

groov THERMISTOR/RESISTOR INPUT MODULE

Features

- > Select from fixed input ranges or autorange
- > Select from two operating modes: normal or fast ADC
- > Module cover with LED indicates module status
- > Touch-sensitive pad triggers display of module information on *groov* EPIC® processor's display
- > Groups of input channels divided into two isolated zones
- > Operating temperature: -20 to 70 °C
- > Guaranteed for life

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-ITR-12** module has 12 channels of analog to digital conversion that convert resistance to temperature or to Ohms. The 12 channels are divided into two groups: channels 0-5 are isolated from channels 6-11.

The module is ideal for NTC thermistors commonly used in HVAC, refrigeration, and process control applications. It may also be used with PTC thermistors in resistance sensing applications.

The module reads variable resistance type transducers. You can configure each channel for one of the following:

- Select from 12 resistance input ranges from 500 Ohms to 400 K Ohms, or autorange (where the module selects the appropriate resistance input range).
- Select one of the four predefined thermistor curves (based on the Steinhart-Hart equation) for popular thermistors listed in ["Working with 2-Wire Thermistors" on page 8](#).
- Create a custom curve (based on the Steinhart-Hart equation), where you specify the custom coefficients. See ["Custom Thermistor Temperature Curves" on page 8](#).

The module also offers the following options to decrease data refresh time and step input response time:

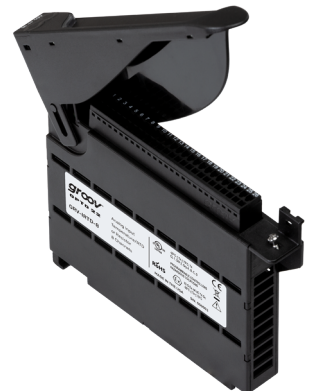
- Fast ADC mode: Choose any *FastADC* channel type on channel 0 to set the module to fast ADC mode, which doubles the



GRV-ITR-12 module



GRV-IRTD-8 module



analog-to-digital conversion rate for the entire module. (Note that this reduces accuracy to 0.5%.)

- You can specify the *Disabled* channel type on unused channels to disable analog-to-digital conversion for that channel.

The **GRV-IRTD-8** analog input module provides 8 input channels, each individually software configurable. The 8 channels are divided into two groups: channels 0–3 are isolated from channels 4–7. Each channel has 3 terminals to measure temperature and resistance from 2-, 3-, or 4-wire RTD sensors; review your RTD sensor's accuracy specifications. For 4-wire RTDs, only 3 of the wires are connected to the module, which may decrease accuracy.

You can individually configure each of the module's 8 channels for a fixed range in ohms or choose from two methods of auto-ranging:

- **Full Auto-range**—The module scrolls up and down the entire set of ranges and dynamically chooses the appropriate range for

Part Numbers

Part	Description
GRV-IRTD-8	Analog input, temperature (RTD) or resistance, 8 channels
GRV-ITR-12	Analog input, temperature (thermistor) or resistance, 12 channels

best resolution. Note that this channel type can result in higher latency when ranging up (see "[Specifications: GRV-IRTD-8](#)" on [page 3](#)). The data returned is resistance in ohms.

- **Auto-range Down**—The module scrolls down and up within the specified range limit. If the value goes above the specified range, the module issues an out-of-range value (16-bit). These channel types allow auto-ranging within the selected range but limit the data latency when ranging up. The data returned is resistance in ohms.

The GRV-IRTD-8 module does not offer channel-to-channel isolation, so make sure you use isolated RTD probes.

Wiring is simplified with a top-mounted connector, which provides spring-clamp terminals for common, power, and field wiring. 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 power to the unit) 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.

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 and UKCA directives. Each module is factory tested twice before shipment and most modules are guaranteed for life.

FEATURES AND SPECIFICATIONS

Specifications begin on the next page.

Features

Features	GRV-IRTD-8	GRV-ITR-12
Number of Channels	8	12
Channel-to-Channel Isolation		
Analog Totalizing	●	●
Average Filter Weight	●	●
Fast ADC Mode ^a		●
Minimum/Maximum Values	●	●
Offset and Gain	●	●
Quality Indication	●	●
Scaling	●	●
Simple Moving Average (SMA)	●	●

a. Select any "FastADC" channel type on channel 0.

Specifications: GRV-IRTD-8

Specification	GRV-IRTD-8
Input Ranges (Ohms)	8.0 K, 4.0 K, 2.0 K, 1.0 K 800, 400, 200, 100 80, 40, 20, 10, and Autoranges
Accuracy (Ohms @ Range)	4.2@8 K, 2.6@4 K, 1.8@2 K, 1.4@1 K 0.47@800, 0.31@400, 0.23@200, 0.19@100 0.082@80, 0.066@40, 0.058@20, 0.058@10 Ohms
Excitation RMS Current (Range & Load Watts Dissipated)	>301 μ A (8 K & 363 μ W), (4 K & 182 μ W), (2 K & 91 μ W), (1 K & 46 μ W) >1.84 mA (800 Ohms & 1.355 mW), (400 Ohms & 677 μ W), (200 Ohms & 339 μ W), (100 Ohms & 169 μ W) >3.96 mA (80 Ohms & 627 μ W), (40 Ohms & 313 μ W), (20 Ohms & 156 μ W), (10 Ohms & 78 μ W)
3-wire RTD Type	Accuracy from factory / Accuracy after setting offset and gain
1000 Ohm @ 70 °F Ni, a=0.00637, -45 °C to 250 °C (-49 °F to 482 °F)	0.6 °C (1.1 °F) / 0.4 °C (0.7 °F)
1000 Ohm @ 0 °C Ni, a=0.00618, -60 °C to 250 °C (-76 °F to 482 °F)	0.6 °C (1.1 °F) / 0.4 °C (0.7 °F)
1000 Ohm Pt, a=0.00385, -200 °C to 850 °C (-328 °F to 1562 °F)	0.8 °C (1.4 °F) / 0.6 °C (1.1 °F)
120 Ohm Ni, a=0.00672, -80 °C to 260 °C (-112 °F to 500 °F)	0.6 °C (1.1 °F) / 0.4 °C (0.7 °F)
100 Ohm Ni, a=0.00618, -60 °C to 250 °C (-76 °F to 482 °F)	0.6 °C (1.1 °F) / 0.4 °C (0.7 °F)
100 Ohm Pt, a=0.00385, -200 °C to 850 °C (-328 °F to 1562 °F)	0.8 °C (1.4 °F) / 0.6 °C (1.1 °F)
10 Ohm Cu, a=0.00427, -200 °C to 260 °C (-328 °F to 500 °F)	1.7 °C (3.1 °F) / 1.7 °C (3.1 °F)

Specifications continued on next page.

