

SCADAPack E

5610 Input/Output Module Hardware Manual

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1 Legal Information

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

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2 Technical Support

Questions and requests related to any part of this documentation can be directed to one of the following support centers.

Technical Support: Americas, Europe, Middle East, Asia

Available Monday to Friday 8:00am – 6:30pm Eastern Time

Toll free within North America 1-888-226-6876

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3 Safety Information

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **can result in** death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.


Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

Before You Begin

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

| |
|--|
|  WARNING |
| EQUIPMENT OPERATION HAZARD <ul style="list-style-type: none">• Verify that all installation and set up procedures have been completed.• Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.• Remove tools, meters, and debris from equipment. Failure to follow these instructions can result in death or serious injury. |

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future reference.

Test all software in both simulated and real environments.

Verify that the completed system is free from all short circuits and grounds, except those grounds installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to help prevent accidental equipment damage.

Operation and Adjustments

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to help prevent unauthorized changes in operating characteristics.

Acceptable Use

SCADAPack E remote Programmable Automation Controllers (rPACs), Remote Terminal Units (RTUs) and input/output (I/O) modules are intended for use in monitoring and controlling non-critical equipment only. They are not intended for safety-critical applications.

WARNING

UNACCEPTABLE USE

Do not use SCADAPack E rPACs, RTUs, or I/O modules as an integral part of a safety system. These devices are not safety products.

Failure to follow this instruction can result in death or serious injury.

CAUTION

EQUIPMENT OPERATION HAZARD

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Use only Schneider Electric software or approved software with Schneider Electric hardware products.

Failure to follow these instructions can result in minor or moderate injury.

4 Documentation Check

Before you begin installation, verify that you are viewing the correct documentation. If your I/O expansion module looks like this (with green connectors and a black circuit board), continue with this manual.



SCADAPack 5610 I/O Expansion Module

If your I/O expansion module has grey connectors and a green circuit board, you will need to get the legacy hardware manual.

To access the legacy hardware manual, select the **Start or Windows** icon, then navigate to the **Schneider Electric** folder and select **SCADAPack E > User and Reference Manuals > Legacy Hardware Manuals**.

5 About this Manual

Audience

This manual is written for people who need to install, troubleshoot or maintain the Remote Terminal Unit (RTU) hardware. These individuals are typically:


- Systems Engineers
- Commissioning Engineers
- Maintenance Technicians

Scope

This manual describes:

- The physical design of the I/O expansion module, including detailed hardware specifications
- Installation, wiring and addressing for the I/O expansion module
- Diagnostics capabilities available on the I/O expansion module
- Maintenance recommendations for the I/O expansion module

Product Related Information

 **WARNING**

UNINTENDED EQUIPMENT OPERATION

The application of this product requires expertise in the design and programming of control systems. Only persons with such expertise should be allowed to program, install, alter and apply this product.

Follow all local and national safety codes and standards.

Failure to follow these instructions can result in death or serious injury.

Related Documents

Use this manual with other manuals included in your SCADAPack E documentation set. The table below lists the main manuals for the tasks described. However, it is not a complete list of the manuals available to you. Please see the SCADAPack E Reference Manual set for a complete listing of manuals.

| For Information About | See |
|--|--|
| Using the I/O expansion module with your Remote Terminal Unit (RTU). | I/O Expansion Technical Reference Manual The Hardware Manual for the RTU to which this I/O expansion module is connected. |

| | |
|---|--|
| Configuring I/O expansion module inputs and outputs | SCADAPack E Configurator User Manual Configuration Technical Reference Manual |
|---|--|

6 About the 5610 I/O Expansion Module

The 5610 I/O expansion module provides:

- 16 digital inputs
- 10 relay digital outputs

The 5610 I/O module is available as a standalone unit that can be added to the I/O expansion bus for the following RTUs:

- SCADAPack 312E
- SCADAPack 313E
- SCADAPack 314E
- SCADAPack 330E
- SCADAPack 333E
- SCADAPack 334E
- SCADAPack 337E

A maximum of eight (8) 5610 modules (and 5606, 5607, 5608, 5609 and 5611 modules together) can be addressed on a 5000 Series I/O bus.

This manual covers the powering, wiring and configuration of a 5610 I/O module only. It is meant to be used with the hardware manual of the respective RTU to which it is connected.

The 5610 I/O expansion module is shown in the image below:



Connections

The I/O expansion module includes a short intermodule cable for connecting to an RTU or to another I/O expansion module. For information about the maximum number of expansion modules supported, see the Specifications. For details on connecting I/O expansion modules, see [Connecting I/O Expansion Modules](#) [30].

Screw-termination connectors are provided for connecting the inputs and outputs to the devices you want to monitor or control. For details on wiring input and output connectors, see [Wiring Screw-Termination Connectors](#) [42].

Configuration

You can configure the I/O expansion module inputs and outputs using one of three methods:

- Locally or remotely using SCADAPack E Configurator, a software application that runs on a desktop or laptop computer connected to the RTU through the USB device port or through any of the available serial ports or Ethernet port.
- Remotely as part of an end-to-end SCADA system using the StruxureWare SCADA Expert

ClearSCADA software.

- Locally using applications created in the SCADAPack Workbench or ISaGRAF 3 Workbench user programming tools. Typically, applications created in these tools extend and enhance the functionality provided by the I/O expansion module. However, you can also write applications that replace the configuration functionality provided through the SCADAPack E Configurator software or the SCADA Expert ClearSCADA software.

Before you begin configuring the inputs and outputs on the I/O expansion module, determine whether the ClearSCADA software will be used for any configuration tasks. This documentation assumes you are using the SCADAPack E Configurator software to configure the I/O expansion module. For information about using the ClearSCADA software, see the ClearSCADA documentation.



7 **Hardware Overview**

The figure below shows the locations of the inputs and outputs on the device.



The following table describes input and output characteristics. The inputs and outputs use 5 mm (0.197 in.) pitch connectors. See the [Specifications](#)⁵⁸ section for the recommended wire sizes.

| Input/Output Type | Description |
|--|-------------------|
| Digital inputs ¹⁹ | 16 digital inputs |

| Input/Output Type | Description |
|--|---|
| | Optically isolated from logic power Wired to connectors P5 and P8 |
| Digital outputs  19 | 10 dry contact, digital (mechanical relay) outputs Wired to connector P7 |
| Input Power  18 | 11...30 Vdc input power Wired to connector P3 |

7.1 Power Supply

The I/O expansion module is powered primarily by the 11...30 Vdc power supply of the RTU. The analog inputs and optional analog outputs (where available), require an external 12 Vdc or 24 Vdc power supply connected to the input power supply of the I/O expansion module. For further information, see the [Power Supply Wiring](#) ²⁵ section.

7.2 Digital Inputs and Outputs

The I/O module expands the function of the RTU with 16 digital inputs and 10 dry digital (mechanical relay) outputs.

Digital inputs and outputs can be used to monitor or control panel lamps, relays, motor starters, solenoid valves, and other devices.

Digital inputs are available for nominal 12...24 Vdc operation. A current-limiting resistor on each input determines the voltage range.

The relay outputs are suited to applications that cannot tolerate any off-state leakage current, that require high load currents, or that involve non-standard voltages or current ranges.

Configuration

Using the SCADAPack E Configurator software, you can configure each input or output to define its characteristics, including:

- DNP3 attributes
- Point state
- Remote control interlock attributes
- Event attributes
- Alarm and trend attributes
- Properties
- Debounce time (inputs)
- Output pulse time (outputs)

For more information about configuring digital inputs and outputs, see the SCADAPack E Configurator User Manual and the Configuration Technical Reference Manual.

Specifications

For digital input and output specifications, see [Specifications](#) ⁵⁸.

[Digital Inputs](#) ¹⁹

[Digital Outputs](#) ¹⁹

Wiring

Digital inputs and outputs support solid or stranded wires from 3.3...0.08 mm² (12...28 AWG).

For more information, see [Wiring Screw-Termination Connectors](#) ⁴².

7.2.1 Digital Inputs

The I/O module expands the function of the RTU with 16 digital inputs.

The digital inputs are optically isolated from the logic power and are available in 12 or 24 Vdc voltage ranges. A current limiting resistor, on each input, determines the voltage range. Light Emitting Diodes (LED) on the digital inputs show the status of each of the input. The digital input LEDs can be disabled to conserve power.

To simplify field wiring, the 16 inputs are organized into two groups of eight inputs. Each group shares a common return. These groups of eight inputs are isolated from each other. Inputs 0 to 7 are in one group. Inputs 8 to 15 are in another group.

7.2.2 Digital Outputs

The I/O module expands the function of the RTU with 10 dry digital (mechanical relay) outputs.

