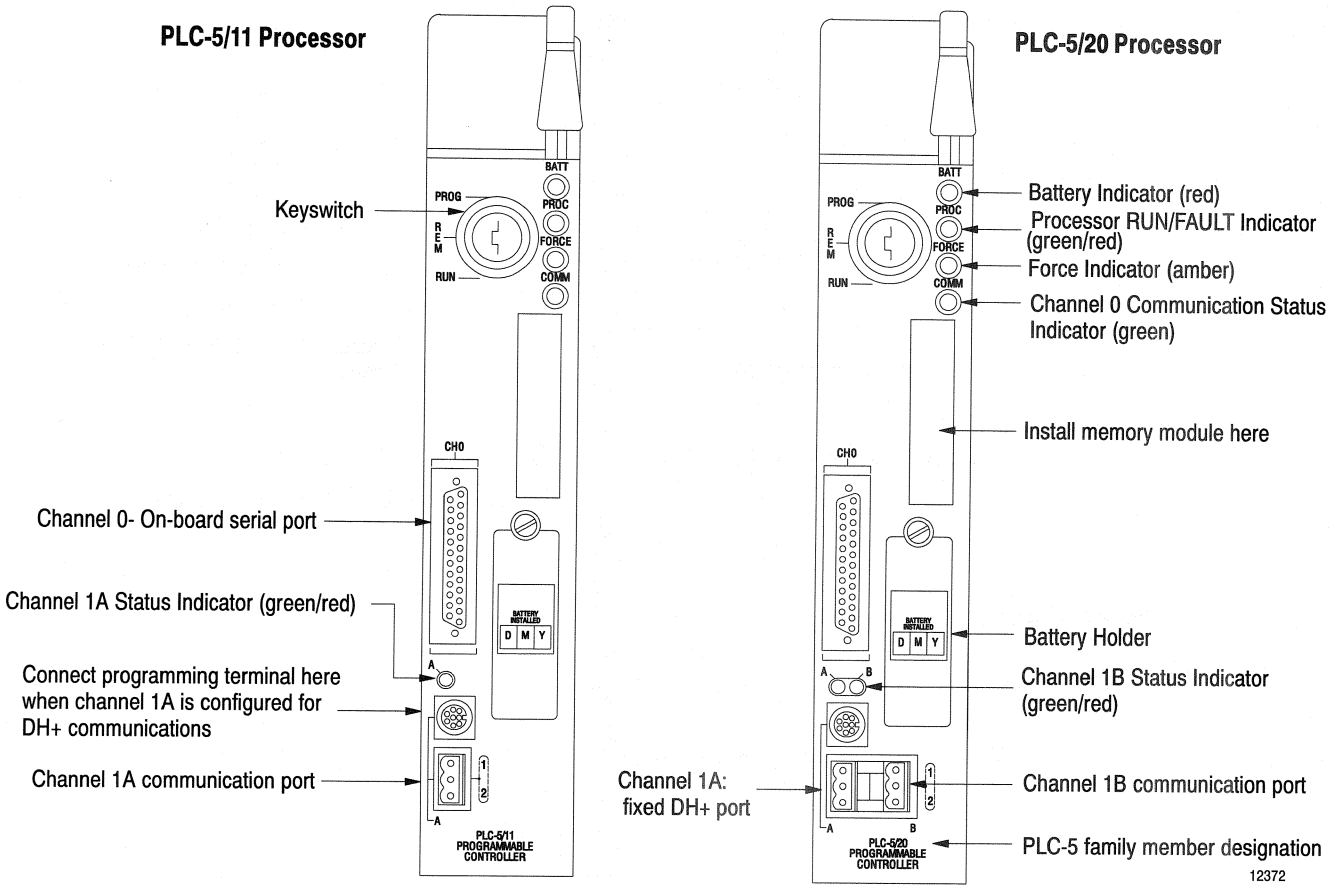
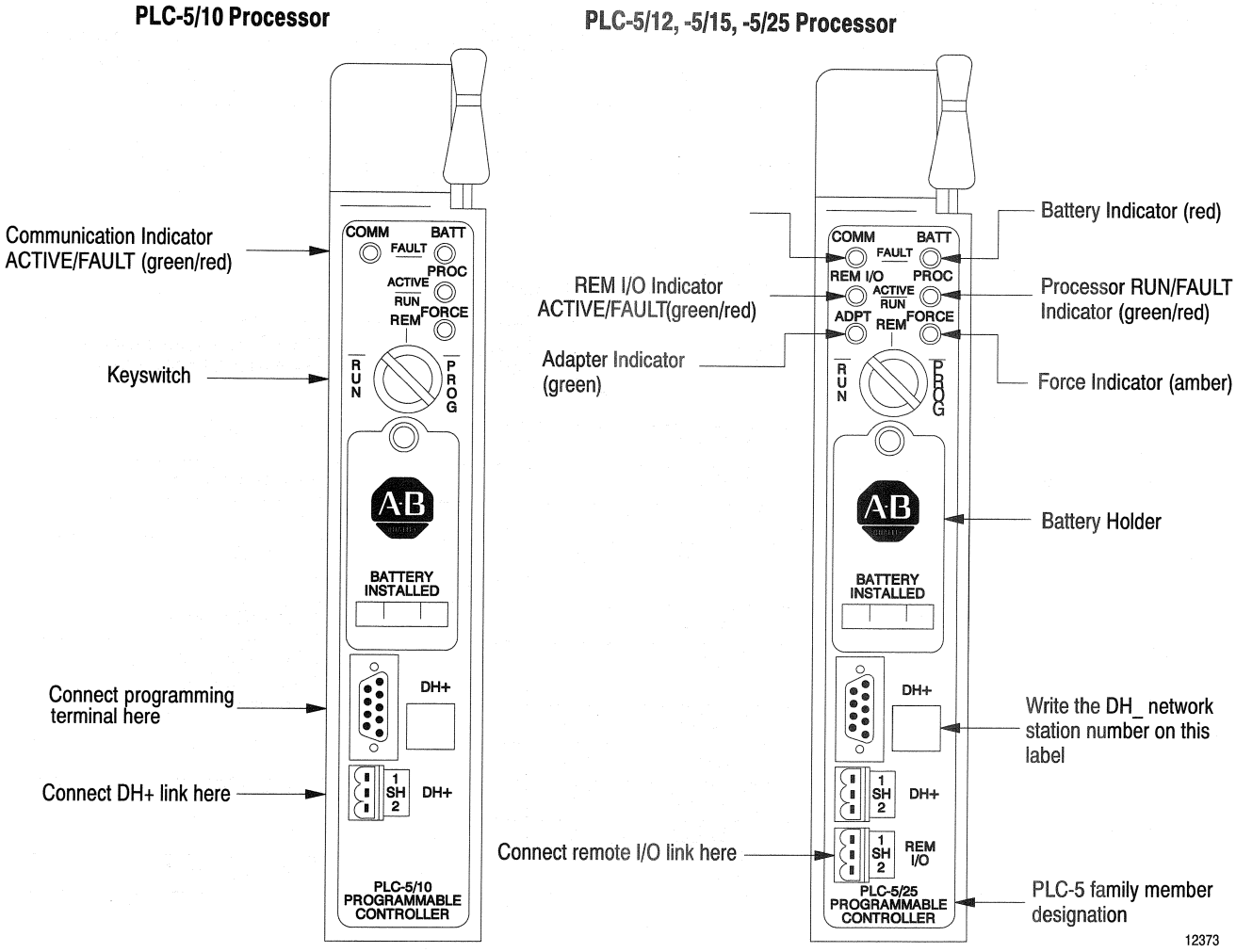


Figure 1.5
PLC-5/10, -5/12, -5/15, -5/25 Processor Front Panels



PLC-5 Processor Features and Capacities

In addition to the common features of the PLC-5 processors, each processor has unique hardware and processing capabilities.

Check with your Allen-Bradley distributor or Allen-Bradley sales office if you have questions regarding the features of your processor. Table 1.A (below) shows memory capacity and features available.

Table 1.B shows I/O and rack capacities for each processor.

Table 1.A
PLC-5 Processor Base Memory Capacity and Features

PLC-5 Processors	Base Memory (words)	Additional RAM memory modules	EEPROM module memory size (words) and module number
PLC-5/10	6K	-	8K (1785-MJ)
PLC-5/11	8K	-	64K (1785-ME64)
PLC-5/12	6K	-	8K (1785-MJ)
PLC-5/15	6K	4K (1785-MR) or 8K (1785-MS)	8K (1785-MJ)
PLC-5/20	16K	-	64K (1785-ME64)
PLC-5/25	13K	4K (1785-MR) or 8K (1785-MS)	8K (1785-MJ) or 16K (1785-MK)
PLC-5/30	32K	-	64K (1785-ME64)
PLC-5/40	48K	-	64K (1785-ME64)
PLC-5/40L	48K	-	64K (1785-ME64)
PLC-5/60	64K	-	64K (1785-ME64)
PLC-5/60L	64K	-	64K (1785-ME64)

Table 1.B
PLC-5 Processor I/O and Rack Capacities

PLC Processors	I/O Capacity (any mix)	Total no. of I/O racks	Rack Configurations	I/O Rack Numbers[8]	Remote I/O Chassis/Devices Supported	Remote I/O Communication Modes	Automatically Configuring I/O	Adjustable Size I/O Image Table
PLC-5/10	512[1]	4	1-4 local	0-3 (all local)	0	none	no	no
PLC-5/12	512[1]	4	1-4 local	0-3 (all local)	0	adapter	no	no
PLC-5/15	512[2]	4	1-4 local, 0-3 remote	0-3	12	adapter **or** scanner	yes	no
PLC-5/25	1024[3]	8	1-4 local 1-7 remote	0-7	16	adapter **or** scanner	yes	yes
PLC-5/11	512[1]	4	1-4 local 1 remote[11]	0-3[12]	4	adapter **or** scanner	yes	yes
PLC-5/20	512[1]	4	1-4 local 3 remote	0-3	12	adapter **and** scanner	yes	yes

PLC Processors	I/O Capacity (any mix)	Total no. of I/O racks	Rack Configurations	I/O Rack Numbers[8]	Remote I/O Chassis/Devices Supported	Remote I/O Communication Modes	Automatically Configuring I/O	Adjustable Size I/O Image Table
PLC-5/30	1024[3]	8	1-4 local 1-7 remote	0-7	28	adapter **and** scanner	yes	yes
PLC-5/40	2048[4]	16	1-4 local 1-15[6] remote	0-17	60[9]	adapter **and** scanner	yes	yes
PLC-5/40L	2048[4]	16	1-4 local 1-15[7] extended-local and remote	0-17	60[10]	adapter **and** scanner	yes	yes
PLC-5/60	3072[5]	24	1-4 local 1-23[6] remote	0-27	92[9]	adapter **and** scanner	yes	yes
PLC-5/60L	3072[5]	24	1-4 local 1-23[7] extended-local and remote	0-27	64[10]	adapter **and** scanner	yes	yes

1 512 I/O using 32-pt I/O modules with 1/2-slot addressing in 1771-A4B chassis
2 512 inputs and 512 outputs using 16- or 32-pt modules
3 1024 inputs and 1024 outputs using 16- or 32-pt modules
4 2048 inputs and 2048 outputs using 16- or 32-pt modules
5 3072 inputs and 3072 outputs using 16- or 32-pt modules
6 15 remote racks numbered 1 through 17 octal (PLC-5/40) or 23 remote racks numbered 1 through 27 octal (PLC-5/60)
7 15 racks numbered 1 through 17 octal (PLC-5/40L) or 23 racks numbered 1 through 27 octal (PLC-5/60L). Rack numbers are divided between extended-local I/O link and remote I/O link.
8 All I/O rack numbers are octal.
9 With all 4 channels as scanner, you can have no more than 32 I/O chassis per channel
10 For extended-local I/O processors (PLC-5/40L and -5/60L), you can use up to 32 chassis per channel when channels 1A and 1B are configured as remote I/O scanners. You can use up to 16 chassis on the extended-local I/O port, channel 2.
11 If you configure all four racks as local, then you can't have a remote rack.
12 If you configure a remote rack, it must be rack 3.

Automatically update I/O configuration status

Using 6200 programming software, you can automatically update the I/O configuration status to reflect the actual hardware configurations of the remote I/O in your PLC-5 processor system.

I/O Capacity

Each processor has memory allocated for a specific number of input (I) and output (O) addresses. Input and output files are 0 and 1 of the data table files. Words of memory allocated in each processor for I/O are:

- PLC-5/10, -5/11, -5/12, -5/15 -5/20: fixed at 32 words
- PLC-5/25: varies from 32-64 words (32 words is the default)
- PLC-5/30: varies from 32-64 words (64 is the default)
- PLC-5/40: varies from 32-128 words (128 is the default)
- PLC-5/60: varies from 32-192 words (192 is the default)

Chapter 2

System Components

Chapter Objectives

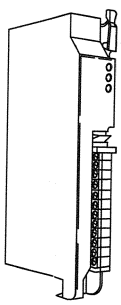
This chapter introduces the components that you can include in a PLC-5 processor system:

- I/O modules
- adapter modules
- chassis
- power supplies
- batteries
- memory modules
- programming terminal
- cables
- backup system

I/O Modules

Table 2.A describes the four general types of I/O modules. For more information on I/O modules, refer to the appropriate I/O module installation datamanual or the Allen-Bradley ICCG Product Guide (publication ICCG-1.1).

Table 2.A
I/O Module Types and Descriptions



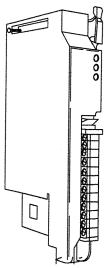
Discrete Modules:	Analog Modules:	Communication Modules:	Specialty I/O Modules:
interface with on/off devices such as limit switches, pushbuttons, and motor starters. Discrete I/O modules are available with 8, 16, or 32 input or output terminals per module. You must use series B I/O chassis with 16- and 32-point I/O modules.	perform the required A/D and D/A conversions to directly interface analog signals to a processor.	interface a processor with other devices such as loop controllers, DLI counter/ratemeters, remote I/O chassis, and fiber optic cables.	provide more specific I/O functions such as monitoring contact and wire status, setting time/date information for time-dependent applications, and detecting optical sensor pulses.

Adapter Modules

An adapter module provides communication between a PLC-5 processor and I/O modules in a remote I/O link or an extended-local I/O link. The adapter module resides in the left-most slot of a 1771 Universal I/O chassis.

Remote I/O Adapter Module

1771-ASB adapter module



For remote I/O, a PLC-5/11, -5/15, -5/20, -5/25, -5/30, -5/40, -5/40L, -5/60, or -5/60L processor can communicate with a 1771-AS or 1771-ASB remote I/O adapter or 1771-AM1, -AM2 chssis with integral power supply and remote I/O adapter. Except for the PLC-5/10 processor, you can also use a PLC-5 processor in adapter mode. Table 2.B shows the addressing modes you can use with I/O chassis and remote I/O adapter modules based on the I/O image density of I/O modules.

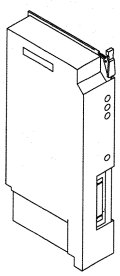
Table 2.B
Remote I/O Compatibility with I/O Modules

Remote I/O Adapter Module Cat. No.	I/O Bits Per Module	Addressing		
		2-slot	1-slot	1/2-slot
1771-AS	8	yes	no	no
	16	*	no	no
	32	no	no	no
1771-ASB Series A	8	yes	yes	no
	16	*	yes	no
	32	no	*	no
1771-ASB Series B or C	8	yes	yes	yes
	16	*	yes	yes
	32	no	*	yes
1771-AM1, -AM2	8	–	yes	yes
	16	–	yes	yes
	32	–	*	yes

* Conditional module placement; you must use an input module and an output module in an even/odd pair of slots beginning with slot 0. If you cannot pair the modules this way, leave the adjacent slot empty.

Extended-Local I/O Adapter Module

1771-ALX adapter module



The extended-local I/O adapter module provides parallel communication between the PLC-5/40L or -5/60L processor and I/O modules. A PLC-5/40L or -5/60L processor **cannot** be used as an extended-local I/O adapter module. Table 2.C shows the addressing modes you can use with I/O chassis and extended-local I/O adapter modules. For a description of these addressing modes, refer to Chapter 3, "Addressing."

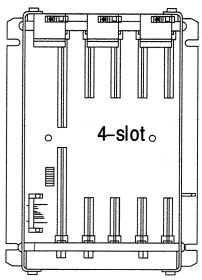
Table 2.C
Extended-Local I/O Chassis/Adapter Module Combinations

Local I/O Adapter Module Cat. No.	I/O Bits Per Module	Addressing Mode		
		2-slot	1-slot	1/2-slot
1771-ALX	8	yes	yes	yes
	16	*	yes	yes
	32	no	*	yes

* Conditional module placement; you must use an input module and an output module in an even/odd pair of slots beginning with slot 0. If you cannot pair the modules this way, leave the adjacent slot empty.

I/O Chassis

The processor communicates with its processor-resident local I/O via the backplane of the 1771 Universal I/O chassis. The I/O chassis requires a power supply; the chassis contains the processor and the I/O modules. The processor resides in the left-most slot of the chassis. Table 2.D lists the available chassis for PLC-5 programmable controllers.



Cat. no. 1771-A1B

Table 2.D
Available Chassis for PLC-5 Programmable Controllers

For this Size Chassis:	Specify this Catalog Number:	Type of Mount:
4-slot	1771-A1B	panel mount
8-slot	1771-A2B	panel mount
12-slot	1771-A3B 1771-A3B1	rack/panel mount panel mount
16-slot	1771-A4B	panel mount

You can also use a 1-slot or 2-slot chassis which contains an integral power supply and remote I/O adapter (Table 2.E).

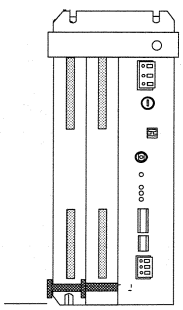
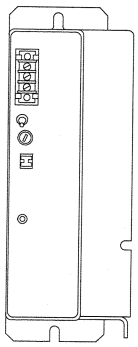

Cat. no. 1771-AM1
Cat. no. 1771-AM2

Table 2.E
Available Chassis with Integral Power Supply and Remote I/O Adapter

For this Size Chassis:	Specify this Catalog Number:
1-slot with integral power supply	1771-AM1
2-slot with integral power supply	1771-AM2

Power Supply

The power supply provides power to the processor or adapter module and I/O modules in a chassis. Table 2.F lists the most commonly used power supplies. Use this table to determine the power supply that best fits your processor-resident chassis.



