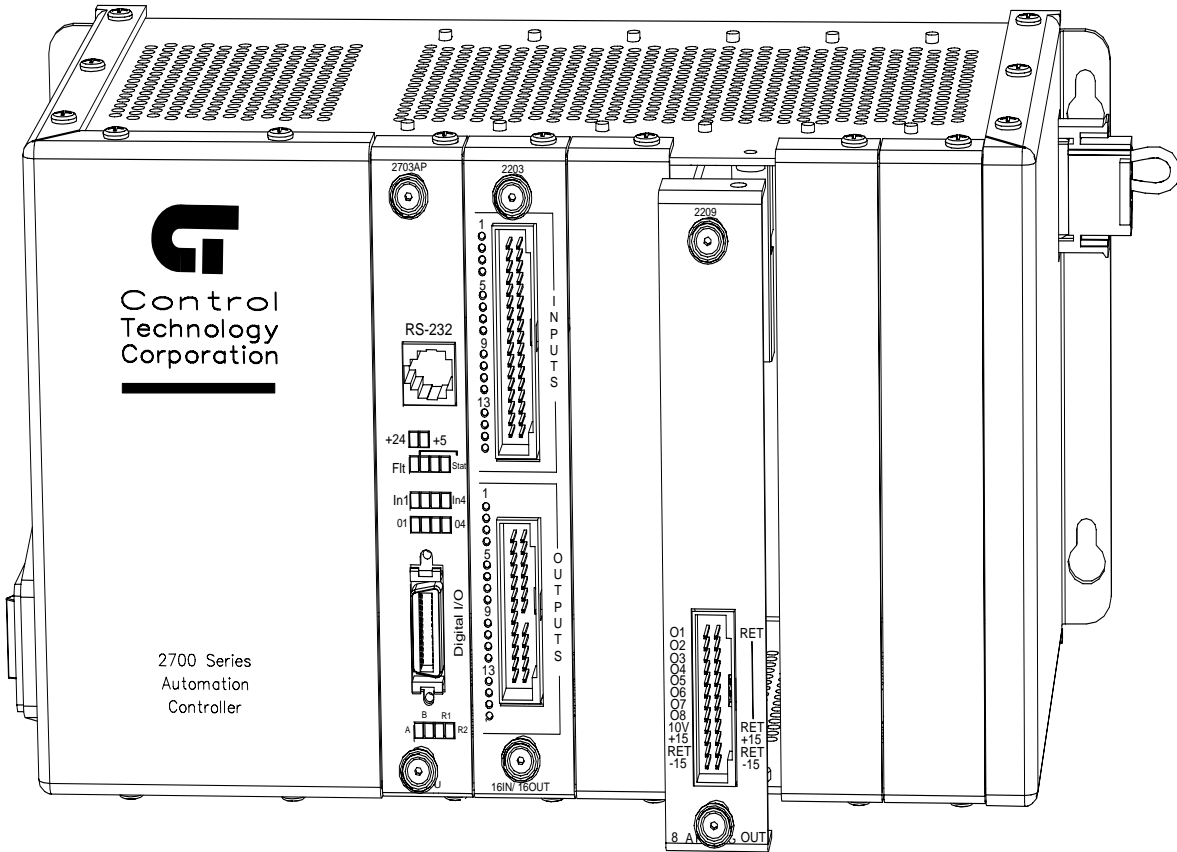




Model 2209 8-Channel Analog Output Module Installation Guide



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Notes to Readers

The *Model 2209 Installation Guide* provides the following information:

- System Overview -- describes the 2209's basic features.
- Description and Connection Diagrams -- an overview of the 2209's basic functions; pinout diagram for its analog output connector.
- Specifications -- general specifications; hardware and firmware revision levels.
- Board Handling Precautions-- contains general guidelines on handling printed circuit boards with ESD devices.
- Installation -- describes how to install the 2209 module in a CTC controller.
- Jumper Configuration -- shows the jumper locations and their function.
- Applications Guide -- contains technical information on the 2209's analog outputs and describes how to access these outputs.


