SIEMENS

SIMATIC 505

Input/Output Modules

User Manual

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Preface

This manual provides the information needed to install, wire, and configure the SIMATIC® TI505™ Input/Output modules listed below.

- Discrete Input Modules (AC Input):
  PPX:505–4008 PPX:505–4016 PPX:505–4032
  PPX:505–4008–A PPX:505–4016–A PPX:505–4032–A
  PPX:505–4208 PPX:505–4216 PPX:505–4232
  PPX:505–4208–A PPX:505–4216–A PPX:505–4232–A
  PPX:505–4408 PPX:505–4416 PPX:505–4432*
  PPX:505–4408–A PPX:505–4416–A PPX:505–4432–A*

- Discrete Input Modules (DC Input):
  PPX:505–4108 PPX:505–4116 PPX:505–4132
  PPX:505–4308 PPX:505–4316 PPX:505–4332
  PPX:505–4316–A

- Discrete Output Modules (DC Sinking):
  PPX:505–3508 PPX:505–3516 PPX:505–3532
  PPX:505–3708* PPX:505–3716* PPX:505–3732*

- Discrete Output Modules (DC Sourcing):
  PPX:505–4508 PPX:505–4516 PPX:505–4532
  PPX:505–4708* PPX:505–4716* PPX:505–4732*

- Discrete Output Modules (AC Output):
  PPX:505–4608 PPX:505–4616 PPX:505–4632
  PPX:505–4808* PPX:505–4816* PPX:505–4832*

- Relay Output Modules:
  PPX:505–4908 PPX:505–4916 PPX:505–4932*
  PPX:505–5417
  PPX:505–5518

- Word Input Module:
  PPX:505–6308*

- Word Output Module:
  PPX:505–6408*

- Input Simulator:
  PPX:505–6010

- Output Simulator
  PPX:505–6011

* double-wide

Other Manuals

Refer to the manuals listed below for instructions on installing, programming, and troubleshooting your Series 505™ PLCs.

- *SIMATIC® TI525™/TI535™ Hardware and Installation Manual* (PPX:505–8103–x)
- *SIMATIC® TI545™ System Manual* (PPX:545–8101–x)
- *SIMATIC® TI560T™/TI565T™ System Manual* (PPX:560/565–8105–x)
- *SIMATIC TI505/SIMATIC® TI500™ Programming Reference Manual* (PPX:505–8104–x)
- *SIMATIC® TI505 TISOFT™ User Manual* (PPX:TS505–8101–x)
- *SIMATIC® TI555™ System Manual* (PPX:555–8101–x)
- *SIMATIC® TI575™ System Manual* (PPX:575–8101–x)

Agency Approvals

The Series 505 I/O modules meet the standards of the following regulatory agencies:

- Underwriters Laboratories Inc.®: UL Listed (Industrial Control Equipment)
- Canadian Standards Association: CSA Certified (Process Control Equipment)
- Factory Mutual Research Corporation: approved for Class I, Div 2, Groups A, B, C, and D, Hazardous Locations

Series 505 products have been developed with consideration of the draft standard of the International Electrotechnical Commission Committee proposed standard (IEC-65A/WG6) for programmable controllers (released as IEC 1131–2, Programmable Controllers Part 2: Equipment Requirements and Tests, First Edition, 1992–09). Contact Siemens Industrial Automation, Inc., for a listing of the standards to which Series 505 complies.

For Assistance

If you have difficulty with your system, contact the Siemens Energy & Automation, Inc., Technical Services Group in the U.S.A. at 423–461–2522. Outside the U.S.A., call 49–911–895–7000

Chapter 1

Discrete Input and Output Modules

1.1 Module Descriptions

Discrete Input/Output Modules

The 505 Discrete Input and Discrete Output modules (see Figure 1-1) contain 8-, 16- or 32- input or output circuits and can accept AC or DC voltage, depending on the model. (See Appendix A for model numbers and number of input or output points.)

Both the input and output circuits are grouped into four commons for each module. (Isolation is provided between each of the four commons. See Appendix A for isolation specifications.)

The Discrete Input modules are particularly valuable in areas where applications such as limit switches or pushbuttons are needed.

The Discrete AC Output modules are equipped with heavy-duty triacs, without zero cross circuits, to give a faster turn-on response.

Relay Output Modules

The 505 Relay Output Modules (see Figure 1-1) may contain 8-, 16- or 32-output points. (See Appendix A for number of points contained in each model.) These modules are particularly valuable for applications where:

- A “no leakage” output is mandatory in the off-state condition.
- Load currents must be isolated.
- A mixture of voltages must be connected to the same module (for example, 24 VDC and 24 VAC).

The 16- and 32- point relay modules are equipped with four isolated commons, and can switch either AC or DC power at each common. The 8-point module is equipped with 8 isolated commons (one for each point), and can switch either AC or DC power at each point. These modules are less susceptible than other DC-type modules to inductive load transients when the outputs are turned on or off.

The 32- and 16- point modules (PPX:505–4932 and PPX:505–4916) provide normally open (Form-A) contacts, while the 8-point module (PPX:505–4908) provides both normally open and normally closed contacts (Form-C). The PPX:505–5417 and PPX:505–5518 provide both normally open and normally closed contacts (Form-C).

The PPX:505–5518 module provides snubbers on the normally open contacts. This snubber should be used with inductive loads to extend the contact life. The snubber is composed of a series 330 Ω resistor and a 0.1 μf capacitor. If the load requires a “dry contact” relay then the snubber can be disconnected. To connect the snubber, move the shorting plug associated with the output point, to on. For example, for a normally open output 5 the snubber is controlled by E5. See Figure 3-14 for a typical connection.

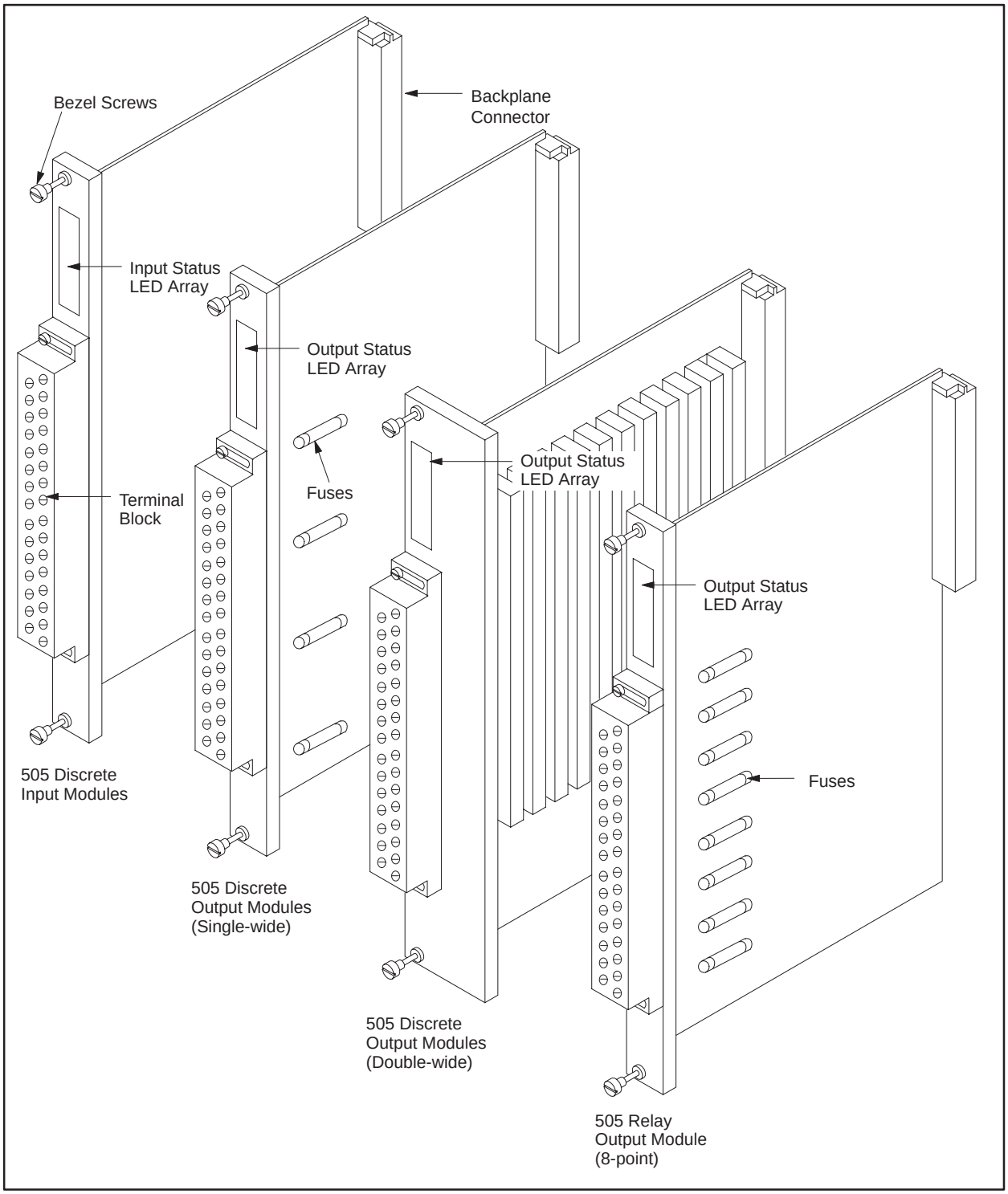


Figure 1-1 505 Discrete Input, Discrete Output, and Relay Output Modules

I/O Simulators

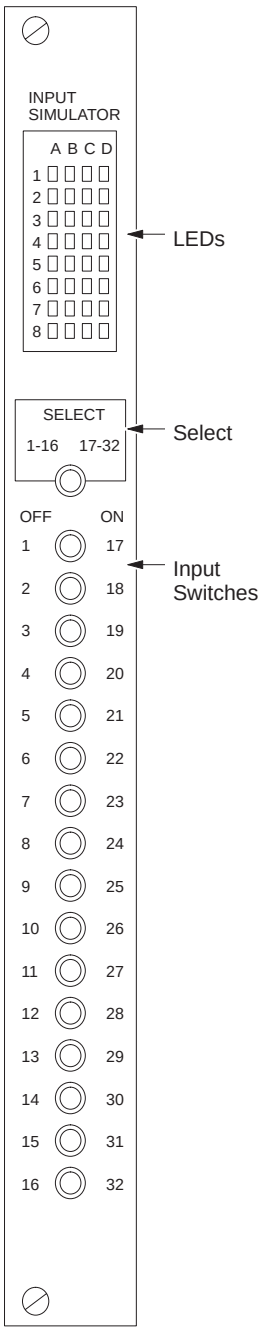
The PPX:505–6010 Input Simulator Module simulates discrete inputs to the Series 505 PLC; PPX:505–6011 Output Simulator Module simulates discrete outputs from the Series 505 PLC. The modules are designed for use in debugging and troubleshooting.

The modules fit any I/O slot of your Series 505 base. No wiring is necessary and the modules operate without user-side power.

Each I/O Simulator Module has 32 LEDs on the front bezel. Each LED represents an input or output point. The Input Simulator points are configured as X and the Output Simulator points are configured as Y. The Input Simulator Module also has 17 switches on its front bezel. See page 1-5 for details on switch functions.

Operation of the Input Simulator Module Switches

The Input Simulator Module has 17 switches on its front bezel. The SELECT switch allows you to control either inputs 1 – 16 or 17 – 32. The SELECT switch also has a latching function.



Input Simulator Module

Position SELECT to the left to control inputs 1 – 16, and to the right to control inputs 17 – 32. After setting the input switches, position SELECT to the center to latch the inputs into the desired state. Latched inputs are cleared when power is cycled.

To turn on up to 16 inputs in a single PLC scan, follow these steps.

1. Position SELECT in the middle.
2. Set the switches to the desired positions.
3. Move SELECT to the right or left (depending on which group of inputs you wish to control).
4. To latch the set of 16 inputs selected, move SELECT to the center position.

Turn inputs off by setting the input switches to OFF and positioning SELECT to the left or right (depending on which group of inputs you wish to control).

1.2 Power Sources

Discrete and Relay Modules

The 505 Discrete Output and Relay modules must receive both user- and base-supplied power to operate correctly. Refer to your controller system manual for instructions on wiring the base and power supply.

⚠CAUTION

The outputs in the Discrete Output and normally open outputs in the Discrete Relay Output modules will be off as long as the power to the base is off, even if the user power is on.

Table 1-1 shows the I/O response for the conditions shown if a power cycle occurs on the base, and the relay ladder logic (RLL) program is stored in random access memory (RAM). If the RLL program is stored in EPROM and a power cycle occurs, the I/O response will be a result of the continuation of the program execution, regardless of PLC mode or battery status.

Table 1-1 Power Cycle

PLC Mode (before power down)	CPU Battery Status	I/O Response (after power cycle)
1. Run	On	Program execution continues.
2. Program	On	All discrete unforced outputs are turned off. Forced outputs remain in previous forced mode; they can be forced on or off.
3. Run or program (RLL in RAM)	Off	Returns from power cycle in program mode with all outputs off.
4. Run or program (RLL in EPROM)	Off	Program execution continues.

1.3 LED Arrays

Discrete I/O Modules

The LED Channel Status Indicator on the front of each module indicates the input/output status to/from the PLC. When an input/output is on, a corresponding LED turns on. See Figure 1-2. The LEDs indicate the state of the input/output from the Programmable Logic Controller (PLC) side, not from the field side.

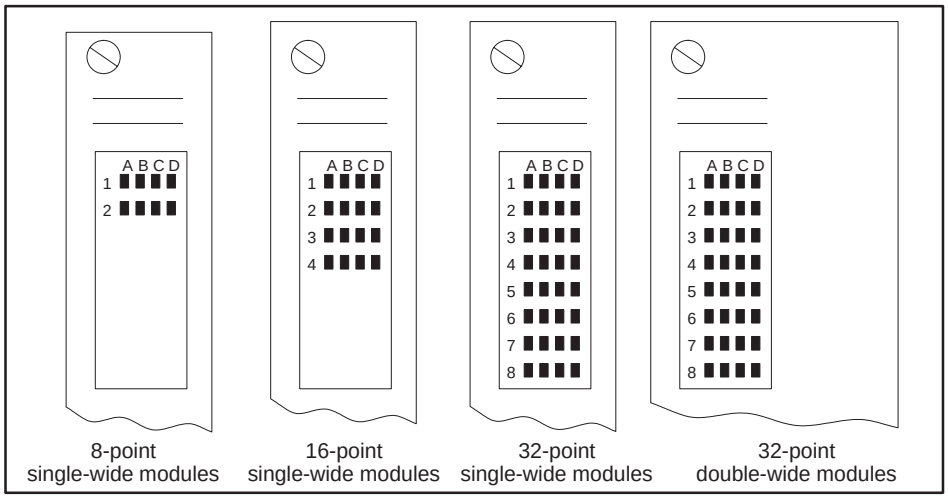


Figure 1-2 LED Array for Discrete Input, Discrete Output, I/O Simulators, and Relay Output Modules

1.4 Fuses

Discrete Output Modules

Fuses on the Discrete AC and DC Output modules are located on the Printed Circuit Board (PCB). (Figure 1-1 shows these boards.) There are four fuses on the module, one for each common. To gain access to the fuses, remove the module from the base.

⚠WARNING

Disable all power to the module and base before attempting to replace a fuse. Failure to do so may result in injury to personnel or damage to equipment.

⚠CAUTION

The fuse protects the PCB and minimizes the risk of fire in case of an overload. The fuse does not always protect the output circuit.

The red indicator located at the bottom of the LED array on each Discrete Output DC module indicates a blown fuse in an output circuit. The AC modules do not have blown fuse indicators. Note that the modules are supplied from the factory with UL/CSA approved fuses. Table 1-2 lists the fuses, their ratings, and spare part numbers.

Table 1-2 Agency-Approved Fuses for Discrete Output Modules

Module	Description	UL/CSA	IEC
PPX:505–3508 PPX:505–3516 PPX:505–3532 PPX:505–4508 PPX:505–4516 PPX:505–4532	1/2 A DC Output 1/2 A DC Output 1/2 A DC Output 1/2 A DC Output 1/2 A DC Output 1/2 A DC Output	3.0 A 125 V Normal Blow 5 x 20 mm San-O-Ind. Corp. TSC or equivalent (2587679–8012)	2.5 A 250 V Normal Blow 5 x 20 mm San-O–Ind.corp. EQ or equivalent
PPX:505–4608 PPX:505–4616 PPX:505–4632 PPX:505–3708 PPX:505–3716 PPX:505–3732 PPX:505–4708 PPX:505–4716 PPX:505–4732	24–110 VAC Output 24–110 VAC Output 24–110 VAC Output 2 A DC Output 2 A DC Output 2 A DC Output 2 A DC Output 2 A DC Output 2 A DC Output	3.15 A 125 V Normal Blow 5 x 20 mm San-O-Ind. Corp. TSC or equivalent (2587679–8014)	2.5 A 250 V Normal Blow 5 x 20 mm San-O–Ind.corp. EQ or equivalent
PPX:505–4808 PPX:505–4816 PPX:505–4832	110–220 VAC Output 110–220 VAC Output 110–220 VAC Output	5 A 250 V Normal Blow .25” x 1.25” San-O-Ind. Corp. SS2–5 A or equivalent (2587679–8013)	No IEC equivalent

Relay Output Modules

The 8-point Relay Output Module (PPX:505–4908) is equipped with one fuse for each point. The 16-point Relay Output Modules (PPX:505–5417 and PPX:505–5418) are equipped with one fuse for each common (4 fuses). See Figure 1-1. Table 1-3 lists the fuses, their ratings, and spare part numbers. The fuses are located on the PCB and can be accessed by removing the module from the base.

The 16-point (PPX:505–4916) and 32-point (PPX:505–4932) modules are not fuse-protected.

⚠WARNING

Disable all power to the module and base before attempting to replace a fuse. Failure to do so may result in injury to personnel or damage to equipment.

⚠CAUTION

The fuse protects the PCB and minimizes the risk of fire in case of an overload. The fuse does not always protect the output circuit.

Table 1-3 Agency-Approved Fuses for Relay Output Modules

Module	UL/CSA
PPX:505-4908	3 A 125 V Normal Blow 1.25″ x .25″ SS2-3 A San-O Ind. Corp. or equivalent (2587679–8006)
PPX:505-5417	4 A 250 V Fast Blow 1.25″ x .25″ SS2-4 A San-O Ind. Corp. or equivalent (2587679–8016)
PPX:505-5518	8 A 250 V Fast Blow 1.25″ x .25″ AGC-8 Cooper Industries or equivalent (2587679–8017)

Chapter 2

Word Input and Output Modules

2.1 Module Descriptions

Word Input Module

The 505 Parallel Word Input Module (Figure 2-1) connects field devices, such as thumbwheel switches and analog-to-digital converters (ADCs), to the 505 PLC. Any device that uses a multi-bit parallel word code, such as binary coded decimal (BCD) or Gray, may be connected.

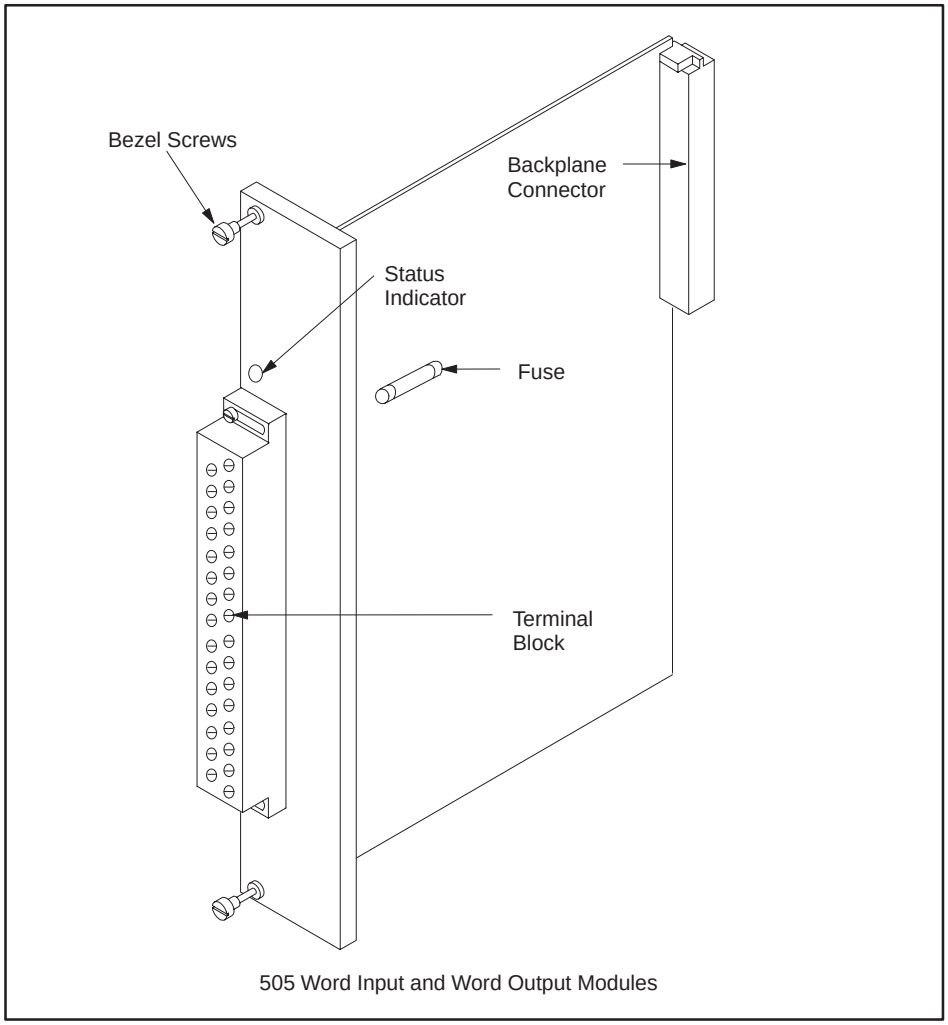


Figure 2-1 SIMATIC 505 Word Input and Word Output Modules

The 505 Parallel Word Input Module accepts eight 16-bit parallel words of data in binary code and transmits that data to the CPU for processing. This transmission is through 16 parallel data lines that are wired directly from the field device to the field terminal screw connections on the terminal block of the module.

Each module can multiplex eight 16-bit inputs by using strobe signals. The strobes operate at complementary metal oxide semiconductor (CMOS) and transistor-transistor logic (TTL) levels, and ensure that only one channel is read at a time. All eight 16-bit inputs are wired in parallel, and strobing selects which input is read. The input circuit for the data lines and the output circuit for the module-generated strobes are shown in Figure 2-2.

