

2.0 General

This chapter describes the hardware associated with the PLC-2/20 and PLC-2/30 programmable controllers. Each programmable controller is made up of the following components:

- o Processor
- o I/O Chassis
- o I/O Modules
- o Industrial Terminal
- o Auxiliary Power Supplies

You must specify each of these above components and their associated cables when ordering the programmable controller.

PLC-2/20, PLC-2/30 Common Equipment

There are three components common to the PLC-2/20 and the PLC-2/30 processors. They are:

- o Processor Chassis
- o Processor Interface Module
- o Power Supply

These components are discussed in section 2.2.

PLC-2/20 Programmable Controller

There are two modules which are unique to the PLC-2/20 processor (figure 2.1). They are:

- o Processor Control Module (cat. no. 1772-LI)
- o Memory Module - A memory module is required for the processor to function. It is not included as a part of the 1772-LP2 programmable controller and must be ordered separately.

These modules are discussed in section 2.1.

PLC-2/30 Programmable Controller

There are two modules which are unique to the PLC-2/30 processor (figure 2.1). They are:

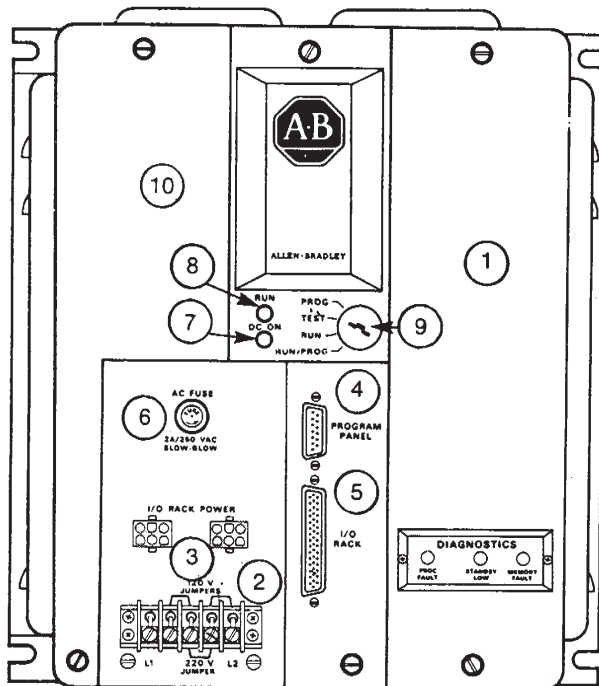
- o Processor Control Module (cat. no. 1772-LG)
- o Memory Module - A memory module is required for the processor to function. It is not included as a part of the 1772-LP3 programmable controller and must be ordered separately.

These modules are discussed in section 2.1.

2.1 PLC-2/20 and PLC-2/30 Processors

The PLC-2/20 Processor (cat. no. 1772-LP2, -LP2D4) or the PLC-2/30 Processor (cat. No. 1772-LP3, -LP3D4) is the central processing unit of the system (figure 2.1). Input module signals are transmitted to the processor which operates on this data in accordance with your program. Then it transmits this data to the output modules.

Figure 2.1
Processor Front Panel – AC Version



Legend:

1. Access memory and processor modules by removing panel
2. User power connections
3. I/O rack power socket
4. Program panel socket
5. I/O rack socket
6. Main input fuse
7. DC ON indicator
8. RUN indicator
9. Four-position mode select switch
10. System power supply module located here

