SNAP Digital Input Modules

Features

- Four channels per module
- 4,000-volt transient isolation
- Convenient pluggable wiring terminals
- Channel-specific LEDs
- UL and CE approved
- Accepts 22 to 14 AWG wire
- Factory Mutual approved (part numbers ending in FM)

SNAP Digital Input Modules

Description

Opto 22 SNAP I/O digital input modules are part of the SNAP PAC System. Optical isolation on these modules provides 4,000 volts of transient (4000 V for 1 ms) protection for sensitive control electronics from industrial field signals. Digital input modules can sense either AC or DC signals.

All SNAP digital modules have removable top-mounted connectors to provide easy access for field wiring, and all operate on 5 VDC control logic. Each digital module features integral channel-specific LEDs for convenient troubleshooting and maintenance. Each module is factory tested twice and is UL and CE approved. In addition, part numbers ending in FM are Factory Mutual approved.

SNAP input modules are used to sense the on or off status for AC or DC voltages from such sources as proximity switches, push buttons, or auxiliary contacts. The SNAP-IDC5G is ideal for detecting 48 VDC in telecom applications. The SNAP-IDC5-HT is designed for sensors that have a high leakage current.

The SNAP-IDC5-SW and SNAP-IDC5-SW-NC modules supply power to an external dry contact switch and sense switch closure (SNAP-IDC5-SW) or opening (SNAP-IDC5-SW-NC).

SNAP-IAC5MA and SNAP-IDC5MA feature manual-on/manual-off/automatic switches, ideal for testing control applications. The switches override input from field devices, so you can determine whether a problem lies in the application or in the device.

SNAP racks use a retention rail locking system that holds modules securely to the rack. Normally, a hold-down screw is not required. However, for applications that require additional module security, each module has provisions for two 4-40 by ½-inch standard machine screws to hold the module in position on the SNAP rack.

Part Numbers

Part	Description
SNAP-IAC5	SNAP 4-channel 90–140 VAC input, 5 VDC logic
SNAP-IAC5A	SNAP 4-channel 180–280 VAC input, 5 VDC logic
SNAP-IAC5MA	SNAP 4-channel isolated 90–140 VAC/VDC input, 5 VDC logic, with manual/auto switches
SNAP-IAC5FM	SNAP 4-channel 90–140 VAC/VDC input, 5 VDC logic, Factory Mutual approved
SNAP-IAC5AFM	SNAP 4-channel 180–280 VAC input, 5 VDC logic, Factory Mutual approved
SNAP-IDC5	SNAP 4-channel 10–32 VDC input, 5 VDC logic
SNAP-IDC5D	SNAP 4-channel 2.5–28 VDC input, 5 VDC logic
SNAP-IDC5-FAST	SNAP 4-channel high-speed 2.5–16 VDC input, 5 VDC logic
SNAP-IDC5-FAST-A	SNAP 4-channel high-speed 18–32 VDC input, 5 VDC logic
SNAP-IDC5G	SNAP 4-channel 35–75 VAC/DC input, 5 VDC logic
SNAP-IDC5AF	SNAP 4-channel high-speed 75–140 VDC input, 5 VDC logic
SNAP-IDC5GF	SNAP 4-channel high-speed 35–75 VDC input, 5 VDC logic
SNAP-IDC5-HT	SNAP 4-channel 15–32 VDC leakage-tolerant input, 5 VDC logic
SNAP-IDC5MA	SNAP 4-channel isolated high-speed 10–32 VAC/VDC input, 5 VDC logic, with manual/auto switches
SNAP-IDC5-SW	SNAP 4-channel switch status input, normally open
SNAP-IDC5-SW-NC	SNAP 4-channel switch status input, normally closed
SNAP-IDC5FM	SNAP 4-channel 10–32 VDC input, 5 VDC logic, Factory Mutual approved
SNAP-IDC5DFM	SNAP 4-channel 2.5–28 VDC input, 5 VDC logic
SNAP-RETN4	SNAP 4-module retention rail (OEM)
SNAP-RETN4B	SNAP 4-module retention rail, 25-pack (OEM)
SNAP-RETN6	SNAP 6-module retention rail (OEM)
SNAP-RETN6B	SNAP 6-module retention rail, 25-pack (OEM)
SNAP-FUSE4AB	SNAP 4-amp fuse, 25-pac

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SNAP Digital Input Modules

SNAP digital input modules are compatible with all SNAP PAC brains and rack-mounted controllers, including Wired+Wireless™.

Notes for legacy hardware: These modules can also be used with SNAP Ultimate, SNAP Ethernet, and SNAP Simple brains, and with other SNAP brains such as the serial B3000 and the B3000HA. They also mount on B-series, M-series, and D-series racks.

Wiring Options

For easier, faster wiring of field devices to input modules, see the *SNAP TEX Cables and Breakout Boards Data Sheet*, form #1756. Each SNAP TEX cable snaps into the top of the module and terminates at the breakout board with 18-gauge, color-coded flying leads, already stripped and ready for wiring. Breakout boards offer optional fusing, fuse-blown indicators, and bussed power to loads.

Specifications: AC Input Modules

	SNAP-IAC5	SNAP-IAC5A	SNAP-IAC5MA
Key Feature	--	--	Diagnostic switches
Wire size	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)			
Nominal Input Voltage	120 VAC/VDC	240 VAC/VDC	120 VAC/VDC
Channel-to-channel isolation	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)
Input Voltage Range	90–140 VAC/VDC	180–280 VAC/VDC	90–140 VAC/VDC
Turn-on Voltage	90 VAC/VDC	180 VAC/VDC	90 VAC/VDC
Turn-off Voltage	35 VAC/VDC	35 VAC/VDC	35 VAC/VDC
Input Resistance	169 K ohms (nominal)	305 K ohms (nominal)	169 K ohms (nominal)
Logic Side Ratings			
Logic Output Voltage	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 400 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 400 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 400 mA sourcing
Logic Supply Voltage*	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum	50 mA maximum
Negative True Logic Output Drive	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL
Module Ratings			
Number of Channels Per Module	4	4	4
Turn-on Time	30 msec	30 msec	30 msec
Turn-off Time	30 msec	30 msec	30 msec
Optical Isolation, Field to Logic	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 °C to 70 °C, operating -40 °C to 85 °C, storage	-20 °C to 70 °C, operating -40 °C to 85 °C, storage	-20 °C to 70 °C, operating -40 °C to 85 °C, storage
Agency Approvals	UL, CE, CSA, RoHS, DFARS	UL, CE, CSA, RoHS, DFARS	UL, CE, RoHS, DFARS
Warranty	Lifetime	Lifetime	30 months

* When used with an I/O processor (brain or on-the-rack controller), the processor requires 5.0 to 5.2 VDC.

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SNAP Digital Input Modules

Specifications: DC Input Modules

See page 7 for SNAP-IDC5-SW and SNAP-IDC5-SW-NC specifications and wiring.

	SNAP-IDC5	SNAP-IDC5D	SNAP-IDC5G	SNAP-IDC5-HT
Key Feature	--	--	--	Leakage-tolerant
Wire size	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)				
Nominal Input Voltage	24 VAC/VDC	5 VDC	48 VAC/VDC	24 VAC/VDC
Channel-to-channel isolation	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)
Input Voltage Range	10–32 VAC/VDC	2.5–28 VDC	35–75 VAC/VDC	15–32 VAC/VDC
Turn-on Voltage	10 VAC/VDC	2.5 VDC	35 VAC/VDC	15 VAC/VDC
Turn-off Voltage	3 VAC/VDC	1 VDC	7 VAC/VDC	8 VAC/VDC
Input Resistance	15 K ohms (nominal)	3 K ohms (nominal)	64 K ohms (nominal)	3 K ohms (nominal)
Logic Side Ratings				
Logic Output Voltage	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing
Logic Supply Voltage***	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum	50 mA maximum	50 mA maximum
Negative True Logic Output Drive	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL
Module Ratings				
Number of Channels Per Module	4	4	4	4
Turn-on Time	5 msec	1 msec	5 msec	20 msec
Turn-off Time	15 msec	1 msec	15 msec	25 msec
Optical Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage
Agency Approvals	UL, CE, CSA, RoHS, DFARS	UL, CE, CSA, RoHS, DFARS	UL, CE, RoHS, DFARS	CE, RoHS, DFARS
Warranty	Lifetime	Lifetime	Lifetime	Lifetime

* At 20kHz, 5Vp-p square wave input, 50% duty cycle.
** At 20kHz, 28Vp-p square wave input, 50% duty cycle.
*** When used with an I/O processor (brain or on-the-rack controller), the processor requires 5.0 to 5.2 VDC.

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Specifications: DC Input Modules (continued)

See page 7 for SNAP-IDC5-SW and SNAP-IDC5-SW-NC specifications and wiring.

	SNAP-IDC5GF	SNAP-IDC5AF
Key Feature	--	--
Wire size	22 to 14 AWG	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)		
Nominal Input Voltage	48 VDC	120 VDC
Channel-to-channel isolation	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)
Input Voltage Range	35–75 VDC	75–140 VDC
Turn-on Voltage	35 VDC	75 VDC
Turn-off Voltage	20 VDC	35 VDC
Input Resistance	54 K ohms (nominal)	169 K ohms (nominal)
Logic Side Ratings		
Logic Output Voltage	<0.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing	<0.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 400 mA sourcing
Logic Supply Voltage*	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum
Negative True Logic Output Drive	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL
Module Ratings		
Number of Channels Per Module	4	4
Turn-on Time	1 msec	1 msec
Turn-off Time	1 msec	1 msec
Optical Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 °C to 70 °C, operating -40 °C to 85 °C, storage	-20 °C to 70 °C, operating -40 °C to 85 °C, storage

* When used with an I/O processor (brain or on-the-rack controller), the processor requires 5.0 to 5.2 VDC.

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Specifications: DC Input Modules (continued)

See page 7 for SNAP-IDC5-SW and SNAP-IDC5-SW-NC specifications and wiring.)

	SNAP-IDC5-FAST*	SNAP-IDC5-FAST-A**	SNAP-IDC5MA
Key Feature	High-speed	High-speed	Diagnostic switches
Wire size	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)			
Nominal Input Voltage	5 VDC	28 VDC	24 VAC/VDC
Channel-to-channel isolation	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)
Input Voltage Range	2.5–16 VDC	18–32 VDC	10–32 VAC/VDC
Turn-on Voltage	2.5 VDC	18 VDC	10 VAC/VDC
Turn-off Voltage	1 VDC	5 VDC	3 VAC/VDC
Input Resistance	440 ohms (nominal)	8 K ohms (nominal)	15 K ohms (nominal)
Logic Side Ratings			
Logic Output Voltage	<0.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing	<0.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing	<0.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 400 mA sourcing
Logic Supply Voltage***	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum	50 mA maximum
Negative True Logic Output Drive	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL	TTL 74 Series = 1 UL TTL 74LS Series = 5 UL
Module Ratings			
Number of Channels Per Module	4	4	4
Turn-on Time	0.025 msec*	0.025 msec**	5 msec
Turn-off Time	0.025 msec*	0.025 msec**	15 msec
Optical Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 °C to 70 °C, operating -40 °C to 85 °C, storage	-20 °C to 70 °C, operating -40 °C to 85 °C, storage	-20 °C to 70 °C, operating -40 °C to 85 °C, storage
Agency Approvals	UL, CE, ATEX, FM, CSA, RoHS, DFARS	UL, CE, CSA, RoHS, DFARS	CE, RoHS, DFARS
Warranty	Lifetime	Lifetime	30 months

* At 20kHz, 5Vp-p square wave input, 50% duty cycle.
** At 20kHz, 28Vp-p square wave input, 50% duty cycle.
*** When used with an I/O processor (brain or on-the-rack controller), the processor requires 5.0 to 5.2 VDC.

Specifications: AC and DC Input Modules (FM models)

	SNAP-IAC5FM	SNAP-IAC5AFM	SNAP-IDC5FM	SNAP-IDC5DFM
Key Feature	Factory Mutual approved	Factory Mutual approved	Factory Mutual approved	Factory Mutual approved
Wire size	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)				
Nominal Input Voltage	120 VAC/VDC	240 VAC/ VDC	24 VAC/VDC	5 VDC
Channel-to-channel isolation	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)	300 VAC (1,500 V transient)
Input Voltage Range	90–140 VAC/VDC	180–280 VAC/VDC	10–32 VAC/VDC	2.5–28 VDC
Turn-on Voltage	90 VAC/VDC	180 VAC/VDC	10 VAC/VDC	2.5 VDC
Turn-off Voltage	35 VAC/VDC	35 VAC/VDC	3 VAC/VDC	1 VDC
Input Resistance	169 K ohms (nominal)	305 K ohms (nominal)	15 K ohms (nominal)	3 K ohms (nominal)
Logic Side Ratings				
Logic Output Voltage	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 400 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 400 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing	<.5 V max. (on) @ 2 mA sinking 2.7 V min. (off) @ 0.4 mA sourcing
Logic Supply Voltage*	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum	50 mA maximum	50 mA maximum
Negative True Logic Output Drive	TTL 74 Series=1 UL TTL 74LS Series=5 UL	TTL 74 Series=1 UL TTL 74LS Series=5 UL	TTL 74 Series=1 UL TTL 74LS Series=5 UL	TTL 74 Series=1 UL TTL 74LS Series=5 UL
Module Ratings				
Number of Channels Per Module	4	4	4	4
Turn-on Time	30 msec	30 msec	5 msec	1 msec
Turn-off Time	30 msec	30 msec	15 msec	1 msec
Optical Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage
Agency Approvals	CE, FM, RoHS, DFARS	CE, FM, RoHS, DFARS	CE, FM, RoHS, DFARS	CE, FM, ATEX, RoHS, DFARS
Warranty	Lifetime	Lifetime	Lifetime	Lifetime

*When used with an I/O processor (brain or on-the-rack controller), the processor requires 5.0 to 5.2 VDC.

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SNAP-IDC5-SW and SNAP-IDC5-SW-NC Modules

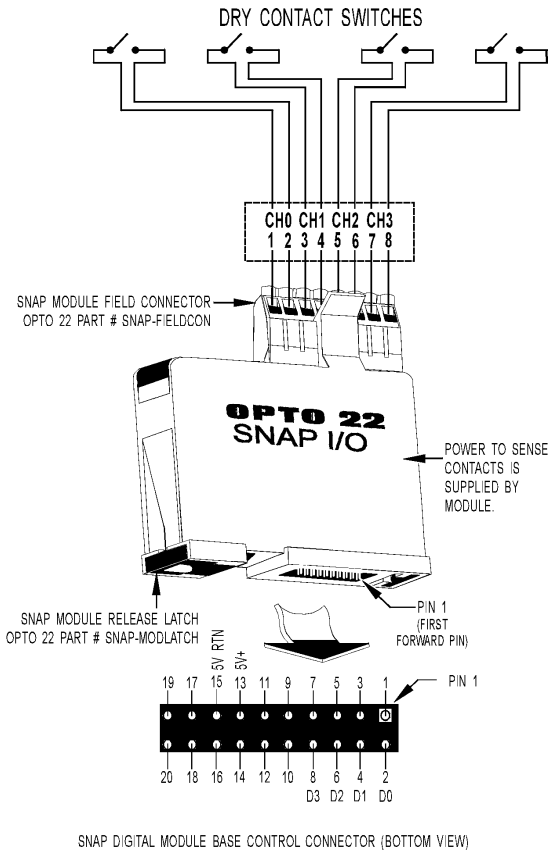
Description

The SNAP-IDC5-SW and SNAP-IDC5-SW-NC modules provide four channels of contact status input. Each module supplies 15 volts of power to an external dry contact switch. The SNAP-IDC5-SW senses switch closure; the SNAP-IDC5-SW-NC senses switch opening. Each user-supplied switch is connected with two wires. Because these modules include power for the switch, they are particularly cost-effective when labor costs for wiring external power are high.

Typical switches for use with these modules are switched status sensors (level sensors, pressure indicators, etc.), magnetic reed switches (used on doors or windows for burglar alarms), snap-action micro switches, the auxilliary switches on motor starters, and most relay contacts.

CAUTION: The SNAP-IDC5-SW and SNAP-IDC5-SW-NC inputs are not intended to be used with contacts that are connected to any external user-supplied voltage or currents.

SNAP-IDC5-SW and SNAP-IDC5-SW-NC Wiring Diagram



SNAP DIGITAL MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

Specifications

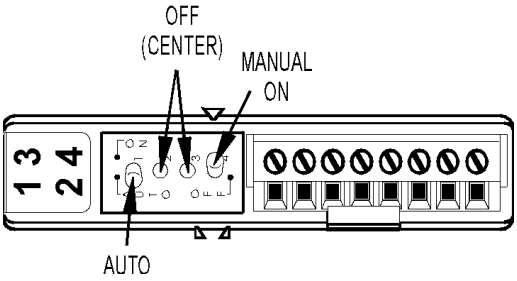
Field Side Ratings (each channel)	
Open Circuit Voltage (Switch Open)	15 VDC typical
Short Circuit Current (Switch Closed)	7 milliamps nominal
Minimum Off Resistance	>20 K ohms
Maximum Allowable On Resistance (Wire + Contact Resistance)	500 ohms
Logic Side Ratings	
Logic Output Voltage for SNAP-IDC5-SW (normally open)	<0.5 V max. (switch closed; LED on) @ 2 mA sinking 2.7 V min. (switch open; LED off) @ 0.4 mA sourcing
Logic Output Voltage for SNAP-IDC5-SW-NC (normally closed)	<0.5 V max.(switch closed; LED off) @ 2 mA sinking 2.7 V min. (switch open; LED on) @ 0.4 mA sourcing
Maximum Operating Common Mode Voltage (Field Term to Logic Connector)	250 V
Power Requirements	5 VDC (±0.25) @ 200 mA
Module Ratings	
Number of Channels Per Module	4
Turn-on Time	5 msec
Turn-off Time	25 msec
Channel-to-channel Isolation	None
Input-to-output Isolation	1500 V AC/DC
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Temperature	-20 °C to 70 °C, operating -40 °C to 85 °C, storage
Agency Approvals	UL, CE, RoHS, DFARS FM (SNAP-IDC5SW only)
Warranty	Lifetime

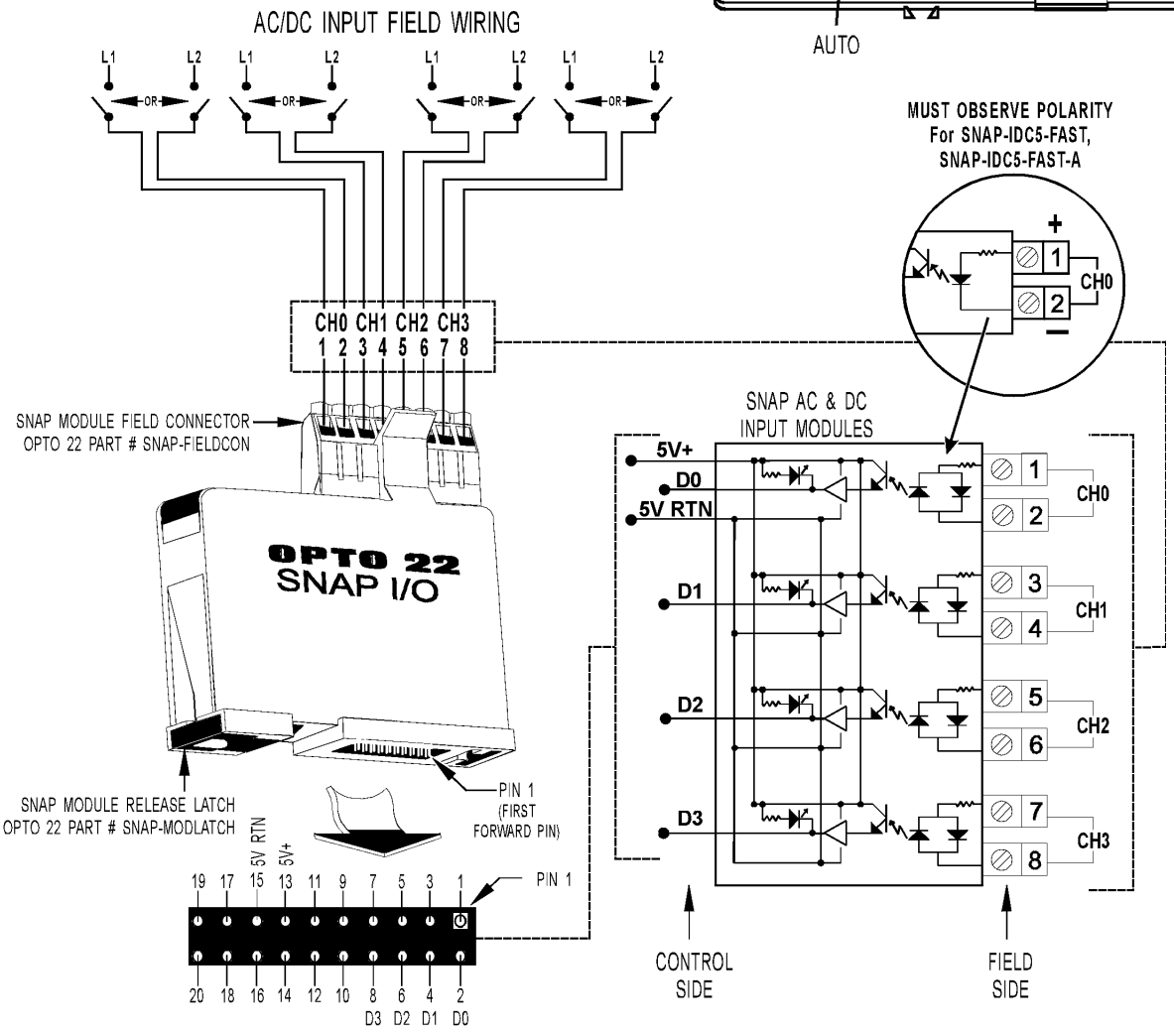
Schematics

Most AC and DC Input Modules

See previous page for SNAP-IDC5-SW and SNAP-IDC5-SW-NC wiring diagram.

MA Modules with Manual/Auto Switches (Top View)





SNAP DIGITAL MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

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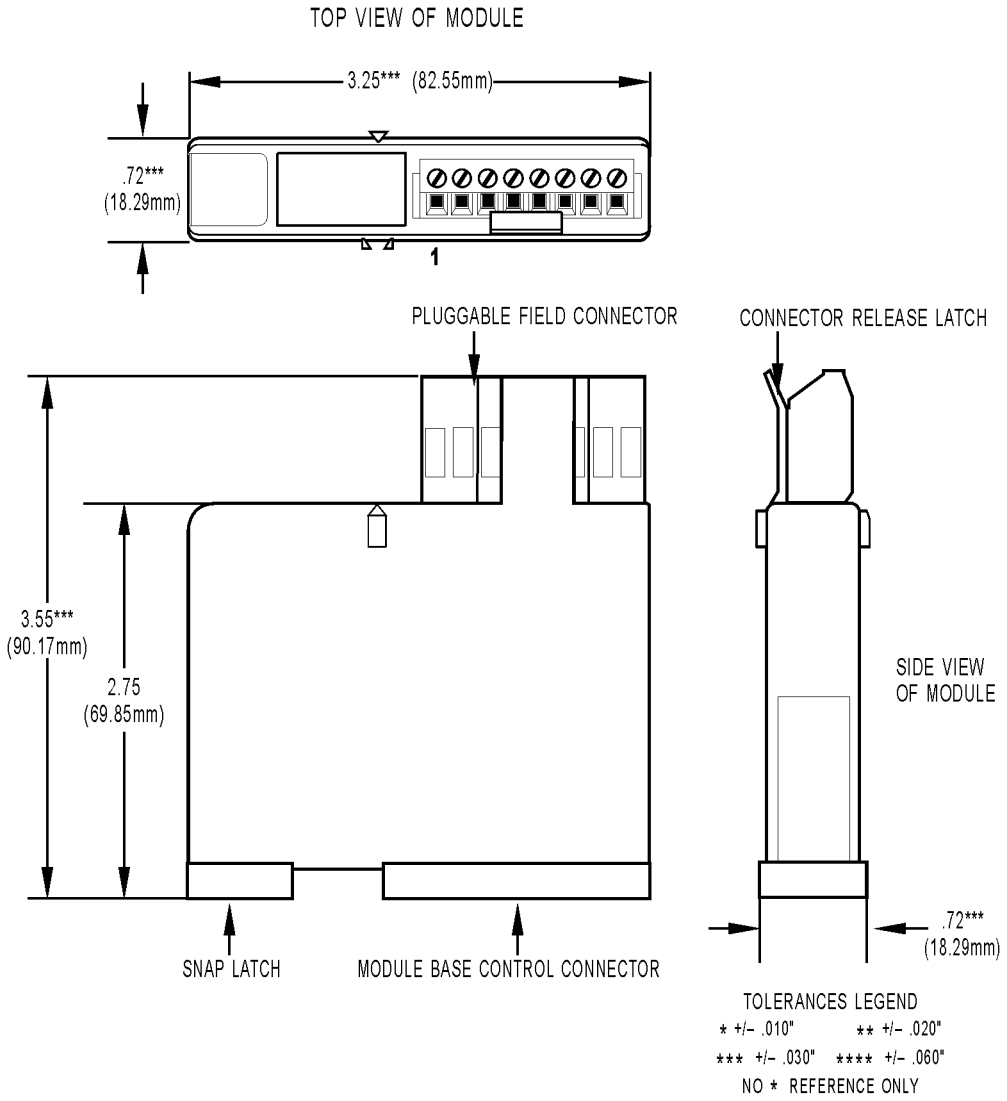
SNAP Digital Input Modules

Dimensional Drawing

All Modules Except MA



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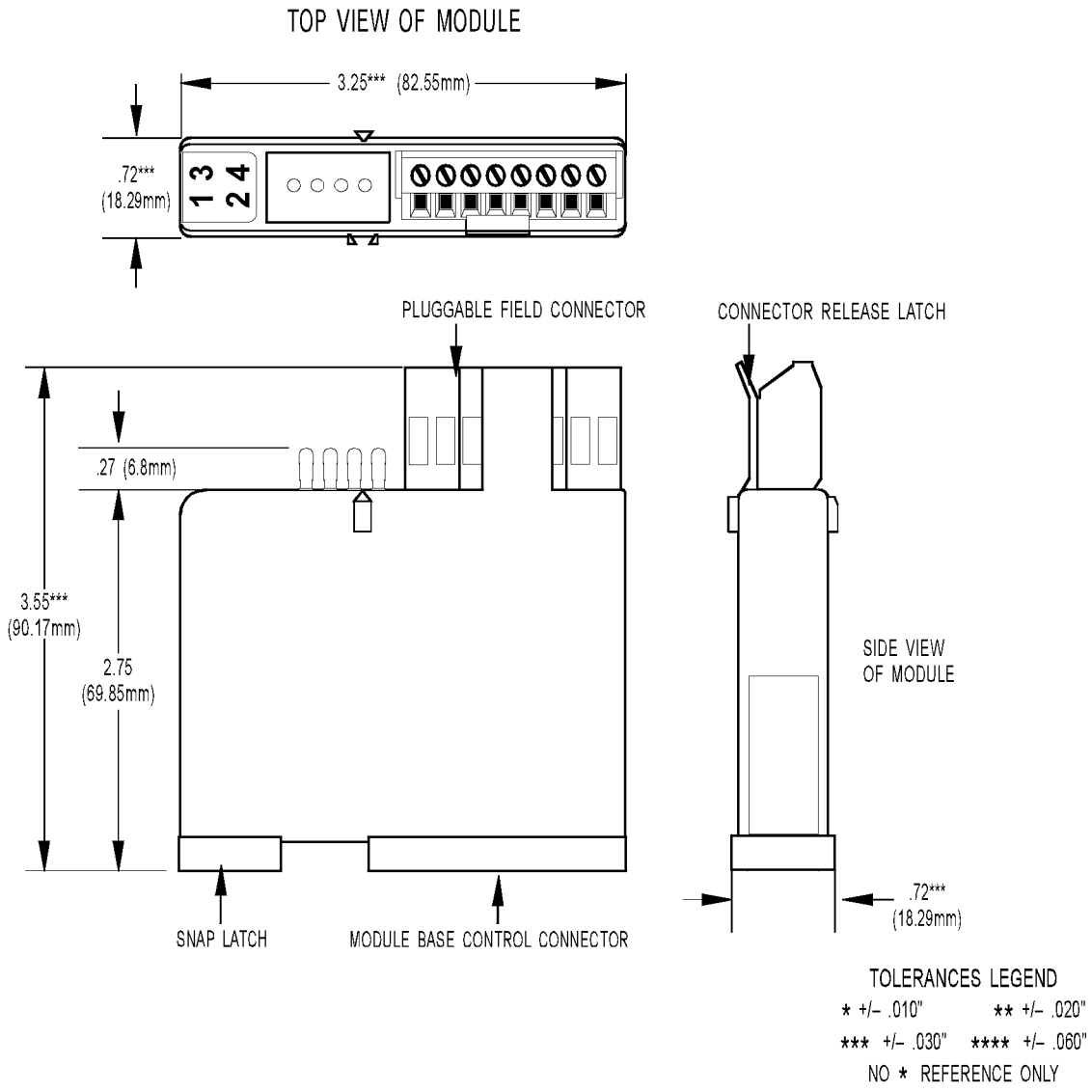
Dimensional Drawing

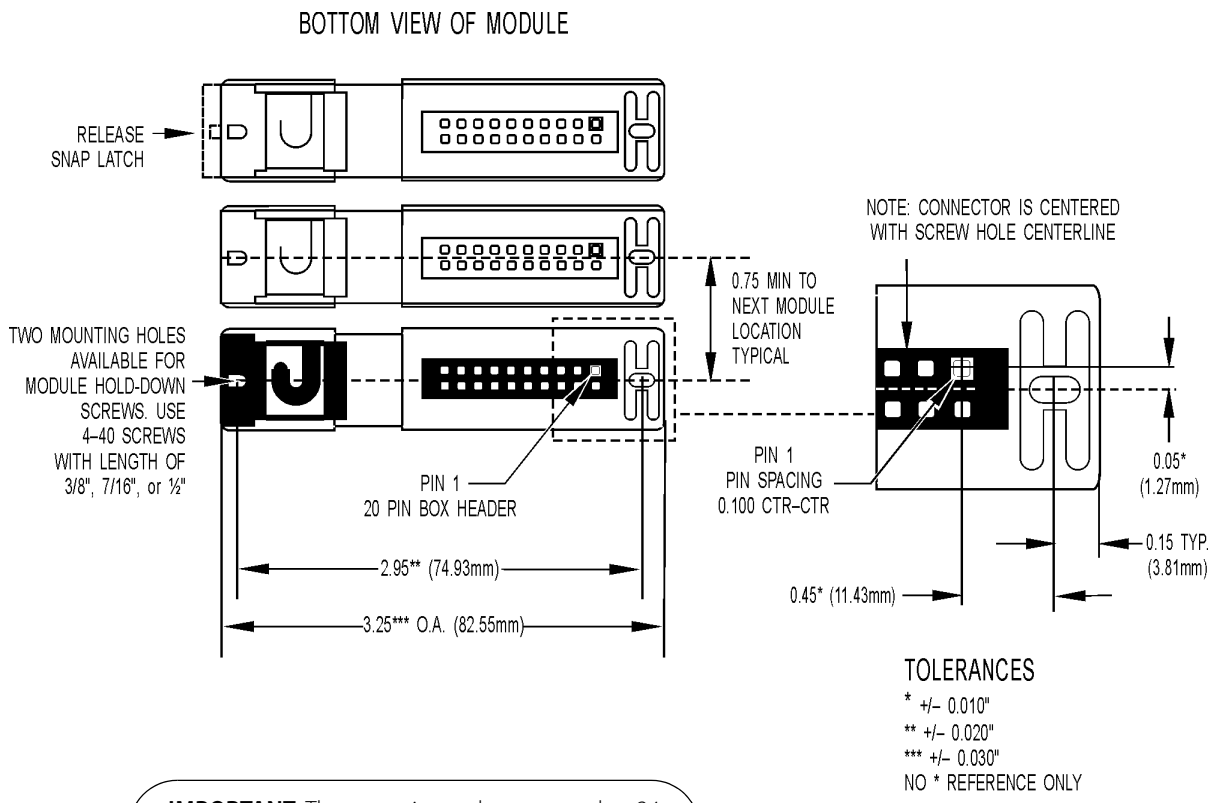
All MA Modules



SNAP Digital Input Modules

Dimensional Drawing

All Models

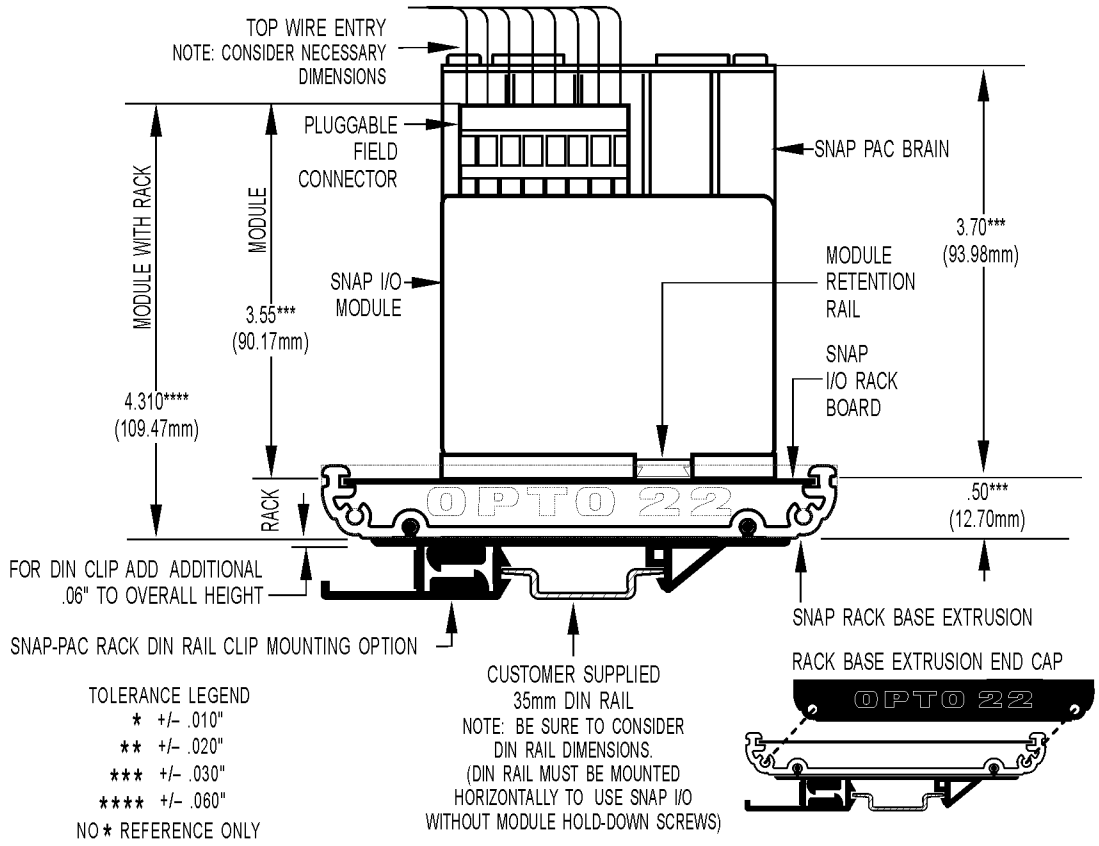


IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Dimensional Drawing

All Models

SNAP Digital Module Mounted on SNAP Rack



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SNAP Digital Output Modules

Features

- Four channels per module
- Convenient pluggable wiring terminals; accepts 22 to 14 AWG wire
- Powered by a single 5-volt supply
- Channel-specific LEDs
- Operating temperature: -20 to 70 °C
- UL and CE approved (most modules); Factory Mutual approved (part numbers ending in FM)

SNAP Digital Output Modules

Description

Opto 22 SNAP I/O digital output modules are part of the SNAP PAC System.

Choose from AC or DC models. Optical isolation on all solid-state modules provides 4,000 volts of transient (4000 V for 1 ms) protection for sensitive control electronics from industrial field signals.

Most SNAP digital modules have removable top-mounted connectors to provide easy access for field wiring. All operate on 5 VDC control logic. Each digital module features integral channel-specific LEDs for convenient troubleshooting and maintenance.

Each module is factory tested twice before shipment, and most modules are UL and CE approved. In addition, part numbers ending in FM are Factory Mutual approved.

SNAP output modules are used to switch up to four separate AC or DC loads. Output modules that are fused use a standard fuse with a convenient handle for easy replacement. DC outputs are available in either a source or sink configuration. AC outputs are zero voltage turn on and zero current turn off for transient-free switching.

SNAP-OAC5MA and SNAP-ODC5MA are special modules featuring manual-on/manual-off/automatic switches, ideal for diagnostic testing of control applications. The switches override output from the application, so you can quickly check field device wiring. These modules each contain four isolated channels.

The SNAP-OAC5-i, SNAP-ODC5-i, and SNAP-ODC5A-i modules provide four isolated output channels.

Part Numbers

Part	Description	See pages
SNAP-OAC5	SNAP 4-channel 12–250 VAC output, 5 VDC logic	3, 5
SNAP-OAC5MA	SNAP 4-channel isolated 12–250 VAC output, 5 VDC logic with manual/auto switches	3, 6
SNAP-OAC5FM	SNAP 4-channel 12–250 VAC output, 5 VDC logic	4, 5
SNAP-OAC5-i	SNAP 4-channel isolated 12–250 VAC output, 5 VDC logic	3, 7
SNAP-OAC5-iFM	SNAP 4-channel isolated 12–250 VAC output, 5 VDC logic	4, 7
SNAP-ODC5SRC	SNAP 4-channel 5–60 VDC output, 5 VDC logic source	8, 12
SNAP-ODC5SRCFM	SNAP 4-channel 5–60 VDC output, 5 VDC logic source	10, 12
SNAP-ODC5SNK	SNAP 4-channel 5–60 VDC output, 5 VDC logic sink	8, 13
SNAP-ODC5SNKFM	SNAP 4-channel 5–60 VDC output, 5 VDC logic sink	10, 13
SNAP-ODC5ASNK	SNAP 4-channel 5–200 VDC output, 5 VDC logic sink	9, 13
SNAP-ODC5MA	SNAP 4-channel isolated 5–60 VDC output, 5 VDC logic with manual/auto switches	9, 14
SNAP-ODC5-i	SNAP 4-channel isolated 5–60 VDC output, 5 VDC logic	9, 15
SNAP-ODC5-iFM	SNAP 4-channel isolated 5–60 VDC output, 5 VDC logic	11, 15
SNAP-ODC5A-i	SNAP 4-channel isolated 5–200 VDC output, 5 VDC logic	9, 15
SNAP-ODC5A-iFM	SNAP 4-channel isolated 5–200 VDC output, 5 VDC logic	11, 15
SNAP-RETN4	SNAP 4-module retention rail (OEM)	--------
SNAP-RETN4B	SNAP 4-module retention rail, 25-pack (OEM)	--------
SNAP-RETN6	SNAP 6-module retention rail (OEM)	--------
SNAP-RETN6B	SNAP 6-module retention rail, 25-pack (OEM)	--------
SNAP-FUSE4AB	SNAP 4-amp fuse, 25-pack	--------
SNAP-MODFUSEH	SNAP digital output module fuse holder, 10-pack	--------

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For Ethernet-based applications requiring higher density of digital I/O points, see Opto 22 form #1556, the *SNAP High-Density Digital Module Data Sheet*.

I/O Processor Compatibility

SNAP digital output modules are compatible with all SNAP PAC brains and rack-mounted controllers, including both standard wired models and Wired+Wireless™ models.

Notes for legacy hardware: SNAP digital output modules are also compatible with SNAP Ultimate, SNAP Ethernet, and SNAP Simple brains, as well as other SNAP brains such as the serial B3000 and the B3000HA. These modules can also be used on B-series and M-series mounting racks.

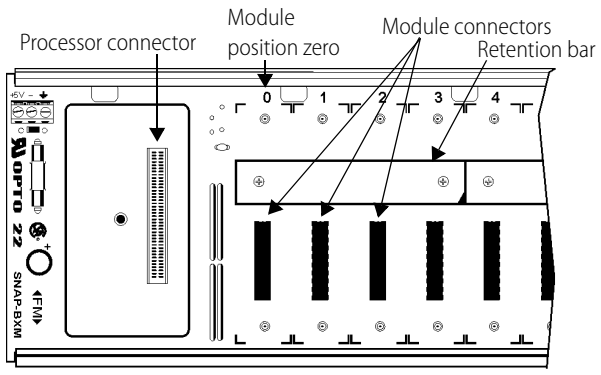
Installation

The following diagram shows part of a SNAP mounting rack. The rack is shown without screw connectors.

Modules snap securely into place in the row of connectors on the rack. Each module connector has a number. Digital output modules and other types of SNAP I/O modules are mounted on the module connectors starting at module position zero.

NOTE: Check the data sheet or user's guide for the brain or on-the-rack controller you are using to determine module features available and any restrictions on module placement.

SNAP Digital Output Modules



1. Place the rack so that the module connector numbers are right-side up, with zero on the left, as shown in the diagram above. (If your rack has screw connectors, the screw connectors will be at the bottom.)
2. Position the module over the module connector, aligning the small slot at the base of the module with the retention bar on the rack. When positioning modules next to each other, be sure to align the male and female module keys at the tops of the modules before snapping a module into position.
3. With the module correctly aligned, push on the module to snap it into place.
4. (Optional) Use standard 4-40 x 1/2 truss-head Phillips hold-down screws to secure both sides of each module. **CAUTION:** Do not over-tighten screws.
5. Follow the wiring diagrams beginning on page 5 to attach modules to the devices they monitor.

Modules require a special tool (provided) for removal.

