groov POWER MONITORING MODULE

Features

- Three-phase power monitoring
- Category III Wye (up to 400 VAC) or Delta (up to 600 VAC)
- Compatible with 0.333 V, 1 V, 1 A, or 5 A current transformers
- Measures AC RMS voltage and AC RMS current; provides power measurements and accumulated energy
- 64 channels of voltage, current, power, energy, and frequency data
- Module cover with LED indicates module status
- Touch-sensitive pad triggers display of module information on *groov* EPIC® processor's display
- Operating temperature: -20 to 70 °C
- UL Hazardous Locations approved and ATEX compliant

GRV-IVAPM-3

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-IVAPM-3** is an analog input module that provides an efficient way to monitor AC voltage, current, power, and energy usage on Wye or Delta circuits up to UL 61010-3 measurement category III. It can monitor three-phase AC current using 0.333 V, 1 V, 1 A, or 5 A current transformers (CT). If the module is part of a *groov* EPIC system running a PAC Control™ strategy, strategy logic can automatically perform additional calculations and take action to address any issues detected.

The module measures AC RMS voltage and AC RMS current for up to three phases. From the measured field inputs, the module automatically calculates additional channels of significant data, for a total of 64 data channels. Calculated data includes true, reactive and apparent power, power factor, frequency, net energy, and other values for each phase as well as combined totals for all phases. For more details, see "Channel Map" on page 5.

Accumulated energy values are preserved in non-volatile memory every 30 seconds to survive across power interruptions to the *groov* EPIC control system.

This module can be configured to eliminate small signals from power measurement and energy accumulation (see "Input Signal Filtering" on page 2).

Each module comes with a top-mounted, removable terminal connector, which provides spring-clamp terminals for phase voltage and CT signals. The connector is held in place by a single, captive retention screw. The connector is uniquely keyed, preventing it from being plugged into any other type of module, a safety feature which prevents the connection of high voltage loads to any other module. You can order additional connectors from our website, www.opto22.com (search for part number GRV-TERMPM13-5).

With the terminal connector removed from the module:

- Module placement is simplified:
  - Mount the module to the chassis without interference by the wires.
  - Easily move the module from one slot to another.
  - Quickly replace the module with another module.
- Wiring is simplified:
  - Wire your signal wires in advance, saving time.
  - Preserve your wiring if you have to replace your existing GRV-IVAPM-3 with another GRV-IVAPM-3.

Important: *If you are using a 1 A or 5 A CT,* ***never*** *remove the terminal connector with power applied to the CT.*

Part Numbers

Part	Description
GRV-IVAPM-3	Input, power monitoring, 3 phase, 600 V with 0.333 V, 1 V, 1 A or 5 A CT

MADE IN THE USA

The module pivots into place and is held securely by a captive retention screw. *groov* I/O modules are hot swappable (which means they can be installed or removed without turning off power to the *groov* EPIC processor) and self-identifying—as soon as you mount the module to the chassis, it communicates to the processor and identifies itself.

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.

Each *groov* I/O module cover provides a large module LED to indicate module health at a glance.

Input Signal Filtering

Each phase can be configured to eliminate small signals from power measurement and energy accumulation through the adjustment of three options: Minimum Voltage Threshold Ratio, Minimum Current Threshold Ratio, and Power Creep Adjustment.

Minimum Voltage Threshold Ratio

The minimum voltage below which all input values for a phase (except energy totals) are set to 0. This value is specified as a fraction of the full-scale voltage (in PAC Control, this is called the "Voltage Type for All Phases" option). For example, if the full-scale voltage is set to 0–520 V_{rms} Delta and Minimum Voltage Threshold Ratio is set to 0.05, input values for the phase are set to 0 when the voltage measured on the phase drops below (520*0.05)=26 V_{rms}.

When set to the default (0.0), the module uses a default Minimum Voltage Threshold Ratio value.

Note: You cannot set a minimum voltage threshold ratio lower than the default value implemented by the module.

When set to 1.0, all input values (except energy totals) for this phase are set to zero regardless of the measured voltage. This is how you disable this phase.

Minimum Current Threshold

The minimum current below which all input values for a phase (except voltage and energy totals) are set to 0. This value is specified in units of RMS amps (A_{rms}).

When set to the default (0.0), the module uses a default Minimum Current Threshold value.

Note: You cannot set a threshold value lower than the default value implemented by the module.

Power Creep Adjustment

The power threshold below which all measured values for the phase are set to zero (except V_{rms}, I_{rms}, and energy totals.) This threshold is specified as percent of full-scale apparent power (full-scale V_{rms}) * (full-scale I_{rms}). The default value is 0.0%.

For example, to set all power values for this phase to zero when the power drops below 10%, specify a value of 10.0. If the full-scale voltage is set to 0–300 V_{rms} Wye and the full-scale current is set to 50 A_{rms}, all values for this phase are set to zero when apparent power is below 300 V_{rms} * 50 A_{rms} * 10% / 100% = 1500 VA.

FEATURES AND SPECIFICATIONS

Specifications are listed on the next page.

Features

Features	GRV-IVAPM-3
Scaling	x
Offset and Gain	N/A
Minimum/Maximum Values	x
Average Filter Weight	x
Simple Moving Average	N/A
Analog Totalizing	x
Quality Indication[a]	x

a. The Quality Indication feature enables a channel to provide a numerical code that describes a characteristic of the signal entering or leaving the channel. For a list of numerical codes and what characteristic they describe, see "Quality Indication" (below).

Quality Indication

The following table lists the quality codes the indicated signal type(s) may report.

