SuperSystems incorporated

Matrix Modules

HARDWARE MANUAL

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Contents

Overview:

The Matrix Series Controller provides a flexible platform for meeting a large variety of control applications. The expandable I/O for analog and digital cards allows for right-sizing an application. The instrument has all the built-in features for sophisticated thermal processing applications, includes a customizable HMI allowing the right interface to be created for the application, and it includes built-in data logging.

The modules are designed for:

- Indoor use
- Altitude up to 2000m
- Temperatures 5˚C - 40˚C
- Maximum relative humidity 80% for temperatures up to 31˚C, decreasing linearly to 50% relative humidity at 40˚C
- Overvoltage category I
- Pollution degree 2

The modules are to be assembled on DIN rail inside a NEMA-12 or better enclosure.

The modules are classified as OPEN EQUIPMENT as per IEC/UL/CSA 61010-2-201. Enclosure must be provided by the user.

If this equipment is used in a manner not specified by SSi, the protection provided by the equipment may be impaired.

Conformity Information

The modules have been tested to the following standards…

- Standard for Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements:
  - IEC 61010-1:2010
  - EN 61010-1:2010 + Corrigendum 1: 2011
  - UL 61010-1, 3rd Edition with revisions through May 11, 2012
  - CAN/CSA-C22.2 No. 61010-1-12 Third Edition
- Standard for Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use; Part 2-201: Particular Requirements for Control Equipment:
  - IEC 61010-1:2017
  - EN61010-2-201:2017
  - UL61010-2-201, Second Edition 05/14/2018
  - CAN/CSA-C22.2 NO. 61010-2-201:18

…under the following Conditions of Acceptability:

- The modules are evaluated in conjunction with the main controller.
- The total configurations of the backplane system shall not exceed One Main Controller (13705), 24 analog inputs, 16 analog outputs, 32 digital inputs, and 64 digital outputs.
- Equipment is only to be installed by trained personal in accordance with the relevant national and regional electrical codes.
- The controllers are "open type" according to IEC 61010-2-201:2017. Therefore, the controller shall be installed within a NEMA 12 enclosure which provides the safety aspects protecting the operator from mechanical and electrical hazards and shall be accessible only by authorized personnel. This metal enclosure is required to serve as fire enclosure. Requirements for mechanical strength, flammability and stability of the modules must be considered in the end use application in conjunction with the overall enclosure.
- Equipment has only been tested for electrical safety. No evaluation of functional safety and performance characteristics have been performed.
- System is required to be supplied only by certified Safety Extra Low Voltage (SELV) power supply providing reinforced or double insulation for protection against electric shock with output voltages below 30 V r.m.s. and 42.4 V peak or 60 Vdc, per clause 6.3.1 of IEC/EN/UL/CSA 61010-1.
- All output circuits are considered as not hazardous live.
- Wiring for SELV circuits shall be either segregated from the wiring for circuits other than SELV, or the insulation of all conductors shall be rated for the higher voltage.
- Disconnection means to be provided by end user.

Backplane Connection

The five contacts on the back of the card supply communications and power to the module. Figure 1 shows the contacts layout of the modules.

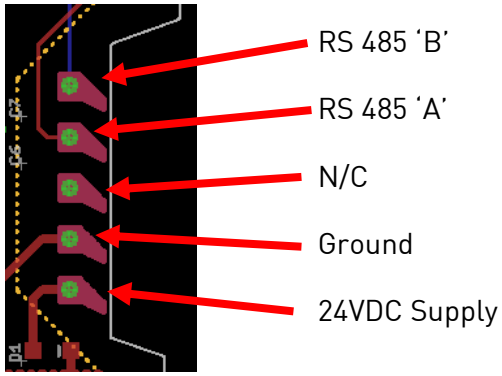


Figure 1- Contacts Layout

The modules will function with a supply voltage between 10.8 VDC and 26.4 VDC, with a nominal voltage of 24.0 VDC. The communications bus conforms to the RS 485 electrical standard, and should not exceed -7 VDC or 12VDC.

DIP Switch Configuration

On the front of the module, there is an eight-position DIP switch used to set the individual address of the module within a greater system setup. Addresses are set in a binary fashion, with the position 1 switch being the least significant bit, and the position 8 switch being the most significant bit.

Figure 2 – DIP Switches

It can take approximately one minute from insertion until a module is recognized by the base controller module, communications are established, and inclusion in the system occurs.

Terminal Connectors

Each signal input has two pairs of contacts utilizing a four contact Phoenix Contact screw terminal connector featuring a 5mm pitch. These connectors are rated to accept at maximum 14 AWG and a minimum 18 AWG wire.

Figure 3 - Terminal Connections

Basic Maintenance

Be sure all equipment is in a safe state and disconnected before servicing.

All personnel working with this device require:

- Training in arc flash prevention
- Knowledge of the system in which the device is installed
- Knowledge of applicable lock out/tag out procedures

