UDC 2500 Application Note

Wiring Diagrams

Identify Your Wiring Requirements

To determine the appropriate diagrams for wiring your controller, refer to the model number interpretation in this section. The model number of the controller is on the outside of the case.

Universal Output Functionality and Restrictions

Instruments with multiple outputs can be configured to perform a variety of output types and alarms. For example, an instrument with a current output and two relays can be configured to perform any of the following: 1) Current Simplex with two alarm relays; 2) Current Duplex 100% with two alarm relays (requires auxiliary output); 3) Time Simplex with one alarm relay; 4) Time Duplex with no alarm relays; or 5) Three Position Step Control with no alarm relays. These selections may all be made via the keyboard and by wiring to the appropriate output terminals, there are no internal jumpers or switches to change. This flexibility allows a customer to stock a single instrument which is able to handle a variety of applications.

Table 1 shows what control types and alarms are available based upon the installed outputs. In this table, when Duplex Control and Reverse Action are configured, "Output 1" is HEAT while "Output 2" is COOL. When Three Position Step Control is configured, "Output 1" is OPEN while "Output 2" is CLOSE. The Output 1/2 option "Single Relay" can be any of the following selections: Electro-Mechanical Relay, Solid-State Relay or Open Collector Output.

Table 1 Universal Output Functionality and Restrictions

Output Algorithm Type	Output 1/2 Option	Function of Output 1/2	Function of Other Outputs		
			Output #3	Output #4	Auxiliary Output
Time Simplex	Single Relay	Output 1	Alarm 2	Alarm 1	Not Needed
	Current Output	INU	Output 1	Alarm 1	Not Needed
	Dual Relay	Output 1	Alarm 2	Alarm 1	Not Needed
Time Duplex or TPSC	Single Relay	Output 1	Output 2	Alarm 1	Not Needed
	Current Output	INU	Output 2	Output 1	Not Needed
	Dual Relay	Outputs 1 and 2	Alarm 2	Alarm 1	Not Needed
Current Simplex	Single Relay	INU	Alarm 2	Alarm 1	Output 1
	Current Output	Output 1	Alarm 2	Alarm 1	Not Needed
	Dual Relay	INU	Alarm 2	Alarm 1	Output 1
Current Dup. 100% Current = COOL and HEAT	Single Relay	INU	Alarm 2	Alarm 1	Outputs 1 and 2
	Current Output	Outputs 1 and 2	Alarm 2	Alarm 1	Not Needed
	Dual Relay	INU	Alarm 2	Alarm 1	Outputs 1 and 2
Current Duplex 50% Current = HEAT Aux Out = COOL	Single Relay	N/A	N/A	N/A	N/A
	Current Output	Output 1	Alarm 2	Alarm 1	Output 2
	Dual Relay	N/A	N/A	N/A	N/A
Current/Time Current = COOL Time = HEAT	Single Relay *	Output 1	Output 2	Alarm 1	Output 2
	Current Output	Output 2	Output 2	Alarm 1	Not Needed
	Dual Relay *	Outputs 1 & 2	Alarm 2	Alarm 1	Output 2
Time/Current Time = COOL Current = HEAT	Single Relay *	Output 1	Output 2	Alarm 1	Output 1
	Current Output	Output 1	Output 2	Alarm 1	Not Needed
	Dual Relay *	Outputs 1 & 2	Alarm 2	Alarm 1	Output 1

TPSC = Three Position Step Control

N/A = Not Available – This output algorithm type cannot be performed with this Output 1/2 option.

INU = Installed, Not Used – The installed Output 1/2 option is not used for the configured output algorithm type.

Not Needed = Auxiliary Output is Not Needed to provide the desired output algorithm and can be used for another purpose. With the proper configuration, Auxiliary Output could also be used as a substitute for the Current Output.

* To obtain this output algorithm type with these Output 1/2 Options: 1) Configure the OUTALG selection as "RLYD"; 2) Configure Auxiliary Output for "OUTPUT" and; 3) Scale the Auxiliary Output as necessary for the desired output algorithm type. For these selections, the Output 1 (HEAT) and Output 2 (COOL) signals will be present both on the Auxiliary Output and on the two relays normally used for Time Duplex.

Wiring the Controller

Using the information contained in the model number, select the appropriate wiring diagrams from the composite wiring diagram below. Refer to the individual diagrams listed to wire the controller according to your requirements.

