SCADAPack E 5606 I/O
Hardware Manual

Schneider Electric

Documentation

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I 5606 Input/Output Module

Schneider Electric

Documentation

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When devices are used for applications with technical safety requirements, the relevant instructions must be followed. Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

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2 Safety Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, 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 an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠WARNING

WARNING indicates a potentially 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.

CAUTION

CAUTION used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage..

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 and operation of electrical equipment and the installation, 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.

⚠CAUTION

EQUIPMENT OPERATION HAZARD

- 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 injury or equipment damage.

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

Software testing must be done 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 prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove ground from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

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 prevent unauthorized changes in operating characteristics.

3 Overview

The 5606 I/O module, also available as a standalone unit, can be integrated with a SCADAPack E controller. The following controllers support the 5606 I/O module:

- **SCADAPack 357E -** A 5209 controller board with an integrated 5606 I/O Module

- **SCADAPack 300E** - A 5606 I/O module connected to the 5000 Series I/O Bus
- **SCADAPack ES** - A 5606 I/O module connected to the 5000 Series I/O Bus

The 5606 I/O module, also available as a standalone unit, increases the I/O capability of a SCADAPack E Smart RTU by providing 8 analog inputs, 32 digital inputs and 16 relay digital outputs. Optionally, two analog outputs can be specified at time of purchase.

A maximum of eight (8) 5606 modules can be addressed on a 5000 Series I/O bus.

The analog inputs are used with devices such as pressure, level, flow, and temperature transmitters; instrumentation such as pH and conductivity sensors; and other high-level analog signal sources. The 5606 input module measures current or voltage inputs in the ranges 0 to 20mA, 4-20mA, 0 to 5 V or 1 to 5 V. Each input is individually configured for input type and range. The 5606 module uses a 16-bit analog to digital (A/D) converter.

The 5606 I/O and outputs are transient protected and optically isolated from the main logic power. The inputs are single ended. They share a common return.

The digital inputs are optically isolated from the logic power. To simplify field wiring, the inputs are grouped with eight inputs sharing a single common return. These groups of eight inputs are isolated from each other. Light emitting diodes show the status of each of the inputs. The digital inputs are available in two standard voltage ranges, for both AC and DC applications.

The 5606 adds sixteen, dry contact, Form A (normally open) mechanical relay outputs to a 5000 Series input/output system. The relay outputs can be used to control panel lamps, relays, motor starters, solenoid valves, and other on/off devices. The relay outputs are well 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.

This manual covers the powering, wiring and configuration of a 5606 I/O module only. It is meant to be used with the hardware manual of the respective controller board to which the I/O module is attached.

4 Installation

The installation of the 5606 module requires mounting the module on the 7.5mm by 35mm DIN rail and connecting the module to the system I/O Bus. Refer to the Schneider Electric ***System Configuration Guide*** for complete information on system layout, I/O Bus cable routing and module installation.

Field Wiring Connectors

The 5606 I/O modules use screw termination style connectors for termination of field wiring. These connectors accommodate solid or stranded wires from 12 to 22 AWG.

Remove power before servicing unit.

The 5606 I/O Module has eight termination connectors for the connection of field wiring. Refer to ***Figure 5.1: 5606 I/O Module Layout*** 8 for wiring connector locations.

- Primary power input connections and optional analog output connections are wired to a 5 pole connector labeled P3. Refer to Section ***Power Supply Overview and Requirements*** 10 for more information on these connections. Loop current will only flow in analog inputs that have been configured for 20mA and when power is applied to P3.
- The eight analog inputs are wired to a 9 pole connector labeled P4. Refer to Section ***Analog Inputs*** 16 for more information on wiring analog input signals.
- The digital outputs are wired to two 10 pole connectors labeled P5 and P6. Refer to the Section ***Digital Inputs & Outputs (Digital Outputs)*** 27 for details on wiring the digital outputs.
- The digital inputs are wired to four 9 pole connectors labeled P7, P8, P9 and P10. Refer to Section ***Digital Inputs & Outputs (Digital Inputs)*** 27 for details on wiring the digital inputs.

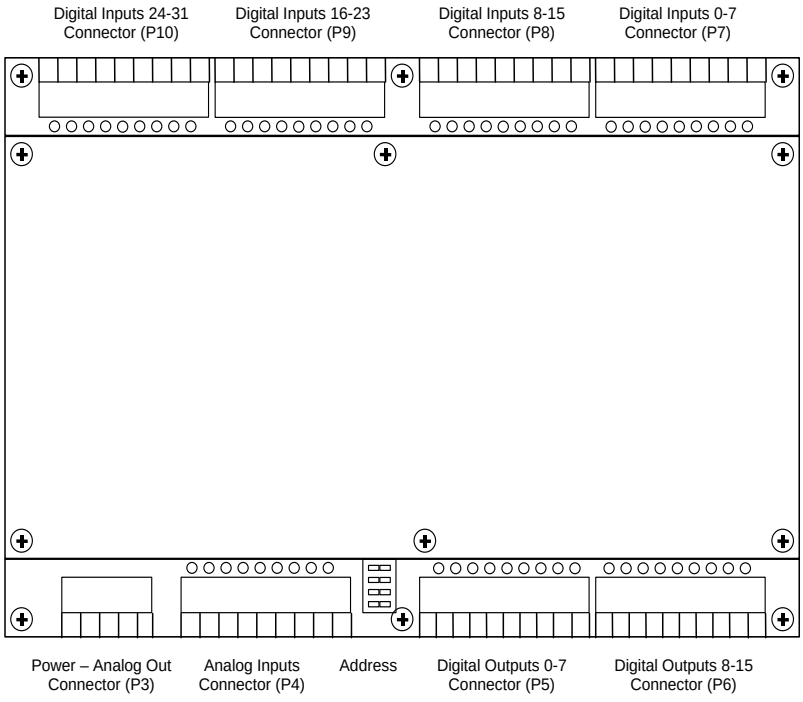


Figure 5.1: 5606 I/O Module Layout

ATEX and IECEx applications only

This equipment is to be installed in an enclosure certified for use, providing a degree of protection of IP54 or better. The free internal volume of the enclosure must be dimensioned in order to keep the temperature rating. A T4 rating is acceptable.
For products using Solid State Relays (5606 SSR) a T4 rating is acceptable for maximum loads of 2A. When 3A loads are connected to the Solid State Relays, the maximum ambient rating is lowered to 50°C in order to maintain the T4 rating.

5 Power Supply Overview and Requirements

The 5606 I/O module requires a nominally 12V or 24V DC power supply applied to the terminals labeled 11-30V 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 5606 I/O board can vary from a minimum of 12mA for basic operation of the analog circuitry plus an additional 40mA for the optional analog outputs.

In addition, the system controller or power supply provides 5V through the I/O Bus cable. Refer to the Specifications section of the controller manual for the power capabilities of the controller. A sample power calculation for integrated SCADAPack controller utilizing this I/O board can be found in the manual of the corresponding controller board.

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

- With a 16Vac source supplying power to the controller board, 24V is available on the DC PWR terminals on connector P5 of the controller board which can be used to power the lower I/O model. See the Section ***Recommended AC Power Supply Configuration*** 11 below for details.
- A 24Vdc source connected to the DC PWR terminals on the controller board and on the 5606 I/O module in a parallel configuration. See Section ***Recommended 24V Power Supply Configuration*** 12 for an example on this wiring configuration.
- With a 12Vdc source connected to the DC PWR terminals on the controller board and on the 5606 I/O module in a parallel configuration. See Section ***Recommended Battery Configuration*** 13 for an example of using a DC power source coming from a 12Vdc battery.
- A 5103 UPS Power Supply supplies 5Vdc to the controller board through the IMC cable and supplies 24Vdc to the 5606 I/O module through the 24Vdc output. See Section ***Recommended 5103 Power Supply Configuration*** 14 for an example of using the 5103 UPS Power Supply.