1771-P7

Table 2.F
Selecting a Power Supply

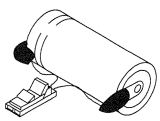
Power Supply[1]	Input Power	Output Current (in amps)	Power Supply Location
1771-P4	120V ac	8	2-slot
1771-P4R	120V ac	8	1-slot
1771-P4S	120V ac	8	1-slot
1771-P4S1	100V ac	8	1-slot
1771-P5	24V dc	8	1-slot
1771-P6S	220V ac	8	1-slot
1771-P6S1	200V ac	8	1-slot
1771-P6R	220V ac	8	1-slot
1771-P7	120/220V ac	16	external[1]
1771-PS7	120/220V ac	16	external[1]

[1] You cannot use an external power supply and a slot-power supply module to power the same chassis; they are not compatible.

You can use two power supplies in parallel (of the same catalog number) if you require 16 amps. Other combinations of power supplies do exist. For more information about other power supplies, contact your Allen-Bradley distributor or Allen-Bradley sales office.

Battery Backup

All PLC-5 processors have a battery backup. The following table lists the type of battery each PLC-5 processor requires.



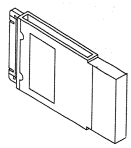
1770-XYC

This Processor:	Uses this Battery:	With these Battery Specifications:		
		At this Temperature:	Power Off 100%	Power Off 50%
• PLC-5/11 or -5/20	1770-XYC; contains 0.65 grams of lithium	60°C	.7 yrs	1.4 yrs
		25°C	2 yrs	4.0 yrs
• PLC-5/30, -5/40, -5/40L, -5/60, -5/60L with a 2-post battery connector	1770-XYC; contains 0.65 grams of lithium	60°C	115 days	200 days
		25°C	1 yr	1.2 yrs
• PLC-5/30, -5/40,- 5/40L, -5/60, -5/60L with a 9 volt snap-style battery connector	1770-XYB; contains 0.65 grams of lithium	60°C	115 days	200 days
		25°C	1 yr	1.2 yrs
• PLC-5/10, -5/12, -5/15 or -5/25	1770-XY; contains less than 1/2 gram of lithium	60°C	329 days	1.4 yrs
		25°C	2 yrs	3.3 yrs

[1] The PLC-5/11, -5/20, -5/30, -5/40, -5/60, -5/40L, -5/60L processors' battery indicator (BATT) warns you when the battery is low. The indicator first lights when the processor has 10 days of battery backup power remaining, but only when the processor is powered.

Each PLC-5 processor has a battery status indicator on the front panel that indicates when the battery needs to be replaced. There is also a status bit in processor memory that indicates when the battery needs to be replaced.

Memory Modules



You can **expand system memory** with a CMOS RAM memory module or you can **back up memory** with an EEPROM memory module.

Expanding System Memory

You can expand the base memory in a PLC-5/15 or -5/25 processor by 4K words or 8K words by installing a CMOS RAM module. Table 2.G lists the specifications for the CMOS RAM memory modules.

Table 2.G
Specifications for the CMOS RAM Memory Modules

Memory Size for:	
1785-MR	4K words
1785-MS	8K words
Environmental Conditions	Operating Temperature: 0° - 60° C (32° - 140° F)
	Storage Temperature: -40° - 85° C (-40° - 185° F)
	Relative Humidity: 5% - 95% without condensation

Providing Backup for Memory

The main memory of a 1785 PLC-5 processor is volatile. Without power or battery backup, its contents is lost. However, you can install an EEPROM memory module to provide backup memory to a PLC-5 processor.

The EEPROM module provides non-volatile storage for your application programs. When the processor is in Program or Remote Program mode, you can transfer a duplicate of the contents of processor memory to the EEPROM module.

When you install your EEPROM you set switches on the processor-resident I/O chassis to determine how to transfer memory if the processor loses power. You can have the processor:

- always transfer EEPROM memory to processor memory at power up
- transfer EEPROM memory if processor memory is invalid
- not transfer EEPROM memory

Table 2.H lists the specifications for the EEPROM modules.

Table 2.H
Specifications for the EEPROM Modules

Memory Size for:	
1785-MJ	6K words
1785-MK	13K words
1785-ME64	64K words
Write Protection	By removing a jumper
Environmental Conditions	Operating Temperature: 0° - 60° C (32° - 140° F) Storage Temperature: –40° - 85° C (-40° - 185° F) Relative Humidity: 5% - 95% without condensation

Programming System Requirements

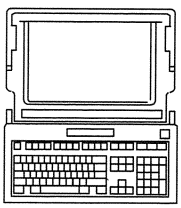


Table 2.I lists the hardware and software requirements when you use 6200 Programming Software to program PLC-5 processors.

Table 2.I
Programming System Requirements

Requirement:	DOS	VAX/VMS
Computer Hardware	• 5.6 Mbyte hard disk space (for 6200 software) • 640 Kbyte RAM to run 6200 Series software online. To run the software offline, we recommend an additional 384 Kbytes of extended or expanded memory • floppy disk drive (5 1/4" or 3 1/2") • monochrome or color monitor	VAX MicroVAX VAXstation MicroVAX Information Processor
Programming Terminal	• T35 • T60 • T50 • 6121 • T45 • 6123 • T47 • 6124	DEC VT200 series (and higher)
Operating System	• DOS 3.2, 3.3, 4.x, or 5.0 • A-B DOS 3.2*x* (1784-T50)	VAX/VMS version 5.4 (or later)
Printer Interface	• parallel or serial • 80, 132, or 255 columns	n/a
Communication	• 1784-KT (DH, DH+, DH II) • 1784-KT2 (DH, DH+, DH II) • 1784-KTK1 (DH+) • 1784-KL/B Series B -T47, T45 (DH+, DH II) • 1770-KF2 Series B (serial to DH+) • 1785-KE (serial to DH+)	• 1770-KF2 series B, revision F (serial to DH+ link) • 1785-KE series B, revision F (serial to DH+ link) • DTL version 3.1 or later • Network DTL version 3.1 or later

Cables

When planning your system, select the cable(s) to connect a processor to a link (DH+, extended-local I/O, or remote I/O) and the cable to connect a processor to a programming terminal.

Connecting to DH+, Remote I/O, or Extended-Local I/O Links

Select your DH+, remote I/O link, or extended-local I/O link cable lengths from Table 2.J.

Table 2.J
Maximum Cable Length per Communication Rate

To connect a PLC-5 processor to:	Transmission rate:	Maximum cable length:
DH+ link	57.6 Kbps	3,044 m (10,000 ft) maximum for trunkline 30.4 m (100 ft) maximum for drop line
remote I/O link	57.6 Kbps 115.2 Kbps 230.4 Kbps	3,044 m (10, 000 ft) (trunk length) 1522 m (5000 ft) (trunk length) 761m (2500 ft) (trunk length)
extended-local I/O link		30 m (98.4 ft)

Connecting to an RS port

See Table 2.K for information about the maximum cable lengths used with channel 0 (RS port) on the PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, and -5/60L processors.

Important: Channel 0 is RS-422A compatibile; do not use terminating resistors anywhere on the link.

Table 2.K
RS Port Cable Lengths per Communication Rate

RS Port Configuration	Transmission Rate:	Maximum Cable Length
232C	110 – 19.2 Kbit/s	50 ft
422A compatible	19.2 Kbit/s	200 ft
423	9600 bit/s	400 ft

Connecting a Processor to a Programming Terminal

The cable that connects a processor to a programming terminal depends on the communication device used. Table 2.L lists the cables you need for different configurations.

Table 2.L
Cables for Connecting a PLC-5 Processor and Programming Terminal

If You Have this Device:	With this Device:	Use this Cable:
PLC-5/10, -5/12, -5/15, -5/25	1784-KT	1784-CP
	1784-KL	1784-CP
	1784-KTK1	1784-CP5
	1784-KT2	1784-CP
PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, -5/60L	1784-KT	1784-CP6 or 1784-CP with 1784-CP7 adapter
	1784-KL	1784-CP6 or 1784-CP with 1784-CP7 adapter
	1784-KTK1	1784-CP5 with 1784-CP7 adapter
	1784-KT2	1784-CP6 or 1784-CP with 1784-CP7 adapter
T50, T60, 6121, IBM PC/AT (or compatible), IBM PS/2 Compaq	1785-KE	1784-CAK
T45, T47, 6123, 6124, IBM PC/XT	1785-KE	1784-CXK
6120, 6122	1785-KE	1784-CYK

You can also use a 1770-KF2/B communication interface. You build your own cables to connect your programming terminal via the COM1 or COM2 serial ports to the 1770–KF2/B. For the cable pin assignments, see the 1785 PLC-5 Programmable Controller Hardware Installation Manual (1785-6.6.1).

On PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, and -5/60L processors, you can connect the processor Channel 0 directly to the COM1 or COM2 port on your programming terminal without using a communications interface.

Complementary I/O

Configure complementary I/O by assigning an I/O rack number of one I/O chassis (primary) to another I/O chassis (complementary), complementing modules I/O group for I/O group. The I/O modules in the complementary chassis perform the opposite function of the corresponding modules in the primary chassis. For example, each input I/O group in the primary rack has a corresponding output I/O group in the secondary chassis.

All PLC-5 processors support a complementary I/O configuration when in a remote I/O scanner mode. You can use complementary I/O only with remote I/O racks. You can complement:

- up to 1 I/O rack for a PLC-5/11 processor
- up to 3 I/O racks for a PLC-5/15, -5/20 processor
- up to 7 I/O racks for channels that are configured as remote I/O scanners on a PLC-5/25 or -5/30 processor or series B PLC-5/40, -5/40L,- 5/60, or -5/60L processors and use the remaining racks for non-complementary I/O.

PLC-5 Backup System

In the PLC-5 backup configuration, one system controls the operation of the remote I/O. This system is referred to as the **primary system**. The other system is ready to take control of the remote I/O in the event of a fault in the primary system. This is referred to as the **secondary system**.

A PLC-5 processor backup system contains two (one for the **primary system** and one for the **secondary system**) of each of the following hardware components:

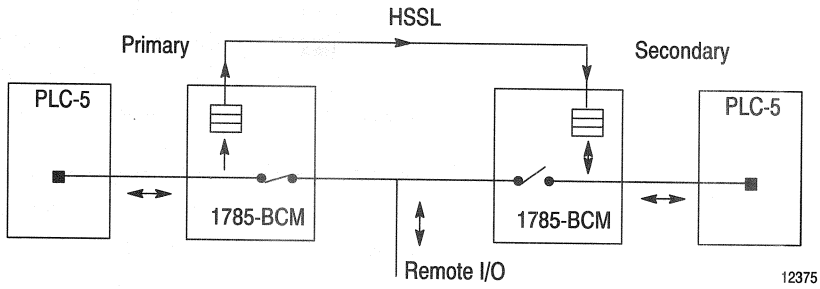
- PLC-5 processor
- 1785-BCM backup communication module (for 2 channels)
- 1785-BEM backup expansion module (for 2 additional channels)
- power supply
- local chassis

Important: The PLC-5 backup system does not back up processor-resident I/O. Do not install I/O in the processor resident-chassis.

During normal operation, the primary system sends remote input and data table data to the secondary system so that in the event of a switchover, the secondary system (which becomes the new primary system) has the same data.

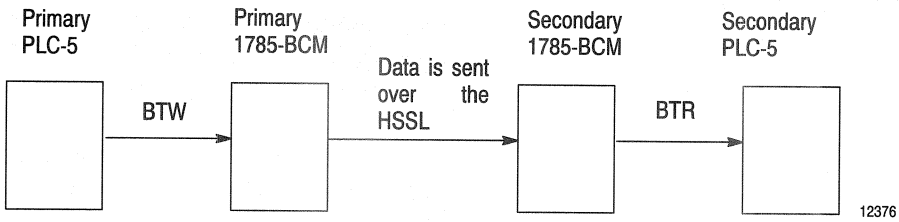
Remote I/O data is automatically transferred over the high speed serial link (HSSL) as shown in Figure 2.1. With automatic transfer, the primary 1785-BCM module is continually updating a copy of the remote input image table in an interface located in the secondary 1785-BCM module. This remote input data includes discrete data as well as block-transfer data. This transfer is independent of the application program.

Figure 2.1
Automatic Transfer of Data Over Remote I/O



Data table values transfer from the primary to the secondary system using block-transfer instructions that you include in your ladder program. (Note: you do not have to transfer data table values if it is not necessary for your application.) Figure 2.2 shows how data from the data table is transferred from the primary to the secondary system.

Figure 2.2
Transfer of Data Table Data From the Primary to Secondary Systems



Chapter 3

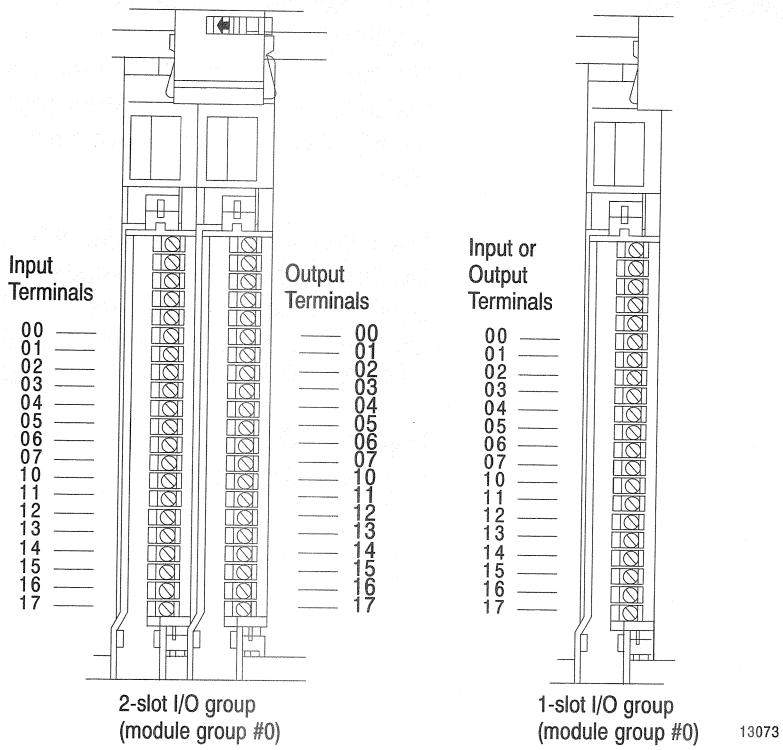
I/O Addressing

Chapter Objectives

This chapter covers I/O addressing modes, rack designation, and group designation.

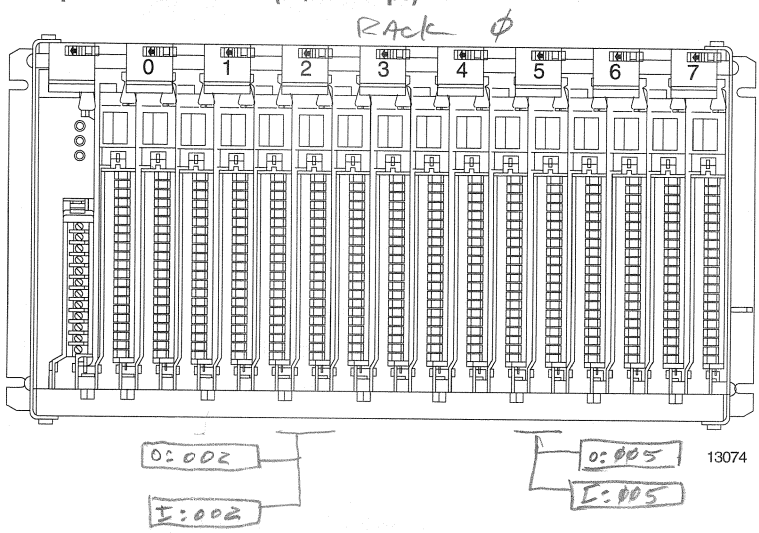
Each PLC-5 processor can address I/O in 2-slot, 1-slot, and 1/2-slot groups. One **I/O group** corresponds to 16 input bits and 16 output bits of the I/O image table (Figure 3.1). An I/O group can contain up to 16 inputs and 16 outputs.

Figure 3.1
Example of an I/O Group



An **I/O rack** consists of up to 8 I/O groups. A rack is an addressing unit that corresponds to up to 8 input words and 8 output words in the I/O image table. Depending on the I/O chassis size and the backplane addressing, an I/O rack can occupy a fraction of a chassis, a full chassis, or multiple chassis. Figure 3.2 shows one I/O rack in one full chassis.

Figure 3.2
Example of One I/O Rack (8 I/O Groups)



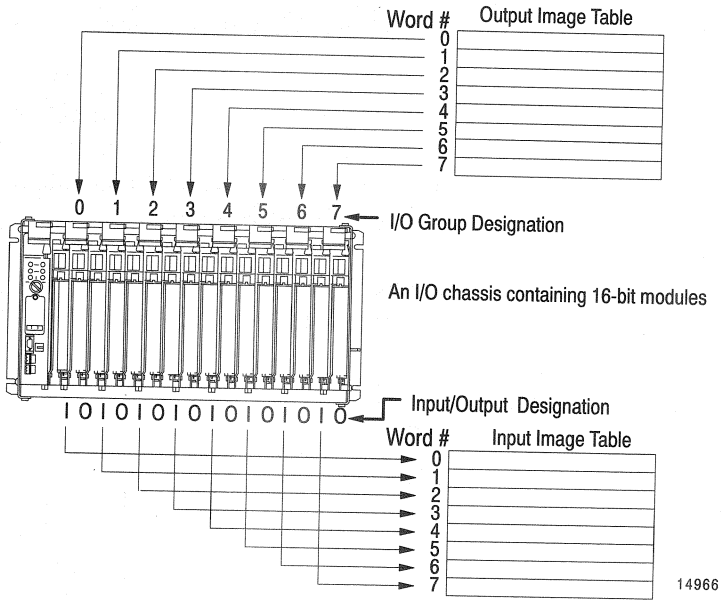
2-Slot Addressing

With **2-slot addressing**, the processor addresses two I/O module slots as one I/O group. Each physical 2-slot I/O group corresponds to one word (16 bits) in the input image table and one word (16 bits) in the output image table. The type (unidirectional or bidirectional) and density of a module that you install determines the number of bits that is used in each word.

Use either 8-point or 16-point I/O modules with 2-slot addressing. Because each 16-point module uses a full word in the image table, the only type of module you can install in a 2-slot I/O group with a 16-point input module is an 8- or 16-point output module and vice versa. You cannot use 32-bit I/O modules if you select 2-slot addressing.

Figure 3.3 shows how to place 16-point input and output modules when you use 2-slot addressing.

