



Geist™ Rack Power Distribution Unit

Installer/User Guide

Upgradeable and Non-Upgradeable M-Series and D-Series

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

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1 Overview

The Vertiv™ Geist™ Rack Power Distribution Unit (rPDU) gives data center managers the flexibility to install the intelligence required today, with the option to upgrade technology as needs evolve. From basic power to power monitoring to outlet switching, the Geist™ rPDU product line adapts to a business' needs now and in the future.

To establish this upgrade path, Vertiv™ engineers took the robust Geist™ rPDU design and incorporated an Interchangeable Monitoring Device (IMD). PDUs last for many years and with the IMD design, businesses are able to upgrade their PDUs to newer monitoring technologies in the future without having to replace the entire Geist™ rPDU. The hot swappable IMD is changed out in a few simple steps, without interrupting power to critical servers.

1.1 Environmental

The operational environmental limits pertaining to temperature, humidity, and elevation are as defined in the following tables.

Table 1.1 Temperature Limits

Description	Minimum	Maximum
Operating	10°C (50°F)	60°C (140°F)
Storage	-40°C (-104°F)	70°C (158°F) max

Table 1.2 Humidity Limits

Description	Minimum	Maximum
Operating	5%	95% (non-condensing)
Storage	5%	95% (non-condensing)

Table 1.3 Elevation Limits

Description	Minimum	Maximum
Operating	0 m (0 ft)	3,050 m (10,000 ft)
Storage	0 m (0 ft)	15,240 m (50,000 ft)

1.2 Electrical

Electrical product characteristics and performance are defined in the following table. Also, please see the product nameplate for additional rating limits.

Table 1.4 Receptacle Ratings

Type	Ratings
Combination C13/C19	250 VAC, 16 A (UL & CSA 16 A, 250 VAC) with C20 cord 250 VAC, 10 A (UL & CSA 12 A, 250 VAC) with C14 cord NOTE: Each Combination C13/C19 outlet bank is restricted to no more than 32A per plate.
German Schuko	250VAC, 16A
IEC-60320 C13	250 VAC, 10 A (UL & CSA 12 A, 250 VAC)
IEC-60320 C19	250 VAC, 16 A (UL & CSA 16 A, 250 VAC)
IEC309 PS6	230VAC, 16A
IEC309 PS56	230/400VAC, 32A
NEMA 5-15R or L5-15R	125 VAC, 12A
NEMA 6-15R or L6-15R	250VAC, 12A
NEMA 5-20R or L5-20R	125 VAC, 16A
NEMA 6-20R or L6-20R	250 VAC, 16A
NEMA L5-30R	125 VAC, 24A
NEMA L6-30R	250 VAC, 24A
NEMA L7-15R	277VAC, 12A
NEMA L7-20R	277VAC, 16A
Saf-D-Grid	277 VAC, 16A
U-Lock Locking IEC-60320 C13	250 VAC, 10A (UL & CSA 12 A, 250 VAC)
U-Lock Locking IEC -60320 C19	250 VAC, 16A (UL & CSA 16 A, 250 VAC)
United Kingdom BS1363	250VAC, 13A

1.3 Networking

The product communications requirements are defined in the next sections.

1.3.1 Ethernet

The Ethernet link speed for this product is: 10/100/1000 Mb; full duplex.

1.3.2 Protocols

The communications protocols supported by this product include: ARP, IPv4, IPv6, ICMP, ICMPv6, NDP, TCP, UDP, RSTP, STP, DNS, HTTP, HTTPS (TLSv1.3), SMTP, SMTPS, Modbus TCP/IP, DHCP, SNMP (V1/V2c/V3), LDAP, TACACS+, RADIUS, NTP, SSH, RS232 and Syslog.

1.3.3 User interfaces

This product supports the following user interfaces: SNMP, JSON-based Web GUI, JSON API and Command line interface using SSH or serial (RS232).

1.4 Regulatory Compliance

Vertiv™ products are regulated for safety, emissions and environment impact per the following agencies and policies.

Underwriters Laboratories (UL)

UL standards are used to assess products; test components, materials, systems and performance; and evaluate environmentally sustainable products, renewable energies, food and water products, recycling systems and other innovative technologies.

The UL standards specific to this equipment are as noted on the device nameplate.

CE

The placement of the CE mark on a product signifies that the product complies with the applicable European (EU) health, safety and environmental protection requirements, including EU legislation and product directives. The CE mark is required for products offered for sale within the European Economic Area (EEA).

The specific regulations, directives and standards applicable to each product are specified on the Declaration of Conformity.

Federal Communications Commission (FCC)

The Federal Communications Commission (FCC) regulates interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia and U.S. territories. An independent U.S. government agency overseen by Congress, the FCC is the United States' primary authority for communications laws, regulation and technological innovation.

The FCC standards specific to this equipment are:

- This Class A device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
 - This device may not cause harmful interference
 - This device must accept any interference received, including interference that may cause undesired operation.
- This Class A digital apparatus complies with Canadian ICES-003.
- Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.



WARNING! Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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2 Installation

Using the images in the mounting section, install your Vertiv™ Geist™ rPDU.

NOTE: Please visit <http://www.Vertiv.com/ComplianceRegulatoryInfo> for important safety information prior to installation.

To install your unit:

1. Using appropriate hardware, attach the unit to the rack.
2. Plug the Geist™ rPDU into an appropriately rated and protected branch circuit receptacle.
3. Plug in the devices to be powered by the Geist™ rPDU.
4. Turn on each device connected to the Geist™ rPDU.

NOTE: Sequential power-up is recommended to avoid high inrush current.

2.1 Mounting

Optional **brackets** are sold separately.