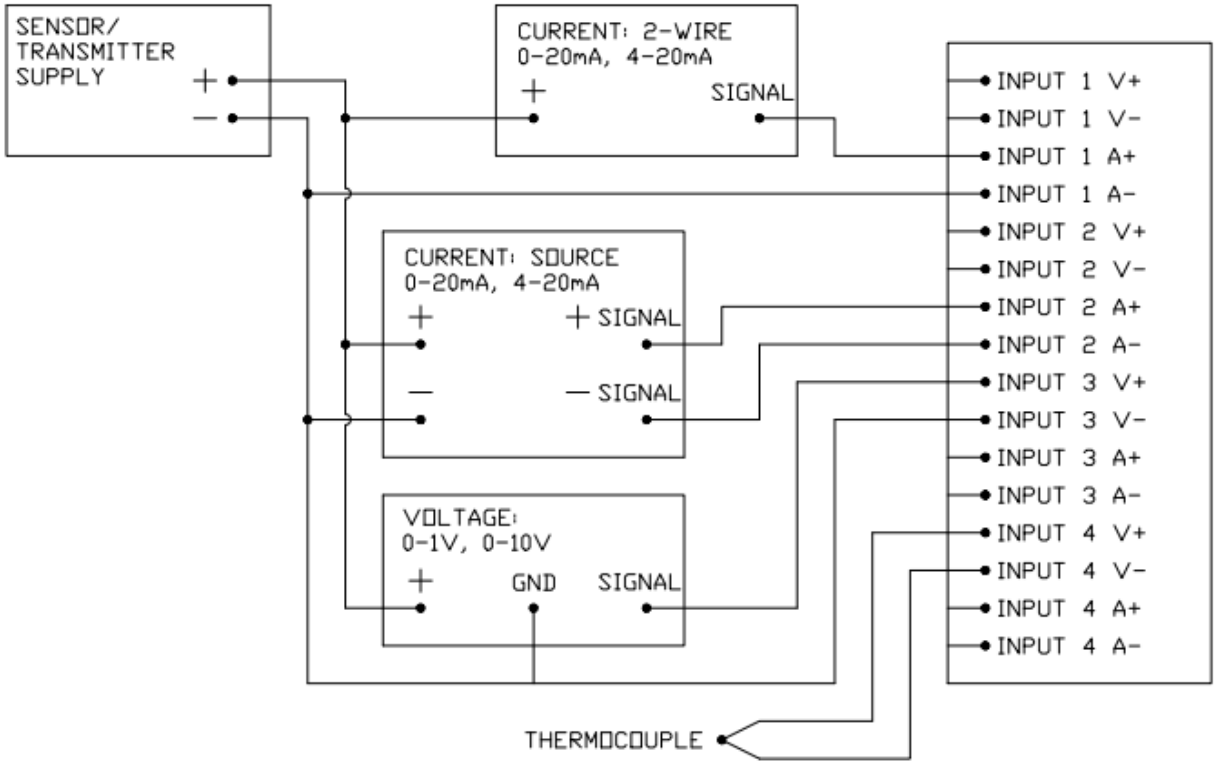
Please contact SSi with any maintenance questions.

13701 – 4-Analog Input Module

Attributes

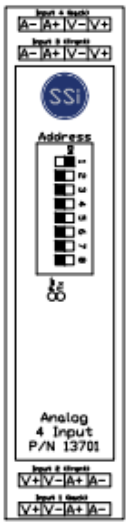
Inputs	4
Input ranges	20 mV 40 mV 80 mV 160 mV 312.5 mV 625 mV 1.250 V 2.500 V 12.50 V 25.00 V 0-20 mA 4-20 mA
Thermocouple types	B C E J K N M R S T D G P
Resolution	24 bits
Working voltage	24 VDC
Current draw @ 24 VDC	55mA
Input impedance	Current terminals: 62Ω Voltage terminals (12.5V and 25V ranges): 20 kΩ Voltage terminals (all other): > 40 mΩ
TC accuracy	+/- 2.0°F (1.1°C) or 0.2% of temp reading, (whichever is greater)
Isolation voltage	1000V
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 - 0.6 N

Diagrams

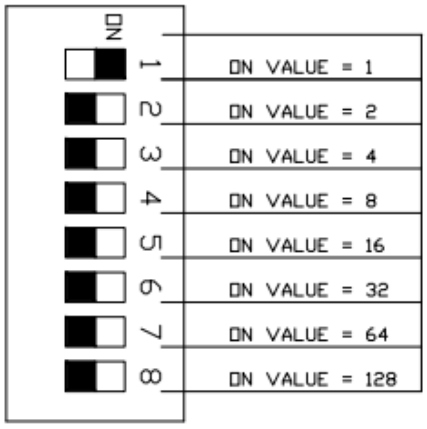


NOTE: FOR 0-10V SIGNALS, INPUT MUST BE CONFIGURED FIRST

INDICATES DIP SWITCH POSITION →



Analog Input Addresses Start at 1



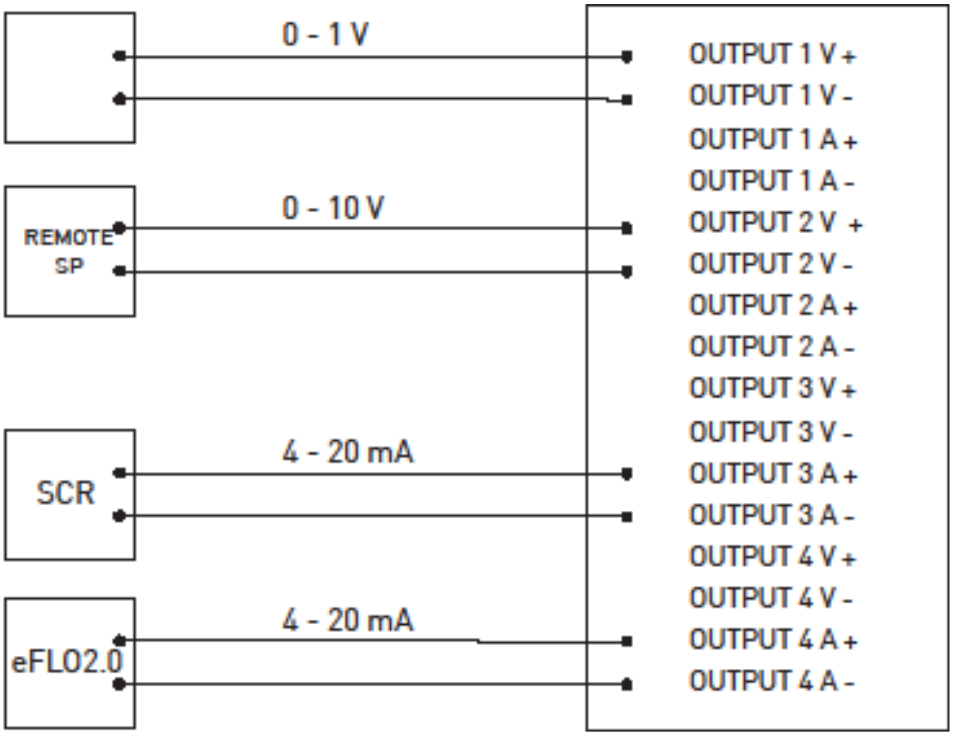
	ATTRIBUTE	COLOR	PURPOSE
Pwr	POWER	GREEN	INDICATES PROPER POWER VIA THE BACKPLANE
Tx	COMMS	AMBER	INDICATES COMMUNICATION VIA THE BACKPLANE

