

These products are obsolete.

HART SNAP I/O MODULES

Features

- > Channel-to-channel isolation
- > UL approved
- > Rugged packaging and convenient pluggable wiring.
Accepts up to 14 AWG wire.
- > Factory calibrated; no user adjustment necessary
- > Communicates digitally with HART current loop devices

DESCRIPTION

NOTE: SNAP-AIMA-iH and SNAP-AOA-23-iH are obsolete and no longer available.

HART® SNAP I/O modules for analog current input and output provide communication with other Highway Addressable Remote Transducer (HART) current loop devices.

Each channel on each module features an integrated HART modem that allows the channel to communicate digitally with a HART FSK (frequency-shift keying) signal superimposed onto the analog 4–20 mA current loop. The channel is a master device when used together with SNAP PAC brains or controllers to communicate with other HART current loop devices in either point-to-point or multidrop configurations.

Current input and output modules are available. Both provide channel-to-channel isolation, are UL approved, and are factory calibrated.

SNAP-AIMA-iH Input Module

The SNAP-AIMA-iH provides two channels of isolated analog input current with a range of 4–20 mA. External loop power supplies are required for current loops.

The SNAP-AIMA-iH is categorized by the HART protocol as a current input connection type, which means that the module is a low impedance device.

SNAP-AOA-23-iH Output Module

The SNAP-AOA-23-iH provides two channels of isolated analog output current with a range of 4–20 mA. External loop power supplies are required for current loops.

The SNAP-AOA-23-iH is categorized by the HART protocol as a current output device, which means that each channel controls the loop current and is a high impedance device.



Isolation

All SNAP analog modules are transformer isolated as well as optically 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. 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.

Transformer isolation provides 1500 V of transient (1500 V for 1 s) protection for control electronics from industrial field signals.

USING HART SNAP I/O MODULES

HART SNAP I/O modules are part of the SNAP PAC System. They mount on SNAP PAC racks alongside other SNAP I/O modules (analog, digital, and serial), so you have the combination of I/O you need at any location. Use two standard 4-40 x 1/2 truss-head Phillips hold-down screws to secure both sides of the module.

Part Numbers

Part	Description
SNAP-AIMA-iH [Obsolete]	[Obsolete] Isolated two-channel analog current input, HART communication, 4–20 mA
SNAP-AOA-23-iH [Obsolete]	[Obsolete] Isolated two-channel analog current output, HART communication, 4–20 mA

As shown in the diagram at right, the SNAP PAC I/O unit can communicate over a standard Ethernet network to databases, HMIs, and other devices.

These modules require a SNAP PAC brain or rack-mounted controller for I/O processing and communications. They are not compatible with legacy brains and controllers.

HART SNAP I/O modules are designed for use with a SNAP PAC programmable automation controller and PAC Control automation software. Several HART-specific PAC Control commands (available in PAC Control version 9.4 and higher) make it possible for these modules to communicate any HART command that adheres to the HART request-response model or the burst message model.

In your PAC Control strategy you will need to assemble all request data sent to the module and to parse all response data returned by the module. In this way the modules can communicate with any wired HART device using any HART command.

For details and examples on all PAC Control commands, see form 1701, the [PAC Control Command Reference](#), available at www.opto22.com.

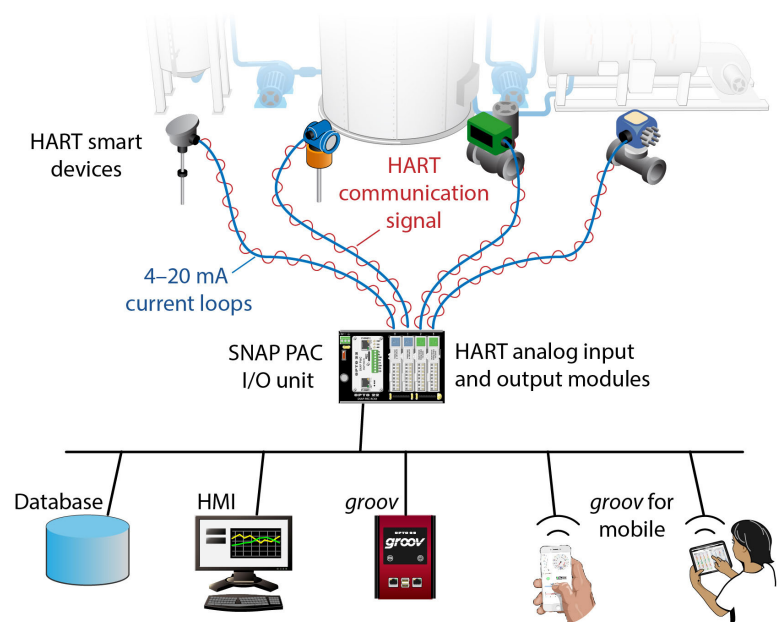
The HART-specific PAC Control commands include:

- Get HART Unique Address
- Send/Receive HART Command
- Receive HART Response
- Receive HART Burst Response

In addition, the following string commands (also in PAC Control version 9.4 and higher) should be useful:

- Pack Float into String
- Pack Integer 32 into String
- Pack Integer 64 into String
- Pack String into String
- Unpack String

System Architecture - HART SNAP I/O Modules



HART Developer Toolkit

HART SNAP I/O modules can also be used without PAC Control. Opto 22 offers the [SNAP PAC .NET HART developer toolkit](#) so you can easily integrate HART SNAP I/O modules into an existing .NET/Mono application.

This toolkit is available for download from www.opto22.com.

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LEDs

Each module includes four LED indicators on the top of the module. LEDs 1 and 3 refer to channel 0; LEDs 2 and 4 refer to channel 1.

LED 1 or 2 Status	LED 3 or 4 Activity	Description
Solid Green	Blinking Green	HART channel is operational; loop voltage and current are within limits.
Solid Red	Blinking Red	HART communication error: <ul style="list-style-type: none">On a SNAP-AOA-23-iH, check loop voltage. Excessive load resistance or an incorrect loop power supply may cause voltage to be too low.On a SNAP-AIMA-iH, check loop current to make sure it is between 3.9 mA and 20.2 mA. NOTE: If loop voltage and current are correct, contact Product Support.
OFF	--	Current loop open or loop voltage is zero. Implies that the channel is not being used.

Specifications: SNAP-AIMA-iH [Obsolete]

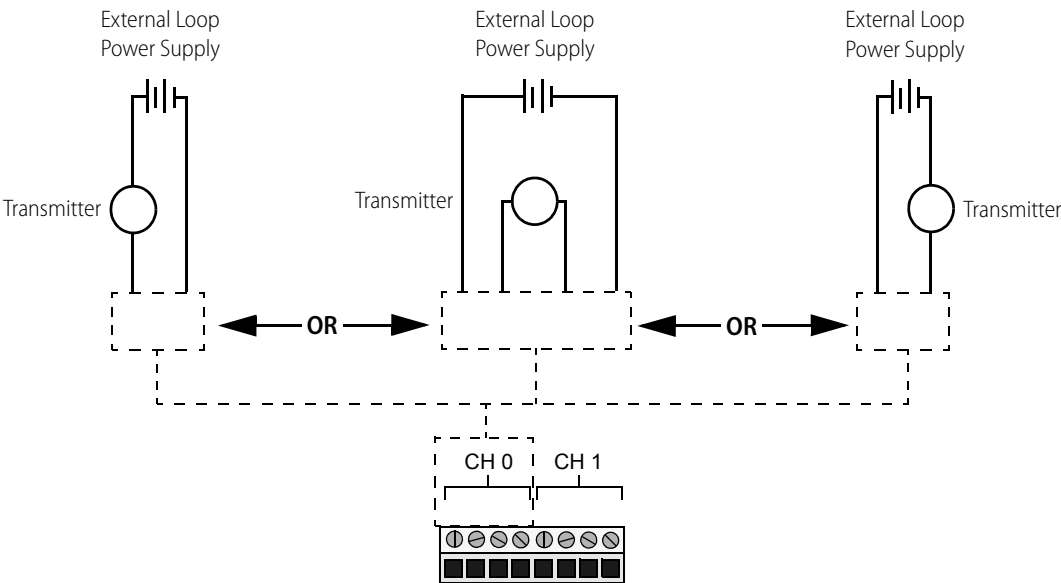
Input Range	
Nominal	4 to 20 mA
Full	3.2 to 24 mA
Maximum Survivable Input	40 V or 160 mA
Impedance	230 Ohms nominal
Resolution	0.8 microamps
Accuracy	+/- 10 microamps
Response Time (% of span/delta I/delta time)	99.9%/20.7mA/10 ms
Gain Temperature Coefficient	30 ppm/ °C
Offset Temperature Coefficient	15 ppm/ °C
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V continuous 1500 V transient (1 s)
Isolation: Channel-Channel	250 V continuous 1500 V transient (1 s)
Power Requirements	5 VDC (+/- 0.15) @ 150 mA
Ambient Temperature: Operating Storage	-20 °C to 70 °C -40 °C to 85 °C
Humidity	5-95%, non-condensing
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	UL, CE, RoHS, DFARS; UKCA
Warranty	Lifetime