Figure 2.1 Full-Length Brackets

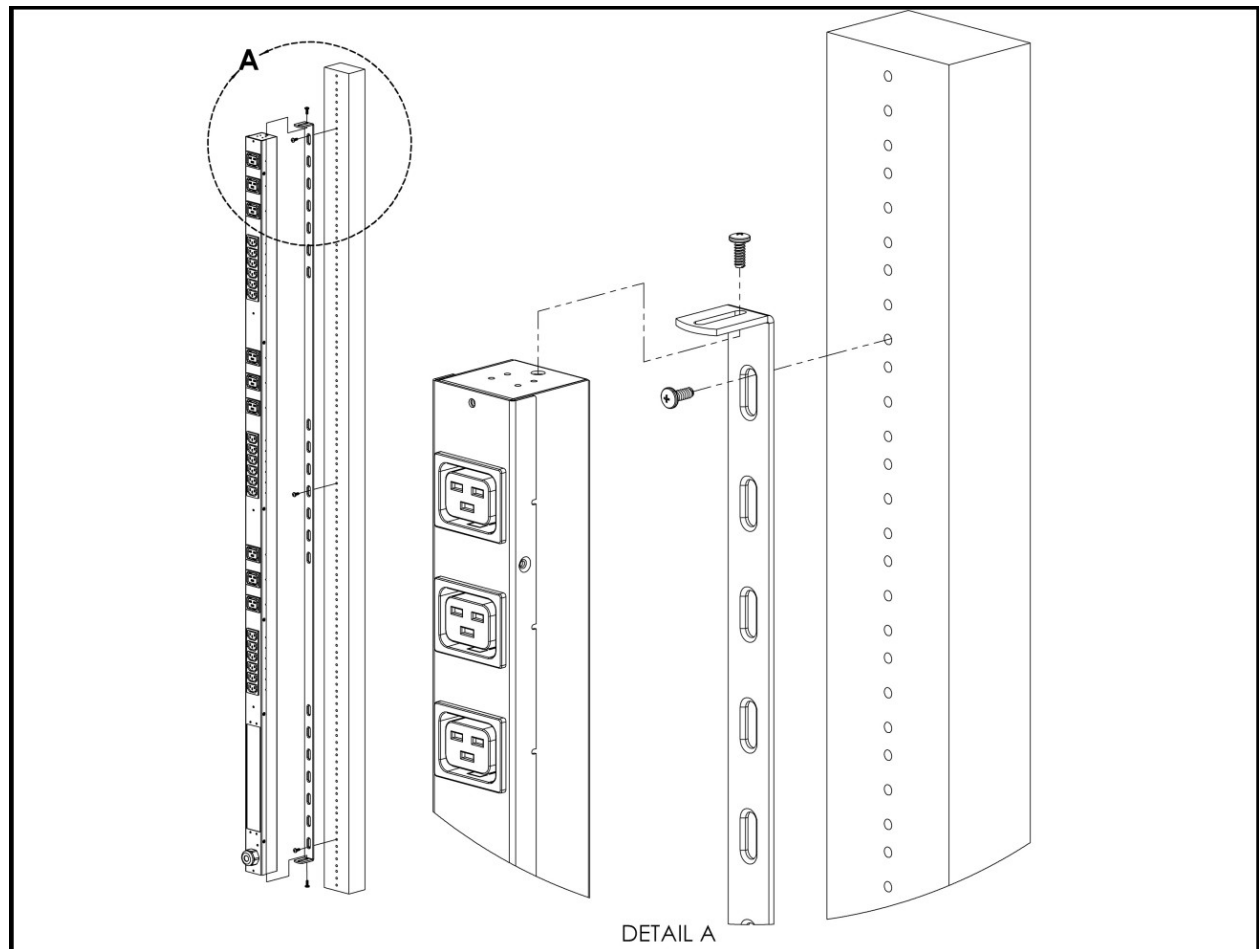


Figure 2.2 Mini L Brackets

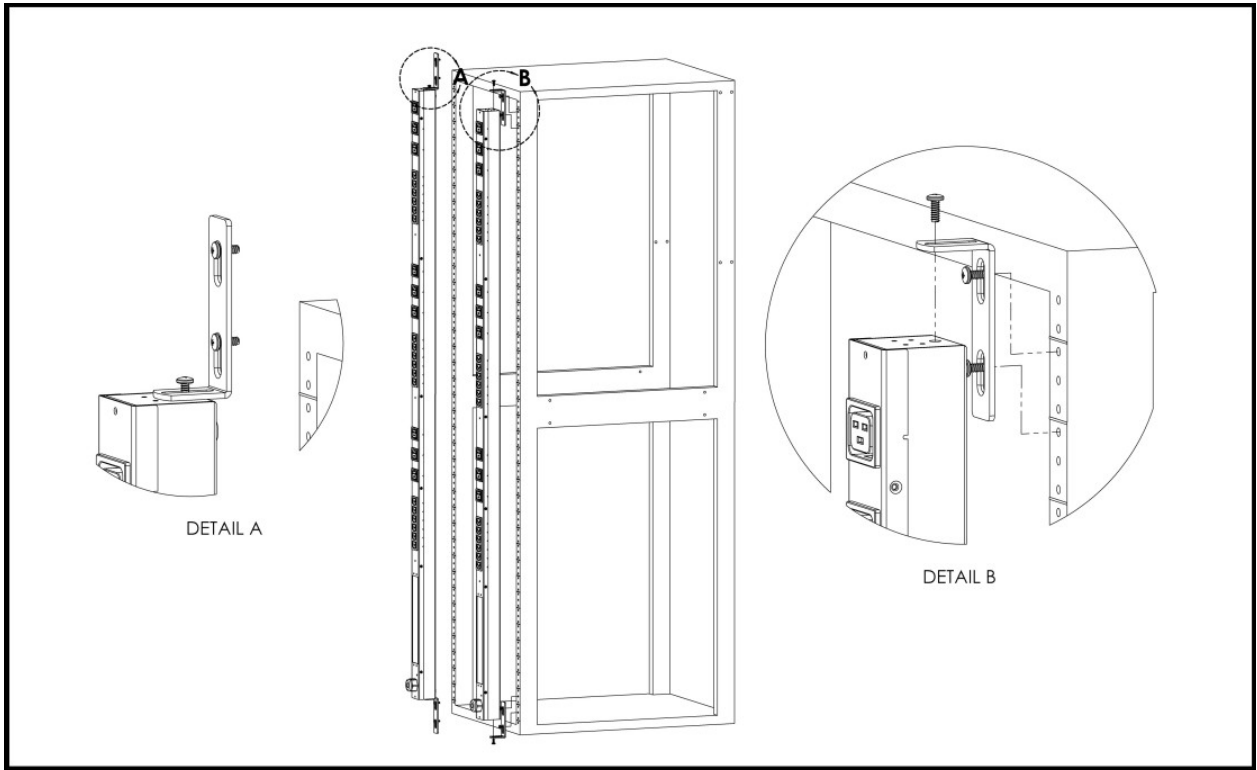


Figure 2.3 Vertical Extension Brackets

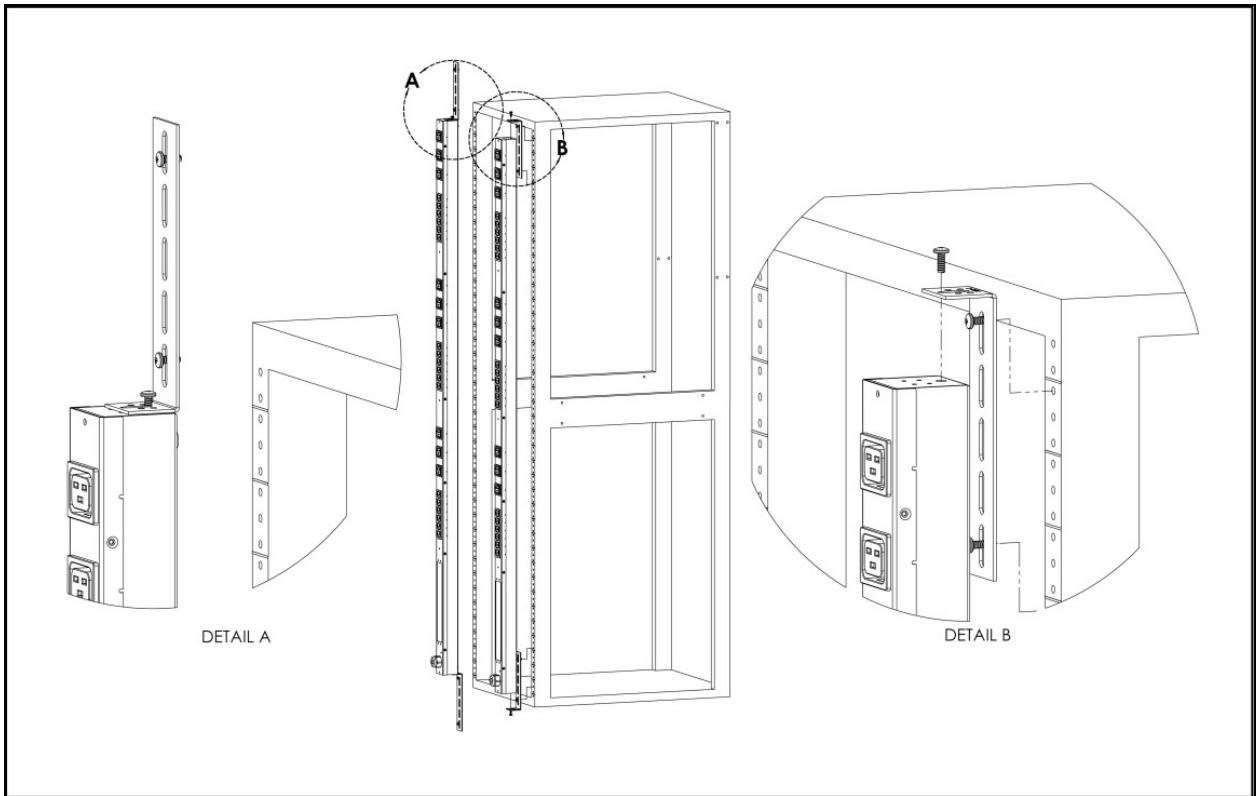


Figure 2.4 Toolless Mounting Hardware

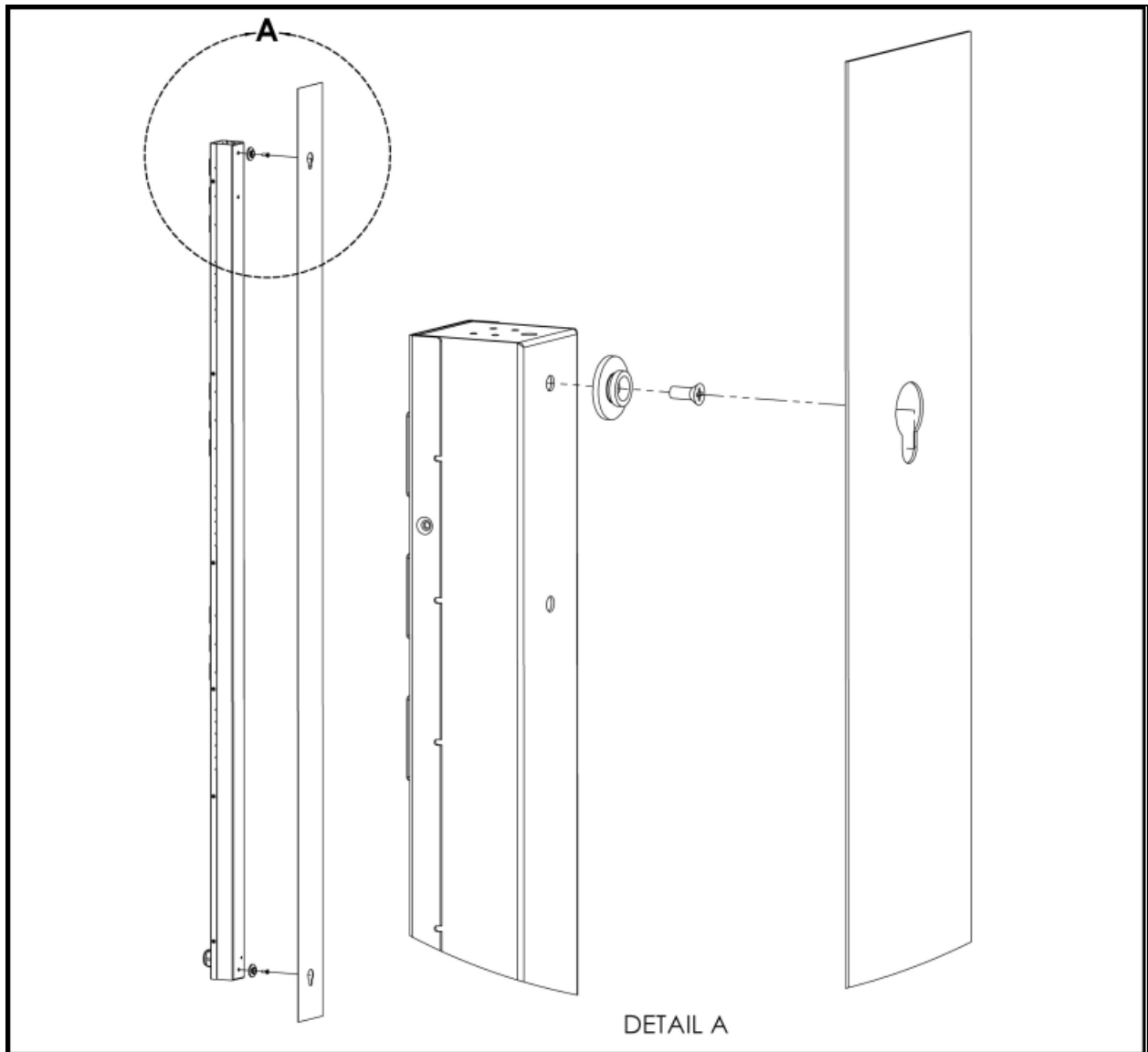


Figure 2.5 Toolless Full Length Brackets

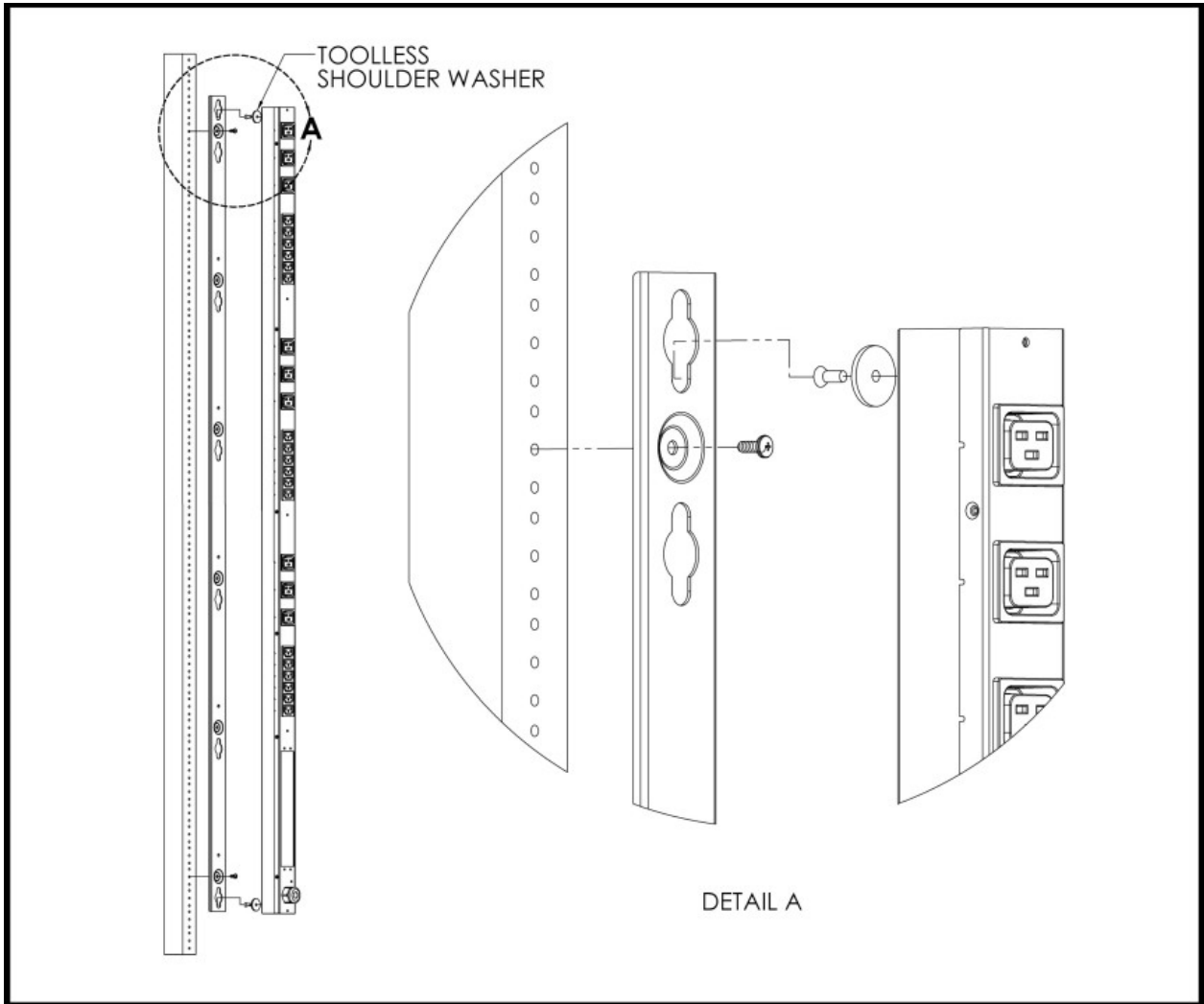


Figure 2.6 Single Side Mount Two Units Brackets

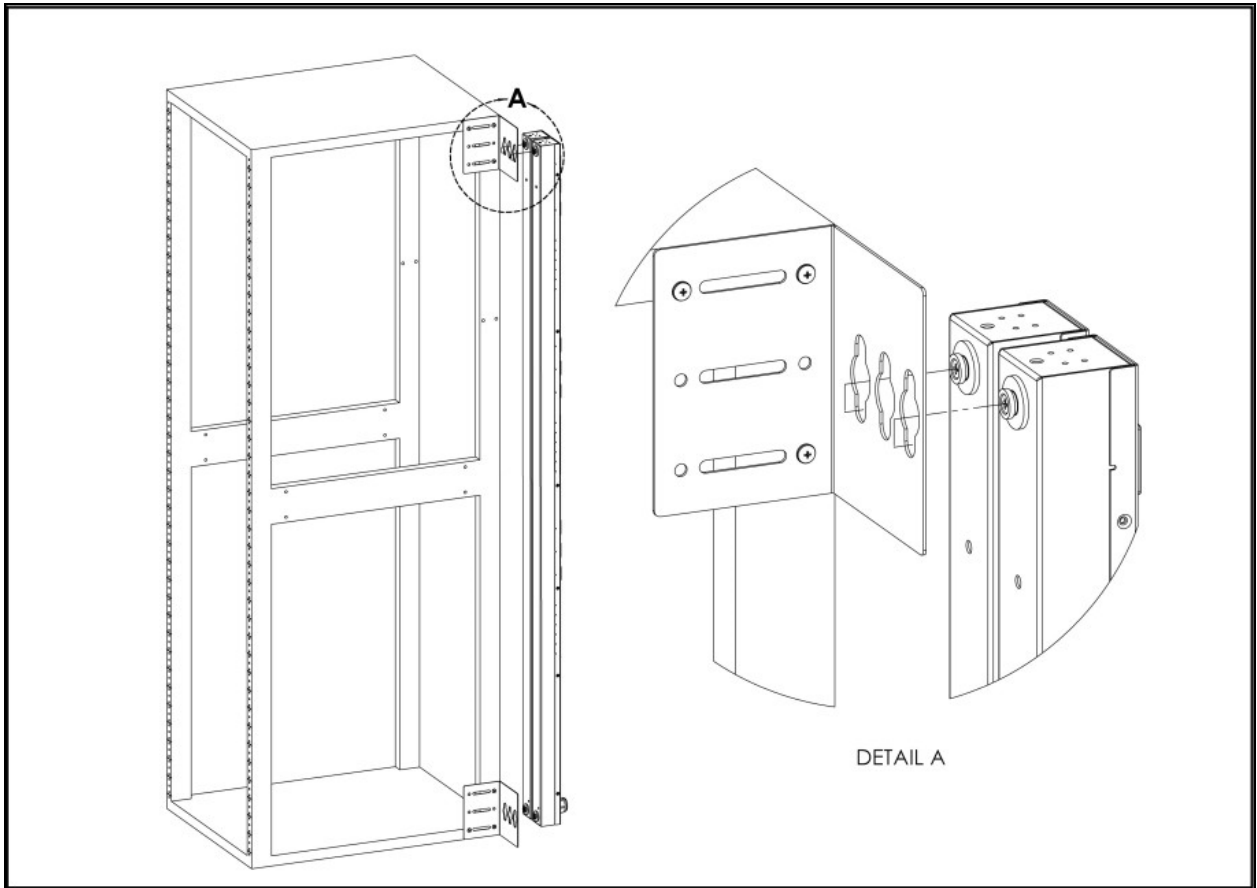


Figure 2.7 Offset/Side Mount Brackets

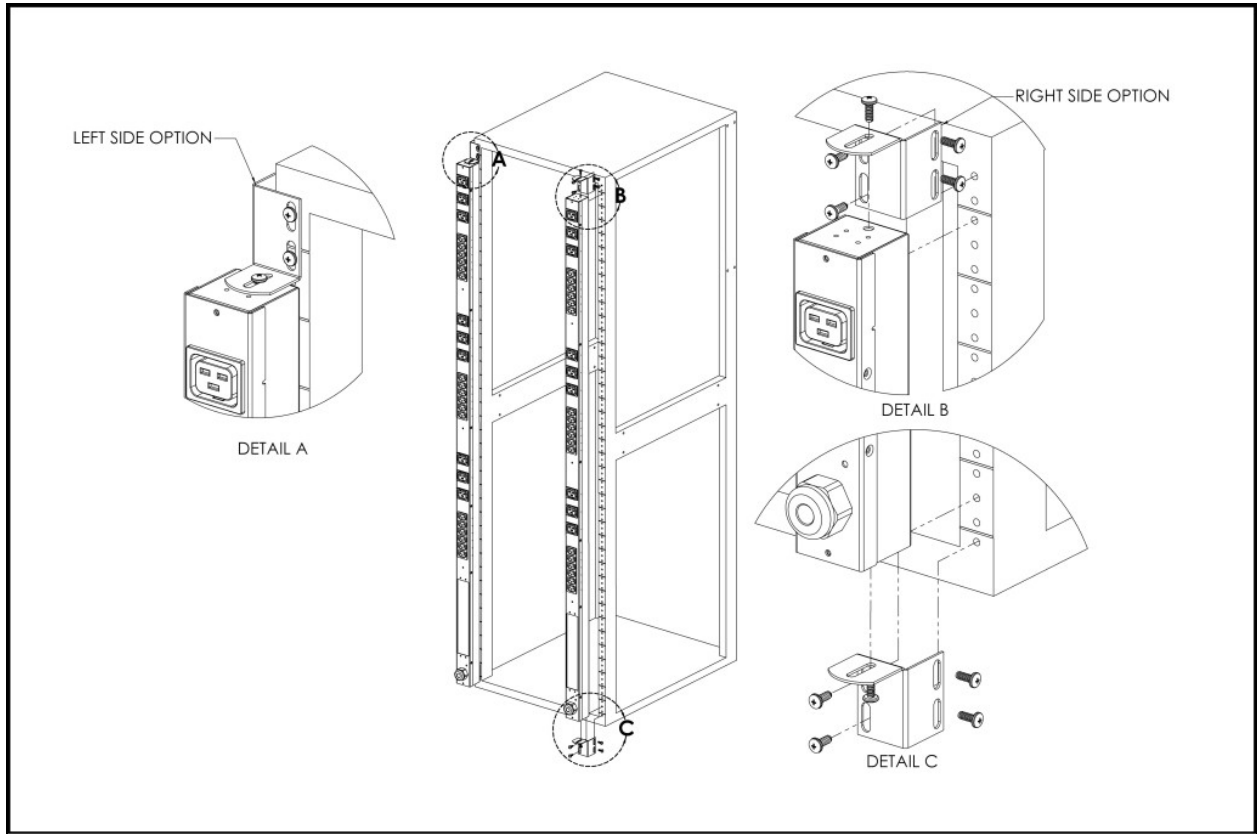


Figure 2.8 7" (inch) Extension Brackets

