МОДУЛИ ДЛЯ ПЕРЕДАЧИ ДАННЫХ
Технические характеристики
IO-R-34

Remote IO-R-34 Module
14022

Mounting and Wiring Guide

This document covers the mounting and wiring of the IO-R-34 module for expanding a JACE-8000® controller. It assumes that you are an engineer, technician, or service person who is performing control system design or installation. Please read through this entire document before beginning the installation procedures.

Product Description

The IO-R-34 expands a JACE-8000 controller[1] with 34 I/O points that can be remotely located, including:

- 16 Universal Inputs (UIs) compatible with 0-10Vdc, 0-20mA, dry contacts, pulsing dry contacts, 0-100K ohm resistive, or Type 3 thermistor temperature sensors.
- 10 Digital Outputs (DOs) with Form-A relay contacts for on/off control of loads up to 24Vac/dc, at 0.5A max.
- 8 Analog Outputs (AOs) for 0-10Vdc analog control of loads at 2.5K ohm minimum, or 4mA drain maximum.

The IO module uses DIN rail mounting and has two end-mounted 5-pin connectors that support direct-chaining (in-line attachment) to IO-R-16 modules.

Communications to a JACE-8000 uses RS-485 multidrop on 3 wires of an end-mounted 5-pin connector. The other two wires are for OUTPUT power (15 Vdc) used to power IO-R-16 modules. The IO-R-34 can provide power to up to 4 attached IO-R-16 modules (if used). A two position connector is provided for primary power input to the module. The RS-485 bus is wired back to Com 1 or Com 2 of the JACE-8000 controller.

Related Documentation

For more information on mounting, wiring and configuring a system, refer to the *JACE-8000 Mounting & Wiring Guide*, *Remote IO-R-16 Mounting and Wiring Guide*, and the *NRIO Driver Guide*.

System Planning

System planning requires consideration of options regarding power, RS-485 communications, mounting and wiring. The following sections describe communications and power variables to consider before mounting and wiring your hardware.

Number of Supported Expansion Modules

A JACE-8000 controller can support a maximum of 8 IO-R-34 modules OR a maximum of 16 IO-R-16 modules on a single RS-485 bus. So, the IO-R-34 counts as two IO-R-16 modules. For example, the JACE-8000 could support 2 IO-R-34 modules and 12 IO-R-16 modules. Table 1 shows possible options for combinations of IO-R-16 and IO-R-34 modules. If you are using T-IO-16-485 modules, they count the same as an IO-R-16.

Power Supply Options and Considerations

The IO-R-34 is a 24Vac or dc powered device compatible with JACE-8000 input power requirements. Use a dedicated transformer to supply 21.6 to 26.4Vac/dc power to the module. Only the JACE-8000 and IO-R-34 modules should be powered from the same transformer. Wire the input voltage to the module's 2-pin 24Vac/dc power connector, located on the lower right corner of the unit.

Table 1 shows possible combinations. For example, Option 2 includes a total of 14 IO-R-16s and one IO-R-34. Four of the IO-R-16s are powered by the IO-R-34. The remaining 10 IO-R-16s must be powered by an external source.

Table 1   IO Module Combinations and IO-R-16 Power Options

Combinations	Module	Number of Devices	Powered by IO-R-34(s)	Powered by External Supply
Option 1	IO-R-16	16	0	16
	IO-R-34	0		
Option 2	IO-R-16	14	4	10
	IO-R-34	1		
Option 3	IO-R-16	12	8	4
	IO-R-34	2		
Option 4	IO-R-16	10	10	0
	IO-R-34	3		
Option 5	IO-R-16	8	8	0
	IO-R-34	4		
Option 6	IO-R-16	6	6	0
	IO-R-34	5		
Option 7	IO-R-16	4	4	0
	IO-R-34	6		
Option 8	IO-R-16	2	2	0
	IO-R-34	7		
Option 9	IO-R-16	0	0	0
	IO-R-34	8		

Both IO-R-16 and IO-R-34 should have a UPS power backup if continuous operation during power failures is a requirement. These modules do not support the battery powered configurations provided on some legacy hardware. The 5 pin power/comm connectors do not include a battery pin, preventing connection to (and possible damage from) legacy controllers.

Note   When cabling power to modules located some distance from the controller, you should allow for voltage drops introduced by cabling distances.

