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SIEMENS

SIMATIC 505

Analog I/O Modules (PPX:505–6108A PPX:505–6108B PPX:505–6208A PPX:505–6208B)

User Manual

Order Number: PPX:505–8120–3
Manual Assembly Number: 2586546–0072
Third Edition

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Preface

Manual Content

This manual contains instructions for installing, wiring, and calibrating the Analog Input Modules (PPX:505–6108A and PPX:505–6108B), and the Analog Output Modules (PPX:505–6208A and PPX:505–6208B). The modules operate with the Series 505™ controller.

The manual does not give the details of analog-to-digital conversion techniques. Familiarity with these techniques may be necessary in some applications.

References

Refer to the manuals listed below for instructions on installing, programming, and troubleshooting your System 505 controller.

- *SIMATIC® 505 System Manual* (PPX:505–8201–x)
- *SIMATIC 505 Programming Reference Manual* (PPX:505–8204–x)
- *SIMATIC 505 Softshop™ for Windows User Manual (PPX:SS505–8101–x)*
- *SIMATIC 500™/505 TISOFT™ Release 6.3 User Manual* (PPX:TS505–8101–x)

Agency Approvals

Series 505 Analog Input and Analog Output Modules meet standards of the following agencies:

- Underwriters Laboratories: UL® Listed (Industrial Control Equipment)
- Canadian Standards Association: CSA Certified (Process Control Equipment)
- Factory Mutual Approved; Class I, Div. 2 Hazardous Locations
- CE Marking: Low Voltage Directive 73/23/EEC; Electromagnetic Compatibility Directive 89/336/EEC
- Verband Deutscher Elektrotechniker (VDE) 0160 Electrical Equipment (Self-Compliance)

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 Energy & Automation, Inc., for information about regulatory agency approvals that have been obtained on Series 505 units.

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Chapter 1

Product Overview

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1.1 Description

The Series 505 Analog Input (PPX:505–6108A and PPX:505–6108B), and Output (PPX:505–6208A and PPX:505–6208B) Modules are single-wide versions of the Analog I/O Modules (PPX:505–6108 and PPX:505–6208), and can replace the double-wide models without any wiring changes. The Input Modules (PPX:505–6108A and PPX:505–6108B) offer the additional benefit of an optional ±10 V input range, and they do not require external user-supplied power. The Output Modules (PPX:505–6208A, and PPX:505–6208B), like the double-wide PPX:505–6208, require user-supplied 24 VDC power to maintain low power consumption from the base.

The Series 505 Analog I/O Modules (Figure 1-1) connect the controller with devices which monitor or control pressure, position, flow, temperature, or speed using voltage or current signals. The input module translates an analog input signal from a monitoring device into an equivalent digital word and transmits that data to the controller for processing. The output module translates a digital word from the controller into an equivalent analog signal and transmits that data to an output device that controls pressure, position, flow, temperature, or speed.

A Module Good LED on the front of each module indicates the status of the power, self-diagnostics, and the fuse (for the output module). Figure 1-1 shows the location of the Module Good LED indicator of the PPX:505–6108B and PPX:505–6208B.

If the LED is on:

- System and user power are good
- Fuse is good
- Module has passed self-diagnostics

If the LED is off, one of the above has failed. See Chapter 3 for instructions on using the LED to troubleshoot.

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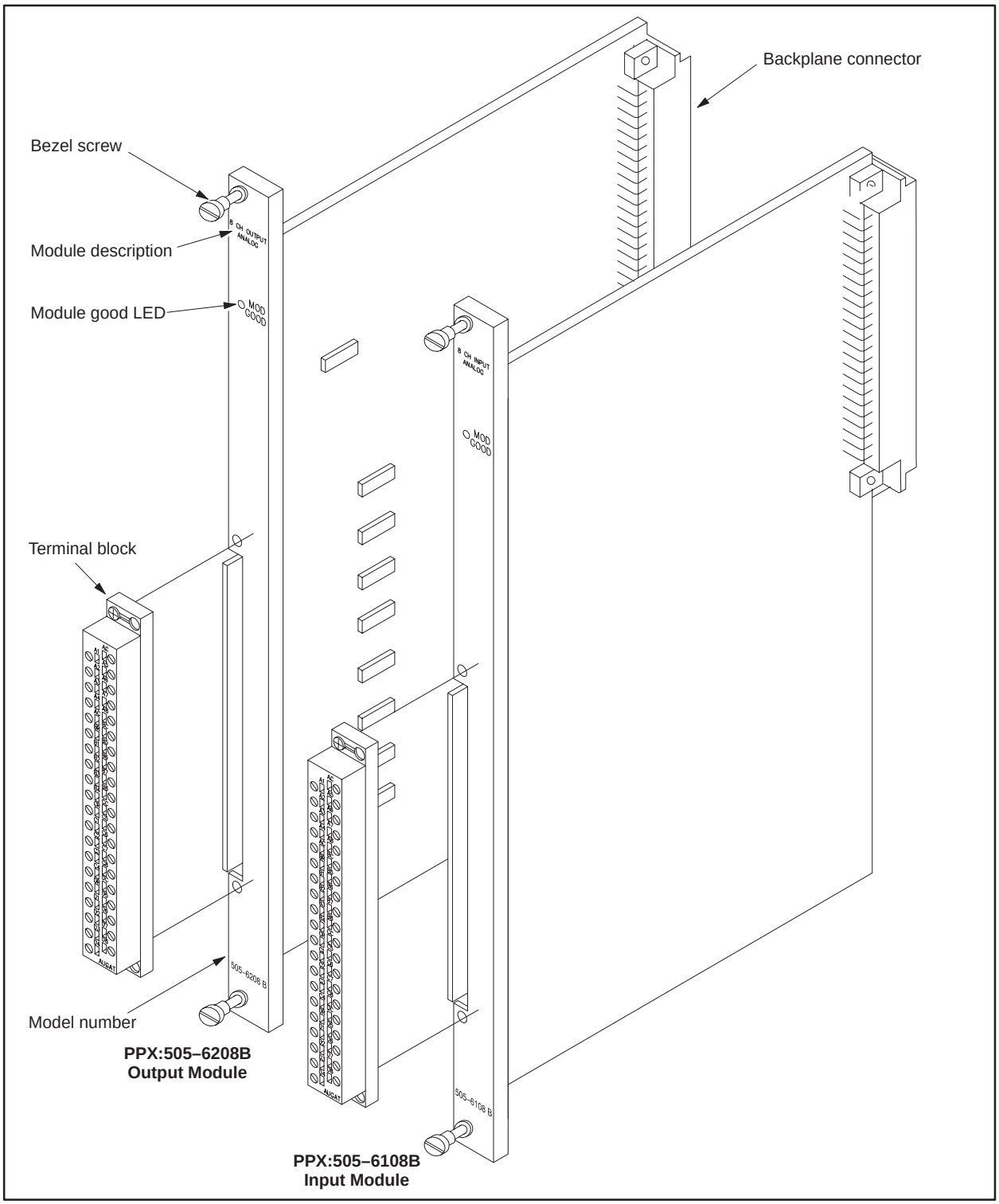


Figure 1-1 Series 505 Analog Modules (PPX–505–6108B and PPX–6208B)

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1.2 Analog Input Operation

Signal Translation

The Analog Input module operates asynchronously with the controller. That is, the controller and module do not update at the same time. Instead, the module translates all analog inputs in one module update and stores the translated words in buffer memory. When the controller I/O scan starts, it retrieves the words from the buffer memory of the module.

Analog Signal for PPX:505–6108A

The PPX:505–6108A analog signal is translated into a 12-bit digital word. Since the controller requires a 16-bit word for inputs, the 12-bit value from the converter is placed into a 16-bit word for transmittal to the controller. As shown in Figure 1-2, of the four bits not used for the converter magnitude, one is used to show the sign of the value, one is used to note overrange values, and the remaining two are not used and are set to zero.

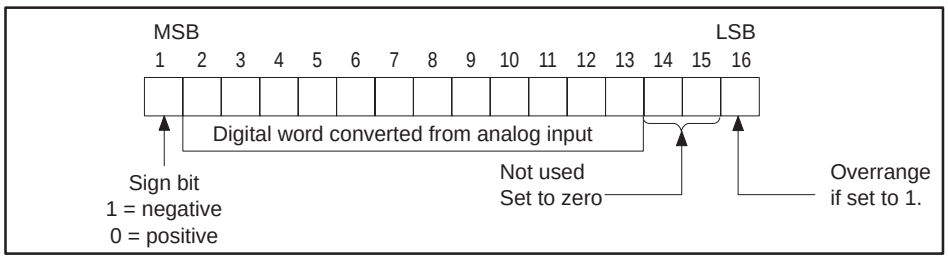


Figure 1-2 Output from the PPX:505–6108A Module to the Controller

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Analog Signal for PPX:505–6108B

The PPX:505–6108B analog signal is translated into a 13-bit digital word. Since the controller requires a 16-bit word for inputs, the 13-bit value from the converter is placed into a 16-bit word for transmittal to the controller. As shown in Figure 1-3, of the three bits not used for the converter magnitude, one is used to show the sign of the value, one is used to note overrange values, and the remaining one is not used and is set to zero.

