

5506 Analog Input Module

Installation, Operation and Maintenance
Setup Manual

5/19/2011



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.

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.

Failure to observe this information can result in injury or equipment damage.

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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.

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.

About The Book

At a Glance

Document Scope

This manual describes the operation and maintenance of the 5506 Analog Input module.

Validity Notes

This document is valid for all versions of the 5506 Analog Input 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, serious injury or equipment damage.

User Comments

We welcome your comments about this document. You can reach us by e-mail at technicalsupport@controlmicrosystems.com.

Overview

The Model 5506 Analog Input Module adds eight analog inputs to the 5000 input/output system. These 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 5506 input module measures current or voltage inputs in the ranges 0 to 20mA, 4-20mA, 0 to 5 V or 1 to 5 V. The inputs are configured using the Telepace AIN 5506 register assignment or the IEC 61131-1 sp5506 I/O Connection. Each input is individually configured for input type and range.

The 5506 module uses a 16-bit analog to digital (A/D) converter. A single chip microcontroller with integral watchdog timer operates the A/D and communicates over the I/O bus.

Inputs are transient protected and optically isolated from the main logic power. The inputs are single ended. They share a common return.

Installation

The installation of the 5506 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 **System Configuration Guide**, at the beginning of this manual, for complete information on system layout, I/O Bus cable routing and module installation.

For ATEX and IECx 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.

Field Wiring

Controller, modem and I/O modules use screw termination style connectors for termination of field wiring. They accommodate solid or stranded wires from 22 to 12 AWG.

The connectors are removable. This allows module replacement without disturbing the field wiring. Leave enough slack in the wiring for the connector to be removed.

Remove power before servicing unit.

To remove the connector:

- Pull the connector upward from the board. Apply even pressure to both ends of the connector.

To install the connector:

- Line up the pins on the module with the holes in the connector.

Push the connector onto the pins. Apply even pressure to both ends on the connector.

Input Power Connection

Connect an external 11-30V DC power supply to the Power Input terminals. This is to power the isolated analog input circuits. 5V power required for the digital circuitry is available on the I²C bus. Refer to the specifications for details.

In systems where multiple 5000 modules and other devices are connected to the DC power supply, it is possible for noise to be coupled into the DC power supply. For these reasons it is recommended that the negative side of the DC supply be connected to the panel or chassis ground. This connection can be made on the 5000 power supply, SCADAPack or TeleSAFE Micro16 terminal blocks or as part of the panel wiring.

Analog Input Wiring

The 5506 module provides 8 analog inputs for use with 20 mA loop powered transmitters, 20mA self powered transmitters and 5V self powered transmitters.

Figure 1: Typical 5506 Analog Input Field Wiring shows three examples of how to wire these inputs. These examples are described below.

Example on Analog Input 0: A 20mA loop powered transmitter is connected from a suitable DC power source to the analog input. Analog Input 0 is configured as a 20mA current input.

Example on Analog Input 1: A 20mA self-powered transmitter is powered from an external source. The positive output of the transmitter is connected to the analog input. The negative output of the transmitter is connected to the terminal COM. Analog Input 1 is configured as a current input.

Example on Analog Input 2: A 5V self-powered transmitter is powered from an external source. The positive output of the transmitter is connected to the analog input. The negative output of the transmitter is connected to the terminal COM. Analog Input 2 is configured as a voltage input.

In the **5501 Emulate Mode** inputs are configured as either current or voltage as determined by the **mA** dip-switch on the 5506 module. Mixing of voltages and currents is not possible when in the 5501 Emulate Mode. Mixing of voltages and currents is possible when the 5506 is used in Native Mode.

This module should 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 in-effect opens the current loop.

When power is restored to the module the analog inputs are set to the state configured by Telepace register assignment or IEC 61131-1 I/O configuration. Applications that cannot tolerate this possibility must utilize external current sense resistors, and with the module input range set to voltage.

The terminal **COM** is common to the analog inputs and is electrically connected to the negative side of the DC power supply that powers the analog input section of the 5506 module.