Specifications: SNAP-AOA-23-iH [Obsolete]

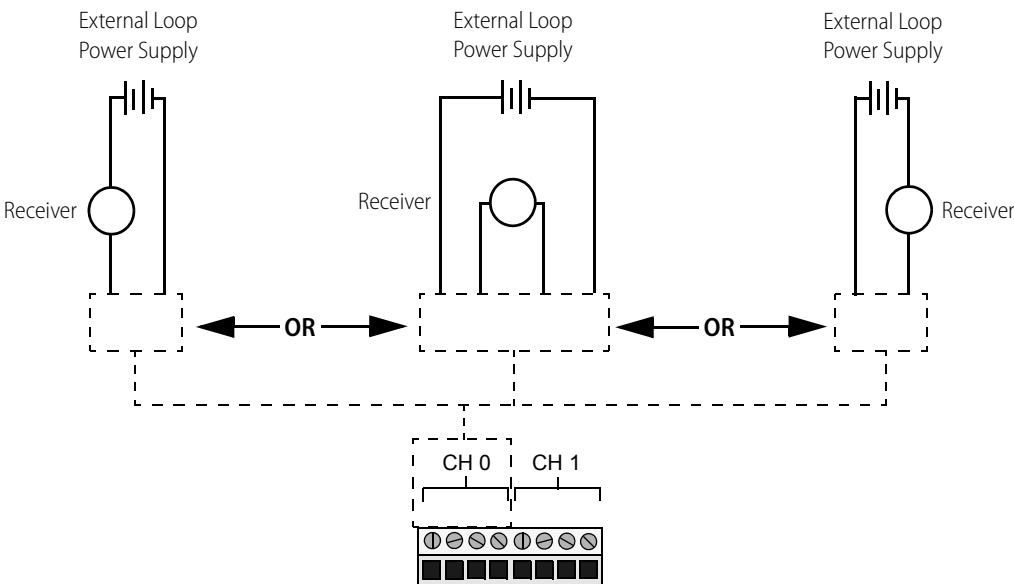
Output Range	
Nominal	4 to 20 mA
Full	3.2 to 24 mA
External Loop Voltage Range	12-36 VDC
Nominal	24 VDC
Maximum Load Resistance at Specified Loop Voltage	
12 VDC	300 Ohms
24 VDC	850 Ohms
36 VDC	1350 Ohms
Resolution	5 microamps
Accuracy	+/- 20 microamps
Response Time (% of span/delta I/delta time)	99.9%/20.7 mA/400 ms
Gain Temperature Coefficient	-50 ppm/ °C
Offset Temperature Coefficient	-25 ppm/ °C
DC Common Mode Rejection	>-120 dB
AC Common Mode Rejection	>-120 dB @ 60 Hz
Maximum Operating Common Mode Voltage	250 V continuous 1500 V transient (1 s)
Common Mode Resistance	>1000 megohms
Isolation: Channel-Channel	250 V continuous 1500 V transient (1 s)
Power Requirements	5 VDC (+/- 0.15) @ 150 mA
Ambient Temperature: Operating Storage	-20 °C to 70 °C -40 °C to 85 °C
Humidity	5-95%, non-condensing
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Agency Approvals	UL, CE, RoHS, DFARS; UKCA
Warranty	Lifetime

WIRING DIAGRAMS - SNAP HART MODULES

SNAP-AIMA-iH



SNAP-AQA-23-iH



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WIRING DIAGRAMS (CONTINUED)

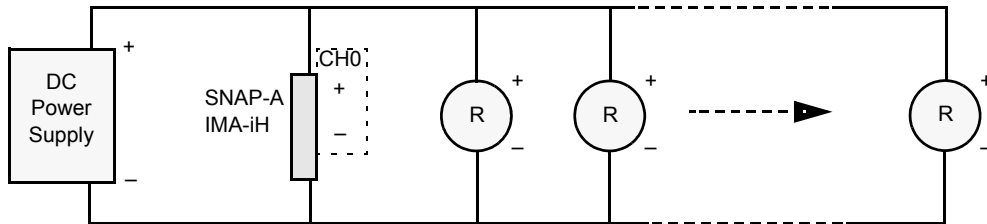
Wiring shown on the previous page is typical use.