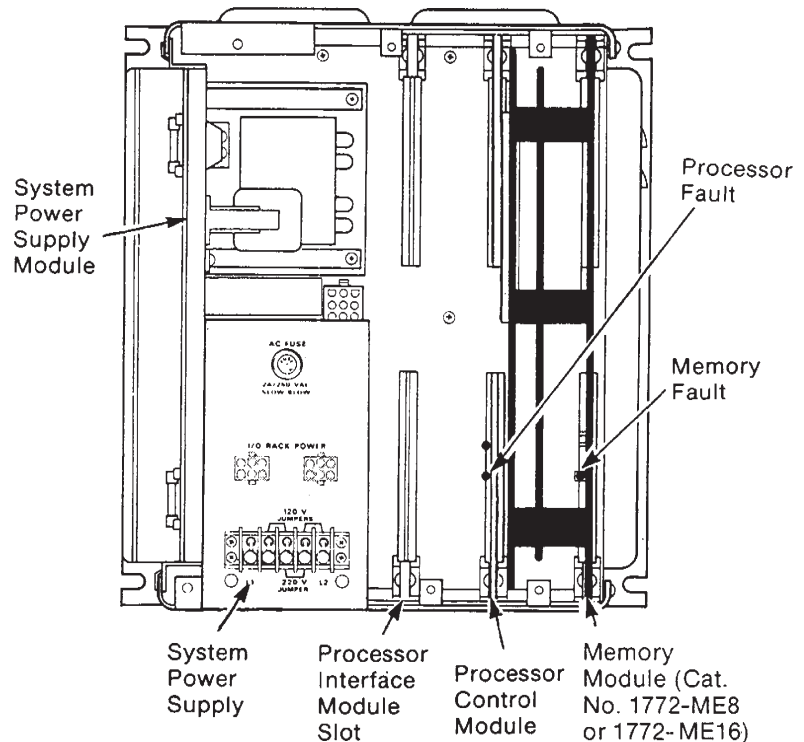
2.1.1 Processor Control Module

The Processor Control Module (cat. no. 1772-LI (PLC-2/20), 1772-LG (PLC-2/30)) occupies the middle plastic slot (second slot from the right) of the processor chassis (figure 2.2). This module's primary function is to provide control functions, timing, and interfacing with other processor modules. Once inserted and properly seated into the backplane socket, it is covered with a front panel which is secured to the processor chassis with two thumb screws (one on top and one on bottom). In addition to covering this module, the front panel also covers the memory module.

Indicator

The PROCESSOR FAULT indicator (figure 2.2) is often helpful in isolating processor malfunctions. It illuminates when the logic controlling the processor scan fails. This fault is usually corrected by replacing this module. This indicator can be seen through the window on the front panel cover and is labeled PROC FAULT on the window.

Figure 2.2
Processor with the Memory Module (cat. no. 1772-ME8 or -ME16)
Installed



2.1.2 Memory Modules

The Memory Module (cat. no. 1772-ME, 1772-MEB, 1772-ME8, or 1772-ME16) occupies the right-most plastic slot in the processor chassis (figure 2.2). Table 2.A specifies the memory module for each processor.

Table 2.A
PLC-2/20 and PLC-2/30 Memory Modules

Maximum Memory Size	Module Type	Processor		Max Data Table Size
		2/20	2/30	
8K Words (8192 Words)	1772-ME 1772-MEB 1772-ME8	1772-LP1 1772-LP2 1772-LP2D4	1772-LP3 1772-LP3D4	8064 words
16K Words (16256 Words)	1772-MEB 1772-ME16	n/a n/a	1772-LP3 1772-LP3D4	8192 words

Fixed CMOS RAM Memory Modules (cat. nos. 1772-ME8 and 1772-ME16)

These modules contain non-removable RAM storage. The 1772-ME8 stores 8K words; the 1772-ME16 stores 16K words. You may use the 1772-ME8 with either a 1772-LP2 (PLC-2/20) or a 1772-LP3 (PLC-2.30); you may use the 1772-ME-16 only with the 1772-LP3 processor.

CMOS RAM Memory Modules (cat. nos. 1772-ME and 1772-MEB)

These CMOS RAM memory modules support removable solid state Random Access Memory (RAM) and contains support circuitry needed to store and retrieve memory information. Each contains a battery pack for memory backup support. Maximum memory capacity is 8K (K = 1024) words for the 1772-ME and 16K words with the 1772-MEB.

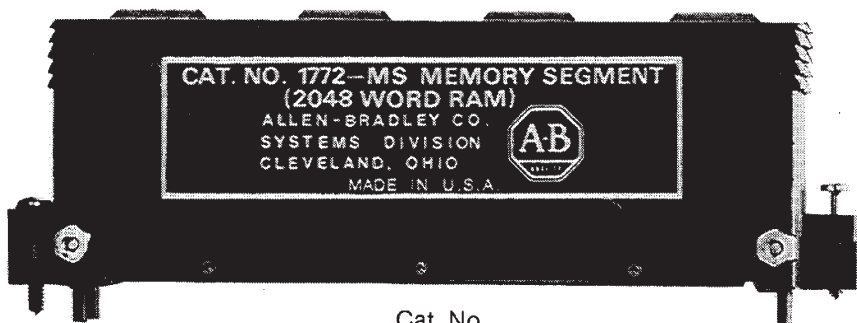
The following memory segments (figure 2.3) are used with the CMOS RAM memory module:

- o 512 word memory segment (cat. no. 1772-MT)
- o 2048 (2K) word memory segment (cat. no. 1772-MS)
- o 8192 (8K) word memory segment (cat. no. 1772-MS8)

Combinations of up to a maximum of four segments are possible (for example: a 2K 1772-MS and an 8K 1772-ME8 provide 10K words of storage). However, you are limited to 8K words when using the 1772-ME and 16K words when using the 1772-MEB.