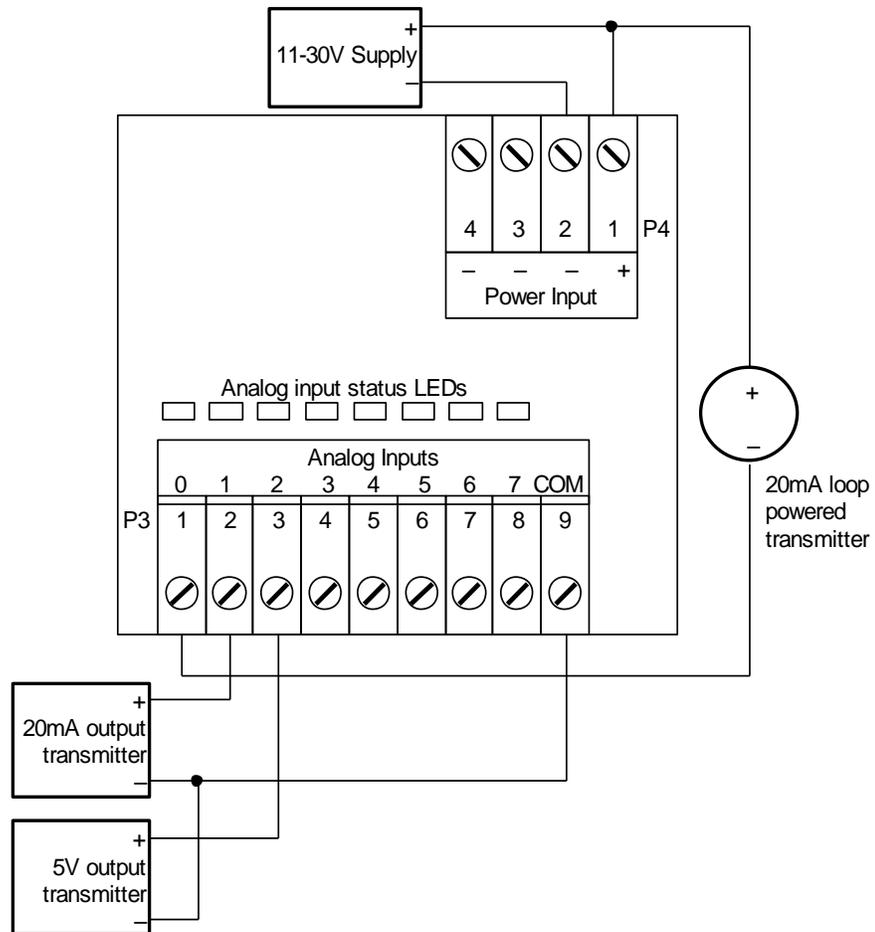


Figure 1: Typical 5506 Analog Input Field Wiring

Address Selection

The 5000 I/O bus will support a maximum of twenty I/O (input/output) modules. 5000 I/O module types may be combined in any manner to the maximum supported by the controller used. The types of input and output modules available are:

- Digital Input modules
- Digital Output modules
- Analog Input modules
- Analog Output modules
- Counter Input modules

Each type of I/O module, connected to the I/O bus, has 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.

The four address switches labeled 8, 4, 2, and 1 set the address. To set the address:

- Open the four switches by sliding the actuators to the “OFF” position.
- Close the switches that total to the desired address by sliding the actuators to “ON”.

Switch settings for each of the 16 module addresses are shown in **Figure 2: 5506 Analog Input Module Address Switches**