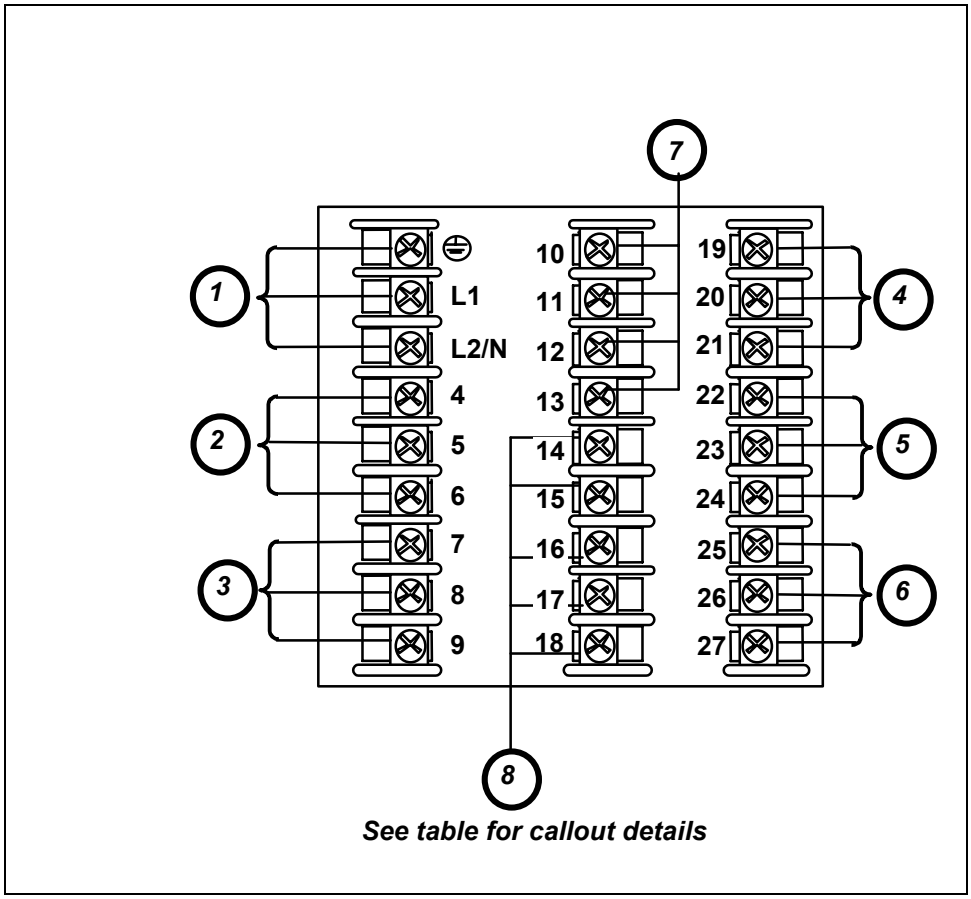
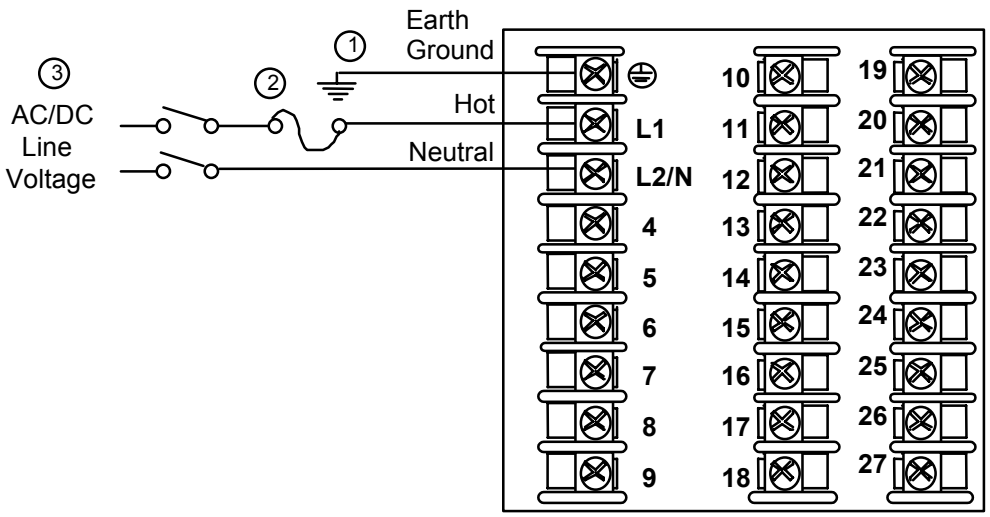


Figure 1 Composite Wiring Diagram

Callout	Details
1	AC Line Voltage Terminals..
2	Output 3 Terminals.
3	Output 4 Terminals..
4	Outputs 1 and 2 Terminals.
5	Input #2 Terminals..
6	Input #1 Terminals..
7	Aux. Output and Digital Inputs Terminals
8	Communications Terminals.

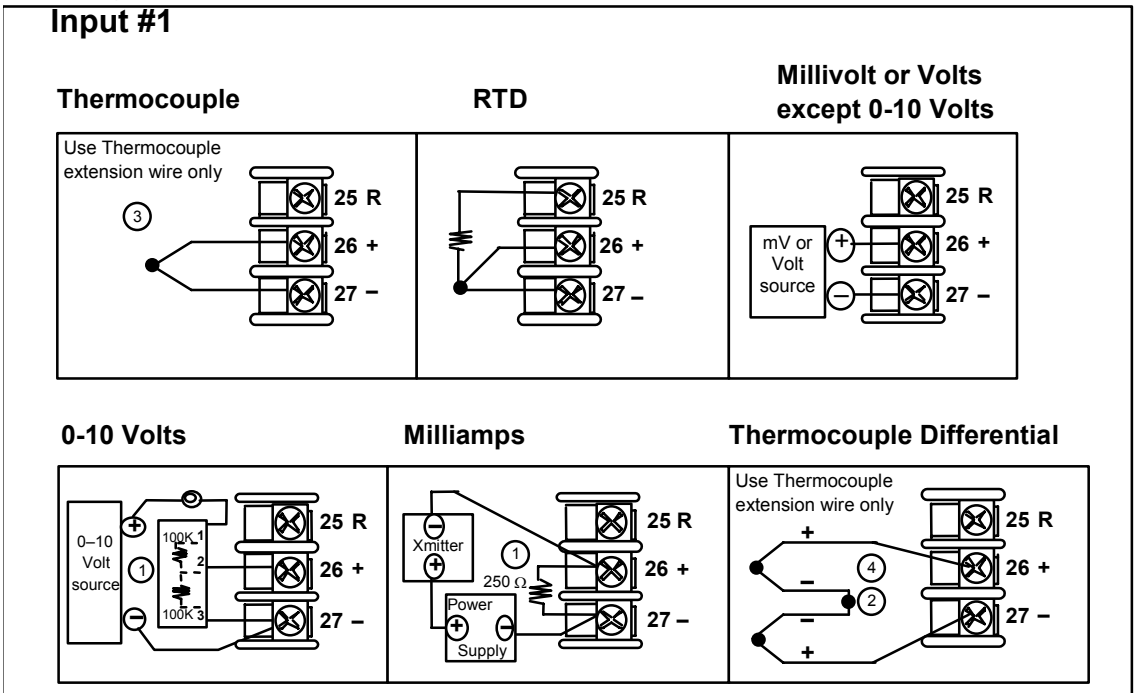


① PROTECTIVE BONDING (grounding) of this controller and the enclosure in which it is installed, shall be in accordance with National and local electrical codes. To minimize electrical noise and transients that may adversely affect the system, supplementary bonding of the controller enclosure to local ground using a No. 12 (4 mm^2) copper conductor is recommended. Before powering the controller, see "Prelimnary Checks" in this section of the Product Manual.