Specification	GRV-IRTD-8
Data Refresh Time	600 ms
Step Input Response Time	600 ms x SMA value (19.2 s @ 32 SMA, Default SMA = 4)
Analog Data Filtering	-3 dB @ 23.5 Hz -18 dB @ 60 Hz
Software Filtering: Simple Moving Average	1 to 32 readings
Software Filtering: Weighted Average	1 to 4096
Total Lead Resistance	200 Ohms Max, > 4 Kft / 1.2 Km (24 AWG)
Quality Indication	out of range
Isolation (field-to-logic)	300 V working, 1500 V transient (1 minute)
Isolation (channel-to-channel)	300 V between channel group 0-3 & group 4-7. None within a group.
Number of Channels	8
Chassis Power Consumption	1.3 W
Minimum <i>groov</i> EPIC Firmware Version	1.4.2
Minimum PAC Project Version	10.2003
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
Humidity (non-condensing)	5–95% RH
MTBF (minimum, 25 °C)	1.2 Mhrs
Agency Approvals	UL/cUL (Class 1, Div 2); CE: ATEX (Category 3, Zone 2) and RoHS; DFARS; UKCA
Warranty	Lifetime

Channel Types

The channels on the GRV-IRTD-8 module can be configured to one of three types of input ranges:

- **RTD**—Converts Ohms to temperature for the chosen RTD type:
 - RTD: 1000 Ohm @ 70 °F Ni 3-wire
 - RTD: 1000 Ohm @ 0 °C Ni 3-wire
 - RTD: 1000 Ohm Pt 3-wire
 - RTD: 120 Ohm Ni 3-wire
 - RTD: 100 Ohm Ni 3-wire
 - RTD: 100 Ohm Pt 3-wire
 - RTD: 10 Ohm Cu 3-wire
- **Autorange**—Measures Ohms within the specified limits and automatically chooses the highest resolution possible. Configuration selection is faster with smaller ranges.

- **Fixed range**—Measures Ohms within the specified limits with the same resolution across the entire range. (The resolution is the range divided by 100,000.)

Channel Type	Units	Low Limit	High Limit
RTD: 1000 Ohm @ 70 °F Ni 3-wire	°C	-45	250
RTD: 1000 Ohm @ 0 °C Ni 3-wire	°C	-60	250
RTD: 1000 Ohm Pt 3-wire	°C	-200	850
RTD: 120 Ohm Ni 3-wire	°C	-80	260
RTD: 100 Ohm Ni 3-wire	°C	-60	250
RTD: 100 Ohm Pt 3-wire	°C	-200	850
RTD: 10 Ohm Cu 3-wire	°C	-200	260
0-8k Ohms (autorange)	Ohms	0	8000
0-4k Ohms (autorange)	Ohms	0	4000
0-2k Ohms (autorange)	Ohms	0	2000
0-1k Ohms (autorange)	Ohms	0	1000
0-800 Ohms (autorange)	Ohms	0	800
0-400 Ohms (autorange)	Ohms	0	400
0-200 Ohms (autorange)	Ohms	0	200
0-100 Ohms (autorange)	Ohms	0	100
0-80 Ohms (autorange)	Ohms	0	80
0-40 Ohms (autorange)	Ohms	0	40
0-20 Ohms (autorange)	Ohms	0	20
0-8k Ohms	Ohms	0	8000
0-4k Ohms	Ohms	0	4000
0-2k Ohms	Ohms	0	2000
0-1k Ohms	Ohms	0	1000
0-800 Ohms	Ohms	0	800
0-400 Ohms	Ohms	0	400
0-200 Ohms	Ohms	0	200
0-100 Ohms	Ohms	0	100
0-80 Ohms	Ohms	0	80
0-40 Ohms	Ohms	0	40
0-20 Ohms	Ohms	0	20
0-10 Ohms	Ohms	0	10

Specifications: GRV-ITR-12

You can configure the channels on the GRV-ITR-12 module to read resistance input from any of the ranges listed in the following specification table, or to read temperature input according to predefined or custom curves.