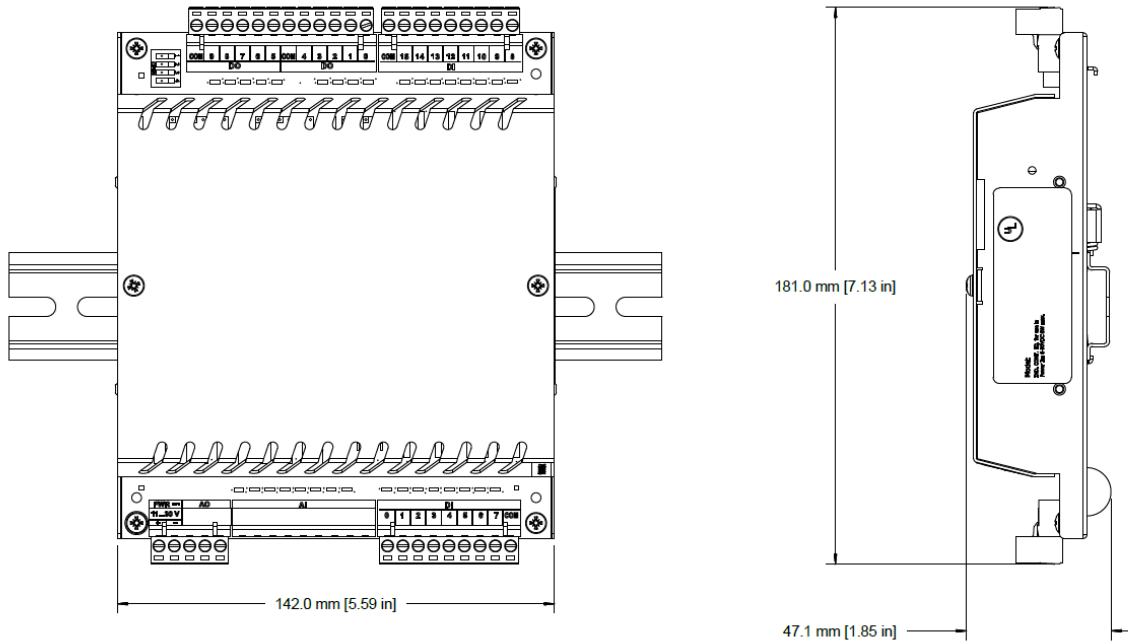
| |
|---|
| <p><i>NOTICE</i></p> |
| <p>UNINTENDED EQUIPMENT OPERATION</p> <p>Incandescent lamps and other loads may have inrush currents that will exceed the rated maximum current of the relay contacts. This inrush current may damage the relay contacts. Interposing relays need to be used in these situations.</p> <p>Failure to follow these instructions can result in equipment damage.</p> |

The 10 digital outputs are dry contact (mechanical) relay outputs. Outputs are Form A (normally open NO). Loads can be connected to either output terminal and to either the high or the low side of the power source. Light Emitting Diodes (LEDs) on the digital outputs show the status of each of the outputs. The digital output LEDs can be disabled to conserve power.

8 Installation

The topics in this section describe how to mount the I/O expansion module, power it, and connect it to the system I/O bus.

The following diagram shows the dimensions of the I/O expansion module.



For more information, see:

[Mounting the I/O Module](#) ^[21]

[Power Supply Requirements](#) ^[24]

[Power Supply Wiring](#) ^[25]

[Connecting I/O Expansion Modules](#) ^[30]

8.1 Mounting the I/O Module

The I/O expansion module mounts on a 7.5 x 35 mm (0.3 x 1.4 in) DIN rail.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment being monitored or controlled by the SCADAPack E RTU and the I/O expansion module before removing power.

Failure to follow these instructions can result in death or serious injury.

⚠ WARNING

ELECTRICAL HAZARD

Remove power from the I/O expansion module before mounting it on a DIN rail.

Do not remove the I/O expansion module cover when mounting the module. The I/O expansion module is designed so that it can be mounted on a DIN rail with the cover in place.

Failure to follow these instructions can result in death or serious injury.

NOTICE

UNINTENDED EQUIPMENT OPERATION

Installing the I/O expansion module in an environment where the electromagnetic compatibility (EMC) rating exceeds the certified EMC rating for the I/O expansion module can lead to unpredictable operation and unexpected results.

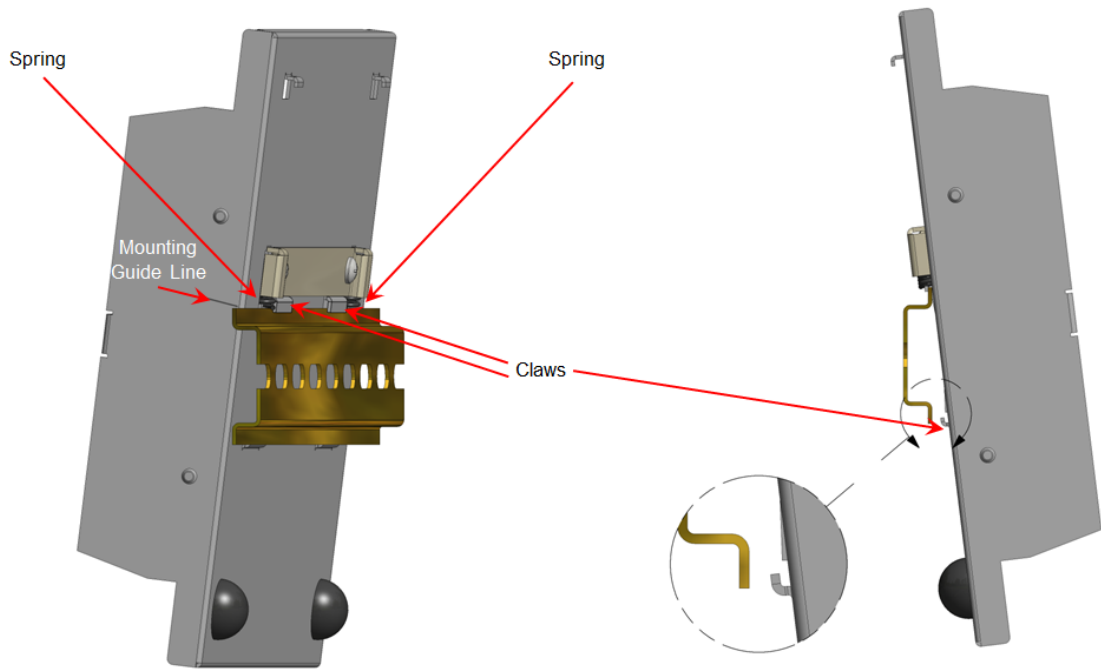
Failure to follow these instructions can result in equipment damage.

To Mount the I/O Expansion Module on a DIN Rail

The illustrations in this procedure show the correct way to mount the device on a horizontally oriented DIN rail. The steps to mount the device on a vertically oriented DIN rail are the same. Your device may look different from the device shown in the illustrations.

1. With the lower part of the device tilted away from the DIN rail, position the mounting guide line on the side of the device so that it is just above the edge of the DIN rail.

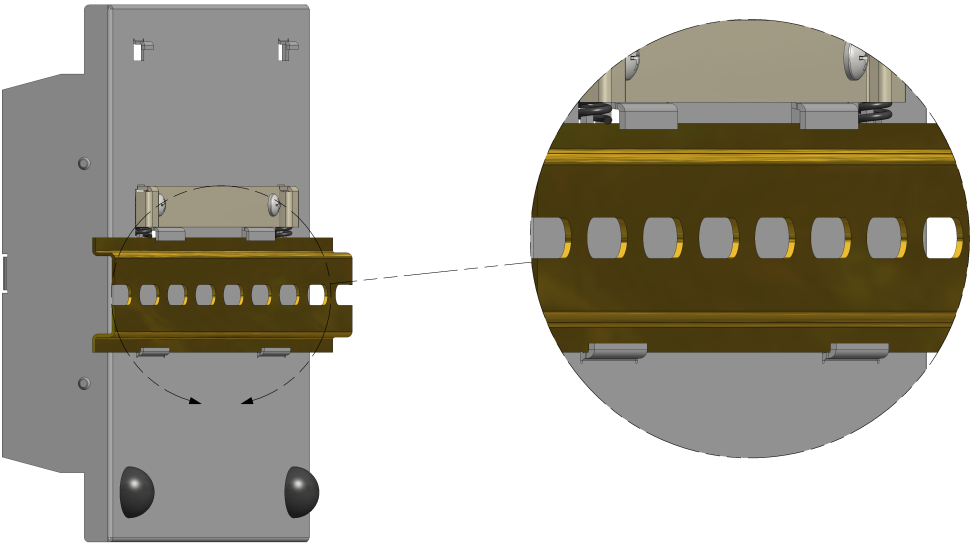
The springs on the back of the device should rest on the DIN rail and the edge of the DIN rail should be under the support claws that are adjacent to the springs, as shown below.



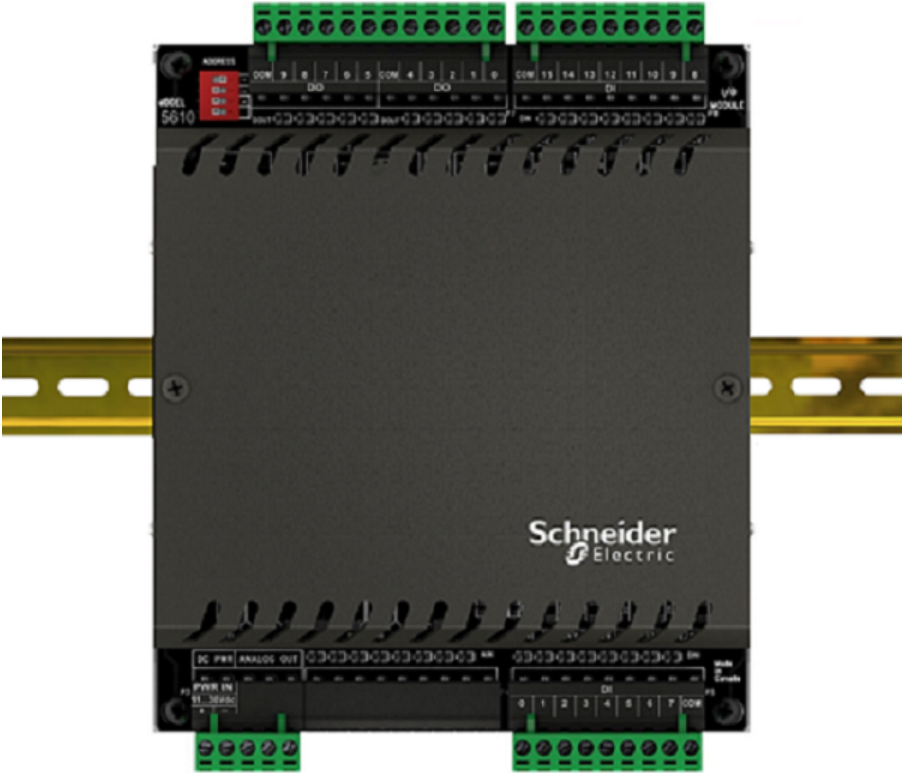
2. Push firmly on the device while tilting it toward the DIN rail until the DIN rail is positioned under both the upper and lower claws on the back of the device.
3. Release the pressure on the springs so that the DIN rail is held firmly in place between the upper and lower claws.

