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.
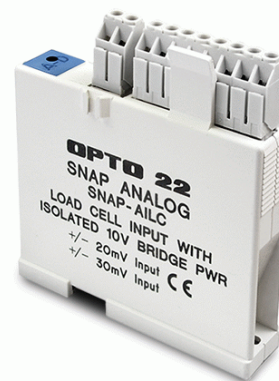
The bridge and 10 VDC bridge power are isolated from the 24 VDC bridge source and the 5 VDC source used by the mounting rack. The 24 VDC input is reverse-polarity protected and may be used for multiple modules. The 10 VDC bridge source is current limited so that an external fault on the load cell is 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 b y 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.

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

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.

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 Opto 22 form #1688, *SNAP PAC System Migration Technical Note*, and form #1693, *Legacy and Current Product Comparison and Compatibility Charts*.

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
  SNAP-AILC-2
	2 mV/V or 3 mV/V (Over range ± 2.2 mV or ± 3.3 mV)
	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 (± 6,400,000 counts = ± 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
  Gain
	± 0.05% (= 3,200 counts out of 6,400,000, out of box)
	± 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 (±524,288 counts @ channel 2) At filter weight 64, settles to 99.9% of final reading in 3.9 s.

DRIFT:
  Gain
  Offset
	40 PPM / °C
	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
  Input Current
  Output Fault Current
	24 VDC nominal (22 V min. to 30 V max.)
	40 mA for one load cell or 115 mA for four load cells
	124 mA typical (field fault—shorted bridge)

Ambient Temperature:
  Operating
  Storage
	-20 to 70 °C
	-40 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	CE, RoHS, DFARS
Warranty	Lifetime

SNAP Load Cell Modules

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:

$$Ynew = ((X - Y) / W) + Y$$

Ynew =	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 and 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.
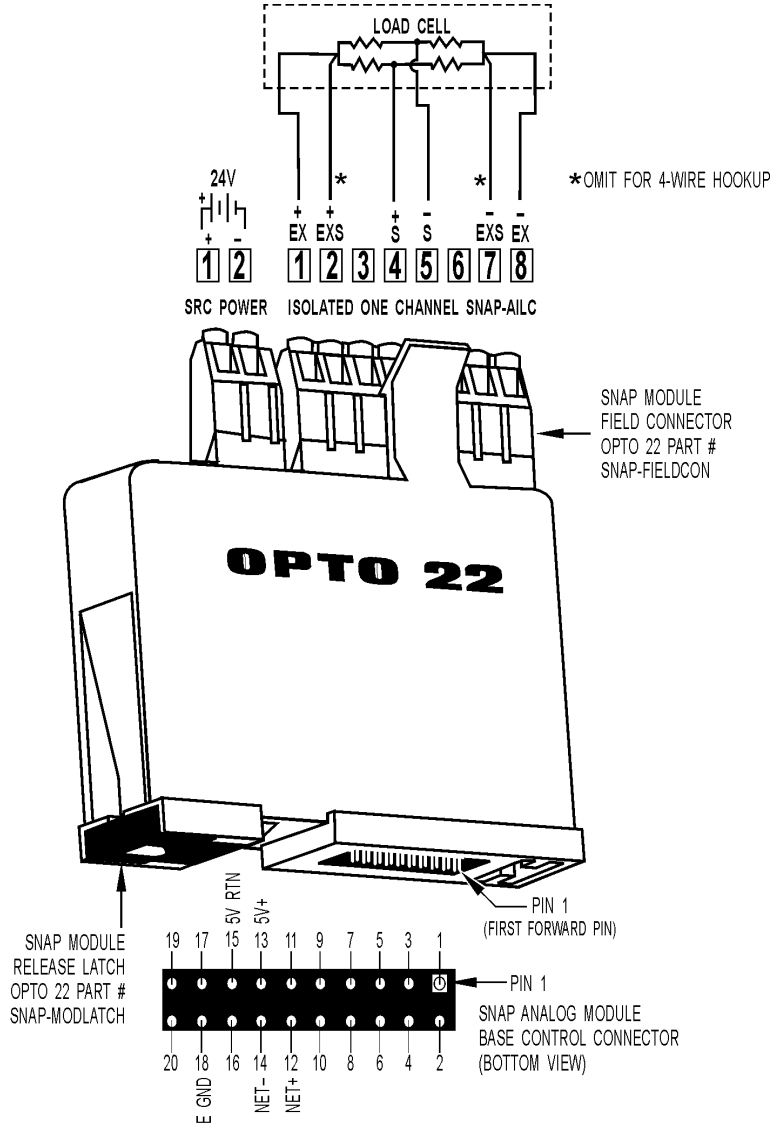
Set Analog Load Cell Fast Settle Level

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* (Opto 22 form #1701).