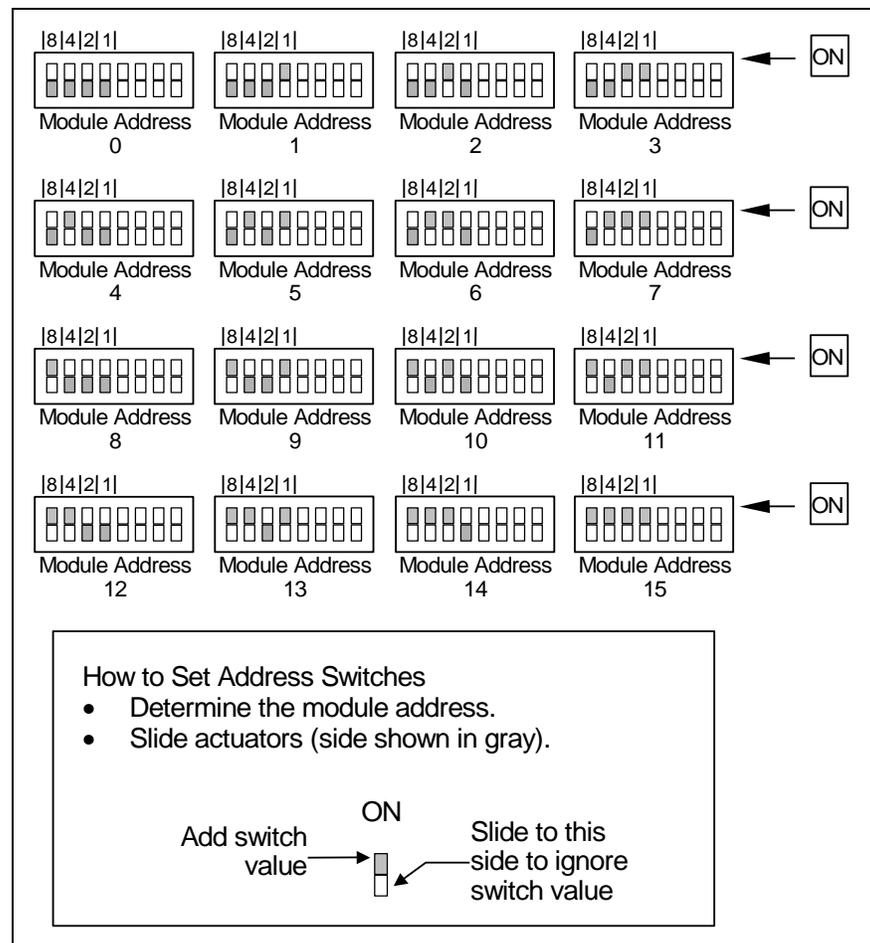


Figure 2: 5506 Analog Input Module Address Switches

LED Indicators

There are 8 LED's on the 5506 analog input module. The SCADAPack, through the I/O bus, powers the LED's. The LED's can be disabled to conserve power. Refer to the controller manual for more information.

The table below describes the LED's.

LED	Function
AIN Status	On when analog input is configured for current. Off when analog input is configured for voltage. Long flashes when current input is out of range. Short flashes when voltage input is out of range.

Operation and Maintenance

5506 Native Mode

The 5506 Analog Input module native mode provides enhanced capability over the 5501 emulation mode. The module operates in native mode if the 5501 Emulation DIP switch is open.

Each input is individually configurable for 0-5V, 1-5V, 0-20mA, or 4-20mA operation.

Converted analog input data is returned as a signed 15-bit value, providing 8 times more resolution than in 5501 mode. Negative values are possible, for example if a 4-20mA is open loop.

The module returns status information for each analog input indicating if the analog input is in or out of range for the defined signal type.

Inputs have a configurable filter rate.

The input-scanning rate is software configurable to 50 or 60 hertz.

Data Format

The 5506 Analog Input Module uses a 16-bit analog to digital (A/D) converter. The ADC output is scaled to provide output data in a 16 bit signed format. The 5506 also returns 8 bits of over and under range status when configured as a 5506 (not as a 5501). Over and under range status detection occurs when the measured input exceeds the measurement range by greater than 0.05%.

- For **Telepace** applications the analog input and status data is returned using the **AIN 5506** register assignment module. Refer to the Telepace User and Reference Manual for details on configuring the register assignment.
- For **IEC 61131-1** applications the analog input and status data is returned using the I/O Connection **sp5506** Equipment. Refer to the IEC 61131-1 User and Reference Manual for details on configuring the I/O Connection.

The configuration of the 5506 analog input module is also set using the Telepace AIN 5506 register assignment or the IEC 61131-1 sp5506 I/O Connection.

