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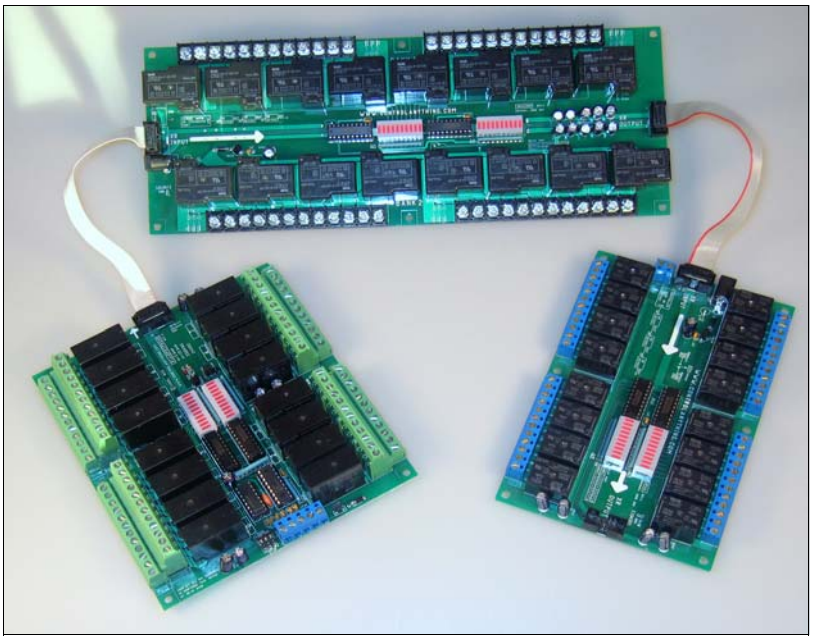
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Find the *National Control Devices XR88DPDT* at our website: *Click HERE*

XR Expansions

Add Relays to ANY NCD Device with an XR Expansion Port!

5-Year Repair or Replace Warranty!!!



NCD XR Series Relay Expansion Controllers allow you to add relay switching to NCD devices with an XR Expansion Port. Simply chain controllers together, one after another to add the appropriate relay switching for your application. Choose from SPDT, DPDT, High Current, Signal Switching. Some versions of XR Expansion Controllers have Open Collector outputs for driving your own relays. Mix any kinds of relays you need on the XR Chain.

XR Expansion controllers include a 6" Keyed Cable allowing you to add relays to your existing NCD controller in seconds. And when you need to add more relays, just chain another relay bank to the output of the previous relay bank.

Features include a 2.1mm Power Jack and a 2-Position terminal block for connecting an external +12VDC power supply.

Controlling NCD XR Expansion boards is easy, each group of 8 relays you add to your XR Port allows you to control a new "Bank" of relays. Refer to the manual of the "master" controller for programming details (the master controller is the device that communicates data from your computer, such as the ProXR, Ultra, or Wireless LR Series Relay Controllers).

On-Board Power LEDs
+12VDC Operation
XR Input and XR Output allows you to Chain Additional Relay Banks Together
Universal Command Set is Determined by the "Master" Device for Unlimited Flexibility
Only 100ma Required for Logic and 80ma Required for Each Activated Relay
Mix and Match Relays to Your Specific Needs
Available with SPDT, SPST, High Current, and Open Collector Outputs
Ideal for Switching Lights, Solenoids, Motors, Telephones, Computer Networks, and a Large Variety of Signal Sources.

Mix and Match Relay Banks in Any Combination to Any NCD Device with an XR Expansion Port!

XR Expansion Family:

Compatible with ANY NCD Device Equipped with an XR Expansion Port.

