groov SERIAL MODULES

Features

> Module cover with LED indicates module status

> Touch-sensitive pad triggers display of module information on *groov* EPIC® processor's display

> 2 or 4 independent isolated channels (ports)

> Selectable operations for GRV-CSERI-4: RS-232 or RS-485

GRV-CSERI-4 serial module

GRV-CCANI-2 serial module

DESCRIPTION

groov I/O modules are part of the *groov* EPIC® (Edge Programmable Industrial Controller) system. Wired directly to field devices (sensors and actuators), *groov* I/O translates the electrical signals from those devices into the digital language computers understand—so you can monitor and control devices and use their data wherever you need it, in your local computer network or in cloud services.

The **GRV-CSERI-4** serial module provides 4 independent, isolated serial channels (ports) allowing the GRV-EPIC-PR1 to communicate with RS-232 or RS-485 serial devices. You can set up the module to communicate with RS-485 serial devices in half-duplex (2-wire transmission) or full-duplex (4-wire transmission) mode. Each channel is selectable between RS-232 mode and RS-485 mode, with configurable termination and bias in RS-485 mode. Channel 0 can also be configured to handle modem commands. Baud rates of up to 1 Mbps are supported. Please note that GRV-CSERI-4 modules may only be installed in chassis slots 0-3, for a maximum of 4 modules (16 channels) per chassis.

The **GRV-CCANI-2** serial module provides 2 independent, isolated serial channels (ports) allowing the GRV-EPIC-PR1 to communicate through a Controller Area Network (CAN).

Wiring is simplified with a top-mounted connector, which provides spring-clamp terminals for easy connection to all types of CAN, RS-232, and RS-485 devices. The connector is held in place by a single, captive retention screw but can be removed with the field wiring intact for wiring in advance or easier module field replacement.

A swinging, two-position cover protects wiring from inadvertent contact, as does the dead-front design. The two positions of the cover offer the option of more space to accommodate larger wire. The module cover provides a touch-sensitive pad; touch the pad and the *groov* EPIC processor displays information about the module, including specifications and a wiring diagram.

The module pivots into place and is held securely in place by a captive hold-down (retention) screw.

groov I/O modules are hot swappable (which means they can be installed or removed without turning off the unit or stopping the process) and self-identifying—as soon as you mount the module to the chassis, it communicates to the processor and identifies itself.

Each *groov* I/O module cover provides a large module LED to indicate module health at a glance. Serial modules also include a transmit and receive LED on each port.

All *groov* power supplies, voltage converters, pass-through power adapters, and processors, are UL/cUL listed and compliant with the ATEX, Low Voltage, and EMC CE directives. Each module is factory tested twice before shipment and most modules are guaranteed for life.

Part Numbers

Part	Description
GRV-CCANI-2	Serial communication, 2 channels, CAN2.0B, channel-to-channel isolation
GRV-CSERI-4	Serial communication, 4 channels, RS-232 or RS-485, channel-to-channel isolation

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Serial Module Control

Because *groov* serial modules are directly connected to the *groov* EPIC processor via the bus on the chassis, each serial port works like a port that's built into the processor. Essentially you can add up to 16 serial ports to your processor. (Each *groov* serial module contains four ports, and as noted, serial modules can be placed only in the first four positions on the chassis.)

This direct connection means that an EPIC processor can control serial modules on its own chassis, but it cannot control serial modules on a separate EPIC chassis. Other devices, such as a SNAP PAC controller, also cannot control serial modules on an EPIC chassis.

SPECIFICATIONS & FEATURES

Specifications are on the next few pages.

Features: GRV-CSERI-4

Feature	Channel 0	Channel 1	Channel 2	Channel 3
RS-232 Tx / Rx	●	●	●	●
RS-232 RTS / CTS	●	●	●	●
RS-232 DCD, DTR, DSR, RI	●			
RS-485 Half-duplex Mode (TxRx+/-)	●	●	●	●
RS-485 Full-duplex Mode (Tx+/-, Rx+/-)	●	●	●	●
RS-485 Termination (120 Ohms)	●	●	●	●
RS-485 Bias (750 Ohms to +V and COM)	●	●	●	●

Specifications: GRV-CCANI-2

Specifications	GRV-CCANI-2
Serial Standards	CAN 2.0
Bit Rates	10 Kbps, 20 Kbps, 50 Kbps, 100 Kbps, 125 Kbps, 250 Kbps, 500 Kbps, 750 Kbps, 1 Mbps
Maximum Bus Length (1 Mbps)	40 m
Maximum Bus Length (50 Kbps)	1000 m
Bus Termination	120 Ohms, selectable
Isolation (field-to-logic)	300 V working, 1500 V transient (1 minute)
Isolation (channel-to-channel)	300 V working
Number of Channels	2 individually configurable channels
Indicators	Transmit and Receive LEDs for each channel
Chassis Power Consumption	1.5 W
Chassis Compatibility	Slots 0–3 only. The maximum number of modules per chassis is 4.
Minimum *groov* EPIC Firmware Version	1.5.0
Minimum PAC Project Version	Upcoming release
Minimum Library Package for CODESYS Version	1.0.2.0
Wire Size	28–14 AWG
Wire Strip Length	0.315–0.354 inches (8–9 mm)
Torque, connector screw	2.5 in-lb (0.28 N-m)
Torque, hold-down screw	3.5 in-lb (0.4 N-m)
Temperature (operating)	-20 °C to +70 °C
Temperature (storage)	-40 °C to +85 °C
Relative Humidity (non-condensing)	5–95%
MTBF (minimum, 25 °C)	1.2 Mhrs
Agency Approvals	UL/cUL (Class 1, Div 2)[a]; CE: ATEX (Category 3, Zone 2) and RoHS; DFARS; CB Scheme; UKCA
Warranty	30 months

a. For use in hazardous locations, equipment must be mounted in an enclosure that meets the requirements of the National Electrical Code, ANSI/NFPA 70, and ANSI/ISA-61010-1 (82.02.01).

