SECTION 3
SYSTEM CONFIGURATION

The 584L Programmable Control System can be equipped to solve a variety of process and industrial control problems. The system's capabilities can be easily tailored or configured to meet the user's specific control requirements. Such options as memory size, processing capability, and I/O capacity are changed by simply replacing a printed circuit board.

3.1 BASICS OF THE 584L PROGRAMMABLE CONTROL SYSTEM

The 584L PC can simulate the operation of relays, timers and counters, as well as perform basic arithmetic operations. Additional functions such as MOVE, MATRIX, SKIP and operations such as ASCII and Proportional Integral Derivative (PID) are optionally available. To accommodate such variety in processing capability, different memory sizes are required.

Two levels of control capability can be selected on a 584L Programmable Controller. The 584L PC supports up to 2048 discrete I/O points and 1920 registers, or up to 8192 discrete I/O points and 9999 registers. Memory capacity for the controller is available in 12, 16, and 32K.

The controller's CMOS semi-conductor memory is equipped with lithium batteries. The batteries provide DC power to retain the memory's contents whenever external power fails or is removed by the user. This ensures that programmed logic, register content, coil state, and internal system parameters are not lost inadvertently. It is recommended that these batteries be replaced approximately every twelve months.

NOTE

The batteries are not designed to support the controller's operation.

The system's I/O circuitry converts the user's field voltages into signals that are compatible with the controller's processor. Different I/O module's are used to convert various types of voltage signals. Discrete I/O modules convert signals which have only two states, ON or OFF. Register modules are used for signals which can have a range of numerical values. The modules are installed in I/O housings for connection to the user's field devices. Modicon's 200 and 500 Series I/O modules are shown in Figure 3-1.

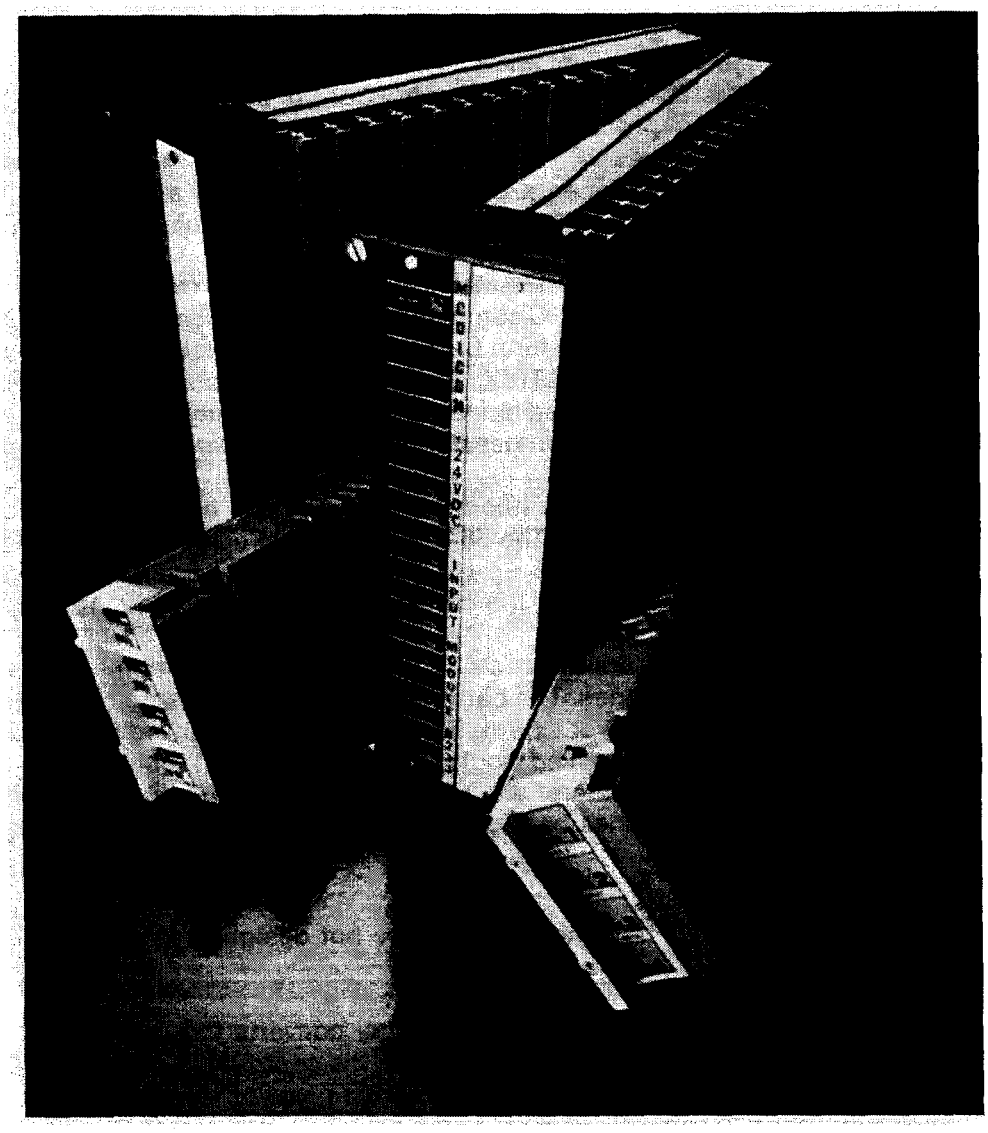

Figure 3-1. 200 and 500 Series I/O Modules

A single channel of I/O consists of 128 input points and 128 output points. The 584L has 32 channels, subject to the following limitations: Level I can have up to 2048 discrete I/O points and 1920 registers and Level II can have up to 8092 discrete I/O points and 9999 registers. The user's I/O can be a mix of discrete (ON/OFF) and register (numerical) signals. Within a channel, inputs cannot be traded for outputs, nor outputs for inputs. An I/O channel is structured in this manner for ease in wiring I/O signals to the controller. A typical configuration of the 584L's local I/O is illustrated in Figure 3-2.

The controller's processing capability is tailored to meet a variety of the user's needs. The instruction set includes the basic relays, timers, counters, and arithmetics, and the enhanced instructions MOVE, MATRIX, SKIP and ASCII capabilities.

Proportional Integral Derivative (PID) has also been added as a powerful function used for process control. With the use of PID, control devices can respond to a range of signals which indicate a degree of control, instead of a simple ON/OFF. For example, a valve can be controlled to close 50 percent rather than shutting OFF completely.

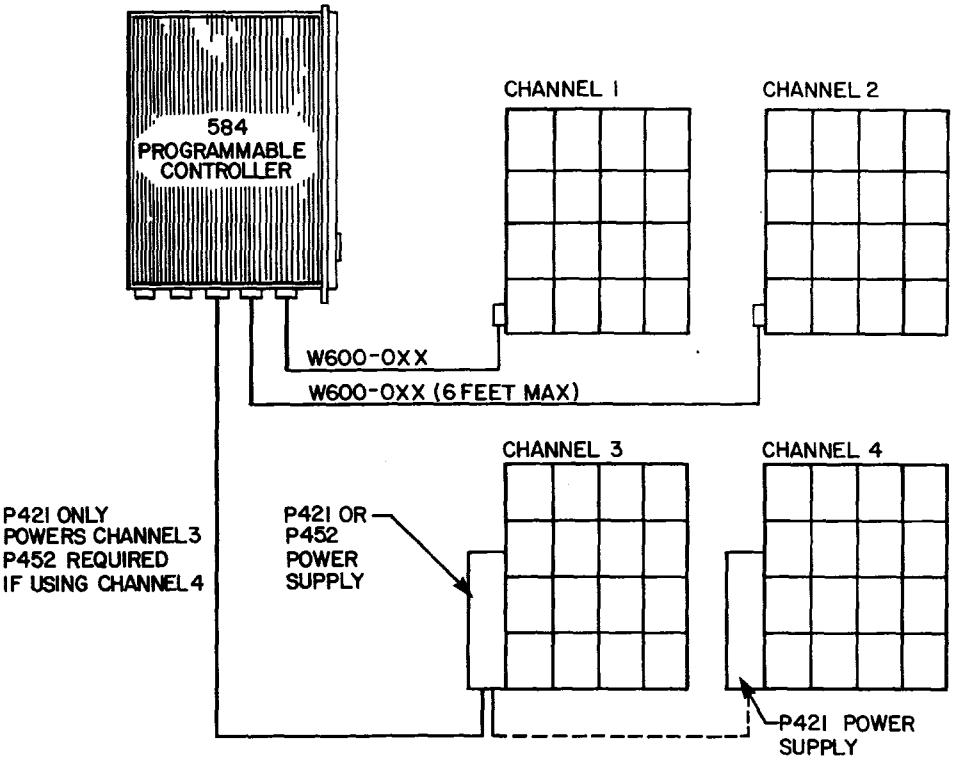

Figure 3-2. 584L Local I/O Configuration

3.2 THE 584L PROGRAMMABLE CONTROLLER

The 584L Programmable Controller is housed within one unit. This greatly simplifies the task of installation, as well as configuring the 584L system.

The 584L PC can be mounted directly onto a back panel, a vertical supporting member, or a 19 inch rack. For proper ventilation, the unit should be installed vertically. This ensures that the heavy-duty housing fins are exposed to permit proper heat flow. Keyholes are located on the top and bottom of the unit to aid with installation.