5506 Analog Input configuration includes:

- Each input is configured for 0-20mA, 4-20mA, 0-5V or 1-5V input type
- Analog input filtering is applied for each analog input. Filtering is used to dampen process variations or noise.
- Analog input scan frequency is set for all analog inputs. The scan frequency selection improves AC noise rejection at the correct frequency.

0% Input Offset

The 5506 Analog Input module may be set for 0-20mA or 0-5V (0% input offset) input measurement using the Telepace AIN 5506 register assignment or the ISaGRAF ain 5506 I/O Connection. When set for 0% input offset the input resolution is:

- 0.61uA resolution on 20mA inputs.
- 0.15mV resolution on the 5V inputs.

The table below shows the analog input data for several input signals.

Current	Voltage	Analog Data	5506 over and under-range status
0mA	0 V	0	OFF
5mA	1.25 V	8192	OFF
10mA	2.5 V	16384	OFF
15mA	3.75 V	24576	OFF
20mA	5V	32767	OFF
>20.01mA	>5.0025V	32767	ON

20% Input Offset

The 5506 Analog Input module may be set for 4-20mA or 1-5V (20% input offset) input measurement using the Telepace AIN 5506 register assignment or the IEC 61131-1 ain 5506 I/O Connection. When set for 20% input offset the input resolution is:

- 0.49uA resolution on 20mA inputs
- 0.12mV resolution on the 5V inputs

The table below shows the analog input data for several input signals.

Current	Voltage	Analog Data 5501	Analog Data 5506	5506 over and under-range status
0mA	0	0	0	ON
<3.92mA	<0.98V	0	0	ON
3.92mA	0.98V	0	0	OFF
4mA	1 V	0	0	OFF
8mA	2 V	8192	8192	OFF
12mA	3 V	16384	16384	OFF
16mA	4 V	24576	24576	OFF
20mA	5V	32767	32767	OFF
>20.01mA	>5.0025V	32767	32767	ON

Status

The 5506 analog input module Input Status Registers return the following data.

- Input channel is okay.
- Input channel is over of under range.

This data is available from the Telepace AIN 5506 register assignment or the IEC 61131-1 ain5506 I/O connection.

Status Register	Function
0	OFF = channel 0 is OK ON = channel 0 is over or under range
1	OFF = channel 1 is OK ON = channel 1 is over or under range
2	OFF = channel 2 is OK ON = channel 2 is over or under range
3	OFF = channel 3 is OK ON = channel 3 is over or under range
4	OFF = channel 4 is OK ON = channel 4 is over or under range
5	OFF = channel 5 is OK ON = channel 5 is over or under range
6	OFF = channel 6 is OK ON = channel 6 is over or under range
7	OFF = channel 7 is OK ON = channel 7 is over or under range

5501 Emulation Mode

The 5506 analog input module can be set to emulate a 5501 analog input module. This is desirable when using the 5506 module in systems that have been programmed to use the 5501. When emulating a 5501, inputs signals are either all voltage or current with a 0% or 20% offset. It is not possible to mix voltages and currents inputs or mix 0% and 20% input offset when emulating a 5501.

5501 Emulation

Set the **ON** switch in the 5501 EMU section of the dip-switch for 5501 Emulation mode. Set the switch to the ON position for 5501 Emulation and to the OFF position for 5506 Native mode.. See **Figure 3: 5501 Emulation** below.

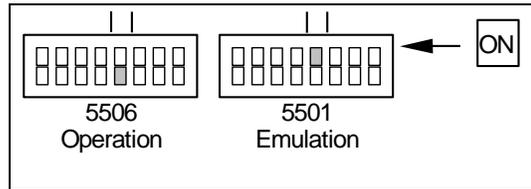


Figure 3: 5501 Emulation

Analog Input Offset Switch

The Analog Input Offset Switch setting applies only if the 5506 analog input module is in the 5501 Emulation mode. See section **5501 Emulation** above.

The 5506 module measures analog inputs in the 0 to 20mA (or 0-5V) range and scales the data for 4-20mA (or 1-5V) if the **20%** switch is in the ON position. The 5506 module measures analog inputs in the 0 to 20mA (or 0-5V) range and returns the data for 0-20mA (or 0-5V) if the **20%** switch is in the OFF position.