Power can be applied to either the AC/DC power input **OR** the DC power input. Damage to the power supply may result if power is applied to both inputs.

System Grounding

It is desirable to ground the system by connecting the system power supply common, to the chassis or panel ground. On the 5606 I/O module, the "-" terminal of the 11-30V supply (DC PWR "-") along with terminals labeled COM are isolated from the chassis.

5.1 Recommended AC Power Supply Configuration

This configuration uses a single Class 2 16Vac transformer to power the controller board and the 5606 I/O Module. 24V is available on the controller module connector P3. This is used to power the analog circuitry on the 5606 I/O module.

Notes on this configuration:

- Only a limited amount of power is available from the controller. This configuration is not recommended when a large amount of current is required at 24V.
- The Controller Board DC Power terminal needs to be connected to the same power supply as the 5606 I/O Module DC Power terminals.

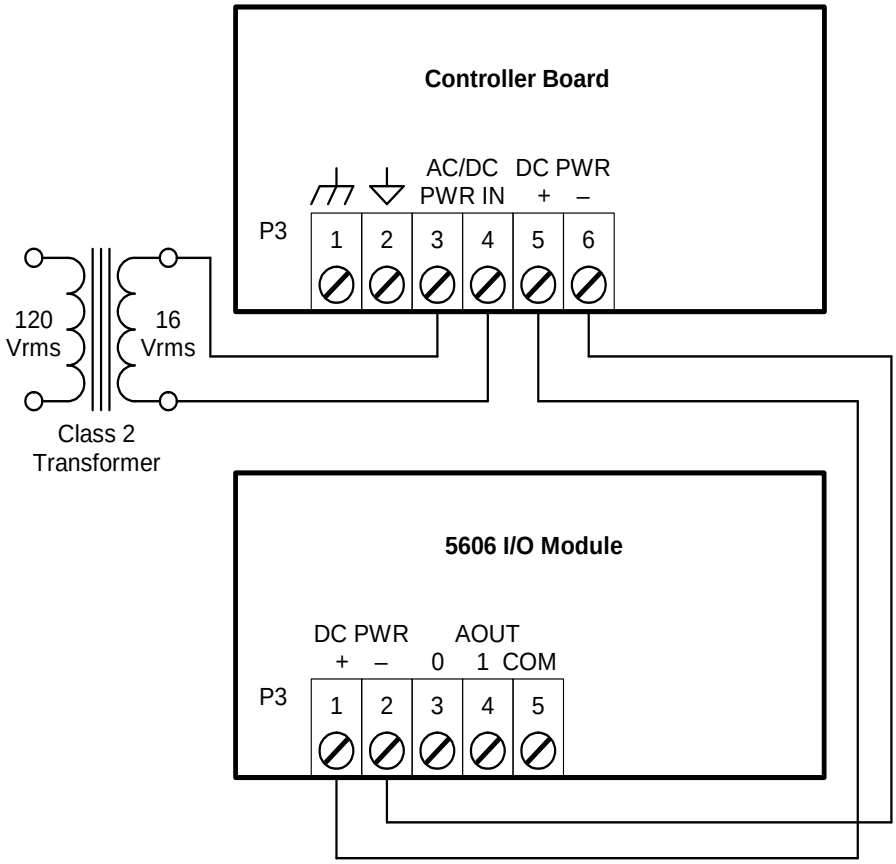


Figure 6.1: Recommended AC Power Supply Configuration

5.2 Recommended 24V Power Supply Configuration

This configuration uses a 24V power supply to power the controller board and the 5606 I/O module. This 24V is used to power the analog circuitry for the analog on the 5606 I/O module.

Notes on this configuration:

- This configuration is recommended when a large amount of current is required at 24V. Refer to Section ***Specifications*** 35.
- The Controller Board DC Power terminal needs to be connected to the same power supply as the 5606 I/O Module DC Power terminals.

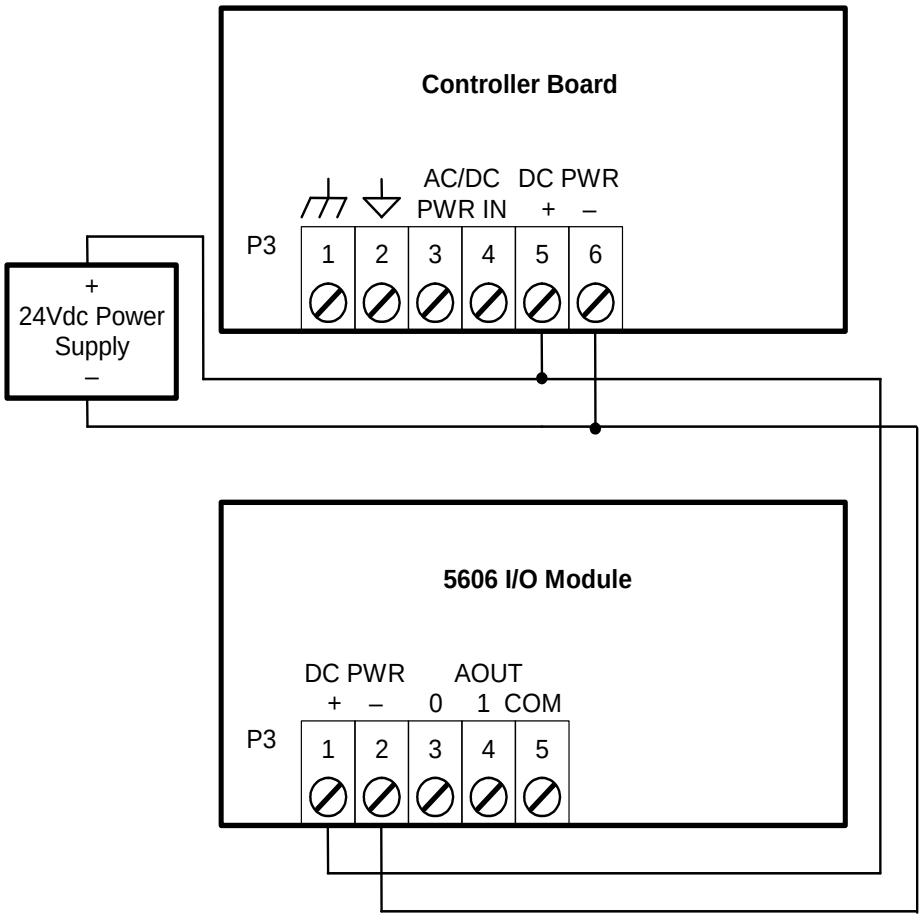


Figure 6.2: Recommended DC Power Supply Configuration

5.3 Recommended Battery Configuration

This configuration uses a 12V battery to power the controller board and the 5606 I/O Module. This 12V is used to power the analog circuitry for the analog inputs and analog outputs on the 5606 I/O Module.

Notes on this configuration:

- This configuration is recommended when a large amount of current is required at 12V. Refer to Section ***Specifications*** 35 for power requirements from a 12V battery.
- The Controller Board DC Power terminal needs to be connected to the same power supply as the 5606 I/O Module DC Power terminals.