Specification	GRV-ITR-12
Input Ranges (Ohms)	400 k, 200 k, 100 k, 50 k, 40 k, 20 k, 10 k, 5 k, 4 k, 2 k, 1 k, 500 and Autorange
Accuracy, normal mode (Ohms @ Range)	0.1%; specific values for indicated range: 400 @ 400 k, 200 @ 200 k, 100 @ 100 k, 50 @ 50 k, 40 @ 40 k, 20 @ 20 k, 10 @ 10 k, 5 @ 5 k, 4 @ 4 k, 2 @ 2k, 1 @ 1 k, 0.5 @ 500
Accuracy, fast ADC mode (Ohms @ Range)	0.5%; specific values for indicated range: 2000 @ 400 k, 1000 @ 200 k, 500 @ 100 k, 250 @ 50 k, 200 @ 40 k, 100 @ 20 k, 50 @ 10 k, 25 @ 5 k, 20 @ 4 k, 10 @ 2 k, 5 @ 1 k, 2.5 @ 500
Excitation Current (Range & Load Watts Dissipated)	>7.9 μ A (400 K & 25 μ W), (200 K & 12.4 μ W), (100 K & 6.2 μ W), (50 K & 3.1 μ W), >84.7 μ A (40 K & 287 μ W), (20 K & 144 μ W), (10 K & 72 μ W), (5 K & 36 μ W), >169.2 μ A (4 K & 115 μ W), (2 K & 57 μ W), (1 K & 29 μ W), (500 & 14 μ W)
Analog Data Filtering	-3 dB @ 2.4 Hz -25 dB @ 60 Hz
Software Filtering: Simple Moving Average	1 to 32 readings
Software Filtering: Weighted Average	1 to 4096
Data Refresh Time (normal mode)	900 ms
Data Refresh Time (fast ADC mode)	450 ms
Step Input Response Time (normal mode)	900 ms x SMA value (for example, 28.8 s @ 32 SMA, Default SMA = 4)
Step Input Response Time (fast ADC mode)	450 ms x SMA value (for example, 14.4 s @ 32 SMA, Default SMA = 4)
Quality Indication	out of range
Isolation (field-to-logic)	300 V working, 1500 V transient (1 minute)
Isolation (channel-to-channel)	300 V between channel group 0–5 & channel group 6–11. None within a group.
Number of Channels	12
Chassis Power Consumption	1.3 W
Minimum <i>groov</i> EPIC Firmware Version	1.3.0
Minimum PAC Project Version	10.2000

Specifications continued on next page.

Specification	GRV-ITR-12
Minimum Library Package for CODESYS Version	1.0.0.0
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
Humidity (non-condensing)	5–95% RH
MTBF (minimum, 25 °C)	1.2 Mhrs
Agency Approvals	UL/cUL (Class 1, Div 2); CE: ATEX (Category 3, Zone 2) and RoHS; DFARS; UKCA
Warranty	Lifetime

Predefined Thermistor Temperature Curves

The table below shows temperatures in °C and °F that correlate with resistance values in Ohms for the generic curve types of four popular thermistors using the [Steinhart-Hart equation](#). When you configure a channel, you can select Thermistor and the corresponding curve as the channel type.

Temp °C	Temp °F	2252 curve	3K curve	10K type 3 curve	10K type 2 curve
		Resistance (Ohms)			
-40	-40	75,769.0	100,935.0	239,686.0	336,450.0
-35	-31	54,647.0	72,798.0	179,200.0	242,660.0
-30	-22	39,851.0	53,088.0	135,185.0	176,960.0
-25	-13	29,368.0	39,123.0	102,861.0	130,410.0
-20	-4	21,861.0	29,122.0	78,913.0	97,072.0
-15	5	16,429.0	21,885.0	61,020.0	72,951.0
-10	14	12,459.0	16,598.0	47,543.0	55,326.0
-5	23	9,532.0	12,698.0	37,313.0	42,326.0
0	32	7,353.0	9,795.0	29,490.0	32,650.0
5	41	5,718.0	7,617.0	23,457.0	25,391.0
10	50	4,481.0	5,970.0	18,780.0	19,899.0
15	59	3,538.0	4,713.0	15,130.0	15,711.0
20	68	2,813.0	3,748.0	12,263.0	12,492.0
25	77	2,252.0	3,000.0	10,000.0	10,000.0
30	86	1,814.0	2,417.0	8,194.0	8,057.0
35	95	1,471.0	1,959.0	6,752.0	6,531.0
40	104	1,200.0	1,598.0	5,592.0	5,326.0
45	113	983.8	1,311.0	4,655.0	4,368.0

Temp °C	Temp °F	2252 curve	3K curve	10K type 3 curve	10K type 2 curve
		Resistance (Ohms)			
50	122	811.2	1,081.0	3,893.0	3,602.0
55	131	672.5	895.8	3,271.0	2,986.0
60	140	560.3	746.3	2,760.0	2,488.0
65	149	469.0	624.8	2,339.0	2,083.0
70	158	394.5	525.5	1,990.0	1,752.0
75	167	333.1	443.8	1,700.0	1,479.0
80	176	282.7	376.6	1,458.0	1,255.0
85	185	240.9	320.9	1,255.0	1,070.0
90	194	206.2	274.6	1,084.0	915.4
95	203	177.1	236.0	939.3	786.6
100	212	152.8	203.6	816.8	678.6
105	221	132.3	176.3	712.6	587.6
110	230	115.0	153.2	623.6	510.6
115	239	100.3	133.6	547.3	445.2
120	248	87.7	116.9	481.8	389.6
125	257	77.0	102.6	425.3	341.9
130	266	67.8	90.3	376.4	301.0
135	275	59.9	79.7	334.0	265.8
140	284	53.0	70.6	297.2	235.4
145	293	47.1	62.7	265.1	209.0
150	302	41.9	55.8	237.0	186.1

The information in this table is provided by Automation Components, Inc.

Custom Thermistor Temperature Curves

To create a custom curve, you can enter custom coefficients through any of the following:

- **PAC Control**—When you add an analog channel on a GRV-ITR-12 module, select the custom curve channel type and enter three coefficient values for the Steinhart-Hart equation. For more instructions, see [PAC Control User's Guide](#) (form 1700).
- **CODESYS Development System**—When you are configuring channel features and parameters on an analog channel, select the custom curve channel type and enter three coefficient values for the Steinhart-Hart equation. For more instructions, see [groov EPIC User's Guide](#) (form 2267).
- **groov Manage**—Navigate through *groov Manage* to the configuration page of the channel, select the custom curve as the channel type and enter three coefficient values for the Steinhart-Hart equation. For more instructions, see [groov EPIC User's Guide](#) (form 2267).