The mounting guide line should be aligned with the edge of the DIN rail.

The figure below shows a device with the DIN rail correctly positioned in the upper and lower claws on the back of the device.



The figure below shows the front view of a device that is mounted on a horizontally oriented DIN rail.



8.2 Power Supply Requirements

Analog outputs are not included in this calculation. Add 20 mA for each analog output used.

The power requirement of the I/O module is summarized in the table below:

| Digital Output Relays | LEDs | Digital Inputs | 24 Vdc | 5 Vdc Current Required from the RTU |
|-----------------------|------|----------------|--------|-------------------------------------|
| On | On | On | 2.2 W | 400 mA |

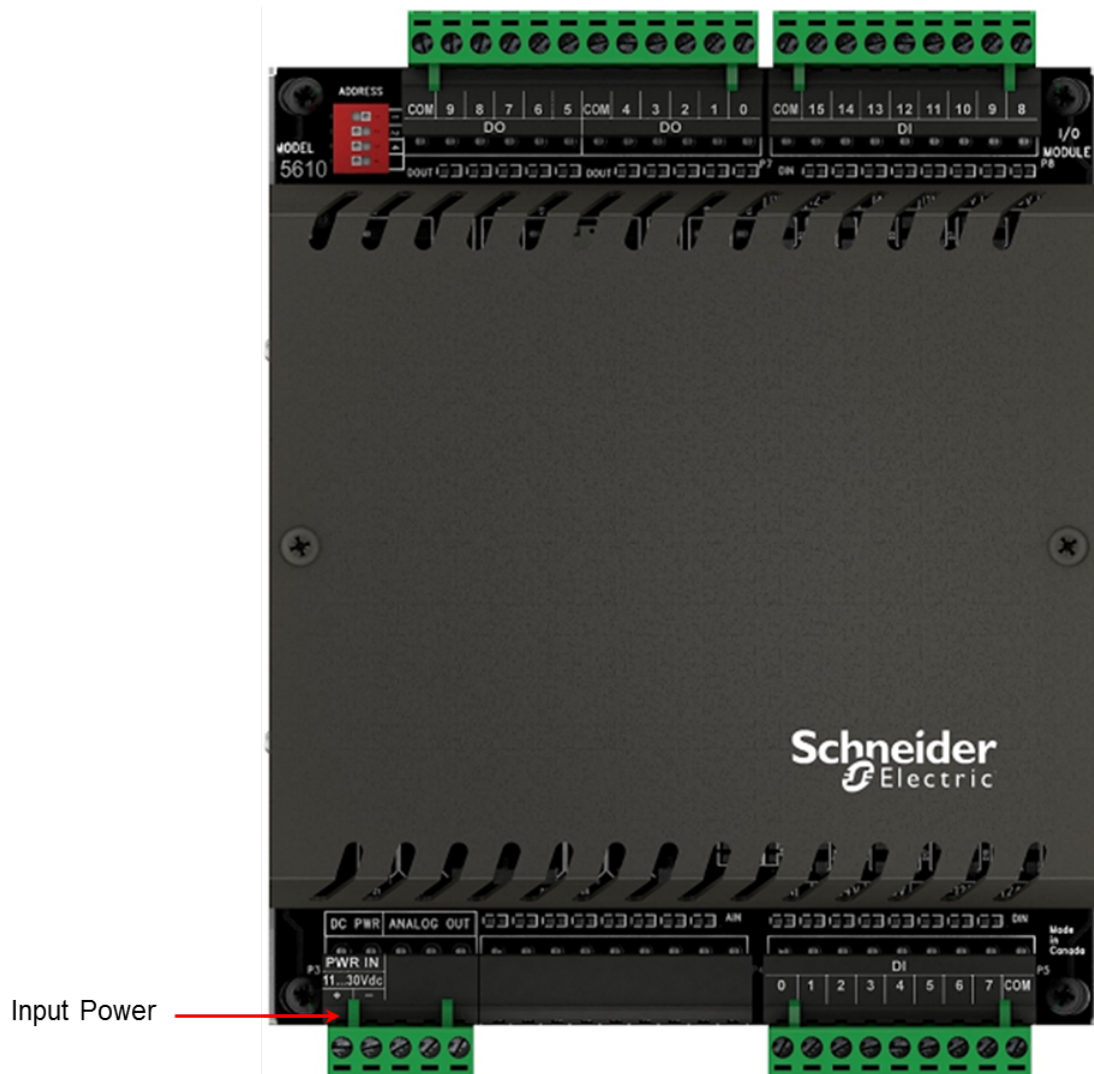
8.3 Power Supply Wiring

The I/O board requires a nominally 12 Vdc or 24 Vdc power supply applied to the terminals labeled 11...30 Vdc on connector P3 to power the analog input and optional analog output circuitry.

The current requirement of the analog portion (input and optional output circuitry) on the I/O board can vary from a minimum of 12 mA for basic operation of the analog circuitry plus an additional 40 mA for the optional analog outputs.

In addition, the system controller or power supply provides 5 Vdc through the I/O Bus cable. Refer to the [Specifications](#) section of the RTU manual for its power capabilities. A sample power calculation for a SCADAPack RTU with an integrated I/O board can be found in the manual of the corresponding RTU.

See the image below for the location of the input power connection.



Power for the I/O board can be provided in several ways:

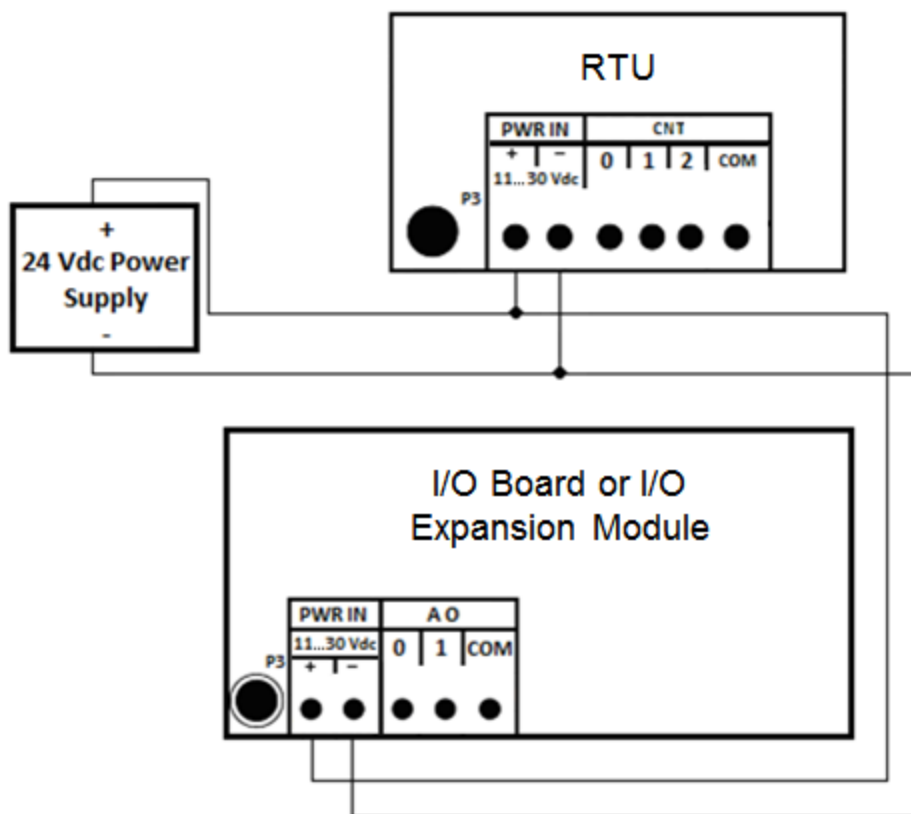
- With a 24 Vdc source connected to the PWR IN terminals on the controller board and on the I/O board in a parallel configuration. See [Recommended 24 Vdc Power Supply Configuration](#)^[27] for an example of this wiring configuration.
- With a 12 Vdc source connected to the PWR IN terminals on the controller board and on the I/O board in a parallel configuration. See [Recommended Battery Configuration](#)^[28] for an example of this wiring configuration.
- With a 5103 Uninterruptible Power Supply (UPS) providing 5 Vdc to the controller board through the IMC cable and 24 Vdc to the I/O board through the 24 Vdc output. See [Recommended 5103 Power Supply Configuration](#)^[29] for an example of this wiring configuration.

For information about grounding the system, see [System Grounding](#)^[29].

8.3.1 Recommended 24 Vdc Power Supply Configuration

This configuration uses a 24 Vdc power supply to power the RTU and the I/O board or I/O expansion module. This 24 Vdc is also used to power the analog circuitry on the I/O board or the I/O expansion module.

