OPTO 22

groov EPIC PROCESSOR

Features

> High-resolution LCD display with touch capability for edge configuration and *groov*® View HMI

> Web-based commissioning, troubleshooting, and HMI

> Built-in security with encryption, user authentication including LDAP, device firewall, VPN client, and more

> Pre-loaded software: *groov* Manage, *groov* View, Node-RED, CODESYS® Runtime Engine, and (PR2 only) Ignition/Ignition Edge®

> Programmable with flowcharts and scripting, or IEC 61131-3 compliant languages including ladder diagram, or with C/C++, Python, Java, or other languages using secure shell access (SSH)

> Dual independent Gigabit Ethernet network interfaces

> Dual USB ports for serial communication, touchscreen monitors, keyboards, or a mouse

> HDMI port for external monitors or touchscreen

> UL Hazardous Locations approved and ATEX compliant

groov EPIC processor
With built-in touchscreen display that opens to reveal power button, LEDs, ports, and connectors

DESCRIPTION

The **E**dge **P**rogrammable **I**ndustrial **C**ontroller is an embedded Linux® real-time controller with gateway functions, well suited for any automation or industrial internet of things (IIoT) application.

A compact industrial computer, the *groov* EPIC processor features a resistive-touch, high-resolution LCD display for on-the-spot configuration, troubleshooting, and HMI. The LCD display swings open to provide easy access to the power button, power supply connectors, network interfaces, ports, and status LEDs.

- Dual, independent Gigabit Ethernet network interfaces securely segment trusted networks (like your control network) from untrusted networks (like the internet).
- Dual USB ports connect to serial interfaces, WiFi adapters, and keyboard, mouse, and touchscreen controls.
- An HDMI port connects to an external monitor for displaying configuration and *groov* View HMI on an external large screen, useful for local process visualization and OEM applications.

The processor can operate through a wide range of operating temperatures (-20 to 70 °C), and with its industrial design, it can be used in a large variety of applications and operating environments. The CPU is an industrial, quad-core ARM® processor running open-source Linux with real-time extensions.

Models

Two *groov* EPIC processors are available. Both have the same features and include the same software with the following differences:

- **GRV-EPIC-PR1** has 2 GB RAM and 6 GB user space. Through a firmware update, you can install Inductive Automation's Ignition & Ignition Edge version 7 or version 8 (license required for either).
- **GRV-EPIC-PR2** has more memory and disk space: 3.75 GB RAM and 22 GB user space. It ships pre-installed with Ignition version 8 (license required). (It cannot run version 7 of the Ignition or Ignition Edge software.)

For included software and license information, see .
For more specifications, see .

Part Numbers

Part	Description
GRV-EPIC-PR1	Chassis mount processor for the *groov* EPIC system; supports Ignition 7 and 8
GRV-EPIC-PR2	Chassis mount processor for the *groov* EPIC system with increased RAM & storage; supports and ships with Ignition 8
GROOV-LIC-EDGE	Activation key for Ignition Edge software, version 7
GROOV-LIC-EDGE8	Activation key for Ignition Edge software, version 8
GROOV-LIC-CRE	Activation key for CODESYS Runtime Engine software
GROOV-LIC-SHELL	Activation key for secure shell access to Linux operating system

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Software

Both models include the following software:

- *groov* **Manage** for browser-based management of your *groov* EPIC system, from the integrated front touchscreen display or any browser-based device
- **PAC Project**™ Basic Software Suite (installed and running on your Microsoft® Windows® computer) for developing control programs and a Windows-based HMI
- **CODESYS** Development System and Runtime Engine for creating and running **IEC 61131-3** compliant programs. All IEC 61131-3 languages are supported including Function Block Diagram (FBD), Structured Text (ST), Sequential Function Charts (SFC), and Ladder Diagram (LD). (Requires the free CODESYS Runtime Engine License, GROOV-LIC-CRE.)
- Access to the Linux operating system through a **secure shell** to run custom applications (requires the free SSH License, GROOV-LIC-SHELL)
- *groov* **View** for building and viewing custom operator interfaces for local, mobile, and browser-based devices
- **Node-RED** for creating data flows to connect cloud services, databases, and APIs through pre-built nodes
- **Ignition** or **Ignition Edge** from Inductive Automation® (no PC required):
  - Ignition Edge connects to Allen-Bradley®, Siemens®, and Modbus®/TCP devices via OPC UA and offers efficient IIoT communications using MQTT with Sparkplug B payload.
  - Ignition Edge requires purchase of license GROOV-LIC-EDGE for Ignition Edge version 7 or GROOV-LIC-EDGE8 for version 8. GRV-EPIC-PR1 only: Firmware update required to install either version of Ignition Edge.
  - Full Ignition includes MQTT with Sparkplug B, connects to PLCs, adds external access to the OPC UA server, and offers scripting, database support, and a wide array of Ignition modules. Contact us for Ignition license information.
- **Data Service** for accessing PAC Control tags, I/O data, and Scratchpad through a built-in OPC UA server and MQTT service. With MQTT you can configure string or Sparkplug payloads to publish to one or more MQTT brokers. For added security, both OPC UA and MQTT support security certificates for authentication.

Programming

You can run a range (from simple to complex) of control programs on the *groov* EPIC processor developed with any of the following:

- PAC Control, Opto 22's flowchart-based programming language
- CODESYS Development System V3 using any IEC 61131-3 compliant programming language

- Python, C/C++, JavaScript, and other popular software development tools

Configuration

The *groov* Manage app gives you central access to your *groov* EPIC for configuration, troubleshooting, and commissioning. Use *groov* Manage from your computer, smartphone, tablet, or the *groov* EPIC's touchscreen—the interface is consistent and easy to use on all devices.

In addition to configuring I/O channels for signal inputs and features including PID (proportional-integral-derivative) control loops, you can also set up security, networking, software, and other features in *groov* Manage.