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Specifications: GRV-CSERI-4

Specification	GRV-CSERI-4
Serial Standards	RS-232 (DTE), RS-485 half- and full-duplex
Baud Rates	300 bps - 1 Mbps
Maximum Cable Length (RS-232)	10 m
Maximum Cable Length (RS-485)	1200 m at 38.4 Kbps, 500 m at 115.2 Kbps, 50 m at 1 Mbps
Bus Loading (RS-485)	1/8 Unit Load
Bus Termination	5 KOhms (RS-232 mode), 120 Ohms (RS-485 mode, selectable)
Bus Bias	750 Ohms, (RS-485 mode only, selectable)
Isolation (field-to-logic)	300 V working, 1500 V transient (1 minute)
Isolation (channel-to-channel)	300 V working
Number of Channels	4 individually configurable channels
Indicators	Transmit and Receive LEDs for each channels
Chassis Power Consumption	1.5 W
Chassis Compatibility	Slots 0–3 only. The maximum number of modules per chassis is 4.
Minimum *groov* EPIC Firmware Version	1.2.0
Minimum PAC Project Version	10.1000
Minimum Library Package for CODESYS Version	1.0.0.1
Wire Size	28–14 AWG
Wire Strip Length	0.315–0.354 inches (8–9 mm)
Torque, connector screw	2.5 in-lb (0.28 N-m)
Torque, hold-down screw	3.5 in-lb (0.4 N-m)
Temperature (operating)	-20 °C to +70 °C
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MTBF (minimum, 25 °C)	1.2 Mhrs
Agency Approvals	UL/cUL (Class 1 Div. 2)[a]; CE: ATEX (Category 3, Zone 2) and RoHS; DFARS; CB Scheme; UKCA
Warranty	30 months

a. For use in hazardous locations, equipment must be mounted in an enclosure that meets the requirements of the National Electrical Code, ANSI/NFPA 70, and ANSI/ISA-61010-1 (82.02.01).
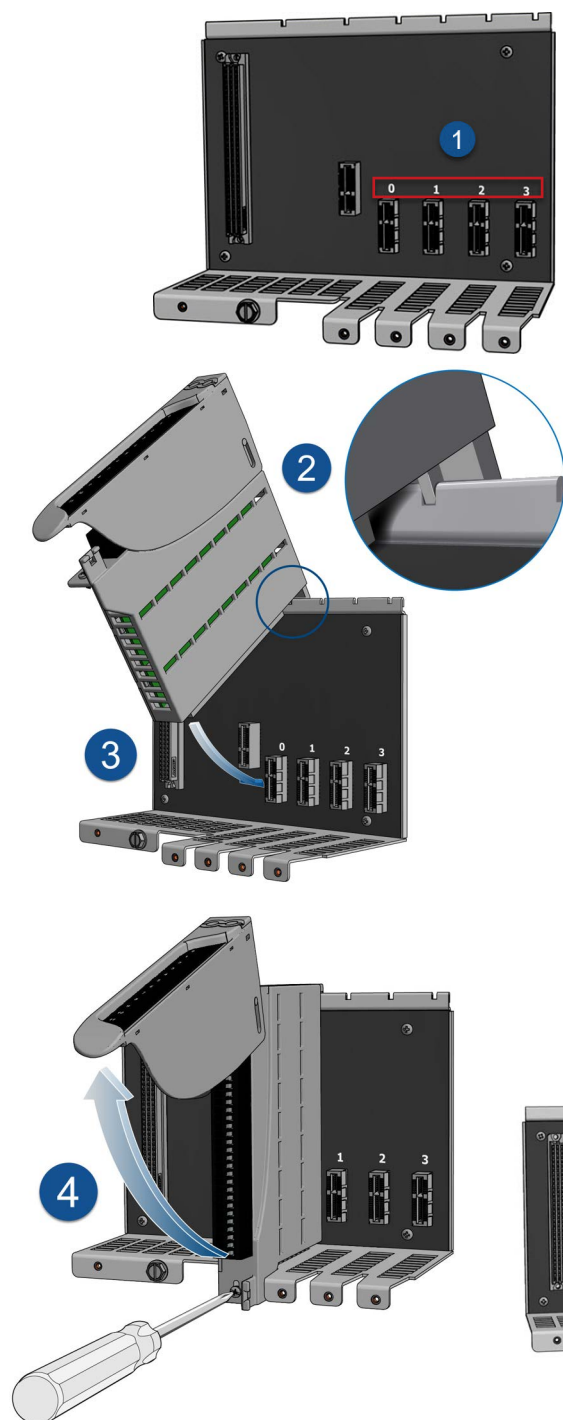
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MOUNTING

Mount *groov* I/O modules onto a *groov* EPIC chassis (see the *groov* EPIC Chassis Data Sheet (form 2247) for instructions). To learn the names and physical features of the parts of the module, see "Description of Module Parts" on page 12.

Mounting the Module

The numbers on the diagrams correspond to the numbered steps in these instructions.

CAUTION: For electrical safety, de-energize field devices wired to the terminal connector before starting.