XR16OCLP	*XR Expansion Module 16-Channel Low Power Open Collector*
XR121DPDTR125	*12-Channel 1A DPDT Relay + 12-Channel 5A SPDT Expansion Relay Controller*
XR123DPDTR125	*12-Channel 3A DPDT Relay + 12-Channel 5A SPDT Expansion Relay Controller*
XR125DPDTR125	*12-Channel 5A DPDT Relay + 12-Channel 5A SPDT Expansion Relay Controller*
XR121DPDTR1210	*12-Channel 1A DPDT Relay + 12-Channel 10A SPDT Expansion Relay Controller*
XR123DPDTR1210	*12-Channel 3A DPDT Relay + 12-Channel 10A SPDT Expansion Relay Controller*
XR125DPDTR1210	*12-Channel 5A DPDT Relay + 12-Channel 10A SPDT Expansion Relay Controller*
XR241DPDT	*24-Channel 1A DPDT Expansion Relay Controller*
XR243DPDT	*24-Channel 3A DPDT Expansion Relay Controller*
XR245DPDT	*24-Channel 5A DPDT Expansion Relay Controller*
XR245	*24-Channel 5A SPDT Expansion Relay Controller*
XR2410	*24-Channel 10A SPDT Expansion Relay Controller*
XR161DPDTR16OCLP	*16-Channel 1A DPDT Relay + 16-Channel 150ma O.C. Output Expansion Relay Controller*
XR163DPDTR16OCLP	*16-Channel 3A DPDT Relay + 16-Channel 150ma O.C. Output Expansion Relay Controller*
XR165DPDTR16OCLP	*16-Channel 5A DPDT Relay + 16-Channel 150ma O.C. Output Expansion Relay Controller*
XR161DPDTR165	*16-Channel 1A DPDT Relay + 16-Channel 5A SPDT Expansion Relay Controller*
XR163DPDTR165	*16-Channel 3A DPDT Relay + 16-Channel 5A SPDT Expansion Relay Controller*
XR165DPDTR165	*16-Channel 5A DPDT Relay + 16-Channel 5A SPDT Expansion Relay Controller*
XR161DPDTR1610	*16-Channel 1A DPDT Relay + 16-Channel 10A SPDT Expansion Relay Controller*
XR163DPDTR1610	*16-Channel 3A DPDT Relay + 16-Channel 10A SPDT Expansion Relay Controller*
XR165DPDTR1610	*16-Channel 5A DPDT Relay + 16-Channel 10A SPDT Expansion Relay Controller*
XR321DPDT	*32-Channel 1A DPDT Expansion Relay Controller*
XR323DPDT	*32-Channel 3A DPDT Expansion Relay Controller*
XR325DPDT	*32-Channel 5A DPDT Expansion Relay Controller*
XR165OC16LP	*16-Channel 5A SPDT Relay + 16-Channel 150ma O.C. Output Expansion Relay Controller*
XR1610OC16LP	*16-Channel 10A SPDT Relay + 16-Channel 150ma O.C. Output Expansion Relay Controller*
XR325	*32-Channel 5A SPDT Expansion Relay Controller*
XR3210	*32-Channel 10A SPDT Expansion Relay Controller*
XR81DPDTOC8LP	*8-Channel 1A DPDT Relay + 8-Channel 150ma O.C. Output Expansion Relay Controller*
XR83DPDTOC8LP	*8-Channel 3A DPDT Relay + 8-Channel 150ma O.C. Output Expansion Relay Controller*
XR85DPDTOC8LP	*8-Channel 5A DPDT Relay + 8-Channel 150ma O.C. Output Expansion Relay Controller*
XR81DPDTR85	*8-Channel 1A DPDT Relay + 8-Channel 5A SPDT Expansion Relay Controller*
XR83DPDTR85	*8-Channel 3A DPDT Relay + 8-Channel 5A SPDT Expansion Relay Controller*
XR85DPDTR85	*8-Channel 5A DPDT Relay + 8-Channel 5A SPDT Expansion Relay Controller*
XR81DPDTR810	*8-Channel 1A DPDT Relay + 8-Channel 10A SPDT Expansion Relay Controller*
XR83DPDTR810	*8-Channel 3A DPDT Relay + 8-Channel 10A SPDT Expansion Relay Controller*
XR85DPDTR810	*8-Channel 5A DPDT Relay + 8-Channel 10A SPDT Expansion Relay Controller*
XR161DPDT	*16-Channel 1A DPDT Expansion Relay Controller*
XR163DPDT	*16-Channel 3A DPDT Expansion Relay Controller*
XR165DPDT	*16-Channel 5A DPDT Expansion Relay Controller*
XR1620HP	Low Cost Expansion Relay Controller Board with 16 20-Amp High Power Relays
XR16OCLP	XR Expansion Module 16-Channel Low Power Open Collector

5-Year Repair or Replace Warranty

Warranty

NCD Warrants its products against defects in materials and workmanship for a period of 5 years. If you discover a defect, NCD will, at its option, repair, replace, or refund the purchase price. Simply return the product with a description of the problem and a copy of your invoice (if you do not have your invoice, please include your name and telephone number). We will return your product, or its replacement, using the same shipping method used to ship the product to NCD.

This warranty does not apply if the product has been modified or damaged by accident, abuse, or misuse.