Related Documents

The following documents contain additional information:

- For information on Quickstep, refer to the *Quickstep™ Language and Programming Guide* or the *Quickstep™ User Guide*.
- For information on the registers in your controller, refer to the *Register Reference Guide* (available at www.ctc-control.com).
- For information on Microsoft Windows or your PC, refer to the manuals provided by the vendor.

Formatting Conventions

The following conventions are used in this book:

ALL CAPS BOLDFACE	Identifies DOS, Windows, and installation program names.
Boldface	Indicates information you must enter, an action you must perform, or a selection you can make on a dialog box or menu.
<i>Italics</i>	Indicates a word requiring an appropriate substitution. For example, replace <i>filename</i> with an actual file name.
Text_Connected_With_Underlines	Indicates symbolic names used in Quickstep programs. Step Names are ALL_CAPITALS. Other symbolic names can be Initial_Capitals or lower_case.
SMALL CAPS	Identifies the name of Quickstep instructions in text.
Courier font	Identifies step names, comments, output changes, and Quickstep instructions appearing in the Quickstep editor.
Art Code 	Identifies the file name of a particular graphic image.

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Your Comments

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System Overview

The Model 2209 is an 8-channel analog output module. You can configure each output channel with jumpers to operate in one of three modes:

- Unipolar - 0 to +10 V
- Bipolar - ± 10 V or ± 5 V

The 2209's outputs all have 12-bit resolution (1 part in 4096), which makes this module suitable for such demanding applications as process control, motor control, and interfacing with external systems.

Fast Response Times

The 2209 has a unique architecture that responds quickly to programmed changes in analog output values. This makes it useful in such critical applications as mass flow controllers, electromechanical servos, and precise fluid dispensing where response time is a primary factor.

External Interface Flexibility

The 2209 has several other features that help the module interface with external circuitry. The module has an internal ± 15 V power supply that is accessed through the output connector. Use this supply as a power source if you have an application that requires external interface circuitry and you don't want to use an external power supply.



Note

If you use the internal supply, observe all the current limitations of this feature.

In addition, there is also a ± 10 V reference available through the output connector for external use.