Figure 3.3
Placing 16-Bit Input and Output Modules When You Use 2-Slot Addressing



1-Slot Addressing

With **1-slot addressing**, the processor addresses one I/O module slot as one I/O group. Each physical slot in the chassis corresponds to an input (16 bits) and output (16 bits) image table word. The type (unidirectional or bidirectional) and density of module that you install determines the number of bits used in these words.

If you use an 8-point I/O module, the processor only uses 8 bits of the I/O image table words for that slot. If you use a 16-point I/O module, the processor uses 16 bits of the I/O image table words for that slot.

If you use a 32-point I/O module, the processor needs 32 input or 32 output bits. Only 16 input bits and 16 output bits are available for each 1-slot I/O group. To address a 32-point module, the processor uses the address of the unused input or output word associated with the adjacent I/O slot within an even/odd pair of slots (under the same retention tab).

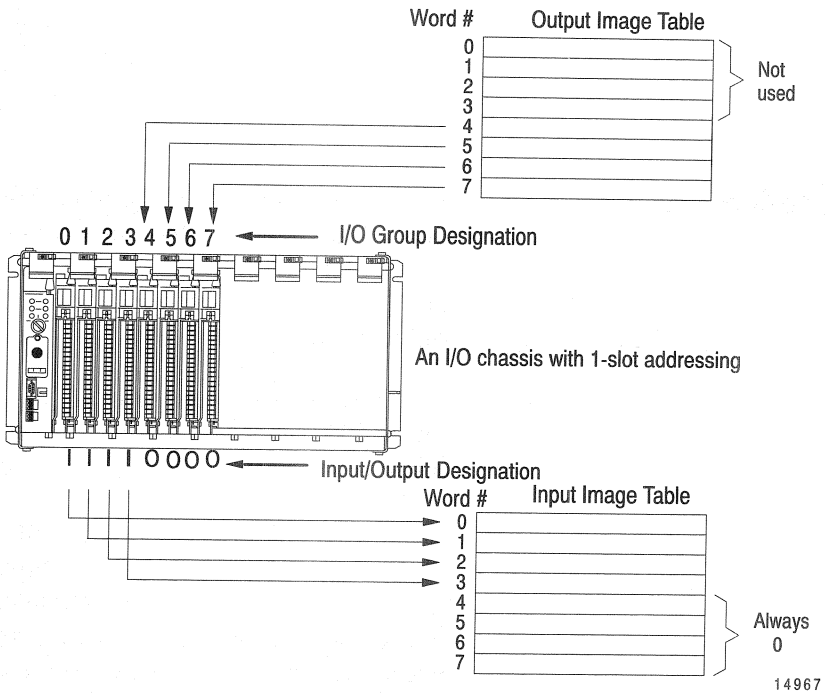
To use 32-point I/O modules with 1-slot addressing, you must install as a pair:

- a 32-point input module and an 8-, 16-, or 32-point output module
- a 32-point output module and an 8-, 16-, or 32-point input module

in two adjacent slots of the I/O chassis (under the same retention tab). If you cannot pair the modules in this way, one of the two slots of the pair must be empty. For example, if I/O chassis slot 0 holds a 32-point input module, I/O chassis slot 1 can hold an 8-, 16-, or 32-point output module; or the slot must be empty.

Figure 3.4 shows an example of how to place 32-point input and output modules when you use 1-slot addressing.

Figure 3.4
Placing 32-Point Input and Output Modules When You Use 1-Slot Addressing



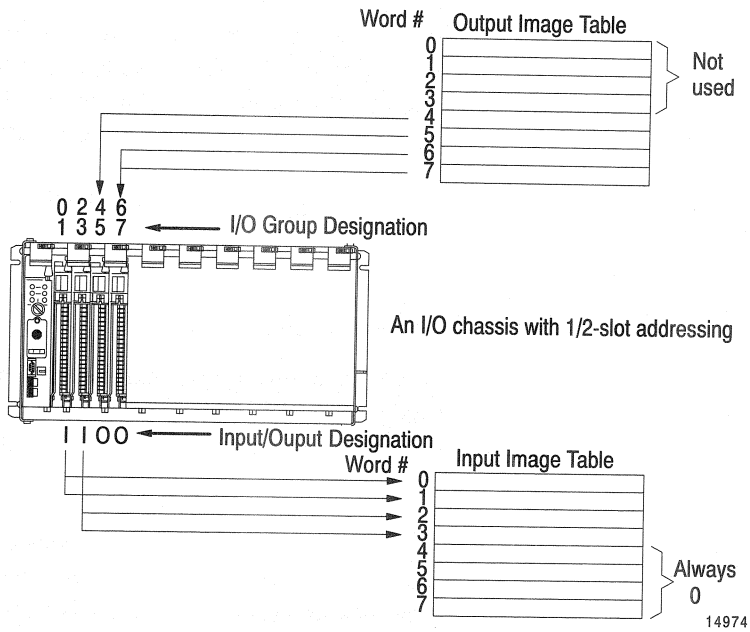
1/2-Slot Addressing

With **1/2-slot addressing,** the processor addresses one-half of an I/O module slot as one I/O group. Each physical slot in the chassis corresponds to two input and two output image table words. The type (unidirectional or bidirectional) and density of the module that you install determines the number of bits that are used in each word.

If you use 8-point or 16-point modules, the processor uses 8 or 16 bits of the I/O image table words available for that slot. You can mix 8-point, 16-point, and 32-point modules in any order in the I/O chassis.

Figure 3.5 shows an example of how to place 32-point input and output modules when you use 1/2-slot addressing.

Figure 3.5
Placing 32-Bit Input and Output Modules When You Use 1/2-Slot Addressing



Rack Numbers

The number of racks in a chassis depends upon the chassis size and the addressing mode. Table 3.A summarizes the relationship among chassis size and addressing mode.

Table 3.A
How Chassis Size and Backplane Addressing Determine the Quantity of Racks

If You are Using this Chassis Size:	with 2-slot addressing, number of rack(s):	with 1-slot addressing, number of rack(s):	with 1/2-slot addressing, number of rack(s):
4-slot	1/4 rack	1/2 rack	1 rack
8-slot	1/2 rack	1 rack	2 racks
12-slot	3/4 rack	1 1/2 rack	3 racks
16-slot	1 rack	2 racks	4 racks

You can assign from one to four racks in your **processor-resident chassis** depending on the chassis size, addressing mode, and module density. You cannot split a processor-resident local I/O rack over two or more chassis. The first rack in your processor-resident chassis is rack 0.

You can assign a **remote I/O rack** to:

- a fraction of a chassis
- a single chassis
- multiple chassis

When configuring both **extended local I/O and remote I/O racks**, the total number of both extended-local I/O racks and remote I/O racks must not exceed the maximum limit that the PLC-5 processor that you select can support.

A processor-resident local I/O chassis cannot be addressed by the same I/O rack designation as any other I/O chassis. Also, an extended-local I/O chassis and a remote I/O chassis cannot be addressed by the same I/O rack designation. For example, if an 8-slot extended-local I/O chassis is configured as I/O groups # 0-3 of I/O rack 2, an 8-slot remote I/O chassis cannot be configured as I/O groups 4-7 of I/O rack 2.

Important: You do not have to number logical racks consecutively: for example, remote I/O racks can be numbered 2, 4, and 6; extended local I/O racks can be numbered 3, 5, and 7.

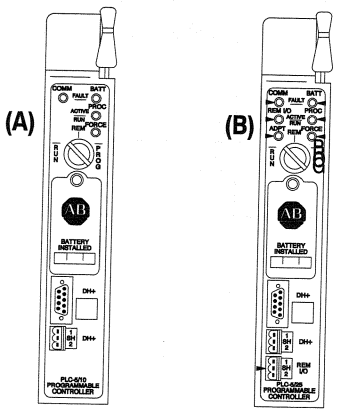
Chapter 4

Connecting Devices to a PLC-5 Processor

Connecting Devices to a PLC-5 Processor

This chapter describes front panel connectors for the PLC-5 processors.

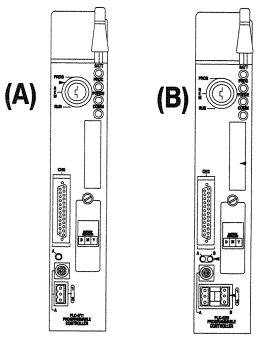
Figure 4.1
PLC-5/10, -5/12, -5/15, or -5/25 Processor Front Panels



(A) PLC-5/10 Processor
(B) PLC-5/12, -5/15, -5/25 Processor

Connector Name	Connector Type	Description
programming terminal	9-pin, D-shell	Use this connector to directly connect a programming terminal to the processor. This programming terminal connector has a parallel connection with the 3-pin DH+ communications link connector.
DH+ link	3-pin	Use this connector to connect to DH+ communications link.
remote I/O link	3-pin	Use this connector for the remote I/O link. (This connector is **not** available for a PLC-5/10 processor.)

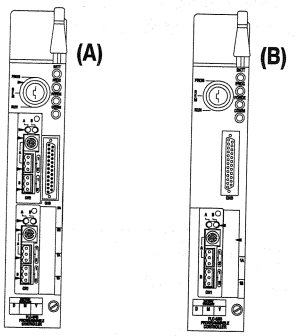
Figure 4.2
PLC-5/11, -5/20 Processor



(A) PLC-5/11 Processor
(B) PLC-5/20 Processor

Channel/ Connector	Physical Description	Functional Description	Default Communication Mode
0	25-pin D-shell	This port is an optically-isolated serial port and supports communication protocols defined by EIA RS-232C and RS-423 standards. It is also RS-422A compatible. The port can be used with most RS-422A equipment as long as: termination resistors are not used and the distance and transmission rate are reduced to comply with RS-423 requirements. Use this port with ASCII or DF1 (point-to-point, slave, or master) protocol.	DF1 point-to-point (2400 bps, no parity, one stop-bit, BCC error check, and no handshaking).
1A 1B	3-pin	These are user configurable ports that support scanner, adapter, and DH+ communication modes. **Exception:** PLC-5/20 channel 1A is a fixed DH+ port. Each channel is configured with a default communication mode.	DH+ (channel 1A) Scanner (channel 1B)
Programming terminal	8-pin mini-DIN (1 connector)	This programming terminal connector has parallel connections with the 3-pin connectors of channel 1A.	DH+

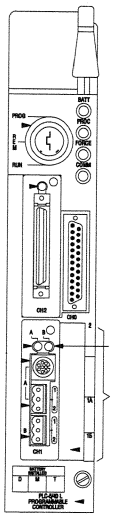
Figure 4.3
PLC-5/30, -5/40, and -5/60 Processor Front Panel



(A) PLC-5/40 or -5/60 Processor (B) PLC-5/30 Processor

Channel/ Connector	Physical Description	Functional Description	Default Communication Mode
0	25-pin D-shell	This port is an optically-isolated serial port and supports communication protocols defined by EIA RS-232C and RS-423 standards. It is also RS-422A compatible. The port can be used with most RS-422A equipment as long as: termination resistors are not used and the distance and transmission rate are reduced to comply with RS-423 requirements. Use this port with ASCII or DF1 (point-to-point, slave, or master) protocol.	DF1 point-to-point (2400 bps, no parity, one stop-bit, BCC error check, and no handshaking).
1A 1B 2A 2B	3-pin	These are user configurable ports that support scanner, adapter, and Data Highway Plus (DH+) communication modes.	DH+ (channel 1A) Scanner (channel 1B) Unused (channel 2A) Unused (channel 2B)
Programming terminal	8-pin mini-DIN (2 connectors)	This programming terminal connector has parallel connections with the 3-pin connectors of channels 1A and 2A. Use these connectors only when channels 1A and/or 2A are configured for DH+ communication.	

Figure 4.4
PLC-5/40L and PLC-5/60L Front Panel



PLC-5/40L Processor

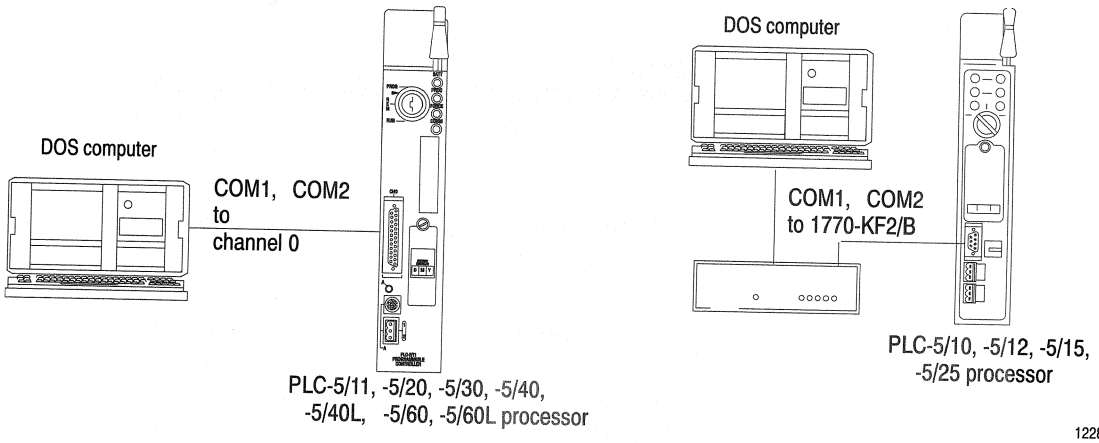
Channel/ Connector	Physical Description	Functional Description	Default Communication Mode
0	25-pin D-shell	This port is an optically-isolated serial port and supports communication protocols defined by EIA RS-232C and RS-423 standards. It is also RS-422A compatible. The port can be used with most RS-422A equipment as long as: termination resistors are not used and the distance and transmission rate are reduced to comply with RS-423 requirements. Use this port with ASCII or DF1 (point-to-point, slave, or master) protocol.	DF1 point-to-point (2400 bps, no parity, one stop-bit, BCC error check, and no handshaking).
1A 1B	3-pin	These are user configurable ports that support scanner, adapter, and Data Highway Plus (DH+) communication modes.	DH+ (channel 1A) Scanner (channel 1B)
2	50-pin	This channel supports extended-local I/O communication, which is a parallel communication link. The communication mode of this channel cannot be changed using 6200 Series software. However, you configure extended-local I/O racks using 6200 Series software.	Extended-local I/O
Programming terminal	8-pin mini-DIN (2 connectors)	This programming terminal connector has parallel connections with the 3-pin connectors of channel 1A. Use these connectors only when channel 1A and are configured for DH+ communications.	None

Choose a Communication Set-up for Your System

PLC-5 Programming Software – DOS Connections

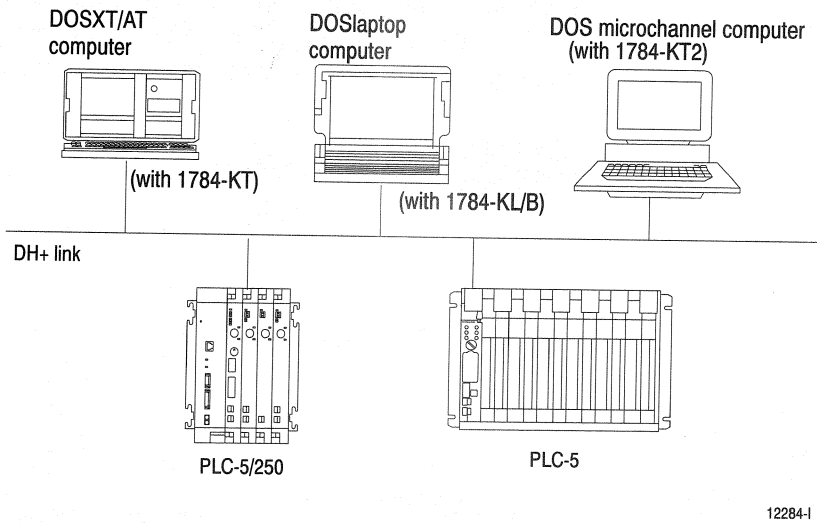
You can connect to a processor directly using the COM1 or COM2 serial port (Figure 4.5). PLC-5/30, -5/40, -5/40L, -5/60 and -5/60L processors use channel 0; for PLC-5/10, -5/12, -5/15 and -5/25 processors, use a 1770-KF2/B or 1785-KE.

Figure 4.5
Directly Connected to a PLC-5 Processor



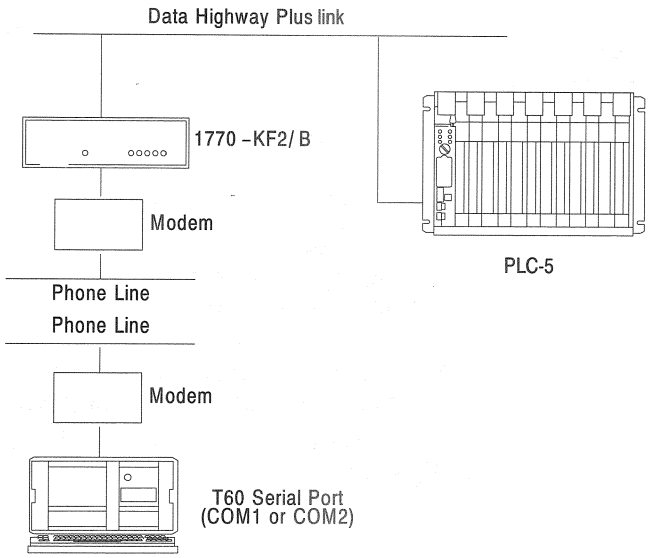
You can connect to a processor on a DH+ or DH II link using a 1784-KT or 1784-KTK1. If you have an IBM-compatible microchannel computer, use a 1784-KT2. If you have a 1784-T47 or -T45, use a 1784-KL/B (Figure 4.6).

Figure 4.6
PLC-5 Processor Connected to DH+ Link



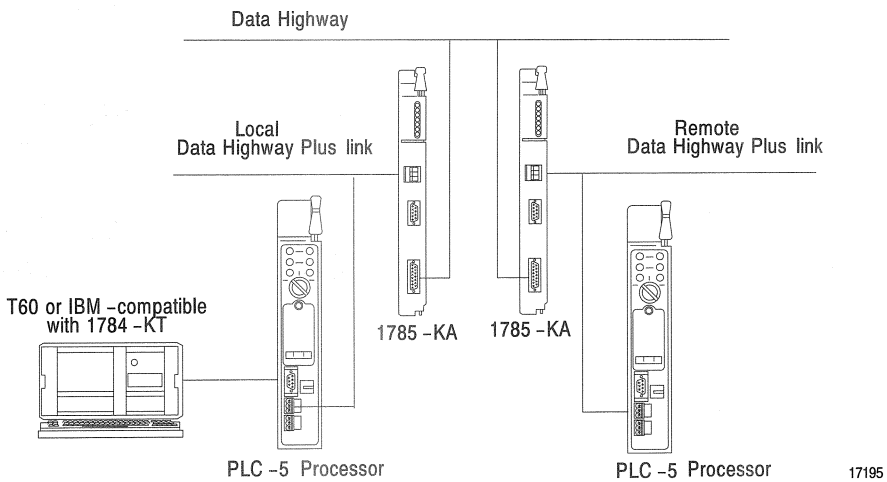
Use a modem. You can use a serial port, 1770-KF2/B or 1785-KE, and an external modem to connect a programming terminal to a programmable controller through a DH+ link (Figure 4.7).