The wiring on this page is nonstandard. **Use this page only if:**

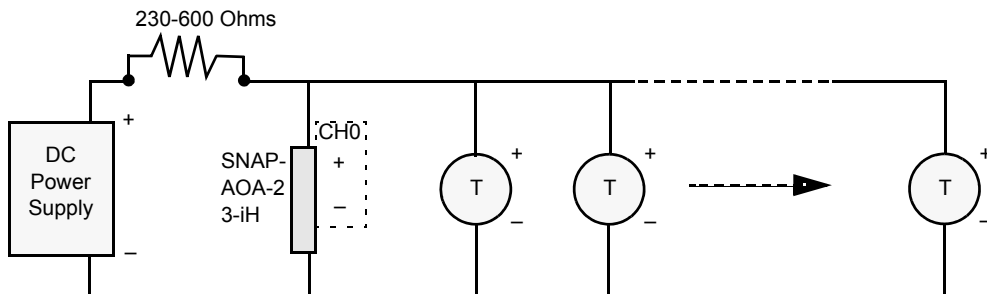
- You are using the HART protocol but not using the analog signal.
- Your HART network includes too many devices for a standard 4–20 mA loop.

This alternative wiring makes sure all HART devices on your network have adequate power.

Multidrop Wiring—SNAP-AIMA-iH

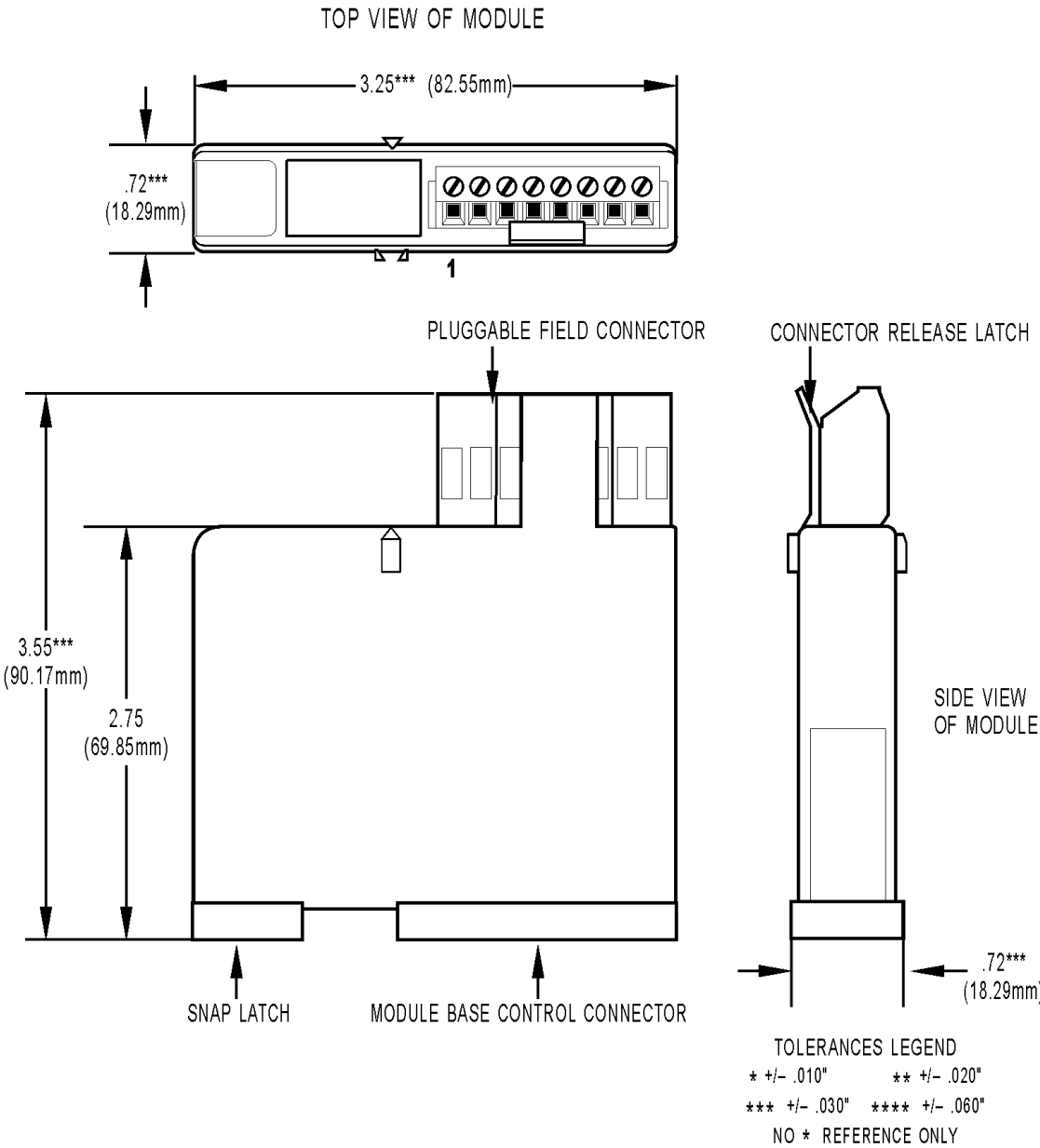