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SNAP Digital Output Modules

Specifications—AC Modules

	SNAP-OAC5	SNAP-OAC5MA	SNAP-OAC5-i
Key Feature	--	Diagnostic switches Four isolated channels	Four isolated channels
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)			
Line Voltage - Range	12–250 VAC	12–250 VAC	12–250 VAC
Line Voltage - Nominal	120/240 VAC	120/240 VAC	120/240 VAC
Current Rating 0 °C to 70 °C Ambient	3 amps per module	3 amps per module	3 amps per module
One Cycle Surge	80 amps peak (50/60 Hz)	80 amps peak (50/60 Hz)	80 amps peak (50/60 Hz)
Minimum Load Current	20 mA	20 mA	20 mA
Output Voltage Drop	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps
Off-state Leakage at Nominal Voltage - 60 Hz	2.5 mA @ 240 VAC 1.25 mA @ 120 VAC	2.5 mA @ 240 VAC 1.25 mA @ 120 VAC	2.5 mA @ 240 VAC 1.25 mA @ 120 VAC
Peak Blocking Voltage	500 V	500 V	500 V
Operating Frequency	25–65 Hz	25–65 Hz	25–65 Hz
dV/ dt - Off-state	200 volts/msec	200 volts/msec	200 volts/msec
dV/ dt - Commutating	Snubbed for rated 0.5 power factor load	Snubbed for rated 0.5 power factor load	Snubbed for rated 0.5 power factor load
Fuse (Common to all Channels)	250 VAC - 4A 5x20 mm Fast-acting Bell Fuse Part: BEL 5HF4 Opto 22 Part: SNAP-FUSE4AB	Has four isolated channels. User must provide own fusing.	Has four isolated channels. User must provide own fusing.
Channel-to-channel isolation	Not applicable	300 VAC (1500 V transient)	300 VAC (1500 V transient)
Logic Side Ratings			
Pickup Voltage	4 V @ 5.5 mA	4 V @ 5.5 mA	4 V @ 5.5 mA
Dropout Voltage	1 VDC	1 VDC	1 VDC
Control Resistance	220 ohms	220 ohms	220 ohms
Logic Supply Voltage	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum	50 mA maximum
Module Ratings			
Number of Channels Per Module	4	4	4
Turn-on Time	0.5 cycle maximum (zero volts crossover)	0.5 cycle maximum (zero volts crossover)	0.5 cycle maximum (zero volts crossover)
Turn-off Time	0.5 cycle maximum (zero current crossover)	0.5 cycle maximum (zero current crossover)	0.5 cycle maximum (zero current crossover)
Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 ° to 70 °C, operating -40 ° to 85 °C, storage	-20 ° to 70 °C, operating -40 ° to 85 °C, storage	-20 ° to 70 °C, operating -40 ° to 85 °C, storage
Wire size range	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG
Agency Approvals	UL, CE, CSA, RoHS, DFARS	UL, CE, RoHS, DFARS	UL, CE, RoHS, DFARS
Warranty	Lifetime	30 months	Lifetime

Specifications—AC Modules (continued)

	SNAP-OAC5-FM	SNAP-OAC5-i-FM
Key Feature	Factory Mutual approved	Four isolated channels Factory Mutual approved
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)		
Line Voltage - Range	12–250 VAC	12–250 VAC
Line Voltage - Nominal	120/240 VAC	120/240 VAC
Current Rating 0 °C to 70 °C Ambient	3 amps per module	3 amps per module
One Cycle Surge	80 amps peak (50/60 Hz)	80 amps peak (50/60 Hz)
Minimum Load Current	20 mA	20 mA
Output Voltage Drop	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps
Off-state Leakage at Nominal Voltage - 60 Hz	2.5 mA @ 240 VAC 1.25 mA @ 120 VAC	2.5 mA @ 240 VAC 1.25 mA @ 120 VAC
Peak Blocking Voltage	500 V	500 V
Operating Frequency	25–65 Hz	25–65 Hz
dV/ dt - Off-state	200 volts/msec	200 volts/msec
dV/ dt - Commutating	Snubbed for rated 0.5 power factor load	Snubbed for rated 0.5 power factor load
Fuse (Common to all Channels)	250 VAC - 4A 5x20 mm Fast-acting Bell Fuse Part No. BEL 5HF4 Opto 22 Part No. SNAP-FUSE4AB	Has four isolated channels. User must provide own fusing.
Channel-to-channel isolation	Not applicable	300 VAC (1500 V transient)
Logic Side Ratings		
Pickup Voltage	4 V @ 5.5 mA	4 V @ 5.5 mA
Dropout Voltage	1 VDC	1 VDC
Control Resistance	220 ohms	220 ohms
Logic Supply Voltage	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum
Module Ratings		
Channels Per Module	4	4
Turn-on Time	0.5 cycle maximum (zero volts crossover)	0.5 cycle maximum (zero volts crossover)
Turn-off Time	0.5 cycle maximum (zero current crossover)	0.5 cycle maximum (zero current crossover)
Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 ° to 70 °C, operating -40 ° to 85 °C, storage	-20 ° to 70 °C, operating -40 ° to 85 °C, storage
Wire size range	22 to 14 AWG	22 to 14 AWG
Agency Approvals	CE, FM, RoHS, DFARS	CE, FM, RoHS, DFARS
Warranty	Lifetime	Lifetime

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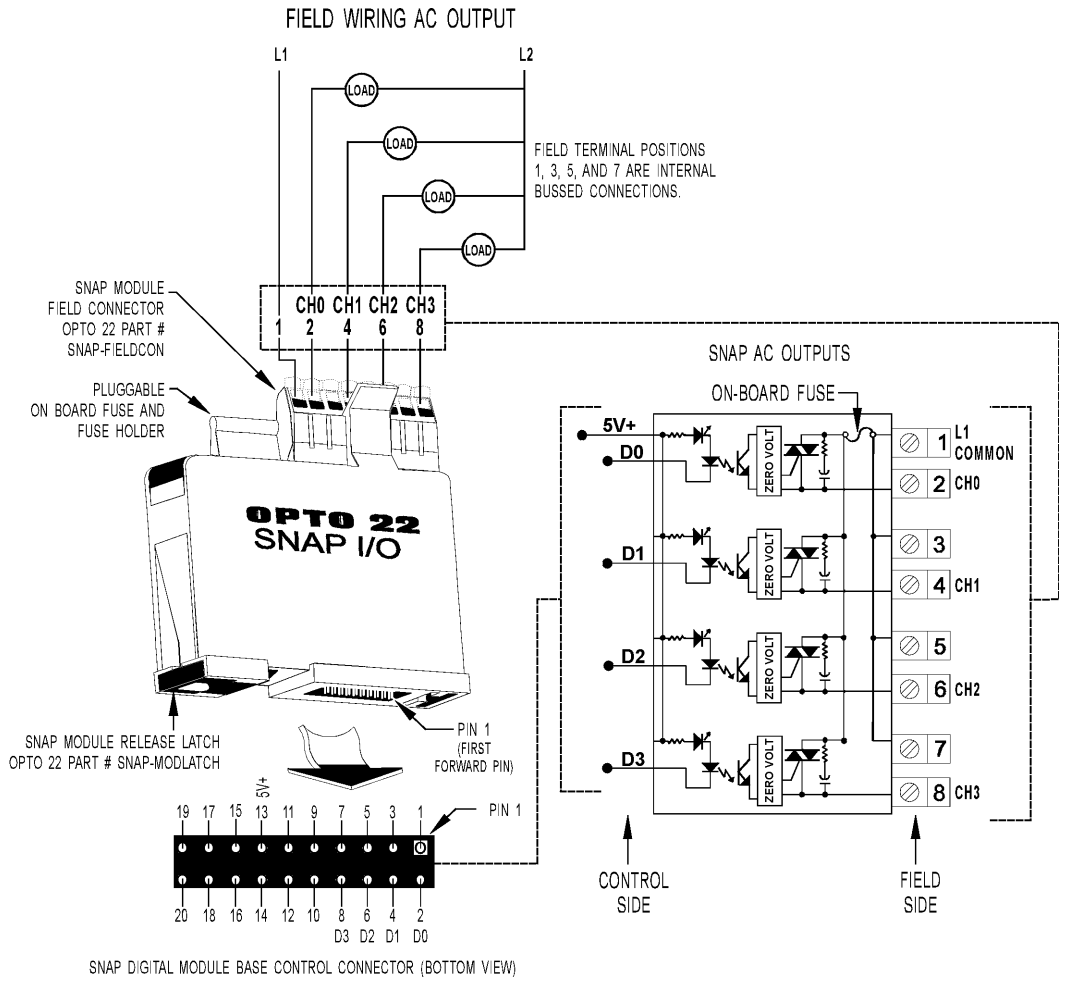
SNAP Digital Output Modules

Schematics

SNAP-OAC5 Output Module

Part Number	Description
SNAP-OAC5	4-channel AC output 12–250 VAC 5 VDC logic
SNAP-OAC5FM	4-channel AC output 12–250 VAC 5 VDC logic, Factory Mutual approved

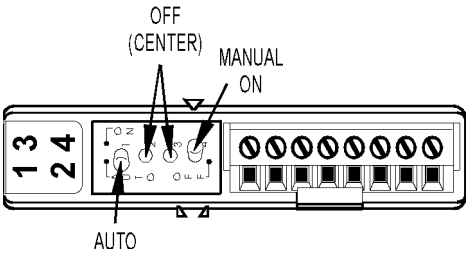


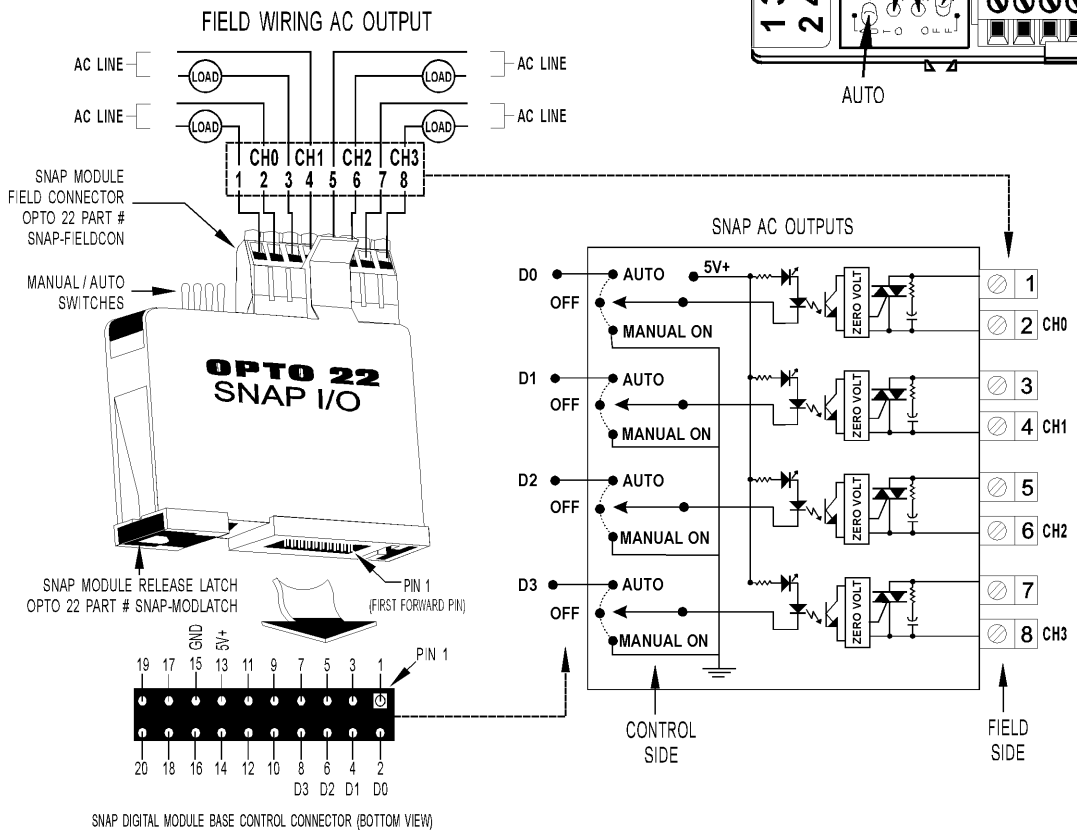
SNAP DIGITAL MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

Schematics

SNAP-OAC5MA Output Module With Manual/Auto Switches

Part Number	Description
SNAP-OAC5MA	4-channel isolated AC output 12–250 VAC, 5 VDC logic, with manual/auto switch





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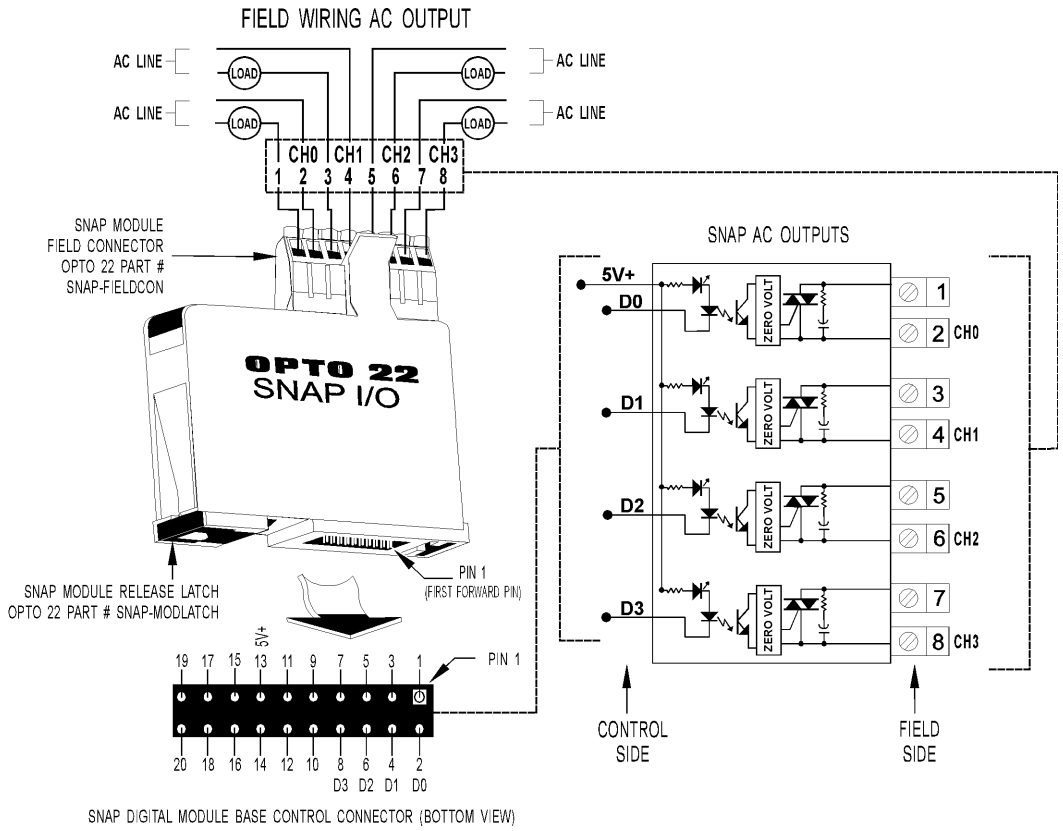
SNAP Digital Output Modules

Schematics

SNAP-OAC5i Isolated Output Module

Part Number	Description
SNAP-OAC5-i	4-channel isolated AC output 12–250 VAC, 5 VDC logic
SNAP-OAC5-iFM	4-channel isolated AC output 12–250 VAC, 5 VDC logic, Factory Mutual approved



Specifications—DC Modules

	SNAP-ODC5SRC	SNAP-ODC5SNK
Key Feature	Load sourcing	Load sinking
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)		
Line Voltage - Range	5–60 VDC	5–60 VDC
Line Voltage - Nominal	5–48 VDC	5–48 VDC
Current Rating 0 °C to 70 °C Ambient	3 amps per module	3 amps per module
Surge Current	5 amps peak for 1 second	5 amps peak for 1 second
Minimum Load	20 mA	20 mA
Output Voltage Drop	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps
Off-state Leakage	1 mA @ 60 VDC	1 mA @ 60 VDC
Peak Blocking Voltage	60 VDC	60 VDC
Fuse (Common to all Channels)	250 VAC - 4A 5x20 mm Fast-acting Bell Fuse Part No. BEL 5HF4 Opto 22 Part SNAP-FUSE4AB	250 VAC - 4A 5x20 mm Fast-acting Bell Fuse Part No. BEL 5HF4 Opto 22 Part SNAP-FUSE4AB
Channel-to-channel isolation	Not applicable	Not applicable
Logic Side Ratings		
Pickup Voltage	4 V @ 5.5 mA	4 V @ 5.5 mA
Dropout Voltage	1 VDC	1 VDC
Control Resistance	220 ohms	220 ohms
Logic Supply Voltage	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum
Module Ratings		
Number of Channels Per Module	4	4
Turn-on Time	100 usec	100 usec
Turn-off Time	750 usec	750 usec
Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage
Wire size range	22 to 14 AWG	22 to 14 AWG
Agency Approvals	UL, CE, CSA, RoHS, DFARS	UL, CE, CSA, RoHS, DFARS
Warranty	Lifetime	Lifetime

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SNAP Digital Output Modules

Specifications—DC Modules (continued)

	SNAP-ODC5MA	SNAP-ODC5-i	SNAP-ODC5A-i	SNAP-ODC5ASNK
Key Feature	Diagnostic switches Four isolated channels	Four isolated channels	Four isolated channels	Load sinking
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)				
Line Voltage - Range	5–60 VDC	5–60 VDC	5–200 VDC	5–200 VDC
Line Voltage - Nominal	5–48 VDC	5–48 VDC	5–200 VDC	5–200 VDC
Current Rating 0 °C to 70 °C Ambient	2 amps per module 0.5 amps per channel	3 amps per module	3 amps per module	3 amps per module
Surge Current	1.5 amps peak for 1 second	5 amps peak for 1 second	5 amps peak for 1 second	5 amps peak for 1 second
Minimum Load	20 mA	20 mA	20 mA	20 mA
Output Voltage Drop	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps
Off-state Leakage	1 mA @ 60 VDC	1 mA @ 60 VDC	1 mA @ 200 VDC	1 mA @ 200 VDC
Peak Blocking Voltage	60 VDC	60 VDC	200 VDC	200 VDC
Fuse (Common to all Channels)	Has four isolated channels. User must provide own fusing.	Has four isolated channels. User must provide own fusing.	Has four isolated channels. User must provide own fusing.	250 VAC - 4A 5x20 mm Fast-acting Bell Fuse Part: BEL 5HF4 Opto 22 Part: SNAP-FUSE4AB
Channel-to-channel isolation	300 VAC (1500 V transient)	300 VAC (1500 V transient)	300 VAC (1500 V transient)	Not applicable
Logic Side Ratings				
Pickup Voltage	4 V @ 5.5 mA	4 V @ 5.5 mA	4 V @ 5.5 mA	4 V @ 5.5 mA
Dropout Voltage	1 VDC	1 VDC	1 VDC	1 VDC
Control Resistance	220 ohms	220 ohms	220 ohms	220 ohms
Logic Supply Voltage	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum	50 mA maximum	50 mA maximum
Module Ratings				
Number of Channels Per Module	4	4	4	4
Turn-on Time	100 usec	100 usec	100 usec	100 usec
Turn-off Time	750 usec	750 usec	750 usec	750 usec
Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage
Wire size range	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG
Agency Approvals	UL, CE, RoHS, DFARS	UL, CE, RoHS, DFARS	UL, CE, RoHS, DFARS	UL, CE, RoHS, DFARS
Warranty	30 months	Lifetime	Lifetime	Lifetime

Specifications—DC Modules (continued)

	SNAP-ODC5SRCFM	SNAP-ODC5SNKFM
Key Feature	Factory Mutual approved	Factory Mutual approved
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)		
Line Voltage - Range	5–60 VDC	5–60 VDC
Line Voltage - Nominal	5–48 VDC	5–48 VDC
Current Rating 0°C to 70°C Ambient	3 amps per module	3 amps per module
Surge Current	5 amps peak for 1 second	5 amps peak for 1 second
Minimum Load	20 mA	20 mA
Output Voltage Drop	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps
Off-state Leakage	1 mA @ 60 VDC	1 mA @ 60 VDC
Peak Blocking Voltage	60 VDC	60 VDC
Fuse (Common to all Channels)	250 VAC - 4A 5x20 mm Fast-acting Bell Fuse Part No. BEL 5HF4 Opto 22 Part SNAP-FUSE4AB	250 VAC - 4A 5x20 mm Fast-acting Bell Fuse Part No. BEL 5HF4 Opto 22 Part SNAP-FUSE4AB
Logic Side Ratings		
Pickup Voltage	4 V @ 5.5 mA	4 V @ 5.5 mA
Dropout Voltage	1 VDC	1 VDC
Control Resistance	220 ohms	220 ohms
Logic Supply Voltage	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum
Module Ratings		
Number of Channels Per Module	4	4
Turn-on Time	100 usec	100 usec
Turn-off Time	750 usec	750 usec
Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 to 70 °C, operating -40 to 85 °C, storage	-20 to 70 °C, operating -40 to 85 °C, storage
Wire size range	22 to 14 AWG	22 to 14 AWG
Agency Approvals	CE, FM, RoHS, DFARS	CE, FM, RoHS, DFARS
Warranty	Lifetime	Lifetime

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SNAP Digital Output Modules

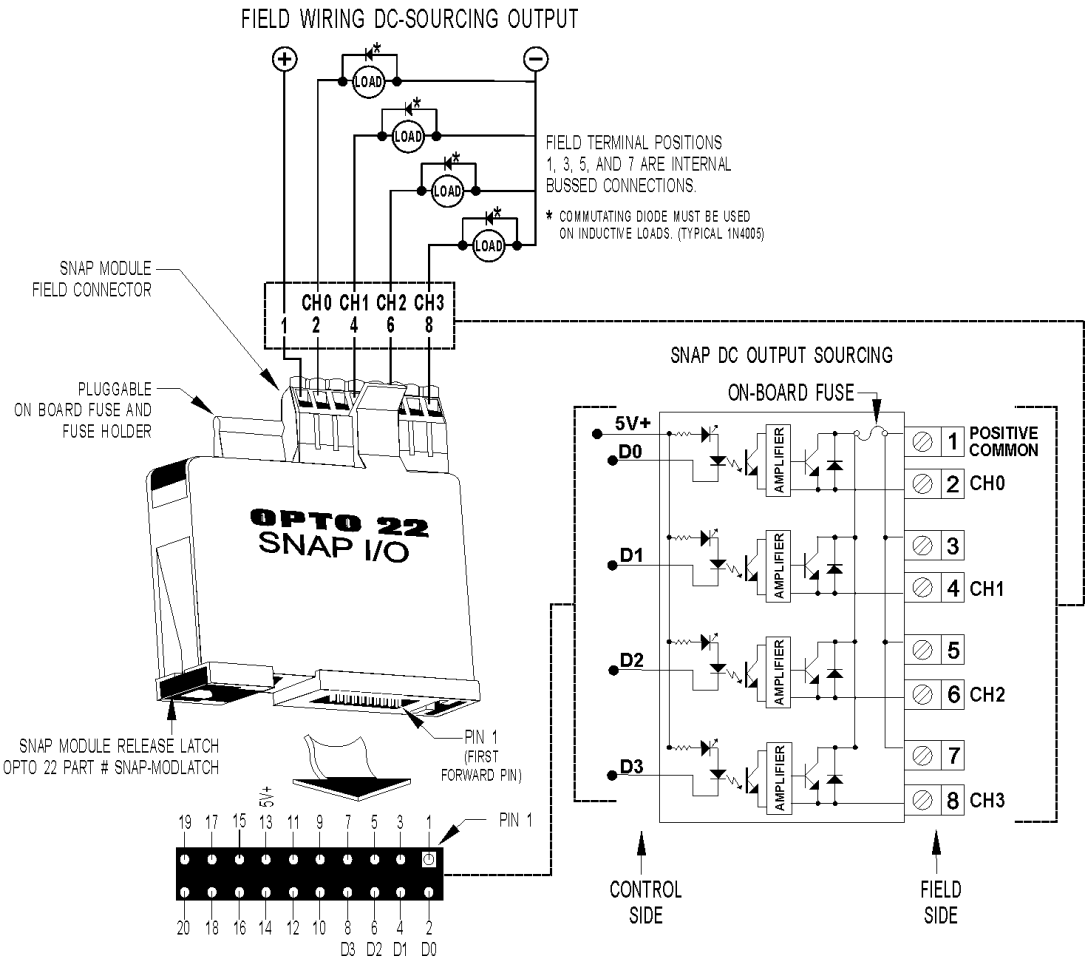
Specifications—DC Modules (continued)

	SNAP-ODC5-iFM	SNAP-ODC5A-iFM
Key Feature	Four isolated channels Factory Mutual approved	Four isolated channels Factory Mutual approved
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Field Side Ratings (each channel)		
Line Voltage - Range	5–60 VDC	5–200 VDC
Line Voltage - Nominal	5–48 VDC	5–200 VDC
Current Rating 0°C to 70°C Ambient	3 amps per module	3 amps per module
Surge Current	5 amps peak for 1 second	5 amps peak for 1 second
Minimum Load	20 mA	20 mA
Output Voltage Drop	1.6 volts max.@ 0.75 amps	1.6 volts max.@ 0.75 amps
Off-state Leakage	1 mA @ 60 VDC	1 mA @ 60 VDC
Peak Blocking Voltage	60 VDC	200 VDC
Fuse (Common to all Channels)	Has four isolated channels. User must provide own fusing.	Has four isolated channels. User must provide own fusing.
Logic Side Ratings		
Pickup Voltage	4 V @ 5.5 mA	4 V @ 5.5 mA
Dropout Voltage	1 VDC	1 VDC
Control Resistance	220 ohms	220 ohms
Logic Supply Voltage	5 VDC ± 0.25 VDC	5 VDC ± 0.25 VDC
Logic Supply Current	50 mA maximum	50 mA maximum
Module Ratings		
Number of Channels Per Module	4	4
Turn-on Time	100 usec	100 usec
Turn-off Time	750 usec	750 usec
Isolation (Field Side to Logic Side)	4,000 volts (transient)	4,000 volts (transient)
Temperature	-20 ° to 70 °C, operating -40 ° to 85 °C, storage	-20 ° to 70 °C, operating -40 ° to 85 °C, storage
Wire size range	22 to 14 AWG	22 to 14 AWG
Agency Approvals	CE, FM, ATEX, RoHS, DFARS	CE, FM, RoHS, DFARS
Warranty	Lifetime	Lifetime

Schematics

SNAP-ODC5SRC Output Module—Sourcing

Part Number	Description
SNAP-ODC5SRC	4-channel DC output 5–60 VDC logic source
SNAP-ODC5SRCFM	4-channel DC output 5–60 VDC logic source, Factory Mutual approved



SNAP DIGITAL MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

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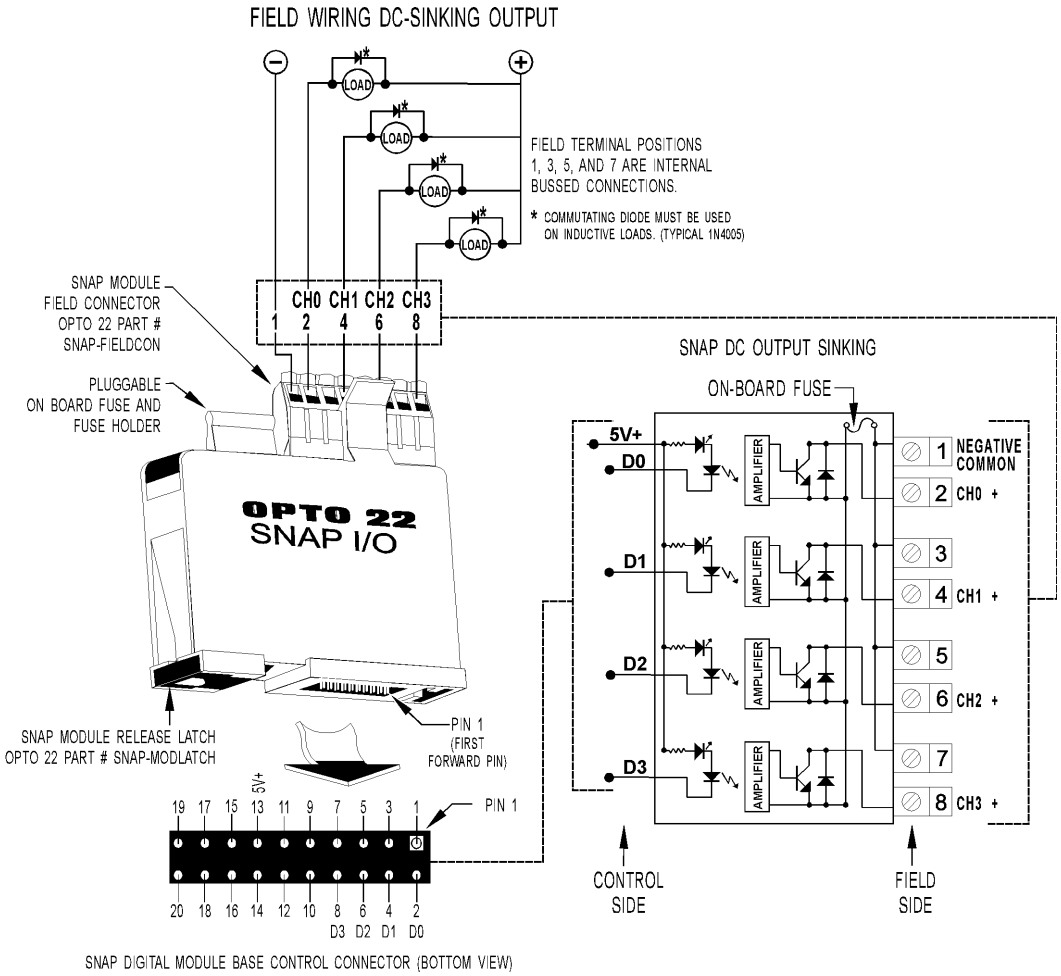
SNAP Digital Output Modules

Schematics

SNAP-ODC5SNK and SNAP-ODC5ASNK Output Modules—Sinking

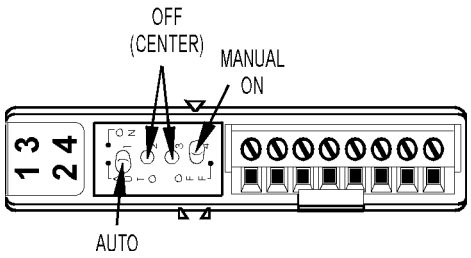
Part Number	Description
SNAP-ODC5SNK	4-channel DC output 5–60 VDC logic sink
SNAP-ODC5SNKFM	4-channel DC output 5–60 VDC logic sink, Factory Mutual approved
SNAP-ODC5ASNK	4-channel DC output 5–200 VDC logic sink

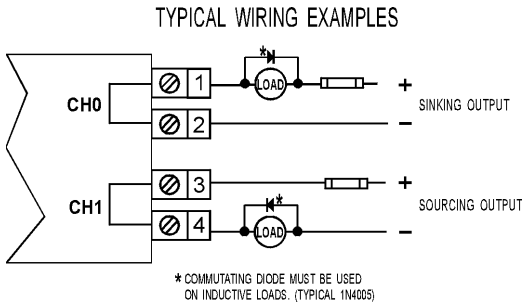


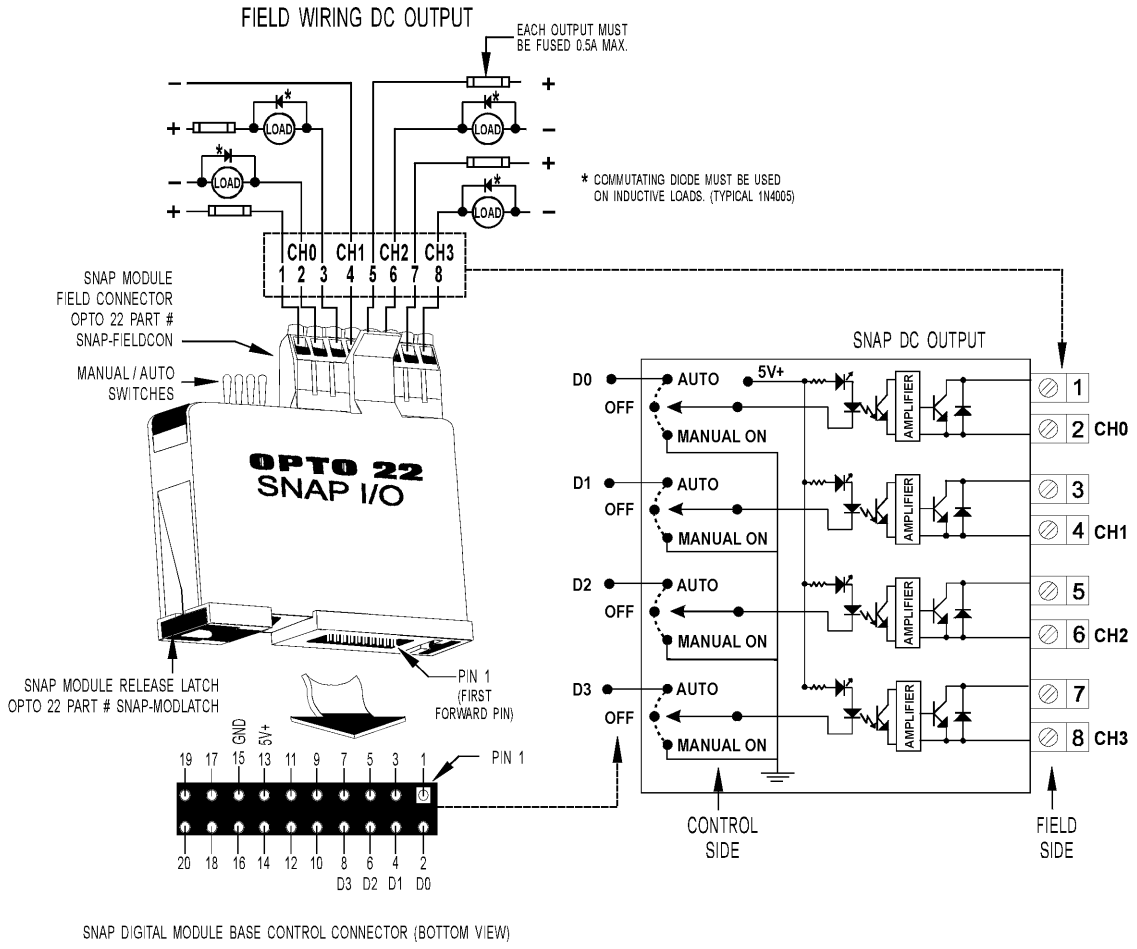
Schematics

SNAP-ODC5MA Output Module with Manual/Auto Switches

Part Number	Description
SNAP-ODC5MA	4-channel isolated DC output 5–60 VDC, 5 VDC logic, with manual/auto switches







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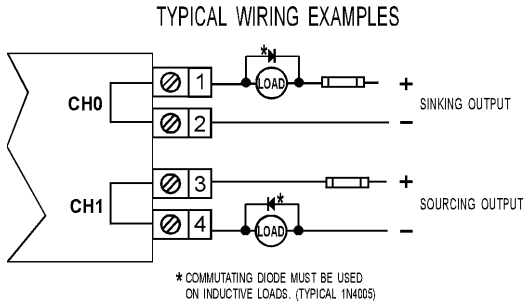
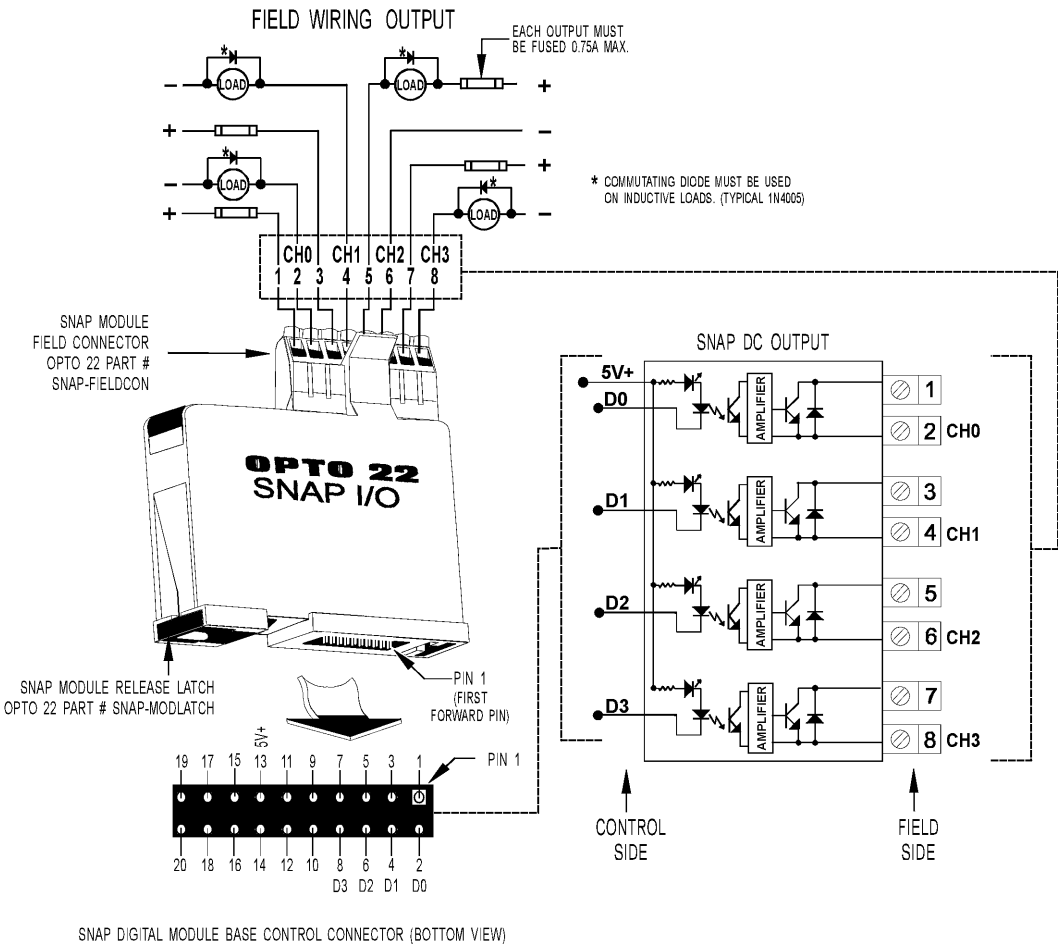
Schematics

SNAP-ODC5-i and SNAP-ODC5A-i Isolated Output Module

Part Number	Description
SNAP-ODC5-i	4-channel isolated DC output 5–60 VDC, 5 VDC logic
SNAP-ODC5A-i	4-channel isolated DC output 5–200 VDC, 5 VDC logic
SNAP-ODC5-iFM	4-channel isolated DC output 5–60 VDC, 5 VDC logic, Factory Mutual approved
SNAP-ODC5A-iFM	4-channel isolated DC output 5–200 VDC, 5 VDC logic, Factory Mutual approved





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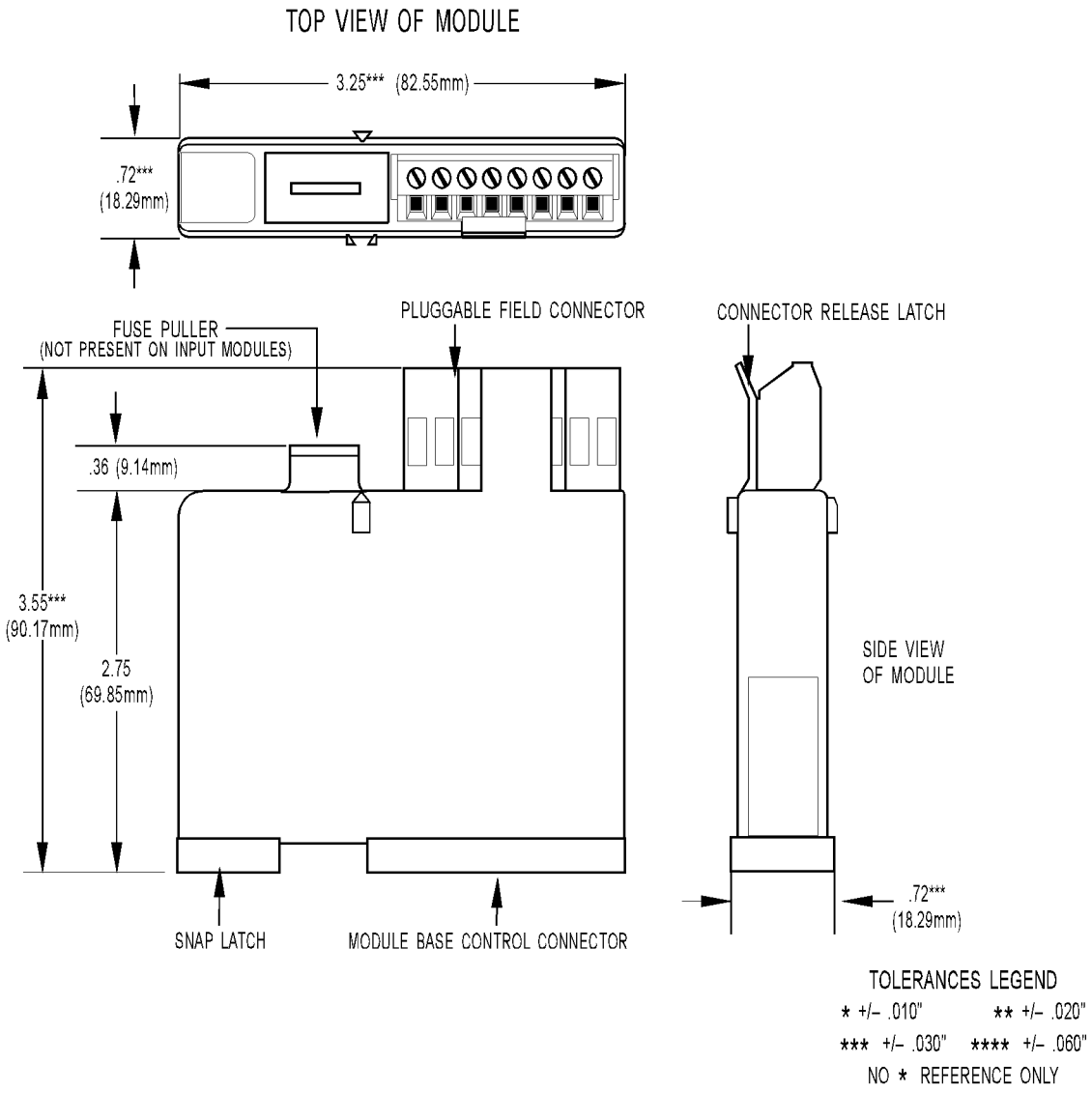
Dimensional Drawing

All Models Except MA



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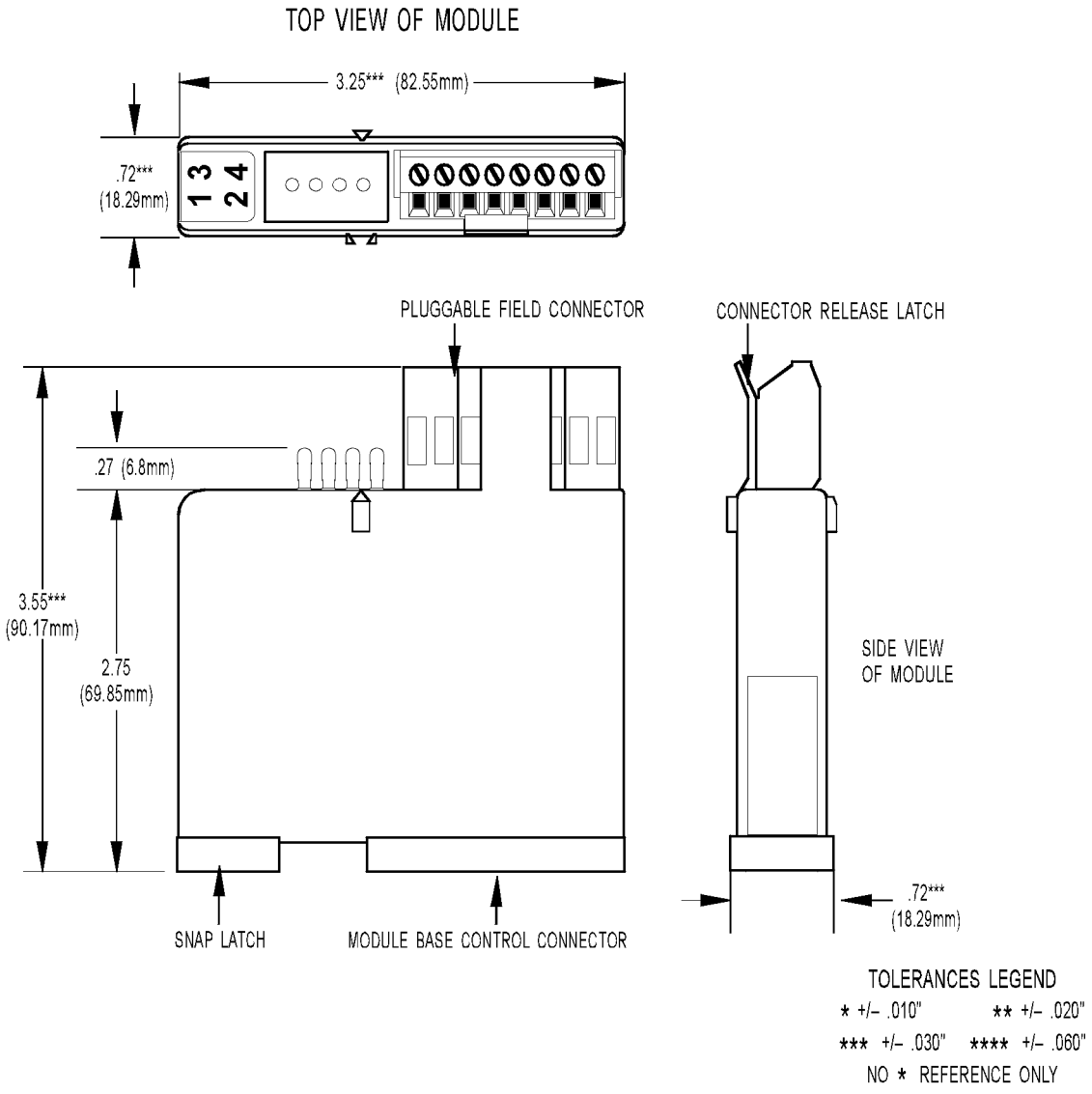
SNAP Digital Output Modules

Dimensional Drawing

All MA Models



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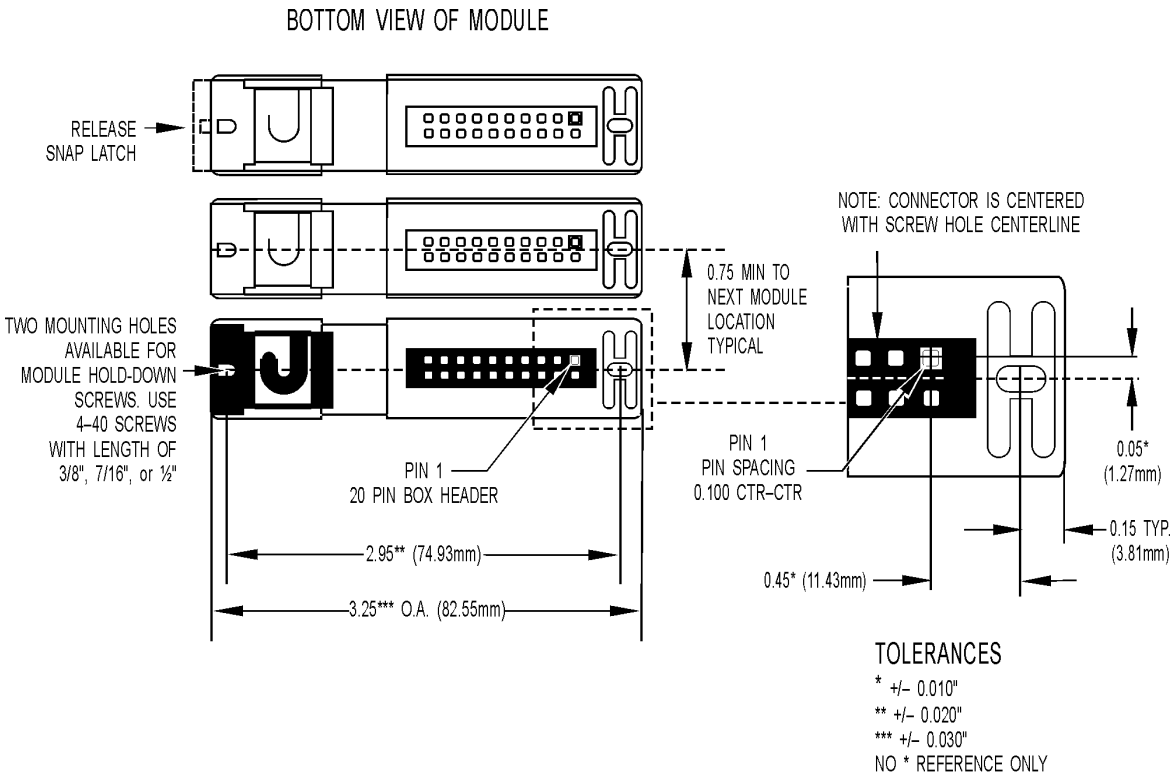
Dimensional Drawing

All Models



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

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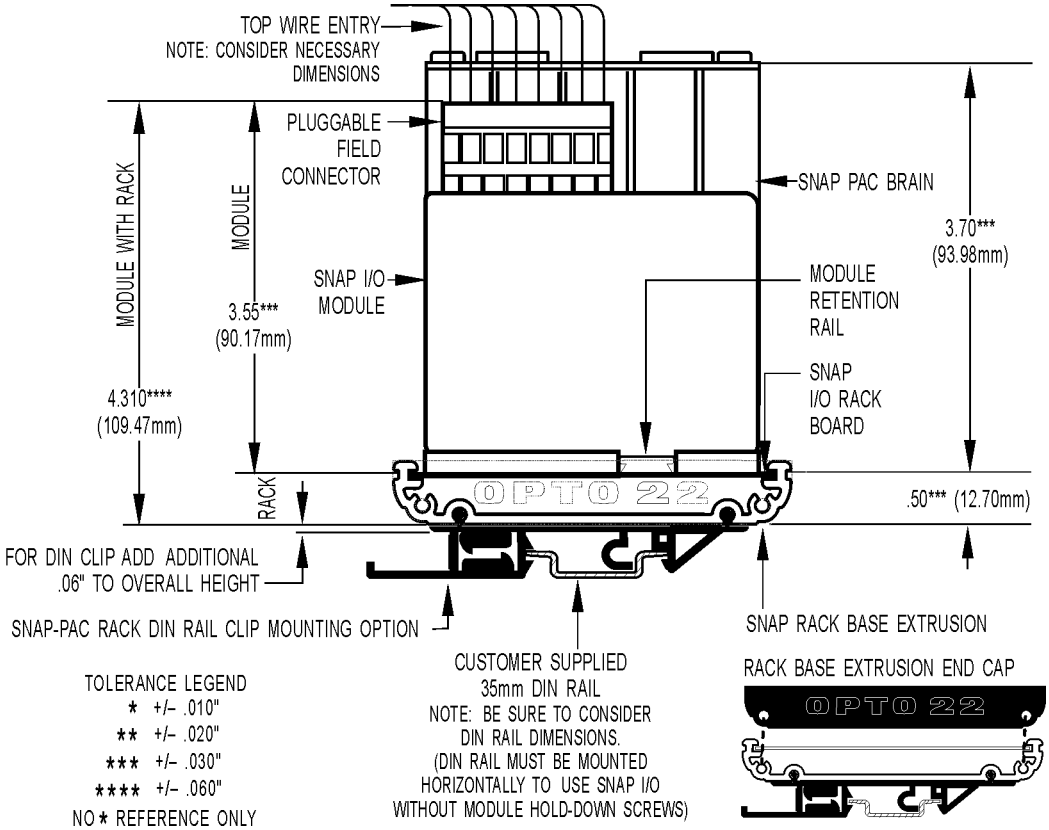
SNAP Digital Output Modules

Dimensional Drawing

All Models

SNAP Digital Module Mounted on SNAP Rack



SNAP Analog Input Modules

Features

- Resolution = 0.004% of nominal range
- Two, 4, 8, or 32 single-ended inputs per module
- Out-of-range indication
- Factory calibrated; no user adjustment necessary

SNAP Analog Input Modules

Description

SNAP I/O analog input modules are part of Opto 22's SNAP PAC System. All of these modules mount on a SNAP PAC rack with a SNAP PAC brain or R-series controller, either a standard wired model or a Wired+Wireless™ model.