Working with 2-Wire Thermistors

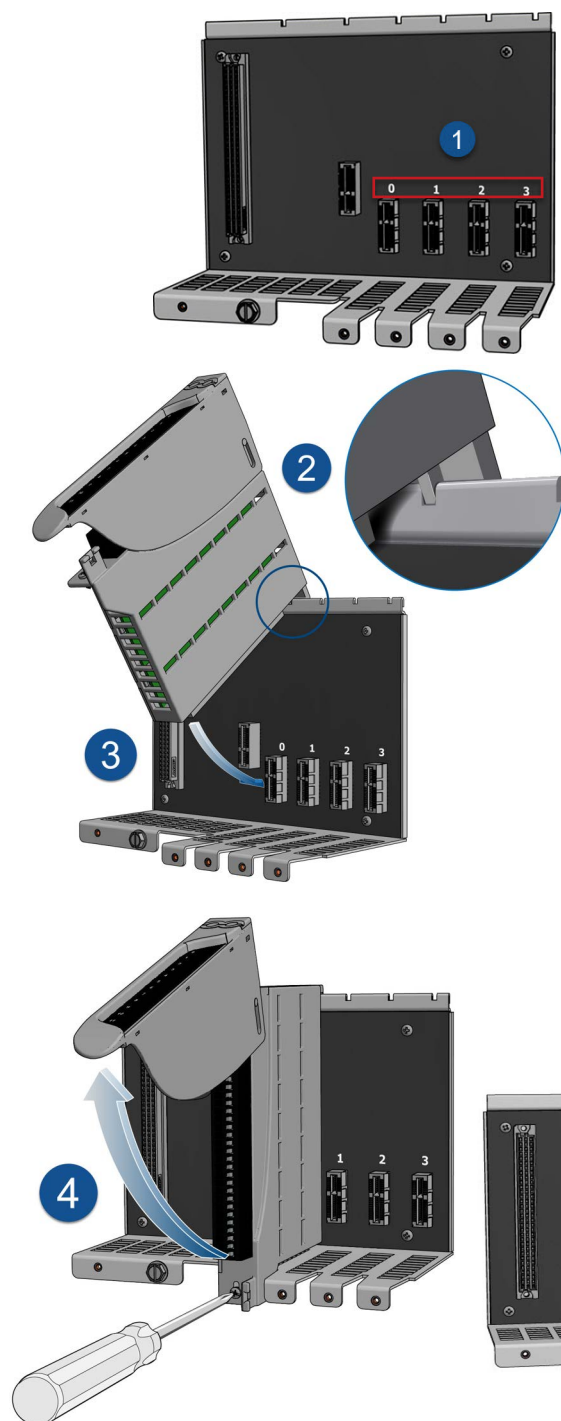
Typically, 3-wire thermistors are used. When using 2-wire thermistors, it's important to make sure that the thermistor resistance in the temperature range used in the application is significantly higher than the resistance of the thermistor lead wires.

Also keep in mind that lower value curves (2252 or 3K) work best at cooler temperatures (less than 25 °C or 77 °F) because long lead wire resistance can add significant errors to the measurement.

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 .

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.

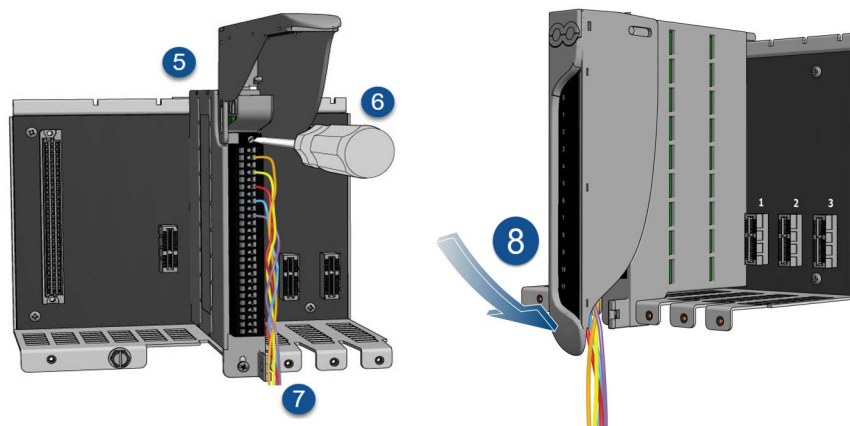
CAUTION: Do not over-tighten. See the torque specs in the “Specifications” table.