1. Orient the *groov* EPIC chassis so that the module connector numbers are right-side up, with **0** on the left as shown in the diagram.
2. Hold the module at a 45° angle, and line up the alignment tab on the back tip of the module with the slot at the back of the chassis.
3. Pivot the front of the module down to the module connector on the chassis, and push to snap the module into the connector.
4. Lift the module cover up to access the module hold-down (retention) screw, and tighten the screw to secure the module into position.
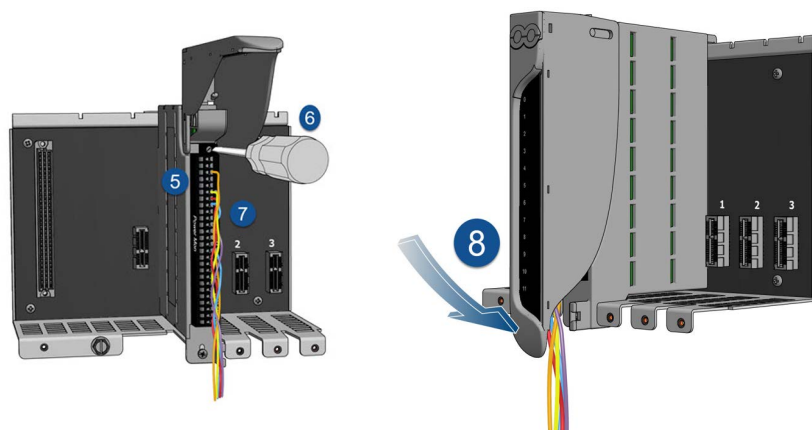
   CAUTION: Do not over-tighten. See the torque specs in the "Specifications" table.

5. If the module does not have a terminal connector, install one.
6. Secure the terminal connector by tightening the terminal connector screw.
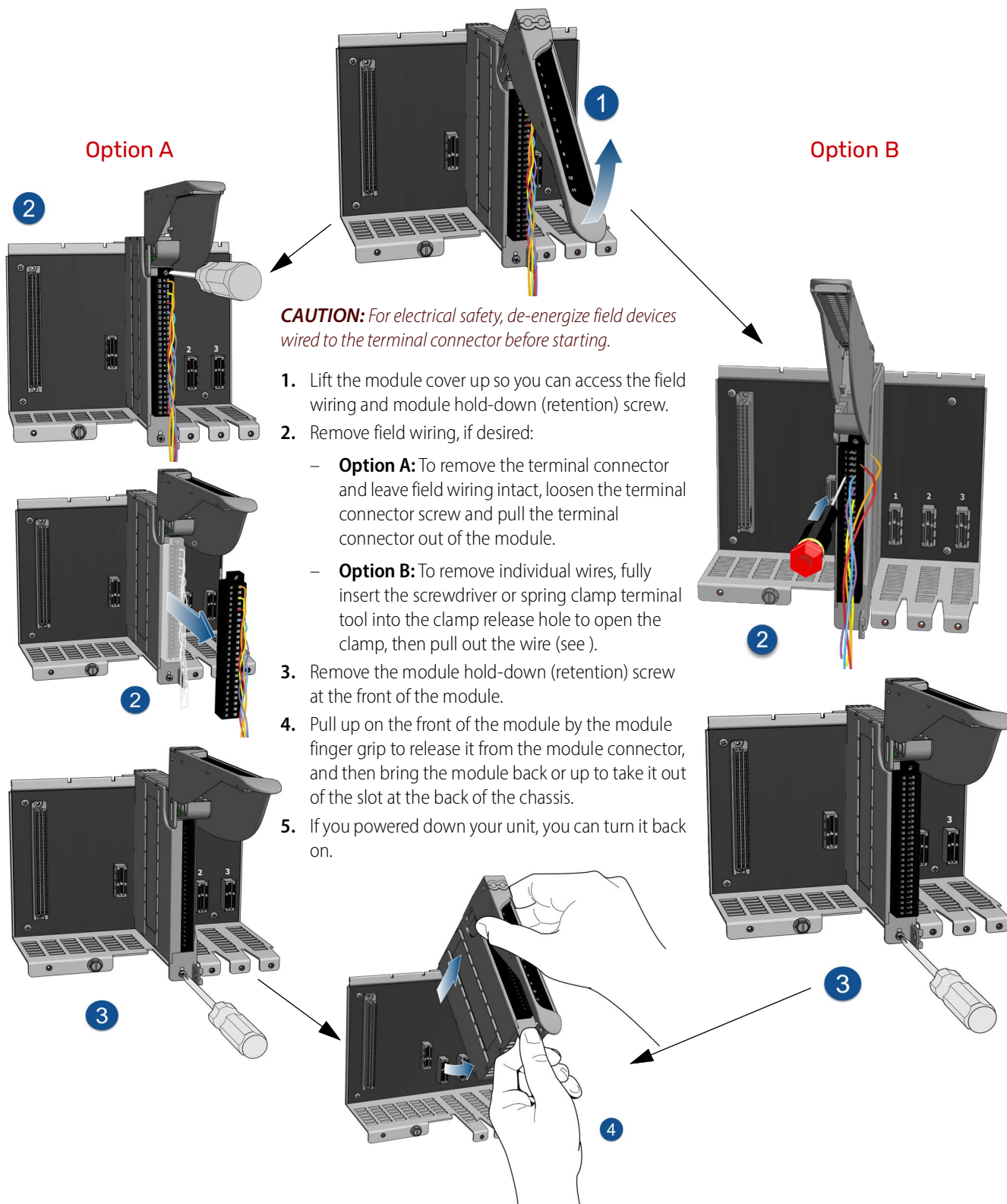
   CAUTION: Do not over-tighten. See the torque specs in the "Specifications" table.

