

SNAP LOAD CELL MODULES

Features

- > SNAP-AILC works with 2 mV/V or 3 mV/V load cells; SNAP-AILC-2 works with or 3 mV/V or 4 mV/V load cells
- > Provides both direct ADC readings and filtered values
- > Convenient pluggable wiring terminals
- > Module converts power from an external 24 VDC power supply to isolated 10 VDC for bridge excitation for up to four 350 ohm load cells.
- > Rugged packaging



SNAP-AILC Load Cell Module

DESCRIPTION

The SNAP-AILC and SNAP-AILC-2 modules each provide one channel of transformer and optically-isolated analog-to-digital conversion for load cell inputs.

These modules support 6- or 4-wire load cells (4-wire is at reduced performance). Both modules provide isolated 10 VDC bridge excitation for up to four parallel 415/350 ohm load cells as a load cell front end. For both modules, 24 VDC is required at the separate connector on top of the module.

The bridge and 10 VDC bridge power are isolated from the 24 VDC bridge source and the 5 VDC source used by the mounting rack. The 24 VDC input is reverse-polarity protected and may be used for multiple modules. The 10 VDC bridge source is current limited so that an external fault on the load cell is isolated and will not affect another load cell module.

In applications where multiple load cells are being joined at a load cell junction box, each AILC module is able to provide power for up to four 350-ohm load cells. The single output of the load cell junction box would be wired as the single channel input to the AILC module.

An LED on the module's top indicates that 24 VDC are present at the top connector and that excitation is being provided to the load cell.

There are two channels of data: channel 1 is unfiltered, and channel 2 is filtered by a 0 to -48dB programmable digital filter. The filtered data has a fast settling feature with a programmable fast settle level. This feature decreases settling time when there are large step changes in the load cell output and high filter weights. For more information, see "Using the Filter Weight and Fast Settling Features" on page 3.

As part of the SNAP PAC System, these modules can be used with all SNAP PAC brains and rack-mounted controllers, both standard wired and Wired+Wireless™ models. The modules snap onto Opto 22 SNAP PAC mounting racks, and field connections are made by a pluggable terminal strip on top of the module.

SNAP racks have a retention rail locking system. Use two 4-40 by ½-inch standard machine screws to hold each module securely in position on the SNAP rack.

The SNAP-AILC and SNAP-AILC-2 are configured using PAC Manager or PAC Control.

Notes for legacy products: SNAP-AILC and SNAP-AILC-2 modules can also be used with legacy SNAP Ultimate, SNAP Ethernet, and SNAP Simple brains that have analog capability, and with SNAP M-series and B-series mounting racks. These modules cannot be used with the serial B3000 brain.

The SNAP-AILC is also supported by legacy software ioManager, and both modules are supported by ioControl. See the following table for minimum firmware and software.

Firmware and Software Versions Required	
SNAP-AILC	SNAP-AILC-2
Processor firmware 6.1c or higher	Processor firmware 7.1d or higher
PAC Manager or ioManager 7.0a or higher	PAC Manager
PAC Control or ioControl 6.1c or higher	PAC Control or ioControl 7.1d or higher

For more information on legacy products, see the [SNAP PAC System Migration Technical Note](#) (form 1688) and the [Legacy and Current Product Comparison and Compatibility Charts](#). (form 1693).

Part Number

Part	Description
SNAP-AILC	Load cell input, 10 VDC excitation, 2 or 3 mV/V input sensitivity
SNAP-AILC-2	Load cell input, 10 VDC excitation, 3 or 4 mV/V input sensitivity

SPECIFICATIONS

Input Range Sensitivity:	
SNAP-AILC	2 mV/V or 3 mV/V (Over range ± 2.2 mV or ± 3.3 mV)
SNAP-AILC-2	3 mV/V or 4 mV/V (Over range ± 3.3 mV or ± 4.4 mV)
Input Resistance	100 Megohms differential
Resolution: Analog Scale Points	>22 bits + sign ($\pm 6,400,000$ counts = $\pm 100\%$ of scale)
Response Time, Data Freshness	See the following table
DC Reversal (Input)	0.015% (± 1000 counts of reading @ 6,400,000 F.S.)
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Survivable Input	± 15 volts across module load cell connector
Maximum Operating Common Mode Voltage	250 V
Accuracy (% Full Scale):	
Offset	$\pm 0.05\%$ (= 3,200 counts out of 6,400,000, out of box)
Gain	$\pm 0.05\%$ (= 3,200 counts out of 6,400,000, out of box)
Usable Resolution at Default Configuration (Fast)	38 nV - sign and 19 bits ($\pm 524,288$ counts @ channel 2) At filter weight 64, settles to 99.9% of final reading in 3.9 s.
DRIFT:	
Gain	40 PPM / °C
Offset	10 PPM / °C
Isolation: Optical	4000 V
Isolation: Transformer	1500 V
Rack Power Requirements	5.00 VDC to 5.20 VDC @ 120 mA
24V Bridge Supply:	
Input Voltage	24 VDC nominal (22 V min. to 30 V max.)
Input Current	40 mA for one load cell or 115 mA for four load cells
Output Fault Current	124 mA typical (field fault—shorted bridge)
Ambient Temperature:	
Operating	-20 to 70 °C
Storage	-40 to 85 °C
Humidity	5-95%, non-condensing
Wire size	22 to 14 AWG
Torque, hold-down screws	Not to exceed 1 in-lb (0.11 N-m)
Torque, connector screws	5.22 in-lb (0.59 N-m)
Agency Approvals	CE, RoHS, DFARS
Warranty	Lifetime