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

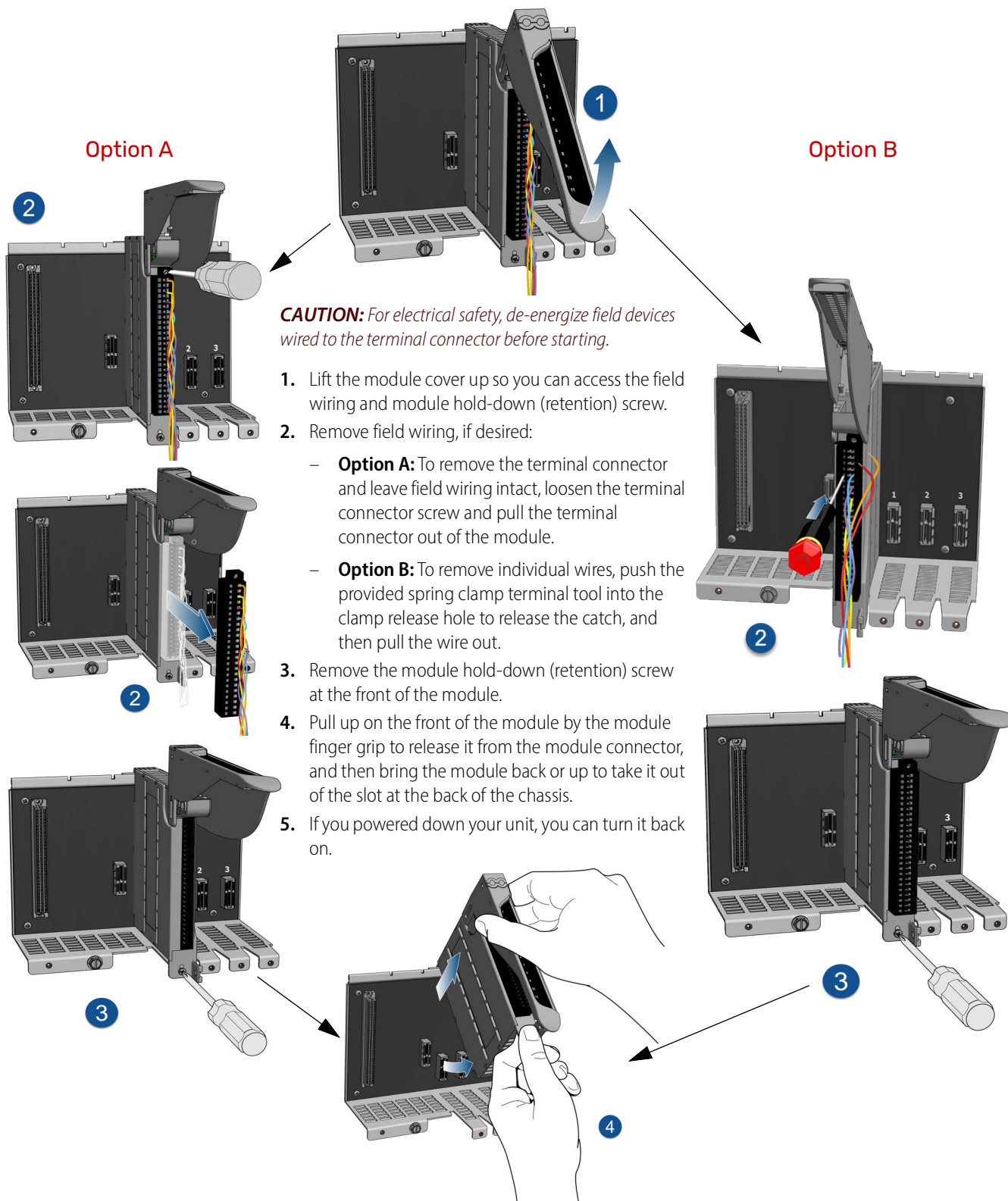
CAUTION: Do not over-tighten. See the torque specs in the “Specifications” table.

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.



Un-mounting the module



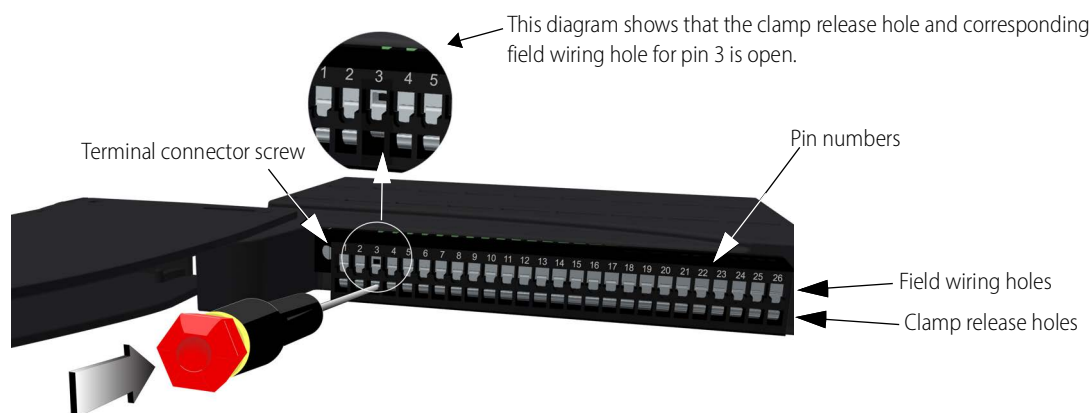
PINOUTS AND WIRING

Select and prepare the appropriate wire. The terminal connectors are rated for 28–14 AWG wire. Prepare the wire by exposing the strands according to the Wire Strip Length specification listed in the Specifications table on [page 3](#) or [page 6](#). If you're using stranded wire, tin the strands or add ferrules to make it easier to insert the wire and create a stronger connection.

The right tool to open spring-clamps. Make sure 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](#).)

Detach with the terminal connector. It may be easier to insert wires if you detach the terminal connector from the module. To detach the terminal connector, loosen the terminal connector screw at one end of the connector, then pull the connector straight out.

Unfamiliar with spring-clamp wiring systems? Review the diagram below. In the field wiring hole, a spring-powered clamp holds the wire in place. You open the clamp by pushing the spring-clamp terminal tool into the clamp release hole. When you pull out the terminal tool, the spring closes the clamp.



