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

GRV-ITR-12 module

GRV-IRTD-8 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-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 7.

- Create a custom curve (based on the Steinhart-Hart equation), where you specify the custom coefficients. See "Custom Thermistor Temperature Curves" on page 7.

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 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. This module is commonly used for 3-wire RTD temperature inputs but is also suited to high-resolution resistance measurements.

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 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,

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

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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 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 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

Features

Features	GRV-IRTD-8	GRV-ITR-12
Scaling	x	x
Offset and Gain	x	x
Minimum/Maximum Values	x	x
Average Filter Weight	x	x
Simple Moving Average (SMA)	x	x
Analog Totalizing	x	x
Quality Indicator	x	x

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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 µA (8 K & 363 µW), (4 K & 182 µW), (2 K & 91 µW), (1 K & 46 µW) >1.84 mA (800 Ohms & 1.355 mW), (400 Ohms & 677 µW), (200 Ohms & 339 µW), (100 Ohms & 169 µW) >3.96 mA (80 Ohms & 627 µW), (40 Ohms & 313 µW), (20 Ohms & 156 µW), (10 Ohms & 78 µW)
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)

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 Indicator	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 *groov* 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
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; 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

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 @ 2 k, 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 µA (400 K & 25 µW), (200 K & 12.4 µW), (100 K & 6.2 µW), (50 K & 3.1 µW), >84.7 µA (40 K & 287 µW), (20 K & 144 µW), (10 K & 72 µW), (5 K & 36 µW), >169.2 µA (4 K & 115 µW), (2 K & 57 µW), (1 K & 29 µW), (500 & 14 µW)
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 Indicator	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 *groov* EPIC Firmware Version	1.3.0
Minimum PAC Project Version	10.2000
Minimum Library Package for CODESYS Version	1.0.0.0
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; UKCA
Warranty	Lifetime

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

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.

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.

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

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Temp °C	Temp °F	2252 curve	3K curve	10K type 3 curve	10K type 2 curve
		Resistance (Ohms)			
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
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.

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MOUNTING

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.

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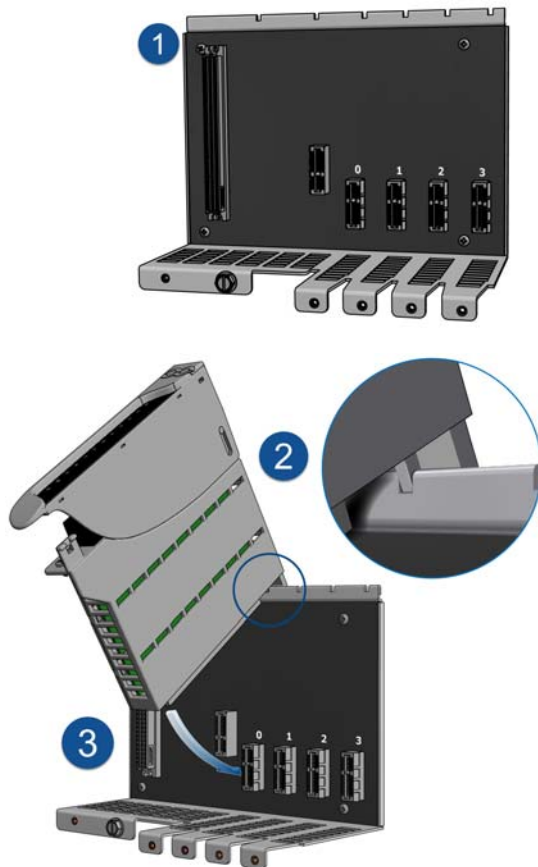
The numbers on the diagrams correspond to the numbered steps in these instructions.

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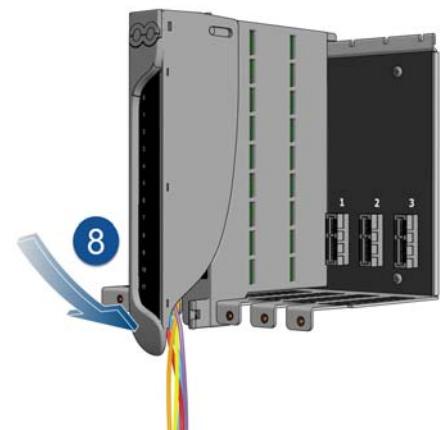
    CAUTION: *Do not over-tighten. See the torque specs in the Specifications table.*