7. Follow the wiring instructions in the "Pinout and Wiring" section to wire your field devices to the channels on the terminal connector.
8. When wiring is complete, bring the module cover back down to cover the wires. If the wires are too thick to close the module cover easily, lift the module cover, raise the back of the module cover up to the higher position, and then bring the module cover back down to cover the wires.

If you powered down your unit, you can turn it back on when you are done installing modules and wiring.

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Un-mounting the Module

Option A

Option B

CAUTION: *For electrical safety, de-energize field devices wired to the terminal connector before starting.*

1. Lift the module cover up so you can access the field wiring and module hold-down (retention) screw.

2. Remove field wiring, if desired:

   – **Option A:** To remove the terminal connector and leave field wiring intact, loosen the terminal connector screw and pull the terminal connector out of the module.

   – **Option B:** To remove individual wires, fully insert the screwdriver or spring clamp terminal tool into the clamp release hole to open the clamp, then pull out the wire (see).

3. Remove the module hold-down (retention) screw at the front of the module.

4. Pull up on the front of the module by the module finger grip to release it from the module connector, and then bring the module back or up to take it out of the slot at the back of the chassis.

5. If you powered down your unit, you can turn it back on.

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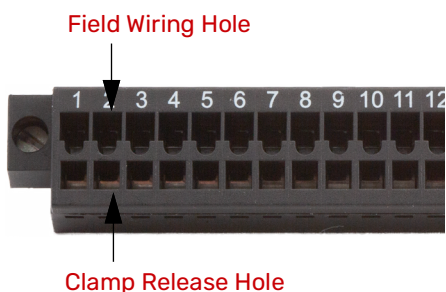
WIRING AND PINOUT

Before you begin wiring your field devices to your *groov* I/O module, make sure you select and prepare the appropriate wires and review how to use the spring clamps on terminal connectors:

Select and prepare the appropriate wire. The terminal connectors are rated for 28–14 AWG wire. Strip the wire according to the Wire Strip Length listed in the Specifications table on page 3 or page 4. If you're using stranded wire, twist or tin the strands or add ferrules to make it easier to insert the wire and create a stronger connection.
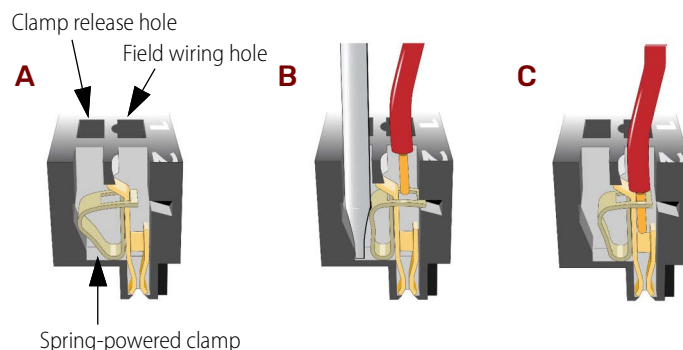
Use the right tool. To open the spring clamps, make sure to use either:

- a flathead screwdriver with a tip dimension of 2.5 mm x 0.4 mm, ***or***
- the *groov* spring-clamp terminal tool, typically supplied with a *groov* EPIC chassis. You can order a replacement spring-clamp terminal tool on our website www.opto22.com. Search for GRV-TEX-SCTOOL.

Familiarize yourself with the spring clamps. On the terminal connector, each terminal number has a corresponding **clamp release hole** and **field wiring hole**.
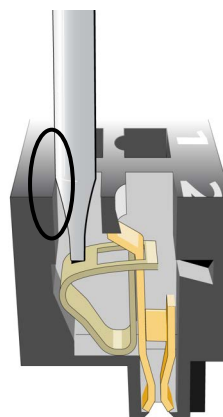
Field Wiring Hole

Clamp Release Hole

A spring-powered clamp sits between the clamp release hole and the field wiring hole (**A**). When you push the correct screwdriver (see above for dimensions) or the *groov* spring-clamp tool straight down into the clamp release hole, the diameter of the screwdriver or tool displaces the spring laterally, which exposes the hole through which you can insert the wire (**B**). When you pull the screwdriver or spring-clamp tool straight up, the spring returns to its original position, which causes the clamp to hold the wire (**C**). You can view a video that explains how to wire your field devices and demonstrates how the spring clamp works on our website, www.opto22.com.
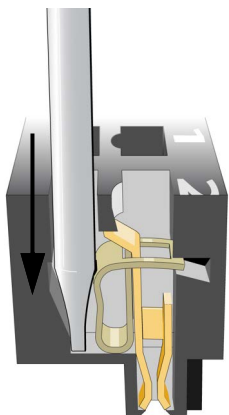
Clamp release hole
Field wiring hole

