

# SECTION 5

## 584 SYSTEM I/O CONFIGURATIONS

### 5.1 INTRODUCTION

The 584 Programmable Controller's Input/Output Section can contain either 200 or 500 Series I/O modules, or a combination of both. I/O modules are contained in groups of housings which are configured together as "I/O channels" to the mainframe.

The 584 system can support a maximum of 4096 input and 4096 output points, configured as:

- Two local I/O channels, with power supplied from the mainframe
- Two local I/O channels, with auxiliary power supplies
- A remote I/O driver controlling 28 remote I/O channels, with auxiliary power supplies

This section describes configuration and maintenance techniques for 200 and 500 Series I/O modules, housings, Local I/O Channels, Remote I/O Channels, Auxiliary Power Supplies, and ASCII devices configured to the 584 controller.

### 5.2 200 AND 500 SERIES I/O MODULES

Principal features of each series of I/O modules are:

#### 200 Series Modules

- 16 points per module
- Echo check confirms data transmission. CPU must "refresh" data every 250 milliseconds or active light goes out and all outputs are turned off

#### 500 Series Modules

- 4 points per module
- Parity checking only

In addition to the features described above, both 200 and 500 Series modules have the following features:

- Conduit for user wiring
- Clamp terminals for one #12 or two #14 wires
- Module lights for I/O status and fuse condition
- Individual 1500 Volt opto-isolation to prevent field wiring transients from affecting internal logic
- Surge suppressors capable of sinking approximately 80 #5 starters or 350 small relays

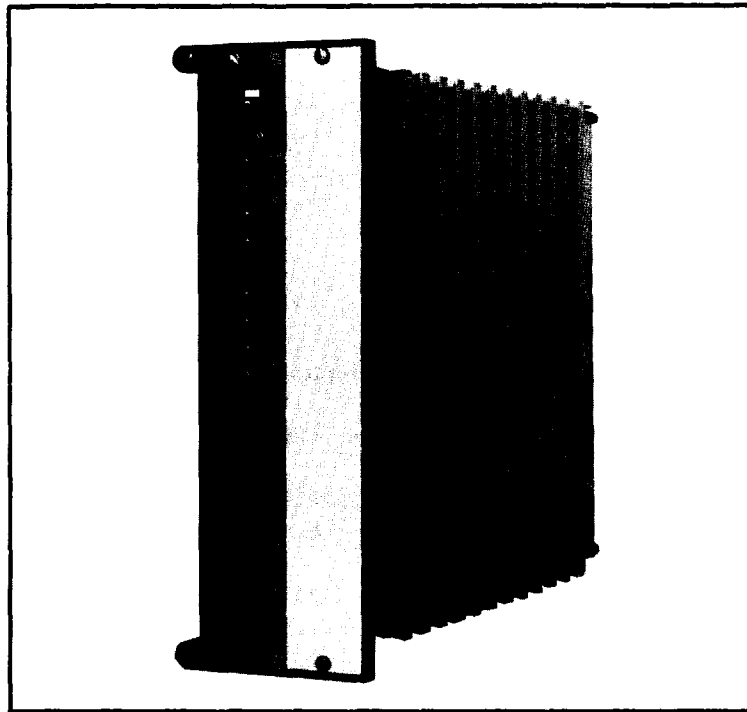
- Can be removed or replaced without interrupting power or the controller's scan

**NOTE**

Full information on specific types of I/O modules is located in Appendix B.

**5.3 200 SERIES I/O CONFIGURATIONS**

The 200 Series I/O provides modules with up to 16 circuits each (Figure 5-1). Each module also contains an ACTIVE light which shows mainframe to I/O module communication, and status indicators for each circuit to show ON or OFF status of field terminal voltages.



*Figure 5-1 Typical 200 Series I/O Module*

Each 200 Series module is color coded (Figure 5-2). AC output modules contain a blown fuse indicator for each output circuit which lights if the fuse is blown. Fuse specifications are listed in Figure 5-3.

Module	Type	PMS* Code	Color	Module	Standard Size Pico Fuse	Littlefuse Part No. or Equivalent	Quantity per Module
B230	115 VAC Output	199	Red	B230	5 amps	275-005	16
B231	115 VAC Input	197	Pink	B232	7 amps	275-007	1
B232	24 Vdc Output	286	Dark Blue	B234	5 amps	275-005	16
B233	24 Vdc Input	284	Light Blue	B236	2 amps	275-002	1
B234	220 Vac Output	151	Orange	B238*	3 amps	275-003	17
B235	220 Vac Input	149	Melon	B243	1/4 amp	275-250	8
B236	5V TTL Output	259	Violet	B244*	7 amps	275-007	8
B237	5V TTL Input	264	Light Purple		1/4 amp	275-250	1
B238	24 Vdc Output, 2.5A	354	Green	B246*	7 amps	275-007	8
B239	Dual Hi-Speed Counter	515	Blue		1/4 amp	275-250	1
B243	Analog Input	109	Yellow	B248	3 amps	275-003	16
B244	220 Vac Output, Isolated	465	Brown	B258	1/2 amp	276-500	1
B245	220 Vac Input, Isolated	465	Light Brown	B266	3 amps	212-003	8
B246	115 Vac Output, Isolated	233	Rhodamine Red	R270	5 amps	275-005	16
B247	115 Vac Input, Isolated	231	Dark Pink				
B248	10-60 Vdc Output	347	Green				
B258	Analog MUX	101	Yellow				
B260	Analog Output (Voltage)	380	Light Green				
B262	Analog Output (4-20 ma)	382	Green				
B266	Reed Relay Output	298	Silver Blue				
B270	48 Vac Outputs	207	Dark Red				
B271	48 Vac Inputs	204	Dark Rubine Red				
B275	10-60 Vdc Input	314	Blue				

\*Pantone Matching System

**NOTE:** Those modules indicated by an asterisk (\*) are provided with one fuse for each output circuit plus one fuse for separate indicator lamp supply.

Figure 5-3 200 Series I/O Fuse Types

Figure 5-2 200 Series I/O Color Codes

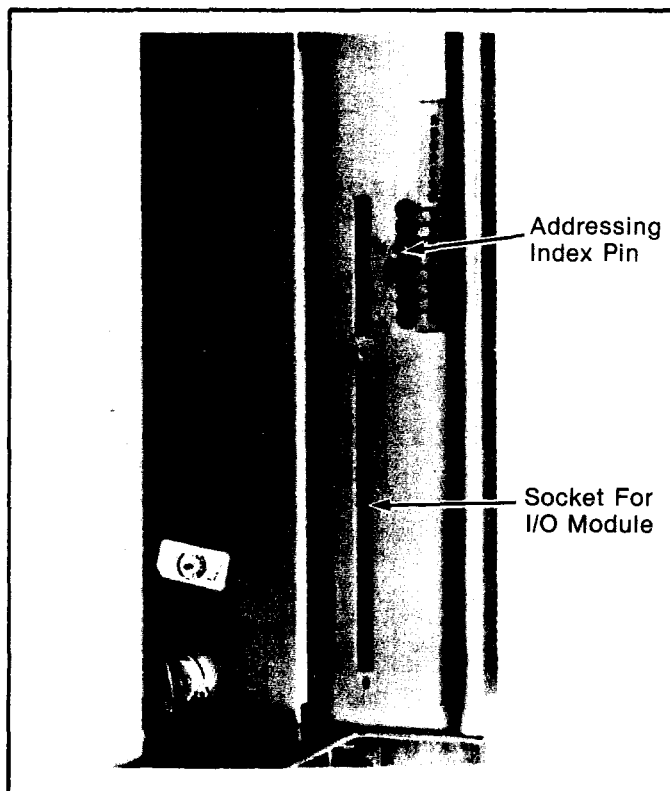
The modules are installed into a B240 I/O standard housing which can take up to four modules or a B241 I/O half housing which can take a maximum of two modules. Type B242 I/O housings allow for special intrinsically safe modules, such as the B273 input module.

## B240 Standard Housings

A single channel of I/O can support up to 128 input and 128 output points, which can be configured as up to eight input and eight output Series 200 modules. These sixteen modules can be mounted into four B240 housings — four modules to a housing.

Each of the four module positions in a housing has an addressing slot pin that can be set to any address, one through eight. I/O modules that represent discrete (ON/OFF) conditions can be set up to reside at any address, one through eight. Additional addressing information is designed inside each module to identify it to the 584 mainframe as either an input or an output module.

When replacing a housing, set the index pins on the new housing to correspond to the settings of the replaced housing. This will ensure that the user field devices will continue to be controlled properly by the user program. Figure 5-4 shows a typical B240 housing.



*Figure 5-4 B240 Housing*

I/O modules that use numerical values rather than discrete (ON/OFF) conditions can represent more than one index pin location. See Figure 5-5 for a list of these modules and their requirements.

MODULE TYPE	DESCRIPTION	CIRCUITS INPUT	CIRCUITS OUTPUT	INDEX PIN ASSIGNMENT
B239	Dual Hi-Speed Counter (I/O)	2	2	1,3,5,7
B243	Analog Input	4	0	1 or 5
B258	Analog Multiplexer	0	1	Any
B260	Analog Voltage	0	4	1 or 5
B262	Analog Current	0	4	1 or 5

Figure 5-5 Addressing Numerical Value Modules

### B241 Half Housings

The B241 housing is addressed in the same manner as B240 housings except that it carries only two modules per housing. The B241 can be used where space problems exist. When replacing a housing, set the index pins on the new housing to correspond to the settings of the replaced housing. This will ensure that the user field devices will continue to be addressed properly by the user program.

### B242 Housings

There are two types of B242 housings. The type B242-004 housing accepts four modules of the intrinsically safe type (B273 input modules). The type B242-002 accepts two of the intrinsically safe modules. These housings are addressed in the same manner as the B240 and B241 housings. When replacing a housing, set the index pins on the new housing to correspond to the settings of the replaced housing. This will ensure that the user field devices will continue to be addressed properly by the user program.

200 Series I/O housings are provided with conduits for user wiring and wire clamp terminals to accommodate one AWG #12 or two AWG #14 wires (Figure 5-6).

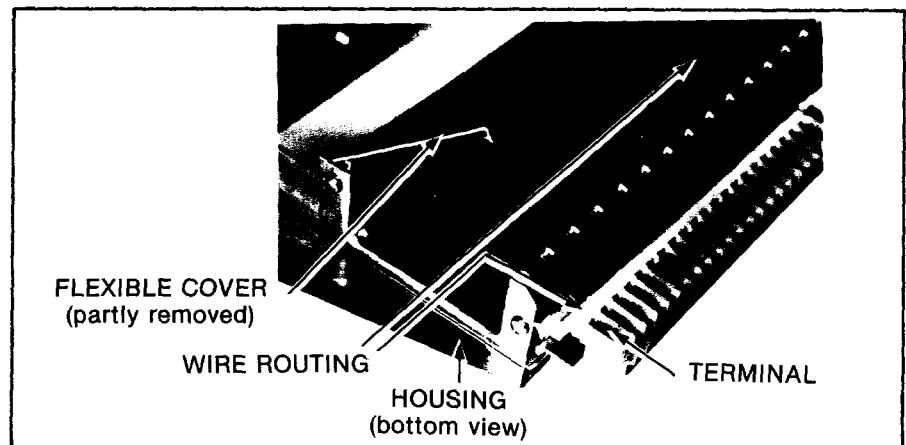


Figure 5-6 Series 200 Wire Terminals

## 5.4 500 SERIES I/O CONFIGURATIONS

The 500 Series I/O provides modules with four circuits each (Figure 5-7). Each 500 Series module is color coded (Figure 5-8).

Input and output status lights are provided to show the ON or OFF status of field terminal voltages.

All output modules contain blown fuse indicators for each circuit, except B556 5V TTL.

500 Series I/O fuses are type 3AG, normal blow. AC output modules use 5 ampere fuses, and DC modules 3 ampere fuses.

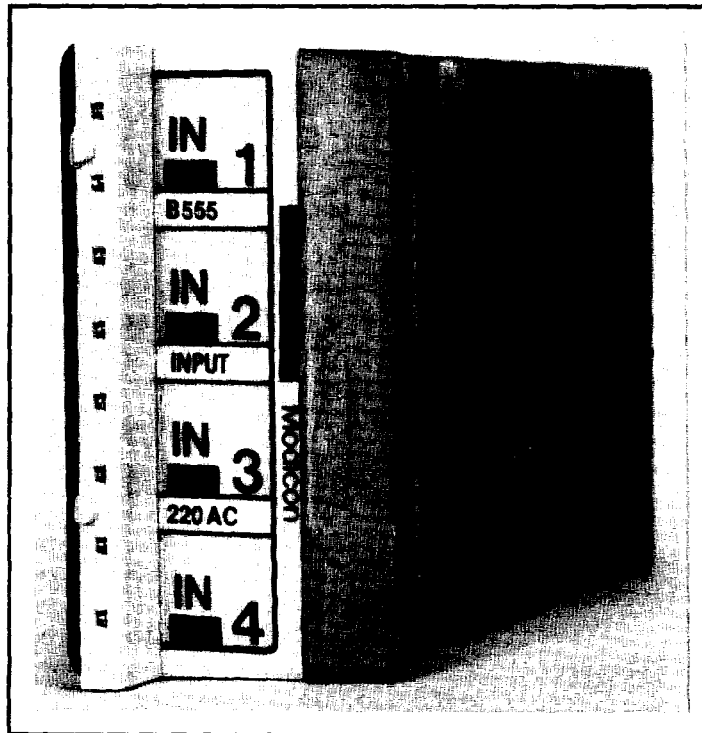


Figure 5-7 Typical 500 Series I/O Module

MODULE TYPE	DESCRIPTION	PMS* CODE	COLOR
B550	115 VAC Output	199	Red
B551	115 VAC Input	197	Pink
B552	DC True High Output	286	Dark Blue
B553	DC True High Input	284	Light Blue
B554	220 VAC Output	151	Orange
B555	220 VAC Input	149	Melon
B556	5V TTL Output	259	Violet
B557	5V TTL Input	264	Light Purple
B558	DC True Low Output	314	Turquoise
B559	DC True Low Input	311	Blue
B560	120 VDC Output	307	Blue
B561	120 VDC Input	305	Blue

\*Pantone Matching System

Figure 5-8 500 Series Color Codes

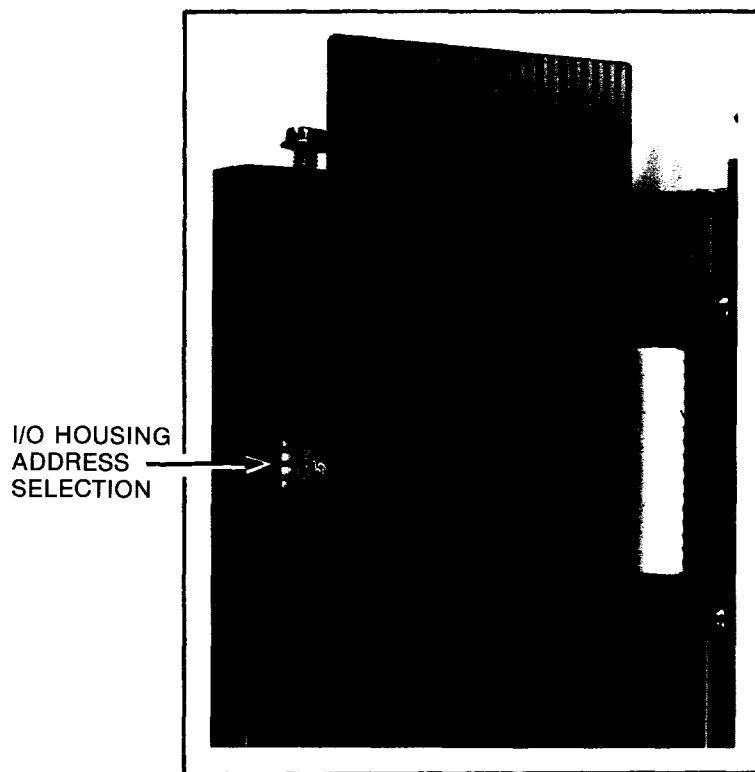
The modules are installed into either a B545 I/O housing which can take up to eight modules or a B546 I/O housing which can take a maximum of four modules. A J540 Adaptor is necessary to interface the 500 Series modules with the 584 and is installed between the housings and the 584.