OPTO 22

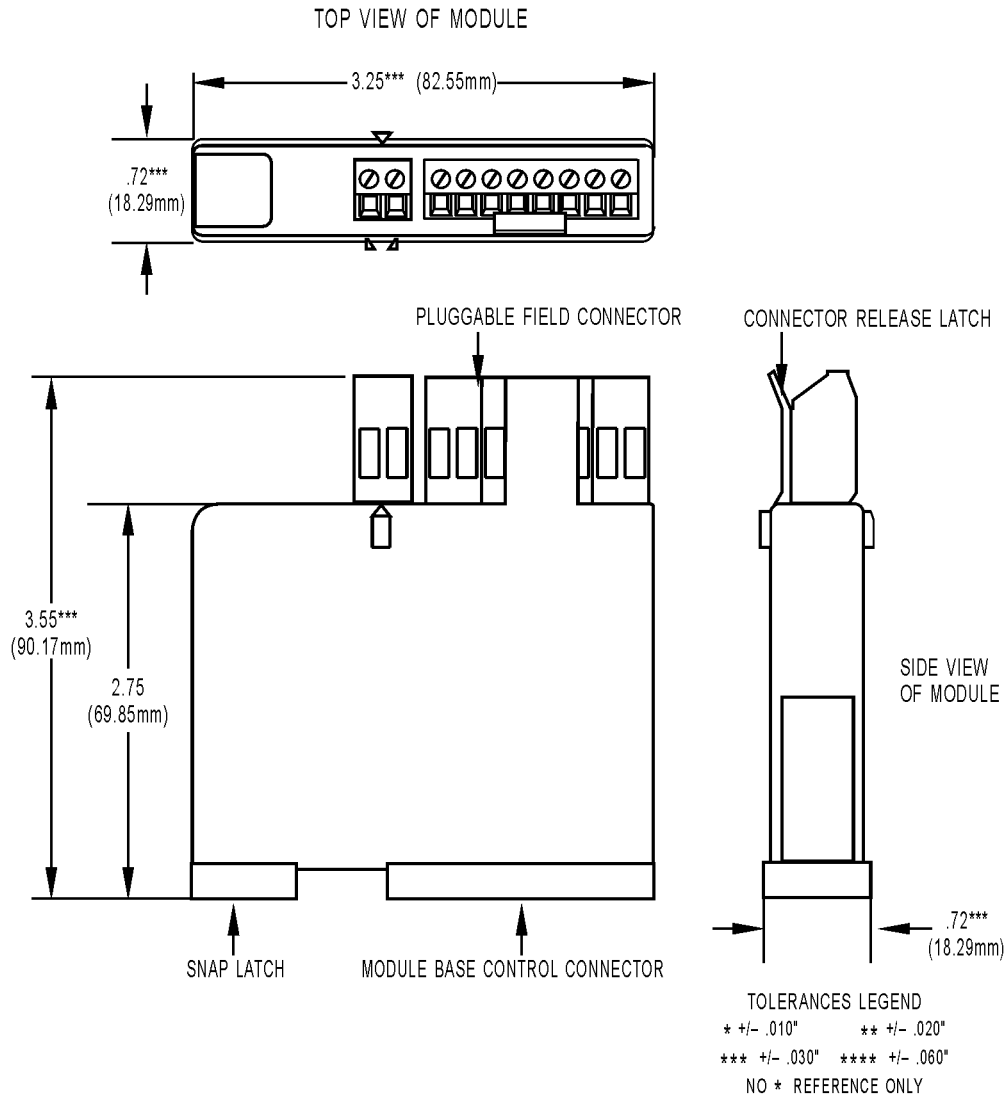## Wiring: SNAP-AILC and SNAP-AILC-2 Modules

LOAD CELL

24V

* OMIT FOR 4-WIRE HOOKUP

| + | – |
| 1 | 2 |

SRC POWER

| EX | EXS | +S | –S | | EXS | EX |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

ISOLATED ONE CHANNEL SNAP-AILC

SNAP MODULE
FIELD CONNECTOR
OPTO 22 PART #
SNAP-FIELDCON

OPTO 22

PIN 1
(FIRST FORWARD PIN)

SNAP MODULE
RELEASE LATCH
OPTO 22 PART #
SNAP-MODLATCH

| 19 | 17 | 15 | 13 | 11 | 9 | 7 | 5 | 3 | 1 |
| 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 |

5V RTN   5V+   E GND   NET–   NET+

PIN 1
SNAP ANALOG MODULE
BASE CONTROL CONNECTOR
(BOTTOM VIEW)