HMI

groov View offers easy browser-based, mobile-ready development of a custom HMI with trending, events, and user notification. Communication is secured with user authentication and TLS encryption. And, because the HMI is web server-based, what you build can be viewed on any authorized device with a web browser.

REMOTE I/O TOOLS

groov Manage provides a robust complement of features to configure EPIC as remote I/O:

- Easy I/O configuration—With just a few clicks, you can:
  - Configure Digital inputs/outputs with features like latches
  - Configure Analog inputs/outputs with features like scaling
  - Enable and disable Watchdogs
  - Configure features like temperature units for the entire chassis.
- PID configuration—Configure PIDs, then monitor and change values directly on the touchscreen or through a browser. In the browser, you can view trends and then adjust scaling to view trends over a long period of time or zoom in on specific values or axes.
- Scratch Pad—Peer-to-peer communication of values: define your area and then set the values through *groov* Manage.
- Generic MMP—Look up and change values in OptoMMP memory map areas.
- MMP and Modbus Calculators—Need help calculating the hexadecimal address of the Analog Channel Write area of the OptoMMP map for the fourth channel of the third module? Or, how about converting it to the correct Modbus Unit ID and register? These two calculators can help.

NETWORKING CAPABILITY AND TOOLS

groov EPIC provides dual, independent Gigabit Ethernet network interfaces, helping you connect to up to two different networks. Plug in a compatible USB-to-WiFi adapter and you can expand connectivity to include a wireless network. Set up an OpenVPN server (on-site or in a cloud) and create a Virtual Private Network (VPN) connection to your *groov* EPIC with the on-board OpenVPN client.

You can connect to a single, flat network right-out-of-the-box: insert an Ethernet cable to ETH0 and turn on *groov* EPIC. Have a slightly more complex network or need to fine-tune some network settings? *groov* EPIC provides networking capabilities so that your IT department can:

- Add or override existing DNS server IP addresses, domain names, and Gateway IP addresses assigned by DHCP servers, plus manage their query order.
- Enable port redirect to control the flow of network traffic to, through, and out of the network interfaces.
- Create static routes to direct IP traffic through a specific gateway.

Add your *groov* EPIC to your network management by enabling SNMP. Configure it to broadcast event messages to your network management tool. Send control messages to your *groov* EPIC through your PAC Control strategy or an OptoMMP client.

If you encounter any issues, on-board networking tools can help you diagnose them:

- **Ping**—A commonly used tool to test basic connectivity from each of the *groov* EPIC processor's interfaces.
- **Test TCP Port**—Helps determine if a port on a particular server is open or closed.
- **Traceroute**—A tool to help you see the route a packet takes to reach its destination.
- **NsLookup**—Determine the domain name and IP address of a DNS server at the host.

SECURITY

Designed for secure data communication, *groov* EPIC processors help you create and maintain a secure system with features like these:

- **Two independent network interfaces**—Use one for your trusted network and the other for an untrusted network, like the internet. Plug in a compatible USB-to-Wifi adapter and add a wireless network. Data cannot pass between networks.
- **Data encryption**—Out of the box, all connections to *groov* EPIC from your computer or mobile device are encrypted using SSL/TLS. So is the data EPIC communicates to on-premises or cloud-based software, systems, and services.

- **Device firewall and security certificates**—You have control over firewall ports on *groov* EPIC and can upload server and client security certificates as needed.
- **VPN client**—Data on *groov* EPIC can be securely accessed from remote locations through a virtual private network, using the built-in Open VPN client.
- **Controlled user access**—From the time you first turn it on, *groov* EPIC requires user authentication. You control all user accounts and groups. And you can scale up your control system more easily by configuring *groov* EPICs to connect to your LDAP-compatible directory service. With **LDAP**, your IT staff can manage all users for all EPICs from a central place. Centralized user management can also help satisfy data integrity requirements in regulated industries.
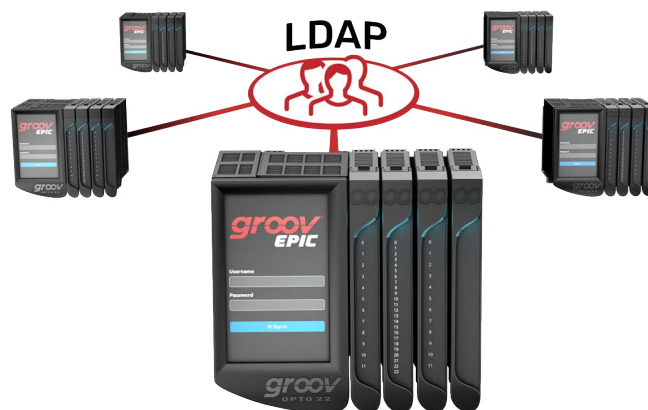
- **MQTT/Sparkplug B**—Communicate data more securely and efficiently using device-originated, outbound connections between *groov* EPIC and an MQTT broker located either on premises or in the cloud. For more on MQTT, see Getting Started with MQTT in *groov* Products (form 2350).
- **OPC UA** —Provide secure access to your PAC Control strategy tags and I/O data by enabling and configuring the built-in OPC UA server (Data Services OPC UA server) on your *groov* EPIC.
- **OptoSupport Remote Support Service** (RSS)—If problems arise, you can use OptoSupport RSS to create a secure, encrypted connection between your *groov* EPIC and Opto 22's support team, so they can remotely help diagnose and troubleshoot. The remote connection can only be started by you, and only after you and an Opto 22 support team member have determined that the best way to help you is through a remote connection.