Memory segments 1772-MS and 1772-MT have a case that can be secured to the memory module with mounting screws.

Figure 2.3
Memory Segment

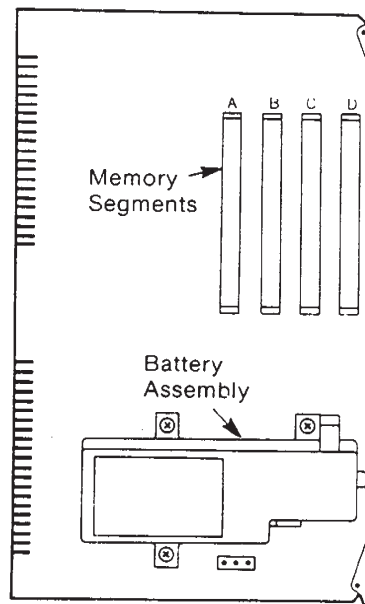


Cat. No.
1772-MS, -MS8

Battery Backup

A Battery (cell) Housing (cat. no. 1772-B1) is shipped mounted on the memory module (figure 2.4). This battery housing will hold two alkaline cells (cat. no. 1771-BA) or one Lithium cell (cat. no. 1770-XO). The battery housing provides a convenient storage location for battery backup power to guard against loss of memory if power from the power supply is interrupted.

Figure 2.4
Memory Module Showing Battery Holder



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You may use *lithium* cells with:

- o 1772-ME, Revision K or later
- o any 1772-MEB, -ME8 or -ME16 memory modules.

A lithium cell provides approximately two years of memory backup at a maximum of 60°C (140°F). This cell is not rechargeable.

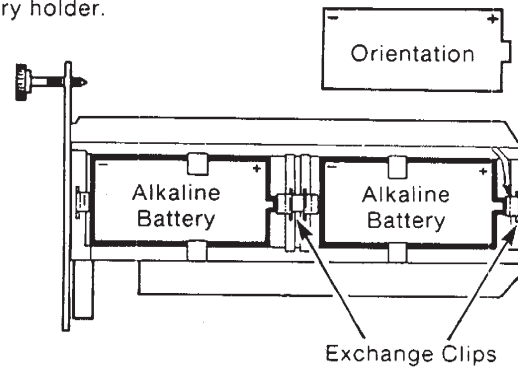
You may use *alkaline* cells with:

- o 1772-ME, all revisions
- o any 1772-MEB, -ME8 or -ME16 memory modules

Two D-size alkaline (Panasonic) cells (figure 2.5) provide approximately six months of battery backup time at 60°C (140°F) or approximately 12 months at 45°C (113°F).

Figure 2.5
Battery Housing Showing Two Alkaline Cells Installed

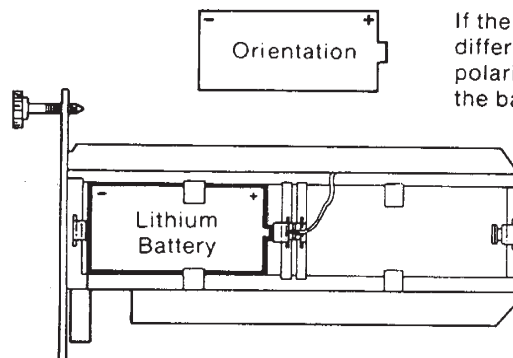
If the battery housing has a different configuration, correct polarity will be clearly labeled in the battery holder.



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The one D-size lithium cell (figure 2.6) cell provides approximately 2 years of battery backup time at a maximum of 60°C (140°F).

Figure 2.6
Battery Housing Showing a Lithium Cell Installed



If the battery housing has a different configuration, correct polarity will be clearly labeled in the battery holder.

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Regardless of cell type used, they are not rechargeable. Replace these cells at periodic intervals. When the STANDBY LOW indicator starts flashing, replace the battery as soon as possible, as further minimum life of the battery cannot be predicted. To avoid loss of memory during battery changes, be sure the processor is receiving power and the memory module is firmly seated in the processor chassis when you change the battery.

