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Control Technology Corporation

Installation Guide

Model 2221 32-Channel Output Module

(For 2600 and 2700 series Controllers)

This document is current as of the following revision levels:

- Controller Firmware – 2.6
- Model 2221 Hardware – 0

This guide shows how to install your model 2221 32-Channel Output Module. This module provides 32 open-collector DC outputs for driving solenoid valves and other similar loads

The model 2221 has two output connectors with identical pin configurations; each supplying pins for 16 output connections. These connectors also provide access to the controller's internal +24 volt power supply and are plug-compatible with a variety of Control Tech wiring aids and accessories.

This guide is divided into the following sections:

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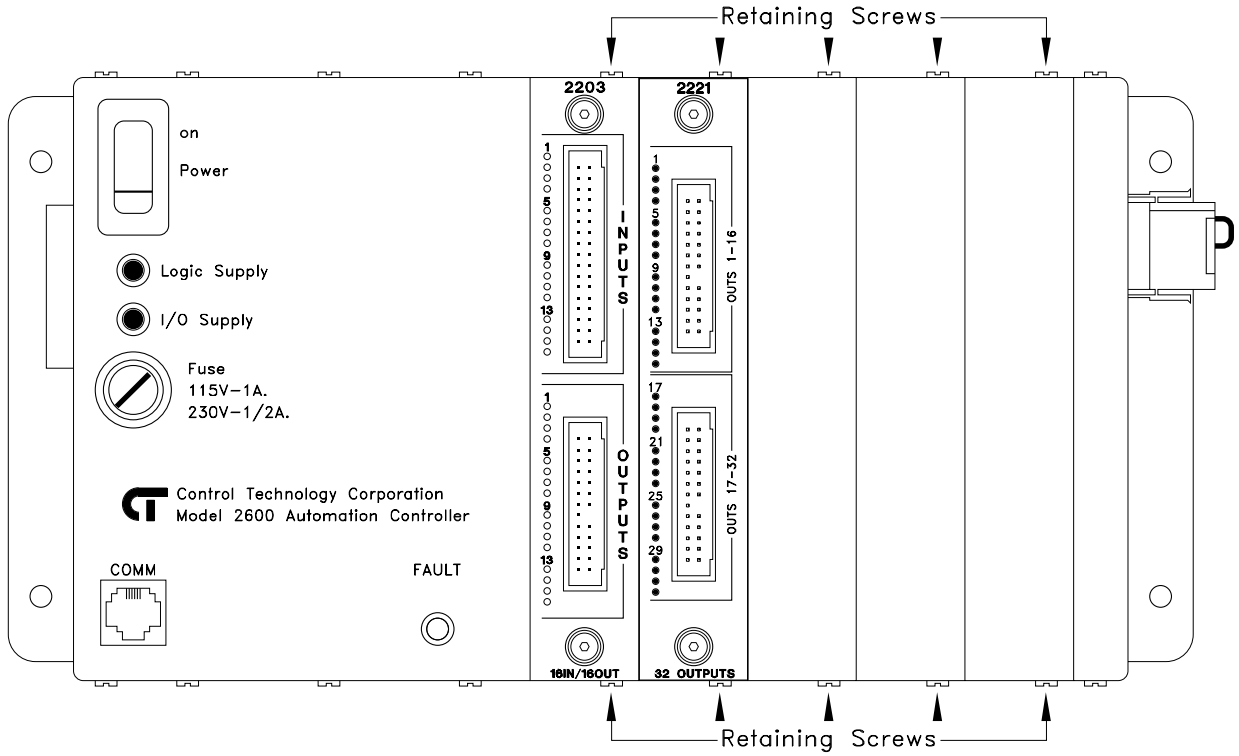
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Inserting the 2221 Module into Your Controller

The model 2221 32-Channel Output Module must be inserted into one of the slots of your automation controller. Any combination of modules may be inserted into the controller, subject to system limits. You may insert them in any order; the controller's CPU dynamically assigns motor numbers, input numbers, output numbers, etc., each time power is reapplied to the controller. These numbers are assigned from left to right across the controller. For example, from slot No. 1 to slot No. 5 in the controller shown below.