A minimum number of SNAP module types support a full range of analog input requirements. These software-configurable modules handle a wide variety of signal levels. They provide high resolution (0.004% of nominal range) for precise signal levels, as well as multiple-channel packaging. All SNAP analog modules are factory calibrated and individually tested. Part numbers ending in -FM are Factory Mutual approved.

SNAP analog input modules have an on-board microprocessor to provide module-level intelligence, which makes them an ideal choice for Original Equipment Manufacturers (OEMs). For additional information about the standalone operation of SNAP analog modules, see Opto 22 form #0876, *SNAP I/O Module Integration Guide*.

Notes for legacy hardware: Some of these modules also work with older Opto 22 I/O processors (brains or on-the-rack controllers) and M-series or B-series racks. To check processor compatibility, see the table on page 3.

Specifications begin on page 4. For dimensional drawings, see pages 38–49.

IMPORTANT: Any system using analog sensors and input modules should be calibrated annually for analog signals. For I/O units on a SNAP PAC System, use the PAC Control™ commands "Calculate and Set Offset" and "Calculate and Set Gain." For other Ethernet-based I/O units, you can also

Part Number

Part	Description	See page
SNAP-AIARMS	2-channel 0 to 10 amp RMS AC/DC input	4
SNAP-AIMA	2-channel analog current input, -20 to +20 mA	6
SNAP-AIMA-4	4-channel analog current input -20 to +20 mA	6
SNAP-AIMA-8	8-channel analog current input -20 to +20 mA	8
SNAP-AIMA-32 SNAP-AIMA-32-FM*	32-channel analog current input -20 to +20 mA	9
SNAP-AIRATE	2-channel 0–25,000 Hz analog rate input	11
SNAP-AIR40K-4	4-channel analog resistor/thermistor input, 40 K Ohms, 20 K Ohms, 10 K Ohms, or 5 K Ohms	13
SNAP-AIR400K-8	8-channel analog resistor/thermistor input, 400 K Ohms	14
SNAP-AIRTD	2-channel 100 ohm platinum RTD input	18
SNAP-AIRTD-1K	2-channel 1000 ohm platinum RTD input	18
SNAP-AIRTD-10	2-channel 10 ohm copper RTD input	18
SNAP-AIRTD-8U	8-channel multifunction RTD/resistance input	20
SNAP-AICTD	2-channel analog temperature input, ICTD	23
SNAP-AICTD-4	4-channel analog temperature input, ICTD	23
SNAP-AICTD-8	8-channel analog temperature input, ICTD	25
SNAP-AITM	2-channel analog type E, J, or K thermocouple or -150 to +150 mV input or -75 to +75 mV input	26
SNAP-AITM-2	2-channel analog type B, C, D, G, N, T, R, or S thermocouple or -50 to +50 mV DC or -25 to +25 mV DC input	27
SNAP-AITM-8 SNAP-AITM-8-FM*	8-channel B, C, D, E, G, J, K, N, R, S, or T thermocouple or -75 to +75 mV, -50 to +50 mV, or -25 to +25 mV input	28
SNAP-AIVRMS	2-channel 0 to 250 V RMS AC/DC input	29
SNAP-AIV	2-channel analog voltage input -10 to +10 VDC or -5 to +5 VDC	30
SNAP-AIV-4	4-channel analog voltage input -10 to +10 VDC or -5 to +5 VDC	30
SNAP-AIV-8	8-channel analog voltage input -10 to +10 VDC or -5 to +5 VDC	32
SNAP-AIV-32 SNAP-AIV-32-FM*	32-channel analog voltage input -10 to +10 VDC or -5 to +5 VDC	33
SNAP-AIMV2-4	4-channel -50 to +50 mV input or -25 to +25 mV input	35
SNAP-AIMV-4	4-channel -150 to +150 mV input or -75 to +75 mV input	36

* Factory Mutual approved

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use PAC Manager™ software to calculate and set offset and gain.

Isolation

All SNAP analog input modules are isolated from all other modules and from the SNAP I/O processor. The modules in this data sheet do not have channel-to-channel isolation, however. (If you need isolated analog modules, see Opto 22 form #1182.)

Transformer isolation prevents ground loop currents from flowing between field devices and causing noise that produces erroneous readings. Ground loop currents are caused when two grounded field devices share a connection, and the ground potential at each device is different.

Isolation also protects sensitive control electronics from industrial field signals.

IMPORTANT: Since these analog input modules provide multiple single-ended input channels with a common reference, the channels are not isolated from each other. (See Opto 22 form #1182 for isolated modules.)

Bipolar and Unipolar Input Modules

Most SNAP analog input modules are considered to be bipolar, which means the range extends equal amounts above and below zero. An example of this is the SNAP-AIV module, which has a range of -10 to +10 VDC.

Some modules are considered unipolar, which means the range starts or ends at zero. For example, the SNAP-AIVRMS module has a range of 0 to 250 VAC because AC current cannot be negative.

Nominal Range and Over-range Limits

All SNAP analog input modules have a nominal range for the field signal and most support a 10% over-range limit. The nominal range is the normal range of the field signal for the module or point configuration. The over-range limit is the maximum valid field signal the module or point configuration can read outside of the nominal range. For example, the over-range limits for the SNAP-AIV are -11 and +11 VDC, and for the SNAP-AIVRMS, the over-range limit is 275 VAC.

Some modules or point configurations do not support field signals outside of the nominal range. For example, points configured as temperature inputs (thermocouple, RTD, ICTD) do not support over-range readings.

When the field signal is outside of the over-range limits of the module, the brain will not be able to determine if the value is too high or too low, so it will return an "out of range" value of -32768.0

Over-range limits only apply to input modules. Output modules are limited to their nominal ranges.

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Installation

Note module and processor compatibility in the following table:

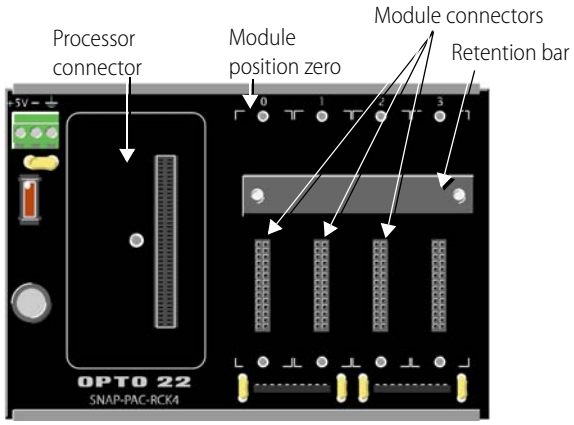
Modules	Compatible I/O Processors
32-channel inputs 8-channel inputs SNAP-AIRTD-10 SNAP-AIRTD-1K	SNAP PAC R-series controllers and SNAP PAC brains, including Wired+Wireless models
4-channel inputs	SNAP PAC R-series controllers and SNAP PAC brains, including Wired+Wireless models Also the following legacy brains: SNAP Ethernet, SNAP Simple, SNAP Ultimate; SNAP-DNP-ASDS; SNAP OEM
2-channel inputs (except SNAP-AIRTD-10 and SNAP-AIRTD-1K)	SNAP PAC R-series controllers and SNAP PAC brains, including Wired+Wireless models Also the following legacy brains: SNAP Ethernet, SNAP Simple, SNAP Ultimate; SNAP-DNP-ASDS; SNAP OEM; serial SNAP brains (B3000, Modbus, Profibus); B3000-HA; B6

All modules can be used with SNAP PAC rac ks and can be placed in any position on the rack. Two- and four-channel modules (except the SNAP-AIRTD-10 and SNAP-AIRTD-1K) can also be used with legacy SNAP M-series and B-series mounting racks. (For more information on using legacy hardware, see form #1688, the *SNAP PAC System Migration Technical Note*.)

Modules snap securely into place in the row of connectors on the mounting rack. Each module connector has a number. Analog input modules and other types of SNAP I/O modules are mounted on the module connectors starting at module position zero.

Modules require a special tool (provided) for removal.

The following diagram shows part of a SNAP PAC mounting rack.



1. Place the rack so that the module connector numbers are right-side up, with zero on the left, as shown in the diagram above. (If your rack has screw connectors, the screw connectors will be at the bottom.)
2. Position the module over the module connector, aligning the small slot at the base of the module with the retention bar on the rack. When positioning modules next to each other, be sure to align the male and female module keys at the tops of the modules before snapping a module into position.
3. With the module correctly aligned, push on the module to snap it into place.
4. (Optional) Use standard 4-40 x 1/4 truss-head Phillips hold-down screws to secure both sides of each module. **CAUTION:** Do not over-tighten screws.
5. Follow the wiring diagrams beginning on page 4 to attach modules to the devices they monitor. Most modules accept 22 to 14 AWG wire; the SNAP-AITM-8 accepts a maximum of two solid 18 AWG wires.

For faster, easier field wiring installation and maintenance, use **SNAP TEX** cables and breakout boards. See Opto 22 form #1756, the *SNAP TEX Cables & Breakout Boards Data Sheet*, for compatibility and specifications.

0 to 10 Amp RMS AC/DC Input Module

Description

The SNAP-AIARMS module provides an input range of 0 to 10 amps RMS AC/DC. An ideal input is the 5-amp secondary of a standard current transformer used to monitor AC line current.

The SNAP-AIARMS module may be used to monitor AC current to greater than a 100-amp range, using a current transformer of suitable ratio.

If you need a module with channel-to-channel isolation, see form #1182, the *SNAP Isolated Analog Input Modules Data Sheet*.

Wiring diagrams are on the following page.

Part Number	Description
SNAP-AIARMS	Two-channel 0 to 10 amp RMS AC/DC input

Specifications

Input Range	0 to 10 amp RMS AC/DC
Input Over-Range	To 11 amps
Input Resistance	0.005 ohms
Maximum Input	11 amps AC/DC
Accuracy (AC)	±8 mA and ±0.2% reading
Resolution	400 microamps
DC Reversal	±16 mA (0.16%)
Input Response Time (Step Change)	63.2% (158 V) in 50 mS 99% (248 V) in 75 mS
Data Freshness (Max)	32.3 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB at 60 Hz
Maximum Operating Common Mode Voltage	250 V
Isolation	1500 V
Power Requirements	5 VDC (±0.15 V) at 170 mA
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

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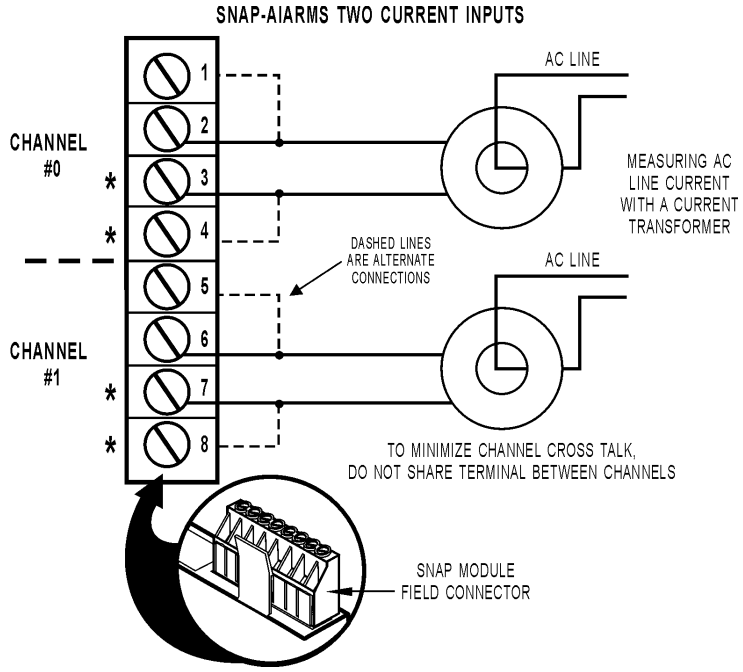
SNAP Analog Input Modules

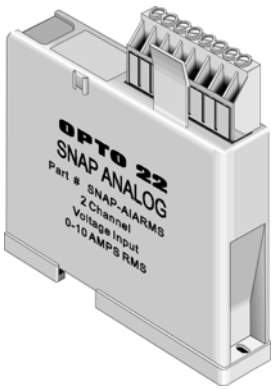
0 to 10 Amp RMS AC/DC Input Module (continued)

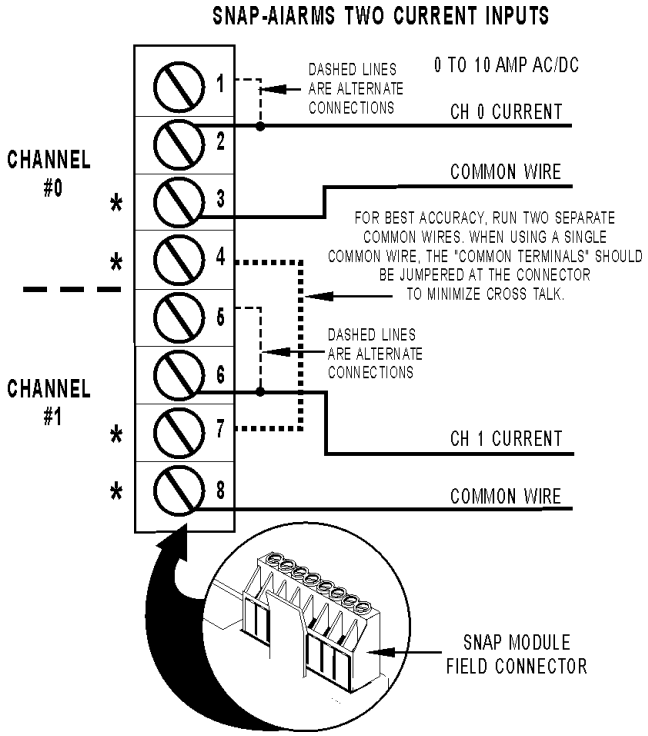
SNAP-AIARMS Wiring Diagrams

Two possible wiring diagrams are shown below.



* Terminals 3, 4, 7, and 8 share a common connection inside the module. **Make sure you observe polarity** when connecting the second channel. To avoid a potentially hazardous short, double-check wiring before turning on the current to be monitored.





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Current Input Module, -20 mA to +20 mA, Two or Four Channels

Specifications

Input Range	-20 mA to +20 mA
Resolution	0.8 microamps
Over-Range Limits	From -22 to +22 mA (+/-20 mA range)
Input Response Time (% of span/ delta I/delta tme)	99.9% / 19.9 mA / 10 ms
Data Freshness (Max)	SNAP-AIMA: 11.5 ms SNAP-AIMA-4: 23 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	36 mA or 9 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05% (10 microamps)
DRIFT: Gain Temperature Coefficient	30 PPM/ °C
DRIFT: Offset Temperature Coefficient	15 PPM/ °C
Power Requirements	5 VDC (±0.15) @ 170 mA
Input Resistance - Single Ended	200 ohms (each channel)
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size	22 to 14 AWG
Agency Approvals	UL, FM, CE, RoHS, DFARS ATEX (SNAP-AIMA-4 only)
Warranty	Lifetime

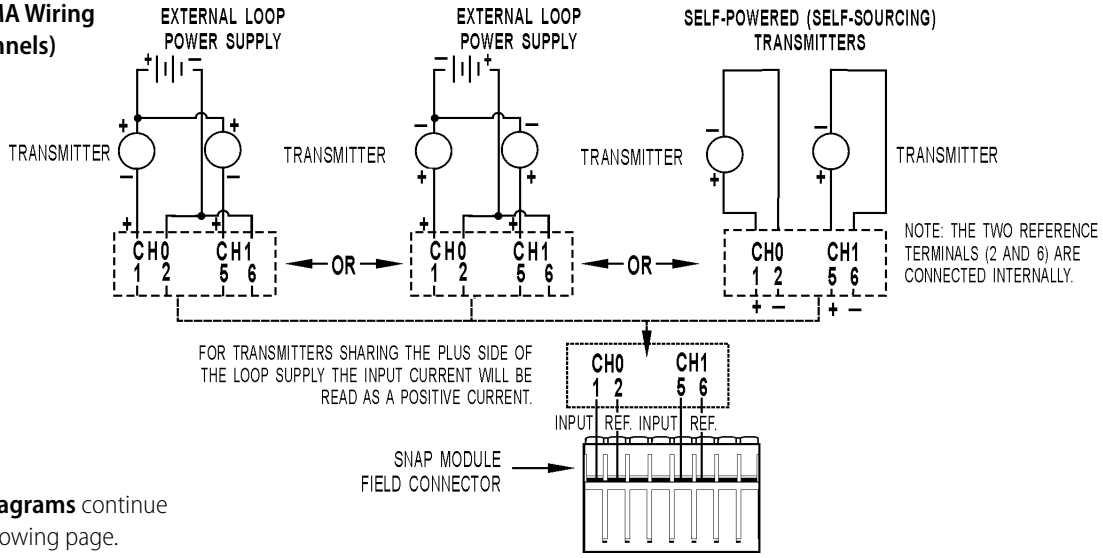
Part Number	Description
SNAP-AIMA	Two-channel analog current input, -20 mA to +20 mA
SNAP-AIMA-4	Four-channel analog current input, -20 mA to +20 mA

Description

The SNAP-AIMA and SNAP-AIMA-4 modules provide an input range of -20mA to +20mA. The SNAP-AIMA has two channels, and the SNAP-AIMA-4 has four. If you need a similar module with more channels, see page 9. Check the table on page 3 for I/O processor compatibility. These modules DO NOT supply loop excitation current.

Since all inputs share a common reference, the module must be installed at the beginning or end of a typical 4–20mA loop. If you are using both standard and self-sourcing transmitters, either put the transmitters on different modules or use different power supplies. If you need channels that are isolated from each other on the same module, see Opto 22 form #1182.

SNAP-AIMA Wiring (Two channels)



Wiring diagrams continue on the following page.

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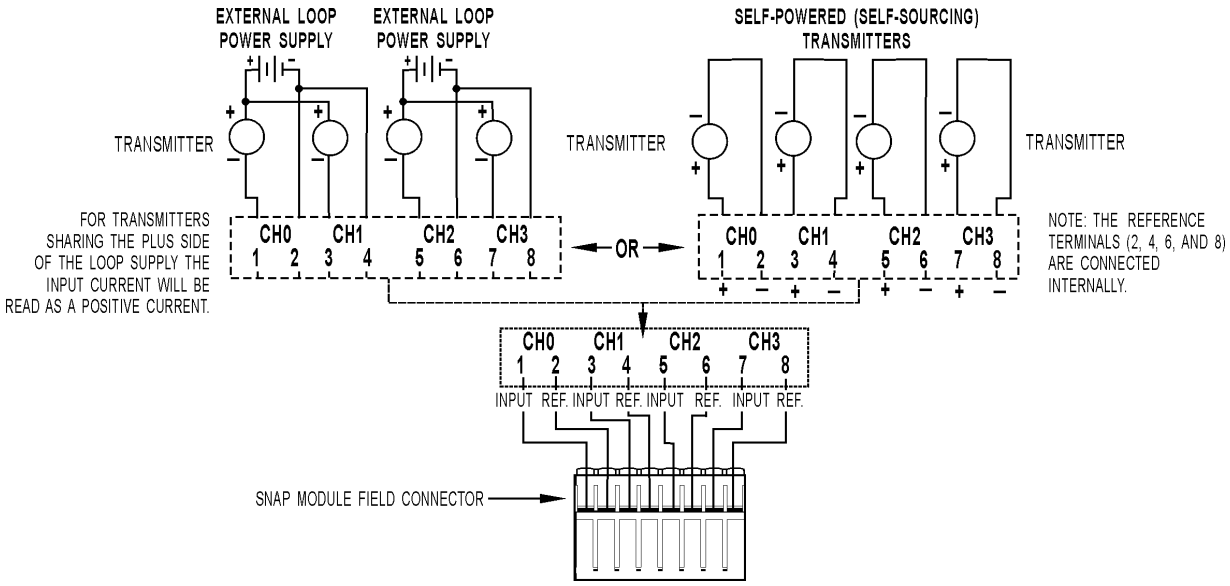
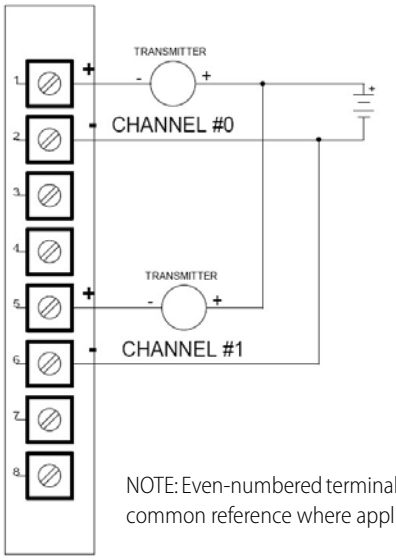
Current Input Module, -20 mA to +20 mA, Two or Four Channels (continued)

SNAP-AIMA-4 Wiring (Four channels)



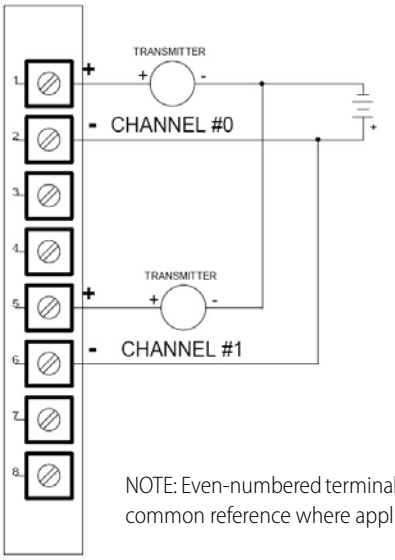
SNAP-AIMA Wiring: Positive Common vs. Negative Common Connections

The following diagrams apply to SNAP-AIMA-2, SNAP-AIMA-4, and SNAP-AIMA-8 modules.



NOTE: Even-numbered terminals share a common reference where applicable.

SNAP-AIMA
For transmitters sharing the plus side of the loop supply. Note that input current will be read as a positive current.



NOTE: Even-numbered terminals share a common reference where applicable.

SNAP-AIMA
For transmitters sharing the minus side of the loop supply. Note that input current will be read as a negative current.

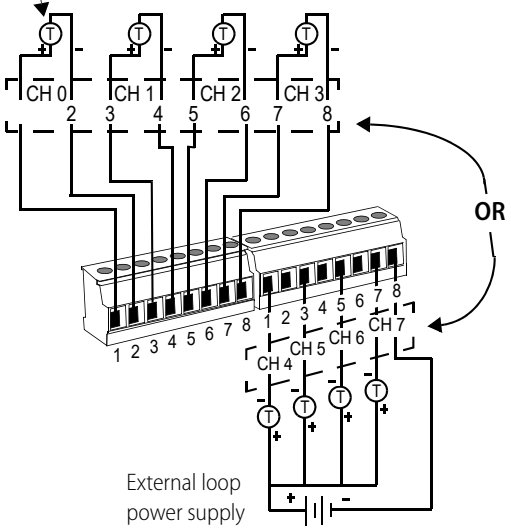
Current Input Module, -20 mA to +20 mA, Eight Channels

SNAP-AIMA-8

Current Source

4-20 self-powered (self-sourcing) transmitters

NOTE: Terminals 2, 4, 6, and 8 on both connectors are connected internally.



NOTE: For transmitters sharing the plus side of the loop power supply, the input current will be read as a positive current.

See additional wiring diagrams on page 7.

Part Number	Description
SNAP-AIMA-8	Eight-channel analog current input, -20 mA to +20 mA

Specifications

Input Range	-20 mA to +20 mA
Over-Range Limits	From -22 to +22 mA (+/-20 mA range)
Resolution	0.8 microamps
Data Freshness (Max)	0.28 seconds
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	36 mA or 9 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05% (10 microamps)
DRIFT: Gain Temperature Coefficient	30 PPM/ °C
DRIFT: Offset Temperature Coefficient	15 PPM/ °C
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 170 mA
Input Resistance - Single Ended	100 ohms (all channels share the same reference point)
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	1.7 in-lb (0.19 N-m)
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

Description

The SNAP-AIMA-8 module provides an input range of -20mA to +20mA with eight channels of analog current input. (If you need a similar module with 32 channels, see page 9.) The SNAP-AIMA-8 can be used with SNAP PAC brains and rack-mounted controllers only. These modules DO NOT supply loop excitation current.

Since all inputs share a common reference, the module must be installed at the beginning or end of a typical 4–20mA loop. If you are using both standard and self-sourcing transmitters, either put the transmitters on different modules or use different power supplies. If you need channels that are isolated from each other on the same module, see Opto 22 form #1182.

If you have multiple self-sourcing transmitters that share the same positive common, do not use this module. Use the SNAP-AIMA-i module instead. See Opto 22 form #1182.

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SNAP Analog Input Modules

Current Input Module, -20 mA to +20 mA, 32 Channels

Specifications

Input Range	-20 mA to +20 mA
Over-Range Limits	From -22 to +22 mA (+/-20 mA range)
Resolution	0.8 microamps
Input Filtering	-3 dB @ 31 Hz
Data Freshness (Max)	1.15 s
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	36 mA or 9 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.1% (20 microamps)
DRIFT: Gain Temperature Coefficient	30 PPM/ °C
DRIFT: Offset Temperature Coefficient	15 PPM/ °C
Isolation	1500 V, field to logic
Power Requirements	5 VDC (±0.15) @ 150 mA
Input Resistance - Single Ended	100 ohms (each channel)
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	SNAP-AIMA-32: UL, CE, RoHS, DFARS. SNAP-AIMA-32-FM: CE, FM, RoHS, DFARS
Warranty	Lifetime

Description

The SNAP-AIMA-32 and SNAP-AIMA-32-FM modules provide 32 channels of input with an input range of -20mA to +20mA. The SNAP-AIMA-32-FM is Factory Mutual approved. Check the table on page 3 for I/O processor compatibility. Dimensional drawings are on page 43.

These modules DO NOT supply loop excitation current.

Channels are not isolated from each other. Since all inputs share a common reference, the module must be installed at the beginning or end of a typical 4–20 mA loop. If you use both standard and self-sourcing transmitters, put the transmitters on different modules or use different power supplies. (If you need channels that are isolated from each other on the same module, see Opto 22 form #1182.)

Part Number	Description
SNAP-AIMA-32 SNAP-AIMA-32-FM	32-channel analog current input, -20 mA to +20 mA
SNAP-HD-BF6	Wiring harness for SNAP-AIMA-32 modules and breakout racks
SNAP-AIMA-HDB SNAP-AIMA-HDB-FM	Breakout racks for SNAP-AIMA-32 and SNAP-AIMA-32-FM

Wiring

SNAP TEX cables and a breakout rack are available separately for wiring points to field devices (see form #1756, the *SNAP TEX Cables & Breakout Boards Data Sheet*). The SNAP-HD-BF6 cable connects the module to the breakout rack, which can then be wired to field devices. (NOTE: The SNAP-HD-CBF6 wiring harness with flying leads is not recommended for this module.)

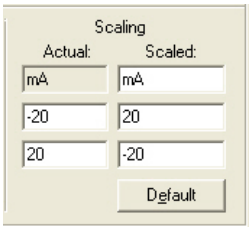
CAUTION: We strongly recommend that you use the breakout rack with these modules. Miswiring of any point on the module can cause severe out-of-warranty damage. The breakout rack protects the module from many wiring errors.

if you are using the module with loop power (2-wire) negative common devices, connect to the SNAP-AIMA-HDB (or -FM) rack. If you are using the module with self-powered devices (4-wire) or with devices that share a common positive connection, do not use the SNAP-AIMA-HDB (or -FM) boards, which have a current limiting diode. Instead, wire to the SNAP-AIV-HDB or SNAP-AIV-HDB-FM.

Correcting for Inverted Scaling

Positive readings for these modules appear as negative values. Therefore, in order to obtain meaningful readings, use the scaling feature in PAC Control as follows:

1. In the Add or Edit Analog Point dialog box for each point, choose the scalable version of the module.
2. Under Scaling, scale each point negatively as shown below:



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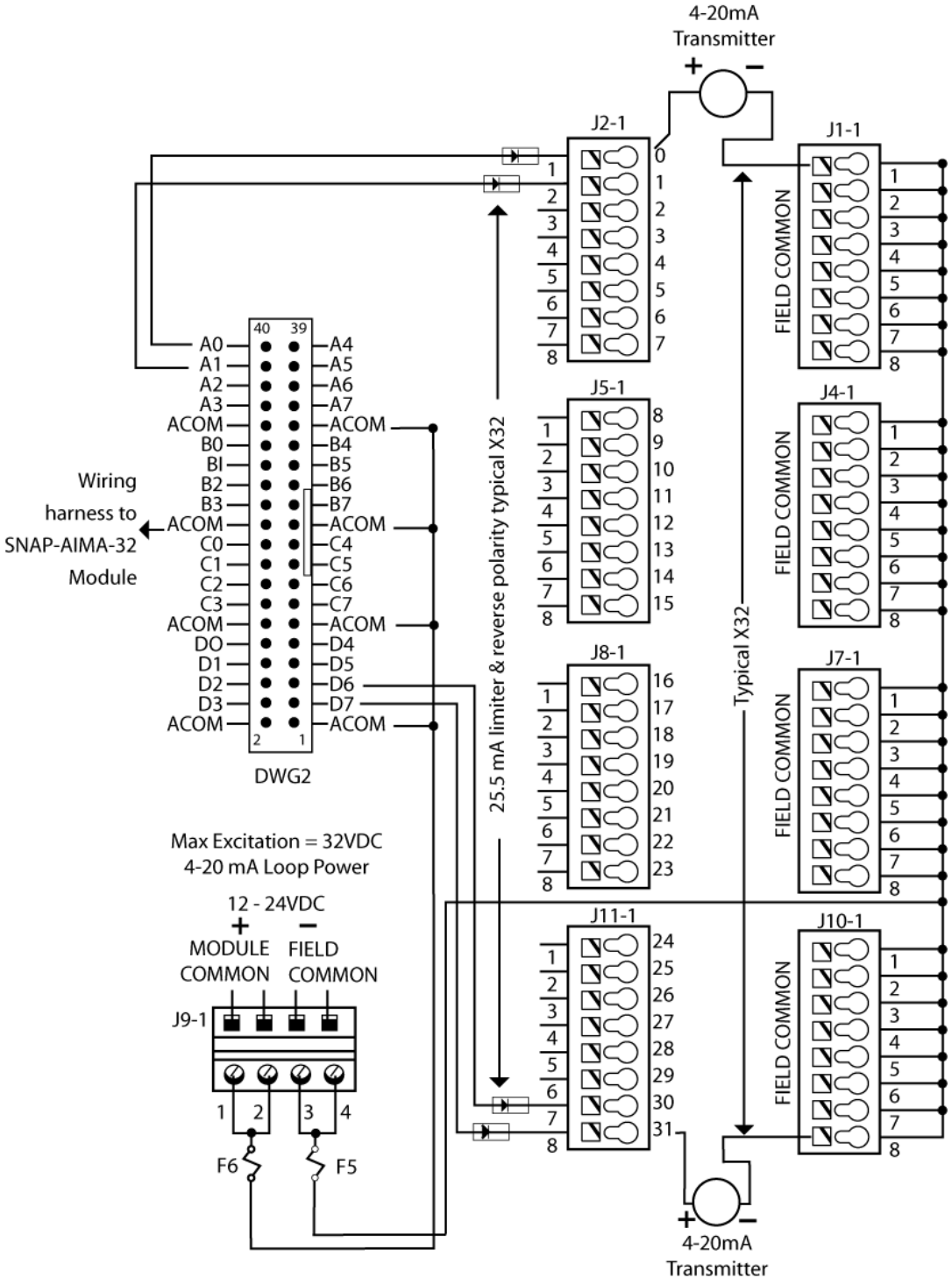
Current Input Module, -20 mA to +20 mA, 32 Channels (continued)

Wiring diagram: SNAP-AIMA-HDB breakout rack to SNAP-AIMA-32 module

NOTE: This diagram also applies to the SNAP-AIMA-HDB-FM rack and the SNAP-AIMA-32-FM module.



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SNAP Analog Input Modules

0 to 25,000 Hz Analog Rate Input Module

Specifications

Nominal Input Range	0 to 25,000 Hz
Input Over-Range	To 27,500 Hz
Resolution	1 Hz
Input Response Time(% of span / delta Hz / delta time)	10.0% / 2,500 Hz / 0.1 sec 63.2% / 15.8 K Hz / 0.9 sec 99.0% / 24.75 K Hz / 4.2 sec
Data Freshness (Max)	126 ms
DC Common Mode Rejection	> -120 dB
AC Common Mode Rejection	> -120 dB at 60 Hz
Maximum Operating Common Mode Voltage	250 V
Accuracy (% full scale)	±4 Hz or ±0.5% of the input frequency (whichever is greater)
Drift: Gain Temperature Coefficient	200 ppm / °C
Drift: Offset Temperature Coefficient	50 ppm / °C
Input Coupling	Single-ended AC (capacitor coupled)
Input Amplitude Sine wave Square wave	 2.5 V to 24 V p-p 0.5 V to 24 V p-p
Minimum Pulse Width	18 microseconds
Input Impedance (Inputs share the same reference point.) Pull-up Voltage Pull-up Resistor	50 K ohms AC coupled (-input to +input) 6 to 9 V 4.7 K ohms
Isolation	1500 V
Power Requirements	5 VDC (±0.15 V) at 190 mA
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

Part Number	Description
SNAP-AIRATE	0–25,000 Hz analog rate input

Description

The SNAP-AIRATE module provides two channels of frequency-to-digital conversion. The nominal input range is 0 to 25,000 Hz with an over-range capability to 27,500 Hz. Nine volts through a 4.7 K ohm pull-up resistor are provided internally for use with devices that have open collector outputs. This feature eliminates the need for the user to provide the pull-up voltage supply and associated wiring, barrier strips, etc.

The module works with TTL, CMOS, and open collector outputs. Truly a two-wire hookup, the SNAP-AIRATE module is ideally suited for use with a tachometer.

Please note that this module does not provide channel-to-channel isolation. If you need isolated channels, see the *SNAP Isolated Analog Input Modules Data Sheet*, form 1182.

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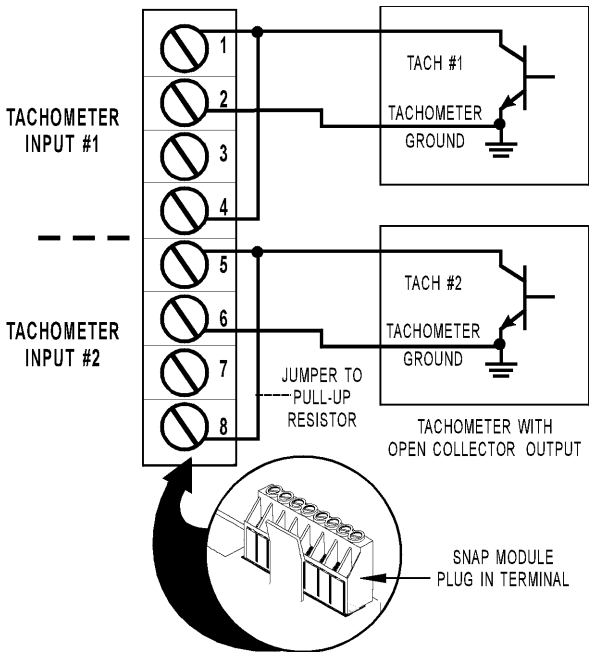
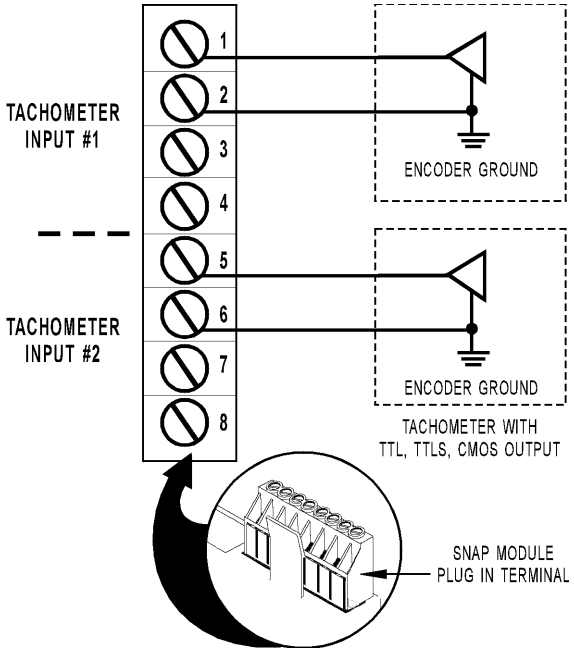
0 to 25,000 Hz Analog Rate Input Module (continued)

SNAP-AIRATE Wiring Diagrams





NOTE: This module does not provide channel-to-channel isolation.

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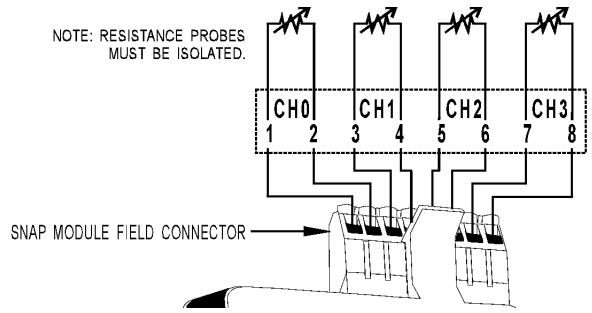
SNAP Analog Input Modules

Thermistor Input Module 0–40 K, 0–20 K, 0–10 K, or 0–5 K Ohm

Part Number	Description
SNAP-AIR40K-4	Four-channel analog resistor/thermistor input, 40 K Ohms, 20 K Ohms, 10 K Ohms, or 5 K Ohms

SNAP-AIR40K-4



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIR40K-4 module provides four channels of analog to digital conversion, ideal for thermistors used in HVAC applications or for reading the resistance of potentiometer input. See the table on page 3 for I/O processor compatibility.

The default input range is 0 to 40 K Ohms. The module can also be configured for 0 to 20 K, 0 to 10 K, or 0 to 5 K Ohms.

NOTE: Resistance probes must be isolated from each other.

Specifications

Input Range	0 to 40,000 Ohms 0 to 20,000 Ohms 0 to 10,000 Ohms 0 to 5,000 Ohms
Maximum Over-Range	44 K (40 K Ohms range) 22 K (20 K Ohms range) 11 K (10 K Ohms range) 5.5 K (5 K Ohms range)
Resolution	1.6 Ohm @ 40 K Ohms 0.8 Ohm @ 20 K Ohms 0.4 Ohm @ 10 K Ohms 0.2 Ohm @ 5 K Ohms
Input Filtering	-3 dB @ 3.2 Hz
Data Freshness (Max)	100 (40 K Ohms) 200 (20 K Ohms) 400 (10 K Ohms) 800 (5 K Ohms)
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.1% ± 40 Ohms @ 40 K Ohms 0.1% ± 20 Ohms @ 20 K Ohms 0.1% ± 10 Ohms @ 10 K Ohms 0.1% ± 5 Ohms @ 5 K Ohms
DRIFT: Gain Temperature Coefficient	30 PPM/ °C
DRIFT: Offset Temperature Coefficient	15 PPM/ °C
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 190 mA
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

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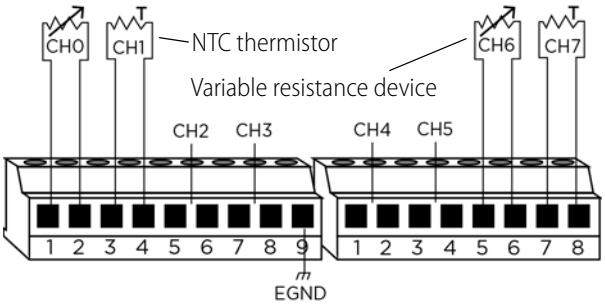
Thermistor Input Module 0–400 K, 0–200 K, 0–100 K, 0–50 K, 0–40 K, 0–20 K, 0–10 K, 0–5 K, 0–4 K, 0–2 K, 0–1 K, 0–500 Ohm

SNAP-AIR400K-8



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIR400K-8 module has eight channels of analog to digital conversion that convert resistance to temperature or to Ohms. The module is ideal for NTC thermisters commonly used in HVAC, refrigeration, and process control applications. It may also be used with PTC thermisters in resistance sensing applications. See the table on page 3 for I/O processor compatibility.

Part Number	Description
SNAP-AIR400K-8	Eight channel analog resistor/thermistor input, 400 K Ohms, 200 K Ohms, 100 K Ohms, 50 K Ohms, 40 K Ohms, 20 K Ohms, 10 K Ohms, 5 K Ohms, 4 K Ohms, 2 K Ohms, 1 K Ohms, 500 Ohms

The SNAP-AIR400K-8 reads variable resistance type transducers, and it has 12 resistance input ranges from 500 Ohms to 400 K Ohms, plus Autorange. Range dependent resolution is from 20 milliOhms to 16 Ohms.

SNAP PAC brains and PAC Control provide direct temperature readings for four popular thermistors using the Steinhart-Hart equation (see page 16). You may also enter custom coefficients for unsupported thermistor curves.