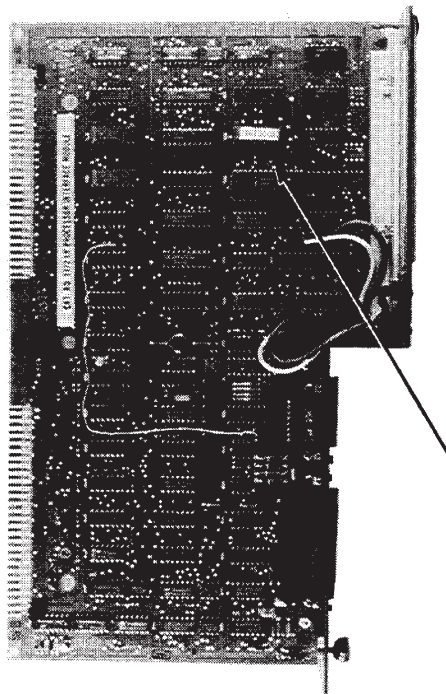
CAUTION: Memory contents are altered if you remove the cell or cells when the power supply is powered down or off. You must re-enter the entire memory contents if stored data is lost.

Memory Write Protect

If the memory write protect jumper (figure 2.7) is removed from a 1772-LH processor interface module, data table values between address 010g and 377g can be changed but **only** when the processor is in the PROGRAM or RUN/PROGRAM modes using on-line data change.

The remaining words in memory from 400g to the end of memory, including data table and user program, are protected and cannot be altered by programming. The memory write protect feature guards against unintentional changes to processor memory.

Figure 2.7
Memory Write Protect Jumper



2.2 Common Equipment

There are three pieces of equipment common to the PLC-2/20 (1772-LP2, -LP2D4) and PLC-2/30 (1772-LP3, -LP3D4) controllers. They are:

- o Processor Chassis
 - o Processor Interface Module
 - o Power Supply
-

2.2.1 Processor Chassis

Important: Only series C, AC supplies are discussed below. See section 2.7.3 for information on earlier series.

The Processor Chassis (cat. no. 1772-LA) is of rugged construction with louvers, or holes, cut into the sides, top, and bottom to allow convection cooling. There are two types of module tracks located in the processor chassis. The metal track on the left side of the chassis is only for the system power supply module. The other three tracks in the chassis are constructed of plastic and are for the remaining processor modules.

2.2.2 Processor Interface Module

The Processor Interface Module (cat. no. 1772-LH) occupies the left-most plastic slot (third slot from the right) in the processor chassis (figure 2.3). This module contains the circuitry used for communication between the processor, user inputs/outputs, and the industrial terminal.

On the front panel of this module are two sockets (a 15-pin and a 50-pin), two indicators, and a four-position mode select switch (figure 2.1).

Interface Sockets

The 15-pin socket labeled PROGRAM PANEL (Figure 2.9) links the processor with its programming terminal. One end of the Program Panel Interconnect Cable (cat. no. 1772-TC) attaches to this socket and the other end attaches to the Industrial Terminal (cat. no. 1770-T3) or a 1784-T45 or a 1784-T50 or other IBM PC-compatible with 6201 or 6211 software.

The 50-pin I/O chassis socket accepts the I/O Interconnect Cable (cat. no. 1777-CA, -CB) or the Processor/Scanner Interconnect cable (cat. no. 1772-CS). Either of which links the PLC-2/20 or PLC-2/30 processor to the I/O system.

Indicators

DC ON INDICATOR -- This front panel indicator (figure 2.1) illuminates when the appropriate power is applied to the system power supply module.

RUN INDICATOR -- This indicator (figure 2.1) should only be on if the module select switch is in the RUN or RUN/PROGRAM position.

Mode Select Switch

A four-position mode select switch is located on the front panel of the processor interface module. The four positions and their functions are:

- o **PROG** -- Program position is used when entering program instructions.
- o **TEST** -- Test position is used to test program operations under simulated operating conditions. Your output devices are disabled in this switch position but the program will respond to inputs.
- o **RUN** -- In this position, the processor scans and executes the user's program that is contained in memory. Outputs will be energized and de-energized in accordance with the user's program.
- o **RUN/PROG** -- In this position, all of the functions that apply in the RUN position also apply. Additionally, you can change the processor to **REMOTE TEST** mode or **REMOTE PROGRAM LOAD** mode with the industrial terminal.

The key can be removed when the mode select switch is in any of the above mentioned positions.

2.2.3 System Power Supply Module

The System Power Supply Module (cat. no. 1772-P1 series C, 120/220V AC; 1772-P4, 24V DC) occupies the left-most slot (metal) in the processor chassis (figure 2.2). (This slot will not accept any of the other processor modules.) The system power supply converts input voltages into the proper DC voltages for the processor and I/O chassis. A single connector extends from the rear of this module (figure 2.8) and plugs into a socket located on the processor chassis backplane (figure 2.9). This connector provides the power link from the power supply to the other processor modules and is capable of supplying 4 amperes of output current to power logic circuitry in the I/O modules. If the processor contains a CMOS RAM memory module, you may use either an AC or DC system power supply which may power an I/O chassis.