SNAP-AILC and SNAP-AILC-2 Configuration Options

Both modules can be configured as “Fast” or “Slow,” depending on the response you need. Configure modules in PAC Control or PAC Manager.

Item	Fast (Default)		Slow (Configuration option)	
ADC Notch Filter (Channel 1)	60 Hz (-3 dB @ 125 Hz)		20 Hz (-3 dB @ 42 Hz)	
Data Freshness (Channel 1)	9 ms		25.8 ms	
Noise Reduction (Channel 2)	At filter weight 64 (default): -3 dB T.C. = 567 ms	At filter weight 8: -18 dB T.C. = 72 ms	At filter weight 64: -3 dB T.C. = 1626 ms	At filter weight 8: -18 dB T.C. = 206 ms
Settle Time to % of Final Reading (Channel 2)	At filter weight 64 (default): 2.637 s to 99.0% 3.924 s to 99.9% 5.238 s to 99.99%	At filter weight 8: 0.31 s to 99.0% 0.47 s to 99.9% 0.62 s to 99.99%	At filter weight 64: 7.56 s to 99.0% 11.25 s to 99.9% 15.00 s to 99.99%	At filter weight 8: 0.9 s to 99.0% 1.3 s to 99.9% 1.8 s to 99.99%

USING THE FILTER WEIGHT AND FAST SETTLING FEATURES

There are two channels of data on the SNAP-AILC and SNAP-AILC-2 modules. The first channel provides raw Analog-to-Digital (ADC) data, while the second channel provides filtered data.

The filtered reading is calculated by the module from channel 1 data after every ADC conversion. Filtered output is calculated as follows:

$$Y_{new} = (X - Y) / W + Y$$

Y _{new} =	new filtered reading
Y =	last filtered reading
X =	new ADC reading =
W =	filter weight (range: 1 to 255)

You configure filtering in PAC Control software using these two commands:

- Set Analog Load Cell Filter Weight
- Set Analog Load Cell Fast Settle Level.

Set Analog Load Cell Filter Weight

The Set Analog Load Cell Filter Weight command sets the filter weight on channel 2 of a load cell module to a range of 1 to 255. Noise is reduced by up to 255, at the expense of settling time.

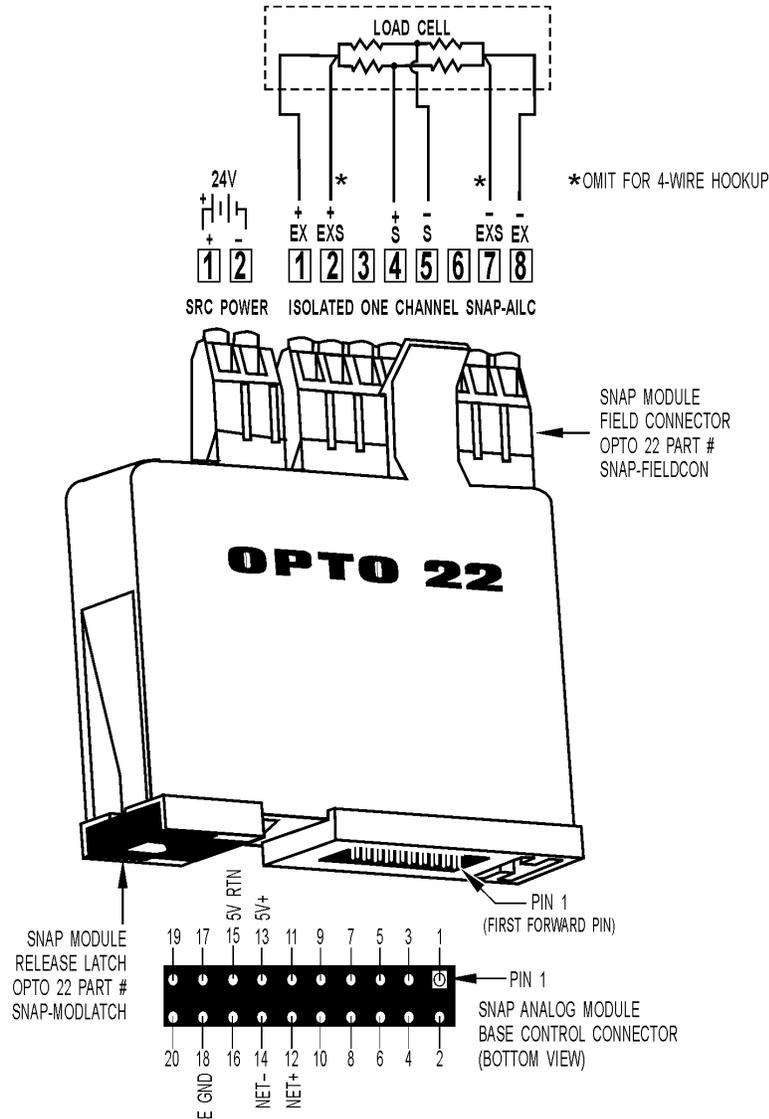
For maximum resolution, set the filter weight to less than half the peak-to-peak system noise as seen while trending the data in PAC Display.