Table 3-1. 584L Instruction Set Summary

Instruction Set	Discretes/Registers	Capabilities
(Level 1)	2048/1920	Super scan, 16-bit. Basic + Enhanced Instruction set.
Enhanced (Level 2)	8192/9999	Super scan, 24-bit. Basic + Enhanced + PID, etc.

The controller's power supply is removable and contained within the unit's right chamber. System operation will not stop when the cover door on the controller is swung open. However, the system will shut-down when the power supply or any other internal component is disconnected. If this occurs, proper power-down for the system will not be performed.

Section 4 of this manual provides a complete description for installing the 584L Programmable Controller.

NOTE

The controller's memory is not affected by a power failure if the back-up batteries are properly installed and functioning. The batteries can support the controller's memory for up to thirty days. The batteries are not rechargable and have a shelf-life of five years.

An LED and numerical display, numerical keypad, key lock, and Modbus communications connector are located on the controller's front panel. The numerical display is used to display maintenance information and, in conjunction with the keyboard, the status of discretes, register content, and system data. The three LED's, when energized, indicate adequate battery voltage (BATTERY OK), adequate power (DC POWER), and proper operation of the processor (RUN). These indicators are shown in Figure 3-3.

NOTE

AC power must be applied to the controller for the LED indicators to function. If the BATTERY OK LED is OFF, the battery voltage is low. Replace the batteries at this time.

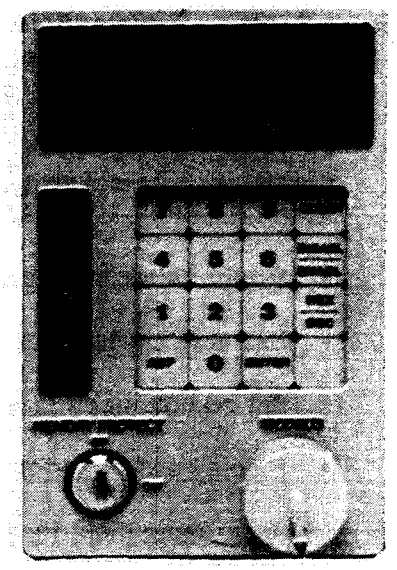

Figure 3-3. 584L Register Access Panel

Table 3-2 summarizes the range of AC power over which the 584L Controller can operate. Voltage sensing circuitry is provided in the power supply to detect out-of-tolerance line voltages. If AC power is not within proper specifications the processor will stop operating, forcing all outputs to the OFF condition and turning the RUN light OFF. Operation will be automatically restored when AC power is within tolerance. There will usually be a delay in restoring processor operation while the processor runs its power-up sequence, which includes time to perform diagnostics after AC and DC power return to operating voltages. This delay is approximately 3 seconds.

Table 3-2. 584L AC Power Requirements

Normal Voltage (Jumper Selectable)	115 V RMS ± 15% or 220 V RMS ± 15%
Transient Voltage 10 ms (max)	115 V RMS ± 30% or 220 V RMS ± 30%
17 ms (max)	115 V RMS ± 100% or 220 V RMS ± 100%
Line Spikes	1000 V RMS (max) - 500 microseconds duration, 0.5% (max) duty cycle
Frequency	47-63 Hz
Normal Load	100 Volt amps (min) 450 Volt amps (max)

Load is dependent upon I/O, memory, and peripheral device requirements.

3.2.1 Register Access Panel — Register/Reference Configuration

The controller's Register Access Panel (RAP) provides a unique operator interface that permits basic system maintenance without the use of a programming device. The panel, displayed in Figure 2-3, provides immediate access to selected registers within the controller's memory. If the memory protect switch is OFF and system parameters permit, changes to the register's contents can be made. Functions of the panel include:

- Monitor/alter the status of inputs and outputs.
- Examine contents of registers.
- Set communication parameters (Modbus).
- Display system error messages.

In these capacities, the panel becomes an extremely powerful, top-level diagnostic tool.

3.2.1.1 Examine Registers

Input registers are 30XXX Series; holding registers are 4XXXX Series. Examine an input or holding register in the following manner:

1. Press CLEAR to remove any previous operation currently displayed.
2. Enter the register's number from the keypad. The number is displayed.
3. Press REF. The panel now displays the value contained in the register.
4. To display the value in hexadecimal notation, press HEX/DEC. Pressing the key a second time converts the value back to decimal notation.
5. Press REF to examine the contents of the next sequential register. For example, if the current register is 40121, the next register is 40122.

NOTE

The maximum decimal value for any register is 65,535.

3.2.1.2 Alter Holding Registers

Alter the contents of a holding register as follows:

1) Press CLEAR.
2) Enter the register's reference number.
3) Press REF. The register's value is displayed.
4) Ensure that memory protect is OFF.
5) Enter the new decimal value from the keypad.

6) Press ENTER.

7) Press REF to display the contents of the next register.

NOTE

The register's decimal value can only be changed to a maximum of 9999. The value of the register is still under the control of any programmed logic within the processor.

3.2.1.3 Examine Discrete References

Discrete references include both coils and inputs. Coils are notated as 0XXXX, inputs as 1XXXX. Examine a discrete reference as follows:

1) Press CLEAR.

2) Enter the reference number from the keypad.

3) Press REF. The display changes to show the status of the reference. E indicates enabled, D indicates disabled. The remaining five digits display the state of the reference for the most recent five scans (1 = ON, 0 = OFF). The most recent scan appears closest to the E or D character.

4. Press REF to display the status of the next sequential reference.

NOTE

Signals of extremely short duration may not be apparent. The panel is a real-time display, updated every scan.

3.2.1.4 Alter Discrete References

Change a discrete reference as follows:

1. Press CLEAR.

2. Enter the reference number from the key pad.

3. Press REF

NOTE

Memory protect must be OFF to change the status of any reference.

4. Press DISABL/ENABL. This will change the reference to opposite state, e.g. enabled to disabled.

NOTE

An enabled coil reference assumes the state (ON or OFF) that is determined by the controller's logic; an enabled input reference assumes the state determined by the I/O configuration. Both references, when disabled, will hold their previous state.

5. A disabled reference can be forced ON or OFF by a one or zero. Press a 1 or 0, then press ENTER.

6. Press REF to display the status of the next sequential reference.

3.2.1.5 Display Modbus Parameters

Modbus parameters for the 584L PC are displayed in the following manner:

1) Press CLEAR

2) Enter the digit 6, followed by the port number (1 or 2), three zeros, and one of six display codes:

Code	Parameter
1	Device Address
2	Baud Rate
3	Parity/No Parity
4	Parity Type (ODD/EVEN)
5	Number of Stop Bits
6	Communication Mode

3) Press REF. The first Modbus parameter is displayed. Continue to press REF to display succeeding parameters.

NOTE

The displays are interpreted based upon the code selected. The device address (1 to 247), baud rate (134 = 134.5 baud), and number of stop bits (1 or 2) are decimal displays. The parity is a single character, E = Parity Enabled (parity is desired) or D = Parity Disabled (parity is not desired). The parity type will show which parity has been selected; EEEEEE = even and 000000 = odd. If no parity is desired, an error code appears if the parity type is requested. The communications mode is displayed as bbbbb = RTU or 0A5C11 = ASCII.

3.2.1.6 Change Modbus Parameters

Modbus parameters are changed for the 584L PC as follows:

1) Display the parameter to be changed (as described in section 3.2.1.5).

NOTE

Memory protect must be OFF to change any Modbus parameter.

2) To change the device address or baud rate:

- Key the new value from the key pad.
- Press ENTER. The new value will only be entered for the port originally selected.

The device address can range from 1 to 247. Baud rates can include the following (134.5 is entered as 134):

50	150	1800	4800
75	300	2000	7200
110	600	2400	9600
134.5	1200	3600	19200

3) To change parity/no parity, parity type, number of stop bits, or communication mode, press ENTER. No numerical value need be entered. Whenever ENTER is pressed, the parameter will change to its opposite state:

Parameter	State
Parity	Parity/No Parity
Parity Type	Even/Odd
Stop Bits	One/Two
Communication Mode	RTU/ASCII

Table 3-3. Modbus Parameters

FRONT PANEL (Port 2):

Enter	Result
620001, REF	584L Port 2 ID #
620002, REF	584L Port 2 Baud Rate
620003, REF	584L Port 2 Parity Enabled (00000E) or Disabled (00000d)
620004, REF	584L Port 2 Parity Even (EEEEEE) or Odd (000000)
620005, REF	584L Port 2 Number of Stop Bits (1 or 2)
620006, REF	584L Port 2 RTU (bbbbbb) or ASCII (ASCII)

Table 3-3. Modbus Parameters (cont.)