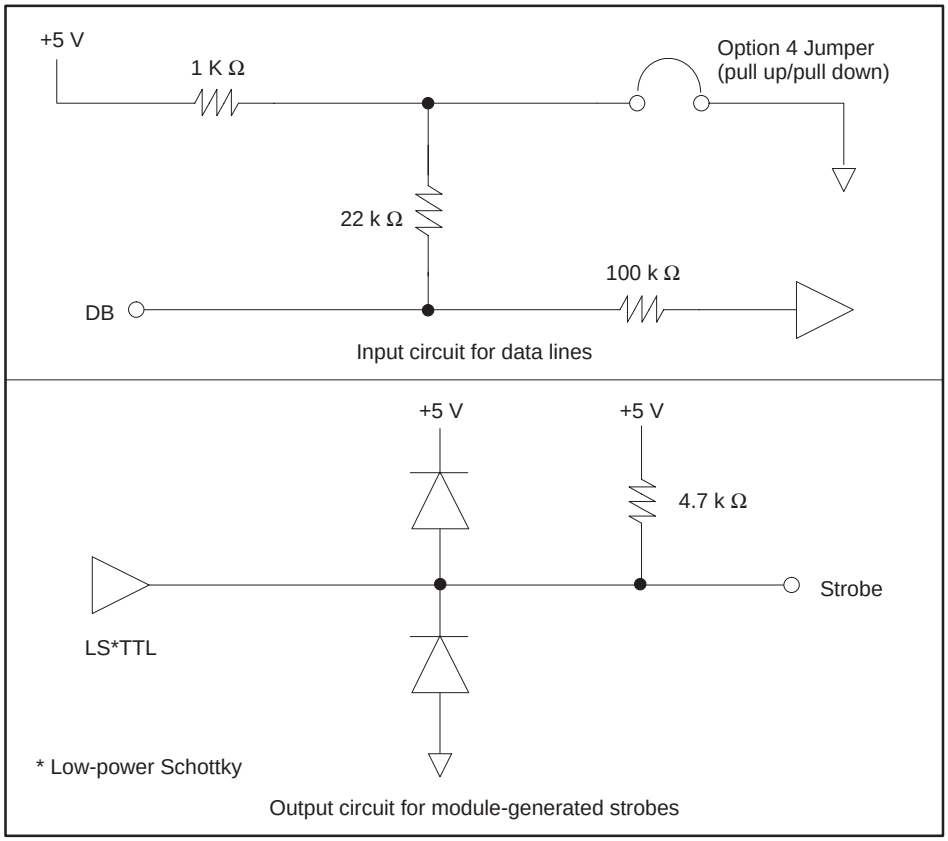


Figure 2-2 Input Circuit for Data Lines and Output Circuit for Module-Generated Strobes

Word Output Module

The 505 Parallel Word Output Module (Figure 2-1) connects field devices, such as seven-segment displays or digital-to-analog converters, to the 505 PLC. Any device that uses a multi-bit parallel word code, such as binary coded decimal (BCD) or Gray, may be connected.

The 505 Parallel Word Output Module receives binary data from the PLC and transmits eight 16-bit parallel words to the field device. Transmission is through sixteen parallel data lines that are wired directly from the field terminal screw connections on the module terminal block to the field device.

Each module can multiplex eight 16-bit outputs using strobe signals. The strobes, which operate at complementary metal oxide semiconductor (CMOS) and transistor-transistor logic (TTL) levels, synchronize the transfer of output data between the module and the field device. A schematic of the output circuit for the data and strobe lines is given in Figure 2-3 below.

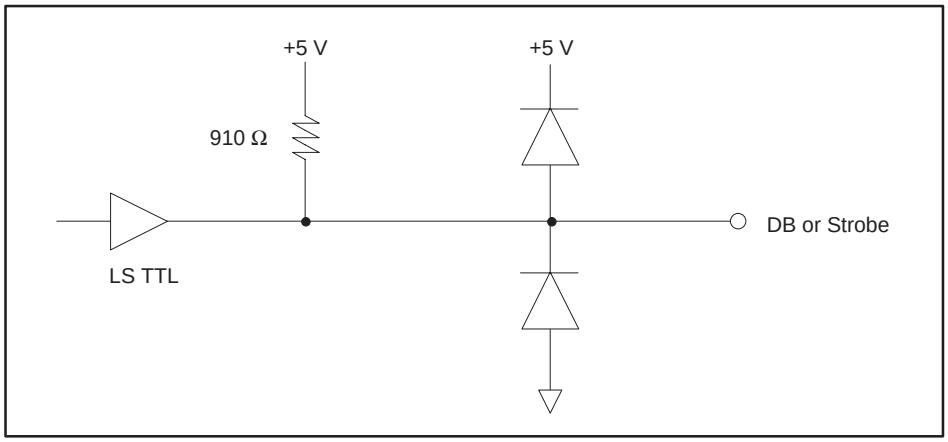


Figure 2-3 Output Circuit for Data and Strobe Lines

Data Word Format

Figure 2-4 illustrates the format of a 16-bit binary word for both the input and output modules that is transmitted from the PLC. Bit 16 is the least significant bit (LSB). You can select the inputs or outputs to be high true or low true.

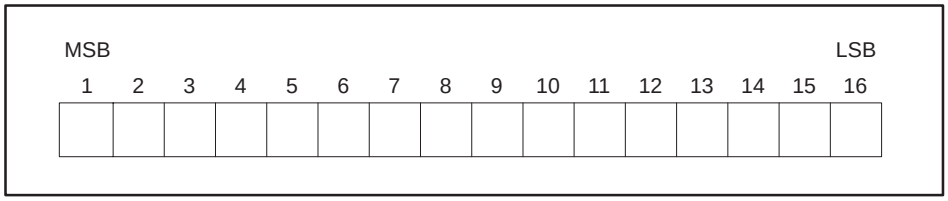


Figure 2-4 Data Word Format for Word Input and Word Output Modules

2.2 Power Sources

Power Supplies

The Word Input and Word Output modules have been designed to use a low-cost, user-provided power supply. Each module requires only a single voltage source of 20-30 VDC: 0.25 A for the Word Input, and 0.35 A for the Word Output. The user power supply must have a ripple less than 0.4 volts. Power supply connections are shown in Figure 3–15.

NOTE: A UL Class 2 power supply must be used to ensure UL listing compliance for this module.

Early Power Failure

The module can detect a user power failure, and provides a warning signal through the Early Power Failure (EPF) output located on the terminal block (see Figure 2-5). This open collector (referenced to user ground) is capable of sinking 100 mA and is normally on, but turns off when power fails. Use of this EPF output is optional. It is a warning to the field device that all module outputs are about to go to high impedance, since there is no user power available to the module. When the user power is again available to the module, the EPF output turns on, and the module begins strobing data out on the data lines.

⚠ CAUTION

If the user power to the EPF terminal is not wired correctly, it can damage the module. The damage is limited to the EPF circuitry.

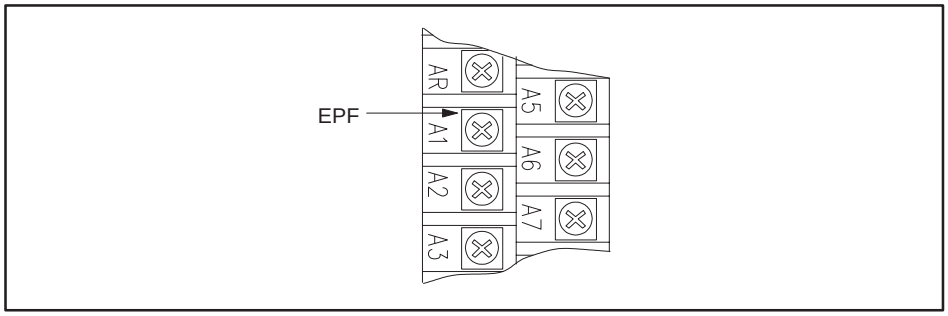


Figure 2-5 Early Power Failure Output (on Terminal Block)

2.3 LED Arrays

LED Status Indicators

The LED status indicator (shown in Figure 2-6) is located on the front of each Word Input and Output module to indicate the status of power, self-diagnostics, and the fuse. The LED is on if all of the following conditions are met.

- The system- and user-supplied power inputs are good.
- Self-diagnostic tests have been passed.
- The fuse is good.

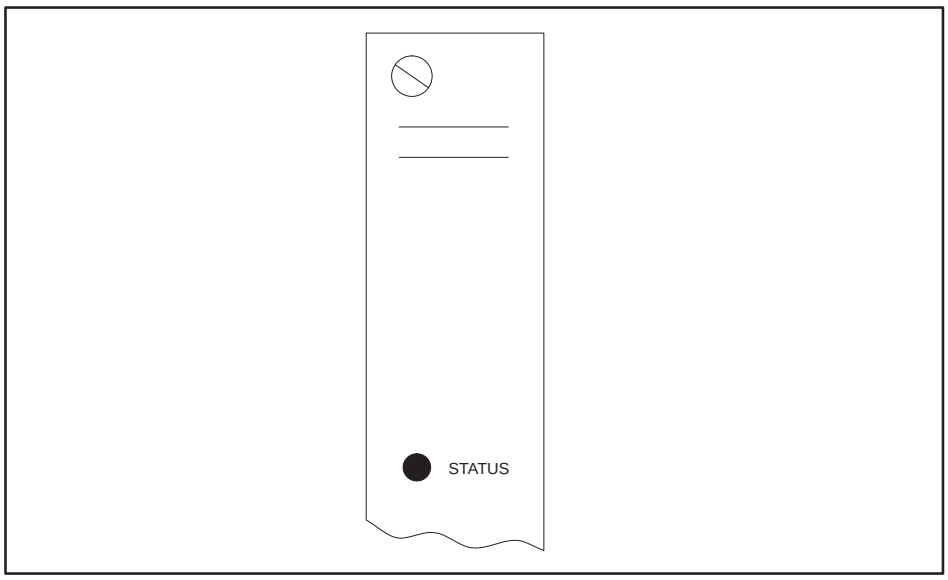


Figure 2-6 LED Status Indicator for Word Input and Word Output Modules

2.4 Fuses

Fuse Locations

Each Word Input and Output module is equipped with one fuse for each module. The fuse is located on the printed circuit board (PCB). The fuse can be accessed by removing the module from the base. (See Chapter 4 for the fuse replacement procedure.) The replacement fuse is described in Table 2-1.

Table 2-1 Fuses

Module	Description	UL/CSA
PPX:505-6308 PPX:505–6408	8 ch word input 8 ch word output	0.5 A 125 V/250 V Fast acting 5x20 mm San-O Ind. Corp. MT4 or equivalent (2587679-8009)

2.5 Timing Characteristics

Both the Word Input and Word Output modules operate asynchronously with the PLC; i.e., the scan time and PLC scan time are not synchronized.

Input Scan

The input module scan consists of converting all input channels, and storing the conversion data in the buffer memory. The channels are converted one at a time. The update time associated with the eight channels is less than 8 ms. The input module does not update its buffer memory when the PLC is accessing the module. For example, if the module has just updated channel 3 when the PLC accesses the module, then channel 3 contains the most recent data, then channel 2, followed by channels 1, 8, 7, 6, 5, and 4.

Output Scan

The output module scan consists of accepting all output data words, storing the data in buffer memory, and transferring the data to the output memory. The channels are transferred one at a time from buffer memory to output memory. The update time associated with the eight channels is less than 16 ms. The module does not update its output memory when the PLC is accessing the module. For example, if the module has just updated the output memory for channel 3 when the PLC accesses the module, then the data words for channels 1 through 3 would have been transmitted with values from the previous module scan. Channels 4 through 8 are transmitted with data words from the next module scan, unless the PLC accesses the module again before the remaining data words are transmitted.

2.6 Jumper Options

Selecting Options

User-selected options that determine module operation are given in Table 2-2. These options are selected by attaching jumper wires to the terminal block. All selections are made without removing or disassembling the module. Replacing the module with another module of the same type does not alter the options selected, as long as the same wired terminal block is used.

Table 2-2 Jumper Selections (Word Input)

Jumper Location	Jumper Function	Jumper Installed	Jumper Not Installed
A1 – A2	(1) Data active level	High true	Low true
A3 – A4	(2) Strobe active level	High true	Low true
B1 – B2	(3) Strobe source	User-supplied	Module supplied
B3 – B4	(4) Internal resistance	Pull-down	Pull-up

Table 2-3 Jumper Selections (Word Output)

Jumper Location	Jumper Function	Jumper Installed	Jumper Not Installed
A3 – A4	(1) Data active level	High true	Low true
B1 – B2	(2) Strobe active level	High true	Low true
B3 – B4	(3) Channel operation	Single channel	All eight channels

Word Input Data Active Level

The Word Input Data Active level jumper determines whether the incoming data is low true or high true.

- Low true data means that, for input levels below 0.8 volts, the incoming bit on the binary data word is set to 1 for that data line.
- High true data means that, for input levels above 2.0 volts, the incoming bit in the binary data word is set to a 1, and any voltage less than 0.8 volts for the data line is set to 0.

If the jumper is installed, then high true logic is selected. If the jumper is not installed, then low true logic is selected. The word input module can accept any voltage on the data lines between 0 and +28 VDC. Table 2-4 shows voltage levels (ranges) for both low true and high true, and the state to which the bit for the data line be set.

Table 2-4 Word Input Data Switching levels

Voltage Ranges of the Word Input Data Lines			
	0 to 0.8 VDC	>0.8 and <2.0 VDC	>2.0 to 28.0 VDC
Low true	Set to 1	Indeterminate	Set to 0
High true	Set to 0	Indeterminate	Set to 1

The module loading on the data lines not exceed a single TTL load at TTL input voltage levels; i.e., a current of -1.6 mA maximum at 0.4 volts, and a current of 40 μa maximum at 2.4 volts. For high voltage levels at the data inputs, the current is 2 mA maximum at 28 volts. Figure 2-7 shows the location of the Data Active level jumper on the terminal block.

Word Output Data Active Level

The Word Output Data Active level jumper selects whether the outgoing data words are low true or high true. See Table 2-3.

- Low true data: the module delivers voltage levels below 0.55 volts on the data line when the data bit is set to 1, and greater than 2.4 volts when the data bit is set to 0.
- High true data: the module outputs voltage levels greater than 2.4 volts on the data line when the data bit is set to 1, and less than 0.55 volts when the data bit is set to 0.

If the jumper is installed, then high true logic is selected. If the jumper is not installed, then low true logic is selected. See Figure 2-7.

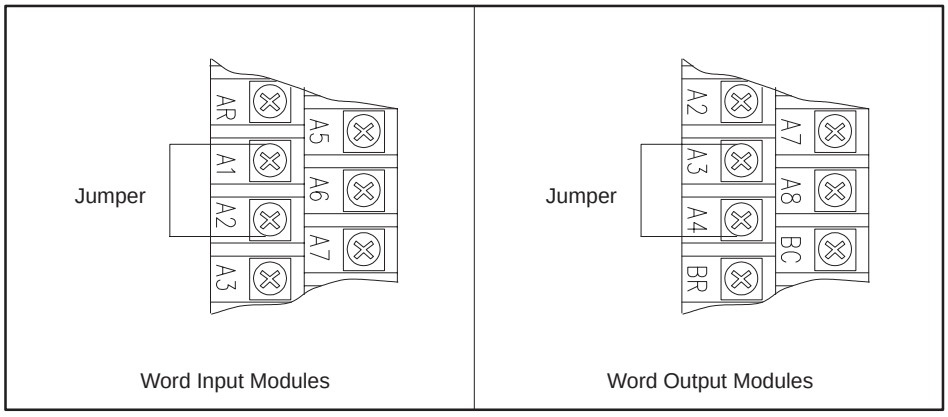


Figure 2-7 Data Active Level Jumper (on Terminal Block)

Word Input Strobe Active Level

The Word Input Strobe Active level jumper determines whether the strobe lines are low-true or high-true. The following is true when the module is strapped for user-supplied strobes. When the strap is not installed, the module drives the voltage levels shown in the next section (Word Output Strobe Active Level).

- Low true strobe: the module reads the channel corresponding to the strobe when the input voltage levels are below 0.8 volts.
- High true strobe: for input voltage levels above 2.0 volts, the incoming strobe causes the module to read the channel corresponding to the strobe; and for any voltage less than 0.8 volts, the module does not read the channel.

NOTE: Switching levels are identical to those required for the data lines. However, the maximum input voltage is 5.25 VDC for the strobe lines rather than 28 VDC allowed for the data lines. (See Table 2-5.)

Table 2-5 Word Input Strobe Switching levels

Voltage Ranges of the Strobe Lines			
	0 to 0.8 VDC	>0.8 and < 2.0 VDC	>2.0 to 5.25 VDC
Low true	Reading data	Indeterminate	Not reading data
High true	Not reading data	Indeterminate	Reading data

Figure 2-8 shows the location of the Strobe Active level jumper on the terminal block.

Word Output Strobe Active Level

The Word Output Strobe Active level jumper determines whether the strobe lines are low true or high true.

- Low true strobe means that the module delivers voltage levels below 0.55 volts on the strobe line when transmitting a data word, and above 2.4 volts when not transmitting.
- High true strobe means that the module delivers voltage levels above 2.4 volts on the strobe line when transmitting a data word, and less than 0.55 volts when not transmitting.

All strobes are generated by the Word Output Module. If the jumper is installed, then high true logic is selected. If the jumper is not installed, then low true logic is selected. Figure 2-8 shows the location of the Strobe Active level jumper on the terminal block.

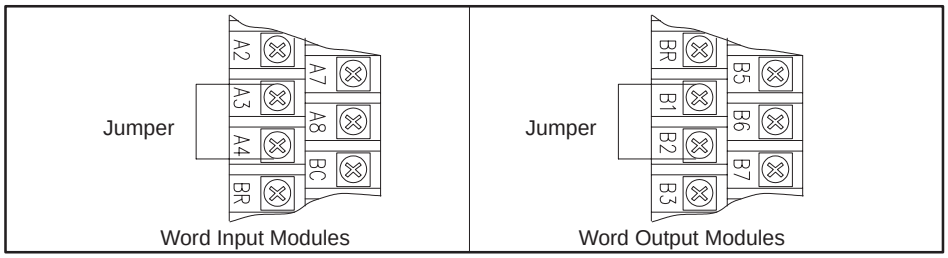


Figure 2-8 Strobe Active Level Jumper (on Terminal Block)

Word Input Internal Resistance

The Word Input Internal Resistance jumper determines whether or not the internal resistors on the data lines are pull-up resistors for low true data, or pull-down resistors for high true data. The Internal Resistance jumper is used in conjunction with the Data Active level and the Strobe Active level options. If the jumper is installed, then the resistors are pull-down. If the jumper is not installed, then the resistors are pull-up. Figure 2-9 shows the location of the Internal Resistance jumper.

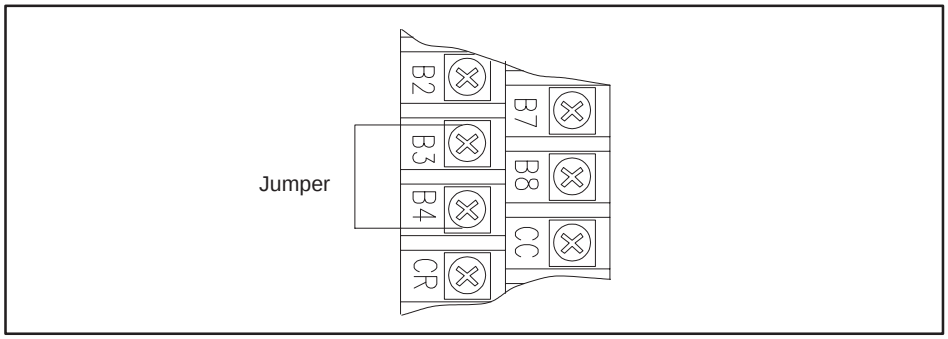


Figure 2-9 Internal Resistance Jumper (on Terminal Block)

Word Input Drive Capabilities

The Word Input Strobe Lines can drive either TTL or CMOS devices. The maximum load capacitance must not exceed 3000 pF for each output. Table 2-6 shows the drive capabilities of the strobe lines for both TTL and CMOS devices.

Table 2-6 Drive Capabilities of Strobe Lines

Logic level	Voltage/Current
TTL–High	2.40 V @ 2.5 mA sourcing
TTL–Low	0.5 V @ 8.5 mA sinking
CMOS–High	0.4 V @ 2 mA sourcing
CMOS–Low	4.4 V @ .075 mA sinking

Word Output Drive Capabilities

The Word Output Data/Strobe Lines can drive either TTL or CMOS devices. The maximum load capacitance must not exceed 3000 pF for each output. Table 2-7 shows the drive capabilities of the data and strobe lines for both TTL and CMOS devices.

Table 2-7 Drive Capabilities of Data/Strobe Lines

Logic level	Voltage/Current
TTL–High	2.40 V @ 4.5 mA sourcing
TTL–Low	0.55 V @ 30 mA sinking
CMOS–High	4.40 V @ 0.35 mA sourcing
CMOS–Low	0.4 V @ 3.5 mA sinking

Word Input Strobe Source

The Word Input Strobe Source jumper determines whether the strobe is generated by the module, or by an external (user-supplied) source. If the jumper is installed, then the strobe source is external. If the jumper is not installed, then the module generates the strobe. Figure 2-10 shows the period (Tp), the pulse width (Tpw), and the next pulse (Tnp) of the module-supplied strobe, and Figure 2-11 shows timing requirements for user-supplied strobes.

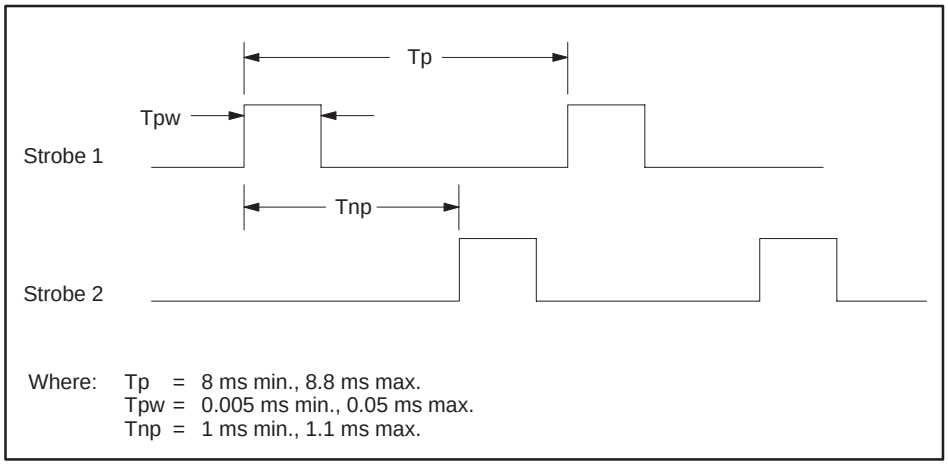


Figure 2-10 Timing of Module-Supplied Strobes (High True)

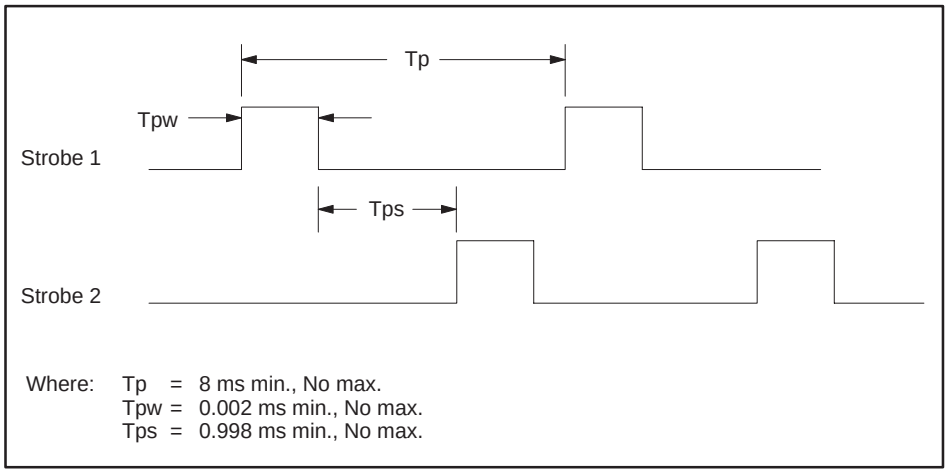


Figure 2-11 Timing of User-Supplied Strobes (High True)

NOTE: Timing constraints must be met at the module terminal block. This is affected by wire type and length, as well as the drive characteristics of the field device. If data transfer problems are encountered, check the timing at the module terminal block.