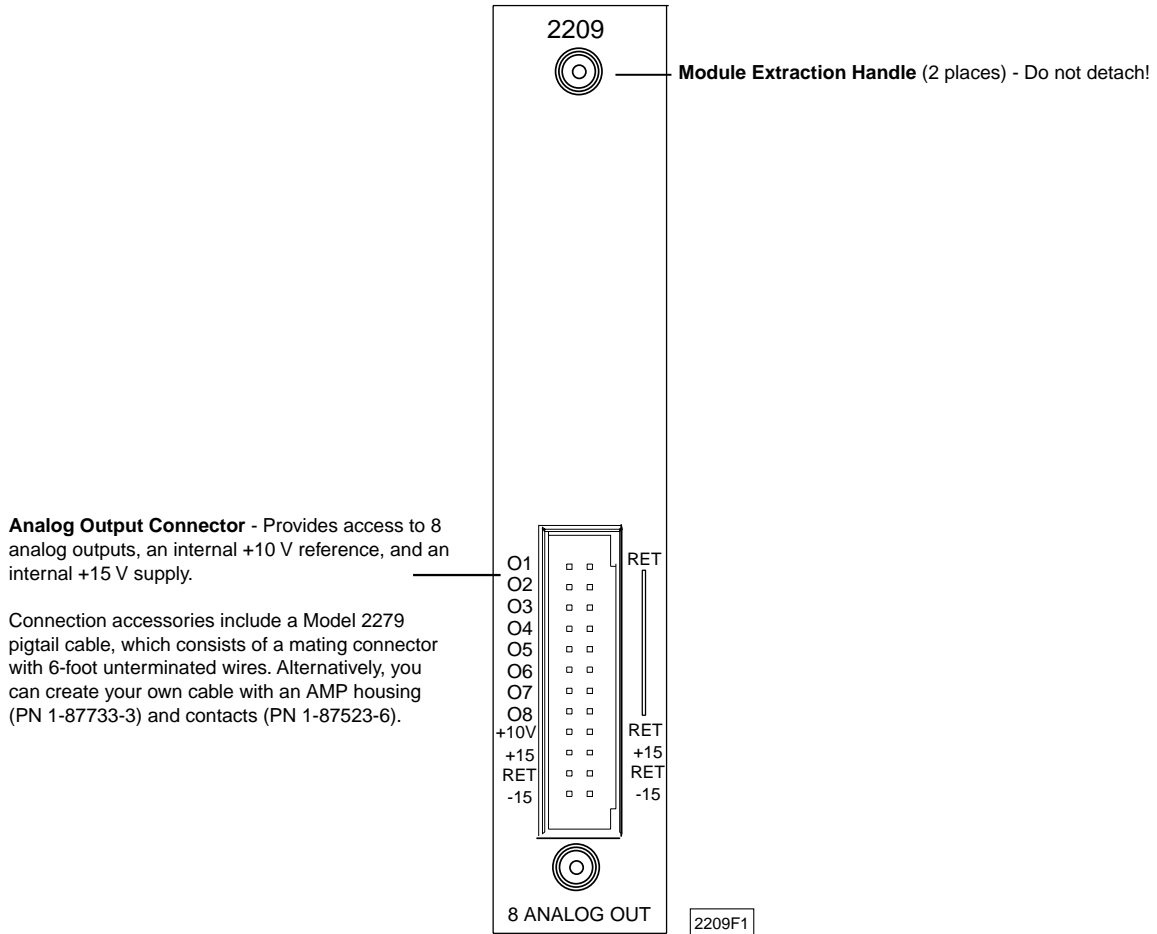
Opto-isolated Outputs

The analog signals are opto-isolated from both the controller's logic circuitry and from the power line ground, which greatly reduces the occurrence of unintended ground loops. These loops can inject considerable noise into your readings. The result is a module with a large degree of noise immunity.

2209 Description

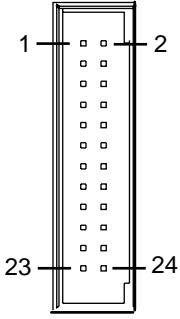
Figure 1 shows the 2209's faceplate and describes its different features.

Figure 1. 2209 Faceplate and Features



2209 Connection Diagram

Table 1. Connection Diagram - Analog Output Connector

Analog Output Connector	Pin #	Signal	Pin #	Signal
 <p>2209P1</p>	1	Output 1	2	Return
	3	Output 2	4	Return
	5	Output 3	6	Return
	7	Output 4	8	Return
	9	Output 5	10	Return
	11	Output 6	12	Return
	13	Output 7	14	Return
	15	Output 8	16	Return
	17	+10 V Ref.	18	Return
	19	+15 VDC	20	+15 VDC
	21	Return	22	Return
	23	-15 VDC	24	-15 VDC

Specifications

Table 2. General Specifications

Description	Min.	Typical	Max.	Units
Power Supply Requirements				
Logic Supply (5 V)		170.0	225.0	mA
Auxiliary Supply (24 V)		107.0	175.0	mA
Absolute Maximum Ratings				
Ambient Temperature				
Operating	0		+50	°C
Storage	-20		+80	°C
Output Load Resistance	225			kΩ
Output Current				
+10 V Reference			15	mA DC
+15 V Supply ¹			60	mA DC
Operating Characteristics				
Analog Output Voltage Ranges				
Unipolar, 10 V Span	0.000		+10.000	VDC
Bipolar, 10 V Span	-5.000		+5.000	VDC
Bipolar, 20 V Span	-10.000		+10.000	VDC
Output Resolution				
10 V Span Setting		2.44		mV
20 V Span Setting		4.88		mV
Output Accuracy				
10 V Span Setting			± 2.44	mV
20 V Span Setting			± 4.88	mV
Power Supply Output				
Negative Supply Voltage	-16.5	0	+13.5	VDC
Positive Supply Voltage	13.5		16.5	VDC
Conversion Update Interval (from command)		3.0		ms
Reference Output Voltage	9.90		10.100	VDC
Settling Time				
Full Scale Change, +10 V to -10 V		2.8		ms
1 Volt Change, 0 to +1 V		2.2		ms
<ol style="list-style-type: none"> The ± 15 V supply's external capacity must be reduced by the amount drawn from the analog outputs. The specifications listed above are at 25°C, unless otherwise specified. 				