4TH PORT ON BOTTOM (PORT 1):

Enter	Result
610001, REF	584L Port 1 ID #
610002, REF	584L Port 1 Baud Rate
610003, REF	584L Port 1 Parity Enabled (00000E) or Disabled (00000d)
610004, REF	584L Port 1 Parity Even (EEEEEE) or Odd (000000)
610005, REF	584L Port 1 Number of Stop Bits (1 or 2)
610006, REF	584L Port 1 RTU (bbbbbb) or ASCII (ASCII)

TO CHANGE A VALUE:

Parameter	Enter
ID #	Desired ID #, ENTER
Baud Rate	Desired Baud Rate, ENTER
Parity Yes/No	Press ENTER
Parity Even/Odd	Press ENTER
Stop Bits	Press ENTER
RTU or ASCII	Press ENTER

3.2.1.7 Error and Dim Awareness Codes

The 584L's register access panel also displays a series of codes which are useful for routine maintenance and system diagnostics. These consist of both dim awareness and error codes. Dim awareness codes display the state of the 584L PC upon power-up prior to configuration, or, if an error should occur, while the 584L is cycling. Error codes indicate that information has not been correctly entered from the key pad. Dim awareness codes are listed in Table 3-4 and error codes listed in Table 3-5.

Table 3-4. Dim Awareness Codes

Code	Description
000584	584L is running error free
SAFE84 (dEAd84)	Straight from the shipping box — configuration table has not been entered.
dEAd05	Executive checksum failure. The integrity of the executive PROM's on the I/OP board can no longer be guaranteed. The I/OP board should be replaced.

Table 3-4. Dim Awareness Codes (cont.)

Code	Description
dEAd10	Failure of the system memory board. The executive cannot detect any page "0" memory. Most probable cause is loose bus cables.
dEAd20	Executive cannot detect any RAM or scratch pad memory. The problem could be the I/OP board, but it is most likely loose bus cables.
dEAd30	The problem is most likely to be the CPU board. There is also a low probability of an I/OP board failure and a very low probability of a memory board failure.
dEAd40	An illegal minicode instruction; a possible error in a loadable software module.
dEAd50	Peripheral port parameters were improperly modified while the 584L was active.

When a DIM awareness code is displayed peripheral port access reverts (by-default) to the following:

1200 Baud; Device Addr "1"; Parity Enabled; Parity Even; One Stop Bit; RTU Mode

Table 3-5. RAP Error Codes

Code	Description
EEE001	Function not allowed. Press CLEAR, then press REF.
EEE002	Bad sub-function field. Press CLEAR, then press REF.
EEE003	Reference out of range. Press CLEAR, then press REF.
EEE004	Invalid data for entry. Press CLEAR to recall display.
EEE005	Coil not disabled. Press CLEAR to recall display.

Table 3-5. RAP Error Codes (cont.)

Code	Description
EEE006	Entry prohibited by definition of function. Press CLEAR to recall display.
EEE007	Memory protect ON. Press CLEAR to recall display.
EEE008	Attempting to disable a register. Press CLEAR to recall display.

3.3 INPUT/OUTPUT SYSTEM

A major portion of the 584L programmable control system consists of the controller's input and output configuration. With use of the appropriate I/O modules, the 584L can process a variety of inputs and outputs for the user's control application.

The controller itself can support up to four local channels of I/O. If more than four channels are needed for the application, an I/O expander is required. The J200 Expander is capable of driving an additional twenty-eight channels of I/O, increasing the I/O capacity to a total of thirty-two channels. With the expander, a channel of I/O can be distributed up to 15,000 feet from the controller. The twenty-eight I/O channels can be placed in up to fourteen locations with a maximum of two complete channels at each location. The 584L PC offers a choice of four local channels and 28 remote channels or all 32 remote channels. If the J211 Redundancy system is on, only 28 remote channels are allowed.

A channel of I/O contains up to 128 input points and 128 output points. Fewer I/O points can be installed if required. There are no requirements to completely fill one channel before installing another.

3.3.1 200 Series I/O

The 200 Series I/O modules transmit a total of sixteen input or sixteen output signals per module. A module can only send an input or an output signal. Mixing input or output signals within a module is not possible. Discrete modules send signals up to four BCD digits (maximum value of 9999). Analog modules are capable of twelve bit binary signals (maximum value of 4095). A standard 200 Series I/O module is shown in Figure 3-4.

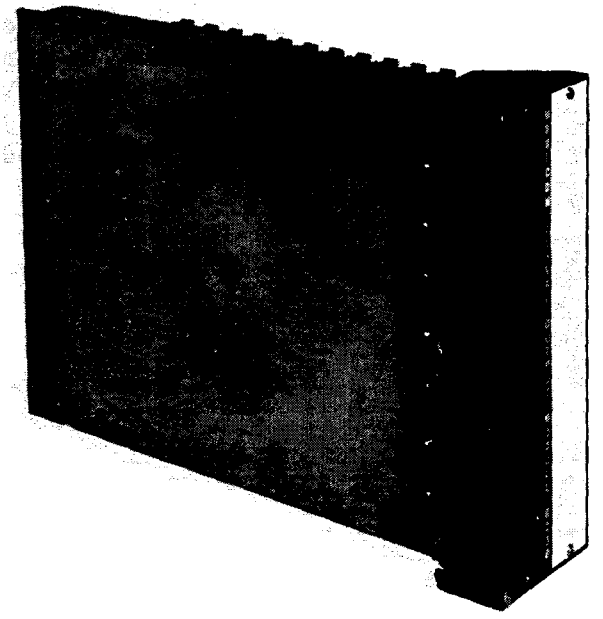

Figure 3-4. 200 Series I/O Module

3.3.1.1 I/O Housings

The 200 Series modules are installed into I/O housings. These housings include:

B240 — Holds four modules per housing
B241 — Holds two modules per housing
B242 — Holds intrinsic safe modules
(see Section 3.3.2.3)

Connecting four B240 housings together forms a complete channel of I/O. Recall that a single channel consists of 128 inputs and 128 outputs — eight input and eight output 200 Series modules. Since each channel is connected separately to the controller, only those I/O modules required in each channel need to be installed.

NOTE

Normally the first I/O housing connects directly to a W600 cable or a P4XX AUXILIARY POWER SUPPLY, and each additional housing then connects to the right side of the first housing. If, due to cabinet space problems, the power supply and four I/O housings cannot fit in one bay of the cabinet, two special cables are available to extend out the I/O bus. First a W608-004 (4 foot cable) is available to allow an approximately 3 foot gap to be placed between two B240 Housings. (Only 1 W608 per I/O channel.) In addition, a W609-006 cable is available to allow an approximately 5 foot gap to be placed between a P4XX Aux power supply and the first B240 housing. (Only 1 W609-006 per I/O channel.) A W608 and a W609 should not be used on the same I/O channel.

Modicon cables are used to connect each local I/O channel to the controller. The cables are heavy duty and double-shielded and are available in the lengths listed in Table 3-6. Cables provided for connections to an auxiliary power supply are permanently attached; cables for connection to the remote drivers must be ordered separately.

Table 3-6. 200 Series I/O Cable Options (584L PC to Channels I and II)

Local	From Auxiliary Power Supply	From Remote Driver
W600-003	W602-012	W604-006
W600-006	W602-025	W604-009
W600-009	W602-050	W604-012
	W602-075	

NOTE

All W6XX cables are thick and semi-rigid. They require a 6 inches to complete a 90 degree bend. Thus useable cable length is generally 1 foot less than the specified length.

Last three digits in cable number indicate cable length in feet, except W600-003 which is 30 inches long.

Within a 200 Series I/O channel (four B240 housings or an intermixing of B240's and B241's), I/O modules can be placed in any physical configuration desired. At the rear of each I/O housing are index pins, one pin set per module. This pin is displayed in Figure 3-5. Prior to installing the module, the pin must be set to indicate which of eight input or eight output modules are being placed in that location. The identification as to input or output is automatically accomplished by the module itself. Thus, there can be two modules with the same index pin position, one input and one output.

Since the specific input or output identification is not established by physical placement of the module, any convenient physical arrangement of I/O modules in a channel is possible. I/O can be placed with all inputs on the top and all outputs on the bottom, or all inputs on the left and all outputs on the right. Both options can also be alternated if desired.

I/O modules which utilize numerical values instead of discrete signals occupy more than one index pin location. If only register modules are installed, a complete channel is used up by two register modules. For example, if a register I/O module is placed in a channel and indexed to position one, adjacent physical locations in the housing can be used for any module type; the only caution is to limit the use of the index pin locations values two, three, or four. Index pin utilization for the 200 Series register I/O is listed in Table 3-7.

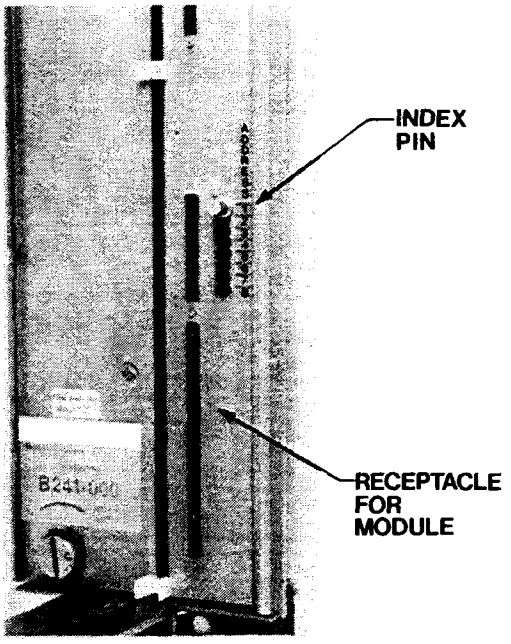

Figure 3-5. I/O Housing Address Index Pin

Module	Type	Quantity Input	Used Output	Must be Assigned to
B239	Dual Hi-Speed Counter (I/O)	2	2	Odd Pins
B243	Analog Input	4	0	1 or 5
B258	Analog Multiplexer	0	1	Any
B260	Analog Voltage Output	0	4	1 or 5
B262	Analog Current Output	0	4	1 or 5

Each I/O housing has on its lower left side a male printed-circuit connector and on its lower right a female receptacle. The male connector is normally retracted within the housing and is extended by rotating a cam driven by a large screw on the lower section of the backplane. Rotating this screw 180 degrees clockwise extends the male connector; rotating it 180 degrees counterclockwise retracts the male connector. The connector is used to connect the housing to either a cable to the mainframe, an auxiliary power supply, or another housing.