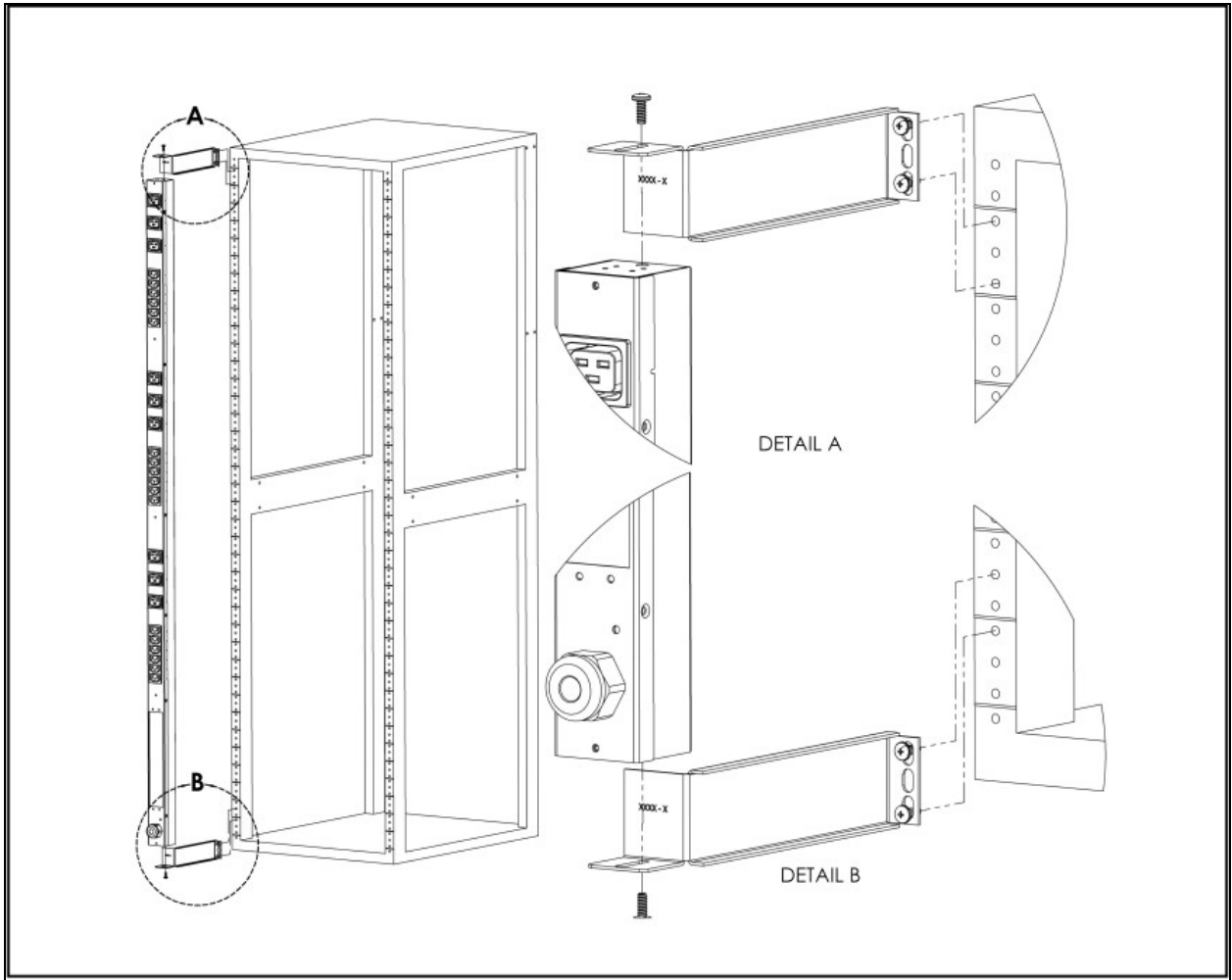


Figure 2.9 Flush Mount Bracket

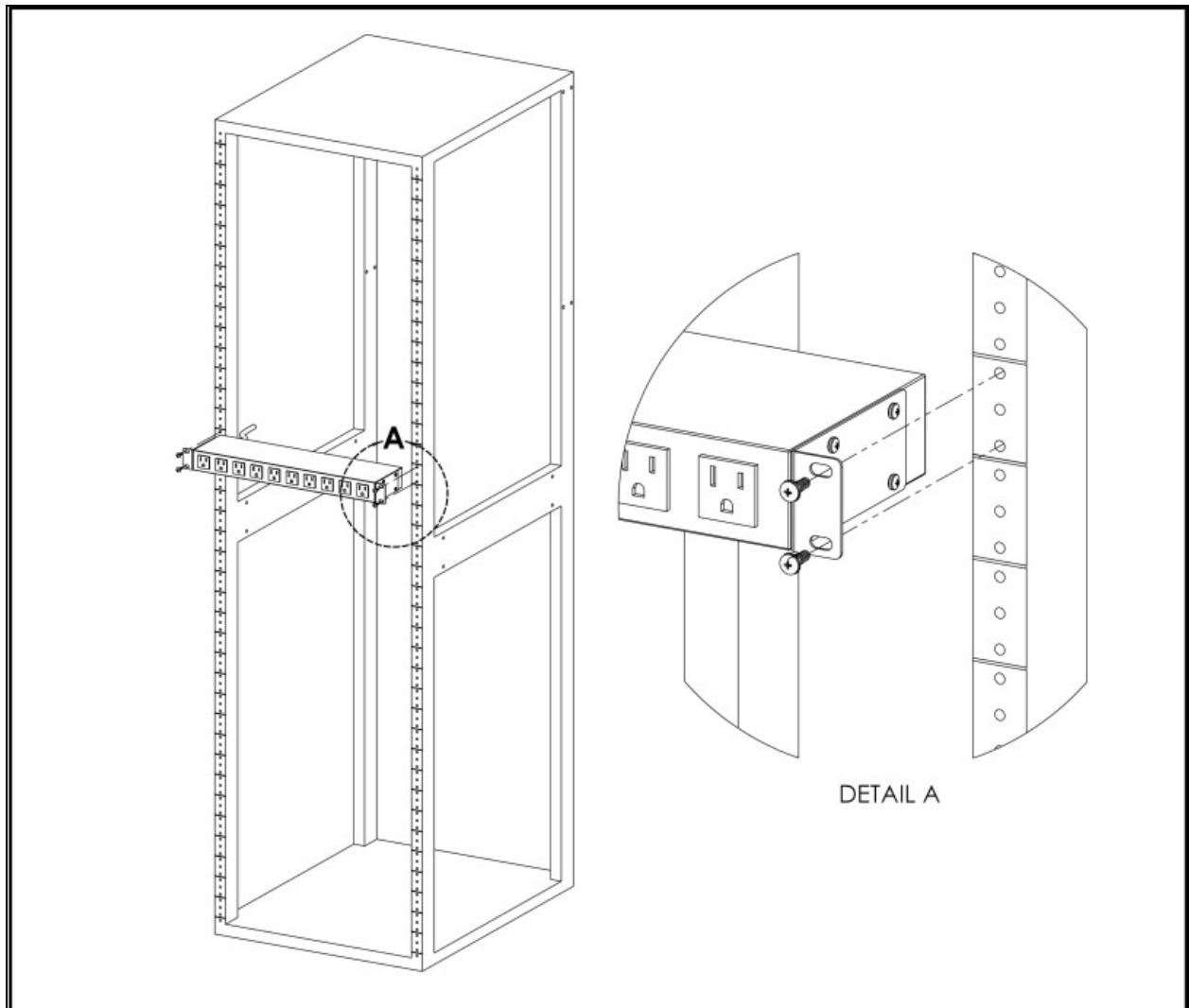


Figure 2.10 Adjustable Mount Bracket

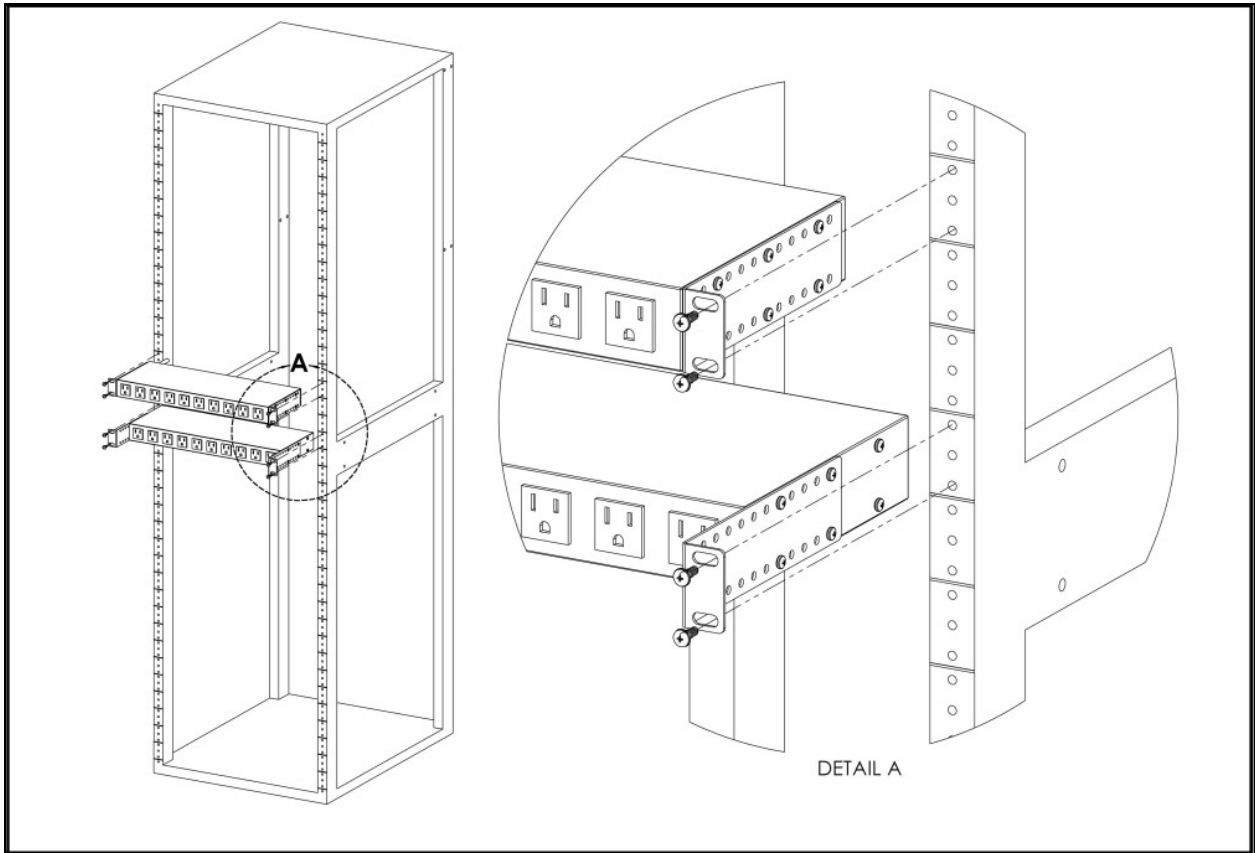


Figure 2.11 Panel Mount Bracket

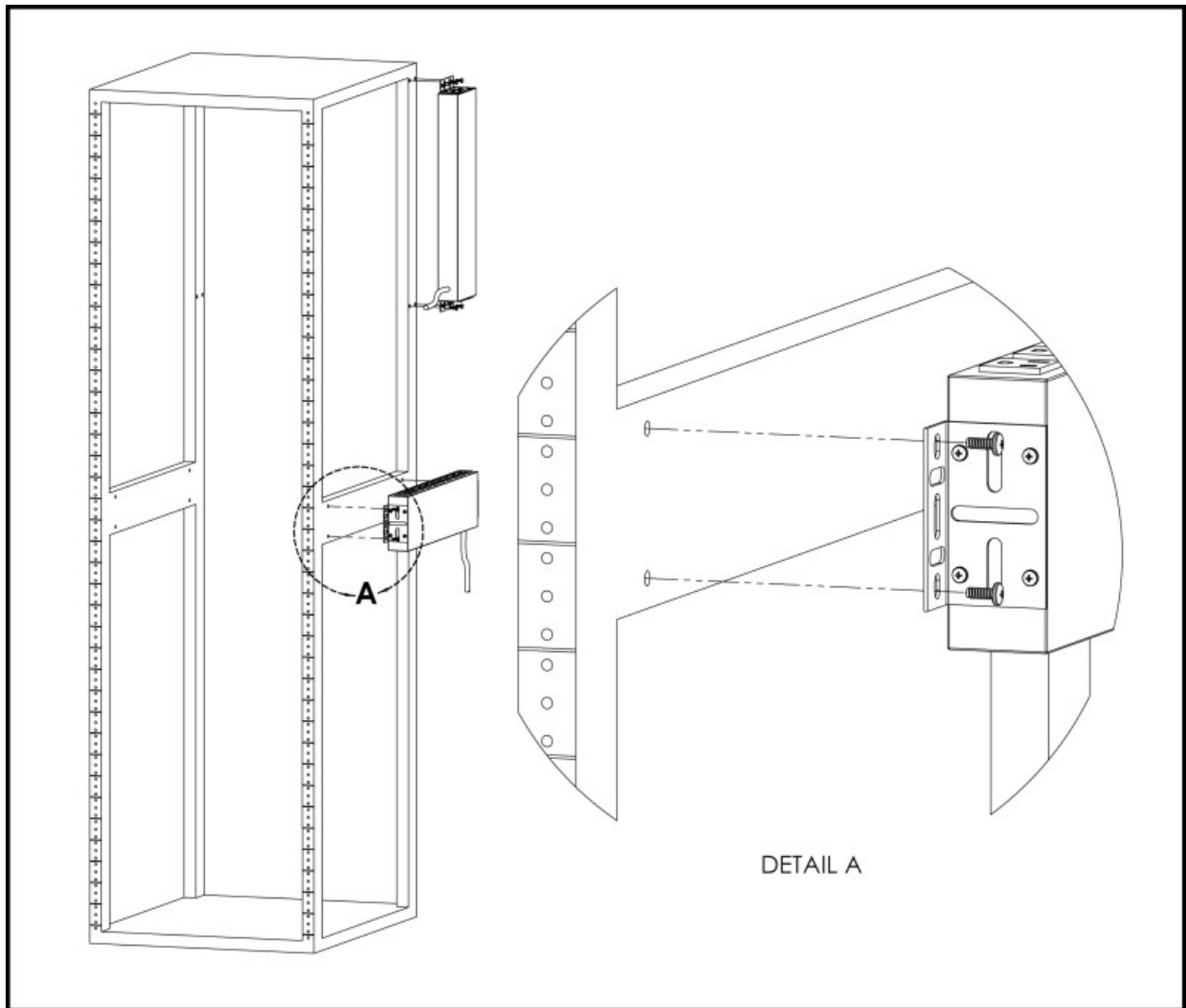


Figure 2.12 23" (inch) Conversion Mount Brackets

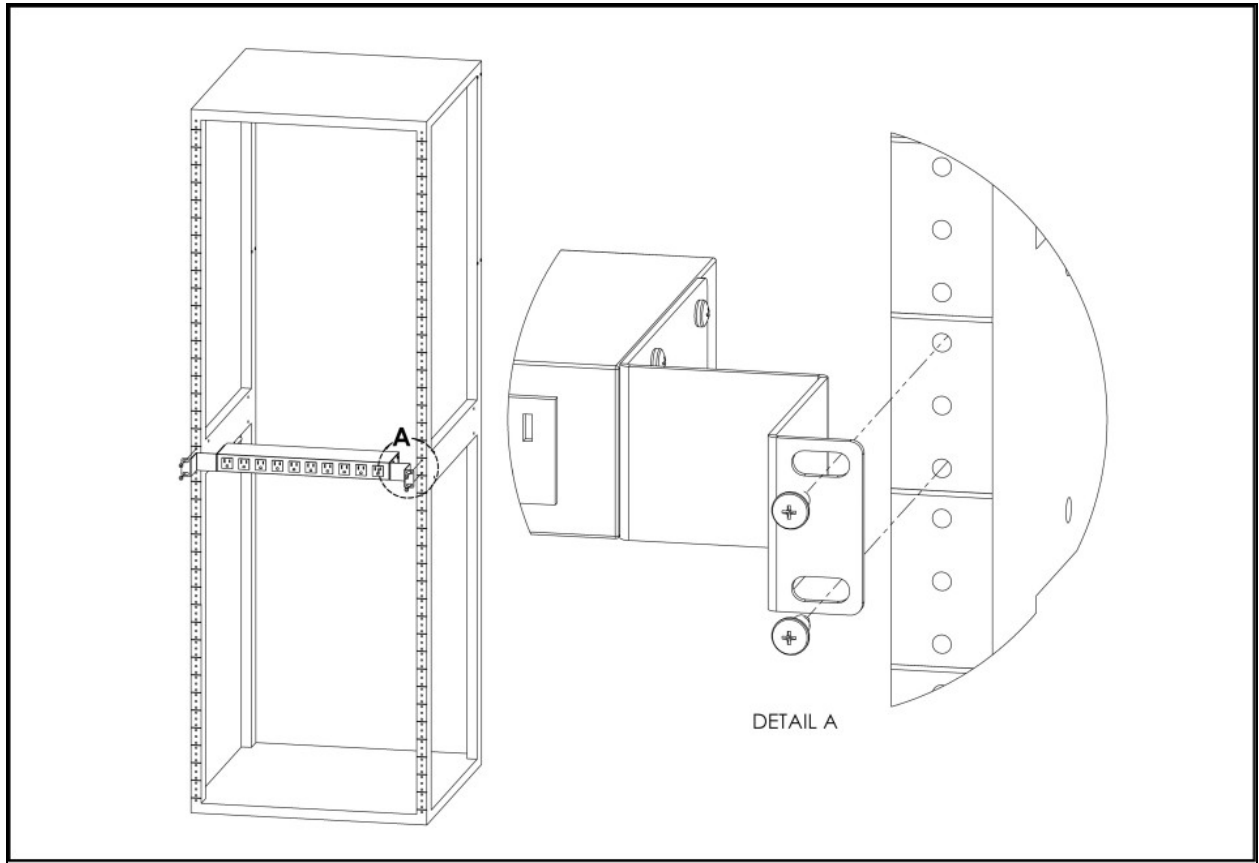


Figure 2.13 19" (inch) Horizontal/Panel-Mount Brackets

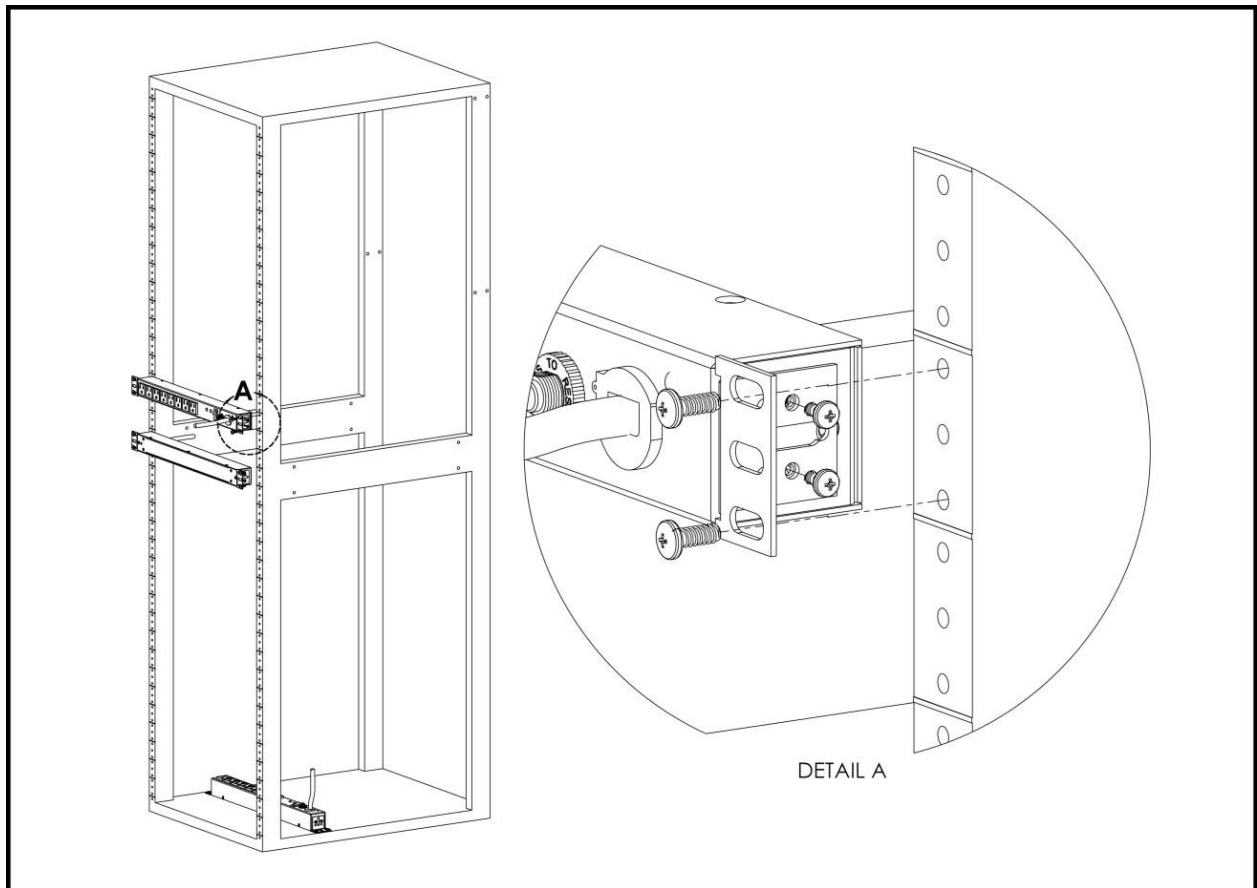
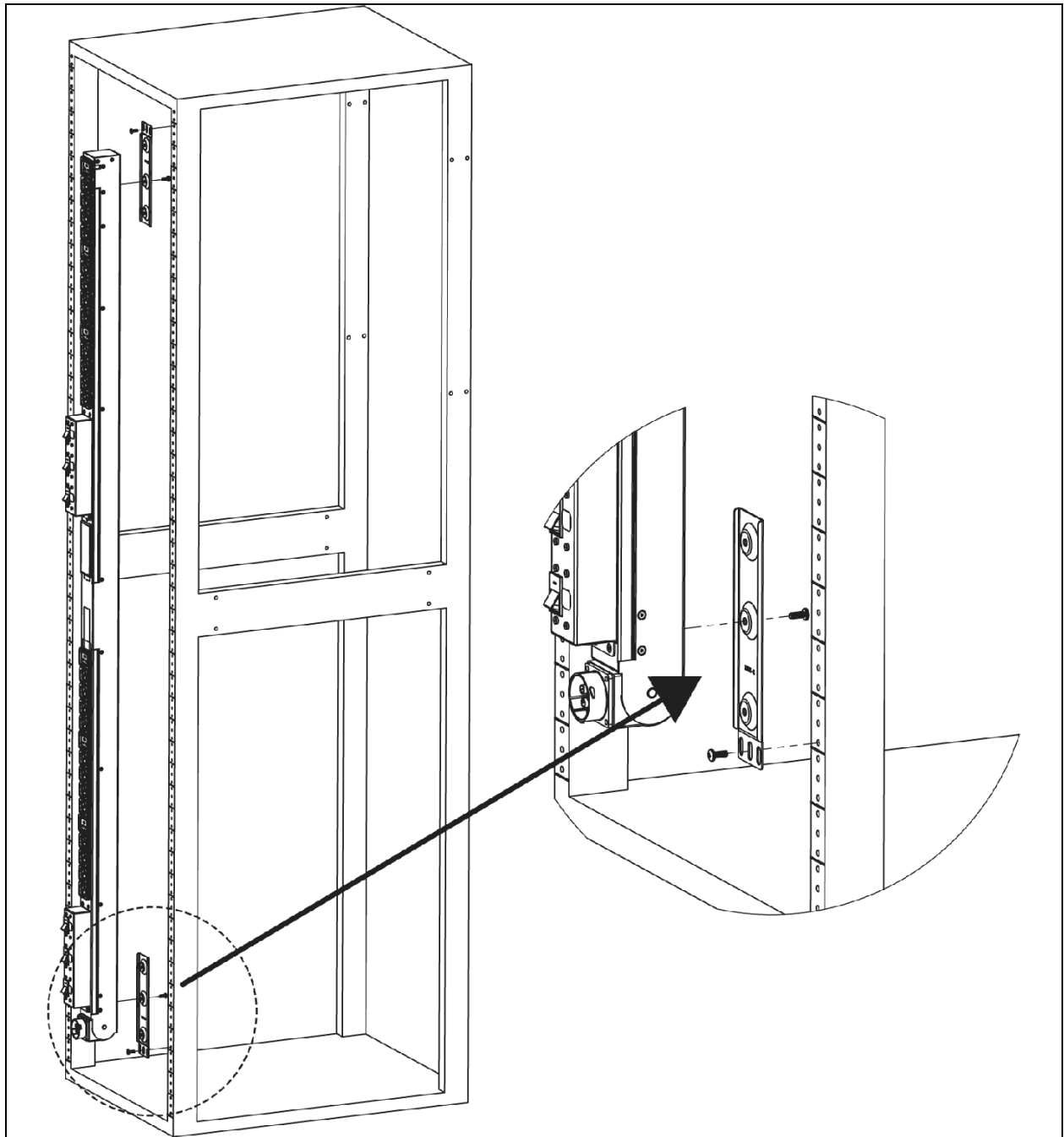


Figure 2.14 Mount Brackets for UPDU with Pivoting End



2.2 Power Connection

Plug the Vertiv™ Geist™ rPDU into an appropriately rated and protected branch circuit receptacle.