Figure 4.7
Modem Connection through a Serial Port to a DH+ Link



Attach to a processor on a remote DH+ link. While connected to your DH+ link with a 1784-KT or 1784-KL/B communication board, you can attach to any programmable controller on a remote DH+ link in the Data Highway network (Figure 4.8). This remote programming option expands the range of processors you can attach to from a programming terminal.

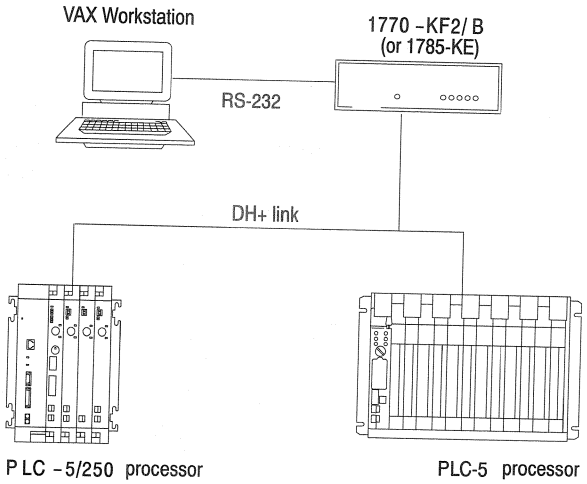
Figure 4.8
Example DH+ to DH to DH+ Network Configuration



PLC-5 Programming Software - VAX/VMS Connections

You can connect to a processor using a terminal server, or through a 1770-KF2/B or 1785-KE (Figure 4.9).

Figure 4.9
Connecting to a Processor Using a 1770-KF2/B or 1785-KE



You can use DTL™ (Figure 4.10) or Network DTL™ (Figure 4.11) to connect to a PLC-5/250 processor.

Figure 4.10
Connecting to a Processor Using DTL with MicroVAX Information Processor™ in the PI chassis

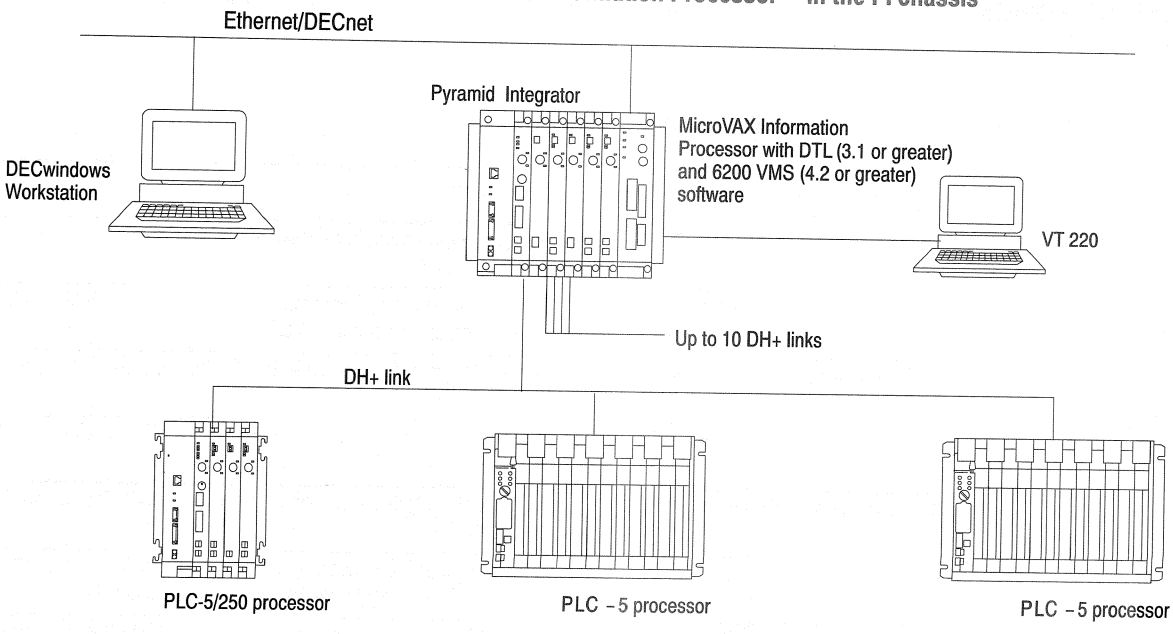
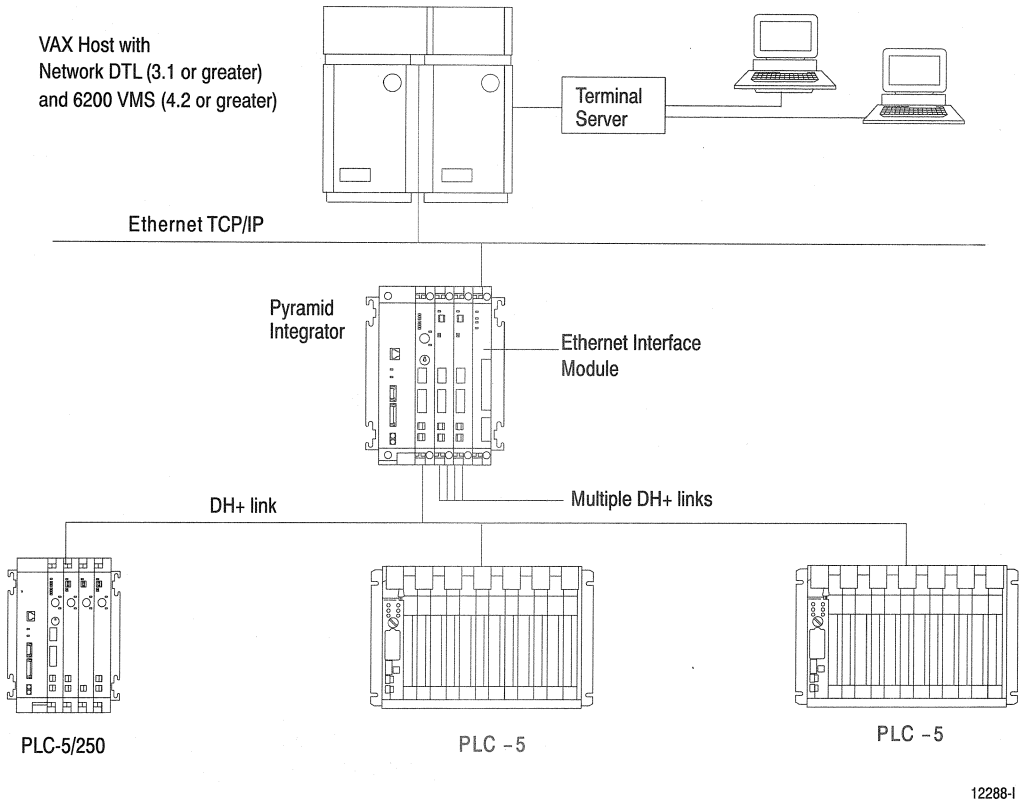


Figure 4.11
Connecting to a Processor Using Network DTL



System Requirements

Table 4.A lists the catalog numbers for the available PLC-5 programming software packages.

Table 4.A
Available PLC-5 Programming Software Packages

Operating System/Media		Catalog Number	Description
DOS	3 1/2" disks	6201-PLC5	PLC-5 Programming Terminal SW Online Programming and Documentation
		6203-PLC5	PLC-5 Programming Terminal, Dev and Doc SW Online and Offline Programming and Documentation
	5 1/4" disks	6211-PLC5	PLC-5 Programming Terminal SW Online Programming and Documentation
		6213-PLC5	PLC-5 Programming Terminal, Dev and Doc SW Online and Offline Programming and Documentation
VAX/VMS	TK50 tape	6233-5VDL	PLC-5 Program Development Software for VMS, Online and Offline via a DH+ link
		6233-5VTL	PLC-5 Program Development Software for VMS, Online and Offline via TCP/IP Ethernet (Network DTL license included)
	magnetic tape	6223-5VDL	PLC-5 Program Development Software for VMS, Online and Offline via a DH+ link

Chapter 5

Programming PLC-5 Processors

Programming PLC-5 Processors

You perform three major tasks when you develop ladder-logic programs for processors. These include:

- setting up a data table for addressing inputs and outputs
- monitoring processor status
- entering and editing ladder logic (using the programming software and considering special programming situations)

This chapter describes how to accomplish these tasks.

Addressing Data

PLC-5 processors address data in a logical format that specifies:

```
datatype filenumber : wordnumber / bitnumber
```

Use the variations of the logical formats described in the following table to address data-table files:

Logical Address:	I/O Image Address:	Indirect Address:	Indexed Address:	Symbolic Address:
an alphanumeric coded format with punctuation to specify the data location. For example: N7:0	logical address format, but relates physical locations in the I/O chassis to memory addresses in the I/O image file. For example: I:001/10	logical address format, but lets you change address values in the base address with your ladder program. For example: N[N8:6]:0 (You cannot use indirect addresses to address BT, MG, PD, SC, or ST data.)	index prefix (#) followed by a logical address format, but adds an index value from processor status file to the base address. For example: #N7:0	ASCII character name that relates the address (of a file, word, or bit) to what it represents in the application. When you enter ladder logic, use the symbols you defined rather than typing the actual address. For example: Mixer_1

Table 5.A lists valid data table file-type specifications.

Table 5.A
PLC-5 Processor Data Table Memory

File Identifier		Number	Maximum Size of File (16-bit words except for floating-point)				Memory Used (in 16-bit words)	
			PLC-5/10, -5/12, -5/15	PLC-5/25 -5/30	PLC-5/40	PLC-5/60	PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, -5/60L	PLC-5/10, -5/12, -5/15, -5/25
Output Image	O	O0	32 words	64 words	128 words	192 words	6/file + 1/word (32 for -5/11 and -5/20)	2/file + 1/word
Input Image	I	I1	32 words	64 words	128 words	192 words	6/file + 1/word (32 for -5/11 and -5/20)	2/file + 1/word
Status	S	S2	32 words	32 words (128 words for the -5/30)	128 words	128 words	6/file + 1/word (128 for -5/11 and -5/20)	2/file + 1/word
Bit (binary)	B	B3[1]	1000 words				6/file + 1/word	2/file + 1/word
Timer	T	T4[1]	1000 structures of 3 words				6/file + 3/structure	2/file + 3/structure
Counter	C	C5[1]	1000 structures of 3 words				6/file + 3/structure	2/file + 3/structure
Control	R	R6[1]	1000 structures of 3 words				6/file + 3/structure	2/file + 3/structure
Integer	N	N7[1]	1000 words				6/file + 3/word	2/file + 3/word
Floating bit	F	F8[1]	1000 floating-point words (32-bit words)				6/file + 2/float word	2/file + 2/float word
ASCII	A	3 - 999	1000 words				6/file + $^1/_2$ per character	2/file + $^1/_2$ per character
BCD	D	3 - 999	1000 words				6/file + 1/word	2/file + 1/word
Block Transfer[2]	BT	3 - 999	1000[2] structures of 6 words				6/file + 6/structure	
Message[2]	MG	3 - 999	585[2] structures of 56 words				6/file + 56/structure	
PID[2]	PD	3 - 999	399[2] structures of 164 bytes				6/file + 82/structure	
SFC Status[2]	SC	3 - 999	1000[2] structures of 3 words				6/file + 3/structure	
ASCII String[2]	ST	3 - 999	780[2] structures of 42 words				6/file + 42/structure	
Extra Storage		3 - 999						

[1] These are default file numbers. Any of these files can be assigned to any number.

[2] Available on PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60 and -5/60L processors only.

The BT (block transfer), D (BCD), MG (message), PD (PID), SC (SFC status), ST (ASCII string) and A (ASCII) do not appear on the default data table that 6200 programming software displays.

PLC-5/11, -5/20, -5/30, PLC-5/40, -5/40L, -5/60, -5/60L Processor Status

Each PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60, -5/60L stores both processor and channel status. The processor stores processor status in a status file (file 2); the processor stores channel status in a diagnostic file you specify (one file per channel).

You can use your programming software to display processor status. Figure 5.1 and Figure 5.2 show the Processor Status screens for PLC-5/11, -5/20, -5/30, -5/40, -5/40L,-5/60 and PLC-5/60L processors.

3 major Sections of Memory

gram Files

0 SYSTEM (names)
1 SFC
2 MAIN LADDER
3 SUBROUTINES
FAULTS
STI (Selectable Timed Interrupt)
ENHANCED 16 MEPS (main program files)
PII Processor Input Interrupt)

Figure 5.1
PLC-5/11, -5/20, -5/30, -5/40 and -5/60 Processor Status Screen, Page 1

```
                              Processor Status
Fault code:              0
Where faulted:             0:0
Major fault:        00000000 00000000
Minor fault 1:      00000000 00000000
            2:      00000000 00000000
Processor status:   00000000 10001000      Mode switch in remote
                                              27      20  17      10  7       0
I/O status          btx full:                 00000000    00000000    00000000
                    rack fault:               00000000    00000000    00000000
I/O control         reset:                    00000000    00000000    00000000
                    inhibit:                  00000000    00000000    00000000

Arithmetic flags:  S:0  Z:0  V:0  C:0
RTC date:                  0000-00-00      RTC time:                      00:00:00
Processor checksum:              0x0000    Indexed addressing offset:            0
EEPROM:           TRANSFER AT POWERUP      Resident I/O chassis addr:      1-SLOT
Memory:                      PROTECTED

Press a function key, page up or page down, or enter a value.
S:12 =
Rem Prog   Forces:None                                        5/40 File BATCHTES
   Proc Config F2                                          Clear Min Flt F9   Clear Maj Flt F10
```

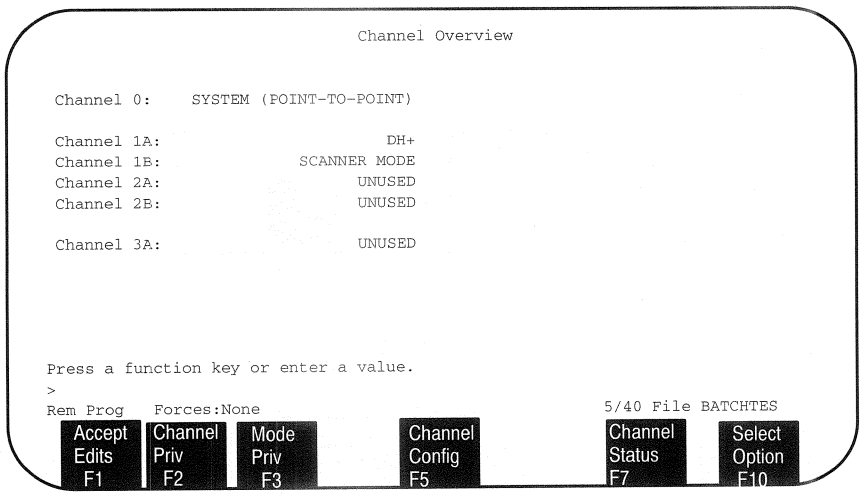
Figure 5.2
PLC-5/11, -5/20, -5/30, -5/40 and -5/60 Processor Status Screen, Page 2

```
                              Processor Status
Processor input interrupt  changed bits                        00000000 00000000
                           events since last interrupt:                        0
                           scan [ms]      last:       0       maximum:         0

Selectable timed interrupt scan [ms]      last:       0       maximum:         0

Overall program scan [ms]                 last:       0       maximum:         0

Main control program A scan [ms]          last:       0       maximum:         0
                     B scan [ms]          last:       0       maximum:         0
                     C scan [ms]          last:       0       maximum:         0
                     D scan [ms]          last:       0       maximum:         0
                     E scan [ms]          last:       0       maximum:         0
                     F scan [ms]          last:       0       maximum:         0
                     G scan [ms]          last:       0       maximum:         0
                     H scan [ms]          last:       0       maximum:         0
                     I scan [ms]          last:       0       maximum:         0

Press a function key  page up or page down or enter a value
S:10/15
Rem Prog      Forces:None      Data:Octal    Addr:Octal    PLC-5/40 File CHANNEL
   Proc Config F2                                          Clear Min Flt F9   Clear Maj Flt F10
```

Channel Status

Use your programming software to display channel status for each configured channel. The status screen depends on the mode selection for the channels. The data displayed on a channel status screen applies only to the channel indicated on the screen. Figure 5.3 shows the Channel Status screen for PLC-5/30 Series A, -5/40 and -5/60 Series B processors.

Figure 5.3
Channel Overview Screen for PLC-5/30 Series A, -5/40 and -5/60 Series B Processors (Defaults are shown)



Channel 0 status

The system displays one of these screens depending upon the mode in which channel 0 is operating. (Figures 5.5-5.7). These screens display the information stored in the diagnostic file you specified when you configured channel 0.