Operation without power backup

If an IO-R-34 module is powered locally and a momentary AC power loss occurs, note that a number of *undesirable things can result*, including:

- Load cycling from module relays dropping out, including several seconds lag to first re-establish communications with the JACE (Nrio driver) before relays can pull in again, as needed.
- Totalized "counts" zeroed out.
- History (logging) entries for associated IO points as "down," as well as Nrio "device down" alarms.

Further, loss of power without backup makes an IO firmware upgrade a risky operation. Such an upgrade is initiated from the "Nrio Device Manager" view (in a station connection to the JACE). If this upgrade process is interrupted by a IO-R-34 power cycle, the module may be rendered inoperable—and will likely need to be replaced. Therefore, consider providing UPS backup power.

Configure default settings for comm loss scenarios—You can use Niagara Workbench to configure default AO and DO values to be set in case of a power outage or other communications-loss situations. The feature is configurable for timing and function. You can choose to use it on Powerup, CommLoss, both or neither. See the *Niagara Nrio Driver Guide* for details.

Preparation

Unpack the IO-R-34 and inspect the contents of the packages for damaged or missing components. If damaged, notify the appropriate carrier at once and return any damaged components for immediate repair or replacement. See "Returning a Defective Unit" on page 18.

Included in this Package

Included in this package you should find the following items:

- IO-R-34 module with quick-disconnect female connectors.
- *Remote IO-R-34 Module Mounting and Wiring Guide*, Part Number 32327280-001.
- Hardware bag containing the following items:
  - One (1) grounding wire, with quick-disconnect 0.187" female connector.
  - Sixteen (16) 499-ohm resistors, used for 4–20mA input

Material and Tools Required

The following supplies and tools are required for installation:

- A suitable power source, as *one* of the following:
  - UL listed, Class 2, 24Vac transformer, rated a minimum of 21.6 to 26.4Vac and 28VA. Note that a *dedicated* transformer is required. Only a JACE-8000 and the IO-R-34 may be powered from the same transformer.
  - 22 to 26.4Vdc power supply capable of supplying at least 916mA (22 Watts). This is sufficient to power a fully loaded IO-R-34 (4 IO-R-16 modules plus the IO-R-34).
- DIN rail, type NS35/7.5 (35mm x 7.5mm) and low-profile DIN rail end-clips (stop clips), recommended for mounting with the controller. The DIN rail should be sufficient length to accommodate both the JACE-8000 and any other modules. See Figure 1 on page 7.
- Suitable screws and screwdriver for mounting DIN rail, or if DIN rail not used, for mounting bases of the controller and the module. A small flat-bladed screwdriver is needed for wiring terminals.

Precautions

This document uses the following warning and caution conventions:

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Caution   Cautions remind the reader to be careful. They alert readers to situations where there is a chance that the reader might perform an action that cannot be undone, might receive unexpected results, or might lose data. Cautions contain an explanation of why the action is potentially problematic.

⚠ Warning Warnings alert the reader to proceed with extreme care. They alert readers to situations where there is a chance that the reader might do something that can result in personal injury or equipment damage. Warnings contain an explanation of why the action is potentially dangerous.

Safety Precautions

The following items are warnings of a general nature relating to the installation and start-up of the **JACE-8000** controller. Be sure to heed these warnings to prevent personal injury or equipment damage.

⚠ Warning
- **A 24Vac or 24Vdc circuit powers the IO-R-34 and JACE-8000 controller. Disconnect power before installation or servicing to prevent electrical shock or equipment damage.**
- **Make all connections in accordance with national and local electrical codes. Use copper conductors only.**
- **To reduce the risk of fire or electrical shock, install in a controlled environment relatively free of contaminants.**
- **Controllers and I/O modules are only intended for use as monitoring and control devices. To prevent data loss or equipment damage, do not use them for any other purposes.**

Static Discharge Precautions

These items are cautionary notes to help prevent equipment damage or loss of data caused by static discharge.

⚠ Caution
- Static charges produce voltages high enough to damage electronic components. The microprocessors and associated circuitry within an IO-R-34 are sensitive to static discharge. Follow these precautions when installing, servicing, or operating the system:
- Work in a static-free area.
- Discharge any static electricity you may have accumulated. Discharge static electricity by touching a known, securely grounded object.
- Do not handle the printed circuit board (PCB) without proper protection against static discharge. Use a wrist strap when handling PCBs, with the wrist strap clamp secured to earth ground.

Module Connection Precautions

⚠ Caution Do not connect more than the maximum number of IO-R-34 modules to the RS-485 port of the parent JACE controller—note that *8 is the maximum number supported in software*. However, less IO-R-34 modules may be supported. See "Number of Supported Expansion Modules," page 1.