When delivered, each housing has its male and female connectors, as well as its module backplane connectors, covered by a protective tape. This tape must be removed prior to the connector's use. However, if the connector is not to be used (no module inserted or last housing in channel), the tape should remain in place to ensure noise shielding and protect against entry of foreign matter.

Field wiring, shown in Figure 3-6, can be installed on the I/O housing either before or after installation of the modules. However, the address index pin must be positioned prior to module insertion. It is also recommended that the field wiring be fitted prior to module installation.

Special AC I/O modules can be isolated since separate pairs of field terminals are provided for each circuit. These modules require no special isolation from environmental conditions, such as electrical noise.

Color-coded adhesive strips are available to identify the 21 field-wiring terminals opposite each I/O module, terminal 1 (top) to 21 (bottom). These strips are color-coded to match the color code of the module. This aids in preventing a module from being installed in a location not properly wired for that module type. These strips are available for each I/O module and are installed by the user in accordance with his particular input/output configuration. Also provided with each module is a white plastic plate so that the user can add his/her individual identification for each I/O circuit. The plate is reversible; both sides can be engraved. Installation instructions for the 200 Series I/O are provided in Section 4 of this manual.

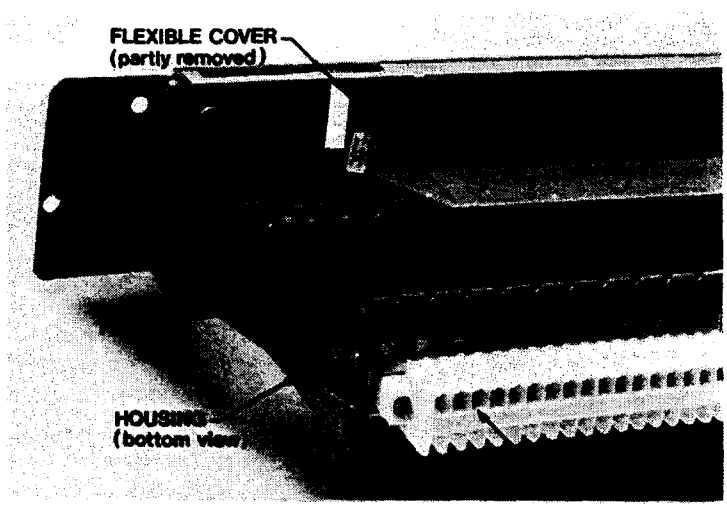

Figure 3-6. I/O Field Wiring Location

3.3.1.2 Units of Load

Table 3-8 lists PMS color codes and units of load for each of the 200 Series I/O modules. A 200 Series load can be calculated as follows:

300 mA x (No. of unit loads) = total current load

A complete I/O channel consists of eight input modules, one unit of load per input module, and eight output modules, two units of load per output module. This equates to a total load of twenty-four units. The controller's main power supply can drive two complete I/O channels, Channel I and Channel II. An auxiliary power supply must be used for each subsequent I/O channel. The main power supply can deliver a maximum of twenty-seven units of load each to Channels I and II, for a total of fifty-four units of load.

Table 3-8. 200 Series I/O PMS Codes and Units of Load/Module

Module	Type	PMS* Code	Color	Load (Per Module)
B224	24 VDC True High Output	—	—	2 Units
B225	24 VDC True High Input	—	—	1 Unit
**B230	115 VAC Output	199	Red	.85 Unit
**B231	115 VAC Input	197	Pink	.50 Unit
**B232	24 VDC True Low Output	286	Dark Blue	.85 Unit
**B233	24 VDC True High Input	284	Light Blue	.50 Unit
**B234	220 VAC Output	151	Orange	.85 Unit
**B235	220 VAC Input	149	Melon	.50 Unit
**B236	5V TTL Output	259	Violet	.85 Unit
**B237	5V TTL Input	264	Blue	.50 Unit
B238	24 VDC True Low Output, 2.5A	354	Green	2 Units
B239	Dual Hi-Speed Counter	515	Blue	3 Units
B243	Analog Input	109	Yellow	2 Units
B244	220 VAC Output, Isolated	465	Brown	2 Unit
B245	220 VAC Input, Isolated	465	Light Brown	1 Unit
**B246	115 VAC Output, Isolated	233	Rhodamine Red	.85 Unit
**B247	115 VAC Input, Isolated	231	Red	1 Unit
**B248	10-60 VDC Output	347	Green	.85 Unit
B258	Analog MUX	101	Yellow	2 Units
B260	Analog Output (Voltage)	380	Light Green	2 Units
B262	Analog Output (4-20 ma)	382 382	Green Green	2 Units 2 Units
**B266	Reed Relay Output 115 VAC	298	Silver Blue	.85 Unit
B268	220 VAC Reed Relay Output	—	—	2 Units
B270	48 VAC Outputs	207	Dark Red	2 Units
B271	48 VAC Inputs	204	Dark Rubine Red	1 Unit

Table 3-8. 200 Series I/O PMS Codes and Units of Load/Module (cont)

Module	Type	PMS* Code	Color	Load (Per Module)
B273	Intrinsically Safe 12 VDC Input	—	—	1 Unit
B274	115 VAC Reed Relay Output, Normally Closed	—	—	2 Units
**B275	10-60 VDC Input	314	Blue	.50 Unit
B276	220 VAC Reed Relay Output, Normally Closed	—	—	2 Units
B278	24 VAC Output	—	—	2 Units
B279	24 VAC Input	—	—	1 Unit
B285	10-60 VDC Fast Response True Low Input	—	—	1 Unit
J340	I/O Communicator	—	—	1 Unit
J342	I/O Comm. with Switchover	—	—	2 Units
J540	500 Series Adapter	—	—	3 Units
J540/ B5XX	Adapter with one I/O Channel	—	—	13 Units
I425	Remote Driver	—	—	5 Units

*Pantone Matching System
**The power consumption shown for these modules is for the latest revision level that uses the LSI microcircuits.

NOTE

When using the B273 intrinsically safe 12 VDC input module, an intrinsically safe I/O housing must be used. The B242-004 I/O housing can hold up to four B273 I/O modules. No other type of I/O module can be inserted into the B242 I/O housing.

3.3.1.3 Indicator Lights

An active light on each module indicates when communication occurs between the controller and module. This indicator is extremely valuable in troubleshooting the I/O system. Additionally, each input and output circuit has an indicator that displays the status of field terminal voltage. The indicator can be used to test the interface between the controller and external field devices.

NOTE

Input circuit status indicators will operate without power and communications. They depend only upon field voltage. AC output modules also have indicators which are energized if an output fuse should fail.

Fuses used on modules which accommodate field replacement are listed in Table 3-9. To replace a fuse, remove the module from its housing. Access to the fuse is provided by an opening approximately 1 inch x 5 inches) on the terminal side of the module. All the fuses are oriented in accordance with the output terminals such that the top fuse is for the No. 1 output and the bottom fuse is for the No. 16 output; except for the B238, whose top fuse is for the common indicator supply, and the B244 and B246, whose orientation is shown in Figure 3-7.