If Channel 0 is in this Mode:	The System Displays:	See Figure:
System Mode (point-to-point)	System Mode (DF1 point-to-point) Configuration Screen, Figure 5.4	5.4
System Mode (slave)	System Mode (DF1 Slave) Configuration Screen, Figure 5.5	5.5
System Mode (DF1 Master)	System Mode (DF1 Master) Configuration Screen, Figure 5.5	5.5
User Mode (ASCII)	User Mode (ASCII), Figure 5.6	5.6

Figure 5.4
Channel 0 – System Mode (DF1 Point-to-Point) Status Screen

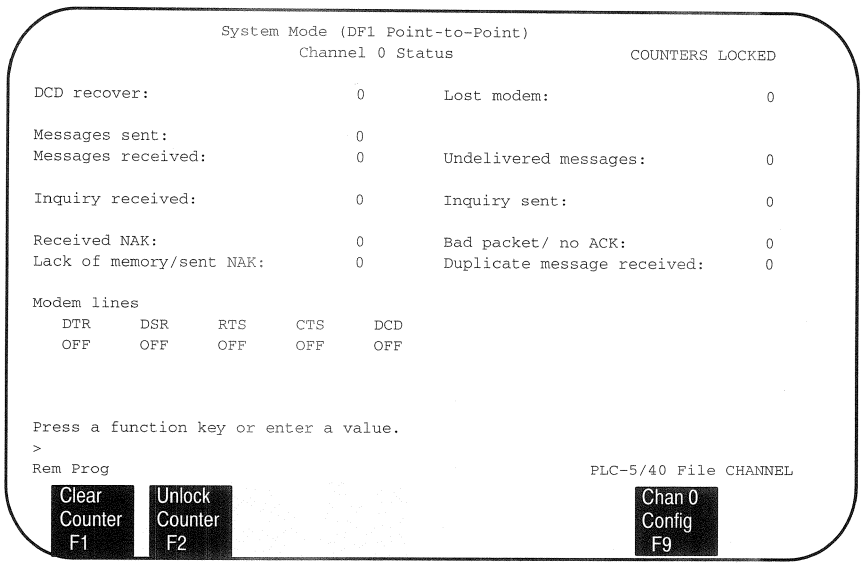


Figure 5.5
Channel 0 – System Mode (DF1 Slave/Master) Status Screen

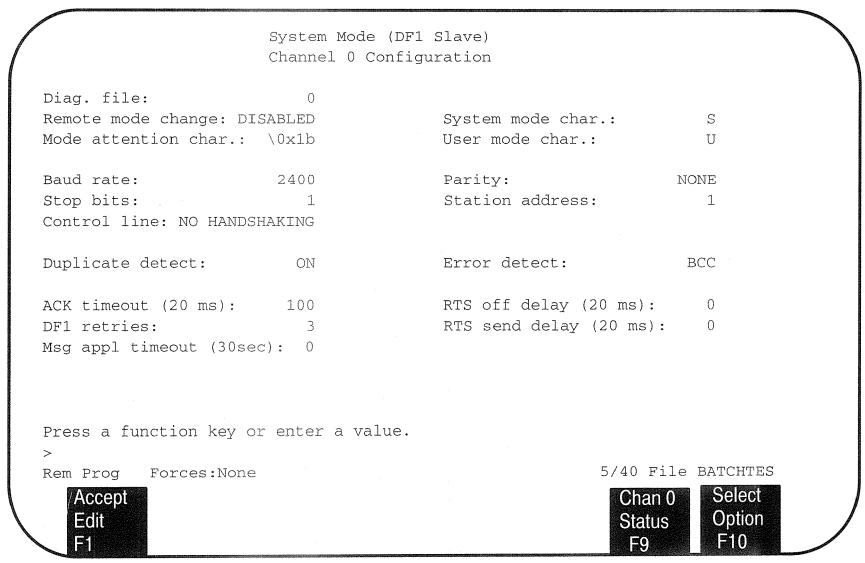
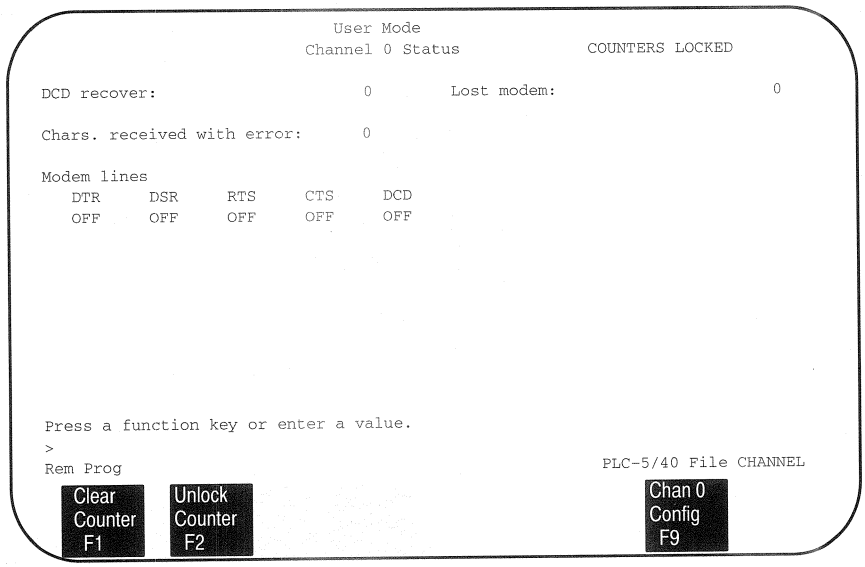


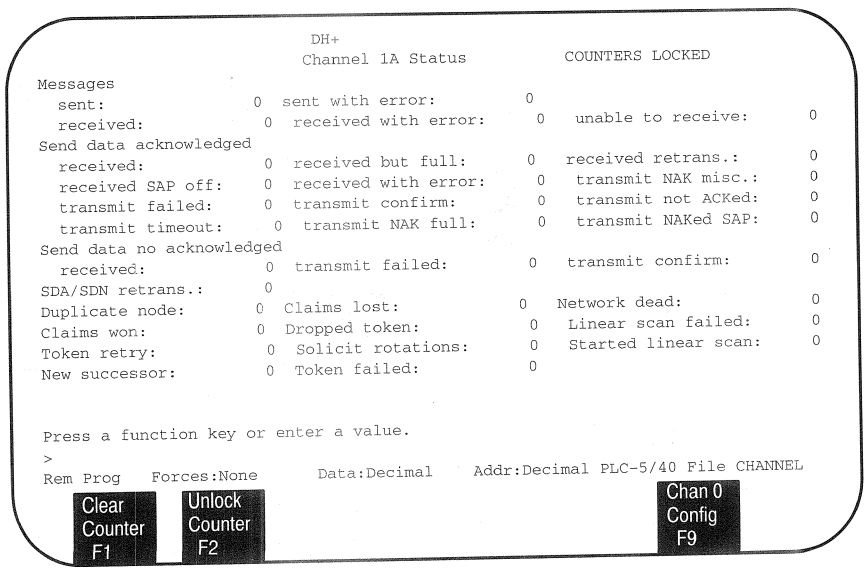
Figure 5.6
Channel 0 - User Mode Status Screen



DH+ status

Use the DH+ Status screen to monitor channels that are configured to support a DH+ link. The data displayed is stored in the diagnostic file defined on the DH+ Configuration screen. Figure 5.7 shows the DH+ Status screen.

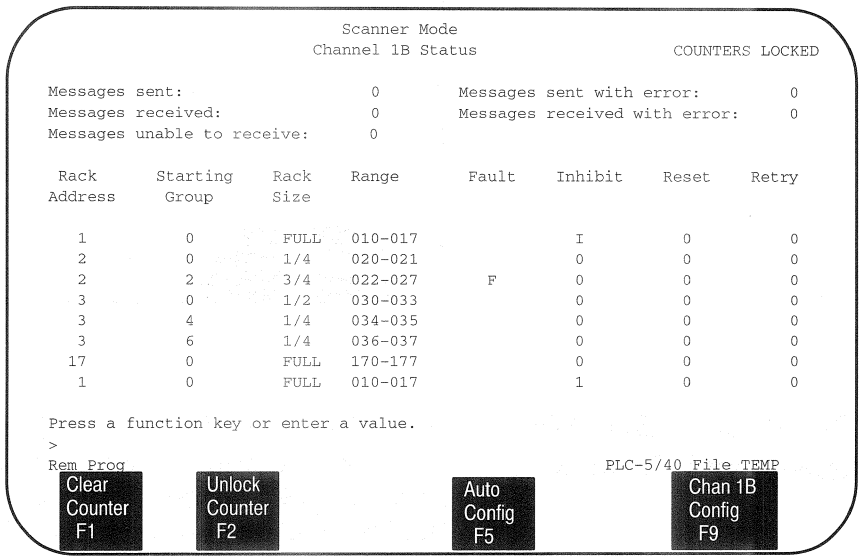
Figure 5.7
DH+ Status Screen



Scanner status

Monitor channels configured as remote I/O scanner mode using the Scanner Mode Status screen. The diagnostic counter data displayed is stored in the diagnostic file defined on the Scanner Mode Configuration screen. The remaining information displayed is stored in the I/O status file defined on the Processor Configuration screen. Figure 5.8 shows the Scanner Status screen.

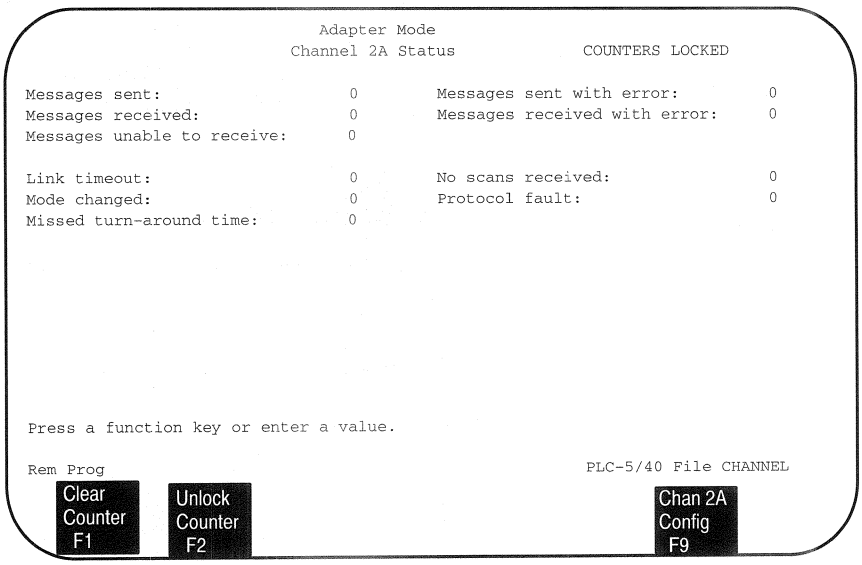
Figure 5.8
Scanner Mode Status Screen



Adapter status screen

Use the Adapter Mode Status screen to monitor channels that are configured to support a remote I/O adapter mode link. The data displayed is stored in the diagnostic file defined in the Adapter Mode Configuration screen. Figure 5.9 shows the Adapter Status screen.

Figure 5.9
Adapter Mode Status Screen



PLC-5/10, -5/12, -5/15, -5/25 Processor and I/O Status

Each PLC-5/10, -5/12, -5/15, -5/25 processor stores configuration and status information in a status file (file 2). You can use your programming software to display the information stored in this file. Figure 5.10 shows the Processor Status screen; Figure 5.11 shows the I/O Status screen.

Figure 5.10
PLC-5/10, -5/12, -5/15, -5/25 Processor Status Screen

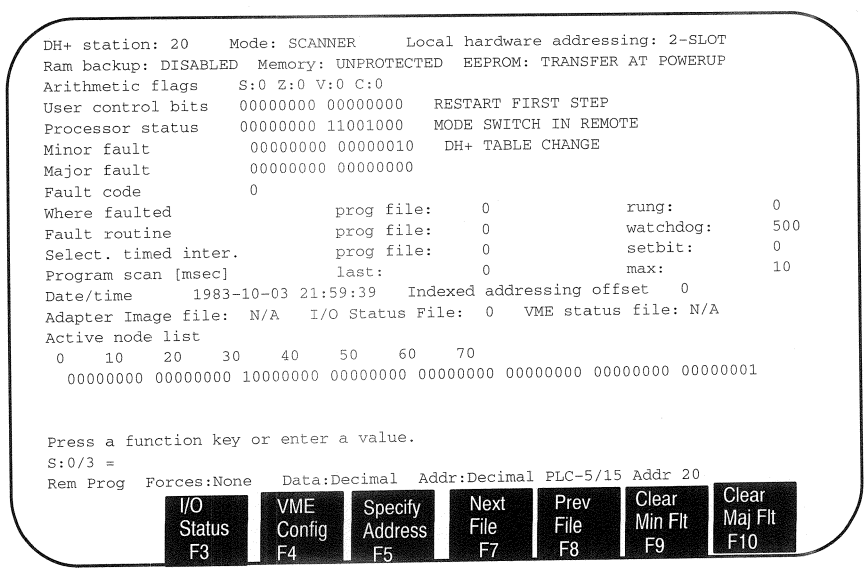
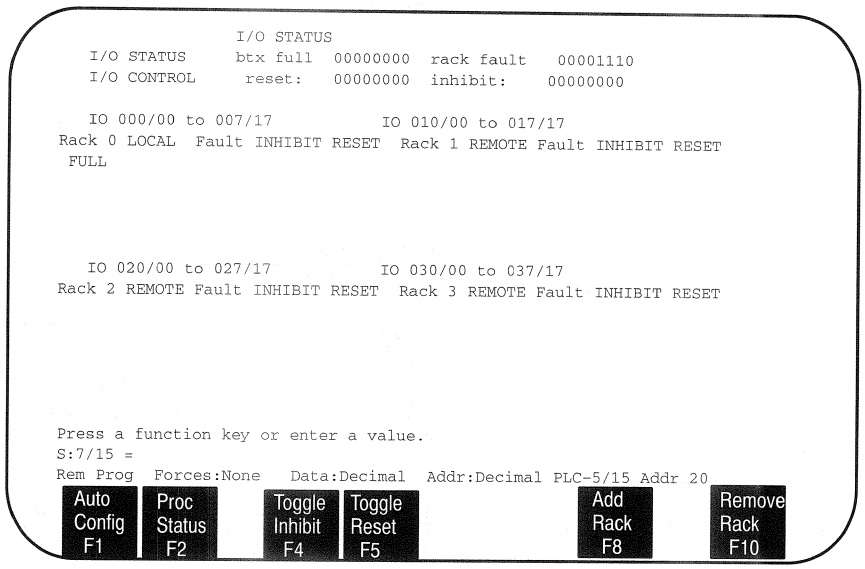


Figure 5.11
PLC-5/15, -5/25 I/O Status Screen



Programming Software

Table 5.B shows the 6200 software packages that are available for PLC-5 processors.

Table 5.B
6200 Series Software Products for PLC-5 Processors

Operating System	Catalog Number	Online Capability	Offline Capability	Upload/Download Capability
DOS	6201–PLC5 (3 1/2 inch disks)	YES	NO	via DH+ link
	6211–PLC5 (5 1/4 inch disks)			
	6203–PLC5 (3 1/2 inch disks)	YES	YES	
	6213–PLC5 (5 1/4 inch disks)			
VMS	6223-5VDM (mag tape)	YES	YES	via DH+ link
	6233-5VDM (TK50)	YES	YES	via DH+ link
	6233-5VTM (TK50)	YES	YES	VAX via Ethernet to PI Ethernet

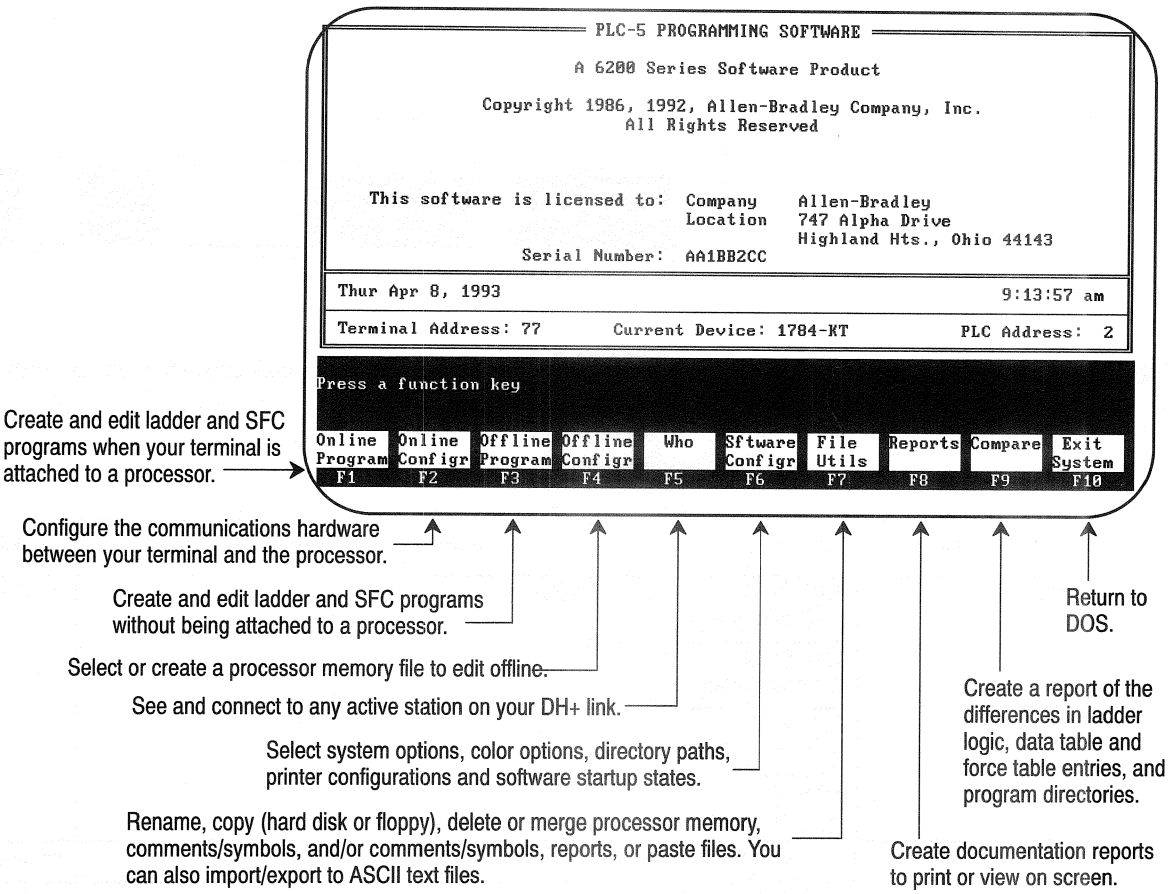
NOTES:
1. Online means your programming terminal is connected to the PLC-5 processor and you create or edit a program directly in processor memory.
2. Offline means program development and storage is internal to the programming terminal. Connection to PLC-5 is not required.

Using the Programming Software

The programming software displays its functions in a tree structure. The 6200 series programming software provides configuration options that let you start the software at a screen other than the main menu and short cuts ([Alt] key combinations) that let you jump to different screens within the software.

Figure 5.12 shows the PLC-5 Programming Software Main Menu.