To install a module into the automation controller:

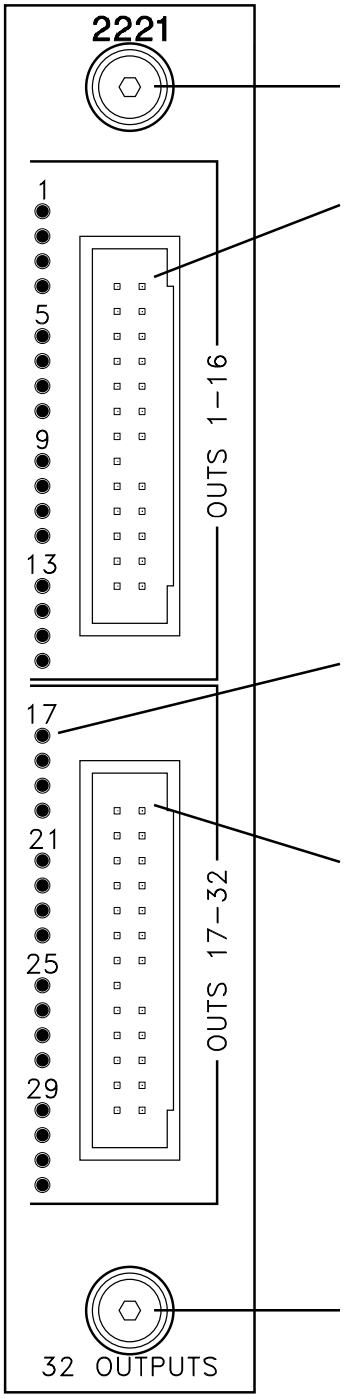
1. Insure that all AC and DC power to the controller has been removed. This includes any external supplies which may be connected to the controller.
2. Remove the retaining screws from the top and bottom of the cover plate in the position to be used for the new module. Save these screws to reinstall the new module.
3. Slide the module into the slot, insuring that the circuit board slides into the nylon guides at top and bottom, and that the card is oriented properly (labelling should read right-side-up).
4. Press the module firmly into the controller; when properly seated, the faceplate of the module should be flush with the adjacent sheet metal surface.
5. Reinstall the retaining screws in the top and bottom of the new module.



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Model 2221 32-Channel Output Module Connections

Front View of Model 2221



Module Extraction Handle – Do Not Detach!

Upper Output connector – This connector provides access to the first 16 outputs represented by this module. If this module is the left-most module in the controller the outputs will be outputs 1 through 16. If this output module is not the left-most output module, the controller counts the outputs in any previous module first.

To connect to the outputs use a model 2275 output pigtail cable, 2252 connector kit, or 2375 terminal block. You can also create your own cable with an AMP housing #87733-4 housing and #87523-6 contacts. You can also mate a ribbon cable connector with this output connector, for example., 3M part #3399-6000.

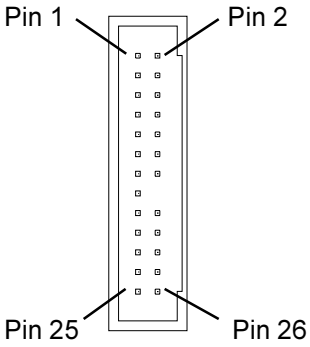
LED Indicators – Each of the module's output has an LED indicator. An LED indicator for an output is illuminated when the output is active (on).

Lower Output connector – This connector provides access to the second group of 16 outputs represented by this module. If this module is the left-most module in the controller the outputs will be outputs 17 through 32. You can use the same wiring options described for the upper output connector.

Module Extraction Handle – Do Not Detach!

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Pin Connections for Outputs



Wiring of Upper Connector

Pin No.	Signal	Pin No.	Signal
1	Output 1	2	Output 14
3	Output 2	4	Output 15
5	Output 3	6	Output 16
7	Output 4	8	Return
9	Output 5	10	Return
11	Output 6	12	Return
13	Output 7	14	Return
15	Output 8	16	No pin
17	Output 9	18	+ 24 VDC
19	Output 10	20	+ 24 VDC
21	Output 11	22	+ 24 VDC
23	Output 12	24	+ 24 VDC
25	Output 13	26	N/C

Wiring of Lower Connector

Pin No.	Signal	Pin No.	Signal
1	Output 17	2	Output 30
3	Output 18	4	Output 31
5	Output 19	6	Output 32
7	Output 20	8	Return
9	Output 21	10	Return
11	Output 22	12	Return
13	Output 23	14	Return
15	Output 24	16	No pin
17	Output 25	18	+ 24 VDC
19	Output 26	20	+ 24 VDC
21	Output 27	22	+ 24 VDC
23	Output 28	24	+ 24 VDC
25	Output 29	26	N/C

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Model 2221 Specifications

Absolute Maximum ratings	Min	Typ	Max	
Ambient temperature				
operating	0		50	°C
storage	-20		80	°C
Applied output voltage	0		24	VDC
Applied output Current				
Single output			500	mA DC
Total limit			5.0	Amp DC

Operating Characteristics	Min	Typ	Max	
Output parameters				
Output on voltage (I_o = 500 mA)	0.6		1.2	VDC
Output off leakage (applied V = 24 v)	1		100	µA DC
Power supply requirements from controller				
+ 5 VDC with all outputs on		140	200	mA
+ 24 VDC with all outputs on		120	180	mA

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Connecting Outputs

Using Open-collector Outputs

The model 2221 provides 32 outputs for driving external loads, such as solenoid valves, indicators, solid-state relays and other low-power DC loads. These outputs are in the form of open-collector transistors capable of switching loads up to 0.5 Amp DC.