2.2.1 U-Lock operation

Plug in the devices to be powered by the Geist™ rPDU.

- Vertiv patented U-Lock power cord retention.
- Uses standard power cords.
- Cord insertion activated locking system.
- Easy push-and-hold bezel unlocking feature.

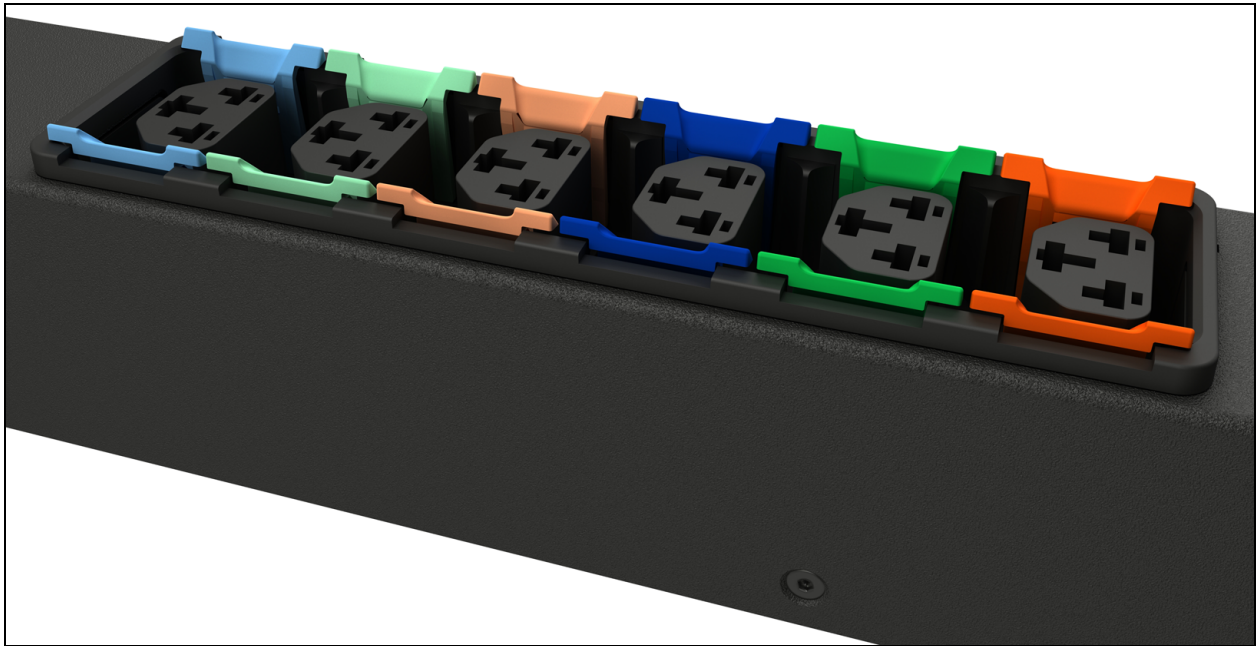
Figure 2.15 U-Lock Cord Retention Operation



2.2.2 P-Lock Operation

- Plug in the devices to be powered by the Vertiv™ Geist™ rPDU.
- Vertiv™ Combination C13/C19 Outlet with P-Lock power cord retention.
- Compatible with P-Lock power cords.
- Use press-and-hold tabs on the P-Lock cord to release from outlet.