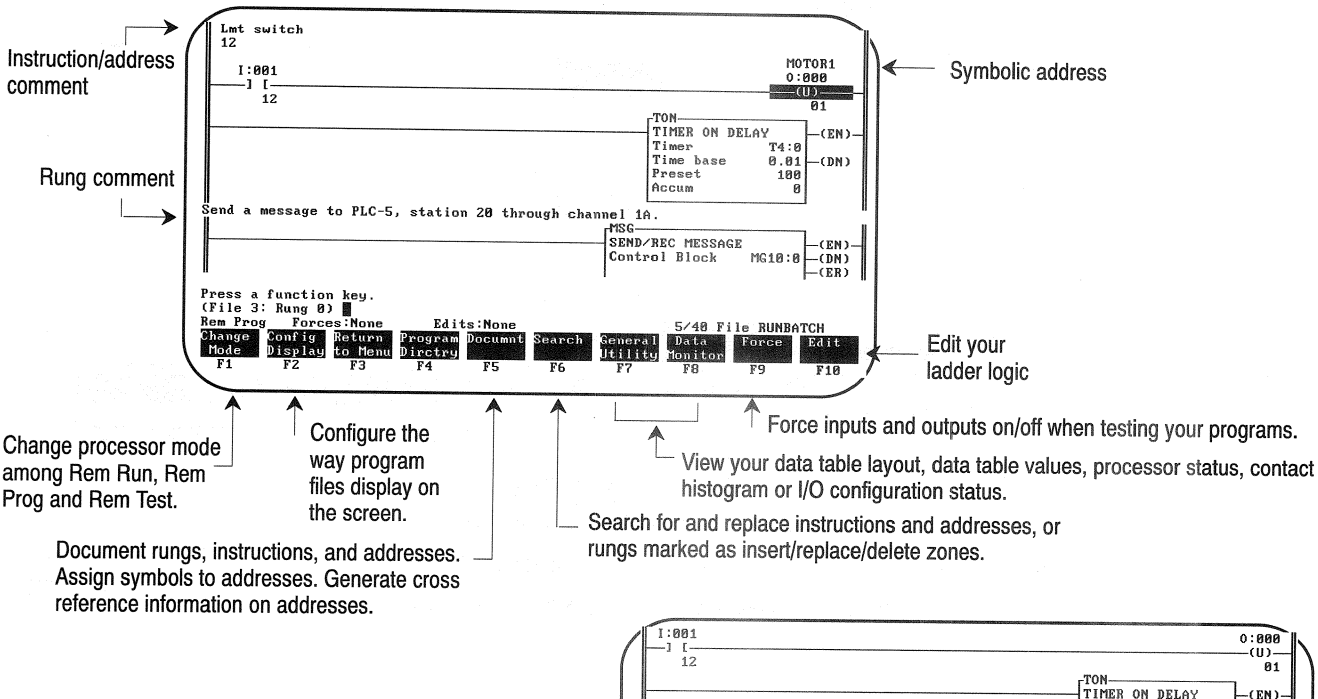
Figure 5.12
PLC-5 Programming Software Main Menu



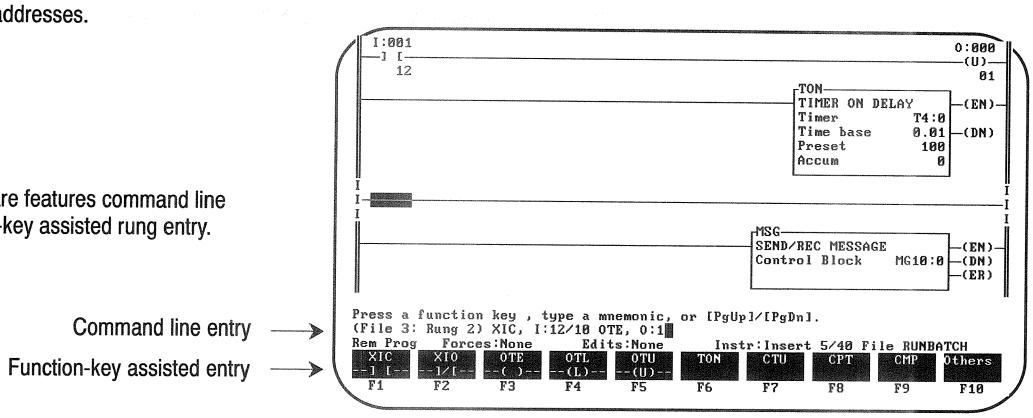
Creating and Editing Ladder Logic Programs

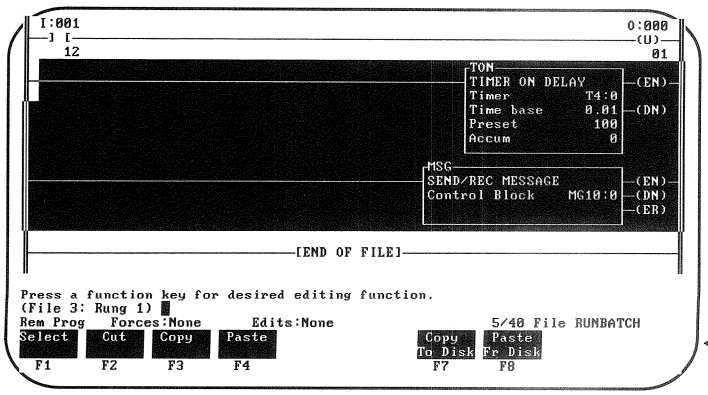
The ladder editor lets you create new or modify existing ladder logic programs. Figure 5.13 shows a sample ladder program and the basic functions available on the main ladder editor screens.

Figure 5.13
Develop and Maintain Ladder Logic



The software features command line or function-key assisted rung entry.



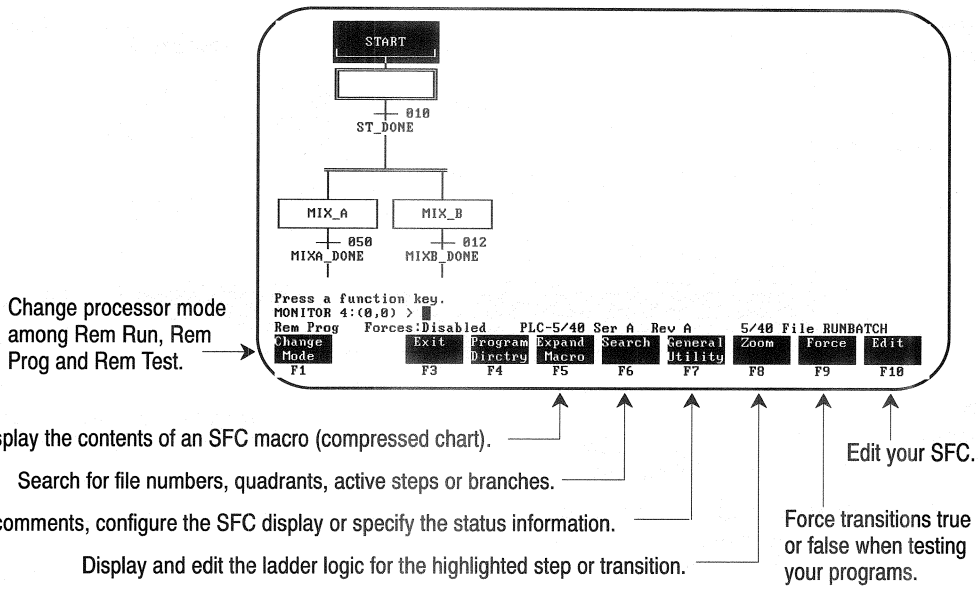


The advanced editing features let you cut, copy and paste rungs (including comments and symbols) within a program file or between program files, and save/retrieve rungs to/from disk.

Creating and Editing Sequential Function Charts

An SFC is a structured programming tool that uses steps (control tasks) and transitions (conditions) to control the flow of ladder program files. Figure 5.14 shows a sample SFC and the basic functions available on the main SFC Editor screen.

Figure 5.14
Control Program Flow with a Sequential Function Chart



Programming Considerations

Some of the programming techniques to consider as you design your system are whether you want to use:

Programming Consideration:	Comment:
Main control programs	PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60 and -5/60L processors can have up to 16 main control programs (instead of just one) active in a single PLC processor to control your entire process. Define one main control program (MCP) for each particular machine or aspect of your process. You can also use multiple main control programs to separate sequential logic from scanned logic to better modularize your process and make troubleshooting easier. A main control program can be a sequential function chart or a ladder program in any program file numbered 1 through 999. You can use any mix of SFC and ladder programs to define up to 16 main control programs. You configure which programs are your main control programs on the Processor Configuration screen by specifying the program file number and the order in which the MCPs should be run.
Processor input interrupts (PII)	A PLC--5/11, -5/20, 5/30, -5/40, -5/40L, -5/60 or -5/60L processor input interrupt (PII) is a hardware internet used in high-speed processing applications, where, based on input the processor receives, the processor interrupts the active program to run the specified PII program file.There are two ways that you can use a PII program: • counter mode • bit transition mode **Using Counter Mode** Using counter mode, you make use of the internal counter. You configure the PII with a preset value so that the hardware counts your input condition and then runs the PII when the accumulated value equals the preset. **Using Bit-Transition Mode** Using bit transition mode, you configure the PII to occur every time the input condition is true (versus counting *x* input conditions and then running the PII). To get the same result as counter mode, you would have to include a counter in your PII ladder program to count the input events, and then set the output when the counter reaches the preset value. To enable a processor input interrupt, enter the program file number (3–999), of the file that contains the PII logic, in the processor configuration screen in the PII section.
Fault routines	You can use a fault routine to specify how a processor responds to a major fault. You can also use a fault routine to provide protection from powering up in run mode when the processor recovers from a power loss. To enable a fault routine, store the program file number (3–999), of the file that contains the fault routine logic, in the processor status file. When the processor encounters a major fault, the processor runs the fault routine logic to handle the fault.
Devices on Channel 0	PLC-5/11, -5/20, -5/40, 5/40L, -5/60 and 5-60L processors have a serial port through which you can write programs or run programs. You can run in one of two modes from the serial port: • System Mode • User Mode In System mode, the processor interprets commands from the other device using DF1 protocol. Using system mode, you can use either of the following protocols: • DF1 point-to-point • DF1 slave • DF! Master In User mode, all received data is put into a buffer. In order to access this data, you use ASCII instructions in your ladder program. Likewise, using ASCII instructions in your ladder program, you can then send ASCII string data to a processor or other device.

Programming Consideration:	Comment:
Scanner mode	In scanner mode, a PLC-5/11, -5/20, -5/25, -5/30, -5/40, -5/40L, -5/60, or -5/60L processor scans and controls its processor-resident local I/O and scans and controls a remote I/O link(s). The scanner-mode processor also acts as a supervisory processor to other processors in adapter mode. The processor scans the processor memory file to read inputs and to control outputs. A PLC-5 processor scans processor-resident local I/O during the I/O scan, which is synchronous and simultaneous to the logic scan. A PLC-5 processor scans remote I/O asynchronously to the program scan, but updates the data table from the remote I/O buffer synchronously to the logic scan. The processor gathers and transfers discrete-transfer data and block-transfer data to I/O modules in the processor-resident local racks as well as to modules in remote I/O racks.
Adapter mode	A -5/30, -5/40, -5/40L, -5/60 or -5/60L processor can scan local I/O and remote I/O and communicate with a supervisory processor. A PLC-5/11, 5/12, -5/15, -5/20, -5/25 processor in adapter mode can communicate with the local I/O chassis and with a supervisory processor. In adapter mode, your PLC-5 processor: • appears to the supervisory processor as a remote I/O adapter and configured to send/receive 4 or 8 words for a PLC-5/12, -5/15, or -5/25 and configured to send/receive 2, 4, 6 or 8 words for a PLC-5/11, 5/20, -5/30, -5/40, -5/40L, -5/60 or -5/60L • transfers I/O data and status data using discrete transfers and block transfers • a PLC-5/40, -5/40L, -5/60 or -5/60L processor scans ladder logic, monitors and controls its local I/O and remote I/O simultaneously (due to the different channel configurations) • a PLC-5/12, -5/15, -5/25 processor scans ladder logic, monitors and controls its own local I/O • provides concurrent communication over DH+ To transfer data in adapter mode for PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60 and -5/60L: • discrete I/O transfer using selectable file types; i.e. integer, binary, I/O • block transfers initiated through channel configuration – no ladder instructions required To transfer data in adapter mode for PLC-5/12, -5/15 and -5/25: • discrete I/O transfer (using the default configuration or using an adapter image file) • block transfer The processor performs the transfer of discrete I/O and block data in the same way. The processor scans the processor memory file to read inputs and control outputs. The processor scans local I/O and block data during the I/O scan and the I/O update is synchronous to the program scan.

Chapter 6

Instruction Set Quick Reference

Chapter Objective

The following table shows an example of the available PLC-5 instructions and provides a brief description of the example. For a more detailed description of each of these instructions, see the appropriate chapter in the "Instruction Set" module of the PLC-5 Software Programming documentation set.

Instruction Set

Instructions marked with an asterisk (*) are supported only on PLC-5/11, -5/20, -5/30, -5/40, -5/40L, -5/60 and -5/60L processors. The last column of Table 6.A indicates the chapter in the PLC-5 Programming Software Instuction Set Reference, (6200–6.4.11) in which each instruction is described.

Table 6.A
Available PLC-5 Instructions

Category	Instruction		Description	Chapter
Relay Instructions	I:012 —] [— 07	Examine On XIC	Examine bit I:012/07, which corresponds to terminal 7 of an input module in I/O rack 1, I/O group 2. If this bit is set (1), the instruction is true.	1
	I:012 —]/[— 07	Examine Off XIO	Examine bit I:012/07, which corresponds to terminal 7 of an input module in I/O rack 1, I/O group 2. If this bit is reset (0), the instruction is true.	1
	O:013 —( )— 01	Output Energize OTE	If the input instructions go true, set (1) bit O:013/01, which corresponds to terminal 1 of an output module in I/O rack 1, I/O group 3.	1
	O:013 —(L)— 01	Output Latch OTL	If the input conditions go true, set (1) bit O:013/01, which corresponds to terminal 1 of an output module in I/O rack 1, I/O group 3. This bit remains set until an OTU instruction or other logic resets the bit.	1
	O:013 —(U)— 01	Output Unlatch OTU	If the input conditions go true, reset (0) bit O:013/01, which corresponds to terminal 1 of an output module in I/O rack 1, I/O group 3. This bit remains reset until an OTL instruction or other logic sets the bit.	1
	01 —(IIN)— 	Immediate Input IIN	This instruction updates a word of input-image bits before the next normal input-image update. For a local chassis, program scan is interrupted while the inputs of the addressed I/O group are scanned; for a remote chassis, program scan is interrupted only to update the input image with the latest states as found in the remote I/O buffer.	1

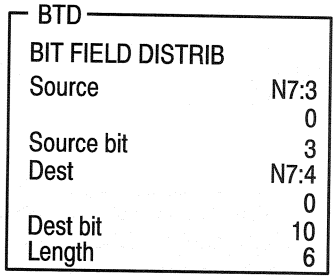
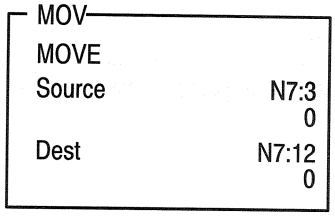
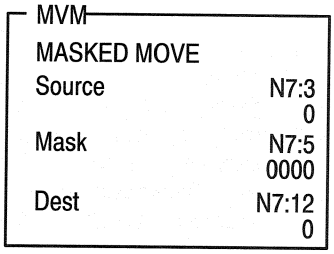
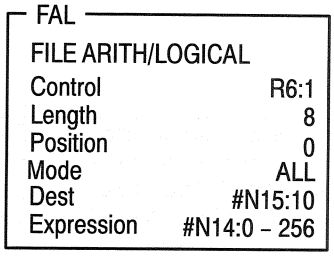
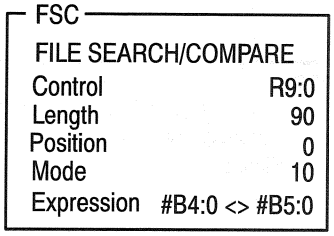
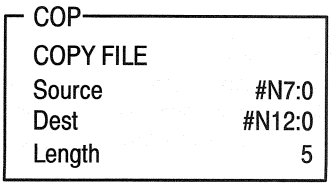
Category	Instruction		Description	Chapter
	01 ——(IOT)——	Immediate Output IOT	This instruction updates a word of output-image bits before the next normal output-image update. For a local chassis, program scan is interrupted while the outputs of the addressed I/O group are scanned; for a remote chassis, program scan is interrupted only to update the output image with the latest states as found in the remote I/O buffer.	1
Timer and Counter Instructions	TON TIMER ON DELAY Timer T4:1 Time Base 1.0 Preset 15 Accum 0	Timer On Delay TON	If the input conditions go true, timer 4, element 1 starts incrementing in 1-second intervals as long as the rung conditions remain true. When the accumulated value is equal to the preset vale (15), the timer stops and sets the timer done bit.	2
	TOF TIMER OFF DELAY Timer T4:1 Time Base 1.0 Preset 180 Accum 0	Timer Off Delay TOF	If the input conditions are false, timer 4, element 1 starts incrementing in 1-second intervals as long as the rung conditions remain false. When the accumulated value is equal to the preset vale (180), the timer stops and resets the timer done bit.	2
	RTO RETENTIVE TIMER ON Timer T4:10 Time Base 1.0 Preset 10 Accum 0	Retentive Timer On RTO	If the input conditions go true, timer 4, element 10 starts incrementing in 1-second intervals as long as the rung remains true. When the rung goes false, the timer stops. If the rung goes true again, the timer continues. When the accumulated value is equal to the preset (10), the timer stops and sets the timer done bit.	2
	CTU COUNT UP Counter C5:1 Preset 10 Accum 0	Count Up CTU	If the input conditions go true, counter 5, element 1 starts counting, incrementing by 1 every time the rung goes from false to true. When the accumulated value is greater than or equal to the preset value (10), the counter sets the counter done bit.	2
	CTD COUNT DOWN Counter C5:1 Preset 10 Accum 35	Count Down CTD	If the input conditions go true, counter 5, element 1 starts counting, decrementing by 1 every time the rung goes from false to true. When the accumulated value is less than or equal to the preset value (10), the counter resets the counter done bit.	2
	T4:1 ——(RES)——	Timer and Counter Reset RES	If the input conditions go true, timer 4, element 1 is reset. This instruction resets timers and counters, as well as control blocks.	2
Compare Instructions	CMP COMPARE Expression N7:5 = N7:10	Compare CMP	If the compare expression is true, this input instruction is true. The CMP instruction can perform these operations: equal (=), less than (<), less than or equal (<=), greater than (>), greater than or equal (>=), not equal (<>), to BCD (TOD), from BCD (FRD), square root (SQR). The following operations can only be performed using a PLC-5/40 or -5/60: radians (RAD), degrees (DEG), log (LOG), natural log (LN), sine (SIN), cosine (COS), tangent (TAN), inverse sine (ASN), inverse cosine (ACS), inverse tangent (ATN).	3