② It is the user's responsibility to provide a switch and non-time delay (North America), quick-acting, high breaking capacity, Type F (Europe), 1/2A, 250V fuse(s), or circuit-breaker for 90-264 Vac applications; or 1 A, 125 V fuse or circuit breaker for 24 Vac/dc applications, as part of the installation.

③ **CAUTION** Applying 90-264 Vac to an instrument rated for 24 Vac/dc will severely damage the instrument and is a fire and smoke hazard.

Figure 2 Mains Power Supply



1. The 250 ohm resistor for milliamp inputs or the voltage divider for 0-10 Volt inputs are supplied with the controller when those inputs are specified. These items must be installed prior to start up when the controller is wired. For 0-20 mA applications, the resistor should be located at the transmitter terminals if Burnout detection is desired.
2. Splice and tape this junction between the two thermocouples. This junction may be located anywhere between the thermocouples and the instrument terminals, it does not need to be close to the other thermocouple junctions. Both thermocouples must be of the same type. For best accuracy, the two thermocouples should be matched or, preferably, made from the same batch of wire.
3. This controller does not produce a steady current for burnout detection. For that reason, when a thermocouple is used in parallel with another instrument, it may be desirable to configure the burnout selection for this controller to “NOFS” and use the burnout current from the other instrument to also drive this controller.
4. The millivolt values for the Thermocouple Differential Input are for a pair of J thermocouples at an ambient temperature mean of 450°F / 232°C.