Figure 2.16 P-Lock Cord Retention Operation



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3 Setup

3.1 Interchangeable Monitoring Device

The Interchangeable Monitoring Device (IMD) is the core behind the Upgradable Vertiv™ Geist™ rPDU line of power products. The IMD can be replaced and upgraded to allow data centers to future proof their locations. Installing the wrong IMD for replacement in an rPDU can lead to damage to the IMD.

3.1.1 Basic

The Basic upgradeable Geist™ rPDU is the baseline for the GU line of products. It is built with the IMD-01X module, and provides low cost power distribution with the option to upgrade to add local metering and/or remote monitoring and other features in the future.

3.1.2 Metered

The Metered upgradeable Geist™ rPDU is a locally metered option for the GU line of products. It is built with the IMD-01D module, and provides a local display for viewing current draw (Amps) with the option to upgrade to add monitoring and other features in the future.

Figure 3.1 IMD-01D Module

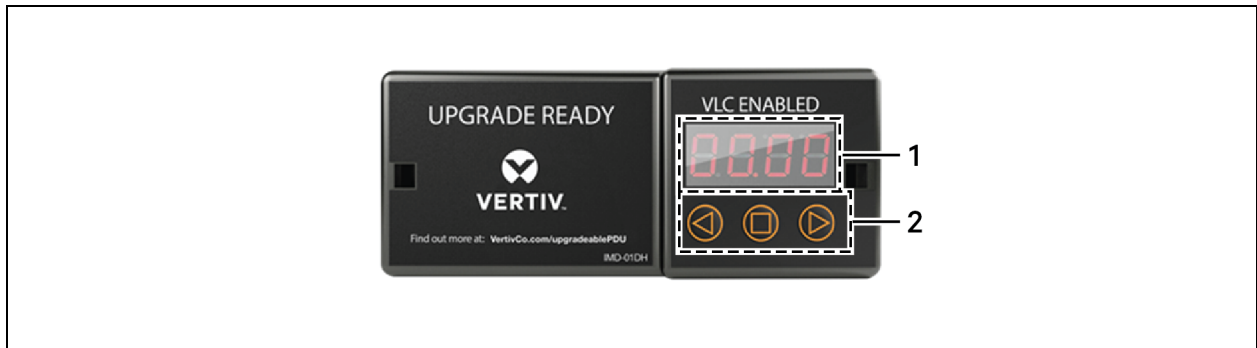


Table 3.1 IMD-01D Module Descriptions

Number	Name	Description
1	Local Display	The local display shows the phase, line, and circuit current values (in Amperes).
2	Display Buttons	There are three buttons near the IMD display; a back button, a forward button, and a center button. The functions of these buttons are described in the following table.

Table 3.2 Display Button Functions

Button	Symbol	Description
Back Button		Decrement to the previous channel.
Forward Button		Increment to the next channel.
Center Button		Toggle between scrolling and static display modes. Holding this button for 10 seconds will perform a network reset, restoring the default IP address and resetting user account information.
Center Button x3		Pressing this button three times within two seconds enables VLC mode. Pressing the button while VLC mode is active returns the unit to the standard current display. For more information, see Visible Light Communication (VLC) on page 81.
	and	Pressing both buttons at the same time flips the display 180 degrees.

NOTE: Display Button functionality may vary based on unit configuration.

3.1.3 Enhanced Monitored with RS-232 (IMD-03E-G)

All Vertiv™ Unit Level Monitoring Vertiv™ Geist™ rPDUs ship with the IMD-03E-G module. This module provides all of the same features as the IMD-03E, with the addition of a RS232 serial port using RJ-45.

Figure 3.2 IMD-03E-G Module Descriptions

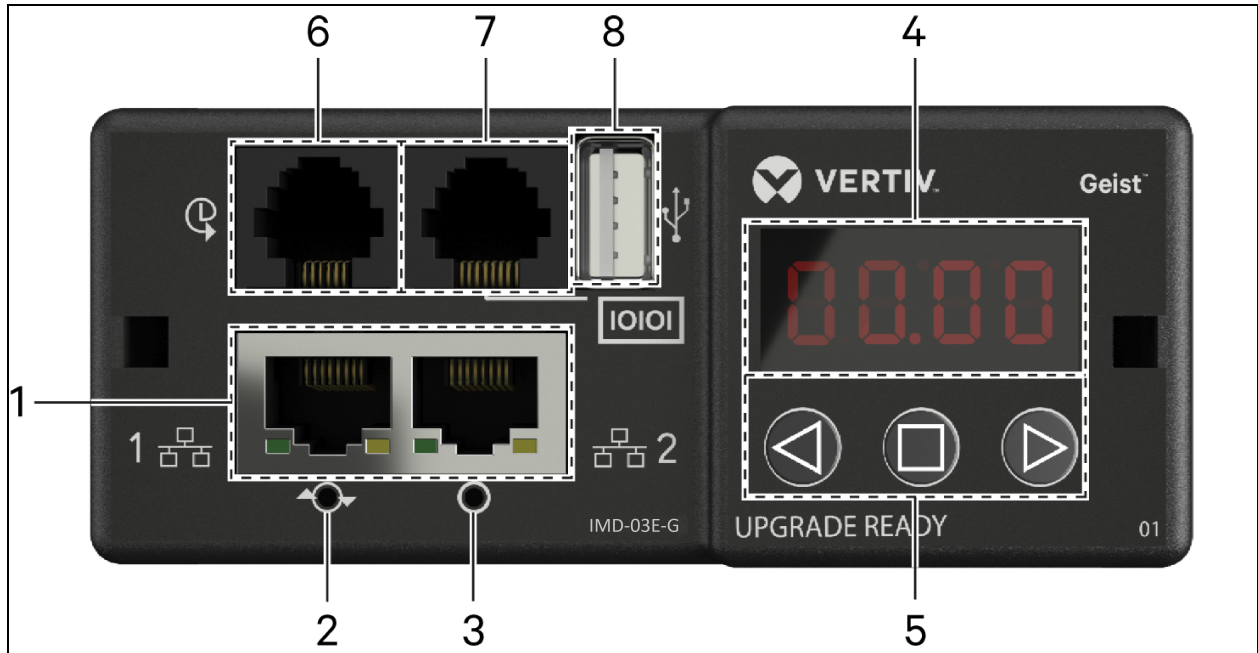


Table 3.3 IMD-03E-S Module Descriptions

Number	Name	Description
1	Dual Ethernet Ports	The dual ethernet ports act as a two-port ethernet switch, allowing for multiple devices to be daisy- chained. The dual ethernet ports can be independently configured dual Ethernet network interfaces, allowing the rPDU to connect to two different networks.
2	Hard-Reboot Button	Pressing the hard-reboot button reboots the IMD. This acts as a power-cycle for the IMD; it does not change or remove any user information.
3	Network Reset Button	Holding the network-reset button for 5 seconds during normal operation will restore the default IP address and reset the user accounts.
4	Local Display	The local display shows the phase, line and circuit current values (in amperes).
5	Display Buttons	There are three buttons near the IMD display: a back button, a forward button and a center button. The functions of these buttons are described in the Display Button Functions below .
6	Remote Sensor Port	RJ-12 port for connecting a Vertiv™ plug-and-play remote digital sensors (sold separately). Each digital sensor has a unique serial number and is automatically discovered. GU2 PDUs support up to 16 sensors. The optional Vertiv™ A2D Converter can be added to support analog sensing.The optional SN-ADAPTER can be added to support Geist™ Integrated and Modular Sensors. For more information, see Available Sensors on page 89 ..
7	Serial Port	RS-232 via RJ-45 port.
8	USB Port	USB port used to upload firmware, backup/restore device configuration, expand logging capacity via a USB storage device or support TP-Link wireless USB adapters. The USB port must be enabled - see 8 on page 54 . Provides up to 100mA power capacity for USB- connected devices.

NOTE: Serial connection does not support flow control.

Table 3.4 Display Button Functions




Button	Symbol	Description
Back Button		Press to decrement to previous channel. Holding the button for 3 seconds initiates a configuration backup. The display will show a "bcup" message while the backup is being generated and will then go back to normal operation. The backup is stored on available USB storage devices and the operation will do nothing if no such drives are available.
Forward Button		Press to increment to next channel. Holding this button for 3 seconds initiates a configuration restore. The display will show a "load" message followed by a "conf" message and then a 3 second countdown. Once the countdown expires, a "8888" message is displayed and the backup will be applied. The backup will be read from USB storage devices. If the button is released at any time during this sequence, the restore is aborted. Once the backup is applied, or if there are no backup images or no USB storage device attached, the display will then go back to normal operation..
Center Button		Toggle between scrolling and static display modes. Holding this button for 3 seconds initiates a parameter reset sequence. This sequence consists of an <i>rset</i> message, followed by a <i>dflt</i> message and then a 3-second countdown. Once the countdown expires, an <i>8888</i> message is displayed and the network, <i>http</i> user accounts and <i>LDAP/RADIUS</i> information is reset to default values. If the button is released at any time during this sequence, the reset will be aborted.

Table 3.4 Display Button Functions (continued)

Button	Symbol	Description
Center Button x3		Pressing this button 3 times within 2 seconds enables VLC mode. Pressing the button while VLC mode is active returns the unit to the standard current display.
Back and Forward Buttons		Pressing both buttons at the same time flips the display 180 degrees.
Back and Center Buttons		Pressing both buttons at the same time displays the primary IPv4 address for the unit.

NOTE: Display Button functionality may vary based on unit configuration.

3.1.4 Enhanced switched monitored with RS-232

All Vertiv™ Geist™ Switched Unit Level Monitoring, Outlet Level Monitoring and Switched Outlet Level Monitoring Vertiv™ Geist™ rPDUs ship with the IMD-3E-G module. This module provides all of the same features as the IMD-3E, with the addition of a RS-232 serial port via RJ-45.

Figure 3.3 IMD-3E-G Module

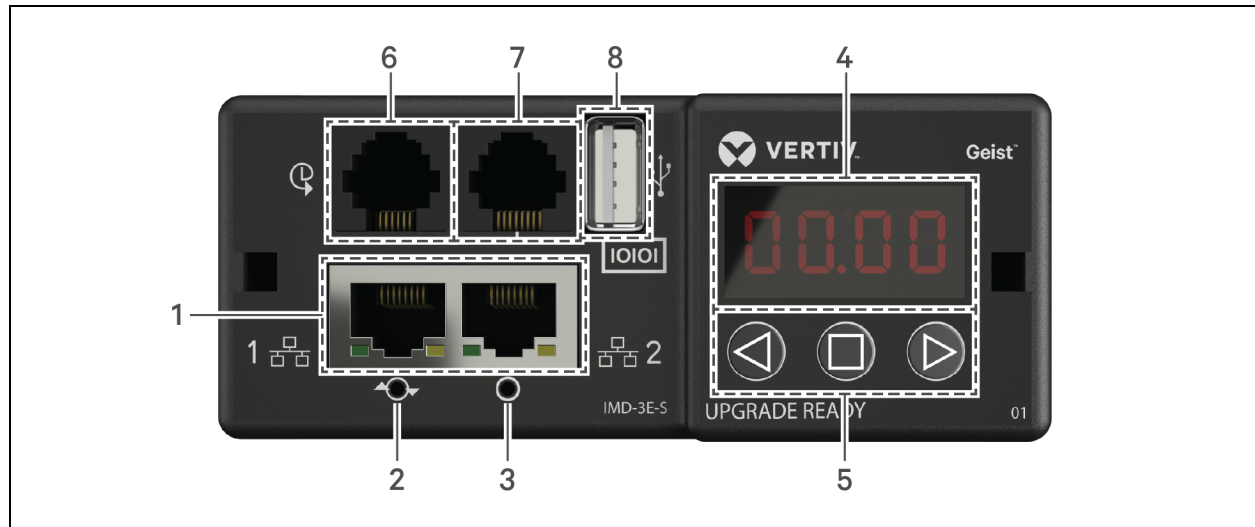


Table 3.5 IMD-3E-G Module Descriptions

Number	Name	Description
1	Dual Ethernet Ports	The dual ethernet ports act as a two port ethernet switch, allowing for multiple devices to be daisy chained. The dual ethernet ports can be independently configured dual Ethernet network interfaces, allowing the rPDU to connect to two different networks.
2	Hard-Reboot Button	Pressing the hard-reboot button reboots the IMD. This acts as a power cycle for the IMD and does not change or remove any user information.
3	Network Reset Button	Holding the network reset button for 5 seconds during normal operation will restore the default IP address and reset the user accounts.
4	Local Display	The local display shows the phase, line and circuit current values (in amperes).

Table 3.5 IMD-3E-G Module Descriptions (continued)

Number	Name	Description
5	Display Buttons	There are three buttons near the IMD display: a back button, a forward button and a center button. The functions of these buttons are described in Display Button Functions on the next page .
6	Remote Sensor Port	RJ-12 port for connecting a Vertiv™ plug-and-play remote digital sensor (sold separately). Each digital sensor has a unique serial number and is automatically discovered. GU2 PDUs support up to 16 sensors. The optional Vertiv™ A2D Converter can be added to support analog sensing. The optional SN-ADAPTER can be added to support Vertiv™ Integrated and Modular Sensors. For more information see Available Sensors on page 89 .
7	Serial Port	RS-232 via RJ-45 port.
8	USB Port	USB port used to upload firmware, backup/restore device configuration, expand logging capacity via a USB storage device or support TP-Link wireless USB adapters. The USB port must be enabled - see 8 on page 54 . Provides up to 1A power capacity for USB-connected devices.









NOTE: USB MSC devices such as thumb drives or external hard drives are supported. USB storage devices must be formatted as FAT32.

NOTE: Serial connection does not support flow control.

Display Buttons

There are three buttons near the IMD display: a back button, a forward button and a center button. The functions of these buttons are described in the following table.

