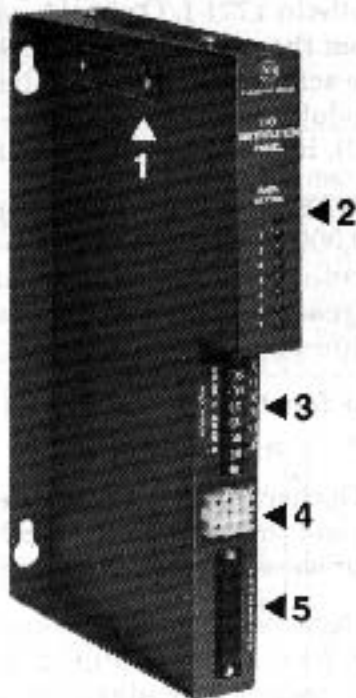




# Allen-Bradley Remote I/O Scanner/Distribution Panel

(Cat. No. 1772-SD2)

## Product Data



- 1. Mode Select Switches Cover Plate
- 2. RACK STATUS Indicators
- 3. I/O RACK Terminal Strip
- 4. POWER Connection Socket
- 5. PROCESSOR Connection Socket

## Introduction

The Remote I/O Scanner/Distribution Panel is a compact, single board, stand-alone unit. It enables the Allen-Bradley PLC-2, PLC-2/20 and PLC-2/30 processors to communicate with up to 1792 I/O points (896 inputs and 896 outputs) as indicated in table A.

**Table A**

Processor	Max I/O <sup>1</sup>	Max I/O with Complementary <sup>2</sup>
PLC-2 (1772-LR)	256	512
PLC-2/20 (1772-LP1)	512	1024
PLC-2/20 (1772-LP2)	896	1792
PLC-2/30 (1772-LP3)	896	1792

<sup>1</sup> I/O maximum is 256 regardless of processor type if system includes any 1777 I/O.

<sup>2</sup> 1772-SD2 only - half inputs/half outputs.

**NOTE:** The 1772-SD remote I/O scanner/distribution panel has all the capabilities of the 1772-SD2 remote I/O scanner/distribution panel except complementary I/O. The 1772-SD will communicate with up to 896 I/O points maximum (any mix). The 1772-SD2 obsoletes the 1772-SD. However, since many 1772-SD panels are in use, this document covers both panels.

Bulletin 1771 I/O chassis may be placed up to 10,000 feet away from the scanner/distribution panel. Interconnection between the scanner/distribution panel and the Remote I/O Adapter Module (cat. no. 1771-AS) is via Twinaxial Cable (cat. no. 1770-CD). Refer to figures 1 and 2.

**NOTE:** The cable limitation is 10,000 feet for each channel (20,000 feet total) at 57.6k baud rate, or 5000 feet for each channel (10,000 feet total) at 115.2k baud rate. A maximum of 16 remote I/O adapter modules may be connected to each channel.