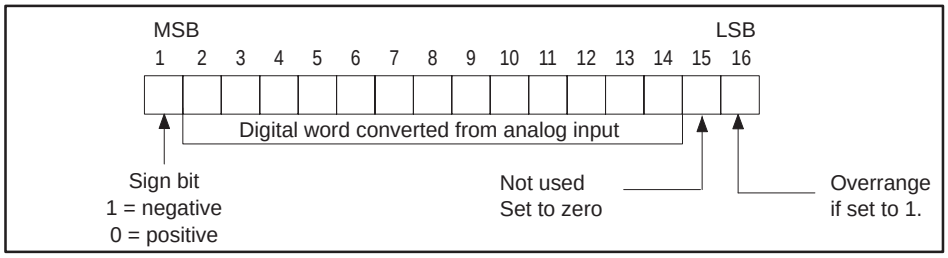


Figure 1-3 Output from the PPX:505–6108B Module to the Controller

An overrange condition arises from an excessive voltage input, causing the digital word to be in excess of ±32000. Figure 1-4 shows the effects of excessive voltage. Values in parentheses apply to the ±10 V range.

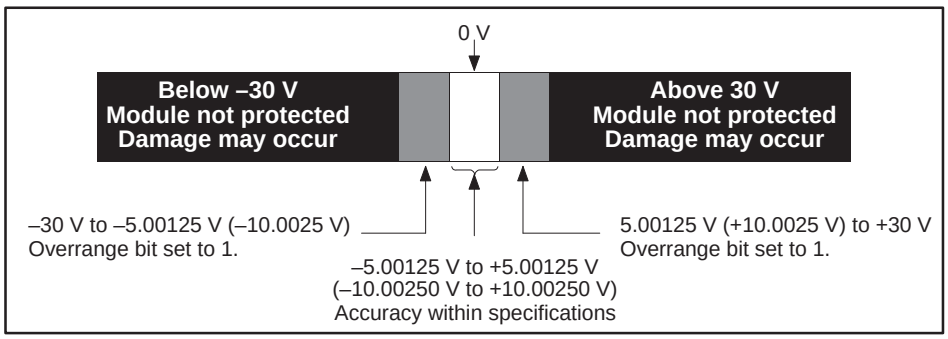


Figure 1-4 Effect of Voltage Input on the Module

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Current or Voltage Input

The analog input module has eight inputs. You can select each of the eight inputs to receive either voltage or current as the incoming analog signal. Since the inputs are single-ended, the source for a current signal must be a true current-sourcing transmitter, not a current-sinking transmitter.

- For a voltage input, the incoming signal may range from –5 to +5 V, or from –10 to +10 V. The optional voltage input range of ±10 V is available via jumper selection on the circuit board. The voltage range selected applies to all eight input channels. Refer to Figure 3-2.
- For a current input, the incoming signal may range from 0 to 20 mA.

NOTE: The module is factory-calibrated and shipped configured for the ±5 V input range, which is required for current input using the internal sense resistors. If your application requires ±10 V, recalibrate the module with the ±10 V setting selected.

Choosing Resistors

The input module has eight (one per point) built-in, precision resistors (250 Ω, 0.1%). The resistor changes input current to voltage, which is what the module monitors internally. The built-in resistor allows a current range from 0 to 20 mA. You may use other external resistor values for other current ranges. If you install an external resistor, be sure that it meets the ±5 V input constraint and connects between Voltage In and Return for the selected channel. Follow proper safety guidelines when you install resistors. To determine the resistor needed, use the following equation.

$$Resistor\ needed\ (\Omega) = \frac{5\ V}{max\ current\ in\ amps}$$

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Calculating Digital Words for the PPX:505–6108A

The PPX:505–6108A module has a resolution of 8 counts out of 32000. That is, the smallest unit into which the module divides a unipolar input is 1 part out of 4000. For a voltage input of 0 to +5 V, this division corresponds to a step of 1.25 mV. For a current input of 0 to 20 mA, a step of 5 µA can be resolved.

Use the following equations to calculate the digital word which results from a particular voltage or current input.

$$Digital\ word\ (WX) = \frac{Input\ voltage}{5\ V} \times 32000$$

$$Digital\ word\ (WX) = \frac{Input\ current\ (mA)}{20\ mA} \times 32000$$

If the module is set for ±10 V input range, each step of eight counts corresponds to an input voltage change of 2.5 mV, and the digital word is defined as follows:

$$Digital\ word\ (WX) = \frac{Input\ voltage}{10\ V} \times 32000$$

Calculating Digital Words for the PPX:505–6108B

The PPX:505–6108B module has a resolution of 4 counts out of 32000. That is, the smallest unit into which the module divides a unipolar input is 1 part out of 8000. For a voltage input of 0 to +5 V, this division corresponds to a step of 625µV. For a current input of 0 to 20 mA, a step of 2.5 µA can be resolved.

Use the following equations to calculate the digital word which results from a particular voltage or current input.

$$Digital\ word\ (WX) = \frac{Input\ voltage}{5\ V} \times 32000$$

$$Digital\ word\ (WX) = \frac{Input\ current\ (mA)}{20\ mA} \times 32000$$

If the module is set for ±10 V input range, each step of eight counts corresponds to an input voltage change of 1.25 mV, and the digital word is defined as follows:

$$Digital\ word\ (WX) = \frac{Input\ voltage}{10\ V} \times 32000$$

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1.3 Analog Output Operation

The analog output module operates synchronously with the controller. Any change in the output signal is dependent on the update time of the module. Figure 1-5 shows this relationship.

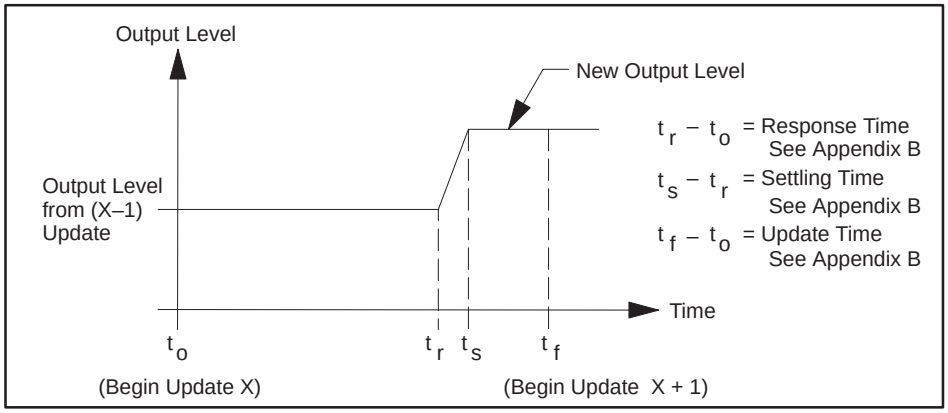


Figure 1-5 Relationship of Update Time to Change in Signal Output

The analog output module has eight channels, providing simultaneous voltage and current, ranging from 0 to 10 V and from 0 to 20 mA. Note that the current output is a sourcing type. Therefore, any shorts in the output circuit cause the output current to bypass the field device in the circuit.

The controller sends a 16-bit binary word to the module. Figure 1-6 shows the data word format. The digital value, which is translated into an analog output signal, occupies 12 of the 16 bits. The most significant bit (MSB) denotes the sign of a value. The remaining bits are unused.

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NOTE: Bit 1 (the sign bit) is used to check for a negative number sent to the output module. If this bit is set to 1, the output for the point is not updated, and the last positive output is repeated.

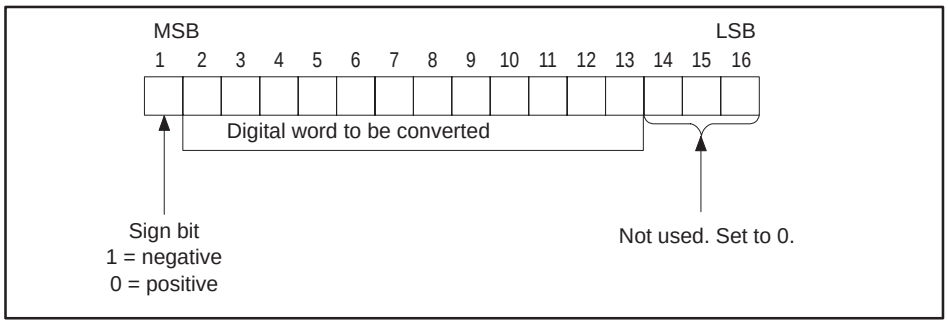


Figure 1-6 Output from Controller to Module

The resolution of the module is 8 counts out of 32000, regardless of whether the signal is used as voltage or current. Therefore, the smallest step unit for voltage is 2.5 mV and for current is 5 µA. To calculate the digital word necessary to achieve a certain output voltage or current, use the following equations.

$$Digital\ word\ (WY) = \frac{Desired\ output\ voltage}{10\ V} \times 32000$$

$$Digital\ word\ (WY) = \frac{Desired\ output\ current\ (mA)}{20\ mA} \times 32000$$

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1.4 Power Sources

The output module requires both user-supplied and base-supplied power.