Set Analog Load Cell Fast Settle Level

The Set Analog Load Cell Fast Settle Level command sets the fast settling trigger level (FSTL). The filtered weight is reduced when the difference between the ADC data and the filtered data is greater than the FSTL. This feature is useful to decrease settling time when there are large step changes in the load cell output and a large filter weight.

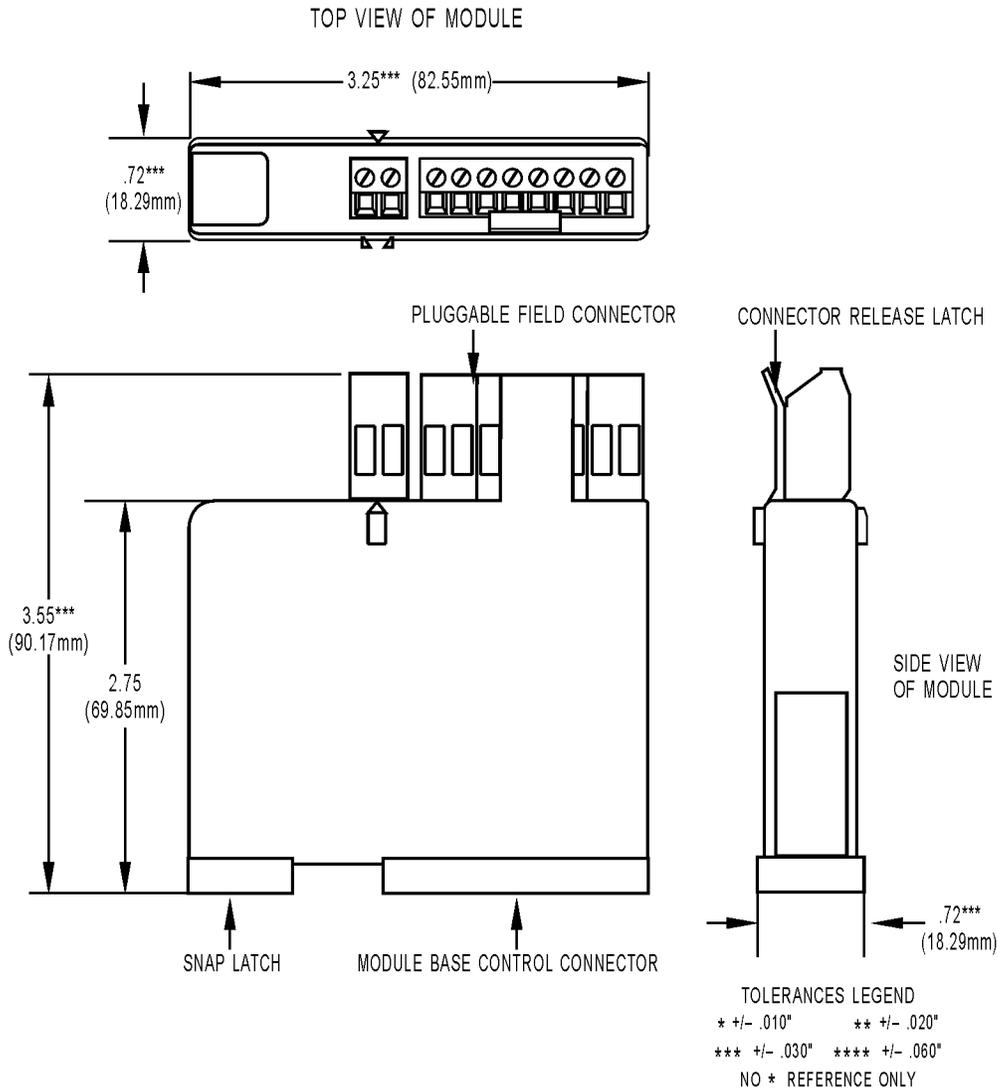
For more information on the weight filtering and fast settling features, see the commands Set Analog Load Cell Filter Level and Set Analog Load Cell Fast Settle Level in the [PAC Control Command Reference](#) (form 1701).