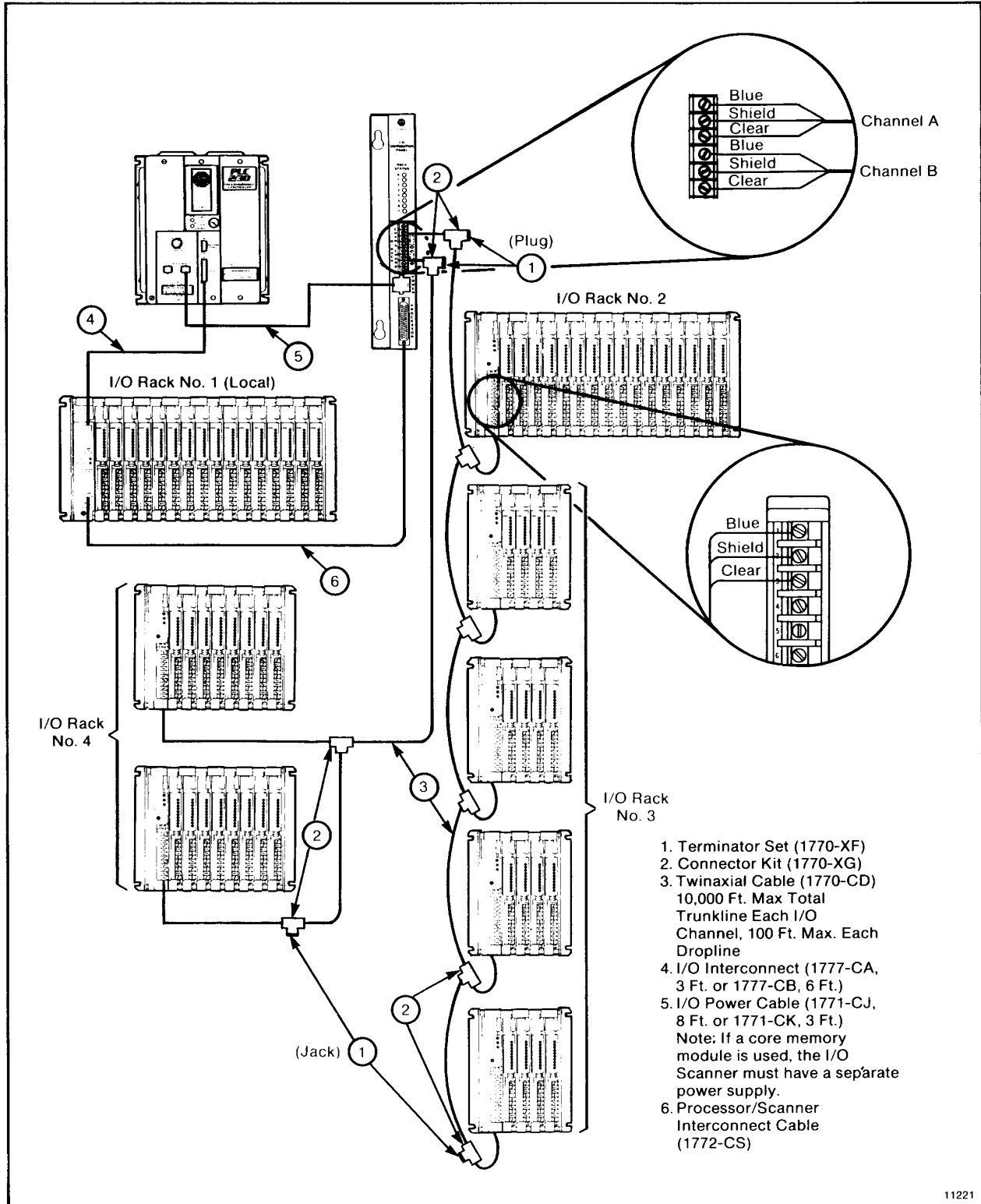
The functions of the remote I/O scanner/distribution panel are:

- Gather input data from remote I/O adapter modules and send this data to the PLC-2, PLC-2/20 and PLC-2/30 processor which uses it to update the input image table.
- Receive output data from the output image table of the PLC2, PLC-2/20 and PLC-2/30 processor and distribute this data to remote I/O adapter modules, thereby updating the status of the output signals.

The scanner/distribution panel may be connected directly for all remote I/O, or up to two local I/O chassis may be connected between it and the processor chassis. Remote I/O consists of racks of up to 128 I/O, made up of one to four 1771I/O chassis.(Refer to Remote I/O Adapter Module Assembly product data, publication 1771-938.)

Figures 1 and 2 outline I/O configuration examples and figure 3 illustrates I/O addressing.