Multidrop Wiring—SNAP-AOA-23-iH

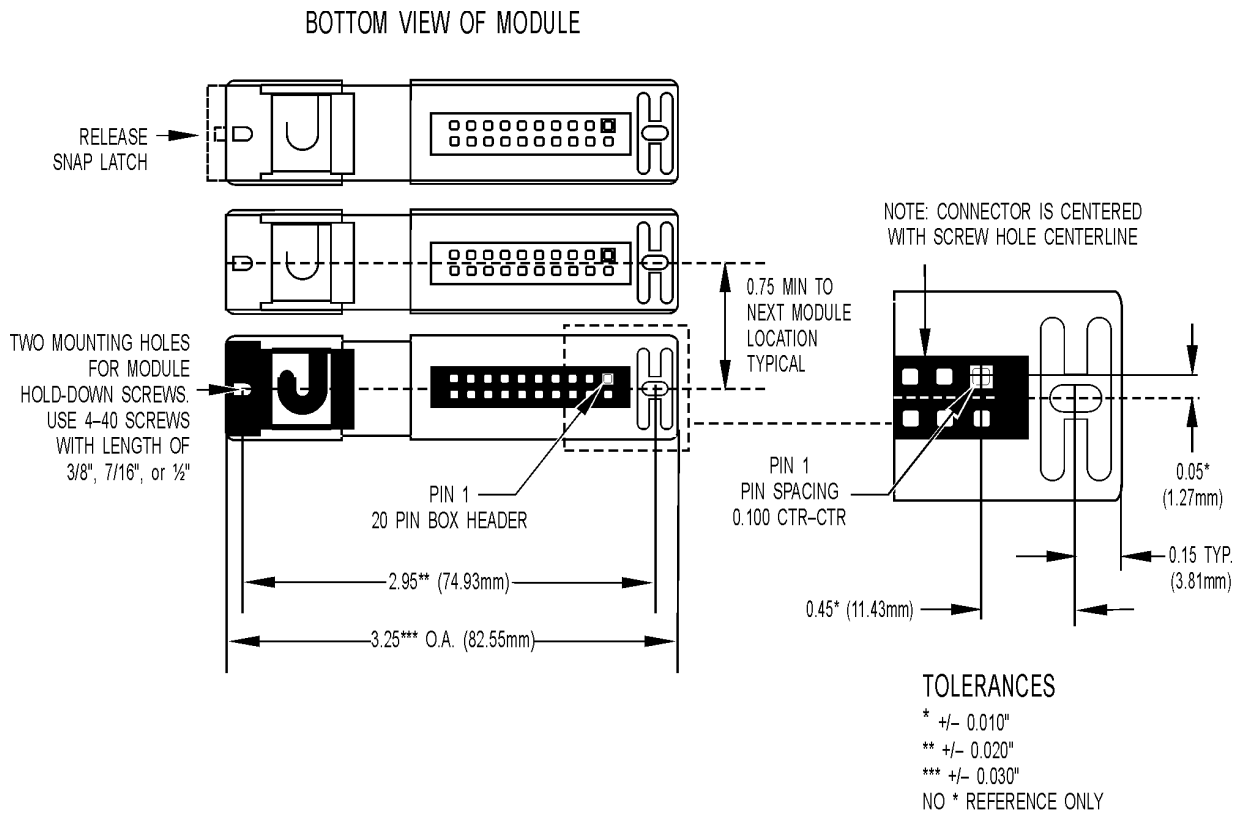


DIMENSIONAL DRAWINGS

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DIMENSIONAL DRAWINGS



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.

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 even write an IEC 61131-3 compliant control program to run on *groov RIO*, using CODESYS. 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.