A   **B**   **C**

Spring-powered clamp

Inserting Wires

1. Orient the module or terminal connector to match the wiring diagrams on page 9 or page 10.
2. To make it easier to handle the screwdriver or the spring-clamp terminal tool and the field wires, secure the module or terminal connector:
   - If you are working with the terminal connector while it is attached to the module, make sure the module is screwed securely to the chassis.
   - If you are working only with the terminal connector, secure the terminal connector with a clamp.
3. Open the spring clamp:
   a. Insert the screwdriver or spring-clamp terminal tool into the clamp release hole, pressing the tool against the side of the hole furthest from the terminal numbers.
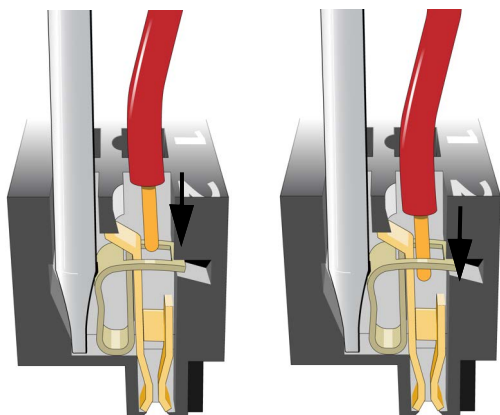
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b. Press straight down firmly until you feel the screwdriver or tool reach the bottom.
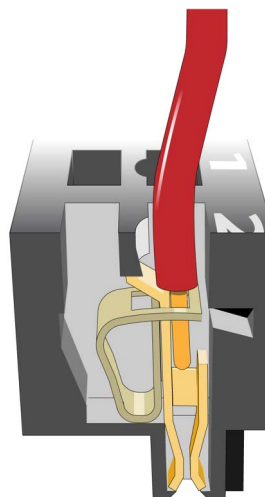
Important: Let the shape of the tool, as it is pressed straight down, open the clamp. Do not rock or wiggle the tool because it may damage the clamp.

c. You can confirm that the clamp is open by looking into the field wiring hole.
  – If the hole is dark, the clamp is open. You can go to the next step.
  – If you see a shiny surface, repeat steps a through c.
    Important: Do not rock or wiggle the tool to try to open the clamp because it may damage the clamp.

4. Insert the wire into the field wiring hole.

5. Pull out the screwdriver or spring-clamp terminal tool. The spring returns to its original position and clamps down on the wire.
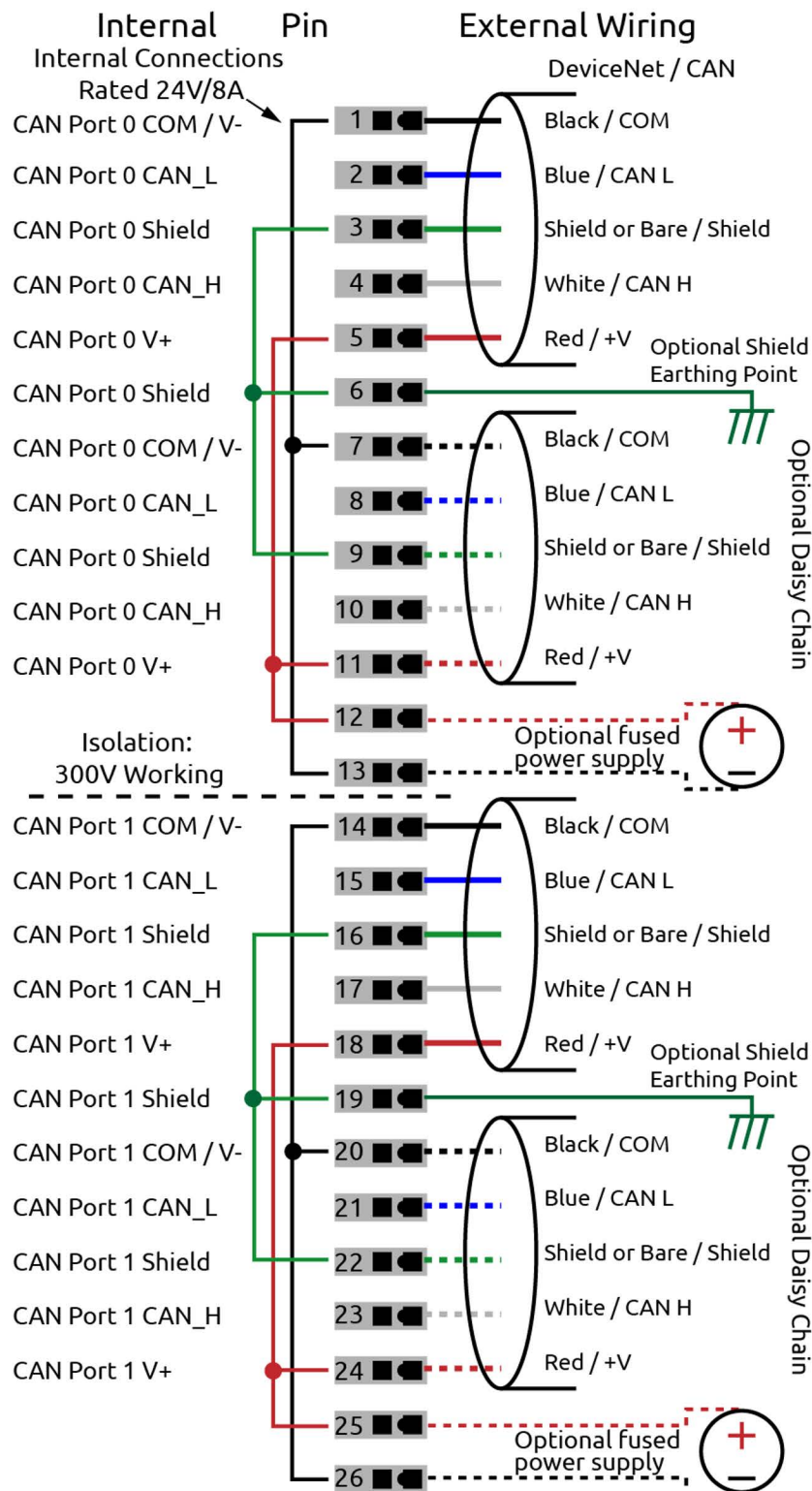
6. Test that the wire is secure by gently pulling on it. If the wire pulls out, repeat steps 3 and 4.