### B545 Standard Housings

A single Channel of I/O can support up to 128 input and 128 output points, which can be configured as 32 input and 32 output Series 500 modules. These 64 modules can be plugged into eight B545 housings—eight modules to a housing.

Each housing has a set of four STRIP SELECT switches which can be set to select any housing address, one through four. Since there may be up to eight B545 housings present on the I/O channel, a pair of housings may share the same address if one housing contains only input and the other only output modules. Additional addressing information is designed inside each module to identify it to the 584 mainframe as either an input or an output module.

When replacing a housing, set the switches on the new housing to correspond to the settings of the replaced housing. This will ensure that the user field devices will continue to be addressed properly by the user program. The location of housing address switches is shown in Figure 5-9.



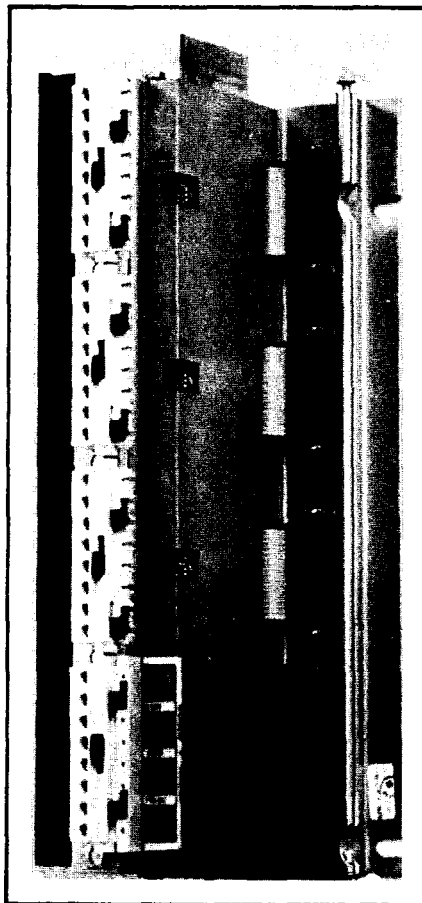
*Figure 5-9 B545 Housing Switches*

### B546 Half Housings

B546 half housings are used in locations in which four or less I/O modules will be installed in a housing, or where space is restricted.

Each housing has a set of four STRIP SELECT switches which can be set to select any housing address, one through four. Since there may be up to sixteen B546 housings present on the I/O channel, up to four housings may share the same address with two housings containing eight input modules and the other pair of housings containing eight output modules. Additional switches are used to address the modules contained in a housing. In each housing, an UPPER BYTE SELECT switch is set to provide an address for the top two modules, and a LOWER BYTE SELECT switch is set to address the bottom two modules.

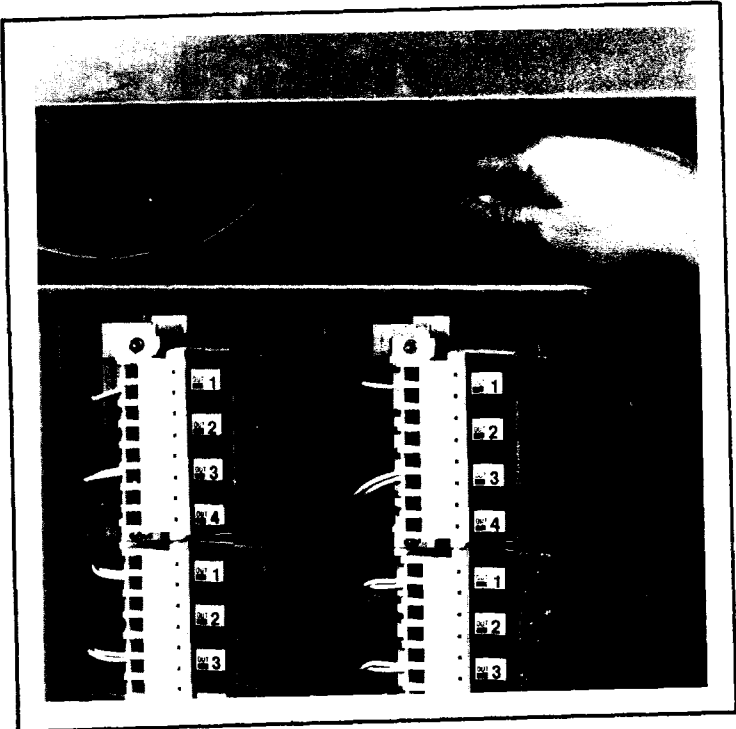
When replacing a housing, set the switches on the new housing to correspond to the settings of the replaced housing. This will ensure that the user field devices will continue to be addressed properly by the user program. Figure 5-10 illustrates the B546 housing.



*Figure 5-10 B546 Half Housing*



500 Series I/O housings are provided with conduits for user wiring and wire clamp terminals to accommodate one AWG #12 or two AWG #14 wires. The housings are connected across the top with a wiring duct containing the data bus ribbon cable (Figure 5-11).



*Figure 5-11 Series 500 Wire Terminals and Bus Cable*

## 5.5 J540 ADAPTER

In order to interface 500 Series I/O housings and modules with the 584, a J540 Adapter must be attached to each channel.

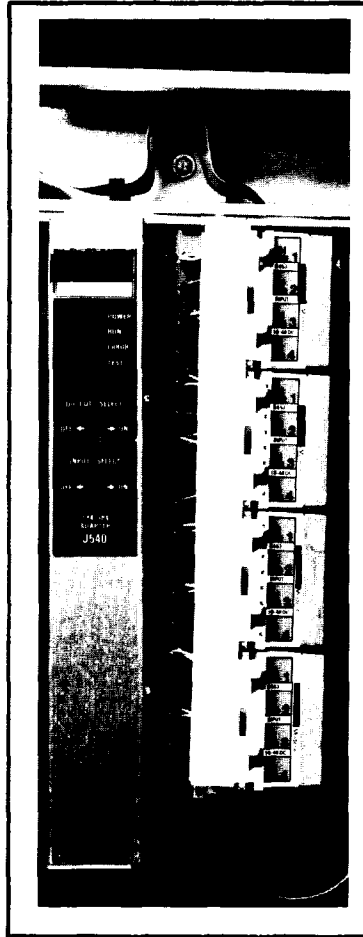
On the front of the J540 are eight input switches and eight output switches used for selecting combinations of 500 Series modules. These will be described below. Also on the front of the J540 are four indicator lights (Figure 5-12):

**POWER** — On if DC power has been applied.

**RUN** — On if adapter is receiving a 584 scan at least once every 200 milliseconds.

**ERROR** — On if an Input/Output communications error has been detected and cannot be corrected by error checking capabilities.

**TEST** — On if adapter is in internal test mode, and test is successful.



*Figure 5-12 J540 Front View*

## 5.6 J540 I/O SWITCH SELECTION

The 584 communicates with the J540 by sending or receiving 16 I/O points of information. Since each 500 Series I/O module utilizes only four I/O points, the J540 I/O switches address the sixteen Mainframe I/O points to a group of four 500 Series modules. Each J540 output switch will enable a group of four output modules, and each J540 input switch enables a group of four 500 Series input modules. Figure 5-13 shows typical J540 switch settings.

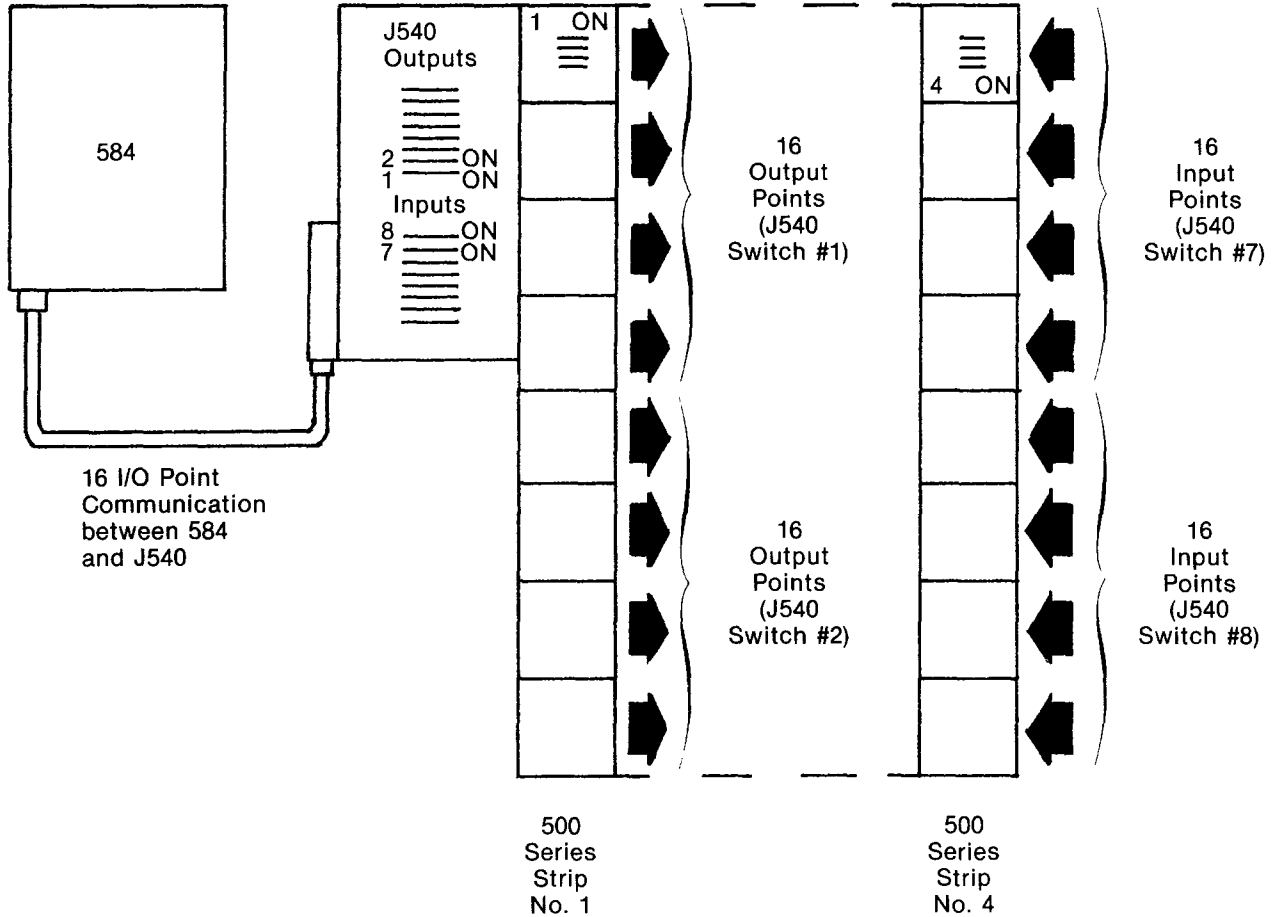


Figure 5-13 Typical J540 Switch Settings

## 5.7 INPUT/OUTPUT CHANNEL CONFIGURATIONS

The 584 mainframe unit is connected by cables to various I/O housings, containing input or output modules which control user field devices. Groups of housings are connected together, supplied with power, and cabled to the mainframe unit to form "Input/Output Channels" of data flow to and from the mainframe.

The 584 is capable of communicating with up to 32 channels of I/O, with each channel controlling up to 128 discrete input points and 128 discrete output points. These channels are connected to the mainframe as either Local or Remote I/O channels.

Local I/O channels, as the name implies, are located relatively close to the 584 mainframe. Typical distances from the 584 mainframe to the Local I/O channel housings are six feet or less. Local I/O is connected to the mainframe as Channels 1 through 4, with power for the housings being supplied by the mainframe to Channels 1 and 2, and by auxiliary power supply units to Channels 3 and 4.

Remote I/O channels 5 through 32 can be located up to 15,000 feet (4545 metres) away from the 584 mainframe. Channels 5 through 32 communicate with the 584 through a J200 Remote I/O Driver unit connected to a Remote I/O port on the 584 mainframe. Auxiliary power supplies are necessary for these channels.

Channels 1 and 2 can also be connected as Remote I/O channels if desired, using I425 or I427 Remote I/O Driver units. Auxiliary power supply units are also required. When connected as Remote I/O, these channels can be located up to 5000 feet (1515 metres) from the mainframe unit.

Channels 3 and 4 can only be connected as Local I/O channels.

There is no restriction as to which channels are used with the mainframe or in their order of placement. There is also no requirement to fully utilize all input or output field device connections to a channel of I/O before connecting devices to another channel.

## 5.8 CHANNELS 1,2 CONFIGURATION

### Channels 1 and 2 - Local I/O

If Channels 1 and 2 are located six feet or closer to the 584 mainframe, they can serve as Local I/O. They can also serve as local I/O at a maximum distance of 75 feet from the mainframe if driven by an auxiliary power supply. They are connected directly to the appropriate Channel 1 port or Channel 2 port on the 584 mainframe, via a W600 cable to each port. The power to drive Channels 1 and 2 is provided by the 584 mainframe.

Addressing of these two channels is fixed by connection of the cables to the Channel 1 or Channel 2 ports on the 584 mainframe.