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THE *groov* EPIC SYSTEM

GRV-EPIC-PR1 and GRV-EPIC-PR2 are part of the *groov* EPIC system, which provides a complete control and communications system at the network's edge, including:

- **I/O.** Connect to field devices and translate their electrical signals into the ones and zeros that computer systems understand. The *groov* EPIC system offers analog, digital, and serial functions, including thermocouple linearization, local PID loop control, watchdog, totalizing, and much more.

- **Control.** Automate equipment and systems at the network's edge. Create flowchart-based control strategies, IEC 61131-3 compliant programs, or custom-developed applications with popular software development tools.

- **Connectivity and Data Handling.** Acquire, move, and share data from industrial systems, legacy equipment, business and IT systems, and the cloud through a variety of connecting technologies like Node-RED, RESTful APIs, and Ignition SCADA.

- **Visualization.** Securely monitor, control, and use data as you need it—locally, on premises, or from anywhere using *groov* View. Authorized users can view your operator interface on the *groov* EPIC's touchscreen, a mobile device, a computer, or anything with a web browser.

The system includes processor, software, I/O modules, chassis, and power supply.

- The chassis holds the power supply, processor, and selected, modular I/O modules you need for your application. For more information, see the *groov* EPIC Chassis Data Sheet (form 2247).

- Power supplies are available for AC power, DC conversion, and pass-through connections from a DC power supply you already own. For more information, see the *groov* EPIC Power Supplies Data Sheet (form 2246).

- The *groov* I/O modules connect a variety of field devices to your *groov* EPIC system. The table above lists the available I/O modules and the form numbers to learn more about them.

Module description	Part numbers	Form number
groov 115 VAC Discrete Input Modules	GRV-IAC-24, GRV-IACS-24, GRV-IACI-12, GRV-IACIS-12	2226
groov 180–280 VAC Discrete Input Modules	GRV-IACHV-24, GRV-IACHVS-24, GRV-IACIHV-12, GRV-IACIHVS-12	2222
groov DC Discrete Input Modules	GRV-IDC-24, GRV-IDCS-24, GRV-IDCI-12, GRV-IDCIS-12, GRV-IDCIFQ-12, GRV-IDCSW-12	2236
groov 2–16 VAC VDC Discrete Input Modules	GRV-IACDCTTL-24, GRV-IACDCTTLS-24	2237
groov 12–250 VAC Output Modules	GRV-OAC-12, GRV-OACI-12, GRV-OACS-12, GRV-OACIS-12	2231
groov 5–60 VDC Discrete Output Modules	GRV-ODCI-12, GRV-ODCIS-12	2238
groov DC Discrete Output Sourcing Module	GRV-ODCSRC-24	2242
groov Mechanical Relay Output Module	GRV-OMRIS-8	2243
groov ICTD Temperature Input Module	GRV-IICTD-12	2300
groov Thermistor/Resistor Input Module	GRV-IRTD-8, GRV-ITR-12	2301
groov Analog Current Input Module	GRV-IMA-24, GRV-IMAI-8	2239
groov Analog Thermocouple/Millivolt Input Module	GRV-ITM-12, GRV-ITMI-8	2240
groov Analog Voltage Input Module	GRV-IV-24, GRV-IVI-12, GRV-IVIRMS-10	2241
groov Analog Voltage and Current Output Module	GRV-OVMALC-8, GRV-OVMAILP-8	2244
groov Multifunction Mixed Signal Module	GRV-MM1001-10	2353
groov Power Monitor Module	GRV-IVAPM-3	2351
groov Serial Module	GRV-CCANI-2, GRV-CSERI-4	2296

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SYSTEM COMPATIBILITY

The *groov* EPIC system is compatible with many other Opto 22 products:

- Your *groov* EPIC processor is fully compatible with *groov* RIO Ethernet-based edge I/O modules. EPIC can use them not only as traditional remote I/O but also for exchanging data with sensors and devices that *groov* RIO is wired to and applications it connects to. See the *groov* RIO Data Sheet (form 2317), for more information on these capable multifunction, multi-signal I/O industrial units.
- A *groov* EPIC processor running a PAC Control strategy can also use existing SNAP PAC I/O units as remote I/O.
- If you already have a SNAP PAC controller running a PAC Control strategy and need additional capabilities in your system, you can add *groov* EPIC for remote I/O and to easily connect with PLCs, enterprise software, and cloud services for IIoT applications.

Device Compatibility

The following USB devices have been tested to be compatible with *groov* EPIC processors for the function listed.

Serial communication

The following USB-to-serial adapters have been tested and proven to be compatible with *groov* EPIC:

Device Manufacturer	Model
B&B Electronics	USOPTL4 (isolated RS-485) USPTL4 (non-isolated RS-485) USO9ML2 (isolated RS-232)
Gearmo	GM-482422 (non-isolated RS-485/RS-422) GM-FTD1-A12 (non-isolated RS-232) SERIAL-B (non-isolated RS-232)

Wireless communication

The following WiFi USB adapters have been tested and proven to be compatible with *groov* EPIC:

Device Manufacturer	Model
ALFA	AWUS036ACS
Netgear	AC1200 (A6150)
Netis	WF2180 WF2190
Panda Wireless	PAU0A AC600 PAU0D AC1200
Linksys	AE6000
TP-Link	Archer T1U
Sabrent	AC600

