Laboratory Room Controller
Model LRC

Installation Instructions

Contents

W A R N I N G
The Model LRC Laboratory Room Controller must be wired to 24 VAC only. Wiring the unit to 110 VAC will cause serious unit damage and void the warranty.

These installation instructions guide the installer through the installation of the TSI® Model LRC Laboratory Room Controller and all TSI® options. Some options may not have been provided by TSI®, so please review those product installation instructions. Please read these instructions thoroughly before beginning installation.
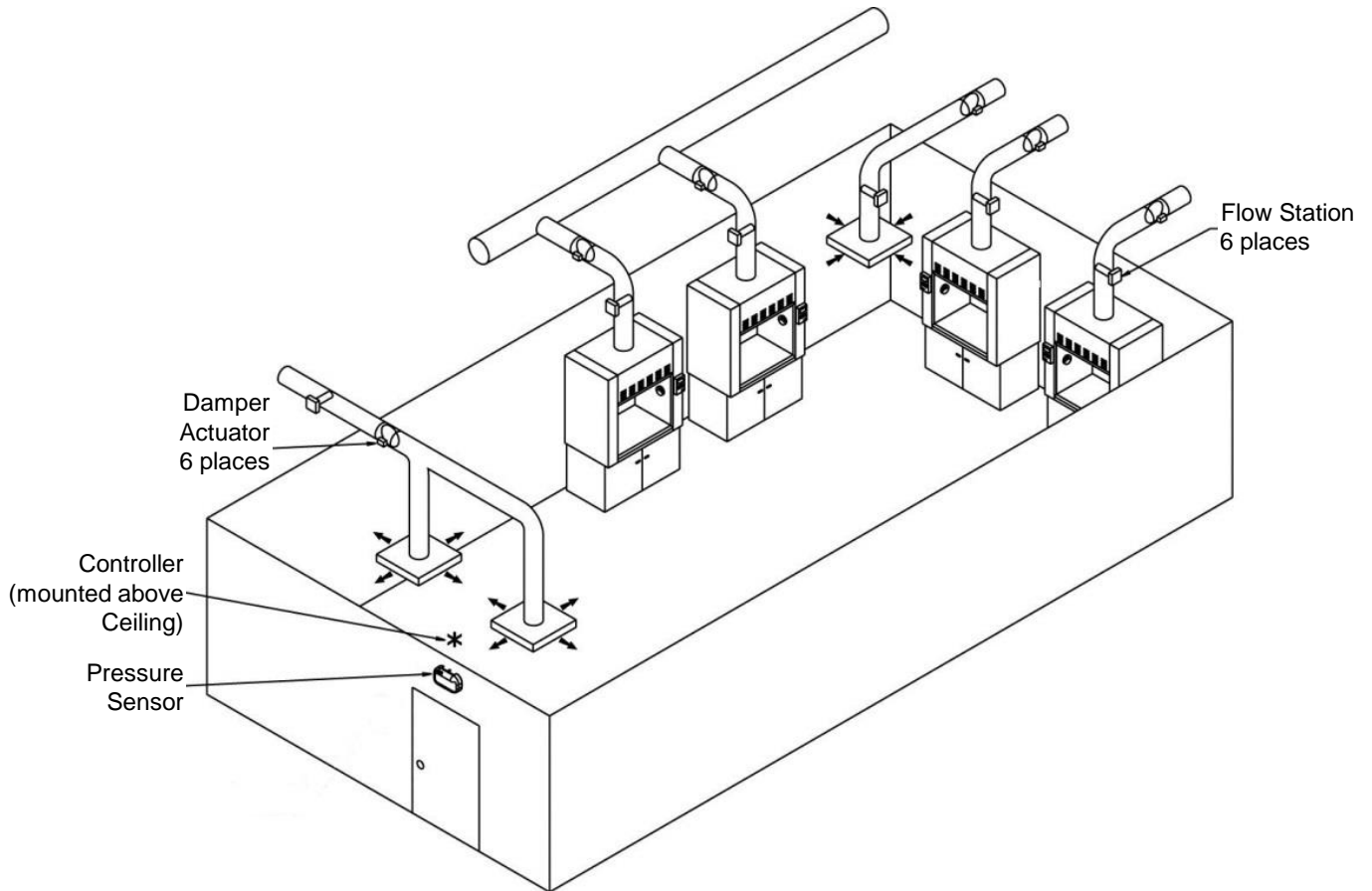

Figure 1: Typical laboratory installation

Component List

N O T I C E
There are a large variety of options that can be installed with the Laboratory Room Controller. The system you are installing may not have all components or quantity of components listed below.
Only TSI-supplied devices, listed below, are covered in these installation instructions. Please refer to the manufacturer's installation instructions for proper installation of non TSI devices.

Laboratory Room Controller

Qty	Part Number	Description
1	LR-PWR	LRC Power Supply
1	LRC00	Laboratory Room Controller (CFM), -LPS, -CMH
1	LR-EXP68	LRC Input/Output Module
1	LR-EXP08	LRC Input Expansion Module

Qty	Part Number	Description
1	LR-WIFI	LRC Wi-Fi Adapter
1	LR-DISPLAY	LRC Display
1	LR-CABLE	LRC Cable for 2nd row

Laboratory Room Controller Installation

The LRC can be mounted to DIN rail, or directly to another material.

Each module can be mounted on a DIN rail for fast installation and easy maintenance. Each module also has two pre-molded mounting holes allowing the module to be mounted in a panel or on a wall.

Ensure that the mounting surface can support the controller, DIN rail, and any site-supplied enclosure.

1. Select the mounting location of the Laboratory Room Controller (LRC). The construction plans normally show the mounting location. If no location is specified then the unit is typically installed above the ceiling in the laboratory next to the main entrance. Mounting inside a proper electrical enclosure is recommended.