Code	Reportable by	Description
0	Any channel reporting quality	Data quality is good. No exception conditions occurred.
5	Any channel configured for I_{rms}, V_{rms}, or True Power	Analog input above operating limits.
7	Any channel configured for I_{rms}, V_{rms}, or True Power	Module isolated field circuitry in reset; part of module firmware to auto-recover field circuitry that may be in an undefined state.
8	Any channel configured for I_{rms}, V_{rms}, or True Power	Module failed communication with isolated field circuitry like analog to digital and digital to analog converters.
15	Any channel configured for I_{rms} or V_{rms}	Analog input is 10% above the highest range. Applicable to unipolar (zero and positive values only) and bipolar (can include negative and positive values) signal ranges. For example: • A channel on a GRV-IVAPM-3 module is configured for 0–5 A_{rms} and the field signal is actually 5.5 A_{rms}. To determine the highest range value, see the specification table.
30	Any channel reporting quality	Channel not present.

Specifications

Specification	GRV-IVAPM-3
Maximum UL61010-3 Measurement Category	Category III 600 VAC
Delta Voltage Input Ranges, V_{rms}	600, 520, 260
Wye Voltage Input Ranges, V_{rms}	400, 300, 150
Voltage Accuracy (% of range @ 50-60 Hz, excluding Voltage transformer)	Wye: ±0.35%, Delta: ±0.5%
Current Transformer (CT) Outputs Supported	5.0 A, 1.0 A, 1.0 VAC or 0.3333 VAC
Current Accuracy (% of CT range @ 50-60 Hz, excluding Current transformer)	±0.5%
Power Accuracy (% of (V_{rms} range) * (CT current rating), @ 50-60Hz)	±0.5%
Data Refresh Time	1 s
Step Response Time	1 s
Quality Indication	V_{rms} out of range, I_{rms} out of range
Isolation (field-to-logic)	3600 VAC working, 5400 VAC transient
Isolation (channel-to-channel)	N/A
Number of Data Channels	64
Chassis Power Consumption	1.1W
Minimum *groov* EPIC Firmware Version	3.3.0
Minimum PAC Project Version	10.4000
Minimum Library Package for CODESYS Version	2.0.3.0
Wire Size	28–14 AWG
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
Humidity (non-condensing)	5–95% RH
Agency Approvals	UL/cUL(Class 1 Div. 2), CE, ATEX(Category 3, Zone 2), RoHS, DFARS
Warranty	Lifetime

CHANNEL MAP

Ch	Phase	Description	Details
0	A	V_{rms}	Root-mean-square voltage for the phase in units of V_{rms}, measured relative to the neutral terminal, calculated once per second from 4000 samples. This value is always positive. This channel can be configured with one of the following channel types: 0–600 V_{rms} Delta, 0–520 V_{rms} Delta, 0–260 V_{rms} Delta, 0–400 V_{rms} Wye, 0–300 V_{rms} Wye, 0–150 V_{rms} Wye.
1	A	I_{rms}	Root-mean-square current for the phase in units of A_{rms}, calculated once per second from 4000 samples. This value is always positive. This channel can be configured with one of the following channel types: 0–5 A_{rms} CT, 0–1 A_{rms} CT, 0–1 V_{rms} CT, 0–0.333 V_{rms} CT.
2	A	True Power	True (or real or active) power for the phase in units of W, calculated once per second from 4000 samples of instant power. This value can be positive or negative.
3	A	Reactive Power	Reactive power for the phase in units of var. This value is calculated once per second from the square root of the apparent power square minus the true power squared. This value is always positive.
4	A	Apparent Power	Apparent power for the phase in units of VA, calculated once per second from V_{rms} times I_{rms}. This value is always positive.
5	A	Power Factor	Ratio of true power to apparent power for the phase, calculated once per second. This ratio is always between -1.0 and 1.0.
6	A	Peak Voltage	Instantaneous peak voltage over the last second for the phase in units of V. This value can be positive or negative.
7	A	Peak Current	Instantaneous peak current over the last second for the phase in units of A. This value can be positive or negative.
8	A	Frequency	AC line frequency for the phase in units of Hz. This value is updated once per second and is always positive.
9	A	True Power at Fundamental Frequency	True (or real or active) power at the fundamental frequency for the phase in units of W, calculated once per second from a discrete Fourier transform at the fundamental frequency on the voltage and current and multiplying the result. This value can be positive or negative.
10	A	Harmonic True Power	True (or real or active) power in the harmonics for the phase in units of W, calculated once per second by subtracting true power at the fundamental frequency from true power. This value can be positive or negative.
11	A	Reactive Power at Fundamental Frequency	Reactive power at the fundamental frequency for the phase in units of var, calculated once per second from a discrete Fourier transform at the fundamental frequency on the voltage and current and multiplying the result. This value can be positive or negative.
12	A	Average Reactive Power	Reactive power for the phase in units of var. This value is updated once per second from the average of 4000 samples of the product of the voltage, shifted 90 degrees, and the current. This value can be positive (due to a capacitive load) or negative (due to an inductive load.)
13	A	Net Energy	Net energy for the phase, accumulated by adding true power once per second to a signed 64-bit integer in units of mWh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kWh, 64-bit signed integer in units of mWh, and 32-bit signed integer in units of mWh. For more details, see "Energy Values" on page 8.
14	A	Positive Energy	Positive energy for the phase, accumulated by adding true power, if it is positive, once per second to a signed 64-bit integer in units of mWh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kWh, 64-bit signed integer in units of mWh, and 32-bit signed integer in units of mWh. For more details, see "Energy Values" on page 8.

Continued on next page.