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SPECIFICATIONS

| Specification	GRV-EPIC-PR1	GRV-EPIC-PR2
Power requirements	7.1 W typical, 9.1 W max.	
Memory	2 GB RAM 2 MB battery-backed RAM 6 GB user space	3.75 GB RAM 2 MB battery-backed RAM 22 GB user space
Backup battery for real-time clock	BR2032	
Screen size and resolution	5 inches diagonal; 480 x 800 pixels	
Ethernet Communication (wired)	Two independent 10/100/1000 Mbps RJ-45 connectors, each with a separate IP address (separate IP networks). Supports Auto MDI-X (crossover cable not needed).	
USB	USB 2.0 (two ports; can be used to connect serial devices via a USB-to-serial converter with an FTDI chipset)	
HDMI	Connector Type: A. HDMI Specification: Version 1.4a. Max. Resolution: 1920 x 1080 pixels at 60 Hz	
Minimum PAC Project Version	10.000	10.3003
Minimum Opto 22 Library Package For CODESYS Version	1.0.0.0	2.0.1.0
Ignition & Ignition Edge Versions	7; 8 with firmware upgrade	8 only
Maximum Number of PAC Control Engine Charts	64	64
Torque, bottom hold-down screw	3.5 in-lb (0.4 N-m)	3.5 in-lb (0.4 N-m)
Torque, top hold-down screw	1.5 in-lb (0.17 N-m)	1.5 in-lb (0.17 N-m)
Operating temperature	-20 °C to +70 °C	-20 °C to +70 °C
Storage temperature	-40 °C to +85 °C	-40 °C to +85 °C
Humidity	5–95% RH	5–95% RH
MTBF (minimum, 25 °C)	900,000 hours	750,000 hours
Agency approvals and certifications	UL/cUL (Class 1 Div. 2[a]), CE, ATEX (Category 3, Zone 2), RoHS, DFARS, UKCA	
Warranty	30 months	30 months

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

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MOUNTING AND UN-MOUNTING THE PROCESSOR

Important: *Before mounting the processor, ensure the power supply is properly mounted to avoid damage to the EPIC processor connector pins.*

Mounting the Processor

1. Make sure you properly mounted the power supply by aligning the tabs on the back of the power supply with the notches on the chassis. For complete instructions, see the *groov* EPIC Power Supplies, Converters, and Adapters Data Sheet (form 2246).


groov EPIC power supply

groov EPIC chassis (GRV-EPIC-CHS4 shown)
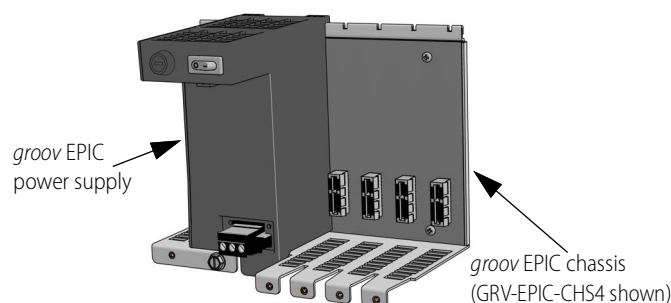
2. Review "Processor orientation" on page 10 to understand which side of the processor is the top, underside, back, and face.

3. Pull open the LCD display using the handgrip so you can see the notch on the top side of the processor.
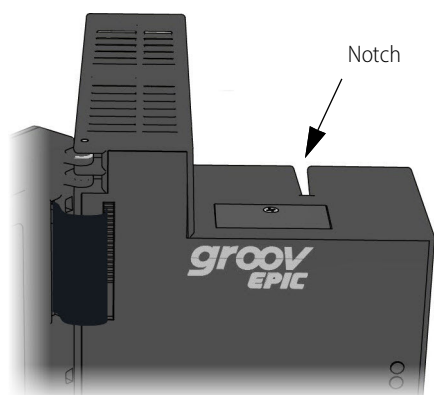
Notch

4. Hold the processor by the body with both hands, and make sure that the notch on the processor aligns with the guide tab on the power supply.

5. **Align the processor.** With the LCD display open, slowly guide the processor straight onto the chassis—holding it flush against the side of the power supply—until you feel the processor start to touch the pin connector on the chassis.

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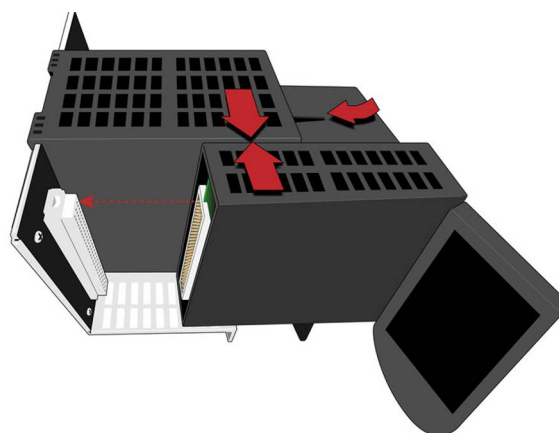
6. **Seat the pins.** When they touch, gently jiggle the processor until the pins on the processor's connector properly seat themselves into the connector holes on the chassis.
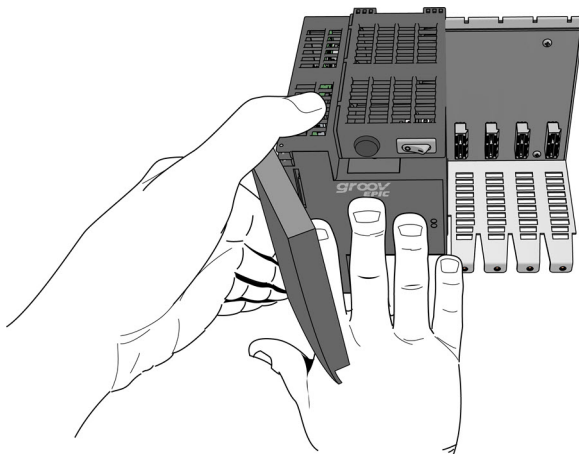

7. **Seat the processor.** Push the processor (not the LCD display) into the connector until it resists further pressure and is all the way in.
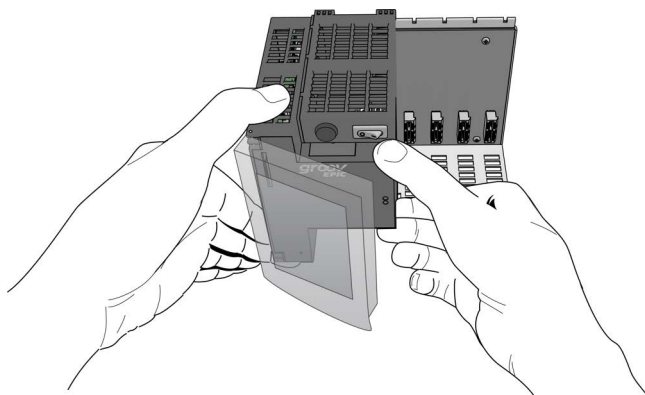
   IMPORTANT: Do not push on the LCD display.