Table 3.6 Display Button Functions

Button	Symbol	Description
Back Button		Press to decrement to previous channel. Holding this button for 3 seconds initiates a configuration backup. The display will show a "bcup" message while the backup is being generated and will then go back to normal operation. The backup is stored on available USB storage devices and the operation will do nothing if no such drives are available.
Forward Button		Press to increment to next channel. Holding this button for 3 seconds initiates a configuration restore. The display will show a "load" message followed by a "conf" message and then a 3 second countdown. Once the countdown expires, a "8888" message is displayed and the backup will be applied. The backup will be read from USB storage devices. If the button is released at any time during this sequence, the restore is aborted. Once the backup is applied, or if there are no backup images or no USB storage device attached, the display will then go back to normal operation.
Center Button		Toggle between scrolling and static display modes. Holding this button for 3 seconds initiates a parameter reset sequence. This sequence consists of an <i>rset</i> message, followed by a <i>dflt</i> message and then a 3 second countdown. Once the countdown expires, an <i>8888</i> message is displayed and the network, http, user accounts and LDAP/RADIUS information are reset to default values. If the button is released at any time during this sequence, the reset will be aborted.
Center Button x3		Pressing this button three times within 2 seconds enables VLC mode. Pressing the button while VLC mode is active returns the unit to the standard current display. For more information, see Visible Light Communication (VLC) on page 81.
Back and Forward Buttons	 and 	Pressing both buttons at the same time flips the display 180 degrees.
Back and Center Buttons	 and 	Pressing both buttons at the same time displays the primary IPv4 address of the unit.

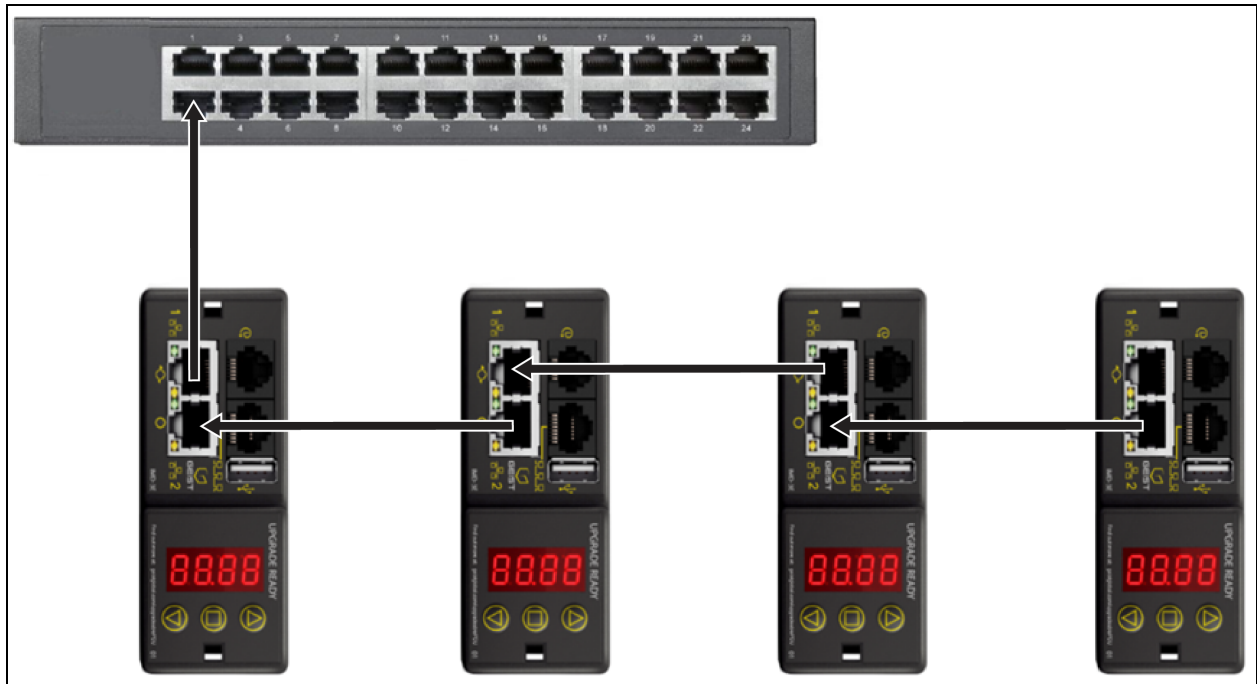
3.1.5 Rapid spanning tree protocol (RSTP)

Upgradeable monitored devices, built with the IMD-03E or built with the IMD-3E, include two Ethernet Ports that work together as an internal Ethernet Bridge. One of these ports can be used to connect the IMD to an existing network or both ports can be used at the same time to connect one IMD to another in a daisy chain configuration.

Daisy-Chaining

- Use daisy chaining to reduce network switch port count.
- Rack PDUs are connected using an Ethernet daisy chain.
- The head of the chain rack PDU connects to a network switch port.
- Each rack PDU has its own unique IP address.

Figure 3.4 Daisy-Chaining



Fault Tolerant Daisy-Chaining

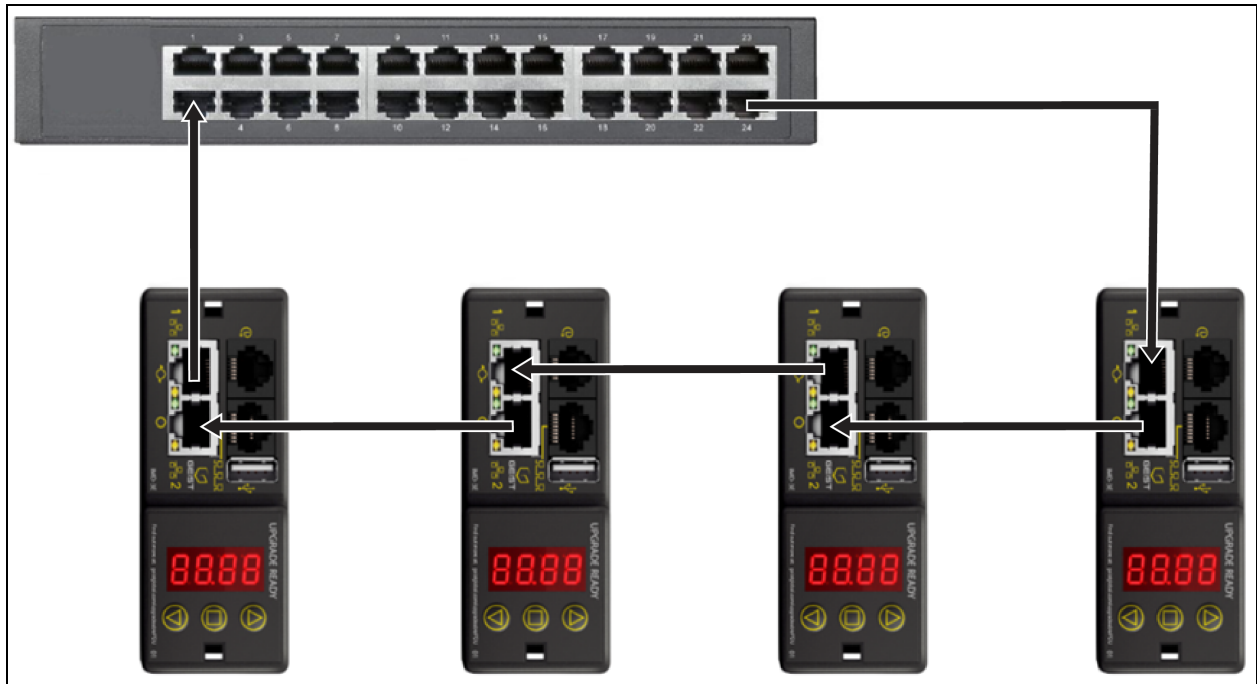
Use fault tolerant daisy-chaining to provide resilient network connectivity.

Rack PDUs are connected using an Ethernet daisy chain.

Both head and tail of the chain rack PDUs connect to network switch ports.

Each rack PDU has its own unique IP address.

Rapid Spanning Tree protocol (RSTP) must be configured to manage fault tolerance and maintain connectivity in the event of a cable fault or rack PDU power loss.

Figure 3.5 Fault Tolerant Daisy Chaining

When both network interfaces are connected, the IMD implements a network bridging protocol called the Rapid Spanning Tree Protocol (RSTP). RSTP is an IEEE standard that is implemented by all managed bridges. Using RSTP, bridges in the network exchange information to find redundant paths or loops.

When a loop is detected, the bridges in the network work together to temporarily disable the redundant paths. This allows the network to avoid broadcast storms caused by the loops. In addition, RSTP regularly checks for changes in the network topology. When a connection is lost, RSTP allows the bridges to quickly switch to a redundant path.

NOTE: RSTP protocol imposes a limit of 40 links between bridges, including IMDs.

3.2 Network Setup

The Upgradeable IMD has a default IP address for initial setup and access.

To restore the default IP address and reset all user-account information:

If the user-assigned address or passwords are lost or forgotten, press and hold the network reset button located below the Ethernet Port for 15 seconds. Holding the center button of the LED display for 10 seconds also resets the network and user account information.

The Network Page, located under the *System Tab*, allows you to assign the network properties manually or use DHCP to connect to your network. Access to the unit requires the IP address to be known. Use of a static IP or a reserved DHCP is recommended. The default address is displayed on the front of the unit.

- **IP Address:** 192.168.123.123
- **Subnet Mask:** 255.255.255.0
- **Gateway:** 192.168.123.1

To access the unit for the first time, you must temporarily change your computer's network settings to match the 192.168.123.xxx subnet. To setup the unit, connect it to your computer's Ethernet Port, then follow the appropriate instructions for your computer's operating system.

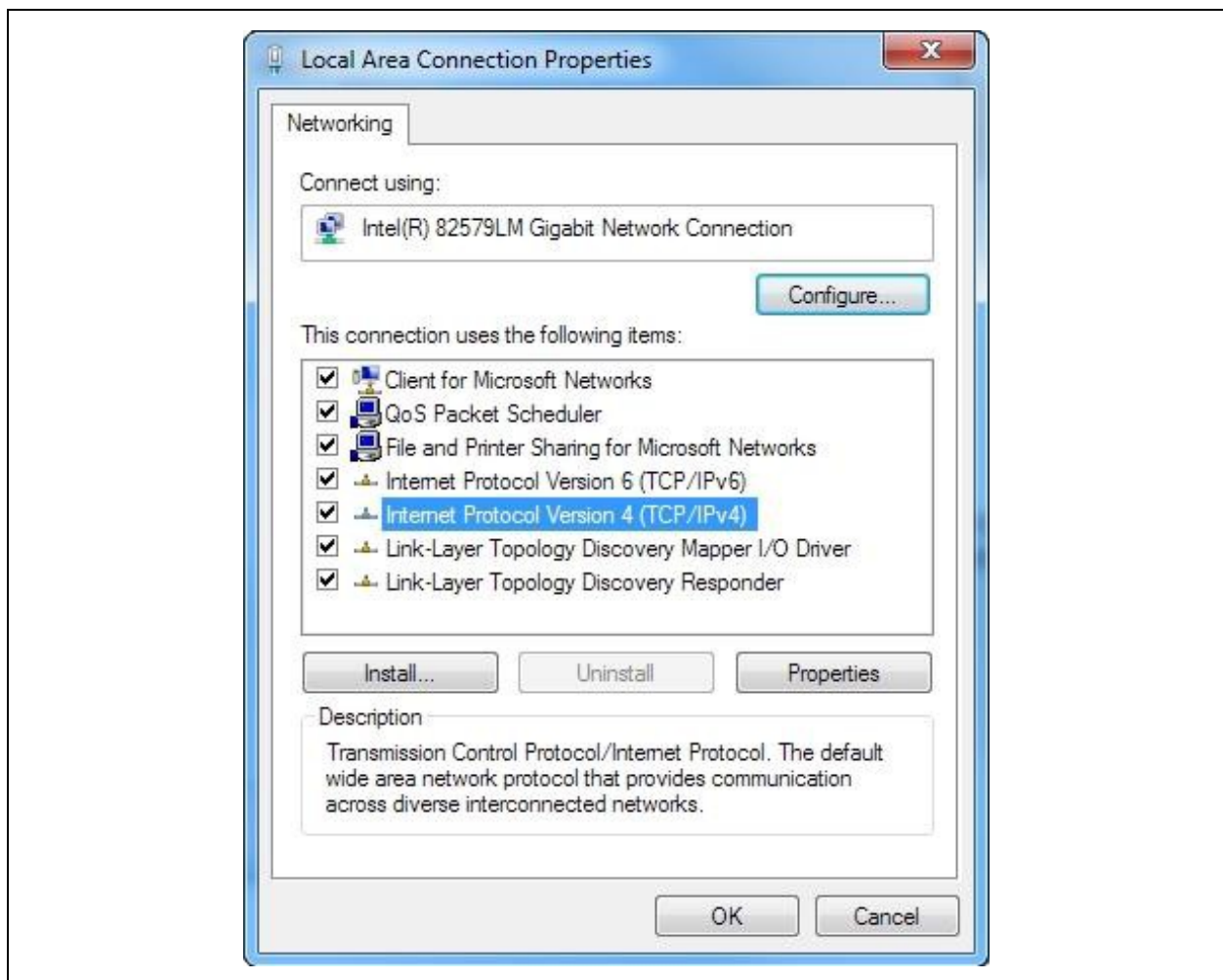
To set up the network for a Windows operating system:

1. Access the network settings for your operating system.
 - Using Microsoft Windows 2000, XP or Server 2003, click *Start -Settings-Network Connections*.
 - Using Microsoft Windows 7 or Server 2008, click *Start-Control Panel-Adjust your Computer's Settings-View Network Status and Tasks-Change Adapter Settings* or click *Start>Settings-Control Panel-Network and Sharing Center-Change Adapter Settings*.
 - Using Microsoft Windows 8 or Server 2012, move the mouse to the bottom or top right corner, click *Settings-Control Panel-Large or Small Icons-Network and Sharing Center-Change Adapter Settings*.
 - Using Microsoft Windows 10, click *Start-Network and Internet-Change Adapter Settings*.
2. Locate the entry under LAN, High Speed Internet or Local Area Connection that corresponds to the Network Card (NIC). Double click on the network adapter's entry in the Network Connections list.

NOTE: Most computers will have a single Ethernet NIC installed, but a WiFi or 3G adapter also shows as a NIC in this list. Be sure to choose the correct entry.

