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.

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.

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.

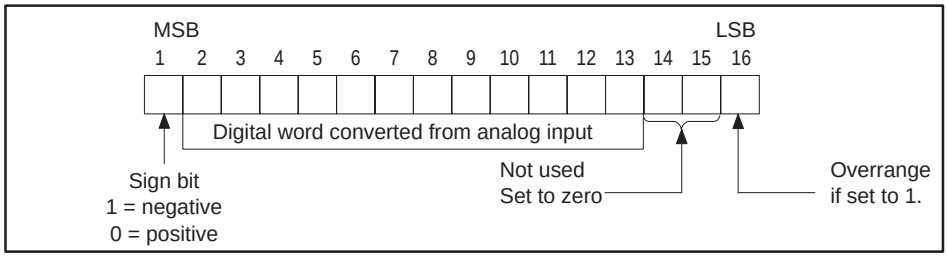


Figure 1-2 Output from the PPX:505–6108A Module to the Controller

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.

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

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:

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

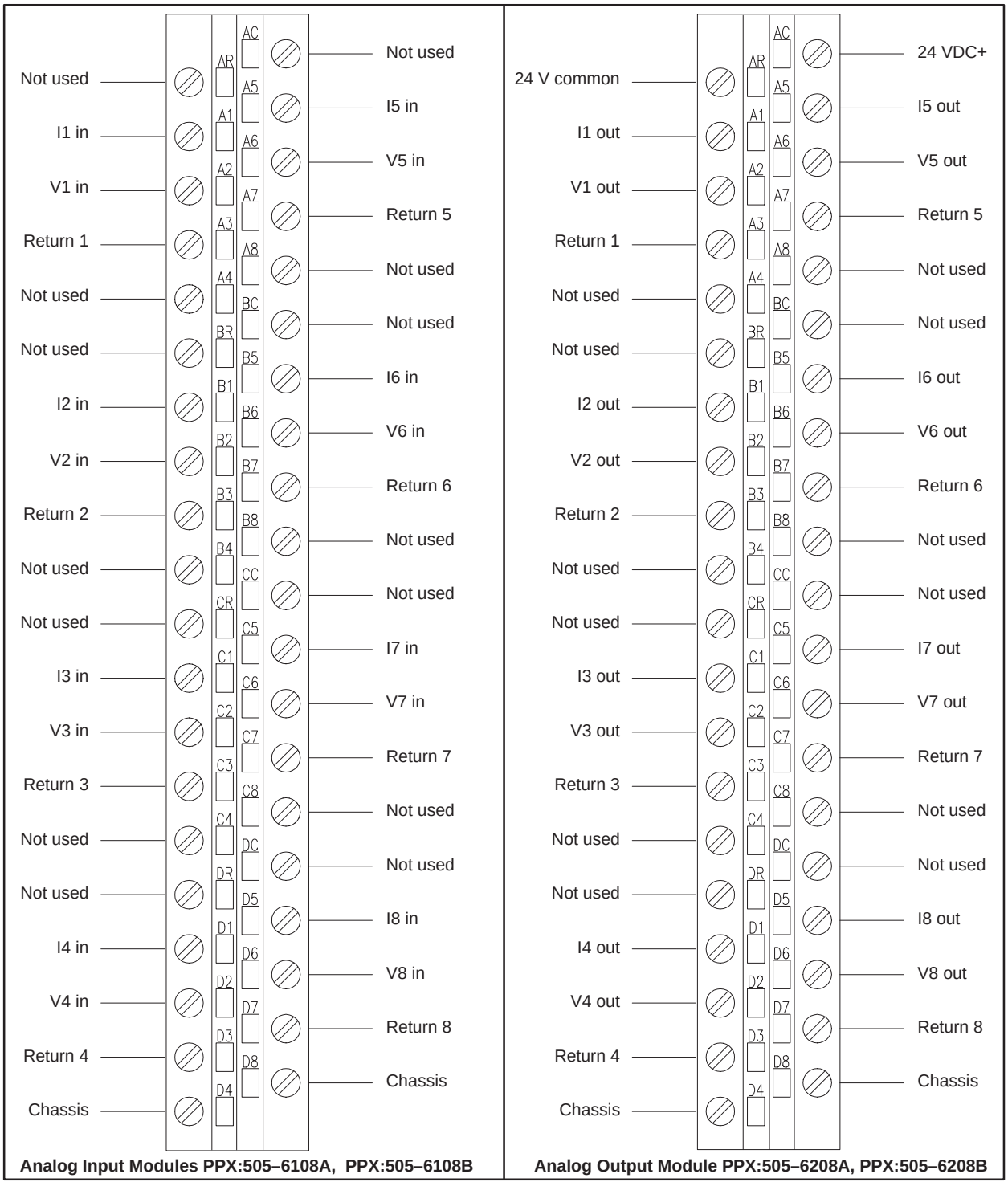


Figure 2-4 Pinouts for PPX:505–6108A, PPX:505–6108B, PPX:505–6208A, and PPX:505–6208B

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).

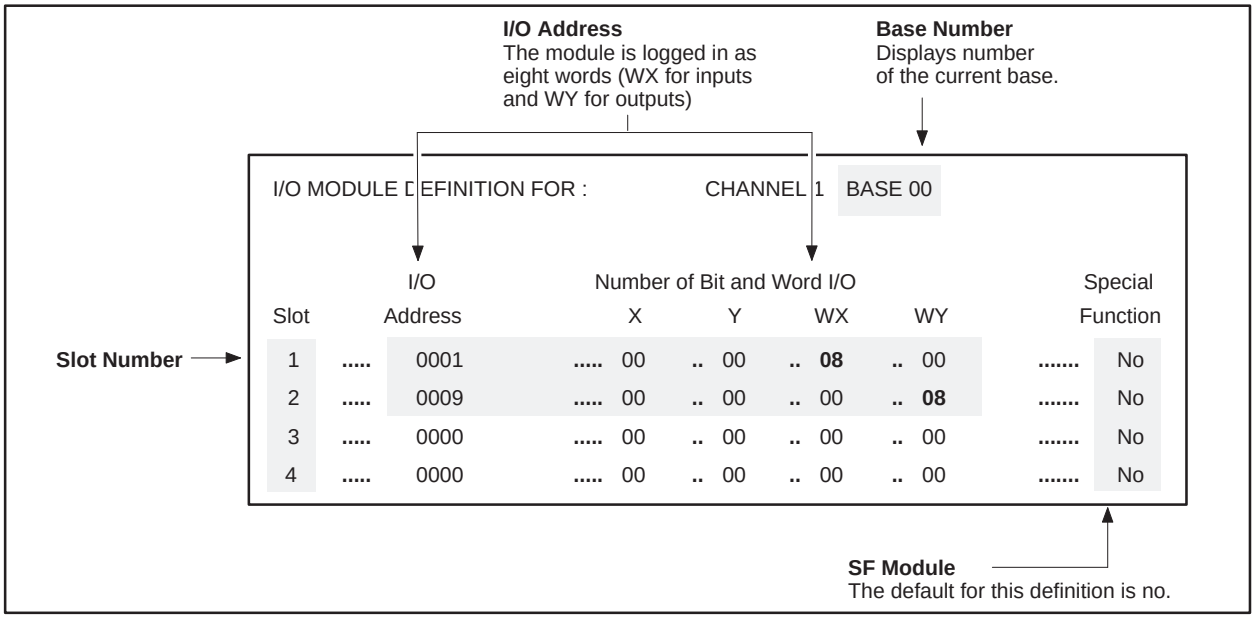


Figure 2-10 Sample I/O Module Definition Chart

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

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)