8. Tighten the retention screws that attach the processor to the power supply and chassis to the recommended torque listed in "Specifications" on page 6.

Retention Screws

9. Close the LCD display.
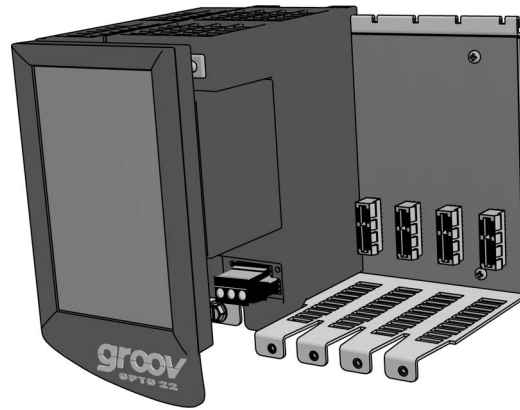
Un-mounting the Processor

1. Pull open the LCD display using the handgrip on the bottom to access the retention screws and power switch.
2. Turn off the power switch on the power supply.

   IMPORTANT: *Do not attempt to remove the processor and power supply as a single unit.*

3. Remove the retention screws that attach the processor to the power supply and the chassis.
4. Hold the processor by the body with both hands as shown in the diagram below.

   IMPORTANT: *Do not attempt to remove the processor by the LCD display.*
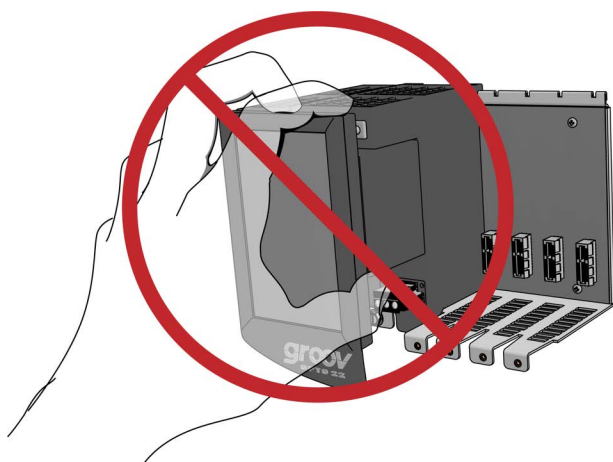
5. Pull the processor straight out. Do not rock or rotate the processor as you pull.

   IMPORTANT: *When handling the processor, do not touch any of the exposed circuitry.*

6. Close the LCD display.

PROCESSOR ORIENTATION

The following diagram identifies which side of the processor is the bottom or underside, the face, the top and the back.
This helps orient the processor correctly when you are reading the mounting and un-mounting instructions.

Face

Top (not visible in this diagram)

Bottom or underside

Back (not visible in this diagram)
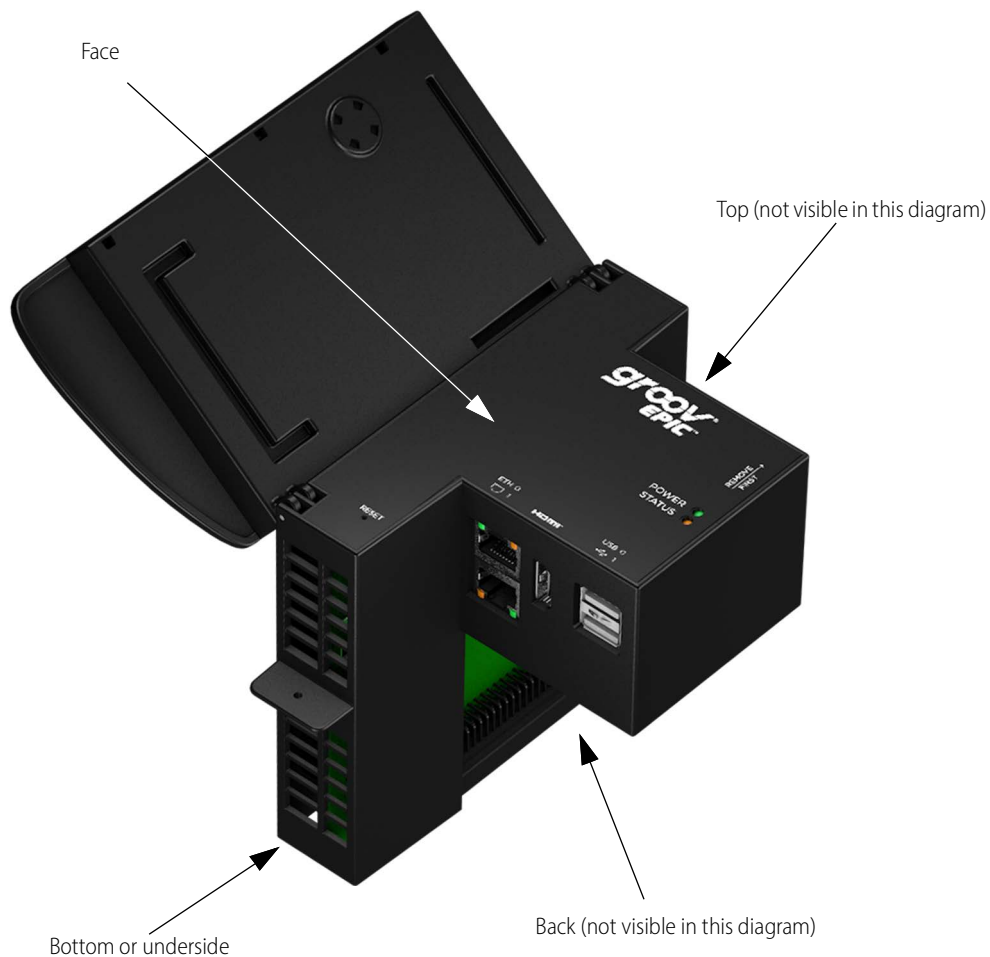
LCD DISPLAY