Table 3. Hardware / Firmware Revision Levels

Model Numbers	Hardware Revision Level	Firmware Revision Level ^{1 2}
2209	B	2.1
2200 Series	0	6.0
2600 Series	C	1.0
2700 Series	C	2.10

1. You can confirm firmware revision levels by doing a register read in Quickstep's monitor program. Use register 13003 to confirm the firmware revision in a 2600/2700 series controller.
2. Firmware revision levels are not equivalent to standard decimal numbers. For example, firmware revision level 2.10 translates to:

Major Revision Level 2
 Major Revision Level 10

If this value changes to 2.20, it translates to

:
 Major Revision Level 2
 Major Revision Level 20 (not revision level 2)

Board Handling Precautions

The module's printed circuit board contains electrostatic discharge sensitive (ESD) devices. Improper board handling could result in damage to the board. The following precautions are recommended when handling the board or before inserting it into the controller:

- Make sure you are grounded electrically by using a wrist strap connected to an electrically grounded workstation or by physically touching the controller case or something electrically connected to the controller case.
- Avoid touching the leads or contacts of the circuit board and handle the board by its edges only.
- Transport circuit boards in protective, anti-static bags, bins, or totes. Do not insert boards into materials such as plastic, polystyrene foam, clear plastic bags, bubble wrap, or plastic trays.

2209 Jumper Configuration

Figure 2 shows the jumper locations on the 2209 board. Additional information on these jumpers is listed in Table 4.