Table 3-9. 200 Series Fuse Requirements

Module	Standard Size Pico Fuse	Part No. or Equivalent	Quantity per Module
B230	5 amps	275-005	16
B232	7 amps	275-007	1
B234	5 amps	275-005	16
B236	2 amps	275-002	1
B238*	3 amps	275-003	17
B243	1/4 amp	275-250	8
B244*	7 amps	275-007	8
	1/4 amp	275-250	1
B246*	7 amps	275-007	8
	1/4 amp	275-250	1
B248	3 amps	275-003	16
B258	1/2 amp	276-500	1
B266	3 amps	212-003	8
B270	5 amps	275-005	16

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

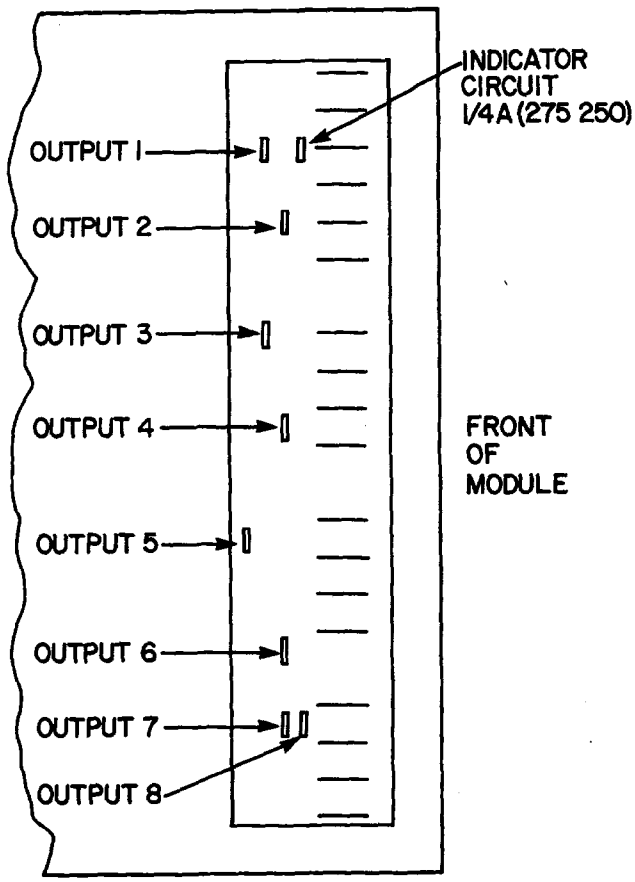

Figure 3-7. B244 and B246 Fuse Location

3.3.2 500 Series I/O System

The 500 Series I/O accommodates four discrete circuits per module. A module is either all input or all output; a mix of input and output signals within one module is not possible. A typical 500 Series module is shown in Figure 3-8.

3.3.2.1 I/O Housings

The 500 Series modules are installed into a B545 or B546 I/O housing. The B545 housing fits up to eight modules. The housings are normally connected to configure a complete channel of I/O, 128 inputs and 128 outputs. One channel contains thirty-two input modules and thirty-two output modules. A J540 adapter is used to interface the 500 Series I/O with the 584L Controller. The J540 is required for each standard 200 Series I/O channel.

Since 128 inputs can be supplied by 32 input modules and 128 outputs by 32 output modules, a complete channel of 500 Series I/O consists of 64 modules. The I/O housings are connected across their tops via a metallic duct. Further information with regard to installing the 500 Series I/O system is provided in Section 4.0 of this manual.

Address assignments for the I/O system are made at each housing, 32 I/O points per housing within each channel. At the top of each housing is a set of four switches (see Figure 3-9). One switch is closed (moved towards field terminals) to select the address. Each I/O housing can have an address assignment from one to four; the address does NOT depend upon physical position, but by the position of these switches.

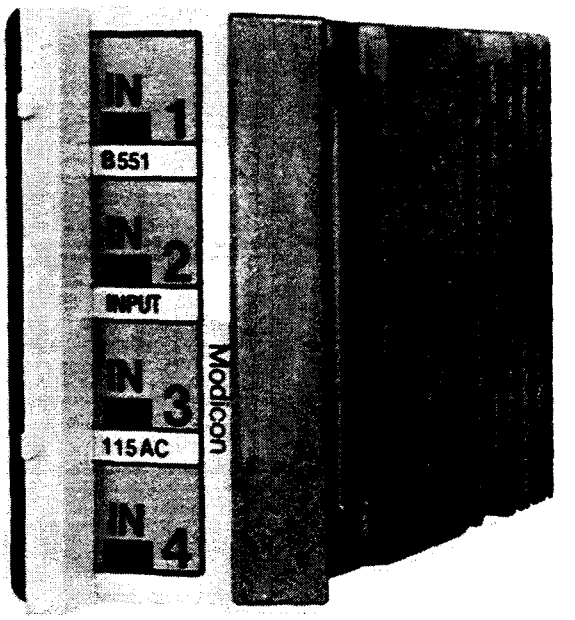

Figure 3-8. 500 Series I/O Module

Within a housing, the eight modules (four input or four output points per module) can be of any type (input or output). Since there are a maximum of eight housings and only four address positions, two housings can have the same address. Any two housings with the same address must have I/O configurations which are the exact opposites of each other; thus, the top module must be an input in one housing and an output in the other. The same is true of every module position in the housing pair.

NOTE

If two output modules are in the same position of identically addressed housings, both modules will be the same state, either ON or OFF. When two input modules have the same address, the inputs will be OFF only if both inputs are OFF.

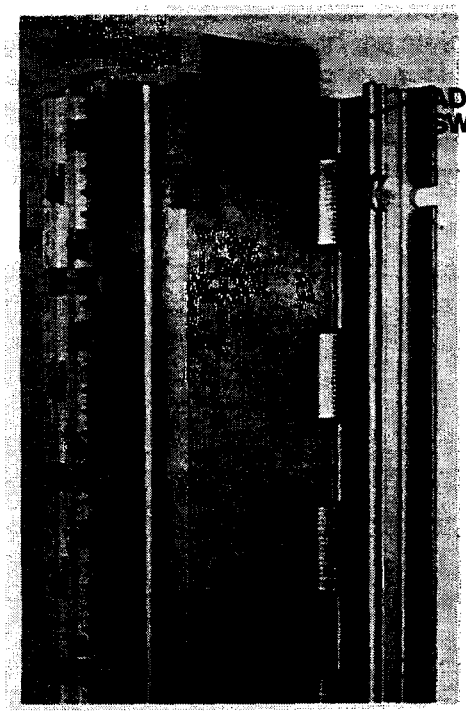

Figure 3-9. 500 Series I/O Housing Address Switch

Each I/O housing has a four position address switch which addresses the housing as strip one through strip four. Since an I/O channel consists of 128 inputs/128 outputs, up to eight housings (each with eight I/O modules) are required to hold the modules. Since only four addresses are available, each address is used twice. Thus, two housings are addressed as strip 1. The two housings should contain an exact complement of inputs and outputs at each module location. If the first location in the first housing addressed as strip 1 contains an input module, then the second housing addressed as strip 1 should contain an output module.

For example, if the first housing addressed as strip 1 contained the following eight I/O modules (I = Input, 0 = Output):

I,I,0,0,0,I,0,0

Then the second housing addressed as strip 1 should contain its modules in the following order:

0,0,I,I,I,0,I,I

NOTE

It is good practice to use the strip select switches sequentially, filling strip 1 before starting strip 2. Both housings addressed as strip 1 should also be placed next to each other. (Housings addressed as strips 2, 3, and 4 should also be adjacent.) This procedure will eliminate confusion during system maintenance and check-out.

In addition to the STRIP SELECT switches, the half-size B546 I/O housing contains two additional sets labeled UPPER BYTE SELECT and LOWER BYTE SELECT. These switches select, respectively, the upper and lower references for each pair of modules attached to the housing. Four DIP switches are contained in each set.

To establish the modules' upper and lower references, one DIP switch is positioned towards the field wiring terminals. For example, the UPPER BYTE SELECT switch number one selects modules one and two, the next switch selects modules three and four, etc., concluding with switch number four which selects modules seven and eight. The LOWER BYTE SELECT switches function in the same manner.

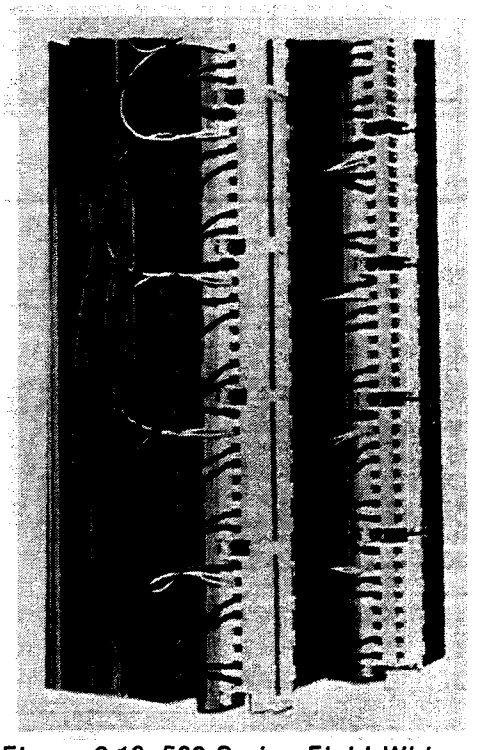

Figure 3-10. 500 Series Field Wiring

Field wiring, can be connected either before or after the I/O modules are installed. However, for user convenience, it is recommended that the wiring be installed prior to inserting the modules. The I/O housing address can be readjusted at any time the I/O modules are inserted or removed. To set the housing address, the top I/O module must be removed.

Color-coded adhesive strips are available to identify the field wiring terminals opposite each I/O module, terminal one (top) to eight (bottom). This aids in preventing a module from being installed in a location not properly wired for the module type. Strips are available for each I/O module. Color codes for the 500 Series modules are listed in Table 3-8.

3.3.2.2 Units of Load

All 500 Series modules require DC power to function with the 584L Controller. This power is supplied either from the controller's power supply or from an auxiliary power supply. The modules can only receive their power from one source.

Table 3-10 summarizes the load each discrete I/O module places upon its power source. Loads for the 500 Series modules are listed in terms of 200 Series loads. Total current load is determined by the following equation:

300 mA x No. of unit loads = total current load

Each auxiliary power supply can drive twenty-seven units of load. Units of load are convenient measures of load designed for easy computations.