Ch	Phase	Description	Details
15	A	Negative Energy	Negative energy for the phase, accumulated by adding true power, if it is negative, once per second to a signed 64-bit integer in units of mWh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kWh, 64-bit signed integer in units of mWh, and 32-bit signed integer in units of mWh. For more details, see "Energy Values" on page 8.
16	A	Net Reactive Energy	Net reactive energy for the phase, accumulated by adding reactive power once per second to a signed 64-bit integer in units of mvarh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kvarh, 64-bit signed integer in units of mvarh, and 32-bit signed integer in units of mvarh. For more details, see "Energy Values" on page 8.
17	A	Apparent Energy	Apparent energy for the phase, accumulated by adding reactive power once per second to a signed 64-bit integer in units of mVAh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kVAh, 64-bit signed integer in units of mVAh, and 32-bit signed integer in units of mVAh. For more details, see "Energy Values" on page 8.
18	B	V_{rms}	For details, see channel 0
19	B	I_{rms}	For details, see channel 1
20	B	True Power	For details, see channel 2
21	B	Reactive Power	For details, see channel 3
22	B	Apparent Power	For details, see channel 4
23	B	Power Factor	For details, see channel 5
24	B	Peak Voltage	For details, see channel 6
25	B	Peak Current	For details, see channel 7
26	B	Frequency	For details, see channel 8
27	B	True Power at Fundamental Frequency	For details, see channel 9
28	B	Harmonic True Power	For details, see channel 10
29	B	Reactive Power at Fundamental Frequency	For details, see channel 11
30	B	Average Reactive Power	For details, see channel 12
31	B	Net Energy	For details, see channel 13
32	B	Positive Energy	For details, see channel 14
33	B	Negative Energy	For details, see channel 15
34	B	Net Reactive Energy	For details, see channel 16
35	B	Apparent Energy	For details, see channel 17
36	C	V_{rms}	For details, see channel 0
37	C	I_{rms}	For details, see channel 1
38	C	True Power	For details, see channel 2
39	C	Reactive Power	For details, see channel 3
40	C	Apparent Power	For details, see channel 4
41	C	Power Factor	For details, see channel 5
42	C	Peak Voltage	For details, see channel 6
43	C	Peak Current	For details, see channel 7
44	C	Frequency	For details, see channel 8

Continued on next page.

Ch	Phase	Description	Details
45	C	True Power At Fundamental Freq	For details, see channel 9
46	C	Harmonic True Power	For details, see channel 10
47	C	Reactive Power At Funda-mental Freq	For details, see channel 11
48	C	Average Reactive Power	For details, see channel 12
49	C	Net Energy	For details, see channel 13
50	C	Positive Energy	For details, see channel 14
51	C	Negative Energy	For details, see channel 15
52	C	Net Reactive Energy	For details, see channel 16
53	C	Apparent Energy	For details, see channel 17
54	All	Total True Power	True power for all 3 phases in units of W, calculated once per second from the sum of true power for each phase. This value can be positive or negative.
55	All	Total Reactive Power	Reactive power for all 3 phases in units of var, calculated once per second from the sum of reactive power for each phase. This value is always positive.
56	All	Total Apparent Power	Apparent power for all 3 phases in units of VA, calculated once per second from the sum of apparent power for each phase. This value can be positive or negative.
57	All	Total Net Energy	Net energy for all 3 phases, accumulated by adding the sum of true power for all phases once per second to a signed 64-bit integer in units of mWh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kWh, 64-bit signed integer in units of mWh, and 32-bit signed integer in units of mWh. For more details, see "Energy Values" on page 8.
58	All	Total Unsigned Energy	Net energy for all 3 phases, accumulated by adding the sum of the absolute value of true power for each phase once per second to a signed 64-bit integer in units of mWh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kWh, 64-bit signed integer in units of mWh, and 32-bit signed integer in units of mWh. For more details, see "Energy Values" on page 8.
59	All	Total Positive Energy	Positive energy for all 3 phases, accumulated by adding the sum of true power for all phases if this sum is greater than zero once per second to a signed 64-bit integer in units of mWh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kWh, 64-bit signed inte-ger in units of mWh, and 32-bit signed integer in units of mWh. For more details, see "Energy Values" on page 8.
60	All	Total Negative Energy	Negative energy for all 3 phases, accumulated by adding the sum of true power for all phases if the sum is less than zero once per second to a signed 64-bit integer in units of mWh. This value can be positive or negative (due to roll-over) and is stored to non-volatile memory every 30 sec-onds. This value can be read in three different formats: 32-bit IEEE float in units of kWh, 64-bit signed integer in units of mWh, and 32-bit signed integer in units of mWh. For more details, see "Energy Values" on page 8.
61	All	Total Net Reactive Energy	Net reactive energy for all 3 phases, accumulated by adding the sum of reactive power for all phases once per second to a signed 64-bit integer in units of mvarh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kvarh, 64-bit signed integer in units of mvarh, and 32-bit signed integer in units of mvarh. For more details, see "Energy Values" on page 8.

Ch	Phase	Description	Details
62	All	Total Net Apparent Energy	Positive energy for all 3 phases, accumulated by adding the sum of true power for all phases if this sum is greater than zero once per second to a signed 64-bit integer in units of mVAh. This value can be positive or negative and is stored to non-volatile memory every 30 seconds. This value can be read in three different formats: 32-bit IEEE float in units of kVAh, 64-bit signed integer in units of mVAh, and 32-bit signed integer in units of mVAh. For more details, see "Energy Values" on page 8.
63	All	Average Power Factor	Average power factor for all 3 phases, calculated once per second from the ratio of Total True Power to Total Apparent Power. This value can be positive or negative.

Energy Values

The following channels provide accumulated energy values:

Channels	Phase
13–17	A
31–35	B
49–53	C
57–62	Totals for All Phases

The module provides read, write, and read & clear operations to these channels; each operation supports specific data type(s).

Reading Accumulated Energy Values

The read operation reads the units as either kWh or mWh, depending on the data type:

- **32-bit IEEE floating-point,** which the operation reads as units of kWh (kvarh or kVAh).

  In a PAC Control strategy, you can read the values as 32-bit IEEE floating points with the Get Counter command.

  Note: *With this data type, you lose precision as the magnitude of the value increases. For example, when the magnitude reaches approximately 15 kWh, the data type cannot report the accumulated energy with 0.000001 kWh precision. This is due to the properties of the 32-bit IEEE floating-point data type. If your application requires this level of precision at this magnitude, use the 64-bit signed integer.*

- **64-bit signed integer,** which the operations reads as units of mWh (mvarh or mVAh).

  In a PAC Control strategy, you can read the values as 64-bit signed integers with the Get Counter 64 command.