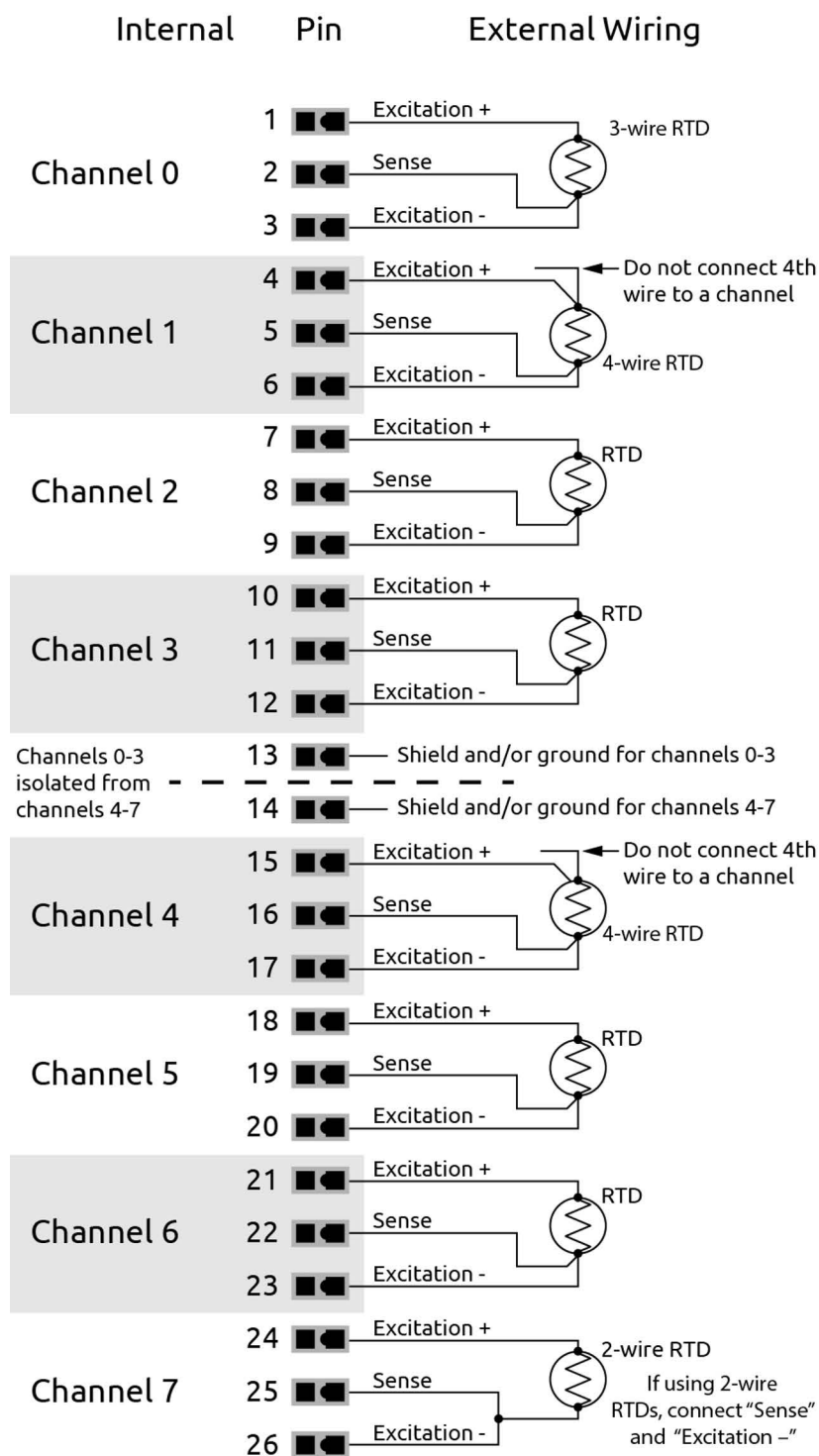
Inserting Wires

- To make it easier to handle 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.
 - 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 maintain 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 down too hard, the spring-clamp terminal tool might pop out of the clamp release hole.*
- Insert the wire into the field wiring hole until it meets complete resistance, and then pull out the spring-clamp terminal tool.
 - Test that the wire is secure by gently pulling on it. If the wire pulls out, repeat steps [2](#) and [3](#).

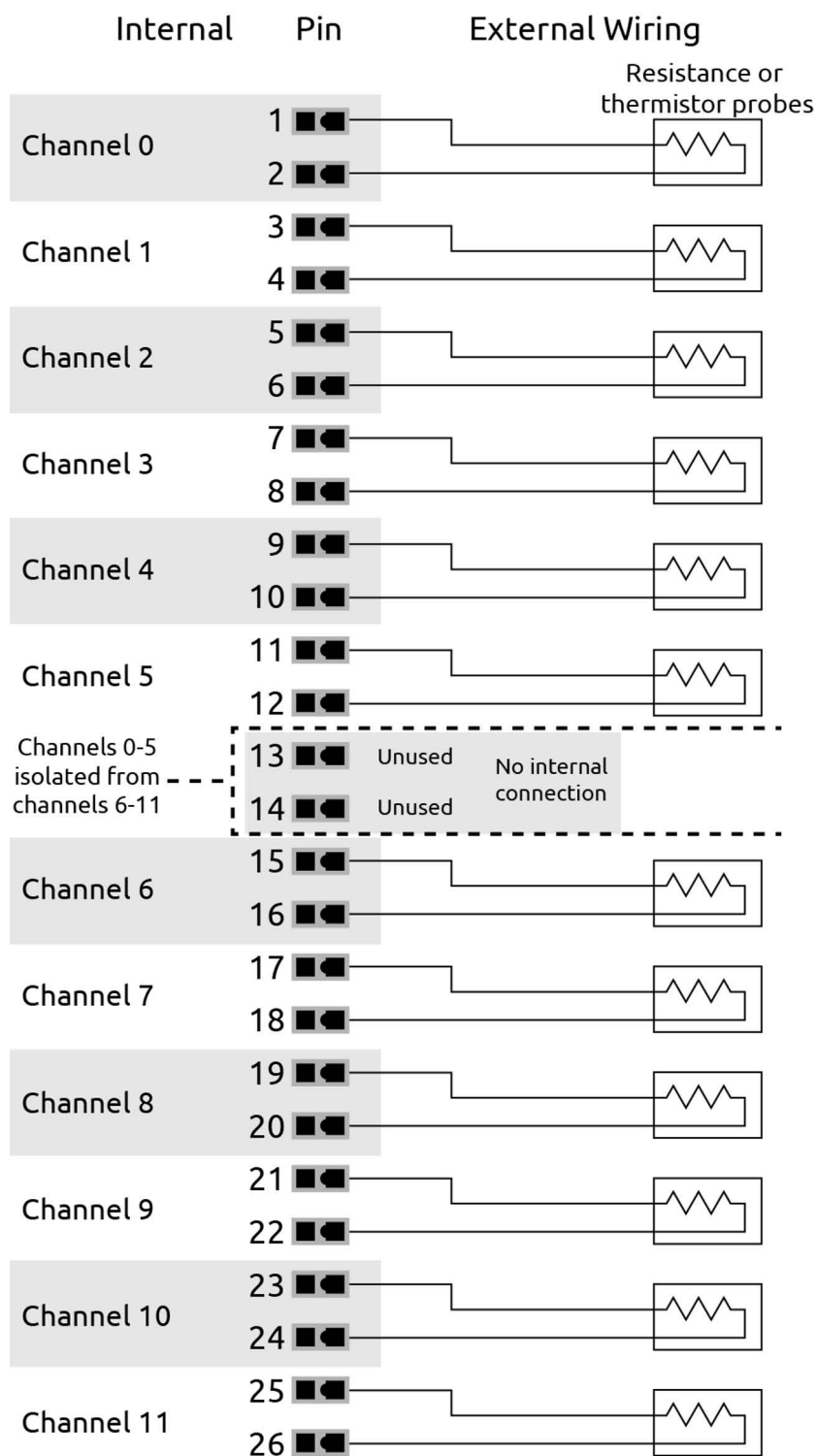
Removing Wires

Insert the spring-clamp terminal tool into the clamp release hole, press and hold down the tool to open the clamp, and then pull the wire out.