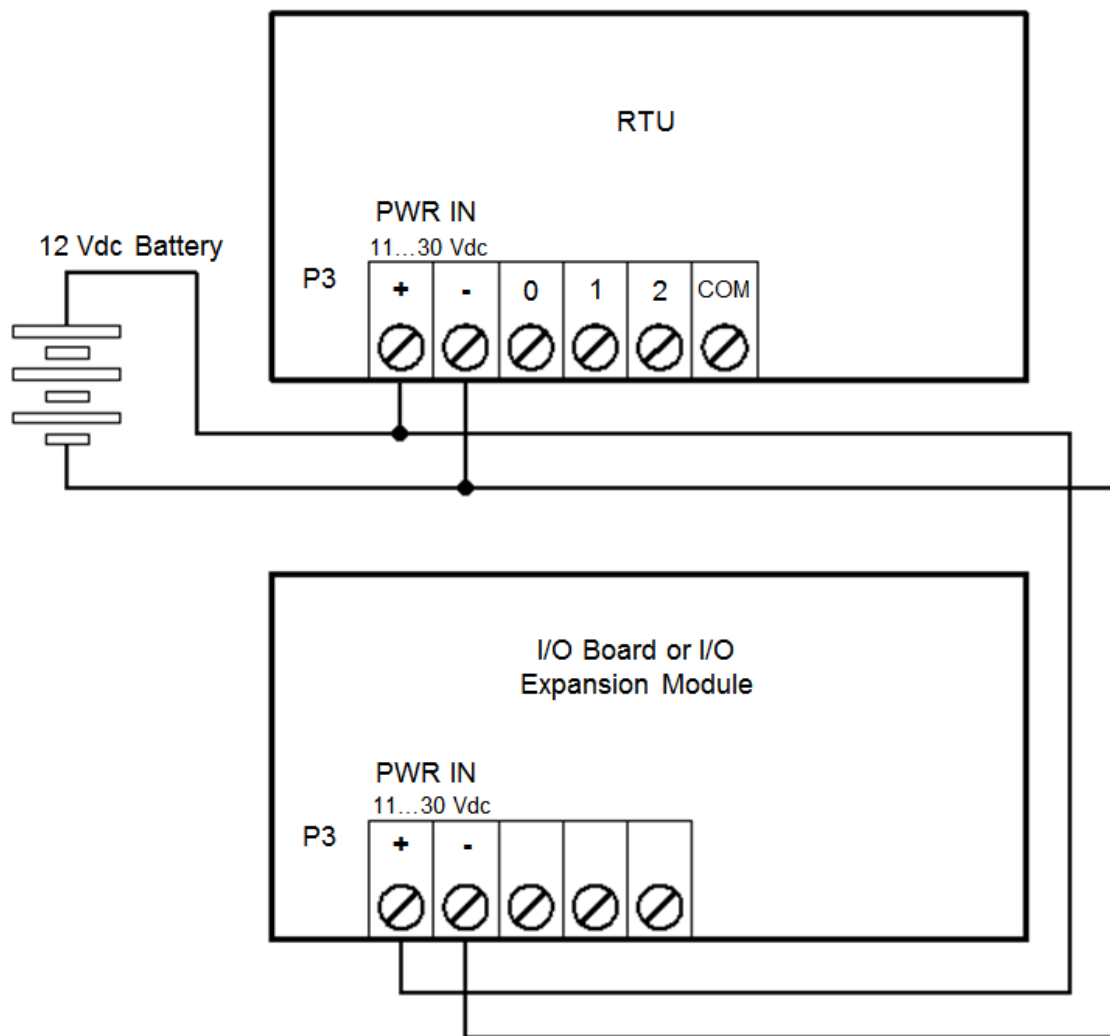
- This configuration is recommended when a large amount of current is required at 24 Vdc. Refer to the [Specifications](#) ⁵⁸ section.
- Connect the controller board **PWR IN** terminal to the same power supply as the I/O board or I/O expansion module **PWR IN** terminal.



8.3.2 Recommended Battery Configuration

This configuration uses a 12 V battery to power the RTU and the I/O board or I/O expansion module. This 12 V battery is also used to power the analog circuitry for the analog inputs and optional analog outputs (where available) on the I/O board or I/O expansion module.

- This configuration is recommended when a large amount of current is required at 12 Vdc. Refer to the [Specifications](#) ⁵⁸ section for power requirements from a 12 V battery.
- Connect the RTU **PWR IN** terminal to the same power supply as the I/O board or I/O expansion module **PWR IN** terminal.



8.3.3 Recommended 5103 Power Supply Configuration

When additional power is required by the system, 5103 power supplies can be used in combination with the RTU. The 5103 power supplies can be connected anywhere downstream (to the right) of the RTU. They supply power to the modules that are downstream from them.

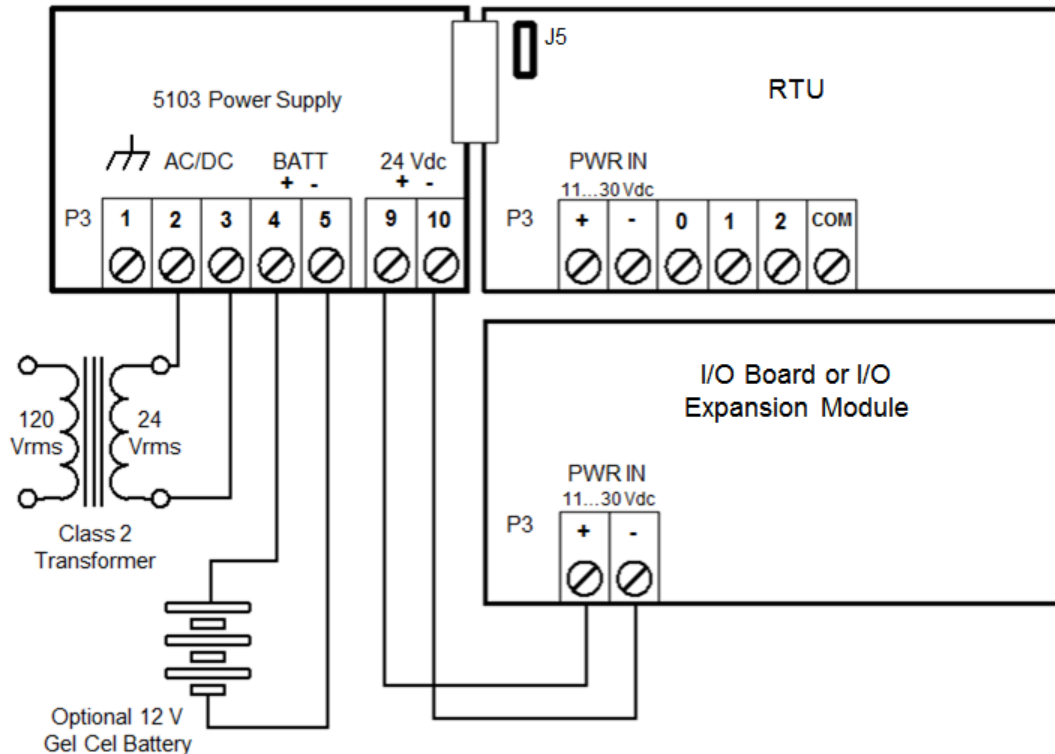
The 5103 power supply can also be connected upstream (to the left) of the RTU, but only if the following conditions are met:

- No power is applied to the power inputs of the controller board
- A jumper is installed at position J5

This configuration uses a 5103 Uninterruptible Power Supply (UPS) to power an RTU. The 24 Vdc output from the 5103 powers the I/O board. The 5103 power supply provides a 5 Vdc output to power the I/O board, the RTU and any additional 5000 series modules through the intermodule cables.

No connection is made to the **PWR IN** terminals on the RTU.

The diagram below is representational, meant to illustrate the power connections of the devices.



8.3.4 System Grounding

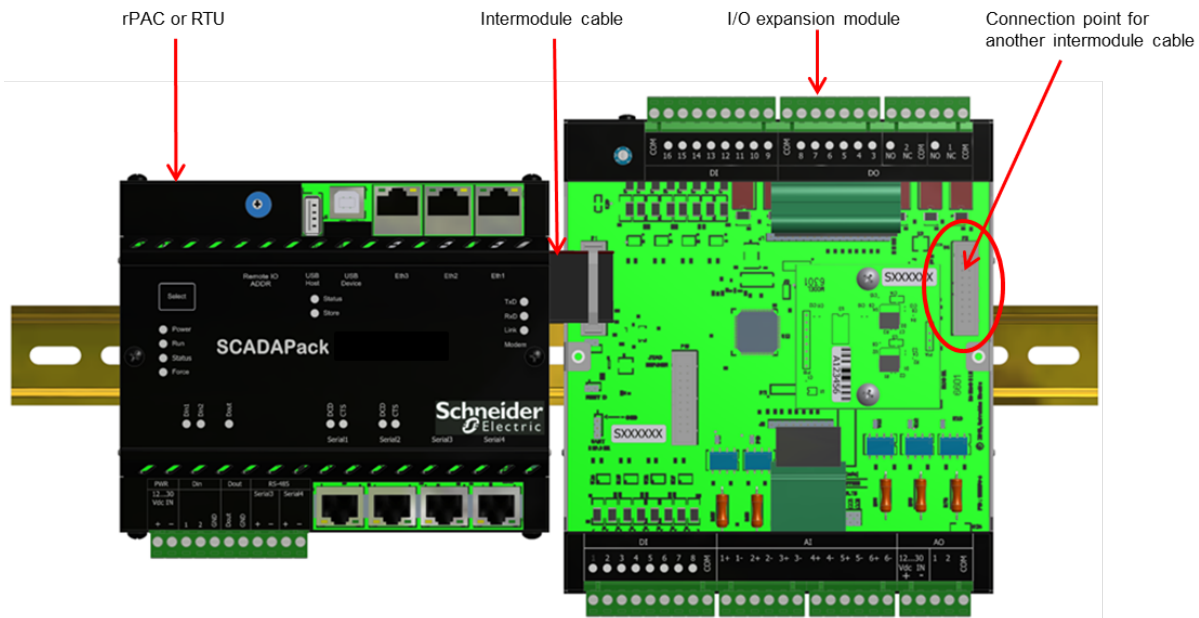
Ground the system by connecting the system power supply common, to the chassis or panel ground. On the I/O board, the negative (-) terminal of the 11...30 Vdc supply (PWR IN) along with terminals labeled COM are isolated from the chassis.