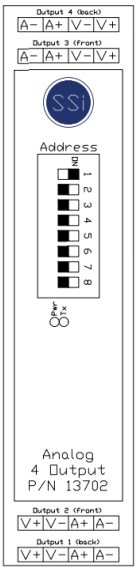
13702 – 4-Analog Output Module

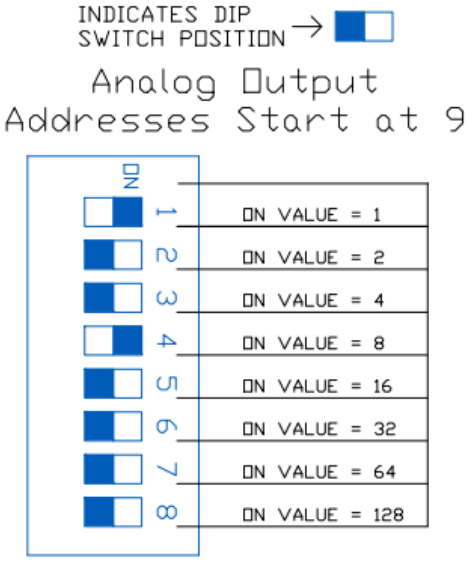
Attributes

Outputs	4
Output Ranges	4 – 20 mA 0 – 1 V 0 – 10 V
Resolution	16 bit
Working voltage	24 VDC
Current Draw @ 24 VDC	155 mA
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 – 0.6 N

Diagrams







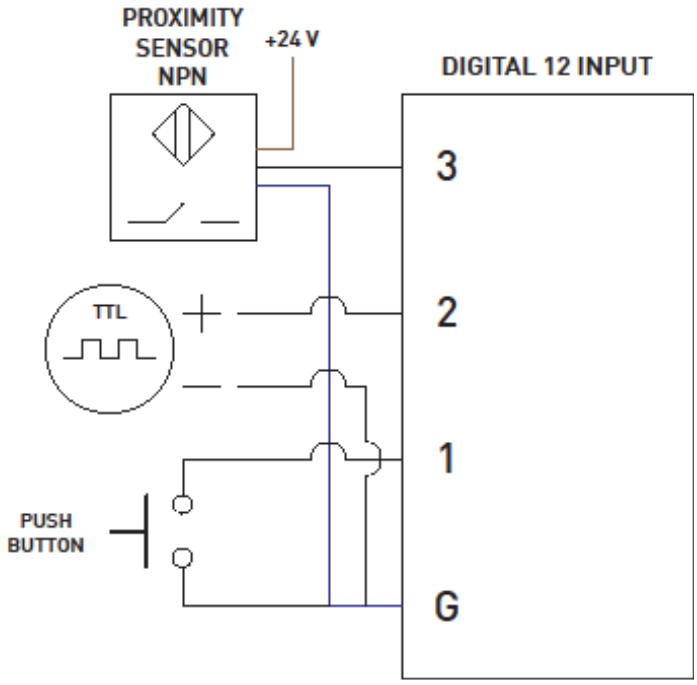
	ATTRIBUTE	COLOR	PURPOSE
Pwr	POWER	GREEN	INDICATES PROPER POWER VIA THE BACKPLANE
Tx	COMMS	AMBER	INDICATES COMMUNICATION VIA THE BACKPLANE

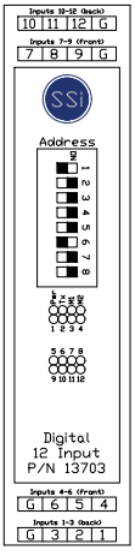
13703 – 12-Digital Input Module

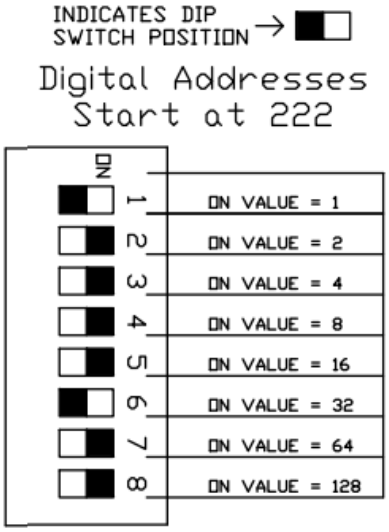
Attributes

Inputs	12
Transistor type	NPN
Working voltage	24 VDC
Current Draw @ 24 VDC	35 mA
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 – 0.6 N

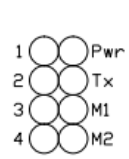
Diagrams





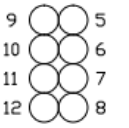


ATTRIBUTE	COLOR	PURPOSE
DIGITAL INPUT 1	GREEN	INDICATES INPUT 1 IS ACTIVE
DIGITAL INPUT 2	GREEN	INDICATES INPUT 2 IS ACTIVE
DIGITAL INPUT 3	GREEN	INDICATES INPUT 3 IS ACTIVE
DIGITAL INPUT 4	GREEN	INDICATES INPUT 4 IS ACTIVE