Table 3-10. 500 Series I/O Module PMS Codes and Units of Load/Module

Module	Type	PMS* Code	Color	Load (Per Module)
B531	Latched Input True Low	—	—	.06
B550	115 VAC Output	199	Red	.23
B551	115 VAC Input	197	Pink	.06
B552	DC True High Output	286	Dark Blue	.23
B553	DC True High Input	284	Light Blue	.06
B554	220 VAC Output	151	Orange	.23
B555	220 VAC Input	149	Melon	.06
B556	5V TTL Output	259	Violet	.23
B557	5V TTL Input	264	Light Purple	.06
B558	DC True Low Output	314	Turquoise	.23
B559	DC True Low Input	311	Blue	.06
B560	120 VDC Output	307	Blue	.35
B561	120 VDC Input	305	Blue	.06
B562	DC Clamped Output			.23
B564	24/48 VAC Output			.23
B565	24 VAC Input			.06
B569	48 VAC Input Module	—	—	.06
B581	5 VDC Encoder Input Module	—	—	.06
B583	Intrinsically Safe Proximity Switch	—	—	.06
B592	Reed Relay, Normally Open	—	—	.23
B596	Reed Relay Normally Closed	—	—	.23

*Pantone Matching System

More than eight discrete I/O housings can be utilized on any channel as long as the modules do not overload the power supply and there are not more than four different B545 I/O housing addresses.

3.3.2.3 Intrinsic Safe Modules

The 500 Series I/O includes an intrinsically safe input module. Intrinsically safe I/O modules are enhanced by a special circuit design which allows the modules to function in the most hazardous industrial conditions. These modules require special I/O housings, Model B543/B544, which prevent installation of non-intrinsic safe modules. Otherwise, these housings are identical to B545 and B546 housings. Each circuit (both input and output) also has an indicator that displays the state of the field terminal voltage. The indicators can be used to troubleshoot the interfaces between the controller and external field devices. These indicators are displayed in Figure 3-11.

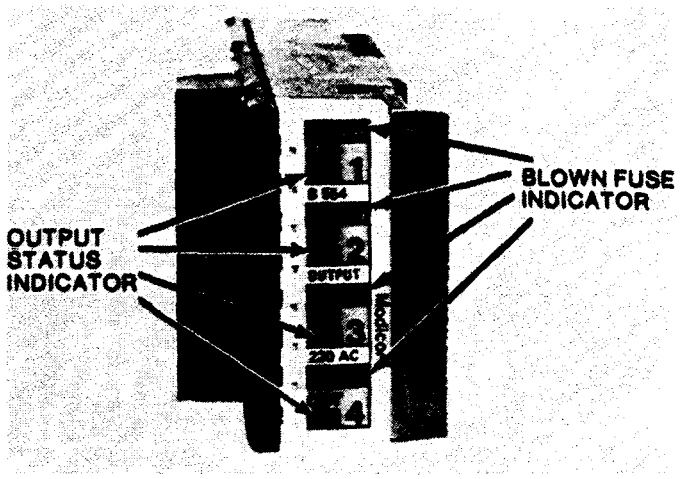

Figure 3-11. 500 Series I/O Indicator Lights

3.3.2.4 J540 Adapter

The J540 Adapter allows the 500 Series discrete I/O to be interfaced with any I/O channel of the 584L Controller. One adapter is required per channel increasing capacity by 128 input points and 128 output points. The 500 Series I/O provide these I/O points in groups of four in lieu of the 200 Series which provide I/O points in groups of sixteen.

The J540 Adapter can be interfaced to the 584L Controller by using:

- W600 Cable, from 584L Local I/O or a P451/P453 to a J540.
- Auxiliary Power Supply (P42l, P451, P452 or P453) direct connect to a J540.
- B240 I/O Housing containing 200 Series I/O, direct connect to a J540.
- B240 I/O Housing via a W608 cable to a J540.

Four indicators and two sets of switches are located on the front of the J540 adapter. These indicators are:

POWER	—ON if DC power is applied.
RUN	—ON if the adapter is scanned by the 584L at least once every 200 ms.
ERROR	—ON if I/O communication has been detected and cannot be corrected by error checking.
TEST	—ON if in test mode (utilized by Modicon service technicians only).

The switches on the panel enable the 500 Series I/O to provide information normally obtained from the 200 Series address index pin in that channel. Two sets of switches are provided, one for inputs and the other for outputs. However, if a channel has a mix of 200 and 500 Series I/O, they can be used to lock-out the 500 Series from those index pins whose information is being used by the 200 Series I/O. Correlation between index pin location and 500 Series I/O is as follows:

Channel		500 Series I/O Module Location
Index Pin	Housing	Top/Bottom Four Modules
1	1	Top
2	1	Bottom
3	2	Top
4	2	Bottom
5	3	Top
6	3	Bottom
7	4	Top
8	4	Bottom

Only discrete I/O modules such as modules B550-B563 can be interfaced to this adapter; register devices such as MUX's (B570/B571), analog (B572-574), high speed counter (B579), and stepping motor control (B575) cannot be used. The B531, B581 and B583 modules which look like register modules, but are special discrete I/O modules (installed in register I/O housings like the B547 and B548) can be used.

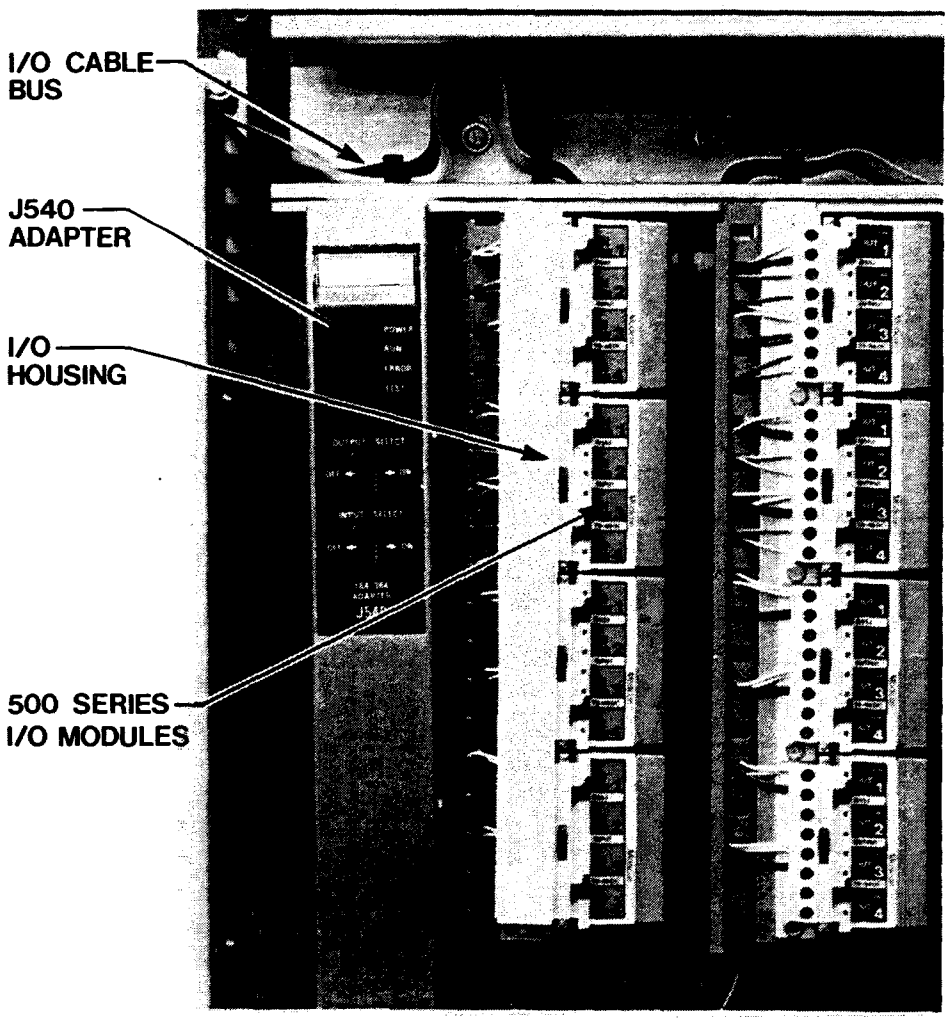

Figure 3-12. J540 Adapter with 500 Series I/O

3.3.2.5 Fuse Requirements

All AC/DC output modules, except the B556 (5 V TTL) are fused with field replaceable fuses and fitted with a blown fuse indicator. The blown fuse indicator is viewed from the front of the module as shown in Figure 3-11. One blown fuse indicator is provided per circuit. To replace fuses, the module must be removed from the I/O housing.

NOTE

When a module is removed, all four circuits (input or output) will be disconnected.

All fuses are 3 AG, normal blow. The AC output modules utilize a 5 amp fuse size, and the DC output modules utilize a 3 amp size. Once the module is removed, fuses are easily removed from the module's left side.

3.3.3 Remote I/O

The 584L Programmable Control System can also accommodate remote I/O. Complete I/O channels, or portions of channels, can be located thousands of feet from the controller. The I/O modules communicate with the controller via a user supplied, single coaxial cable.

With remote I/O, modules can be placed adjacent to field devices. Each signal from the device is transmitted to the module. Signals are then combined and sent to the controller through a single channel connection. This communications scheme uses an industry proven, high security HDLC protocol.