30-Day Money-Back Guarantee

If, within 30 days of having received your product, you find that it does not suit your needs, you may return it for a refund. NCD will refund the purchase price of the product, excluding shipping/handling costs. This guarantee does not apply if the product has been altered or damaged.

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Technical Assistance

Technical questions should be e-mailed to Ryan Sheldon at ryan@controlanything.com. Technical questions submitted via e-mail are answered up to 20 times daily. Technical support is also available by calling (417) 646-5644.

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www.controlanything.com
www.controleverything.com

IMPORTANT POWER SUPPLY REQUIREMENTS

1) DO NOT USE A WALL WART TYPE UNREGULATED POWER SUPPLY.
2) USE ONLY A COMPUTER GRADE REGULATED SWITCHER SUPPLY RATED AT 12 VOLTS DC, 1.25 AMPS OR GREATER.
3) USE A SUPPLY RATED FOR MORE AMPERAGE WHEN POWERING MULTIPLE BOARDS.
4) DC POWER SHOULD NEVER TRAVEL GREATER THAN 20 FEET. A SEPARATE POWER SUPPLY SHOULD BE USED FOR EACH CONTROLLER IF CONTROLLERS ARE NOT LOCATED WITHIN 20 FEET OF EACH OTHER.
5) RELAY COILS ARE RATED AT 12 VOLTS DC. HIGHER VOLTAGES WILL SHORTEN THE COIL LIFE. LOWER VOLTAGES MAY CAUSE UNRELIABLE OPERATION, BUT WILL NOT DAMAGE THE CONTROLLER.
6) XR SERIES CONTROLLERS CAN BE USED IN 12 VOLT AUTOMOTIVE ELECTICAL SYSTEMS.

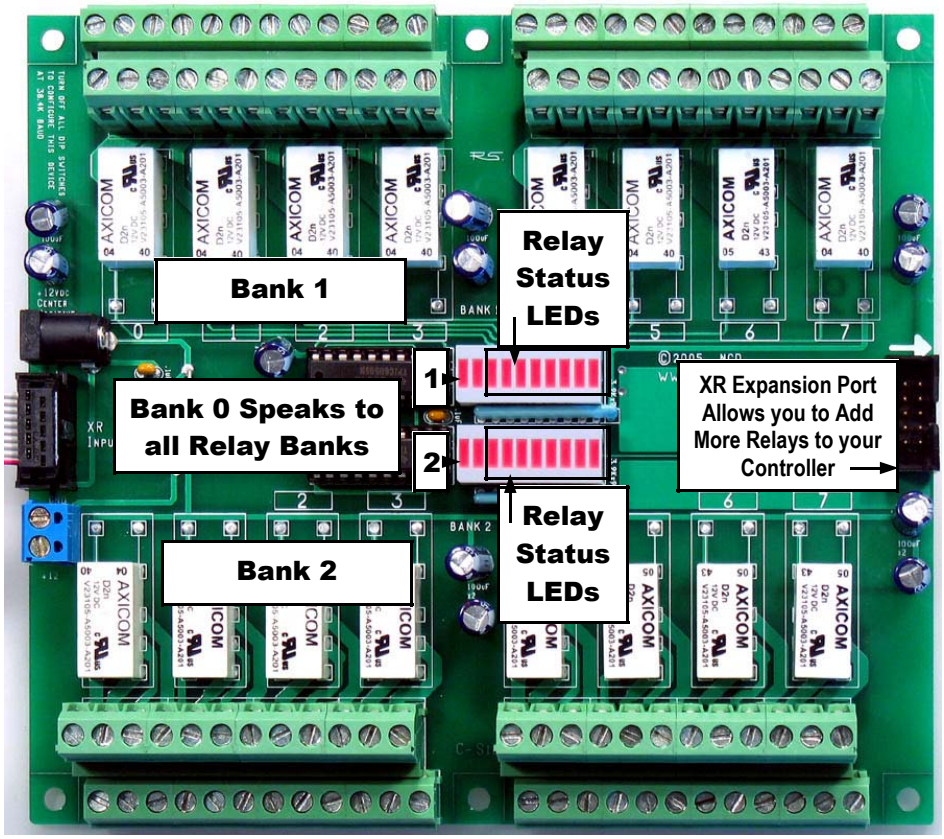
Status LEDs:

LEDs	Description
1	Power LED
2	Power LED

Did You Know?

The mechanical relays we have chosen for our controllers are rated to easily withstand ***several million continuous high-current switching cycles*** and have an operational life of more than 10 years. In many ways, today's mechanical relays can outlast solid state relays because of their mechanical ability to handle high current surges. In addition, the mechanical relays we have chosen are hermetically sealed, greatly reducing wear on the contacts by eliminating internal sparking.