3. Click *Properties* to open the Local Properties window.

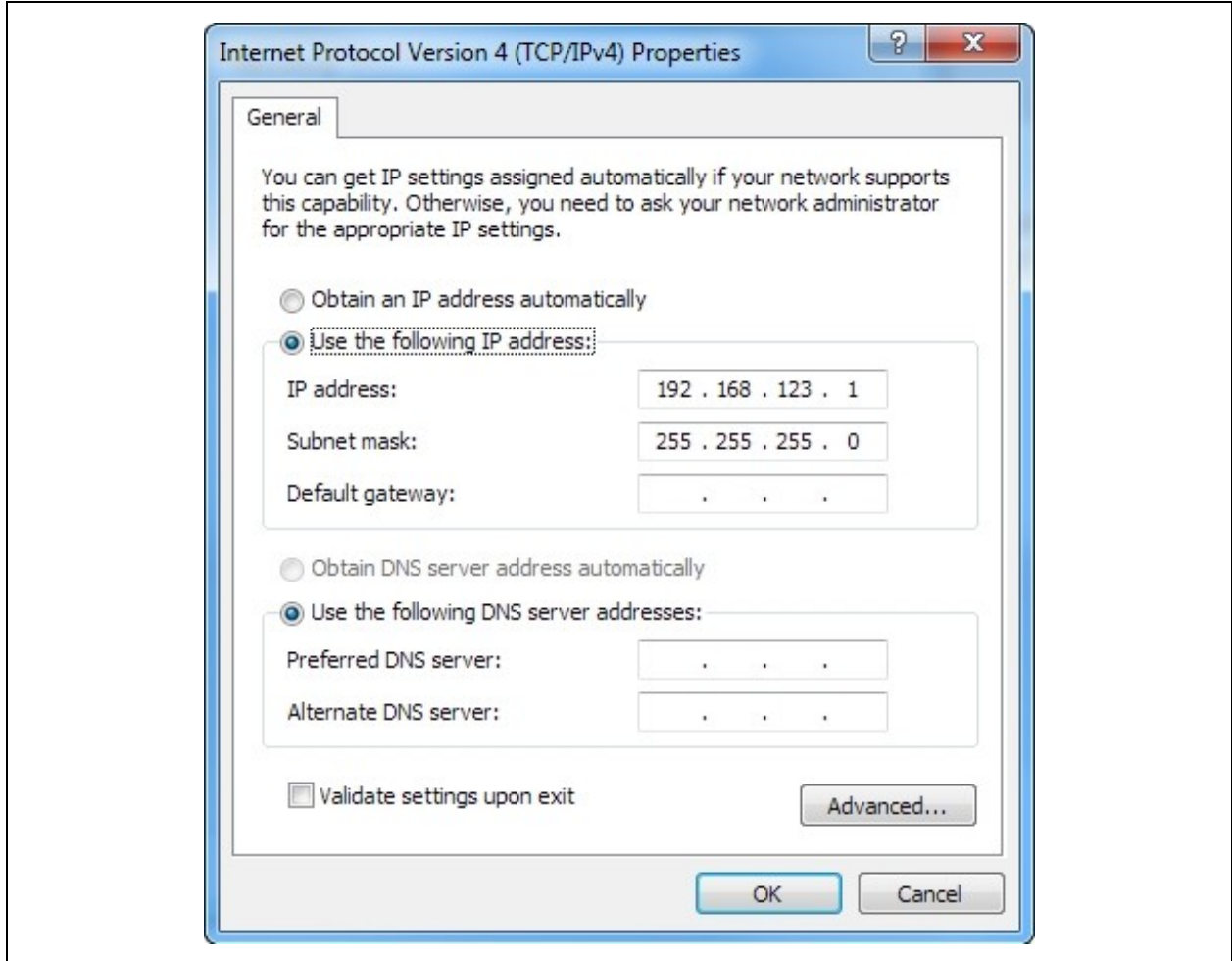
Figure 3.6 Local Area Connection Properties



4. Select *Internet Protocol Version 4 (TCP/IPv4)* from the list, then click *Properties*.

NOTE: If you see more than one TCP/IP entry, as in the example above, the computer may be configured for IPv6 support as well as IPv4; make sure to select the entry for the IPv4 protocol. Write down the current NIC card settings so you can restore them to normal after you have completed the setup procedure.

Figure 3.7 Internet Protocol Version 4



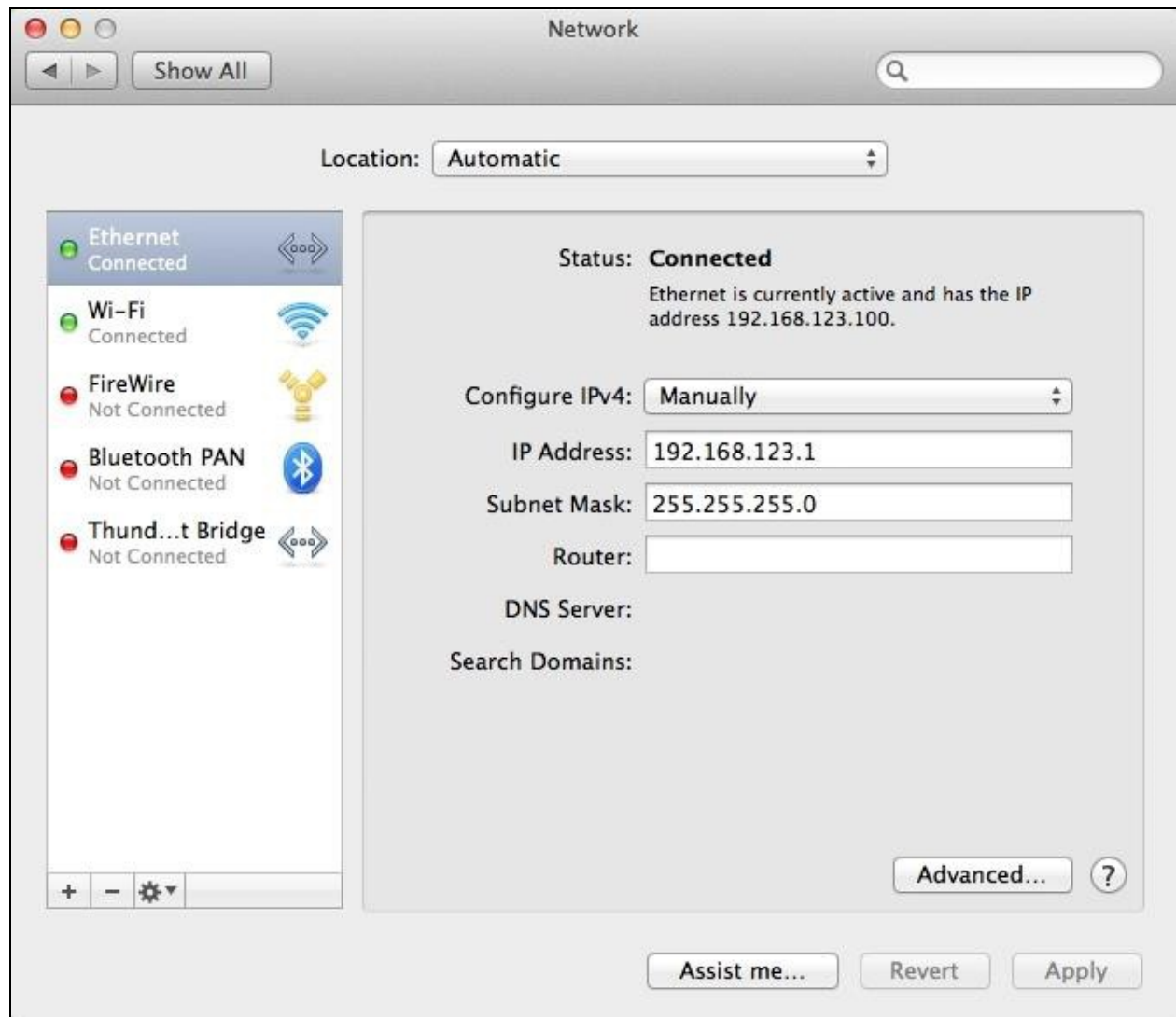
5. Choose *Use the following IP address*, set IP address to *192.168.123.1* and Subnet Mask to *255.255.255.0*. For initial setup, Default Gateway and the DNS Server entries can be left blank. Select *OK* - *OK* to close both the Internet Protocol Properties and Local Properties windows.
6. In a web browser, enter *http://192.168.123.123* to access the unit. If you are setting up the unit for the first time, the unit requires you to create an Admin account and password before you can proceed.
7. After the Admin account is created, log in to the unit.
8. By default, the default sensors page is displayed. Navigate to the *System Tab*, then the *Network Page* to configure the device's network properties. The unit's IP address, Subnet Mask, Gateway and DNS settings can either be assigned manually or acquired via DHCP.
9. Click *Save*.

NOTE: After the changes are saved, the browser will no longer be able to reload the web page from the *192.168.123.123* address and displays *Page not Found* or *Host Unavailable* message; this is normal. After you are finished configuring the unit's IP address, repeat the steps above, changing the computer's Ethernet NIC card settings to the ones you wrote down prior to changing them.

To set up the network for a MAC:

1. Click the *System Preferences* icon on the Dock and choose *Network*.

Figure 3.8 MAC System Preferences



2. Ensure ETHERNET is highlighted on the left side of the NIC window. In most cases, there will be one ETHERNET entry on a Mac. Write down the current settings so you can restore them to normal after you have completed the setup procedure.
3. Select *Manually* from the Configure IPv4 drop-down list, then set IP address to *192.168.123.1* and Subnet Mask to *255.255.255.0* and click *Apply*.

NOTE: The Router and DNS Server settings can be left blank for this initial setup. In a web browser, enter <http://192.168.123.123> to access the unit. If you are setting up the unit for the first time, the unit requires you to create an Admin account and password before you can proceed.

4. After the Admin account is created, log in to the unit.
5. By default, the default sensors page is displayed. Navigate to the *System* tab, then the *Network* page to configure the device's network properties. The unit's IP Address, Subnet Mask, Gateway and DNS settings can either be assigned manually or acquired via DHCP.
6. Click *Save*.

NOTE: After the changes are saved, the browser will no longer be able to reload the web page from the **192.168.123.123** address and displays *Page not Found* or *Host Unavailable* message; this is normal. After you are finished configuring the unit's IP address, repeat the steps above, changing the computer's Ethernet NIC card settings to the ones you wrote down prior to changing them.

3.3 Web Interface

The unit is accessible via a standard, unencrypted HTTP connection as well as an encrypted HTTPS (TLS) connection.

NOTE: An administrator account (username and password) must be created when logging in to the device the first time.

NOTE: If "Clock not set." appears at the top of the page, please follow procedures in [Time](#) on page 54 .

3.3.1 Home page

The Home Page gives both current and historical views of the unit's data. Real-time readings are provided for all Vertiv™ Geist™ rPDU data and individual circuits' data.



WARNING! Do not connect electric heaters, electric heating appliances or other electric appliances which may cause fire, electric shock, injuries when operated unattended.

Figure 3.9 Home Page

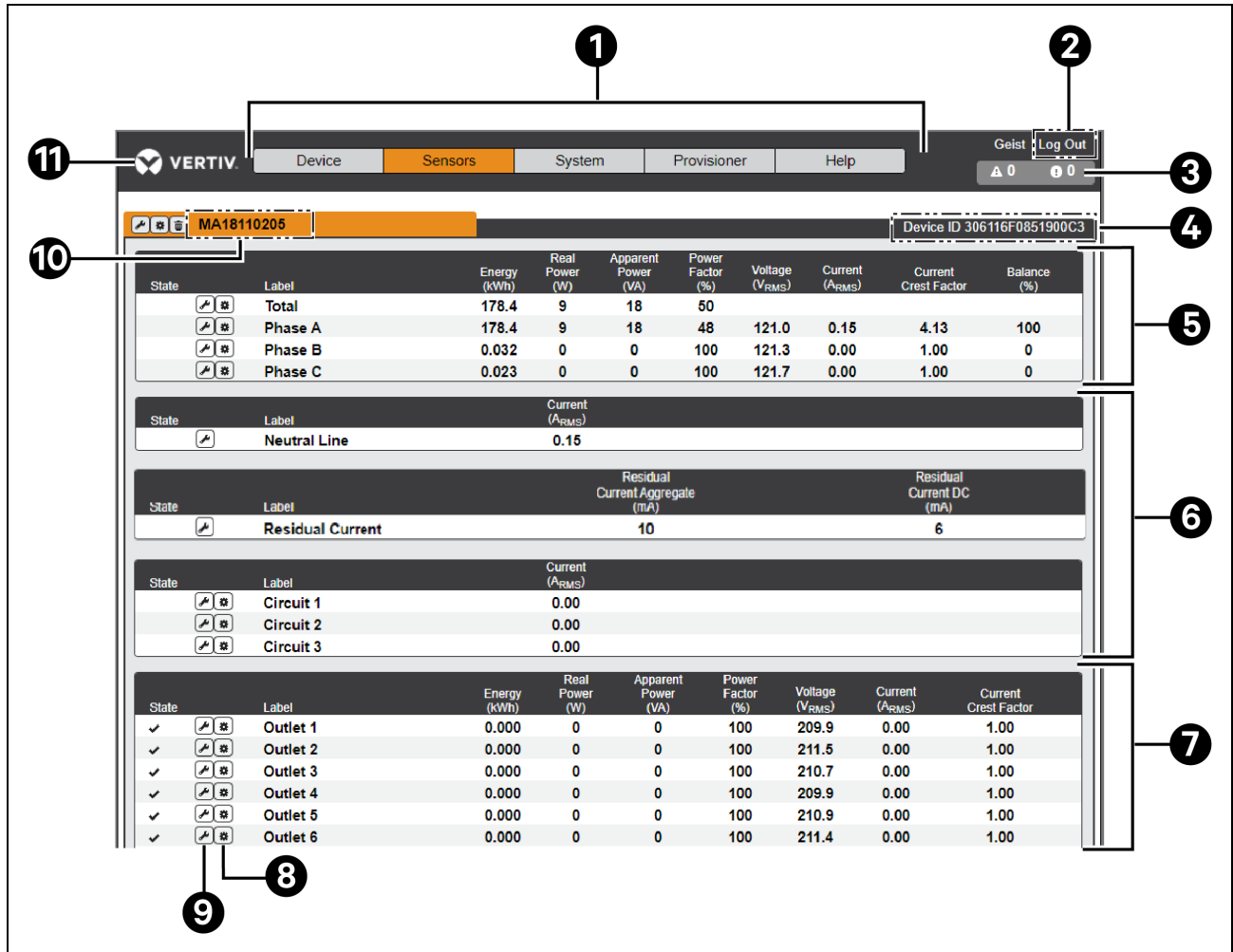


Table 3.7 Home Page Descriptions

Number	Name	Description
1	Device, Sensors, System and Help	Mouseover to show submenus: Device, Sensors, System, Provisioner and Help. NOTE: Device will only appear as a sub menu when the unit is configured as an array manager. See the Vertiv™ Intelligence Director on page 65 section for further definition and configuration.
2	Log In/Log Out	Click to log in or log out of the unit. NOTE: Both username and password are case-sensitive and no spaces are allowed. Prohibited characters for username are: \$&`<:>[]{}"+%@/ ; =?\"'-.,
3	Alarms and Warnings	Indicates the number of alarms and warnings currently occurring, if any.
4	Device ID	Unique product identification and cannot be changed. May be required for technical support.
5	Total and Individual Phase Monitor	Displays AC current, voltage and power statistics for each individual phase and for the total of all phases combined. Current Crest Factor and Phase Balance (%) are also indicated.