⚠ Caution Connect S terminal wiring as shown in Figure 6 or communication errors may result. S terminal serves as reference ground between isolated RS-485 ports on JACE-8000, IO-R-16 and IO-R-34 modules.

Installation and Start-up Outline

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Note If installing the JACE-8000 controller and IO-R-34s at the same time, please refer to the appropriate controller installation document.

The major steps to installing and starting the IO-R-34, are outlined as follows:

1. Physically mount the module with the controller. See "Physical Mounting." If directly attaching to other modules, ensure that the 5-position end connector(s) are properly seated into the end connector(s) of the other units. Note the previous "Module Connection Precautions" on page 4.

2. Make wiring connections for grounding, 24Vac power, and I/O wiring. See "Wiring Details," page 8.

3. Apply power and perform an initial checkout. See "Power up and Initial Checkout" on page 16.

Physical Mounting

The following applies to mounting an IO-R-34 module with a JACE-8000 series controller:

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Note Horizontal mounting is strongly recommended to achieve maximum heat dissipation and meet the operating temperature upper limit. Any other mounting orientation reduces this upper limit.

- Mounting on a 35mm wide DIN rail is recommended. The IO-R-34 unit base has a molded DIN rail slot and locking clip, which simplifies mounting with other modules. Mounting on a DIN rail ensures accurate alignment of connectors between all modules.
- If DIN rail mounting is not practical, you can use screws in mounting tabs on the IO-R-34.

Procedure 1   To mount IO-R-34 on existing installed DIN rail.

Step 1 Pull or pry down the plastic locking clip until it snaps into the open (down) position.

Step 2 Position the IO-R-34 module on the rail, tilting to hook the top DIN rail tab over the upper edge of the DIN rail (Figure 1). Rotate the module flush against the DIN rail and then press the locking clip upward to release it and secure the module to the rail.

Step 3 Slide the IO-R-34 module along the DIN rail to its intended location. If connecting to an IO-R-16 module, seat the 5-position plug into that module's connector socket.

Step 4 Carefully install DIN rail end clips to secure the assembly. Make sure that the DIN rail stops do not press against the end connectors on the IO-R-34 or other modules.

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Caution • Do not mount hardware on **both** a DIN Rail and with tab mounts to another surface. This causes physical stress on equipment and prevents good connections between controller and modules.
- Do not mount DIN rail stops so that they press against module end connectors. If possible, use low-profile rail stops to eliminate possibility of contact and damage to the connectors.

Step 5 Repeat this for all items, until all are mounted on the DIN rail(s), firmly connected to each other, and secured with DIN rail end clips.

Figure 1   IO-R-34 module mounting details.
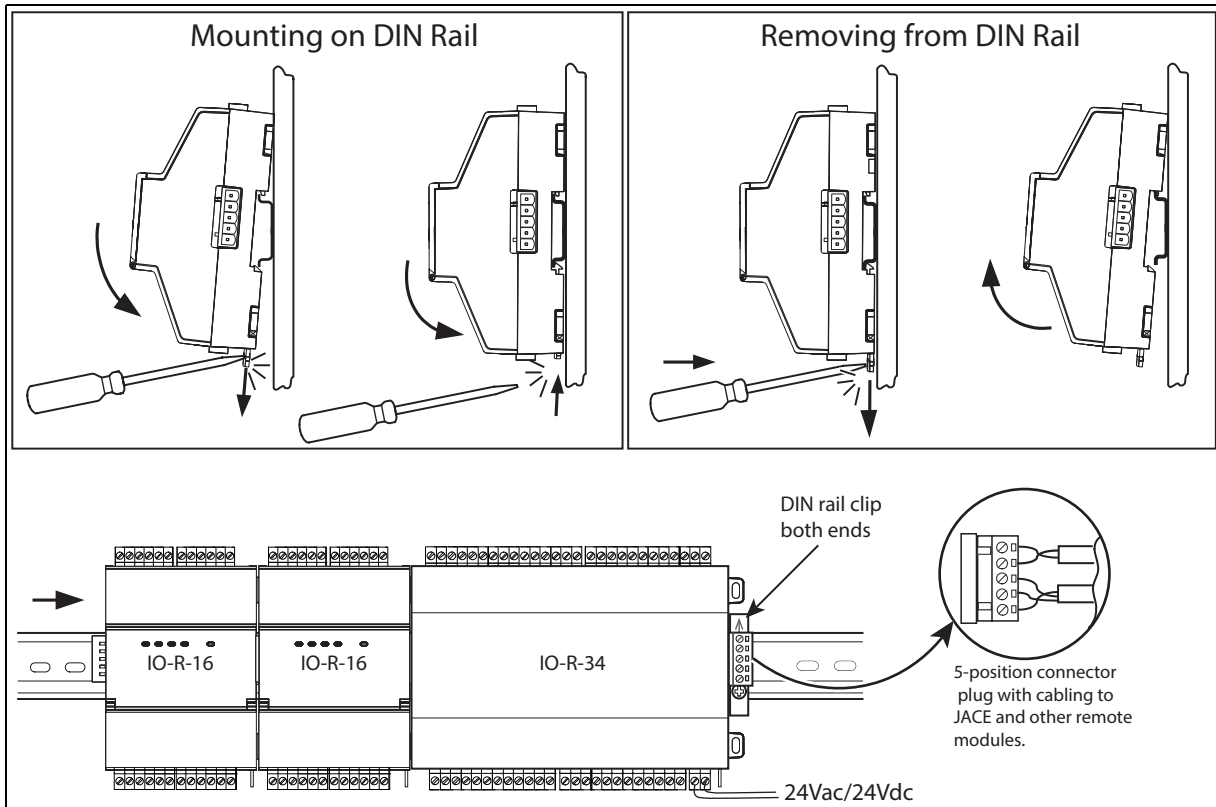
Note   To remove an IO-R-34 module from a DIN rail, remove DIN rail end clips and (if applicable) slide it away from other modules. Move the plastic locking tab down to open position then lift unit outwards.