Figure 2. 2209 Jumper Configuration Diagram

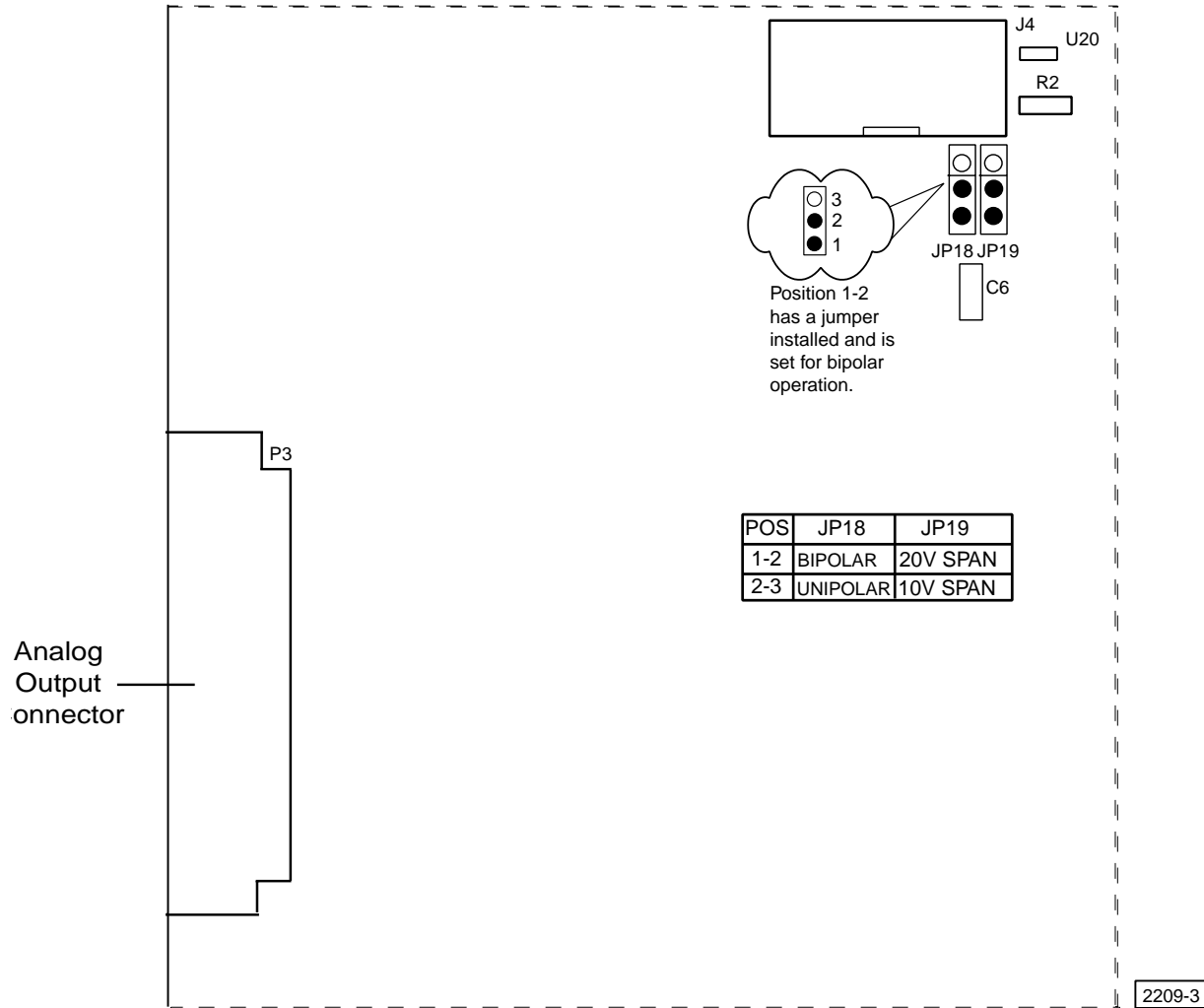








Table 4. 2209 Jumpers - Position and Function

JP18	JP19	Function
		-10 V to +10V; analog outputs are set to bipolar and 20 V.
		-5 V to +5 V; analog outputs are set to bipolar and 10 V.
		0 V to +10 V; analog outputs are set to unipolar and 10 V.

1. The combined jumper settings for unipolar outputs and 20V are not supported on the 2209 module.

Installing the 2209 Module

The module fits into one of the slots of your automation controller (Figure 3). You can insert any combination of modules into the controller (subject to system limits) and can install them in any order. This is possible because the controller's CPU dynamically assigns such items as motor numbers, input numbers, and output numbers each time power is re-applied to the controller. These numbers are assigned from left-to-right across the controller. To install a module into the automation controller:

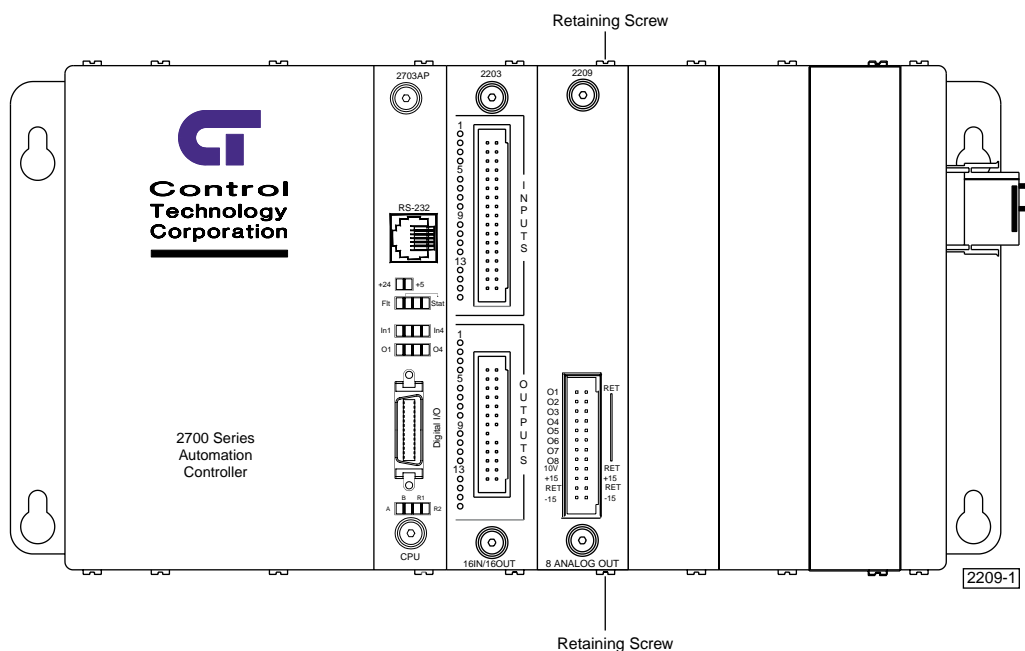


Note

Retain all hardware removed during this procedure.

1. Remove all AC and DC power, including any external supplies connected to the controller.
2. Locate an unused slot and remove two retaining screws from the top and bottom of its cover plate.
3. Slide the module into the slot and make sure that the circuit board slides into the nylon guides at the top and bottom of the controller case. Make sure that the card is oriented properly so that its labels are right-side-up.
4. Press the module firmly into the controller. Make sure that the module's faceplate is flush with the adjacent sheet metal surface.
5. Re-install two retaining screws in the top and bottom of the new module.

Figure 3. 2700 Series Controller with the 2209 module installed in the right-hand slot



Connecting and Programming Analog Outputs

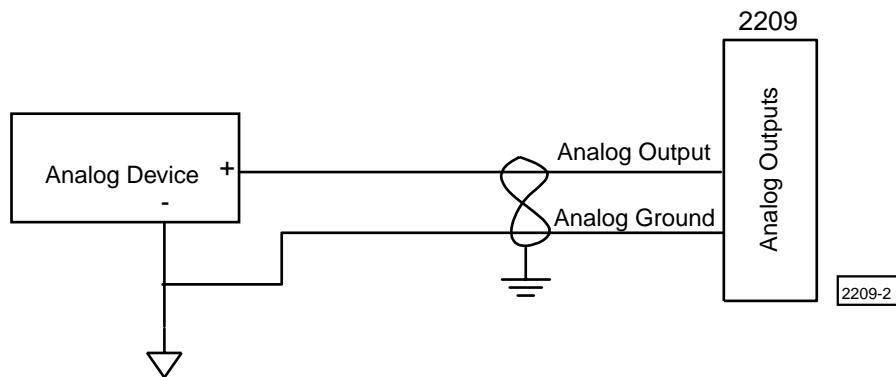
This section discusses analog output connections and describes how to gain access to these outputs.

Connecting Analog Outputs

The 2209 has 8 bipolar (± 5 V, ± 10 V, or $0 - 10$ V) analog outputs with 12-bit resolution. Figure 4 shows an analog output's wiring configuration.

Figure 4. Wiring Configuration - Analog Output

Note: Analog output returns are common to one another on each module.



Note

All shields, which are part of a cable, are connected to ground on the controller end (side) of the cable.

Access to Analog Outputs

You can use a STORE instruction to directly change an analog output's value.

```
store 4500 to AOUT_6
```

Registers 8001-8128 provide alternate access to the analog outputs. The following examples check the value on an analog output and change the value of an output. All values are expressed in millivolts.

This example checks the value of analog output 1 and proceeds to the next step when the value is reached:

```
if Reg_8001 > 1259 goto TURN_OFF_VALVE
```

This example instructs the controller to send 4.500 VDC out on analog output 6.

```
store 4500 to Reg_8006
```