Category	Instruction		Description	Chapter
	EQU EQUAL Source A N7:5 3 Source B N7:10 1	Equal to EQU	If the value in Source A (N7:5) is equal to the value in Source B (N7:10), this input instruction is true.	3
	GEQ GRTR THAN OR EQUAL Source A N7:5 3 Source B N7:10 1	Greater than or Equal GEQ	If the value in Source A (N7:5) is greater than or equal to the value in Source B (N7:10), this input instruction is true.	3
	GRT GREATER THAN Source A N7:5 3 Source B N7:10 1	Greater than GRT	If the value in Source A (N7:5) is greater than the value in Source B (N7:10), this input instruction is true.	3
	LEQ LESS THAN OR EQUAL Source A N7:5 3 Source B N7:10 1	Less than or Equal LEQ	If the value in Source A (N7:5) is less than or equal to the value in Source B (N7:10), this input instruction is true.	3
	LES LESS THAN Source A N7:5 3 Source B N7:10 1	Less than LES	If the value in Source A (N7:5) is less than the value in Source B (N7:10), this input instruction is true.	3
	LIM LIMIT TEST (CIRC) Low limit N7:10 3 Test N7:15 4 High limit N7:20 22	Limit Test LIM	If the Test value (N7:15) is greater than or equal to the Low Limit (N7:10) and less than or equal to the High Limit (N7:20), this input instruction is true.	3
	MEQ MASKED EQUAL Source N7:5 0 Mask N7:6 0000 Compare N7:10 0	Mask Compare Equal MEQ	The processor takes the value in the Source (N7:5) and passes that value through the Mask (N7:6). Then the processor compares the result to the Compare value (N7:10). If the result and this comparison values are equal, the input instruction is true.	3

Category	Instruction		Description	Chapter
	NEQ NOT EQUAL Source A N7:5 3 Source B N7:10 1	Not Equal NEQ	If the value in Source A (N7:5) is not equal to the value in Source B (N7:10), this input instruction is true.	3
Compute Instructions	CPT COMPUTE Dest N7:3 3 Expression N7:4 – (N7:6 * N7:10)	Compute CPT	If the input conditions go true, evaluate the Expression (N7:4) – (N7:6 * N7:10) and store the result in the Destination (N7:3). The CPT instruction can perform these operations: add (+), subtract (–), multiply (*), divide (/), convert from BCD (FRD), convert to BCD (TOD), square root (SQR), logical and (AND), logical or (OR), logical not (NOT), exclusive or (XOR), negate (–), clear (0), and move. The following operations can also be performed with a PLC-5/40, -5/40L, -5/60, or -5/60L: radians (RAD), degrees (DEG), log (LOG), natural log (LN), sine (SIN), cosine (COS), tangent (TAN), inverse sine (ASN), inverse cosine (ACS), inverse tangent (ATN).	4
	ADD ADD Source A N7:3 3 Source B N7:4 1 Dest N7:12 4	Addition ADD	When the input conditions are true, add the value in Source A (N7:3) to the value in Source B (N7:4) and store the result in the Destination (N7:12).	4
	AVE AVERAGE FILE File #N7:1 Dest N7:0 Control R6:0 Length 4 Position 0	Average AVE *	When the input conditions are true, add N7:1, N7:2, N7:3, and N7:4. Divide the sum by 4 and store the result in N7:0	4
	CLR CLR Dest D9:34 0000	Clear CLR	When the input conditions are true, clear BCD file 9, word 34 (set to zero).	4
	DIV DIVIDE Source A N7:3 3 Source B N7:4 1 Dest N7:12 3	Division DIV	When the input conditions are true, divide the value in Source A (N7:3) by the value in Source B (N7:4) and store the result in the Destination (N7:12).	4

Category	Instruction		Description	Chapter
	MUL MULTIPLY Source A N7:3 3 Source B N7:4 1 Dest N7:12 3	Multiply MUL	When the input conditions are true, multiply the value in Source A (N7:3) by the value in Source B (N7:4) and store the result in the Destination (N7:12).	4
	NEG NEGATE Source N7:3 3 Dest N7:12 -3	Negate NEG	When the input conditions are true, take the opposite sign of the Source (N7:3) and store the result in the Destination (N7:12). This instructions turns positive values into negative values and negative values into positive values.	4
	SQR SQUARE ROOT Source N7:3 25 Dest N7:12 5	Square Root SQR	When the input conditions are true, take the square root of the Source (N7:3) and store the result in the Destination (N7:12).	4
	SRT SORT File #N7:1 Control R6:0 Length 4 Position 0	Sort SRT *	When the input conditions are true, the elements in N7:1, N7:2, N7:3 and N7:4 are sorted into ascending order.	4
	STD STANDARD DEVIATION File #N7:1 Dest N7:0 Control R6:0 Length 4 Position 0	Standard Deviation STD *	When the input conditions are true, the elements in N7:1, N7:2, N7:3 and N7:4 are used to calculate the standard deviation and the result is stored in N7:0..	4
	SUB SUBTRACT Source A N7:3 3 Source B N7:4 1 Dest N7:12 2	Subtract SUB	When the input conditions are true, subtract the value in Source B (N7:4) from the value in Source A (N7:3) and store the result in the Destination (N7:12).	4

Category	Instruction		Description	Chapter
Logical Instructions	AND BITWISE AND Source A D9:3 0000 Source B D9:4 0000 Dest N7:10 0	AND	When the input conditions are true, the processor evaluates an AND operation between Source A (D9:3) and Source B (D9:4) (bit-for-bit) and stores the result in the Destination (N7:10). The truth table for an AND operation is: Source A Source B Result 0 0 0 1 0 0 0 1 0 1 1 1	5
	NOT NOT Source D9:3 0000 Dest N7:10 0	NOT Operation	When the input conditions are true, the processor performs a NOT operation (takes the opposite of) on the Source (D9:3) (bit-for-bit) and stores the result in the Destination (N7:10). The truth table for a NOT operation is: Source Destination 0 1 1 0	5
	OR BITWISE INCLUS OR Source A D9:3 0000 Source B D9:4 0000 Dest N7:10 0	OR	When the input conditions are true, the processor evaluates an OR operation between Source A (D9:3) and Source B (D9:4) (bit-for-bit) and stores the result in the Destination (N7:10). The truth table for an OR operation is: Source A Source B Result 0 0 0 1 0 1 0 1 1 1 1 1	5
	XOR BITWISE EXCLUS OR Source A D9:3 0000 Source B D9:4 0000 Dest N7:10 0	Exclusive OR XOR	When the input conditions are true, the processor evaluates an EXCLUSIVE OR operation between Source A (D9:3) and Source B (D9:4) (bit-for-bit) and stores the result in the Destination (N7:10). The truth table for an XOR operation is: Source A Source B Result 0 0 0 1 0 1 0 1 1 1 1 0	5
Conversion Instructions	FRD FROM BCD Source D9:3 0 Dest N7:12 0	Convert from BCD FRD	When the input conditions are true, convert the value in the Source (D9:3) from a BCD format to an integer format and store the result in the Destination (N7:12).	6
	TOD TO BCD Source N7:3 0 Dest D9:3 0	Convert to BCD TOD	When the input conditions are true, convert the value in Source (N7:3) from integer to a BCD format and store the result in the Destination (D9:3).	6

Category	Instruction		Description	Chapter
Bit Modify and Move Instructions		Bit Distribute BTD	When the input conditions are true, the processor copies the number of bits specified by Length, starting with the Source bit (3) of the Source (N7:3), and placing the values in the Destination (N7:4), starting with the Destination bit (10).	7
		Move MOV	When the input conditions are true, move a copy of the value in Source (N7:3) to the Destination (N7:12). This overwrites the original value in the Destination.	7
		Masked Move MVM	When the input conditions are true, the processor passes the value in the Source (N7:3) through the Mask (N7:5) and stores the result in the Destination (N7:12). This overwrites the original value in the Destination.	7
File Instructions		File Arithmetic and Logic FAL	When the input conditions are true, the processor reads 8 elements of N14 :0, and subtracts 256 (a constant) from each element. The results are stored in N15:10. The control file R6:1 controls the operation. The Mode determines whether the processor performs the expression on all elements in the files (ALL) per program scan, one element in the files (INC) per false-to-true transition, or a specific number of elements (NUM) per scan.	9
		File Search and Compare FSC	When the input conditions are true, the processor performs the not-equal-to comparison on 90 elements (10 per scan) between files B4:0 and B5:0. The Mode determines whether the processor performs the expression on all elements in the files (ALL) per program scan, one element in the files (INC) per false-to-true, or a specific number of elements (NUM) per scan.	9
		File Copy COP	When the input conditions are true, the processor copies the contents of the Source file (N7) into the Destination file (N12). The source remains unchanged. The COP instruction copies the number of elements from the source as specified by the Length.	9

Category	Instruction		Description	Chapter
	FLL FILL FILE Source N10:6 Dest #N12:0 Length 5	File Fill FLL	When the input conditions are true, the processor copies the value in Source (N10:6) to the elements in the Destination (N12). The FLL instruction only fills as many elements in the destination as specified in the Length.	9
Diagnostic Instructions	FBC FILE BIT COMPARE Source #I:031 Reference #B3:1 Result #N7:0 Cmp Control R6:4 Length 48 Position 0 Result Control R6:5 Length 10 Position 0	File Bit Compare FBC	When the input conditions are true, the processor compares the number of bits specified in the Cmp Control Length (48) of the Source file (I:031) with the bits in the Reference (B3:1). The processor stores the results in the Result (N7:0). Element R6:4 controls the compare and element R6:5 controls the file that contains the results. The file containing the results can hold up to 10 mismatches between the compared files.	10
	DDT DIAGNOSTIC DETECT Source #I:030 Reference #B3:0 Result #N10:0 Cmp Control R6:0 Length 20 Position 0 Result Control R6:1 Length 5 Position 0	Diagnostic Detect DDT	When the input conditions are true, the processor compares the number of bits specified in the Cmp Control Length (20) of the Source file (I:030) with the bits in the Reference (B3:0). The processor stores the results in the Result (N10:0). Element R6:0 controls the compare and element R6:1 controls the file that contains the results. The file containing the results can hold up to 5 mismatches between the compared files.	10
	DTR DATA TRANSITION Source I:002 Mask 0FFF Reference N63:11	Data Transition DTR	The DTR instruction compares the bits in the Source (I:002) through a Mask (0FFF) with the bits in the Reference (N63:11). When the non-masked source is different than the reference, the instruction is true for only 1 scan. The source bits are written into the reference address for the next comparison. When the non-masked source and the reference are the same, the instruction remains false.	10
Shift Instructions	BSL BIT SHIFT LEFT File #B3:1 Control R6:53 Bit Address I:022/12 Length 5	Bit Shift Left BSL	If the input conditions go true, the BSL instruction shifts the number of bits specified by Length (5) in File (B3:1), starting at bit 0, to the left by one bit position. The source bit (I:022/12) shifts into the first bit position, B3:1.	11
	BSR BIT SHIFT RIGHT File #B3:2 Control R6:54 Bit Address I:023/06 Length 3	Bit Shift Right BSR	If the input conditions go true, the BSR instruction shifts the number of bits specified by Length (3) in File (B3:2), starting with the highest bit position, to the right by one bit position. The source bit (I:023/06) shifts into the first bit position B3:2/2.	11

Category	Instruction		Description	Chapter
	FFL FIFO LOAD Source N60:1 FIFO #N60:3 Control R6:51 Length 64 Position 0	FIFO Load FFL	When the input conditions go true, the processor loads N60:1 into the next available element in the stack, as pointed to by the position word of R6:51. Each time the rung goes from false to true, the processor loads another element in the stack #N60:3.	11
	FFU FIFO UNLOAD FIFO #N60:3 Dest N60:2 Control R6:51 Length 64 Position 0	FIFO Unload FFU	When the input conditions go true, the processor unloads an element as pointed to by the position word of R6:51 from #N60:3 into N60:2. Each time the rung goes from false to true, the processor unloads another element.	11
	LFL LIFO LOAD Source N70:1 LIFO #N70:1 Control R6:61 Length 64 Position 0	LIFO Load LFL*	When the input conditions go true, the processor loads N70:1 into the next available element in the stack, as pointed to by R6:61. Each time the rung goes from false to true, the processor loads another element.	11
	LFU LIFO UNLOAD LIFO #N70:3 Dest N70:2 Control R6:61 Length 64 Position 0	LIFO Unload LFU*	When the input conditions go true, the processor unloads the last element from #N70:3 and puts it into N70:2. Each time the rung goes from false to true, the processor unloads another element.	11
Sequencer Instructions	SQI SEQUENCER INPUT File #N7:11 Mask FFF0 Source I:031 Control R6:21 Length 4 Position 0	Sequencer Input SQI	The SQI instruction compares the Source (I:031) input image data through a Mask (FFF0) to Reference file #N7:11 to see if they match. The operation is controlled by the information in the control element R6:21. When the status of all unmasked bits matches the corresponding reference bits, the rung goes true.	12
	SQL SEQUENCER LOAD File #N7:20 Source I:002 Control R6:22 Length 5 Position 0	Sequencer Load SQL	The SQL instruction loads data into the sequencer File (#N7:20) by stepping through the number of elements specified by Length (5) of the File (N7:20), starting at the Position (0). The operation is controlled by the information in the control file R6:22. When the rung goes from false to true, the SQL instruction increments to the next step in the sequencer file and loads the Source data into it for every scan that the rung remains true.	12

Category	Instruction		Description	Chapter
	SQO SEQUENCER OUTPUT File #N7:1 Mask 0F0F Dest O:014 Control R6:20 Length 4 Position 0	Sequencer Output SQO	When the rung goes from false to true, the SQO instruction increments to the next step in the sequencer File (#N7:1). The data in the sequencer file is transferred through a Mask (0F0F) to the Destination (O:014) for every scan that the rung remains true.	12
Program Control Instructions	—(MCR)—	Master Control Reset MCR	If the input conditions are true, the program scans the rungs between MCR instruction rungs and processes the outputs normally. If the input conditions are false, all non-retentive outputs are reset within the MCR zone.	13
	10 —(JMP)—	Jump JMP	If the input conditions are true, the processor skips rungs by jumping to the rung identified by the label (10).	13
	10 —[LBL]—	Label LBL	When the processor reads a JMP instruction that corresponds to label 10, the processor jumps to the rung containing the label and starts executing.	13
	FOR FOR Label Number 0 Index N7:0 Initial Value 0 Terminal Value 10 Step Size 1	FOR Loop FOR *	The processor executes the rungs between the FOR and the NXT instruction repeatedly in one program scan, until it reaches the terminal value (10) or until a BRK instruction aborts the operation.	13
	NXT NEXT Label Number 0	Next NXT *	The NXT instruction returns the processor to the corresponding FOR instruction, identified by the label number specified in the FOR instruction. NXT must be programmed on an unconditional rung that is the last rung to be repeated in a For-Next loop.	13
	—[BRK]—	Break BRK*	When the input conditions go true, the BRK instruction aborts a For-Next loop.	13
	JSR JUMP TO SUBROUTINE Program File 90 Input par N16:23 Input par N16:24 Input par 231 Return par N19:11 Return par N19:12	Jump to Subroutine JSR	If the input conditions are true, the processor starts running a subroutine Program File (90). The processor uses the Input Parameters (N16:23, N16:24, 231) in the subroutine and passes Return Parameters (N19:11, N19:12) back to the main program, where the processor encountered the JSR instruction.	13
	SBR SUBROUTINE Input par N43:0 Input par N43:1 Input par N43:2	Subroutine SBR	The SBR instruction is the first instruction in a subroutine file. This instruction identifies Input Parameters (N43:0, N43:1, N43:2) the processor receives from the corresponding JSR instruction. You do not need the SBR instruction if you do not pass input parameters to the subroutine.	13

Category	Instruction		Description	Chapter
	RET RETURN ( ) Return par N43:3 Return par N43:4	Return RET	The RET instruction ends the subroutine and stores the Return Parameters (N43:3, N43:4) to be returned to the JSR instruction in the main program.	13
	(TND)	Temporary End TND	The TND instruction stops the processor from scanning the rest of the current ladder file.	13
	[AFI]	Always False AFI	The AFI instruction disables the rung (i.e., the rung is always false).	13
	B3 [ONS] 10	One Shot ONS	If the input conditions are true, the ONS instruction conditions the rung so that the rung is true for one scan. The rung is false on successive scans.	13
	OSF ONE SHOT FALLING Storage Bit O:010/12 Output Bit 15 Output Word N7:0	One Shot Falling OSF *	The OSF instruction triggers an event to occur one time. Use the OSF instruction whenever an event must start based on the change of state of a rung from true-to-false, not on the resulting rung status.	13
	OSR ONE SHOT RISING Storage Bit O:010/12 Output Bit 15 Output Word N7:0	One Shot Rising OSR *	The OSR instruction triggers an event to occur one time. Use the OSR instruction whenever an event must start based on the change of state of a rung from false-to-true, not on the resulting rung status.	13
	SFR SFC RESET Prog file number 3	SFC Reset SFR *	The SFR instruction resets the logic in a sequential function chart. When the SFR instruction goes true, the processor performs postscan/lastscan on all active steps in program file 3, and then resets the logic on the next program scan. The chart remains in this reset state until the SFR instruction goes false.	13
	(EOT)	End of Transition EOT	The EOT instruction should be the last instruction in an SFC transition file. If you do not use an EOT instruction, the processor always evaluates the transition as true.	13
	(UID)	User Interrupt Disable UID *	The UID instruction temporarily disables an interrupt-driven ladder program (such as an STI or PII).	13
	(UIE)	User Interrupt Enable UIE *	The UIE instruction re-enables the interrupt-driven ladder program.	13
Process Control Instructions	PID PID Control Block N10:0 Processor Variable N15:13 Tieback N15:14 Control Output N20:21	Proportional, Integral, and Derivative PID	If the input conditions are true, the processor performs PID calculations and controls a closed loop. The control block (N10:0) contains the instruction information for the PID. The PID gets the process variable from N15:13 and sends the PID output to N20:21. The tieback stored in N15:14 handles the manual control station.	14