Figure 2.8
System Power Supply Module - Side View (cat. no. 1772-P1, Series C)

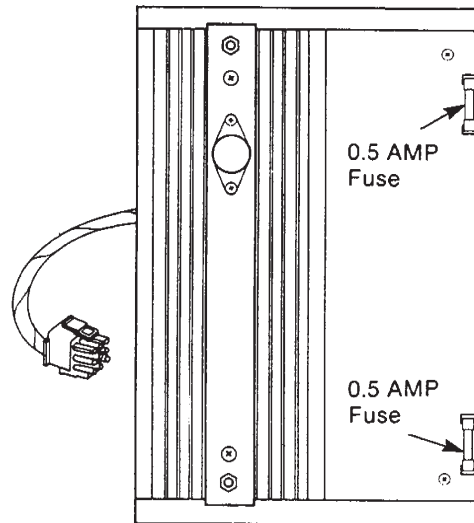
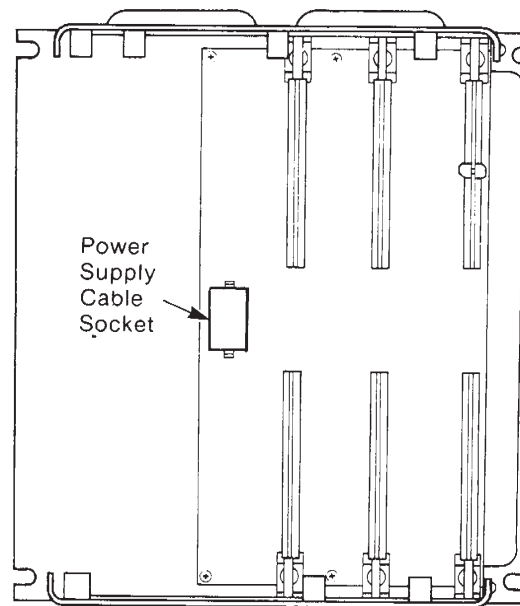


Figure 2.9
Power Supply Backplane Socket



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The power supply monitors the input voltage for proper levels (98 to 132V AC for 120V AC operation, 196 to 250V AC for 220/240V AC operation or 20.5 to 32V DC for 24V DC operation). If the AC line voltage drops below the minimum rated voltage for more than one cycle or if the DC input line drops out of range for more than 15ms in the 24V DC input version, the DC output voltages are shut down. The power supply signals the processor when the AC voltage drops to 92V (184V for 220/240V operations or 20.5V DC for 24V DC operation) to stop communication with the I/O chassis before signal levels get too low to transmit valid data. The DC output voltages are re-established when the correct input voltage level returns.

On the front of the power supply module are the processor fuse, two sockets for the I/O chassis and a terminal strip. On the left side of the power supply module are two fuses that protect the DC power circuitry against overload conditions.

Input Fuse

The input circuitry of the power supply is fuse protected to guard against overcurrent conditions on the input line. When replacing this fuse always replace it with one of the same size and rating to avoid possible equipment damage.

I/O Chassis Power Sockets

These two sockets provide power to the I/O chassis connected to them. These sockets are keyed to guard against improper connection (figure 2.1).

An 8-foot Power Cable (cat. no. 1771-CJ) or a 3-foot Power Cable (cat. no. 1771-CK) is used to interface the power supply with an I/O chassis.

Terminal Strip

Input power connections are made to the terminals labeled L1 and L2. Proper connection information is given in Section 3, Installation.

WARNING: Connect wires only to the two outer terminals of the terminal strip. Failure to observe this warning may result in equipment damage and/or personal injury.

DC Power Protection

On the left side of the power supply module (as viewed from the front) are two fuses that guard against overcurrent condition on both the +12V DC and -5.1V DC circuits (figure 2.8). These fuses are accessed by removing the fuse access cover. The fuse for the +12V DC circuit is 0.5 amperes (located near the top front edge) and the fuse for the -5.1V DC circuit is 0.5 amperes (located near the bottom front edge).