**Figure 1**  
I/O Trunkline/Dropline Configuration Example



**Figure 2**  
Daisy Chain Configuration Example

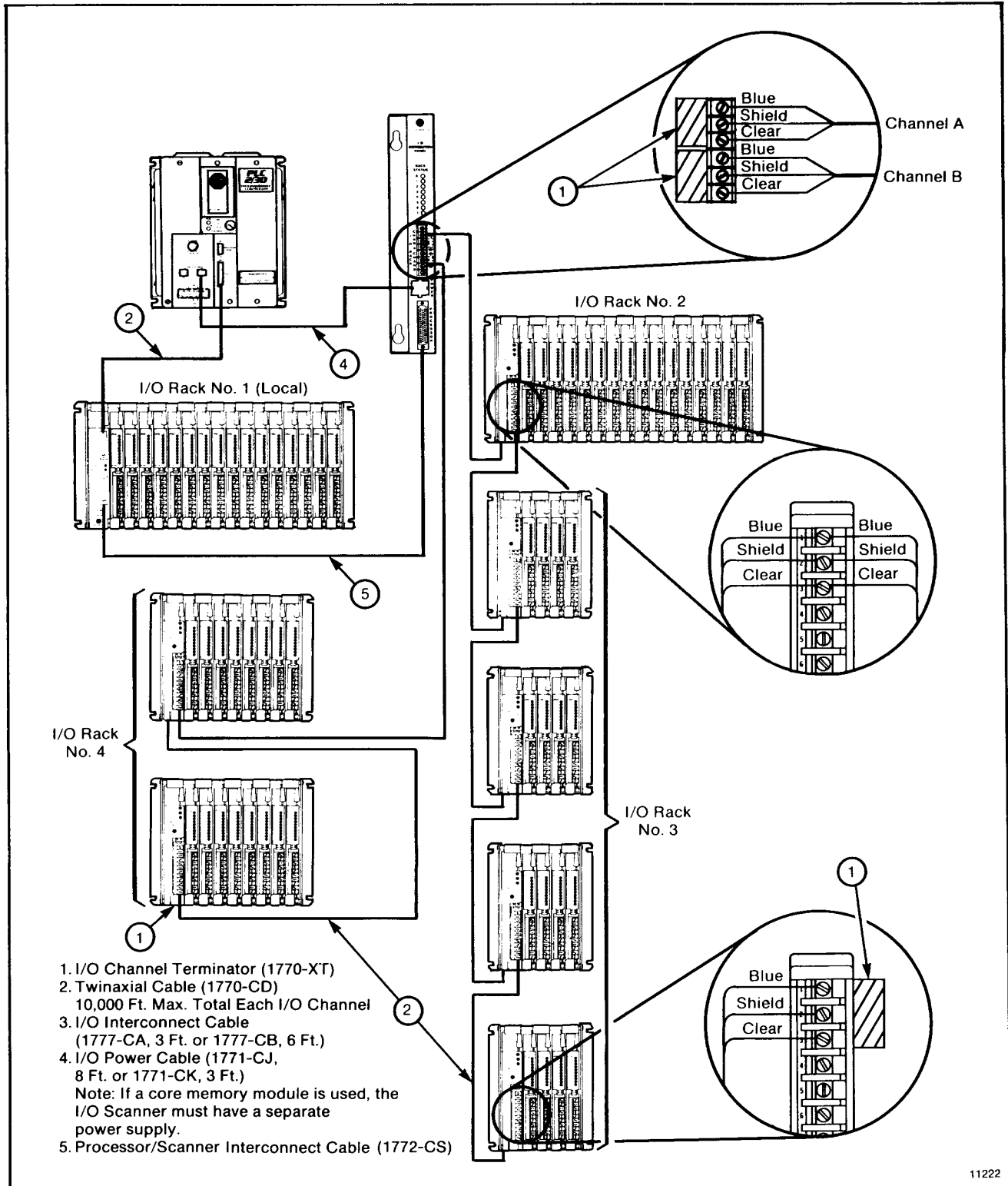
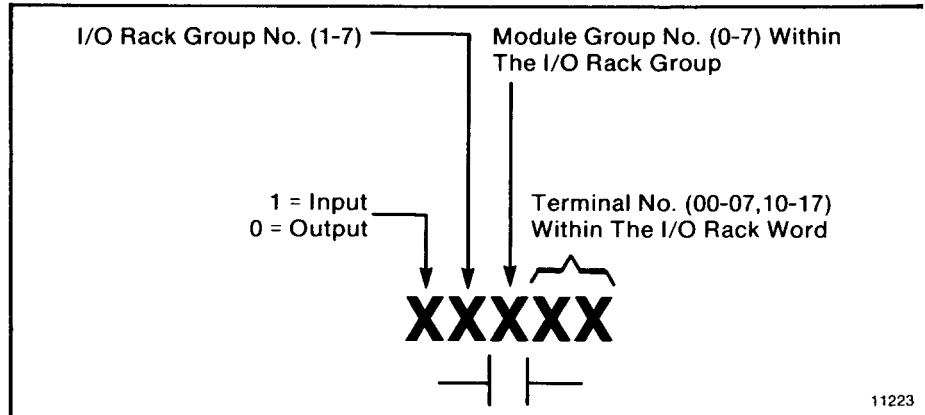