Figure 3 Input 1 Connections

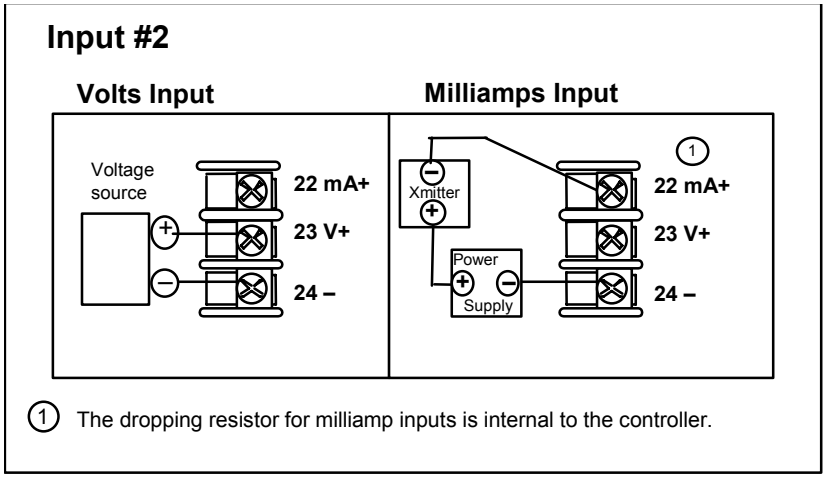


Figure -4 Input 2 Connections

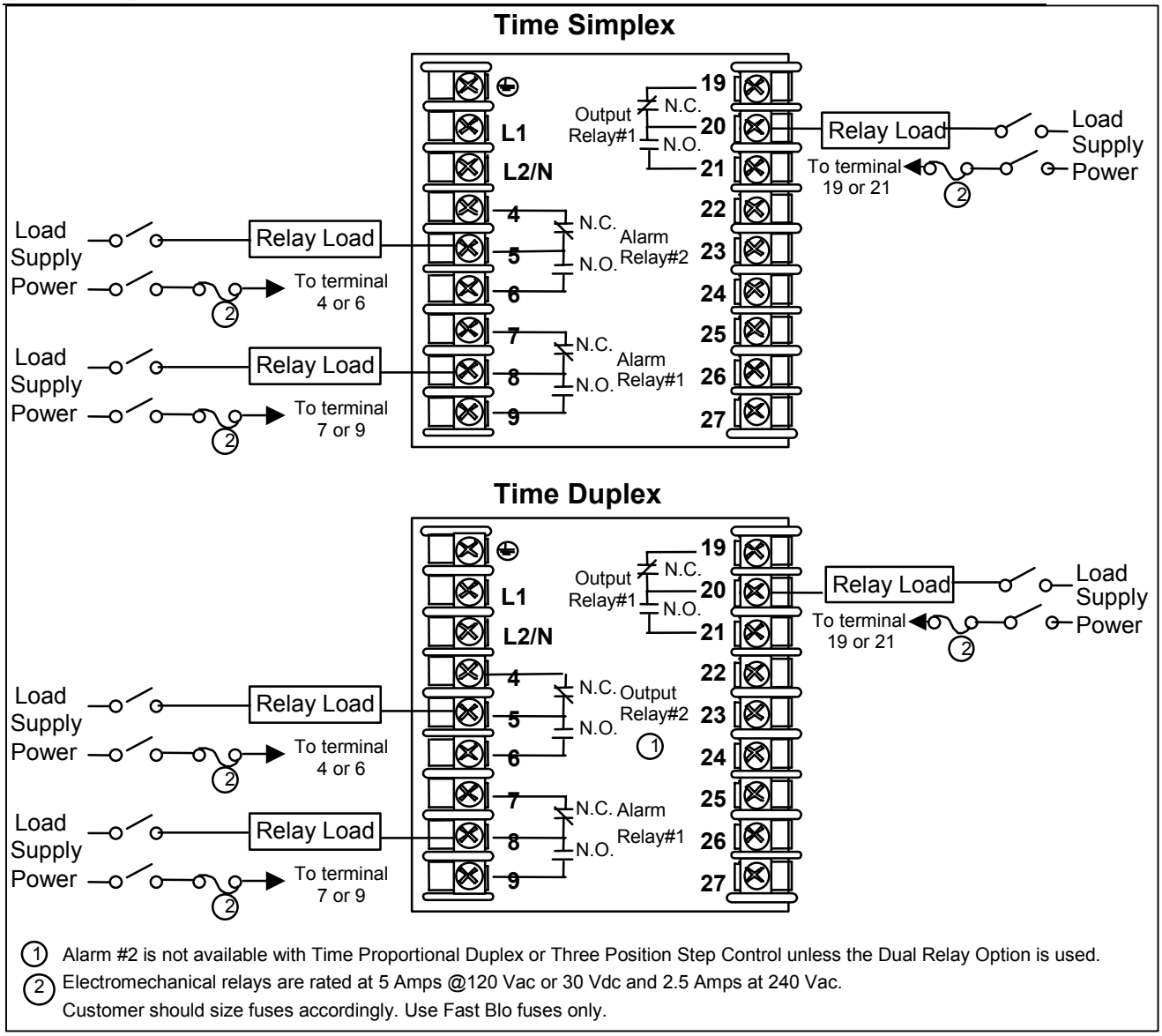


Figure -5 Electromechanical Relay Output

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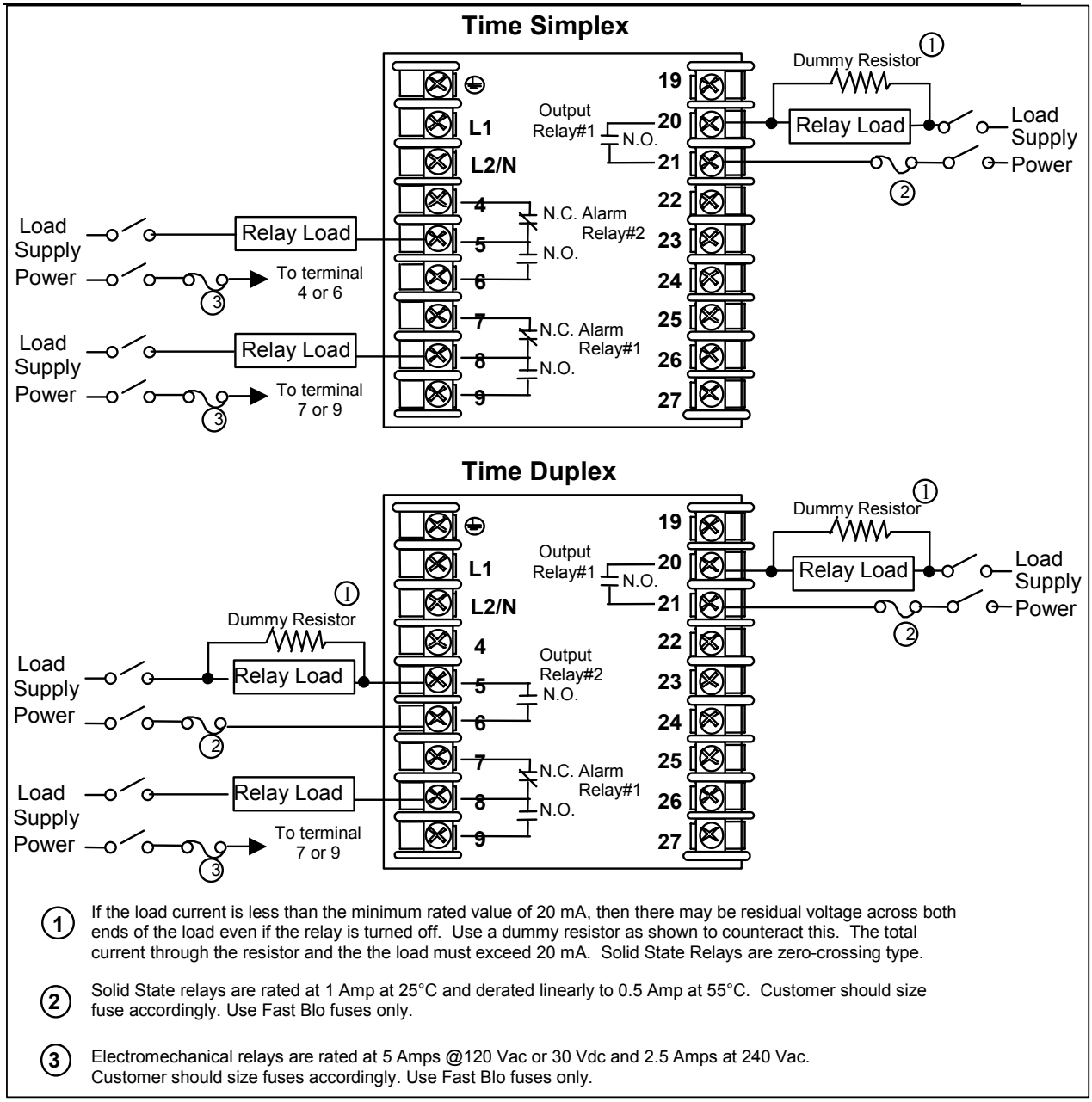


1. If the load current is less than the minimum rated value of 20 mA, then there may be residual voltage across both ends of the load even if the relay is turned off. Use a dummy resistor as shown to counteract this. The total current through the resistor and the the load must exceed 20 mA. Solid State Relays are zero-crossing type.

2. Solid State relays are rated at 1 Amp at 25°C and derated linearly to 0.5 Amp at 55°C. Customer should size fuse accordingly. Use Fast Blo fuses only.

3. Electromechanical relays are rated at 5 Amps @120 Vac or 30 Vdc and 2.5 Amps at 240 Vac. Customer should size fuses accordingly. Use Fast Blo fuses only.