W A R N I N G
If the LRC is mounted in a box, be sure to maintain proper clearances for access and wiring knockouts.
DO NOT install if any other equipment will interfere with opening the door.
DO NOT block the wiring knockouts on the side of the box.
DO NOT drill in panel after LRC has been mounted.

2. Remove the products from the box and set in a safe location.

3. Set the pieces in the correct mounting order (Figure 3) and position (Figure 4).

Mounting Positions

The controller's mounting orientation must be horizontal with controllers back attached to a vertical wall surface.
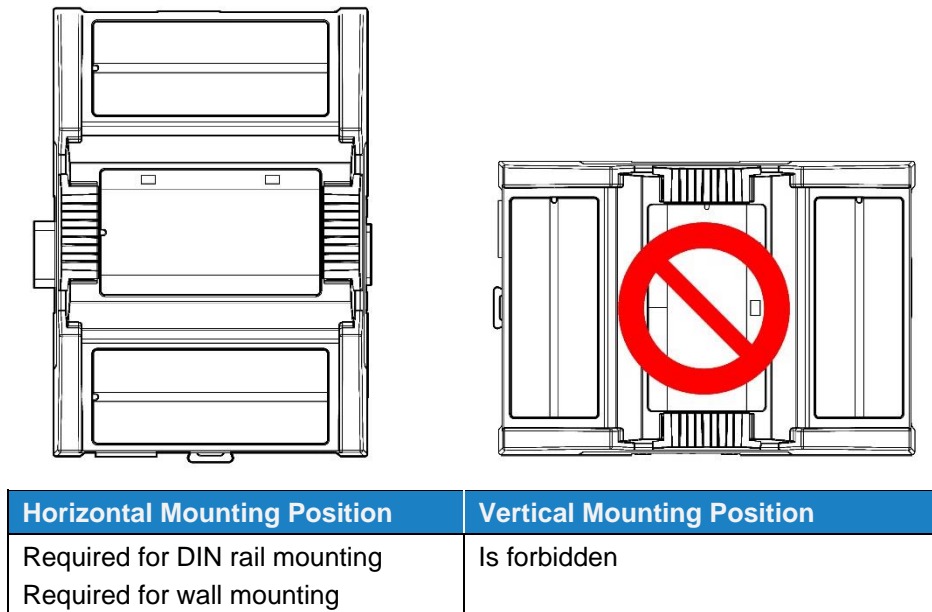

Horizontal Mounting Position	Vertical Mounting Position
Required for DIN rail mounting Required for wall mounting	Is forbidden

Figure 2: Horizontal and vertical mounting positions

Assembly Order

Modules are connected in a left to right order, starting with the LR-PWR, the LRC00, followed by LR-EXP68 module(s), and then finally the LR-EXP08 module(s).

On the top panel of each module there are roman numerals to aid in maintaining proper installation order. One line (LR-PWR) signifies this to be the first module on the left. Two lines (LRC00) denote the second module from the left. Three lines (LR-EXP68) will be the third module from the left.
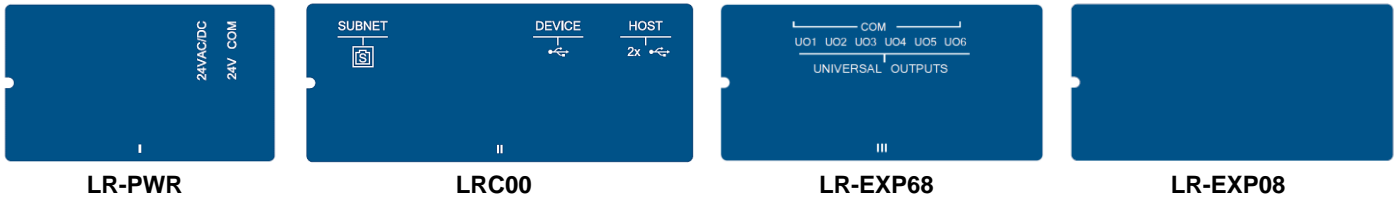

Figure 3: Module Top Panel Labels denoting assembly order

If you have more than one LR-EXP68 module, both LR-EXP68 modules will still be right of the LRC00 Module, but to the left of any LR-EXP08 Module (if applicable), which has no lines on the upper panel.