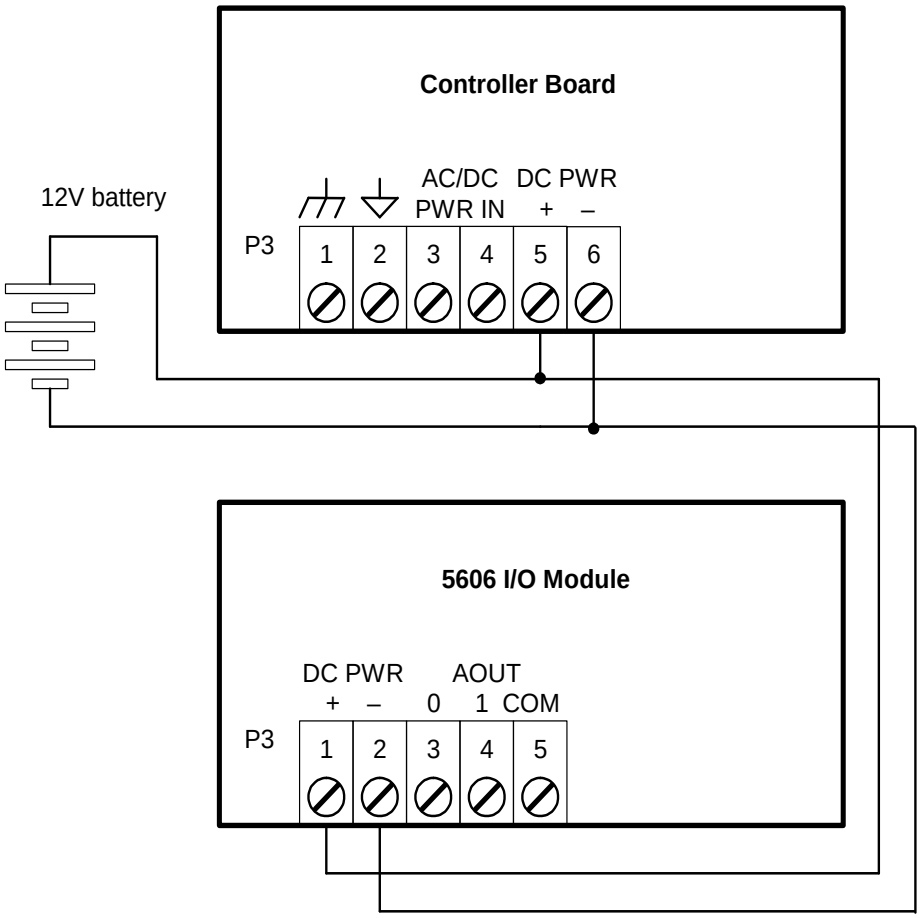


Figure 6.3: Recommended Battery Configuration

5.4 Recommended 5103 Power Supply Configuration

When additional power is required by the system, 5000 Series 5103 power supplies can be used in combination with the SCADAPack controllers. Refer to the ***System Configuration Guide*** for more information.

The 5103 power supplies can be connected anywhere *downstream* (to the right) of the controller. They will supply power to the modules downstream of them.

The Sleep Mode feature of the controller applies only to those modules powered by the controller.

The 5103 power supply may also be connected *upstream* (to the left) of any SCADAPack Controller, but only if the following conditions are observed:

- No power is applied to the power inputs of the controller board.
- A jumper is installed at position J5. See the hardware manual of your respective controller board for the location and use of this jumper.
- The sleep mode feature is not used.

This configuration uses a 5103 Power Supply module to power a SCADAPack controller. The 24VDC output from the 5103 powers the 5606 I/O module. The 5103 power supply provides a 5V output to power the 5606 I/O module, the controller board and 5000 Series modules through the IMC cables.

No connection is made to the AC/DC PWR IN or DC PWR terminals on the controller board.

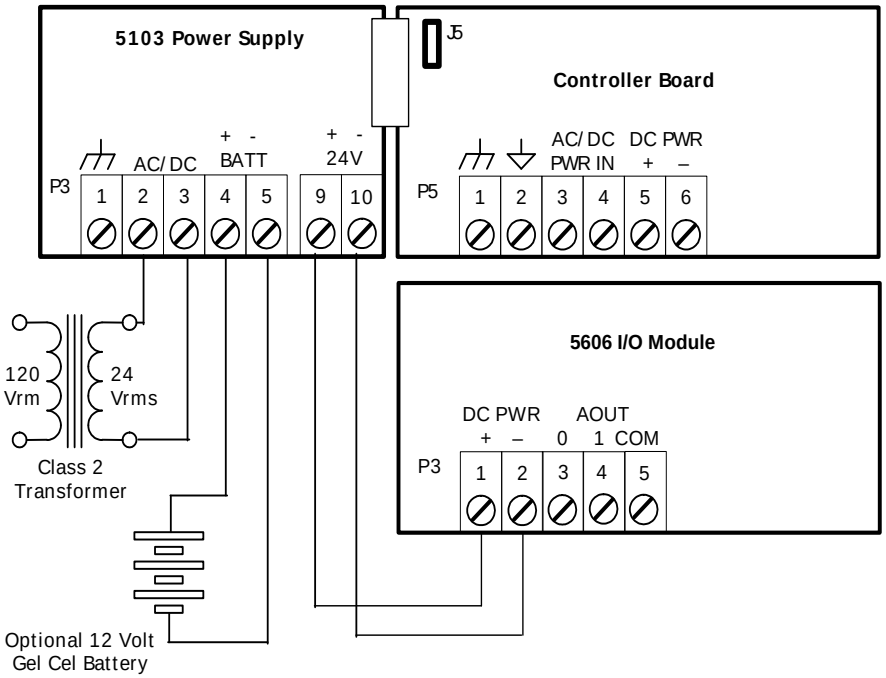


Figure 6.4: Recommended 5103 Power Supply Configuration

6 DIP Switch Settings

Address Selection

5000 Series I/O module types may be combined in any manner to the maximum supported by the controller used.

Each type of I/O module, connected to the I/O bus, needs to have a unique I/O module address. Different types of I/O modules may have the same module address.

The address range supported by the controller module may restrict the I/O module address range. Refer to the controller manual for the maximum address supported.

5606 Addressing

Three address switches on the 5606 labeled 4, 2, and 1 set the address. A 5606 I/O module that is installed in a SCADAPack is generally set to address 0. Address 0 can be used if there is no 5606 installed in a SCADAPack. A second 5606 is generally set to address 1.

The 5606 and 5607 modules share the same address numbering, and therefore 5606 and 5607 modules on the I/O bus need to have unique address numbers.

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.

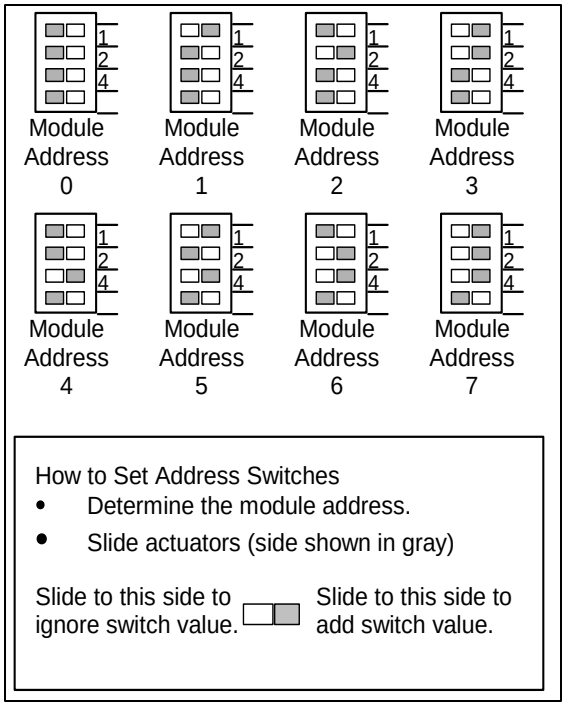


Figure 7.1: 5606 Address Switch Settings

7 Analog Inputs

The 5606 I/O module enhances the capacity of a SCADAPack controller by providing an additional eight single ended analog inputs on connector P4 that can be configured for current or voltage mode. Refer to ***Figure 5.1: 5606 I/O Module Layout*** 8 for the location of this connector.