Open collector outputs have the collector terminal of the output transistor left open, or unconnected, to allow greater flexibility in its use.

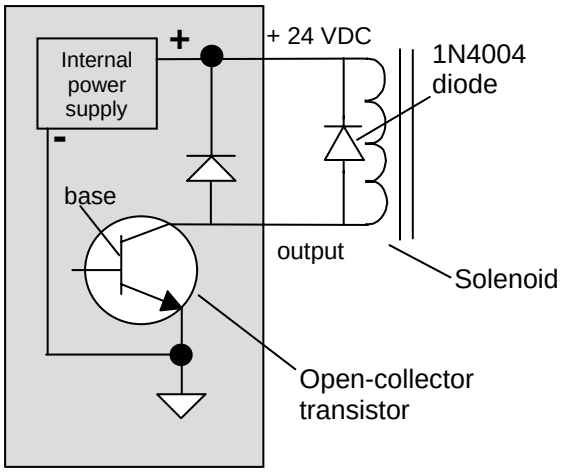
An open-collector output, shown schematically below, performs roughly the same function as a switch contact with one side of the switch connected to ground. When the output is turned off, no current can flow through the transistor. This is the equivalent of the switch contact being open, because the device being controlled is turned off.

When the output is turned on, current flows through the transistor, just as though a switch contact had been closed. The controlled device turns on in response to the flow of current.

To connect a device to an open-collector output, one terminal of the device is connected to the open-collector output (if the device is polarized, the negative [-] terminal is connected to the output). The remaining terminal of the device is connected to the positive side of the power supply.

IMPORTANT! Control Tech recommends that you place a suppression diode across inductive loads. Use a 1N4004 diode or equivalent. The diode should go as close to the load as possible, as shown in the illustrations.

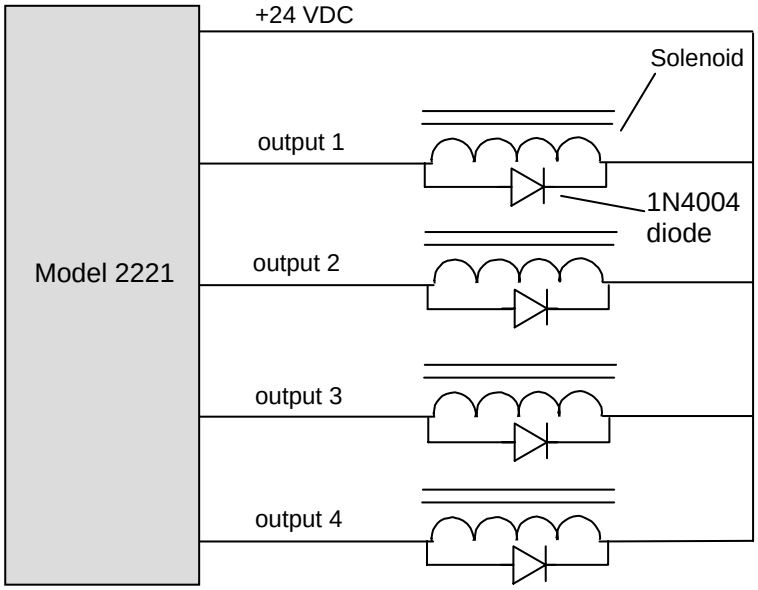
NOTE: Do not exceed the rated current of the power supply being used. When calculating the current requirements of your system, you only need to consider the maximum number of output devices to be turned on simultaneously.