Writing Accumulated Energy Values

The write operation stores the value to non-volatile memory immediately. The operation requires that the value be specified as a **64-bit signed integer**.

In a PAC Control strategy, you can write the values as 64-bit signed integers with the Set Counter 64 command.

Reading and Clearing Accumulated Energy Values With One Operation

The read and clear operation reads the current value as units of mWh (mvarh or mVAh) and sets it to zero in a manner that prevents the loss of accumulated energy during the operation. The operation stores the cleared value into non-volatile memory immediately. The operation requires that the value be specified as a **64-bit signed integer**.

In a PAC Control strategy, you can read the values as 64-bit signed integers with the Get & Clear Counter 64 command.

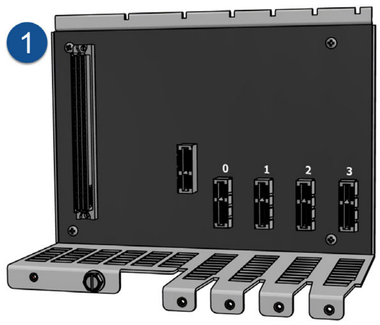
MOUNTING & REMOVING

Mount *groov* I/O modules onto a *groov* EPIC chassis (see *groov* EPIC Chassis Data Sheet, form 2247). To learn the names and physical features of the parts of the module, see "Description of Module Parts" on page 15.

Mounting a 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.*



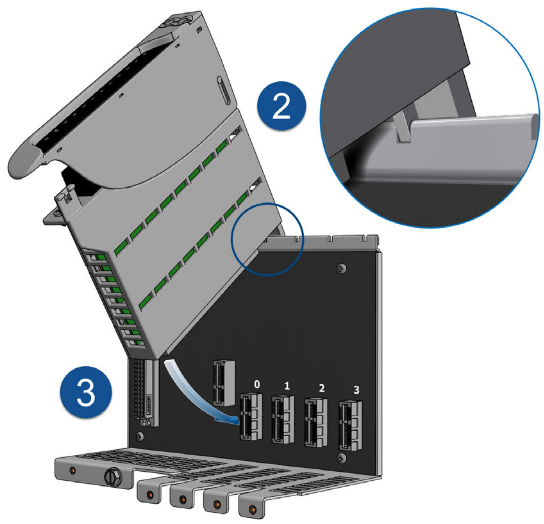
1. Orient the *groov* EPIC chassis so that the module connector numbers are right-side up, with module connector zero on the left, as shown in the diagram.
2. Hold the module at a 45° angle, lining up the alignment tab on the back tip of the module with the slot at the back of the chassis.
3. Pivot the front of the module down to the module connector on the chassis. Push to snap the module into the connector.
4. Swing the module cover up so you can access the module retention screw. Secure the module into position by tightening the module retention screw.

   CAUTION: *Do not over-tighten. See the torque specs in the Specifications table.*

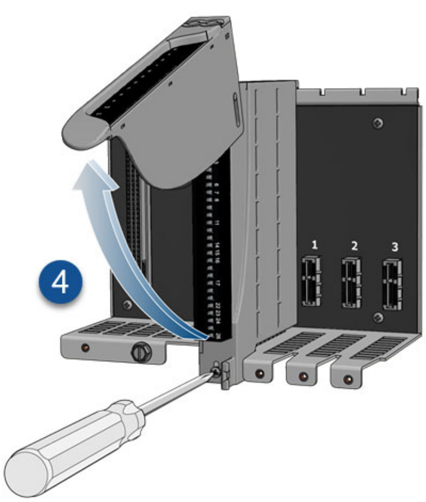
5. If the module does not have a terminal connector, install one.
6. Secure the terminal connector by tightening the terminal connector screw.

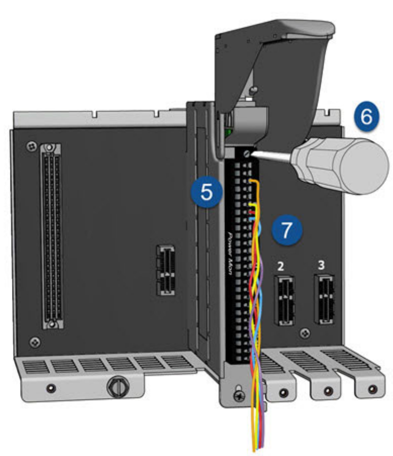
   CAUTION: *Do not over-tighten. See the torque specs in the Specifications table.*

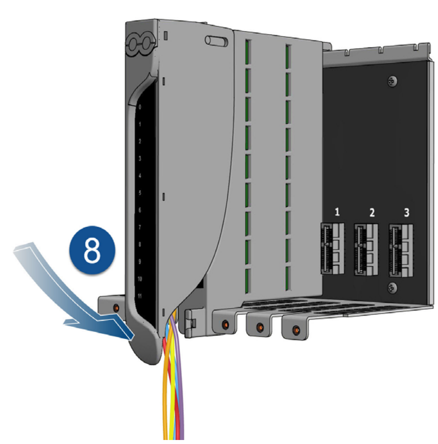
7. Follow the wiring instructions in the Pinout and Wiring section to wire your field devices to the channels on the terminal connector.
8. When wiring is complete, swing the module cover back down to cover the wires. If the wires are too thick to close the module cover easily, lift the module cover,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



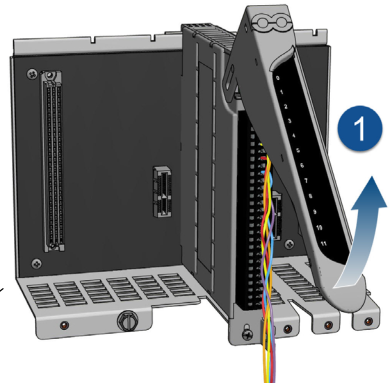
When you are done installing modules and wiring, if you powered down your unit, you can turn it back on.