Analog inputs can be configured for current or voltage mode via software. Please refer to the Section ***Current or Voltage Mode & Range and Resolution (Current or Voltage Mode)*** 17 below on how to choose input modes.

- In voltage mode, these analog inputs are single ended with a measurement range of 0-5V or 0-10V. The range is selected via software.
- In current mode, a 250Ω current sense resistor appears across each analog input channel. Measurement range in current mode is 0-20mA or 4-20mA selectable via software. The 250Ω resistor produces a voltage drop (input reading) of 5V for a 20mA of current flow.

The analog inputs use a 16-bit successive approximation digital to analog (A/D) converter.

- Use SCADAPack E Configurator to assign RTU database points to the I/O card channels
- For ISaGRAF applications use I/O board connections to the RTU point database (rtuxxxx boards) or Complex Equipment types (sp357e) to read the eight analog inputs.

Please refer to the ISaGRAF software and SCADAPack E Configurator manuals on how to assign RTU points to use ISaGRAF I/O Boards and Complex Equipment types.

Configuration for points attached to the 5606 Analog Input channels uses the SCADAPack E RAW_MIN / RAW_MAX and ENG_MIN / ENG_MAX parameters for integer and engineering scaling, respectively. These scaling ranges apply to the analog input signal range selected by SCADAPack E Configurator for each analog input point channel on the 5606 I/O module.

7.1 Current or Voltage Mode & Range and Resolution

Current or Voltage Mode

The analog inputs on the 5606 module can be configured for either voltage or current mode via SCADAPack E Configurator.

In current mode a 250Ω resistor appears across the analog input channel. In voltage mode, input channels are high impedance.

Range and Resolution

The 5606 analog inputs (Channels 0-7) have a 16-bit, unipolar, analog to digital (A/D) converter that measures input voltages from 0-5V or 0-10V. The analog inputs are factory calibrated to scale the data and represent it with a 16 bit signed number.

When assigning RTU database points to the 5606 module channels using SCADAPack E Configurator, the user configures the **Input Type** signal range for each analog input channel.

The following **Input Type** ranges can be configured for each 5606 analog input channel:

- 0 to 5V
- 1 to 5V
- 0 to 10V
- 0 to 20mA
- 4 to 20mA

The **Input Type** range selected is scaled to the **Raw Min.** to **Raw Max.** range configured for the individual analog input point when point integer values are used. The **Eng. Min.** to **Eng. Max.** range for the point is used to scale the analog input Engineering Floating Point database value.

For example, if a SCADAPack 357E analog input or 5606 Module point's attributes are RAW_MIN = 0, RAW_MAX = 10000 and the input channel is selected for 4-20mA: a 20mA input is 100% of the selected input signal range and corresponds to 10000 counts. a 4mA input is 0% of the selected input signal range and corresponds to 0 counts.

The following table shows the analog input and the status of the over and under range for several input signals. Over and under range status detection occurs when the measured input is outside of the measurement range by greater than 0.2%.

Table 8.1: Analog Input Signals

0-5V Range (V)	1-5V Range (V)	0-10V Range (V)	4-20mA Range (mA)	0-20mA Range (mA)	Point database value	Over or under range status*
N/A	< 0.992	N/A	< 3.968	N/A	under-range	ON
0	1	0	4	0	RAW_MIN ENG_MIN	OFF

0-5V Range (V)	1-5V Range (V)	0-10V Range (V)	4-20mA Range (mA)	0-20mA Range (mA)	Point database value	Over or under range status*
1.25	2	2.5	8	5	25% of scale	OFF
2.5	3	5.0	12	10	50% of scale	OFF
3.75	4	7.5	16	15	75% of scale	OFF
5	5	10	20	20	RAW_MAX ENG_MAX	OFF
5.0024	5.0024	10.0048	20.032	20.01	over-range	ON

* Under-range and Over-range point status may also be asserted by SCADAPack E Analog Input Point configuration parameters. For more information see the *SCADAPack E 5000 Series I/O Expansion Reference* manual and *SCADAPack E Data Processing Technical Reference* manual.

7.2 Wiring

The analog inputs support loop powered and self powered transmitters. Loop powered transmitters are two terminal devices that are connected between a power supply and the analog input. The loop current from the power supply travels through the transmitter, and to ground through a 250Ω resistor built into the 20mA input circuit. Self-powered transmitters have three terminals: Power In, Signal Out and, Common. Self-powered transmitters can have a current or voltage output. Signal out connects to the Analog Input Channel; Common connects to COM; and, Power In connects to a power supply.

Wiring Example

Figure 8.1: Analog Input Wiring 20 below shows several examples for wiring of transmitters loop and self powered transmitters with the corresponding analog inputs set to voltage mode with a 0-5V measurement range.

CAUTION

UNEXPECTED EQUIPMENT OPERATION

Do not exceed the maximum voltage specified for each analog input.

Failure to follow these instructions can result in equipment damage.

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, serious injury or equipment damage.

This module must be the only loop current measurement device in the loop when using the analog inputs in the 20mA measurement mode. If power to the module is removed, the module reverts to voltage mode and results in an open current loop. Applications that cannot tolerate this possibility need to utilize external current sense resistors, and with the module input range set to voltage. Refer to the section, **Configuring SP334/SP334E Analog Inputs as Current Inputs**, below.

Example 1: Channel **A0** has a loop powered current transmitter connected to the external power supply.

Example 2: Channel **A1** has a self-powered voltage transmitter connected to the external power supply.
Channels **A2** through **A6** are unused.

Example 3: Channel **A7** has a self-powered current transmitter connected to the external power supply.