Category	Instruction		Description	Chapter
Block Transfer Instructions	BTR BLOCK TRANSFER READ Rack 1 Group 0 Module 0 Control Block N10:100 Data File N10:110 Length 40 Continuous Y	Block Transfer Read BTR	If the input conditions are true, the block transfer read is initiated for the I/O module located at rack 1, group 0, module 0. The Control Block (N10:100) contains status for the transfer. The Data File contains the data that is read from the I/O module (N10:110). The BT Length (40) identifies the number of words in the transfer. A non-continuous block transfer is queued and run only once per false-to-true transition; a continuous block transfer is repeatedly requeued.	15
	BTW BLOCK TRANSFER WRITE Rack 1 Group 0 Module 0 Control Block N10:0 Data File N10:10 Length 64 Continuous Y	Block Transfer Write BTW	If the input conditions are true, the block transfer write is initiated for the I/O module located at rack 1, group 0, module 0. The Control Block (N10:0) contains status for the transfer. The Data File contains the data to write (N10:10) The BT Length (64) identifies the number of words in the transfer. A non-continuous block transfer is queued and run only once per false-to-true transition; a continuous block transfer is repeatedly requeued.	15
Message Instructions	MSG SEND/RECEIVE MESSAGE Control Block N7:10	Message MSG	If the input conditions are true, the data is transferred according to the instruction parameters you set when you entered the message instruction. The Control Block (N7:10) contains status and instruction parameters.	16
ASCII Instructions	ABL ASCII TEST FOR LINE Channel 0 Control Characters R6:32	ASCII Test for Line ABL *	If input conditions go true, the processor reports the number of characters in the buffer, up to and including the end-of-line characters and puts this value into the position field.	17
	ACB ASCII CHARS IN BUFFER Channel 0 Control Characters R6:32	ASCII Characters in Buffer ACB *	If input go true, the processor reports the total number of characters in the buffer and puts this value into the position field.	17
	ACI ASCII STRING TO INTEGER Source ST38:90 Dest N7:123 75	Convert ASCII String to Integer ACI *	If input conditions are true, convert the string in ST38:90 to an integer and store the result in N7:123.	17
	ACN STRING CONCATENATE Source A ST38:90 Source B ST37:91 Dest ST52:76	ASCII String Concatenate ACN *	If input conditions are true, concatenate the string in ST38:90 with the string in ST37:91 and store the result in ST52:76.	17

Category	Instruction		Description	Chapter
	AEX STRING EXTRACT Source ST38:40 Index 42 Number 10 Dest ST52:75	ASCII String Extract AEX *	If input conditions are true, extract 10 characters starting at the 42nd character of ST38:40 and store the result in ST52:75.	17
	AIC INTEGER TO STRING Source 876 Dest ST38:42	Convert Integer to ASCII String AIC *	If input conditions are true, convert the value 876 to a string and store the result in ST38:42.	17
	AHL ASCII HANDSHAKE LINES Channel 0 AND Mask ABCD OR Mask DACB Control R6:23 Channel Status	ASCII Handshake Lines AHL *	If input conditions go true, bit 0 of the AND mask is set to clear the DTR line. Bits 0 and 1 of the OR mask then set the DTR and RTS lines.	17
	ARD ASCII READ Channel 0 Dest ST52:76 Control R6:32 String Length 50 Characters Read	ASCII Read ARD *	If input conditions are true, read 50 characters from the buffer and move them to ST52:76.	17
	ARL ASCII READ LINE Channel 0 Dest ST50:72 Control R6:30 String Length 18 Characters Read	ASCII Read Line ARL *	If input conditions are true, read 18 characters (or until end-of-line) from the buffer and move them to ST50:72.	17
	ASC STRING SEARCH Source ST38:40 Index 35 Search ST52:80 Result 42	ASCII String Search ASC *	If input conditions are true, search ST52:80 starting at the 35th character, for the string found in ST38:40. In this example, the string was found at index 42.	17
	ASR ASCII STRING COMPARE Source A ST37:42 Source B ST38:90	ASCII String Compare ASR *	If the string in ST37:42 is identical to the string in ST38:90, set the output conditions.	17

Category	Instruction		Description	Chapter
	AWA ASCII WRITE APPEND Channel 0 Source ST52:76 Control R6:32 String Length 50 Characters Sent	ASCII Write Append AWA *	If input conditions are true, read 50 characters from ST52:76 and write it to the display device connected to Channel 0; then write a carriage return.	17
	AWT ASCII WRITE Channel 0 Source ST37:40 Control R6:23 String Length 40 Character Sent	ASCII Write AWT *	If input conditions are true, read 40 characters from ST37:40 to the display device connected to Channel 0.	17

Chapter 7

Processor Specifications

General

This table lists general specifications of the PLC-5 family processors.

Backplane Current	2.5A (PLC-5/10, -5/12, -5/15, -5/25) 2.3A (PLC-5/11, -5/20, -5/30) 3.3A (PLC-5/40, -5/40L, -5/60, -5/60L)
Environmental Conditions:	
operating temperature	0-60° C (32-140° F)
storage temperature	-40-85° C (-40-185° F)
relative humidity	5-95% (without condensation)
Time-of Day Clock and Calender:	
maximum variations at 60° C	± 3 min per month (PLC-5/10, -5/12, -5/15 and PLC-5/25 processors) ± 5 min per month (PLC-5/11, -5/20, 5/30, -5/40, -5/40L, -5/60 -5/60L processors)
typical variations at 20° C	± 20 s per month
timing accuracy	one program scan
Typical Discrete I/O Scan	• 1ms/local I/O rack • 10 ms/remote I/O adapter communication at 57.6 kbps • 7 ms/remote I/O adapter communication at 115.2 kbps (PLC-5/11, -520, -5/30, -5/40, -5/40L-, 5/60, and -5/60L only) • 3ms/remote I/O adapter communication at 230.4 kbps (PLC-5/11, -5/20, 5/30, -5/40, -5/40L, -5/60, and -5/60L only)
I/O Modules	Bulletin 1771 I/O including 8-, 16-, 32-pt., and intelligent modules
Hardware Addressing:	
2-slot	• any mix of 8-pt modules • 16-pt modules must be I/O pairs • no 32-pt modules
1-slot	• any mix of 8- or 16-pt modules • 32-pt modules must be I/O pairs
1/2-slot	any mix of 8-,16-, or 32-pt modules
Communication	• DH+ 3,048 cable-m (or 10,000 cable-ft) max • DH using 1785-KA
Location	1771-I/O chassis, left-most slot
Keying	• between 40 and 42 • between 54 and 56
Agency Certification (when product is marked)	• CSA certified • CSA Class I, Division 2, Groups A, B, C, D • UL listed

Processor Specific

This table lists specifications of each PLC-5 family processor.

Processor	Maximum Local Racks Supported	Maximum Remote Racks Supported	I/O Capacity	Memory (Words)	Program Scan Time	Communication	Memory Modules (optional)	Battery
PLC-5/10	4 (1 resident chassis)	none	• 256 I/O with 16-pt modules • 512 I/O with 32-pt modules	6 K	2 ms/K words (bit logic) 8 ms/K words (typical)	standalone DH+	8K EEPROM (1785-MJ)	1770-XY
PLC-5/12	4 (1 resident chassis)	none	• 256 I/O with 16-pt modules • 512 I/O with 32-pt modules			standalone, adapter (slave to a supervisor) DH+	8K EEPROM (1785-MJ)	
PLC-5/15	4 (1 resident chassis)	3 (up to 12 physical devices)	• 512 I/O, any mix • 512 inputs and 512 outputs using 16- or 32-pt modules			standalone scanner (local and remote I/O) or adapter (slave to a supervisor) DH+	• 4K RAM expansion, 1785-MR • 8 K RAM expansion, 1785-MS • 8K EEPROM (1785-MJ)	
PLC-5/25	4 (1 resident chassis)	7 (up to ~~28~~ 16 physical devices)	• 1024 I/O, any mix • 1024 inputs and 1024 outputs using 16- or 32-pt modules	13 K	2 ms/K words (bit logic) 8 ms/K words (typical)	standalone scanner (local and remote I/O) or adapter (slave to a supervisor) DH+	• 4K RAM expansion (1785-MR) • 8 K RAM expansion (1785-MS) • 8K EEPROM (1785-MJ) • 16K EEPROM backup, 1785-MK	
PLC-5/11	4 (1 resident chassis) If all 4 racks used, cannot have a remote I/O rack	1 (up to 4 physical devices) rack must be addressed as rack 3	• 256 I/O with 16-pt modules • 512 I/O with 32-pt modules	8 K	0.5 ms/K words (bit logic) 2 ms/K words (typical)	• 1channel independently selectable for remote I/O scanner or adapter, or DH+ • on-board serial port configurable for RS-232C, RS-423, RS-422A compatible	1785-ME64	1770-XYC

Processor	Maximum Local Racks Supported	Maximum Remote Racks Supported	I/O Capacity	Memory (Words)	Program Scan Time	Communication	Memory Modules (optional)	Battery
PLC-5/20	4 (1 resident chassis)	3 (up to 12 physical devices)	• 512 I/O, any mix • 512 inputs and 512 outputs using 16- or 32-pt modules	16 K	0.5 ms/K words (bit logic) 2 ms/K words (typical)	• 1channel independently selectable for remote I/O scanner or adapter, or DH+ • 1 channel DH+ • on-board serial port configurable for RS-232C, RS-423, RS-422A compatible	64K EEPROM 1785-ME64	1770-XYC
PLC-5/30	4 (1 resident chassis)	7 (up to 28 physical devices)	• 1024 I/O, any mix • 1024 inputs and 1024 outputs using 16- or 32-pt modules	32 K	0.5 ms/K words (bit logic) 2 ms/K words (typical)	• 2 channels independently selectable for remote I/O scanner or adapter, or DH+ • on-board serial port configurable for RS-232C, RS-423, RS-422A compatible	64K EEPROM (1785-ME64)	1770-XYB or -XYC
PLC-5/40	4 (1 resident chassis)	15 (up to 60 physical devices)	• 2048 I/O, any mix • 2048 inputs and 2048 outputs using 16- or 32-pt modules	48 K	0.5 ms/Kwords (bit logic) 2 ms/Kwords (typical)	• 4 channels independently selectable for remote I/O scanner or adapter, or DH+ • on-board serial port configurable for RS-232C, RS-423, RS-422A compatible	64K EEPROM (1785-ME64)	1770-XYB or -XYC

Processor	Maximum Local Racks Supported	Maximum Remote Racks Supported	I/O Capacity	Memory (Words)	Program Scan Time	Communication	Memory Modules (optional)	Battery
PLC-5/40L	• 4 (1 resident chassis) • up to 15 extended local chassis • 16 rack addressing capability	15 (up to 60 physical devices)	• 2048 I/O, any mix • 2048 inputs and 2048 outputs using 16- or 32-pt modules	48 K	0.5 ms/Kwords (bit logic) 2 ms/Kwords (typical)	• 2 channels independently selectable for remote I/O scanner or adapter, or DH+ • 1 channel configured for extended local I/O • on-board serial port configurable for RS-232C, RS-423, RS-422A compatible	64K EEPROM (1785-ME64)	1770-XYB or -XYC
PLC-5/60	4 (1 resident chassis)	23 (up to 92 physical devices)	• 3072 I/O, any mix • 3072 inputs and 3072 outputs using 16- or 32-pt modules	64 K	0.5 ms/Kwords (bit logic) 2 ms/Kwords (typical)	• 4 channels independently selectable for remote I/O scanner or adapter, or DH+ • on-board serial port configurable for RS-232C, RS-423, RS-422A compatible	64K EEPROM (1785-ME64)	1770-XYB or-XYC
PLC-5/60L	• 1 resident • up to 16 extended local • 24 rack addressing capability	23 (up to 64 physical devices)	• 3072 I/O, any mix • 3072 inputs and 3072 outputs using 16- or 32-pt modules	64 K	0.5 ms/Kwords (bit logic) 2 ms/Kwords (typical)	• 2 channels independently selectable for remote I/O scanner or adapter, or DH+ • 1 channel configured for extended local I/O • on-board serial port configurable for RS-232C, RS-423, RS-422A compatible	64K EEPROM (1785-ME64)	1770-XYB or-XYC

Compatible Remote I/O Link Devices

This table lists devices compatible with a PLC-5 processor.

Supervisory Processors	• PLC-2/30 processor • PLC-3, -3/10 processor • PLC-5/15, -5/25 processor • PLC-5/250 processor • PLC-5/11, -5/20, -5/30, -5/40 and -5/60 processor • PLC-5/40L and -5/60L processor
I/O Adapters	• Remote I/O Adapter Module (1771-ASB) • I/O chassis with integral power supply and adapter (1771-AM1, -AM2) • Any PLC®-5 processor in adapter mode • PLC®-5/250 Remote Scanner (5150-RS2) in adapter mode • Direct Communication Module (1771-DCM) • PLC Interface Module (3500–NA1) for digital ac and dc drives • Remote I/O Adapter for Bulletin 1336 drives (1336-MOD-G2) • Serial Port Connector (MOD-S1) • RediPANEL™ Pushbutton and Keypad Modules (bulletin 2705) • Option Module (1784-F30D) for the T30 Plant-Floor Terminal • 8600 CNC with remote I/O adapter option (8600-2058K) • CVIM™ set for adapter mode (5370-CVIM) • Pro-Spec 6000 Fastening System with the remote I/O adapter option (1860-CPUC)

Backup Communication Module

This table lists the specifications for the 1785-BCM backup communication module.

Compatible Processors	PLC-5/15 Series B PLC-5/25, -5/20, -5/30, -5/40, -5/40L, -5/60, -5/60L
Module Location	1771 I/O Chassis (local)
Backplane Current	.8A @ 5V dc
Keying Locations	between 8 and 10 between 34 and 36
Wiring Arm	1771-WG
Customer Relay	.25A @24V dc (resistive)
Environmental Conditions Operational Temperature Storage Temperature Relative Humidity	 0 to 60C (32 to 140) -40 to 85 C (-40 to 185 F) 5 to 95% (without condensation)
Certification (when specified on product)	UL - Industrial Control Equipment CSA - Class I, Division 2

Programming and Instruction Capabilities

This table lists the type of programming and instructions supported by the PLC-5 processor.

Programming	• ladder diagram (all) • sequential function chart (all) • I/O configuration (all) • selectable timed interrupt (all) • multiple main programs (PLC-5/11, -5/20, -5/30, -5/40, -5/60, -5/40L and -5/60L) • processor input interrupt (PLC-5/11, -5/20,-5/30, -5/40, -5/60, -5/40L and -5/60L)
Instruction Set	• relay-type through advanced (all) • PID control (all) • machine diagnostics (all) • ASCII (PLC-5/11, -5/20, -5/30, -5/40, -5/60, -5/40L and -5/60L) • complex expressions (PLC-5/11, -5/20, -5/30, -5/40, -5/60, -5/40L and -5/60L)

Table 7.A
PLC-5 Processing Features

PLC Processors	Sequential Function Charts (SFCs)	Multiple MCPs and quantity	Integral serial port (RS-232-C, -422, -423)	Program Scan Time
PLC-5/10	yes	no (1)	no	2 ms/k word (bit logic) 8 ms/k word (typical)
PLC-5/12	yes	no (1)	no	
PLC-5/15	yes	no (1)	no	
PLC-5/25	yes		no	
PLC-5/30	yes	yes (16)	yes	0.5 ms/k word (bit logic) 2 ms/k word (typical)
PLC-5/11	yes	yes (16)	yes	
PLC-5/20	yes		yes	
PLC-5/40	yes		yes	
PLC-5/40L	yes		yes	0.5 ms/k word (bit logic) 2 ms/k word (typical)
PLC-5/60	yes		yes	0.5 ms/k word (bit logic) 2 ms/k word (typical)
PLC-5/60L	yes		yes	

For more Information

For more information on PLC-5 processors, call your local Allen-Bradley sales office or Allen-Bradley distributors.

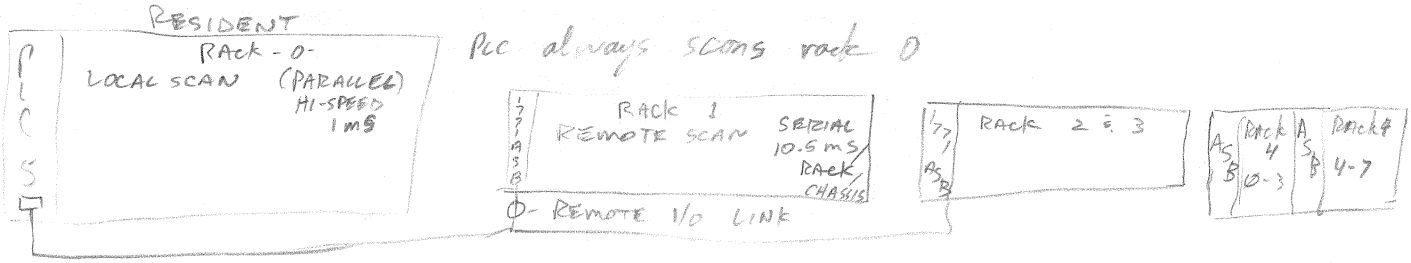
Allen-Bradley Distribution Network

Allen-Bradley uses local distributors to ensure quick turn-around on your orders and local support. While no one knows your Allen Bradley PLC-5 processors better than Allen-Bradley, no one knows your local situation better than your local Allen-Bradley distributor.

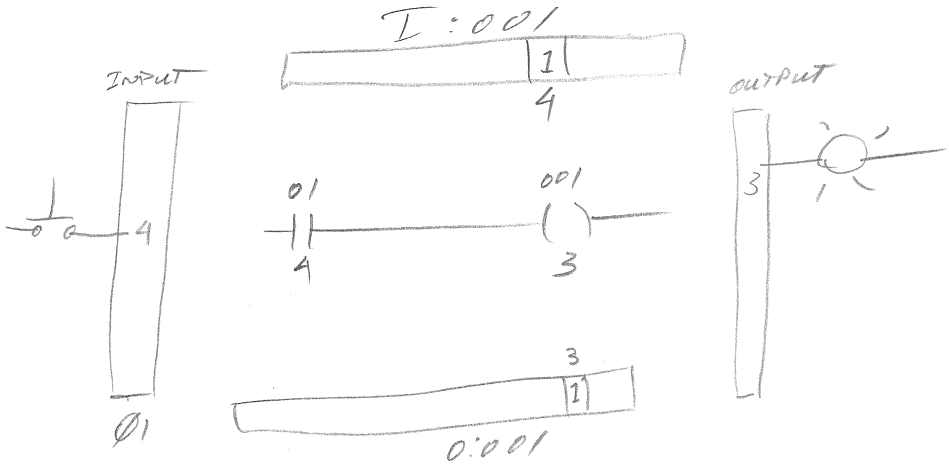
Module Group = 1 input word & 1 output word
(1/0)

allocate memory before writing program

Rack = 8 module groups



Enhanced processors are faster but more sensitive to noise.
Max cable length is 10,000' unless scan time is reduced.
540L & 560L 'L' means Extended local (98' max cable length)



TERMINAL No. ON MODULE ≠ BIT No.

I:001/04

BIT DELIMITER (.)

MODULE (GROUP)

RACK

ELEMENT

MODULE TYPE = FILE TYPE

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