Figure 2   Tab Mounting Dimensions.
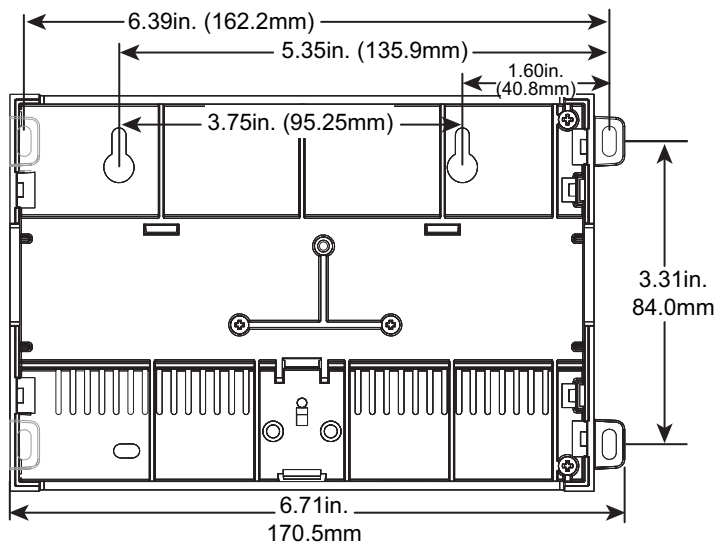
IO-R-34 Board Layout and Terminal Locations

The IO-R-34 provides 16 universal inputs compatible with 0–10Vdc, 0–20mA, dry contacts, pulsing dry contacts, 0–100K ohm resistive, or Type 3 thermistor temperature sensors, and 18 outputs: 10 relay (24Vac/dc, 0.5A max.) outputs and 8 analog outputs (0–10 Vdc). Wiring terminal positions are shown in Figure 3, along with LED locations.