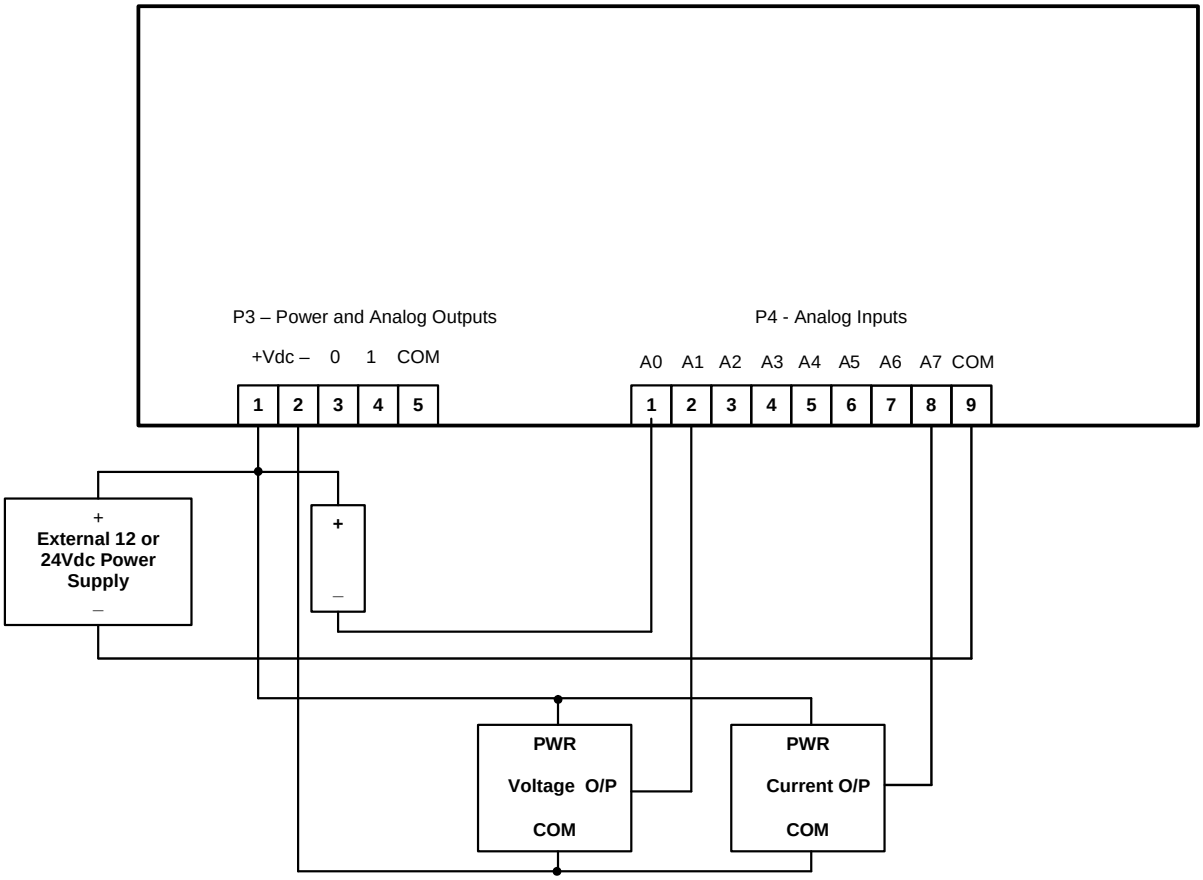


Figure 8.1: Analog Input Wiring

Configuring SP334/SP334E Analog inputs as Current Inputs

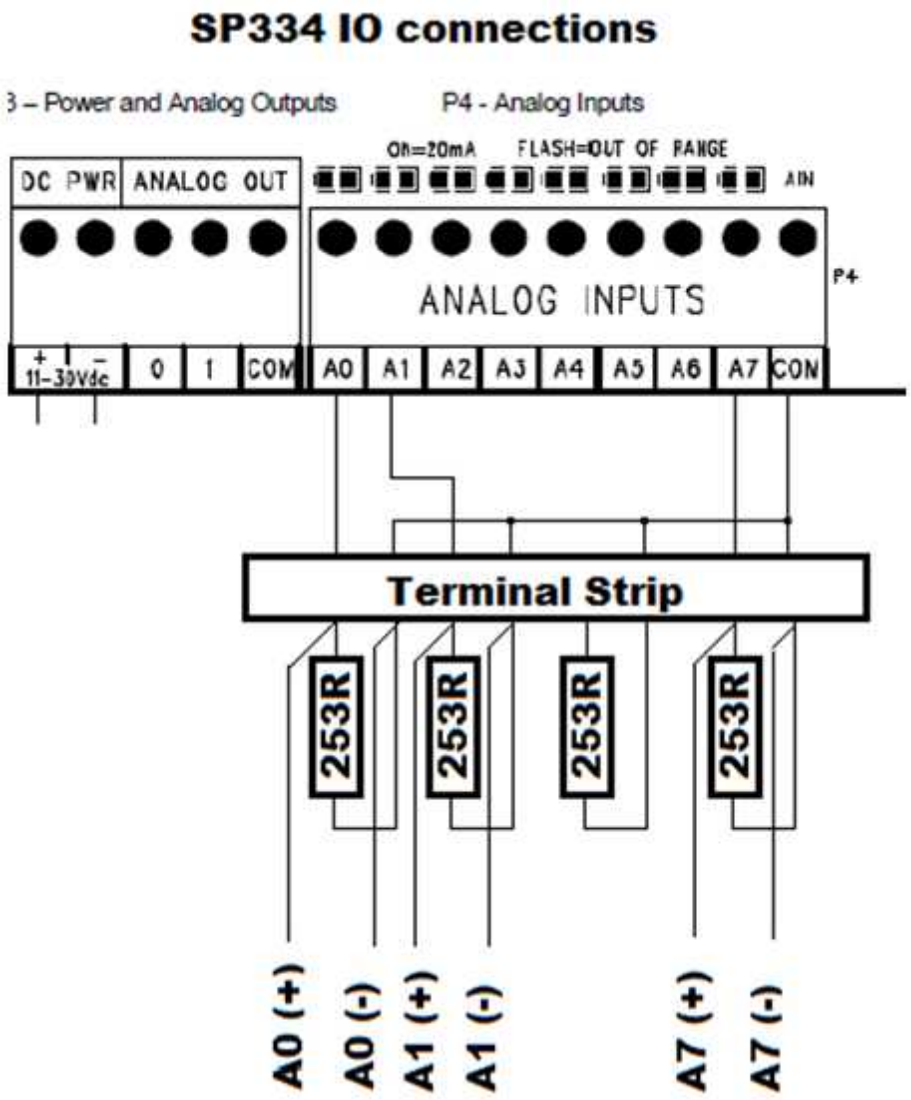
The analog inputs for the SCADAPack 334/SP334E modules are configured in Current Input mode and have these possible operating conditions::

- The SP334/SP334E is not the only transducer in a particular current loop;
- The SP334/SP334E is powered down, or reset.

If you power down or reset the SP334/334E module in a multiple device loop, the analog inputs emulate voltage inputs that present a high impedance to the current loop, and effectively break the current loop of the system.

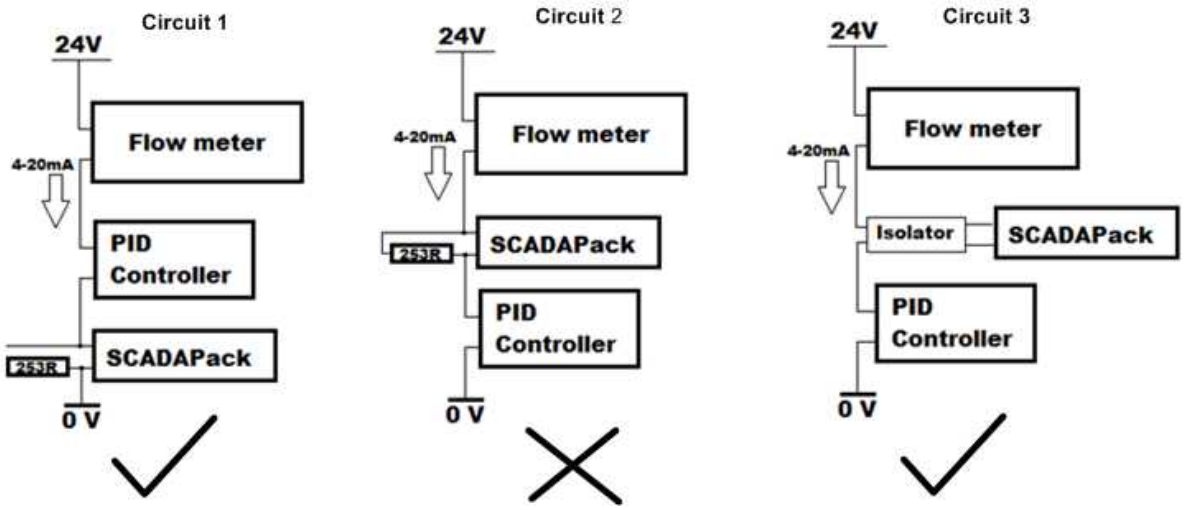
Preventing Interruption of the Current Loop

Prevent the interruption of the current loop in the module by configuring the analog inputs as voltage Inputs, and add an external 253 resistor to the current loop at the terminal strip as shown in the figure below.



This wiring method is preferred if you need to swap the SCADAPack SP334/334E Module; you can remove the module without affecting the current loop; the loop is NOT interrupted if the device is removed.

The circuit configurations for the external 253 ohm resistor, or a signal isolator, are shown in the figure below:



1. The external resistor shown here must be 253 Ohms in consideration of the 20K ohm internal resistance of the SCADAPack 334/334E Voltage Input circuit as shown in **Circuit 1**.
2. The SP **MUST** be the last device in the current loop, or you must use a signal isolator in the circuit without the 253 ohm resistor as shown in **Circuit 3**.
3. You can create other parallel resistor combinations to achieve a 253 ohm impedance (See Note 1.).
4. **Circuit 2** indicates an incorrect SCADAPack configuration.