8.4 Connecting I/O Expansion Modules

The topics in this section describe how to attach I/O expansion modules to an rPAC or RTU, or to another I/O expansion module.

I/O expansion modules are mounted on a 7.5 x 35 mm (0.3 x 1.4 in) DIN rail then connected to an rPAC or RTU using intermodule cables. The intermodule cable is a ribbon cable that distributes power and communications signals from the rPAC or RTU to the I/O expansion modules. These power and communication signals are referred to as the I/O bus.

The figure below shows a SCADAPack E rPAC or RTU with an I/O expansion module connected to it. You can connect multiple I/O expansion modules to a single rPAC or RTU up to the maximum number of modules supported by the device. See the rPAC or RTU hardware manual for details.



Before [attaching intermodule cables](#) ^[33], read the [Precautions](#) ^[31] and the [General Connection Rules](#) ^[32]. If you are connecting a 5000 series I/O expansion module to a SCADAPack 530E or SCADAPack 535E, read the SCADAPack 530E and SCADAPack 535E Connection Rules.

8.4.1 Precautions

Before connecting I/O expansion modules:

- Confirm that the power supply is rated for the total number of modules in the system. Some I/O expansion modules, such as those with analog outputs, require an additional DC power supply to operate. See the I/O expansion module hardware manual for details.
- Confirm that the intermodule cables you are using do not exceed the maximum total cable length. See [Maximum Intermodule Cable Length](#) ³².
- Review the recommendations below to help avoid static electricity damage.

NOTICE

STATIC ELECTRICITY DAMAGE

Static electricity damage can cause intermittent or total loss of equipment operation. To help avoid static electricity damage:

- Wear an anti-static wrist strap that is connected to ground if you need to remove the device cover.
- Use the shortest length intermodule cable that is practical. This helps to minimize voltage drops and interference from electrical noise.
- Keep the intermodule cable away from electrical noise sources such as inductive load switching and variable frequency drives.
- If you are using a shielded cable, connect the shielding wire on the intermodule cable to a convenient chassis ground point. There is a small hole in the I/O expansion module for grounding the shielding wire.
- Do not install intermodule cables in the same cable tray or in parallel with field wiring. Intermodule cables can cross field wiring at 90° if necessary.

Failure to follow these instructions can result in equipment damage.

8.4.2 Connection Rules

This topic summarizes the rules for maximum intermodule cable length and shielded intermodule cables. These rules apply to every SCADAPack E rPAC and RTU.

Maximum Intermodule Cable Length

I/O expansion modules ship with a short intermodule cable that is used to connect to I/O expansion modules to an rPAC or RTU, or to another I/O expansion module.

The maximum total intermodule cable length in a single system is 1.2 m (48 in). This length restriction does not include the short intermodule cable supplied with the I/O expansion module. Schneider Electric offers several cables lengths that can be combined to reach the 1.22 m (48 in) limit.

A 30 cm (12 in) or a 76 cm (30 in) cable is typically used to connect modules on separate DIN rails.

To purchase additional intermodule cables, contact your Schneider Electric representative.

Shielded Intermodule Cables

Intermodule cables longer than 30 cm (12 in) are shielded for physical protection and for protection from electrical noise. Shielded intermodule cables have a foil and braid shielding. The shielding is connected to a terminal lug at one end of the cable.

When using a shield for an intermodule cable, fasten the shield only to the module that is closest to the rPAC or RTU. Connect the shield to the enclosure using the self-tapping screw provided.

8.4.3 Attaching Intermodule Cables

This topic describes how to attach an intermodule cable between an rPAC or RTU and an I/O expansion module. Follow the same steps to connect two I/O expansion modules.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment being monitored or controlled by the rPAC or RTU and the I/O expansion module before removing power.

Failure to follow these instructions can result in death or serious injury.

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

The I/O bus does not support live-swapping.

Remove power from the rPAC or RTU and the I/O expansion module before removing the cover.

Failure to follow these instructions can result in death or serious injury.

NOTICE

STATIC ELECTRICITY DAMAGE

Static electricity damage can cause intermittent or total loss of equipment operation.

Always wear an anti-static wrist strap that is connected to ground when you remove the device cover.

Failure to follow these instructions can result in equipment damage.

Cabling guidance

- Use the shortest length intermodule cable that is practical. This helps to minimize voltage drops and interference from electrical noise.
- Keep the intermodule cable away from electrical noise sources such as inductive load switching and variable frequency drives.
- If you are using a shielded cable, connect the shielding wire on the intermodule cable to a convenient chassis ground point. There is a small hole in the I/O expansion module for grounding the shielding wire.
- Do not install intermodule cables in the same cable tray or in parallel with field wiring. Intermodule cables can cross field wiring at 90° if necessary.

To Attach Intermodule Cables

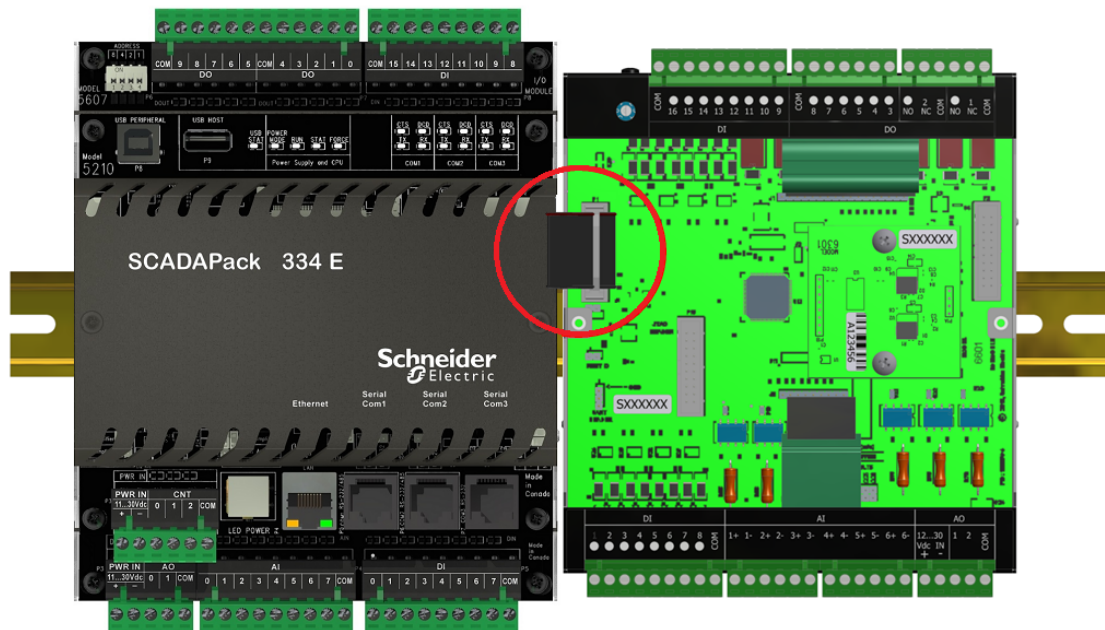
1. Power down each rPAC, RTU and I/O expansion module that you are connecting.
2. Remove the cover from the device if required to access the intermodule cable.
3. Press one end of the intermodule cable firmly into the I/O bus connector on the rPAC or RTU.

If you are connecting a 5000 series I/O expansion module to a SCADAPack 530E, a SCADAPack 535E or a 6000 series I/O expansion module, connect the 20-pin end of the adaptor provided (part number TBUM297138) to the rPAC or 6000 series module and the 16-pin end of the adaptor to the 16-pin intermodule cable provided with the 5000 series I/O expansion module.

The connectors on intermodule cables are keyed so they can only be inserted in one direction. If the connector does not push easily into the I/O bus connector, reverse it and try again.

4. Press the other end of the intermodule cable firmly into the I/O bus connector on the I/O expansion module.

The illustration below shows a connected intermodule cable. While the size and shape of your devices may differ, the location of the intermodule cable is the same on each device type.



5. Replace the cover on the I/O expansion module, and the rPAC or RTU if it was removed.
6. Apply power to the rPAC or RTU.

You are now ready to configure the I/O module.

9 Addressing

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Review the power requirements for the I/O expansion modules before combining modules.

Failure to follow these instructions can result in death or serious injury.

I/O expansion modules can be combined up to the maximum number supported by the RTU. See the Specifications section to determine the power requirements for your I/O module(s).

Each I/O expansion module address is set to 0 at the factory. The address may need to be changed when you add an I/O expansion module to your system.

For more information, see the following topics.

[Addressing Rules](#) ³⁵

[Setting the I/O Expansion Module Address](#) ³⁷

9.1 Addressing Rules

I/O expansion modules are shipped from the factory at address 0. If the modules on the I/O bus are different types, for example a digital input module and an analog input module, then no address changes are necessary.