Table 1-1 shows the input module response at power-up and power-down.

Table 1-1 Analog Input Module Power Cycling

Base Power	User Power	Module
Transition on	Not applicable	Module resumes converting and controller resumes reading from module
Transition off	Not applicable	Module and controller power down. All input data cleared

Table 1-2 shows the output module response at power up and power down.

Table 1-2 Analog Output Module Power Cycling

Base Power	User Power	Module
On	Transition off	Off—module sets fail bit
On	Transition on	Resumes prior state until next update
Transition off	On	Freezes last value
Transition on	On	Holds last value until next update
Off	Transition on	Off

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Chapter 2
Installation

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2.1 Wiring Guidelines

Wiring for these modules consists of wiring for the input or output signal and wiring user power for the output module. Keep the two types of wiring separate to prevent noise on the signal wiring. Wiring for the input or output signal should be shielded, twisted-pair cable (14–24 AWG or 0.18–1.5 mm^2, either stranded or solid-type).

⚠WARNING **Use wires suitable for at least 75°C. Signal wiring connected to this module 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.***

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Follow these guidelines when you wire the module.

- Use the shortest possible wires.
- Avoid placing signal wires parallel to high-energy wires. If the two must meet, cross them at right angles.
- Avoid placing wires on any vibrating surfaces.
- Avoid bending the wire into sharp angles.
- Use wireways for wire routing.

Terminate shielding for the input cable at the source end of the signal. This means that the point of origin of the input signal wire should be the shield termination point. If more convenient, you can terminate the shield to earth ground at the module using the two lower screws on the user wiring connector. Do not tie the shield to earth ground at both ends of the wiring; this practice may cause ground currents that could induce noise.

Terminate shielding for the output cable at the base, using the two lower screw terminals on the user wiring connector.

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2.2 Planning Analog Output Wiring

Signal Wire Carrying Current

Loop resistance for the output circuit is determined by the length and type of wire and the device series resistance. This section gives instructions for calculating the maximum length cable you can use. The circuit resistance must be in the range of 10–600 Ω. If you use a separate power supply of 10 V, the minimum resistance increases to 600 Ω, and the maximum resistance increases to 1000 Ω. To determine the resistance of a channel output loop, use the following equation.

$$Loop\ resistance = (2 \times CL \times RFT) + TFL$$

where
CL = cable length
RFT = conductor resistance (Ω/unit length)
TFL = sum of resistance for all field devices

The result of this equation must be less than 600 Ω. If the result is greater than 600 Ω but less than 1000 Ω, insert a 10 V power supply into the loop to maintain the accuracy of the module, or change one of the other loop resistance factors. Any value over 1000 Ω prevents the module from operating accurately. Figure 2-1 shows a schematic for wiring an output loop with a resistance of less than 600 Ω. Also shown in Figure 2-1 is a schematic for adding a power supply to allow loop resistance up to 1000 Ω.

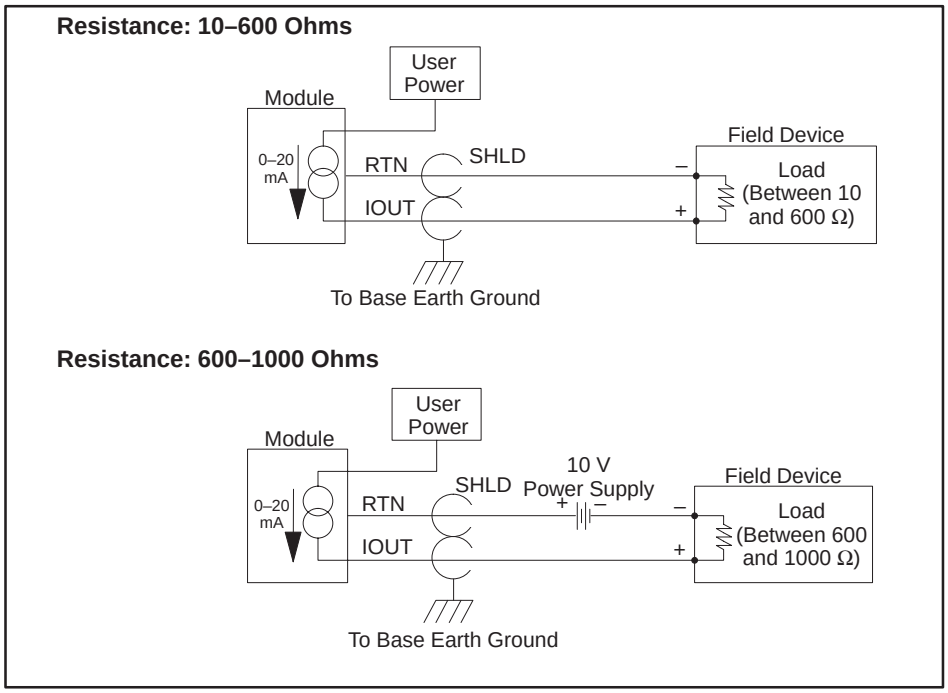


Figure 2-1 Current Output Circuit

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Signal Wire Carrying Voltage

To help ensure accuracy within module specifications, consider the following in choosing wire that carries voltage:

- Load imposed by the field device
- Type and length of wire
- Wiring practices

The load imposed by a field device must be at least 5000 Ω. The maximum capacitance that can be driven by the output is 0.01 µ F. The maximum cable length is a function of cable capacitance. To determine the maximum distance for a given cable, obtain the nominal value of cable capacitance per unit length as given by the manufacturer. Use this value in the following equation.

$$\textit{Maximum cable length} = \frac{0.01\ \mu F}{\textit{Nominal cable capacitance (per unit length)}}$$

NOTE: Nominal capacitance is capacitance between conductors. However, if one conductor is connected to the shield via a grounded power supply, the nominal value roughly doubles.

You can use the length and conductor resistance of the cable to find the fixed error appearing at the field device. To determine the fixed error, use the following equation.

$$\textit{Fixed error (\%)} = \left[1 - \frac{R1}{R1 + (2 \times CL \times RFT)}\right] \times 100$$

where

R1 = field load resistance
CL = cable length
RFT = conductor resistance (Ω/unit length)

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2.3 Wiring and Installing the Terminal Block

Terminal Block Options

Figure 2-2 shows the two terminal block types that are available for use with the analog I/O modules. Connector PPX:2587705–8006 is shipped with the modules. However, you can order the other connector, PPX:2587705–8002, and wire it identically. If you are replacing double-wide analog modules with single-wide analog modules, you can simply install the new modules and attach the old, wired terminal blocks.