Figure 3   IO-R-34 Wiring Terminal Locations.
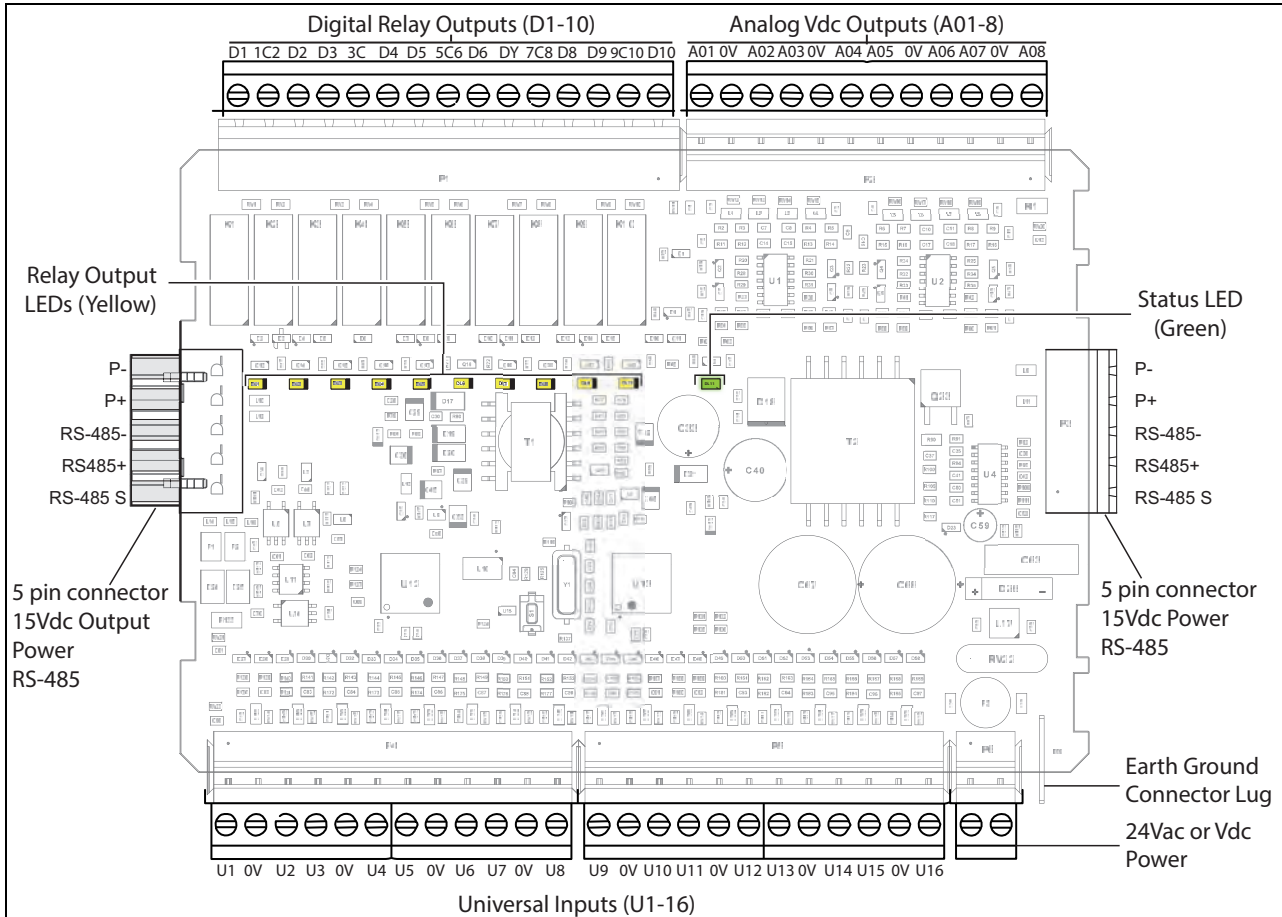
Wiring Details

See Figure 3 above to locate connectors and other components on the IO-R-34 module.

Make connections to the IO-R-34 in the following order.

1.   Connect the earth grounding wire (with spade connector) from the earth ground lug on the IO-R-34 to a nearby earth grounding point. See "Grounding" for details.

2.   Wire the supply power to the IO-R-34, but *do not energize the power source* until all other wiring is completed. See "Power Wiring" for details.

3.   Connect RS-485 wiring between the IO-R-34 and the JACE-8000, and (if applicable) to other modules (for example: IO-R-16, IO-R-34, or IO-16-485) in a continuous multidrop fashion. See sections "RS-485 Communications" on page 10, "Inputs" on page 11, and "Outputs" on page 14.
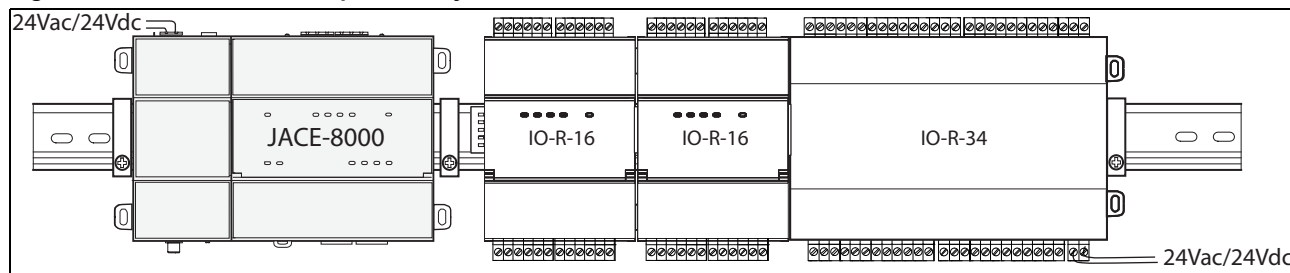
Power from IO-R-34

If powering one or more IO-R-16 modules from a IO-R-34 module, simply connect the modules as shown in Figure 5. Power and RS-485 communication connection is provided through the 5-position "Powered RS-485" connector.