Typical Channels 1 and 2 Local I/O connections are shown in Figure 5-14.

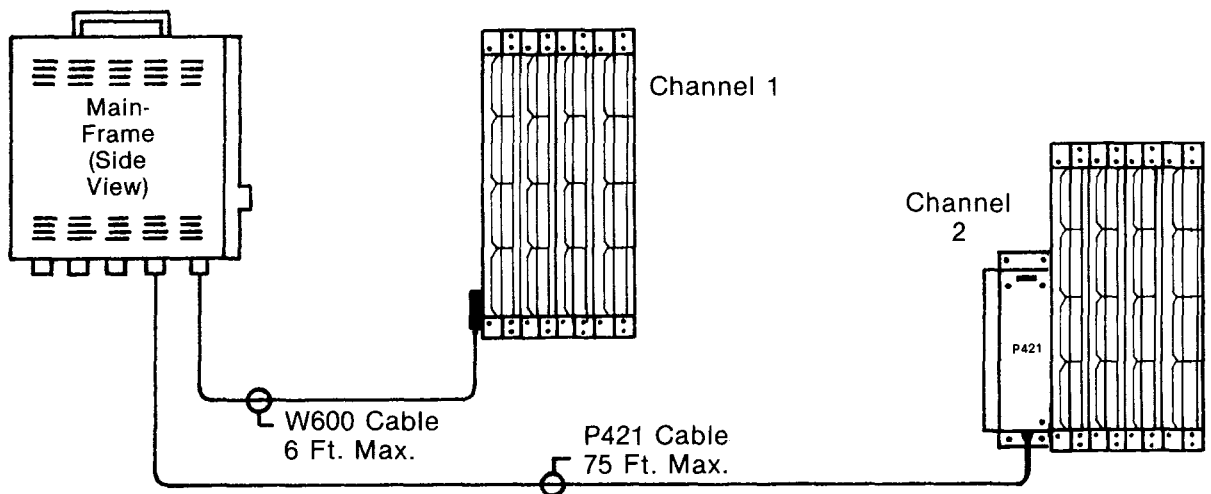


Figure 5-14 Channels 1,2 Local Configuration

## Channels 1 and 2 - Remote I/O

In addition to serving as local I/O, Channels 1 and 2 can also be used as remote I/O. This allows the 584 mainframe to be located up to 5000 feet (1515 metres) away from the Channels 1 and 2 I/O housings. Each channel requires an I425 or I427 Remote I/O Driver unit, and each housing requires a P421 or P431 Auxiliary Power Supply unit. The I425 or I427 can each drive a maximum of one channel.

Typical Channels 1 and 2 Remote I/O connections are shown in Figure 5-15.

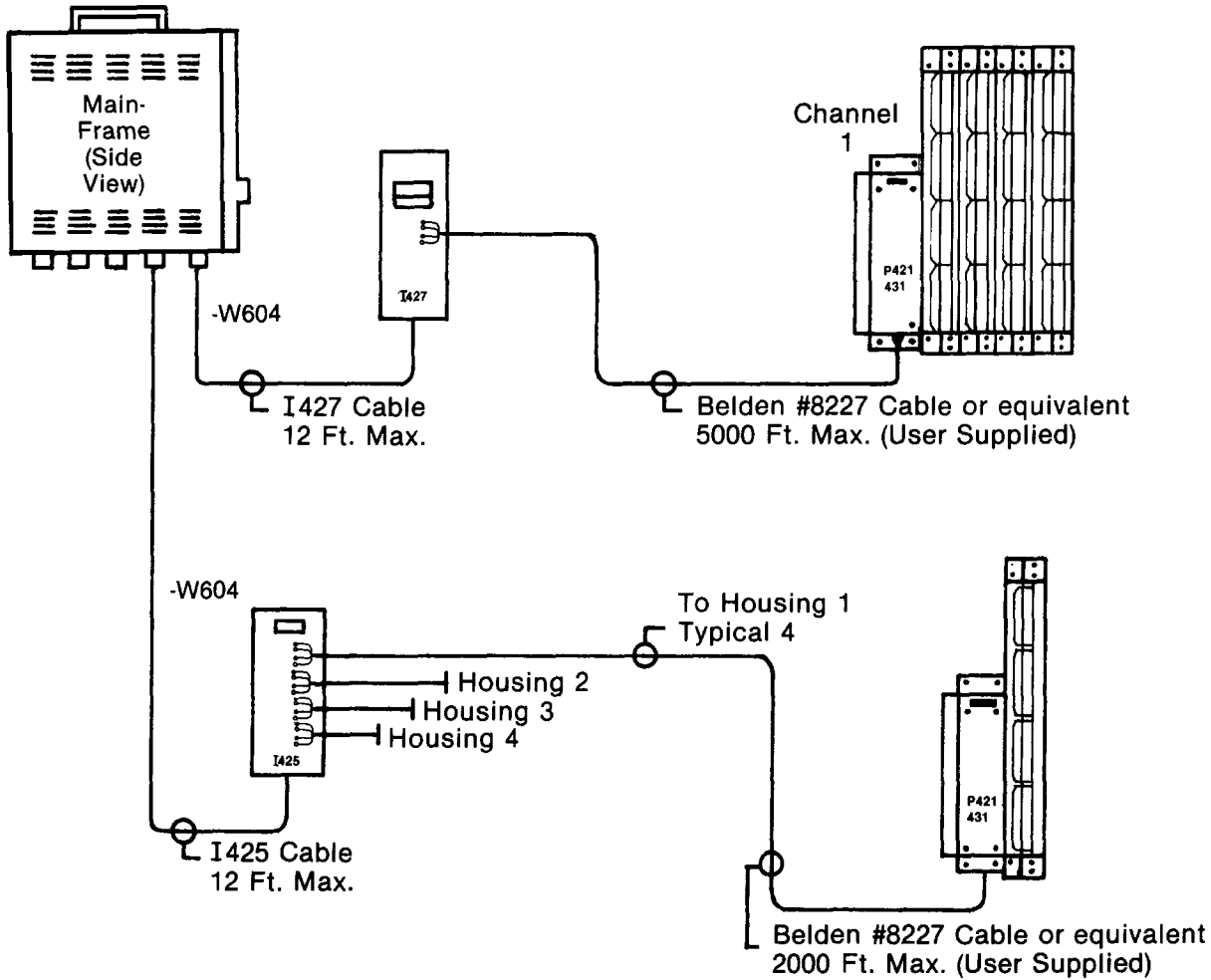


Figure 5-15 Channels 1,2 Remote Configuration

## 5.9 CHANNELS 3,4 CONFIGURATION

Channels 3 and 4 are always used as Local I/O and are connected to one common port on the 584 mainframe. Power to these channels must be supplied by auxiliary power supplies.

Two kinds of auxiliary power supplies are used with Channels 3 and 4. The P452 is capable of driving power to one channel of I/O, and also is used to decode and split data to Channel 3 and 4 when both channels are present. The P421 also is capable of driving power to one channel of I/O, but cannot split the data to another channel. The P421 is used for Channel 3 when Channel 4 is not connected, or for Channel 4 when the P452 is used on Channel 3.

Typical Channels 3 and 4 connections are shown in Figure 5-16.

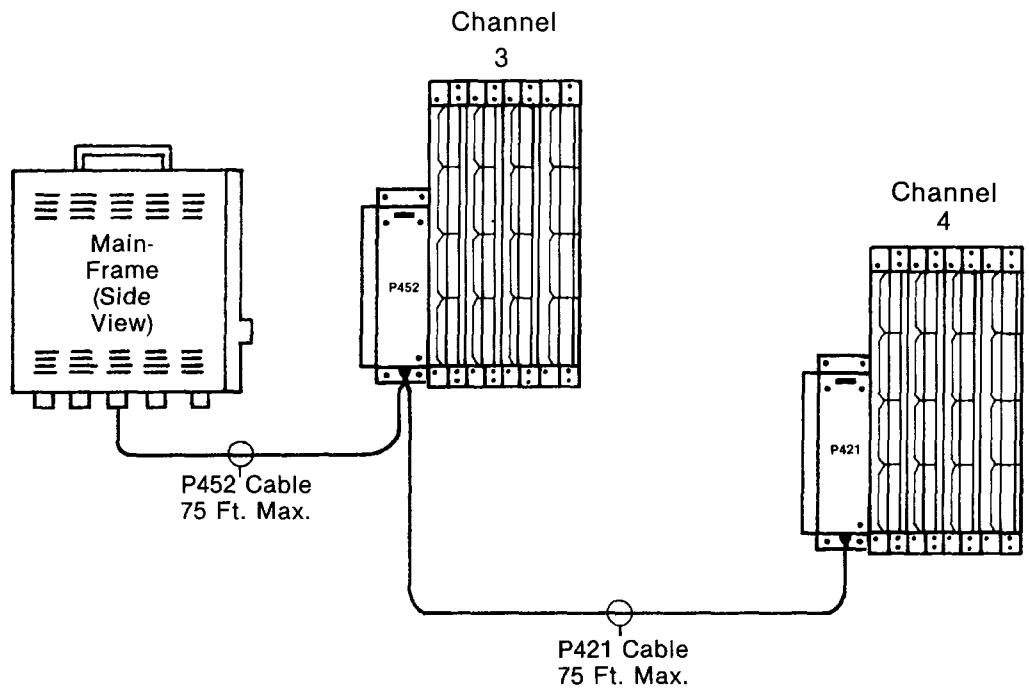


Figure 5-16 Channels 3,4 Configuration

### 5.10 CHANNELS 5 THROUGH 32 CONFIGURATION

In addition to the four channels of I/O previously described, up to 28 additional remote channels of I/O (Channels 5 through 32) can be connected to a common coaxial cable. This cable connects to a J200 Remote I/O Driver which in turn is connected to a Remote I/O port on the 584 mainframe. The total length of the coaxial cable can be up to 15,000 feet (4545 metres).

Along this length of cable can be placed up to 14 cable taps, each connected to a P451 Auxiliary Power Supply. The P451 drives power to one I/O channel, and splits the data further to a second I/O channel receiving power from a P421 Auxiliary Power Supply. A P453 Remote I/O Interface unit is used for channels which connect to an ASCII device, such as a printer or badge reader. The P453 can drive power to two channels of I/O.

A typical configuration of Remote I/O for Channels 5 and up is shown in Figure 5-17.

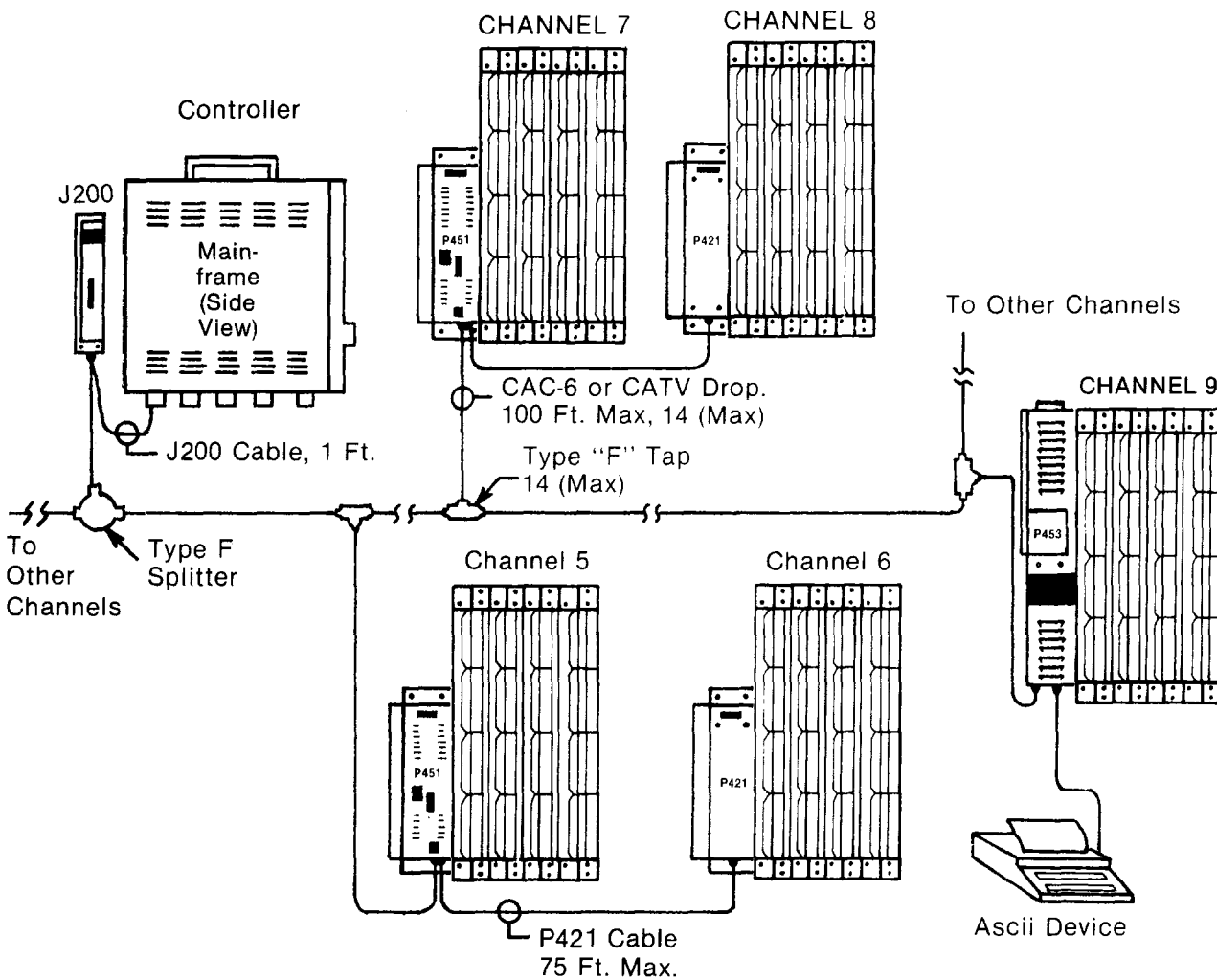


Figure 5-17 Channels 5 and Up Configuration

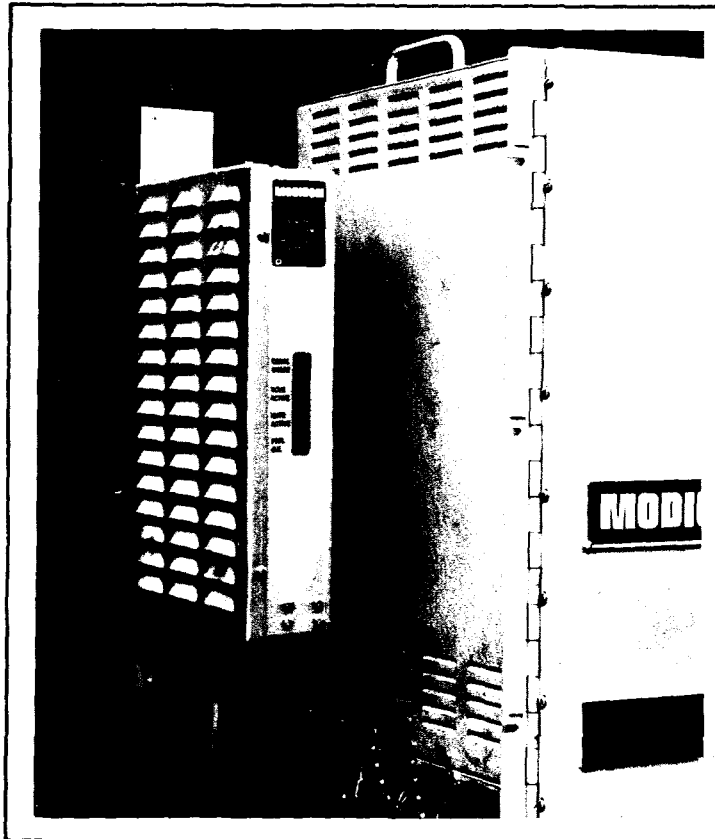


### 5.11 J200 REMOTE I/O DRIVER

Channel 5 through 32 data is conducted through a single connector on the 584 mainframe. Attached to this connector is a J200 Remote I/O Driver, which receives its operating power from the mainframe. The J200 transfers data between the mainframe and Channels 5 through 32 through a coaxial cable using Type "F" connectors, connected to the bottom panel of the J200 unit.