Set the **20%** switch to the ON position to configure the 5506 to return data offset by 4mA in current mode (or 1V in voltage mode). See **Figure 4: 5506 Analog Input Offset Switch**.

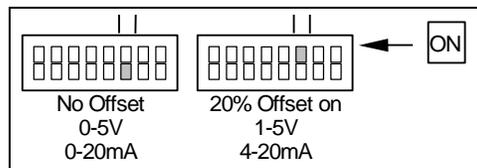


Figure 4: 5506 Analog Input Offset Switch

Current Input Switch

The Current Input Switch setting applies only if the 5506 analog input module is in the 5501 Emulation mode. See section **5501 Emulation** above.

The 5506 module sets the eight analog inputs as current inputs (250 ohm inputs) when the **mA** switch is in the ON position. The 5506 module sets the eight analog inputs as voltage inputs (high impedance inputs) when the **mA** switch is in the OFF position. See **Figure 5: 5506 Analog Input Current Switch**.

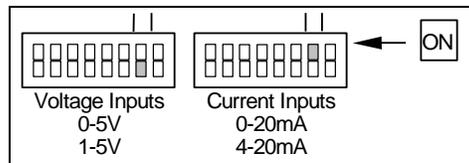


Figure 5: 5506 Analog Input Current Switch

50 / 60 Hz Rejection Switch

The 50/60 Hz Rejection Switch setting applies only if the 5506 analog input module is in the 5501 Emulation mode. See section **5501 Emulation** above.

The 5506 module rejects 50Hz. noise on the inputs when the **50Hz** switch is in the ON position. The 5506 module rejects 60Hz noise on the inputs when the **50Hz** switch is in the OFF position. See **Figure 6: 5506 Analog Input 50/60Hz. Rejection Switch.**

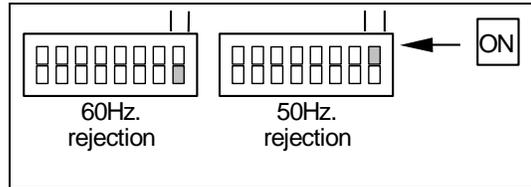


Figure 6: 5506 Analog Input 50/60Hz. Rejection Switch

Data Format

When the 5506 Analog input module is in the 5501 Emulate mode, see section **5501 Emulation** above, the Analog Input Offset switch determines the data range returned from the module.

0% Input Offset

The 5506 module measures analog inputs in the 0 to 20mA (or 0-5V) range and returns the data for 0-20mA or 0-5V (0% input offset) if the **20%** switch is in the OFF position. When set for 0% input offset the input resolution is:

- 4.88uA/count on 20mA inputs.
- 1.22mV/count on the 5 V inputs.

The table below shows the A/D output value for several input signals.

Current	Voltage	A/D Output
0mA	0 V	0
5mA	1.25 V	8192
10mA	2.5 V	16384
15mA	3.75 V	24576
19.995mA	4.999 V	32760

20% Input Offset

The 5506 module measures analog inputs in the 0 to 20mA or 0-5V range and scales the data for 4-20mA or 1-5V (20% offset) if the **20%** switch is in the ON position. When set for 20% input offset the input resolution is:

- 3.91uA/count on the 20mA inputs.
- 0.976mV/count on the 5 V inputs.

The table below shows the A/D output value for several input signals.

Current	Voltage	A/D Output
< 4mA	< 1V	0
4mA	1V	0
8mA	2V	8192
12mA	3V	16384
16mA	4V	24576
19.996mA	4.999V	32760

Maintenance

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

Troubleshooting

Condition	Action
20mA inputs read 0.	Check transmitter power.
Reading is at or near 0 for input signals.	Check if the input transient suppressers are damaged.
Reading is constant.	Check that the analog input is not forced.
20mA readings are not accurate.	Check for a damaged 250Ω current sense resistor. Check that the input is configured for 20mA or current inputs.

Calibration

The 5506 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.

Specifications

Disclaimer: Control Microsystems reserves the right to change product specifications. For more information visit www.controlmicrosystems.com.