- Each IO-R-34 can power up to four (4) IO-R-16 modules.

- Do not apply power (at any location) until all other wiring is completed. See "Power up and Initial Checkout," page 17.

Figure 5   **IO-R-16 modules powered by IO-R-34 connection.**

In some cases, some number of IO-R-16 modules may be powered this way (from IO-R-34), while others may be powered locally using a third-party 13.5-15.75 Vdc power supply. This may be advisable when IO modules are located long distances from the IO-R-34 providing power, to avoid excessive voltage drops due to wiring resistances. See the following sections:

- "Power from third party 13.5-15.75 Vdc power supply," page 10

Power from third party 13.5-15.75 Vdc power supply

IO-R-16 modules can be powered by a third-party, 13.5V–15.75Vdc power supply. A "battery backed" power supply is recommended. This provides power to the IO module(s) during AC power loss scenarios.

Figure 6 shows wiring for two assemblies of IO-R-16 modules powered by a battery-backed power supply.

Notes

- For power budgeting purposes, estimate each IO-R-16 module to consume 2W nominal (0.133 A @15V). Typical current will be less— as this estimate factors in all four relays being pulled in.

- Be aware of potential voltage drops when connecting via "trunk power" cabling. Voltage drops are more typical when modules are not located near the power supply. See "Voltage drop considerations," page 3.

- For other wiring on the 5-position end connector, see "RS-485 Communications," page 11.

- Do not apply power (energize the power supply) until all other wiring is completed. See "Power up and Initial Checkout," page 17.

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Caution   Connect S terminal wiring as shown in Figure 6 or communication errors may result. S terminal serves as reference ground between isolated RS-485 ports on JACE-8000 and IO-R-16 and IO-R-34 modules.

4.   Apply power to the unit. See "Power up and Initial Checkout," page 16.

Grounding

An earth ground spade lug (0.187") is provided on the base of the IO-R-34 for connection to earth ground. For maximum protection from electrostatic discharge or other forms of EMI, connect **each** earth ground using a #16 AWG or larger wire. Keep these wires as short as possible.

See Figure 4 for the location of the earth grounding wire for the IO-R-34.

Figure 4   **Earth ground connection required to the IO-R-34 module as well as IO-R-16 modules, if used.**
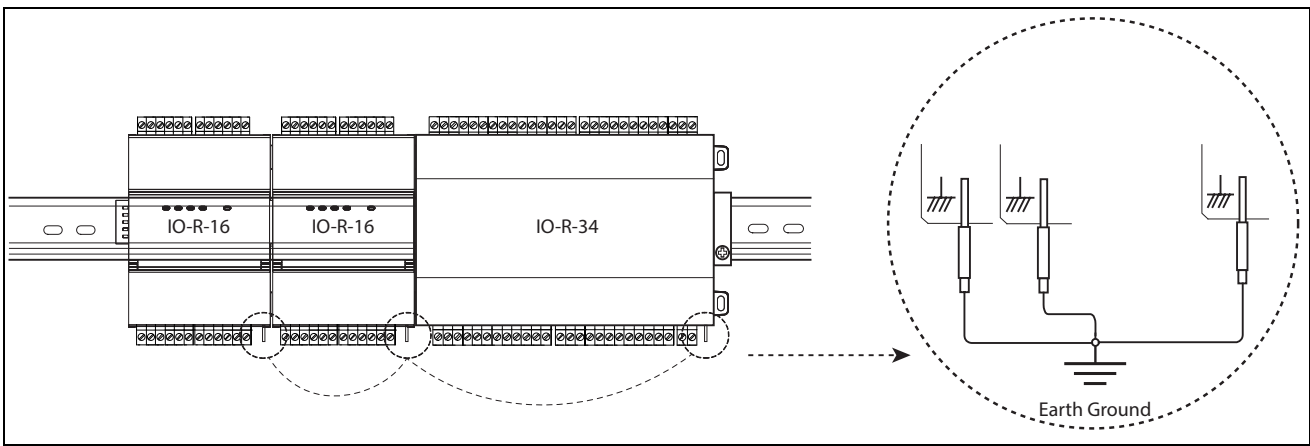
Power Wiring

The IO-R-34 can be powered by wiring to a **dedicated** Class 2, 24V transformer, or to a 24Vdc power source. The IO-R-34 can share transformer power with a JACE-8000.