A defective J200 is replaced as a unit. A replacement procedure is provided later in this section.

A typical view of the J200 Remote I/O Driver unit is shown in Figure 5-18.



*Figure 5-18 J200 Remote I/O Driver*

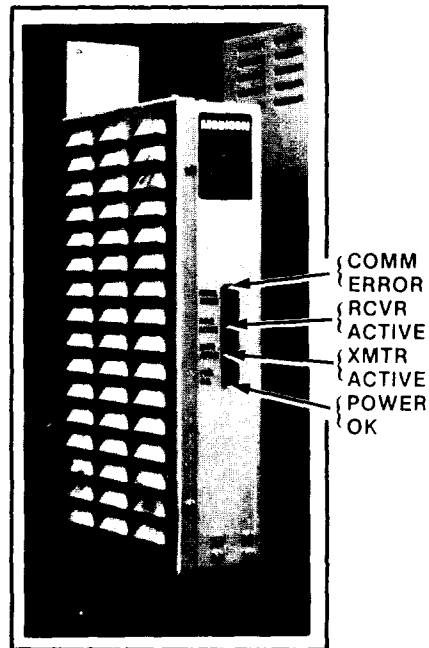
The J200 has four front panel indicator lights (Figure 5-19). Their purposes are:

COMM ERROR — Blinks if a communication error exists between the J200 and a Remote I/O Channel.

RCVR ACTIVE — Blinks when receiving data.

XMTR ACTIVE — Blinks when transmitting data.

POWER OK — Remains lit when operating power is being received from the mainframe.



*Figure 5-19 J200 Indicator Lights*

A communication error between the J200 and a Remote I/O Channel connected to the J200 could be caused by a faulty coaxial cable or cable connection at any point along the cable length. Bad connections (crimped or cold solder points) along the cable should be suspected when troubleshooting in the area of the Remote I/O Channels.

## J200 Cabling

Remote I/O connections to the J200 use types CATV or CAC-6 coaxial cable with associated coaxial Splitter, Tap, and Terminator devices. A Splitter is used at the J200 to split the cable layout into two directions. Taps are placed at points along the cable at which I/O channel connections are made to a P451 or P453. A Terminator connects to a cable end which is not terminated at a P451 or P453. No cable ends should be left "floating" without a termination.

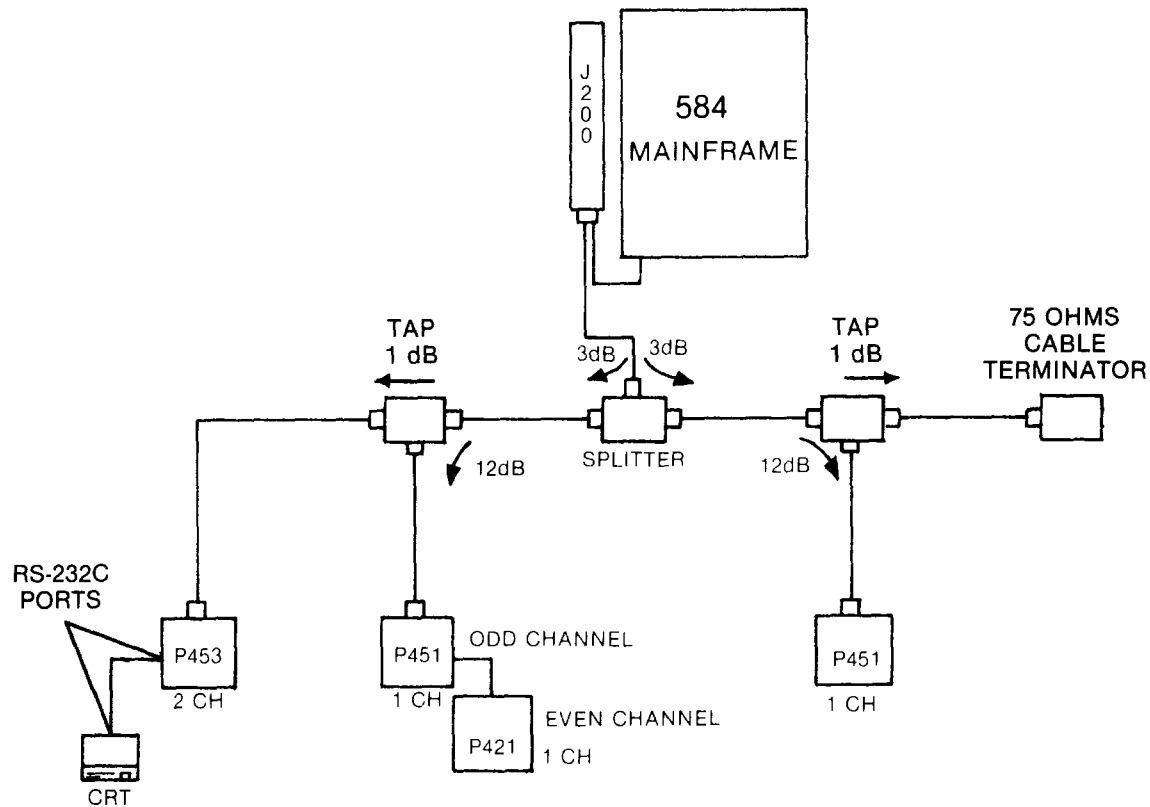
Typical part numbers for Connectors, Taps and Terminators are as follows:

<p>CATV Cable</p> <ul style="list-style-type: none"><li>• Comm-Scope Co. Parameter III Model No. P-3-75-500-JCA</li><li>• Times Co. Lumifoam III Model No. JT-4500</li></ul> <p>CAC-6 Cable</p> <ul style="list-style-type: none"><li>• Belden Model No. 9283</li></ul> <p>CATV Cable to Male "F" Connector Adapter</p> <ul style="list-style-type: none"><li>• Gilbert Engineering Model No. GRS-500-AFM-DU03</li></ul> <p>Type "F" Male Connector</p> <ul style="list-style-type: none"><li>• Taco-Jerrold Model No. F56</li></ul> <p>Coax Cable Splitter with "F" Connectors</p> <ul style="list-style-type: none"><li>• Modicon Model No. MA-0186-000</li></ul> <p>Coax Cable Tap with "F" Connectors</p> <ul style="list-style-type: none"><li>• Modicon Model No. MA-0185-000</li></ul> <p>Cable Terminator - 75 Ohm</p> <ul style="list-style-type: none"><li>• Taco-Jerrold Model No. TR-75F</li></ul>
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The user should ensure that ground currents are not conducted along the system's cable run. The cable shield receives its ground connection at the J200. No grounds should be made at the cable splitter, taps, terminators, or other similar points.

I/O channels can be located at up to 15,000 feet (4545 metres) of total cable length from the J200, provided there is not more than 35 db signal loss in the line between the J200 and each P451 or P453. Signal loss is caused by the splitter, each tap, and within the coaxial cable.

Figure 5-20 shows a typical cable configuration and signal losses.

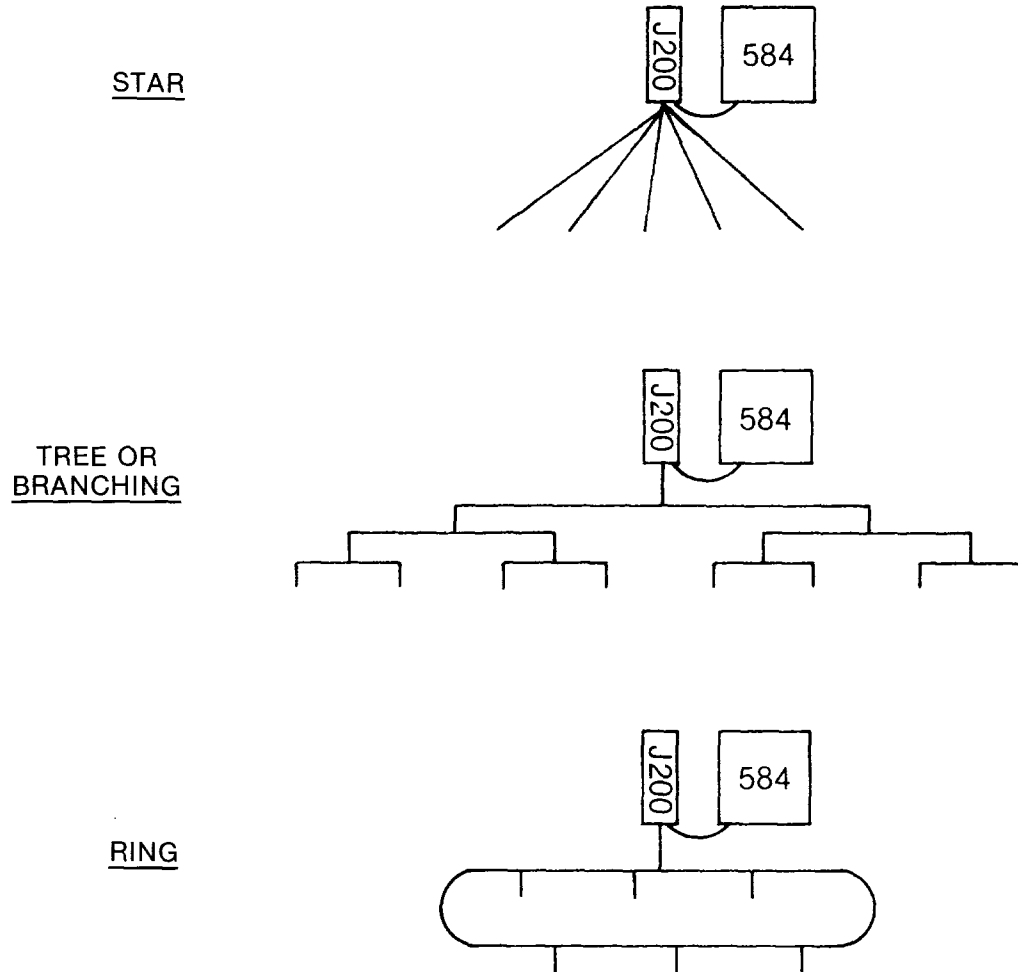


- MAXIMUM dB LOSS AT ANY P451 IS 35 dB.
- MAXIMUM CABLE IS 15,000 EACH WAY.
- CATV CABLE LOSS IS .8 dB/1000 FEET.
- CAC-6 CABLE LOSS IS 7 dB/1000 FEET.

Figure 5-20 J200 Cabling

## Cable Configurations Not Allowed

The Remote I/O cabling configurations shown in this manual are straight line linear configurations, either center fed or end fed at the J200. Because of the signal propagation and reflection complications of “star” configurations, these configurations must be avoided. Figure 5-21 shows some configurations to avoid:



*Figure 5-21 Configurations Not Allowed*

To replace a J200, perform the following steps:

1. Remove AC power to the 584 mainframe.
2. Disconnect the J200 cable at its connector on the 584 mainframe.
3. Disconnect the coaxial cable from the bottom front connector on the J200.
4. Remove the J200 mounting hardware.
5. Install the replacement J200 using the mounting hardware. Connect the coaxial cable to the J200 and connect the J200 cable to its 584 mainframe connector.
6. Restore power to the 584 mainframe.
7. Check for proper communication to the I/O channels, shown by the absence of a COMM ERROR indication on the J200.

## 5.12 P452 AUXILIARY POWER SUPPLY

The P452 Auxiliary Power Supply is required for Channel 3, if both Channels 3 and 4 are used. The P452 drives power to Channel 3 I/O, decodes Channel 3 data, and decodes the data for Channel 4. On the bottom panel of the P452 unit are two connectors. The front connector, with cable attached, connects directly to the Channel 3,4 port on the 584 mainframe. The rear connector connects to a P421 Auxiliary Power Supply when Channel 4 is used. The P452 can be located up to 75 feet from the 584 mainframe.

Indicator lights on the front panel show presence of AC power input and DC voltage output. A front panel circuit breaker opens if a power overload occurs, and can be manually reset. A front view of the unit, power specifications, and AC power connections are shown in the following illustrations.

When troubleshooting the 584 system and it is determined that the P452 is defective, the P452 is replaced as a unit.