The LCD display features resistive-touch capability, which means you can manipulate the touchscreen with gloved fingers or a stylus (not included).

The LCD display is your window to both your control system and HMI. With *groov* Manage, you can:

- Configure and troubleshoot all *groov* I/O modules mounted on the chassis, including I/O channel signal inputs and features like PID control loops.
- Configure the EPIC's Ethernet network interfaces and device firewall, and create rules to control access to its ports.

- View the current state of input channels and set the state of output channels.
- Access a library of information about all *groov* I/O modules available through Opto 22, including specifications and wiring diagrams.
- Review logs for troubleshooting.

The LCD display also shows your *groov* View HMI, which you can build and configure within your web browser on your PC. This HMI is also available to authorized users on computers and mobile devices.

groov Manage

groov View HMI
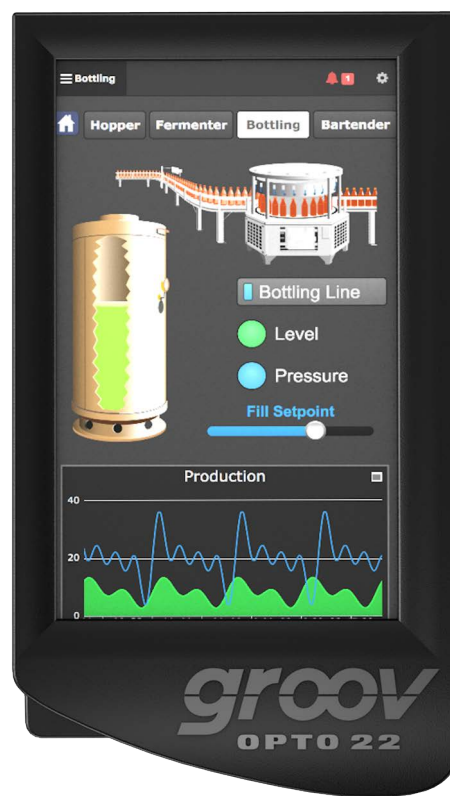
LEDs, NETWORK INTERFACES, AND PORTS

The diagram below describes the LEDs, network interfaces, and ports on the *groov* EPIC processor. All of these interfaces and indicators are easily accessed by opening the hinged LCD display. When the LCD display is closed, it does not interfere with cables connecting the processor to external devices like an external monitor. For more information about LEDs, network interfaces, and ports, see *groov* EPIC User's Guide (form 2267).

LEDs

LED	Indicates
SPEED LED	Indicates link speed: • Off = 10 Mbps • Green = 100 Mbps • Orange = 1000 Mbps
LINK ACT LED	Indicates link status or activity: • on/solid = link present • blinking = link present and local activity
POWER LED	Indicates status of power: • Green = on • Red = on, resetting
STATUS LED	Indicates whether the unit is running with full functionality: • Green = all normal • blink green and red = starting a restore to defaults

Independent Ethernet Network Interfaces

The Ethernet network interfaces are independent, which means they are not connected internally. Each requires its own IP address, and the two interfaces must be on different subnets.
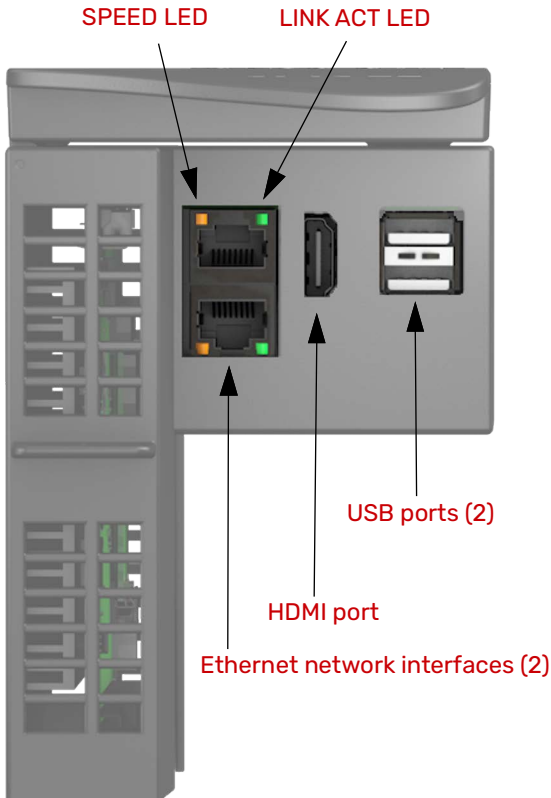
Ports

The HDMI port offers a connection to an external monitor, such as an HDMI-ready touchscreen monitor, so that you can display *groov* Manage or your *groov* View HMI on a separate screen.