8 Analog Outputs

The 5606 I/O Module may include two channels of analog output if this option was requested at time of purchase.

- Use SCADAPack E Configurator to assign RTU database points to the I/O card channels
- For ISaGRAF applications use I/O board connections to the RTU point database (rtuxxxx boards) or Complex Equipment types (sp357e) to write the two analog outputs.

Please refer to the ISaGRAF software and SCADAPack E Configurator manuals on how to assign RTU points to use ISaGRAF I/O Boards and Complex Equipment types.

8.1 Current & Voltage Outputs

Current Outputs

The 5606 I/O Module can be equipped with an optional 5305 Analog Output Module that provides two 20mA analog outputs. Analog output resolution is 12 bits. The outputs are transient and over voltage protected. The outputs share a common return (GND) with each other and the 5606 I/O Module analog inputs. The figure below gives an illustration on how to connect current outputs.

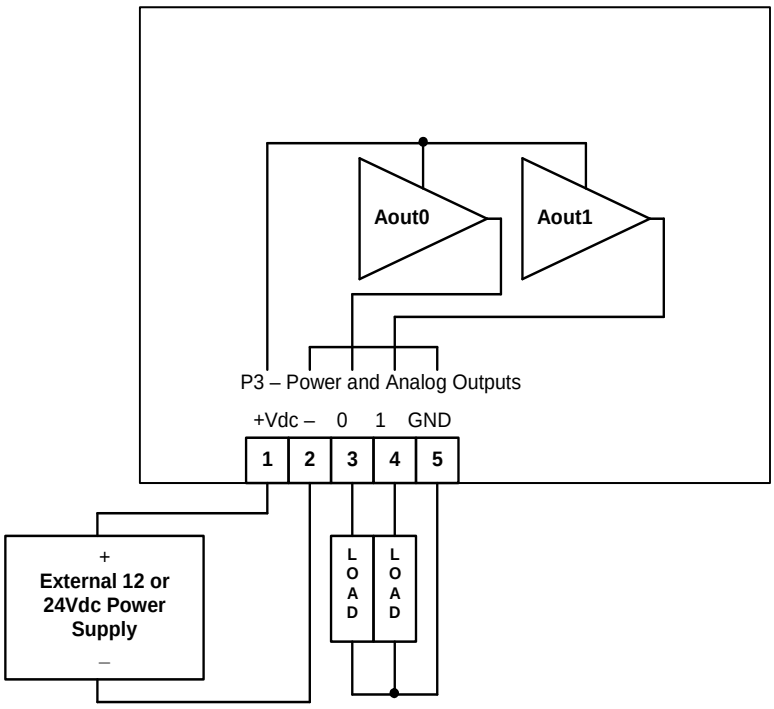


Figure 9.1: Analog Output Wiring

Voltage Outputs

To obtain voltage outputs, connect a load resistor as shown in ***Figure 9.1: Analog Output Wiring*** 24 above and connect the voltage device across the load resistor. The table below lists resistance values and output range settings for common voltage ranges. The resistance value listed is the parallel resistance of the device and the load resistor.

Table 9.1: Resistance Values and Output Ranges

Resistance	Output Range	Voltage Range
250Ω	0-20mA 4-20mA	0 to 5V 1 to 5V
500Ω	0-20mA	0 to 10V

8.2 Range and Resolution

The optional analog output module installed on the 5606 I/O Module has a 12-bit, unipolar, digital to analog (D/A) converter. One of the following **Output Type** ranges can be configured on SCADAPack E Configurator **I/O | SCADAPack I/O** page for the 5606 module. Both AO channels use the same range:

- 0 to 20mA
- 4 to 20mA

The 0-20mA output range resolution is 4.88µA per D/A count.

Configuration for points attached to the optional 5606 Analog Output channels uses the SCADAPack E Raw Min. to Raw Max. and Eng. Min. to Eng. Max. parameters for integer and engineering scaling, respectively.

These scaling ranges automatically apply to the analog input signal range selected by SCADAPack E Configurator for the 5606 module analog **Output Type** (0-20mA or 4-20mA).

9 Digital I/O Overview

The 5606 I/O provides 32 digital input and 16 dry digital (mechanical relay) outputs.

- Use SCADAPack E Configurator to assign RTU database points to the I/O card channels
- For ISaGRAF applications use I/O board connections to the RTU point database (rtuxxxx boards) or Complex Equipment types (sp357e) to read the digital inputs or control the relay outputs.

Please refer to the ISaGRAF software and SCADAPack E Configurator manuals on how to assign RTU points to use ISaGRAF I/O Boards and Complex Equipment types.

9.1 Digital Inputs & Outputs

Digital Inputs

The digital inputs are optically isolated from the logic power and are available in four standard voltage ranges, for both AC and DC applications. 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 32 inputs are organized into four 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. Inputs 16 to 23 are in third group. Inputs 24 to 31 are in the final group.

Digital Outputs

The 5606 I/O module has 16, dry contact, digital (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.

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.

9.2 Wiring Examples

The 5606 I/O module accommodates AC or DC inputs.

The voltage range is configured at the factory.

CAUTION
UNEXPECTED EQUIPMENT OPERATION Do not exceed the maximum voltage specified for each digital input. **Failure to follow these instructions can result in equipment damage.**

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, serious injury or equipment damage.**

Figure 10.1: Digital Input Wiring of DC Signals 28 shows typical wiring of DC signals to the digital input ports.

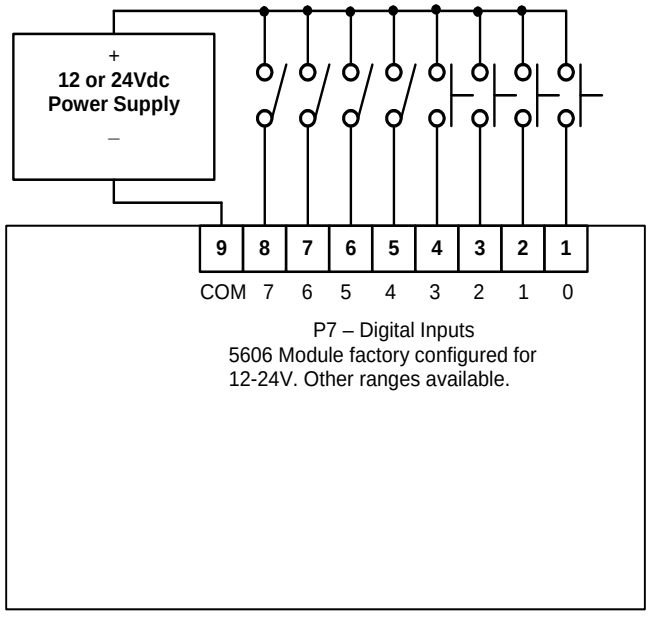


Figure 10.1: Digital Input Wiring of DC Signals

Figure 10.2: Digital Input Wiring of AC Signals 29 shows a typical wiring of AC signals to the digital input ports.

The signal polarity needs to be observed when using DC inputs. Connect the positive signal to the input. Connect the negative signal to the common.