General

I/O Terminations	12 to 22 AWG 15A contacts Screw termination - 6 lb.-in. (0.68 Nm) torque
Dimensions	2.9 inch (74 mm) wide 4.9 inch (124 mm) high 1.8 inch (45 mm) deep
Packaging	corrosion resistant zinc plated steel with black enamel paint
Environment	5% RH to 95% RH, non-condensing -40°C to 70°C (-40°F to 158°F) operation -40°C to 85°C (-40°F to 185°F) storage
Addressing	16 modules. DIP switch selectable.

Analog Inputs

Quantity	8
Ranges	0-20mA 4-20mA 0-5V 1-5V
LED Indicators	8 red status LEDs indicating, current input, voltage input and under or over range signal applied.
Input configuration	Individual inputs configurable with 4mA/1V (20%) offset and for voltage/current operation when configured as a 5506. Inputs are DIP switch selectable with 4mA/1V (20%) offset and for voltage/current operation when configured to emulate a 5501 module.
Input resistance	250 ohms - Current configuration. 66k ohms - Voltage configuration.
Resolution	15 bits over the 0-5V and 0-20mA measurement range

Type	Single ended
Accuracy	±0.1% of full scale at 25°C (77°F) ±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	53dB with 3Hz filter 50dB with 6Hz filter 49dB with 11Hz filter 45dB with 30Hz filter
Normal mode rejection at 50Hz with 50Hz scanning	73dB with 3Hz filter 56dB with 6Hz filter 52dB with 11Hz filter 49dB with 30Hz filter
Response Time for 10% to 90% signal change (60Hz scanning)	250ms with 3Hz filter 130ms with 6Hz filter 60ms with 11Hz filter 30ms with 30Hz filter
Response Time for 10% to 90% signal change (50Hz scanning)	300ms with 3Hz filter 140ms with 6Hz filter 80ms with 11Hz filter 40ms 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. 10 positions.
Isolation	500Vac isolation from logic supply and chassis.

Power Supply

5V power requirements	22mA, LEDs off 45mA, LEDs on
11-30Vdc power requirements	UL508 rated 13.75-28Vdc. Class 2 11mA
11-30Vdc - Connector	Removable. 4 positions.
11-30Vdc - Isolation	Isolation from logic supply and chassis

Approvals and Certifications

Hazardous Locations - North America	<p>Suitable for use in Class I, Division 2, Groups A, B, C and D Hazardous Locations. Temperature Code T5</p> <p>CSA certified to the requirements of:</p> <ul style="list-style-type: none"> • CSA Std. C22.2 No. 213-M1987 - Hazardous Locations.. • UL Std. No. 1604 - Hazardous (Classified) Locations.
Hazardous Locations - Europe	<p>ATEX II 3G, Ex nA IIC T4</p> <p>per EN 60079-15, protection type n (Zone 2)</p>
Hazardous Locations	<p>IECEX, Ex nA IIC T4</p> <p>per IEC 60079-15, protection type n (Zone 2)</p>
ATEX and IECEX Applications only	<p>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.</p> <p>For products using Solid State Relays (5415, 5606 and 5607 modules and SCADAPack using 5606 and 5607 modules) 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.</p>
Safety	<p>CSA (cCSAus) certified to the requirements of: CSA C22.2 No. 142-M1987 and UL916. (Process Control Equipment, Industrial Control Equipment) in Canada and USA.</p> <p>UL (cULus) listed: UL508 (Industrial Control Equipment)</p>
Digital Emissions	<p>FCC 47 CFR Part 15, Subpart B, Class A Verification</p> <p>EN61000-6-4: Electromagnetic Compatibility Generic Emission Standard Part 6-4: Industrial Environment</p> <p>C-Tick compliance. Registration number N15744.</p>
Immunity	<p>EN61000-6-2: Electromagnetic Compatibility Generic Standards Part 6-2: Immunity for Industrial Environments</p>
Declaration	<p>This product conforms to the above Emissions and Immunity Standards and therefore conforms with the requirements of Council Directive 2004/108/EEC (as amended) relating to electromagnetic compatibility and is eligible to bear the CE mark.</p>

The Low Voltage Directive is not applicable to this product.