There must be a minimum of 0.0015 ms data setup. The data must remain in the same state for a minimum of 0.0015 ms before the strobe pulse goes inactive.

If more than one user-supplied strobe is active at the same time, the module does not read data on any of the input channels. As soon as a single strobe becomes active, the module starts reading data into the module again. The user-supplied strobes may be active in any order, but the pulse width must be at least 0.002 ms in length, and the strobes must be at least 0.998 ms apart. For example, if only one channel is to be used, then the data for that channel could be strobed into the module every 1.0 ms.

Figure 2-12 shows the location of the Strobe Source jumper on the terminal block.

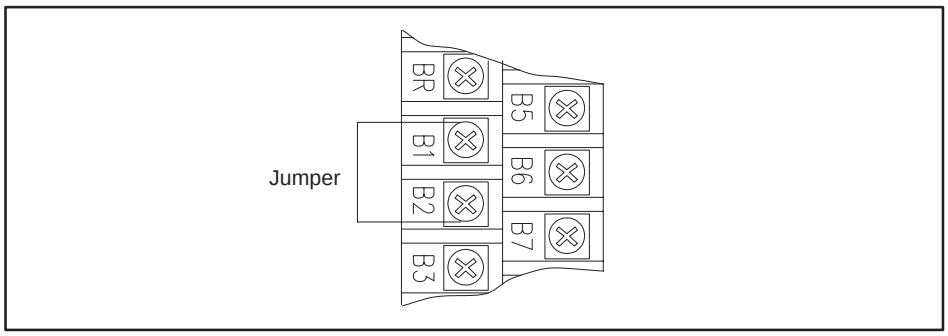


Figure 2-12 Word Input Strobe Source Jumper (on Terminal Block)

Word Output Channel Operation

The Word Output Channel Operation jumper determines whether the module provides eight data words with eight strobe pulses, or only one data word with one strobe pulse. With the jumper installed, single-channel operation is selected. With the jumper not installed, eight-channel operation is selected. Figure 2-13 shows the jumper location for determining channel operation.

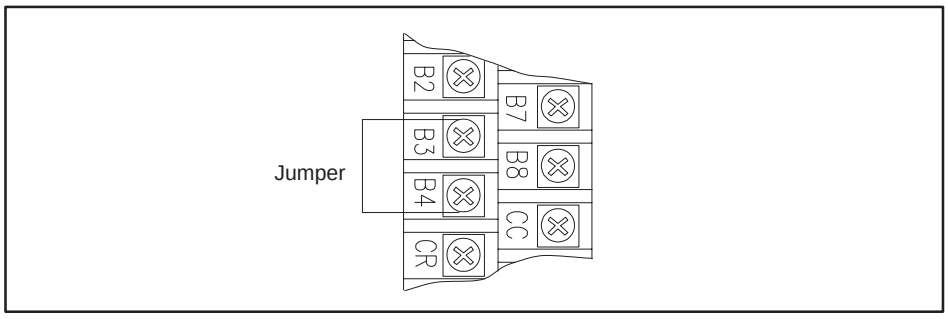


Figure 2-13 Word Output Channel Operation Jumper (on Terminal Block)

Eight- and Single-Channel Modes

The module updates all eight channels in 16 ms (2 ms for each channel) when using the eight-channel mode. In the single-channel mode, the module updates Channel 1 every 2 ms. Use the strobe line to prevent reading spurious information on the data lines during the transition time that follows the data update. The data is valid at least .006 ms before the leading edge of the strobe, and 0.480 ms after the trailing edge of the strobe.

Figure 2-14 and Figure 2-15 show the period (Tp), pulse width (Tpw), and the next pulse (Tnp) for strobe signals for eight- and one-channel operation of the module. These timing diagrams reflect the timing measured at the module when installed in accordance with the recommendations in this manual. Exceeding the recommended loading conditions can cause significant changes in the timing.

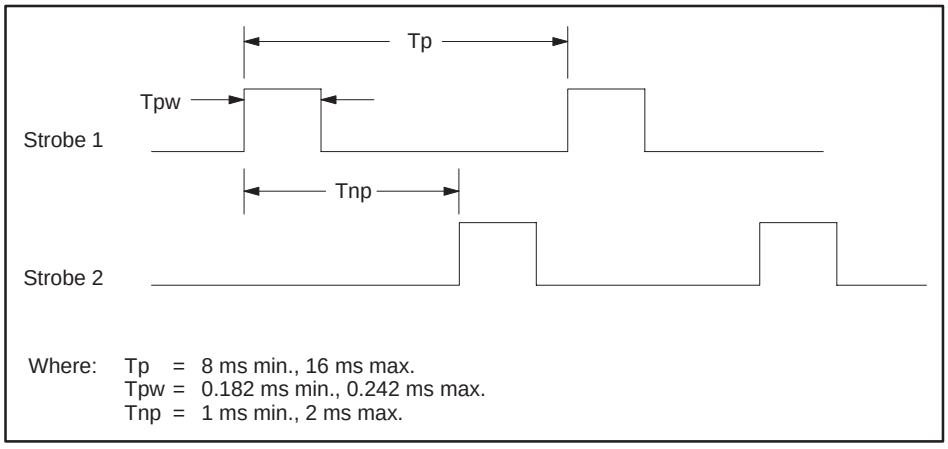


Figure 2-14 Strobe Timing - Eight Channel Mode (High True)

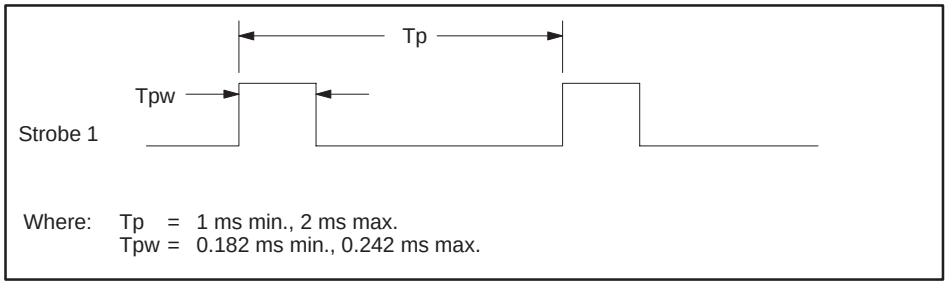


Figure 2-15 Strobe Timing - Single Channel Mode (High True)

Chapter 3

Installing the Modules

3.1 Installing the Modules

Overview

The 505 Discrete Input and Output modules, and Word Input and Output modules, may be installed in any available slot (or in two adjacent slots for double-wide modules).

⚠WARNING

To minimize risk of potential shock hazard, turn off power to the I/O base and to any modules installed in the base before inserting or removing a module, or installing a terminal block. Failure to do so may result in potential injury to personnel or damage to equipment.

Guidelines

Do not touch the printed circuit board (PCB) while inserting the module. This could cause electrostatic damage to its components. To minimize the effect of noise on the system, separate high energy modules from all other modules in the base, i.e., place relay and AC output modules in the far right slots of the base.

To insert the 505 I/O modules, follow these steps.

1. Turn off all power to the base and the modules.
2. Position the module so that the front bezel is facing you.
3. Hold the top and bottom of the bezel and slide the module carefully into the slot (or slots for double-wide modules), pushing it all the way into the base. You will feel a slight increase in resistance as the module connects with the base-plane connector. (See Figure 3-1).
4. Use a flat-head screwdriver to tighten the screws at the top and bottom of the bezel. This grounds the module to the base. Do not overtighten.

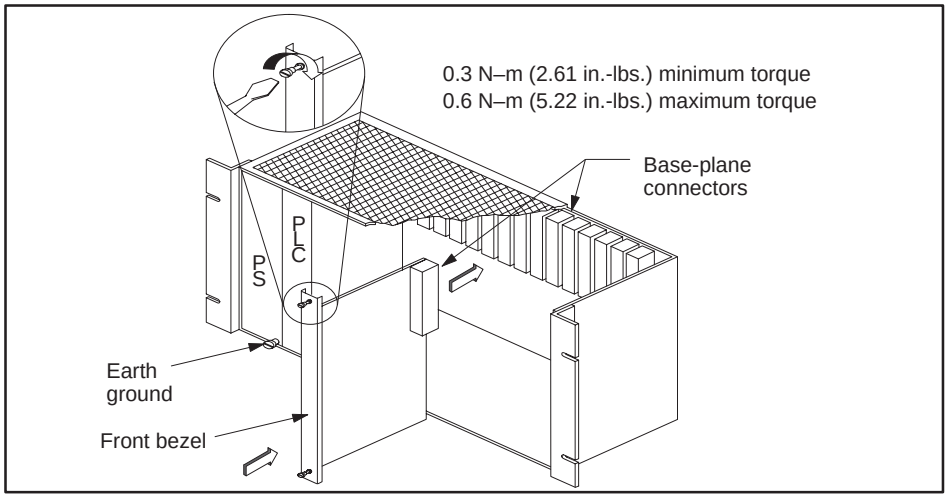


Figure 3-1 Inserting the Module into the Base

3.2 Wiring the Discrete Input and Output Modules

Pin-outs for Discrete Input and Output Modules

Table 3-1 through Table 3-10 show the pin-out sequences for the 505 Input and Output modules. These tables are arranged in two columns that correspond to the two rows of screws on the terminal blocks. (The right column represents the right row of screws on the terminal block, and the left column represents the left row of screws.) Appendix A provides a worksheet to use when wiring the terminal blocks for all Input and Output modules.

The letters A, B, C, and D designate the common sections. The numbers adjacent to the letters refer to the input or output points within those sections. (See Figure 3-2.)

The Discrete Input modules are both sinking and sourcing. Therefore, the inputs operate when wired in either a sinking or a sourcing configuration.

On the Discrete Output modules, the XC connections are for user-power connections, and the XR connections are for user-power return connections, when applicable. On AC modules, user-power return is provided through your load.

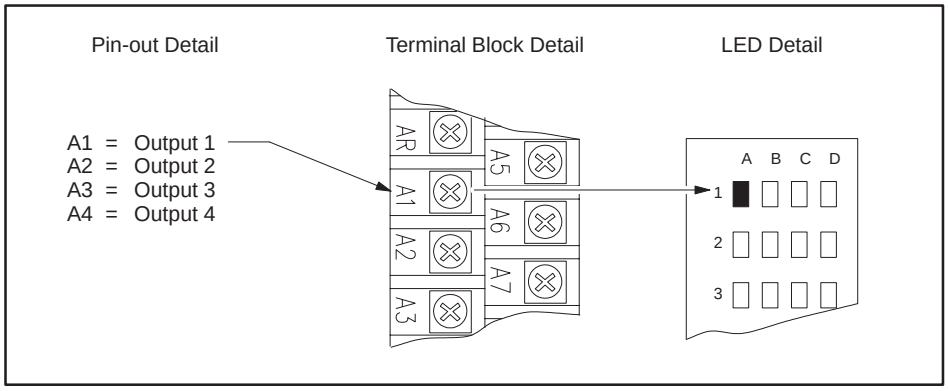


Figure 3-2 Example of Terminal Block Wiring

Table 3-1 Terminal Block Pin-out: 32-Point Discrete Input Modules (PPX:505–4032(A), PPX:505–4132, PPX:505–4232(A), PPX:505–4332, and PPX:505–4432(A))

User Connection	User Connection
AR = Return for 1–8	AC = Not Used
A1 = Input 1	A5 = Input 5
A2 = Input 2	A6 = Input 6
A3 = Input 3	A7 = Input 7
A4 = Input 4	A8 = Input 8
BR = Return for 9–16	BC = Not Used
B1 = Input 9	B5 = Input 13
B2 = Input 10	B6 = Input 14
B3 = Input 11	B7 = Input 15
B4 = Input 12	B8 = Input 16
CR = Return for 17–24	CC = Not Used
C1 = Input 17	C5 = Input 21
C2 = Input 18	C6 = Input 22
C3 = Input 19	C7 = Input 23
C4 = Input 20	C8 = Input 24
DR = Return for 25–32	DC = Not Used
D1 = Input 25	D5 = Input 29
D2 = Input 26	D6 = Input 30
D3 = Input 27	D7 = Input 31
D4 = Input 28	D8 = Input 32

Table 3-2 Terminal Block Pin-out: 16-Point Discrete Input Modules (PPX:505–4016(A), PPX:505–4116, PPX:505–4216(A), PPX:505–4316, and PPX:505–4416(A))

User Connection	User Connection
AR = Return for 1–4	AC = Not Used
A1 = Input 1	A5 = Not Used
A2 = Input 2	A6 = Not Used
A3 = Input 3	A7 = Not Used
A4 = Input 4	A8 = Not Used
BR = Return for 5–8	BC = Not Used
B1 = Input 5	B5 = Not Used
B2 = Input 6	B6 = Not Used
B3 = Input 7	B7 = Not Used
B4 = Input 8	B8 = Not Used
CR = Return for 9–12	CC = Not Used
C1 = Input 9	C5 = Not Used
C2 = Input 10	C6 = Not Used
C3 = Input 11	C7 = Not Used
C4 = Input 22	C8 = Not Used
DR = Return for 13–16	DC = Not Used
D1 = Input 13	D5 = Not Used
D2 = Input 14	D6 = Not Used
D3 = Input 15	D7 = Not Used
D4 = Input 16	D8 = Not Used

Table 3-3 Terminal Block Pin-out: 16-Point Discrete Input Module (PPX:505–4316–A)

24 VDC User Connection	48 VDC User Connection
AR = Return for 1–4 (24 & 48 V)	AC = Not Used
A1 = 24 VDC Input 1	A5 = 48 VDC Input 1
A2 = 24 VDC Input 2	A6 = 48 VDC Input 2
A3 = 24 VDC Input 3	A7 = 48 VDC Input 3
A4 = 24 VDC Input 4	A8 = 48 VDC Input 4
BR = Return for 5–8 (24 & 48 V)	BC = Not Used
B1 = 24 VDC Input 5	B5 = 48 VDC Input 5
B2 = 24 VDC Input 6	B6 = 48 VDC Input 6
B3 = 24 VDC Input 7	B7 = 48 VDC Input 7
B4 = 24 VDC Input 8	B8 = 48 VDC Input 8
CR = Return for 9–12 (24 & 48 V)	CC = Not Used
C1 = 24 VDC Input 9	C5 = 48 VDC Input 9
C2 = 24 VDC Input 10	C6 = 48 VDC Input 10
C3 = 24 VDC Input 11	C7 = 48 VDC Input 11
C4 = 24 VDC Input 12	C8 = 48 VDC Input 12
DR = Return for 13–16 (24 & 48 V)	DC = Not Used
D1 = 24 VDC Input 13	D5 = 48 VDC Input 13
D2 = 24 VDC Input 14	D6 = 48 VDC Input 14
D3 = 24 VDC Input 15	D7 = 48 VDC Input 15
D4 = 24 VDC Input 16	D8 = 48 VDC Input 16
Note: Each input can only be wired for 24 or 48 VDC operation.	

Table 3-4 Terminal Block Pin-out: 8-Point Discrete Input Modules (PPX:505–4008(A), PPX:505–4108, PPX:505–4208(A), PPX:505–4308, and PPX:505–4408(A))

User Connection	User Connection
AR = Return for 1–2	AC = Not Used
A1 = Input 1	A5 = Not Used
A2 = Input 2	A6 = Not Used
A3 = Not Used	A7 = Not Used
A4 = Not Used	A8 = Not Used
BR = Return for 3–4	BC = Not Used
B1 = Input 3	B5 = Not Used
B2 = Input 4	B6 = Not Used
B3 = Not Used	B7 = Not Used
B4 = Not Used	B8 = Not Used
CR = Return for 5–6	CC = Not Used
C1 = Input 5	C5 = Not Used
C2 = Input 6	C6 = Not Used
C3 = Not Used	C7 = Not Used
C4 = Not Used	C8 = Not Used
DR = Return for 7–8	DC = Not Used
D1 = Input 7	D5 = Not Used
D2 = Input 8	D6 = Not Used
D3 = Not Used	D7 = Not Used
D4 = Not Used	D8 = Not Used

Table 3-5 Terminal Block Pin-out: 32-Point Discrete AC Output Modules (PPX:505–4632 and PPX:505–4832)

User Connection	User Connection
AR = Not Used	AC = User-Power
A1 = Output 1	A5 = Output 5
A2 = Output 2	A6 = Output 6
A3 = Output 3	A7 = Output 7
A4 = Output 4	A8 = Output 8
BR = Not Used	BC = User-Power
B1 = Output 9	B5 = Output 13
B2 = Output 10	B6 = Output 14
B3 = Output 11	B7 = Output 15
B4 = Output 12	B8 = Output 16
CR = Not Used	CC = User-Power
C1 = Output 17	C5 = Output 21
C2 = Output 18	C6 = Output 22
C3 = Output 19	C7 = Output 23
C4 = Output 20	C8 = Output 24
DR = Not Used	DC = User-Power
D1 = Output 25	D5 = Output 29
D2 = Output 26	D6 = Output 30
D3 = Output 27	D7 = Output 31
D4 = Output 28	D8 = Output 32

Table 3-6 Terminal Block Pin-out: 16-Point Discrete AC Output Modules PPX:505–4616 and PPX:505–4816

User Connection	User Connection
AR = Not Used	AC = User-Power
A1 = Output 1	A5 = Not Used
A2 = Output 2	A6 = Not Used
A3 = Output 3	A7 = Not Used
A4 = Output 4	A8 = Not Used
BR = Not Used	BC = User-Power
B1 = Output 5	B5 = Not Used
B2 = Output 6	B6 = Not Used
B3 = Output 7	B7 = Not Used
B4 = Output 8	B8 = Not Used
CR = Not Used	CC = User-Power
C1 = Output 9	C5 = Not Used
C2 = Output 10	C6 = Not Used
C3 = Output 11	C7 = Not Used
C4 = Output 12	C8 = Not Used
DR = Not Used	DC = User-Power
D1 = Output 13	D5 = Not Used
D2 = Output 14	D6 = Not Used
D3 = Output 15	D7 = Not Used
D4 = Output 16	D8 = Not Used

Table 3-7 Terminal Block Pin-out: 8-Point Discrete AC Output Modules (PPX:505–4608 and PPX:505–4808)

User Connection	User Connection
AR = Not Used	AC = User-Power
A1 = Output 1	A5 = Not Used
A2 = Output 2	A6 = Not Used
A3 = Not Used	A7 = Not Used
A4 = Not Used	A8 = Not Used
BR = Not Used	BC = User-Power
B1 = Output 3	B5 = Not Used
B2 = Output 4	B6 = Not Used
B3 = Not Used	B7 = Not Used
B4 = Not Used	B8 = Not Used
CR = Not Used	CC = User-Power
C1 = Output 5	C5 = Not Used
C2 = Output 6	C6 = Not Used
C3 = Not Used	C7 = Not Used
C4 = Not Used	C8 = Not Used
DR = Not Used	DC = User-Power
D1 = Output 7	D5 = Not Used
D2 = Output 8	D6 = Not Used
D3 = Not Used	D7 = Not Used
D4 = Not Used	D8 = Not Used

Table 3-8 Terminal Block Pin-out: 32-Point Discrete DC Output Modules (PPX:505–3532, PPX:505–3732, PPX:505–4532, and PPX:505–4732)

User Connection	User Connection
AR = User-Power (–)	AC = User-Power (+)
A1 = Output 1	A5 = Output 5
A2 = Output 2	A6 = Output 6
A3 = Output 3	A7 = Output 7
A4 = Output 4	A8 = Output 8
BR = User-Power (–)	BC = User-Power (+)
B1 = Output 9	B5 = Output 13
B2 = Output 10	B6 = Output 14
B3 = Output 11	B7 = Output 15
B4 = Output 12	B8 = Output 16
CR = User-Power (–)	CC = User-Power (+)
C1 = Output 17	C5 = Output 21
C2 = Output 18	C6 = Output 22
C3 = Output 19	C7 = Output 23
C4 = Output 20	C8 = Output 24
DR = User-Power (–)	DC = User-Power (+)
D1 = Output 25	D5 = Output 29
D2 = Output 26	D6 = Output 30
D3 = Output 27	D7 = Output 31
D4 = Output 28	D8 = Output 32

Table 3-9 Terminal Block Pin-out: 16-Point Discrete DC Output Modules (PPX:505–3516, PPX:505–3716, PPX:505–4516, and PPX:505–4716)

User Connection	User Connection
AR = User-Power (–)	AC = User-Power (+)
A1 = Output 1	A5 = Not Used
A2 = Output 2	A6 = Not Used
A3 = Output 3	A7 = Not Used
A4 = Output 4	A8 = Not Used
BR = User-Power (–)	BC = User-Power (+)
B1 = Output 5	B5 = Not Used
B2 = Output 6	B6 = Not Used
B3 = Output 7	B7 = Not Used
B4 = Output 8	B8 = Not Used
CR = User-Power (–)	CC = User-Power (+)
C1 = Output 9	C5 = Not Used
C2 = Output 10	C6 = Not Used
C3 = Output 11	C7 = Not Used
C4 = Output 12	C8 = Not Used
DR = User-Power (–)	DC = User-Power (+)
D1 = Output 13	D5 = Not Used
D2 = Output 14	D6 = Not Used
D3 = Output 15	D7 = Not Used
D4 = Output 16	D8 = Not Used

Table 3-10 Terminal Block Pin-out: 8-Point Discrete DC Output Modules (PPX:505–3508, PPX:505–3708, PPX:505–4508, and PPX:505–4708)

User Connection	User Connection
AR = User-Power (–)	AC = User-Power (+)
A1 = Output 1	A5 = Not Used
A2 = Output 2	A6 = Not Used
A3 = Not Used	A7 = Not Used
A4 = Not Used	A8 = Not Used
BR = User-Power (–)	BC = User-Power (+)
B1 = Output 3	B5 = Not Used
B2 = Output 4	B6 = Not Used
B3 = Not Used	B7 = Not Used
B4 = Not Used	B8 = Not Used
CR = User-Power (–)	CC = User-Power (+)
C1 = Output 5	C5 = Not Used
C2 = Output 6	C6 = Not Used
C3 = Not Used	C7 = Not Used
C4 = Not Used	C8 = Not Used
DR = User-Power (–)	DC = User-Power (+)
D1 = Output 7	D5 = Not Used
D2 = Output 8	D6 = Not Used
D3 = Not Used	D7 = Not Used
D4 = Not Used	D8 = Not Used

3.3 Wiring the Relay Output Modules

Pin-outs for Relay Output Modules

The LED readout sequence for the Relay Output modules is listed in a column adjacent to each of the user connector columns. Figure 3-3 shows a 32-point module with the corresponding connection between the pin-out guide, the terminal block, and the LED array. Note that the figure is an example only: the complete LED readout locations are listed in Table 3-11 through Table 3-14.

NOTE: Unlike the LED status indicators on other Discrete I/O modules, those on the Relay Output module do not directly correspond to the terminal block markings.