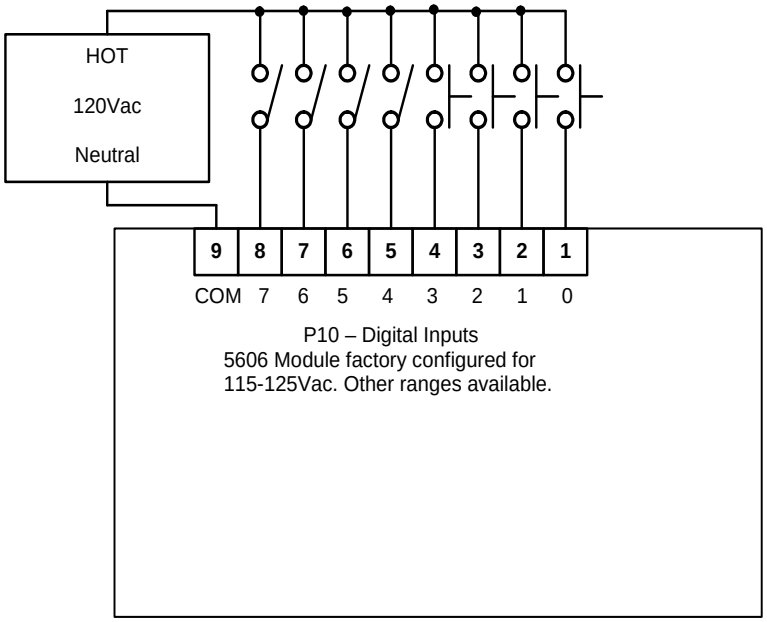


Figure 10.2: Digital Input Wiring of AC Signals

Refer to ***Figure 10.3: Digital Output Wiring*** 30 below for a digital output wiring example.
In this example 120Vac is switched through the common of relays 0-3 through relays 0 and 2 to the loads. The loads share a common 120Vac Neutral. The fuses shown are recommended.
Relays 4 and 6 are used to switch the DC power to two loads. In the DC example the negative side of the loads are switched through the common of relays 4 through 7 to the negative side of the DC power supply.

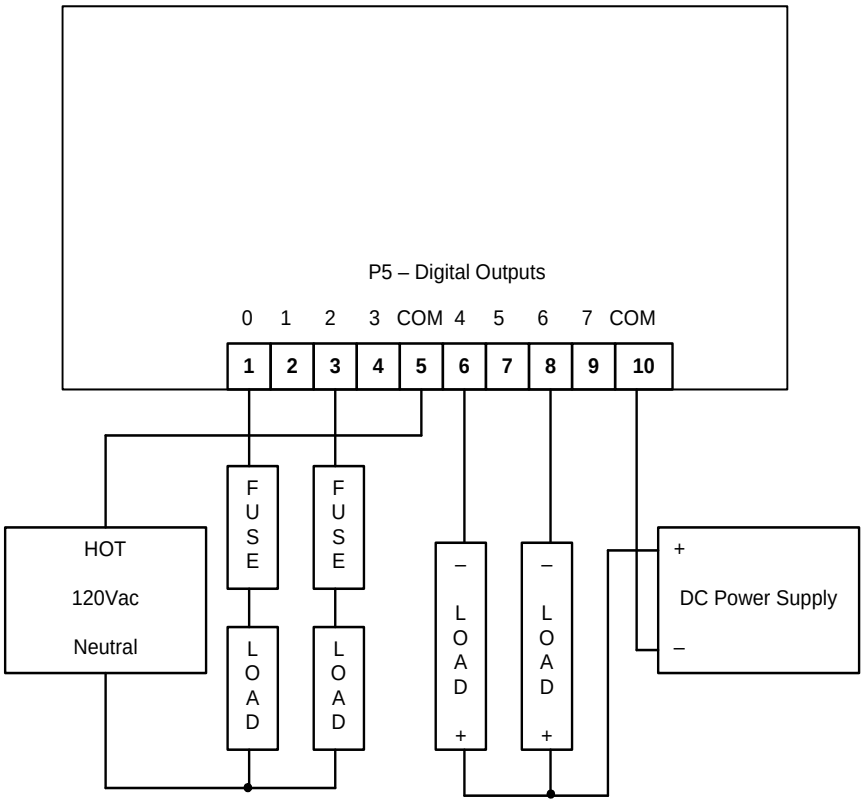


Figure 10.3: Digital Output Wiring

Care needs to be taken when controlling inductive loads with digital outputs. The energy stored in the coil is capable of generating significant electrical noise when the relay contacts are opened. This noise can be suppressed using a diode across the coil in DC circuits or using a MOV (varistor) across the coil in AC circuits.

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.

10 Operation and Maintenance

LED Indicators

There are 56 LEDs on the 5606 I/O Module. 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.

The table below describes the LEDs.

Table 11.1: LED Indicators

LED	Function
DOUTs	On when the corresponding output is on.
DINs	On when the corresponding input is on.
AINs	On when analog input is configured for current. Off when analog input is configured for voltage. Long flashes when the applied current is out of range. Short flashes when the applied voltage is out of range.*

* Under-range is not indicated on analog input channel LEDs on the 5606 I/O module when configured in 1-5V input range.

Maintenance

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

10.1 Troubleshooting

Calibration

The 5606 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.

- ***Analog Inputs & Outputs*** 33
- ***Digital Inputs & Outputs*** 34

10.1.1 Analog Inputs & Outputs

Analog Inputs

Condition	Action
20mA inputs read 0.	Check transmitter power.
Reading is at or near 0 for every input signals.	Check if the input transient suppressors are damaged.
20mA readings are not accurate.	Check for a damaged 250Ω current sense resistor.
Reading is constant.	Check that the analog input is not forced.
Reading seems out of calibration for small inputs but improves as input increases.	Check the input range setting.
In Current Loop Mode, there can be an open circuit in the Current Loop.	Refer to the Section, **Configuring SP334/SP334E Analog Inputs as Current Inputs** in the topic Wiring 19 under Analog Inputs 16.
Other devices are not functional after installation of the SP334/SP334E module.	In Current Loop Mode, the SP334/SP334E module must be the last device in the loop, or use a signal isolator as discussed in the Section, **Configuring SP334/SP334E Analog Inputs as Current Inputs** in the topic Wiring 19 under Analog Inputs 16.

Analog Outputs

Condition	Action
Outputs are 0mA	Check the 24V power.
The full-scale output is less than 20mA.	Check the 24V power. Check that the load resistance is within specification.
Output is constant and should be changing.	Check that the analog outputs are not forced.

10.1.2 Digital Inputs & Outputs

Digital Inputs

Condition	Action
Input LED does not come on when input signal is applied.	Check the input signal at the termination block. It should be 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.

Digital Outputs

Condition	Action
Output LED does not come on when output is turned on.	Check the LED POWER from the SCADAPack controller.
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 should be off.	Check that the output is not forced on.
Output LED and relay are off when they should be on.	Check that the output is not forced off.

11 Specifications

***Disclaimer**: Schneider Electric reserves the right to change product specifications without notice. For more information visit http://www.schneider-electric.com.*

11.1 General & Power Supply

General

I/O Terminations	12 to 22 AWG 15A contacts Screw termination - 6 lb.-in. (0.68 Nm) torque
Dimensions	8.40 inch (213mm) wide 6.50 inch (165mm) high 1.80 inch (72mm) deep
Packaging	corrosion resistant zinc plated steel with black enamel paint
Environment	5% RH to 95% RH, non-condensing –40ºC to 70ºC (–40ºF to 158ºF) operation –40ºC to 85ºC (–40ºF to 185ºF) storage
Addressing	8 modules. DIP switch selectable.