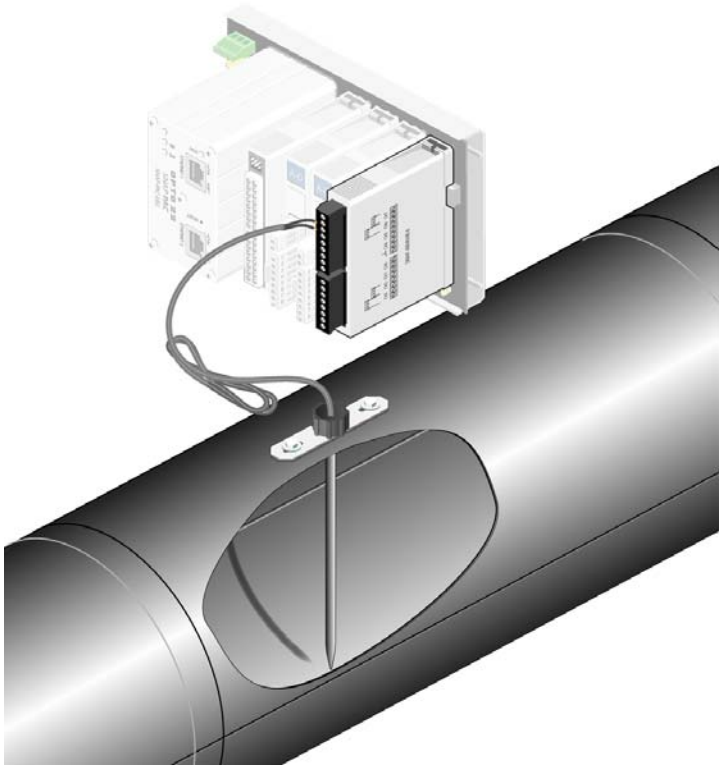
The simple two-wire connections are made to the pluggable terminal strip on top of the module.

NOTE: The eight input channels must be electrically isolated from each other and earth ground. The transducer resistor element must be isolated from any electrically conducting probe tube housing.

See page 15 for module specifications.

Wiring Information

Unshielded 24 AWG wire (minimum) is recommended.



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Thermistor Input Module 0–400 K (continued)

Specifications

Input Ranges	400 K, 200 K, 100 K, 50 K, 40 K, 20 K, 10 K, 5 K , 4 K, 2 K, 1 K, 500 Ohms, and Autorange		
Resolution	Resolution / Range 16 Ohm / 0 to 400 kOhms 8 Ohm / 0 to 200 kOhms 4 Ohm / 0 to 100 kOhms 2 Ohm / 0 to 50 kOhms	Resolution / Range 1.6 Ohm / 0 to 40 kOhms 0.8 Ohm / 0 to 20 kOhms 0.4 Ohm / 0 to 10 kOhms 0.2 Ohm / 0 to 5 kOhms	Resolution / Range 0.16 Ohm / 0 to 4 kOhms 0.08 Ohm / 0 to 2 kOhms 0.04 Ohm / 0 to 1 kOhms 0.02 Ohm / 0 to 500 Ohms
Accuracy (Ohms @ Range) 0.1% Reading + 2x Range Resolution + 1 Ohm	400 Ohms @ 400 K 200 Ohms @ 200 K 100 Ohms @ 100 K 0 Ohms @ 50 K	40 Ohms @ 40 K 20 Ohms @ 20 K 10 Ohms @ 10 K 5 Ohms @ 5 K	4 Ohms @ 4 K 2 Ohms @ 2 K 1 Ohms @ 1 K 0.5 Ohms @ 500
Data Freshness	1.61 seconds maximum		
DSP Notch Filter	20 Hz (- 3DB = 5.24 Hz)		
Excitation Current Nominal (Range & Load Watts Dissipation)	9uA (50 K–4.1 uW), (100 K–8.1 uW), (200 K–16 uW), (400 K–32 uW) 90uA (5 K–40 uW), (10 K–81 uW), (20 K–160 uW), (40 K–320 uW) 200uA (500 K–20 uW), (1 K–40 uW), (2 K–80 uW), (4 K–160 uW)		
Autorange Step Time	1.6 seconds to next higher or lower range >= 10 seconds for a 500 Ohms to 400 K Ohms step change		
Autorange Ohms Hysteresis	**Ranges** **Ohms Open > 440K** 20K between 200K & 400K 10K between 100K & 200K 5K between 50K & 100K 19K between 40K & 50K 2K between 20K & 40K 1K between 10K & 20K 500 between 5K & 10K 1.9K between 4K & 5K 200 between 2K & 4K 100 between 1K & 2K 50 between 500 & 1K		
DC Common Mode Rejection	>-120 dB		
AC Common Mode Rejection	>-120 dB @ 60 Hz		
Open Resistor Indicator	Channel resistance = 999,999.999 Ohms		
PAC Control Reads	temperature reading or -32768 Ohms if over or under range		
Maximum Operating Common Mode Voltage (Field Term to Logic Connector)	500 VDC or peak VAC		
Drift Gain Tempco Offset Tempco	 30 PPM / °C 15 PPM / °C		
Power Requirements	5 VDC (±0.15) @ 190 mA		
Operating Temperature	-20 °C to 70 °C		
Storage Temperature	-40 °C to 85 °C		
Torque, hold-down screws	4 in-lb (0.45 N-m)		
Torque, connector screws	5.26 in-lb (0.6 N-m)		
Agency Approvals	UL, CE		
Warranty	Lifetime		

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Thermistor Input Module 0–400 K (continued)

Auto-range Curves

The following table shows temperatures in °C and °F that correlate with resistance values in Ohms for the generic curve types for four popular thermistors using the Steinhart-Hart equation. Choose the curve type for your application in PAC Control or PAC Manager when you configure a SNAP-AIR400K-8 module. (For custom curves, see page 17.)

Choose a 2-wire thermistor value with a resistance over the target temperature range that is much larger than the lead resistance for your application

Lower value curves (2252 or 3K) work best at cooler temperatures (< 25 °C or 77 °F) because long lead wire resistance can add significant errors to the measurement.

SNAP-AIR400K-8 Auto-range Curves Table

		2252 curve	3K curve	10K type 3 curve	10K type 2 curve
Temp °C	Temp °F	Resistance (Ohms)			
-40	-40	75,769.0	100,935.0	239,686.0	336,450.0
-35	-31	54,647.0	72,798.0	179,200.0	242,660.0
-30	-22	39,851.0	53,088.0	135,185.0	176,960.0
-25	-13	29,368.0	39,123.0	102,861.0	130,410.0
-20	-4	21,861.0	29,122.0	78,913.0	97,072.0
-15	5	16,429.0	21,885.0	61,020.0	72,951.0
-10	14	12,459.0	16,598.0	47,543.0	55,326.0
-5	23	9,532.0	12,698.0	37,313.0	42,326.0
0	32	7,353.0	9,795.0	29,490.0	32,650.0
5	41	5,718.0	7,617.0	23,457.0	25,391.0
10	50	4,481.0	5,970.0	18,780.0	19,899.0
15	59	3,538.0	4,713.0	15,130.0	15,711.0
20	68	2,813.0	3,748.0	12,263.0	12,492.0
25	77	2,252.0	3,000.0	10,000.0	10,000.0
30	86	1,814.0	2,417.0	8,194.0	8,057.0
35	95	1,471.0	1,959.0	6,752.0	6,531.0
40	104	1,200.0	1,598.0	5,592.0	5,326.0
45	113	983.8	1,311.0	4,655.0	4,368.0
50	122	811.2	1,081.0	3,893.0	3,602.0
55	131	672.5	895.8	3,271.0	2,986.0
60	140	560.3	746.3	2,760.0	2,488.0
65	149	469.0	624.8	2,339.0	2,083.0
70	158	394.5	525.5	1,990.0	1,752.0
75	167	333.1	443.8	1,700.0	1,479.0

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SNAP-AIR400K-8 Auto-range Curves Table (continued)

		2252 curve	3K curve	10K type 3 curve	10K type 2 curve
Temp °C	Temp °F	Resistance (Ohms)			
80	176	282.7	376.6	1,458.0	1,255.0
85	185	240.9	320.9	1,255.0	1,070.0
90	194	206.2	274.6	1,084.0	915.4
95	203	177.1	236.0	939.3	786.6
100	212	152.8	203.6	816.8	678.6
105	221	132.3	176.3	712.6	587.6
110	230	115.0	153.2	623.6	510.6
115	239	100.3	133.6	547.3	445.2
120	248	87.7	116.9	481.8	389.6
125	257	77.0	102.6	425.3	341.9
130	266	67.8	90.3	376.4	301.0
135	275	59.9	79.7	334.0	265.8
140	284	53.0	70.6	297.2	235.4
145	293	47.1	62.7	265.1	209.0
150	302	41.9	55.8	237.0	186.1

The information in this table is provided by Automation Components, Inc.

Custom Curves

To configure the SNAP-AIR400K-8 with custom curves, follow these steps:

1. Configure the I/O unit in PAC Control, PAC Manager, or EtherNet/IP Configurator, and save the configuration to flash memory.
2. Open PAC Manager and choose Tools > Inspect.
3. In the Device Name field, enter the I/O unit's IP address. Click the Point Config button in the left navigation.
4. Choose the module number and point number you want to configure.
5. Click in the Value column next to Point Type and choose Temperature from the dropdown menu.
6. Scroll down and click the Value column next to Thermistor Curve. Choose Unknown.
7. For each coefficient (A, B, K, C), click the Value column and enter your custom coefficient.
8. Click the Apply button at right.
9. Save the configuration to flash memory: Click the Status Write button, under Operation highlight Store configuration to flash, and click Send Command.

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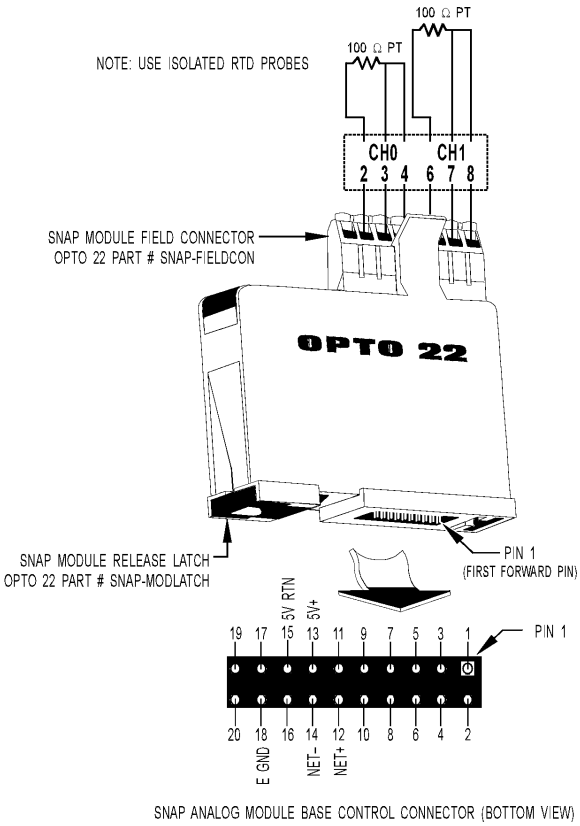
RTD Input Modules

SNAP-AIRTD, SNAP-AIRTD-1K, and SNAP-AIRTD-10



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIRTD and SNAP-AIRTD-1K platinum and the SNAP-AIRTD-10 copper modules are usually used for temperature inputs. They can also be used to make high-resolution resistance measurements.

On all three modules, the two inputs share the same reference terminal. Make sure you use isolated RTD probes.

The SNAP-AIRTD-10 and SNAP-AIRTD-1K require a SNAP PAC brain or R-series controller.

Also see the SNAP-AIRTD-8U module on page 20.

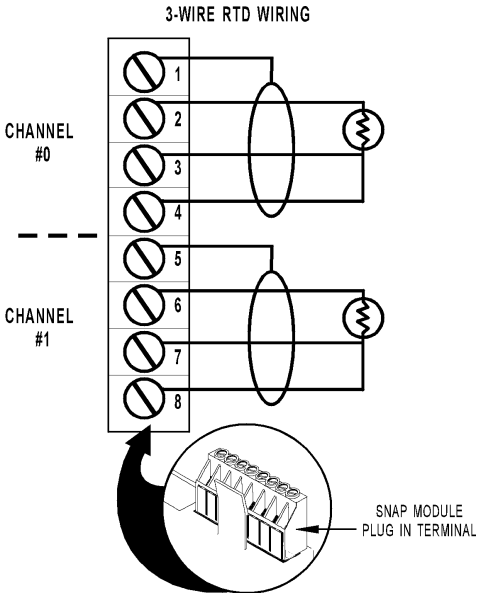
Part Number	Description
SNAP-AIRTD-1K	Two-channel 1000 ohm platinum RTD input
SNAP-AIRTD	Two-channel 100 ohm platinum RTD input
SNAP-AIRTD-10	Two-channel 10 ohm copper RTD input

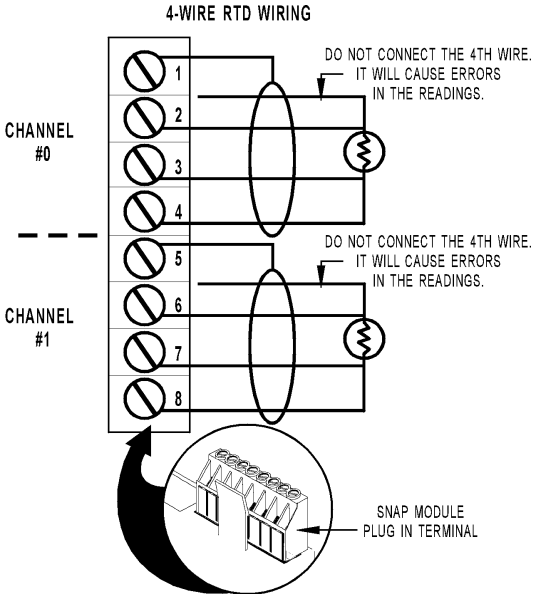
Wiring

RTD input modules are designed for three-wire connections, shown in the diagram below.

If you use a four-wire connection (shown at the bottom right), DO NOT connect the fourth wire, as it will cause errors in the readings.

Two-wire connections are not recommended, as they will degrade accuracy and stability.





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RTD Input Modules (continued)

Specifications

	SNAP-AIRTD-1K	SNAP-AIRTD	SNAP-AIRTD-10
3-wire RTD input	1000 ohm platinum @ 0 °C α= 0.00385 1000 ohm nickel @ 0 °C α= 0.00618 1000 ohm nickel @ 70 °F α= 0.00637	100 ohm platinum; α= 0.00385 100 ohm nickel, -60 to 250 °C 120 ohm nickel, -80 to 260 °C	10 ohm copper; α= 0.00428
Input Temperature Range	-200 °C to 850 °C (-328° to +1,582° F)	-200 °C to 850 °C (-328° to +1,582° F)	-180 °C to 260 °C (-292° to +500° F)
Input Range	0 to 4000 ohms	0 to 400 ohms	0 to 25 ohms
Over-Range Limit	to 4400 ohms	to 440 ohms	to 27.5 ohms
Resolution (average)	0.042 °C (0.16 ohms)	0.042 °C (0.016 ohms)	0.026 °C (0.001 ohms)
Input Filtering	-3 dB @ 0.1 Hz	-3 dB @ 0.1 Hz	-3 dB @ 100 Hz
Data Freshness (Max)	100 ms	100 ms	168 ms
Lead Compensation	Automatic when used with SNAP brains	Automatic when used with SNAP brains	Automatic when used with SNAP PAC brains
DC Common Mode Rejection	>-120 dB	>-120 dB	>-120 dB
AC Common Mode Rejection	>-120 dB at 60 Hz	>-120 dB at 60 Hz	>-120 dB at 60 Hz
Excitation (typical)	0.256 mA constant current	1.25 mA constant current	5.4 mA constant current
Maximum Lead Resistance	40 ohms single wire (all leads to be equal resistance)	40 ohms single wire (all leads to be equal resistance)	15 ohms single wire (all leads to be equal resistance)
Maximum Fault Voltage at Input (between any 2 field wires)	±15 V	±15 V	±15 V
Maximum Operating Common Mode Voltage	250 V	250 V	250 V
Accuracy From factory After setting gain and offset	 0.8 °C 0.6 °C	 0.8 °C 0.6 °C	 0.6 °C 0.5 °C
Isolation	1500 V	1500 V	1500 V
Power Requirements	5.00 to 5.20 VDC @ 190 mA	5.00 to 5.20 VDC @ 190 mA	5.00 to 5.20 VDC @ 190 mA
Operating Temperature	-20 °C to 70 °C	-20 °C to 70 °C	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C	-40 °C to 85 °C	-40 °C to 85 °C
Wire size	22 to 14 AWG	22 to 14 AWG	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Agency Approvals	CE, RoHS, DFARS	UL, FM, CE, RoHS, DFARS	CE, RoHS, DFARS
Warranty	Lifetime	Lifetime	Lifetime

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RTD Input Modules (continued)

SNAP-AIRTD-8U

Part Number	Description
SNAP-AIRTD-8U	8-channel multifunction 3-wire RTD/resistance input

Description

The SNAP-AIRTD-8U provides 8 input channels, each individually software configurable. This module is commonly used for 3-wire RTD temperature inputs but is also suited to high-resolution resistance measurements. It features open circuit detection if any wire breaks.

All 8 inputs share the same reference terminal. Make sure you use isolated RTD probes.

The SNAP-AIRTD-8U requires a SNAP PAC brain or R-series controller with firmware R9.5a or higher. The module cannot be used with legacy brains or controllers.

Point Configuration

See table at right. You can individually configure each of the module's 8 points for a variety of behaviors:

- **Temperature**—Range is fixed. Default range is 0–8000 ohms. Choose nickel, platinum, or copper RTD input. The data returned is degrees C or degrees F, depending on your choice for the I/O unit.
- **Fixed-range** (default)—Choose the range you want to use. If the value goes above the limit for that range, an out-of-range value (16-bit) of –32768 is displayed. The data returned is resistance in ohms.
- **Full Auto-range**—The module scrolls up and down the entire set of ranges and dynamically chooses the appropriate range for best resolution. Note that this point type can result in higher latency when ranging up (see Specifications on next page). The data returned is resistance in ohms.

Point Configuration (continued)

- **Auto-range Down**—The module scrolls down and up within the specified range limit. If the value goes above the specified range, an out-of-range value (16-bit) of –32768 is displayed. These point types allow auto-ranging within the selected range but limit the data latency when ranging up. The data returned is resistance in ohms.

Point configuration choices for each of the 8 inputs (default is highlighted in gray):

Point Type	Range*
1k Ohm at 70 °F Ni	-46 to +148.9 °C
1k Ohm at 0 °C Ni	-40 to +135 °C
1k Ohm Pt	-200 to +850 °C
120 Ohm Ni	-80 to +260 °C
100 Ohm Ni	-60 to +250 °C
100 Ohm Pt	-200 to +850 °C
10 Ohm Cu	-60 to +355 °C
Fixed-range (Default)	0 - 8000 Ohms
Fixed-range	0 - 4000 Ohms
Fixed-range	0 - 2000 Ohms
Fixed-range	0 - 1000 Ohms
Fixed-range	0 - 800 Ohms
Fixed-range	0 - 400 Ohms
Fixed-range	0 - 200 Ohms
Fixed-range	0 - 100 Ohms
Fixed-range	0 - 80 Ohms
Fixed-range	0 - 40 Ohms
Fixed-range	0 - 20 Ohms
Fixed-range	0 - 10 Ohms
Full Auto-range	0 - 8000 Ohms
Auto-range Down	0 - 4000 Ohms
Auto-range Down	0 - 2000 Ohms
Auto-range Down	0 - 1000 Ohms
Auto-range Down	0 - 800 Ohms
Auto-range Down	0 - 400 Ohms
Auto-range Down	0 - 200 Ohms
Auto-range Down	0 - 100 Ohms
Auto-range Down	0 - 80 Ohms
Auto-range Down	0 - 40 Ohms
Auto-range Down	0 - 20 Ohms
Auto-range Down	0 - 10 Ohms

* Maximum range; actual range depends on your probe.

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RTD Input Modules (continued)

Wiring

The SNAP-AIRTD-8U has a plug-in terminal on top with spring-clamp connectors for easy wiring. An insertion tool is provided in the box with the module.

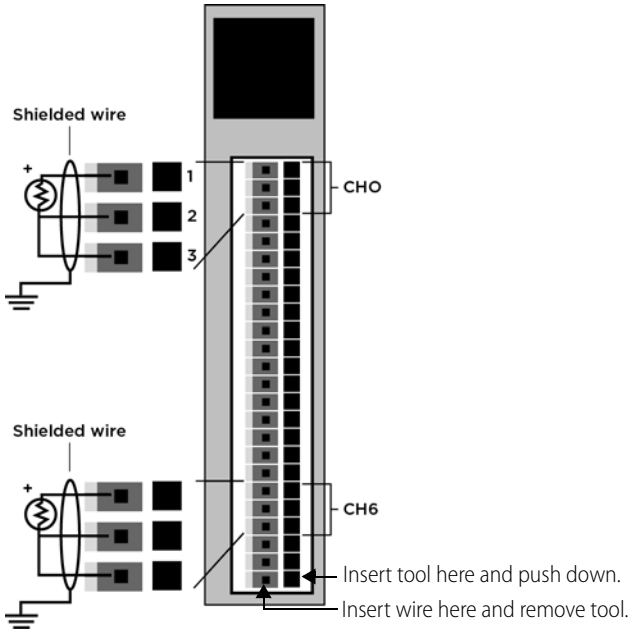
For each connection:

1. Insert the tool in the small square hole and push down.
2. Push the wire firmly into the rectangular hole below the tool, and then remove the tool.

The module is designed for 3-wire RTDs, shown below. All wires must be the same size. If you use a 4-wire connection, DO NOT connect the fourth wire, as it will cause errors in the readings. If you use 2-wire RTDs (not recommended because measurement is less accurate), you must jumper terminal 2 to 3 for each applicable RTD channel.

A Note on Calibration

Because the SNAP-AIRTD-8U uses intermittent excitation current for measurements, it cannot be used with RTD calibrators that require a steady excitation current.



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

RTD Input Modules (continued)

Specifications

	SNAP-AIRTD-8U		
3-wire RTD input and maximum temperature table range (actual range depends on your probe)	1000 ohm platinum @ 0 °C α= 0.00385 Range: -200 to 850 °C (-328 to 1,582 °F) 1000 ohm nickel @ 0 °C α= 0.00618 Range: -60 to 170 °C (-76 to 356 °F) 1000 ohm nickel @ 70 °F α= 0.00637 Range: -46 to 148.9 °C (-50 to 300 °F)	100 ohm platinum @ 0 °C α= 0.00385 Range: -200 °C to 850 °C (-328 to 1,582 °F) 100 ohm nickel @ 0 °C α= 0.00618 Range: -60 to 250 °C (-76 to 482 °F) 120 ohm nickel @ 0 °C α= 0.00672 Range: -80 to 260 °C (-112 to 500 °F)	10 ohm copper @ 25 °C α= 0.00427 Range: -60 to 355 °C (-76 to 671 °F)
Input Range	0 to 4000 ohms	0 to 400 ohms	0 to 40 ohms
Accuracy From factory After setting gain and offset	 0.8 °C (Pt); 0.6 °C (Ni) 0.6 °C (Pt); 0.4 °C (Ni)	 0.8 °C (Pt); 0.6 °C (Ni) 0.6 °C (Pt); 0.4 °C (Ni)	 1.7 °C 1.2 °C
Excitation Current	4.28 mA	2 mA	0.325 mA
Over-Range Limit	10% overrange for all measurements in ohms		
Resolution In Ohms In RTD Temperature	The greater of: (Ohms Range / 100,000) or 1 milliohm Better than or equal to 0.05 °C (0.09 °F)		
Input Filtering Front end filtering DSP Notch filter	-15 dB @ 50 Hz, -20 dB @ 60 Hz 20 Hz (-3 DdB = 5.24 Hz)		
Data Freshness (Max)	1.2 s		
Auto-range Settle Time Step change from 10 to 8000 Step change from 8000 to 10	1.2 s to the next higher or lower range <= 10 s ranging up (channel may show overrange until settled) <= 10 s ranging down (channel will give a reading while settling)		
Total Lead Resistance	200 ohms maximum		
DC Common Mode Rejection	>-120 dB		
AC Common Mode Rejection	>-120 dB at 60 Hz		
Maximum Survivable Fault Voltage at Input (between any 2 field wires)	±8 V		
Maximum Operating Common Mode Voltage	250 V field terminal to logic connector		
Isolation	1500 V field side to logic side		
Power Requirements	5.00 to 5.20 VDC @ 135 mA		
Operating Temperature	-20 °C to 70 °C		
Storage Temperature	-40 °C to 85 °C		
Maximum wire size	20 AWG		
Torque, hold-down screws	4 in-lb (0.45 N-m)		
Agency Approvals	UL, CE, RoHS, DFARS		
Warranty	Lifetime		

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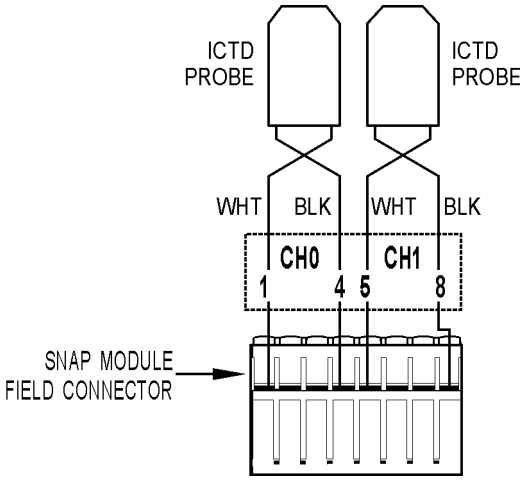
ICTD Temperature Input Module, Two or Four Channels

SNAP-AICTD (Two channels)

Four-channel module wiring is shown on the next page.



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Part Number	Description
SNAP-AICTD	Two-channel analog temperature input, ICTD
SNAP-AICTD-4	Four-channel analog temperature input, ICTD

Description

SNAP-AICTD and SNAP-AICTD-4 modules provide temperature input data from any industry-standard Integrated Circuit Temperature Device (ICTD). The SNAP-AICTD has two channels, and the SNAP-AICTD-4 has four channels. See the table on page 3 for I/O processor compatibility.

The simple two-wire connections are made to the pluggable terminal strip on top of the module. Up to 2,000 feet of ordinary hook-up wire is used to connect the sensor to the input terminal strip.

Both modules are compatible with all industry-standard ICTD probes, including the AD-590 family from Analog Devices and Opto 22's part number ICTD.

Specifications

Input Range with ICTD Probe	-40 °C to +100 °C
Module Input Range Zero Scale Full Scale	 -273 °C +150 °C
Resolution	0.017 °C
Accuracy with ICTD Probe	±0.8 °C
Sensitivity	1.0 microamps/ °C
Data Freshness (Max)	167 ms (2-channel module) 355 ms (4-channel module)
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Isolation	1500 V
Power Requirements	5 VDC (± .015) @ 150 mA
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS

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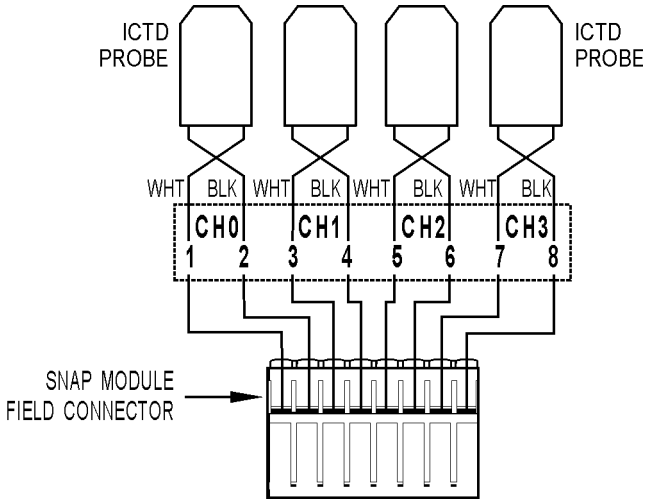
Warranty	Lifetime

ICTD Temperature Input Module (continued)

SNAP-AICTD-4 (Four channels)

Two-channel module wiring is shown on the previous page.



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

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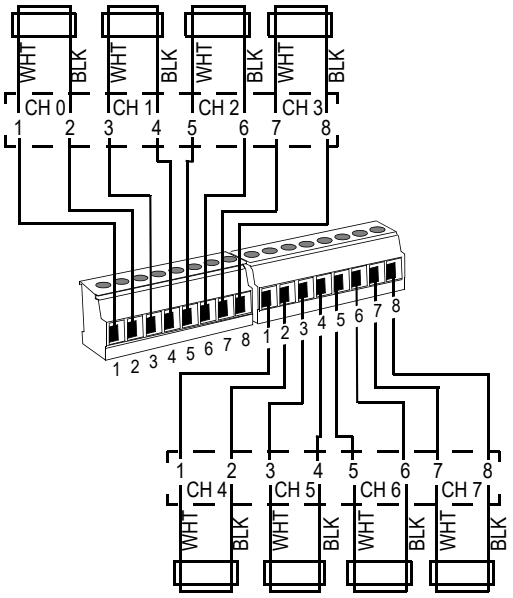
SNAP Analog Input Modules

ICTD Temperature Input Module, Eight Channels

SNAP-AICTD-8

ICTD Source



NOTE: Terminals 2, 4, 6, and 8 on both connectors are connected internally.

Part Number	Description
SNAP-AICTD-8	Eight-channel analog temperature input, ICTD

Description

The SNAP-AICTD-8 module provides temperature input data from any industry-standard Integrated Circuit Temperature Device (ICTD). It has eight channels of input. The SNAP-AICTD-8 can be used only with SNAP PAC brains and rack-mounted controllers (standard wired and Wired+Wireless models).

The simple two-wire connections are made to the terminal strip on top of the module. Up to 2,000 feet of ordinary hook-up wire is used to connect the sensor to the input terminal strip.

The module is compatible with all industry-standard ICTD probes, including the AD-590 family from Analog Devices and Opto 22's part number ICTD.

Specifications

Input Range with ICTD Probe	-40 °C to +100 °C
Module Input Range Zero Scale Full Scale	 -273 °C +150 °C
Data Freshness (Max)	0.28 seconds
Resolution	0.017 °C
Accuracy with ICTD Probe	±0.8 °C
Sensitivity	1.0 mA/ °C
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Isolation	1500 V
Power Requirements	5 VDC (± .015) @ 170 mA
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	1.7 in-lb (0.19 N-m)
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

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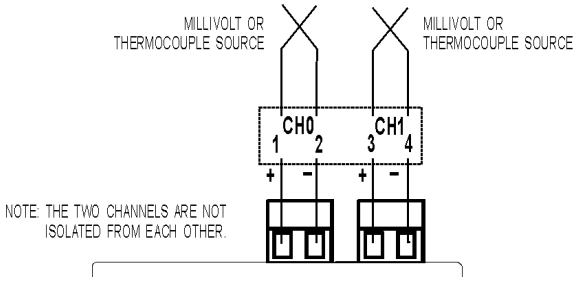
Thermocouple/Millivolt Input Module

SNAP-AITM

Thermocouple Polarity and Range

Type	-	+	Range
E	Red	Purple	-270°C to +1,000 °C
J	Red	White	-210°C to +1,200 °C
K	Red	Yellow	-270°C to +1,372 °C



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AITM module provides two channels of analog to digital conversion. Each channel on the module can be configured for -150 mV DC to +150 mV DC or -75 mV DC to +75 mV DC, or for type E, J, or K thermocouple operation.

Since both inputs share the same reference terminal, use isolated probes for thermocouple inputs. If you need isolated channels on the same module, see Opto 22 form #1182.

Part Number	Description
SNAP-AITM	Two-channel analog type E, J, or K thermocouple or -150 mV to +150 mV input or -75 mV to +75 mV input

Specifications

Input Range	From -150 mV to +150 mV From -75 mV to +75 mV
Over-Range Limits	From -165 to +165 mV (+/-150 mV range) From -82.5 to +82.5 mV (+/-75 mV range)
Resolution	6 microvolts from -150 to +150 mV 3 microvolts from -75 to +75 mV
Cold Junction Temperature Compensation	Automatic when used with SNAP I/O processors
Input Filtering	-3 dB @ 7 Hz
Input Response Time (% of span/delta V/delta time)	63.2%/95 mV/23 mS
Data Freshness (Max)	167 ms (+/-150 mV) 334 ms (+/-75 mV)
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	±15 volts
Maximum Operating Common Mode Voltage	250 V
Accuracy at Full Scale	0.06% (90 microvolts) @ 150 mV 0.1% (75 microvolts) @ 75 mV
Drift: Gain Temperature Coefficient	5 microvolts / °C
Drift: Offset Temperature Coefficient	2 microvolts / °C
Thermocouple Accuracy [°C] From factory After user gain and offset commands	 ± 2.0 (E, J, and K) ± 0.8
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 170 mA
Input Resistance	100 Megohms (each channel)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	3 in-lb (0.34 N-m)
Agency Approvals	FM, CE, RoHS, DFARS
Warranty	Lifetime

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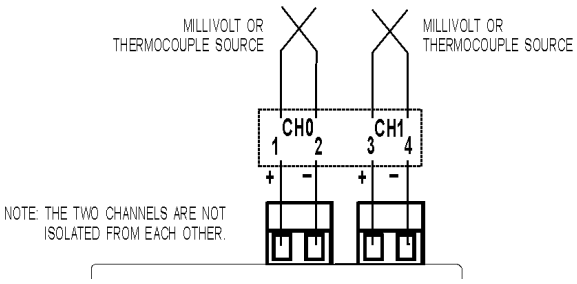
Thermocouple/Millivolt Input Module

SNAP-AITM-2

Thermocouple Polarity and Range

Type	-	+	Range
B	RED	GRAY	+42° C to +1,820 °C
C, D, G	RED	WHITE	0° C to +2,320 °C
N	RED	ORANGE	-270° C to +1,300 °C
R, S	RED	BLACK	-50° C to +1,768 °C
T	RED	BLUE	-270° C to +400 °C



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AITM-2 module provides an input range of ±50 mV, ±25 mV, or Type B, C, D, G, N, T, R, or S thermocouple.

Since both inputs share the same reference terminal, use isolated probes for thermocouple inputs. If you need isolated channels on the same module, see Opto 22 form #1182.

Part Number	Description
SNAP-AITM-2	Two-channel analog type B, C, D, G, N, T, R, or S thermocouple or -50 mV to +50 mVDC input or -25 mV to +25 mVDC input

Specifications

Input Range	From -50 mV to +50 mVDC From -25 mV to +25 mVDC		
Over-range Limits	From -55 to +55 mV (+/-50 mV range) From -27.5 to +27.5 mV (+/-25 mV range)		
Resolution	2 microvolts from -50 mV to +50 mV 1 microvolts from -25 mV to +25 mV		
Cold Junction Temperature Compensation	Automatic when used with SNAP brains		
Input Filtering	-3 dB @ 2.4 Hz		
Input Response Time (% of span/delta V/delta time)	63.2%/31.5 mV/66 ms		
Data Freshness (Max)	167 ms (+/- 50 mV) 334 ms (+/- 25 mV)		
DC Common Mode Rejection	>-120 dB		
AC Common Mode Rejection	>-120 dB @ 60 Hz		
Maximum Survivable Input	±15 volts		
Maximum Operating Common Mode Voltage	250 V		
Accuracy at Full Scale	0.1% (50 microvolts) @ 50 mV 0.2% (50 microvolts) @ 25 mV		
Drift: Gain Temperature Coefficient	5 microvolts / °C		
Drift: Offset Temperature Coefficient	2 microvolts / °C		
Thermocouple Accuracy [°C]	B, R, S	C, D, G	T, N
From factory	±5	±4	±3
After user gain and offset commands	±3	±2	±2
Isolation	1500 V		
Power Requirements	5 VDC (±0.15) @ 170 mA		
Input Resistance	100 Megohms (each channel)		
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C		
Agency Approvals	FM, CE, RoHS, DFARS		
Torque, hold-down screws	4 in-lb (0.45 N-m)		
Torque, connector screws	3 in-lb (0.34 N-m)		
Warranty	Lifetime		

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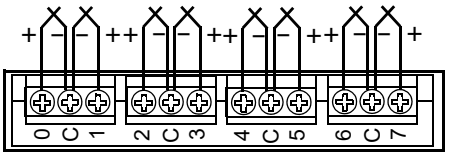
Thermocouple/Millivolt Input Module

SNAP-AITM-8 and SNAP-AITM-8-FM

Thermocouple Polarity and Range

Type	-	+	Range
B	RED	GRAY	+42° C to +1,820 °C
C, D, G	RED	WHITE	0° C to +2,320 °C
E	RED	PURPLE	-270°C to +1,000 °C
J	RED	WHITE	-210°C to +1,200 °C
K	RED	YELLOW	-270°C to +1,372 °C
N	RED	ORANGE	-270° C to +1,300 °C
R, S	RED	BLACK	-50° C to +1,768 °C
T	RED	BLUE	-270° C to +400 °C

Millivolt Thermocouple Source



Common terminals are connected internally.

NOTE: For best accuracy, wire all points before calibrating, and short all unused channels.

The SNAP-AITM-8-FM is Factory Mutual approved.

Description

The SNAP-AITM-8 and SNAP-AITM-8-FM modules provide eight channels of analog to digital conversion. Each channel on the module can be configured for -75 mV DC to +75 mV DC, -50 mV DC to +50 mV DC, -25 mV DC to +25 mV DC, or for type B, C, D, E, G, J, K, N, R, S or T thermocouple operation.

Since all inputs share the same reference terminal, use isolated probes for thermocouple inputs. See the dimensional diagram on page 40.

Part Number	Description
SNAP-AITM-8 SNAP-AITM-8-FM	8-channel B, C, D, E, G, J, K, N, R, S, or T thermocouple or -75 mV to +75 mV, 50 mV to +50 mV, or 25 mV to +25 mV input

Specifications

Input Range	From -75 mV to +75 mV From -50 mV to +50 mV From -25 mV to +25 mV			
Over-Range Limits	From -82.5 to +82.5 mV (+/-75 mV range) From -55 to +55 mV (+/-50 mV range) From -27.5 to +27.5 mV (+/-25 mV range)			
Resolution	3 microvolts from -75 mV to +75 mV 2 microvolts from -50 mV to +50 mV 1 microvolts from -25 mV to +25 mV			
Cold Junction Temperature Compensation	Automatic when used with SNAP I/O processors			
Input Filtering	-3 dB @ 5 Hz			
Data Freshness (Max)	2.25 s			
DC Common Mode Rejection	>-120 dB			
AC Common Mode Rejection	>-120 dB @ 60 Hz			
Maximum Survivable Input	±15 volts			
Max Operating Common Mode Voltage	250 V			
Accuracy at Full Scale	0.1% (75 microvolts) @ 75 mV 0.1% (50 microvolts) @ 50 mV 0.2% (50 microvolts) @ 25 mV			
Drift: Gain Temperature Coefficient	5 microvolts / °C			
Drift: Offset Temperature Coefficient	2 microvolts / °C			
Thermocouple Accuracy [°C]	E, J, K	B, R, S	C, D, G	T, N
From factory	±2.0	±5	±4	±3
After user gain and offset commands	±0.5	±3	±2	±2
Isolation	1500 V			
Power Requirements	5 VDC (±0.15) @ 200 mA			
Input Resistance	100 Megohms (each channel)			
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C			
Torque, hold-down screws	4 in-lb (0.45 N-m)			
Torque, connector screws	3 in-lb (0.34 N-m)			
Agency Approvals	SNAP-AITM-8: UL, CE, RoHS, DFARS SNAP-AITM-8-FM: FM, CE, RoHS, DFARS			
Warranty	Lifetime			

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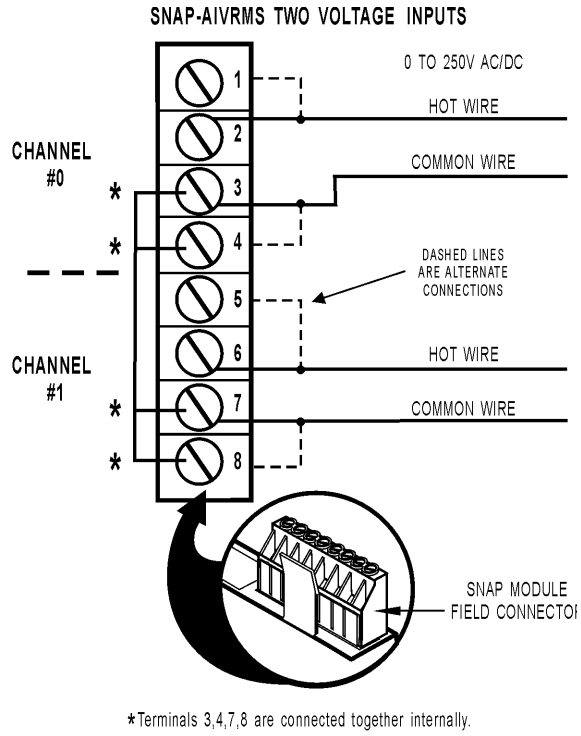
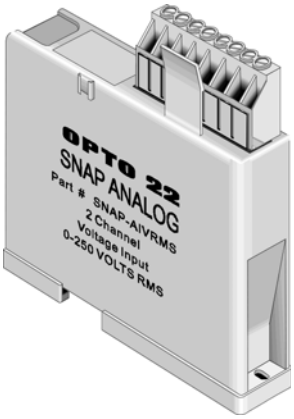
SNAP Analog Input Modules

0 to 250 Volt RMS AC/DC Input Module

SNAP-AIVRMS



*Terminals 3,4,7,8 are connected together internally.



Part Number	Description
SNAP-AIVRMS	Two-channel 0 to 250 V RMS AC/DC input

Description

The SNAP-AIVRMS module provides an input range of 0 to 250 volts AC or DC. The SNAP-AIVRMS module may be used to monitor 120/240-volt AC/DC and 12/24/48-volt AC/DC system voltage.

Terminals 3, 4, 7, and 8 share a common connection inside the module. Make sure you observe polarity when connecting the second channel. To avoid a potentially hazardous short, double-check wiring before turning on the voltage to be monitored.

If you need a module with channel-to-channel isolation, see form #1182, the *SNAP Isolated Analog Input Modules Data Sheet*.

Specifications

Input Range	0 to 250 V RMS AC/DC
Input Over-Range	To 275 V
Input Resistance	1 M ohms
Accuracy	±0.2 V and ±0.2% reading
Resolution	10 mV
DC Reversal	± 0.4 V (.16%)
Input Response Time (Step Change)	5% (12.5 V) in 100 mS 63.2% (158 V) in 200 mS 99% (248 V) in 1200 mS
Data Freshness (Max)	32.3 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Isolation	1500 V
Power Requirements	5 VDC (±0.15 V) at 170 mA
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

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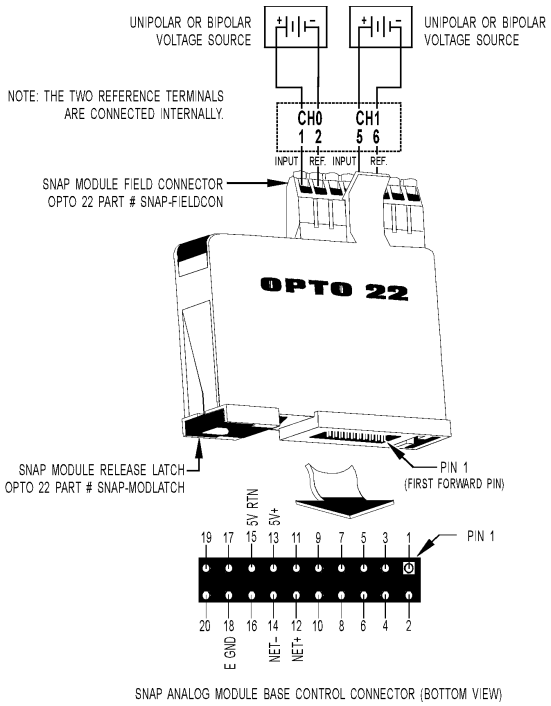
Voltage Input Module, -10 VDC to +10 VDC or -5 VDC to +5 VDC, Two or Four Channels

SNAP-AIV (Two channels)

Four-channel module wiring is shown on page 31.



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIV and SNAP-AIV-4 modules can be configured for either -10 VDC to +10 VDC or -5 VDC to +5 VDC operation on each channel. The SNAP-AIV provides two channels, and the SNAP-AIV-4 four. If you need a module with more channels, see page 32. See the table on page 3 for I/O processor compatibility.

Note that all channels share a common reference terminal. If you need two isolated channels on the same module, see Opto22 form #1182.