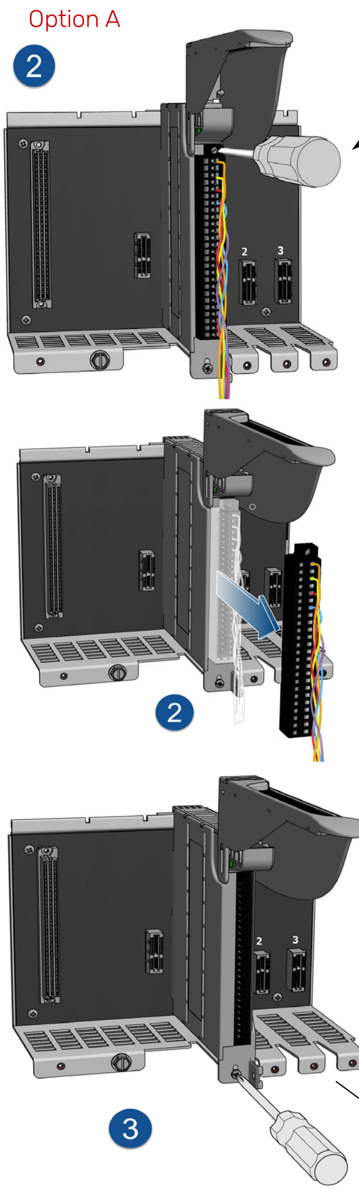


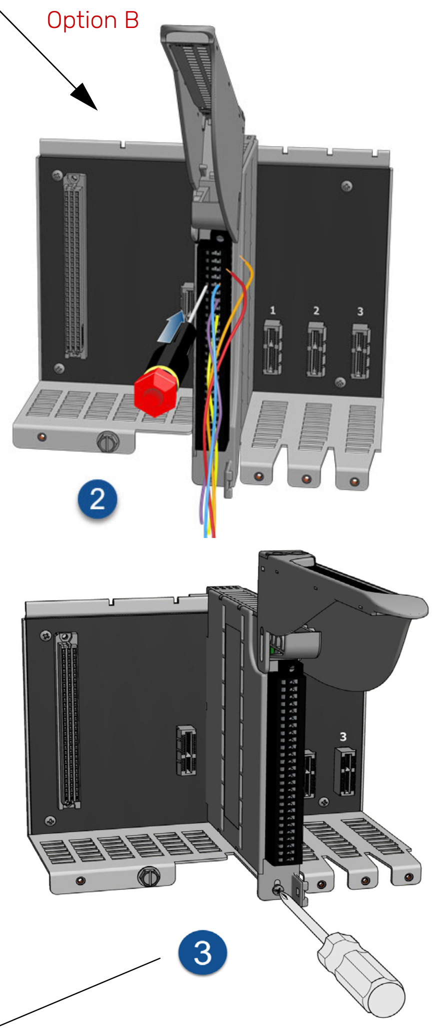




Removing a Module

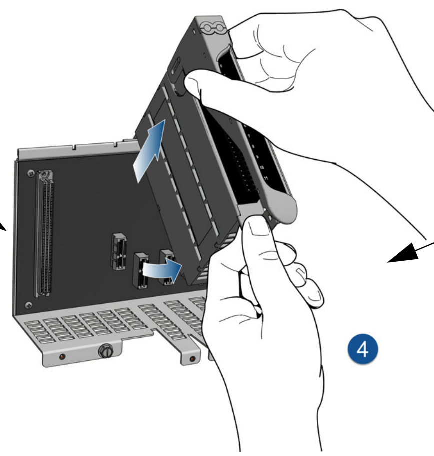






CAUTION: For electrical safety, de-energize field devices wired to the terminal connector before starting.

1. Swing the module cover up so you can access the field wiring and module 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, push the provided spring clamp terminal tool into the clamp release hole to release the catch, and then pull the wire out.
3. Remove the module retention screw at the front of the module.
4. Pull up on the front of the module by the module grip tab to release it from the module connector, and then swing 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.

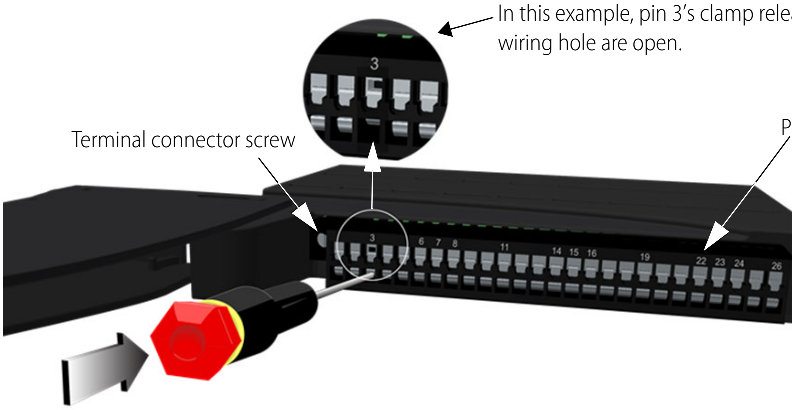


PINOUT AND WIRING

Before you begin wiring, do the following tasks:

- Select the appropriate wire. The terminal connectors are rated for 28–14 AWG wire. If you're using stranded wire, you must add ferrules.
- Ensure that you have the *groov* spring-clamp terminal tool, typically supplied with a *groov* EPIC chassis. (You can order a replacement on our website, www.opto22.com. Search for GRV-TEX-SCTOOL.)
- If you are unfamiliar with the names of some of the parts of the module, review the diagrams on this page and in the Description of Module Parts section.
- It may be easier to insert wires if you remove the terminal connector from the module. To remove the terminal connector, loosen the terminal connector screw at one end of the connector, then pull the connector straight out to remove it from the module.
- If you have never used a spring-clamp wiring system, take a moment to familiarize yourself with the diagram below. The clamp release hole is where you will insert the spring-clamp terminal tool. The field wiring hole is where you will insert your field wires.

  If you look into the field wiring hole, you will see a highly reflective surface. If you can see that surface, that means that the clamp is closed.