Use of remote I/O can provide major savings on installation costs and can simplify maintenance. Extension of the 584L's I/O does not affect the controller's scan time, nor does it add more I/O than the controller allows per channel.

The discussion of remote I/O in this manual should be viewed as introductory. A complete description of remote I/O processing with the 584L can be found in the Modicon 584 Programmable Controller Remote I/O Processing Manual.

3.3.3.1 I425/I427 I/O Driver

The local I/O on a 584L, (channels 1 & 2), can be remotely located up to 2000 feet from the mainframe through the use of the I425 remote I/O driver. The I425 is connected via a cable (6 or 12 feet in length) to the channel 1 or channel 2 local I/O port. The I425 is then connected via Belden 8227 (or equivalent cable) twin conductor shielded cable (2 pair of wires) to a P421-431 remote auxiliary power supply. The twinax cable run can be up to 2000 feet. The I425 also allows the user to divide a channel into four locations. Each location must have a P421-431 remote auxiliary power supply, and each power supply can be located up to 2000 feet from the I425. The connection is made by having each power supply have its own pair of twin conductor cables between the power supply and the 584L.

NOTE

Subdividing a local I/O channel through the I425 does not allow more I/O to be addressed. The limit is still 128 inputs/128 outputs per I/O channel.

The I427 remote I/O driver works in the same manner as the I425 with two exceptions. First, it can only be used with one location (one I427 & one P421-431). Second, it will support runs of up to 5000 feet (4572.00 meters).

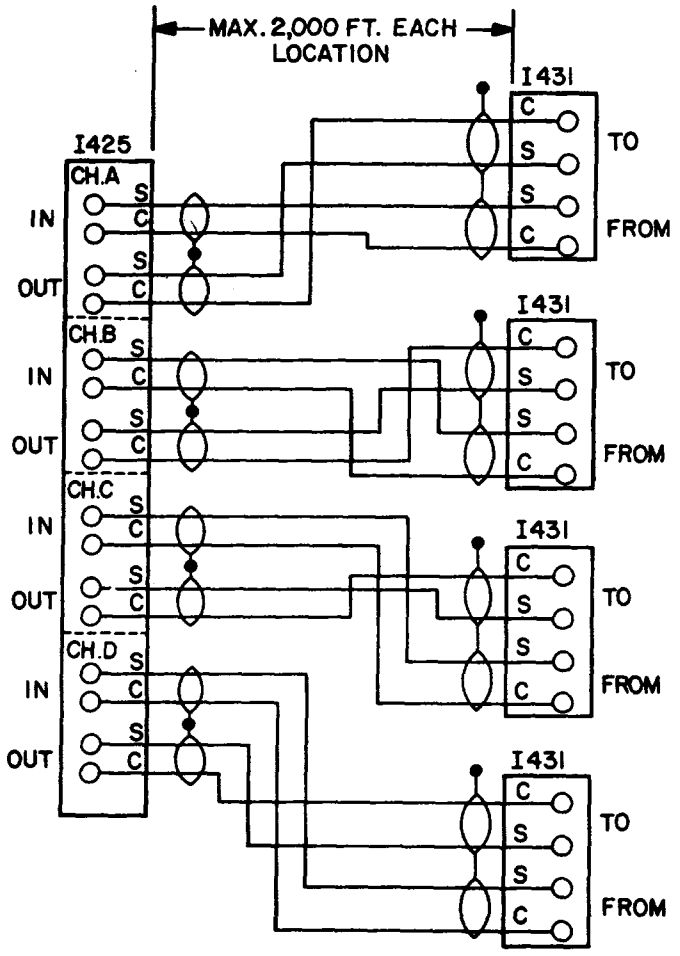

Figure 3-13. I425/I427 Driver I/O Wiring

3.3.3.2 J200 Expander

The J200 expander can support up to fourteen I/O locations each containing two channels of I/O. A single RG-6U, or CATV cable run is used to connect all I/O locations to the J200. The cable is configured as a multi-drop connection with taps used at each location. The maximum length of any tap is 100 feet; the total cable length should not exceed 5,000 feet for an RG-6U or 15,000 feet for CATV.

Four system status lights are located on the J200:

COMM ERROR	Flashes upon a communication error between the J200 and power supply.
RCVR ACTIVE	Flashes when receiving data.
XMTR ACTIVE	Flashes when transmitting data.
POWER OK	Lights upon receiving power from the controller.

There are no switches on the J200 expander. A receptacle for cable connection is located underneath the unit's front panel. The bottom rear connection comes with cable attached and a connector for attachment to the 584L Controller.

Configuration of a J200 and P451 or P453 Power Supply will normally require custom design for each installation. The following guidelines should be used in designing a cable run:

1) The maximum allowable dB loss between the J200 and any power supply is 35 dB.

2) The maximum allowable cable run is 15,000 feet (4572 meters), even if the dB loss is less than 35 dB.

3) Cable dB loss:

   CATV = 1.0 dB/1000 ft. (304.8 meters)
   RG-6U = 7.0 dB/1000 ft. (304.8 meters)

4) Connector dB loss:

TAP (MA-0185):	1 dB straight, through 12 dB down drop
SPLITTER (MA-0186):	3 dB from center to both sides

Figure 3-14 illustrates the connections for a typical J200 installation. The figure includes all the cables, connectors, and terminators which any installation might implement. Table 3-9 lists recommended parts and suppliers for cables and connectors.

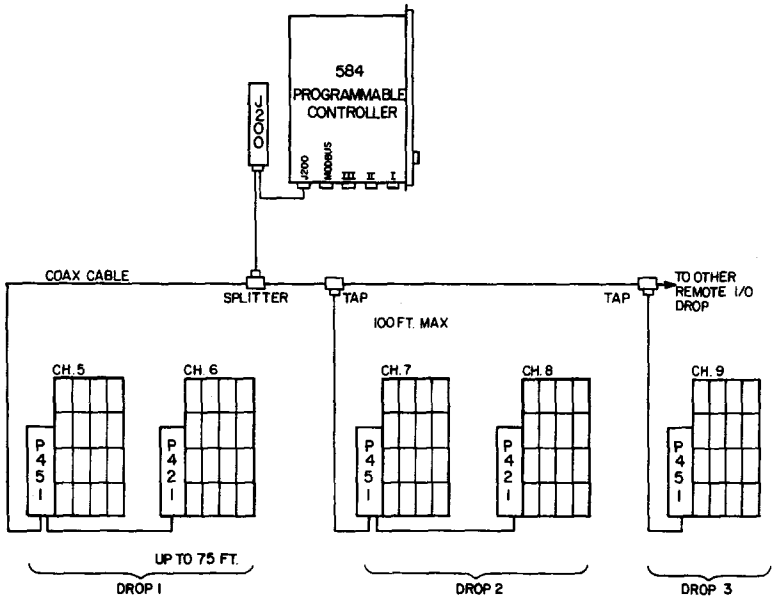

Figure 3-14. J200 Remote I/O Installation

Table 3-11. Connectors, Taps and Terminators for J200 Cable Run

1.	CATV CABLE A) Comm-Scope Co. Parameter III	Model No. P-3-75-500-JCA
	B) Times Co. Lumifoam III	Model No. JT-4500
2.	CAC-6 CABLE Belden	Model No. 9114
3.	CATV CABLE TO MALE F CONNECTOR Gilbert Engineering	Model No. GRS-500-AFM-DU03
4.	CABLE TERMINATOR — 75 Ohm Taco/Jerrold	Model No. TR-75F
5.	TAP Modicon	Part No. MA-0185-000
6.	SPLITTER Modicon	Part No. MA-0186-000
7.	TYPE F MALE CONNECTOR Taco/Jerrold	Model No. F56

The following example describes a sample dB loss calculation for two drops. A splitter is used at the J200 to create a branch in the system and allows the cable to be laid out in two directions. This minimizes the dB loss from the J200 to any P451 drop. An immediate 3 dB loss in both directions out of the tap is created. If the distance from the J200 to the splitter is 10 feet and from the splitter to the first tap on the left is 2000 feet, a sample dB loss calculation is as follows:

10 ft.	RG6/U cable	0.07
1	Splitter	3.00
2000 ft.	CATV cable	2.00
1	TAP	12.00
100 ft.	RG6/U cable	0.70
	TOTAL	17.77 dB

If the 2nd tap to the left is located 3000 feet from the first tap, the calculation is:

10 ft.	RG6/U cable	0.07
1	Splitter	3.00
2000 ft.	CATV cable	2.00
1	TAP	1.00
300 ft.	CATV	3.00
1	TAP	12.00
100 ft.	RG6/U cable	0.70
	TOTAL	21.77 dB

The left and right sides of the illustration in Figure 3-15 show either option for termination of the cable. The left side terminates at a P451 power supply which is connected to the I/O housings. The right side of the cable run ends with a terminator. The advantage of a terminator is the ease with which I/O can be extended by adding additional drops.

The configuration shown uses taps to make all the I/O drops. This adds twelve decibels in losses to each drop. As the cable run lengthens, the maximum 35 decibel loss permitted will limit the number of I/O drops. To avoid this problem, splitters may be substituted for taps. This incurs only a three decibel loss down the drop, but creates a disadvantage in contributing a three decibel loss through the splitter to the next drop. Use of splitters are typically placed in drops furthest from the controller.