Figure 3  
I/O Addressing



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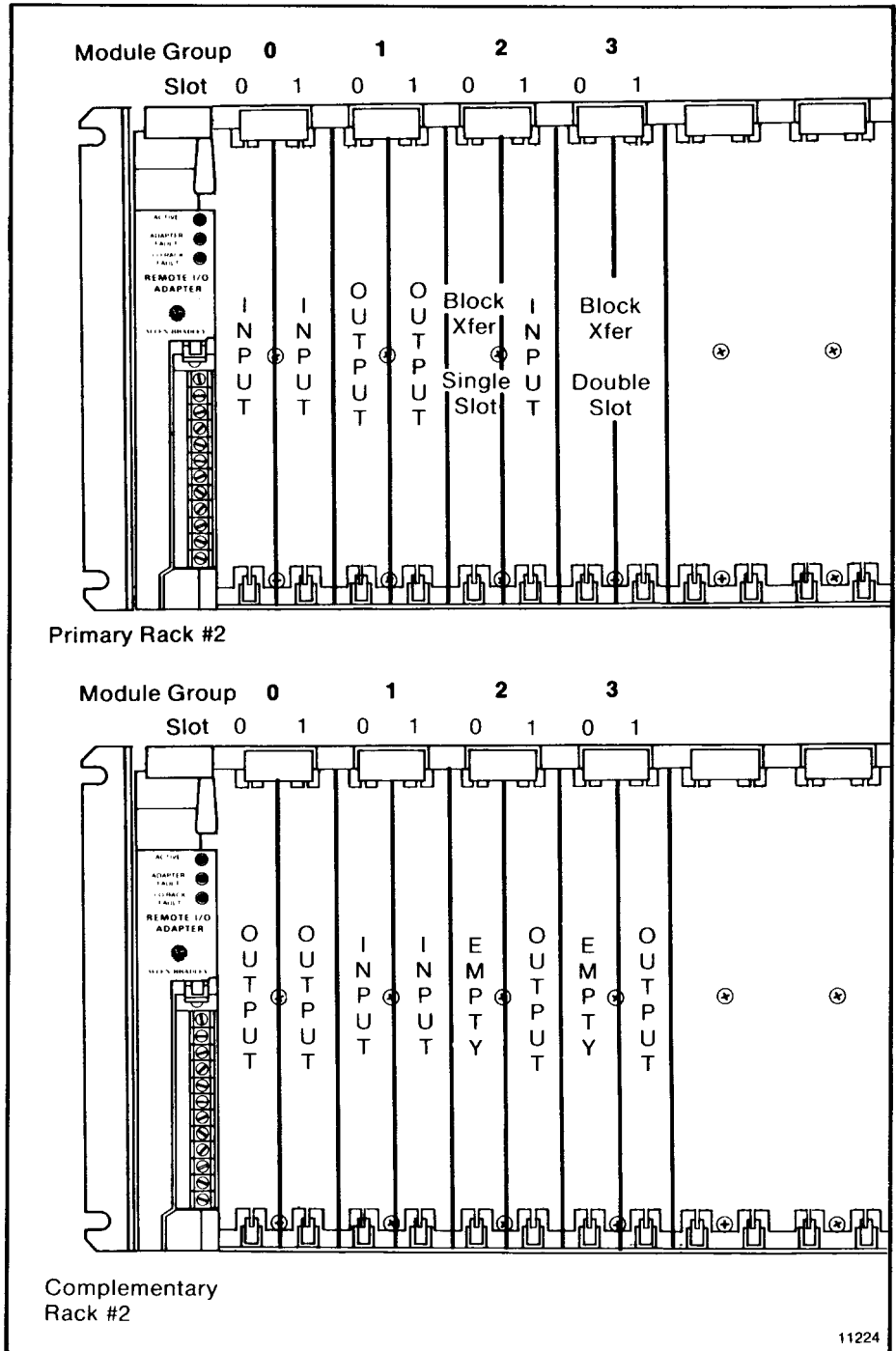
### Complementary I/O (1772-SD2 Only)

To obtain 1792 I/O points, complementary I/O techniques must be used. The essence of complementary I/O is that any physical I/O chassis in the remote I/O system may be duplicated by rack number and module group number within the I/O rack. Complementary I/O racks are restricted as follows:

1. For optimum system utilization, the complementary I/O rack must be the same size as the primary rack that it duplicates. The complementary rack must be on the same channel of the scanner. If the complementary rack is a different size than the primary rack, the first module group number for both must be the same, the maximum physical module group number in the complementary rack must not exceed 7, and the complementary rack must be set for the last rack. In addition, for any given rack number, primary and/or complementary racks beyond the complementary rack set for the last rack will not be scanned.
2. Complementary I/O racks must contain module group-for module group the opposite I/O function of that in the primary rack. That is, if the primary rack has an input module or modules in module group 0, then the complementary rack may only have output modules in module group 0 and vice versa. This is required for all module groups in the racks (figure 4).