Be sure to keep all modules in one straight line orientation. If installation in one straight line is not possible, please see the Multiple Row Configuration section for more information.
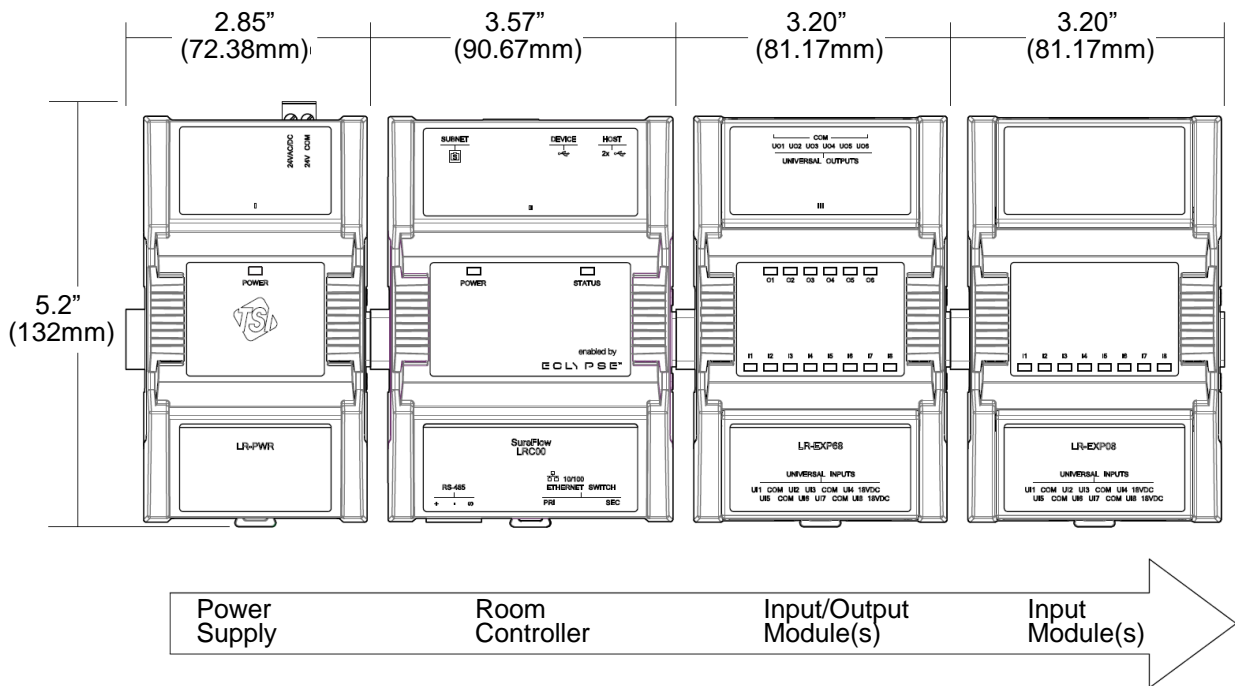

Figure 4: Assembly order

Select the appropriate mounting method (DIN rail, or other) and follow instructions below.

DIN Rail-Mounted Installation

1. Securely mount the DIN rail horizontally on the wall.

2. Clip the modules onto the DIN rail in the assembly order (see above).

3. Slide the modules together so that the side connectors of each module are firmly mated with the adjoining module. Use DIN rail clips to keep the row of modules well secured together and to prevent the movement of any module along the DIN rail. Certain modules come with DIN rail clips in the box.

4. To detach the module from the DIN rail, separate the module from any other module located on either side. Use a flat screw driver to pull down on the release clip located at the bottom center of the module and pull it off the DIN rail, bottom first.
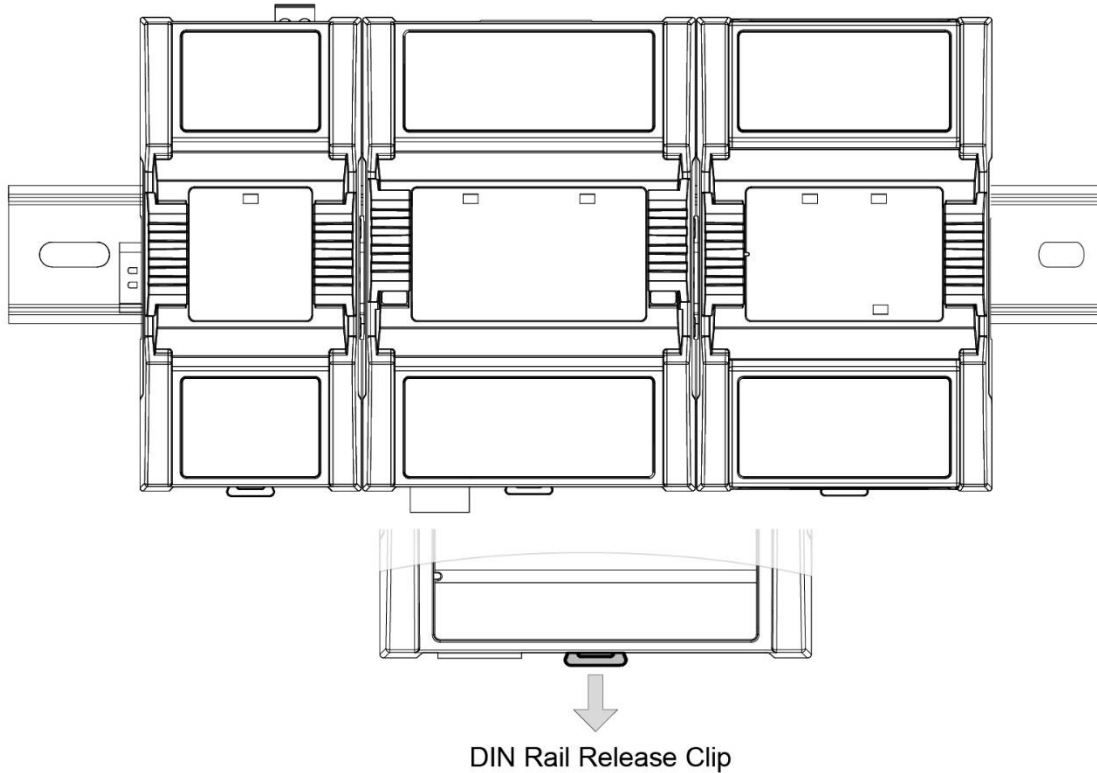

DIN Rail Release Clip

Figure 5: DIN rail-mounted installation

Wall-Mounted Installation

1. Modules should be mounted on a wall one module at a time.

2. Before mounting a module, separate the front assembly from the back plate of each module to be mounted: push the two latches up to unlock a module's front assembly as shown below.