2.3 I/O System Structure

I/O system structure refers to the proximity of the I/O chassis to the processor. Because data communication links are distance dependant, a programmable controller system will have one of these structures:

- o Local (3 - 6 ft./ .9 - 1.8 m)
- o Remote (6-10,000 ft./ 1.8 - 3048 m)
- o Local/Remote combination

Local System Structure

A local system has only nearby I/O chassis (3-6 cable feet). Up to 7 chassis may be assigned. Chassis are connected to each other through 1777-CA (3 ft./ .92 m) or 1777-CB (6 ft./1.8 m). Of course, each chassis must contain a 1771-AL Local I/O adapter.

Remote System Structure

A remote system allows the processor and the I/O chassis to be separated by up to 10,000 cable feet (approx. 3048 meters). Up to 7 remote I/O racks may be assigned.

Proper transmission of data between either the PLC-2/20 or the PLC-2/30 processor and remote bulletin 1771 I/O modules requires a 1772-SD2 Remote I/O Scanner/Distribution Panel plus a 1771-ASB Remote Adapter in each I/O chassis. Connection between the processor and the 1772-SD2 is through a 1772-CS interconnect cable. Connection from the 1772-SD2 to a 1771-ASB Remote I/O Adapter and from one remote I/O adapter to another is through 1770-CD twinaxial interconnect cable.

Local/Remote System Structure

The PLC-2/30 processor system can also be configured with a combination of local and remote I/O chassis.

A local/remote system has both nearby (3-6 cable-ft) and remote (up to 10,000 cable-ft) I/O chassis. Up to 2 local and 7 remote racks may be assigned. (You must limit the total to seven or less.)

Each local chassis must have a 1771-AL Local I/O Adapter module. And, as previously stated, communication with the remote chassis (one or more) requires a 1772-SD2 Remote Distribution panel and one 1771-ASB Remote I/O Adapter in each chassis.

Up to two local I/O chassis may precede the 1772-SD2 Remote Distribution panel. Connection to the preceding local I/O chassis is made with a 1772-CS interconnect cable.

Important: The 1772-SD2 must not be more than 10 cable feet from its processor module.

CAUTION: For proper system data communications a local/remote system structure with 2 local racks, you must use a 1777-CA cable (3 ft./92m) between the processor and the first local rack and another 1777-CA cable between the first and second local racks. You must also use the 1772-CS cable (3 ft./92m) from the second local rack to the distribution panel.

2.4 I/O Chassis Structure

An I/O structure contains the following.

- o At least one I/O Chassis (cat. no. 1771-A1B, -A2B, -A3B or -A4B)
- o At least one I/O Adapter Module (cat. no. 1771-AL or 1771-ASB)
- o I/O modules
- o And for remote systems: at least one I/O Scanner/Distribution panel (cat. no. 1772-SD2) and one Remote I/O Adapter (cat. no. 1771-ASB).

You must specify each of these units when ordering a bulletin 1771 I/O chassis.