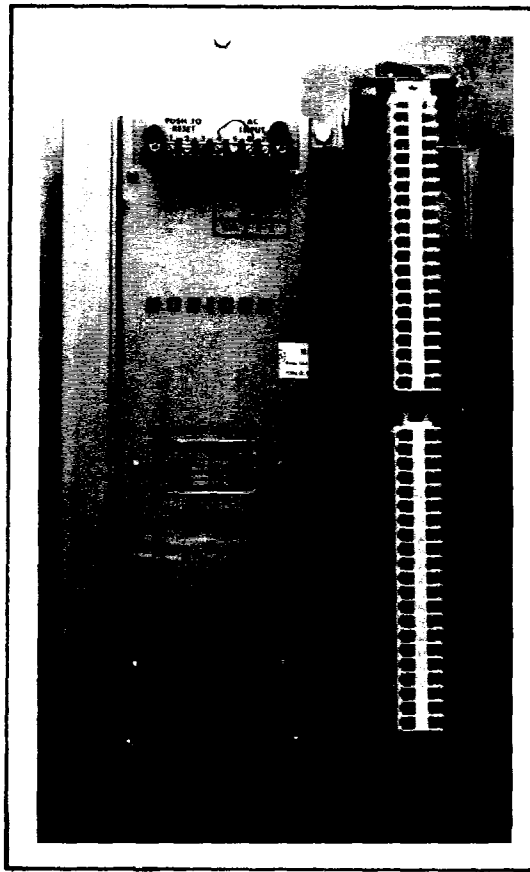


Figure 5-22 P452 Auxiliary Power Supply

Normal Voltage:	
Standard:	115V RMS $\pm$ 15% (100-130V RMS)
Optional: (Jumper Selectable)	220V RMS $\pm$ 15% (187-253V RMS)
Transient Voltage:	
Max. 10 Seconds:	115V RMS $\pm$ 30% (80-150V RMS) or 220V RMS $\pm$ 30% (155-285V RMS)
Max. 17 mSeconds:	115V RMS $\pm$ 100% (0-230V RMS) or 220V RMS $\pm$ 100% (0-440V RMS)
Line Spike:	1000V Max. (500 micro. sec. duration, 0.5% Max. duty cycle.)
Frequency:	
Standard:	60 Hz $\pm$ 5 Percent (57-63 Hz)
Optional:	50 Hz $\pm$ 5 Percent (47.5-52.5 Hz)
Normal Load:	10 Volt-amps (min.) 100 Volt-amps (max.) 4 amp peak on Transient (2 amps at 220 Vac.)

Figure 5-23 P452 Power Specifications

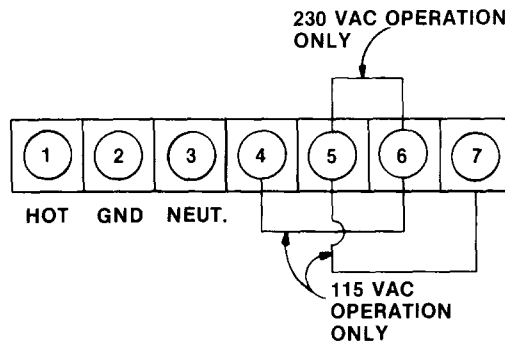


Figure 5-24 P452 AC Power Connections

To replace a P452 unit, perform the following steps:

1. Remove AC power from both the 584 mainframe and the P452 unit.
2. Remove cables from the P452 and cam the I/O housing away from the unit. Remove the P452.
3. Loosely mount the new P452 in place, and cam the I/O housing carefully. Then tighten the mounting hardware and reconnect cables to the unit.
4. Restore AC power to the P452 and 584 and check for proper communication to the I/O channel.



### 5.13 P421 AUXILIARY POWER SUPPLY

The P421 Auxiliary Power Supply is used to drive power for up to one full channel of I/O. The P421 does not have the switching capabilities to decode data for any other channel of I/O. The P421 can be connected directly to the 584 mainframe for I/O Channel 3 when Channel 4 is not used, or connected for Channel 4 to the P452. For remote I/O the unit can be used for any even numbered channel when connected to a P451, which handles the previous odd numbered channel. On the bottom of the P421 is a cable and connector attached for direct connection to the 584 mainframe, P451 or P452. The P421 can be located up to 75 feet from the mainframe, P451, or P452.

Indicator lights on the front panel show presence of AC power input and DC voltage output. A front panel circuit breaker opens if a power overload occurs, and can be manually reset. A front view of the unit, power specifications, and AC power connections are shown in the following illustrations.

When troubleshooting the 584 system and it is determined that the P421 is defective, the P421 is replaced as a unit.

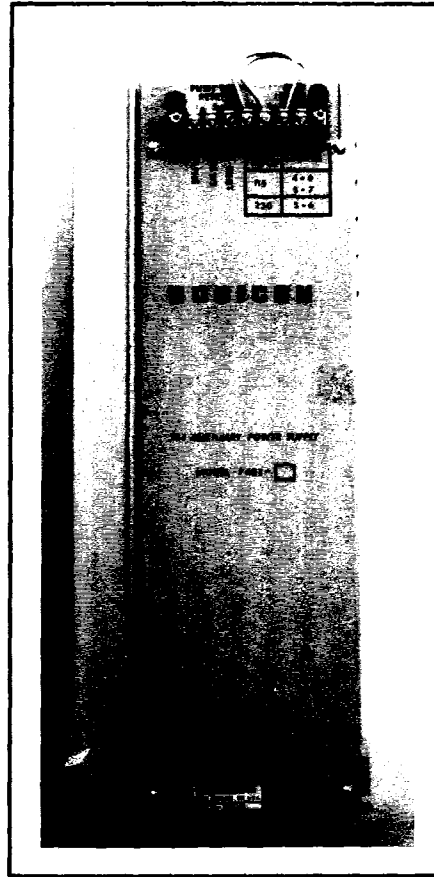


Figure 5-25 P421 Auxiliary Power Supply

Normal Voltage:	
Standard:	115V RMS $\pm$ 15% (100-130V RMS)
Optional:	220V RMS $\pm$ 15% (187-253V RMS)
(Jumper Selectable)	
Transient Voltage:	
Max. 10 Seconds:	115V RMS $\pm$ 30% (80-150V RMS)
	or
	220V RMS $\pm$ 30% (155-285V RMS)
Max. 17 mSeconds:	115V RMS $\pm$ 100% (0-230V RMS)
	or
	220V RMS $\pm$ 100% (0-440V RMS)
Line Spike:	1000V Max. (500 micro. sec. duration, 0.5% Max. duty cycle.)
Frequency:	
Standard:	60 Hz $\pm$ 5 Percent (57-63 Hz)
Optional:	50 Hz $\pm$ 5 Percent (47.5-52.5 Hz)
Normal Load:	10 Volt-amps (min.) 100 Volt-amps (max.) 4 amp peak on Transient (2 amps at 220 Vac.)

Figure 5-26 P421 Power Specifications

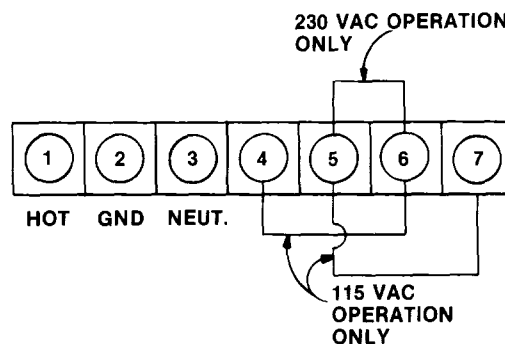


Figure 5-27 P421 AC Power Connections

To replace a P421 unit, perform the following steps:

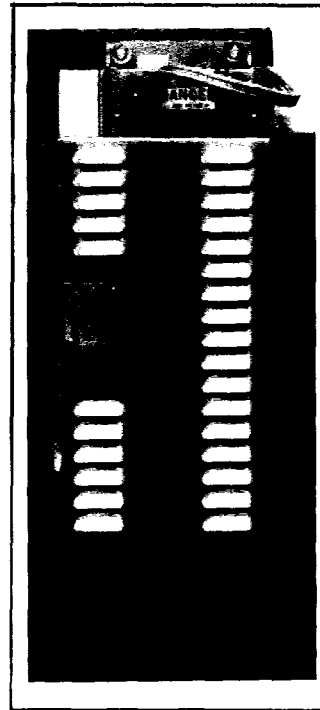
1. Remove AC power from P421 unit. If the unit connects to the 584, remove 584 power also.
2. Remove cables from the P421 and cam the I/O housing away from the unit. Remove the P421.
3. Loosely mount the new P421 in place, and cam the I/O housing carefully. Then tighten the mounting hardware and reconnect cables to the unit.
4. Restore AC power to the P421 and 584 and check for proper communication to the I/O channel.

#### 5.14 P451 AUXILIARY POWER SUPPLY

The P451 Auxiliary Power Supply is used to drive power for up to one full channel of I/O. The P451 is addressed by internal switches to decode data for its own I/O channel, and also for one additional channel. Power for this additional channel of I/O is driven by a P421 connected to the P451. The P451 is connected to the P421 by a connector located on its bottom panel, which also contains a coaxial connector for cable to the J200. The P451 can be located up to 15,000 feet (4545 metres) away from the J200.

Indicator lights on the front panel show presence of AC power input and DC voltage output. A front panel circuit breaker opens if a power overload occurs, and can be manually reset. Additional indicators show the status of communications to the J200 and the attached I/O channels. Front views of the unit, I/O channel address switches, power specifications, and AC power connections are shown in the following illustrations.

When troubleshooting the 584 system and it is determined that the P451 is defective, the P451 is replaced as a unit.



*Figure 5-28 P451 Auxiliary Power Supply*

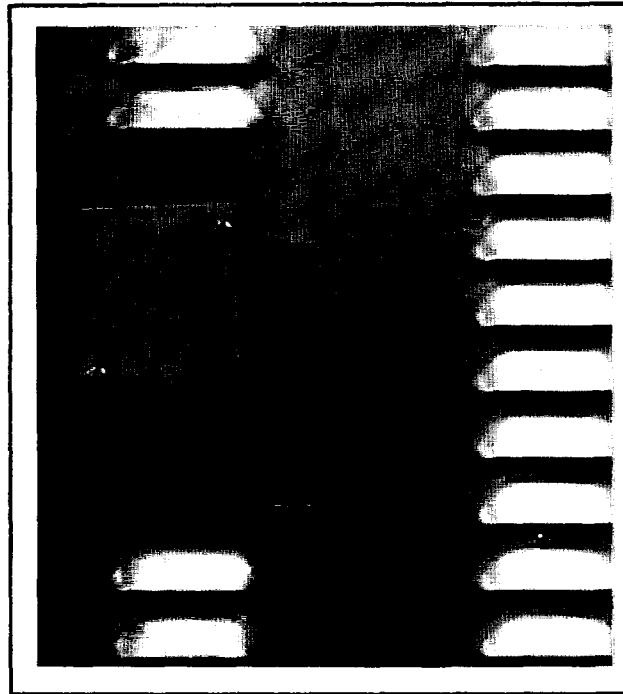
Indicator lights on the front panel show the status of P451 communications (Figure 5-29):

READY — P451 is ready to communicate with the mainframe via the J200.

COMM ACTIVE — Data is being received from the J200.

S200 ERROR — Unsuccessful communication between the P451 and attached I/O.

COMM ERROR — P451 detected a communication error with the J200.



*Figure 5-29 P451 Status Indicators*

The P451 is set to an assigned odd numbered remote I/O channel address by means of a group of switches. These are located to the left of the front panel indicators, behind a removable cover as shown in Figure 5-30.

Loosen the cover screws, and rotate the cover to expose the switches.

The cover should be left closed securely in normal use.

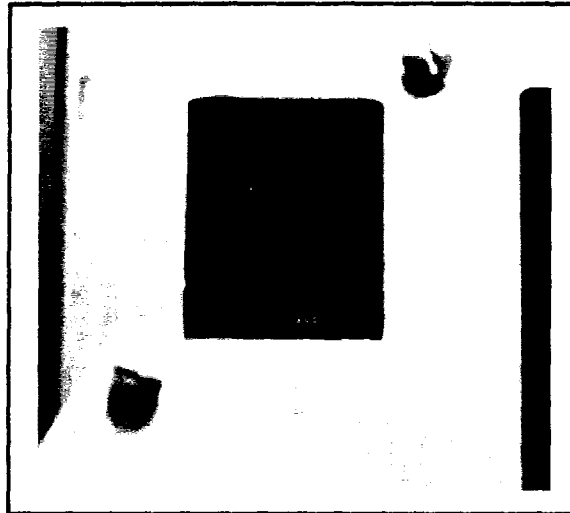


Figure 5-30 P451 I/O Channel Address Switches

Figure 5-31 shows P451 switch settings for each odd numbered channel. When a P421 is attached to the unit, it assumes the next even numbered channel address.

DROP	P451 SWITCH SETTINGS								P451 CHANNEL	P421 CHANNEL
	S 8	S 7	S 6	S 5	S 4	S 3	S 2	S 1		
	0	0	0	0	0	0	0	0	ILLEGAL ADDRESS	
1	0	0	0	0	0	0	0	1	5	6
2	0	0	0	0	0	0	1	0	7	8
3	0	0	0	0	0	0	1	1	9	10
4	0	0	0	0	0	1	0	0	11	12
5	0	0	0	0	0	1	0	1	13	14
6	0	0	0	0	0	1	1	0	15	16
7	0	0	0	0	0	1	1	1	17	18
8	0	0	0	0	1	0	0	0	19	20
9	0	0	0	0	1	0	0	1	21	22
10	0	0	0	0	1	0	1	0	23	24
11	0	0	0	0	1	0	1	1	25	26
12	0	0	0	0	1	1	0	0	27	28
13	0	0	0	0	1	1	0	1	29	30
14	0	0	0	0	1	1	1	0	31	32
	0	0	0	0	1	1	1	1	ILLEGAL ADDRESS	

(1 = Closed, 0 = Open Switch Setting)

**NOTE**

Switches S5-S8 should be left in the open position. Illegal switch settings cause continuous flashing of the COMM ERROR, S200 ERROR, COMM ACTIVE, and READY lights.

Figure 5-31 P451 Channel Addressing

Normal Voltage:	
Standard:	115V RMS $\pm$ 15% (100-130V RMS)
Optional: (Jumper Selectable)	220V RMS $\pm$ 15% (187-253V RMS)
Transient Voltage:	
Max. 10 Seconds:	115V RMS $\pm$ 30% (80-150V RMS) or 220V RMS $\pm$ 30% (155-285V RMS)
Max. 17 mSeconds:	115V RMS $\pm$ 100% (0-230V RMS) or 220V RMS $\pm$ 100% (0-440V RMS)
Line Spike:	1000V Max. (500 micro. sec. duration, 0.5% Max. duty cycle.)
Frequency:	
Standard:	60 Hz $\pm$ 5 Percent (57-63 Hz)
Optional:	50 Hz $\pm$ 5 Percent (47.5-52.5 Hz)
Normal Load:	300 Volt-amps (max. at 130 Vac) 2.7 amp peak at 130 Vac. (2.0 amps at 253 Vac.)

Figure 5-32 P451 Power Specifications

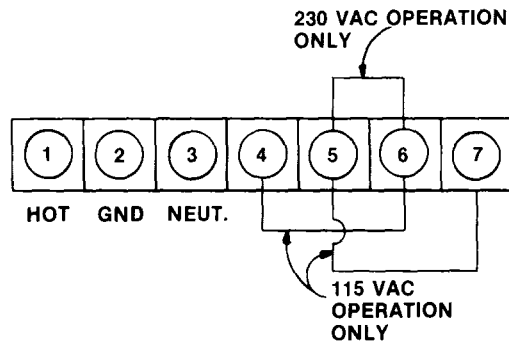


Figure 5-33 P451 AC Power Connections

To replace a P451 unit, perform the following steps:

1. Remove AC power from P451 unit. If the unit connects to a P421, remove P421 power also.
2. Remove cables from the P451 and cam the I/O housing away from the unit. Remove the P451.
3. Loosely mount the new P451 in place, and cam the I/O housing carefully. Then tighten the mounting hardware and reconnect cables to the unit.
4. Restore AC power to the P451 and P421 and check for proper communication to the I/O channel.