   For LRC-PWR or LRC00 modules: Separate the front and back base by gently pulling the front assembly off of the back base, thereby separating the electrical connectors between the two halves (Figure 6).
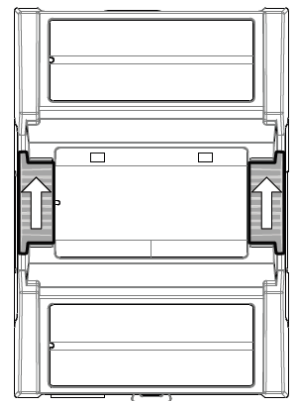

Figure 6: LRC-PWR or LRC00 modules

For LR-EXP68 or LR-EXP08 modules: Separate the front and back base by opening and pulling the hinged gull-wing covers, thereby separating the electrical connectors between the two halves.
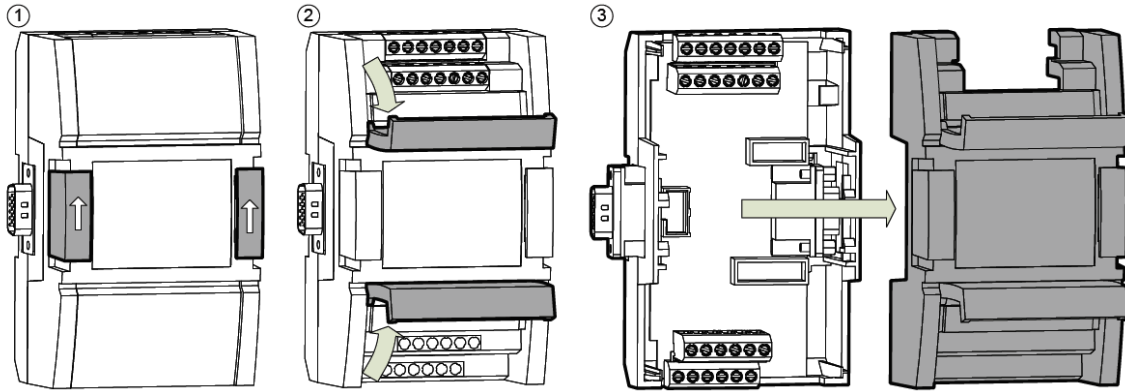

Figure 7: LR-EXP68 or LR-EXP08 modules

3. Once the front assembly has been removed, use the back plate's mounting holes to mark the location of any holes that need to be drilled as shown in Figure 8.

4. Use the mounting holes to mark the location of any holes that need to be drilled.

5. Drill the holes. **DO NOT** attempt to drill through the back plate.

6. Clean the surface.

7. Mount the module using a No. 8 slotted hex, size: ¼" or equivalent mounting hardware appropriate to the wall material type.

8. To lock a module's front assembly in place, attach the front assembly to the module's back base by closing any gull-wing front assemblies (if applicable) and pushing the two latches down.

9. Once this module has been attached to the wall, connect the next module on the right so that the side connectors are firmly coupled and the modules are aligned straight.

10. Now attach this module to the wall.
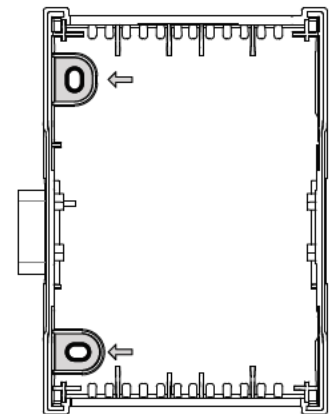
11. Repeat until all modules are mounted in a row.

Figure 8: Back plate's mounting holes

LRC Dimensions

Exact dimensions of the LRC will vary depending on the exact modules. Use the chart below for LRC dimensions. Allow the appropriate space to allow for wiring and accessibility clearance.

Model Number	Dimensions (LWD)
LRC-BASE-xxx (includes LC-PWR, LRC00, LC-EXP68)	9.7 in. x 5.2 in. x 2.4 in. (245 mm x 132 mm x 61 mm)
LRC-BASE-xxx + (1) LC-EXP68	12.9 in. x 5.2 in. x 2.4 in. (326 mm x 132 mm x 61 mm)
LRC-BASE-xxx + (1) LC-EXP08	12.9in. x 5.2 in. x 2.4 in. (326 mm x 132 mm x 61 mm)
LRC-BASE-xxx + (1) LC-EXP68 + (1) LC-EXP08	16.1 in. x 5.2 in. x 2.4 in. (407 mm x 132 mm x 61 mm)
LRC-BASE-xxx + (2) LC-EXP08	16.1 in. x 5.2 in. x 2.4 in. (407 mm x 132 mm x 61 mm)
LRC-BASE-xxx + (1) LC-EXP68 + (2) LC-EXP08	19.3 in. x 5.2 in. x 2.4 in. (488 mm x 132 mm x 61 mm)