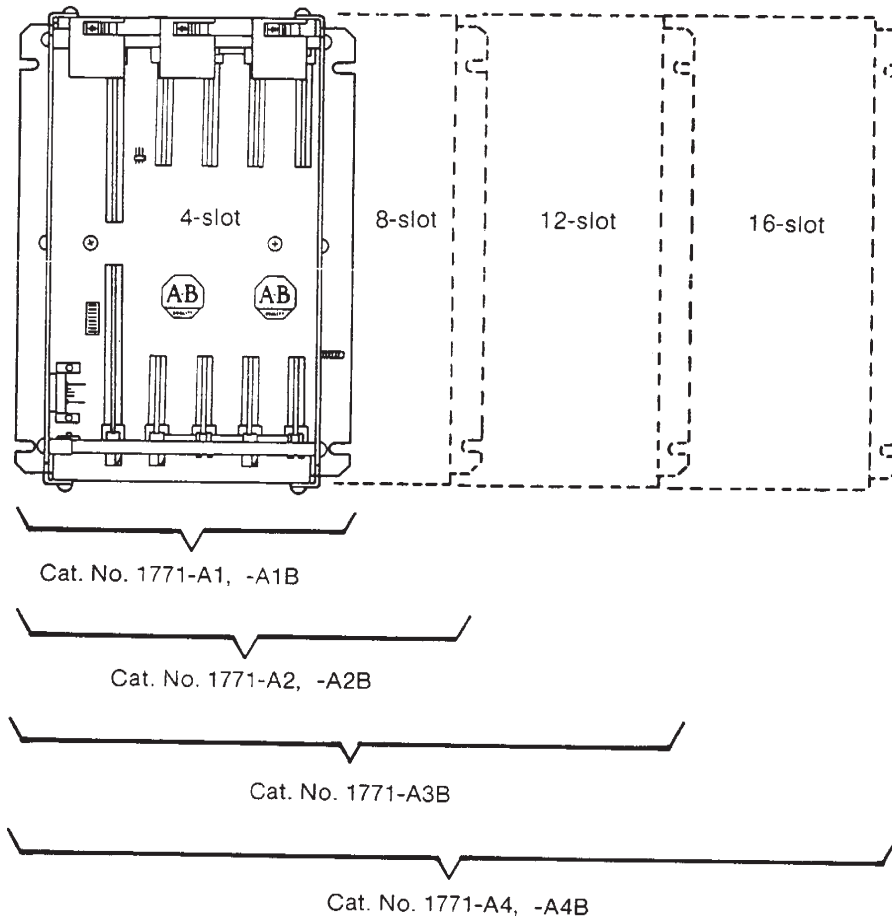
2.4.1 I/O Chassis

The I/O chassis is a single compact containment/support for the I/O adapter module and I/O modules that make up the I/O structure. It has been designed to fit within the same enclosure used for the PLC-2/20 or PLC-2/30 processors.

Slots in the I/O chassis allow for quick, easy insertion of modules. The left most slot accepts the PLC-2 I/O adapter module (1771-AL or -ASB) and all slots to the right accept I/O modules.

There are four I/O chassis sizes available (table 2.B). Consistent chassis design permits controller expansion (figure 2.10). If a 4-slot, 8-slot or 12-slot chassis is used and more I/O points are needed, a larger chassis (8-, 12- or 16-slot) can be installed without rewiring. User wiring is connected to terminals on wiring arms which can be removed from the smaller chassis and snapped onto the corresponding positions of the larger chassis. Also, when wiring arms and I/O modules are placed in corresponding slots on the larger chassis, the originally programmed addresses of the user I/O devices are still valid and need not be changed.

Figure 2.10
I/O Chassis Sizes



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Table 2.B
I/O Chassis Sizes

Cat. No.	I/O Slots	Number of I/O Per Module		
		8-pt.	16-pt.	32-pt.
1771-A1B	4	32	64	128
1771-A2B	8	64	128	256
1771-A3B	12	96	192	384
1771-A4B	16	128	256	512

The backplane of the I/O chassis has sockets for each module, a socket for power supply connection, and a switch group assembly. Latches on top of the chassis snap down to hold the modules securely in place and provide labeling for easy module identification.

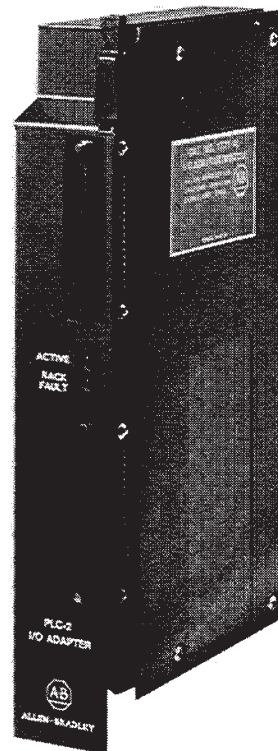
A package of I/O Rack Keying Bands (cat. no. 1777-RK) is shipped with each I/O chassis assembly. These bands are used to ensure that only a user designated module is placed into a particular keyed slot.

Local I/O Adapter Module (Cat. No. 1771-AL)

For proper transmission of data between the processor and local I/O modules (6 cable feet or less), the I/O chassis must contain an I/O Adapter Module (cat. no. 1771-AL).

The I/O adapter module must be installed in each local I/O chassis used with a processor (figure 2.11).

Figure 2.11
1771-AL Local I/O Adapter Module



6.0 General

This chapter contains functional, electrical, environmental and physical information on the controller components. The following are general operational specifications for this equipment.

Environmental Conditions

- o *Operational Temperature:*
0° to 60°C (32°F to 140°F)
 - o *Storage Temperature:*
-40°C to 85°C -40°F to 185°F)
 - o *Relative Humidity:*
5 to 95% (without condensation)
-

6.1 PLC-2/20 Processor

Nominal Input Voltages to Processor Modules

- o +5.1V, +12.0V, -5.1V DC
(Supplied by processor power supply)

Input Power

- o 25VA (max)

Execution Time

- o 5ms/1K of memory (nominal)

Memory Capacity

- o 8K words (maximum)
-

6.2 PLC-2/30 Processor

Nominal Input Voltages to Processor Modules

- o +5.1V, +12.0V, -5.1V DC
(supplied by processor power supply)

Input Power

- o 75VA (max)

Execution Time

- o 5ms/1K of memory (nominal)

Memory Capacity

- o 16K words (maximum)
-

6.3 PLC-2/20, PLC-2/30 Memory Modules

Memory Type

- o CMOS RAM

Power Supply Requirements

- o +5.1V DC

Relative Humidity

- o 5% to 95% (without condensation)
-

6.4 AC Power Supplies

The Auxiliary Power Supply (cat. no. 1777-P2 series B and C) has the same internal circuitry as the System Power Supply (cat. no. 1772-P1 series B and C). The auxiliary power supply is contained within its own enclosure. The system power supply is a module within the processor chassis.