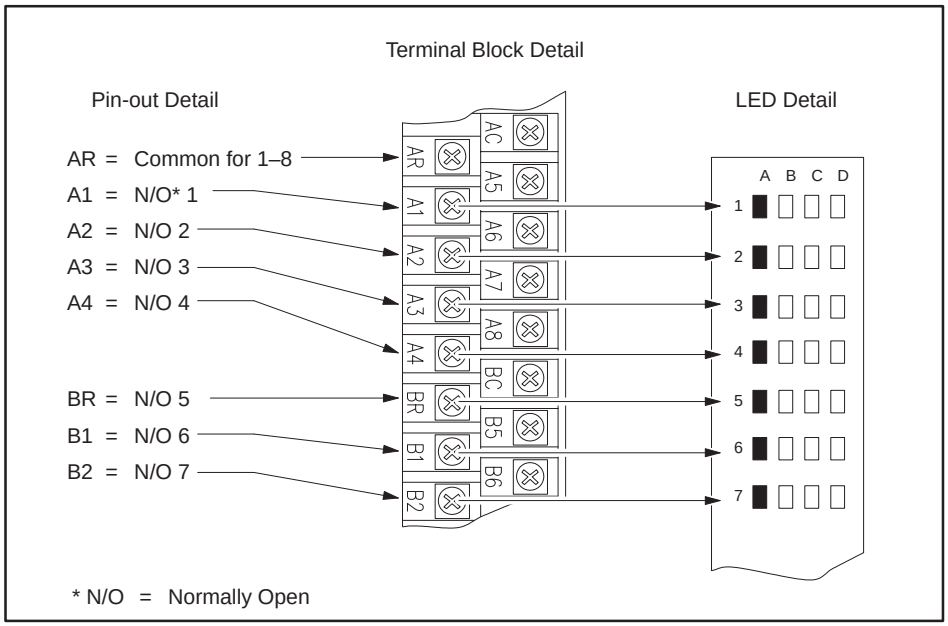


Figure 3-3 Example of Terminal Block Wiring on 32-Point Relay Output Module

Table 3-11 Terminal Block Pin-out: 32-Point Relay Output Module (PPX:505–4932)

User Connection	LED	User Connection	LED
AR = Common for 1–8	–	AC = Common for 9–16	–
A1 = N/O* 1	A1	A5 = N/O 9	B1
A2 = N/O 2	A2	A6 = N/O 10	B2
A3 = N/O 3	A3	A7 = N/O 11	B3
A4 = N/O 4	A4	A8 = N/O 12	B4
BR = N/O 5	A5	BC = N/O 13	B5
B1 = N/O 6	A6	B5 = N/O 14	B6
B2 = N/O 7	A7	B6 = N/O 15	B7
B3 = N/O 8	A8	B7 = N/O 16	B8
B4 = N/O 17	C1	B8 = N/O 25	D1
CR = N/O 18	C2	CC = N/O 26	D2
C1 = N/O 19	C3	C5 = N/O 27	D3
C2 = N/O 20	C4	C6 = N/O 28	D4
C3 = N/O 21	C5	C7 = N/O 29	D5
C4 = N/O 22	C6	C8 = N/O 30	D6
DR = N/O 23	C7	DC = N/O 31	D7
D1 = N/O 24	C8	D5 = N/O 32	D8
D2 = Common for 17–24	–	D6 = Common for 25–32	–
D3 = Not Used	–	D7 = Not Used	–
D4 = User Coil Power (+)	–	D8 = User Coil Power (–)	–

* N/O = Normally Open

Table 3-12 Terminal Block Pin-out: 16-Point Relay Output Module (PPX:505–4916)

User Connection	LED	User Connection	LED
AR = Common for 1–4	–	AC = Common for 5–8	–
A1 = N/O* 1	A1	A5 = N/O 5	B1
A2 = N/O 2	A2	A6 = N/O 6	B2
A3 = N/O 3	A3	A7 = N/O 7	B3
A4 = N/O 4	A4	A8 = N/O 8	B4
BR = Not Used	–	BC = Not Used	–
B1 = Not Used	–	B5 = Not Used	–
B2 = Not Used	–	B6 = Not Used	–
B3 = Not Used	–	B7 = Not Used	–
B4 = N/O 9	C1	B8 = N/O 13	D1
CR = N/O 10	C2	CC = N/O 14	D2
C1 = N/O 11	C3	C5 = N/O 15	D3
C2 = N/O 12	C4	C6 = N/O 16	D4
C3 = Not Used	–	C7 = Not Used	–
C4 = Not Used	–	C8 = Not Used	–
DR = Not Used	–	DC = Not Used	–
D1 = Not Used	–	D5 = Not Used	–
D2 = Common for 9–12	–	D6 = Common for 13–16	–
D3 = Not Used	–	D7 = Not Used	–
D4 = User Coil Power (+)	–	D8 = User Coil Power (–)	–

* N/O = Normally Open

Table 3-13 Terminal Block Pin-out: 16-Point Relay Output Modules (PPX:505–5417 and PPX:505–5518)

User Connection	LED	User Connection	LED
AR = User-Power (–)	–	AC = Common for 1–4	–
A1 = N/O* 1	A1	A5 = N/C** 1	A1
A2 = N/O 2	A2	A6 = N/C 2	A2
A3 = N/O 3	A3	A7 = N/C 3	A3
A4 = N/O 4	A4	A8 = N/C 4	A4
BR = User-Power +	–	BC = Common for 5–8	–
B1 = N/O 5	B1	B5 = N/C 5	B1
B2 = N/O 6	B2	B6 = N/C 6	B2
B3 = N/O 7	B3	B7 = N/C 7	B3
B4 = N/O 8	B4	B8 = N/C 8	B4
CR = Not Used	–	CC = Common for 9–12	–
C1 = N/O 9	C1	C5 = N/C 9	C1
C2 = N/O 10	C2	C6 = N/C 10	C2
C3 = N/O 11	C3	C7 = N/C 11	C3
C4 = N/O 12	C4	C8 = N/C 12	C4
DR = Not Used	–	DC = Common for 13–16	–
D1 = N/O 13	D1	D5 = N/C 13	D1
D2 = N/O 14	D2	D6 = N/C 14	D2
D3 = N/O 15	D3	D7 = N/C 15	D3
D4 = N/O 16	D4	D8 = N/C 16	D4
Note: The LED follows the status of the N/O contact.			

* N/O = Normally Open

** N/C = Normally Closed

Table 3-14 Terminal Block Pin-out: 8-Point Relay Output Module (PPX:505–4908)

User Connection	LED	User Connection	LED
AR = Common 1	–	AC = Common 2	–
A1 = N/O 1*	A1	A5 = N/O 2	A2
A2 = N/C 1**	A1	A6 = N/C 2	A2
A3 = Not Used	–	A7 = Not Used	–
A4 = Not Used	–	A8 = Not Used	–
BR = Common 3	–	BC = Common 4	–
B1 = N/O 3	B1	B5 = N/O 4	B2
B2 = N/C 3	B1	B6 = N/C 4	B2
B3 = Not Used	–	B7 = Not Used	–
B4 = Not Used	–	B8 = Not Used	–
CR = N/O 5	C1	CC = N/O 6	C2
C1 = N/C 5	C1	C5 = N/C 6	C2
C2 = Common 5	–	C6 = Common 6	–
C3 = Not Used	–	C7 = Not Used	–
C4 = Not Used	–	C8 = Not Used	–
DR = N/O 7	D1	DC = N/O 8	D2
D1 = N/C 7	D1	D5 = N/C 8	D2
D2 = Common 7	–	D6 = Common 8	–
D3 = Not Used	–	D7 = Not Used	–
D4 = User Coil Power (+)	–	D8 = User Coil Power (–)	–
Note: The LED follows the status of the N/O contact.			

* N/O = Normally Open

** N/C = Normally Closed

3.4 Wiring the Word Input and Output Modules

Pin-outs for Word Input and Output Modules

Table 3-15 shows the pin-out for Word Input modules and Table 3-16 shows the pin-out for the Word Output modules. Appendix A contains a worksheet for determining the connections to the terminal block.

Table 3-15 Terminal Block Pin-out for Word Input Module (PPX:505–6308)

User Connection	User Connection
AR = User-Power (–)	AC = User-Power (+)
A1 = Option 1 (Data Active Level)	A5 = DB 1
A2 = Option 1	A6 = DB 2
A3 = Option 2 (Strobe Active Level)	A7 = DB 3
A4 = Option 2	A8 = DB 4
BR = Not Used	BC = Signal common
B1 = Option 3 (Strobe Source)	B5 = DB 5
B2 = Option 3	B6 = DB 6
B3 = Option 4 (Internal Resistance)	B7 = DB 7
B4 = Option 4	B8 = DB 8
CR = Signal common	CC = Signal common
C1 = Strobe 1	C5 = DB 9
C2 = Strobe 2	C6 = DB 10
C3 = Strobe 3	C7 = DB 11
C4 = Strobe 4	C8 = DB 12
DR = Signal common	DC = Signal common
D1 = Strobe 5	D5 = DB 13
D2 = Strobe 6	D6 = DB 14
D3 = Strobe 7	D7 = DB 15
D4 = Strobe 8	D8 = DB 16

Table 3-16 Terminal Block Pin-out for Word Output Module (PPX:505–6408)

User Connection	User Connection
AR = User-Power (–)	AC = User-Power (+)
A1 = EPF Out	A5 = DB 1
A2 = Not Used	A6 = DB 2
A3 = Option 1 (Data Active Level)	A7 = DB 3
A4 = Option 1	A8 = DB 4
BR = Not Used	BC = Signal common
B1 = Option 2 (Strobe Active Level)	B5 = DB 5
B2 = Option 2	B6 = DB 6
B3 = Option 3 (Channel Operation)	B7 = DB 7
B4 = Option 3	B8 = DB 8
CR = Signal common	CC = Signal common
C1 = Strobe 1	C5 = DB 9
C2 = Strobe 2	C6 = DB 10
C3 = Strobe 3	C7 = DB 11
C4 = Strobe 4	C8 = DB 12
DR = Signal common	DC = Signal common
D1 = Strobe 5	D5 = DB 13
D2 = Strobe 6	D6 = DB 14
D3 = Strobe 7	D7 = DB 15
D4 = Strobe 8	D8 = DB 16

Avoiding Noise Problems

Wiring the Word Input and Output modules consists of wiring the user-provided power supply, and wiring the input signals and jumpers. All connections are made at the module terminal block. The power supply wiring should be separated from the signal wiring to avoid introducing noise on the input data lines.

Connections and Terminations

Make the power connections at the top two terminals: AR (negative) and AC (positive).

Connect the data lines to the terminals on the right side of the terminal block. The data lines are designated DB1–DB16 in Table 3-15 and Table 3-16; DB16 is the least significant bit.

Terminate the shields for the data lines at the source of the signal, and connect the return lines to the signal common terminals on the terminal block. The five signal common terminals are labeled BC, CC, DC, CR, and DR. These terminals are linked internally. Signal common connections can be made to any of these five terminals.

Because the input data lines are multiplexed on the Word Input modules, the devices connected to them must have tri-state outputs or open collector outputs. Diodes may also be used to isolate field devices, as shown in Figure 3-4.

The strobe lines are connected to the C and D group of terminals on the left side of the terminal block. The strobe lines are designated Strobe 1 through Strobe 8, where Strobe 1 corresponds to Word number 1 (WY1).

Transmission distance for the module-generated strobes is determined by cable size.

- Use up to 10 feet for AWG #20 ribbon cable with interleaved signal returns terminated at both ends.
- Use up to 30 feet for AWG #18 shielded, twisted pair cable.

⚠CAUTION

Use supply wires suitable for at least 75° C. Signal wiring connected in this box must be rated at least 300 V.

⚠ATTENTION

Employer des fils d'alimentation pour au moins 75° C. Le cablage de signalisation raccordé dans cette boîte doit convenir pour une tension nominale d'au moins 300 V.

The shielding for the cable should be terminated at the source end of the signal. Use the earth ground to which the base is connected to terminate the cable shielding.

Figure 3-4 shows the connections for the blocking diodes for multiple thumbwheels that use high true module-generated strobes. If you use this configuration:

- Install jumper one for a high true data active level
- Install jumper two for high true strobes
- Install jumper four for pull-down resistors

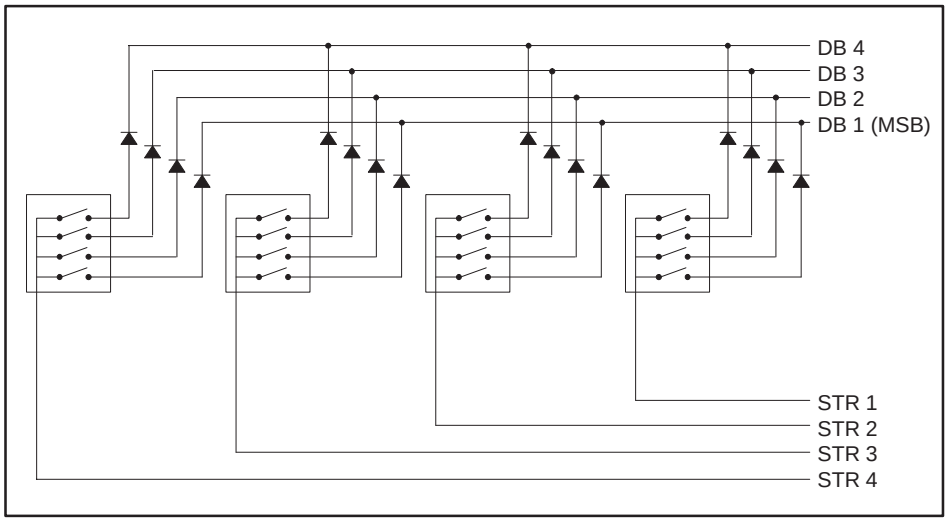


Figure 3-4 Blocking Diodes for Multiple Thumbwheels: Word Input Modules

NOTE: When using the strobe lines to power thumbwheel switches, long line lengths from the field input to the module may degrade the speed (rise time and fall time), and the voltage levels into the module. When using thumbwheels with a low true strobe, the blocking diodes must be reversed from the direction shown in Figure 3-4. For this configuration, jumpers one, two, and four are not installed.

3.5 Field Wiring

Wiring Recommendations

To minimize unwanted noise, follow these wiring installation guidelines.

- Use the shortest possible wires.
- Separate discrete and analog wires.
- Avoid placing signal wires parallel to high-energy wires. If the two must meet, cross them at right angles.
- Avoid bending the wire into sharp angles.
- Use wireways for wire routing.
- When using shielded wires, ground them only at the source end for better noise immunity.
- Place wires so that they do not interfere with existing wiring.
- Label the wires.

⚠ CAUTION

You must use supply wires suitable for at least 75° C. Signal wiring connected in this box must be rated at least 300 V.

⚠ ATTENTION

Employer des fils d'alimentation pour au moins 75° C. Le cablage de signalisation raccordé dans cette boîte doit convenir pour une tension nominale d'au moins 300 V.

Wiring the Terminal Block

You can use either of the terminal blocks shown in Figure 3-5. Both terminal blocks are removable. To wire the terminal block, follow the procedure below.

1. Turn the terminal block, with the screw-heads facing you, until the A series of terminals is at the top and the D series is at the bottom.
2. Using Table 3-1 through Table 3-16 as wiring guides, start with the D series and loosen the appropriate terminal block screws.
3. Strip back the insulation on the wires about 1/4″ to 3/8″ (or one centimeter). Use a 12–26 AWG or a 0.16–3.2 mm^2 metric gauge wire of either stranded or solid type.

   (If you are using the side-accessible connector number, PPX:2587705–8010, a spade or a ring lug may be attached to the end of the wire.)
4. Connect the end of the wire to the loosened terminal block screw and tighten the screw firmly. Once the D series is completed, connect the C series, and continue until the terminal block is completely wired.

NOTE: An easy-to-use, stick-on label is provided separately with space available to write in the name of each input. Write in the corresponding input or output names and apply the label to the flat side of the terminal block. Appendix A contains a worksheet to help you document the input and output labeling.

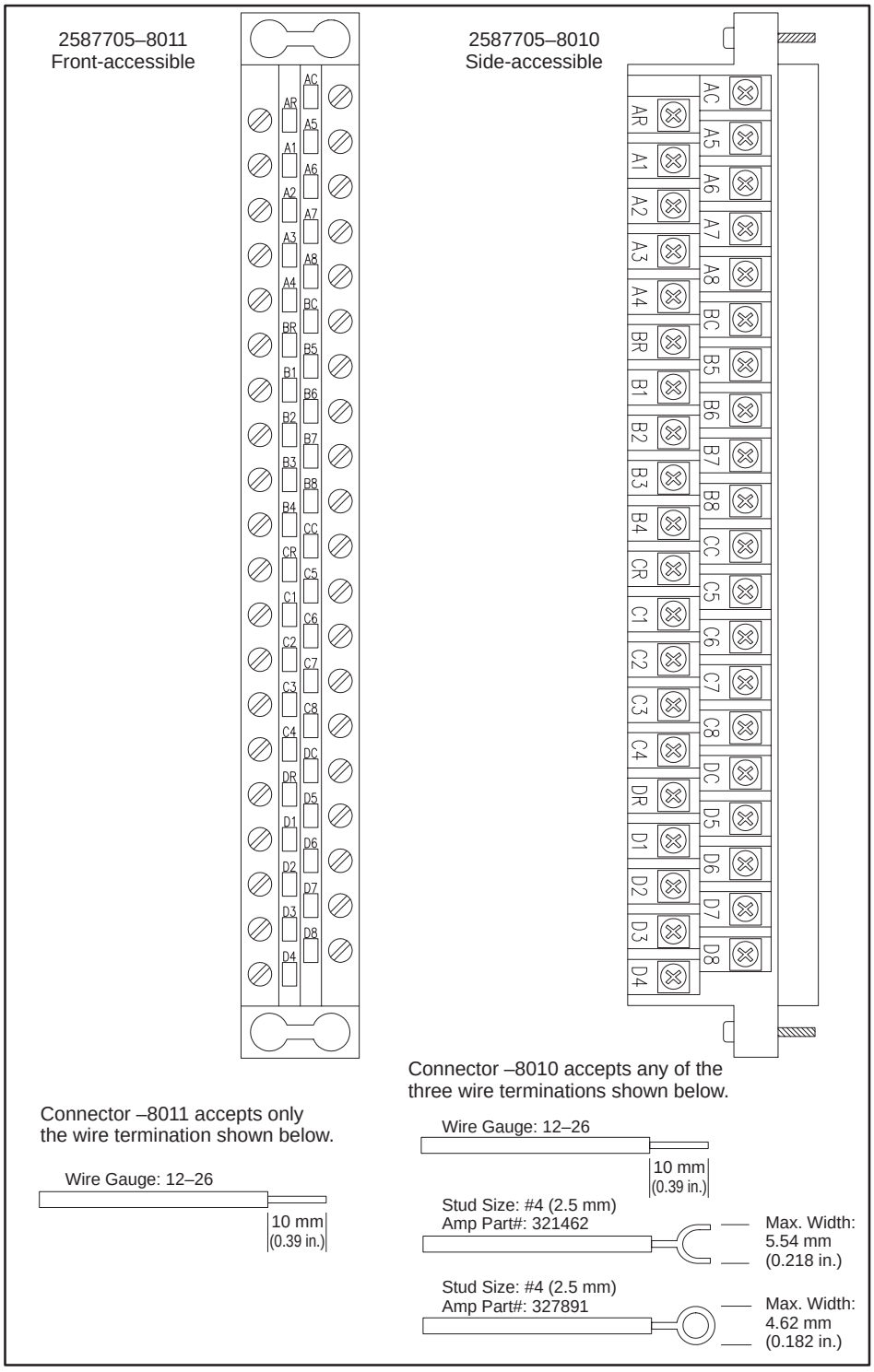


Figure 3-5 Terminal Blocks

Connecting the Terminal Block

To connect the terminal block to the module, follow these steps. (See Figure 3-6.)

⚠WARNING

Disable all power to the base before connecting the terminal block. Failure to do so may result in injury to personnel or damage to equipment.

1. Align the terminal block with the edge card connector on the bezel; AC is at the top of the terminal block.
2. Press firmly at both ends of the terminal block until it is seated.
3. Tighten the screws at the top and bottom. Do not over-tighten.
4. After all terminal blocks have been installed, you may restore power to the base. When power is supplied to the Word Input and Word Output modules, the status indicator comes on if the module has detected no problems. If the status indicator does not light (or goes out during operation), the module has detected a failure. To correct the failure, refer to Chapter 4.

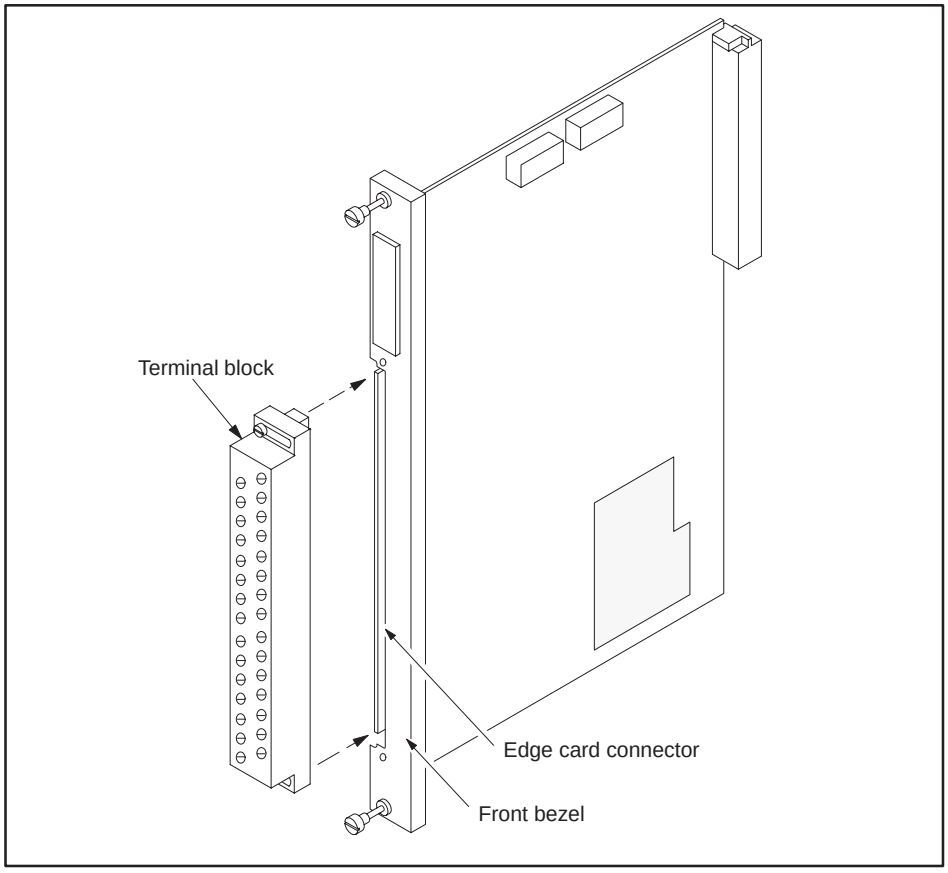


Figure 3-6 Installing the Terminal Block

Typical Connections

Figure 3-7 through Figure 3-15 shows typical connections for all the I/O modules.