NOTICE

UNDETECTED ADDRESS CONFLICT

SCADAPack 530E and SCADAPack 535E rPACs do not detect address conflicts on 5000 series I/O expansion modules. As a result, addressing conflicts on these modules do not generate a system error code in SCADAPack E Configurator.

Verify that each 5000 series I/O expansion module is addressed according to the rules below.

Failure to follow these instructions can result in equipment damage.

If you do need to set the hardware address on your I/O expansion module, keep the following in mind:

- No two digital input modules can have the same address.
- No two digital output modules can have the same address.
- No two analog input modules can have the same address (including the 5505 RTD).
- No two analog output modules can have the same address.
- No two 5606, 5607, 5608, 5610 or 6601 modules can have the same address.
- The 5606, 5607, 5608 and 5610 I/O expansion modules can be configured for addresses 0 to 7. As a result, a total of 8 of these modules, in any combination, is supported on the I/O bus at one time.

- The 5606 and 5607 I/O expansion modules share the same address numbering; if both these modules are installed on the same I/O bus, they need to have unique address numbers.

The table below summarizes the number of I/O expansion module hardware addresses available on each rPAC or RTU type. The number of modules that can be connected to each rPAC or RTU depends on the device type. For details, see the hardware manual.

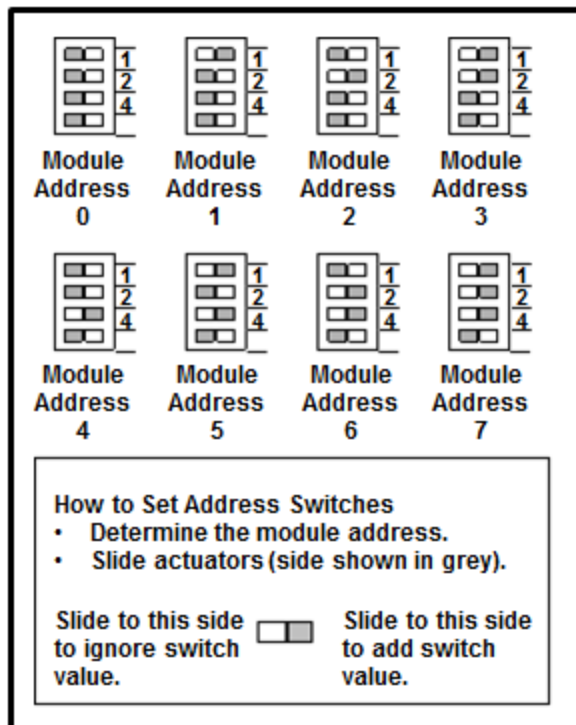
| Device Type | Number of I/O Expansion Addresses Available |
|----------------|---|
| SCADAPack 312E | 14 |
| SCADAPack 313E | 14 |
| SCADAPack 314E | 14 |
| SCADAPack 330E | 15 |
| SCADAPack 333E | 14 |
| SCADAPack 334E | 14 |
| SCADAPack 337E | 14 |
| SCADAPack 350E | 15 |
| SCADAPack 357E | 14 |
| SCADAPack ES | 16 |
| SCADAPack 530E | 16 |
| SCADAPack 535E | 15 |

9.2 Setting the I/O Expansion Module Address

Three address switches on the I/O module, labeled 4, 2, and 1 set the address. An I/O module that is installed in a SCADAPack is generally set to address 0. Address 0 can be used if there is no other module of the same type installed in a SCADAPack. A second module of the same type is generally set to address 1.

To Set the Address

1. Open the four switches by sliding the actuators to the **OFF** position.
2. Close the switches that total to the desired address by sliding the actuators to **ON**. Switch settings for each of the 8 module addresses are shown in the figure below.



10 Field Wiring

Each input and output on the I/O expansion module can be connected to a device that you want to monitor or control. In general, inputs are used to monitor devices, while outputs are used to control devices.

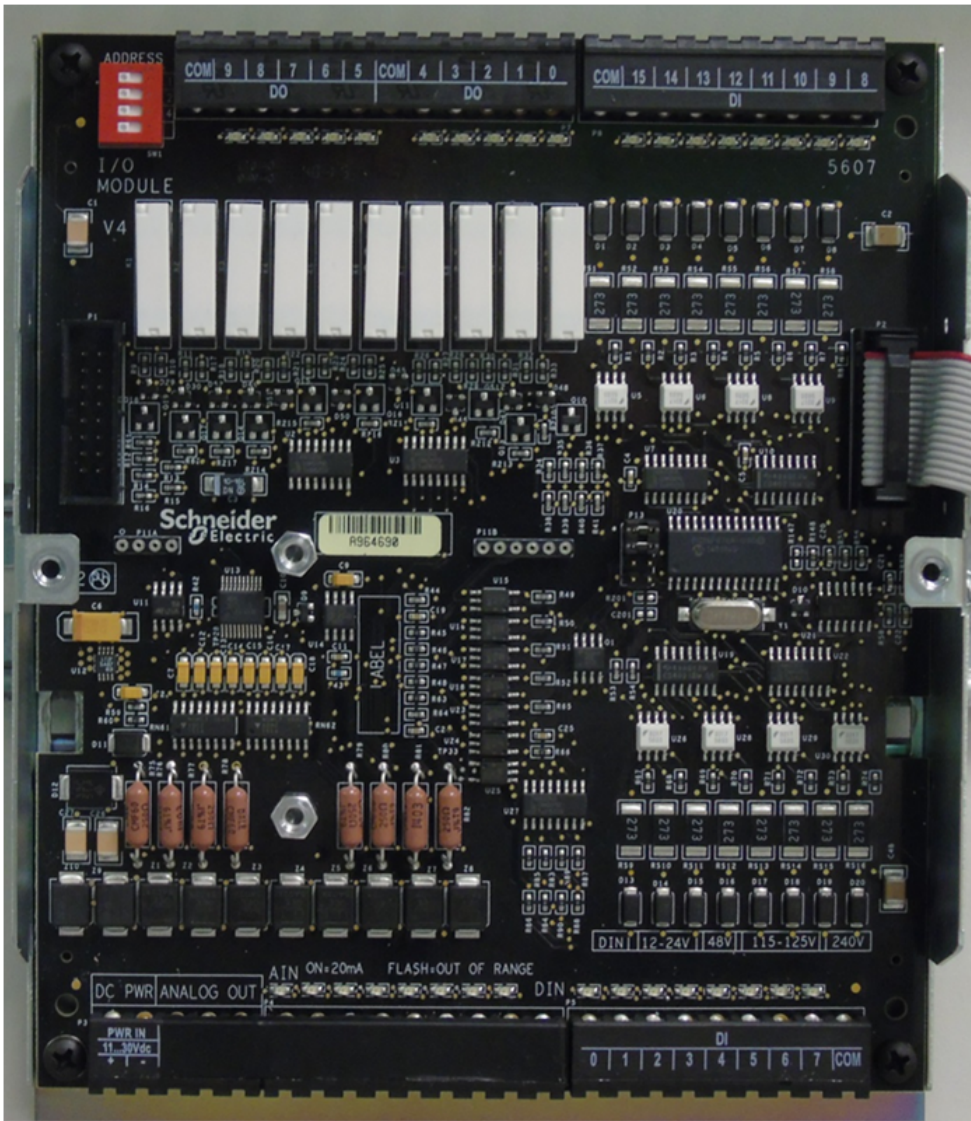
The I/O expansion modules use screw termination style connectors for termination of field wiring. These connectors accommodate solid or stranded wires from 3.3...0.08 mm² (12...28 AWG). The connectors are removable allowing replacement of the module without disturbing the field wiring. Leave enough slack in the field wiring for the connector to be removed.

The 5610 I/O Module has termination connectors for the connection of field wiring. Refer to the board image below for wiring connector locations.

- The digital inputs are wired to connectors P5 and P8.
- The digital outputs are wired to connector P7.
- Primary power input connections are wired to connector P3.

Digital Outputs 0 - 9
Connector P7

Digital Inputs 8 - 15
Connector P8



Power
Connector P3

Digital Inputs 0 - 7
Connector P5

Generally, power supply ports and input/output (I/O) ports provide a level of protection against over-voltages and other conditions. For ease of wiring and maintenance, external connections are terminated on removable connectors. If you need to remove the I/O expansion module cover for any reason, first carefully consider the following information.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment being monitored or controlled by the RTU or the I/O expansion module before removing power.

Failure to follow these instructions can result in death or serious injury.

⚠ WARNING

ELECTRICAL HAZARD

Remove power from the I/O expansion module before removing the I/O expansion module cover.

Failure to follow these instructions can result in death or serious injury.

NOTICE

STATIC ELECTRICITY DAMAGE

The electronics inside the I/O expansion module can be damaged by static electricity. If you need to remove the I/O expansion module cover, wear an anti-static wrist strap that is connected to ground. Failing to follow this simple step can cause intermittent or total loss of I/O expansion module operation and will void the warranty.

Failure to follow these instructions can result in equipment damage.

See the following topics for more wiring information:

[Wiring Screw-Termination Connectors](#) ⁴²

[Digital Input Wiring](#) ⁴⁴

[Digital Output Wiring](#) ⁴⁶

10.1 Wiring Screw-Termination Connectors

Screw-termination style connectors are provided to terminate wiring from:

- Power supplies
- Input/output (I/O) devices

These 5 mm (0.197 in.) pitch connectors support solid or stranded wires from 3.3...0.08 mm² (12...28 AWG).

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Evaluate the operational state of the equipment being monitored or controlled by the RTU or the I/O expansion module before removing power.

Failure to follow these instructions can result in death or serious injury.