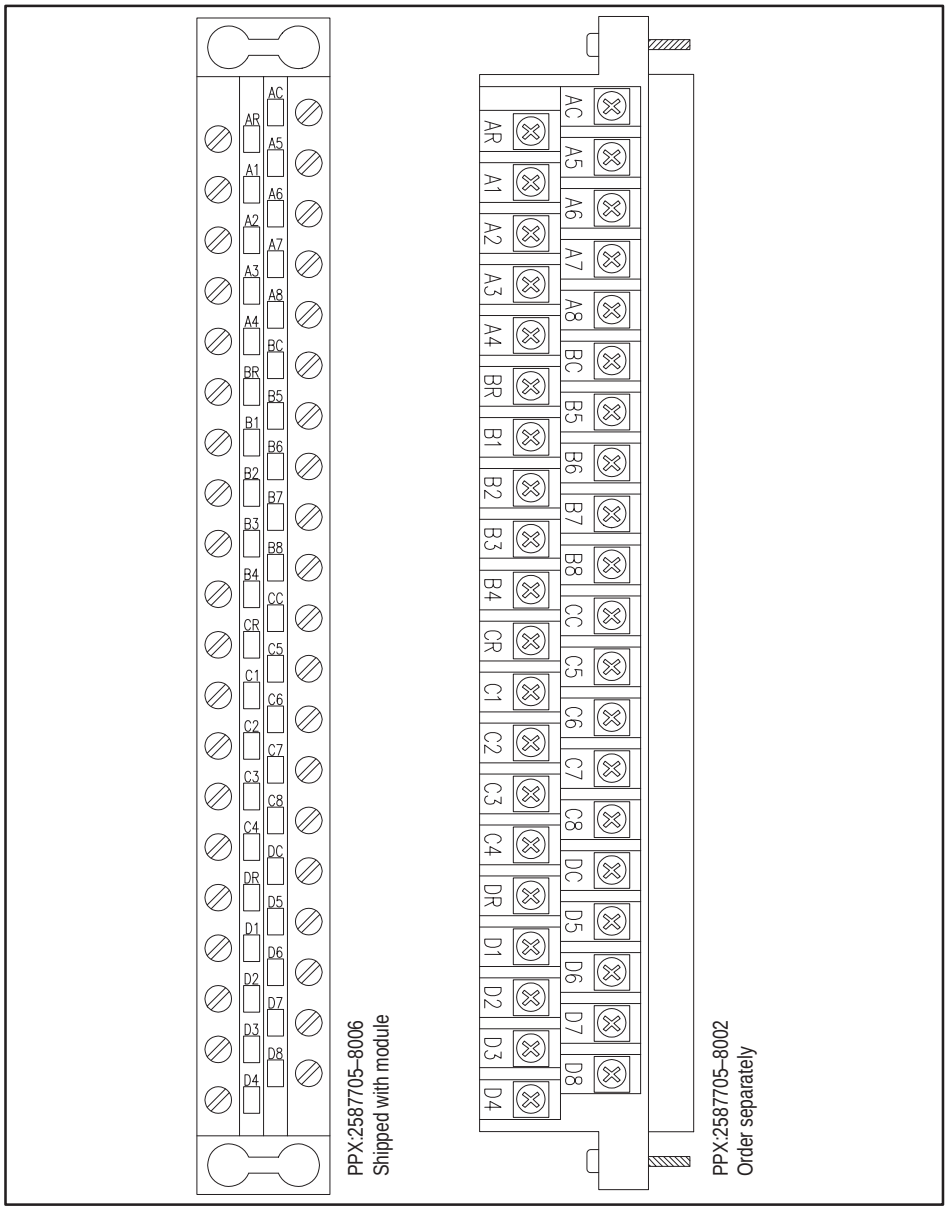


Figure 2-2 Terminal Blocks

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Wiring the Terminal Block

You can wire the terminal block before or after it is attached to the module.

1. Strip back the insulation on the wires 0.25″ or 1.0 cm. Use a 14–24 AWG or 0.18–1.5 mm^2 wire, either stranded or solid-type. You may attach a spade or a ring lug (amp 34141) to the end of the wire if allowed by the connector type. Refer to Figure 2-3.

2. Using the appropriate pinout as a wiring guide (Figure 2-4), start with the D terminals and loosen the terminal block screws.

3. Connect the end of the wire to the loosened terminal block screw, and tighten firmly. Once the Ds are completed, tighten the C terminals, and continue until the terminal block is completely wired.

4. Ensure that all wires have good connections. Without good connections, the module does not operate properly.

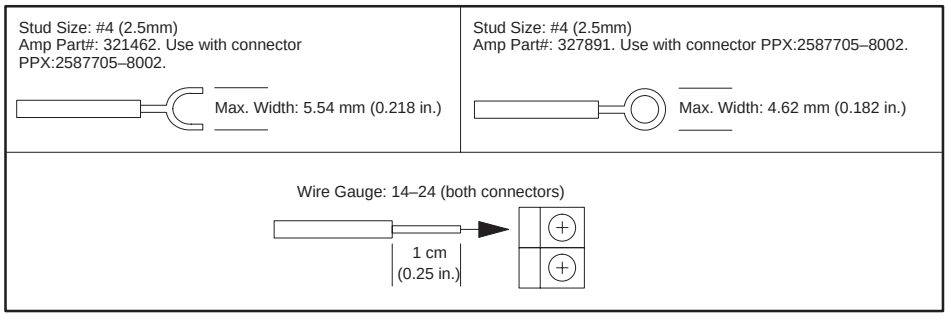


Figure 2-3 Wire Gauge and Stud Sizes

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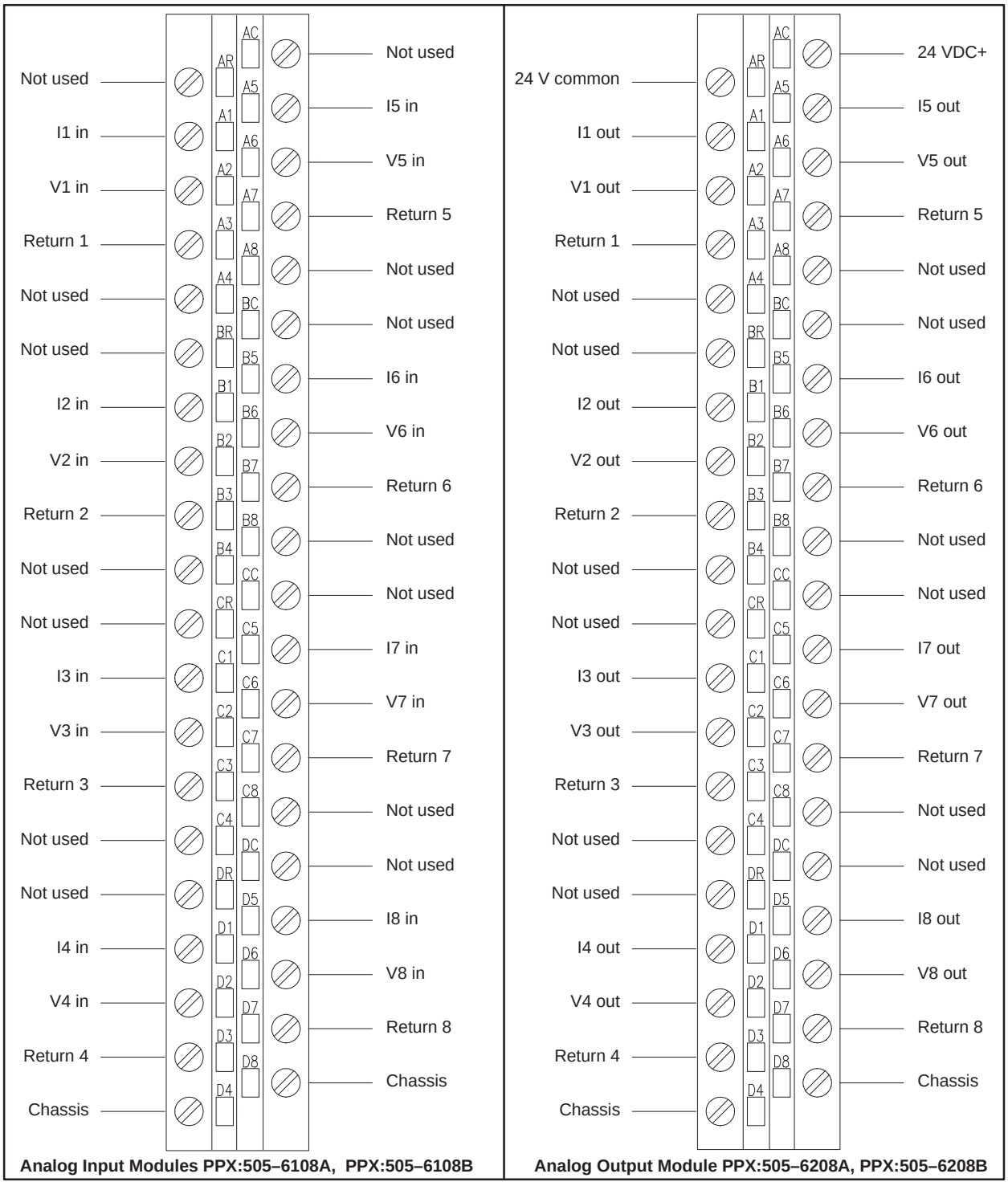


Figure 2-4 Pinouts for PPX:505–6108A, PPX:505–6108B, PPX:505–6208A, and PPX:505–6208B

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Selecting Voltage or Current Inputs for the Analog Input Module

The Analog Input Module has eight input channels. Each of the eight channels may be selected to receive either voltage or current as the incoming analog signal. See Figure 2-5.

- To wire voltage input signals, wire the input signal directly to the voltage input point.
- To wire current input signals, you must jumper the voltage input point to the current input point for that channel.

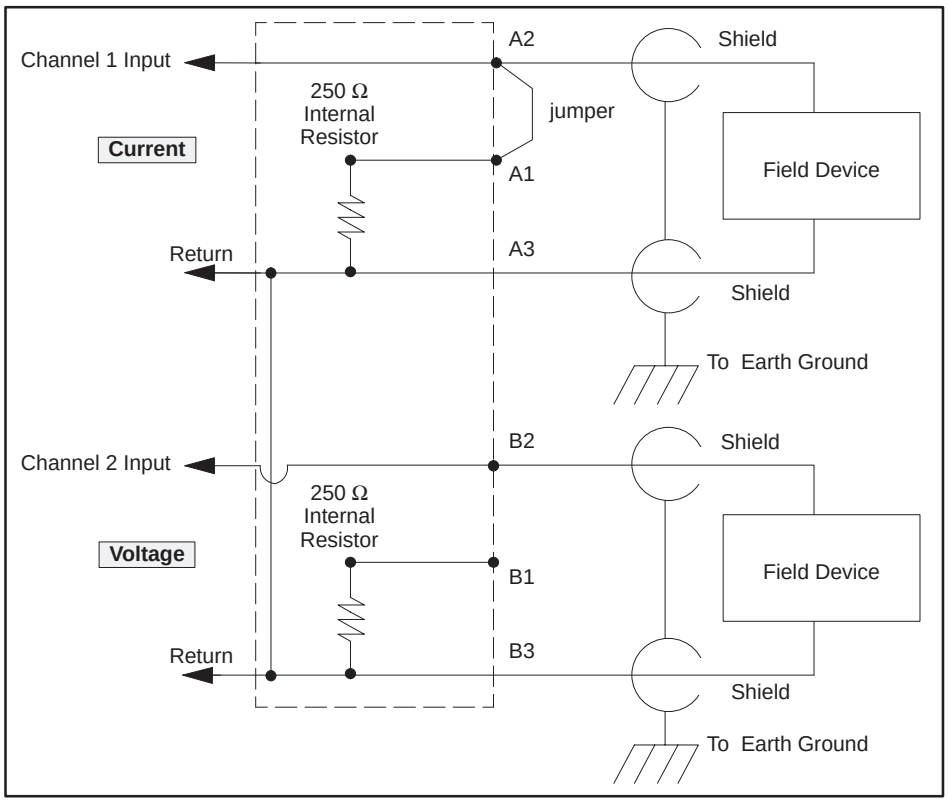


Figure 2-5 Analog Input Module: Field Wiring for Current/Voltage

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Figure 2-6 through Figure 2-8 show typical connections for analog input and analog output modules.