Figure 9: LRC dimensions

Multiple Row Configuration

Some applications may require the LRC to be mounted in multiple rows. Be sure to follow the same assembly order directions, but each new row will require an additional LR-PWR module to begin the left side of each row. The second LR-PWR will require a secondary 24V power source. The LR-CABLE will connect the furthest right module from the row above, to the left most module (LR-PWR) at the beginning of the next row. See Figure 10 for information.
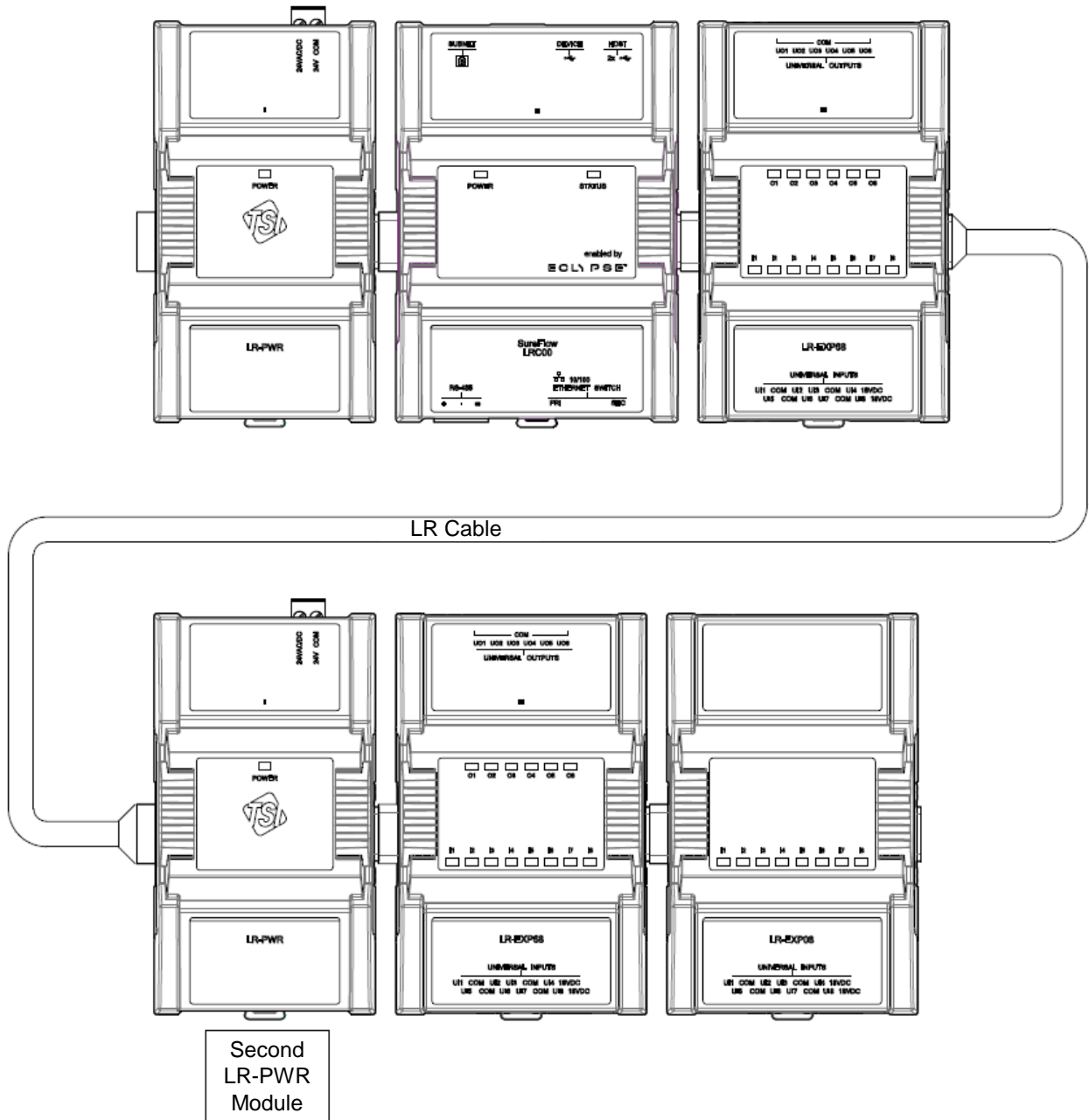
LR Cable

Second
LR-PWR
Module

Figure 10: Typical multiple row configuration

Wiring Information

General Wiring Recommendations

W A R N I N G S
• **Risk of Electric Shock**: Turn off power before any kind of servicing to avoid electric shock. However, it is not necessary to remove power when hot-swapping module front assemblies.   • **DO NOT** connect more than 24 VAC to any terminal.   • **DO NOT** apply voltage to the RS-485 output, analog output, or control output. Severe damage may occur to the unit if voltage is applied and will violate the warranty.

- Refer to Communications Wiring section for specific details about RS-485 or Ethernet wiring requirements.

- All wiring must comply with electrical wiring diagrams as well as national and local electrical codes.

- To connect the wiring to a device, use the terminal connectors. Use a small flat screwdriver to tighten the terminal connector screws once the wires have been inserted (strip length: 0.25'' (6 mm), tightening torque 0.5 nm). Keep wires separate according to their function and purpose to avoid any ambient noise transmission to other wires. Use strapping to keep these wires separated. For example, keep power, hazardous voltage, network, and input wiring separate from each other.

- **DO NOT** connect the universal inputs, analog/digital outputs or common terminals to earth or chassis ground. The controller must be 24V floating common.

- Keep input and output wiring in conduits, trays or close to the building frame if possible.
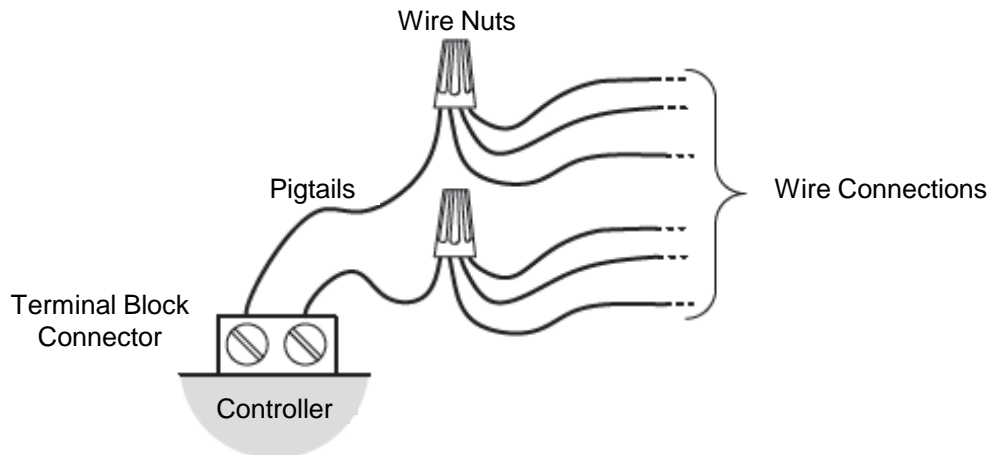

Figure 11: Controller's terminal block connection

LR-PWR Module Wiring

A transformer rated at 50 VA minimum must be used for each power supply for it to operate at full capacity. Each LR-PWR draws 30W.