CAUTION

Ensure that ground currents are not conducted along the system's cable run. The cable shield is grounded at the J200 expander upon installation. The user should be especially careful to prevent grounds which may occur at taps, connector supports, metal framework or other similar points (for example: mounting a tap or splitter directly to a metal enclosure).

3.3.3.3 Cable Routing Guidelines

Environmental considerations are important in cable routing. The following problems are some of the most frequent sources of cable damage and signal impairment.

Temperature: Cable attenuation (loss of signal) increases with temperature. Routing cable through areas with high temperatures and/or large deviations in temperature causes premature cable aging.

Moisture: Moisture can enter a cable through damaged insulation jackets and loose connectors. Water vapor can condense and migrate within the shield. Pollutants may be introduced into the cable and lead to a

degradation of the cable and ultimately of data transmission. Underground cables may be affected by moisture bearing chemicals from the soil. Use cables which are specially designed for moist environments.

Electrical: Electrical noise or electromagnetic fields created by electrical machinery, electrostatic painters, welders, and radio transmitters should be avoided. Static electricity (often caused by vibration and friction) can effect the operation of the cable. Cable should be routed where vibration of carriers and mountings is at a minimum.

Rodents: Underground and low mounted cables are subject to rodent damage which may allow water to enter the cable's shield. Use a specially shielded cable or a conduit for proper protection.

3.3.3.4 P451 Auxiliary Power Supply

The P451 auxiliary power supply provides power for two additional I/O channels. The power supply is used in conjunction with the Modicon J200 expander. The P451 can be connected to the J200 with connectors on a CATV or CAC-6 cable.

The P451 requires a standard 115 VAC or 230 VAC power source. The use of either source is jumper selectable. Wiring the power supply for either voltage is shown in Figure 3-15.

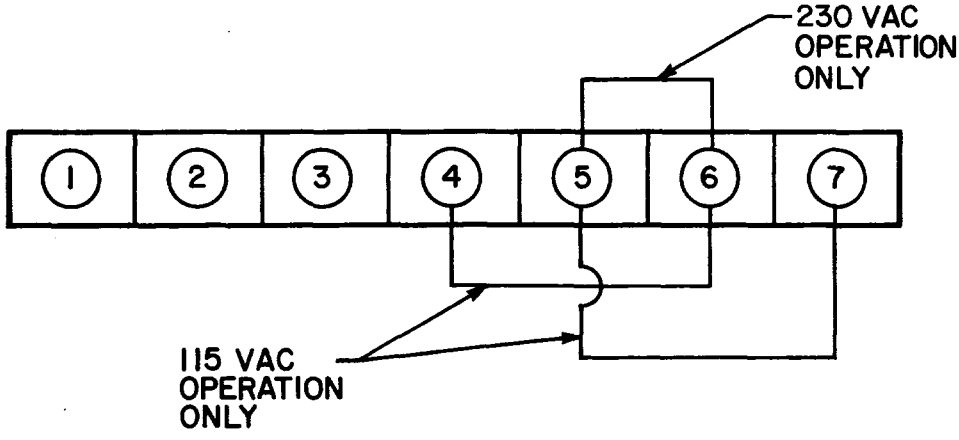

Figure 3-15. P451 115 or 230 VAC Wiring

Indicator lights on the power supply display the absence or presence of AC power (AC INPUT) and the output of DC voltage (I/O POWER ON). A reset push button (PUSH TO TEST) verifies if AC power is being supplied. The indicator lights on the P451 are displayed in Figure 3-16.

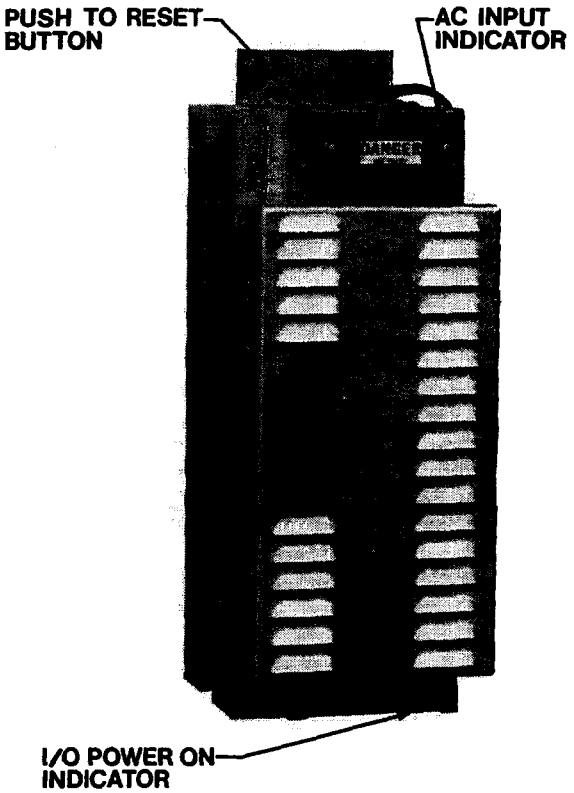

Figure 3-16. P451 Indicator Lights

In addition to power indication, the P451's communication activity during operation is indicated by four lights on the power supply's front panel. When ON, these lights indicate the following:

READY	P451 is ready to communicate with the controller.
COMM ACTIVE	Data is being received from the J200 Expander.
S200 ERROR	I/O module(s) configured in the traffic cop is not communicating to the P451.
COMM ERROR	An error has occurred during communication between the P451 and J200.

3.3.3.5 P453 Auxiliary Power Supply

The Modicon P453 auxiliary power supply provides power for two I/O channels, as well as two ports to attach ASCII devices. The unit can operate on either 115 VAC or 230 VAC power. Wiring the power supply for either voltage is displayed in Figure 3-17.

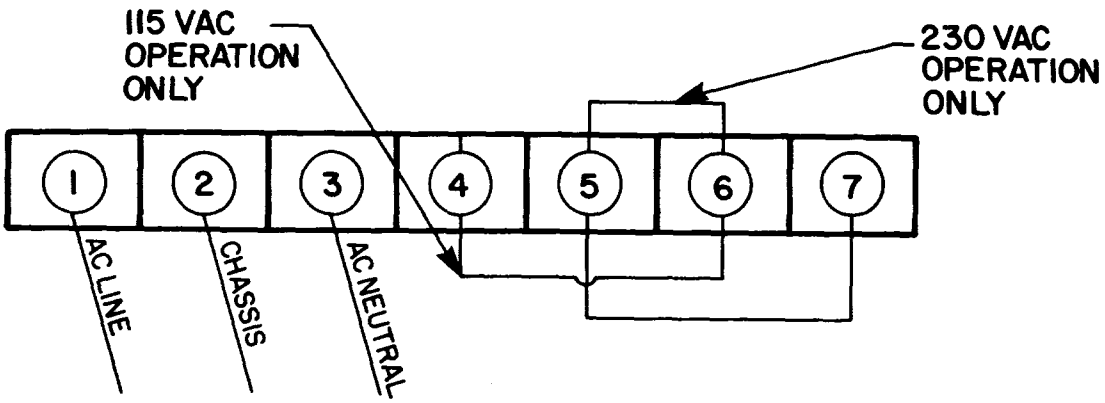

Figure 3-17. P453 115 or 230 VAC Wiring

Indicator lights, located on the power supply's front panel, provide information on the unit's communication with the remote I/O system. The P453's display panel is shown in Figure 3-18.

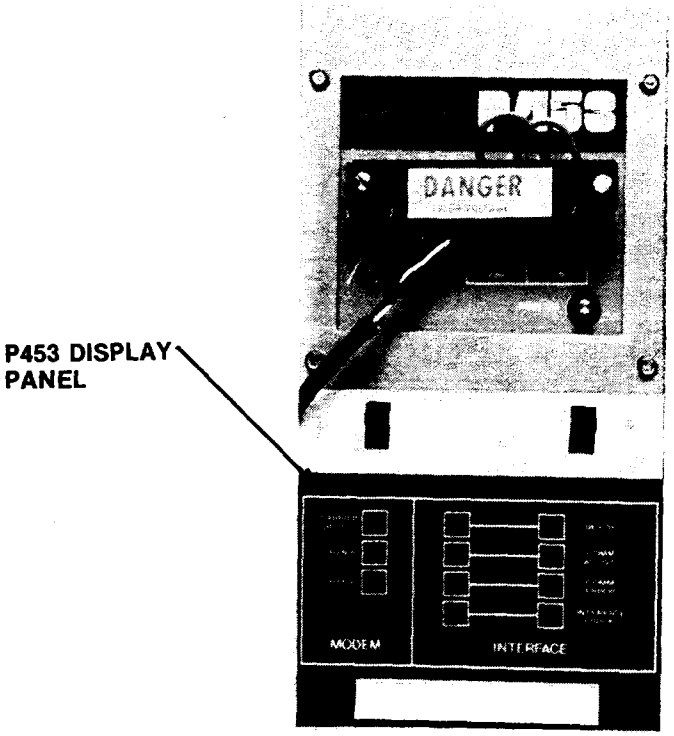

Figure 3-18. P453 Display Panel