Standard Hole Size is .156".
Standard Inset of Mounting Holes from any edge of the board is .175" from edge to Center of Mounting Hole.
We recommend the use of a #8 Screw with a Minimum .250" Standoff.
The component side of the 5/10/20HP Amp Relays require a 1.000" minimum topside clearance.
The component side of any Controller with DPDT in the part number requires 1 1/4" minimum clearance.
The component side of any Relay Controller with 20 or 30 Amp Relay requires 1 1/2" minimum clearance.
NOTE: Some 20 or 30 Amp Relay Controller Varieties require direct connection to the top side of each relay. Additional clearance for the connectors is highly recommended.
Complete mechanical drawings for each device in the XR Series Line can be found on the product description page of each controller at www.controlanything.com.



2.1mm Power Supply Connector, +12VDC.

XR Connector Plugs into the XR Port of an NCD Device. A 6" Cable is Included with the XR Series Controller.

+12VDC Power Connector. Silk Screen is Marked with Polarity.

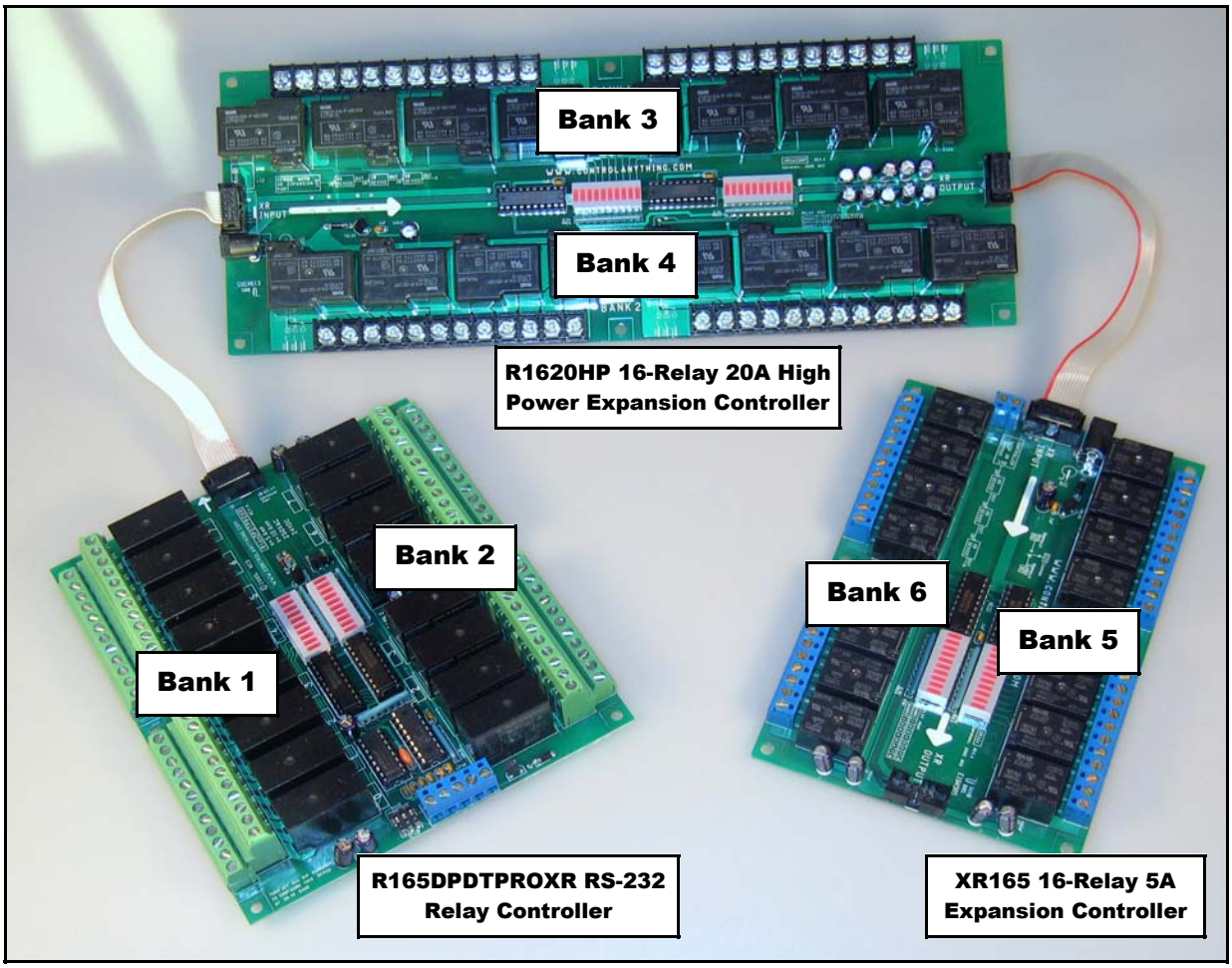
Please visit our web site for mechanical drawings of the XR Series Controllers