5. If the module does not have a terminal connector, install one.

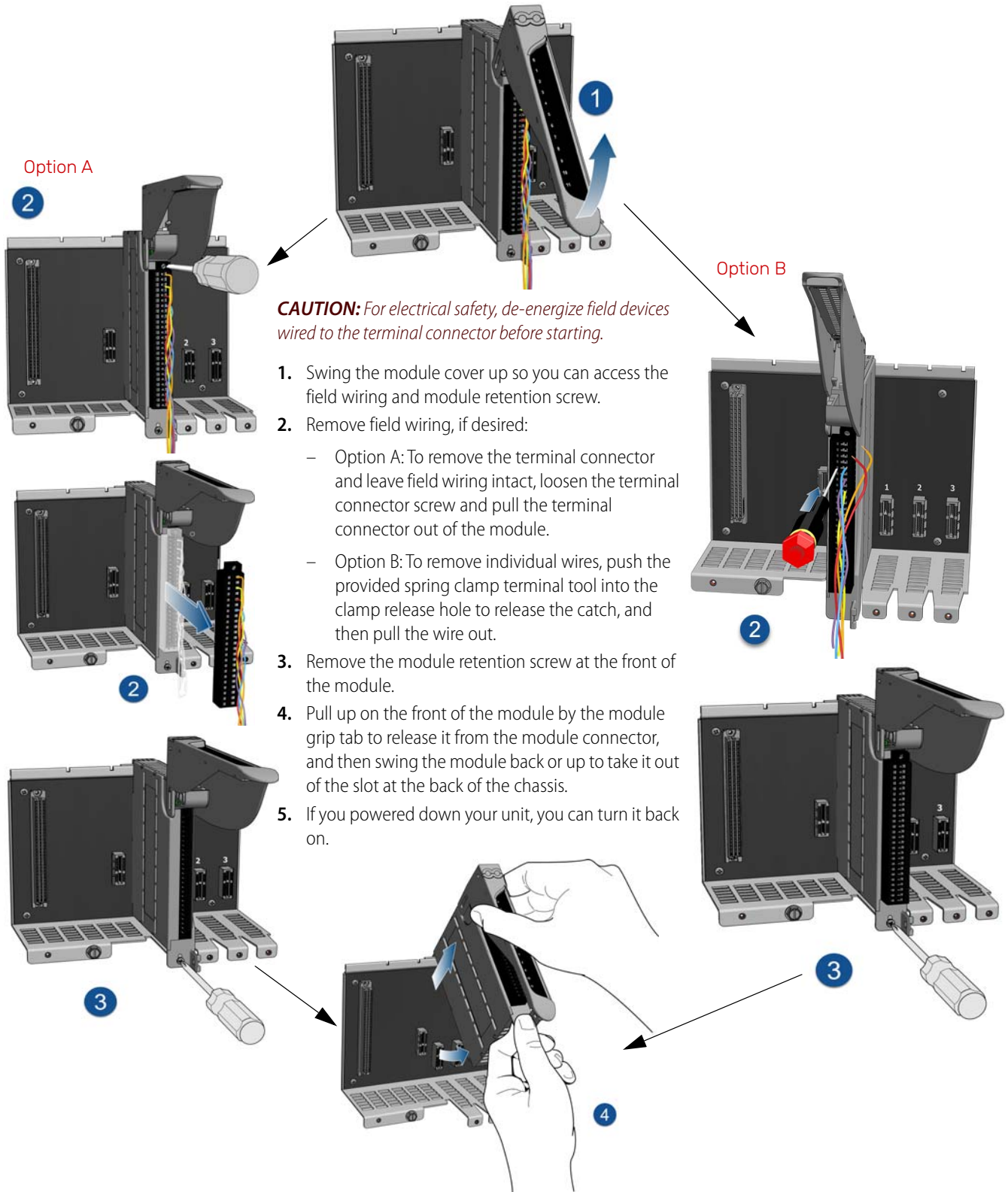6. Secure the terminal connector by tightening the terminal connector screw.

    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.