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Connecting Multiple devices

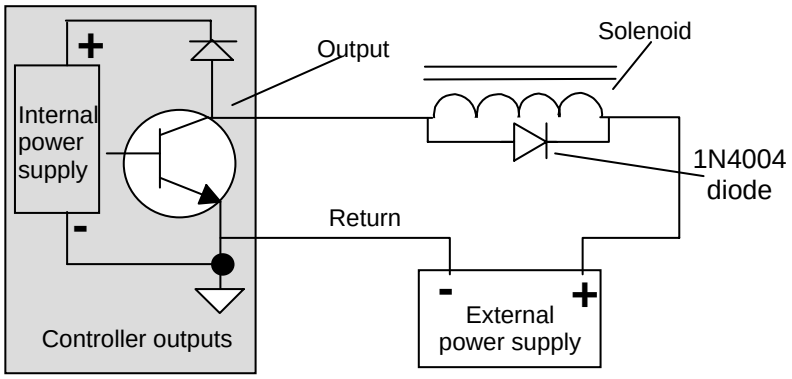
When powering multiple devices from the same power source, each device is connected with one of its leads attached to an independent output and the other lead is connected to the positive terminal of the power source. The illustration on the next page shows four solenoid valves being controlled by outputs 1 through 4. All outputs are powered by the controller's power supply.



Connecting to an External Power Supply

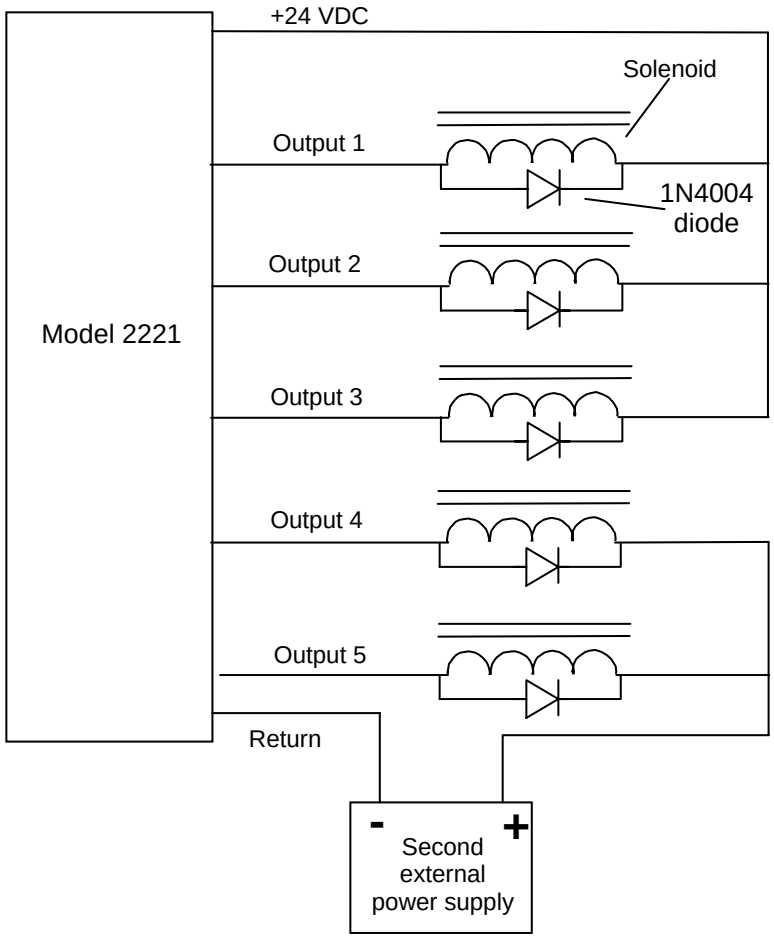
It is also possible to power some of the devices from a second external power supply, while powering others from the supply powering the controller. To do this, you must connect each device being controlled to the positive terminal of the appropriate power supply. When connecting the device being controlled, do not to connect the positive terminals of the two supplies together, either directly or indirectly.

The following diagram shows an output from the model 2221 connected a solenoid valve and an external power supply.



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WARNING: Each output has a protection diode with its cathode connected to the + 24 VDC power supply at the output connector. This diode prevents damage to the output when connected to an inductive load. If a separate power supply is used for the external devices, as shown above, a current path exists between the two supplies through the devices being controlled. Under normal operation this practice is okay. However, some power supplies when powered down, tend to offer a low impedance with respect to power supply return. In the configuration shown here, if the main power supply is powered down and the external one is not, the current from the external supply can energize the device connected to the output, turning it on. To prevent this, make sure that both supplies are powered up and down together.



IMPORTANT! Do not use an external power supply with an output voltage greater than the output voltage rating of the outputs.

Do not connect the positive [+] terminals of the power supplies together! Damage to one of the supplies may result.

In the diagram above, there is a connection between the negative [-] terminal of the external power supply and the return terminal on the controller's output connector. This connection is necessary to provide a complete circuit for the current travelling through the device being controlled.

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