Never Install NCD Relay Controllers Near High Power RF Transmitters, Such as CB Radio and Emergency Vehicle Voice/Data Transmitters. These Devices May Cause All Relays to Turn Off.

The XR Expansion Port

Adding Relay Banks with the XR Expansion Port

The ProXR Series controllers, as well as many other NCD devices, are equipped with an XR Expansion port. This port is used to chain relay controllers together, making it easy to add relay banks as your needs grow. We offer a large line of relay expansion boards, ready to attach to the XR port of your controller. The photo below shows how to connect multiple relay banks to a single ProXR relay controller. You can add all types of relay expansion banks in any combination using the XR Expansion Port built into many NCD devices.



Above

The R165DPDTPROXR relay controller is attached to an R1620HP relay controller, which is chained to an XR165 relay controller. The ProXR series controllers can be expanded with any NCD device with part numbers beginning XR. The expansion cables shown above are included with the XR series relay controllers. In the configuration shown above, there are 6 relay banks. The ProXR firmware supports a chain of up to 32 relay banks. Each relay controller can be powered by itself (we carry the appropriate power supply as a product option), or one large supply can be used to power all relay banks (not supplied).

A Bank is a Group of 8 Relays. Relay Control Commands Require you to Specify a Relay Bank, Identifying which Relays to Control. When Specifying Bank 0 in a Relay Control Command, All Relays on All Banks will Respond to your Command.

Sending Commands to the XR Series Relay Controllers

The XR Series Controllers are designed to add additional relay switching capabilities to other NCD devices. The XR series controllers have no on-board control commands, they rely entirely on the command set built into other NCD devices for which the XR Series controllers must be connected to.

The XR Series Controllers are compatible with any NCD device with an XR Expansion Port. This includes the ProXR Series relay controller, the Wireless 1-Way LR Series Relay Controllers, the Wireless 2-Way ES Series Relay Controllers (also known as Ultra Series), and any other future NCD device with an XR Expansion Port. Please consult these associated product manuals to determine the command set and the maximum supported expansion capacity.

Relay control commands always refer to relays by bank. A bank is simply a group of 8 relays. For instance, any 8, 16, 24, or 32 relay controller has 1, 2, 3, or 4 banks of relays.

As you continue to chain XR expansion boards, the total number of available banks grows. For instance:

A ProXR Series Relay Controller with 16 relays has 2 relay bank. When a 24 Relay XR Expansion Controller is connected the ProXR 16-relay controller, a total of 40 relays are available. The 16 On-board relays are addressed as banks 1 and 2. The 24 External relays are addressed as banks 3, 4, and 5.

If you were to chain an additional 32 relays to the above example, the additional relays would be addressed as banks 6, 7, 8, and 9.

If you were to chain an additional 16 relays to the above example, the additional relays would be addressed as banks 10 and 11.

Many NCD Devices with an XR Expansion Port support Bank 0. When Bank 0 is used in the command set, this command will speak to all relays (both internally and externally connected). Bank 0 commands will cause all relay banks to do the exact same thing.

These concepts are discussed in greater detail in other product manuals for NCD devices that have an on-board XR Expansion port.

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Electrical Ratings and Switching Characteristics

Model	Ratings	Relay Type	Notes
1A DPDT	3A 120VAC / 3A 20VDC	DPDT	DPDT: Two Switches per Relay Not for use with Inductive Loads
3A DPDT	3A 250VAC / 3A 30VDC	DPDT	DPDT: Two Switches per Relay
5A DPDT	5A 250VAC / 5A 30VDC	DPDT	DPDT: Two Switches per Relay
5A SPDT	10A 250VAC / 5A 100VDC	SPDT	Relay Ratings for this Model are Absolute Maximum, Not for Sustained Constant Use. Divide all ratings by 2 for Constant Operation
10A SPDT	10A 250VAC / 8A 30VDC	SPDT	
20A SPDT	20A 240VAC / 20A 28VDC	SPDT	Common to Normally Closed Terminal is rated at 10A 240VAC / 10A 28VDC Flange Type Connections to Relay
30A SPST	30A 250VAC / 20A 28VDC	SPST	SPST: Common and Normally Open Terminals Only Flange Type Connections to Relay

All ratings above are for Resistive Loads. Divide current switching capabilities by 2 for Inductive Loads. Inductive loads not recommended for 1A DPDT relay controller models.