SNAP Load Cell Modules

Dimensions

SNAP-AILC and SNAP-AILC-2 Modules

TOP VIEW OF MODULE

3.25*** (82.55mm)

.72***
(18.29mm)

PLUGGABLE FIELD CONNECTOR

CONNECTOR RELEASE LATCH

3.55***
(90.17mm)

2.75
(69.85mm)

SNAP LATCH

MODULE BASE CONTROL CONNECTOR

SIDE VIEW
OF MODULE

.72***
(18.29mm)

TOLERANCES LEGEND
* +/- .010"   ** +/- .020"
*** +/- .030"   **** +/- .060"
NO * REFERENCE ONLY

More About Opto 22

Products

Opto 22 develops and manufactures reliable, flexible, easy-to-use hardware and software products for industrial automation, energy management, remote monitoring, and data acquisition applications.

groov

groov puts your system on your mobile device. With zero programming, you can build mobile operator interfaces to monitor and control systems from Allen-Bradley, Siemens, Schneider Electric, Modicon, and many more. Web-based *groov* puts mobile-ready gadgets at your fingertips. Tag them from your existing tag database, and they automatically scale for use on any device with a modern web browser. See groov.com for more information and your free trial.

SNAP PAC System

Designed to simplify the typically complex process of selecting and applying an automation system, the SNAP PAC System consists of four integrated components:

- SNAP PAC controllers
- PAC Project™ Software Suite
- SNAP PAC brains
- SNAP I/O™

SNAP PAC Controllers

Programmable automation controllers (PACs) are multifunctional, modular controllers based on open standards.

Opto 22 has been manufacturing PACs for over two decades. The standalone SNAP PAC S-series, the rack-mounted SNAP PAC R-series, and the software-based SoftPAC™ all handle a wide range of digital, analog, and serial functions for data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

SNAP PACs are based on open Ethernet and Internet Protocol (IP) standards, so you can build or extend a system easily, without the expense and limitations of proprietary networks and protocols. Wired+Wireless™ models are also available.

PAC Project Software Suite

Opto 22's PAC Project Software Suite provides full-featured, cost-effective control programming, HMI (human machine interface) development and runtime, OPC server, and database connectivity software for your SNAP PAC System.

Control programming includes both easy-to-learn flowcharts and optional scripting. Commands are in plain English; variables and I/O point names are fully descriptive.

PAC Project Basic offers control and HMI tools and is free for download on our website, www.opto22.com. PAC Project

Professional, available for separate purchase, adds one SoftPAC, OptoOPCServer, OptoDataLink, options for controller redundancy or segmented networking, and support for legacy Opto 22 serial *mistic*™ I/O units.

SNAP PAC Brains

While SNAP PAC controllers provide central control and data distribution, SNAP PAC brains provide distributed intelligence for I/O processing and communications. Brains offer analog, digital, and serial functions, including thermocouple linearization; PID loop control; and optional high-speed digital counting (up to 20 kHz), quadrature counting, TPO, and pulse generation and measurement.

SNAP I/O

I/O provides the local connection to sensors and equipment. Opto 22 SNAP I/O offers 1 to 32 points of reliable I/O per module, depending on the type of module and your needs. Analog, digital, and serial modules are all mixed on the same mounting rack and controlled by the same processor (SNAP PAC brain or rack-mounted controller).

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 only testing a sample of each batch, we can guarantee most solid-state relays and optically isolated I/O modules for life.
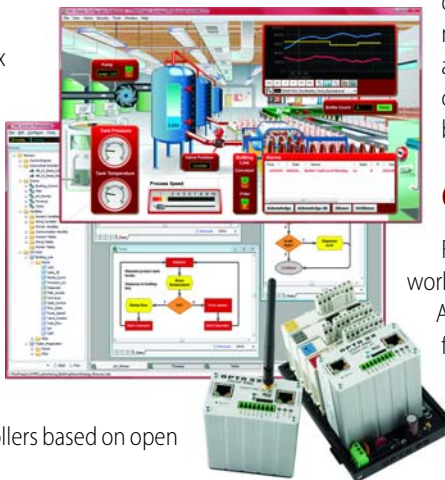
Free Product Support

Opto 22's California-based Product Support Group offers free, comprehensive technical support for Opto 22 products. Our staff of support engineers represents 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.

Additional support is always available on our website: how-to videos, OptoKnowledgeBase, self-training guide, troubleshooting and user's guides, and OptoForums.

In addition, hands-on training is available for free at our Temecula, California headquarters, and you can register online.

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 or 951-695-3000, or visit our website at www.opto22.com.