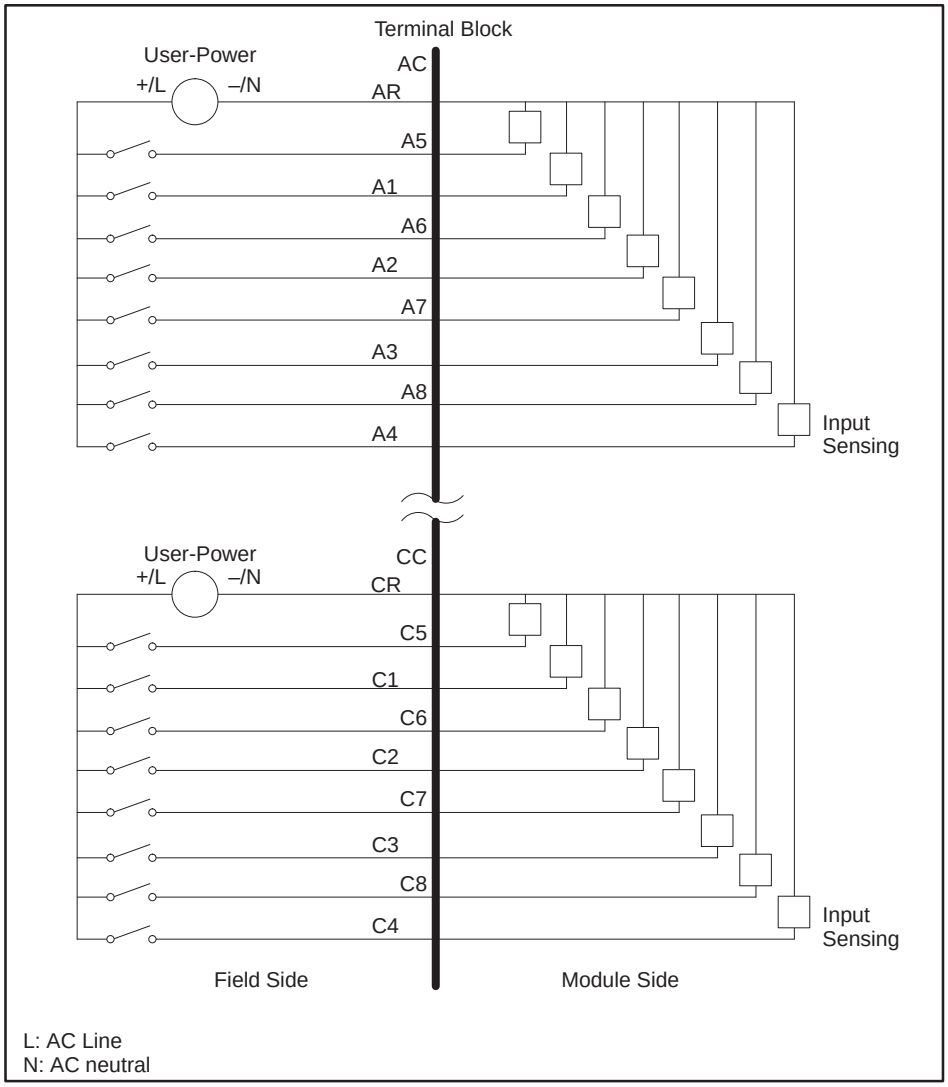


Figure 3-7 Typical Sinking Connection for 32–Point Discrete Input Modules (PPX:505–4032(A), PPX:505–4132, PPX:505–4232(A), PPX:505–4332, and PPX:505–4432(A))

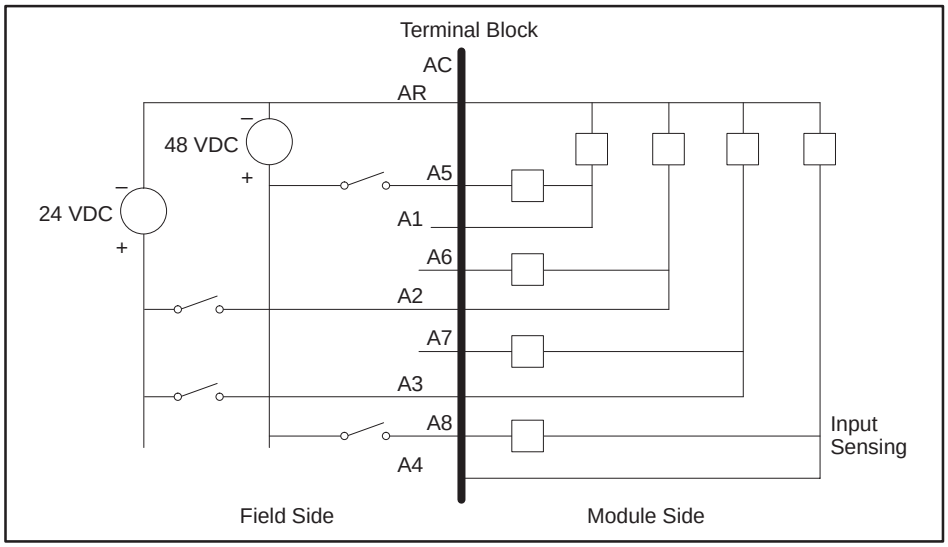


Figure 3-8 Typical Sinking Connection for a 16–Point Discrete Input Module (PPX:505–4316–A)

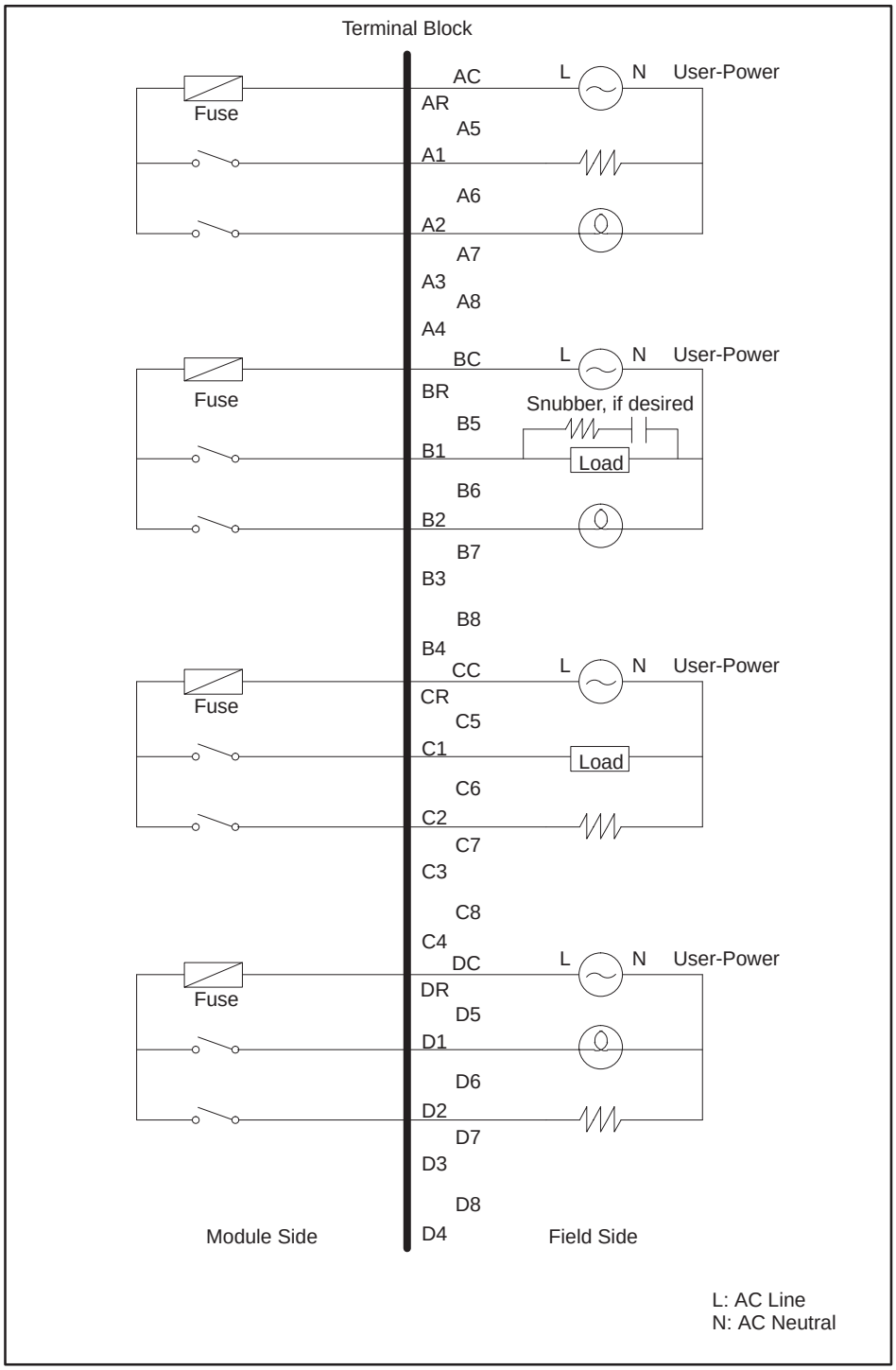


Figure 3-9 Typical Sourcing Connection for 8-Point AC Discrete Output Modules (PPX:505–4608 and PPX:505–4808)

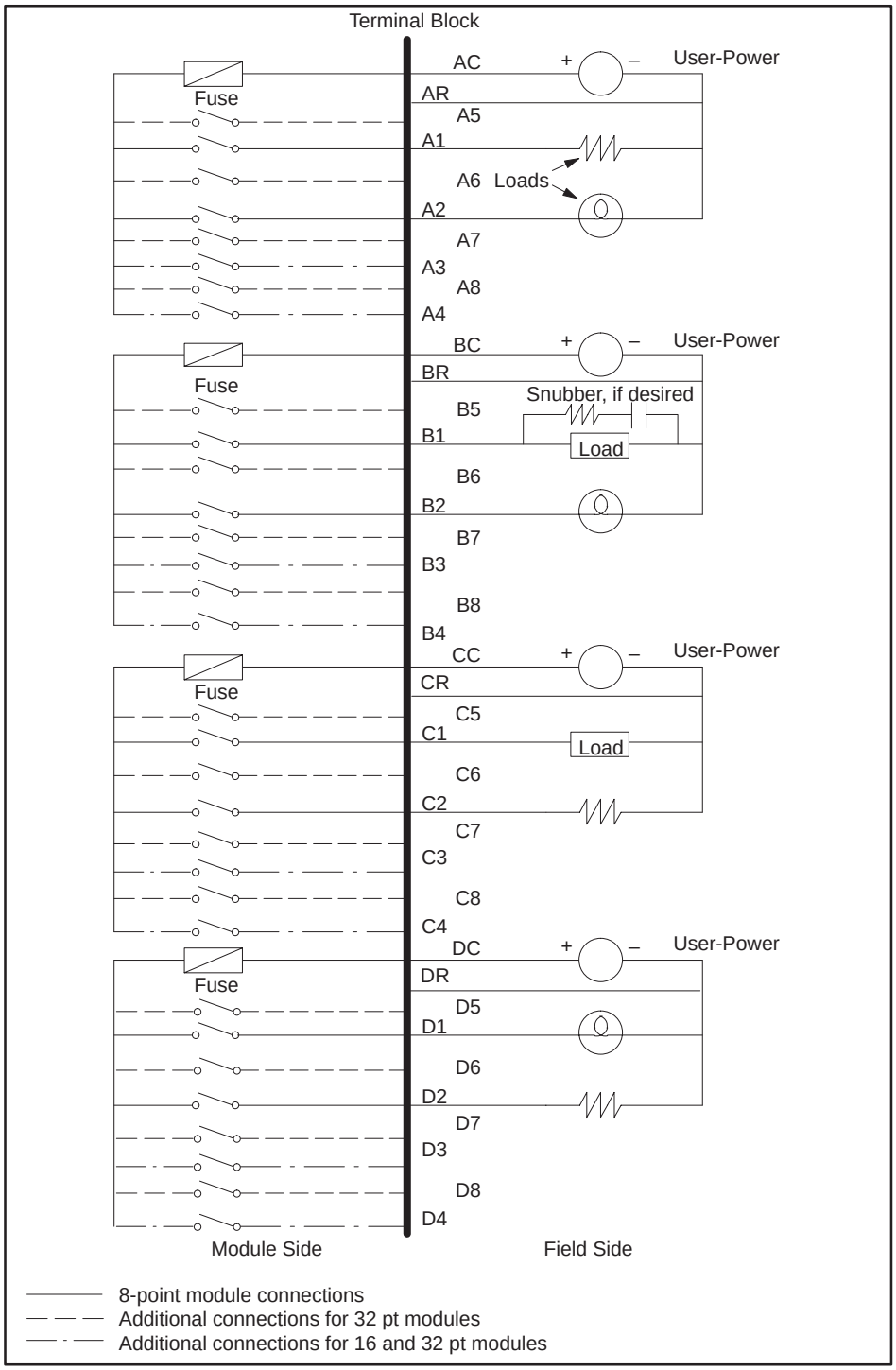


Figure 3-10 Typical Connection for Discrete Sourcing Output Modules (PPX:505–4508, PPX:505–4708, PPX:505–4516, PPX:505–4716, PPX:505–4532, and PPX:505–4732)

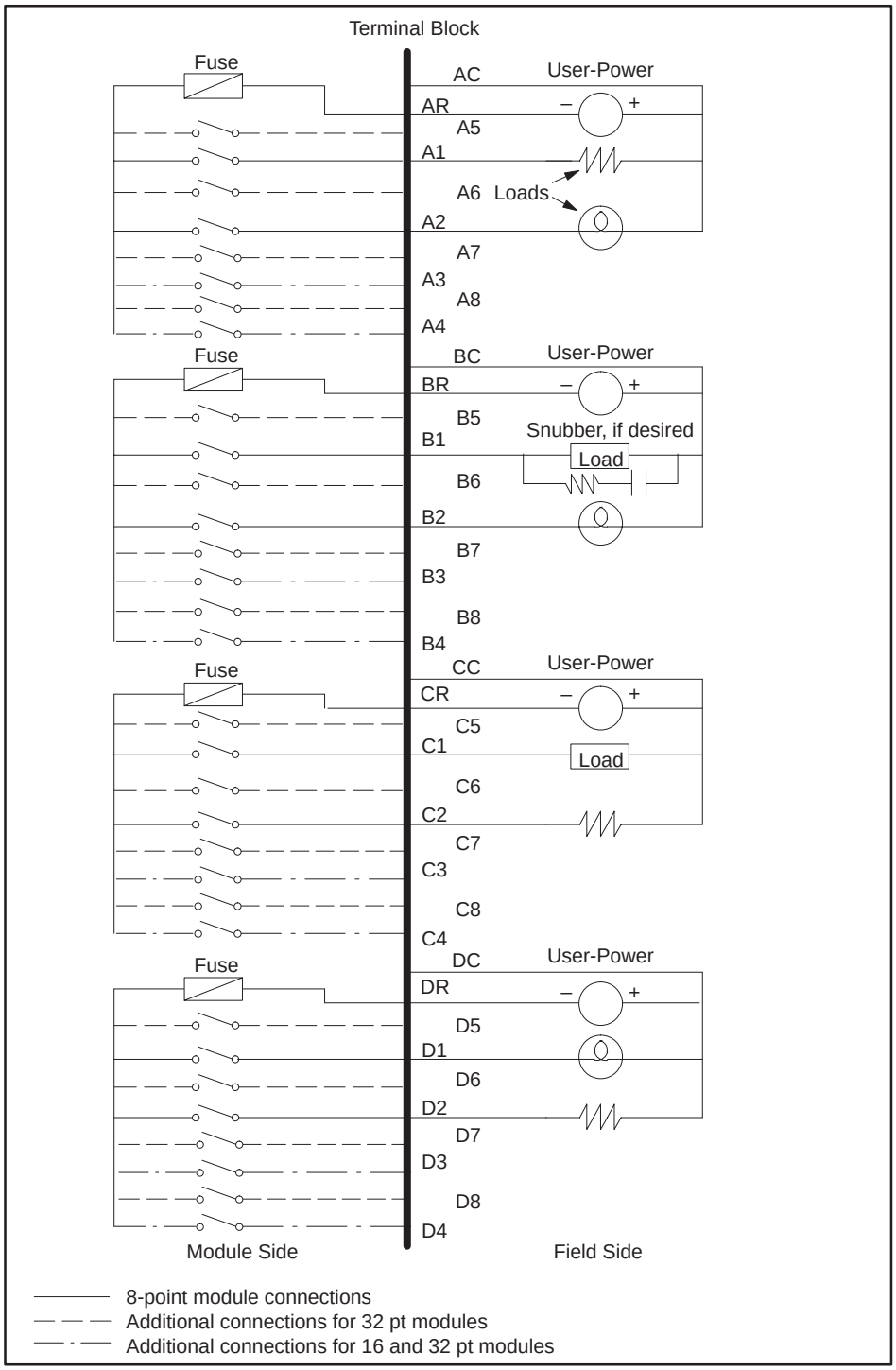


Figure 3-11 Typical Connections for Discrete Sinking Output Modules (PPX:505–3508, PPX:505–3516, PPX:505–3532, PPX:505–3708, PPX:505–3716, and PPX:505–3732)

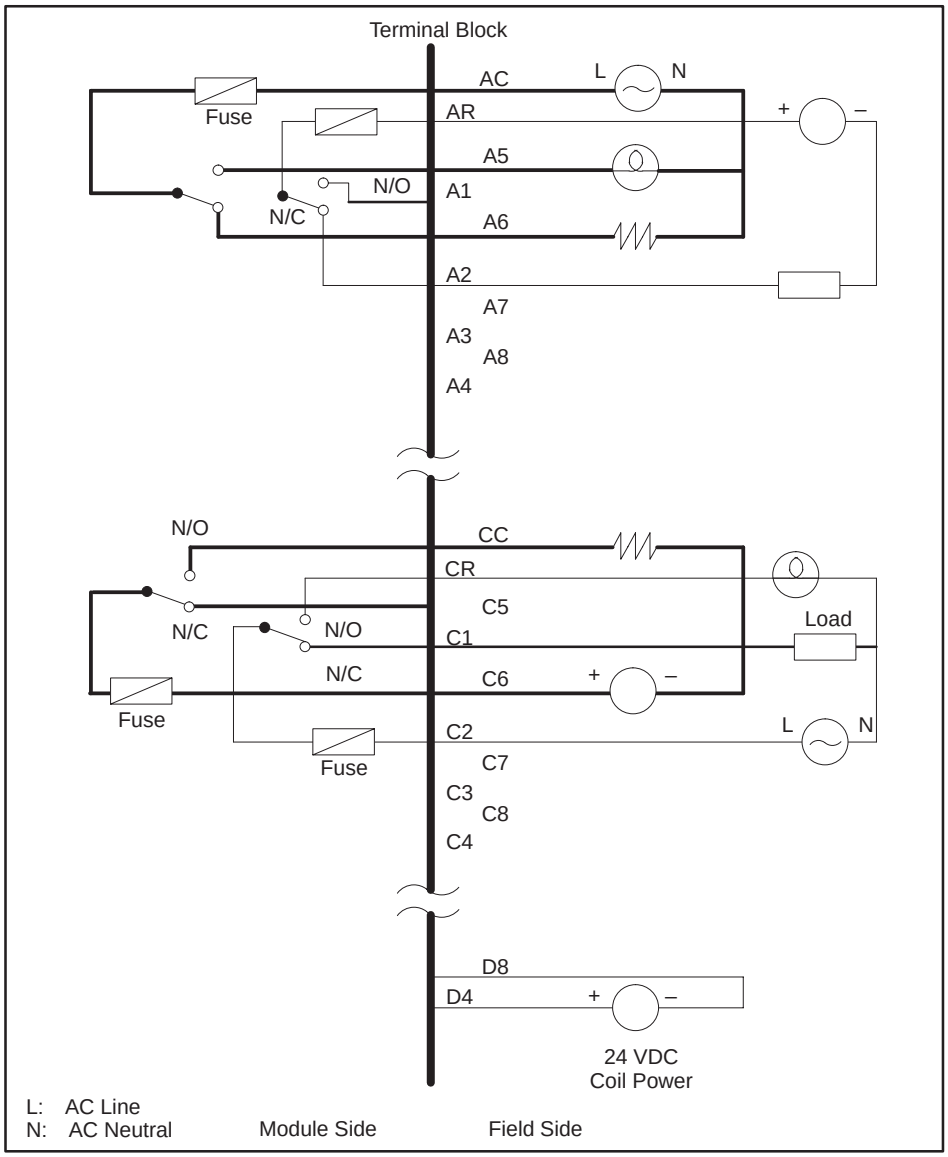


Figure 3-12 Typical Connection for an 8–Point Relay Output Module (PPX:505–4908)

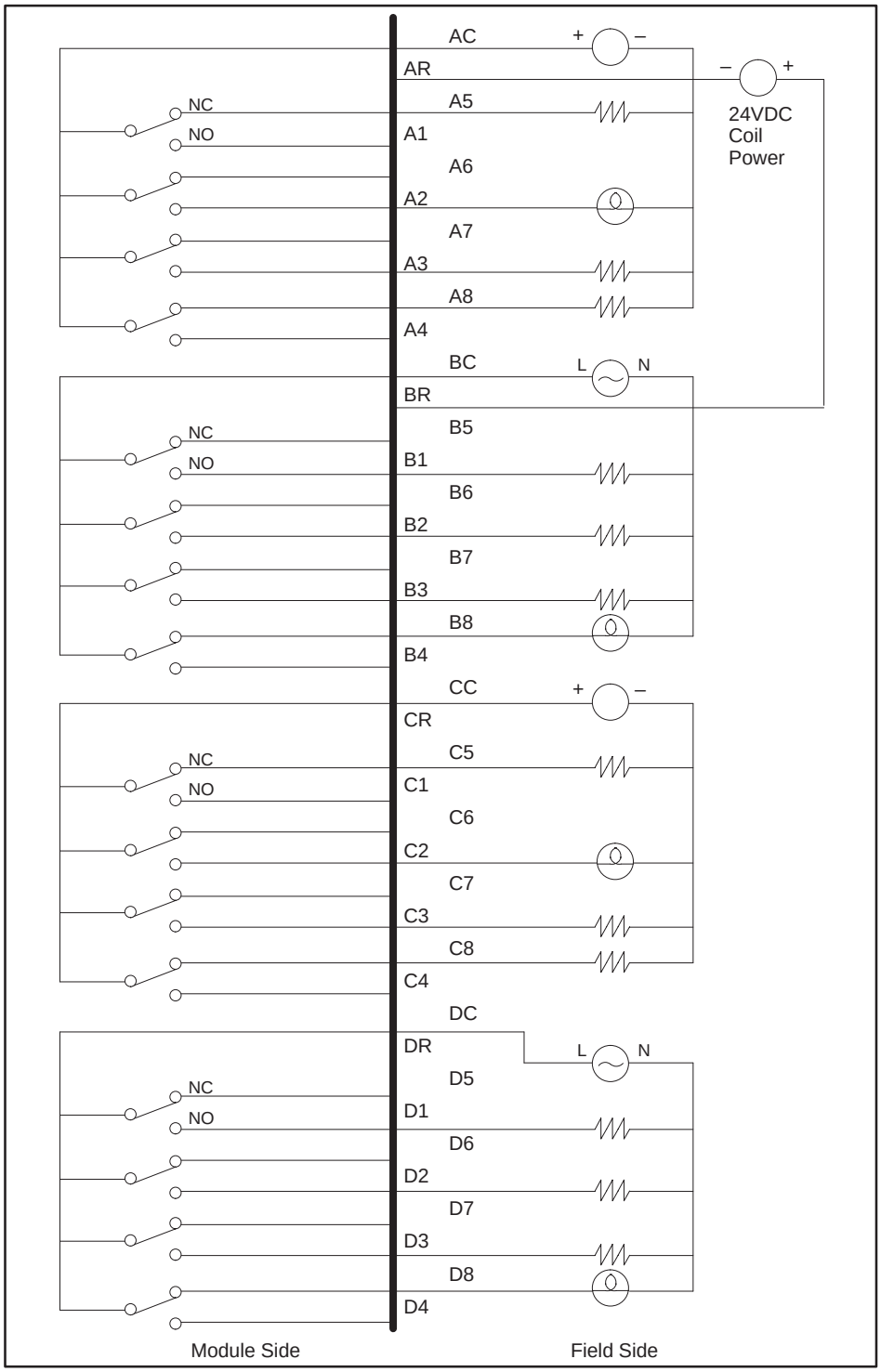


Figure 3-13 Typical Connections for an 16–Point Relay Output Module (PPX:505–5417)