3. Block transfer modules may be used in complementary I/O remote systems. Double slot block transfer modules may be used in either primary or complementary I/O racks provided that: 1) no module is placed in the lower slot of the opposite rack; and 2) only an output module (if any) is placed in the upper slot of the opposite rack. Lower slot is defined as the left slot of a module group; upper slot — right slot of a module group. Single slot block transfer modules may be used in either primary or complementary I/O racks provided that: 1) no module is placed in the corresponding slot of the opposite rack; and 2) only an output module (if any) is placed in the opposite slot of the opposite rack.

**Figure 4**  
Complementary I/O Example



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4. Complementary I/O racks must be connected to the remote I/O trunkline as though they were additional primary racks. The maximum number of adapters per channel remains 16.
5. I/O addressing by the processor for complementary racks follows the same format as that used for primary racks.
6. The ASCII Interface Module (cat. no. 1771-DA) must be at least a revision F to be used in either the primary or complementary rack of a complementary I/O system.
7. The following modules may be used in primary or complementary I/O racks opposite any module.

Analog Input Expander Assembly (cat. no. 1771-E1), 8 single ended inputs

Analog Input Expander Assembly (cat. no. 1771-E2), 6 differential inputs

Analog Input Expander Assembly (cat. no. 1771-E3), 6 current sourcing inputs

Analog Output Expander Assembly (cat. no. 1771-E4), 4 single ended inputs

Thermocouple Input Expander Module Assembly (cat. no.1771-IY), 6 inputs

Servo (Encoder Feedback) Expander Assembly (cat. no.1771-ES)

Communication Adapter Module (cat. no. 1771-KA)

Communication Controller Module (cat. no. 1771-KC)

Stand Alone Communication Controller Module (cat. no.1771-KD)

Data Highway/RS-232-C Interface Module (cat. no. 1771-KF)

PLC-2 Family/RS-232-C Interface Module (cat. no. 1771-KG)

Pulse Output Expander Assembly (cat. no. 1771-OJ)



## Status Indicators

The front of the scanner/distribution panel has eight bicolor red/green LED indicators. If an I/O rack is declared used (regardless of physical configuration) and serial communication is valid, that rack status LED will be green. If not used, the LED will be off. For an I/O rack fault condition, the corresponding rack status LED will be red.

At power up, the scanner/distribution panel PROM memory is checked to verify its integrity. Any diagnostic error results in the scanner/distribution panel halting communication with the processor. In this case, all the LED's turn red.

## Power Supply Requirements

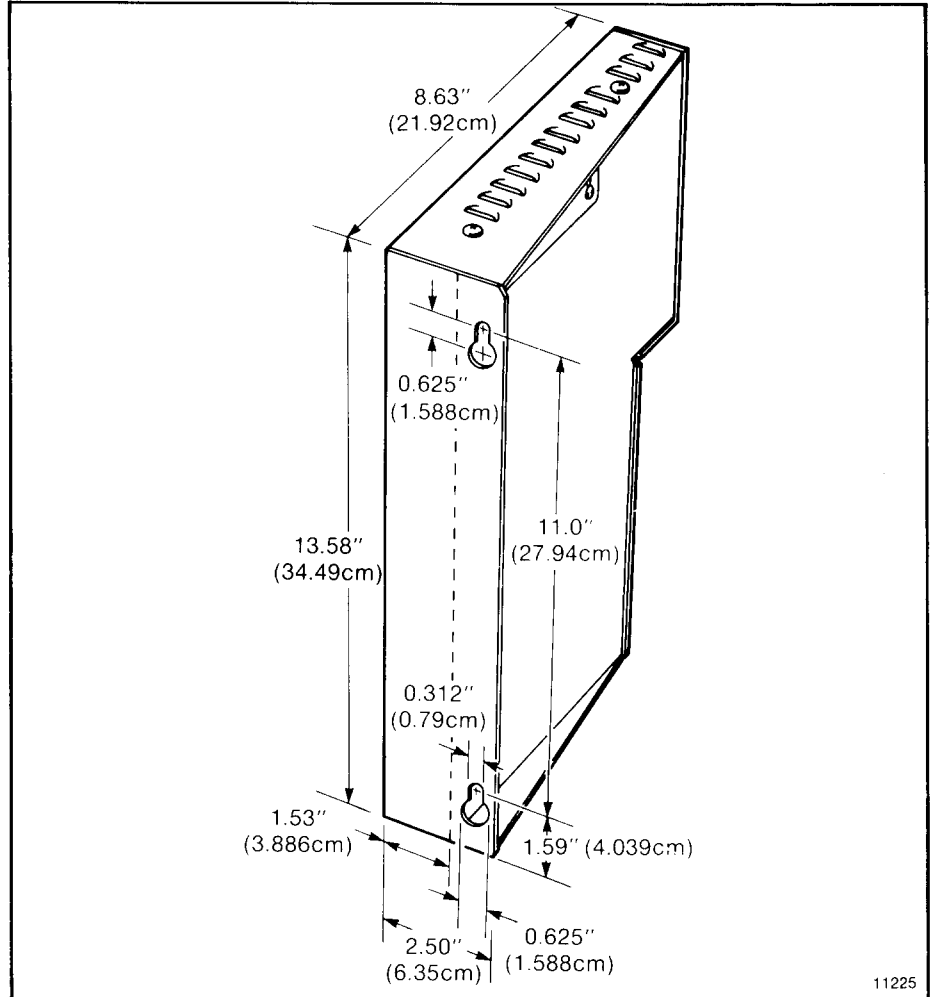
The Power Supply (cat. no. 1772-P1) in the processor or an Auxiliary Power Supply (cat. no. 1777-P2) may be used to power the scanner/distribution panel. The auxiliary supply must be used if the controller is equipped with a core memory module. The auxiliary power supply must be series B or later.