Removing Wires

1. Insert the screwdriver or spring-clamp terminal tool into the clamp release hole, pressing the tool against the side of the hole furthest from the terminal numbers.

2. Press straight down firmly until you feel the screwdriver or tool reach the bottom.

3. Pull the wire out.

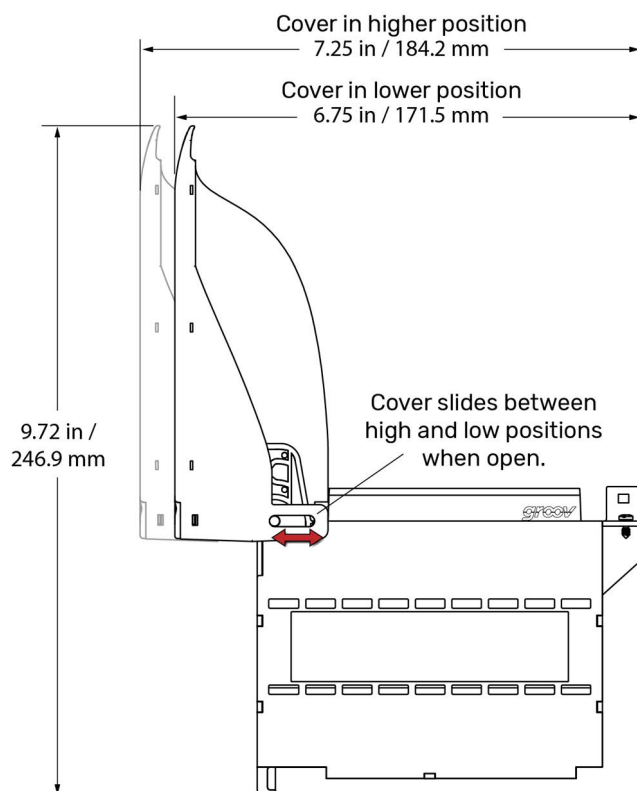**4.** Pull out the screwdriver or spring-clamp terminal tool. The spring returns to its original position.

WIRING: GRV-CCANI-2

Internal — Pin — External Wiring

Internal Connections Rated 24V/8A

DeviceNet / CAN

Internal	Pin	External Wiring
CAN Port 0 COM / V-	1	Black / COM
CAN Port 0 CAN_L	2	Blue / CAN L
CAN Port 0 Shield	3	Shield or Bare / Shield
CAN Port 0 CAN_H	4	White / CAN H
CAN Port 0 V+	5	Red / +V
CAN Port 0 Shield	6	Optional Shield Earthing Point
CAN Port 0 COM / V-	7	Black / COM
CAN Port 0 CAN_L	8	Blue / CAN L
CAN Port 0 Shield	9	Shield or Bare / Shield
CAN Port 0 CAN_H	10	White / CAN H
CAN Port 0 V+	11	Red / +V
	12	Optional fused power supply +
	13	−

Optional Daisy Chain

Isolation: 300V Working

Internal	Pin	External Wiring
CAN Port 1 COM / V-	14	Black / COM
CAN Port 1 CAN_L	15	Blue / CAN L
CAN Port 1 Shield	16	Shield or Bare / Shield
CAN Port 1 CAN_H	17	White / CAN H
CAN Port 1 V+	18	Red / +V
CAN Port 1 Shield	19	Optional Shield Earthing Point
CAN Port 1 COM / V-	20	Black / COM
CAN Port 1 CAN_L	21	Blue / CAN L
CAN Port 1 Shield	22	Shield or Bare / Shield
CAN Port 1 CAN_H	23	White / CAN H
CAN Port 1 V+	24	Red / +V
	25	Optional fused power supply +
	26	−

Optional Daisy Chain

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WIRING DIAGRAM: GRV-CSERI-4

Channel	Pin	RS 485 full duplex	RS 485 half duplex	RS 232 mode		DTE (DE9M)	DCE (DE9F)	DTE (DB25M)	DCE (DB25F)
0	1	Tx+	Tx+/Rx+	TxD	→	2	3	3	2
	2	Tx-	Tx-/Rx-	RTS	→	8	7	5	4
	3	COM	COM	COM	—	5	5	7	7
	4	Rx+	Unused	RxD	←	3	2	2	3
	5	Rx–	Unused	CTS	←	7	8	4	5
	6	Unused	Unused	DTR	→	4	4	20	20
	7	Unused	Unused	DSR	←	6	6	6	6
	8	Unused	Unused	DCD	←	1	1	8	8
	9	Unused	Unused	RI	←	9	9	22	22
	10	COM	COM	COM	—				
	11	Unused	Unused	Unused					
1	12	Tx+	Tx+/Rx+	TxD	→	2	3	3	2
	13	Tx-	Tx-/Rx-	RTS	→	8	7	5	4
	14	COM	COM	COM	—	5	5	7	7
	15	Rx+	Unused	RxD	←	3	2	2	3
	16	Rx–	Unused	CTS	←	7	8	4	5
2	17	Tx+	Tx+/Rx+	TxD	→	2	3	3	2
	18	Tx-	Tx-/Rx-	RTS	→	8	7	5	4
	19	COM	COM	COM	—	5	5	7	7
	20	Rx+	Unused	RxD	←	3	2	2	3
	21	Rx–	Unused	CTS	←	7	8	4	5
3	22	Tx+	Tx+/Rx+	TxD	→	2	3	3	2
	23	Tx-	Tx-/Rx-	RTS	→	8	7	5	4
	24	COM	COM	COM	—	5	5	7	7
	25	Rx+	Unused	RxD	←	3	2	2	3
	26	Rx–	Unused	CTS	←	7	8	4	5