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Note   If powering from a 24V transformer, do not also power equipment (other than a JACE-8000) with the same transformer. Otherwise, conducted noise problems may result. Also, do *not* ground either side of the transformer's 24V secondary.

As shown in Figure 5, the IO-R-34 2-position power connector is located at the lower corner of the unit. Unplug the connector from the module and install wire connections to the connector as shown.

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Note   Do not apply 24V power (reinsert connector plug into the IO-R-34) until all other wiring is completed, including IO-R-34 inputs and outputs. See "Power up and Initial Checkout," page 16.

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Caution   Do not connect two or more IO-R-34 modules together. Connecting IO-R-34 modules directly to each
other may allow for hardware configurations that lead to equipment damage.

Figure 5   **IO-34 Power Wiring to 24vac/dc Power Source, shared with JACE-8000.**
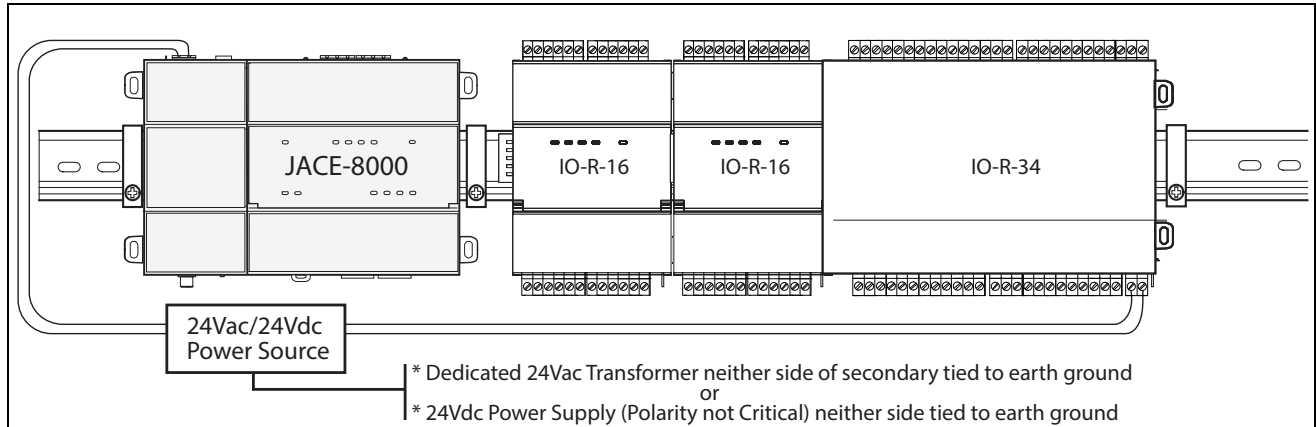
RS-485 Communications

RS-485 communications from the JACE-8000 controller to each IO module (or assembly of modules) requires a continuous "daisy-chain" wiring topology using a shielded, twisted-pair cable. Wire between the IO-R-16 assemblies using the 5-position end connectors. At the controller, wire to either of its 3-position RS-485 connectors.

Use shielded 18-22AWG wiring (refer to the TIA/EIA-485 standard). Wire in a continuous multidrop fashion, meaning "plus to plus," "minus to minus", and "shield to shield." Connect the shield wire (reference ground) to earth ground at one end only, such as at the JACE. See Figure 6.

Bias Settings

Each RS485 port on the JACE-8000 has an adjacent 3-position biasing switch, with these settings:
- **BIA** - (Default, middle) RS485 biasing and termination: 2.7K Ohm bias resistors with no termination resistor
- **END** - RS485 biasing and a termination: 562 Ohm bias resistors and 150 Ohm termination resistor
- **MID** - RS485 biasing or termination: 47.5K bias resistors with no termination resistor

Often, adding RS-485 biasing can improve communications by eliminating indeterminate idle states.
- **BIA** - (Default, middle) Often best if the RS485 trunk needs biasing, but when the controller is not installed at the end of the trunk.
- **END** - Often best if the controller is installed at the end of an RS485 trunk of devices that is not already biased.
- **MID** - Often best if the controller is put in the middle of an already-biased RS485 trunk.

If desired, you can change the position of an RS485 port's bias switch while the controller is running.

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Caution Connect S terminal wiring as shown in Figure 6 or communication errors may result. S terminal serves as reference ground between isolated RS-485 ports on JACE-8000 and IO-R-16 and IO-R-34 modules.