NOTICE

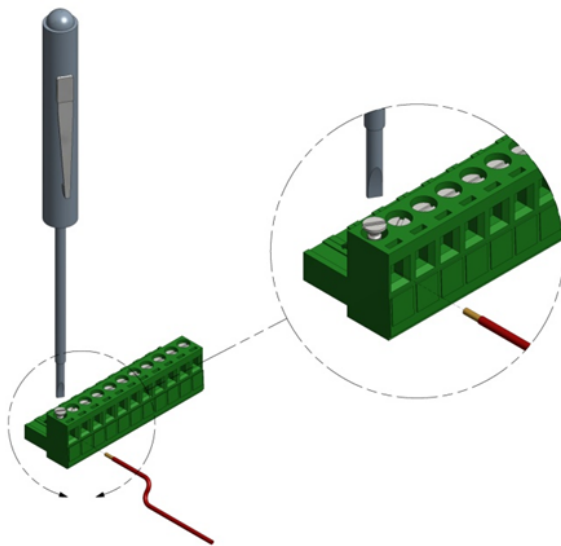
UNINTENDED EQUIPMENT OPERATION

Remove power from the device before servicing.

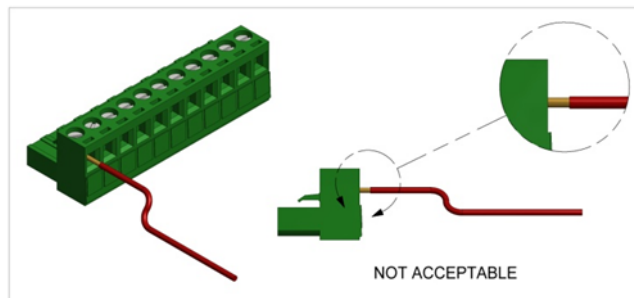
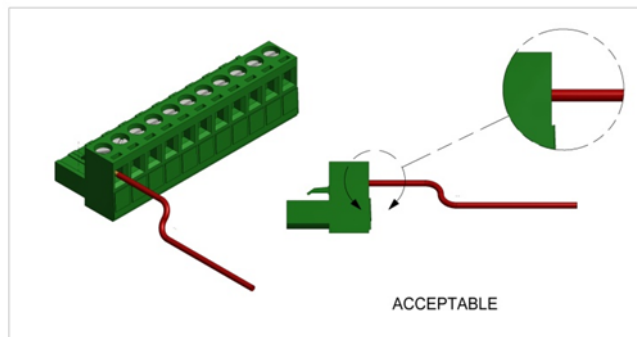
Failure to follow these instructions can result in equipment damage.

To wire a connector

1. Use a slotted screwdriver to loosen the termination screw.



2. Insert the stripped wire into the connector so that the bared wire is located under the screw.
As illustrated below, place the bared wire fully within the connector.



3. Apply 0.5 N•m (4.5 lb-in) torque to tighten the screw so the wire is held firmly in place.

10.2 Digital Input Wiring

This section describes the wiring for the digital inputs.



[Digital Input Wiring Example](#) ⁴⁵

10.2.1 Digital Input Wiring Example

⚠️WARNING

HAZARD OF ELECTRIC SHOCK

Remove power from all devices before connecting or disconnecting inputs or outputs to any terminal or installing or removing any hardware.

Failure to follow these instructions can result in death or serious injury.

NOTICE

UNINTENDED EQUIPMENT OPERATION

When wiring digital inputs:

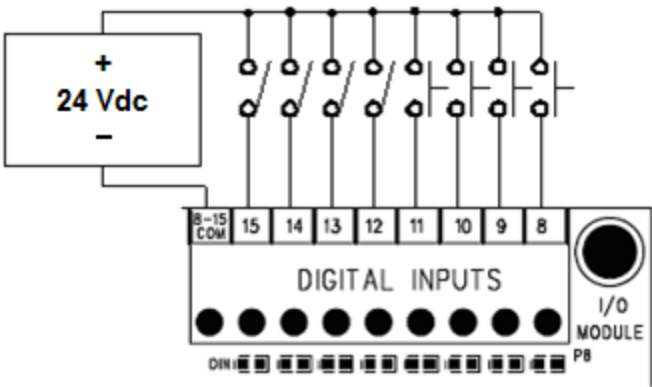
- Confirm that the connection to the digital input does not exceed the ratings for the digital input. See the [Specifications](#) ⁵⁸ section for details.
- Confirm that the polarity of the connection is correct with the two positive terminals wired together and the two negative terminals wired together.

Failure to follow these instructions can result in equipment damage.

The I/O board accommodates DC inputs.

The voltage range is configured at the factory.

The following diagram shows typical wiring of DC signals to the digital input ports.



P8 – Digital Inputs
Module factory-configured for 12...24 Vdc.

10.3 Digital Output Wiring

This section describes the wiring for the digital outputs.



[Digital Output Wiring Example](#) 

10.3.1 Digital Output Wiring Example

⚠ WARNING

HAZARD OF ELECTRIC SHOCK

Remove power from all devices before connecting or disconnecting inputs or outputs to any terminal or installing or removing any hardware.

Failure to follow these instructions can result in death or serious injury.

NOTICE

RELAY CONTACT DAMAGE

Incandescent lamps and other loads may have inrush currents that exceed the rated maximum current of the relay contacts. This inrush current may damage the relay contacts. Use interposing relays in these situations.

When controlling inductive loads, the relay contacts on digital outputs must be protected. The energy stored in inductive loads generates electrical noise when the relay contacts are opened.

To suppress the noise in DC circuits, place a diode across the coil.

Failure to follow these instructions can result in equipment damage.

NOTICE

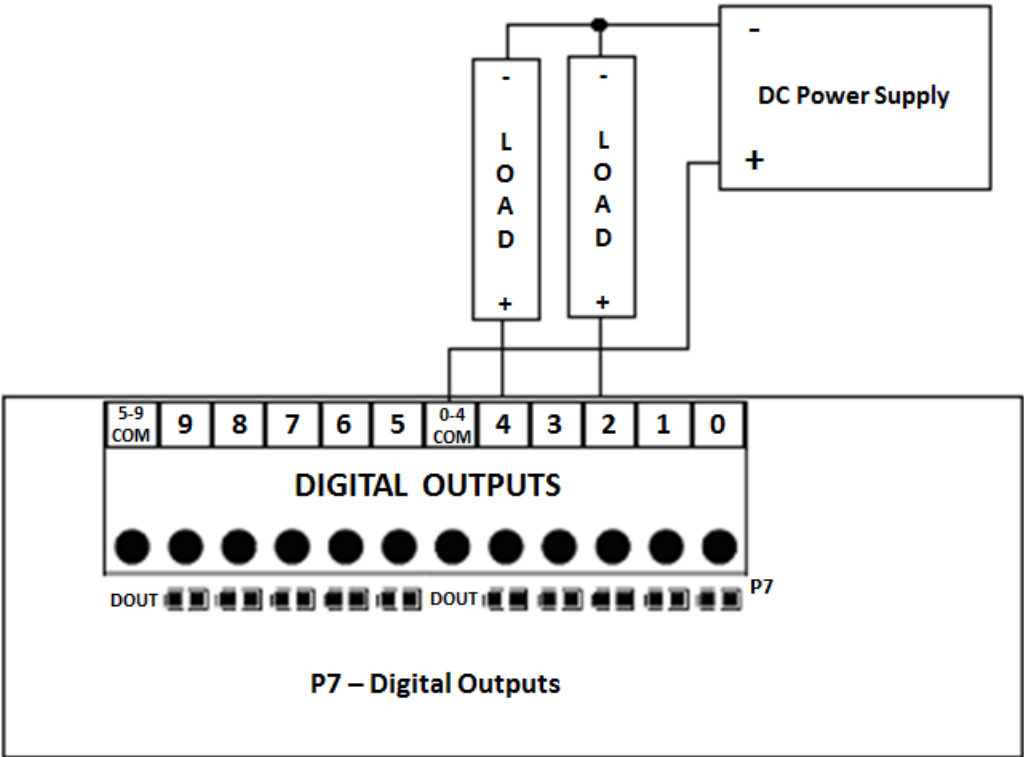
UNINTENDED EQUIPMENT OPERATION

External lightning protection is required if the device being controlled is outside the physical area (cubicle or building) in which the module is located.

Failure to follow these instructions can result in equipment damage.

Wiring Example

In the example below, relays 2 and 4 are used to switch the DC power to two loads. In this example the positive side of the loads are switched through the common of relays 0 - 4 to the positive side of the DC power supply.



11 Configuration

The inputs and outputs on the I/O expansion module can be configured:

- Locally or remotely using **SCADAPack E Configurator**, a software application that runs on a desktop or laptop computer.
- Remotely as part of an end-to-end SCADA system using the **StruxureWare SCADA Expert ClearSCADA** software.
- Locally using applications created in **SCADAPack Workbench** or **ISaGRAF 3 Workbench**.

Before you begin configuration, determine whether the SCADA Expert ClearSCADA software will be used for any configuration tasks. This documentation assumes you are using the SCADAPack E Configurator software for configuration. For information about using the ClearSCADA software, see the ClearSCADA documentation.