Figure 6 Solid State Relay Output

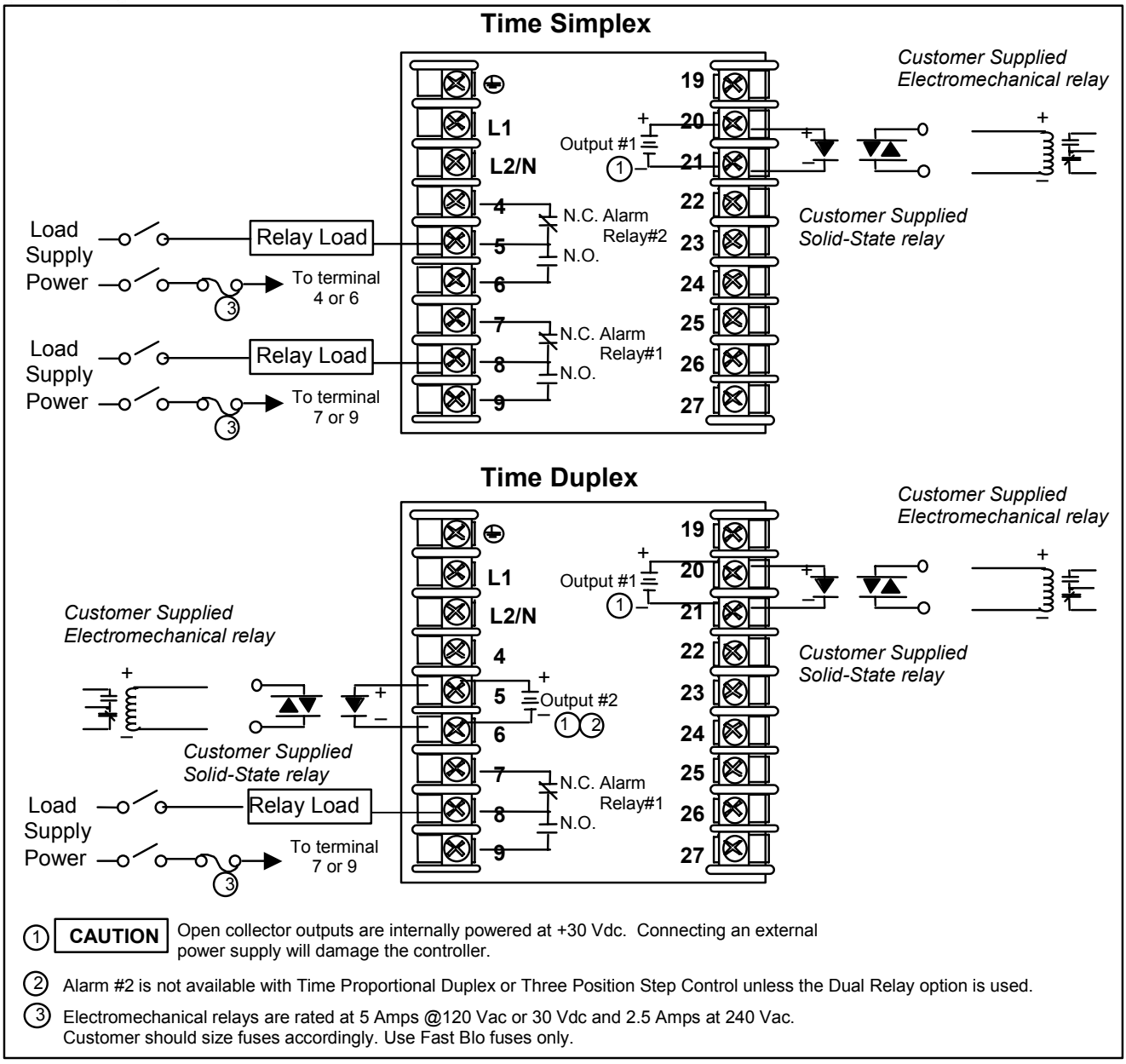


Figure 7 Open Collector Output

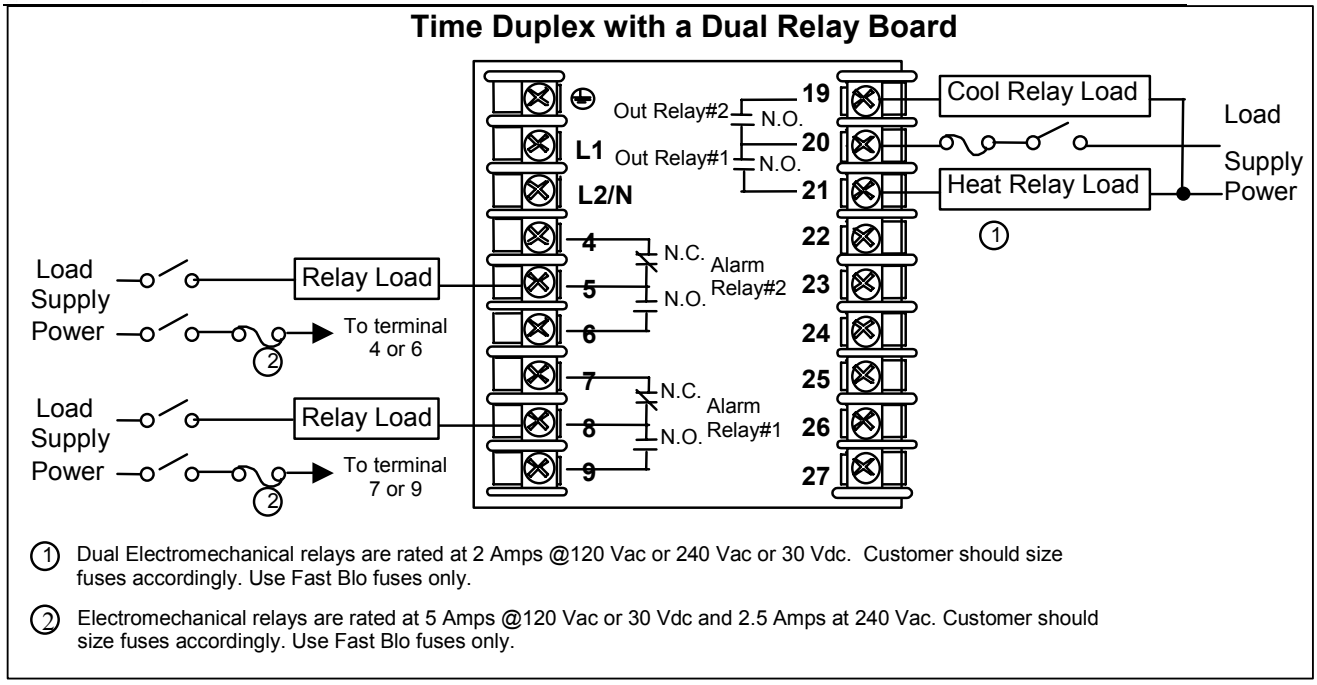


Figure -8 Dual Electromechanical Relay Option Output

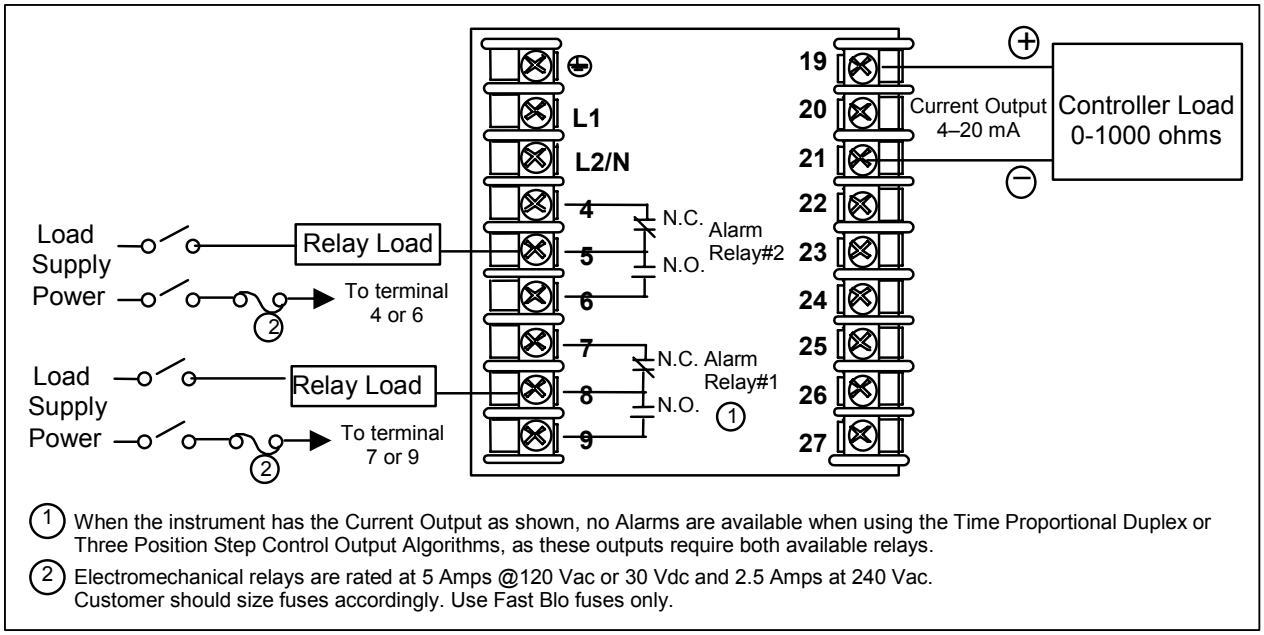
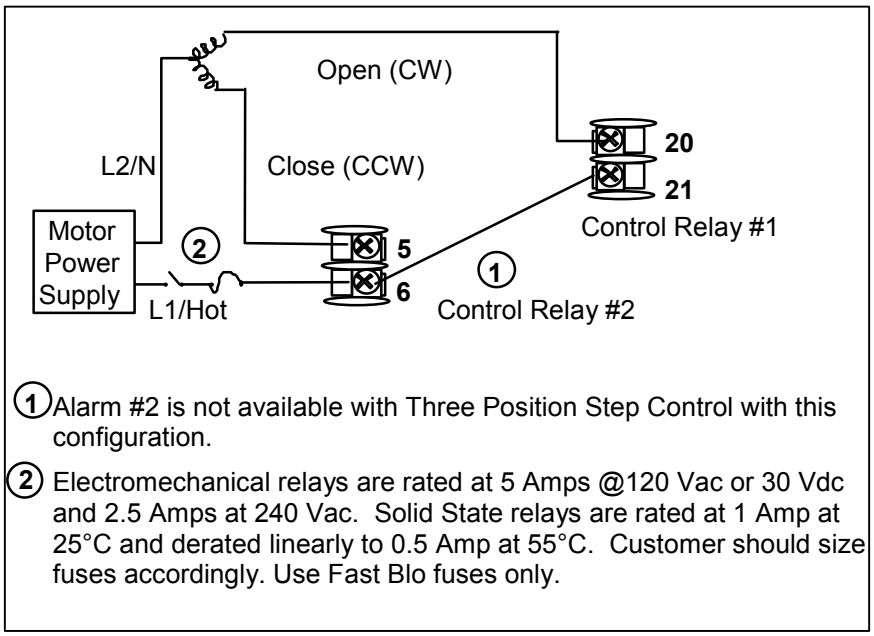


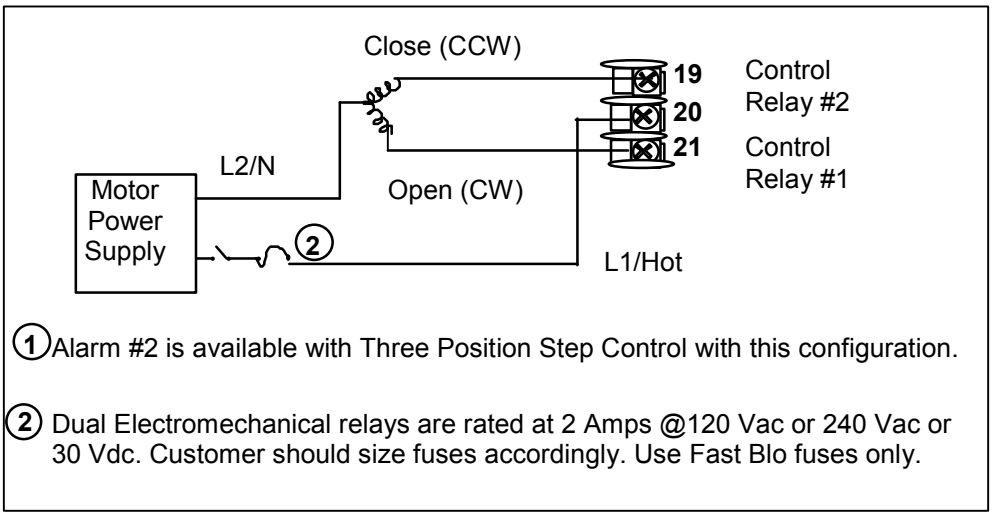
Figure -9 Current Output



1 Alarm #2 is not available with Three Position Step Control with this configuration.

2 Electromechanical relays are rated at 5 Amps @120 Vac or 30 Vdc and 2.5 Amps at 240 Vac. Solid State relays are rated at 1 Amp at 25°C and derated linearly to 0.5 Amp at 55°C. Customer should size fuses accordingly. Use Fast Blo fuses only.