Figure 2-6 and Figure 2-7 show Channel 1 of the analog input module configured for current and wired to a transmitter.

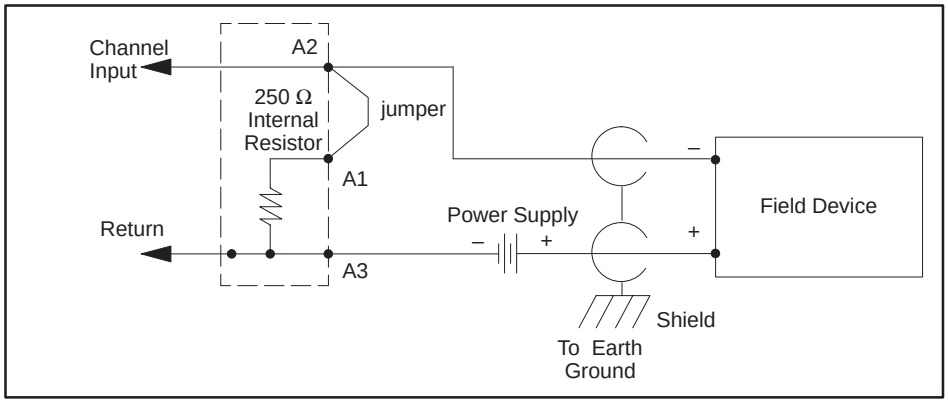


Figure 2-6 Analog Input Module: Field Wiring for 2-wire Transmitter

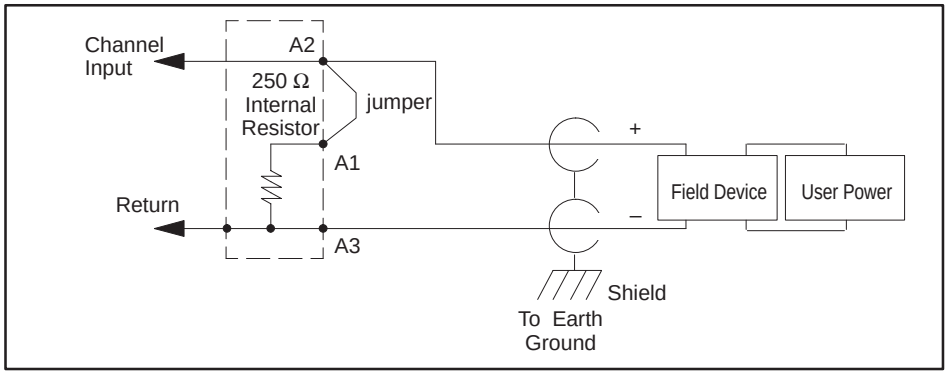


Figure 2-7 Analog Input Module: Field Wiring for 4-wire Transmitter

In the analog output module, output voltage and current are provided simultaneously. As shown in Figure 2-8, you can wire each channel for current, voltage, or both.

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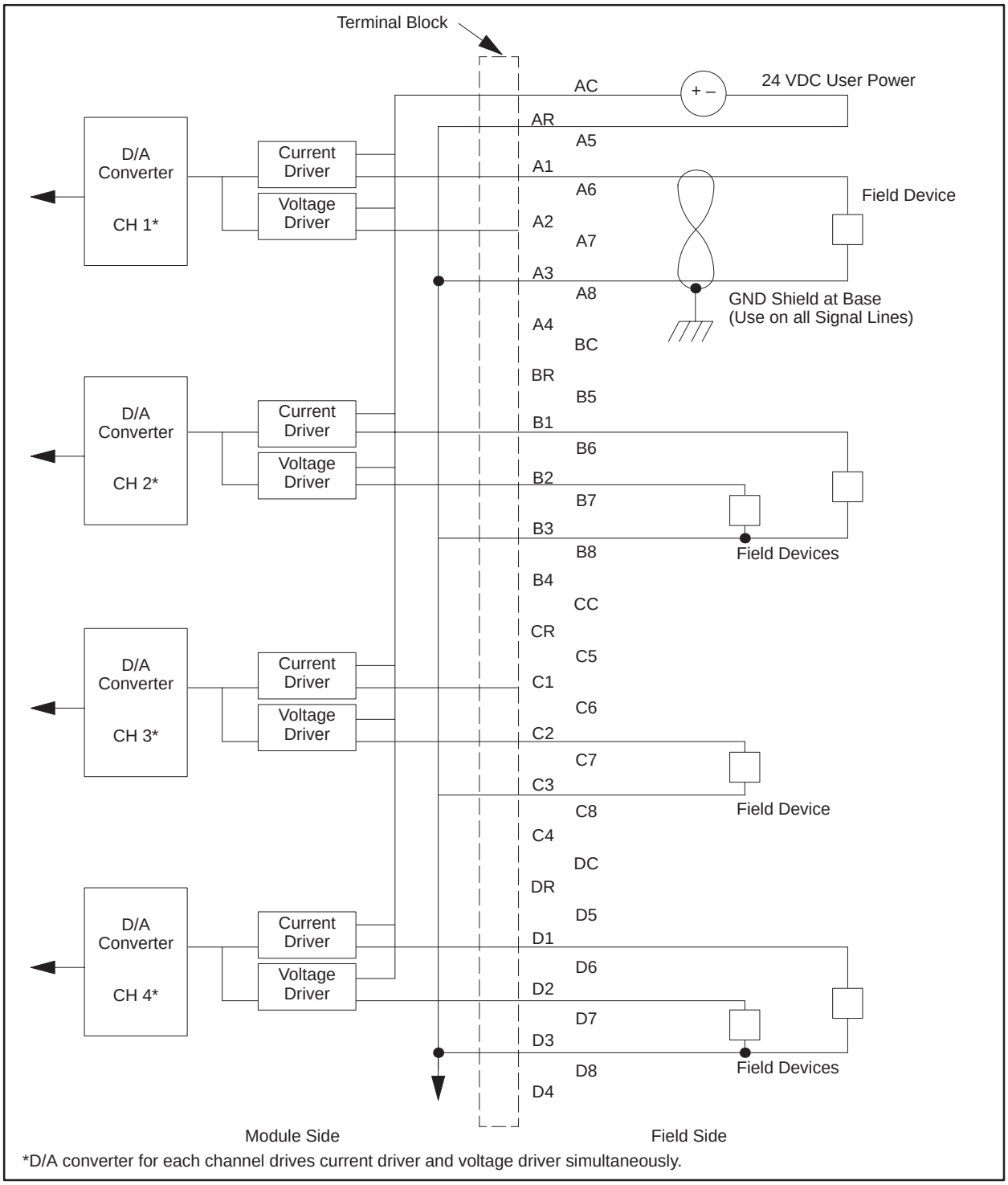


Figure 2-8 Analog Output Module: Typical 4-channel Connection

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2.4 Inserting the Module

These analog I/O modules are single-wide. You can install either module in any unused I/O slot. However, avoid installing the modules next to high-energy switching modules or other potential sources of electromagnetic interference (EMI). Install the module in the same manner as any other Series 505 I/O module. To minimize the possibility of electrostatic damage to the components, do not touch the printed circuit board while you are inserting the module. Refer to Figure 2-9.