Use an external fuse on the 24 VAC side (secondary side) of the transformer, as shown in the figure below, to protect all modules against power line spikes and mis-wiring.

Each power supply can support the base model (LR-PWR, LRC00, LR-EXP68) and (1) additional LR-EXP68 and (2) LR-EXP08 modules mounted on a single DIN rail. If multiple DIN rails are used, each rail requires its own LR-PWR power supply. See Multiple Row Configuration section for more information.

No modules should be connected to the left side of the LR-PWR module.

Maintain consistent polarity when connecting controllers and devices to the transformer. Ensure proper grounding per local codes.

Wire sizing:
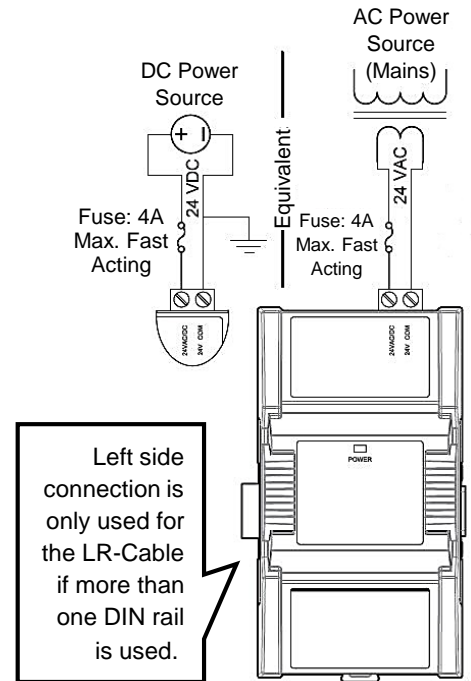- Single wire into the terminal block: 14–18 gauge.

Figure 12: LR-PWR module wiring

LR-EXP68 and LR-EXP08 Input Wiring

For terminal block connector wiring best practices, see General Wiring Recommendations. Inputs can be connected as follows.

Wire sizing:
- Single wire into the terminal block: 16–22 gauge.
- Two wires into the terminal block: 18–22 gauge, same size, and same type (solid or stranded). Twist wire ends together.
- For any other wiring combinations, including mixed wire thickness, mixed wire type, or more than two wires, refer to the terminal block connection in Figure 11.

0–10 VDC Input (2 wire)	
1000Ω Platinum RTD Input	
Dry Contact Input	

LR-EXP68 Output Wiring

For terminal block connector wiring best practices, see General Wiring Recommendations. Outputs can be connected as follows.

Wire sizing:
- Single wire into the terminal block: 16-22 gauge.
- Two wires into the terminal block: 18-22 gauge, same size, and same type (solid or stranded). Twist wire ends together.
- For any other wiring combinations, including mixed wire thickness, mixed wire type, or more than two wires, refer to the terminal block connection in Figure 11.

0–10 VDC Output	
0–20 mA Output	

Communications Wiring

BACnet IP

BACnet® IP utilizes Ethernet cabling to achieve higher data transfer rates. Be sure to use unshielded CAT5e (or better) cables for Ethernet communications.
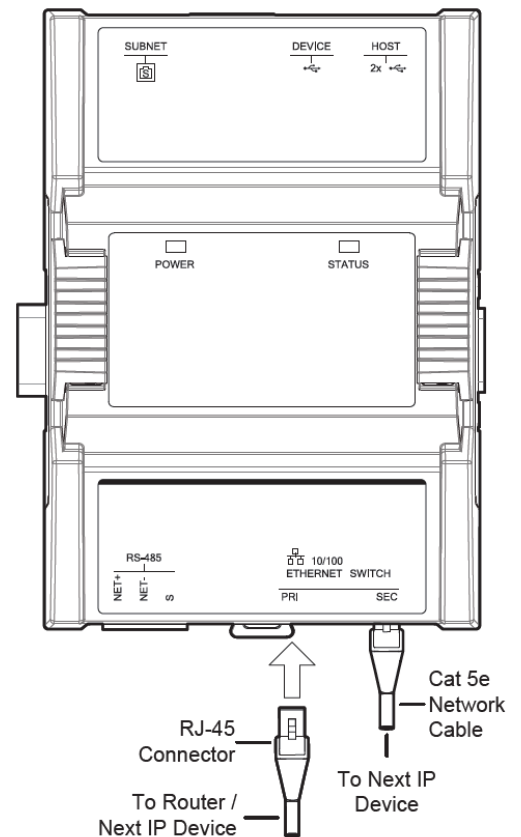

Figure 13: Typical BACnet® IP wiring

For BACnet® IP communication wiring, be sure to comply with the following:

Parameter	Details
Media	Cat 5e Cable; four (4) pairs of wires with RJ-45 Connectors (standard straight patch cable)
RJ-45 Pin Configuration	Straight-through wiring. Crimp connectors as per T568A or T568B (both cables ends must be crimped the same way)
Characteristic impedance	100–130 Ohms.
Distributed capacitance	Less than 100 pF per meter (30 pF per foot)
Maximum Cat 5e cable length between IP devices	328 feet (100m) maximum
Polarity	Polarity sensitive
Multi-drop	Daisy-chain (no T-connections) Devices have two RJ-45 female RJ-45 connectors that provide IP packet switching to support follow-on devices.
Daisy-chain limit, Connected System Controllers	Up to 20 devices can be daisy-chained per network switch port.
EOL terminators	Not applicable
Shield Grounding	Not applicable