Figure -10 Three Position Step Control Connections w/o Dual Relay Option



1 Alarm #2 is available with Three Position Step Control with this configuration.

2 Dual Electromechanical relays are rated at 2 Amps @120 Vac or 240 Vac or 30 Vdc. Customer should size fuses accordingly. Use Fast Blo fuses only.

Figure -11 Three Position Step Control Connections with Dual Relay Option

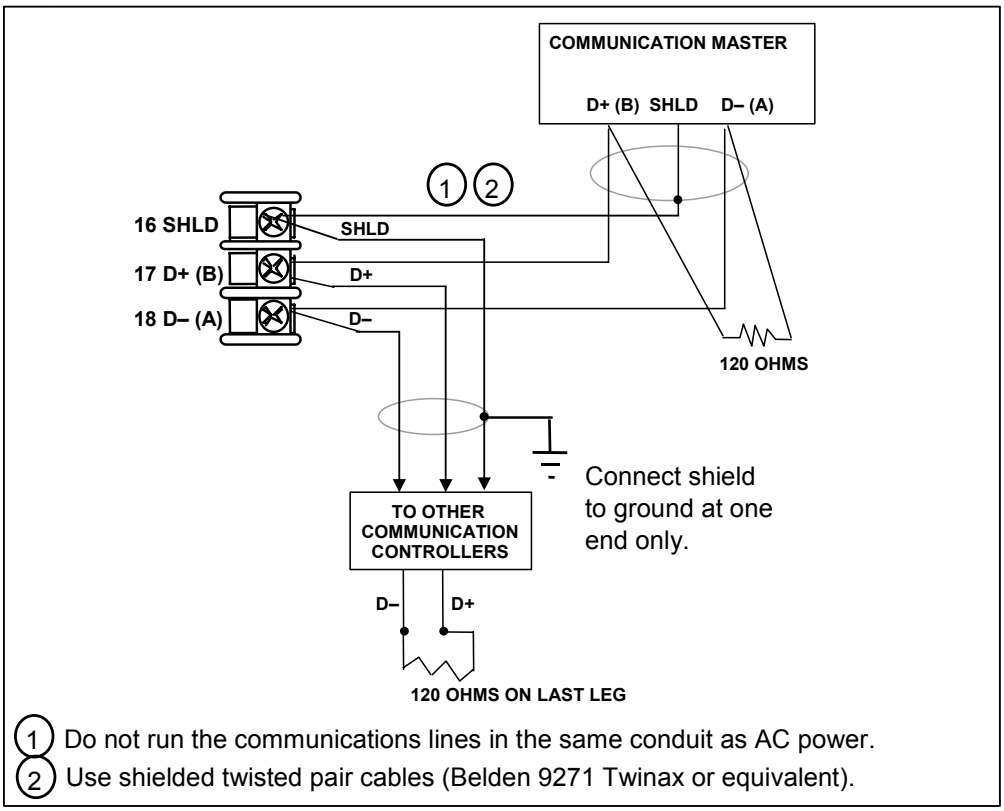


Figure -12 RS-422/485 Communications Option Connections