ATTRIBUTE	COLOR	PURPOSE
POWER	GREEN	INDICATES PROPER POWER VIA THE BACKPLANE
COMMS	AMBER	INDICATES COMMUNICATION VIA THE BACKPLANE
MODE 1	GREEN	NO CURRENT USE
MODE 2	GREEN	NO CURRENT USE

ATTRIBUTE	COLOR	PURPOSE
DIGITAL INPUT 9	GREEN	INDICATES INPUT 9 IS ACTIVE
DIGITAL INPUT 10	GREEN	INDICATES INPUT 10 IS ACTIVE
DIGITAL INPUT 11	GREEN	INDICATES INPUT 11 IS ACTIVE
DIGITAL INPUT 12	GREEN	INDICATES INPUT 12 IS ACTIVE



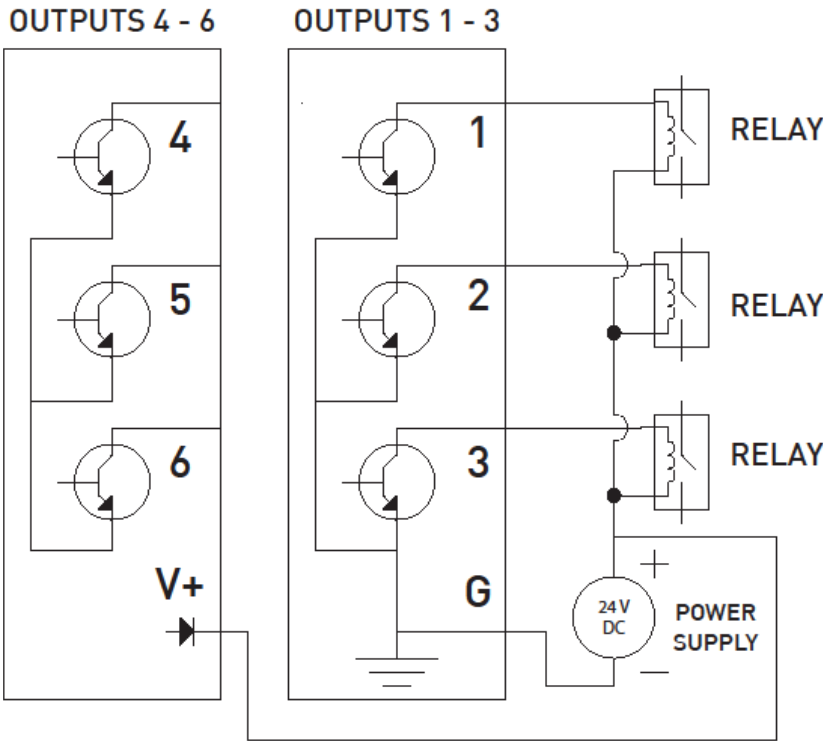
ATTRIBUTE	COLOR	PURPOSE
DIGITAL INPUT 5	GREEN	INDICATES INPUT 5 IS ACTIVE
DIGITAL INPUT 6	GREEN	INDICATES INPUT 6 IS ACTIVE
DIGITAL INPUT 7	GREEN	INDICATES INPUT 7 IS ACTIVE
DIGITAL INPUT 8	GREEN	INDICATES INPUT 8 IS ACTIVE

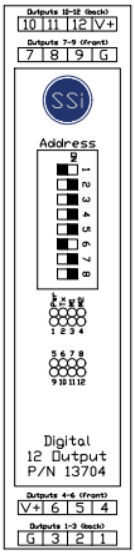
13704 – 12-Digital Output Module

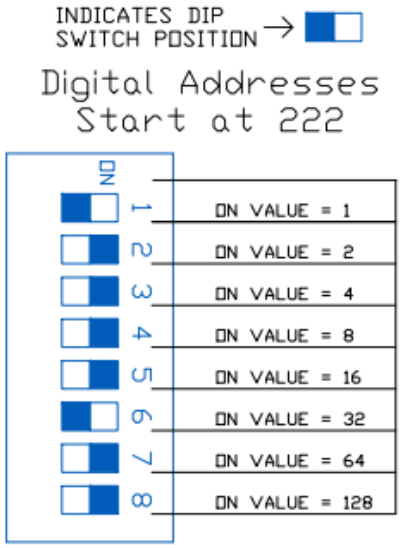
Attributes

Outputs	12
Transistor type	NPN
Working voltage	24 VDC
Current Draw @ 24 VDC	40 mA
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 – 0.6 N

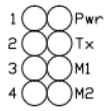
Diagrams





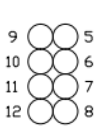


ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 1	GREEN	INDICATES OUTPUT 1 IS ACTIVE
DIGITAL OUTPUT 2	GREEN	INDICATES OUTPUT 2 IS ACTIVE
DIGITAL OUTPUT 3	GREEN	INDICATES OUTPUT 3 IS ACTIVE
DIGITAL OUTPUT 4	GREEN	INDICATES OUTPUT 4 IS ACTIVE



ATTRIBUTE	COLOR	PURPOSE
POWER	GREEN	INDICATES PROPER POWER VIA THE BACKPLANE
COMMS	AMBER	INDICATES COMMUNICATION VIA THE BACKPLANE
MODE 1	GREEN	NO CURRENT USE
MODE 2	GREEN	NO CURRENT USE

ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 9	GREEN	INDICATES OUTPUT 9 IS ACTIVE
DIGITAL OUTPUT 10	GREEN	INDICATES OUTPUT 10 IS ACTIVE
DIGITAL OUTPUT 11	GREEN	INDICATES OUTPUT 11 IS ACTIVE
DIGITAL OUTPUT 12	GREEN	INDICATES OUTPUT 12 IS ACTIVE