## 5.15 P453 REMOTE I/O POWER SUPPLY

The P453 Remote I/O Power Supply is capable of driving power to two full channels of I/O, thus filling the function of two separate supplies. It has internal switches which are set to assign a pair of I/O channel addresses to the unit.

The P453 is also designed to interface with ASCII (RS-232-C) devices such as printers, CRT terminals, badge or card readers, and similar devices which can send information to or receive information from the 584 mainframe. The 584 mainframe supports up to 32 ASCII ports in addition to its 28 remote channels of I/O. When a P453 is configured on the 584 system, the P453 can support either two or four of these ASCII ports.

The P453 Remote I/O Power Supply is available in several models:

<ul style="list-style-type: none"><li>AS-P453-511 (50 Hz.)</li><li>AS-P453-611 (60 Hz.)</li></ul>	Drives two channels of remote I/O
<ul style="list-style-type: none"><li>AS-P453-521 (50 Hz.)</li><li>AS-P453-621 (60 Hz.)</li></ul>	Drives two RS-232-C ports
<ul style="list-style-type: none"><li>AS-P453-531 (50 Hz.)</li><li>AS-P453-631 (60 Hz.)</li></ul>	Drives two channels of remote I/O, and two RS-232-C ports
<ul style="list-style-type: none"><li>AS-P453-541 (50 Hz.)</li><li>AS-P453-641 (60 Hz.)</li></ul>	Drives four RS-232-C ports

The front panel of the P453 contains the terminals for AC power connections, with an indicator showing the presence of AC power to the unit. Additional indicators on the front panel show the communication status between the P453 and J200, and between the P453 and its attached I/O channels. Two removable panels are provided for access to the unit's main power circuit breaker, I/O channel address switches, and ASCII port address switches.

I/O housing connectors are located on the P453 right side and bottom panels. Coaxial cable and ASCII connectors are located on the unit's bottom panel.

Figure 5-34 shows the front view of the P453 with the locations of the AC power connection terminals and AC PWR ON light. Figure 5-35 shows AC power specifications, and Figure 5-36 shows AC power connections to the unit.

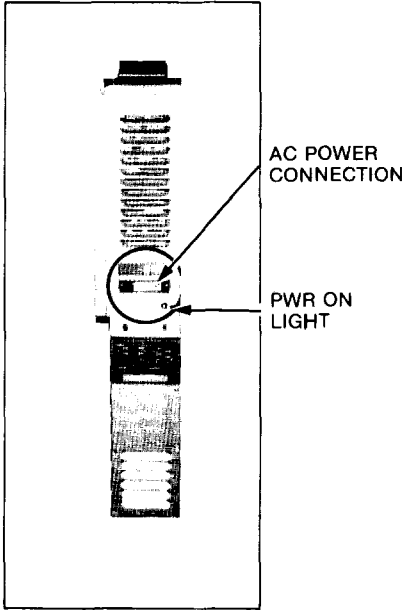


Figure 5-34  
P453 Remote I/O Power Supply  
Front View

Normal Voltage:	
Standard:	120 V RMS $\pm$ 15% (100-130 V RMS)
Optional: (Jumper Selectable)	220 V RMS $\pm$ 15% (187-253 V RMS)
Transient Voltage:	
Max. 10 seconds:	115 V RMS $\pm$ 30% (80-150 V RMS) 220 V RMS $\pm$ 30% (155-285 V RMS)
Max. 17 m seconds:	115 V RMS $\pm$ 100% (0-230 V RMS) 220 V RMS $\pm$ 100% (0-440 VRMS)
Line Spike:	1000 V max. (500 micro second duration, 0.5% max duty cycle.)
Frequency	
Standard:	60 Hz $\pm$ 5% (57 - 63 Hz)
Optional:	220 Hz $\pm$ 5% (47.5-52.5 Hz)
Normal Load	520 Volt-amps (min.) 1050 Volt-amps (max.)

Figure 5-35 P453 AC Power Specifications

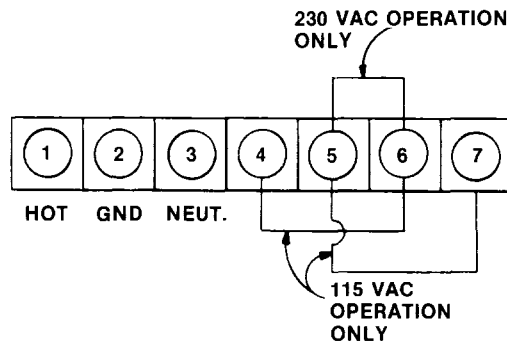


Figure 5-36 P453 AC Power Connections



Mounted on the front center portion of the P453 is an access panel which can be removed for access to the unit's main power circuit breaker. Location of the panel is shown in Figure 5-37. The panel is removed by pressing downward on two pushbuttons on the panel top as shown in Figure 5-38.

When the panel is in place it provides labels for status indicators which show the current status of the communication link between the P453 and J200, and between the P453 and its attached I/O channels. These labels are also shown in Figure 5-38.

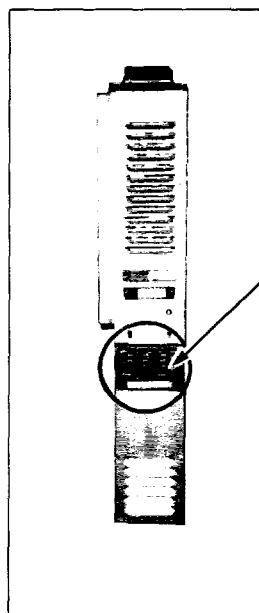


Figure 5-37  
P453 Access Panel Location

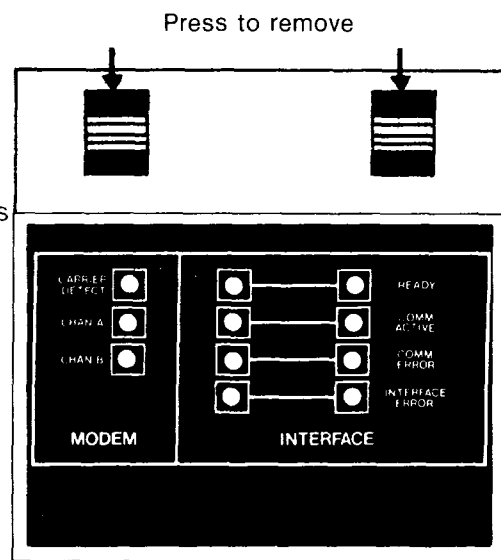


Figure 5-38  
P453 Access Panel Detail

Depending upon the specific P453 model, up to three printed circuit boards can be mounted in slots behind the P453 front access panel. The left board is a modem which communicates with the J200 Remote I/O Driver and is always present in the unit. The center board, if present, communicates with a pair of external ASCII devices. The right board, if present, communicates either with another pair of ASCII devices or with the I/O channels assigned to the P453. Each board contains a group of indicators which show the status of that board's communication to the J200 and its external units.

### P453 Status Indicators

In the MODEM area of the panel, the indicator functions are:

**CARRIER DETECT** — When lit, shows that a link exists between the P453 modem and the modem on the J200.

**CHAN A** — When lit, indicates that the P453 modem board is running.

**CHAN B** — Not used.

In the INTERFACE area of the panel, the indicator functions are:

**READY** — When lit, the P453 is ready to communicate to the J200.

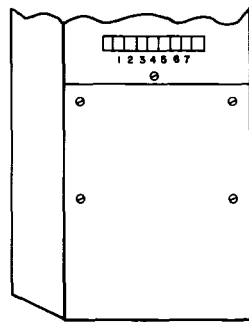
**COMM ACTIVE** — When lit, the P453 is currently communicating with the J200.

**COMM ERROR** — When lit, the P453 has a failure in communications with the J200.

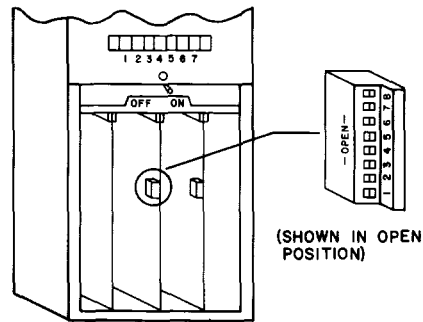
**INTERFACE ERROR** — When lit, a failure exists between the P453 and its I/O channels.

### Access to P453 Circuit Boards

P453 circuit boards can be accessed by removing the lower front cover plate. This plate is secured by five screws located at the front and bottom of the unit (Figure 5-39). This allows access to the circuit board switches which control I/O channel and ASCII port addressing for the P453 (Figure 5-40).



*Figure 5-39*  
*P453 Lower Cover Plate*  
*and Screws*



*Figure 5-40*  
*P453 Circuit Boards*  
*and Address Switches*

### P453 I/O Board Address Switches

A P453 used as a Remote I/O channel drop will have an S200 I/O Board in the slot furthest to the right. This board will allow the P453 to communicate with 2 channels of I/O. Since the P453 is a power supply capable of driving 2 channels of I/O, direct channel connections are possible through the two connectors provided. The odd numbered channel housings will directly connect to the strip connector on the right side of the P453, and the even numbered channel will be connected to a connector on the bottom of the I/O board via a W600 cable.

Located at the front center of the I/O Board is a set of seven switches. Figure 5-41 illustrates the switch settings for addressing the P453 I/O Channels, with S7 toward the top and S1 toward the bottom of the circuit board.

<u>P453 I/O BOARD SWITCH SETTINGS</u>							<u>I/O CHANNELS</u>	
<u>S</u> 7	<u>S</u> 6	<u>S</u> 5	<u>S</u> 4	<u>S</u> 3	<u>S</u> 2	<u>S</u> 1	<u>ODD</u>	<u>EVEN</u>
0	0	0	0	1	SEE		5	6
0	0	0	1	0	NOTE		7	8
0	0	0	1	1			9	10
0	0	1	0	0			11	12
0	0	1	0	1			13	14
0	0	1	1	0			15	16
0	0	1	1	1			17	18
0	1	0	0	0			19	20
0	1	0	0	1			21	22
0	1	0	1	0			23	24
0	1	0	1	1			25	26
0	1	1	0	0			27	28
0	1	1	0	1			29	30
0	1	1	1	0			31	32
1	X	X	X	X			DIAGNOSTIC ROUTINE	

(1 = Closed, 0 = Open Switch Setting)

#### **NOTE**

S1 = Odd Channel, and S2 = Even Channel, define the type of communication selected for those channels at the time the system was configured. Make note of these switch positions and ensure that they always remain in the same position or program failure may result.

*Figure 5-41 P453 I/O Board Switch Settings*

### P453 ASCII Board Address Switches

The P453 can contain up to two ASCII interface boards, each having two ASCII ports, allowing the P453 to interface with up to four ASCII devices. A P453 which interfaces with only one or two ASCII devices would have its ASCII board located in the center slot, whereas a P453 interfacing with three or four ASCII devices would have a pair of ASCII boards occupying the center and right slots. Each board can be addressed separately.

Located on the front center of each ASCII interface board is a set of seven switches. Figure 5-42 illustrates the switch settings for addressing the P453 ASCII ports, with S7 toward the top and S1 toward the bottom of the circuit board.

<u>P453 ASCII BOARD SWITCH SETTINGS</u>							<u>RS-232-C PORTS</u>	
S 7	S 6	S 5	S 4	S 3	S 2	S 1	<u>FRONT</u>	<u>REAR</u>
0	0	0	0	0	SEE		1	2
0	0	0	0	1	NOTE		3	4
0	0	0	1	0			5	6
0	0	0	1	1			7	8
0	0	1	0	0			9	10
0	0	1	0	1			11	12
0	0	1	1	0			13	14
0	0	1	1	1			15	16
0	1	0	0	0			17	18
0	1	0	0	1			19	20
0	1	0	1	0			21	22
0	1	0	1	1			23	24
0	1	1	0	0			25	26
0	1	1	0	1			27	28
0	1	1	1	0			29	30
0	1	1	1	1			31	32
1	X	X	X	X			DIAGNOSTIC ROUTINE	

(1 = Closed, 0 = Open Switch Setting)

#### **NOTE**

Switches S1 and S2 are not used and should be set to their open position.

*Figure 5-42 P453 ASCII Board Switch Settings*

### P453 Replacement Techniques:

The P453 can be maintained to the subassembly (circuit board) level or the entire unit can be replaced.

#### When replacing a P453 board:

1. Remove power from the P453 unit.
2. Refer to Figure 5-39. Remove the five mounting screws securing the lower front cover plate, and remove this plate.
3. Remove external cables from the defective board by disconnecting them at the bottom of the unit, noting the connectors to which they are attached.
4. Note the switch settings on the defective board.
5. Remove the defective board and replace it with an identical board, ensuring that switches on the new board are set the same as the switches on the board being replaced.
6. Reconnect the external cables to their proper connectors at the bottom of the unit.
7. Remount the lower front cover plate and mounting screws.
8. Restore main power to the P453 unit. Check for normal communication of the I/O channels and ASCII devices with the 584 mainframe.

#### To replace the P453 as a complete unit:

1. Remove power from the P453 unit.
2. Disconnect all cables from the bottom of the unit, noting the connectors to which they are attached.
3. Carefully cam the I/O housing connector away from the unit.
4. Refer to Figure 5-39. Remove the five mounting screws securing the lower front cover plate of the unit being replaced, and remove this plate.
5. Remove the lower front cover plate of the new unit also.
6. Note the settings of all internal switches on the unit being replaced, and set the switches on the new unit to the same settings. Remount both cover plates.
7. Remove the unit being replaced from its mounting surface.
8. Loosely mount the new unit on the mounting surface. Do not tighten the mounting hardware at this time.

9. Carefully cam the I/O housing connector into the P453. Then tighten the mounting hardware.
10. Reconnect all external cables to their proper connectors at the bottom of the unit.
11. Restore main power to the P453 unit. Check for normal communication of the I/O channels and ASCII devices to the 584 mainframe.

#### 5.16 I/O POWER SUPPLY LOADING

Each I/O module or other device connected to an I/O channel powered by the 584 mainframe power supply or by an Auxiliary Power Supply causes a current drain, or load upon that supply. Figure 5-43 shows the load capability of each supply and the amount of loading required by each I/O module or device. Total I/O channel units of load must not exceed the capability of the supply driving power to that channel.