Figure 6 RS-485 wiring from the JACE to one or more IO-R-34 modules uses a "daisy-chain" connection.
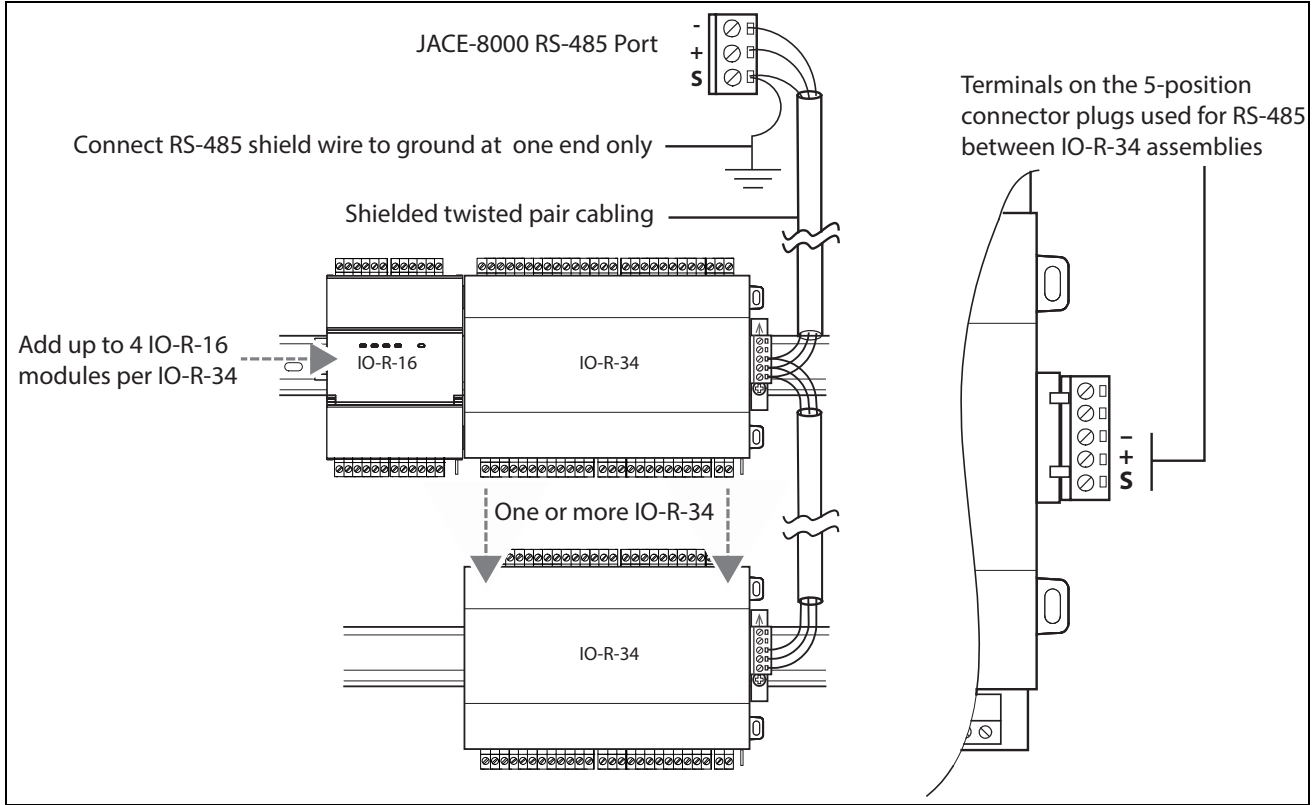
Inputs

Each of the 16 universal inputs (UI) can support any one of the following:

- Type-3 10K ohm Thermistor (also see Caution on page 12)
- Resistive 0-100K ohms
- 0–10 Vdc
- 4–20 mA
- Binary Input

Thermistor

The inputs support 10K Thermistor temperature sensors. Input accuracy is in the range of ±1% of span. By default, conversion is for a standard Type 3 thermistor sensor, with a sensor range of -10° to 135°F (-23.3° to 57.2°C). Using a conversion type of "Tabular Thermistor," you can specify a different thermistor response curve, by importing a thermistor curve .xml file. The *kitIo* module contains an xml folder with thermistor curves for a various thermistor temperature sensors. You can also edit and export (for reuse) *customized* thermistor curve xml files. See the *NRIO Driver Guide* for details.

Figure 7 shows the wiring diagram.

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