To pin No. on RS-232 device

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DIMENSIONS: GRV-CCANI-2, GRV-CSERI-4

Cover in higher position
7.25 in / 184.2 mm

Cover in lower position
6.75 in / 171.5 mm

9.72 in / 246.9 mm

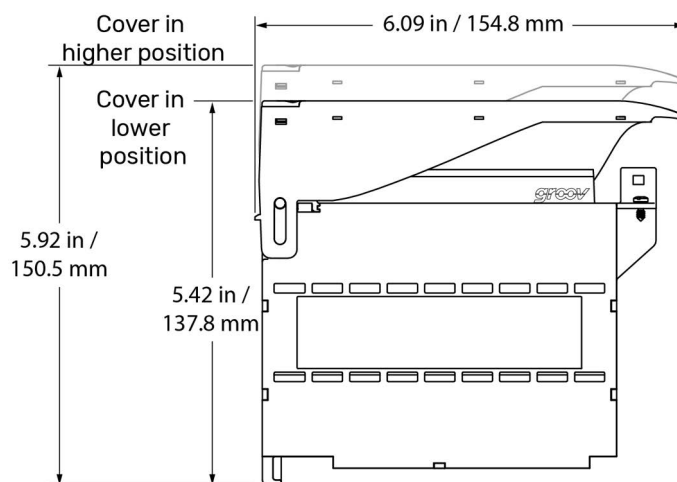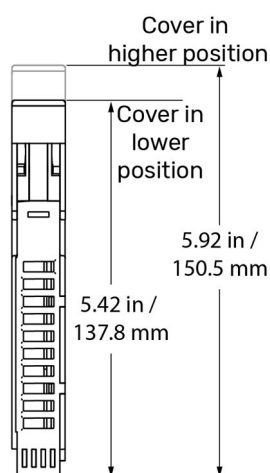Cover slides between high and low positions when open.

The module cover pivots and can be adjusted to two different heights (positions). The higher position provides more space to accommodate thicker wires.
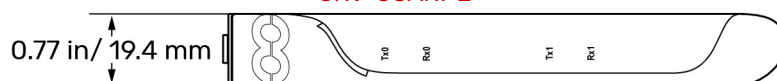
To switch between higher and lower position, lift the cover to at least a 45° angle. Grasp the hinged end of the module cover and do one of the following:

- Pull up on the back hinge to slide it to the higher position.
- Push down on the back hinge to slide it to the lower position.

You cannot switch between the higher and lower positions while the cover is closed.