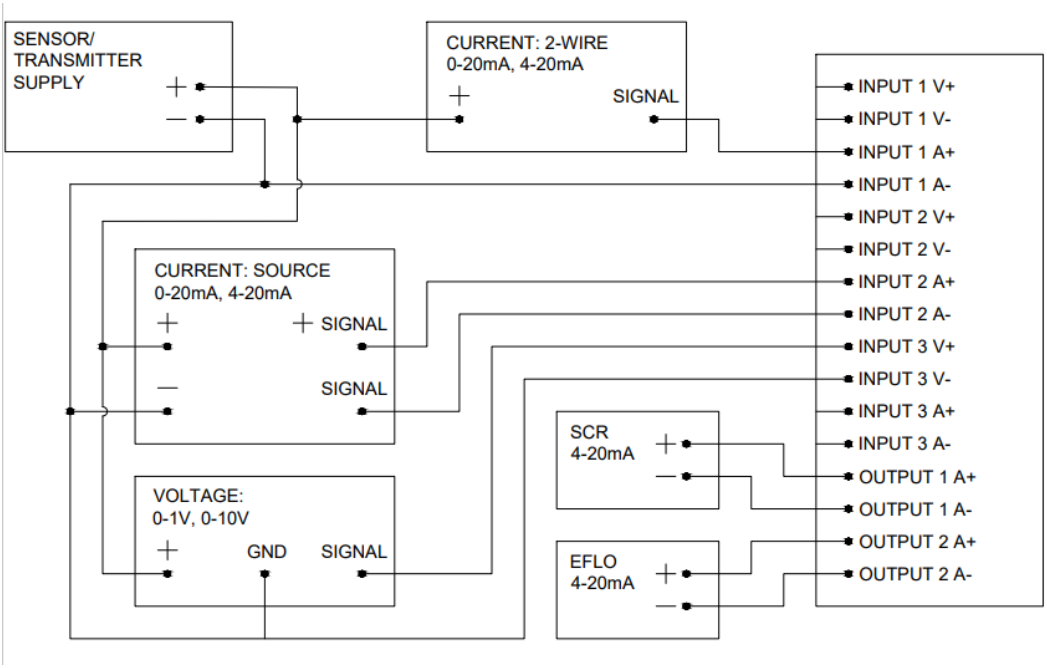
ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 5	GREEN	INDICATES OUTPUT 5 IS ACTIVE
DIGITAL OUTPUT 6	GREEN	INDICATES OUTPUT 6 IS ACTIVE
DIGITAL OUTPUT 7	GREEN	INDICATES OUTPUT 7 IS ACTIVE
DIGITAL OUTPUT 8	GREEN	INDICATES OUTPUT 8 IS ACTIVE

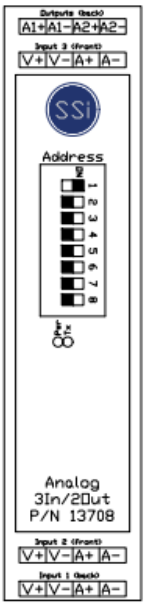
13708 – Analog 3-Input 2-Output Module

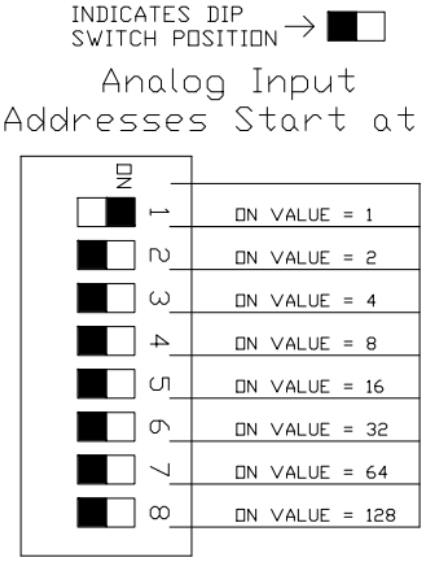
Attributes

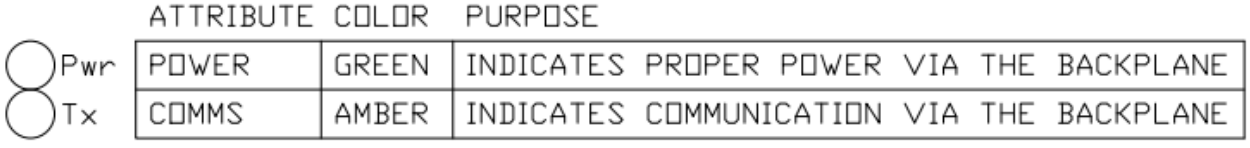
Analog Inputs	3
Input ranges	20 mV 40 mV 80 mV 160 mV 312.5 mV 625 mV 1.250 V 2.500 V 12.50 V 25.00 V 0-20 mA 4-20 mA
Thermocouple types	B C E J K N M R S T D G P
Input Resolution	24 bits
Input impedance	Current terminals: 62Ω Voltage terminals (12.5V and 25V ranges): 20 kΩ Voltage terminals (all other): > 40 mΩ
TC accuracy	+/- 2.0°F (1.1°C) or 0.2% of temp reading, (whichever is greater)
Isolation voltage	1000V
Analog Outputs	2
Output Ranges	4 – 20 mA
Resolution	16 bit
Working voltage	24 VDC
Max Current Draw @ 24 VDC	80 mA
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 – 0.6 N

Diagrams


SENSOR/
TRANSMITTER
SUPPLY
CURRENT: 2-WIRE
0-20mA, 4-20mA
SIGNAL
CURRENT: SOURCE
0-20mA, 4-20mA
SIGNAL
SIGNAL
VOLTAGE:
0-1V, 0-10V
GND
SIGNAL
SCR
4-20mA
EFLO
4-20mA
INPUT 1 V+
INPUT 1 V-
INPUT 1 A+
INPUT 1 A-
INPUT 2 V+
INPUT 2 V-
INPUT 2 A+
INPUT 2 A-
INPUT 3 V+
INPUT 3 V-
INPUT 3 A+
INPUT 3 A-
OUTPUT 1 A+
OUTPUT 1 A-
OUTPUT 2 A+
OUTPUT 2 A-