BACnet MS/TP

For BACnet® MS/TP communication wiring, be sure to comply with the standard RS-485 wiring practices. If the LRC is the end of the communication trunk, end of line resistors are needed. End of line resistors are incorporated within the LRC00, and are defaulted to "off." If this is the first or last device on the communication trunk, turn on the end of line resistors by removing the communications module cover and flip the DIP switches to "on" as shown in Figure 14.
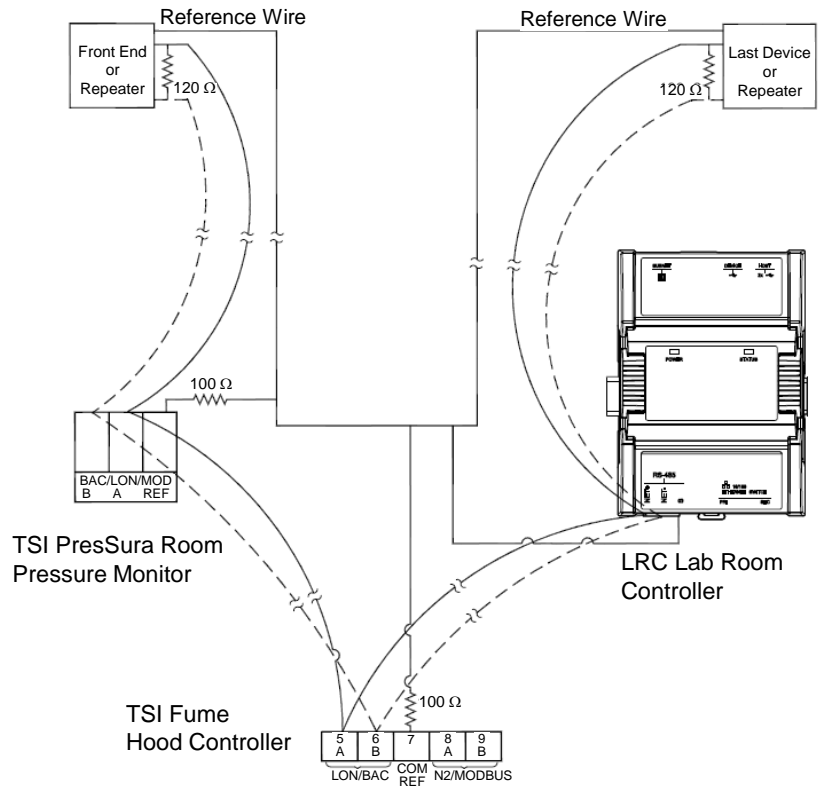

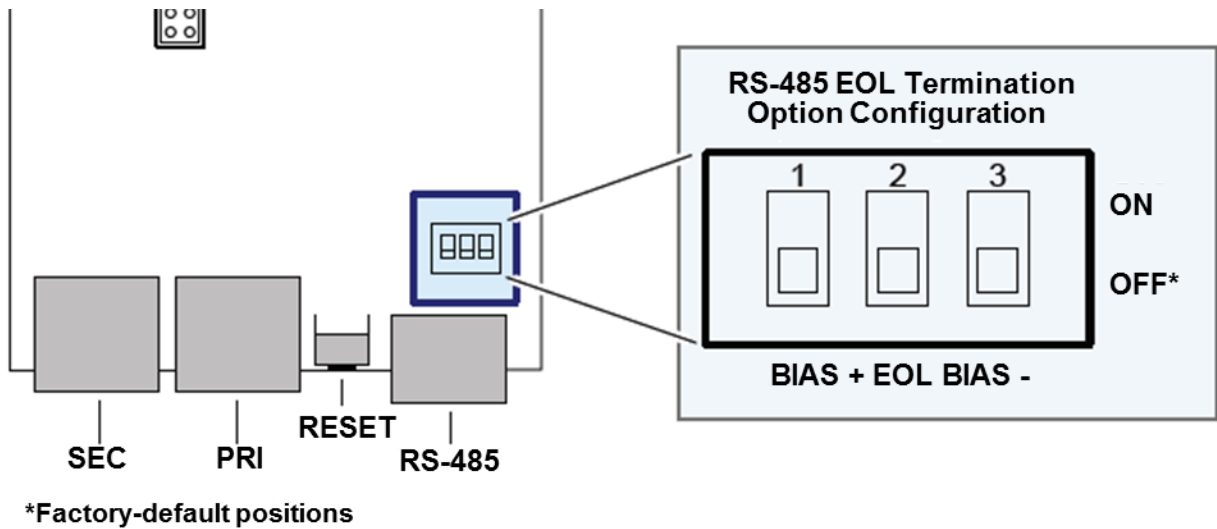**Figure 14: Typical RS-485 wiring diagram for TSI devices**

Figure 15: RS-485 end of line resistor DIP switches

For BACnet® MS/TP communication wiring, be sure to comply with the following:

Parameter	Details
Media	Twisted, 24 AWG
Shielding	Foil or braided shield
Shield Grounding	The shield on each segment is connected to the electrical system ground at one point only.
Characteristic impedance	100–130 ohms. The ideal is 100–120 ohms
Distributed capacitance between conductors	Less than 100 pF per meter (30 pF per foot). The ideal is less than 60 pF per meter (18 pF per foot).
Distributed capacitance between conducted and shield	Less than 200 pF per meter (60 pF per foot).
Maximum length per segment	1220 meters (4000 feet)
Data rate	9600, 19 200, 38 400, and 76 800 baud
Polarity	Polarity sensitive
Multi-Drop	Daisy-chain (no T-connections)
EOL terminations	120 ohms at each end of each segment
Data bus bias resistors	510 ohms per wire (max. of two sets per segment)

Wiring Connection Information

N O T I C E
See project submittals for wiring diagrams.