[SCADAPack E Configurator](#)  501

[Reading and Writing Data with Logic Programs](#)  521

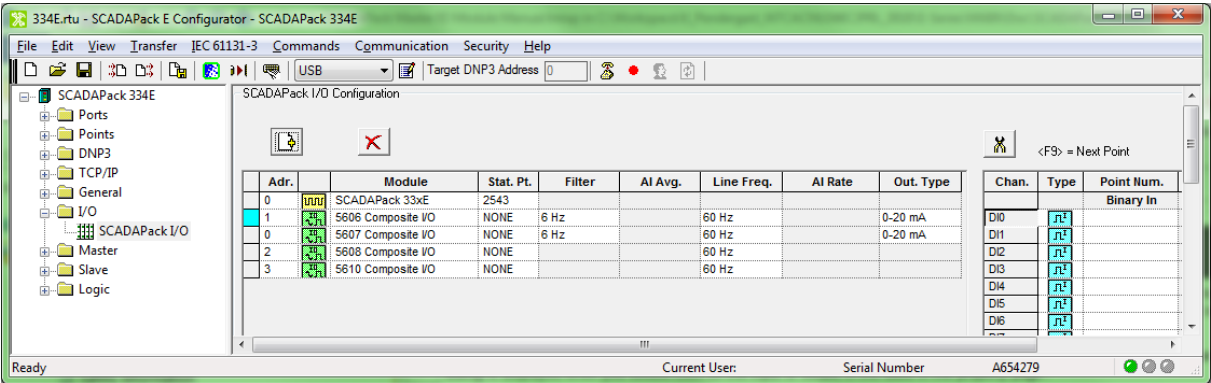
11.1 SCADAPack E Configurator

The SCADAPack E Configurator software provides a graphical user interface that allows you to configure the inputs and outputs and to load those settings onto the RTU. It also integrates with SCADAPack Workbench and ISaGRAF 3 Workbench so you can build and diagnose IEC61131-3 sequences that extend the RTU capabilities.

The following table summarizes where in the SCADAPack E Configurator software you will find the configurable attributes for the I/O board inputs and outputs. The configuration dialog is displayed when you double-click on the input or output in the table in the property page..

| Hardware Label | SCADAPack E Configurator Folder | SCADAPack E Configurator Property Pages |
|----------------|---------------------------------|---|
| DI | Points | Binary Points Counter Points |
| | I/O | SCADAPack IO |
| DO | Points | Binary Points |
| | I/O | SCADAPack IO |

The figure below shows an example SCADAPack I/O property page in SCADAPack E Configurator and the location of the other property pages listed in the table. The I/O components on the SCADAPack I/O depend on the RTU type and the attached I/O modules. For details about using SCADAPack E Configurator, refer to the SCADAPack E Configurator User Manual.



11.2 Reading and Writing Data with Logic Programs

IEC 61131-3 applications use I/O connections to the SCADAPack E RTU points database to access physical I/O points and derived data. Use SCADAPack E Configurator to assign RTU database points to the I/O card channels.

The following table provides a guide to reading and writing data in either SCADAPack Workbench or ISaGRAF 3 Workbench.

| Data Type | SCADAPack Workbench | ISaGRAF 3 Workbench |
|------------------|---|---|
| Digital I/O Data | <ul style="list-style-type: none">• Use RTU_BIN_READ I/O devices to read data.• Use RTU_BIN_READ_OUTPUT I/O devices to read digital output point states.• Use RTU_BIN_WRITE I/O devices to write digital input or output points. | <ul style="list-style-type: none">• Use rtuxxdi, rtuxxdo or rtuxxdos I/O boards to read or write to digital inputs or outputs. |

More Information

Refer to the SCADAPack E Target 5 Technical Reference Manuals, ISaGRAF 3 Technical Manuals, or the SCADAPack E Configurator User Manual for information about how to assign RTU points.

12 Diagnostics

The I/O expansion module provides LEDs that indicate the status of inputs and outputs. There are also a number of actions you can take to determine the cause of unexpected activities. For more information, see:

[LEDs](#) 

[Digital Inputs](#) 

[Digital Outputs](#) 

12.1 LEDs

The table below describes the LEDs on the I/O board. LEDs can be disabled by the controller board to conserve power. Refer to the manual of your controller board for details on disabling the LEDs.

| LED | Function |
|---------------------|---|
| Digital output (DO) | On when the corresponding digital output is on. |
| Digital input (DI) | On when the corresponding digital input is on. |

12.2 Digital Inputs

| Condition | Action |
|--|--|
| Input LED does not come on when input signal is applied. | Check that the input signal at the termination block is at least 50% of the digital input range. If this is a DC input, check the polarity of the signal. |
| Input is on when no signal is applied. The LED is off. | Check that the digital inputs are not forced on. |
| Input is off when a signal is applied. The LED is on. | Check that the digital inputs are not forced off. |

12.3 Digital Outputs

| Condition | Action |
|--|--|
| Output LED does not come on when output is turned on. | Check the LED POWER from the SCADAPack E RTU. |
| Output LED comes on but the output does not close. | Check if the relay is stuck. If so, return the board for repair. |
| Output LED comes on and output is closed, but the field device is not activated. | Check the field wiring. Check the external device. |
| Output LED and relay are on when they are expected to be off. | Check that the output is not forced on. |
| Output LED and relay are off when they are expected to be on. | Check that the output is not forced off. |

13 Calibration

The I/O expansion module is calibrated at the factory. It does not require periodic calibration. Calibration may be necessary if the module has been repaired as a result of damage. Calibration is done electronically at the factory. There are no user calibration procedures.

14 Maintenance

This module requires no routine maintenance. If the module is not functioning correctly, contact [Schneider Electric Technical Support](#) ⁶ for more information and instructions for returning the module for repair.

15 Specifications

Disclaimer: Schneider Electric reserves the right to change product specifications without notice. If you have questions about any of the specifications, contact [Technical Support](#)⁶¹.

[General](#)⁵⁹

[Power Supply](#)⁶⁰

[Digital Inputs](#)⁶¹

[Digital Outputs](#)⁶²

15.1 General

| | |
|------------------|---|
| I/O Terminations | 3.3...0.08 mm ² (12...28 AWG) 15 A contacts Screw termination - 0.51 Nm (4.5 lb-in) torque |
| Dimensions | 142 mm (5.59 in) wide 181 mm (7.13 in) high 47.1 mm (1.85 in) deep |
| Enclosure | Corrosion-resistant zinc-plated steel with black enamel paint |
| Environment | 5...95% RH, non-condensing –40...70 °C (–40...158 °F) operation –40...85 °C (–40...185 °F) storage |

15.2 Power Supply

| | |
|--------------------------------|---|
| 5 Vdc power requirements | 400 mA |
| 11...30 Vdc power requirements | 12 mA at 11...30 Vdc 9...30 Vdc operation possible UL508 rated 13.75...28 Vdc |
| 11...30 Vdc - Connector | Removable, 5-pin |
| 11...30 Vdc - Isolation | Isolation from logic supply and chassis |

15.3 Digital Inputs

| | | |
|------------------------|--|--------------------------------------|
| Quantity | 16 | |
| Connectors | 2 removable, 8-pin | |
| Indicators | Logic-powered LEDs that can be disabled to conserve power | |
| Voltage | Typical: 12 Vdc or 24 Vdc | |
| Over-voltage Tolerance | 36 Vdc | |
| Input Current | 0.67 mA typical at 24 Vdc | |
| Input Logic-HI Level | OFF to ON transition threshold is typically 6.5 Vdc | |
| Input Voltage | Off – To – On 6.5 Vdc +/- 0.5 Vdc | On – To – Off 6.5 Vdc +/- 0.5 Vdc |
| Response Time | Off – To – On | On – To – Off |
| @ 50 Hz | 15...19 ms | 25...29 ms |
| @ 60 Hz | 13.5...18 ms | 23...28 ms |
| Isolation | Isolation is in 2 groups of 8 Isolation from logic supply and chassis: 250 Vac/1000 Vdc | |

15.4 Digital Outputs

| | |
|--------------------|---|
| Quantity | 10 |
| Connector | Removable, 12-pin |
| Type | Form A Contacts (normally open) 5 contacts share one common |
| Indicators | Logic-powered LEDs that can be disabled to conserve power |
| Inductive Loads | Place a diode across the coil to suppress the noise in DC circuits and extend the life of the relay contacts See Digital Output Wiring Example ⁴⁷ for further information |
| Isolation | Isolation is in 2 groups of 5 Chassis to contact: 1500 Vac (1 min) Logic to contact: 1500 Vac (1 min) Output group to output group: 1500 Vac (1 min) |
| Operate Time | 25 ms maximum, 20 ms typical |
| Release Time | 30 ms maximum, 25 ms typical |
| Contact rating | 3 A, 30 Vdc 12 A maximum per common |
| Switching Capacity | 5 A, 30 Vdc (150 W Resistive) |
| Service Life | 2×10^7 mechanical 1×10^5 at contact rating |
| Bounce Time | 1 ms typical |

16 Standards and Certifications

| | |
|---------------------|---|
| Safety | <p>CSA (cCSAus) certified to the requirements of: CSA C22.2 No. 142-M1987 and UL508. (Process Control Equipment, Industrial Control Equipment)</p> <p>UL (cULus) certified to the requirements of UL508 and CSA C22.2 No. 142-M1987 (Industrial Control Equipment, Process Control Equipment)</p> |
| Digital Emissions | <p>FCC Part 15, Subpart B, Class A Verification</p> <p>EN 61000-6-4 Electromagnetic Compatibility (EMC) - Generic Emission Standard for Industrial Environments</p> <p>C-Tick compliance. Registration number N15744</p> |
| Immunity | <p>EN 61000-6-2 Electromagnetic Compatibility (EMC) - Generic Standards - Immunity for Industrial Environments</p> |
| CE Mark Declaration | <p>This product conforms to the above Emissions and Immunity Standards and therefore conforms with the requirements of Council Directive 2014/30/EU (as amended) relating to electromagnetic compatibility and is eligible to bear the CE mark.</p> <p>The Low Voltage Directive 2014/35/EU is not applicable to this product when installed according to our specifications.</p> |

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