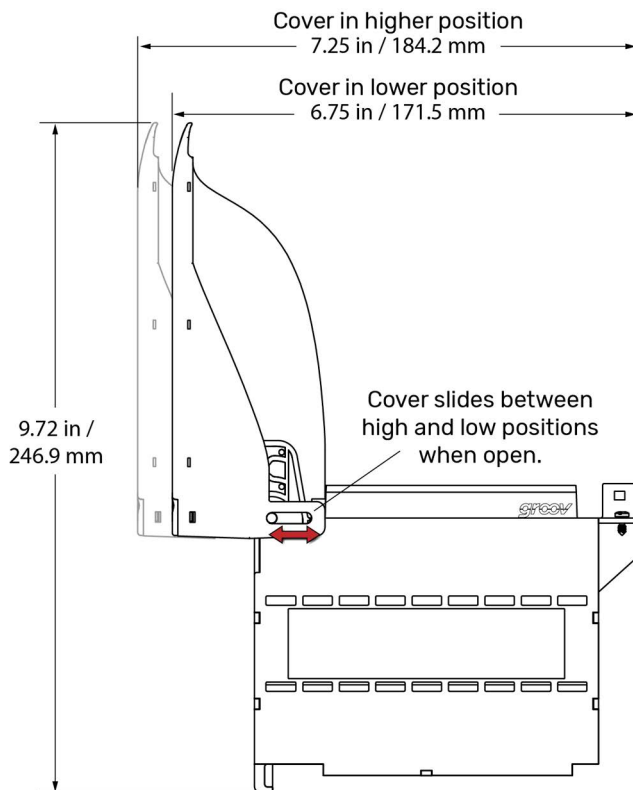
WIRING: GRV-IRTD-8



WIRING: GRV-ITR-12



DIMENSIONS: GRV-IRTD-8, GRV-ITR-12

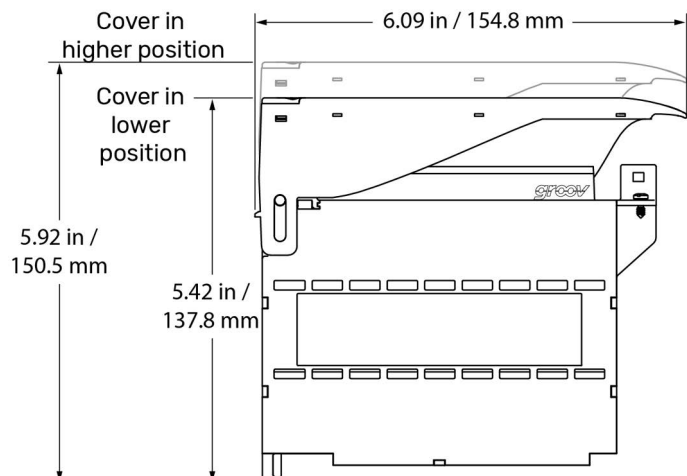
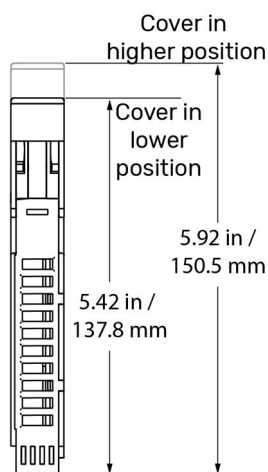


The module cover pivots and can be adjusted to two different heights (positions). The higher position provides more space to accommodate thicker wires.

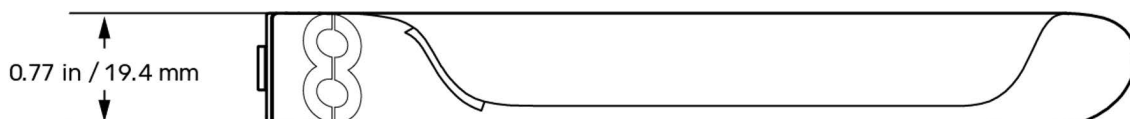
To switch between higher and lower position, lift the cover to at least a 45° angle. Grasp the hinged end of the module cover and do one of the following:

- 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.