WIRING: SNAP-AILC AND SNAP-AILC-2 MODULES



DIMENSIONS

SNAP-AILC and SNAP-AILC-2 Modules



PRODUCTS

Opto 22 develops and manufactures reliable, easy-to-use, open standards-based hardware and software products. Industrial automation, process control, remote monitoring, data acquisition, and industrial internet of things (IIoT) applications worldwide all rely on Opto 22.

groov RIO®

groov RIO edge I/O offers a single, compact, PoE-powered industrial package with web-based configuration and IIoT software built in, support for multiple OT and IT protocols, and security features like a device firewall, data encryption, and user account control.

Standing alone, groov RIO connects to sensors, equipment, and legacy systems, collecting and securely publishing data from field to cloud. Choose a universal I/O model with thousands of possible field I/O configurations, with or without Ignition from Inductive Automation®, or a RIO EMU energy monitoring unit that reports 64 energy data values from 3-phase loads up to 600 VAC, Delta or Wye.

You can also use groov RIO with a Modbus/TCP master or as remote I/O for a groov EPIC system.

groov EPIC® System

Opto 22's groov Edge Programmable Industrial Controller (EPIC) system gives you industrially hardened control with a flexible Linux®-based processor with gateway functions, guaranteed-for-life I/O, and software for your automation and IIoT applications.

groov EPIC Processor

The heart of the system is the groov EPIC processor. It handles a wide range of digital, analog, and serial functions for data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

In addition, the EPIC provides secure data communications among physical assets, control systems, software applications, and online services, both on premises and in the cloud. No industrial PC needed.

Configuring and troubleshooting I/O and networking is easier with the EPIC's integrated high-resolution color touchscreen. Authorized users can manage the system locally on the touchscreen, on a monitor connected via the HDMI or USB ports, or on a PC or mobile device with a web browser.

groov EPIC I/O

groov I/O connects locally to sensors and equipment. Modules have a spring-clamp terminal strip, integrated wireway, swing-away cover, and LEDs indicating module health and discrete channel status. groov I/O is hot swappable, UL Hazardous Locations approved, and ATEX compliant.

groov EPIC Software

The groov EPIC processor comes ready to run the software you need:

- Programming: Choose flowchart-based PAC Control, CODESYS Development System for IEC61131-3 compliant programs, or secure shell access (SSH) to the Linux OS for custom applications
- Node-RED for creating simple IIoT logic flows from pre-built nodes
- Efficient MQTT data communications with string or Sparkplug data formats
- Multiple OPC UA server options
- HMI: groov View to build your own HMI viewable on touchscreen, PCs, and mobile devices; PAC Display for a

Windows HMI; Node-RED dashboard UI

- Ignition or Ignition Edge® from Inductive Automation (requires license purchase) with OPC-UA drivers to Allen-Bradley®, Siemens®, and other control systems, and MQTT communications

Older products

From solid state relays, to world-famous G4 and SNAP I/O, to SNAP PAC controllers, older Opto 22 products are still supported and working hard at thousands of installations worldwide. You can count on us for the reliability and service you expect, now and in the future.

QUALITY

Founded in 1974, Opto 22 has established a worldwide reputation for high-quality products. All are made in the U.S.A. at our manufacturing facility in Temecula, California.

Because we test each product twice before it leaves our factory rather than testing a sample of each batch, we can afford to guarantee most solid-state relays and optically isolated I/O modules for life.

FREE PRODUCT SUPPORT

Opto 22's California-based Product Support Group offers free technical support for Opto 22 products from engineers with decades of training and experience. Support is available in English and Spanish by phone or email, Monday–Friday, 7 a.m. to 5 p.m. PST.

Support is always available on our website, including [free online training](#) at OptoU, how-to [videos](#), [user's guides](#), the Opto 22 KnowledgeBase, and [OptoForums](#).

PURCHASING OPTO 22 PRODUCTS

Opto 22 products are sold directly and through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at **800-321-6786** (toll-free in the U.S. and Canada) or **+1-951-695-3000**, or visit our website at www.opto22.com.