Relay Types

SPST	Single Pole Single Throw: This relay is the most basic type of switch available. SPST relays have only two connections. Typically, an SPST relay shorts these two connections together when the relay is activated. When the relay is OFF, this connections return to their original OFF state (disconnected).
SPDT	Single Pole Double Throw: This is the most popular type of relay used in our relay controller designs. Each relay consists of a Normally Open (NO), Normally Closed (NC), and a Common (COM). When the relay is OFF, NC and COM are connected together. When the relay is turned ON, NC is disconnected from COM and NO and COM are connected together.
DPDT	Same as SPDT above, but there are two of these switches in a single relay that are activated/deactivated at the same time.

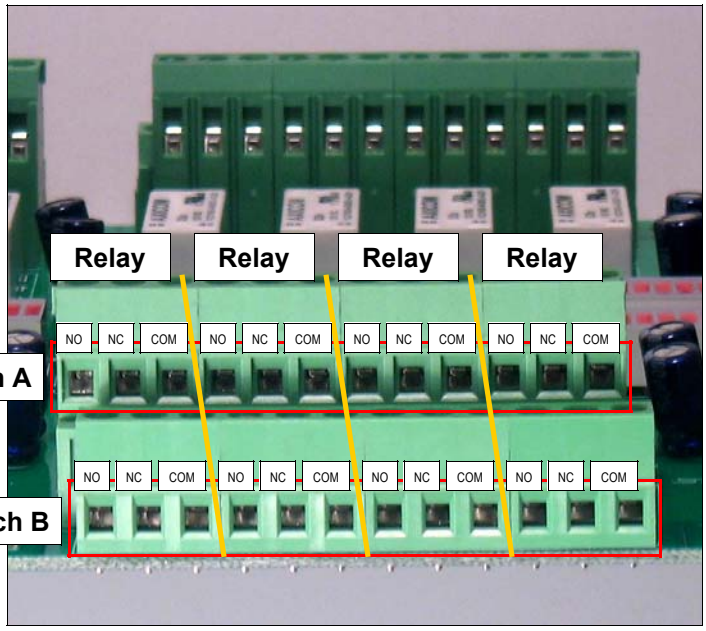
Characteristics Data	Minimum	Maximum
Relay Activation Time	>5 ms	<15 ms
Relay Deactivation Time	>5 ms	<20 ms
Activations per Second at 9600 Baud using “ProXR” Command Set	N/A	480
Activations per Second at 115.2K Baud using “ProXR” Command Set (Bank Pre-Selected)	N/A	5760
Activations per Second at 115.2K Baud using “ProXR” Command Set (Bank Specified)	N/A	3840
Communication Distance from PC Without Boosting Signal 1200 Baud*	N/A	Aprox. 2000 Feet
Communication Distance from PC Without Boosting Signal 2400 Baud*	N/A	Aprox. 1200 Feet
Communication Distance from PC Without Boosting Signal 9600 Baud*	N/A	Aprox. 600 Feet
Communication Distance from PC Without Boosting Signal 19.2K Baud*	N/A	Aprox. 200 Feet
Communication Distance from PC Without Boosting Signal 115.2K Baud*	N/A	Aprox. 10 Feet
Maximum Allowed Activation Time per Relay (Relay Held in On State)	N/A	Unlimited
Expected Operational Life, Non-DPDT Models	>10,000,000 Cycles	N/A
Expected Operational Life, DPDT Models	>2,000,000 Cycles	N/A
Typical Operational Cycles Per Minute	N/A	1,800

* assumes good quality low-capacitive wire, twisted pair preferred. Note that distances are estimated. Typically, longer distances are easily achieved.

Connecting 1-Amp DPDT Relays (White Relays)

Connector Pinouts for 1-Amp DPDT Series Controllers
Any time you see one of our relay controllers with a green 24-Position terminal block and small white relays labeled AXICOM on the board, you can assume the wiring connections shown to the right will always apply. Always view the connector from the angle shown in the picture to the right. This will ensure connections are consistently made to 1A DPDT series controllers.