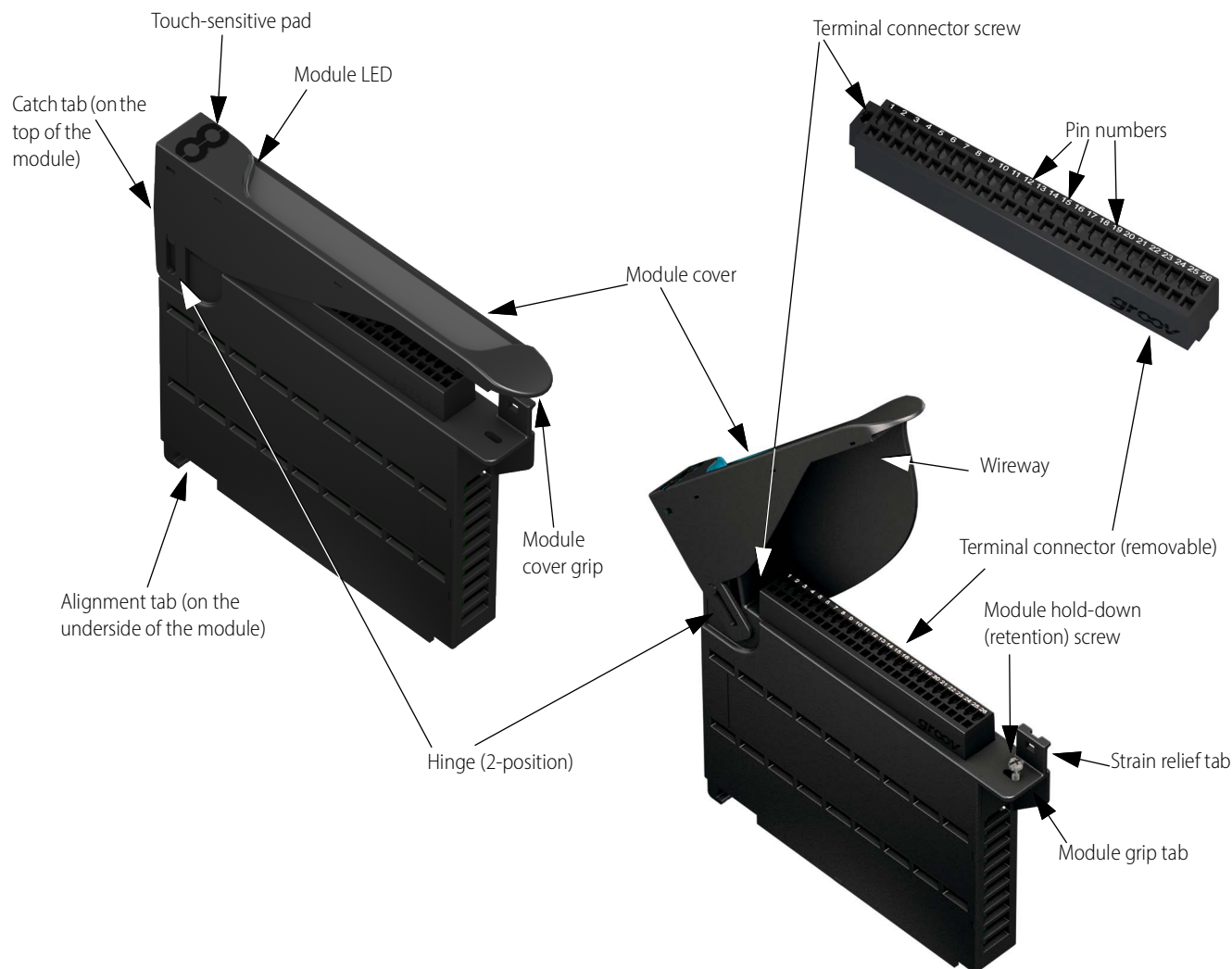


GRV-IRTD-8, GRV-ITR-12



DESCRIPTION OF MODULE PARTS

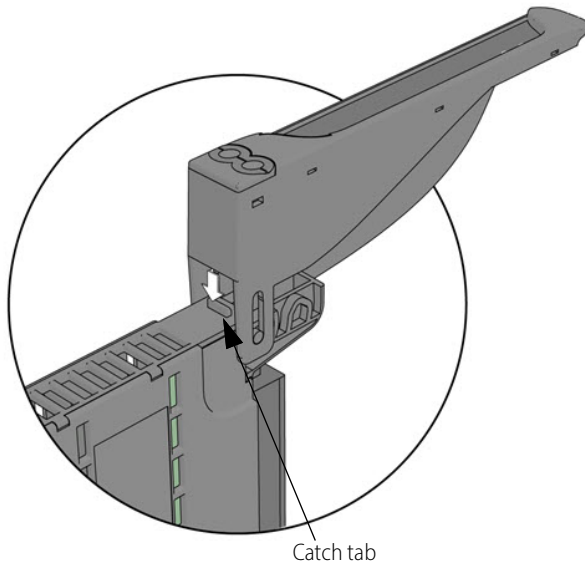
The following diagram identifies the parts of the modules. The installation instructions in the documentation rely on these terms to describe how to handle the module.



Some parts offer unique features:

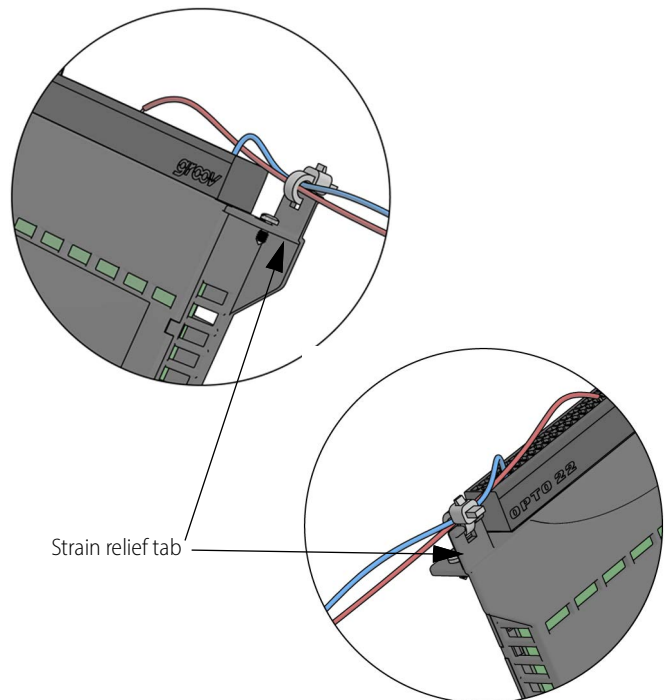
- **Module LED:** Provides a visual indication of the health of the module. For example, if it is blue, the module is operating normally. If it is blinking blue, the module's information is being displayed on the *groov* EPIC processor's screen. For a complete list of the various colors that this LED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