##### Power Available:

Mainframe Power Supply = 54 Units of Load  
 Aux. Power Supplies = 27 "  
 P453 Power Supply = 54 "

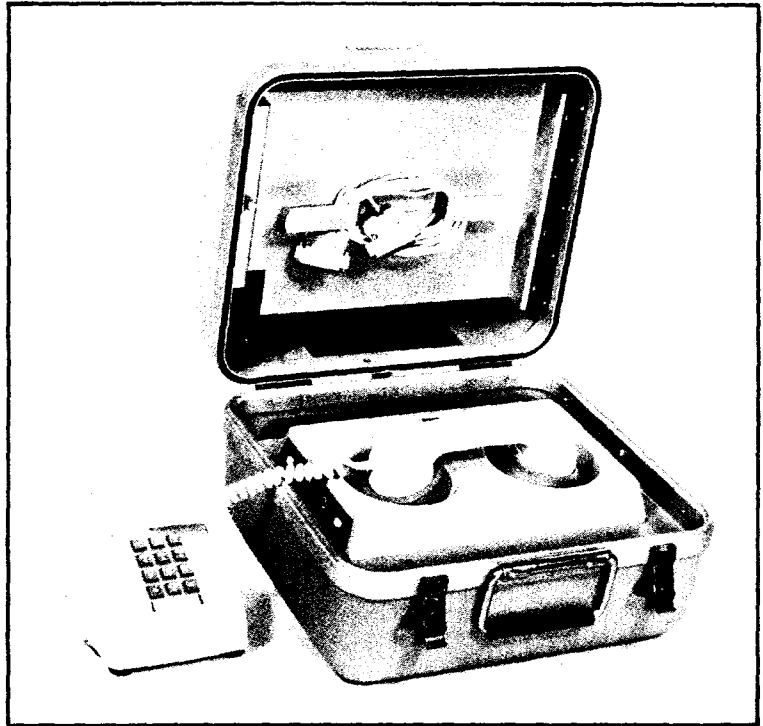
##### I/O Loading:

<u>Module</u>	<u>Type</u>	<u>Units of Load</u>
B230	115 VAC Output	2
B231	115 VAC Input	1
B232	24 VDC Output	2
B233	24 VDC Input	1
B234	220 VAC Output	2
B235	220 VAC Input	1
B236	5 VDC TTL Output	2
B237	5 VDC TTL Input	1
B238	24 VDC Output	2
B239	2x Hi Speed Counter	3
B243	Analog Input	2
B244	220 VAC Out Isolated	2
B245	220 VAC In Isolated	1
B246	115 VAC Out Isolated	2
B247	115 VAC In Isolated	1
B248	10-60 VDC Output	2
B258	Analog Mux	2
B260	Analog Output	2
B262	4-20mA Output	2
B266	Reed Relay Output	2
B270	48 VAC Output	2
B271	48 VAC Input	1
B275	10-60 VDC Input	1
I425	Remote Driver	5
J540	500 I/O Adapter with one channel 500 I/O	3 13

Figure 5-43 I/O Power Supply Loading

### 5.17 TELEPHONE INTERFACE

The Modicon telephone interface (T160, T161, or T162) allows the 584 controller to be linked to the Modicon Service Center over standard voice grade telephone lines (Figure 5-44). Each interface is an acoustical data coupler which mates with a standard telephone handset. The interface can be connected directly by cable to Ports 1 or 2 on the 584 mainframe or to Port 2 on the rear panel of the P190.



*Figure 5-44 Telephone Interface*

## 5.18 584 ASCII CONFIGURATION

The 584 ASCII capabilities support up to 32 ASCII ports (in addition to the 32 channels of I/O), with up to 10,000 messages stored in the 584 memory. Features include efficient message formatting, editing, and printout, as well as message monitoring on the P190.

Typical devices used with Modicon ASCII include: Terminals, Printers, Alphanumeric Displays, Keyboards, Bar Code Readers, Multiplexers (Thermocouple, Linear Measurement, Pressure, etc.), Badge Card Readers, Floppy Disks, and Data Acquisition Systems.

The 584 ASCII hardware configuration includes:

584 Mainframe for storing formats and messages, storing RS-232-C port parameters, sending messages to remote I/O processors, sending or requesting data for remote processing.

P190 Programmer for entering and editing RS-232-C port parameters, monitoring messages.

P453 Remote Interface Assembly (connected through a J200) supporting an ASCII interface to two or four RS-232-C ports.

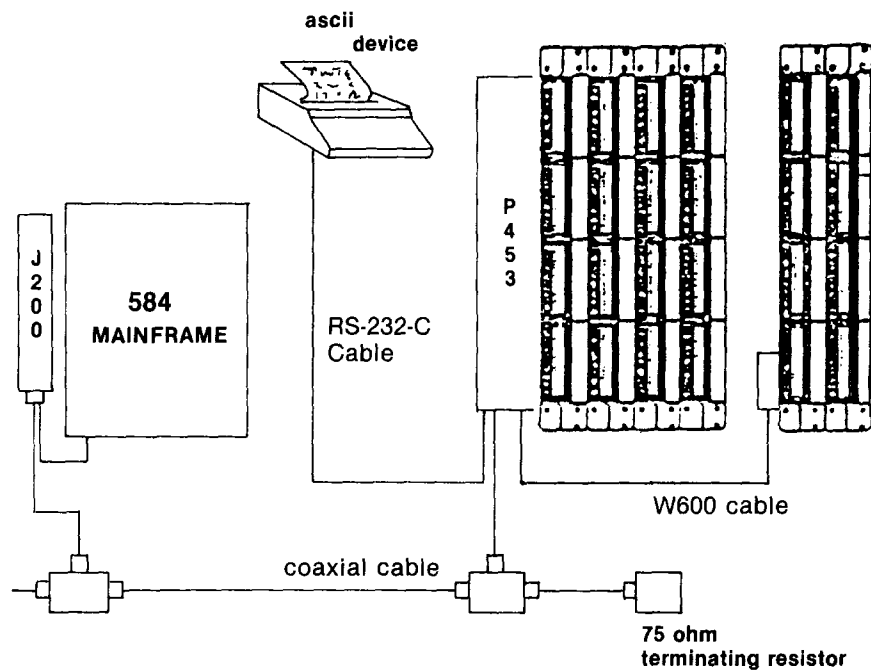


Figure 5-45 584 ASCII Configuration



## RS-232-C and ASCII Standards

RS-232-C is a data communication standard established by the Electronic Industries Association (EIA). Its purpose is to allow devices designed by various manufacturers to communicate with each other. The RS-232-C standard principally specifies:

- The connectors to be used (25-pin "D" connectors, type DB-25-P or DB-25-S)
- The connector pin-out definitions to be used and the purpose of each wire in the cable between devices
- The voltage levels to be used (more than +3 volts = 0, more than -3 volts = 1)
- The baud rate at which two devices (for example, a P190 and a printer) will communicate.

ASCII is an acronym for American Standard Code for Information Interchange. While the RS-232-C standard takes care of the hardware specifications, it does not define the combinations of "1" and "0" bits which must correspond to data characters. This is accomplished by ASCII, a seven bit data code, defining 128 characters much like those on a standard typewriter. For example, the letter "A" is represented by 1000001. Other codes are used for control functions such as defining the start or end of each message or data transmission. The bits of each code are sent serially between devices.

"Parity" is the addition of an eighth bit which is controlled to make the total number of "1" bits either even or odd. For example, with even parity the letter "A" would become 01000001, and with odd parity 11000001. The parity bit is used for checking the data. If a device is set for even parity and receives an odd number of "1" bits for a character, it knows that a communications error has occurred.

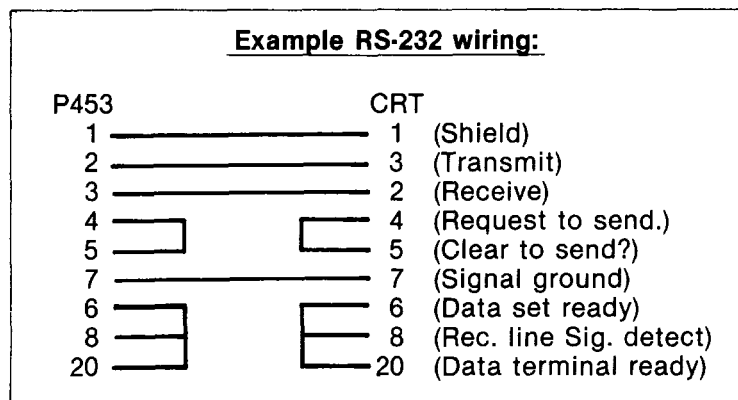
A "Stop Bit" is the addition of a ninth bit which is used to separate characters. Often a second stop bit may be used, making a total of ten bits for each character of data.

"Baud Rate" is the data transmission speed. Typical baud rates are 110, 300, 600, 1200, 2400, 4800, 9600, and 19200. Since a data character consists of about ten bits, to estimate the number of characters per second, divide the baud rate by 10. Two devices communicating together must be set for the same rate.

### Maintenance Techniques:

Maintenance of a 584 ASCII communication system requires a thorough understanding of not only the 584 system hardware, but also of the ASCII devices used. Since these are varied and each device is unique, it is important to become familiar with device maintenance procedures and properly test for a device problem before replacing other parts of the system.

It is not possible to just cable two RS-232-C devices together to be up and running. An RS-232-C compatible device connection may utilize as few as two wires or as many as 16 or more. Figure 5-46 illustrates a typical example of RS-232-C wiring between two devices.



*Figure 5-46 Sample RS-232-C Wiring*

Anyone considering troubleshooting circuits with RS-232-C devices should consider obtaining a "Break-Out" box. This is a small unit which connects between two devices, makes accessible all 25 pins for jumpering and cross wiring, and which usually has several LED's to display line status.

If there is trouble in the 584 ASCII communication, there are several main points to check:

1. Make sure that the RS-232-C cable wiring for the ASCII device is correct and not defective.
2. Ensure that the ASCII port parameters are consistent between the devices (Baud Rate, number of bits per character, Stop Bits, Parity Odd or Even.)
3. Ensure that the device is in an on-line mode for communications to take place.
4. Check the P453 for a COMM ERROR or diagnostic failure indicated by a blinking pattern on its READY light.

ASCII Communication Via Modem

ASCII devices such as printers may also be communicated to from the P453 via a modem. A modem is a device which converts digital signals, such as those used by the P453, to frequency modulated signals, such as radio, microwave, light or telephone signals. The modem used in the sample configuration here is a Modicon J478.

In Figure 5-47, the P453 is shown connected to the first J478, and the second J478 to the ASCII printer, with RS-232-C cables. Communication on these lines is compatible with the RS-232-C standards already described. The J478's then communicate over a distance with communication which has been converted from the RS-232-C form to frequency modulation. The illustration in Figure 5-47 shows the difference in form. The ASCII character "t" is the example used. In the RS-232-C form, the "t" is represented by the bits 1110100 with +12 volts representing zero and -12 volts representing one. The same character is shown converted to FM, with 50 KHz representing one and 80 KHz representing zero.

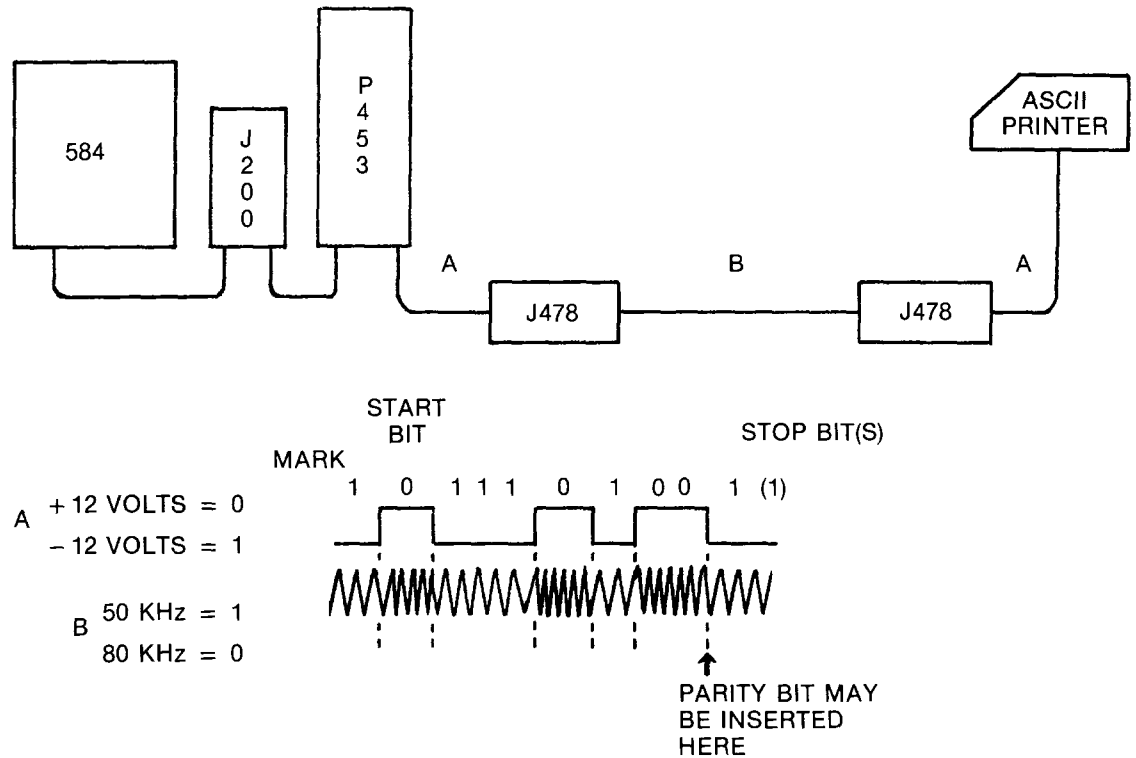


Figure 5-47 ASCII Communication via J478

## ASCII Character Set

The chart which follows contains the ASCII character set in Binary, Hexadecimal, Octal and ASCII codes. Any given ASCII device may support some or all of these characters. This information is available from the manufacturers of these devices.