Part Number	Description
SNAP-AIV	Two-channel analog voltage input -10 to +10 VDC
SNAP-AIV-4	Four-channel analog voltage input -10 to +10 VDC

Specifications

Input Range	From -10 volts to +10 volts From -5 volts to +5 volts
Over-Range Limits	From -11 to +11 volts (+/-10 V range) From -5.5 to +5.5 volts (+/-5 V range)
Resolution	0.4 mV when configured -10 to +10 volts 0.2 mV when configured -5 to +5 volts
Input Filtering	-3 dB @ 64 Hz
Input Response Time (% of span/ delta V / delta t)	63.2% / 6.7 V / 10 ms
Data Freshness (Max)	11.5 ms (2-channel, +/- 10 VDC) 23 ms (2-channel, +/- 5 VDC 23 ms (4-channel, +/- 10 VDC) 46 ms (4-channel, +/- 5 VDC
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	220 VAC or 300 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05%, 5 mV @ 10 VDC 2.5 mV @ 5 VDC
Gain Temperature Coefficient	30 PPM/ °C
Offset Temperature Coefficient	15 PPM/ °C
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 170 mA
Input Resistance	1 M ohms (each channel; both channels share the same reference point)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

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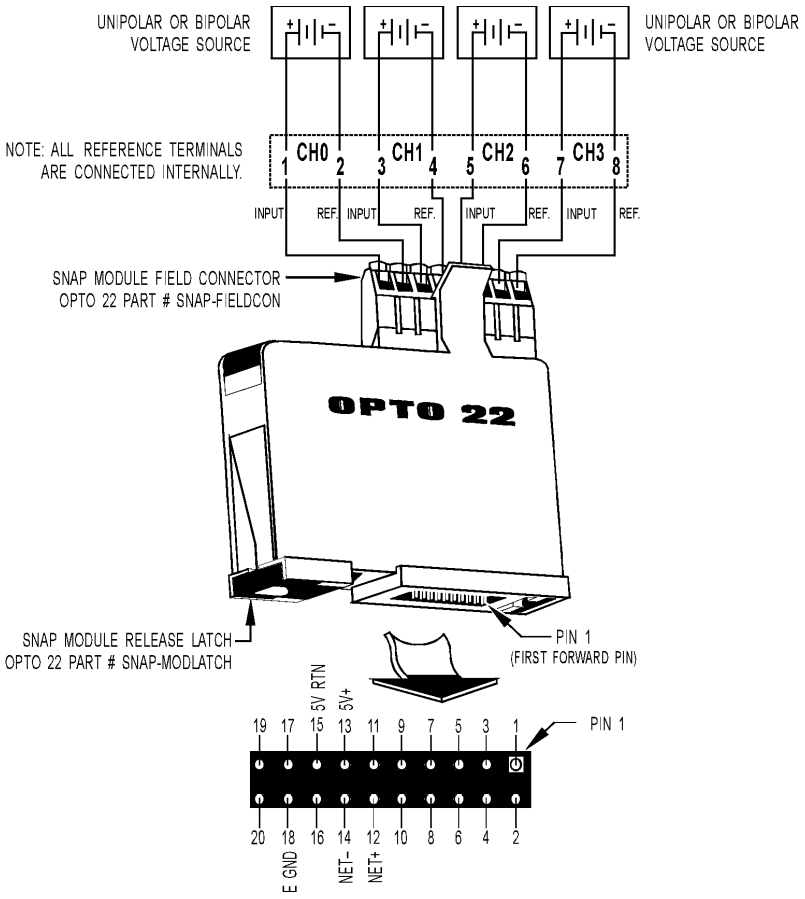
Voltage Input Module, -10 VDC to +10 VDC or -5 VDC to +5 VDC, Four Channels (continued)

SNAP-AIV-4 (Four channels)

Two-channel module wiring is shown on the previous page.



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

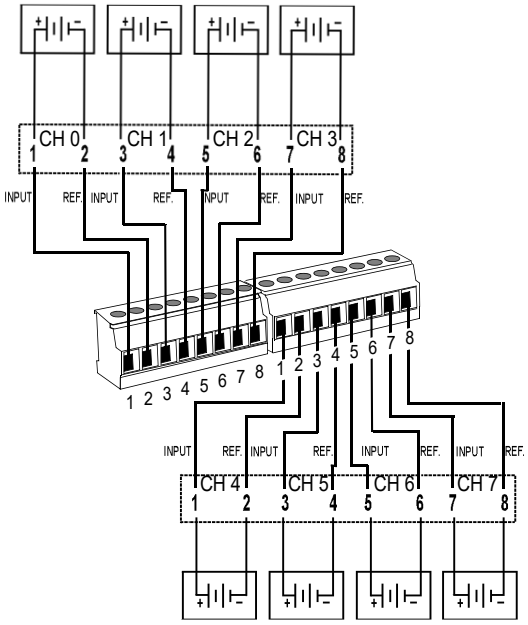
IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Voltage Input Module, -10 VDC to +10 VDC or -5 VDC to +5 VDC, Eight Channels

SNAP-AIV-8

Part Number	Description
SNAP-AIV-8	Eight-channel analog voltage input -10 to +10 VDC

Voltage Source



NOTE: Terminals 2, 4, 6, and 8 on both connectors are connected internally.

Note that all channels share a common reference terminal. If you need two isolated channels on the same module, see Opto22 form #1182.

Specifications

Input Range	From -10 volts to +10 volts From -5 volts to +5 volts
Over-Range Limits	From -11 to +11 volts (+/-10 V range) From -5.5 to +5.5 volts (+/-5 V range)
Resolution	0.4 mV when configured -10 to +10 volts 0.2 mV when configured -5 to +5 volts
Input Filtering	-3 dB @ 64 Hz
Data Freshness (Max)	0.28 seconds
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	220 VAC or 300 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05%, 5 mV @ 10 VDC 2.5 mV @ 5 VDC
Gain Temperature Coefficient	30 PPM/ °C
Offset Temperature Coefficient	15 PPM/ °C
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 170 mA
Input Resistance	1 M ohms (all channels share the same reference point)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	1.7 in-lb (0.19 N-m)
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

Description

The SNAP-AIV-8 module can be configured for either -10 VDC to +10 VDC or -5 VDC to +5 VDC operation on each of its eight input channels. (If you need a module with more channels, see page 33.) The SNAP-AIV-8 can be used only with SNAP PAC brains and rack-mounted controllers (standard wired and Wired+Wireless models).

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Voltage Input Module, -10 VDC to +10 VDC or -5 VDC to +5 VDC, 32 Channels

Specifications

Input Range	From -10 volts to +10 volts From -5 volts to +5 volts
Over-Range Limits	From -11 to +11 volts (+/-10 V range) From -5.5 to +5.5 volts (+/-5 V range)
Resolution	0.4 mV when configured -10 to +10 volts 0.2 mV when configured -5 to +5 volts
Input Filtering	-3 dB @ 31 Hz
Data Freshness (Max)	1.1 s
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	220 VAC or 300 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05%, 5 mV @ 10 VDC 2.5 mV @ 5 VDC
Gain Temperature Coefficient	30 PPM/ °C
Offset Temperature Coefficient	15 PPM/ °C
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 150 mA
Input Resistance	1 M ohms (each channel; all channels share the same reference point)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	SNAP-AIV-32: UL, CE, RoHS, DFARS SNAP-AIV-32-FM: FM, CE, RoHS, DFARS
Warranty	Lifetime

Part Number	Description
SNAP-AIV-32 SNAP-AIV-32-FM	32-channel analog voltage input -10 to +10 VDC
SNAP-HD-CBF6	Wiring harness with flying leads for SNAP-AIV-32 modules
SNAP-HD-BF6	Wiring harness for SNAP-AIV-32 modules and SNAP-AIV-HDB breakout racks
SNAP-AIV-HDB SNAP-AIV-HDB-FM	Breakout racks for SNAP-AIV-32 and SNAP-AIV-32-FM

Description

The SNAP-AIV-32 and SNAP-AIV-32-FM modules can be configured for either -10 VDC to +10 VDC or -5 VDC to +5 VDC operation on each of its 32 channels. See the table on page 3 for I/O processor compatibility. The SNAP-AIV-32-FM is Factory Mutual approved.

Note that all channels share a common reference terminal. (For channel-to-channel isolated modules, see Opto22 form #1182.)

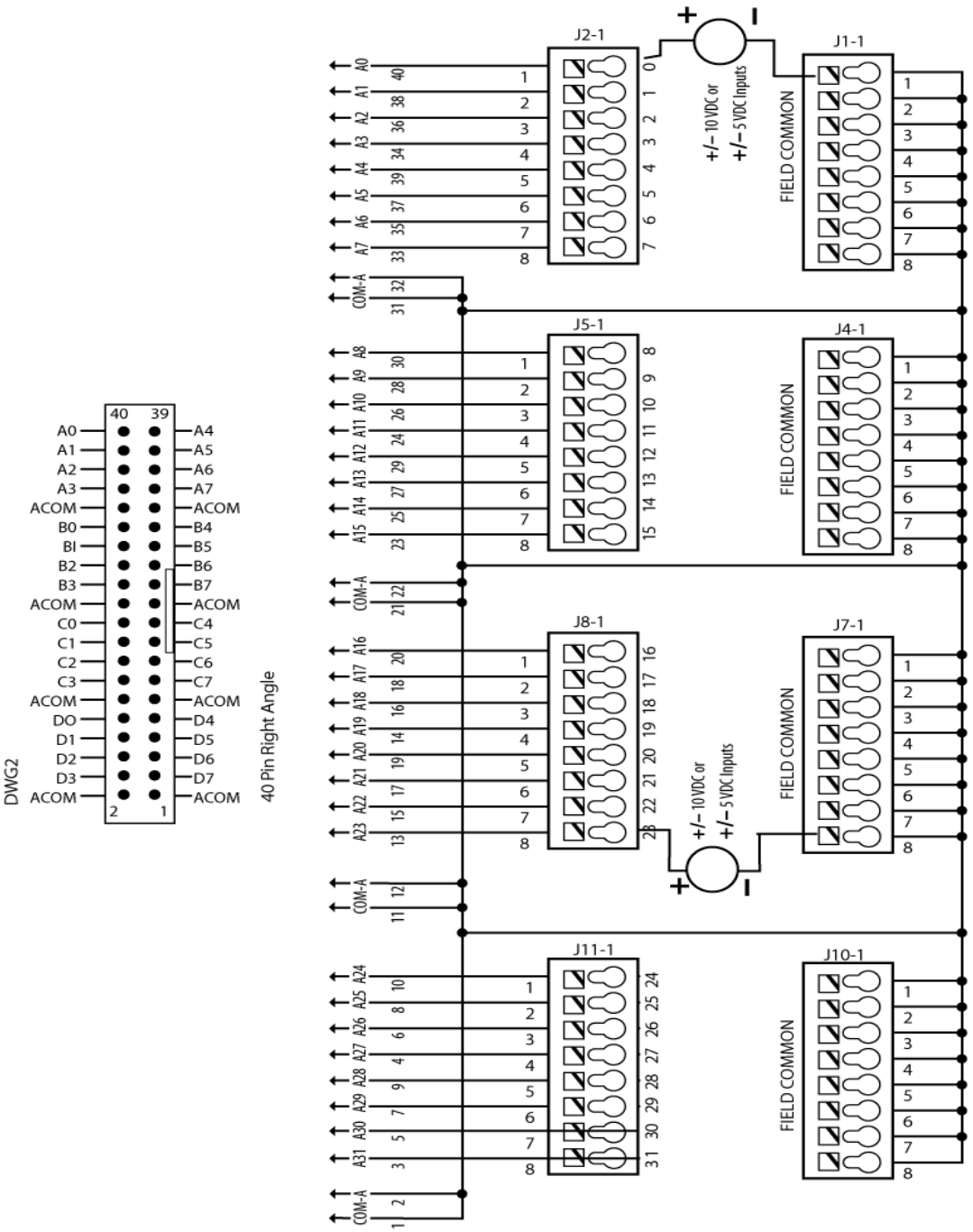
SNAP TEX cables and a breakout rack are available separately for wiring points to field devices (see form #1756, the *SNAP TEX Cables & Breakout Boards Data Sheet*). The SNAP-HD-BF6 wiring harness connects the module to the breakout rack, which can then be wired to field devices. The SNAP-HD-CFB6 wiring harness has flying leads to connect to field devices.

See the dimensional drawing for the module on page 43.

Voltage Input Module -10 VDC to +10 VDC or -5 VDC to +5 VDC (continued)

Wiring diagram: SNAP-AIV-HDB breakout rack to SNAP-AIV-32 or SNAP-AIV-32-FM module

NOTE: This diagram is also used to wire the SNAP-AIV-HDB breakout rack to a SNAP-AIMA-32 or SNAP-AIMA-32-FM module, when the module connects to self-powered (4-wire) device.



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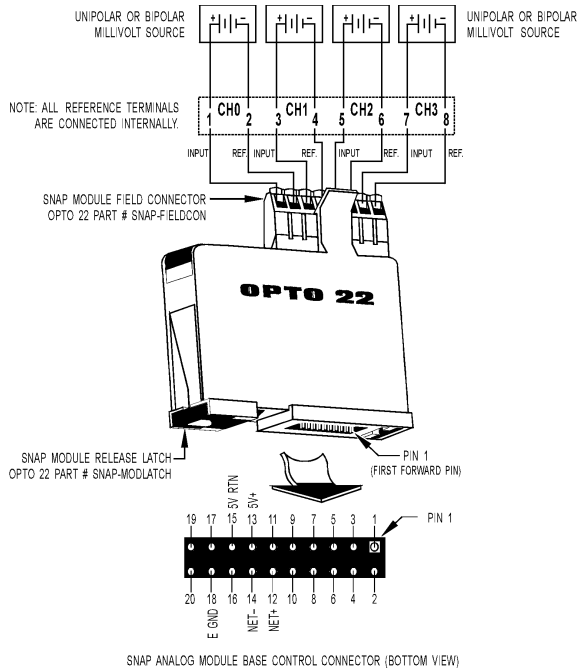
Millivolt Input Module

SNAP-AIMV2-4



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Part Number	Description
SNAP-AIMV2-4	Four-channel -50 to +50 mV input or -25 mV to +25 mV input

Specifications

Input Range	From -50 mV to +50 mV From -25 mV to +25m V
Over-Range Limits	From -55 to +55 mV (+/-50 mV range) From -27.5 to +27.5 mV (+/-25 mV range)
Resolution	2 microvolts (-50 mV to +50 mV) 1 microvolt (-25 mV to +25 m V)
Input Filtering	-3 dB @ 2.4Hz
Input Response Time (% of span/delta V/delta time)	63.2%/31.5 mV/66 ms
Data Freshness (Max)	335 ms (+/- 50 mV) 668 ms (+/- 25 mV)
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	±15 volts
Maximum Operating Common Mode Voltage	250 V
Accuracy at Full Scale	0.1% (50 microvolts) @ 50m V 0.2% (50 microvolts) @ 25 mV
Drift: Gain Temperature Coefficient	3 microvolts / °C
Drift: Offset Temperature Coefficient	2 microvolts / °C
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 170 mA
Input Resistance - Single Ended	100 Megohms (each channel)
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

Description

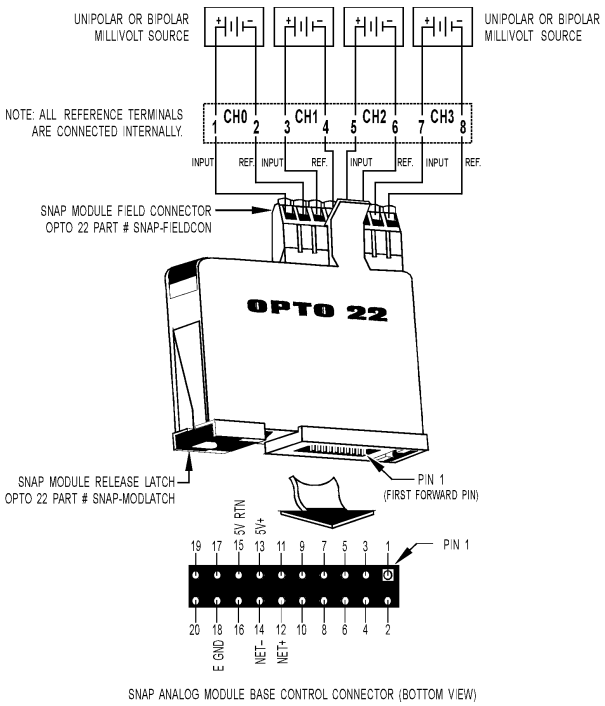
The SNAP-AIMV2-4 module provides four channels of analog to digital conversion. See the table on page 3 for I/O processor compatibility.

Each channel on the module can be configured for -50 mV DC to +50 mV DC or -25 mV DC to +25 mV DC.

Note that all inputs share the same reference terminal.

Millivolt Input Module

SNAP-AIMV-4



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIMV-4 module provides four channels of analog to digital conversion. See the table on page 3 for I/O processor compatibility.

Each channel on the module can be configured for -150 mV DC to +150 mV DC or -75 mV DC to +75 mV DC.

Note that all inputs share the same reference terminal.

Part Number	Description
SNAP-AIMV-4	Four-channel -150 to +150 mV or -75 to +75 mV input

Specifications

Input Range	From -150 mV to +150 mV From -75 mV to +75m V
Over-Range Limits	From -165 to +165 mV (+/-150 mV range) From -82.5 to +82.5 mV (+/-75 mV range)
Resolution	6 microvolts (-150 mV to +150 mV) 3 microvolts (-75 mV to +75 mV)
Input Filtering	-3 dB @ 7 Hz
Input Response Time (% of span/delta V/delta time)	63.2%/95 mV/23 ms
Data Freshness (Max)	335 ms (+/- 150 mV) 668 ms (+/- 75 mV)
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	±15 volts
Maximum Operating Common Mode Voltage	250 V
Accuracy at Full Scale	0.06% (90 microvolts) @ 150 mV 0.1% (75 microvolts) @ 75 mV
Drift: Gain Temperature Coefficient	3 microvolts / °C
Drift: Offset Temperature Coefficient	2 microvolts / °C
Isolation	1500 V
Power Requirements	5 VDC (±0.15) @ 170 mA
Input Resistance - Single Ended	100 Megohms (each channel)
Operating Temperature	-20 °C to 70 °C
Storage Temperature	-40 °C to 85 °C
Wire size	22 to 14 AWG
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

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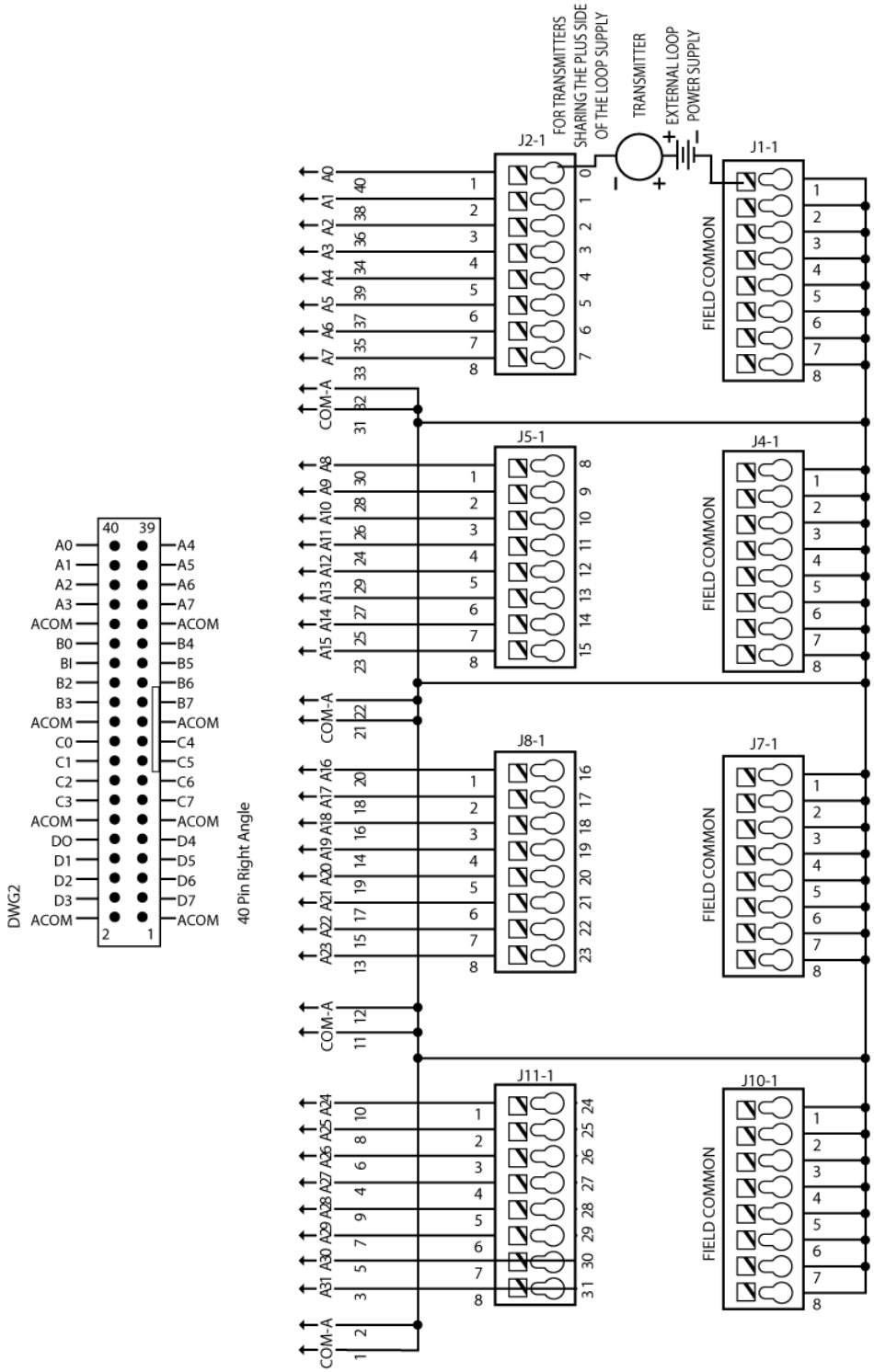
Alternate Wiring Diagram

SNAP-AIV-HDB breakout rack to SNAP-AIMA-32 or SNAP-AIMA-32-FM module when the module connects to devices that share a positive common connection



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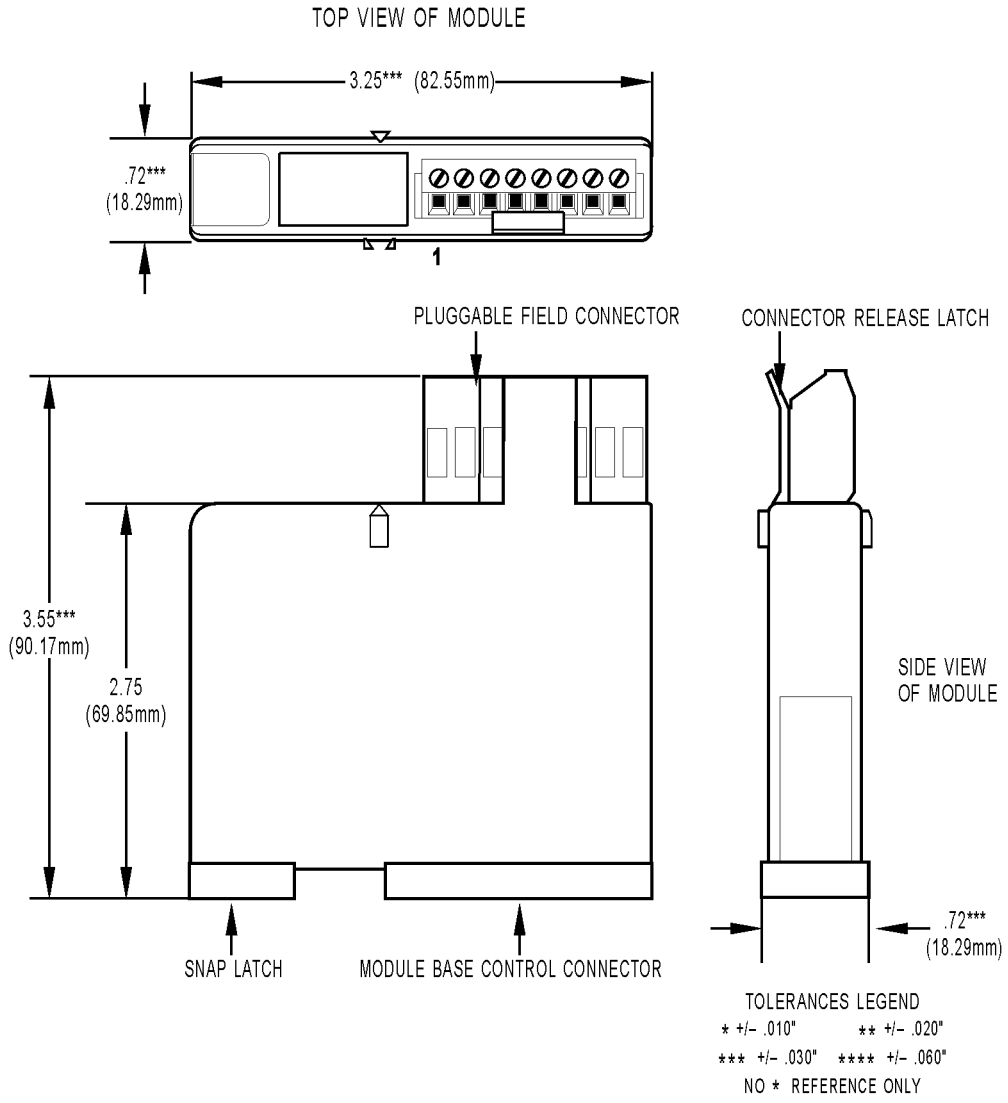
Dimensional Drawing

All Two- and Four-channel Modules, except SNAP-AITM-2



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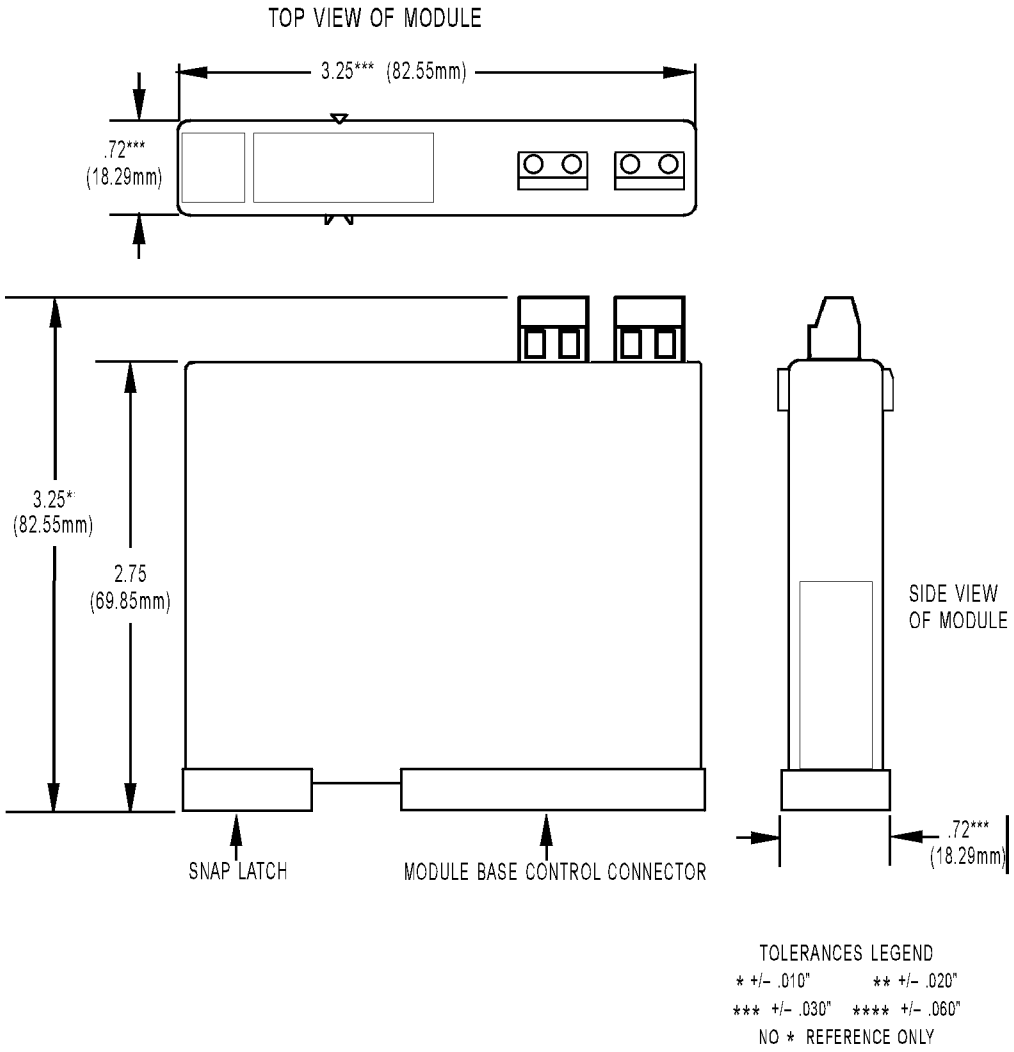
Dimensional Drawing

SNAP-AITM-2 Modules



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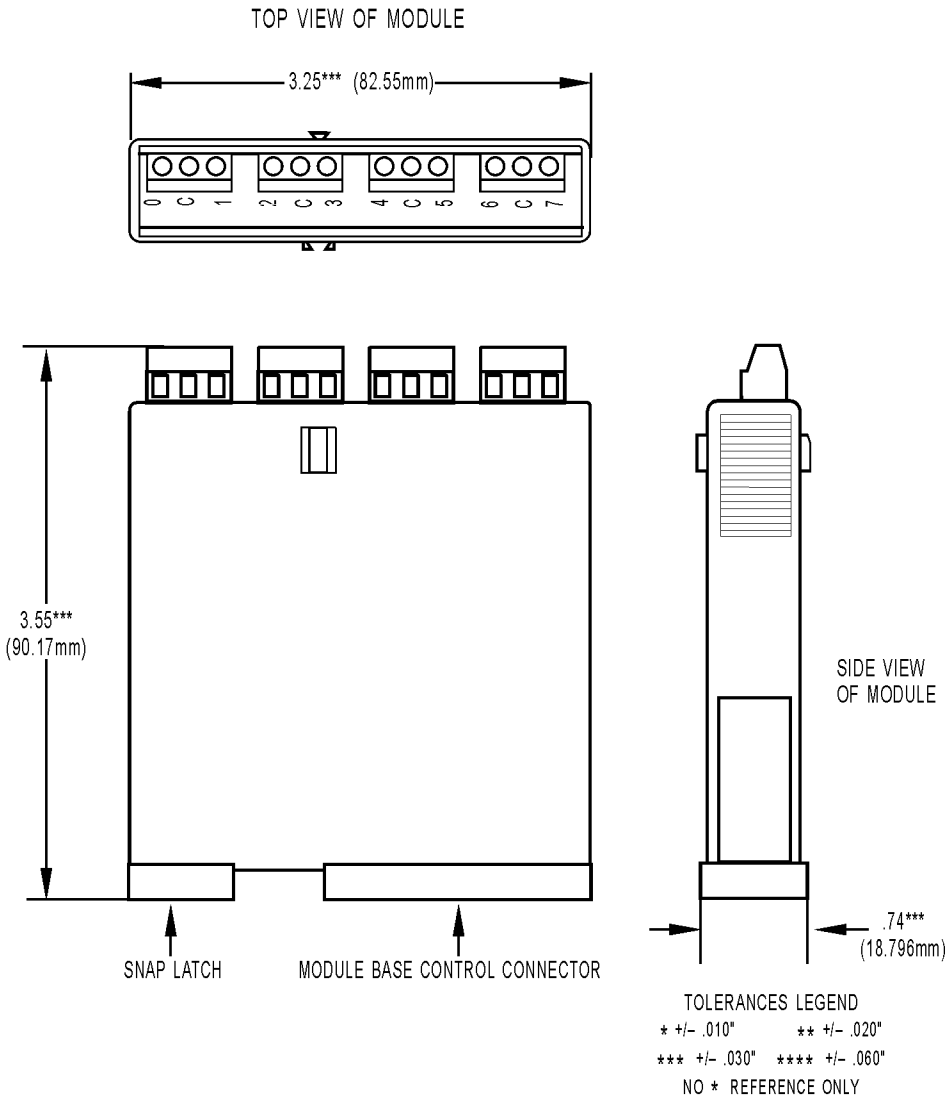
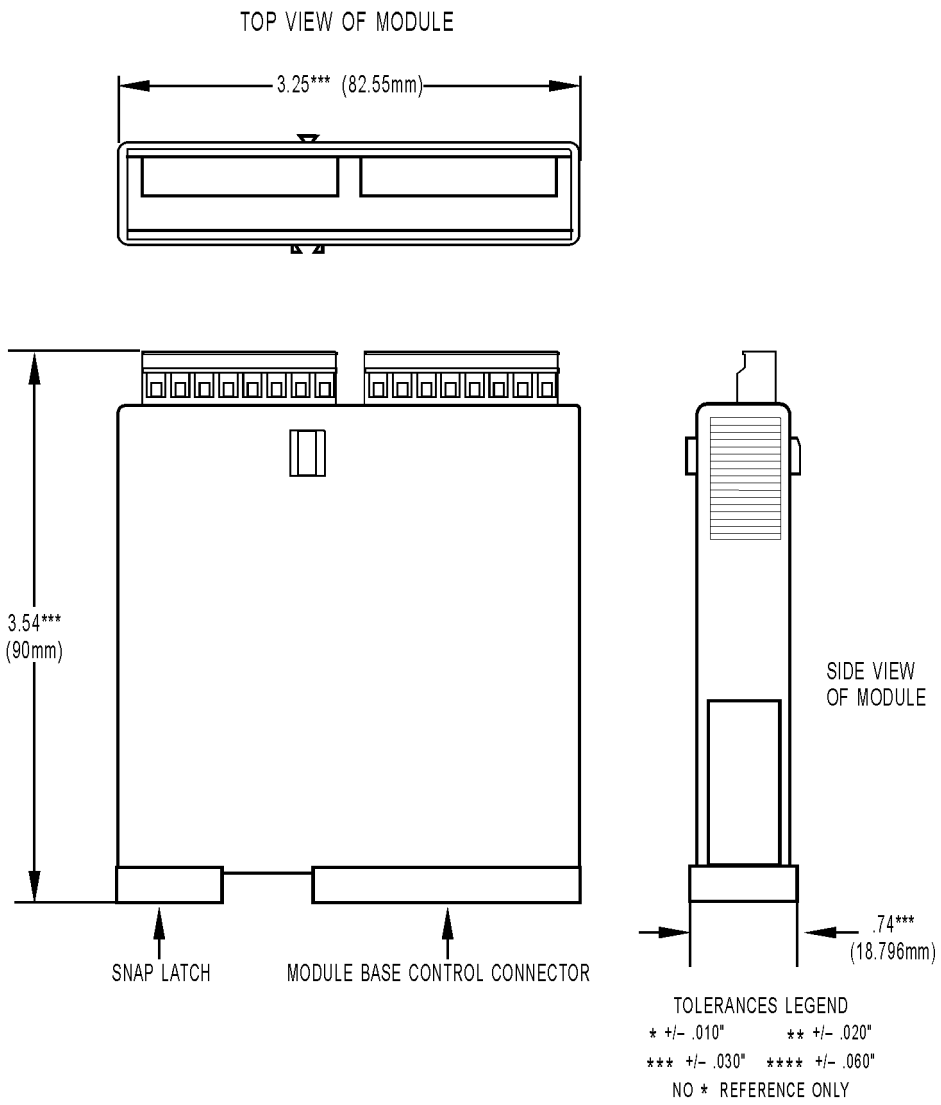
Dimensional Drawing

SNAP-AITM-8 and SNAP-AITM-8-FM Modules



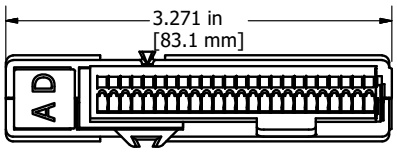
Dimensional Drawing

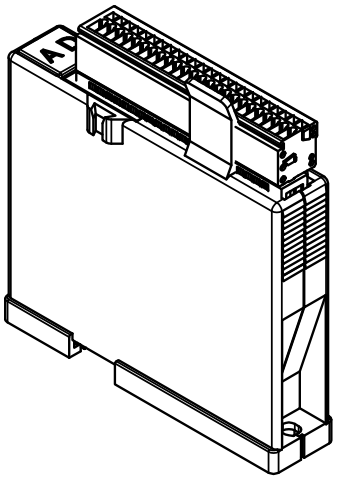
SNAP-AICTD-8, SNAP-AIMA-8, SNAP-AIV-8, and SNAP-AIR400K-8 Modules

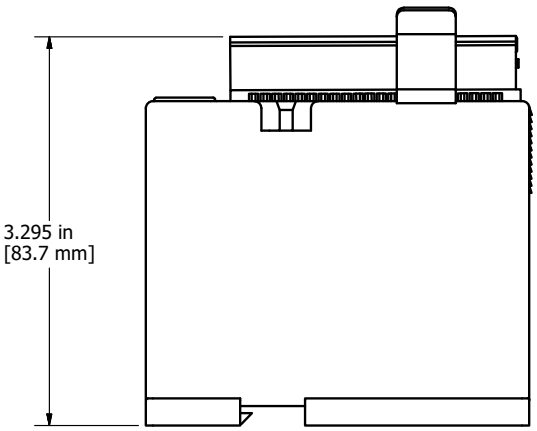


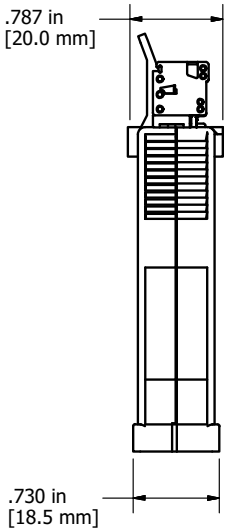
Dimensional Drawing

SNAP-AIRTD-8U









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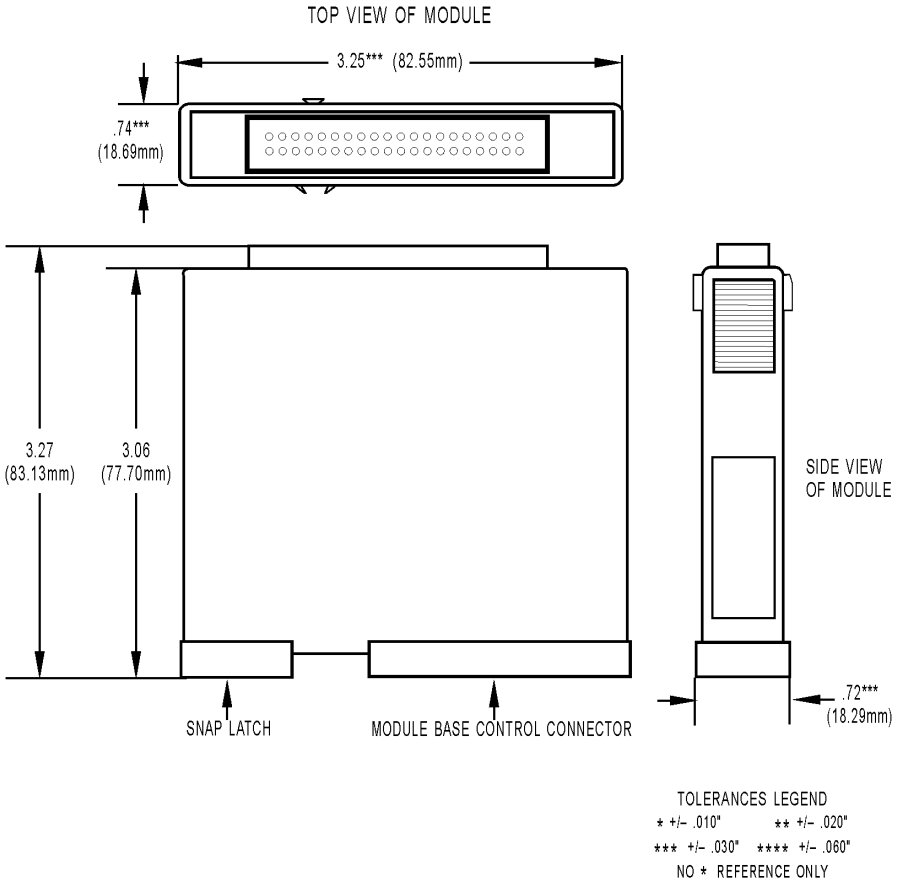
SNAP Analog Input Modules

Dimensional Drawing

All 32-Channel Modules



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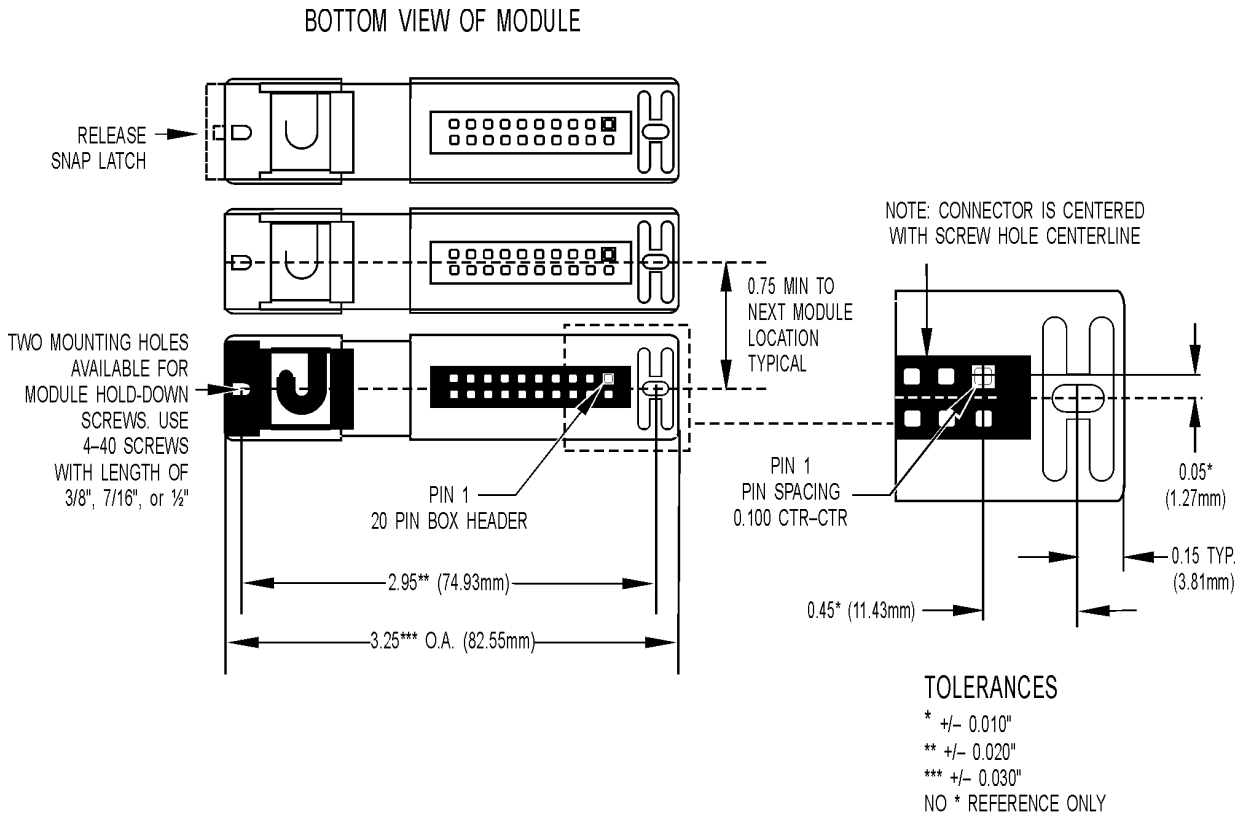
Dimensional Drawing

All Modules



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

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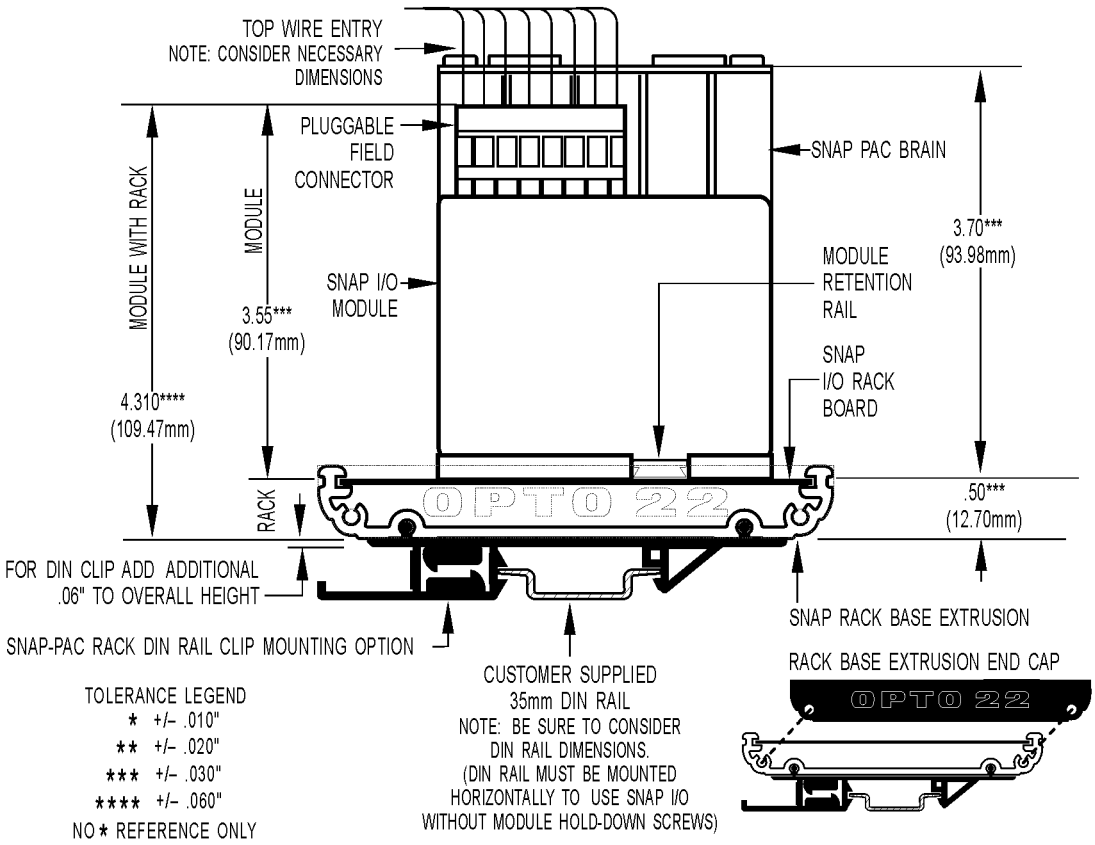
Dimensional Drawing