A1+ A1- A2+ A2-
V+ V- A+ A-
SSi
Address
Analog
3In/2Out
P/N 13708
V+ V- A+ A-
V+ V- A+ A-


INDICATES DIP
SWITCH POSITION
Analog Input
Addresses Start at 1
ON
1 ON VALUE = 1
2 ON VALUE = 2
3 ON VALUE = 4
4 ON VALUE = 8
5 ON VALUE = 16
6 ON VALUE = 32
7 ON VALUE = 64
8 ON VALUE = 128

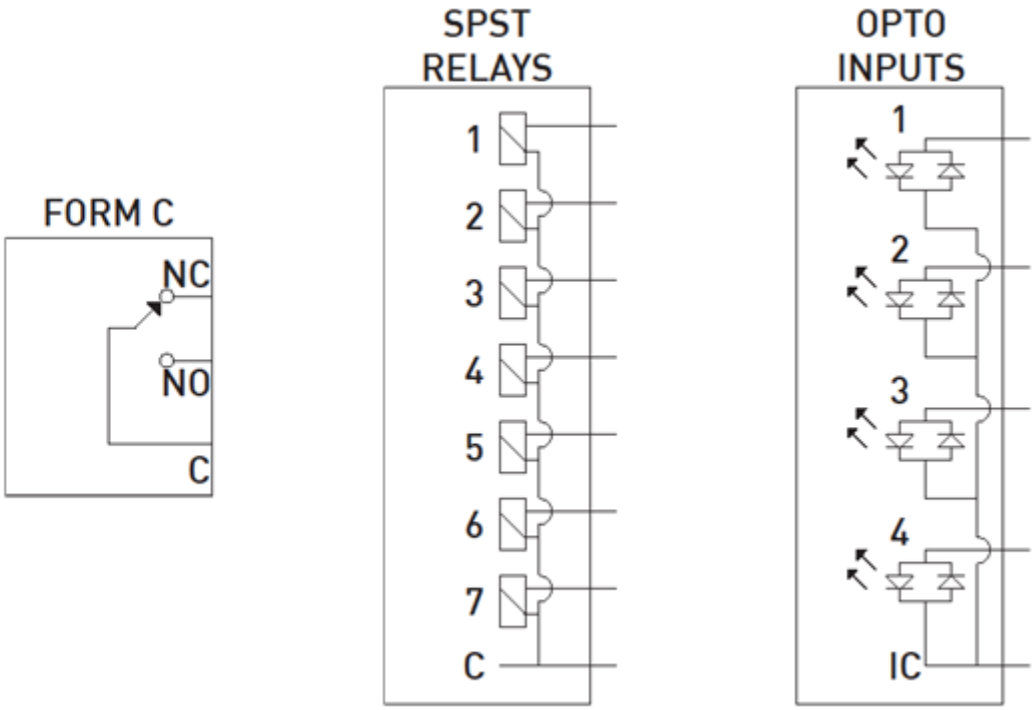

ATTRIBUTE COLOR PURPOSE
Pwr
Tx
POWER GREEN INDICATES PROPER POWER VIA THE BACKPLANE
COMMS AMBER INDICATES COMMUNICATION VIA THE BACKPLANE

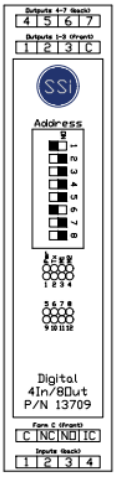
13709 – Digital 4-Input 8-Output Module

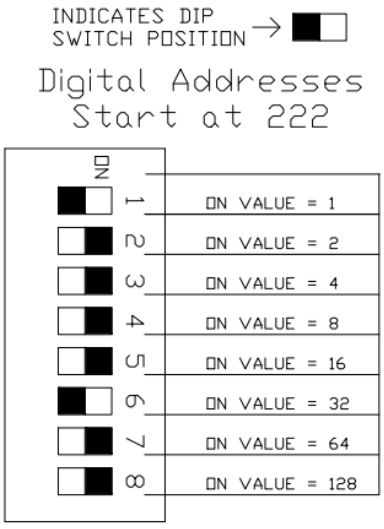
Attributes

Digital Inputs (OPTO ISO)	4
Input Isolation	2.5k VRMS
Relay Outputs	8
Max Output Switching voltage	125 VDC
Relay Contact rating	5 A
Working voltage	24 VDC
Current Draw @ 24 VDC	120mA
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 – 0.6 N

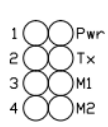
Diagrams





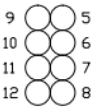


ATTRIBUTE	COLOR	PURPOSE
DIGITAL INPUT 1	GREEN	INDICATES INPUT 1 IS ACTIVE
DIGITAL INPUT 2	GREEN	INDICATES INPUT 2 IS ACTIVE
DIGITAL INPUT 3	GREEN	INDICATES INPUT 3 IS ACTIVE
DIGITAL INPUT 4	GREEN	INDICATES INPUT 4 IS ACTIVE



ATTRIBUTE	COLOR	PURPOSE
POWER	GREEN	INDICATES PROPER POWER VIA THE BACKPLANE
COMMS	AMBER	INDICATES COMMUNICATION VIA THE BACKPLANE
MODE 1	GREEN	NO CURRENT USE
MODE 2	GREEN	NO CURRENT USE

ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 5	GREEN	INDICATES OUTPUT 5 IS ACTIVE
DIGITAL OUTPUT 6	GREEN	INDICATES OUTPUT 6 IS ACTIVE
DIGITAL OUTPUT 7	GREEN	INDICATES OUTPUT 7 IS ACTIVE
DIGITAL OUTPUT 8	GREEN	INDICATES OUTPUT 8 IS ACTIVE



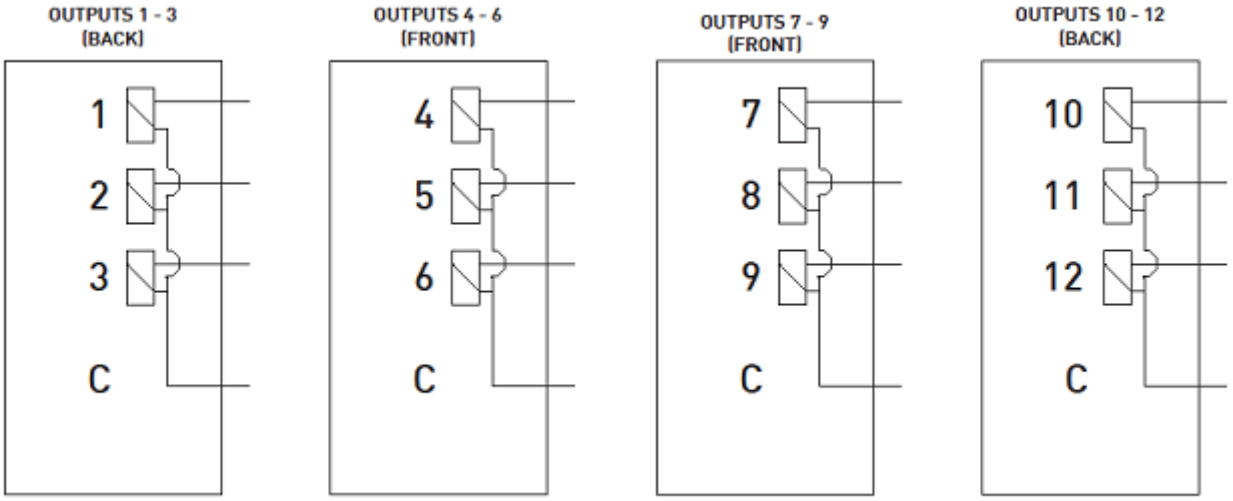
ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 1	GREEN	INDICATES OUTPUT 1 IS ACTIVE
DIGITAL OUTPUT 2	GREEN	INDICATES OUTPUT 2 IS ACTIVE
DIGITAL OUTPUT 3	GREEN	INDICATES OUTPUT 3 IS ACTIVE
DIGITAL OUTPUT 4	GREEN	INDICATES OUTPUT 4 IS ACTIVE

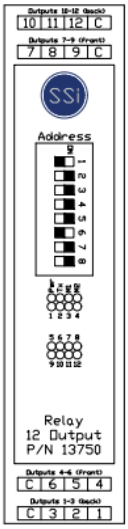
13750 – 12-Output Relay Module

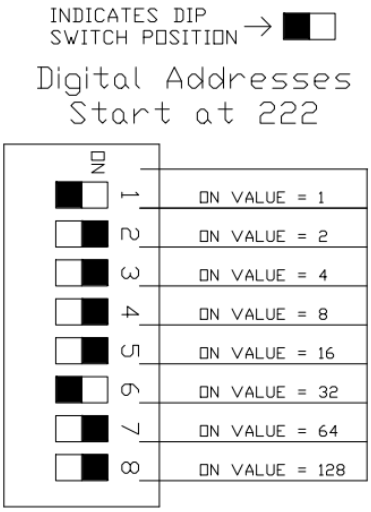
Attributes

Relay Outputs	12
Max Output Switching voltage	125 VDC
Relay Contact rating	5 A
Working voltage	24 VDC
Current Draw @ 24 VDC	130 mA
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 – 0.6 N

Diagrams



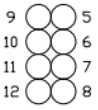




ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 1	GREEN	INDICATES OUTPUT 1 IS ACTIVE
DIGITAL OUTPUT 2	GREEN	INDICATES OUTPUT 2 IS ACTIVE
DIGITAL OUTPUT 3	GREEN	INDICATES OUTPUT 3 IS ACTIVE
DIGITAL OUTPUT 4	GREEN	INDICATES OUTPUT 4 IS ACTIVE

ATTRIBUTE	COLOR	PURPOSE
POWER	GREEN	INDICATES PROPER POWER VIA THE BACKPLANE
COMMS	AMBER	INDICATES COMMUNICATION VIA THE BACKPLANE
MODE 1	GREEN	NO CURRENT USE
MODE 2	GREEN	NO CURRENT USE

ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 9	GREEN	INDICATES OUTPUT 9 IS ACTIVE
DIGITAL OUTPUT 10	GREEN	INDICATES OUTPUT 10 IS ACTIVE
DIGITAL OUTPUT 11	GREEN	INDICATES OUTPUT 11 IS ACTIVE
DIGITAL OUTPUT 12	GREEN	INDICATES OUTPUT 12 IS ACTIVE