⚠WARNING **To minimize the risk of personal injury or property damage, disable all power to the system before installing or removing I/O modules.**

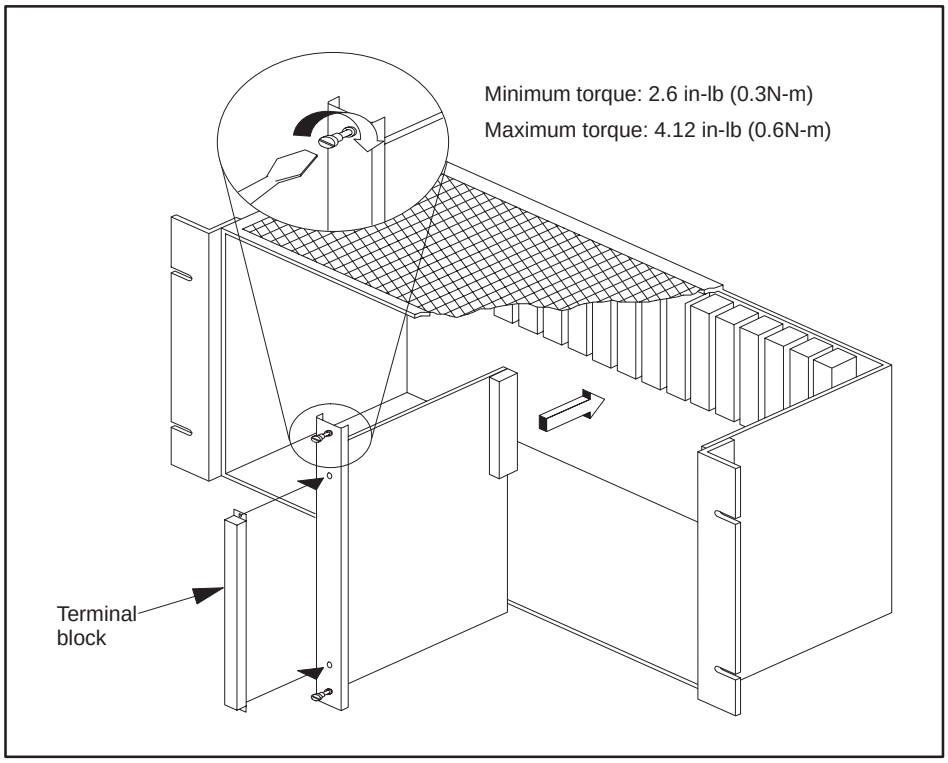


Figure 2-9 Installing the Analog Module

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Apply Power

Apply power only to the base. Configure the I/O. See Section 2.5 on configuring the I/O.

Now that the terminal block is installed and the module is configured, restore all user-supplied power to the base.

NOTE: If more than one module is to be installed, do not restore power until all modules have been installed.

If no problems are detected when power is supplied to the module, the status indicator on the front of the module lights. If the status indicator is not on or goes out during operation, the module has detected a failure. To correct the failure, refer to Chapter 3 on troubleshooting.

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2.5 Configuring I/O

After you have inserted the module into the base, you must register the module in PLC memory.

NOTE: If you do not register the module, the PLC logs a nonfatal error; however, the module LED status indicator remains on.

Configure the analog modules as 8-point word as shown in Table 2-1.

Table 2-1 Module I/O Values

Module	WX	WY
PPX:505–6108-A 8-channel analog input module	08	00
PPX:505–6208-A 8-channel analog output module	00	08
PPX:505–6108-B 8-channel analog input module	08	00
PPX:505–6208-B 8-channel analog output module	00	08

Figure 2-10 shows the typical screen used when configuring I/O (base 0, modules installed in slots 1 and 2).

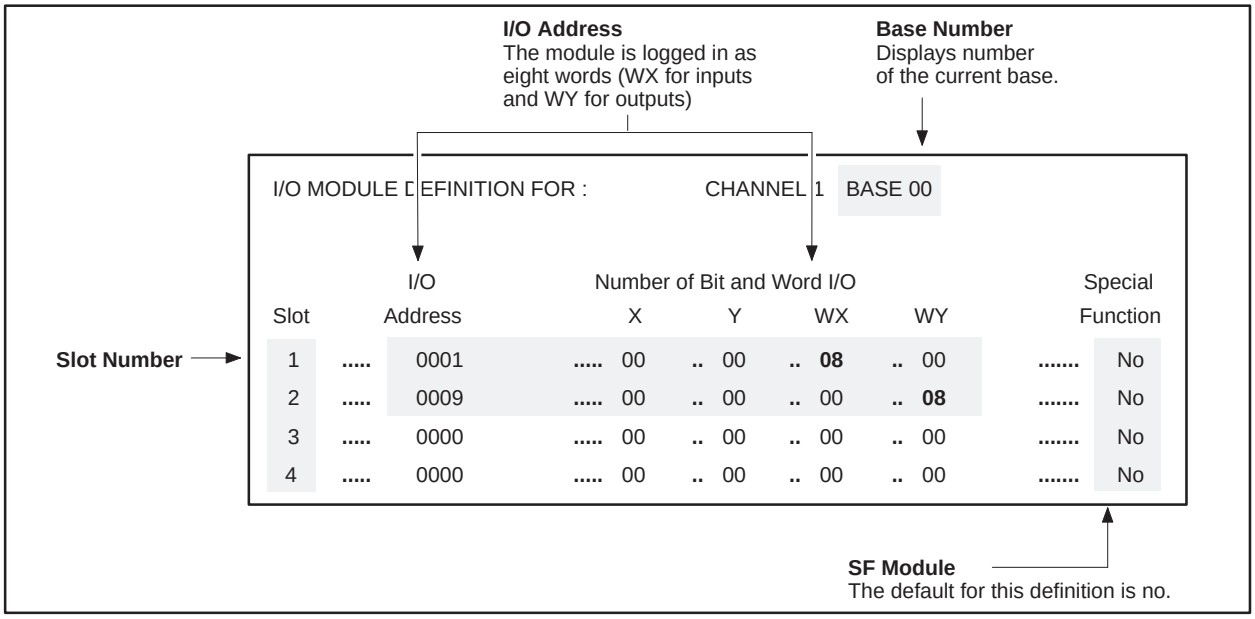


Figure 2-10 Sample I/O Module Definition Chart

For more information on configuring I/O, refer to your *SIMATIC 500/505 TISOFT Release 6.3 User Manual.*

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Chapter 3

Troubleshooting and Maintenance

3.1 Status Indicator 3-2

3.2 Replacing the Fuse 3-3

3.3 Calibration Guidelines 3-4

3.4 Calibrating Analog Input Modules 3-6

3.5 Calibrating Analog Output Modules 3-8

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3.1 Status Indicator

The LED status indicator and the programming device indicate whether the module is operating correctly. Table 3-1 lists symptoms, possible causes, and corrective actions to take if the module is not operating correctly.

Table 3-1 Troubleshooting Chart

Symptom	Probable Cause	Corrective Action
LED is not on	Not receiving user power—output module only	Check power supply and connections
	Blown fuse—output module only	Check for overvoltage or reversed polarity; replace fuse
	Self-diagnostics fail	Return module for repair
	Base power is off	Turn base power on
Incorrect readings	Connections wrong	Trace wiring connections
	Signal wire noise	Use shielded wire and separate from power wiring
	Module not configured	Check I/O configuration
	Module incorrectly calibrated	Recalibrate the module
	Signal source error—input module only	Verify that signal source levels are in range (Figure 1-4)
CPU nonfatal error because of module	Module configured wrong	Reconfigure the module
	Module failed	Check items under *LED is not on*; if the actions listed do not correct the problem, return the module for repair

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3.2 Replacing the Fuse

Figure 3-1 shows the location of the output module fuse. Replace it with the fuse shown.

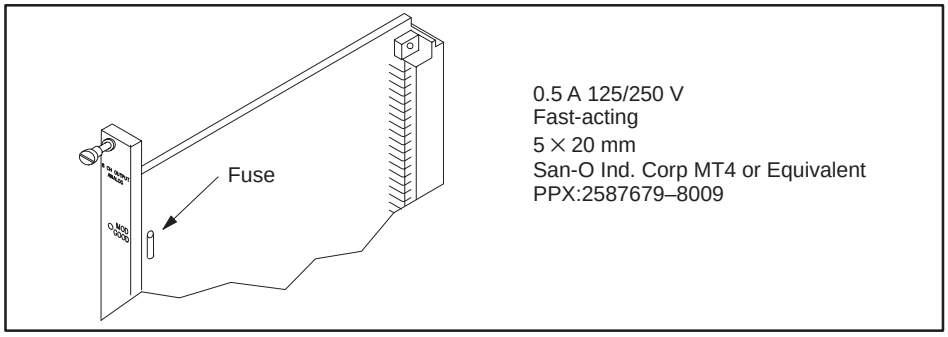


Figure 3-1 Output Module Fuse Location and Replacement Value

Use the following procedure to replace the fuse.

⚠WARNING **To minimize the risk of personal injury or property damage, disable all power to the module before replacing a fuse.**

1. If the wires are too short for you to pull the module out to reach the fuse, disconnect the terminal block from the module.
2. Remove the module from the base.
3. Replace the blown fuse.
4. Insert the module into the base.
5. Connect the terminal block (if necessary).
6. Power up the system.

If you cannot correct the problem, contact your Siemens Energy & Automation, Inc. distributor for technical assistance.

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3.3 Calibration Guidelines

The modules are calibrated during manufacture and should not need to be calibrated again to operate properly; however, a maintenance schedule to check accuracy every six to twelve months is recommended.

If the accuracy is not within specified tolerance at 25°C, recalibrate the module. You must calibrate the module with the CPU in program mode, not in RUN mode.