## Mounting

The scanner/distribution panel is designed for panel mounting. Mounting dimensions are shown in figure 5. Recommended mounting is to the right of the PLC-2, PLC-2/20 or PLC-2/30 processor. Maintain at least six inches clearance between the scanner/distribution panel and the processor.

**NOTE:** Do not mount the scanner/distribution panel more than 10 cable feet from the processor.

**Figure 5**  
**Mounting Dimensions**



## Wiring Connections

Use Twinaxial Cable (cat. no. 1770-CD) to connect the scanner/distribution panel to the remote adapters. Connect the cable to the scanner/distribution panel at the terminal strip on the front of the module.

The remote adapters may be connected to the remote I/O channel using Connector Kit (cat. no. 1770-XG). The remote I/O channel must be terminated using Terminators (cat. no. 1770-XF) at both ends (figure 1).

Optionally, remote adapters may be connected to the remote I/O channel directly. The remote I/O channel is terminated using Terminators (cat. no. 1770-XT) at the scanner/distribution panel and the last remote adapter (figure 2).

## Switch Settings

There are three switch assemblies beneath the cover plate of the scanner/distribution panel (figure 6). To select a particular configuration, remove the two slotted screws which secure the cover plate. Set the switches to your requirements using a blunt-pointed instrument, such as the tip of a ball-point pen. Do not use anything that might break off and jam the switch. Replace the cover plate and secure screws.

## Scan Times

The processor goes through a scan consisting of program execution and I/O update. During the I/O update portion of the processor's scan, the processor communicates with local I/O racks and the scanner/distribution panel.