Power Supply

5V power requirements (Dry Contact Relay Version)	Digital Output Relays Continuous - 375mA LEDs - 195mA Quiescent - 30mA Total - up to 600mA
5V power requirements (Solid State Relay Version)	Digital Output Relays Continuous - 170mA LEDs - 150mA Quiescent - 30mA Total - up to 450mA
11-30Vdc power requirements	12mA plus analog outputs 9-30Vdc operation possible when optional 5305 analog outputs not installed. UL508 rated 13.75 to 28Vdc.
11-30Vdc - Connector	Removable. 5 positions.
11-30Vdc - Isolation	Isolation from logic supply and chassis

11.2 Analog Inputs

Quantity	8
Ranges	Software configurable 0-20mA 4-20mA 0-10V 0-5V 1-5V
Input resistance	250 ohms - Current configuration. 20k ohms - Voltage configuration.
Resolution	15 bits over the 0-10V and 0-20mA measurement range
Type	single ended
Accuracy	±0.1% of full scale at 25ºC (77ºF) ±0.2% over temperature range
Transient Protection	2.5kV surge withstand capability as per ANSI/ IEEE C37.90.1-1989
Normal mode rejection at 60Hz with 60Hz scanning	30dB with 3Hz filter 28dB with 6Hz filter 23dB with 11Hz filter 21dB with 30Hz filter
Normal mode rejection at 50Hz with 50Hz scanning	51dB with 3Hz filter 49dB with 6Hz filter 38dB with 11Hz filter 21dB with 30Hz filter
Response Time for 10% to 90% signal	300mS with 3Hz filter 140mS with 6Hz filter 60mS with 11Hz filter 20mS with 30Hz filter
Over-scale Input Capacity (without damage)	Continuous: 0.10A/14V on the 20mA inputs. 0.05A/14V on the 5V inputs.
Connector	Removable. 9 positions.
Isolation	Isolation from logic supply and chassis. 500VAC
Indicators	Logic powered LEDs. Can be disabled to conserve power. Indicate Voltage / Current mode and out-of-range input signal

11.3 Analog Outputs

Quantity	2 with optional 5305 module
Range	Software configurable 0-20mA sourcing 4-20mA sourcing
Resolution	12 bits
Maximum Load Resistance	925Ω with 24Vdcinput voltage or when internal 24V power supply is on. 375Ω with 12Vdc input voltage 250Ω with input voltage at power supply turnoff
Accuracy	Accuracy specified from 0.5-20mA. ±0.15% of full scale at 25ºC (77ºF) ±0.25% of full scale over temperature range
Noise and Ripple	0.04% maximum
Transient Protection	2.5kV surge withstand capability as per ANSI/ IEEE C37.90.1-1989
Logic End-Of-Scan to Signal Update Latency	With up to 10 off 5000 Series I/O Modules: Typical: 18-27mS
Response time (D/A to signal)	less than 10µs for 10% to 90% signal change
Connector	Removable. 5 positions.
Isolation	Isolation from logic supply and chassis

11.4 Digital Inputs

Quantity	32	
Ranges	Factory configurable 12/24V 48V 115/125V 240V	
Over-voltage Tolerance	150% sustained over-voltage without damage	
Input Current	0.67 mA typical at 24V on the 12/24V range 0.37 mA typical at 48V on the 48V range 0.35 mA typical at 120V on the 115/125V range 0.35 mA typical at 240V on the 240V range	
Input Logic-HI Level	OFF to ON transition threshold is typically 6.5V on 12/24V range OFF to ON transition threshold is typically 50% of full scale range on other ranges.	
AC Input Voltage **12V/24V** **48V** **115/125V** **240V**	Off – To – On 7.5Vrms+/- 2Vrms 25Vrms +/- 5Vrms 65Vrms+/- 5Vrms 135Vrms+/-10Vrms	On – To – Off 6.0Vrms+/ - 2Vrms 20Vrms +/- 5Vrms 55Vrms+/- 5Vrms 115Vrms+/-10Vrms
DC Input Voltage **12V/24V** **48V** **115/125V** **240V**	Off – To – On 6.5Vdc+/- 0.5Vdc 22Vdc+/-5Vdc 65Vdc+/-5Vdc 125Vdc+/-10Vdc	On – To – Off 6.5Vdc+/- 0.5Vdc 22Vdc+/-5Vdc 65Vdc+/-5Vdc 125Vdc+/-10Vdc
AC Response Time **@50 Hz** **@60 Hz**	Off – To – On 5 – 22ms 5— 22ms	On – To – Off 6 – 18ms 6 – 18ms
DC Response Time **@50 Hz** **@60 Hz**	Off – To – On 15 – 19ms 13.5 – 18ms	On – To – Off 25 – 29ms 23 - 28ms
Connectors	4 removable. 9 positions.	
Isolation	Isolation is in 4 groups of 8. Isolation from logic supply and chassis. 1500Vrms.	
Indicators	Logic powered LEDs. Can be disabled to conserve power.	

11.5 Digital Outputs

Quantity	16
Connectors	2 removable. 10 positions.
Type	Form A Contacts (Normally open) 4 contacts share one common
Indicators	Logic powered LEDs. Can be disabled to conserve power.
Voltages	Maximum permitted voltage in Canada or North America is 240Vac. Maximum permitted voltage outside of Canada or North America is 30Vac/42.4Vpk/60Vdc.
Inductive Loads	Inductive loads need to be suitably protected to protect the relay contacts. See manual for recommended inductive load protection circuits.
Isolation	Chassis to contact: 1500Vac Logic to contact: 1500Vac Isolation is in 4 groups of 4.
Operate Time	25ms maximum, 20ms typical
Release Time	30ms maximum, 25ms typical
Dry Contact Relay Version	
Contact Rating	3A, 30Vdc or 240Vac (Resistive) 1000Vac between open contacts 12A maximum per common
Switching Capacity	5A, 30Vdc (150W Resistive) 5A X 250Vac (1250VA Resistive)
Service Life	2×10^7 mechanical 1×10^5 at contact rating
Bounce Time	1ms typical
DC Solid State Relay Version	
Load Voltage	60Vdc maximum
Load Current	3A continuous maximum at 50°C ambient 2A continuous maximum at 70°C ambient 9A peak, 100mS UL508 rated 2A at 50°C and 1.33A at 70°C
On Resistance	0.09 ohms
Off State Leakage Current	10µA

Service Life	Unlimited
Bounce Time	None

12 Approvals and Certifications

Hazardous Locations - North America	Non-Incendive Electrical Equipment for Use in Class I, Division 2 Groups A, B, C and D Hazardous Locations. CSA certified to the requirements of: • CSA Std. C22.2 No. 213-M1987 - Hazardous Locations. • UL Std. No. 1604 - Hazardous (Classified) Locations.
Hazardous Locations - Europe	ATEX II 3G, Ex nA IIC T4 per EN 60079-15, protection type n (Zone 2)
Hazardous Locations - IECEx	IECEx, Ex nA IIC T4 per IEC 60079-15, protection type n (Zone 2)
Safety	CSA (cCSAus) certified to the requirements of: CSA C22.2 No. 142-M1987 and UL508. (Process Control Equipment, Industrial Control Equipment) UL (cULus) listed: UL508 (Industrial Control Equipment)
ATEX and IECEx applications only -	This equipment is to be installed in an enclosure certified for use, providing a degree of protection of IP54 or better. The free internal volume of the enclosure must be dimensioned in order to keep the temperature rating. A T4 rating is acceptable. For products using Solid State Relays (5606 SSR) a T4 rating is acceptable for maximum loads of 2A. When 3A loads are connected to the Solid State Relays, the maximum ambient rating is lowered to 50°C in order to maintain the T4 rating.
Digital Emissions	FCC Part 15, Subpart B, Class A Verification EN61000-6-4: 2007 Electromagnetic Compatibility Generic Emission Standard Part2: Industrial Environment C-Tick compliance. Registration number N15744.
Immunity	EN61000-6-2: 2005 Electromagnetic Compatibility Generic Standards Immunity for Industrial Environments
CE Mark Declaration	This product conforms to the above Emissions and Immunity Standards and therefore conforms with the requirements of Council Directive 89/336/EEC (as amended) relating to electromagnetic compatibility and is eligible to bear the CE mark. The Low Voltage Directive 73/23/EEC applies to devices operating within 50 to 1000 VDC and/or 75 to 1500 VAC. This Directive is not applicable to this product when installed

	according to our specifications.