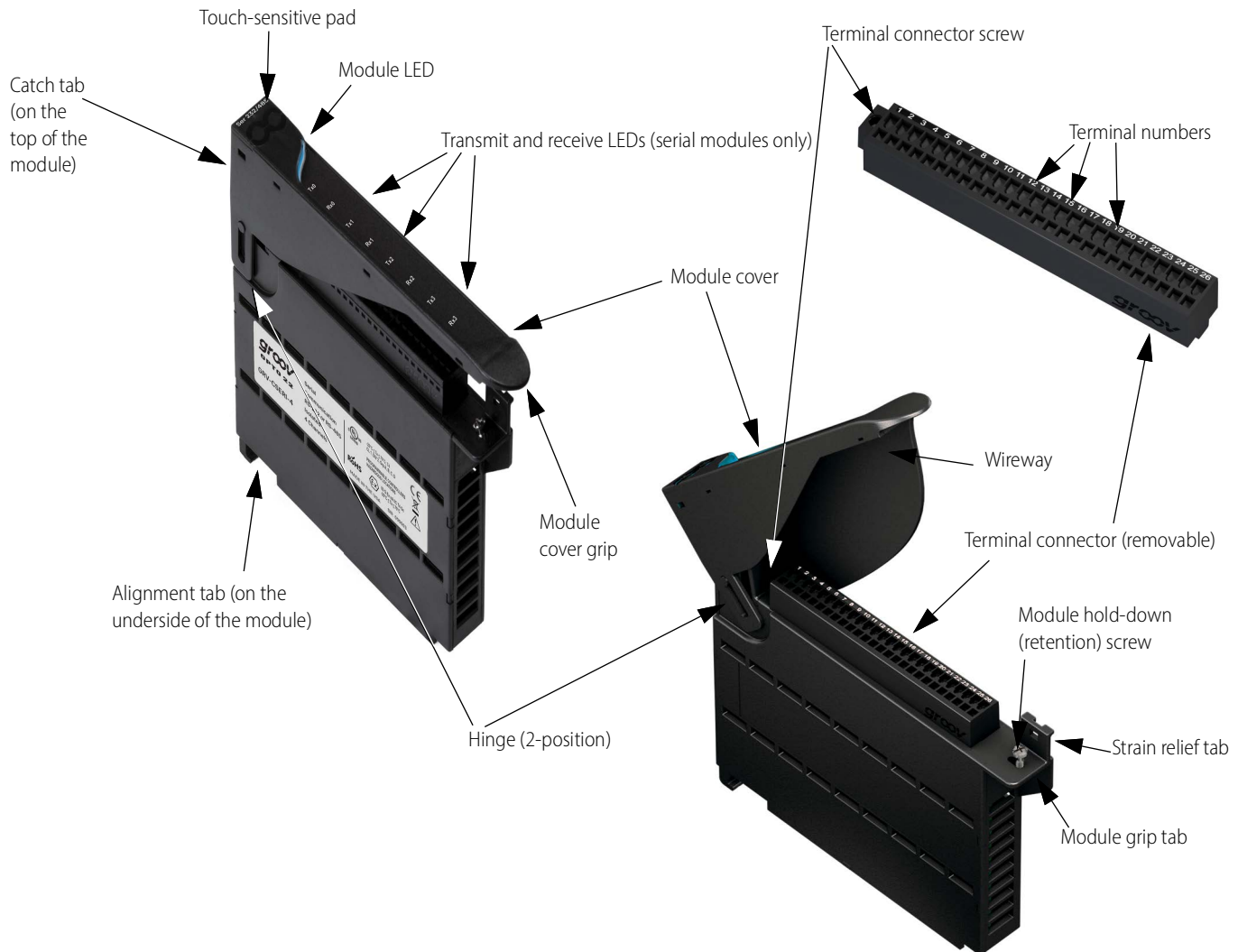Cover in higher position

Cover in lower position

5.92 in / 150.5 mm

5.42 in / 137.8 mm

Cover in higher position

Cover in lower position

6.09 in / 154.8 mm

5.92 in / 150.5 mm

5.42 in / 137.8 mm

GRV-CCANI-2

0.77 in/ 19.4 mm

GRV-CSERI-4

0.77 in/ 19.4 mm

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DESCRIPTION OF MODULE PARTS

The following diagram identifies the parts of the modules. The installation instructions in the documentation rely on these terms to describe how to handle the module.
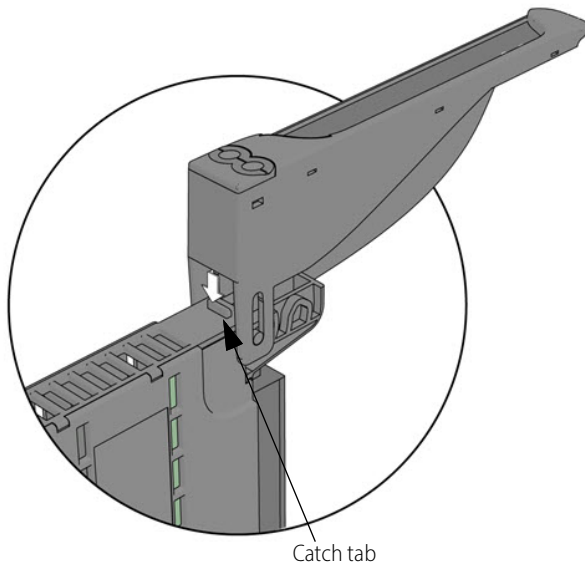

Some parts offer unique features:

- **Module LED**: Provides a visual indication of the health of the module. For example, if it is blue, the module is operating normally. If it is blinking blue, the module's information is being displayed on the *groov* EPIC processor's screen. For a complete list of the various colors that this LED might display, see the *groov* EPIC User's Guide (form 2267).

- **Terminal connector**: Specially designed for *groov* I/O modules, it provides a spring-clamp wiring system to securely connect the wires from your field devices to the module. To learn how to use a spring-clamp wiring system, see the "Pinouts and Wiring" section.

- **Hinge** and **Wireway**: These two features work together to provide more space for wires. The hinge can be adjusted between a lower position and a higher position. The wireway is the space underneath the module cover. To increase this space, you can raise the hinge to the higher position.

- **Transmit and receive LEDs**: Available only on serial modules, when a Rx channel is receiving, the LED lights up. When a Tx channel is transmitting, the LED lights up.

- **Touch-sensitive pad**: Offers a convenient way to display the module's information on the *groov* EPIC processor. Press on the pad for approximately two seconds and the processor displays
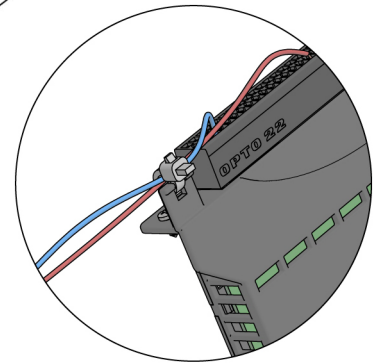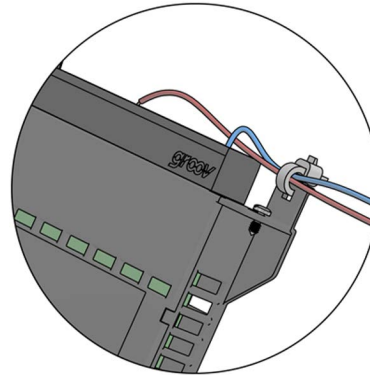
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that module's information on the screen, as well as changing the module LED to a blinking blue light.

- **Catch tab**: Located at the top of the module, the catch tab provides a place for the cover to "catch" or stop. This prevents the cover from closing so that you can work on attaching or detaching wires to the terminal connector.

Catch tab

- **Strain relief tab**: This tab offers a way to collect wires into a bundle and secure them to the module. Attaching the wires to the strain relief tab can help hold the wires in a semi-fixed position, preventing them from interfering while you work on a nearby module, as well as preventing strain on the part of the wire attached to the terminal connector.

Collect the wires into a bundle, pull a zip tie through the hole in the tab, wrap the zip tie around the bundle and tab, and then clip the excess zip tie.

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.