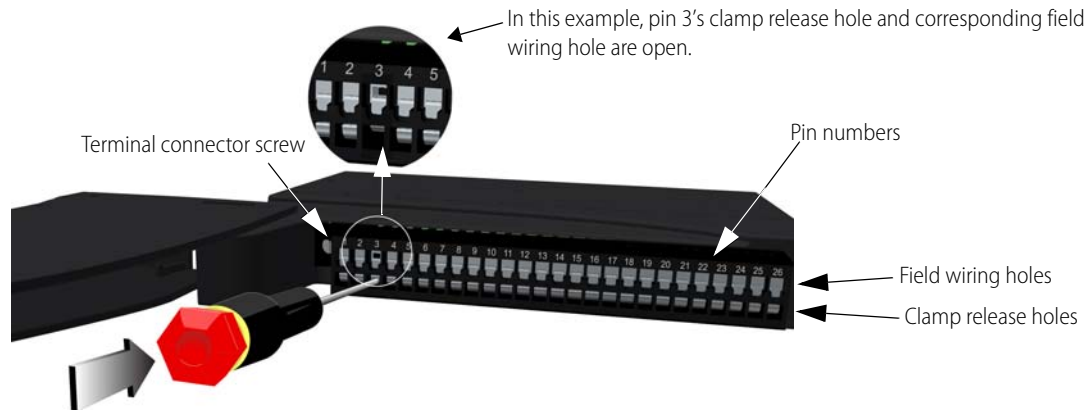When you are done installing modules and wiring, if you powered down your unit, you can turn it back on.

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Removing the module

Option A

Option B

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.

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PINOUTS AND WIRING

Before you begin wiring, do the following tasks:

- 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. Insert the spring-clamp terminal tool in the clamp release hole. Insert field wires in the field wiring hole.

- 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.

In this example, pin 3's clamp release hole and corresponding field wiring hole are open.