Follow these instructions to connect your field wires to the module:

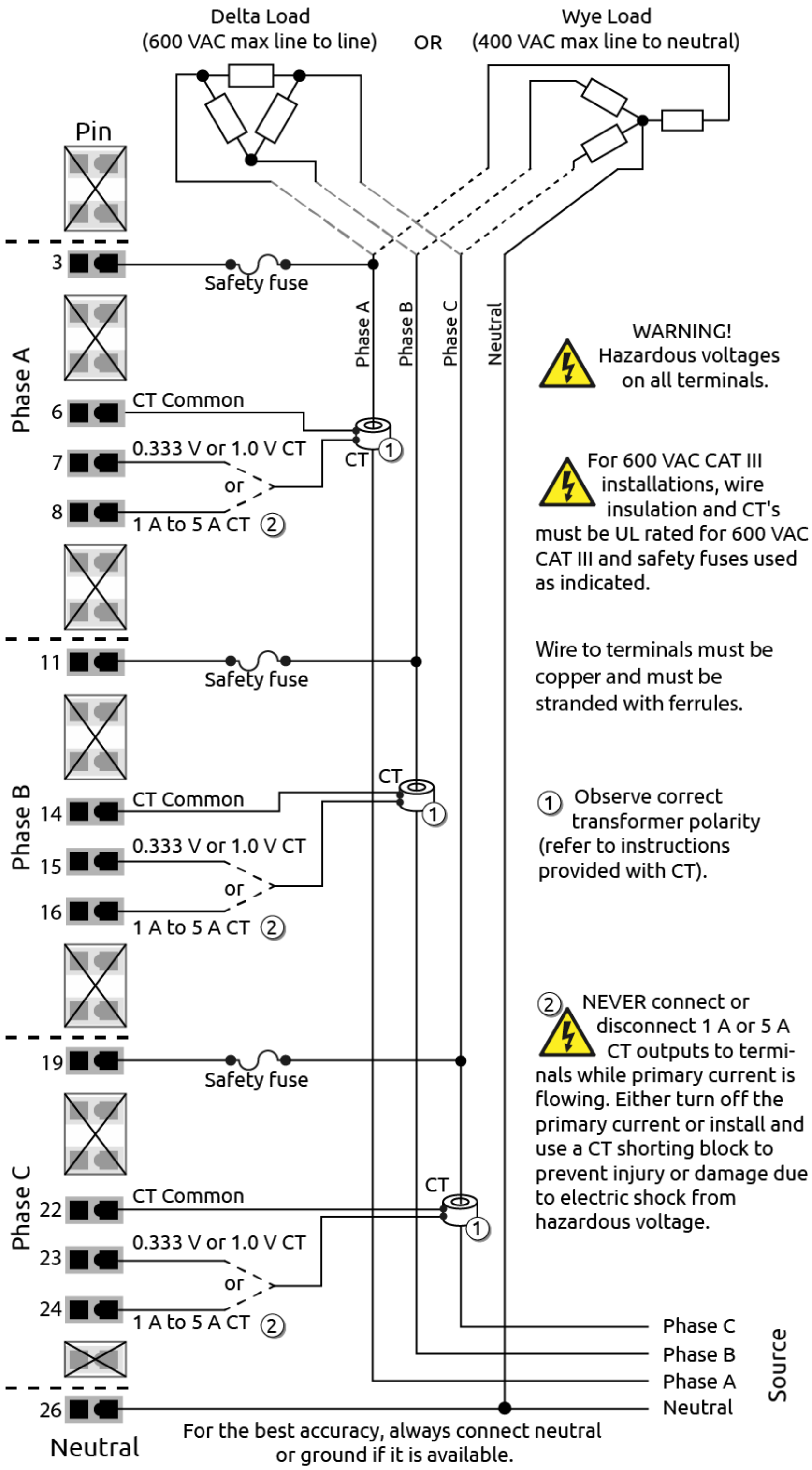
***CAUTION:** For electrical safety, before starting, de-energize field devices wired to the terminal connector.*

1. Orient the module or terminal connector to match the wiring diagrams on the following page. To make it easier to handle the spring-clamp terminal tool and the field wires, secure the module by doing one of the following:
   – 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.
2. Insert the spring-clamp terminal tool into the clamp release hole, then press and hold down the tool to open the clamp. Look into the field wiring hole. If it is dark, the clamp is open. You can go to step 3. If you can still see the highly reflective surface, gently push down again and keep downward pressure on the spring-clamp terminal tool. Look into the field wiring hole. If it is dark, the clamp is open.

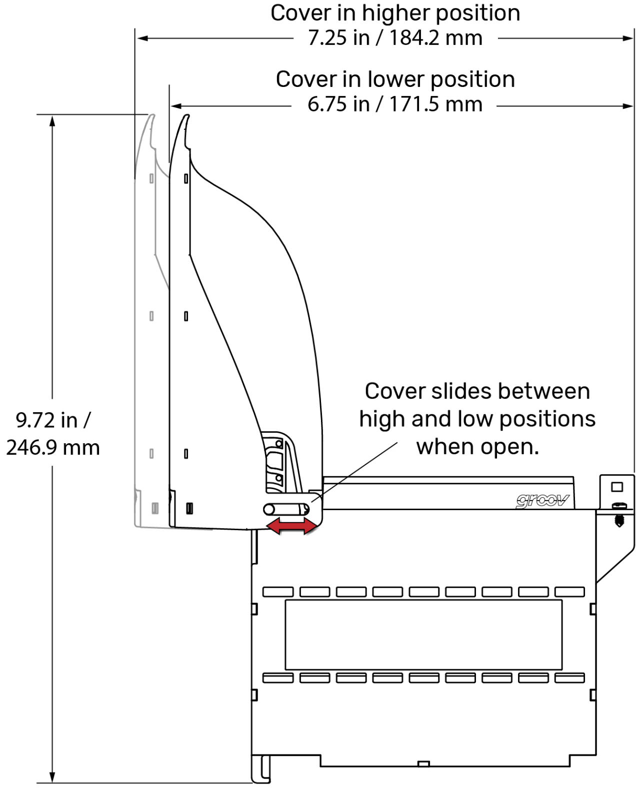
   Note: If you push in too hard, the spring-clamp terminal tool might pop out of the clamp release hole.
3. Insert the wire into the field wiring hole until it meets complete resistance. Then pull out the spring-clamp terminal tool.
4. Test that the wire is secure by gently pulling on it. If the wire pulls out, repeat steps 2 and 3.