The two USB ports offer several ways to extend the capabilities of the processor. You can connect:

• Serial devices via a USB-to-serial converter
• A mouse, keyboard, or both to make it easier to type in data and navigate through the screens
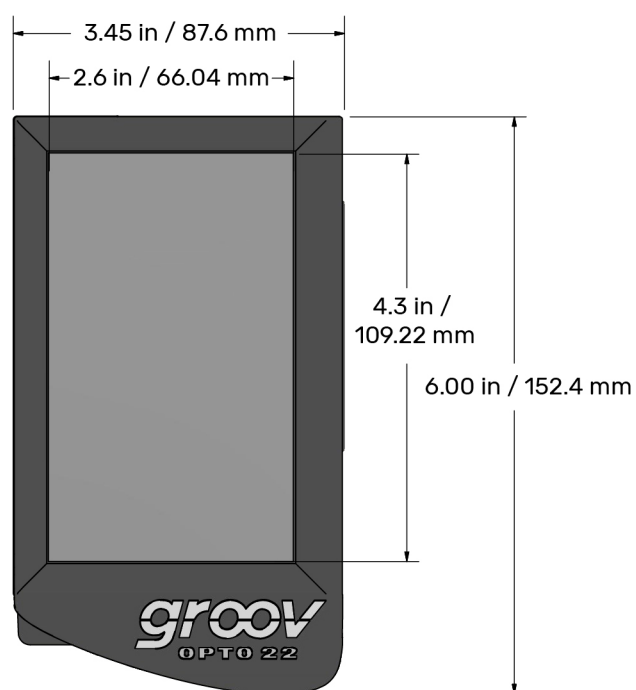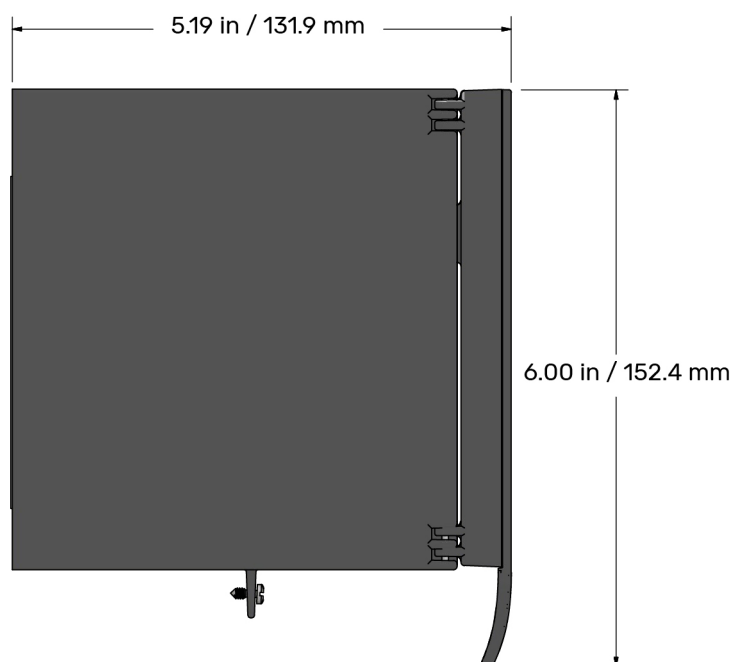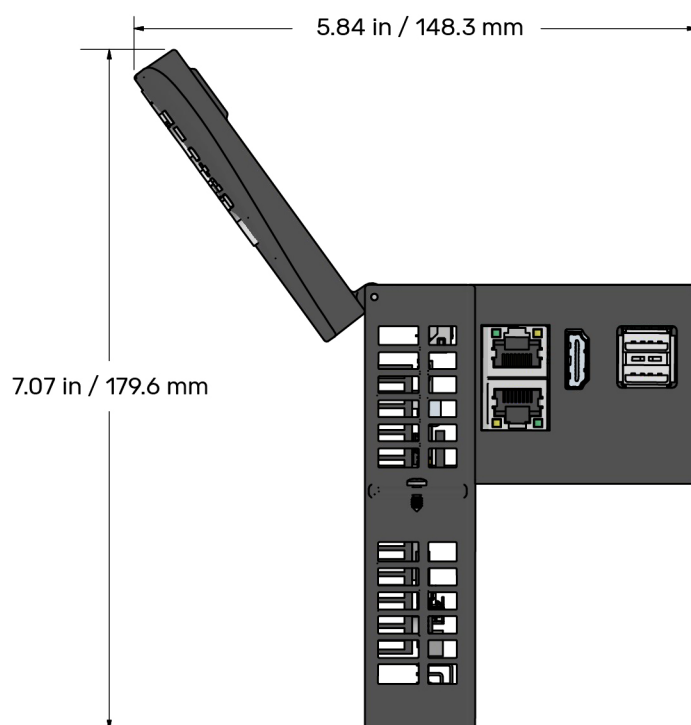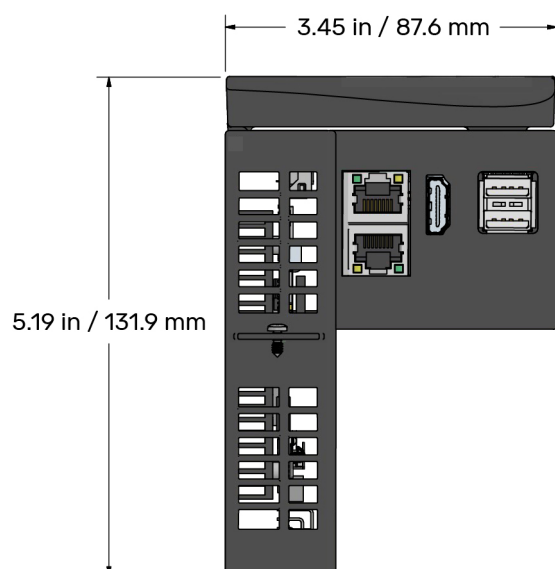• WiFi adapters to add wireless connectivity

For device compatibility information, see "Device Compatibility" on page 5.