A DPDT relay has two separate switches inside each relay. These switches are labeled Switch A and Switch B in the diagram at right. Switches A and B are completely separated from each other, there is no electrical connection between these switches. When a DPDT relay is activated, both switches A and B "activate" or more appropriately change position at the same time. In the diagram at right, each connection is labeled NO, NC and COM.



COM: Common
This terminal is connected to NC when relay is off.
This terminal swings over to NO when the relay is on.

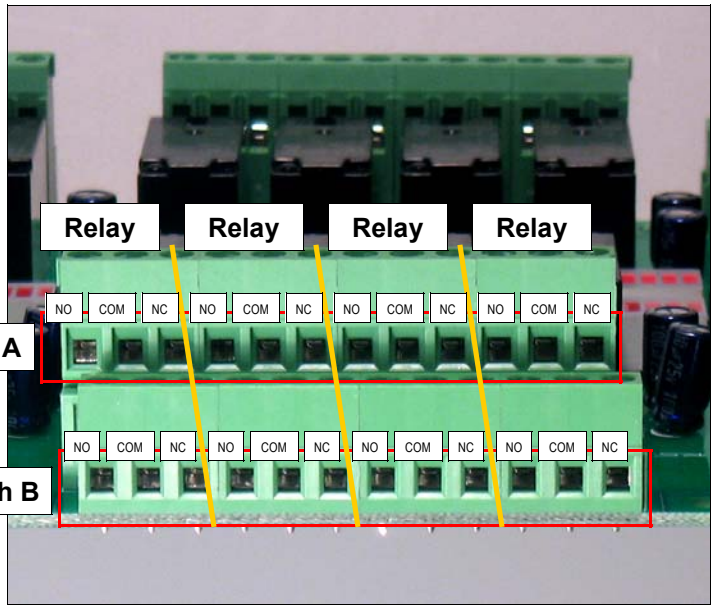
NO: Normally Open
This terminal has no connection with the relay is off.
This terminal is connected to COM when the relay is on.

NC: Normally Close
This terminal is connected to COM when the relay is off.
This terminal has no connection with the relay is on.

Connecting 3-Amp/5-Amp DPDT Relays (Black Relays)

Connector Pinouts for 3-Amp and 5-Amp DPDT Series Controllers
Any time you see one of our relay controllers with a green 24-Position terminal block and black relays on the board, you can assume the wiring connections shown to the right will always apply. Always view the connector from the angle shown in the picture to the right. This will ensure connections are consistently made to 3A and 5A DPDT series controllers.

A DPDT relay has two separate switches inside each relay. These switches are labeled Switch A and Switch B in the diagram at right. Switches A and B are completely separated from each other, there is no electrical connection between these switches. When a DPDT relay is activated, both switches A and B "activate" or more appropriately change position at the same time. In the diagram at right, each connection is labeled NO, NC and COM.



COM: Common
This terminal is connected to NC when relay is off.
This terminal swings over to NO when the relay is on.

NO: Normally Open
This terminal has no connection with the relay is off.
This terminal is connected to COM when the relay is on.

NC: Normally Close
This terminal is connected to COM when the relay is off.
This terminal has no connection with the relay is on.

Connecting 5-Amp/10-Amp SPDT Relays

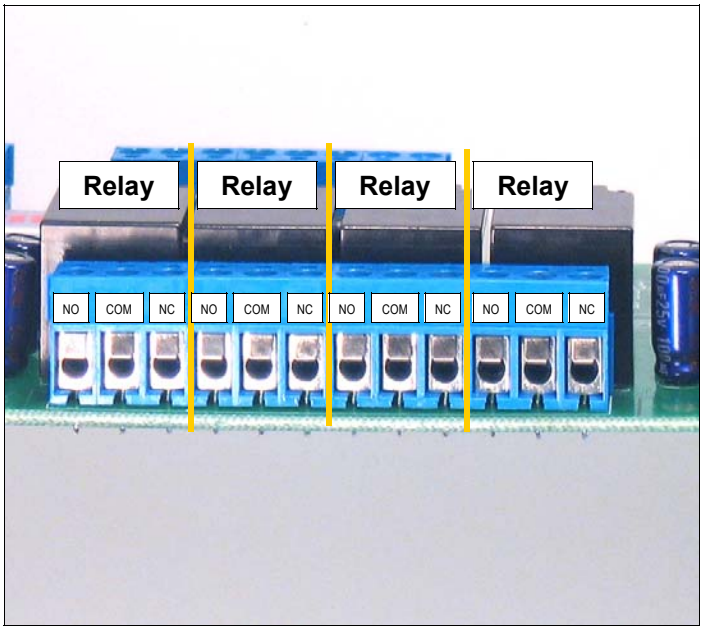
Connector Pinouts for 5-Amp / 10-Amp SPDT Series Controllers
Any time you see one of our relay controllers with blue 12-Position terminal blocks, you can assume the wiring connections shown to the right will always apply. Always view the connector from the angle shown in the picture to the right. This will ensure connections are consistently made to 5 and 10-Amp SPDT series controllers.