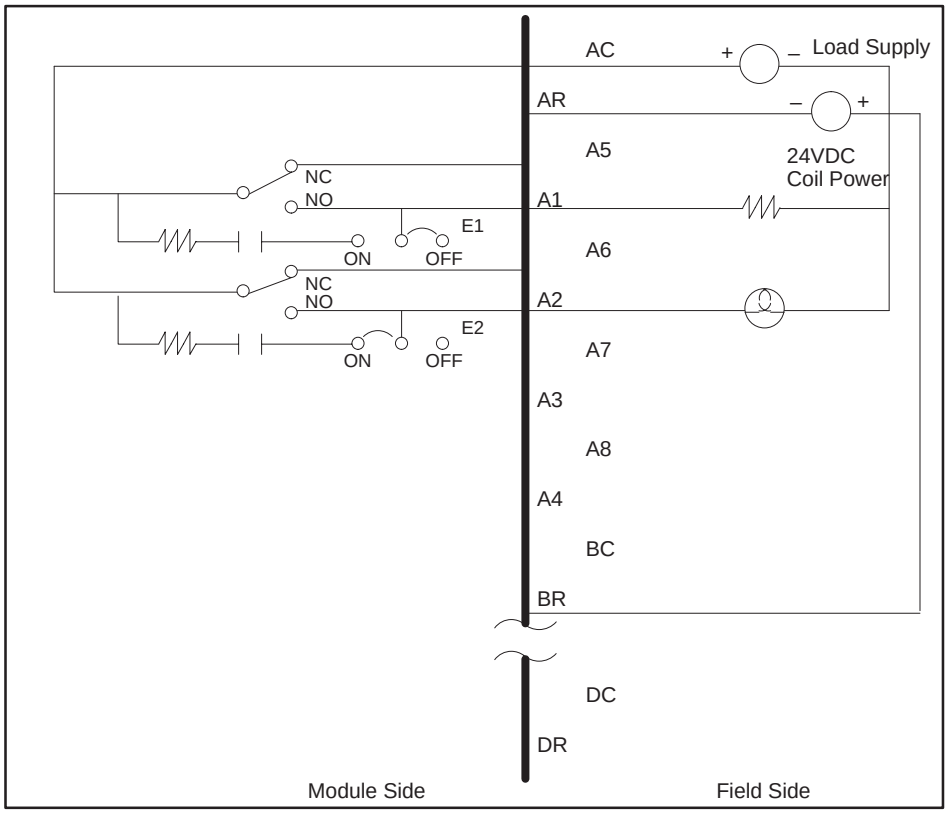


Figure 3-14 Typical Connections for an 16–Point Relay Output Module (PPX:505–5518)

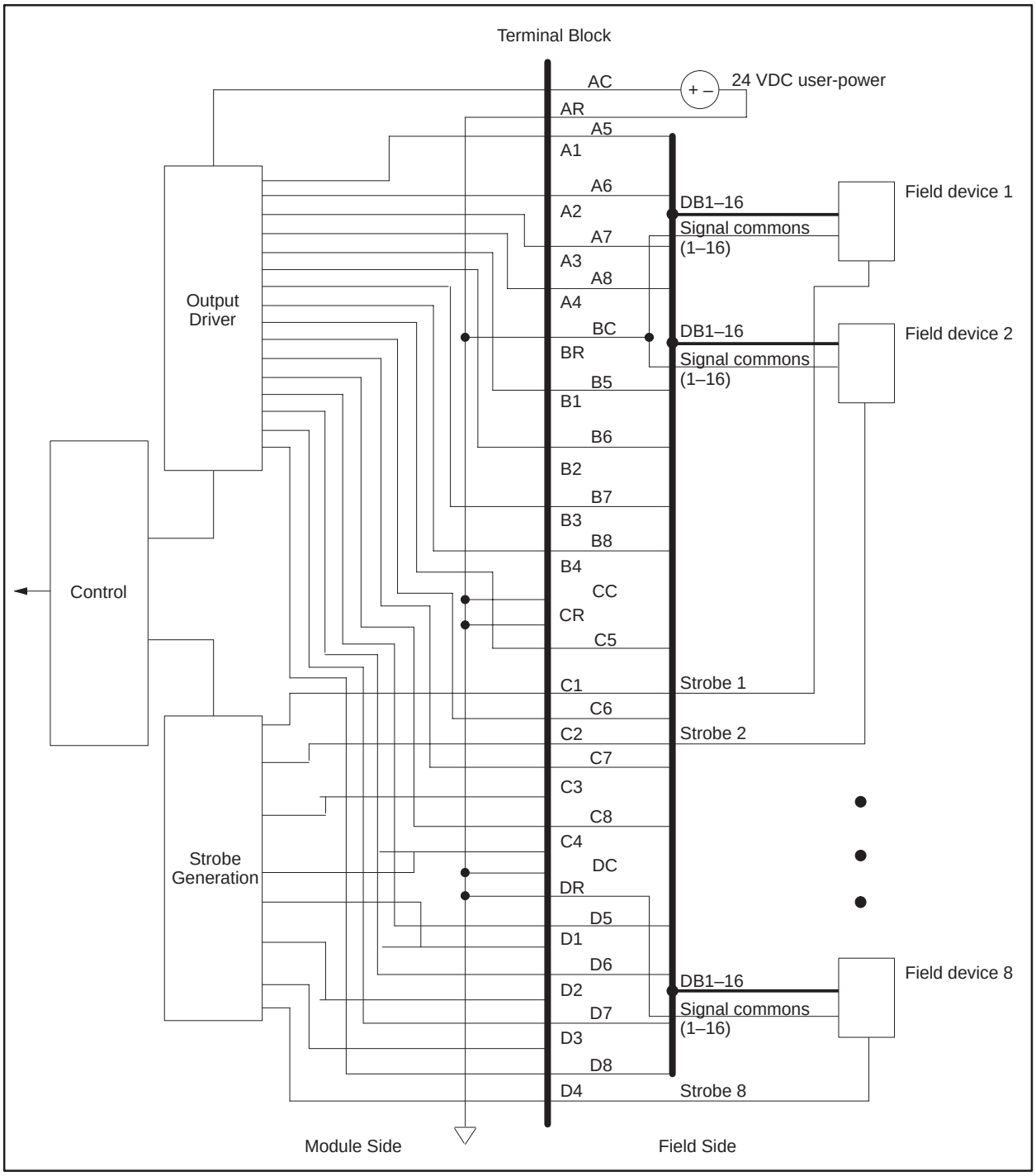


Figure 3-15 Typical Connections for a Word Input or Output Module

3.6 Connecting Discrete Output Modules

AC and DC Output Modules

The Discrete AC Output modules are both sourcing and sinking. Therefore, the outputs operate when wired in either a sourcing or a sinking configuration. AC modules do not have blown-fuse indicators.

⚠CAUTION

On AC or DC modules, the module may be damaged if more than one channel is overloaded simultaneously, or if the temporary overload specification is exceeded.

The Discrete DC Output modules (PPX:505–45xx and PPX:505–47xx) are sourcing outputs, and do not function unless the module is wired correctly. The Discrete DC Output modules (PPX:505–35xx and PPX:505–37xx) are sinking outputs, and do not function unless the module is wired correctly. If the user-power is incorrectly connected, the fuse blows; however, the blown-fuse indicator does not light until power is properly connected. (Note that reverse polarity connections within the ratings of the device does not cause damage to the device.)

3.7 Loopback Configuration

Discrete Input and Output Modules

Input and output modules may be connected to each other to check the operation of the modules. The user- (external) power supply must be the appropriate voltage for both input and output modules. For AC modules, an additional external load resistor may be required to satisfy the minimum load specification. See Table 3-17 for suggested load values, with no other load on the output.

Table 3-17 Load Values for Discrete Input and Output Modules

Connected Pair	Load (20% tolerance)	Power Ratings
48XX to 44XX(A)	2.7K ohms	65.0 W
48XX to 42XX(A)	1.2K ohms	36.5 W
46XX to 42XX(A)	47.0K ohms	0.5 W
46XX to 40XX(A)	22.0K ohms	0.25 W

Discrete I/O Modules and I/O Simulators

After the modules have been inserted into the I/O base, you must register the I/O addresses for each module in the controller memory. (The module does not automatically register addresses in the controller.)

NOTE: The module may appear to be operating correctly, but it does not communicate with the controller unless the module is configured in the I/O map. A programming device must be connected to the controller to configure the I/O map and verify controller-to-module communications.

Double-wide modules occupy two adjacent slots in the base. No connection is made to the base connector at the second slot; therefore, no configuration should be made for this slot.

Discrete Input and Output modules are designated by X and Y respectively. If the values of the Discrete I/O modules listed in Table 3-18 are entered into the programming device, they appear on the screen as shown in Figure 3-16.

Table 3-18 Discrete Module I/O Values

Discrete Module	No. of Bits X .. Y
Discrete 32-point Output Module	00 .. 32
Discrete 32-point Input Module	32 .. 00
Discrete 8-point Output Module	00 .. 8
Discrete 16-point Input Module	16 .. 00

I/O Module Definition for: Channel ...1 Base...0

Slot	I/O Address	Number of Bit and Word I/O X	Y	WX	WY	Special Function
1	0001	00	32	00	00	NO
2	0033	32	00	00	00	NO
3	0065	00	08	00	00	NO
4	0073	16	00	00	00	NO
5	0000	00	00	00	00	NO
6	0000	00	00	00	00	NO
7	0000	00	00	00	00	NO
8	0000	00	00	00	00	NO

Figure 3-16 Sample Discrete I/O Module Definition Chart

Relay Output Modules

The Relay Output module is designated by Y points. If the values of the Relay Output modules listed in Table 3-19 are entered into the programming device, they appear on the screen as shown in Figure 3-17.

Table 3-19 Relay Output Module I/O Values

Relay Module	No. of Bits X Y
Relay 32-point Output Module	00 .. 32
Relay 16-point Input Module	00 .. 16
Relay 8-point Output Module	00 .. 08

I/O Module Definition for: Channel ...1 Base...0

Slot	I/O Address	Number of Bit and Word I/O X	Y	WX	WY	Special Function
1	0001	00	32	00	00	NO
2	0000	00	00	00	00	NO
3	0033	00	16	00	00	NO
4	0049	00	08	00	00	NO
5	0000	00	00	00	00	NO
6	0000	00	00	00	00	NO
7	0000	00	00	00	00	NO
8	0000	00	00	00	00	NO

Figure 3-17 Sample Relay Output Module Definition Chart

Word Input and Word Output Modules

If the Word module I/O values in Table 3-20 (I/O base 0) are entered into the programming device, they appear on the screen as shown in Figure 3-18.

Table 3-20 Word Module I/O Values

Word Module	Word I/O WX .. WY
8-Channel Word Output Module	00 .. 08
8-Channel Word Input Module	08 .. 00

I/O Module Definition for: Channel .. .1Base...0

Slot	I/O Address	Number of Bit and Word I/O X	Y	WX	WY	Special Function
1	0001	00	00	00	08	NO
2	0000	00	00	00	00	NO
3	0009	00	00	08	00	NO
4	0000	00	00	00	00	NO
5	0000	00	00	00	00	NO
6	0000	00	00	00	00	NO
7	0000	00	00	00	00	NO
8	0000	00	00	00	00	NO

Figure 3-18 Sample Word I/O Module Definition Chart

NOTE: In Figure 3-18 slot 1 contains a Parallel Word Output module and slot 3 contains a Parallel Word Input module.

For more information on configuring I/O, refer to the *SIMATIC 505 TISOFT User Manual*.

Chapter 4

Troubleshooting

4.1 LED Status Indicators

The LED Input Status Indicators and the controller indicate whether or not the module is operating correctly.

Discrete Input and Output Modules

Table 4-1 shows symptoms, probable causes and corrective actions to take if the discrete modules are not operating correctly.

Table 4-1 Troubleshooting for Discrete Input and Output Modules

Symptom	Probable Cause	Corrective Action
Module LED is not lit	Not receiving power	Check power supply and connections.
	Not configured	Configure I/O.
	Faulty LED	Return module for repair.
Incorrect values (Input module only)	Wrong terminal block connections	Trace wiring connections.
	Noise on signal wire exceeding immunity level	Use shielded wire near power wire; check ground wire to base.
	Noise from adjacent modules radiating to module	Re-arrange module to separate high energy modules from all others.
	Not configured	Configure I/O.
Outputs not on (Output modules only)	Wrong terminal block connections	Trace wiring connections.
	Not receiving user-power	Check user-power connections.
	Blown fuse	Check for overvoltage or reversed polarity. Replace the fuse.*
	Not configured	Configure I/O.
	Faulty output point	Return module for repair.
Non-fatal error as a result of the module	Module configured incorrectly	Re-configure the module.

* See Section 4.2.

Relay Output Modules

Table 4-2 shows symptoms, probable causes, and corrective actions to take if the relay modules are not operating correctly.

Table 4-2 Troubleshooting Chart for Relay Output Modules

Symptom	Probable Cause	Corrective Action
Module LED is not lit	Not receiving power	Check power supply and connections.
	Not configured	Configure I/O.
	Faulty LED	Return the module for repair
Outputs not on	Wrong terminal block connections	Trace wiring connections.
	Not receiving coil power	Check coil power connections.
	Blown fuse (PPX:505–4908 PPX:505–5417 and PPX:505–5518)	Check for overvoltage or reversed polarity. Replace the fuse. *
	Not configured	Configure I/O.
	Relay damaged	Replace relay ** (PPX:505–4932 only)
		Return the module for repair. (PPX:505–4908, PPX:505–4916, PPX:505–5417, and PPX:505–5518)
Nonfatal error as a result of the module	Module configured incorrectly	Re-configure the module.

* See Section 4.2.

** See Section 4.3.

Word Input and Output Modules

Table 4-3 shows symptoms, probable causes, and corrective actions to take if the word modules are not operating correctly.

Table 4-3 Troubleshooting Chart for Word Input and Output Modules

Symptom	Probable Cause	Corrective Action
Module LED is not lit	Not receiving user-power	Check user-power supply and connections.
	Not receiving power from base	Check power to base.
	Blown fuse	Check for overvoltage or reversed polarity. Replace the fuse. *
	Faulty LED	Return module for repair.
Incorrect readings	Connections wrong	Trace wiring connections.
	Signal wire noise	Use shielded wire near power wire.
	Not configured	Configure I/O.
	Wrong jumpers selected	Check jumpers.
	Signal timing requirements not met (Input modules only)	Check signal timing at the terminal block.
	Noise from adjacent modules radiating to module	Re-arrange module to separate high energy modules from all others.
Nonfatal error as a result of the module	Module has failed	Take actions under LED is not lit, above. If this does not correct the problem, return the module for repair.

* See Section 4.2.

If You Need Help

If you have difficulty with your system, contact the Siemens Energy & Automation, Inc., Technical Services Group in the U.S.A. at 423–461–2522. Outside the U.S.A., call 49–911–895–7000.

4.2 Replacing a Fuse

Discrete Output, Relay Output, Word Input and Word Output Modules

If you have determined that your module has a blown fuse, follow the instructions below to replace it.

⚠WARNING

Disable all power to the module and base before replacing a fuse. Failure to do so could result in injury to personnel or damage to equipment.

1. Disable all power to module and base.
2. Disconnect the terminal block from the module.
3. Use a flat-head screwdriver to loosen the screws at the top and bottom of the bezel.
4. Hold the top and bottom of the bezel, and slide the module carefully out of the slot (or slots for double-wide modules). There will be a slight resistance before the base backplane connectors separate.
5. Replace the blown fuse on the printed circuit board.
6. Insert the module into the base. (See Section 3.1.)
7. Power up the system.

If You Need Help

If replacing the fuse does not correct the problem, check for other causes. If you still cannot correct the problem, contact the Siemens Energy & Automation, Inc., Technical Services Group in the U.S.A. at 423–461–2522. Outside the U.S.A., call 49–911–895–7000.

4.3 Replacing a Relay

Relay Output Modules

The 8-point and 16-point relay modules do not have replaceable relays. If you have determined that one of the relays is the problem, contact your distributor. The 32-point relay module (PPX:505–4932) is equipped with replaceable relays, one for each point. When a relay is bad, the LED indicator continues functioning normally, since the indicators read from the logic side of the PLC. However, the output device does not operate.

⚠WARNING

Disable all power to the module and base before replacing a relay. Failure to do so could result in injury to personnel, or damage to equipment.

Replacing a Damaged Relay

To replace a damaged relay follow the instructions below.

1. Disable all power to module and base.
2. Disconnect the terminal block from the module.
3. Use a flat-head screwdriver to loosen the screws at the top and bottom of the bezel.
4. Hold the top and bottom of the bezel, and slide the module carefully out of the slot (or slots for double-wide modules). There will be a slight resistance before the base backplane connectors separate.
5. Using an ohmmeter, locate the damaged relay. Note its orientation.
6. Grasp the damaged relay at the top, and gently rock it from side to side until the relay is loosened from the socket. Do not pry or apply force. You could break off one of the relay prongs inside the socket.
7. Insert a new relay (PPX:2586289–0001) as shown in Figure 4-1, with the same orientation as the damaged relay.
8. Insert the module into the base. (See Section 3.1.)
9. Power up the system.

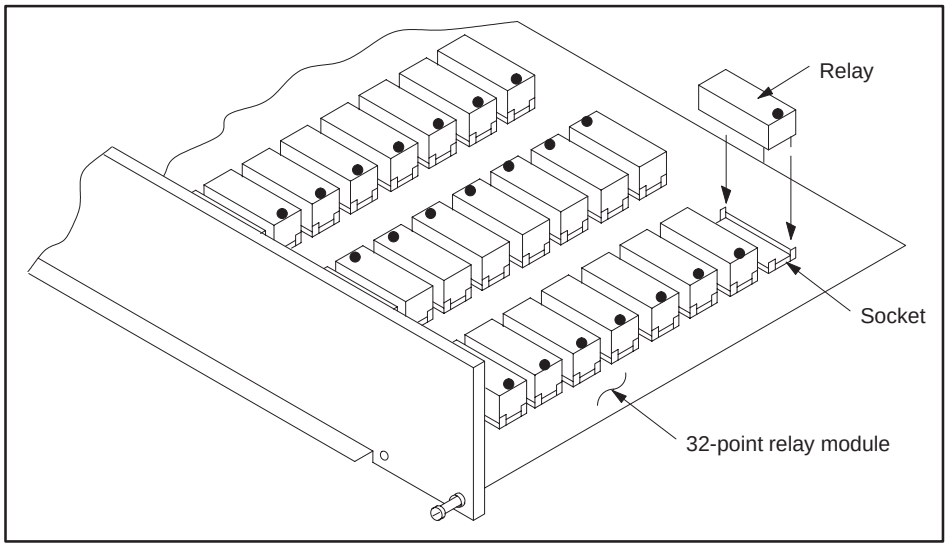


Figure 4-1 Replacing a Relay

If You Need Help

If you cannot correct the problem, contact the Siemens Energy & Automation, Inc., Technical Services Group in the U.S.A. at 423–461–2522. Outside the U.S.A., call 49–911–895–7000.

Appendix A

Specifications

A.1 Environmental Specifications

Table A-1 Environmental Specifications (Discrete I/O, Relay Output and Word I/O Modules)

Operating temperature	0 to 60° C (32 to 140° F)
Storage temperature	–40 to +70° C (–40 to 158° F)
Relative humidity	5% to 95% non-condensing
Pollution degree	2, IEC 664, 664 A
Vibration	Sinusoidal IEC 68-2-6, Test Fc 0.15 mm peak-to-peak, 10–57 Hz; 1.0 g, 57–150 Hz Random IEC 68-2-34, Test Fdc, equivalent to NAVMAT P–9492 0.04 g^2/Hz, 80 Hz to 350 Hz, 3dB/Octave rolloff 80 – 20 Hz, 350 – 2000 Hz
Electrostatic discharge	IEC 801, Part 2, Level 4, (15 kV) *
Shock	IEC 68-2-27; Test Ea
Noise immunity, conducted	IEC 801, Part 4, Level 3
Noise immunity on user power lines	MIL STD 461B CS01, CS02, and CS06 per part 4, IEC 255-4, Appendix E; IEEE 472, 2.5 kV; EEC 4517
Noise immunity, radiated	IEC 801, Part 3, Level 3; MIL STD 461B RS01 &RS02
Corrosion protection	All parts of corrosion-resistant material or plated or painted as corrosion protection

* Note: 6 kV to terminals on PPX:505–49xx Modules

Table A-2 Isolation

Discrete Input and Output Modules	1500 Vrms, input-to-controller 500 Vrms, common-to-common
Relay Output Modules (PPX:505–4908, PPX:505–4916, PPX:505–4932, PPX:505–5417, and PPX:505–5518)	1500 Vrms, input-to-controller 1500 Vrms, common-to-common 1500 Vrms, coil-to-contact
Word Input and Output Modules (PPX:505–6308 and PPX:505–6408)	1500 Vrms, input/output-to-controller

A.2 Electrical Specifications

Discrete Input Modules

Table A-3 through Table A-8 contain the electrical specifications for the 505 Discrete Input Modules. Figure A-1 through Figure A-6 show volt-ampere curves for the same.