Height on Rack: All Two- and Four-channel Modules, except SNAP-AITM-2



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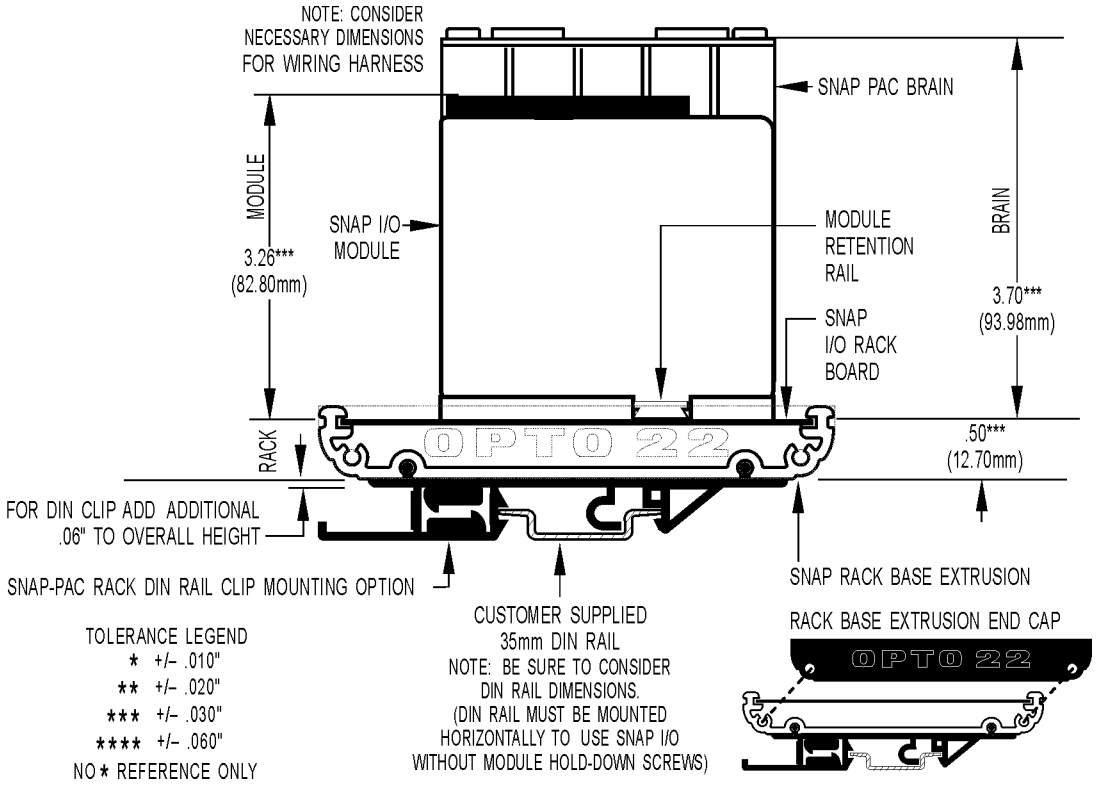
Dimensional Drawing

Height on Rack: 32-Channel Modules



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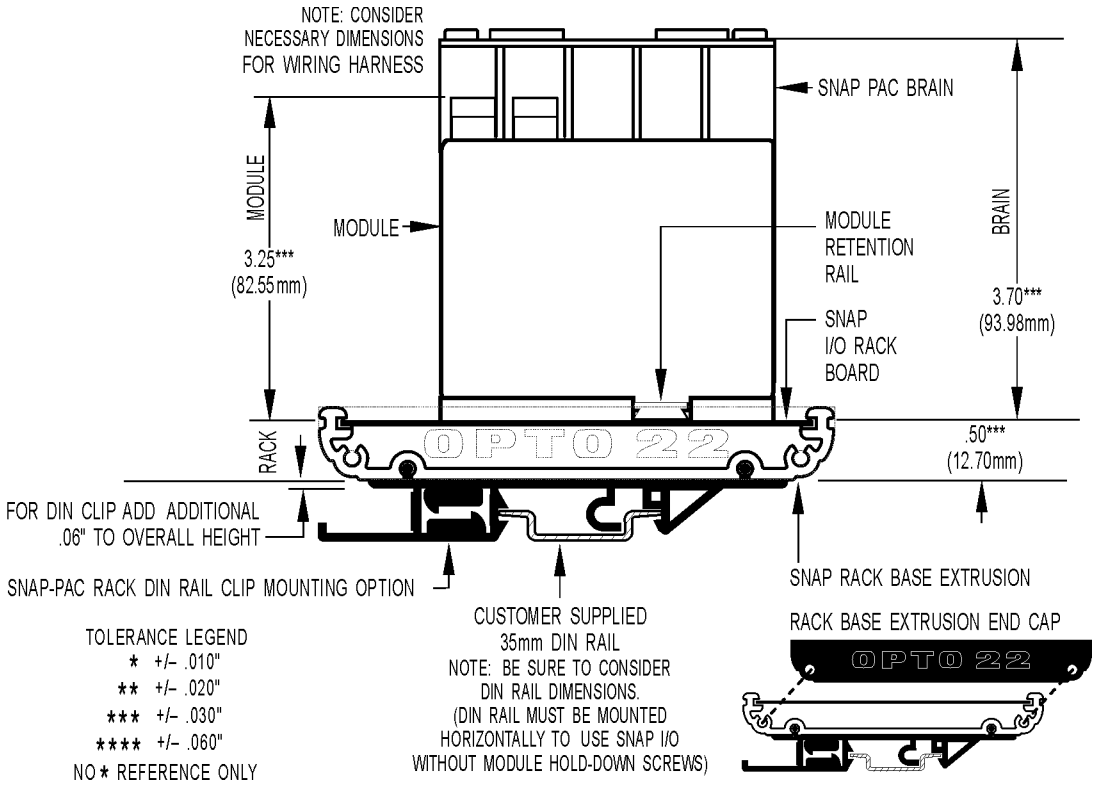
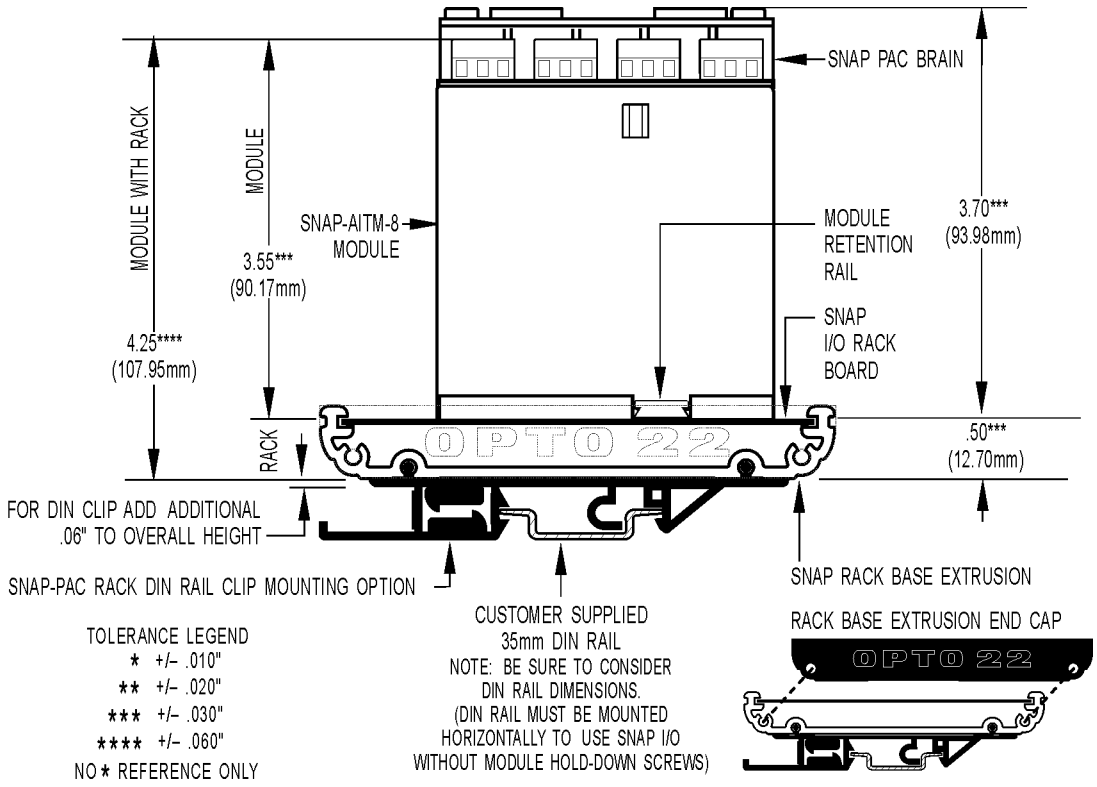
Dimensional Drawinge

Height on Rack: SNAP-AITM-2 Module



Dimensional Drawing

Height on Rack: SNAP-AITM-8 and SNAP-AITM-8-FM Modules



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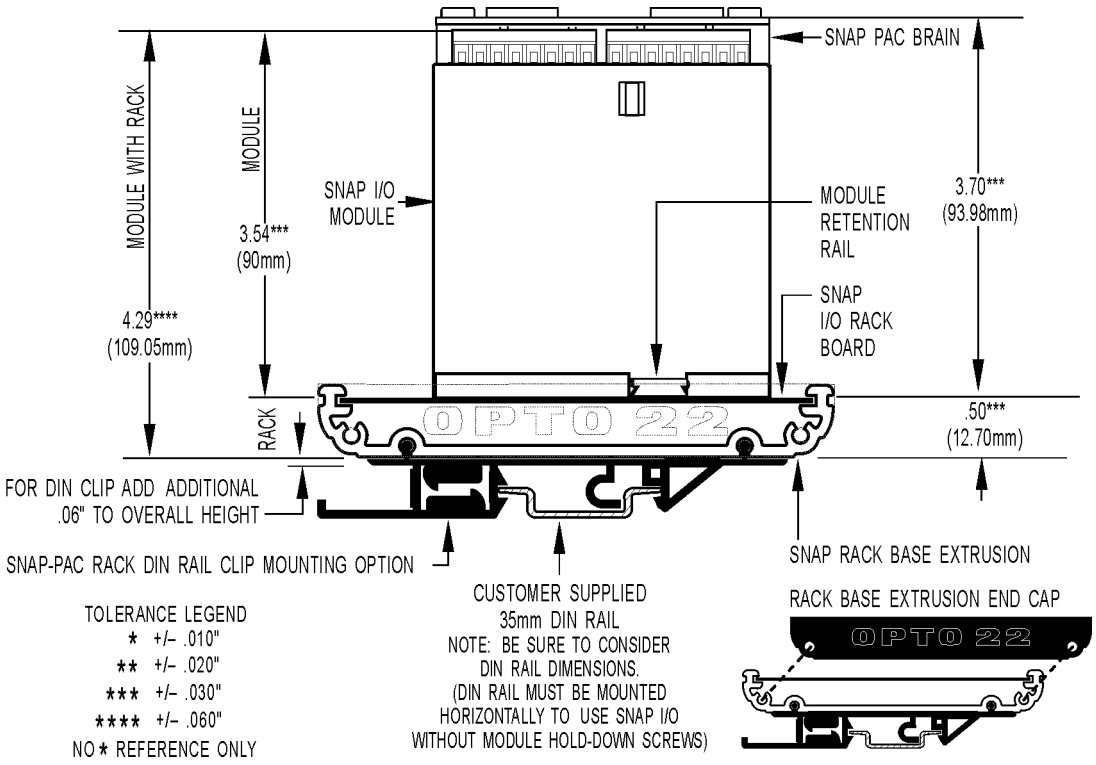
SNAP Analog Input Modules

Dimensional Drawing

Height on Rack: SNAP-AICTD-8, SNAP-AIMA-8, and SNAP-AIV-8



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SNAP Isolated Analog Input Modules

Features

- Channel-to-channel isolation
- Rugged packaging and convenient pluggable wiring. Accepts 22 to 14 AWG wire.
- Factory calibrated; no user adjustment necessary
- Out-of-range indication
- Operating temperature -20 °C to 70 °C

Description

SNAP I/O isolated analog input modules provide two or more channels isolated from each other, thereby eliminating problems caused by ground loop currents. These isolated analog modules are part of Opto 22's SNAP PAC System and mount on SNAP PAC racks with an I/O processor (brain or on-the-rack controller). SNAP isolated analog input modules are compatible with all SNAP PAC brains and rack-mounted controllers, including Wired+Wireless™.

Since many SNAP analog input modules are software-configurable and handle a wide variety of signal levels, a small number of modules can support a wide range of input requirements. Modules provide high resolution for precise signal levels, and all SNAP analog modules are factory calibrated. Part numbers ending in -FM are Factory Mutual approved. Dimensional drawings start on page 14.

SNAP analog input modules have an on-board microprocessor to provide module-level intelligence, making them an ideal choice for original equipment manufacturers (OEMs). For more information about standalone SNAP analog modules, see the *SNAP I/O Module Integration Guide* (form 876).

SNAP racks use a retention rail locking system that holds modules in place. In addition, Opto 22 recommends using two 4-40 by ½-inch standard machine screws to secure each module to the rack (recommended torque: 4 inch pounds [0.45 Newton meters]).

Notes for legacy hardware: Most isolated analog input modules can be used with SNAP Simple, SNAP Ethernet, SNAP Ultimate, and SNAP *mistic* brains such as the serial B3000, and with M-series or B-series mounting racks. For exceptions, see individual module descriptions.

Isolation

All SNAP analog input modules are isolated from all other modules and from the I/O processor. In addition, the modules in this data sheet have all channels isolated from each other.

SNAP Isolated Analog Input Modules

Channel-to-channel isolation gives you complete freedom from ground-loop problems even on grounded devices connected to channels on the same module.

Transformer isolation prevents ground loop currents from flowing between field devices and causing noise that produces erroneous readings. Ground loop currents are caused when two grounded field devices share a connection, and the ground potential at each device is different.

Isolation also provides protection for sensitive control electronics from industrial field signals.

Part Numbers

Part	Description	Pg
SNAP-AIARMS-i SNAP-AIARMS-i-FM*	Isolated two-channel 0 to 10 amp RMS AC/DC input	2
SNAP-AIVRMS-i SNAP-AIVRMS-i-FM*	Isolated two-channel 0 to 250 V RMS AC/DC input	3
SNAP-AIMA-i	Isolated two-channel analog current input -20 mA to +20 mA	4
SNAP-AIMA-iSRC SNAP-AIMA-iSRC-FM*	Isolated two-channel analog current input -20 mA to +20 mA, with loop sourcing	5
SNAP-AIMA2-i	Isolated two-channel analog current input -1 mA to +1 mA	6
SNAP-AIRATE-HFi	Isolated two-channel analog frequency input, 2 Hz to 500 kHz or 20 Hz to 500 kHz	7
SNAP-AITM-i	Isolated two-channel analog type E, J, or K thermocouple or ±150 mV or ±75 mV input	9
SNAP-AITM2-i	Isolated two-channel analog type B, C, D, G, N, T, R, or S thermocouple or ±50 mV or ±25 mV input	10
SNAP-AITM-4i	Isolated four-channel analog type B, C, D, E, G, J, K, N, R, S, or T thermocouple or ±150 mV, ±75 mV, ±50 mV, or ±25 mV input	11
SNAP-AIV-i	Isolated two-channel analog voltage input ±10 VDC or ±5 VDC	12
SNAP-AIV2-i	Isolated two-channel analog voltage input ±100 VDC or ±50 VDC	13

* Factory Mutual approved

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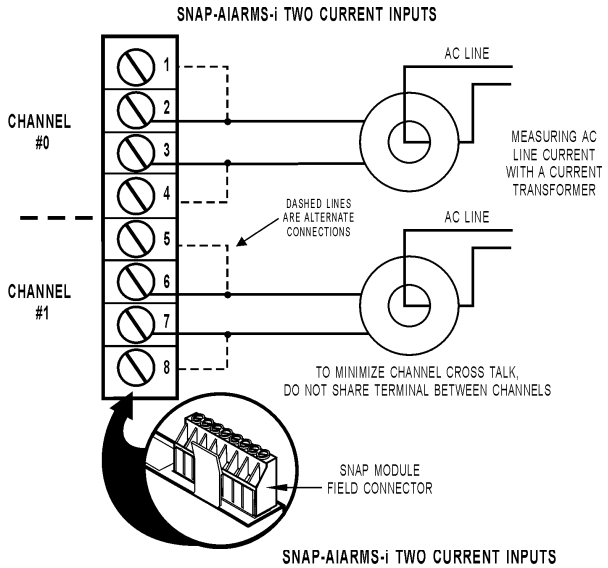
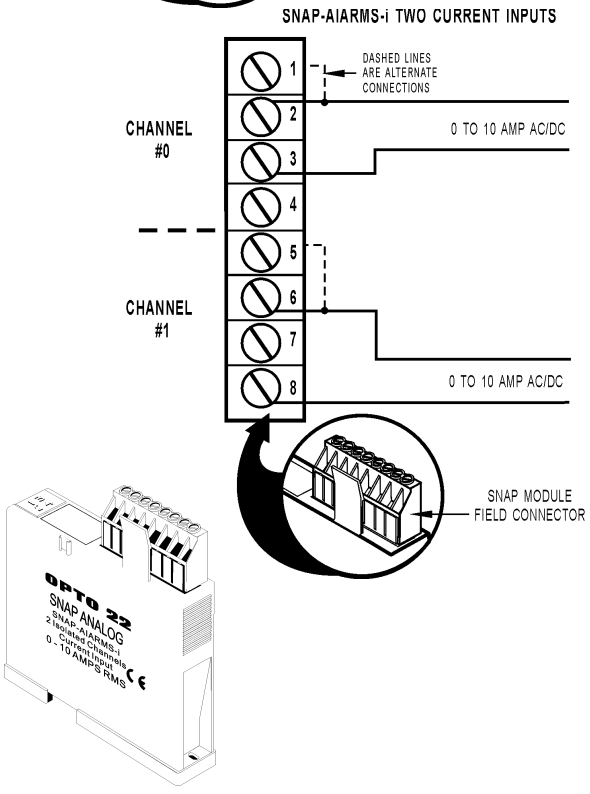
Isolated 0 to 10 Amp RMS AC/DC Input Module





IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Part Number	Description
SNAP-AIARMS-i SNAP-AIARMS-i-FM	Isolated two-channel 0 to 10 amp RMS AC/DC input

Description

The SNAP-AIARMS-i and SNAP-AIARMS-i-FM modules provide an input range of 0 to 10 amps RMS AC/DC. An ideal input is the 5-amp secondary of a standard current transformer used to monitor AC line current. These modules may also be used to monitor AC current to greater than a 100-amp range, using a current transformer of suitable ratio. The SNAP-AIARMS-i-FM module is Factory Mutual approved.

The two channels are isolated from each other; they do not share any field connection. These modules are ideal for differential current measurements.

Specifications

Input Range	0 to 10 amp RMS AC/DC
Input Over Range	To 11 amps
Input Resistance	0.005 ohms
Maximum Input	11 amps AC/DC
Accuracy (AC)	±8 mA and ±0.2% reading
Resolution	400 µA
DC Reversal	±16 mA (0.16%)
Input Response Time (Step Change)	63.2% (6.32 A) in 50 ms 99% (9.92 A) in 75 ms
Data Freshness (Max)	0.025 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB at 60 Hz
Maximum Operating Voltage Between Channels Common Mode Voltage	 250 V 250 V
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15 V) at 200 mA
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, RoHS, DFARS FM (SNAP-AIARMS-FM only)
Warranty	Lifetime

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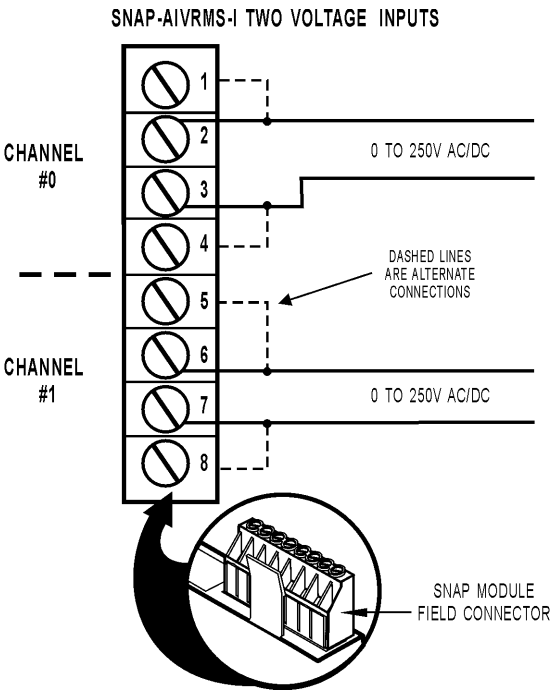
Isolated 0 to 250 Volt RMS AC/DC Input Module



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Part Number	Description
SNAP-AIVRMS-i SNAP-AIVRMS-i-FM	Isolated two-channel 0 to 250 V RMS AC/DC input

Description

The SNAP-AIVRMS-i and SNAP-AIVRMS-i -FM modules provide an input range of 0 to 250 volts AC or DC. These modules may be used to monitor 120/240-volt AC/DC and 12/24/48-volt AC/DC system voltage. The SNAP-AIVRMS-i-FM module is Factory Mutual approved.

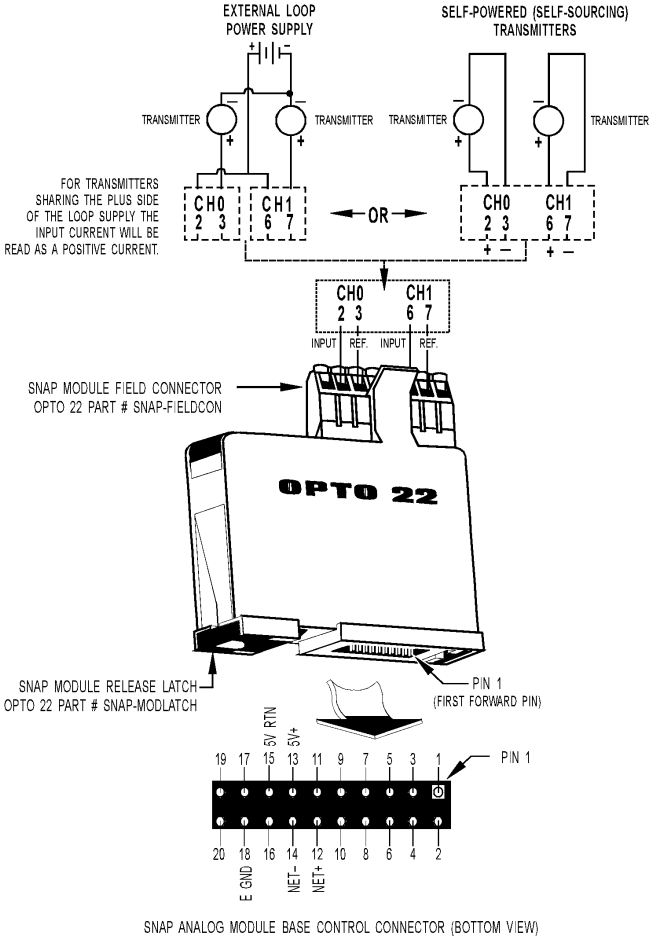
The two channels are isolated from each other; they do not share any field connection. These modules are ideal for differential voltage measurements.

Specifications

Input Range	0 to 250 V RMS AC/DC
Input Over Range	To 275 V
Input Resistance	1 megohms
Accuracy	±0.2 V and ±0.2% reading
Resolution	10 mV
DC Reversal	± 0.2 V (0.08%)
Input Response Time (Step Change)	63.2% (158 V) in 50 ms 99% (248 V) in 75 ms
Data Freshness	25 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Voltage Between Channels Common Mode Voltage	 250 V 250 V
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15 V) at 200 mA
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

Isolated Current Input Module -20 mA to +20 mA

Part Number	Description
SNAP-AIMA-i	Isolated two-channel analog current input -20 mA to +20 mA



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIMA-i module provides an input range of -20mA to +20mA. The SNAP-AIMA-i has two channels that are isolated from each other. This module DOES NOT supply loop excitation current. See page 5 for a loop sourcing model.

Specifications

Input Range	-20 mA to +20 mA
Maximum Over Range	± 10% (= ± 27500 counts)
Resolution	0.8 µA
Input Response Time (% of span/delta I/delta time)	99.9 %/19.9 µA/10 mS
Data Freshness	11 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	36 mA or 9 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05% (10 µA)
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
DRIFT: Gain Temperature Coefficient	30 PPM/ °C
DRIFT: Offset Temperature Coefficient	15 PPM/ °C
Power Requirements	5 VDC (±0.15) @ 200 mA
Input Resistance - Single Ended	200 ohms (each channel)
Ambient Temperature: Operating Storage	-20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, FM, RoHS, DFARS
Warranty	Lifetime

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Isolated Current Input Module -20mA to +20mA with Loop Sourcing

Specifications

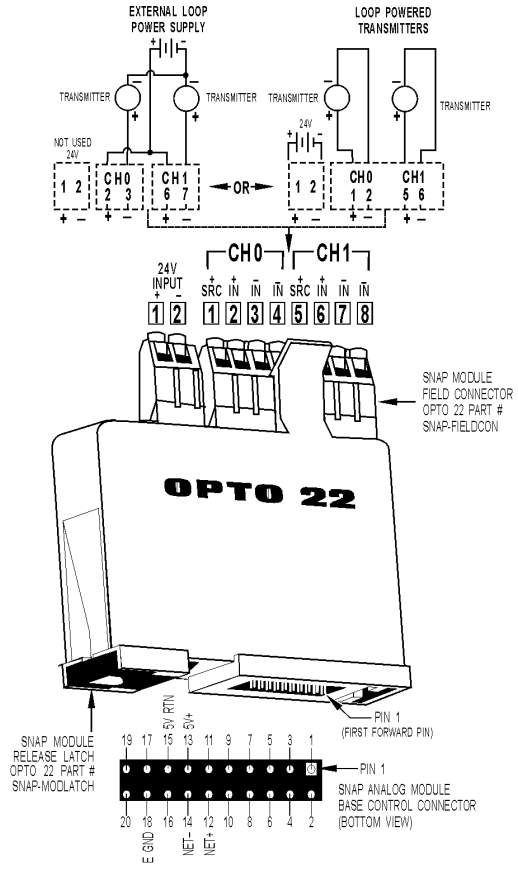
Input Range	0 to +20 mA with loop sourcing -20 mA to +20 mA
Maximum Over Range	± 10% (= ± 27500 counts)
Resolution	0.8 µA
Input Response Time (% of span/delta I/delta time)	99.9 %/19.9 mA/10 ms
Data Freshness	11 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	36 mA or 9 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05% (10 µA)
DRIFT: Gain Temperature Coefficient	30 PPM/ °C
DRIFT: Offset Temperature Coefficient	15 PPM/ °C
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15) @ 200 mA
Power Requirements - Loop Power (Input)	From separate field connector: 24 VDC nominal (70 mA max @ 24 V input, both loops @ 20 mA), 30 VDC maximum
Loop Power (Output)	24 VDC (± 1.5 V) @ 20 mA Open loop: 30 V maximum Shorted loop: 24 mA nominal
LED on top of module	Indicates that there is power to the 24v source supply 2-pin connector
Input Resistance	200 ohms (each channel)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, RoHS, DFARS FM (SNAP-AIMA-iSRC-FM only)
Warranty	Lifetime

Part Number	Description
SNAP-AIMA-iSRC SNAP-AIMA-iSRC-FM	Isolated two-channel analog current input -20 mA to +20 mA, with loop sourcing

Description

The SNAP-AIMA-iSRC and SNAP-AIMA-iSRC-FM are similar to the SNAP-AIMA-i module but include built-in loop sourcing capability. With the connection of a single 24 V power supply, these modules source 24 V for two 4–20 mA loops. The two channels and their loop sources are isolated from each other; they do not share any field connection. The isolation allows you to independently wire one channel to a loop with an external power supply and the other channel to a loop powered through the module. In addition, each loop sourced through the module is current limited so that an external fault on one loop will not affect the other.

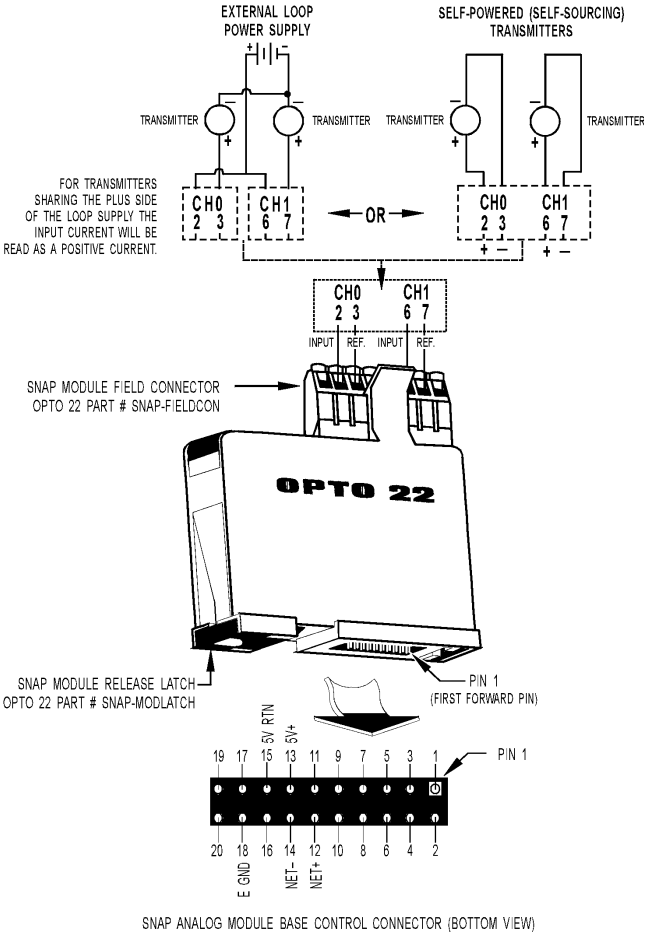
The SNAP-AIMA-iSRC-FM is Factory Mutual approved.



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Isolated Current Input Module -1 mA to +1 mA

Part Number	Description
SNAP-AIMA2-i	Isolated two-channel analog current input -1 mA to +1 mA



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIMA2-i module provides an input range of -1 mA to +1 mA. The SNAP-AIMA2-i has two channels that are isolated from each other. This module DOES NOT supply loop excitation current.

Specifications

Input Range	-1 mA to +1mA
Maximum Over Range	± 10% (= ± 27500 counts)
Resolution	0.04 µA
Input Response Time (% of span/delta I/delta time)	99.9 %/19.9 µA/10 ms
Data Freshness	11 ms
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	11 mA or 28 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05% (0.05 µA)
DRIFT: Gain Temperature Coefficient	30 PPM/ °C
DRIFT: Offset Temperature Coefficient	15 PPM/ °C
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15) @ 200 mA
Input Resistance	5 K ohms (each channel)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

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Isolated Frequency Input Module

Part Number	Description
SNAP-AIRATE-HFi	Isolated two-channel analog frequency input, 2 Hz–500 kHz or 20 Hz–500 kHz

Description

The SNAP-AIRATE-HFi module provides frequency to digital conversion. Each channel can be configured for a 0.1-second measurement interval, providing an input range of 20 Hz to 500 kHz, or a 1-second measurement interval, providing an input range of 2 Hz to 500 kHz. Data freshness is dependent upon and directly related to the measurement interval.

Nine volts through a 3.6 kOhm pull-up resistor is provided internally for each channel for use with devices that have open-collector outputs. This feature eliminates the need for you to provide the pull-up voltage supply and associated wiring, barrier strips, and so on. The module works with TTL, CMOS, and open-collector outputs.

The two channels on the module are isolated from each other. Since these channels do not share any common connections, grounded sensors and field devices may be used with them.

This module requires a SNAP PAC controller or brain with SNAP PAC firmware version 9.3e or higher. It cannot be used with legacy controllers or brains.

See wiring diagrams on the following page.

Specifications

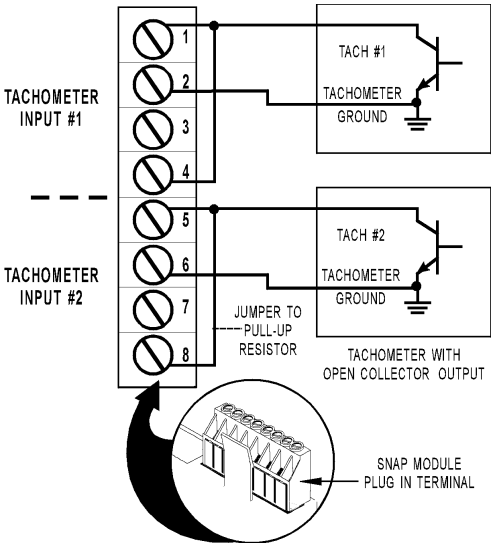
Input Range	2 Hz - 500 kHz at 1.0 s Data Freshness 20 Hz - 500 kHz at 0.1 s Data Freshness
Input Voltage Range Sine wave >= 2000 Hz Sine wave at 200 Hz Sine wave at 20 Hz Sine wave at 2 Hz Square wave Maximum survivable	 3.0 V to 48 V_{p-p} 4.0 V to 48 V_{p-p} 5.0 V to 48 V_{p-p} 17 V to 48 V_{p-p} 3.0 V to 48 V_{p-p} 110 V_{p-p}
Input Impedance	55 kOhms
Input Coupling	Single-ended AC
Pull-up Voltage	6 to 9 VDC
Pull-up Resistor	3.6 kOhm
Minimum Pulse Width	1 microsecond
Data Freshness*	100 ms at 20 Hz - 500 kHz 1.0 s at 2 Hz to 500 kHz
Resolution (Hz)	*f* / (48,000,000 * Data Freshness), where *f* is the current frequency measurement
Accuracy (at 1.0 s Data Freshness)	+- 0.005% of input for input greater than 500 Hz +- 0.005% of input plus an additional +- 0.006 Hz for input less than 500 Hz
Maximum Operating Common Mode Voltage	250 V Continuous 1500 V Transient
DC Common Mode Rejection	> -120 dB
AC Common Mode Rejection	> -120 dB at 60 Hz
Isolation: Channel to Channel	250 V Continuous 1500 V Transient
Power Consumption	1.05 W (210 mA @ 5 V)
Ambient Temperature Operating Storage	 -20 to 70 °C -40 to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

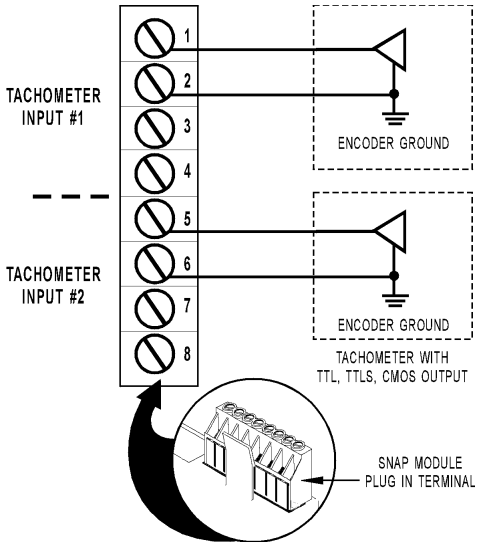
* User selectable. Default is 0.1 seconds.

Isolated Frequency Input Module (cont'd)

SNAP-AIRATE-HFi Wiring Diagrams

The two channels on the module are isolated from each other. Since these channels do not share any common connections, grounded sensors and field devices may be used with them.





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Isolated Thermocouple/ Millivolt Input Module

Part Number	Description
SNAP-AITM-i	Isolated two-channel analog type E, J, or K thermocouple or -150 mV to +150 mV input or -75 mV to +75 mV input

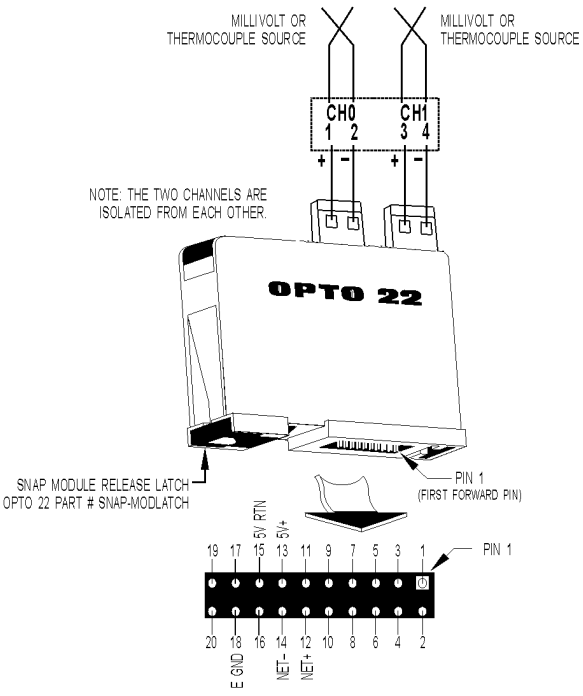
Specifications

Input Range	From -150 mV to +150 mV From -75 mV to +75 mV
Maximum Over Range	± 10% (= ± 27500 counts)
Resolution	6 µV from -150 mV to +150 mV 3 µV from -75 mV to +75 mV
Cold Junction Temperature Compensation	Automatic when used with SNAP brains
Input Filtering	-3 dB @ 7 Hz
Input Response Time (% of span/delta V/delta time)	63.2%/95 mV/23 mS
Data Freshness	65 ms for +/- 150 mV 130 ms for +/- 75 mV 130 ms for E-, J-, and K-type thermocouples
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	±15 volts
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.06% (90 µV) @ 150 mV (full scale) 0.1% (75 µV) @ 75 mV (full scale)
Drift: Gain Temperature Coefficient	5 µV / °C
Drift: Offset Temperature Coefficient	2 µV / °C
Thermocouple Accuracy [°C] From factory After user gain and offset commands	± 2.0 (E, J, and K) ± 0.8
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15) @ 200 mA
Input Resistance	100 megohms (each channel)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	3 in-lb (0.34 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, FM, RoHS, DFARS
Warranty	Lifetime

Description

The SNAP-AITM-i module provides two channels of analog to digital conversion. Each channel on the module can be configured for -150 mV DC to +150 mV DC or -75 mV DC to +75 mV DC, or for type E, J, or K thermocouple operation. The two channels are isolated from each other. Since these channels do not share any common connections, grounded sensors and field devices may be used with them.

Type	-	+	Range
E	Red	Purple	-270 °C to +1,000 °C
J	Red	White	-210 °C to +1,200 °C
K	Red	Yellow	-270 °C to +1,372 °C

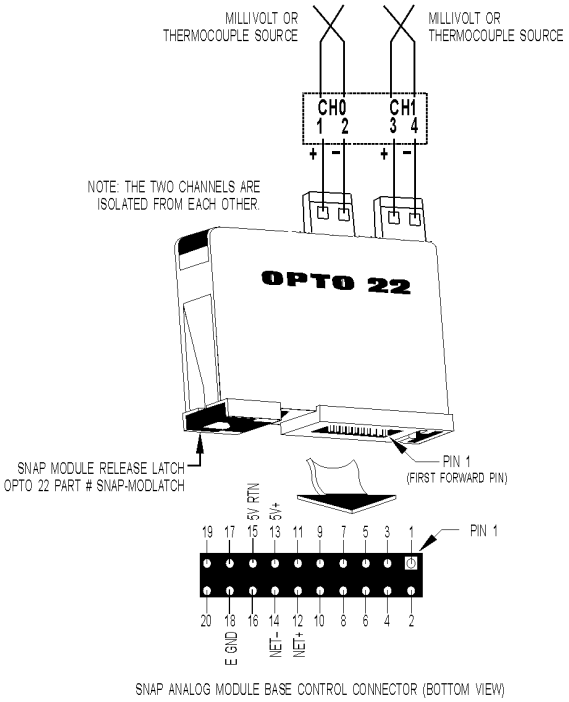


SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Isolated Thermocouple/ Millivolt Input Module

Type	-	+	Range
B	RED	GRAY	+42 °C to +1,820 °C
C, D, G	RED	WHITE	0 °C to +2,320 °C
N	RED	ORANGE	-270 °C to +1,300 °C
R, S	RED	BLACK	-50 °C to +1,768 °C
T	RED	BLUE	-270 °C to +400 °C



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AITM2-i module provides an input range of ±50 mV, ±25 mV, or Type B, C, D, G, N, T, R, or S thermocouple.

The two channels on the module are isolated from each other. Since these channels do not share any common connections, grounded sensors and field devices may be used with them.

Part Number	Description
SNAP-AITM2-i	Isolated two-channel analog type B, C, D, G, N, T, R, or S thermocouple or -50 mV to +50 mVDC input or -25 mV to +25 mVDC input

Specifications

Input Range	From -50 mV to +50 mVDC From -25 mV to +25 mVDC
Maximum Over Range	± 10% (= ± 27500 counts)
Resolution	2 µV from -50 mV to +50 mV 1 µV from -25 mV to +25 mV
Cold Junction Temperature Compensation	Automatic when used with SNAP brains
Input Filtering	-3 dB @ 2.4 Hz
Input Response Time (% of span/delta V/delta time)	63.2%/31.5 mV/66 ms
Data Freshness	65 ms for +/- 50 mV 130 ms for +/- 25 mV 130 ms for B-, R-, S-, and T-type thermocouples 65 ms for C-, D-, G-, and N-type thermocouples
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	±15 volts
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.1% (50 µV) @ 50 mV (full scale) 0.2% (50 µV) @ 25 mV (full scale)
Drift: Gain Temperature Coefficient	5 µV / °C
Drift: Offset Temperature Coefficient	2 µV / °C
Thermocouple Accuracy [°C] From factory After user gain and offset commands	B, R, S C, D, G T, N ±5 ±4 ±3 ±3 ±2 ±2
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15) @ 200 mA
Input Resistance	100 megohms (each channel)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	3 in-lb (0.34 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, FM, RoHS, DFARS
Warranty	Lifetime

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Isolated Thermocouple/ Millivolt Input Module

Part Number	Description
SNAP-AITM-4i	Isolated four-channel analog type B, C, D, E, G, J, K, N, R, S, or T thermocouple or ±150 mV, ±75 mV, ±50 mV, or ±25 mV input

Specifications

Input Range	From -150 mV to +150 mVDC From -75 mV to +75 mVDC From -50 mV to +50 mVDC From -25 mV to +25 mVDC			
Maximum Over Range	± 10% (= ± 27500 counts)			
Resolution	6 µV from -150 mV to +150 mV 3 µV from -75 mV to +75 mV 2 µV from -50 mV to +50 mV 1 µV from -25 mV to +25 mV			
Cold Junction Temperature Compensation	Automatic when used with SNAP PAC brains			
Input Filtering	-3 dB @ 5 Hz			
Data Freshness	mV input: 75 ms Thermocouple input: 140 ms			
DC Common Mode Rejection	>-120 dB			
AC Common Mode Rejection	>-120 dB @ 60 Hz			
Maximum Survivable Input	±15 volts			
Maximum Operating Common Mode Voltage	250 V			
Accuracy	0.06% (90 µV) @ 150 mV (full scale) 0.1% (75 µV) @ 75 mV (full scale) 0.1% (50 µV) @ 50 mV (full scale) 0.2% (50 µV) @ 25 mV (full scale)			
Drift: Gain Temperature Coefficient	5 µV / °C			
Drift: Offset Temperature Coefficient	2 µV / °C			
Thermocouple Accuracy [°C]	B,R,S	C,D,G	E,J,K	N,T
From factory	±5.0	±4.0	± 2.0	±3.0
After user gain and offset commands	±3.0	±2.0	± 0.8	±2.0
Isolation: Transformer	1500 V			
Isolation: Channel to Channel	250 V continuous (1500 V transient)			
Power Requirements	5 VDC (±0.15) @ 150 mA			
Input Resistance	100 megohms (each channel)			
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C			
Torque, connector screws	3 in-lb (0.34 N-m)			
Wire size range	22 to 14 AWG			
Agency Approvals	CE, RoHS, DFARS			
Warranty	Lifetime			

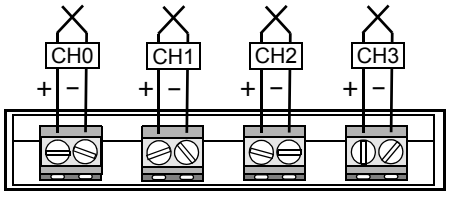
Description

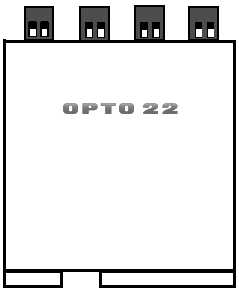
The SNAP-AITM-4i module provides an input range of ±150 mV, ±75 mV, ±50 mV, ±25 mV, or Type B, C, D, E, G, J, K, N, R, S, or T thermocouple.

The four channels on the module are isolated from each other. Since these channels do not share any common connections, grounded sensors and field devices may be used with them.