Calibrate the module with or without a Euro-extender card (Euroboard) using the procedures outlined in the following sections.

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⚠CAUTION

To help avoid potential damage to equipment, use a non-metallic screwdriver to calibrate the module. Do not use a metallic screwdriver.

⚠WARNING

To minimize the risk of personal injury or property damage, do not touch the printed circuit board during the calibration procedure while the system is powered up.

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3.4 Calibrating Analog Input Modules

To calibrate the input module, follow this procedure.

1. Disable system and user power.
2. Disconnect the field wiring.
3. *If you are using a Euro-extender card (Euroboard):*

   Remove the module from the base.

   Insert the extender card into the I/O slot that the module occupied. You may use a Schroff, Inc. Test adapter board.

   Insert the module into the extender card (Figure 3-2). This provides access to the calibration potentiometer and input range select jumper.

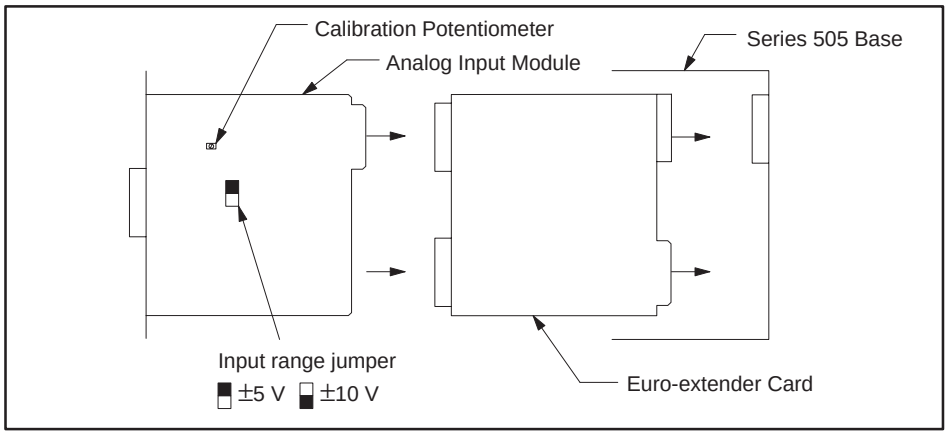


Figure 3-2 Euro-extender Card Assembly for Analog Input

If you are not using a Euro-extender card:

Remove all I/O modules from the base.

Select voltage input range as shown in Figure 3-2.

Move the analog input module to the far left (I/O slot 1) to allow maximum space to reach and adjust the potentiometer.

4. Power up the system and allow the module to reach its operating temperature (usually about 30 minutes, if cold).
5. Connect a programming device to the controller.

   If you are not using a Euro-extender card, configure the analog input module in slot 1.

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6. Prompt the programming device to display the module points and their associated values.

7. Send +5.000 V to all input points (+10.000 V with the ±10 V input range).

8. Locate the calibration potentiometer on the circuit board (Figure 3-2). Turn the screw with a non-metallic screwdriver until the programming screen shows all addresses at an average of +32000.

9. Send –5.000 V to all input points (–10.000 V with the ±10 V input range).

10. Turn the screw on the calibration potentiometer until all the addresses read an average of –32000.

11. Input +5.000 V to all channels (+10.000 V with the ±10 V input range).

12. Verify that all addresses read the value shown below for your module. If not, return to step 9 and ensure that the calibration voltage source is accurate to three decimal places.

    For the PPX:505–6108A and PPX:505–6208A, verify that all addresses read +32000 +129/–128.

    For the PPX:505–6108B and PPX:505–6208B, verify that all addresses read +32000 +81/–80 .

13. Disable all power to the system.

14. *If you are using a Euro-extender card:*

    Remove it and insert the module into the I/O slots.

    Connect the field wiring.

    If you are not using a Euro-extender card:

    Replace all I/O modules and the analog module in the proper slots.

    Reconnect terminal block wiring.

    Reconfigure the WX input point for the analog input module.

    Reconfigure slot 1 to its original state.

15. Power up the system.

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3.5 Calibrating Analog Output Modules

To calibrate the output module, follow this procedure.

1. Disable system and user power.
2. Disconnect all loads and field wiring (except user power).
3. *If you are using a Euro-extender card (Euroboard):*

   Remove the module from the base.

   Insert the extender card into the I/O slot that the module occupied. You may use a Schroff, Inc. Test adapter board.

   Insert the module into the extender card (Figure 3-3). This provides access to the calibration potentiometer.

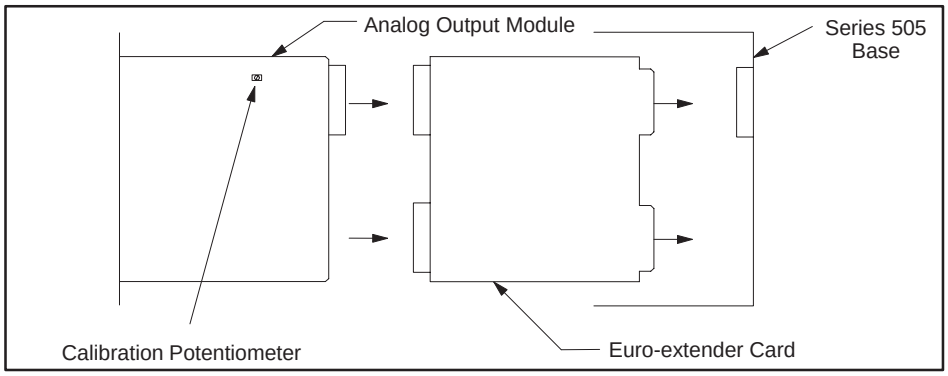


Figure 3-3 Euro-extender Card Assembly for Analog Output

   If you are not using a Euro-extender card:

   Remove all I/O modules from the base.

   Move the analog output module to the far left (I/O slot 1) to allow maximum space to reach and adjust the potentiometer.

4. Power up the system and allow the module to reach its operating temperature (usually about 30 minutes, if cold).
5. Connect a programming device to the controller.
6. *If you are not using a Euro-extender card*, configure the analog output module in slot 1.
7. Connect a 5.1k-Ω ±5% load to the voltage outputs and a 100-Ω ±5% load to the current outputs.
8. Write 32000 to all channels.

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9. Measure all voltage and current channels. Using the current outputs, calculate the mean of the output value, then find the channel whose output is closest to this calculated value.

10. Locate the calibration potentiometer on the circuit board (Figure 3-3). Using the channel which has an output closest to the mean output value, adjust to 20.000 mA at 25° C by using the calibration potentiometer.

11. Check that voltage outputs on channels are 10.000 V ±50 mV, and that the current output of each channel is 20.00 mA ±0.1 mA. If not, return to Step 7. Ensure that the calibration loads are connected properly.

    The calibration procedure is complete at this point.

12. Disable all power to the system.

13. *If you are using a Euro-extender card:*

    Remove it and insert the module into the I/O slots.

    Connect all loads and field wiring to the module.

    If you are not using a Euro-extender card:

    Replace all I/O modules and the analog module in the proper slots.

    Reconnect terminal block wiring.

    Reconfigure the WY output point for the analog output module.