Table A-3 Electrical Specifications for 24 VAC Input Modules (PPX:505–40xx(A))

Model Number	No. of Inputs	Module Width
PPX:505–4008 (–A)	8	Single-wide
PPX:505–4016 (–A)	16	Single-wide
PPX:505–4032 (–A)	32	Single-wide

Type of Inputs	IEC Type 1
Rated Voltage	24–48 VAC
Input voltage range for ON	20.0 VAC UH minimum; 56.0 VAC UH maximum
Input voltage range for OFF	0.0 VAC UL minimum; 5.0 VAC UL maximum
Input current limits during ON	4.5 mA IH minimum; 28.0 mA IH maximum
Max. input current for OFF	1.5 mA IT minimum
Delay time through module	6.0 ms minimum 30.0 ms maximum
Module power from base	2.0 W
Operating frequency	47 to 63 Hz

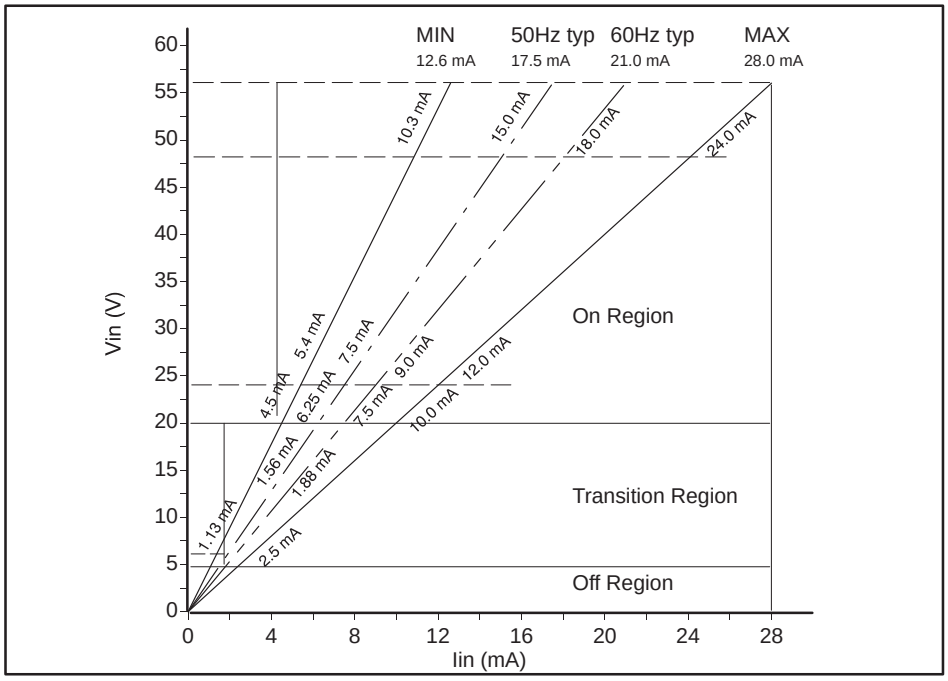


Figure A-1 Volt-Ampere Curve for PPX:505–40xx(A) Modules

Table A-4 Electrical Specifications for Low Voltage DC Input Modules (PPX:505–41xx (A))

Model Number	No. of Inputs	Module Width
PPX:505–4108	8	Single-wide
PPX:505–4116	16	Single-wide
PPX:505–4132	32	Single-wide

Type of Inputs	IEC Type 1
Rated Voltage	6–12 VDC
Input voltage range for ON	4.0 VDC UH minimum; 15.0 VDC UH maximum
Input voltage range for OFF	0.0 VDC UL minimum; 1.5 VDC UL maximum
Input current limits during ON	3.0 mA IH minimum; 22.0 mA IH maximum
Max. input current for OFF	1.0 mA IT minimum
Delay time through module	0.5 ms minimum 3.0 ms maximum
Module power from base	2.0 W

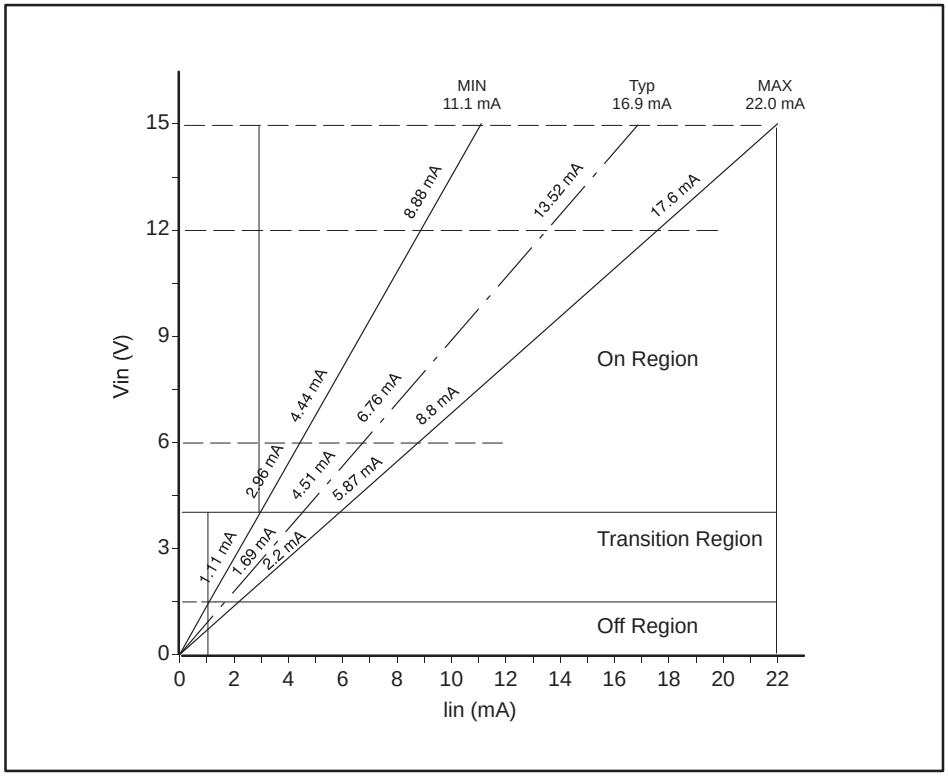


Figure A-2 Volt-Ampere Curve for PPX:505–41xx Modules

Table A-5 Electrical Specifications for 110 VAC Input Modules (PPX:505–42xx (A))

Model Number	No. of Inputs	Module Width
PPX:505–4208 (–A)	8	Single-wide
PPX:505–4216 (–A)	16	Single-wide
PPX:505–4232 (–A)	32	Single-wide

Type of Inputs	IEC Type 1
Rated Voltage	100–115 VAC
Input voltage range for ON	79.0 VAC UH minimum; 132.0 VAC UH maximum
Input voltage range for OFF	0.0 VAC UL minimum; 20.0 VAC UL maximum
Input current limits during ON	4.0 mA IH minimum; 15.0 mA IH maximum
Max. input current for OFF	1.5 mA IT minimum
Delay time through module	6.0 ms minimum 30.0 ms maximum
Module power from base	2.0 W
Operating frequency	47 to 63 Hz

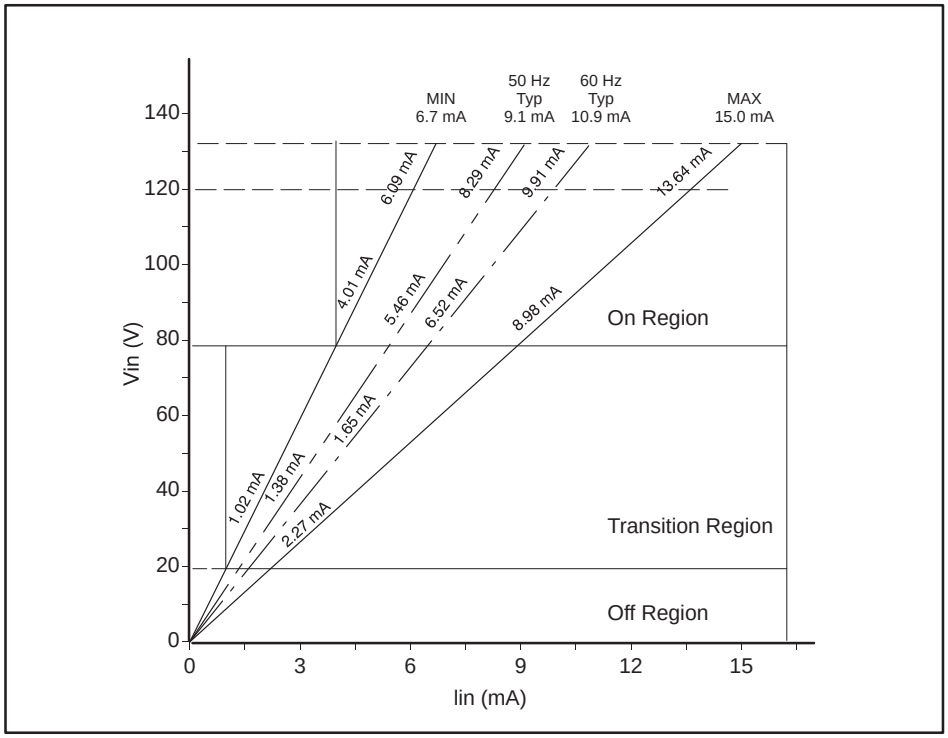


Figure A-3 Volt-Ampere Curve for PPX:505–42xx(–A) Modules

Table A-6 Electrical Specifications for 24 VDC Input Modules (PPX:505–43xx)

NOTE: For 48 VDC connection on the PPX:505–4316–A, see Table A-5.

Model Number	No. of Inputs	Module Width
PPX:505–4308	8	Single-wide
PPX:505–4316 (–A)	16	Single-wide
PPX:505–4332	32	Single-wide

Type of Inputs	IEC Type 1
Rated Voltage	24 VDC
Input voltage range for ON	14.0 VDC UH minimum; 30.0 VDC UH maximum
Input voltage range for OFF	0.0 VDC UL minimum; 5.0 VDC UL maximum
Input current limits during ON	2.0 mA IH minimum; 15.0 mA IH maximum
Max. input current for OFF	0.5 mA IT minimum
Delay time through module	3.0 ms minimum 10.0 ms maximum
Module power from base	2.0 W

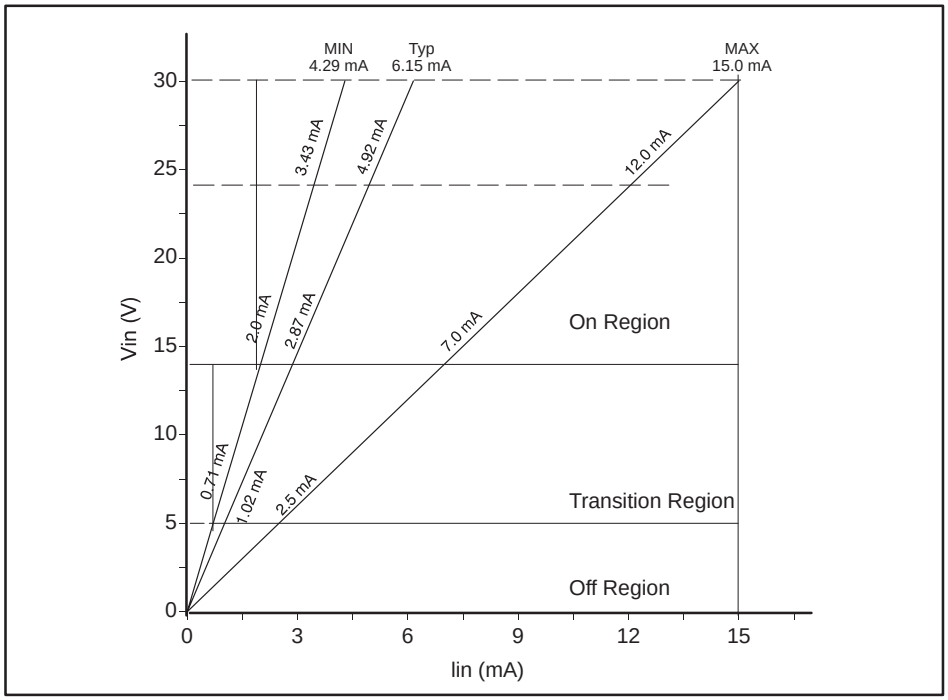


Figure A-4 Volt-Ampere Curve for PPX:505–43xx Modules

Table A-7 Electrical Specifications for 48 VDC Input Modules (PPX:505–4316–A)

NOTE: For 24 VDC connection on the PPX:505–4316–A, see Table A-4.

Model Number	No. of Inputs	Module Width
PPX:505–4316–A	16	Single-wide

Type of Inputs	IEC Type 1
Rated Voltage	48 VDC (Inputs must be wired to 48 V terminals)
Input voltage range for ON	34.0 VDC UH minimum; 60.0 VDC UH maximum
Input voltage range for OFF	0.0 VDC UL minimum; 10.0 VDC UL maximum
Input current limits during ON	2.0 mA IH minimum; 15.0 mA IH maximum
Max. input current for OFF	0.5 mA IT minimum
Delay time through module	3.0 ms minimum 10.0 ms maximum
Module power from base	2.0 W

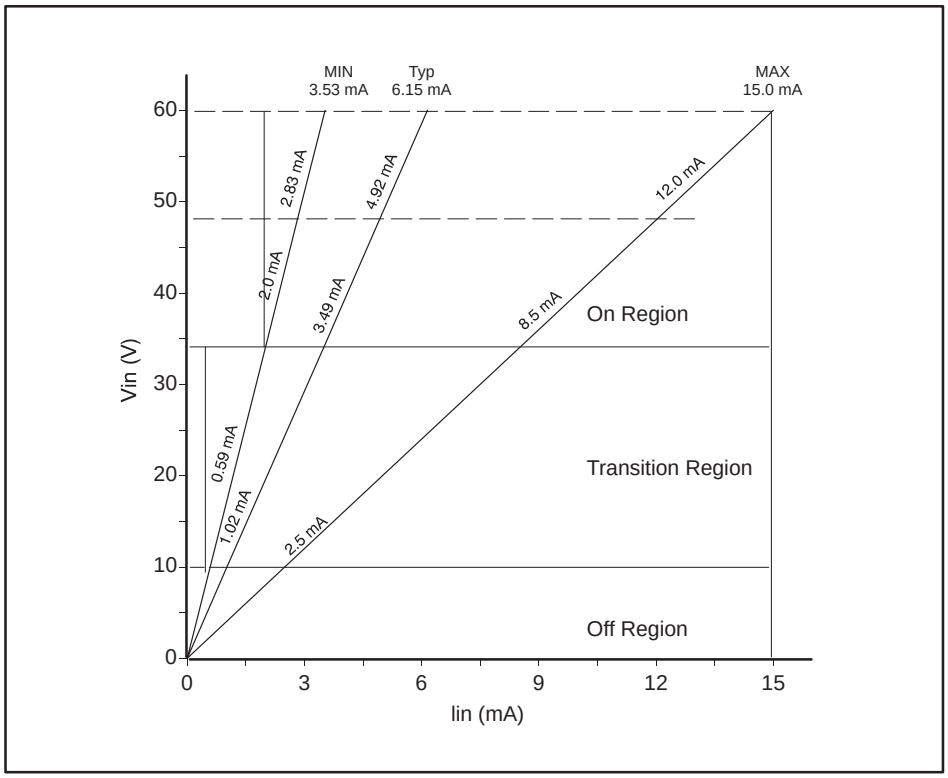


Figure A-5 Volt-Ampere Curve for PPX:505–4316–A Modules

Table A-8 Electrical Specifications for 220 VAC Input Modules (PPX:505–44xx)

Model Number	No. of Inputs	Module Width
PPX:505–4408 (–A)	8	Single-wide
PPX:505–4416 (–A)	16	Single-wide
PPX:505–4432 (–A)	32	Double-wide

Type of Inputs	IEC Type 1
Rated Voltage	200–230 VAC
Input voltage range for ON	164 VAC UH minimum; 265.0 VAC UH maximum
Input voltage range for OFF	0.0 VAC UL minimum; 40.0 VAC UL maximum
Input current limits during ON	6.0 mA IH minimum; 20.0 mA IH maximum
Max. input current for OFF	2.0 mA IT minimum
Delay time through module	6.0 ms minimum 30.0 ms maximum
Module power from base	2.0 W
Operating frequency	47 to 63 Hz

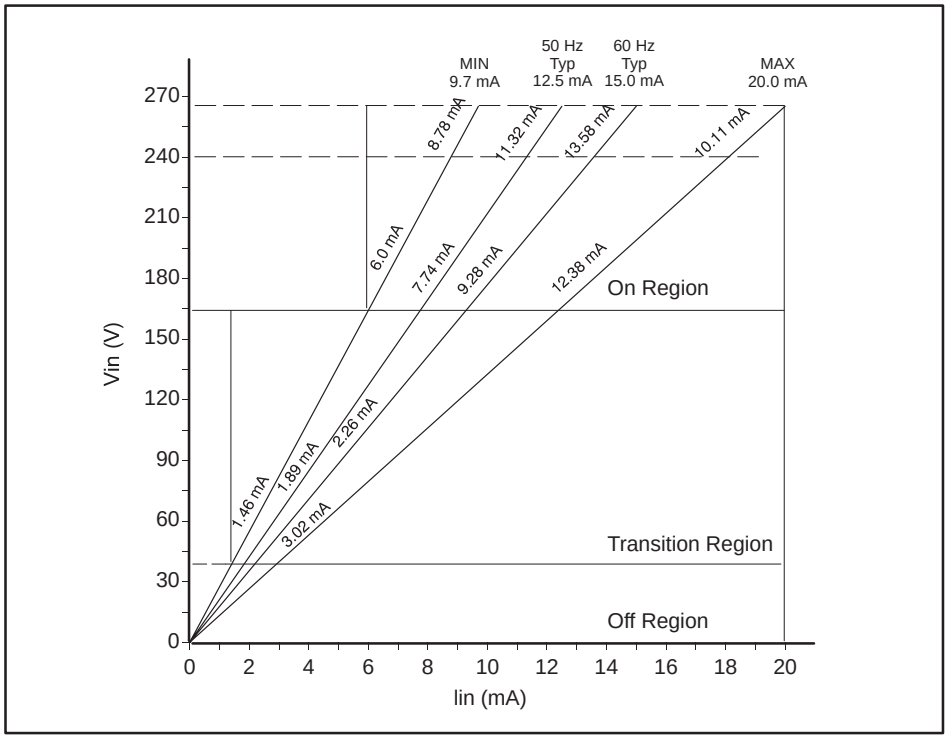


Figure A-6 Volt-Ampere Curve for PPX:505–44xx Modules

Discrete Output Modules

Table A-9 through Table A-12 contains the electrical specifications for the 505 Discrete Output modules and Figure A-7 through Figure A-10 show derating curves for the same.

Table A-9 Electrical Specifications for 6–24 VDC 1/2 Amp Output Modules (PPX:505–35xx and PPX:505–45xx)

Model Number	No. of Outputs	Module Width
PPX:505–3508	8	Single-wide
PPX:505–3516	16	Single-wide
PPX:505–3532	32	Single-wide
PPX:505–4508	8	Single-wide
PPX:505–4516	16	Single-wide
PPX:505–4532	32	Single-wide

Rated Voltage	6–24 VDC
Operating voltage range	4.5–34 VDC
Min. load per point	5 mA
Temporary overload	2.0 A for 1 ms
Max. on-state voltage drop	1.8 VDC
Max. off-state leakage current	0.2 mA
Kickback protection	Diode
Max. Delay time through module (with 5 mA min. load)	1 ms on to off 1 ms off to on
User power current with no load	3.0 mA/common
Max. module power from base	2.5 W
Reverse voltage protection at power terminals	34 VDC
Type of outputs	Non-latching type, unprotected
Output fuse rating	3 A, 125 V 5 x 20 mm, normal blow

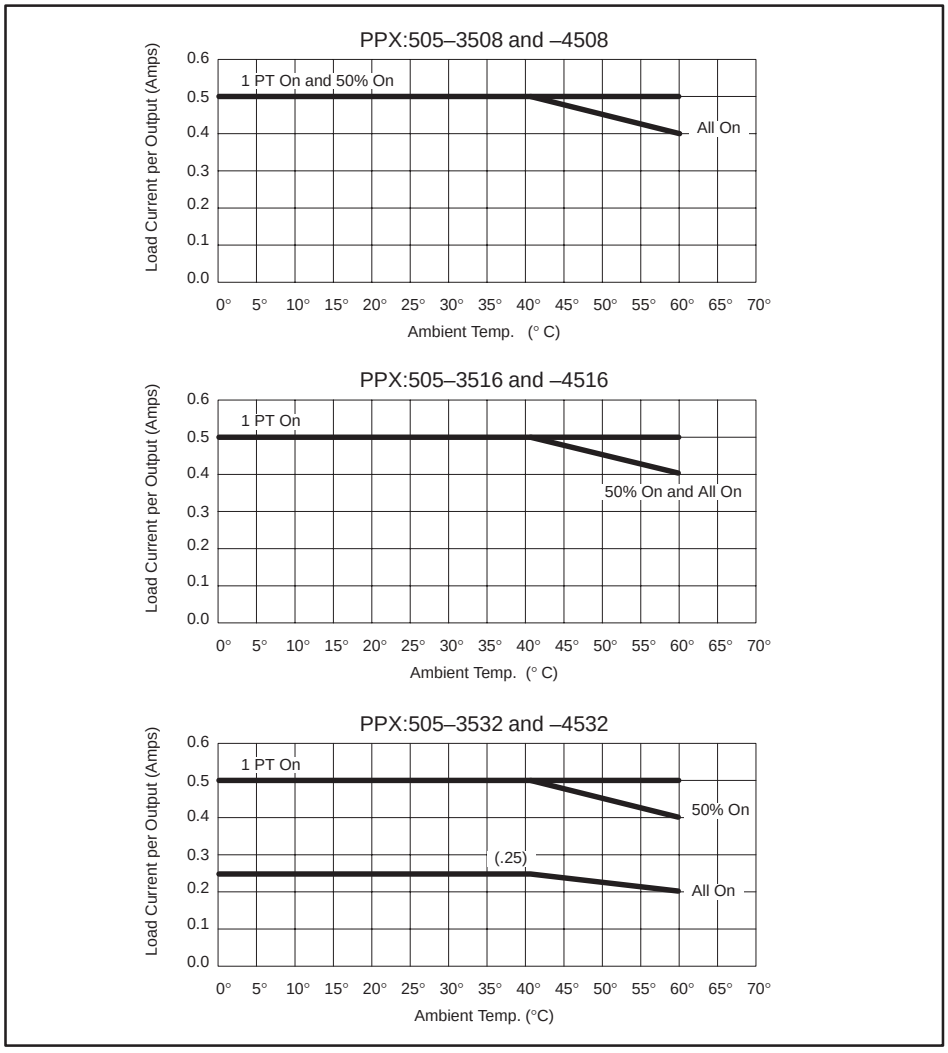


Figure A-7 Derating Curves for PPX:505–35xx and PPX:505–45xx Modules

Table A-10 Electrical Specifications for 24–110 VAC 1/2 Amp Output Modules (PPX:505–46xx)

Model Number	No. of Outputs	Module Width
PPX:505–4608	8	Single-wide
PPX:505–4616	16	Single-wide
PPX:505–4632	32	Single-wide

Rated Voltage	24–115 VAC
Operating voltage range	20–132 VAC
Frequency Range	47–63 Hz
Min. load per point	5.0 mA
Temporary overload	5.0 A rms for 2 cycles
Max. on-state voltage drop	1.8 V, 0 to peak (@ 0.5 A)
Max. off-state leakage current	2.0 mA @ 40 C 6.0 mA @ 60 C
Surge Suppressor	R–C
Max. Delay time through module	11 ms on to off 1.7 ms off to on
User power current with no load	3.0 mA/common
Max. module power from base	2.5 W
Type of outputs	Non-latching type, unprotected
Output fuse rating	3.15 A, 125 V 5 x 20 mm, normal blow
dv/dt for Main Triac	100 V/µs

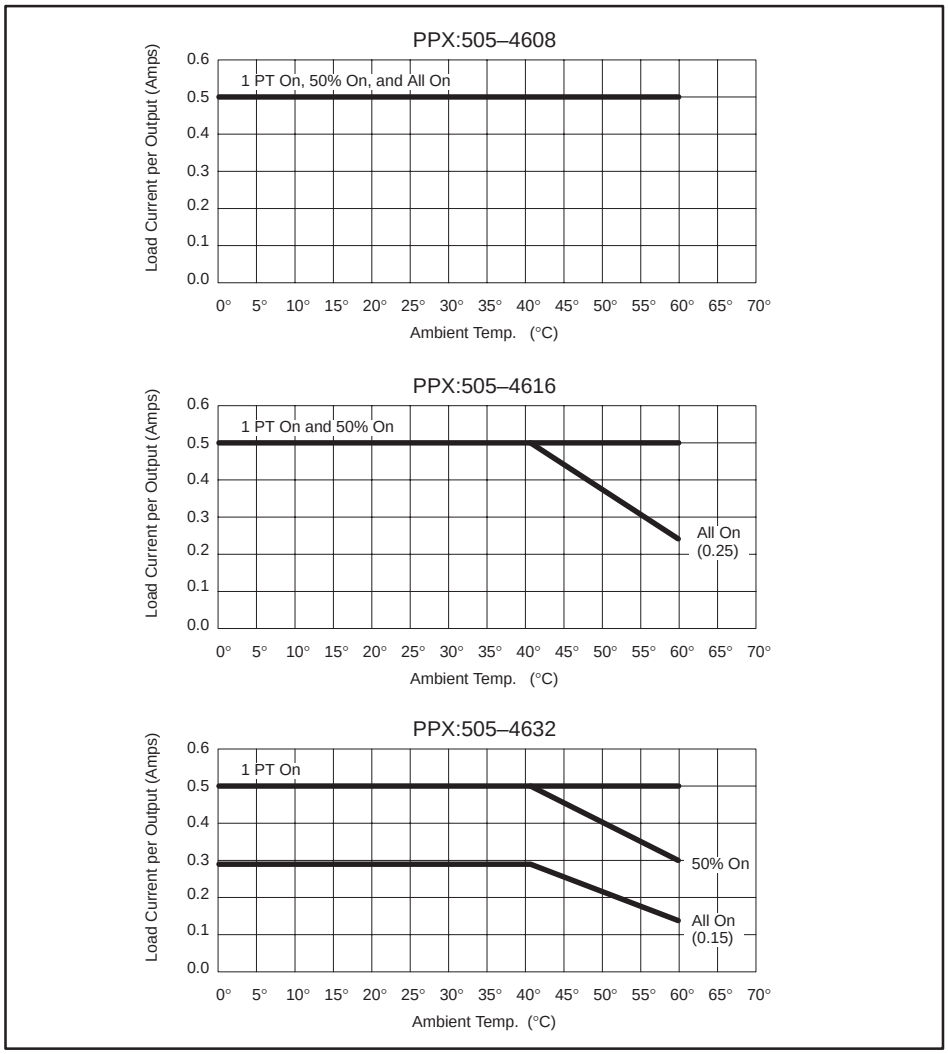


Figure A-8 Derating Curves for PPX:505–46xx

Table A-11 Electrical Specifications for 24 VDC 2 Amp Output Modules (PPX:505–37xx and PPX:505–47xx)