SNAP-AITM-4i requires a SNAP PAC rack, a SNAP PAC brain or R-series controller with firmware 9.1 or newer, and PAC Project 9.1 or newer.

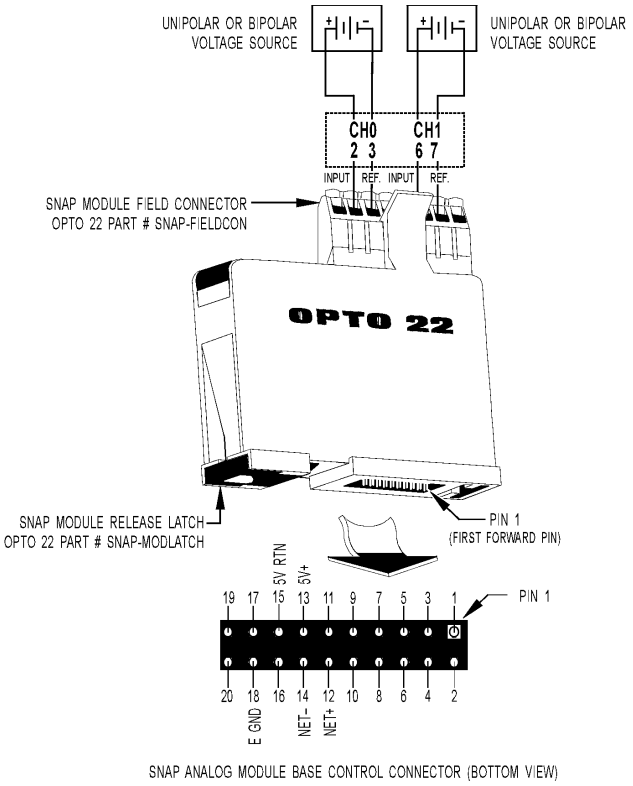
Type	-	+	Range
B	Red	Gray	+42 °C to +1,820 °C
C, D, G	Red	White	0 °C to +2,320 °C
E	Red	Purple	-270 °C to +1,000 °C
J	Red	White	-210 °C to +1,200 °C
K	Red	Yellow	-270 °C to +1,372 °C
N	Red	Orange	-270 °C to +1,300 °C
R, S	Red	Black	-50 °C to +1,768 °C
T	Red	Blue	-270 °C to +400 °C





Isolated Voltage Input Module -10 VDC to +10 VDC or -5 VDC to +5 VDC

Part Number	Description
SNAP-AIV-i	Isolated two-channel analog voltage input -10 VDC to +10 VDC or -5 VDC to +5 VDC



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AIV-i module can be configured for either -10 VDC to +10 VDC or -5 VDC to +5 VDC operation on each channel. The SNAP-AIV-i provides two channels that are isolated from each other. Since these channels do not share any common connections, grounded sensors and field devices may be used with them.

Specifications

Input Range	From -10 volts to +10 volts From -5 volts to +5 volts
Maximum Over Range	± 10% (= ± 27500 counts)
Resolution	0.4 mV when configured -10 volts to +10 volts 0.2 mV when configured -5 volts to +5 volts
Input Filtering	-3 dB @ 64 Hz
Input Response Time (% of span/ DV / Dt)	63.2% / 6.7 V / 10 mS
Data Freshness	11 ms for +/- 10 V 18 ms for +/- 5 V
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	220 VAC or 300 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05%, 5 mV @ 10 VDC 2.5 mV @ 5 VDC
Gain Temperature Coefficient	30 PPM/ °C
Offset Temperature Coefficient	15 PPM/ °C
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15) @ 200 mA
Input Resistance	1 megohms (each channel)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, FM, RoHS, DFARS
Warranty	Lifetime

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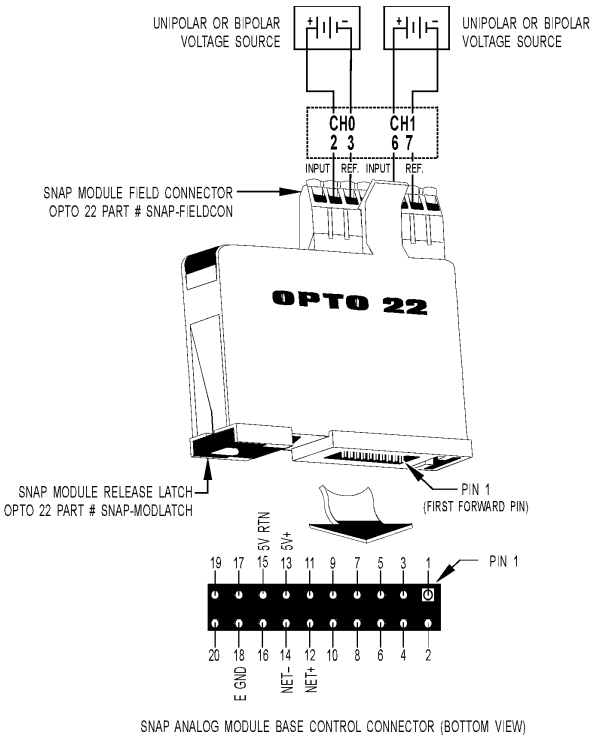
Isolated Voltage Input Module -100 VDC to +100 VDC or -50 VDC to +50 VDC

Part Number	Description
SNAP-AIV2-i	Isolated two-channel analog voltage input -100 VDC to +100 VDC or -50 VDC to +50 VDC



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

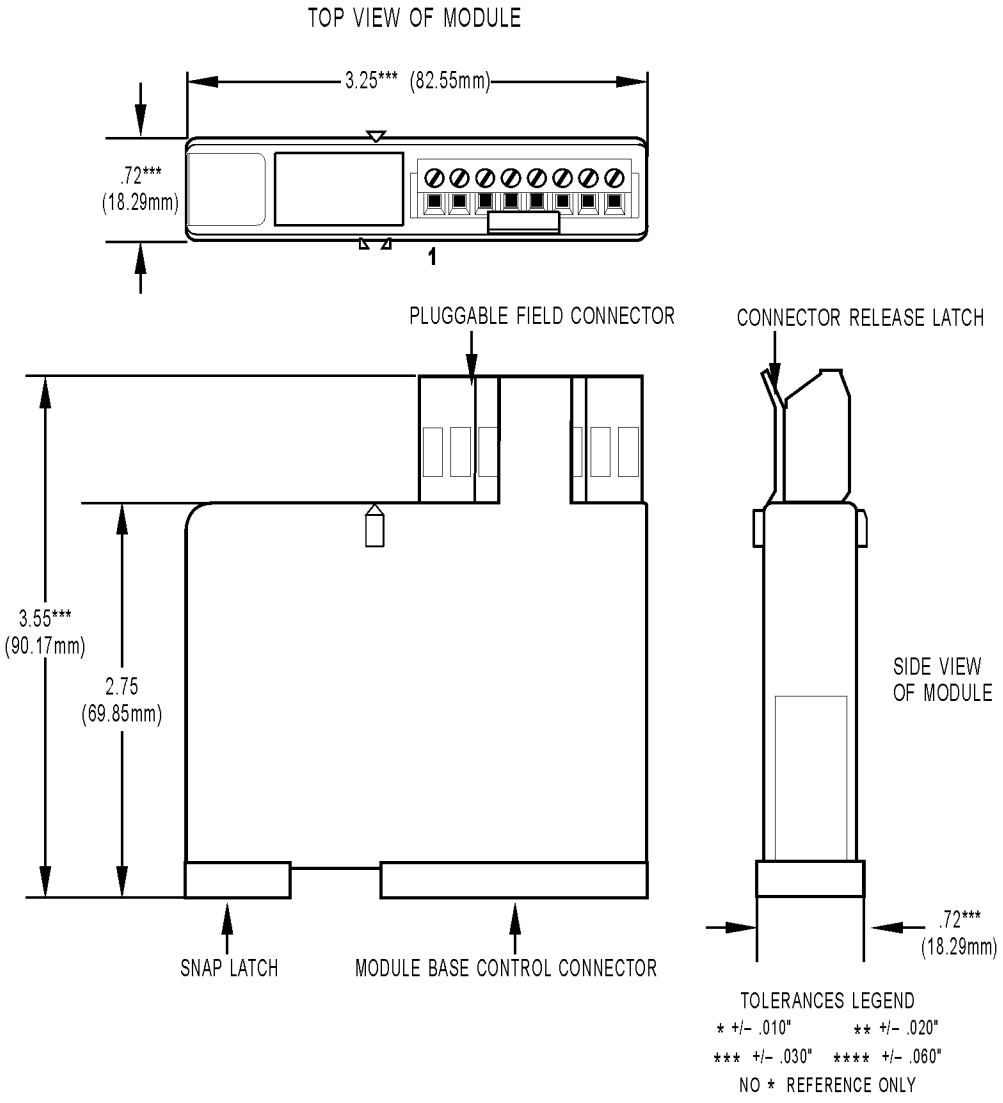
The SNAP-AIV2-i module can be configured for either -100 VDC to +100 VDC or -50 VDC to +50 VDC operation on each channel. The SNAP-AIV2-i provides two channels that are isolated from each other. Since these channels do not share any common connections, grounded sensors and field devices may be used with them.

Specifications

Input Range	From -100 volts to +100 volts From -50 volts to +50 volts
Maximum Over Range	± 10% (= ± 27500 counts)
Resolution	4.0 mV when configured -100 volts to +100 volts 2.0 mV when configured -50 volts to +50 volts
Input Filtering	-3 dB @ 64 Hz
Input Response Time (% of span/ DV / Dt)	63.2% / 6.7 V / 10 mS
Data Freshness	11 ms for +/- 100 V 18 ms for +/- 50 V
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	220 VAC or 300 VDC
Maximum Operating Common Mode Voltage	250 V
Accuracy	0.05%, 50 mV @ 100 VDC 25 mV @ 50 VDC
Gain Temperature Coefficient	30 PPM/ °C
Offset Temperature Coefficient	15 PPM/ °C
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 VDC (±0.15) @ 200 mA
Input Resistance	1 megohms (each channel)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

Dimensional Drawing

All Modules Except SNAP-AITM-i, SNAP-AITM2-i, SNAP-AITM-4i, SNAP-AIMA-iSRC, and SNAP-AIMA-iSRC-FM



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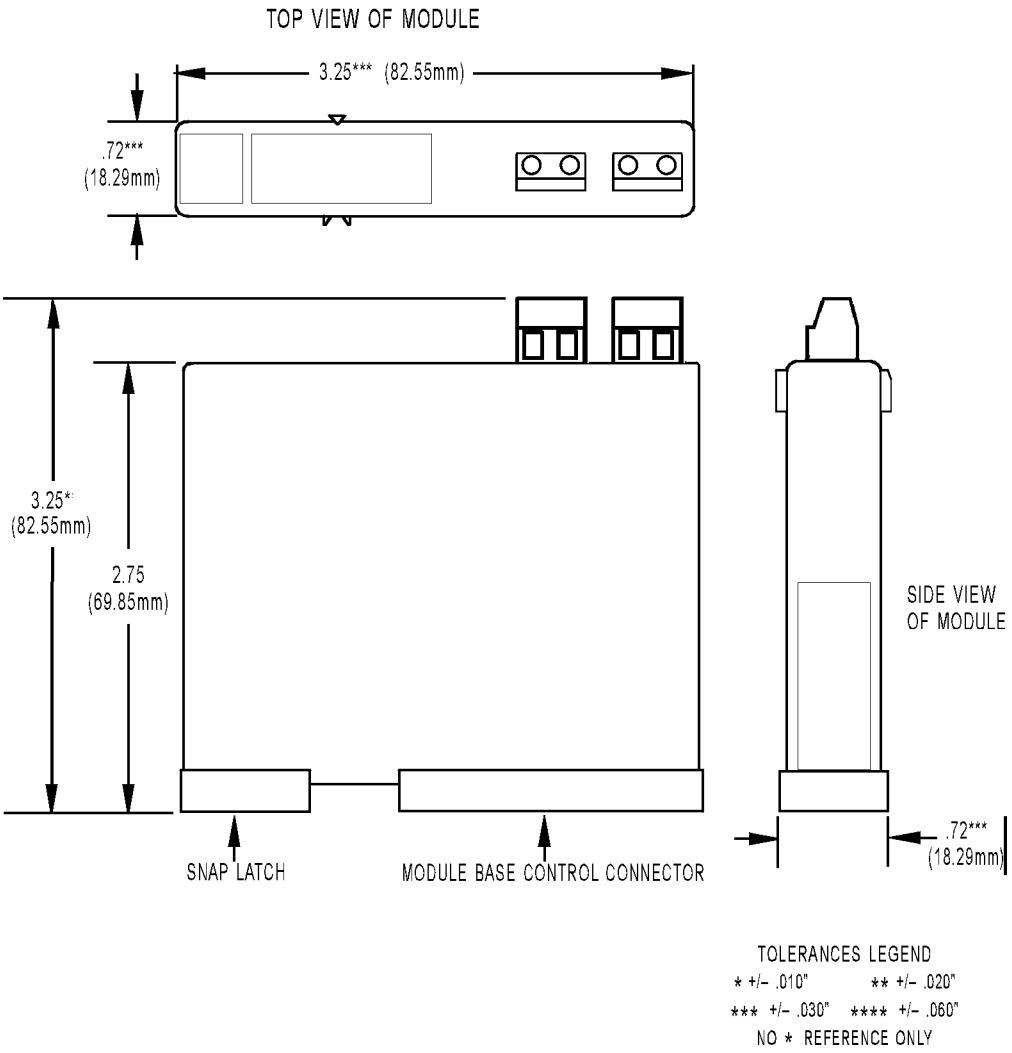
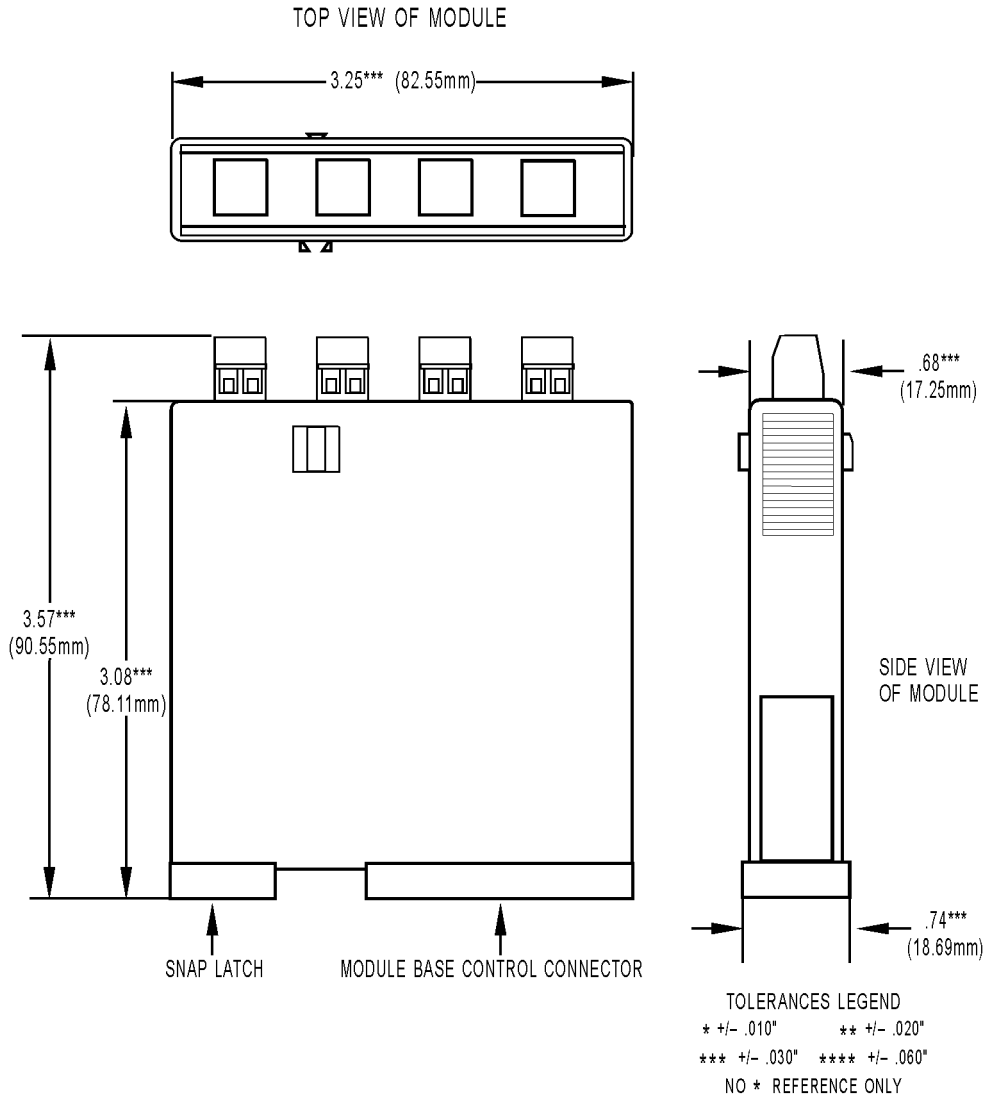
Dimensional Drawing

SNAP-AITM-i and SNAP-AITM2-i Modules



Dimensional Drawing

SNAP-AITM-4i Module



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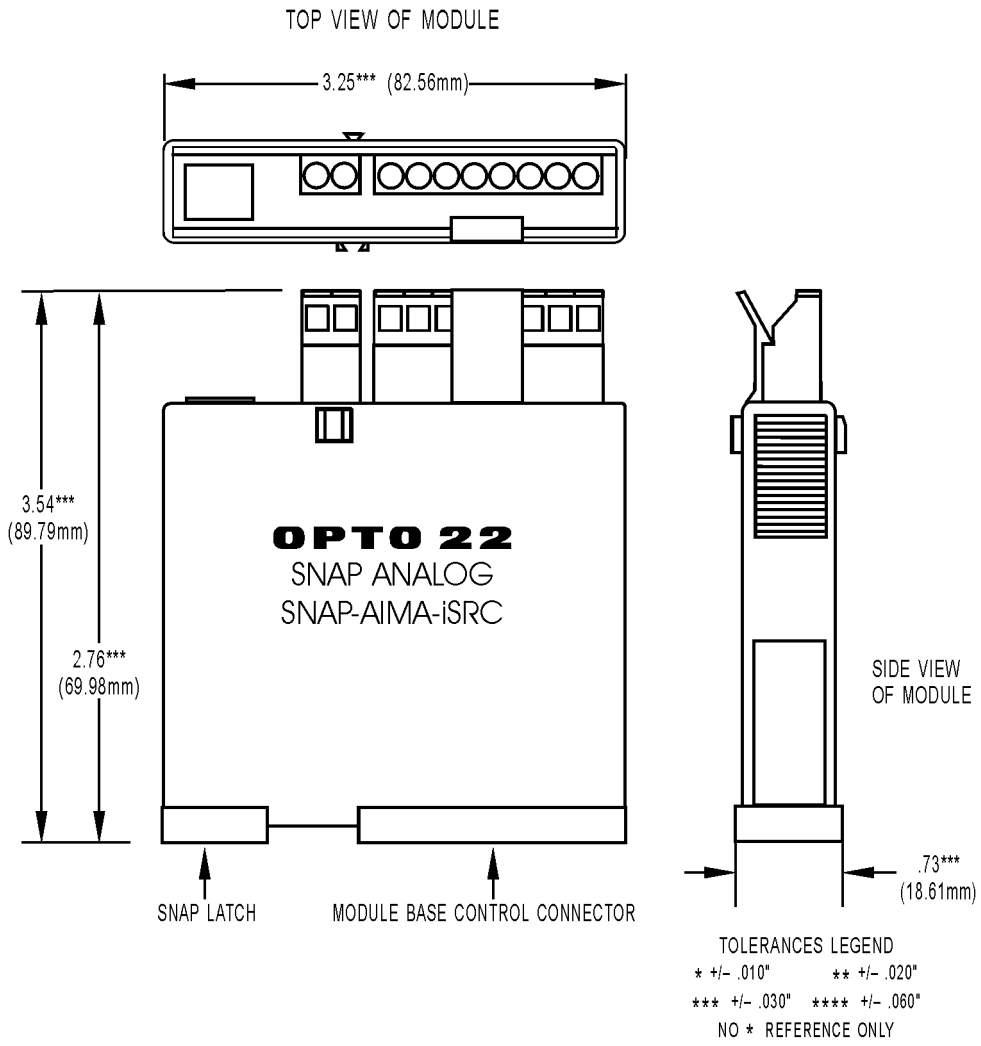
SNAP Isolated Analog Input Modules

Dimensional Drawing

SNAP-AIMA-iSRC and SNAP-AIMA-iSRC-FM Modules



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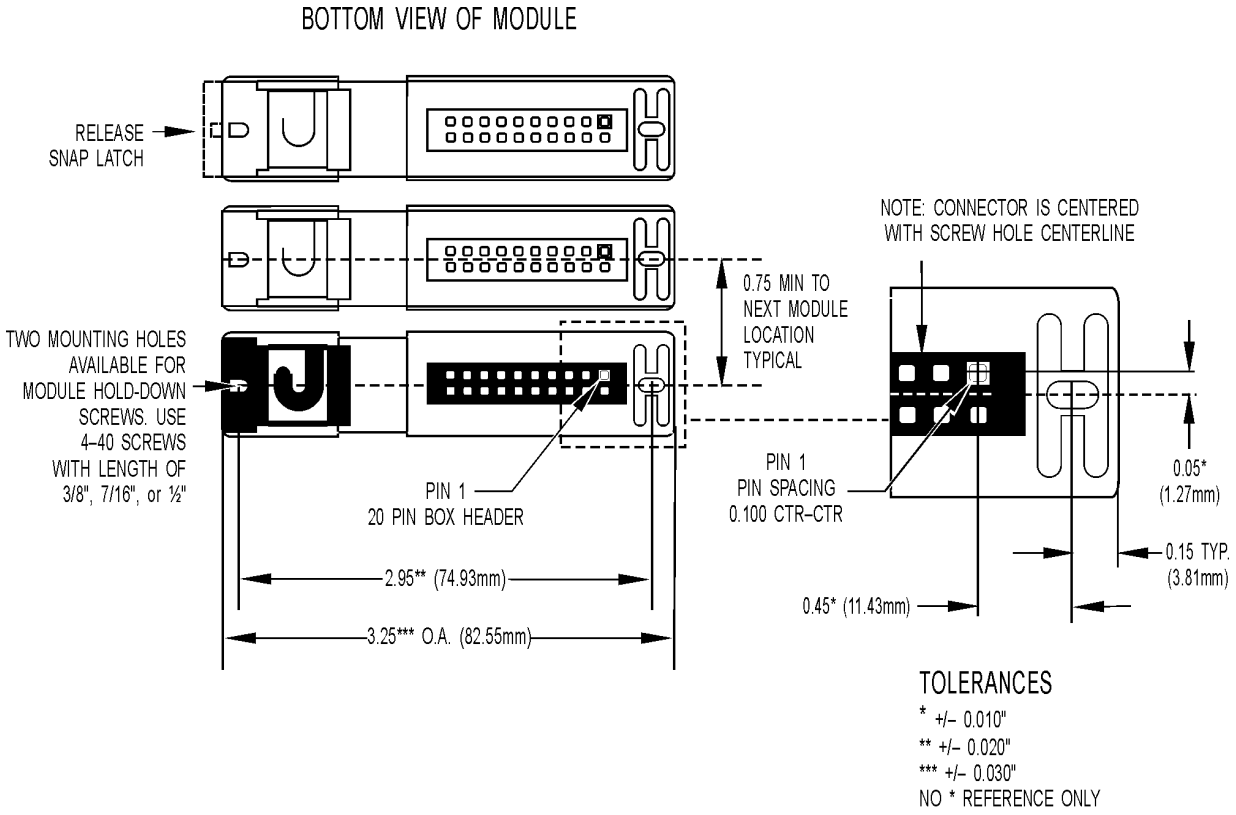
Dimensional Drawing

All Modules



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

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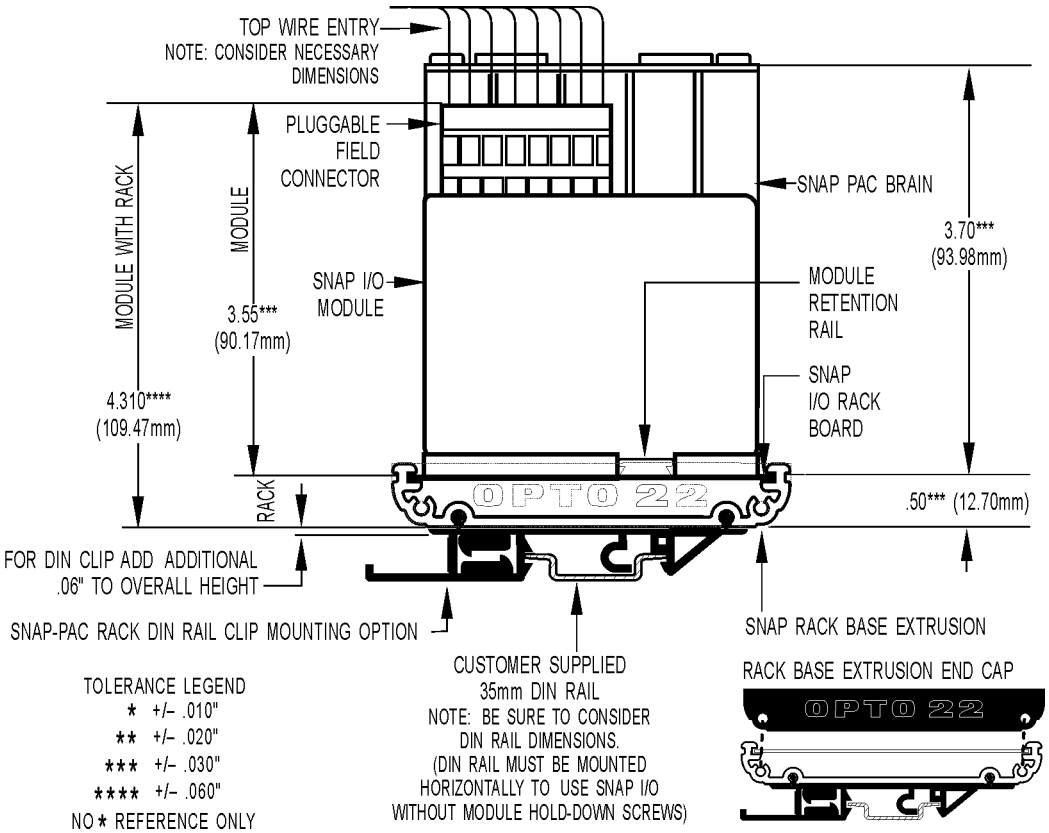
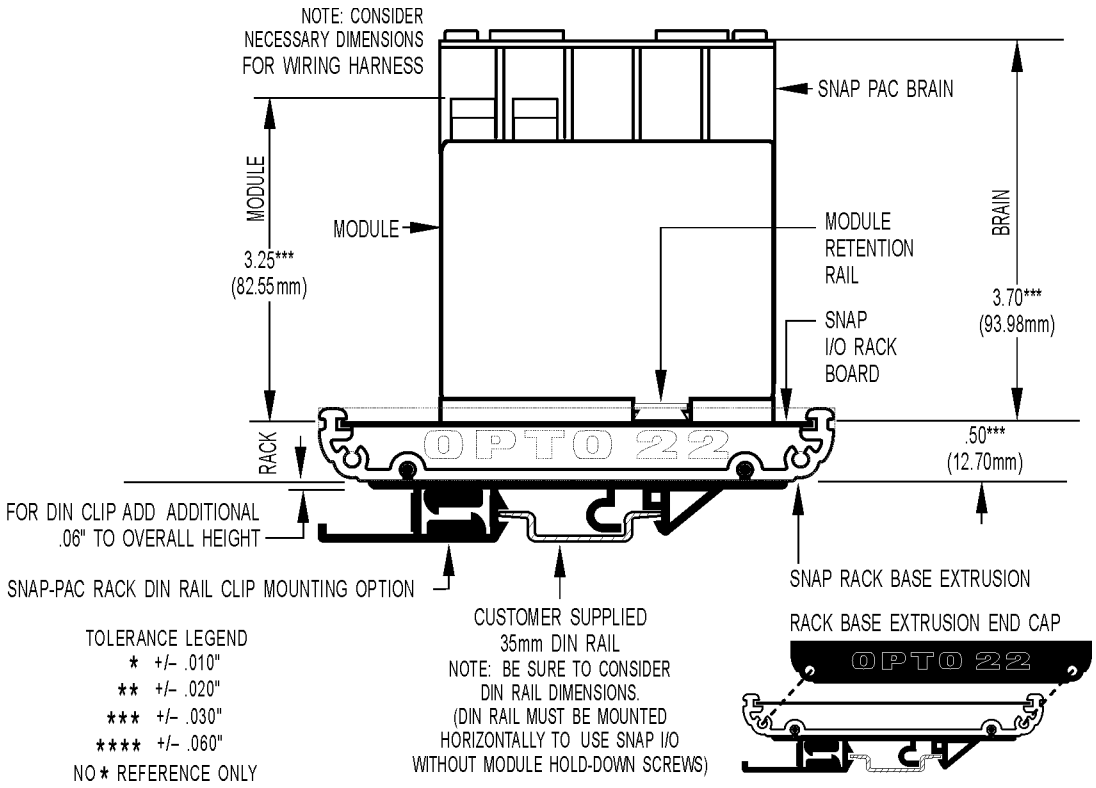
Dimensional Drawing



Dimensional Drawing

Height on Rack: SNAP-AITMi and SNAP-AITM2-i Modules



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SNAP Analog Output Modules

Features

- Resolution = 0.004% of nominal range
- Rugged packaging
- Convenient pluggable wiring
- Powered by a single 5-volt supply
- Factory calibrated; no user adjustment necessary
- Out-of-range indication
- Operating temperature -20 °C to 70 °C
- Accepts up to 22 to 14 AWG wire

Description

SNAP I/O analog output modules are part of Opto 22's SNAP PAC System. They mount on SNAP PAC racks along with other I/O modules and a SNAP PAC brain or R-series controller, either a standard wired or a Wired+Wireless™ model.

These software-configurable output modules handle a wide variety of signal levels. Most provide dual-channel packaging. All SNAP analog modules are factory calibrated. Part numbers ending in -FM are Factory Mutual approved.

SNAP analog output modules have an on-board microprocessor to provide module-level intelligence, which makes them an ideal choice for Original Equipment Manufacturers (OEMs). For additional information about the stand-alone operation of SNAP analog modules, please refer to the *SNAP I/O Module Integration Guide* (Opto 22 form #876).

SNAP racks use a retention rail locking system that holds modules securely to the rack. Normally, a hold-down screw is not required. However, for applications that require additional module security, each module can be secured on the rack with two 4-40 by ½-inch standard machine screws.

Specifications and wiring diagrams are in module descriptions starting on page 2. Dimensional drawings begin on page 13.

Notes for legacy hardware: Most SNAP analog output modules can also be used with legacy SNAP Simple, SNAP Ethernet, and SNAP Ultimate brains and with serial SNAP brains such as the B3000. These modules can be mounted on SNAP B-series or M-series racks. Exceptions are noted in individual module descriptions.

Isolation

All SNAP analog output modules are isolated from all other modules and from the I/O processor (SNAP PAC brain or on-the-rack controller). On most dual-channel modules, the two channels are *not* isolated from each other. Exceptions: SNAP-AOA-23-iSRC, SNAP-AOD-29, and SNAP-AOD-29-HFi have two isolated channels.

SNAP Analog Output Modules

Transformer isolation prevents ground loop currents from flowing between field devices and causing noise that produces erroneous readings. Ground loop currents are caused when two grounded field devices share a connection, and the ground potential at each device is different.

Isolation also provides protection for sensitive control electronics from industrial field signals.

IMPORTANT: Since most SNAP dual-channel analog output modules provide two single-ended output channels with a common reference, these dual channels are transformer and optically isolated from other modules, but not from each other. However, SNAP-AOA-23-iSRC, SNAP-AOD-29, and SNAP-AOD-29-HFi do have channel-to-channel isolation.

Part Numbers

Part	Description	See
SNAP-AOA-23	Dual-channel analog output, current loop, 4–20mA	pg 4
SNAP-AOA-23-iSRC SNAP-AOA-23-iSRC-FM*	Isolated dual-channel analog output, current loop, 4–20 mA, with loop sourcing	pg 5
SNAP-AOA-28	Dual-channel analog output, current loop, 0–20 mA	pg 8
SNAP-AOA-3	Single-channel current output, 4–20mA	pg 2
SNAP-AOD-29	Isolated dual-channel analog time-proportional digital output, 5 to 60 VDC	pg 9
SNAP-AOD-29-HFi	Isolated dual-channel analog TPO or PWM digital output, 2.5 to 24 VDC	pg 10
SNAP-AOV-25	Dual-channel analog voltage output, 0 to 10 VDC	pg 6
SNAP-AOV-27	Dual-channel analog voltage output, -10 to +10 VDC	pg 7
SNAP-AOV-5	Single-channel analog voltage output, 0 to 10 VDC	pg 3
SNAP-AOVA-8	8-channel analog multifunction output, voltage or current	pg 11

* Factory Mutual approved

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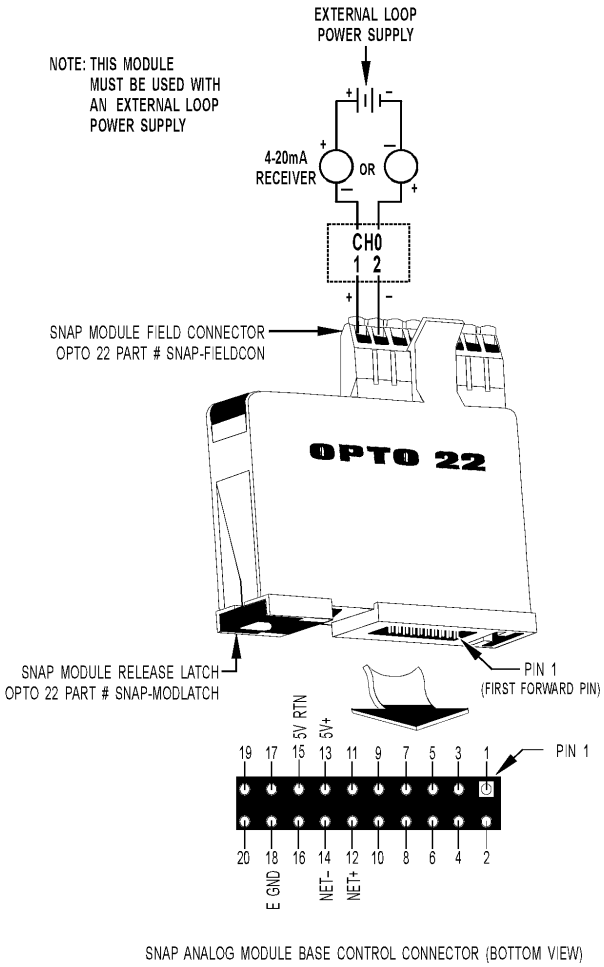
Single-Channel Current Output 4–20 mA



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Part Number	Description
SNAP-AOA-3	Single-channel analog output 4–20 mA

Description

The SNAP-AOA-3 module provides a single channel of transformer and optically-isolated digital to analog conversion. The module has a true differential (floating) output that eliminates ground loops and has a nominal output range of 4 mA to 20 mA.

Specifications:

Input	12-bit serial data
Output	4 to 20 mA (floating)
Span	16 mA
Resolution	3.9 microamps
Response Time (% of span/delta I/ delta time)	99.9%/15.98 mA/3 mS
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1000 M W
Accuracy	0.1% of span
Gain Temperature Coefficient	50 PPM/ °C
Offset Temperature Coefficient	20 PPM/ °C
Module Power Requirements	5 Volts DC (±0.15) @ 140 mA
Loop Power Requirements	10 Volts DC (min) to 32 Volts DC (max)
Max. Loop Resistance (Ohms) @ Loop Supply	250 350 950 1350 10V 12V 24V 32V
Max. Loop Resistance formula	(Loop Voltage - 5) / 0.02
Ambient Temperature: Operating Storage	-20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, RoHS, DFARS
Warranty	Lifetime

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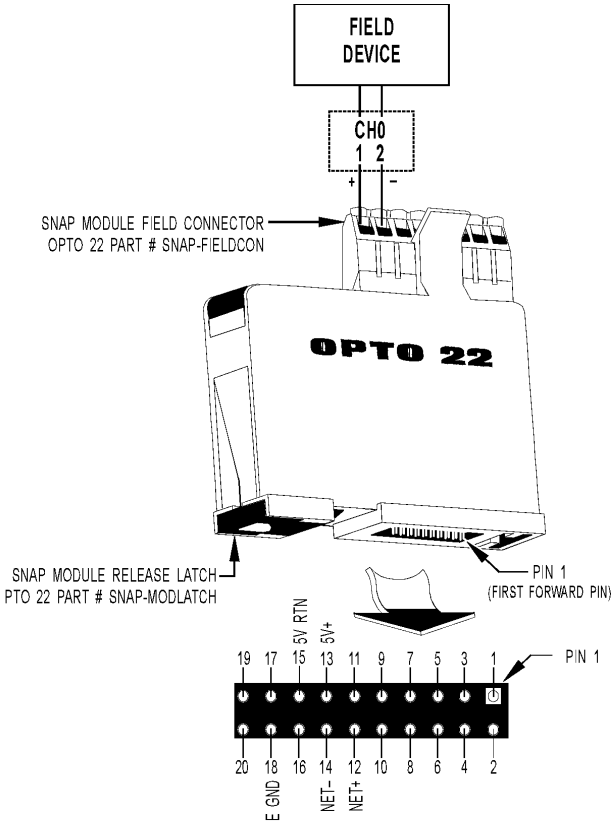
Single-Channel Voltage Output 0–10 VDC

Part Number	Description
SNAP-AOV-5	Single-channel analog output voltage 0 to 10 VDC



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

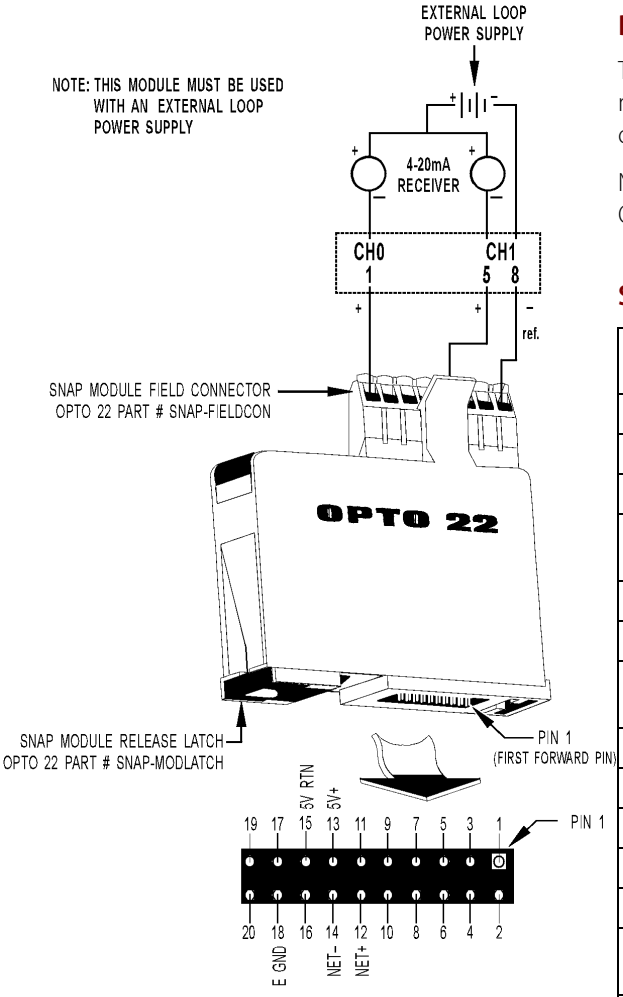
The SNAP-AOV-5 module provides a single channel of transformer and optically-isolated digital to analog conversion. The module has a true differential (floating) output that eliminates ground loops and has a nominal output range of 0 VDC to +10 VDC.

Specifications:

Input	12-bit serial data
Output	0 to +10 Volts DC (floating)
Span	10 Volt span
Resolution	2.44 mV
Response Time (% of span/delta V/delta time)	99.9%/19.98 V/3 mS
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1000 Megohms
Load Current	10 mA (floating)
Short Circuit Current Continuous	125 mA (typical)
Accuracy	0.1% of span
Gain Temperature Coefficient	50 PPM/°C
Offset Temperature Coefficient	20 PPM/°C
Power Requirements	5 Volts DC @ 150 mA
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, RoHS, DFARS
Warranty	Lifetime

Dual-Channel Current Output 4–20 mA

Part Number	Description
SNAP-AOA-23	Dual-channel analog output current loop 4–20 mA



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AOA-23 module provides a nominal output range of 4 mA to 20 mA. An external loop power source is required for the current loops.

NOTE: Both channels share common reference terminals. Common reference terminals are 3, 4, 7, and 8.

Specifications:

Input	12-bit serial data (each channel)
Outputs	4 to 20 mA (each channel)
Span	16 mA
Resolution	3.9 microamps
Response Time (% of span/delta I/ delta time)	99.9%/15.98 mA/3 mS
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1000 Megohms
Accuracy	0.1% of Span
Gain Temperature Coefficient	50 PPM/°C
Offset Temperature Coefficient	20 PPM/°C
Module Power Requirements	5 Volts DC (±0.15) @ 150 mA
Loop Power Requirements	8 VDC (min) to 32 Volts DC (max)
Max. Loop Resistance (Ohms) @ Loop Supply	250 @ 8V; 450 @ 12V; 650 @ 15V; 1050 @ 24V; 1450 @ 32V
Max. Loop Resistance formula	$\frac{\text{(Loop Voltage - 3)}}{0.02}$
Ambient Temperature: Operating Storage	-20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, FM, RoHS, DFARS
Warranty	Lifetime

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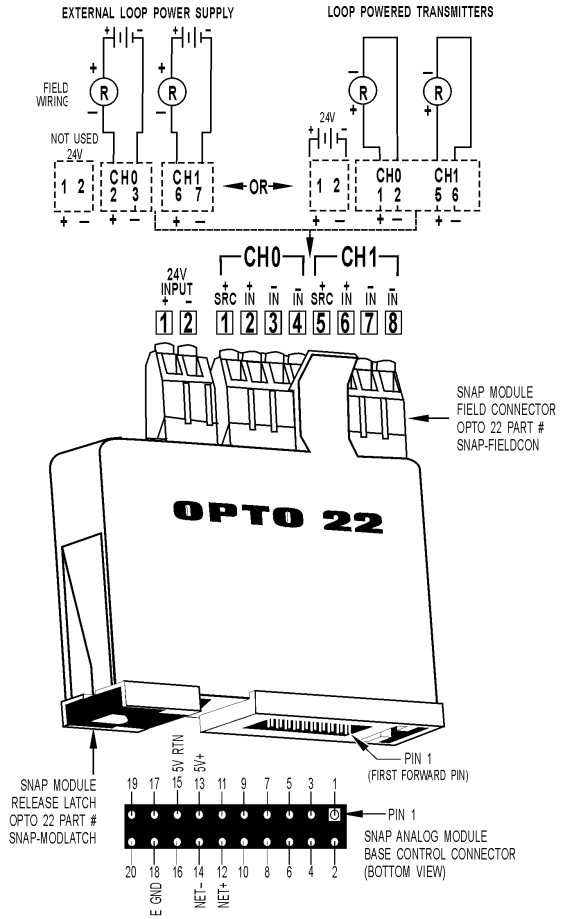
SNAP Analog Output Modules

Isolated Dual-Channel Current Output 4–20 mA



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AOA-23-iSRC and SNAP-AOA-23-iSRC-FM modules provide a nominal output range of 4 mA to 20 mA. These modules include built-in loop sourcing capability. The SNAP-AOA-23-iSRC-FM is Factory Mutual approved.

With the connection of a single 24 V power supply, these modules source two 24 V loops. The loop sources are internally connected to the individual outputs.

The two channels and their loop sources are isolated from each other; they do not share any field connection. In addition, each loop source is current limited so that an external fault on one loop will not affect the other.