Terminal connector screw

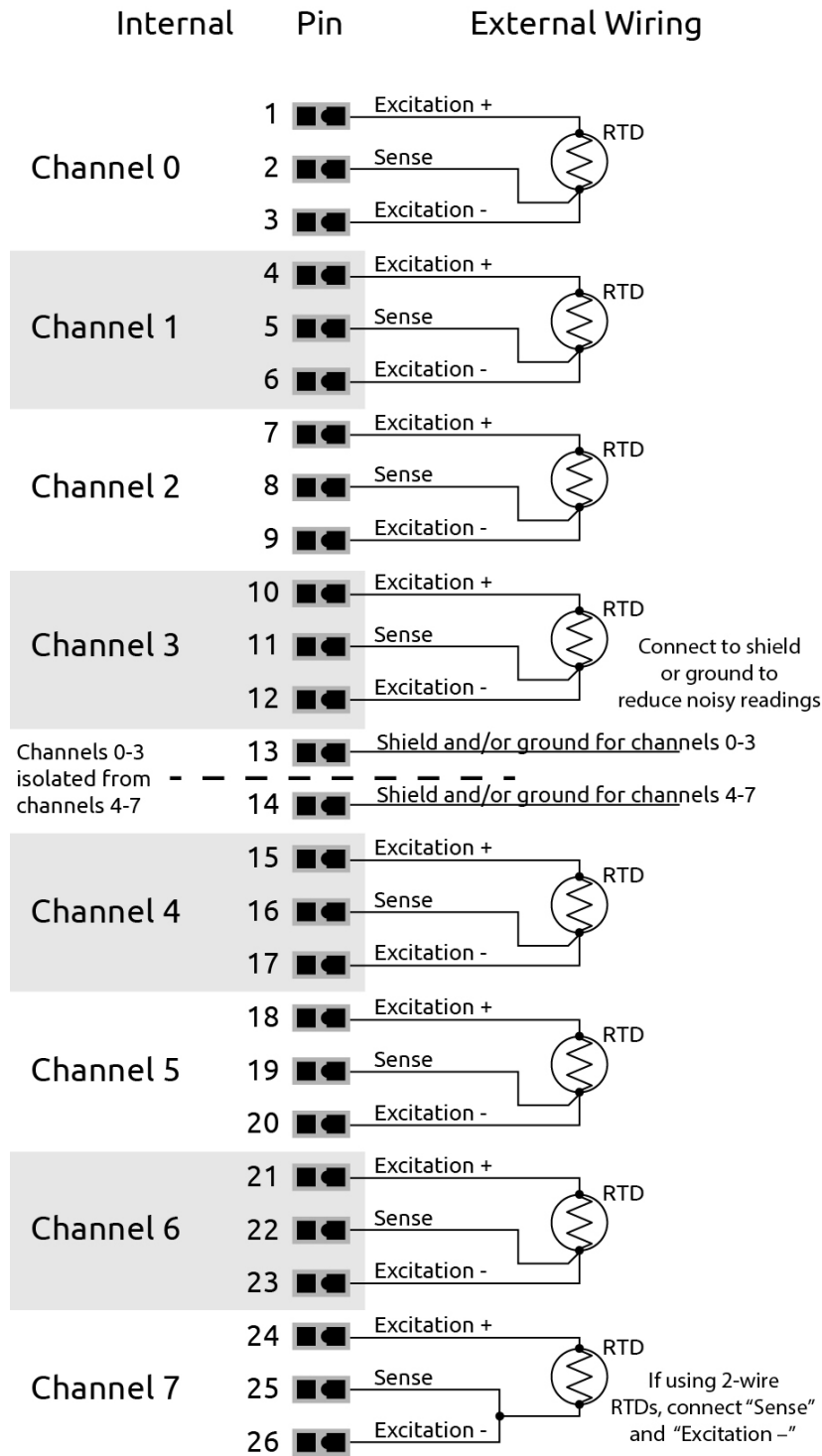Pin numbers

Field wiring holes

Clamp release holes

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

1. 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.
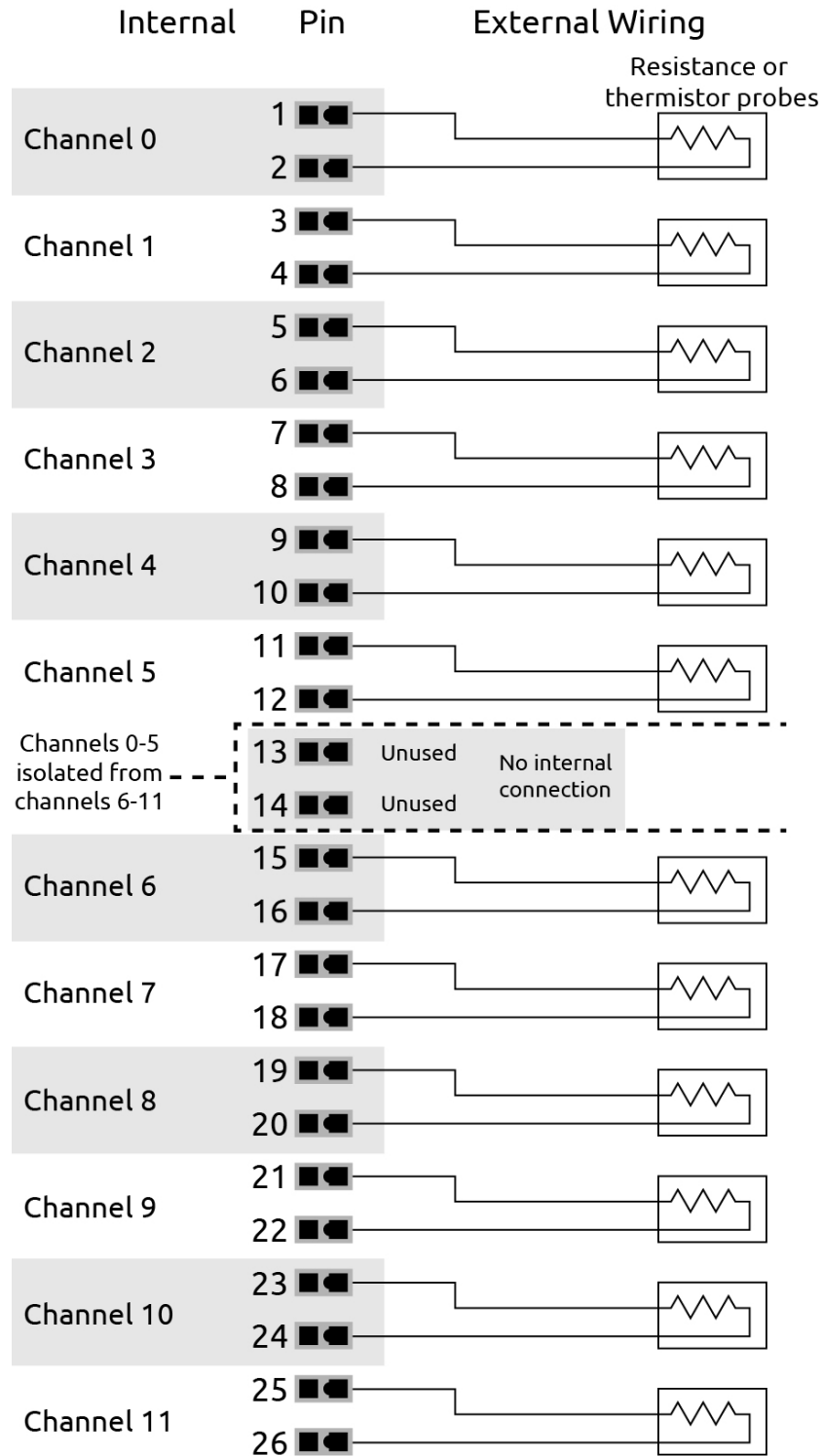
   Note: If you push in too hard, the spring-clamp terminal tool might pop out of the clamp release hole.