A SPDT relay has one switch inside each relay. When a SPDT relay is activated, the switch changes position. In the diagram at right, each connection is labeled NO, NC and COM. Please see the comments below to better understand how connections are made.

COM: Common
This terminal is connected to NC when relay is off.
This terminal swings over to NO when the relay is on.

NO: Normally Open
This terminal has no connection with the relay is off.
This terminal is connected to COM when the relay is on.

NC: Normally Close
This terminal is connected to COM when the relay is off.
This terminal has no connection with the relay is on.

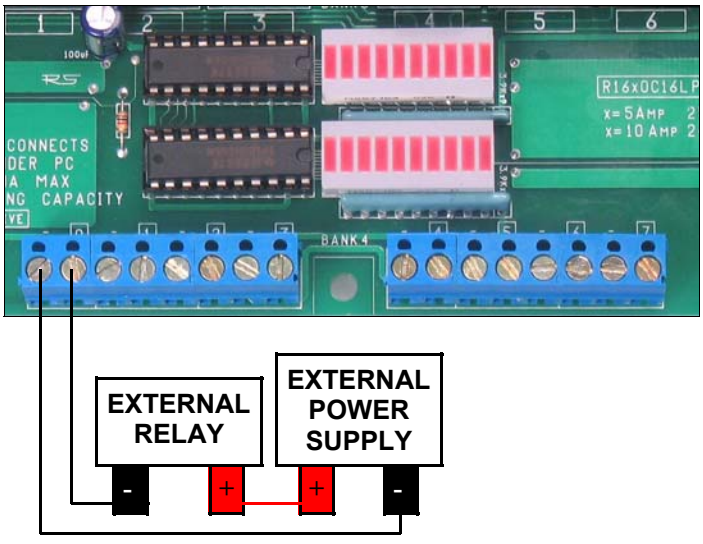


Connecting O.C. Outputs to External Devices

Connecting Open-Collector Outputs
WARNING: DO NOT CONNECT OC OUTPUTS WHILE POWER IS APPLIED TO THE CONTROLLER. THIS WILL DAMAGE THE OUTPUT DRIVER CHIP.
Any time you see one of our ProXR Series relay controllers with blue terminal blocks (8 or 16-Position), you can assume the wiring connections shown to the right will always apply. Always view the connector from the angle shown in the picture to the right. This will ensure connections are consistently made to the OC Outputs.

Open Collector outputs are ideal for adding external relays, small lights, LEDs, and other small loads under 150ma at 12VDC. OC outputs work by connecting an external device to ground. For instance, to connect an external relay to an open collector output, you will connect one of the two power leads directly to the OC output. The other relay power lead should be connected to a power supply. The ground of the power supply should be shared with the Ground leads on the OC output.

When the OC output is activated, the relay will activate by making a connection between the relay and ground. A voltage should always be present on the relay (except during connection).



Repeat the circuit as shown above for every pair of outputs. On some controllers, the two sets 8-position blue terminal blocks are together, forming a single blue 16-position terminal block. Connections are the same for these controllers. Don't forget, this circuit will share the grounds of your external power supply with the ground and RS232 ground of the controller. NEVER CONNECT EXTERNAL DEVICES WHILE THE CONTROLLER IS POWERED UP.

Last Minute Notes

Part Numbers:

R165OC16LP
R1610OC16LP
R325PROXR
R3210PROXR

Revision A boards have an error in the silk screen. A small diagram is shown on the board indicating relay connections. While the diagram is correct, the Labeling of NC and NO connections is backwards. Revision B boards are in production that correct this silk screen error.

Troubleshooting Considerations

If you experience any problems with a relay bank shutting down (all 8 relays turning off) when a relay is activated, this is usually attributed to EMI or Improper Grounding of the Controller. Ensure the device has an earth ground that is shared with the earth ground of any AC loads. Also, this problem may be caused by EMI. The ProXR series controllers has special commands to handle EMI inductive loads. Please consult page 18 of the ProXR manual if you are using an XR Series Expansion Port with a ProXR series controller.

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