<u>Binary Code</u>	<u>Hexadecimal Code</u>	<u>Octal Code</u>	<u>ASCII Char.</u>	<u>Remarks</u>
0000000	00	000	NUL	NULL, TAPE FEED, CONTROL/SHIFT/P.
0000001	01	001	SOH	START OF HEADING: ALSO SOM, START OF MESSAGE CONTROL/A.
0000010	02	002	STX	START OF TEXT: ALSO EOA, END OF ADDRESS CONTROL/B.
0000011	03	003	ETX	END OF TEXT: ALSO EOM, END OF MESSAGE CONTROL/C.
0000100	04	004	EOT	END OF TRANSMISSION (END): SHUTS OFF TWX MACHINES, CONTROL/D.
0000101	05	005	ENQ	ENQUIRY (ENQRY) ALSO WRU, CONTROL/E.
0000110	06	006	ACK	ACKNOWLEDGE: ALSO RU, CONTROL/F
0000111	07	007	BEL	RINGS THE BELL. CONTROL/G.
0001000	08	010	BS	BACKSPACE: ALSO FEO, FORMAT EFFECTOR. BACKSPACES SOME MACHINES, CONTROL/H.
0001001	09	011	HT	HORIZONTAL TAB. CONTROL/I.
0001010	0A	012	LF	LINE FEED OR LINE SPACE (NEW LINE); ADVANCES PAPER TO NEXT LINE, DUPLICATED BY CONTROL/J.
0001011	0B	013	VT	VERTICAL TAB (VTAB), CONTROL/K.
0001100	0C	014	FF	FORM FEED TO TOP OF NEXT PAGE (PAGE) CONTROL/L.
0001101	0D	015	CR	CARRIAGE RETURN TO BEGINNING OF LINE. DUPLICATED BY CONTROL/M.

<u>Binary Code</u>	<u>Hexadecimal Code</u>	<u>Octal Code</u>	<u>ASCII Char.</u>	<u>Remarks</u>
0010000	10	020	DLE	DATA LINK ESCAPE. CONTROL/P (DCO).
0010001	11	021	DC1	DEVICE CONTROL 1, TURNS TRANSMITTER (READER) ON, CONTROL/Q (X ON).
0010010	12	022	DC2	DEVICE CONTROL 2, TURNS PUNCH OR AUX ON. CONTROL/R. (TAPE AUX ON).
0010011	13	023	DC3	DEVICE CONTROL 3, TURNS TRANSMITTER (READER) OFF, CONTROL/S (X OFF).
0010100	14	024	DC4	DEVICE CONTROL 4, TURNS PUNCH OR AUX OFF. CONTROL/T (AUX OFF).
0010101	15	025	NAK	NEGATIVE ACKNOWLEDGE ALSO ERR, ERROR. CONTROL/U.
0010110	16	026	SYN	SYNCHRONOUS FILE (SYNC). CONTROL/V.
0010111	17	027	ETB	END OF TRANSMISSION BLOCK: ALSO LEM, LOGICAL END OF MEDIUM. CONTROL/W.
0011000	18	030	CAN	CANCEL (CANCL). CONTROL/X.
0011001	19	031	EM	END OF MEDIUM. CONTROL/Y.
0011010	1A	032	SUB	SUBSTITUTE. CONTROL/Z.
0011011	1B	033	ESC	ESCAPE. PREFIX. CONTROL/SHIFT/K.
0011100	1C	034	FS	FILE SEPARATOR. CONTROL/SHIFT/L.
0011101	1D	035	GS	GROUP SEPARATOR. CONTROL/SHIFT/M.
0011110	1E	036	RS	RECORD SEPARATOR. CONTROL/SHIFT/N.
0001110	0E	016	SO	SHIFT OUT; CHANGES RIBBON COLOR TO RED. CONTROL/N.
0001111	0F	017	SI	SHIFT IN; CHANGES RIBBON COLOR TO BLACK. CONTROL/O.

<u>Binary Code</u>	<u>Hexadecimal Code</u>	<u>Octal Code</u>	<u>ASCII Char.</u>	<u>Remarks</u>
0011111	1F	037	US	UNIT SEPARATOR. CONTROL/SHIFT/O.
0100000	20	040	SP	SPACE
0100001	21	041	!	
0100010	22	042	”	
0100011	23	043	#	
0100100	24	044	\$	
0100101	25	045	%	
0100110	26	046	&	
0100111	27	047	'	APOSTROPHE
0101000	28	050	(	
0101001	29	051	)	
0101010	2A	052	*	
0101011	2B	053	+	
0101100	2C	054	,	
0101101	2D	055	-	
0101110	2E	056	.	
0101111	2F	057	/	
0110000	30	060	0	
0110001	31	061	1	
0110010	32	062	2	
0110011	33	063	3	
0110100	34	064	4	
0110101	35	065	5	
0110110	36	066	6	
0110111	37	067	7	
0111000	38	070	8	
0111001	39	071	9	
0111010	3A	072	:	
0111011	3B	073	;	
0111100	3C	074		
0111101	3D	075	=	
0111110	3E	076		
0111111	3F	077	?	

<u>Binary Code</u>	<u>Hexadecimal Code</u>	<u>Octal Code</u>	<u>ASCII Char.</u>	<u>Remarks</u>
1000000	40	100		
1000001	41	101	A	
1000010	42	102	B	
1000011	43	103	C	
1000100	44	104	D	
1000101	45	105	E	
1000110	46	106	F	
1000111	47	107	G	
1001000	48	110	H	
1001001	49	111	I	
1001010	4A	112	J	
1001011	4B	113	K	
1001100	4C	114	L	
1001101	4D	115	M	
1001110	4E	116	N	
1001111	4F	117	O	
1010000	50	120	P	
1010001	51	121	Q	
1010010	52	122	R	
1010011	53	123	S	
1010100	54	124	T	
1010101	55	125	U	
1010110	56	126	V	
1010111	57	127	W	
1011000	58	130	X	
1011001	59	131	Y	
1011010	5A	132	Z	
1011011	5B	133	[	SHIFT/K.
1011100	5C	134		SHIFT/L.
1011101	5D	135	]	SHIFT/M.
1011110	5E	136		appears as      on some machines
1011111	5F	137		appears as _ (underscore) on some machines.

<u>Binary Code</u>	<u>Hexadecimal Code</u>	<u>Octal Code</u>	<u>ASCII Char.</u>	<u>Remarks</u>
1100000	60	140		ACCENT GRAVE
1100001	61	141	a	
1100010	62	142	b	
1100011	63	143	c	
1100100	64	144	d	
1100101	65	145	e	
1100110	66	146	f	
1100111	67	147	g	
1101000	68	150	h	
1101001	69	151	i	
1101010	6A	152	j	
1101011	6B	153	k	
1101100	6C	154	l	
1101101	6D	155	m	
1101110	6E	156	n	
1101111	6F	157	o	
1110000	70	160	p	
1110001	71	161	q	
1110010	72	162	r	
1110011	73	163	s	
1110100	74	164	t	
1110101	75	165	u	
1110110	76	166	v	
1110111	77	167	w	
1111000	78	170	x	
1111001	79	171	y	
1111010	7A	172	z	
1111011	7B	173		
1111100	7C	174		
1111101	7D	175		THIS CODE GENERATED BY ALTMODE
1111110	7E	176		THIS CODE GENERATED BY ESC KEY (IF PRESENT)
1111111	7F	177	DEL	DELETE, RUB OUT



## ASCII Character Set

The chart which follows contains the ASCII character set in Binary, Hexadecimal, Octal and ASCII codes. Any given ASCII device may support some or all of these characters. This information is available from the manufacturers of these devices.

## P453 Wiring to J478

It is not possible to just plug a modem into a P453. Figure 5-48 shows the rear view of the J478 to illustrate the wiring connectors, and Figure 5-49 shows the wiring connections necessary for the RS-232-C wiring from the P453 to the J478.

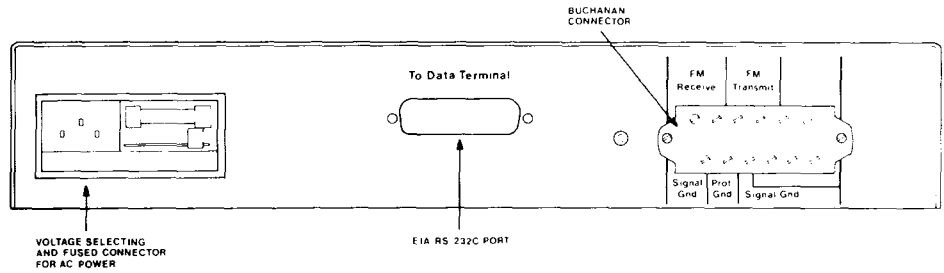


Figure 5-48 J478 Rear View

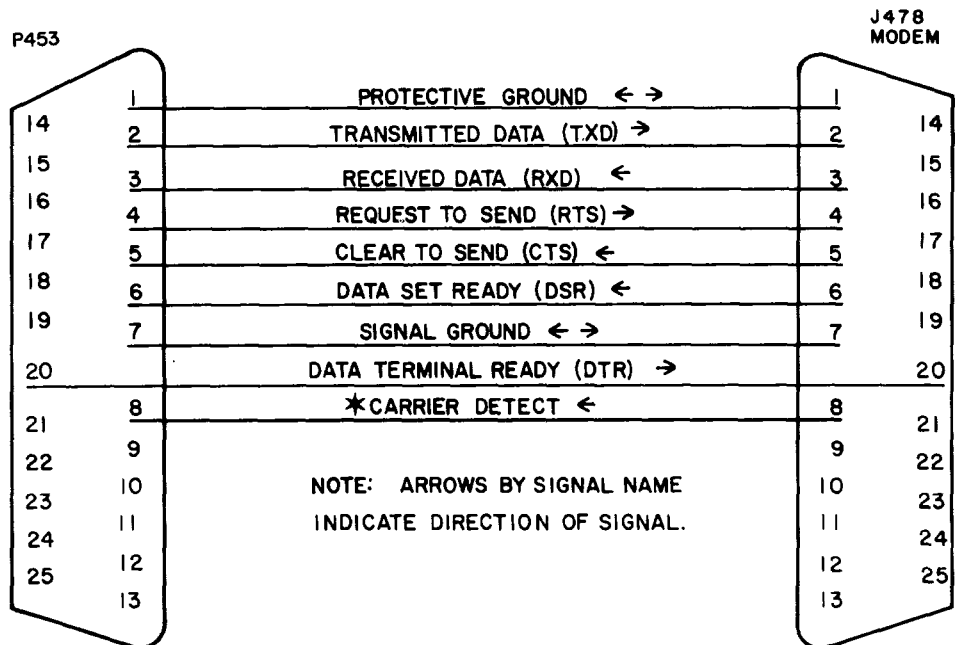


Figure 5-49 P453 Wiring to J478

## Modem to Modem Connection

Since the frequency modulation used from modem to modem is a different form of communication from the RS-232-C standard, the type of wiring used is also different. A twisted-pair cable is used, and on the J478 is connected to the Buchanan connector. Figure 5-50 shows J478 to J478 wiring.

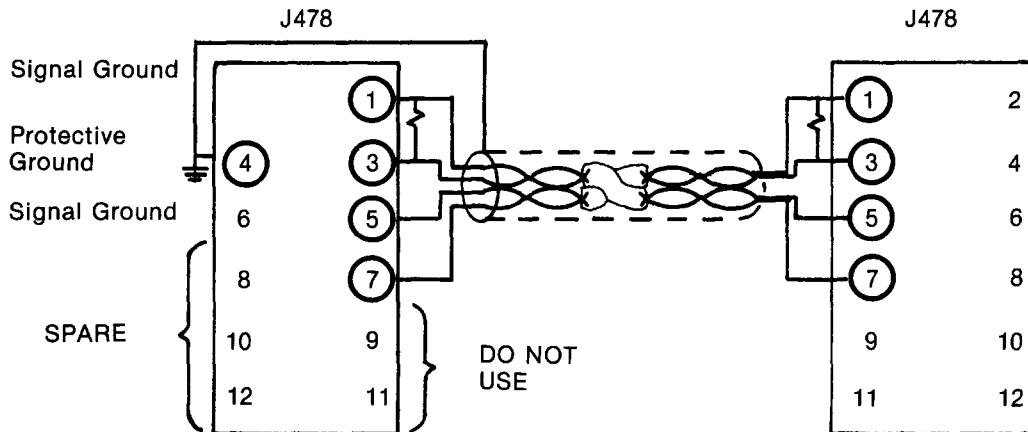


Figure 5-50 J478 to J478 wiring

## Maintenance Techniques with J478

Figure 5-51 shows a front view of the J478 with its indicators.

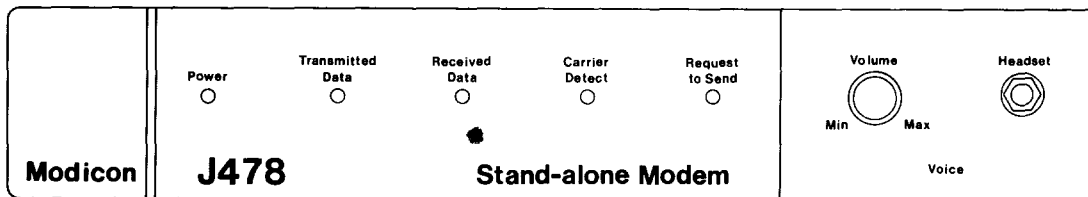


Figure 5-51 J478 Front View

These indicators are observed to troubleshoot problems in communication. Figure 5-52 lists:

**SYMPTOM** — which indicator is not lit

**PROBABLE CAUSE** — faults most likely to be the problem

**CORRECTIVE ACTION** — actions to correct the problem.

Detailed troubleshooting for the P453 is contained in Section 6 of this manual.

These indicators are observed to troubleshoot problems in communication. Figure 5-52 lists:

SYMPTOM — which indicator is not lit

PROBABLE CAUSE — faults most likely to be the problem

CORRECTIVE ACTION — actions to correct the problem.

Detailed troubleshooting for the P453 is contained in Section 6 of this manual.

<u>SYMPTOM</u>	<u>PROBABLE CAUSE</u>	<u>CORRECTIVE ACTION</u>
"Power" Indicator not on	Blown fuse	Replace fuse
	Power cord not plugged into convenience outlet	Plug in power cord
	Faulty power supply within J478 Faulty indicator	Replace J478 Replace J478
"Data Terminal Ready" (DTR) on pin 20 not high. (Check this output on P453)	584 PC not powered up and ready for operation	Power up 584 PC
	Faulty EIA Cable Faulty J478	Replace cable Replace J478
"Request to Send" indicator not on	P453 not transmitting data transmitting data	Check P453 to be sure it is
	Faulty EIA cable	Replace cable
	J478 not sending Clear to Send (CTS) to P453 Faulty indicator	Check CTS at P453. If not present, replace J478. Replace modem.
"Carrier Detect" indicator not on	Slave interface not transmitting carrier	Check slave interface to be sure it is transmitting carrier
	Faulty twisted-pair cable	Replace cable
	FM Demodulator section of J478 not functioning	Replace modem
"Received Data" indicator not on	Faulty indicator	Replace modem
	Slave interface not transmitting data	Check slave unit to be sure it is transmitting data
	Faulty J478 modem	Replace J478

Figure 5-52 Troubleshooting for J478 Modem