Input Voltage

- o 120V, 220/240V AC

Input Voltage Range

- o 120V: 98-132V AC
- o 220/240V: 196-250V AC

Output Voltage

- o +5.1V, +12V, -5.0V DC

Input Power

- o 75VA

Power Supply 5V Capability

- o 8A (Series B)
- o 9A (Series C)

Fuses

- o AC input: 2A/250V AC slow blow
- o +12V DC: 0.5A/250V in +12V DC circuit
- o -5V DC: 0.25A/250V (Series B); 0.5A/250V (Series C)

Weight

- o System power supply:
17 lbs (7.7 kg)
 - o Auxiliary power supply:
27.5 lbs (12.5 kg)
-

6.5 24 Volt DC Power Supplies

The Auxiliary Power Supply (cat. no. 1777-P4) has the same internal circuitry as the System Power Supply (cat. no. 1772-P4). The auxiliary power supply is contained within its own enclosure. The system power supply is a module within the processor chassis.

Input Voltage

- o 24V DC (nominal)

Input Voltage Range

- o 20.5-32.0V DC

Output Voltage

- o +5.1V, +12.0V DC

Input Power

- o 75VA

Power Supply 5V Capability

- o 1 to 9A

Fuses

- o 10A/125V slow blow
- o 0.5A in +12V DC circuit

Weight

- o System power supply module:
9.5 lbs (4.3 kg)
- o Auxiliary power supply module:
20 lbs (9 kg)

6.6 I/O Chassis

5V DC Power Requirements

- o Supplied by system power supply or auxiliary power supply

Dimensions (W x H x D)

(Full specifications are given in publication no. 1771-2.49)

- o 4-slot chassis (cat. no. 1771-A1B):
9.15 x 11.25 x 6.75 in
232.4 x 285.8 x 171.5mm
- o 8-slot chassis (cat. no. 1771-A2B):
14.15 x 11.25 x 6.75 in.
359.4 x 285.8 x 171.5mm

- o 12-slot chassis (cat. no. 1771-A3B)
19.0 x 14.0 x 8.7 in.
483 x 356 x 221mm
- o 16-slot chassis (cat. no. 1771-A4B):
24.15 x 11.25 x 6.75 in.
61.32 x 28.58 x 17.15mm

I/O Capacity

Cat. No.	I/O Slots	Number of I/O Per Module		
		8-pt.	16-pt.	32-pt.
1771-A1B	4	32	64	128
1771-A2B	8	64	128	256
1771-A3B	12	96	192	384
1771-A4B	16	128	256	512

Maximum I/O Configuration

- o 896 I/O (with seven 128 I/O chassis)
- o 1792 I/O with complementary chassis (remote systems only)

6.7 I/O Modules

I/O module specifications are not included in this chapter. If you need their specifications, refer to appropriate publications or to our Publications Index (publication SD499). However, publication 1771-1.2 illustrates the scope of bulletin 1771 I/O interfacing capabilities.

6.8 Industrial Terminal

An Industrial Terminal (cat. no. 1770-T1, -T3) is used with the processor to program/edit/monitor program instructions and ASCII report generation messages.

Input Voltage

- o 120V AC (nominal)
- o 220/240V AC (nominal)

Input Voltage Range

- o 98-132V AC (120V AC operation)
- o 196-250V AC (220/240V AC operation)

Frequency Range

- o 50/60 Hz (47-63 Hz)

Input Power

- o 75 VA

Fuse

- o 1A/120V AC
- o 0.5A/250V AC

Communication Rate

- 110 Baud
- 300 Baud
- 600 Baud
- 1200 Baud
- 2400 Baud
- 4800 Baud
- 9600 Baud

Environmental Conditions

- o Operational Temperature:
0° to 55°C (32° to 130°F)
- o Storage Temperature:
-40° to 65°C (-40° to 149°F)
- o Relative Humidity
5 to 95% (without condensation)

Dimensions (W x H x D)

- o 14.5 x 10 x 23 inches
- o 36.8 x 25.4 x 58.4 centimeters