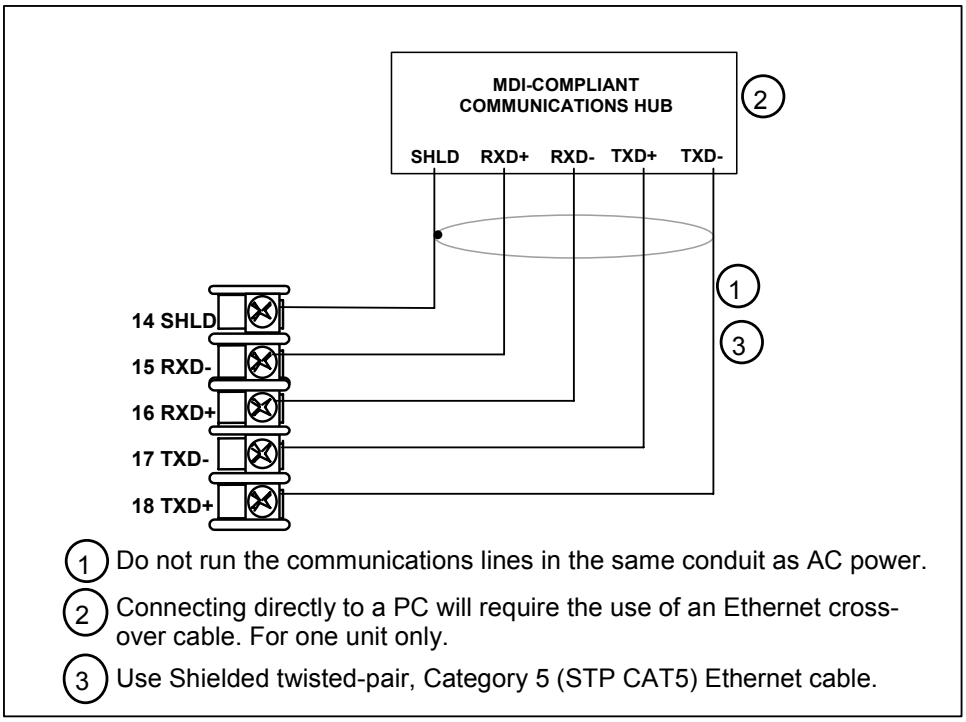


Figure -13 Ethernet Communications Option Connections

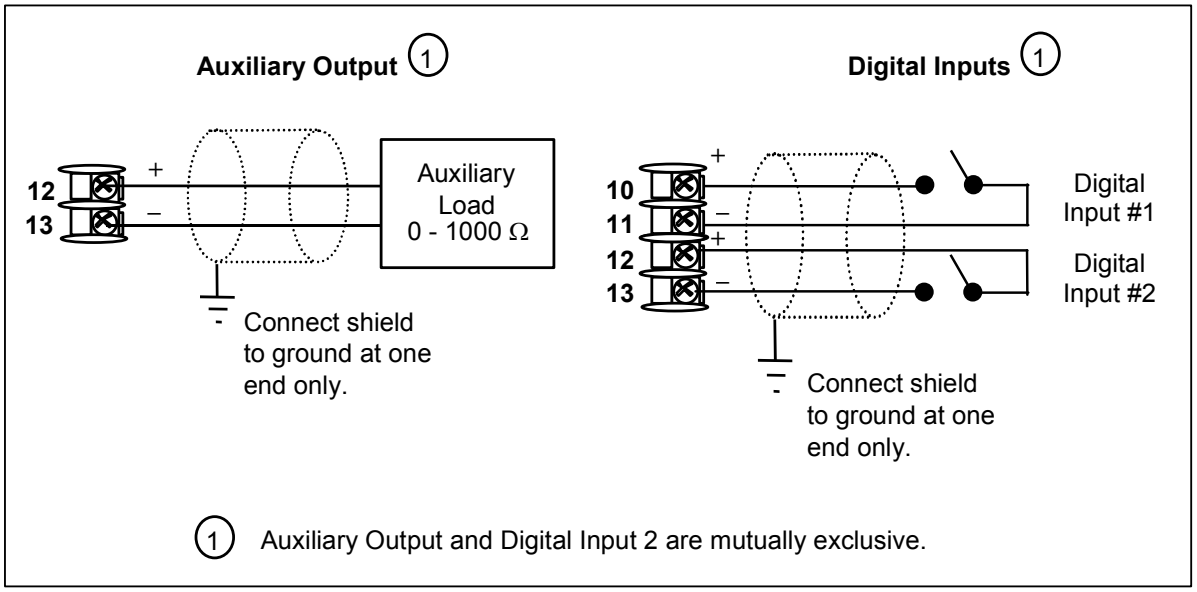


Figure 14 Auxiliary Output and Digital Inputs Option Connections

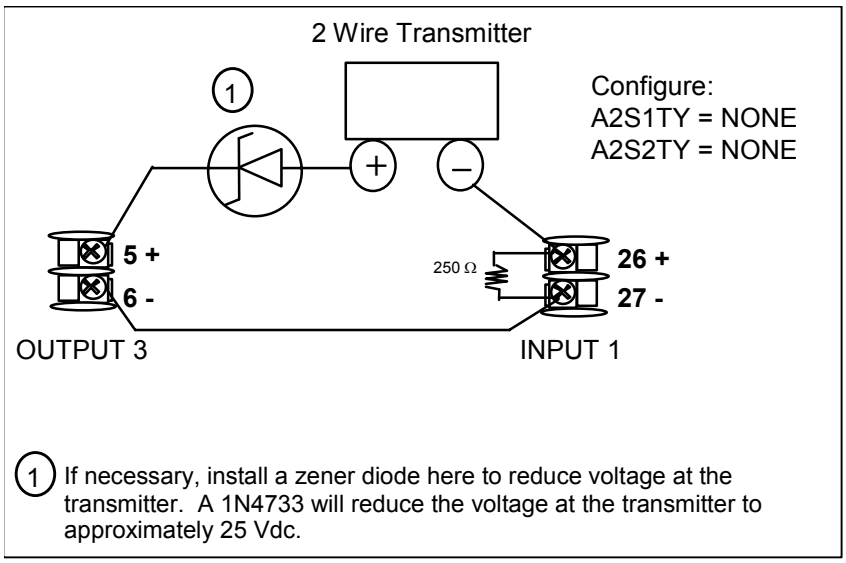


Figure -15 Transmitter Power for 4-20 mA — 2 wire Transmitter Using Open Collector Alarm 2 Output

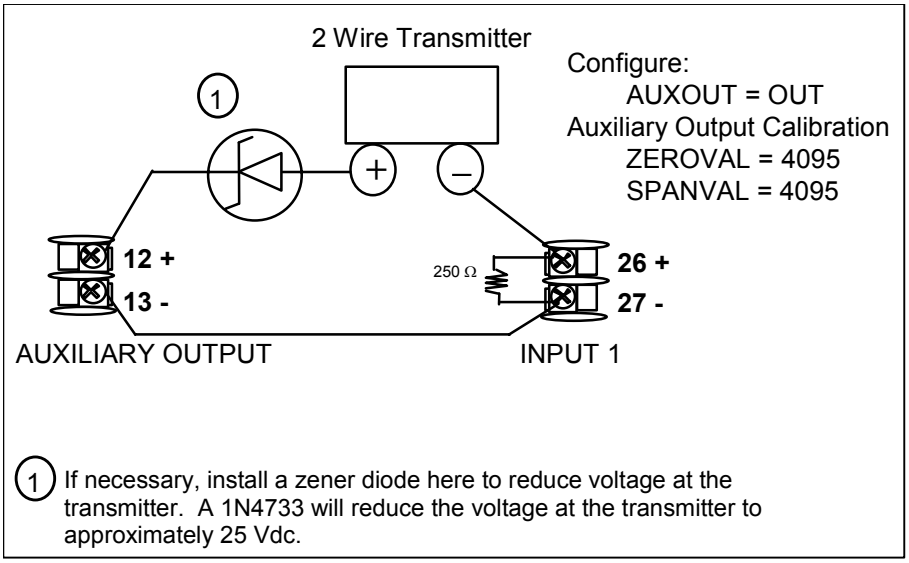


Figure -16 Transmitter Power for 4-20 mA — 2 Wire Transmitter Using Auxiliary Output