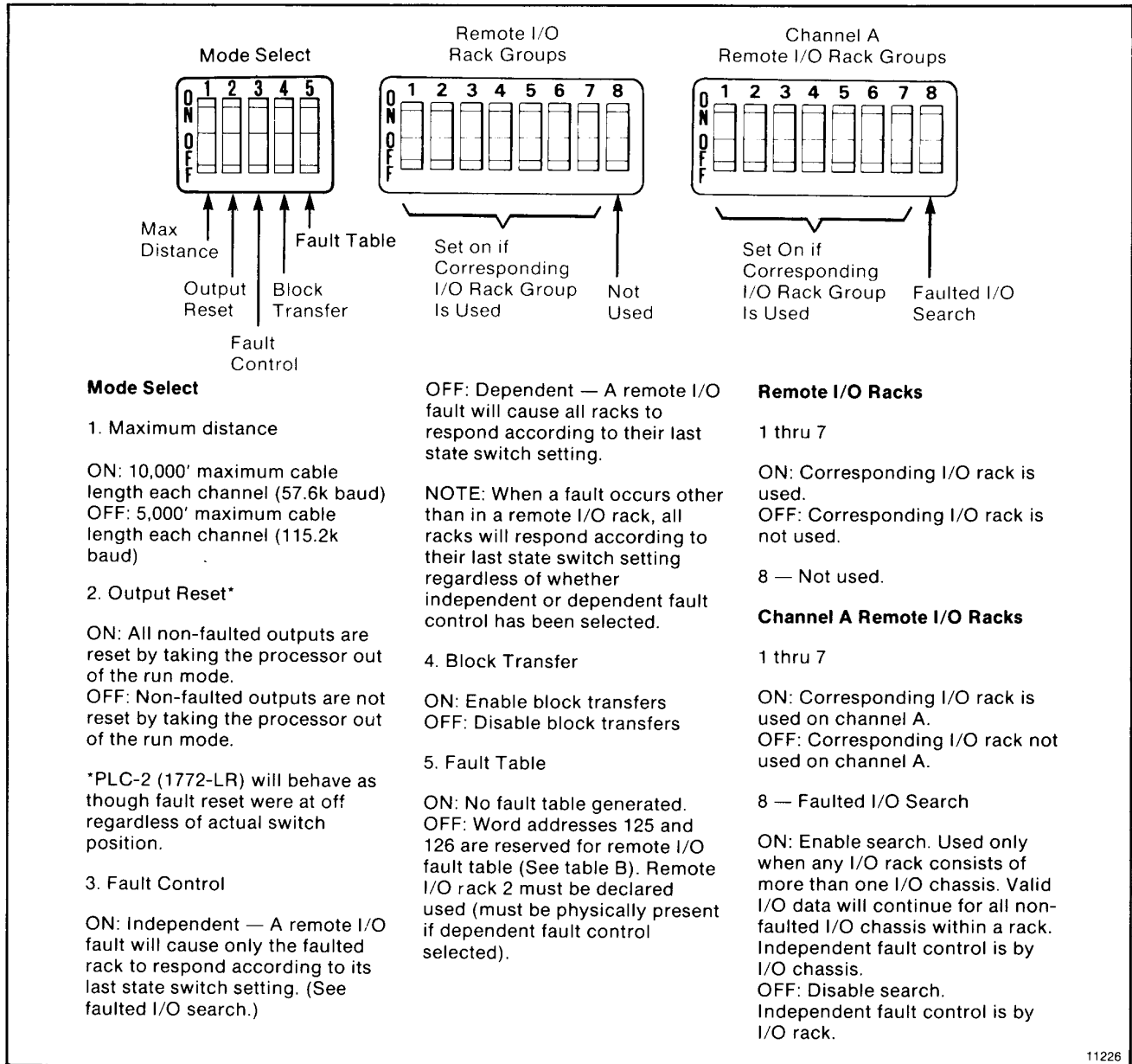
The scanner/distribution panel goes through its own remote I/O scan which is not synchronous to the processor's scan. In this remote I/O scan, I/O chassis are scanned sequentially by I/O rack number regardless of I/O channel. The remote I/O scan time varies according to the amount of I/O data change taking place; however, with no block transfer, the I/O scan time per I/O chassis (primary or complementary) is:

	<b>5,000 ft max (115.2k baud)</b>	<b>10,000 ft max (57.6k baud)</b>
Nominal	7ms	8.5ms
Worst case	8ms	10ms

The remote I/O scan time with no block transfer is the product of the following:

- (I/O scan per chassis) (total number of I/O chassis)

**Figure 6**  
**Switch Settings**



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With no block transfer, the response time for recognizing an input impulse is the sum of the following:

- Input module delay time
- Remote I/O scan time
- Processor scan time including the local I/O update time

**Table B**  
**Fault Table**

Rack	Module Groups	Fault Status Bit
	1 0-1	12507
	2-3	12506
	4-5	12505
	6-7	12504
2	0-1	12503
	2-3	12502
	4-5	12501
	6-7	12500
3	0-1	12517
	2-3	12516
	4-5	12515
	6-7	12514
4	0-1	12513
	2-3	12512
	4-5	12511
	6-7	12510
5	0-1	12607
	2-3	12606
	4-5	12605
	6-7	12604
6	0-1	12603
	2-3	12602
	4-5	12601
	6-7	12600
7	0-1	12617
	2-3	12616
	4-5	12615
	6-7	12614

The response time for changing the state of an output device in response to an input change is the sum of the following:

- Input module delay time
- Two remote I/O scan times
- Processor scan time
- Delay time of the output device

Block transfer modules are handled fastest by placing one in each rack used or distributing them evenly throughout the remote I/O chassis. The scanner/distribution panel performs one block transfer per processor I/O scan. It should be noted that block transfer modules increase I/O scan times significantly, due to the large amounts of data that must be transferred. Therefore, they should be placed in local I/O racks, if possible. Contact your Allen-Bradley systems specialist for detailed information.

## **Applications Considerations**

Some important application considerations are listed below.