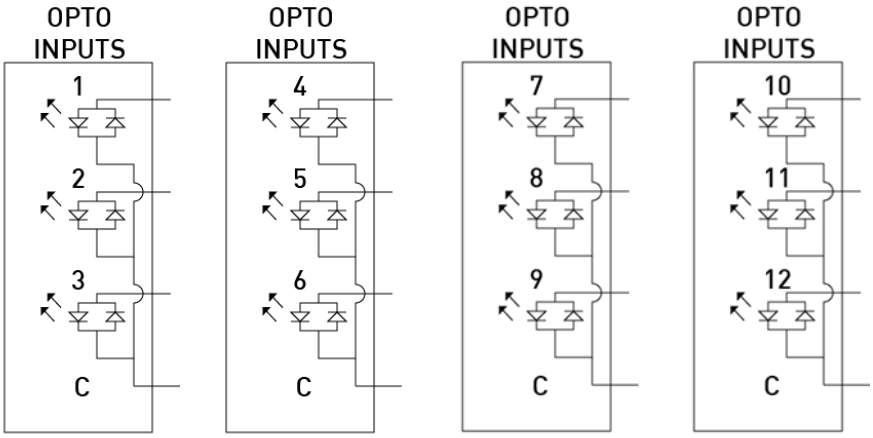
ATTRIBUTE	COLOR	PURPOSE
DIGITAL OUTPUT 5	GREEN	INDICATES OUTPUT 5 IS ACTIVE
DIGITAL OUTPUT 6	GREEN	INDICATES OUTPUT 6 IS ACTIVE
DIGITAL OUTPUT 7	GREEN	INDICATES OUTPUT 7 IS ACTIVE
DIGITAL OUTPUT 8	GREEN	INDICATES OUTPUT 8 IS ACTIVE

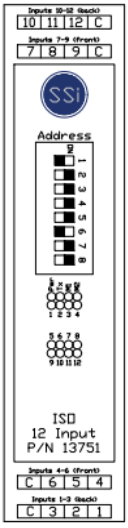
13751 12 ISO input

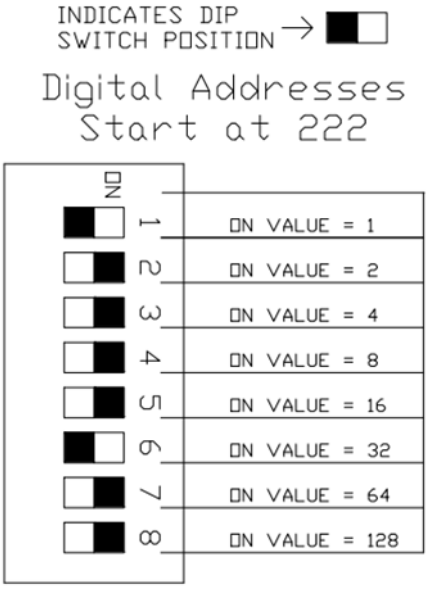
Attributes

Inputs	12
Input type	Opto isolator
Input isolation	2.5k VRMS
Working voltage	24VDC – 120VAC
Current Draw @ 24 VDC	54mA
Dimension	4.25" x 0.9" x 4.5" (99mm x 22.5mm x 114.5mm)
Slot width	1
Module location	DIN rail
Terminal Type	5mm pitch
Terminal Screw Torque	0.5 – 0.6 N

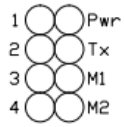
Diagrams







ATTRIBUTE	COLOR	PURPOSE
DIGITAL INPUT 1	GREEN	INDICATES INPUT 1 IS ACTIVE
DIGITAL INPUT 2	GREEN	INDICATES INPUT 2 IS ACTIVE
DIGITAL INPUT 3	GREEN	INDICATES INPUT 3 IS ACTIVE
DIGITAL INPUT 4	GREEN	INDICATES INPUT 4 IS ACTIVE



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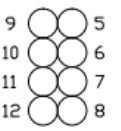
DIGITAL INPUT 11	GREEN	INDICATES INPUT 11 IS ACTIVE
DIGITAL INPUT 12	GREEN	INDICATES INPUT 12 IS ACTIVE



ATTRIBUTE	COLOR	PURPOSE
DIGITAL INPUT 5	GREEN	INDICATES INPUT 5 IS ACTIVE
DIGITAL INPUT 6	GREEN	INDICATES INPUT 6 IS ACTIVE
DIGITAL INPUT 7	GREEN	INDICATES INPUT 7 IS ACTIVE
DIGITAL INPUT 8	GREEN	INDICATES INPUT 8 IS ACTIVE

Warranty

Limited Warranty for Super Systems Products:

The Limited Warranty applies to new Super Systems Inc. (SSI) products purchased direct from SSI or from an authorized SSI dealer by the original purchaser for normal use. SSI warrants that a covered product is free from defects in materials and workmanship, with the exceptions stated below.

The limited warranty does not cover damage resulting from commercial use, misuse, accident, modification or alteration to hardware or software, tampering, unsuitable physical or operating environment beyond product specifications, improper maintenance, or failure caused by a product for which SSI is not responsible. There is no warranty of uninterrupted or error-free operation. There is no warranty for loss of data—you must regularly back up the data stored on your product to a separate storage product. There is no warranty for product with removed or altered identification labels. SSI DOES NOT PROVIDE ANY OTHER WARRANTIES OF ANY KIND, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME JURISDICTIONS DO NOT ALLOW THE LIMITATION OF IMPLIED WARRANTIES, SO THIS LIMITATION MAY NOT APPLY TO YOU. SSI is not responsible for returning to you product which is not covered by this limited warranty.

If you are having trouble with a product, before seeking limited warranty service, first follow the troubleshooting procedures that SSI or your authorized SSI dealer provides.

SSI will replace the PRODUCT with a functionally equivalent replacement product, transportation prepaid after PRODUCT has been returned to SSI for testing and evaluation. SSI may replace your product with a product that was previously used, repaired and tested to meet SSI specifications. You receive title to the replaced product at delivery to carrier at SSI shipping point. You are responsible for importation of the replaced product, if applicable. SSI will not return the original product to you; therefore, you are responsible for moving data to another media before returning to SSI, if applicable. Data Recovery is not covered under this warranty and is not part of the warranty returns process. SSI warrants that the replaced products are covered for the remainder of the original product warranty or 90 days, whichever is greater.

Revision History

Rev.	Description	Date	MCO #
New	Initial release	8/20/2024	2358