SPEED LED   LINK ACT LED

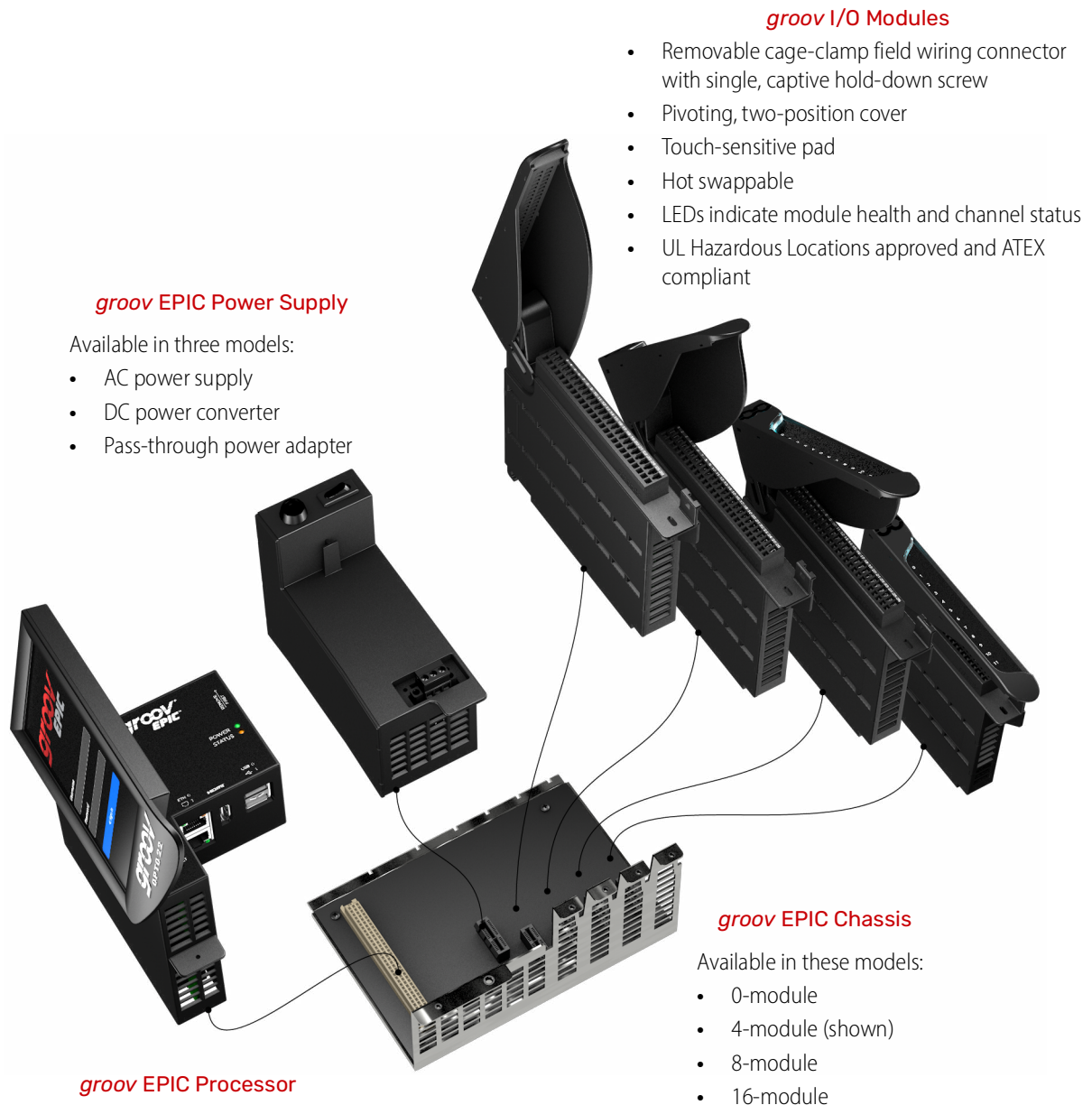USB ports (2)

HDMI port

Ethernet network interfaces (2)

The labels on the face of the processor identify the locations of the interfaces and ports, which are on the underside of the processor, as shown on the image to the left.

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DIMENSIONS: GRV-EPIC-PR1 AND GRV-EPIC-PR2

The processor features a hinged LCD display that opens and closes. The diagram to the right shows the LCD display open to its fullest extent. The diagram below shows the LCD display closed.

3.45 in / 87.6 mm

5.19 in / 131.9 mm

5.84 in / 148.3 mm

7.07 in / 179.6 mm

5.19 in / 131.9 mm

6.00 in / 152.4 mm

3.45 in / 87.6 mm

2.6 in / 66.04 mm

4.3 in / 109.22 mm

6.00 in / 152.4 mm

HARDWARE ARCHITECTURE

groov I/O Modules

- Removable cage-clamp field wiring connector with single, captive hold-down screw
- Pivoting, two-position cover
- Touch-sensitive pad
- Hot swappable
- LEDs indicate module health and channel status
- UL Hazardous Locations approved and ATEX compliant

groov EPIC Power Supply

Available in three models:

- AC power supply
- DC power converter
- Pass-through power adapter

groov EPIC Chassis

Available in these models:

- 0-module
- 4-module (shown)
- 8-module
- 16-module

groov EPIC Processor

- Web-based commissioning, troubleshooting, and *groov* View HMI
- Compatible with PAC Project Basic (installs on Windows computer)
- Pre-installed software: *groov* Manage, *groov* View, Node-RED, Ignition (GRV-EPIC-PR2 only), and CODESYS Runtime Engine
- LCD touchscreen display
- Dual USB ports for serial communications or touchscreen monitors
- HDMI port for external monitors, touchscreens, and WiFi adapters
- Dual independent Gigabit Ethernet network interfaces
- Supports up to 16 *groov* I/O modules
- Available in two models: GRV-EPIC-PR1, GRV-EPIC-PR2