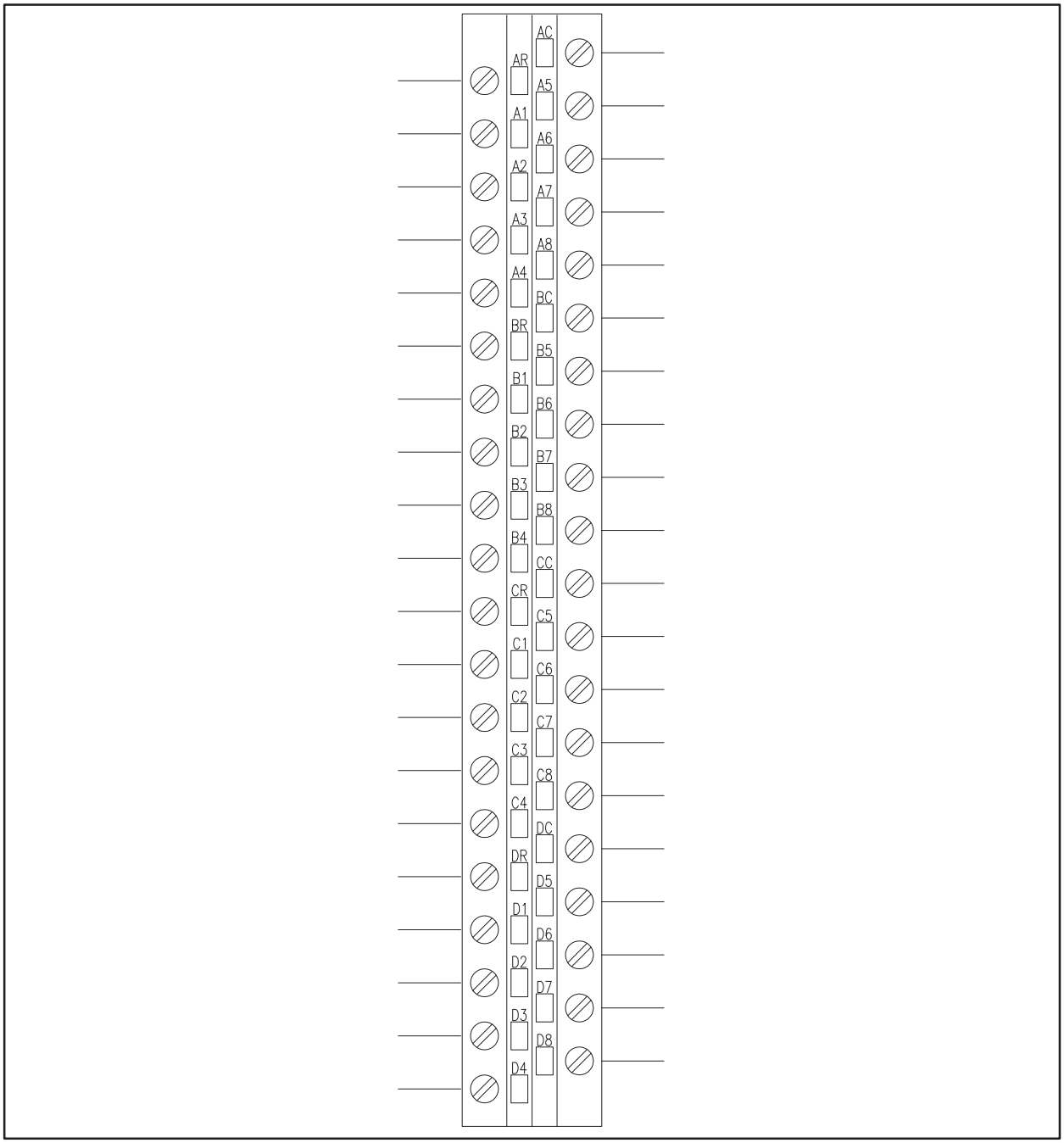
    Reconfigure slot 1 to its original state.

14. Power up the system.

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Appendix A

Terminal Block Worksheet



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Appendix B
Specifications

Table B-1 Environmental Specifications: Analog Input and Output Modules

Minimum torque for bezel screws	2.6 in-lb (0.3N-m)
Maximum torque for bezel screws	4.12 in-lb (0.6N-m)
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% noncondensing
Pollution degree	2, IEC 664, 664A
Vibration	Sinusoidal IEC 68-2-6, Test Fc 0.15 mm peak-to-peak, 10–57 Hz; 1.0 g, 57–150Hz Random IEC 68-2-34, Test Fdc, equivalent to NAVMAT P–9492 0.04 g^2/Hz, 80–350 Hz
Electrostatic discharge	IEC 801, Part 2, Level 4, (15k V)
Shock	IEC 68-2-27; Test Ea
Noise immunity, conducted on Series 505 power supply and output module user power supply	IEC 801, Part 4, Level 3 IEC255–4 Appendix E EEC 4517/79 Com(78) 766 Final Part 4 MIL STD 461B CS01, CS02 and CS06
Noise immunity, radiated	IEC 801, Part 3, Level 3, MIL STD 461B RS01 and RS02
Isolation, field to controller	1500 Vrms
Corrosion protection	All parts of corrosion-resistant material or plated or painted as corrosion protection

NOTE: Variation in readings of up to 100% of full scale may occur during electromagnetic interference (EMI).

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Table B-2 Analog Input Module PPX:505–6108A Electrical Specifications

Number of input points	8, single-ended
Module width	Single-wide
Signal range (selected voltage range applies to all channels)	–5 V to +5 V and 0 to 20 mA, or –10 V to +10 V
Voltage accuracy	(±) 0.82% of full scale over operating range (±) 0.5% of full scale at 25°C
Current accuracy	(±) 1.25% of full scale over operating range (±) 0.7% of full scale at 25°C
Temperature coefficient Voltage input Current input	 58 ppm/°C 83 ppm/°C
Repeatability	(±) 0.1% of full scale over operating range
Resolution (input)	12 bits plus sign, 1.25 mV or 5 µA (±5 V range)
Analog-to-digital conversion	12 bits plus sign
Conversion method	Dual slope integration
Input system conversion time delay	330 ms max
Update time	250 ms max (for all channels)
Sample repetition time	250 ms max
Input filter delay time	75 ms typical
DC input resistance	1M Ω min with ±5 V range selected 500k Ω min with ±10 V range selected
Input protection Voltage Current	 Overvoltage to ±30 VDC Overcurrent to 30 mA
Type of protection	clamp diodes, optical isolation
Module power from base	4 W max, 2.5 W typical
User power requirements	None
Input signal wiring	Shielded, twisted-pair cable (14–24 AWG or 0.18–1.5 mm^2, stranded or solid)

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Table B-3 Analog Input Module PPX:505–6108B Electrical Specifications

Number of input points	8, single-ended
Module width	Single-wide
Signal range (selected voltage range applies to all channels)	–5 V to +5 V and 0 to 20 mA, or –10 V to +10 V
Voltage accuracy	(±) 0.41% of full scale over operating range (±) 0.25% of full scale at 25°C
Current accuracy	(±) 0.63% of full scale over operating range (±) 0.35% of full scale at 25°C
Temperature coefficient Voltage input Current input	 50 ppm/°C typical 80 ppm/°C typical
Repeatability	(±) 0.1% of full scale over operating range
Resolution (input)	13 bits plus sign, 0.625 mV or 2.5 µA (±5 V range)
Analog-to-digital conversion	14 bits
Conversion method	Successive approximation
Sample repetition time	25 ms max
Input filter delay time	75 ms typical
DC input resistance	1M Ω min
Input protection Voltage Current	 Overvoltage to ±30 VDC Overcurrent to 30 mA
Type of protection	clamp diodes, optical isolation
Module power from base	4 W max, 1.1 W typical
User power requirements	None
Input signal wiring	Shielded, twisted-pair cable (14–24 AWG or 0.18–1.5 mm^2, stranded or solid)

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Table B-4 Analog Output Module PPX:505–6208A Electrical Specifications

Output channels	8, single-ended, simultaneous voltage and current
Module width	Single-wide
Signal range	0 to 10 VDC, 0 to 20 mA
Voltage accuracy	(±)1.45% of full scale over full temp. range (±)0.5% of full scale at 25°C
Current accuracy	(±)1.83% of full scale over full temp.range (±)0.5% of full scale at 25°C
Temperature coefficient Voltage output Current output	 136 ppm/°C 204 ppm/°C
Digital-to-analog conversion	12 bits
Resolution (output)	12 bits, 2.5 mV, 5 µA
Update time	29 ms (min), controller scan time + 56 ms (max)
Module response time	27 ms (min), 54 ms (max)
Settling time	Current: 2.0 ms (max); Voltage: 0.2 ms (max)
Overshoot	50 mV typical
Load resistance Voltage Current	 5000 Ω min; no max 10 Ω min; 600 Ω max (600 Ω min, 1000 Ω max if extra 10-V power supply present in circuit)
Capacitance load (voltage outputs)	100 pF max
Inductive load (current outputs)	1.0 mH max
Module power from base	2.0 W max, 1.0 W typical
User power supply	20 to 28 VDC at 0.5 A with maximum ripple ±0.4 VDC, UL Class 2 power supply
Power supply protection	Overvoltage to 30 VDC, reverse voltage protected
Output signal wiring	Shielded, twisted-pair cable (14–24 AWG or 0.18–1.5 mm^2, stranded or solid)

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Table B-5 Analog Output Module PPX:505–6208B Electrical Specifications

Output channels	8, single-ended, simultaneous voltage and current
Module width	Single-wide
Signal range	0 to 10 VDC, 0 to 20 mA
Voltage accuracy	(±)1.45% of full scale over full temp. range (±)0.5% of full scale at 25°C
Current accuracy	(±)1.83% of full scale over full temp.range (±)0.5% of full scale at 25°C
Temperature coefficient Voltage output Current output	 50 ppm/°C typical 100 ppm/°C typical
Digital-to-analog conversion	12 bits
Resolution (output)	12 bits, 2.5 mV, 5 µA
Module response time	10 ms max
Settling time	Current: 2.0 ms (max); Voltage: 0.2 ms (max)
Overshoot	50 mV typical
Load resistance Voltage Current	 5000 Ω min; no max 10 Ω min; 600 Ω max (600 Ω min, 1000 Ω max if extra 10-V power supply present in circuit)
Capacitance load (voltage outputs)	0.01 µF max
Inductive load (current outputs)	1.0 mH max
Module power from base	2.0 W max, 1.0 W typical
User power supply	20 to 28 VDC at 0.5 A with maximum ripple ±0.4 VDC, UL Class 2 power supply
Power supply protection	Overvoltage to 30 VDC, reverse voltage protected
Output signal wiring	Shielded, twisted-pair cable (14–24 AWG or 0.18–1.5 mm^2, stranded or solid)

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