LR-PWR Power Supply Wiring

Pin Name	Connection Type	Signal	Description
24 VAC/DC	Input	24 VAC/DC	Power wiring from transformer
24 V COM	Input	24 V Common	Power wiring from transformer

LRC00 Controller Module

Pin Name	Connection Type	Signal	Description
SUBNET	Not Used	Not Used	Not Used
DEVICE	Not Used	Not Used	Not Used
HOST	USB	USB	Used for Wi-Fi connection
RS-485	Communication	RS-485 (+, -, Reference)	BACnet® communication
Reset Blue Button	None	Push Button	See Installation and Operators Manual for more information.
ETHERNET SWITCH (PRI)	Ethernet	RJ-45	From Router/Next IP Device
ETHERNET SWITCH (SEC)	Ethernet	RJ-45	To next BACnet® IP Device

Figure 16: LR-EXP68 I/O module

LR-EXP68 I/O Module

N O T I C E
COM on the input side is a shared common to be used by the surrounding inputs. COM for the output side has a dedicated common.

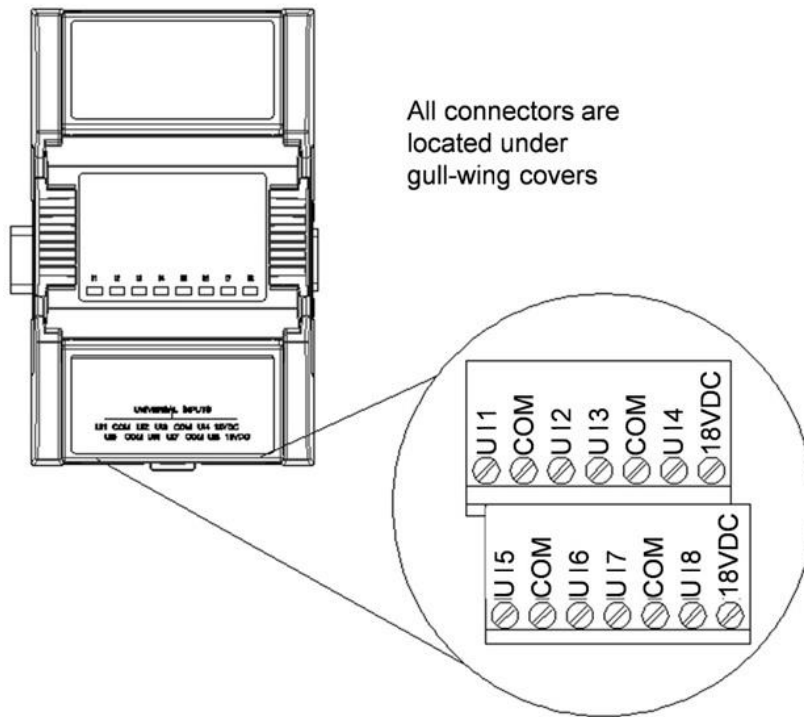| Pin Name	Connection Type	Signal Type	Description
UO1	Output	0–10 VDC or 0–20 mA	Output 1 (Configurable)
UO2	Output	0–10 VDC or 0–20 mA	Output 2 (Configurable)
UO3	Output	0–10 VDC or 0–20 mA	Output 3 (Configurable)
UO4	Output	0–10 VDC or 0–20 mA	Output 4 (Configurable)
UO5	Output	0–10 VDC or 0–20 mA	Output 5 (Configurable)
UO6	Output	0–10 VDC or 0–20 mA	Output 6 (Configurable)
COM	Common	0–10 VDC or 0–20 mA	Electrical Common
UI1	Input	0–10 VDC or 1000Ω RTD or Switch	Input 1 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI2	Input	0–10 VDC or 1000Ω RTD or Switch	Input 2 (Configurable)
UI3	Input	0–10 VDC or 1000Ω RTD or Switch	Input 3 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI4	Input	0–10 VDC or 1000Ω RTD or Switch	Input 4 (Configurable)
18VDC	Not Used	Not Used	Not Used
UI5	Input	0–10 VDC or 1000Ω RTD or Switch	Input 5 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI6	Input	0–10 VDC or 1000Ω RTD or Switch	Input 6 (Configurable)
UI7	Input	0–10 VDC or 1000Ω RTD or Switch	Input 7 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI8	Input	0–10 VDC or 1000Ω RTD or Switch	Input 8 (Configurable)
18VDC	Not Used	Not Used	Not Used

Figure 17: LR-EXP08 input only module

LR-EXP08 Input Only Module

N O T I C E
COM on the input side is a shared common to be used by the surrounding inputs.

Pin Name	Connection Type	Signal Type	Description
UI1	Input	0–10 VDC or 1000Ω RTD or Switch	Input 1 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI2	Input	0–10 VDC or 1000Ω RTD or Switch	Input 2 (Configurable)
UI3	Input	0–10 VDC or 1000Ω RTD or Switch	Input 3 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI4	Input	0–10 VDC or 1000Ω RTD or Switch	Input 4 (Configurable)
18VDC	Not Used	Not Used	Not Used
UI5	Input	0–10 VDC or 1000Ω RTD or Switch	Input 5 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI6	Input	0–10 VDC or 1000Ω RTD or Switch	Input 6 (Configurable)
UI7	Input	0–10 VDC or 1000Ω RTD or Switch	Input 7 (Configurable)
COM	Common	0–10 VDC or 1000Ω RTD or Switch	Electrical Common
UI8	Input	0–10 VDC or 1000Ω RTD or Switch	Input 8 (Configurable)
18VDC	Not Used	Not Used	Not Used

If you need assistance installing the system, call TSI® Customer Service at 651-490-2860 or 1-800-680-1220.

Notes

Knowledge Beyond Measure.