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.
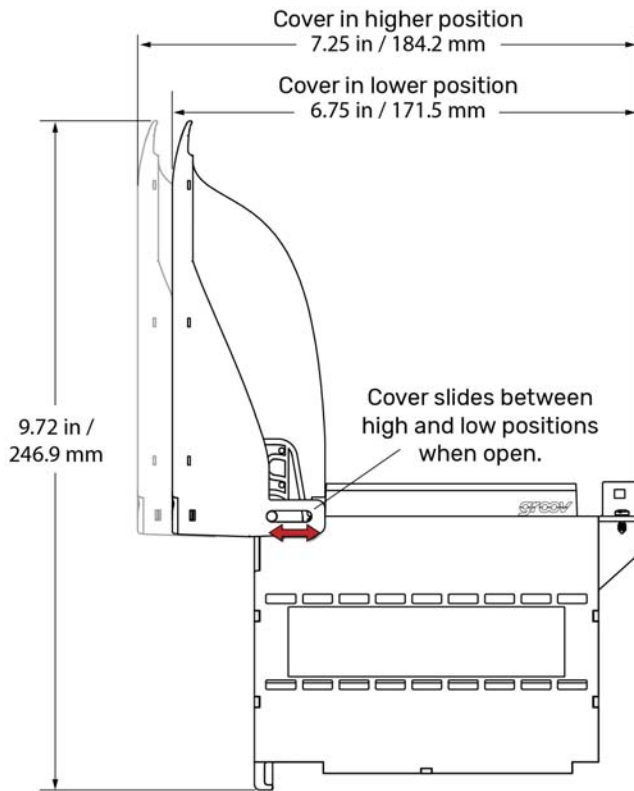
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WIRING: GRV-IRTD-8

Internal	Pin	External Wiring

Channel 0
1 — Excitation +
2 — Sense — RTD
3 — Excitation -

Channel 1
4 — Excitation +
5 — Sense — RTD
6 — Excitation -

Channel 2
7 — Excitation +
8 — Sense — RTD
9 — Excitation -

Channel 3
10 — Excitation +
11 — Sense — RTD
12 — Excitation -

Connect to shield
or ground to
reduce noisy readings

Channels 0-3
isolated from
channels 4-7

13 — Shield and/or ground for channels 0-3
14 — Shield and/or ground for channels 4-7

Channel 4
15 — Excitation +
16 — Sense — RTD
17 — Excitation -

Channel 5
18 — Excitation +
19 — Sense — RTD
20 — Excitation -

Channel 6
21 — Excitation +
22 — Sense — RTD
23 — Excitation -

Channel 7
24 — Excitation +
25 — Sense — RTD
26 — Excitation -

If using 2-wire
RTDs, connect "Sense"
and "Excitation –"

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WIRING: GRV-ITR-12

Internal	Pin	External Wiring

Resistance or thermistor probes

Channel 0 — 1, 2
Channel 1 — 3, 4
Channel 2 — 5, 6
Channel 3 — 7, 8
Channel 4 — 9, 10
Channel 5 — 11, 12

Channels 0-5 isolated from channels 6-11

13 — Unused — No internal connection
14 — Unused

Channel 6 — 15, 16
Channel 7 — 17, 18
Channel 8 — 19, 20
Channel 9 — 21, 22
Channel 10 — 23, 24
Channel 11 — 25, 26