Model Number	No. of Outputs	Module Width
PPX:505–3708	8	Double-wide
PPX:505–3716	16	Double-wide
PPX:505–3732	32	Double-wide
PPX:505–4708	8	Double-wide
PPX:505–4716	16	Double-wide
PPX:505–4732	32	Double-wide

Rated Voltage	6–24 VDC
Operating voltage range	4.5–34 VDC
Min. load per point	5 mA
Temporary overload	5.0 A for 1 ms
Max. on-state voltage drop	2.0 V
Max. off-state leakage current	0.2 mA
Kickback protection	Diode
Max. Delay time through module (with 5 mA min. load)	1 ms on to off 1 ms off to on
User power current with no load	3.0 mA/common
Max. module power from base	5 W
Reverse voltage protection at power terminals	34 VDC
Type of outputs	Non-latching type, unprotected
Output fuse rating	3.15 A, 125 V 5 x 20 mm, normal blow

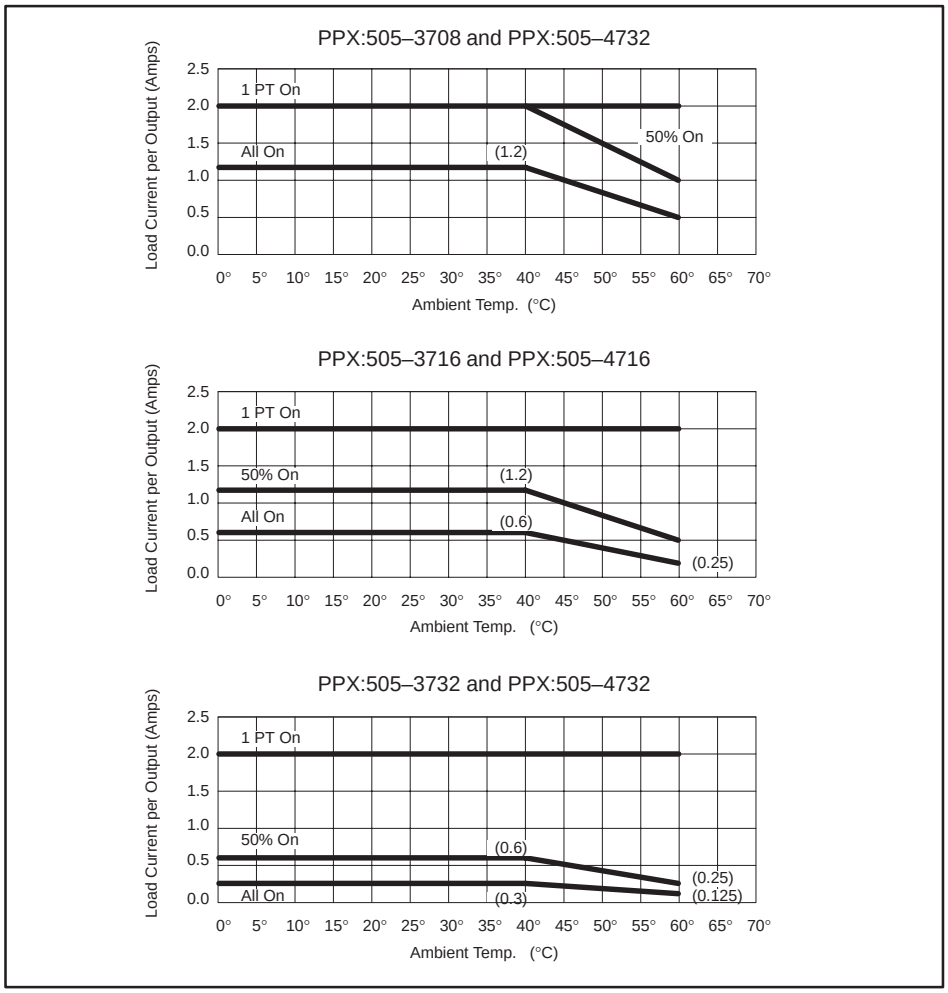


Figure A-9 Derating Curves for PPX:505–37xx and PPX:505–47xx

Table A-12 Electrical Specifications for 110–220 VAC 2 Amp Output Modules (PPX:505–48xx)

Model Number	No. of Outputs	Module Width
PPX:505–4808	8	Double-wide
PPX:505–4816	16	Double-wide
PPX:505–4832	32	Double-wide

Rated Voltage	100–230 VAC
Operating voltage range	85–265 VAC
Frequency Range	47–63 Hz
Min. load per point	50.0 mA
Temporary overload	20.0 A rms for 2 cycles
Max. on-state voltage drop	2.0 V, 0 to peak, (@ 2 A)
Max. off-state leakage current	6.0 mA
Max. Delay time through module	11 ms on to off; 2 ms off to on
Frequency range	47 to 63 Hz
Max. module power from base	5 W
Surge Suppressor	R–C
Type of outputs	Non-latching type, unprotected
Output fuse rating	5.0 A, 250 V 0.25 x 1.25 in., normal blow
dv/dt for Main Triac	100 V/us

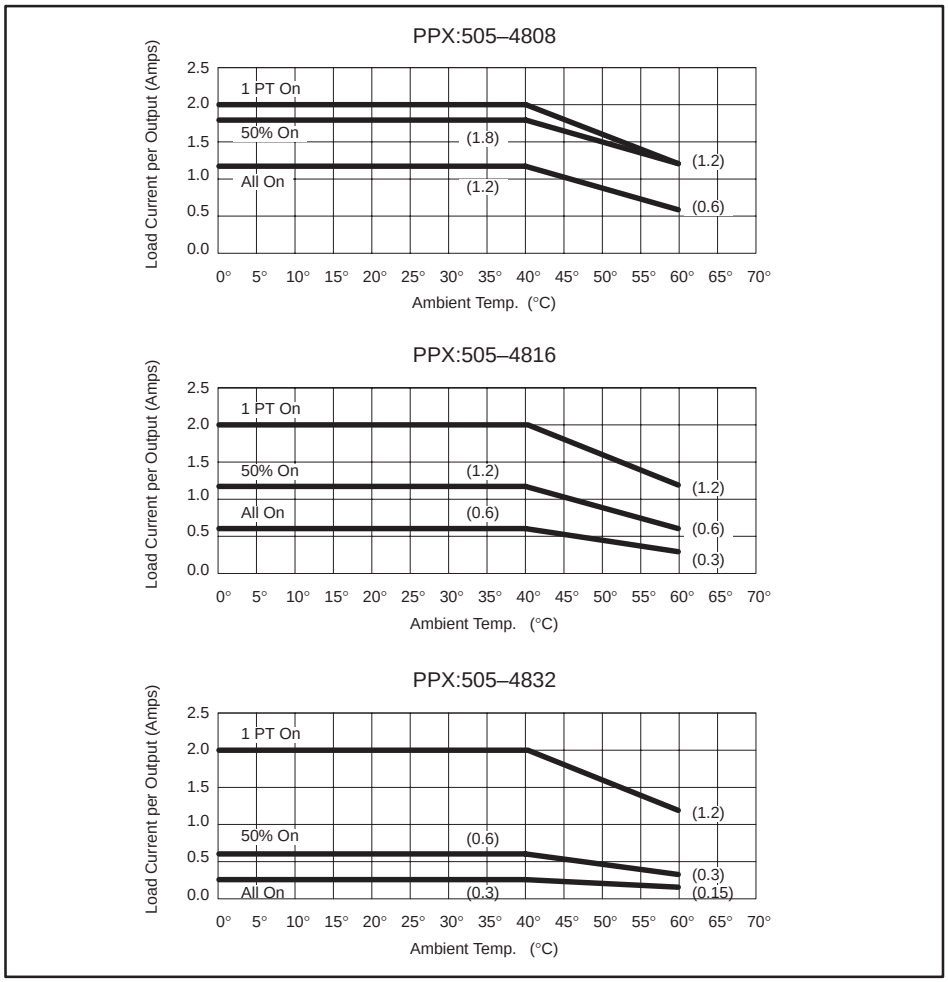


Figure A-10 Derating Curves for PPX:505–48xx

Relay Output Modules

Table A-13 contains the electrical specifications for the 505 Relay Output Modules and Figure A-11 shows the derating curves for the same.

⚠ CAUTION

The Relay Output Module may be damaged if more than one channel is overloaded at the same time, or if the temporary overload specification is exceeded.

Table A-13 Electrical Specifications for Relay Output Modules (PPX:505–49xx)

Model Number	No. of Outputs	Module Width
PPX:505–4908	8	Single-wide
PPX:505–4916	16	Single-wide
PPX:505–4932	32	Double-wide

Rated Voltage Range	24–230 VAC, 6–24 VDC
Operating voltage range	20–265 VAC, 4.5–30 VDC
Temporary overload	5.0 A for 1 ms (See Caution)
Max. off-state leakage current	0.0 mA
Total relay contact resistance	250 milliohms for PPX:505–4916 and –4932 300 milliohms for PPX:505–4908
Max. Delay time through module	10 ms on to off 10 ms off to on
Max. module power from base	2.5 W
Output fuse for PPX:505–4908 (1 fuse per common)	3 A, 250 V 1.25″ x 0.25″, normal blow
Type of contact	Form-A for PPX:505–4916 and –4932 Form-C for PPX:505–4908
Type of outputs	Non-latching type, unprotected
Repetition rate	6 Hz max.
User Power Supply	21.6 – 26.4 V @ 80 mA for the PPX:505–4908 160 mA for the PPX:505–4916 300 mA for the PPX:505–4932
Life cycles (@ 1 Hz repetition rate)	@ Full rated current 100,000 @ 0.5 A for PPX:505–4916 and –4932 300,000 @ 0.5 A for PPX:505–4908 500,000 @ 0.1 A for PPX:505–4908, –4916, and –4932 1,000,000

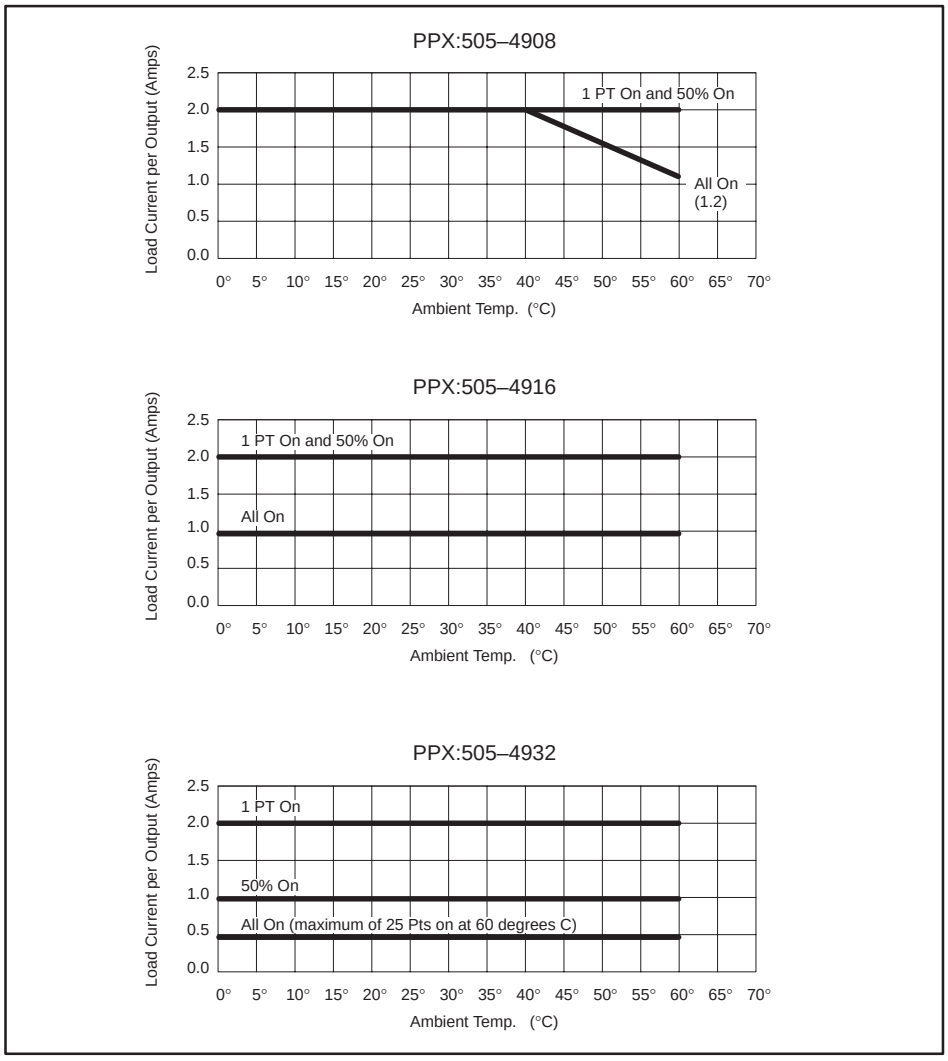


Figure A-11 Derating Curves for PPX:505–49xx

These modules in Table A-14 can be used with inductive loads at the following ratings:

Table A-14 Pilot Duty Ratings at 60°C Ambient

Load Type	PPX:505–4932	PPX:505–4916	PPX:505–4908
1 point on AC	1.0 A	1.0 A	2.0 A
1 point on DC	0.88 A	0.88 A	1.44 A

Table A-15 Electrical Specifications for Relay Output Modules (PPX:505–5417)

Model Number	No. of Outputs	Module Width
PPX:505–5417	16	Single-wide

Operating voltage range	10–125 VAC, 0–120 VDC (Note: This module may be operated up to 220 VDC without agency approvals.)
Maximum rated load Inductive (per contact) (UL/CSA) Resistive (per contact)	 0.25 A @ 120 VDC 1 A @ 24 VDC 0.25 A @ 125 VAC 0.25 A @ 120 VDC 1 A @ 24 VDC 0.25 A @ 125 VAC
Maximum rated load (per common)	4 A (any condition)
Minimum current	10μ A
Temporary overload, one channel	2.0 A for 1 ms
Relay contact resistance from connector	50 mΩ, typical
Max. Delay time through module	3 ms on to off 5 ms off to on
Typical bounce time	1 ms
Max. module +5 V power from base	3 W
Output fuse for, 1/common	4 A, 250 VAC 1.25″ x 0.25″, normal blow
Contact type	Dry, Form C
Output type	Non-latching, unprotected
User power supply	21.6–26.4 VDC @ 300 mA

Table A-16 Electrical Specifications for Relay Output Modules (PPX:505–5518)

Model Number	No. of Outputs	Module Width
PPX:505–5518	16	Single-wide

Operating voltage range	10–250 VAC, 10–54 VDC
Maximum rated load Inductive (per contact) (UL/CSA) (power factor = 0.4) (L/R = 7 ms) (L/R = 7 ms) Resistive (per contact)	 5 A @ 250 VAC 1 A @ 24 VDC; 0.25 A @ 125 VAC 5 A @ 240 VAC 3 A @ 24 VDC 2 A @ 48 VDC
Maximum Starter Size	Size 5 @ 120 VAC
Maximum rated load (per common)	8 A @ 250 VAC or 30 VDC*
Minimum current	20 mA
Temporary overload, one channel	8 A for 100 ms
Relay contact resistance from connector	100 mΩ, typical
Max. Delay time through module	10 ms on to off 10 ms off to on
Typical bounce time	3 ms
Max. module +5 V power from base	2.5 W
Output fuse for, 1/common	8 A, 250 VAC 1.25 x .25, fast blow
Contact type	Dry, Form C
Output type	Non-latching, unprotected
User power supply	20–28 VDC @ 200 mA
Snubber values	0.1 µf, 330 Ω
Typical number of operations Without snubbers With snubbers	 300,000 cycles 2,000,000 cycles
* 8 A with front access connector (2587705–8011) 5 A with side access connector (2587705–8010)	

Word Input Module

Table A-17 contains the electrical specifications for the 505 Parallel Word Input Module. It is a double-wide module and has eight input channels.

Table A-17 Electrical Specifications for Word Input Module (PPX:505–6308)

Input signal types	Data lines: TTL CMOS Up to 28 VDC Strobe lines: TTL CMOS
Output signal drive capabilities (strobe lines)	TTL: Logic high . . . 2.4 V @ 2.5 mA Logic low . . . . 0.5 V @ 8.5 mA CMOS: Logic high . . . 4.4 V @ 0.075 mA Logic low . . . . 0.4 V @ 2 mA
Data line protection	Overvoltage to 40 VDC Reverse voltage protected
Update time	8 ms max.
Data active level	Low true or high true (user selectable on the terminal block)
Internal resistance	Pull up or pull down (user selectable on the terminal block)
Strobe active level	Low true or high true (user selectable on the terminal block)
Strobe source	Word Input module or user-supplied
Channel operation	Single or multiplexed
Input word length	16 bits
User power supply	20 to 30 VDC at 0.35 A with max. ripple of +/– 0.4 V, UL listed Class 2
Voltage protection	Overvoltage to 40 VDC, reverse voltage protected
Max. module power from base	4 W

Word Output Module

Table A-18 contains the electrical specifications for the 505 Parallel Word Output Module. It is a double-wide module and has eight output channels.

⚠CAUTION

Output data errors may occur during electromagnetic interference (EMI). Refer to Section 2.2 in this manual and your controller system manual for installation guidelines to improve noise immunity.

Table A-18 Electrical Specifications for Word Output Module (PPX:505–6408)

Output signal drive capabilities	TTL: Logic high . . . 4.5 mA max. source current at 2.4 VDC Logic low . . . . 30 mA max. sink current at 0.55 VDC CMOS: Logic high . . . 0.35 mA max. source current at 4.4 VDC Logic low . . . . 3.5 mA max. sink current at 0.4 VDC
Update time	16 ms max.
Data active level	Low true or high true (user selectable on the terminal block)
Strobe active level	Low true or high true (user selectable on the terminal block)
Strobe source	Word Output module (not selectable)
Channel operation	Single or multiplexed (user selectable on the terminal block)
Output word length	16 bits
User power supply	20 to 30 VDC at 0.35 A with max. ripple of +/– 0.4 V, UL listed Class 2
Voltage protection	Overvoltage to 40 VDC, reverse voltage protected
Max. module power from base	5 W

I/O Simulators

Table A-19 shows the Electrical Specifications for Input and Output Simulators.

Table A-19 Electrical Specifications for I/O Simulators

Maximum module power from base	2.5 W Input Simulator (PPX:505–6010)
	1.5 W Output Simulator (PPX:505–6011)

A.3 Terminal Block Worksheet

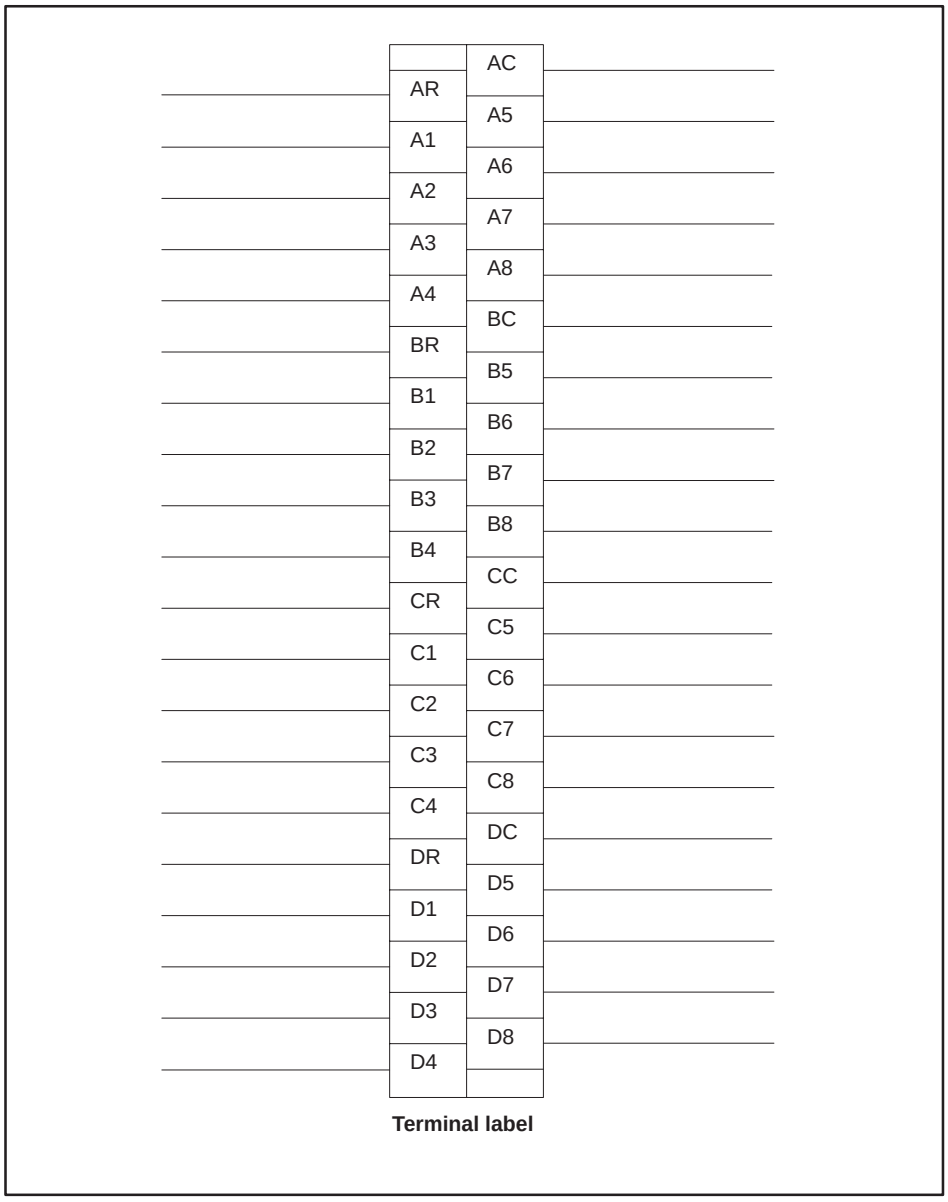


Figure A-12 I/O Terminal Worksheet

Index

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Customer Registration

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	Excellent	Good	Fair	Poor
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Completeness	_____	_____	_____	_____
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