To remove a wire, push the spring-clamp terminal tool into the clamp release hole as described in step 2 above, and then pull the wire out.

WIRING: GRV-IVAPM-3



DIMENSIONS: GRV-IVAPM-3

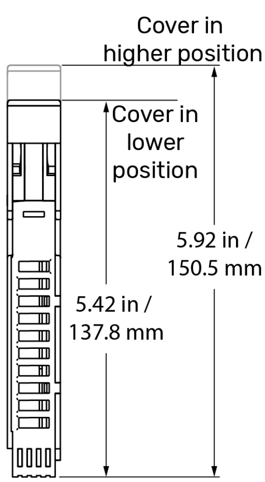


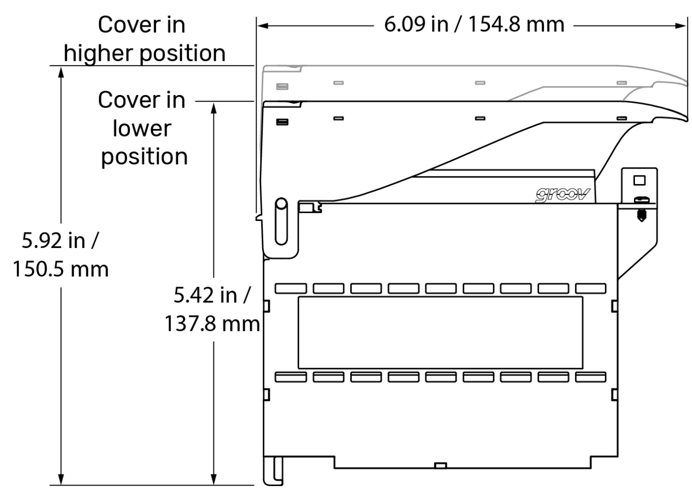
The module cover pivots and can be adjusted to two different heights (positions). The higher position provides more space to accommodate thicker wires.

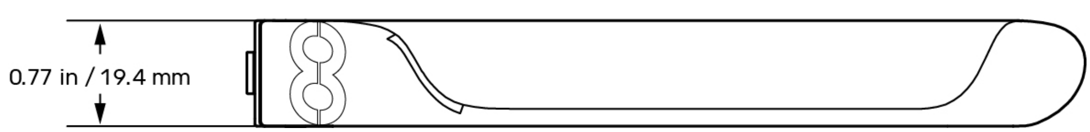
To switch between higher and lower position, open the cover to at least a 45° angle. Grasp the hinged end of the module cover and do one of the following:

- 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.