Part Number	Description
SNAP-AOA-23-iSRC SNAP-AOA-23-iSRC-FM	Isolated dual-channel analog 4–20 mA output with loop sourcing

Specifications:

Input	12-bit serial data (each channel)
Outputs	4 to 20 mA (each channel)
Span	16 mA
Resolution	3.9 microamps
Response Time (% of span/delta I/ delta time)	99.9%/15.98 mA/3 mS
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1000 Megohms
Accuracy	0.1% of Span
Gain Temperature Coefficient	50 PPM/°C
Offset Temperature Coefficient	20 PPM/°C
Max. Loop Resistance @ Loop Supply	950 Ohms
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Isolation: Channel to Channel	250 V continuous (1500 V transient)
Power Requirements	5 Volts DC (±0.15) @ 200 mA
Power Requirements - Loop Power (Input)	From separate field connector; 24 VDC nominal (70 mA max) @ 24 V input, both loops @ 20 mA), 30 VDC maximum
Loop Power (Output)	24 VDC (±1.5 V) @ 20 mA Open loop: 30 V maximum Shorted loop: 24 mA nominal
LED on top of module	Indicates that there is power to the 24v source supply 2-pin connector
Agency Approvals	CE, RoHS, DFARS FM, ATEX (SNAP-AOA-23-iSRC-FM only)
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Warranty	Lifetime

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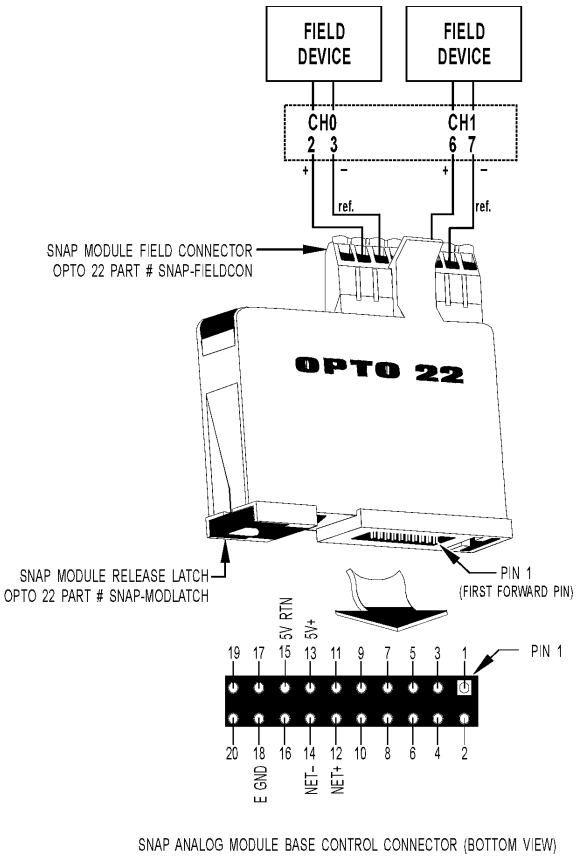
Dual-Channel Voltage Output 0–10 VDC

Part Number	Description
SNAP-AOV-25	Dual-channel analog output voltage 0 to 10 VDC

Description

The SNAP-AOV-25 module provides a nominal output range of 0 to +10 volts. Each channel can supply +5 mA of load current.

NOTE: Both channels share a common reference terminal.



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Specifications:

Input	12-bit serial data (each channel)
Outputs	0 to +10 Volts DC
Span	10 Volts
Resolution	2.44 mV
Response Time (% of span/delta V/delta time)	99.9%/19.98 V/3 mS
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1,000 Megohms
Load Current (nominal)	5 mA (each channel)
Short Circuit Output Current Continuous	40 mA per channel
Accuracy	0.1% of Span
Gain Temperature Coefficient	50 PPM/°C
Offset Temperature Coefficient	20 PPM/°C
Power Requirements	5 Volts DC (±0.15) @ 150 mA
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, FM, RoHS, DFARS
Warranty	Lifetime

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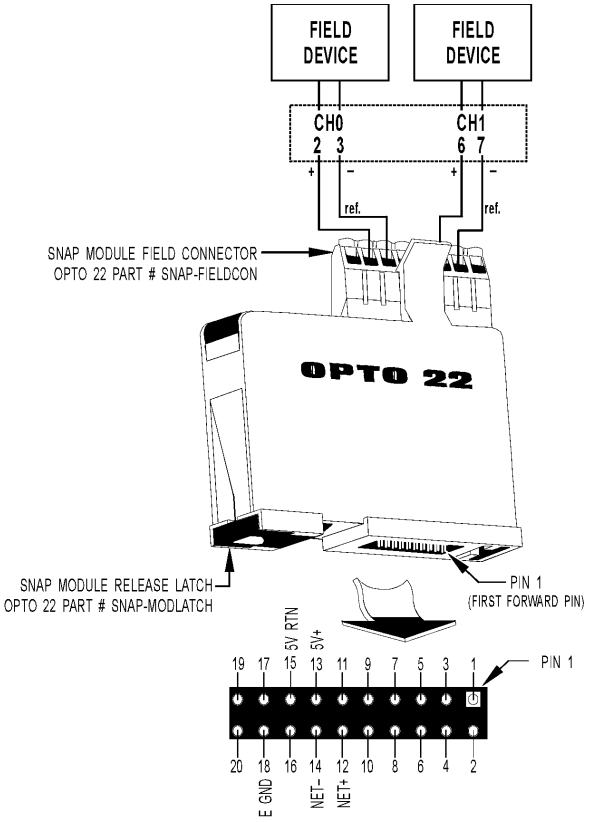
Dual-Channel Voltage Output -10 to +10 VDC



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Part Number	Description
SNAP-AOV-27	Dual-channel analog voltage output -10 VDC to +10 VDC

Description

The SNAP-AOV-27 module provides a nominal output range of -10 to +10 volts. Each channel can supply ±5 mA of load current.

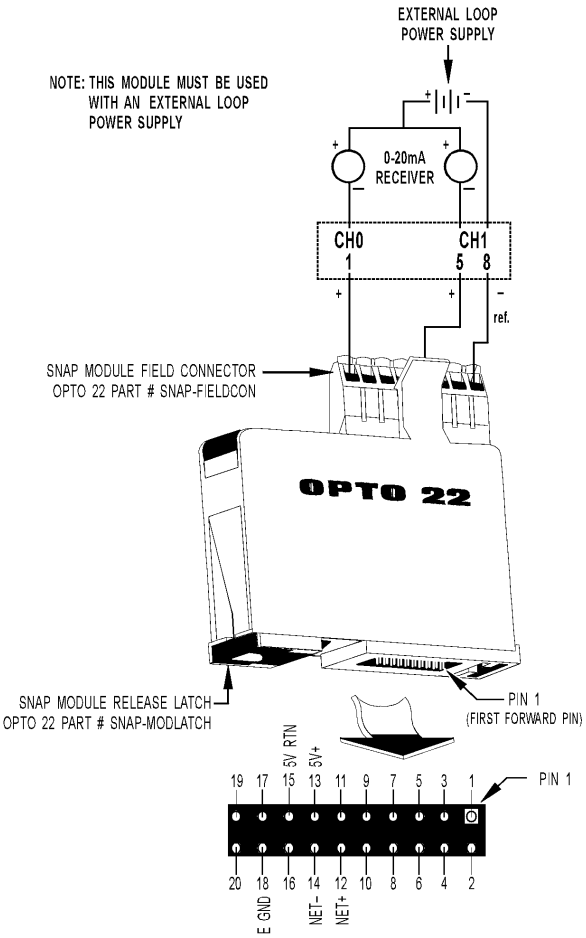
NOTE: Both channels share a common reference terminal.

Specifications:

Input	12-bit serial data (each channel)
Outputs	-10 to +10 Volts DC
Span	20 Volts
Resolution	4.88 mV
Response Time (% of span/delta V/delta time)	99.9%/19.98 V/3 mS
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1,000 Megohms
Load Current (nominal)	5 mA (each channel)
Short Circuit Output Current Continuous	40 mA per channel
Accuracy	0.1% of Span
Gain Temperature Coefficient	50 PPM/°C
Offset Temperature Coefficient	20 PPM/°C
Power Requirements	5 Volts DC (±0.15) @ 150 mA
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, FM, RoHS, DFARS
Warranty	Lifetime

Dual-Channel Current Output 0–20 mA

Part Number	Description
SNAP-AOA-28	Dual-channel analog output current loop 0–20 mA



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AOA-28 module provides a nominal output range of 0 mA to 20 mA. An external loop power source is required for the current loops.

NOTE: Both channels share a common reference terminal.

Specifications:

Input	12-bit serial data (each channel)
Outputs	0 to 20 mA (each channel)
Span	20 mA
Resolution	4.9 microamps
Response Time (% of span/delta I/ delta time)	99.9%/15.98 mA/3 mS
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1000 Megohms
Accuracy	0.1% of Span
Gain Temperature Coefficient	50 PPM/°C
Offset Temperature Coefficient	20 PPM/°C
Module Power Requirements	5 Volts DC (±0.15) @ 150 mA
Loop Power Requirements	8 Volts DC (min) to 32 Volts DC (max)
Max. Loop Resistance (Ohms) @ Loop Supply	250 @ 8V; 450 @ 8V; 650 @ 12V; 1050 @ 24V; 1450 @ 32V
Max. Loop Resistance formula	$\frac{\text{(Loop Voltage - 5)}}{0.02}$
Ambient Temperature: Operating Storage	-20 °C to 70 °C; -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, ATEX, FM, RoHS, DFARS
Warranty	Lifetime

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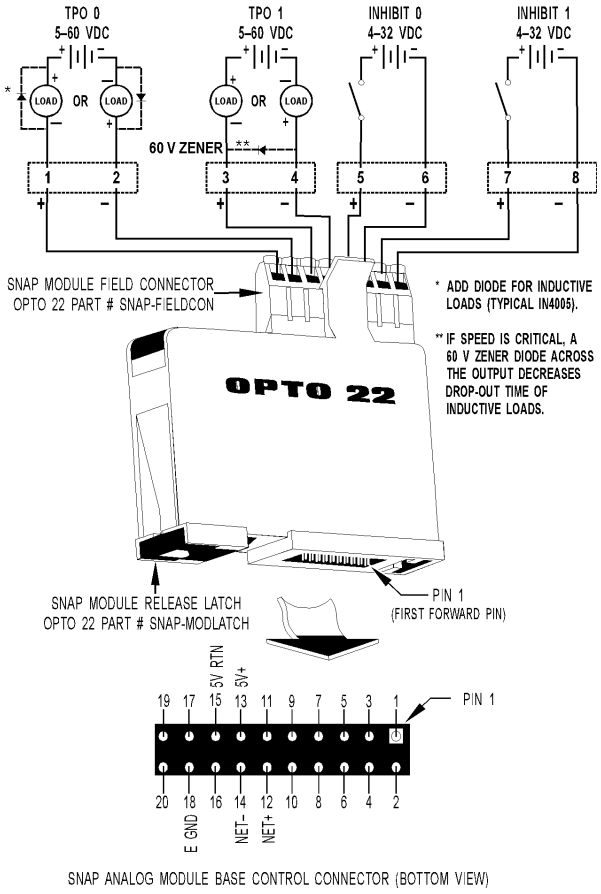
Dual-Channel Time-Proportional Output Voltage 5–60 VDC

Part Number	Description
SNAP-AOD-29	Isolated dual-channel analog Time-proportional digital output 5 to 60 VDC



SNAP ANALOG MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

Description

The SNAP-AOD-29 module provides two channels of time-proportional output (TPO). The outputs are used to switch or control DC loads such as lamps or indicators, solenoids, relay coils, and PLC logic. Each TPO channel can switch 0.5 A of load current ranging from 5 VDC to 60 VDC, over a period range of .25 seconds to 64.25 seconds.

Both TPO channels also have individual "inhibit" inputs dedicated to turning off the output, a useful feature in temperature and interlock control applications. The channels are optically isolated from each other.

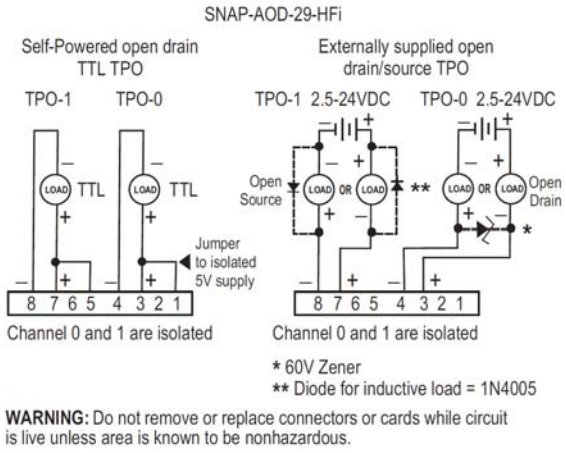
NOTE: The SNAP-AOD-29 module cannot be used in a SNAP PAC IO4AB system. Instead, use the built-in TPO functionality available on all SNAP-PAC brains that support IO4AB.

Specifications:

Input	12-bit serial data (each channel)
Switched Output at 45 °C Ambient at 70 °C Ambient	5 to 60 Volts DC 0.5 A 0.2 A
TPO Resolution	12-bit Each bit = Period/4095 1 millisecond/bit default
Period Range	0.251 sec. to 64.25 sec. (0.251 sec for Ethernet-based I/O units) 0.251 seconds module default
Period Accuracy	± 0.5%
Period Resolution	.251 second
Inhibit Inputs On Off	 4.0 Volts DC at 1.0 mA (32 Volts DC max. 1.0 Volt DC
Maximum Operating Common Mode Voltage	250 V
Common Mode Resistance	>1,000 Megohms
Timebase Temperature Coefficient	50 PPM/°C
Power Requirements	5 Volts DC (±0.15) @ 150 mA
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, FM, CE, RoHS, DFARS
Warranty	Lifetime

Dual-Channel Time-Proportional Output Voltage 2.5–24 VDC, 0 to 100 kHz

Part Number	Description
SNAP-AOD-29-HFi	Isolated dual-channel analog time-proportional or pulse-width modulation digital output, 2.5 to 24 VDC



WARNING: Do not remove or replace connectors or cards while circuit is live unless area is known to be nonhazardous.

Description

The SNAP-AOD-29-HFi is a TPO (time-proptional output) or PWM (pulse-width modulation) module that converts an analog value to a digital on/off output. The outputs are used to switch or control DC loads such as lamps or indicators, solenoids, relay coils, and PLC logic. Each channel can switch 100 mA of load current ranging from 2.5 VDC to 24 VDC supplied externally, over a period range of 0.00001 seconds to 64.25 seconds.

The two channels are optically isolated from each other.

Five volts through a 200 Ohm pull-up resistor are provided internally for each channel for use with TTL loads. This feature means you don't have to provide the pull-up voltage supply required for each output.

This module requires a SNAP PAC controller or brain with SNAP PAC firmware version 9.3c or higher. It cannot be used with legacy controllers or brains.

NOTE: The SNAP-AOD-29-HFi module cannot be used in a SNAP PAC IO4AB system. Instead, use the built-in TPO functionality available on all SNAP-PAC brains that support IO4AB.

Specifications

Switched Output	2.5 to 24 VDC at 100 mA supplied externally
Maximum Survivable Switch Voltage	60 VDC
Peak Current	1.0 A (t < 10 milliseconds)
Period Range	0.00001 sec to 64.25 sec
Percent Range	0-100%
Period Resolution	20.8 nanoseconds
Percent Resolution	0.024% (12-bit)
Period Accuracy	+- 0.005% of period
Pull-up Voltage	4.5 to 5.0 VDC
Pull-up Resistor	200 Ohm
Minimum Output Pulse Width	1 microsecond
Maximum Operating Common Mode Voltage	250 V Continuous
Isolation: Channel to Channel	250V Continuous 1500V Transient
Power Consumption	1.5 W (300 mA @ 5 V)
Ambient Temperature: Operating Storage	 -20 °C to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

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8-Channel Multifunction Voltage/ Current Output

The SNAP-AOVA-8 is an analog output module with 8 channels, individually configurable for any one of six voltage or current output ranges:

Voltage	Self-sourcing Current
0 to 5 VDC 0 to 10 VDC -5 to +5 VDC -10 to +10 VDC	4 to 20 mA 0 to 20 mA

Each range has 4096 counts (12 bits) of resolution.

The SNAP-AOVA-8 requires a 24 VDC excitation voltage brought in through the field connector on the top of the module. This voltage is internally isolated with transformer and digital data isolators, and then used to source all channels.

Because all current is sourced from within the module using the 24 VDC excitation, current outputs are self-sourcing and cannot be used with an external loop supply or in loops that are loop-powered or have a self-sourcing device in the loop.

Each channel is individually current or voltage limited and not affected by opens or shorts on adjacent channels. Connect both wires from the module, so that a change in output on one channel will not affect another channel.

Specifications

Excitation Range	18 TO 32 VDC
Excitation Current Required	200mA @ 32VDC, 250mA @ 24VDC, 350mA @ 18VDC
24V Excitation Fault Recovery Time	15 mS nominal
Power Requirement (from the rack)	5 VDC (±0.15) @ 150 mA
Maximum Operating Common Mode Voltage	250 volts
Isolation	1500 V (transient)
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Data Refresh Time	9 mS nom (update 1 ch/ms)
Ambient Temperature: Operating Storage	 -20 to 70 °C -40 °C to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Wire size range	22 to 14 AWG
Agency Approvals	UL, CE, RoHS, DFARS
Warranty	Lifetime

Part Number	Description
SNAP-AOVA-8	8-channel analog multifunction output, voltage or current
SNAP-HD-20F6	6 ft. (1.8 m) wiring cable for SNAP-AOVA-8 module, with flying leads (required)

All negative output terminals on the module are tied together internally. To prevent ground loops, use loads with isolated signal inputs or use devices with the same power source, so they have a common ground.

To wire the module, a 6-foot-long SNAP-HD-20F6 cable is required. The cable has a 20-pin connector at the module end and flying leads for wiring to field devices. See wiring information on page 12.

You can also use a SNAP-TEX-32 breakout board for wiring convenience. See form 1756, the *SNAP TEX Cables & Breakout Boards Data Sheet,* for more information.

The SNAP-AOVA-8 requires a SNAP PAC brain or rack-mounted controller with firmware version R9.4b or higher. It cannot be used with legacy controllers or brains.

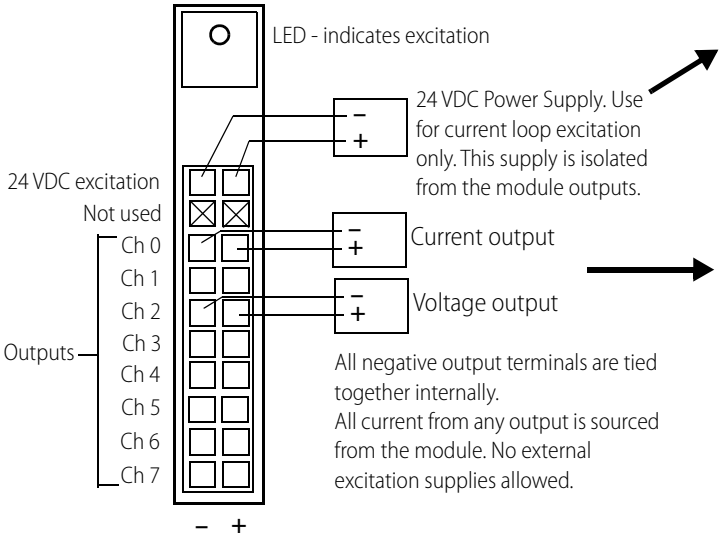
Specifications (continued)

Voltage Outputs	
Output Range (Resolution)	0 to 5 VDC (1.22 mV) 0 to 10 VDC (2.44 mV) -5 to +5 VDC (2.44 mV) -10 to +10 VDC (4.88 mV)
Load Current	+/-10 mA min. each voltage output channel)
Short Circuit Current	16 mA Typ.
Accuracy	0.1% of span
Drift: Gain Temperature Coefficient Offset Temperature Coefficient	 30 PPM / °C 15 PPM / °C
Current Outputs	
Output Range (Resolution)	4 to 20 mA (4 microamps) 0 to 20 mA (5 microamps)
Maximum Loop Resistance	750 Ohms (each current output channel)
Open Circuit Volts	27 VDC max. (24 VDC typical)
Accuracy	0.1% of span
Drift: Gain Temperature Coefficient Offset Temperature Coefficient	 30 PPM / °C 15 PPM / °C

8-Channel Multifunction Voltage/Current Output (continued)

Wiring

SNAP-AOVA-8 Module (from top)



For more information on the SNAP-HD-20F6 cable, see form 1756, the *SNAP TEX Cables & Breakout Boards Data Sheet*.

SNAP-HD-20F6 Cable

Wire colors - Excitation

24 VDC	Color
–	Black
+	White with Black

Wire colors - Output points

Ch	–/+	Color
0	–	Blue
	+	White with Blue
1	–	Pink
	+	White with Pink
2	–	Gray
	+	White with Gray
3	–	Green
	+	White with Green
4	–	Orange
	+	White with Orange
5	–	Red
	+	White with Red
6	–	Purple
	+	White with Purple
7	–	Yellow
	+	White with Yellow

NOTE: Yellow with purple and purple with yellow wires are not used.

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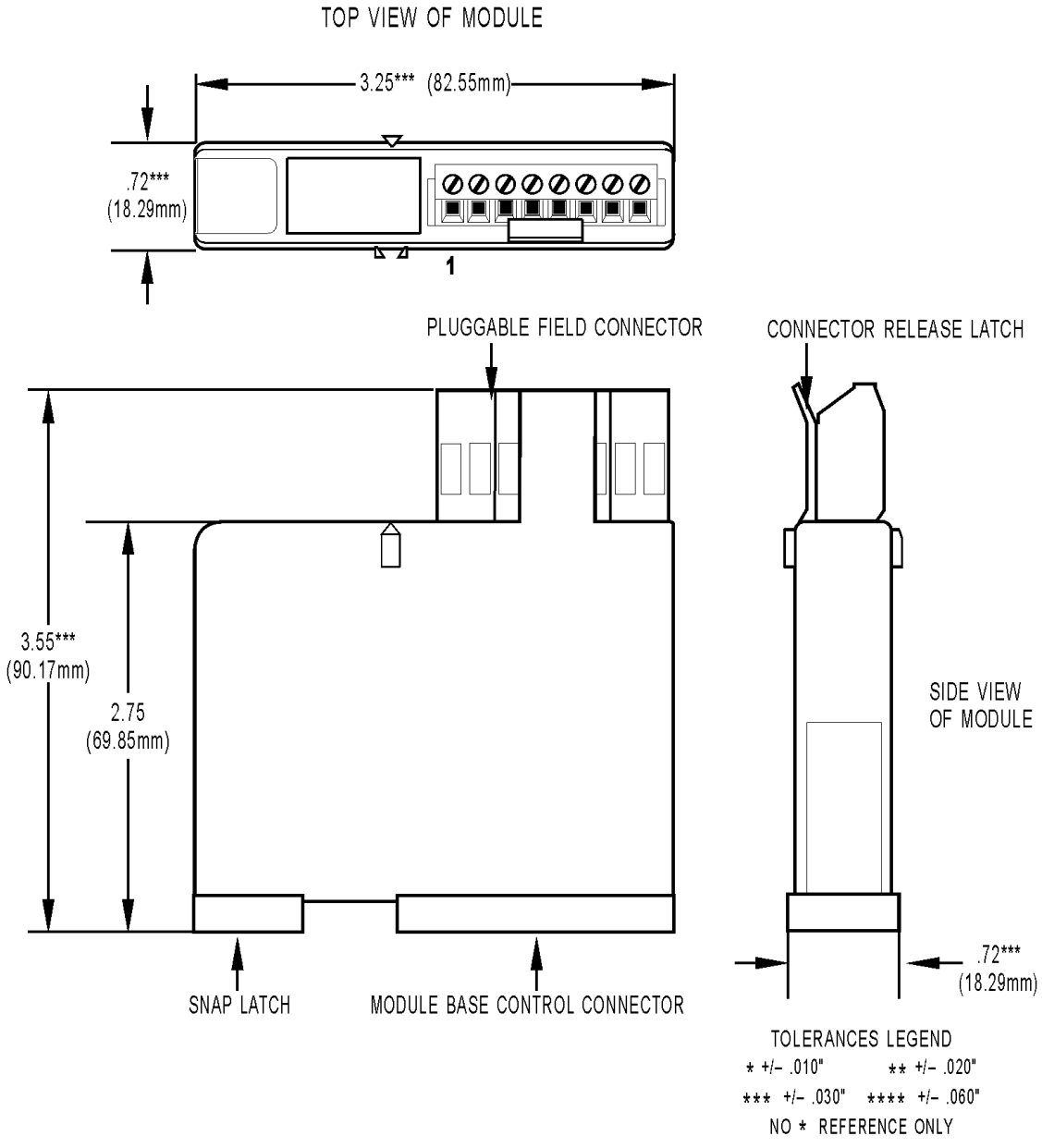
SNAP Analog Output Modules

Dimensional Drawings

All Modules except SNAP-AOA-23-iSRC, SNAP-AOA-23-iSRC-FM, and SNAP-AOVA-8

Note: The SNAP-AOD-29 time-proportional output (TPO) module has integral LEDs for monitoring and troubleshooting the module's outputs and inhibit inputs.



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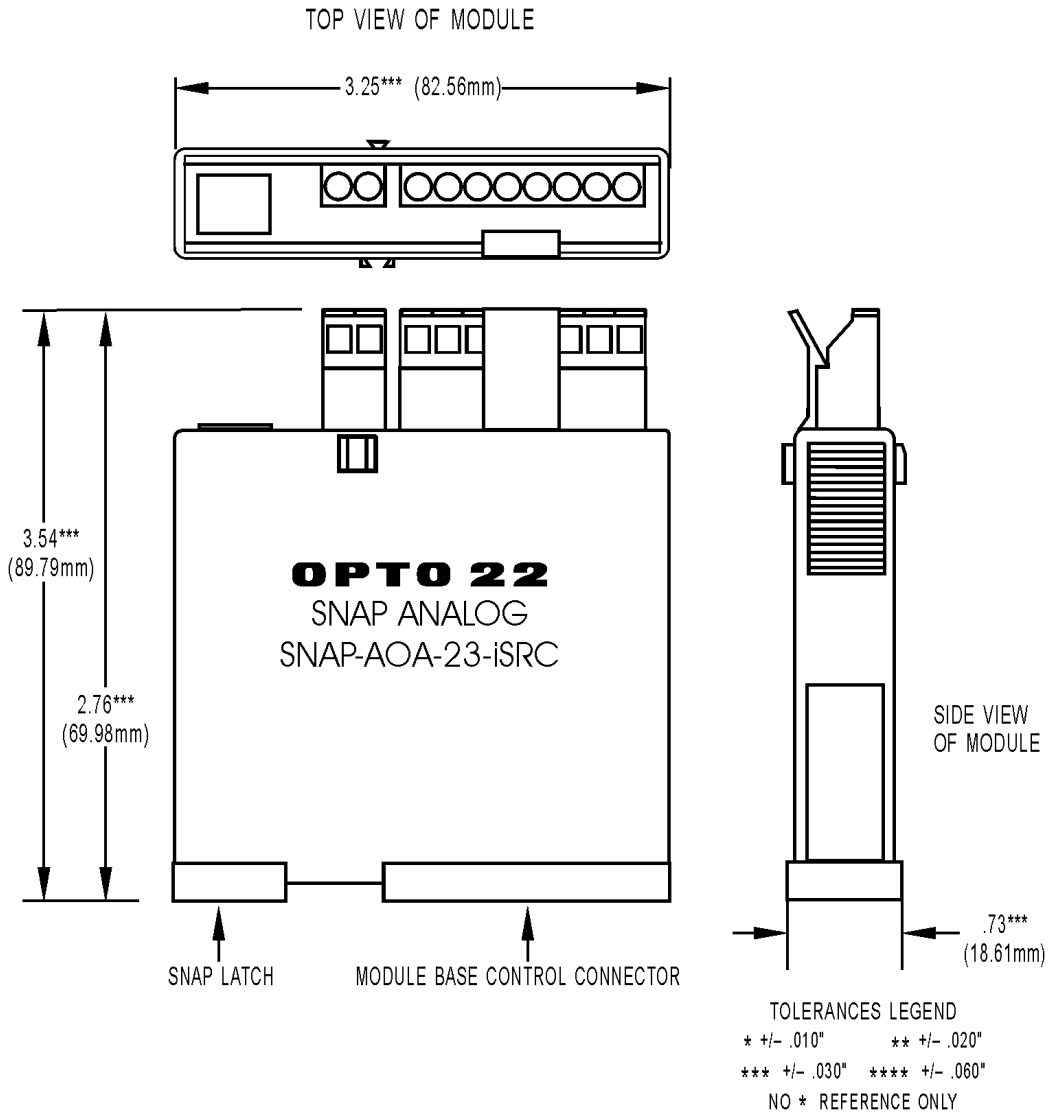
Dimensional Drawings

SNAP-AOA-23-iSRC and SNAP-AOA-23-iSRC-FM only



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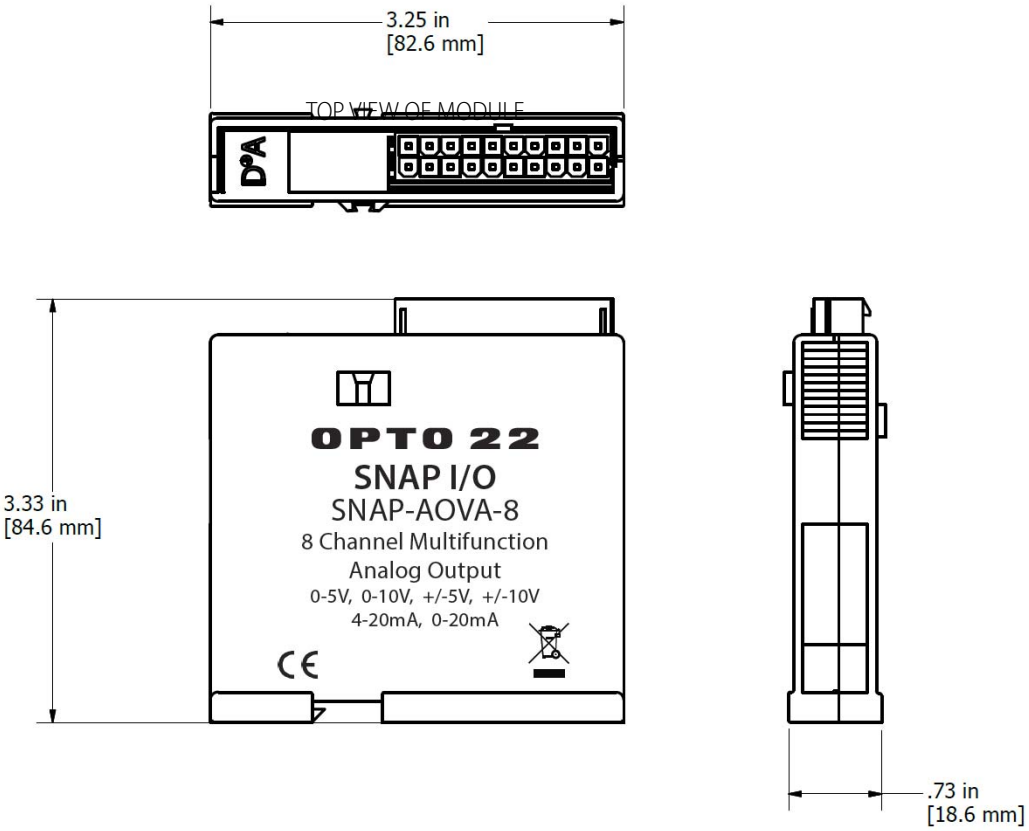
SNAP Analog Output Modules

Dimensional Drawings

SNAP-AOVA-8 only



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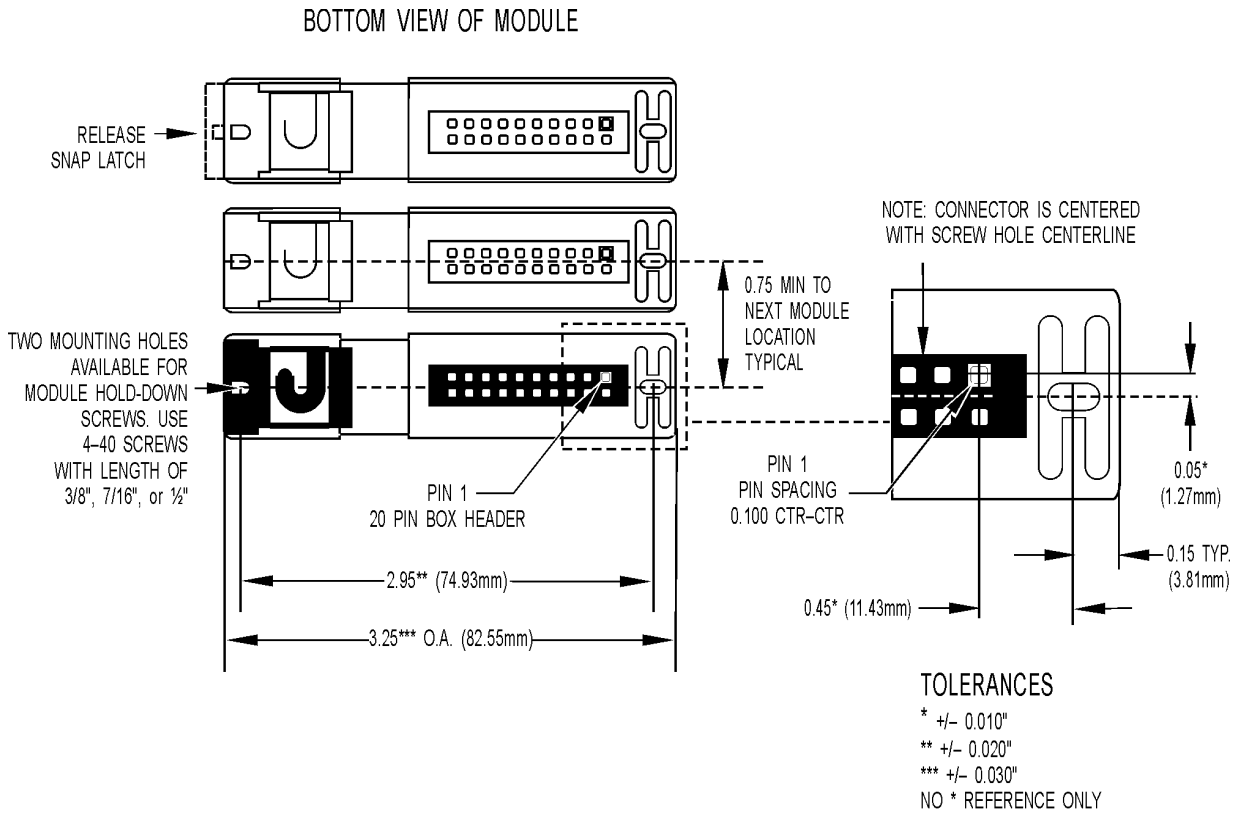
Dimensional Drawings

All Modules



IMPORTANT: The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.

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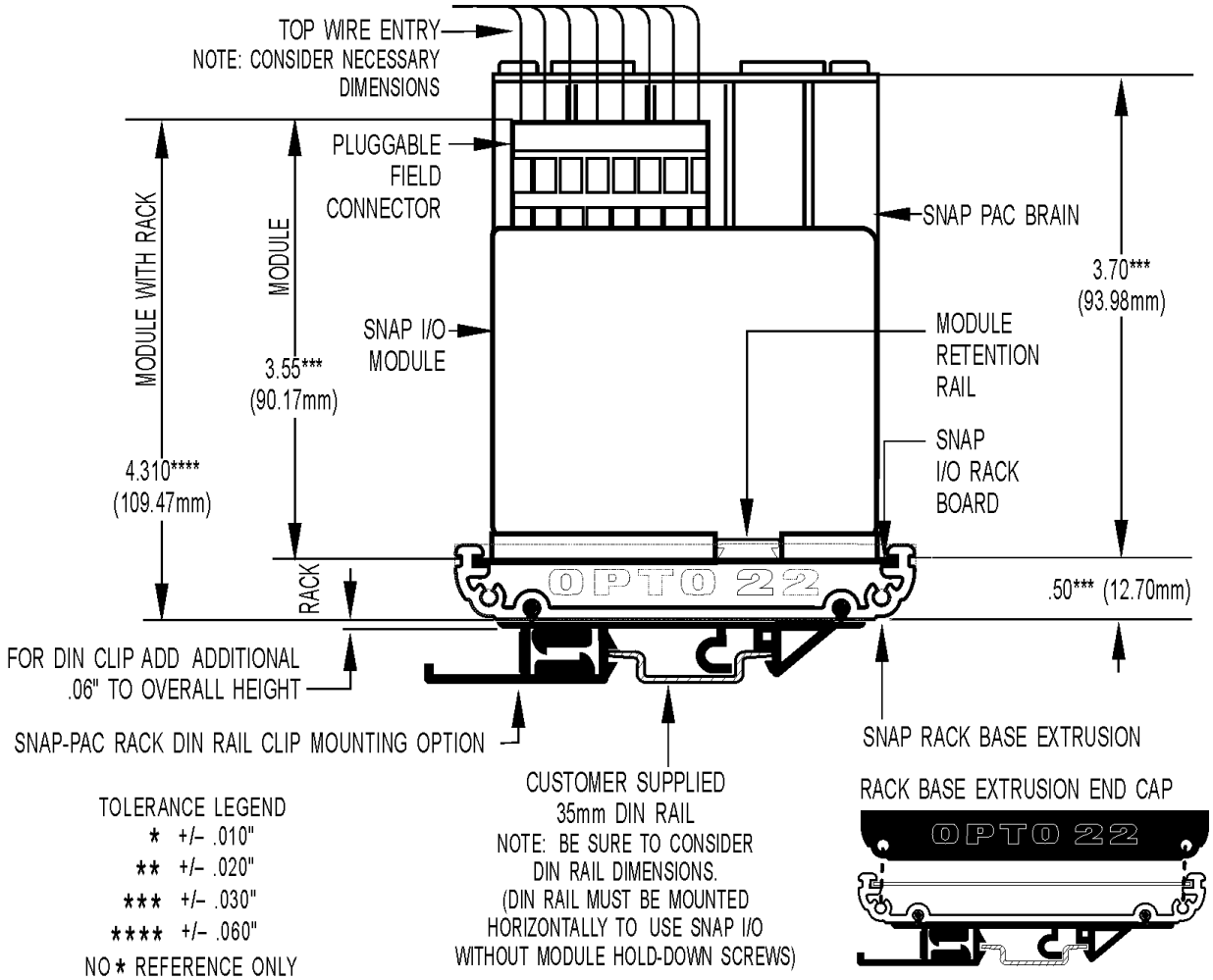
SNAP Analog Output Modules

Dimensional Drawing

All Modules

SNAP Analog Module Mounted on a SNAP Rack



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SNAP Serial Communication Modules

Features

- SNAP-SCM-232: Two RS-232 serial ports with optional RTS/CTS flow control
- SNAP-SCM-485-422: Two RS-485 2-wire serial ports or one RS-485/422 4-wire serial port
- Individually isolated ports
- Baud rates to 115 K Baud
- Connection accessories provided
- Works with the SNAP PAC System
- Up to eight serial modules per rack
- 30-month warranty
- UL approved

Description

The SNAP-SCM-232 and SNAP-SCM-485-422 serial communication modules are part of the SNAP PAC System. They conveniently provide two channels of serial data at a remote Ethernet location.

Many applications require digital, analog, and serial data to provide a complete solution. Traditionally, either separate serial network cabling is required for the serial devices, or an expensive data processor or PC must be used just to interface with the serial devices.

SNAP serial communication modules eliminate this problem by providing two channels of high-speed, isolated serial communications packaged in the compact SNAP module form.

- The **SNAP-SCM-232** interfaces to auxiliary serial equipment via two RJ-45 plug-in data connectors, providing two RS-232 serial ports. The module also supports optional RTS/CTS flow control.
- The **SNAP-SCM-485-422** uses the standard SNAP removable top-mounted connector for easy wiring of two 2-wire RS-485 ports or one 4-wire RS-485/422 port. The module has convenient top switches for termination and bias.

LED indicators are provided on each module to indicate Transmit and Receive on each port.

Both SNAP serial communication modules work with SNAP PAC Ethernet-based brains and rack-mounted controllers, both standard wired models and Wired+Wireless™ models. (They do not work with serial-based SNAP PAC brains.) These modules snap into Opto 22 SNAP PAC mounting racks right beside digital and analog modules, to provide the mix of analog, digital, and serial channels you need at any location.

SNAP Serial Communication Modules

Typical applications include interfacing with printers, scales, chart recorders, and barcode systems. Using the SNAP-SCM-232 or SNAP-SCM-485-422 as a converter, these non-Ethernet devices can be connected to an Ethernet network and be available for control, monitoring, or data acquisition by any authorized PC or other device on the network.

With the SNAP-SCM-232, two short (12-inch), unshielded twisted-pair cables and two DB9 (male) adapters are included for easy connection to all types of RS-232 devices.

SNAP racks use a retention rail locking system that holds modules securely to the rack. Normally, a hold-down screw is not required. However, for applications that require additional module security, each module has provisions for two 4-40 by ½-inch standard machine screws to hold each module in position on the SNAP rack.

For details on using these modules, see Opto 22 form #1191, the *SNAP Serial Communication Module User's Guide*.

Notes for legacy hardware: These SNAP serial communication modules can also be used with SNAP Simple, SNAP Ethernet, and SNAP Ultimate brains on an M-series or B-series rack. SNAP-SCM-232 modules offering RTS/CTS flow control were manufactured in June 2003 or more recently and require I/O processor firmware version 5.0 or newer. The SNAP-SCM-485-422 also requires firmware 5.0 or newer. An older module part number, SNAP-SCM-485, supported 2-wire RS-485 only.

Part Numbers

Part	Description
SNAP-SCM-232	Two-channel RS-232 serial communication module
SNAP-SCM-485-422	Two-channel RS-485 (two-wire) or single-channel RS-485/422 (four-wire) serial communication module

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Specifications

Baud rates	300–115,200*
Channel-to-channel isolation	750 V_{RMS}
Logic supply voltage	5.0 VDC
Logic supply current	250 mA DC
Number of ports per module	2 (1 if SNAP-SCM-485-422 in 4-wire mode)
Max. number of modules per rack**	8
Maximum cable length, point-to-point (SNAP-SCM-232)	50 feet
Maximum cable length, multidrop (SNAP-SCM-485-422)	1,000 feet at 115,200 Kbd
Processor compatibility	SNAP PAC R-series controllers and SNAP PAC EB brains, both standard wired and Wired+Wireless models. Also SNAP-B3000-ENET, SNAP-ENET-RTC, SNAP-ENET-S64, SNAP-UP1-ADS, and SNAP-UP1-M64.
Operating temperature	-20 to 70 °C
Storage temperature	-30 to 85 °C
Torque, hold-down screws	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)
Agency Approvals	UL, CE, FM, RoHS, DFARS ATEX (SNAP-SCM-485-422 only)
Warranty	30 months

* Module performance is limited by the number of serial modules on the SNAP rack. Each rack backplane provides approximately 2.5 Mbps of bandwidth.
** Maximum number of modules per rack assumes an Opto 22 SNAP power supply and SNAP rack.

LED	Indicates
1	TX port A
2	TX port B
3	RX port A
4	RX port B

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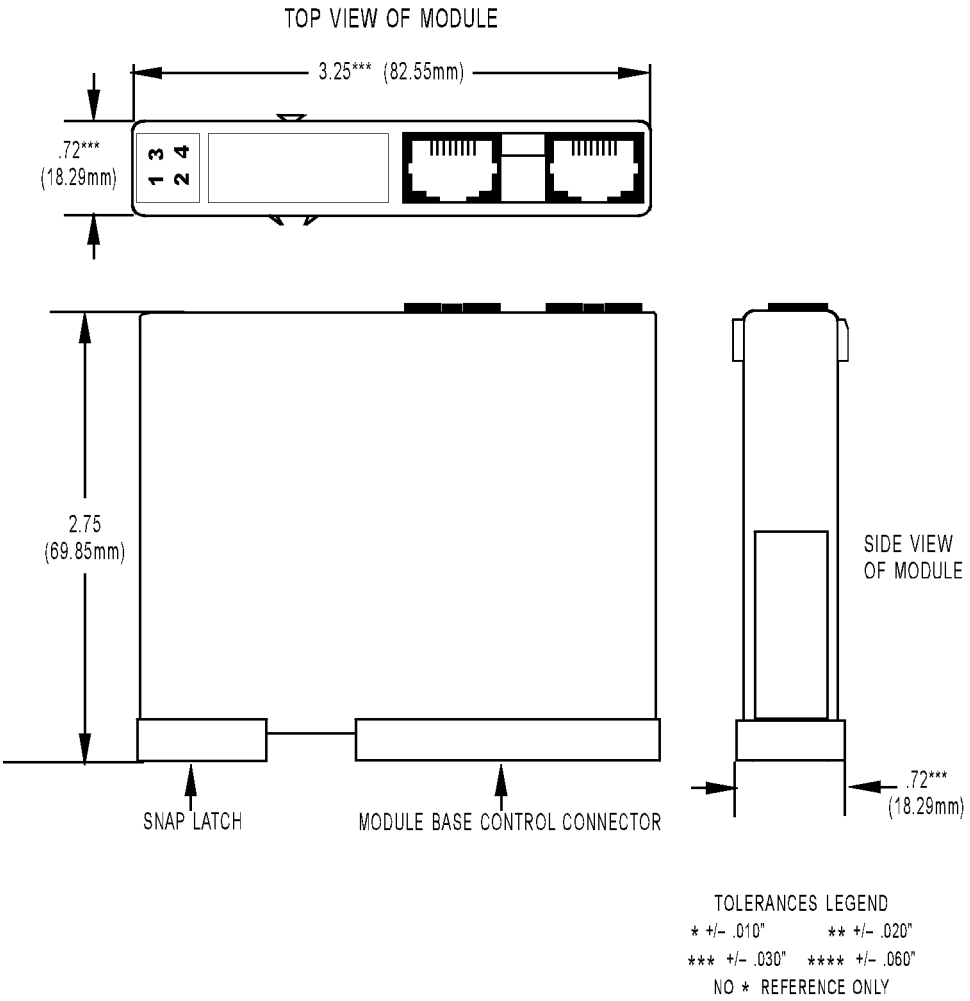
Dimensions

SNAP-SCM-232 Serial Communication Module



Dimensions

SNAP-SCM-485-422 Serial Communication Module