- 1.** If the 1772-SD2 scanner/distribution panel is being operated in the dependent mode or in the independent, nonsearch mode, quarter racks (pair of module groups) within a rack group, i.e., all the same rack number, must have module groups numbered sequentially. For example, the first quarter rack must be numbered module group 0, 1. The second quarter rack must be 2, 3, not 4, 5 or 6, 7. Module group numbers may not be skipped or a rack fault will occur and be indicated at the scanner/distribution panel.
- 2.** If the 1772-SD2 scanner/distribution panel is being operated in the independent and search mode and gaps are left in the module group numbers as described above, a rack fault will be indicated on the 1772-SD2 and in the appropriate bit for the missing rack in the rack fault status word in the processor. However, the existing unfaulted racks will operate properly.
- 3.** If block transfer is used, user program scan time must be less than 250 milliseconds. Scan times longer than this may cause block transfers to be missed.
- 4.** If your 1772-SD2 scanner/distributor panel is prior to series A, revision B (series A, revision G for 1772-SD), the following procedure must be used. When you use a 1770-T1, -T2, or -T3 industrial terminal to enter the remote mode select function for a remote I/O PLC-2/30 system, you must select the remote test mode before changing from remote program to remote run/program mode. To go from remote program to remote run/program mode, press keys [SEARCH] 591 then keys [SEARCH] 590. Following this procedure will help to ensure proper remote system operation.

5. The 1772-SD2 scanner/distribution panel is fully downward compatible with the 1772-SD. That is, a 1772-SD scanner/distribution panel may be replaced with a 1772-SD2 having the same switch settings without changing anything else in the system (1771-AS I/O adapter module switch settings remain valid).

When complementary I/O chassis (racks) are being added to an existing remote system, the switches on the 1771-AS I/O adapter module must be set appropriately. Consult the Remote I/O Adapter Module product data (publication 1771-938) for the appropriate switch setting information.

6. If you are operating a PLC-2/20 or PLC-2/30 remote system with independent fault control, you may have a condition which you should correct thru a change in programming.



**WARNING:** If a fault should occur in a remote I/O chassis containing input data, the input data will remain in their last pre-fault state at the Remote Scanner/Distribution Panel (cat. no. 1772-SD, -SD2). If the following recommendations are not followed, unexpected machine motion could occur with possible injury to personnel.

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The I/O image table of the remote scanner/distribution panel retains the status of inputs when the fault occurred, and updates the PC processor with this status each I/O scan. If you have selected independent fault control, the inputs of either the faulted chassis or the entire rack will be frozen depending on how you have selected the faulted I/O search. This condition applies when these inputs, located in a remote chassis, control outputs located in any chassis.

As a result, if an I/O fault should occur in a chassis containing inputs, outputs in an unfaulted local or remote rack can remain on according to the last state input conditions governing those outputs.

To guard against this condition, you should use programming techniques to ensure that critical outputs are properly controlled when a fault of this type occurs. By monitoring the remote I/O fault status bits (in word addresses 125 and 126) you can detect a fault in the rack and module groups of the input modules which condition your critical outputs. Then you can use one or more of the following programming techniques to establish the required states for your critical outputs.

**MCR** — outputs within the MCR zone are disabled. (The outputs in this case must be controlled by non-retentive program instructions.)

**ZCL** — outputs within the ZCL zone remain in their last state.

FFM — update selected input image table word values with a file-to-file move (FFM) instruction to condition input instructions of critical output rungs. (Place this rung at the beginning of your program. For PLC-2/30 controllers, only.)

**NOTE:** When using remote I/O fault bits, you must not have input modules in rack 2, module groups 5 and 6.

Independent fault control, remote I/O fault bits, and associated module switch settings are described earlier in this publication. For information on MCR and ZCL instructions, refer to the appropriate Programming and Operations Manual (publication 1772-802 for the PLC-2/20 controller; publication 1772-806 for the PLC-2/30 controller). The FFM instruction is described in the PLC-2/30 Controller

## Specifications

### Function

- Distribute output status data to outputs
- Gather input status data from inputs

### I/O Points (Max.)

- 896 Standard (any mix)
- 1792 with complementary I/O (896 inputs/896 outputs)

### Current Requirement (from System power Supply)

- 2A (max.)

### Environmental conditions

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

### Dimensions (W x H x D)

- 2.5 x 13.58 x 8.63 inches
- 6.35 x 34.49 x 21.9 cm



As a subsidiary of Rockwell International, one of the world's largest technology companies — Allen-Bradley meets today's challenges of industrial automation with over 85 years of practical plant-floor experience. More than 11,000 employees throughout the world design, manufacture and apply a wide range of control and automation products and supporting services to help our customers continuously improve quality, productivity and time to market. These products and services not only control individual machines but integrate the manufacturing process, while providing access to vital plant floor data that can be used to support decision-making throughout the enterprise.

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