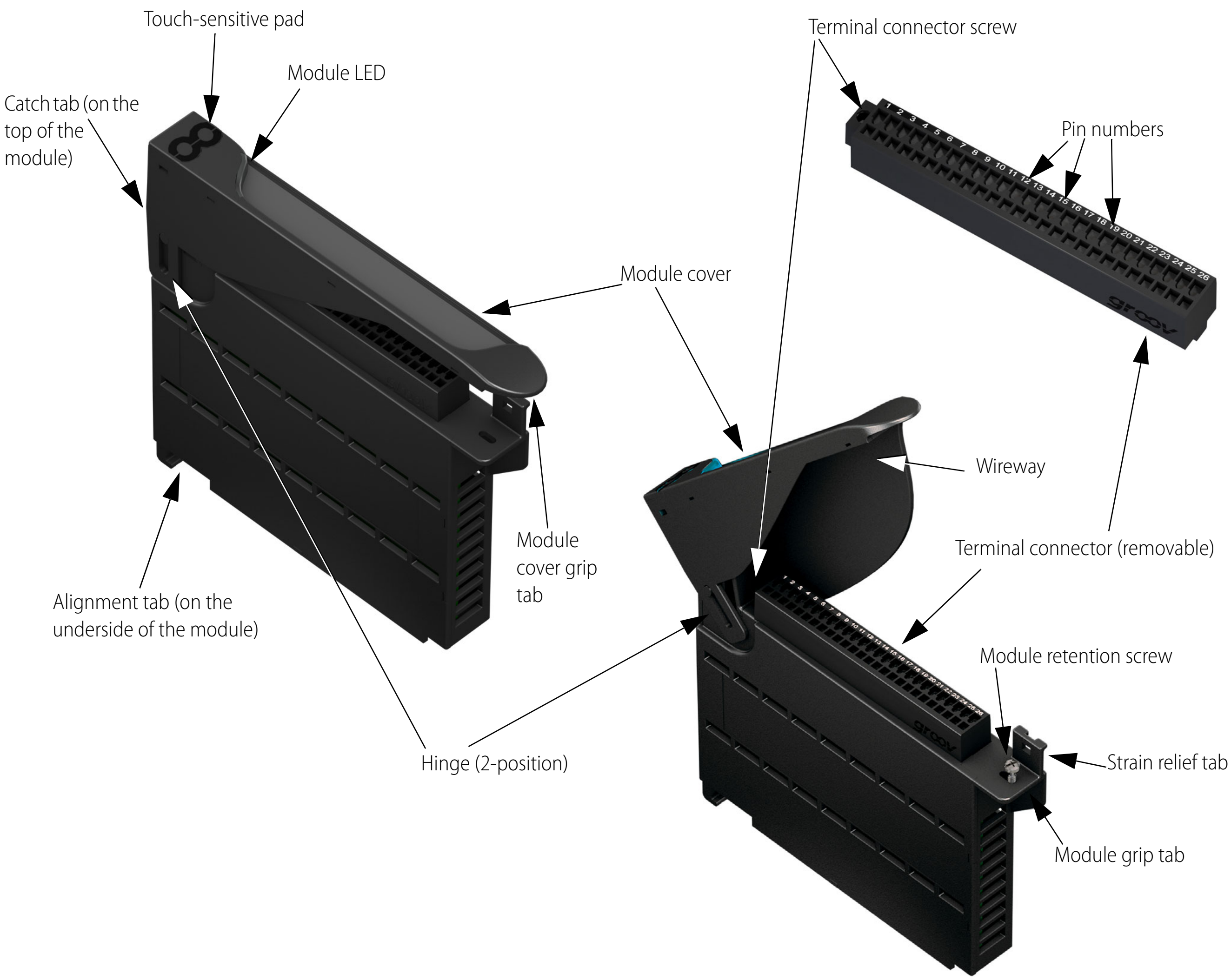






DESCRIPTION OF MODULE PARTS

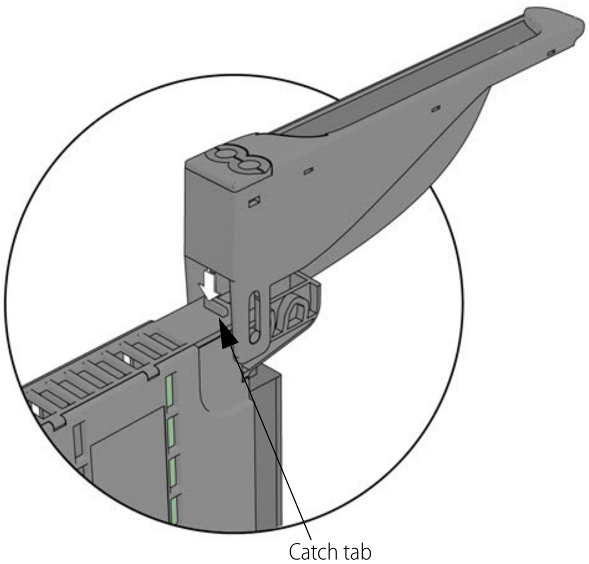
The following diagram identifies the parts of the modules. The installation instructions in the documentation rely on these terms to describe how to handle the module.



Some parts offer unique features:

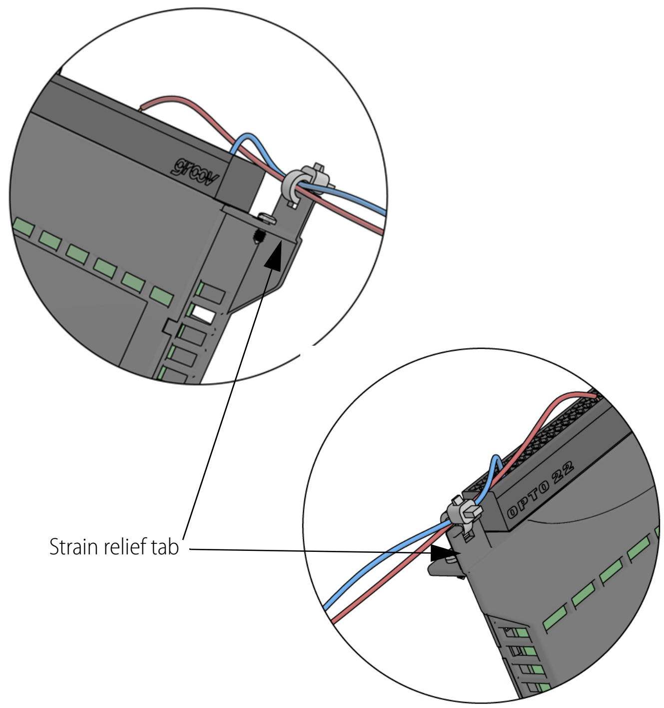
- **Module LED**: Provides a visual indication of the health of the module. For example, if it is blue, the module is operating normally. If it is blinking blue, the module's information is being displayed on the *groov* EPIC processor's screen. For a complete list of the various colors that this LED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



- **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. It also prevents 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, then clip the excess zip tie.



More about Opto 22

PRODUCTS

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

groov EPIC® System

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

groov EPIC I/O

groov I/O connects locally to sensors and equipment with up to 24 channels on each I/O module. 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 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.

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 or on a monitor connected via the HDMI or USB ports.

groov EPIC Software

Software included in the *groov* EPIC processor:

- PAC Control engine to run PAC Control and PAC Display
- CODESYS Runtime engine to run IEC61131-3 compliant programs built with CODESYS Development System
- Optional access to the Linux operating system through a secure shell (SSH) to download and run custom applications
- *groov* View for building your own device-independent HMI, viewable on the touchscreen, PCs, and mobile devices
- Node-RED for creating simple logic flows from pre-built nodes
- Ignition Edge® from Inductive Automation®, with OPC-UA drivers to Allen-Bradley®, Siemens®, and other control systems, and MQTT communications with Sparkplug for efficient IIoT data transfer

groov RIO®

groov RIO revolutionizes remote I/O by offering a single, compact, PoE-powered industrial package with web-based configuration, commissioning, and flow logic software built in, plus support for multiple OT and IT protocols.

Standing alone, it meets the needs of small, variable I/O count applications, especially those that require data logging or data communications, commonly found in IIoT applications. *groov* RIO can also be used with a Modbus/TCP master or as remote I/O for a *groov* EPIC system.

Older products

From solid state relays (our first products) to world-famous G4 and SNAP I/O, to SNAP PAC controllers, older Opto 22 products are still supported and still doing the job at thousands of installations worldwide. You can count on us to give you 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, comprehensive 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, troubleshooting tips, and OptoForums. In addition, instructor-led, hands-on Premium Factory Training is available 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** (toll-free in the U.S. and Canada) or **+1-951-695-3000**, or visit our website at www.opto22.com.

Form 1335-200902