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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, 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.
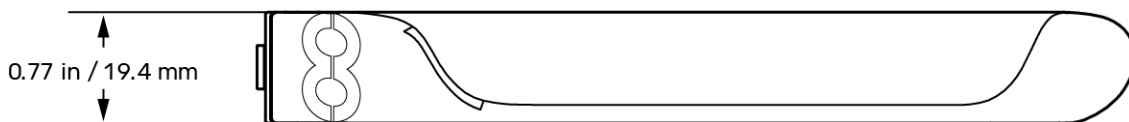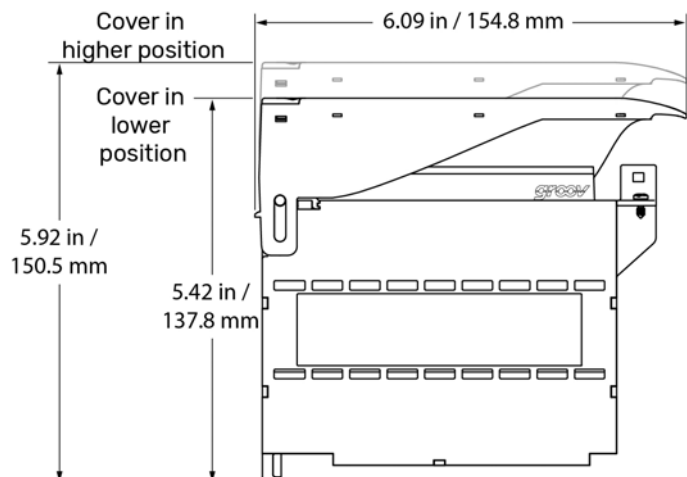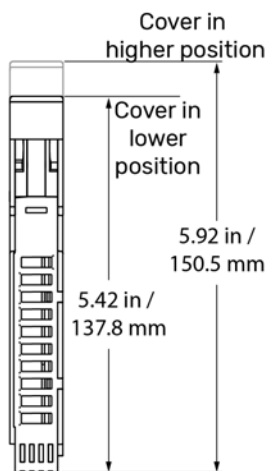
DESCRIPTION OF MODULE PARTS

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.
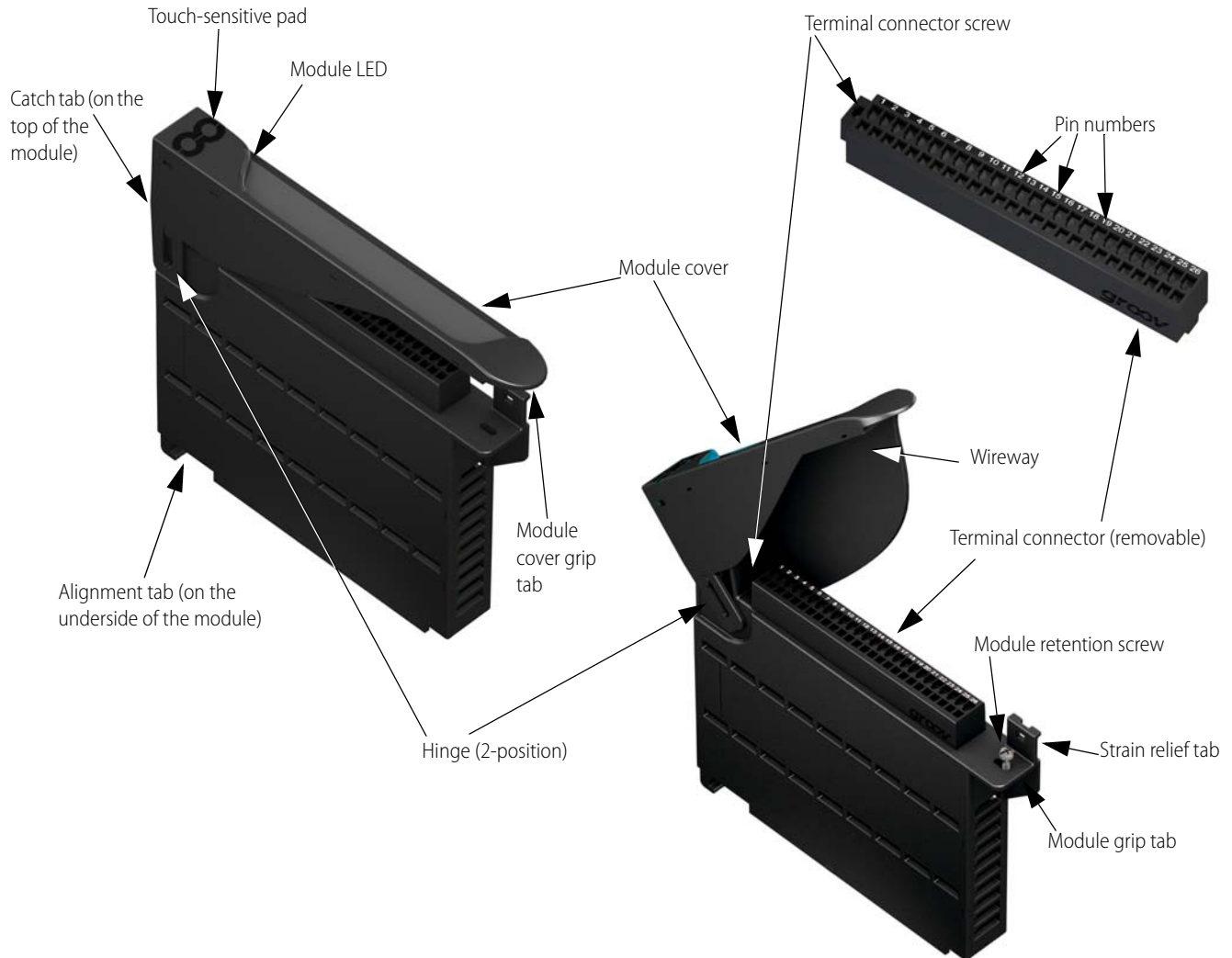
Some parts offer unique features:

- **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

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cover from closing so that you can work on attaching or detaching wires to the terminal connector.

Catch tab
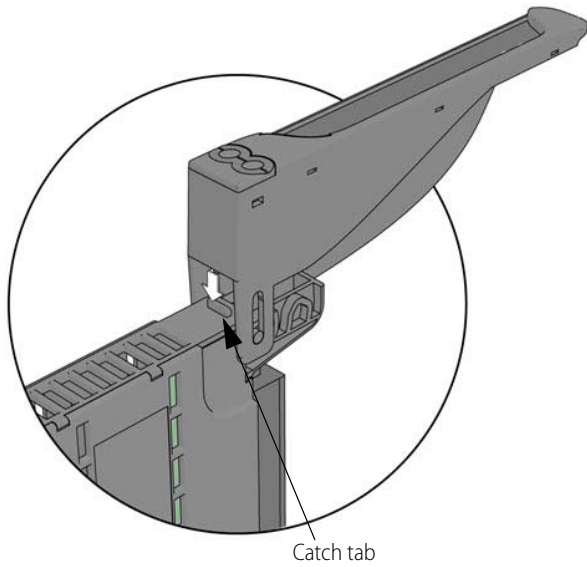
- **Strain relief tab**: This tab offers a way to collect wires into a bundle and secure them to the module. Attaching the wires to the strain relief tab can help hold the wires in a semi-fixed position, preventing them from interfering while you work on a nearby module. It also prevents strain on the 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.

Strain relief tab
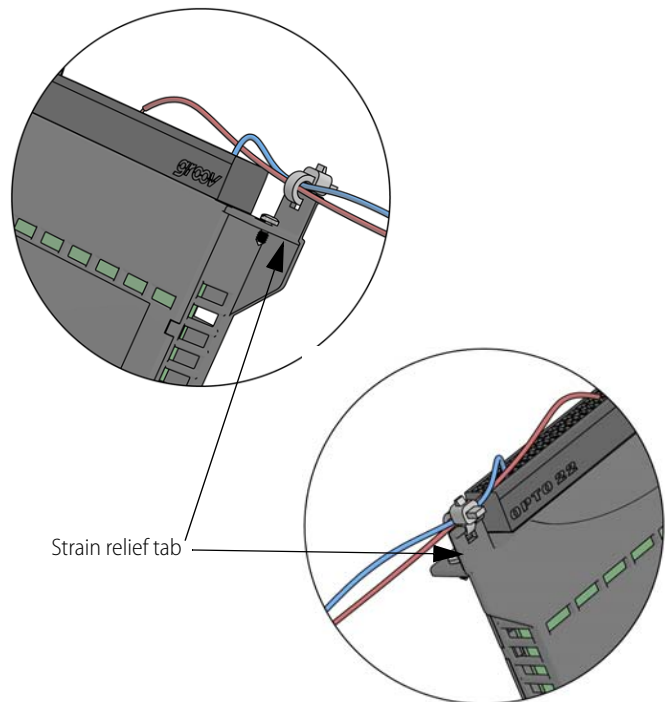
PRODUCTS

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 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
- 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.

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