Table 3.7 Home Page Descriptions (continued)

Number	Name	Description
6	Neutral Line	Displays the current (in Amps RMS) on 3-phase Wye units. This is not shown on single phase and 3-phase Delta units.
6	Residual Current	Only for rPDUs with RCM-B Feature. Displays Residual Current Aggregate (mA) and Residual Current DC (mA). Where applicable, display Residual Current for each Phase.
6	Current Monitor	Displays AC current draw statistics for each individual circuit on the rPDU.
7	Outlet Monitor	Applies to Outlet Monitored / Outlet Switched rPDUs ONLY - Displays AC current, voltage and power statistics for each circuit and outlet. Current Crest Factor also indicated. (Outlet Level Power Monitoring and Switched Outlet Level Monitoring Only). Displays outlet status. (Switched and Switched Outlet Level Monitoring Only)
8	Operation Icon	Applies to Outlet Monitored / Outlet Switched rPDUs ONLY - Modify settings.
9	Configuration Icon	Applies to Outlet Monitored / Outlet Switched rPDUs ONLY - Modify label name.
10	Device Label	Displays the user assigned label of this unit.
11	Vertiv™ Logo	Clicking on this logo from any page will reload the home page.

3.4 Sensors Tab

Click the *Sensors Tab* to access the *Overview, Alarms and Warnings and Logging* page from the drop-down menu.

3.4.1 Overview

You must log in before making any changes. Only users with control-level or higher authorizations have access to these settings.

To change a device label:

1. Click the *Configuration* icon for the Vertiv™ Geist™ rPDU and change the label. The Name is the rPDU's factory name or model and cannot be changed.
2. Click *Save*.

To change device operation:

1. Click the *Operation* icon.
2. Select the operation to perform:
 - **On/Off** - turns all outlets On or Off.
 - **Reboot** - for outlets currently On, reboot cycles the outlets Off, then back On after the reboot hold delay. For outlets currently Off, reboot turns the outlets On.
 - **Cancel** - cancels the current operation if it has not been completed.
 - **Reset Energy** - resets the total energy measured in kWh.
 - **Restore Defaults** - restores device settings to their factory default. This includes Labels, Delays and Power-on Actions for the device.

NOTE: These actions affect the entire device.

NOTE: On/Off and Reboot operations apply to Outlet Switched Geist™ rPDUs only.

3. For operations involving the state of the outlets, setting Delay to *True* uses the current Delay configuration for each outlet when performing the selected operation.
4. Select *Submit* to issue the action.

NOTE: Power-on action delays refer to the time since the unit was plugged in, not the time since it fully booted. They may execute before the unit fully boots.

To change a phase or circuit label:

1. Click the *Configuration* icon for the phase or circuit and change the label. The Name is the physical phase or circuit name and cannot be changed.
2. Click *Save*.

To change phase operation:

1. Click the *Operation* icon.
2. Select *Reset Energy* - to reset the total energy measured in kWh for the selected phase.
3. Select *Submit* to issue the action.

To change circuit operation:

1. Click the *Operation* icon.
2. Select *Reset Loss of Load* - to reset the Loss of Load alarm.
3. Select *Submit* to issue the action.

NOTE: This step is required when State shows a loss of load alarm and the issue has been resolved. Loss of load alarm is triggered by a sudden drop of current detected by the circuit breaker's current measuring transducer when operating close to the circuit load limit. For the Switched Upgradeable horizontal units, the loss of load alarm is additionally triggered by circuit breaker loss of voltage (regardless of circuit load).

To configure an outlet:**NOTE: Applies to Outlet Monitored / Outlet Switched Vertiv™ Geist™ rPDUs only.**

1. Click the *Outlet Configuration* icon.
2. Change the configurations, as needed.
 - a. Label of the outlet.

NOTE: Steps 2b through 2k apply only to switched outlets.

- b. **State** - the outlet's current state (On or Off).
 - c. **Mode** - how the outlet will be controlled:
 - **Manual Control** - the outlet state is controlled using the web user interface, SNMP or the API.
 - **Alarm Control (normally off, on when any associated alarm trips)** - the outlet state is set normally Off and will be switched On when any outlet alarm event is tripped.
 - **Alarm Control (normally on, off when any associated alarm trips)** - the outlet state is set normally On and will be switched Off when any outlet alarm event is tripped.
 - **Alarm Control (normally Off, on when all associated alarm trips)** - the outlet state is set normally Off and will be switched On when all outlet alarm events are tripped.
 - **Alarm Control (normally on, off when all associated alarm trips)** - the outlet state is set normally On and will be switched Off when all outlet alarm events are tripped.
 - d. **Pending State** - the state the outlet is currently transitioning to.
 - e. **Time To Action** - the time left before the pending action takes place. This is adjusted using Delays.
 - f. **On Delay** - the time, in seconds, the unit waits before switching an outlet On.
 - g. **Off Delay** - the time, in seconds, the unit waits before switching an outlet Off.
 - h. **Reboot Delay** - the time, in seconds, the unit waits before rebooting an outlet.
 - i. **Reboot Hold Delay** - the time, in seconds, the unit waits after switching the outlet Off, before switching an outlet back On during a reboot.
 - j. **Power-On Action** - describes the state the outlet will start when powered On (On, Off or Last).
 - k. **Power-On Delay** - the time, in seconds, the unit waits after being powered On before powering On the outlet.
3. Click *Save*.

To change outlet operation:**NOTE: Applies to Outlet Monitored / Outlet Switched Vertiv™ Geist™ rPDUs only.**

1. Click the desired *Outlet Operation* icon.
2. Select the operation to perform:
 - **On/Off** - turns the selected outlet On or Off.
 - **Reboot** - for outlets currently On, reboot cycles the outlets off, then back On after the reboot hold delay. For outlets currently Off, reboot turns the outlets On.
 - **Cancel** - cancels the current operation if it has not been completed.
 - **Reset Energy** - resets the total energy measured in kWh for the selected outlet.
3. For operations involving the state of the outlets, setting Delay to *True* uses the current Delay configuration for each outlet when performing the selected operation.
4. Select *Submit* to issue the action.

3.4.2 Alarms and Warnings

The Alarms and Warnings page allows you to establish alarm or warning conditions (events) for each power and circuit reading. Events are triggered when a measurement exceeds a user-defined threshold, either going above the threshold (high-trip) or below it (low-trip). Events are displayed in different sections, based on the device or measurement the event is associated with. Each event can have one or more actions to be taken when the event occurs.

Figure 3.10 Alarms and Warnings Page

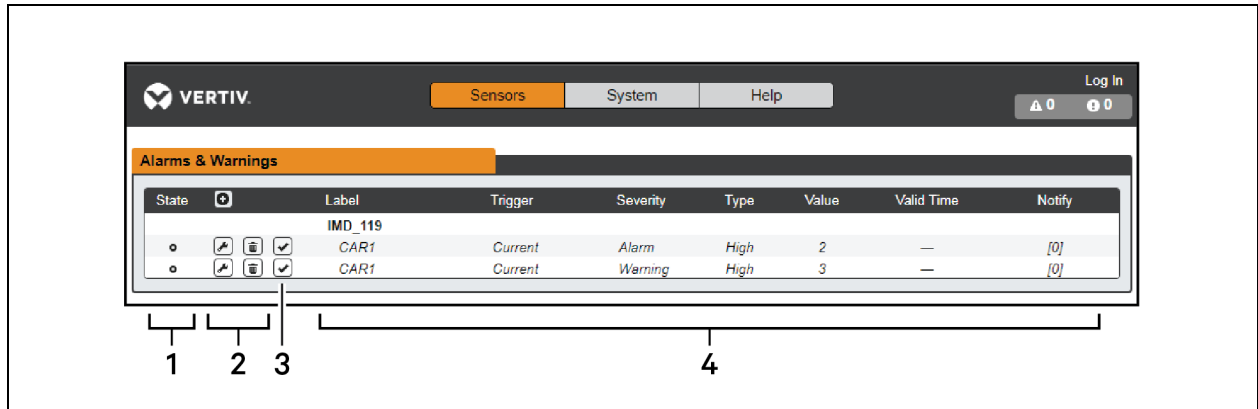


Table 3.8 Alarms and Warnings Descriptions

Number	Description	Symbol	Description
1	Status of each event.		Warning symbol. Event is displayed in orange.
			Alarm symbol. Alarm is displayed in red.
			Acknowledged event symbol. Symbol remains until the condition measured returns to normal.
2	Add/Delete/Modify alarms and warnings.		Add new alarms and warnings.
			Modify existing alarms and warnings.
			Delete existing alarms and warnings.
3	Notify user of tripped Events and request acknowledgment.	n/a	Empty, if there is no alert condition.
			When a warning or alarm event occurs, you can click on this symbol to acknowledge the event and stop the unit from sending any more notifications about it. NOTE: Clicking this symbol does not clear the warning or alarm event; it just stops the notifications from repeating.
4	Displays the conditions for the alarms and warnings settings.		

To add a new Alarm or Warning Event:

1. Click the *Add/Modify* alarms and *Warnings* button.
2. Set the desired conditions for this event as follows:
 - a. From the drop-down lists, select the name of the phase or circuit, the trigger measurement, the severity and the type.

NOTE: High trips if the measurement goes above the threshold and low trips if the measurement goes below the threshold.

- b. Enter the desired Threshold Value (any number between -999.0 through 999.0).
- c. Enter the desired Clear Delay time in seconds. Any value other than 0 means once this event is tripped, the measurement must return to normal for this many seconds before the event will clear and reset. Clear Delay can be up to 14,400 seconds (4 hours).
- d. Enter the desired Trip Delay time in seconds. Any value other than 0 means that the measurement must exceed the threshold for this many seconds before the Event will be tripped. Trip Delay can be up to 14,400 seconds (4 hours).
- e. Latching Mode, if enabled, this event and its associated actions remain active until the event is acknowledged, even if the measurement subsequently returns to normal.
- f. To specify where the alert notifications are sent when this alarm or warning event occurs, click the *Add* icon to create a new action.
- g. Select the desired options from the drop-down menu:
 - Target is the email address or SNMP manager where the notifications are sent when the event is tripped. For more information on configuring a target email address, see [Serial port](#) on page 55.
 - Or, when an outlet number is selected as the target, the outlet state switches when an event is tripped and remains in the switched state until the event resets or is acknowledged. For this option, the outlet mode must be configured for Alarm Control, see [Alarms and Warnings](#) on the previous page.

NOTE: Target Delays and Repeats are shared across all alarms. If multiple delay or repeat values are needed for specific targets, each one must be added to the target list and then the appropriate Enabled box must be checked on each alarm.

NOTE: Applies to Outlet Monitored / Outlet Switched Vertiv™ Geist™ rPDUs only

- Delay determines how long this Event must remain tripped before this Action's first notification is sent. This is different from the Trip Delay above. Trip Delay determines how long the threshold value has to be exceeded before the Event itself is tripped. This delay determines how long the Event must remain tripped before this Action occurs. Delay can be up to 14,400 seconds (4 hours). A Delay of 0 will send the notification immediately.
 - Repeat determines whether multiple notifications will be sent for this Event Action. Repeat notifications are sent at the specified intervals until the Event is acknowledged or until the Event is cleared and reset. The Repeat interval can be up to 14,400 seconds (4 hours). A Repeat of 0 disables this feature and only one notification will be sent.
3. Click *Save* to save this notification action.

NOTE: More than one action can be set for an alarm or warning. To add multiple actions, just click the *Add* icon again and set each one as desired. Each alert can have up to 32 Actions associated with it.

To change an existing alarm or warning event:

1. Click the *Modify* icon next to the alarm or warning event you wish to change.
2. Modify the settings as needed and click *Save*.
3. After an action is added, it has a checkbox in the enabled column at the far left. By default, when an action is added it is unchecked (disabled). Click the *checkbox* to enable it. This allows you to selectively turn different actions On and Off for testing.

To delete an existing alarm or warning event:

1. Click the *Delete* icon next to the alarm or warning event you wish to remove.
2. Click *Delete* and *Save* to confirm.

3.4.3 Logging

The Logging page allows you to access the historical data recorded by the Vertiv™ Geist™ rPDU by selecting the desired sensors and time range to be logged. The Logging page permits selecting all or selecting none. To do so, click on the drop-down menu, choose *Select All* or *Select None* and click on the appropriate check mark.

Figure 3.11 Logging Page

1

2

3

4

5

VERTIV Sensors System Help Admin Log Out

Data Log

Download the data log **JSON**

Download the data log **CSV**

Warning: Changing the interval clears the log.

Log Interval (minutes) 15

Save

Clear the Log

Logging

Click a measurement value to select or deselect.

Save

Select All

Your PDU Name Device ID A532AD00851900C3

State	Label	Energy (kWh)	Real Power (W)	Apparent Power (VA)	Power Factor (%)	Voltage (V _{RMS})	Voltage Min (V _{RMS})	Voltage Max (V _{RMS})	Peak Voltage (V)	Current (A _{RMS})	Current Min (A _{RMS})	Current Max (A _{RMS})	Peak Current (A)
<input checked="" type="checkbox"/>	Phase A	41.321	5	10	51	125.6	125.3	125.7	179.0	0.08	0.07	0.08	0.35
State	Label	Current (A _{RMS})		Current Min (A _{RMS})	Current Max (A _{RMS})	Peak Current (A)							
<input checked="" type="checkbox"/>	Circuit 1	0.00		0.00	0.00	0.00							
State	Label	Energy (kWh)	Real Power (W)	Apparent Power (VA)	Power Factor (%)	Voltage (V _{RMS})	Voltage Min (V _{RMS})	Voltage Max (V _{RMS})	Peak Voltage (V)	Current (A _{RMS})	Current Min (A _{RMS})	Current Max (A _{RMS})	Peak Current (A)
<input checked="" type="checkbox"/>	Outlet 1	0.047	0	0	100	121.2	120.9	121.3	172.8	0.00	0.00	0.00	0.00

Table 3.9 Logging Page Descriptions

Number	Name	Description
1	Data log download	Clicking the <i>JSON</i> link downloads the data log in <i>JSON</i> format. Clicking the <i>CSV</i> downloads the data log in <i>.csv</i> format for use in spreadsheet software.
2	Log interval	The frequency at which data is written to the log file. The logging interval can be 1-600 minutes; the default setting is 15 minutes.
3	Clear log data	Delete the log file.
4	Select All/Select None	Click on the drop-down menu, select <i>Select All</i> or <i>Select None</i> and click on the check mark.
5	Logging	Click the measurement value to select or deselect desired logging parameters. By default, all measurements are selected. Press <i>Save</i> to save changes.

NOTE: The maximum loggable time frame is determined by number of measurements being logged and the interval at which data is written to the log file.

3.5 System Tab

NOTE: You must be logged in as Administrator to modify settings in the System Tab.

3.5.1 Users page

The Users page in the System menu allows you to manage or restrict access to the unit's features by creating accounts for different users.

NOTE: Web/SSH/CLI account lockout policy: An account is locked for 30 minutes when 10 sequential unsuccessful login attempts are made within 60 minutes.

Scope allows an Administrator-level account to restrict Users to the visibility of specified Outlet information.

Figure 3.12 User Page

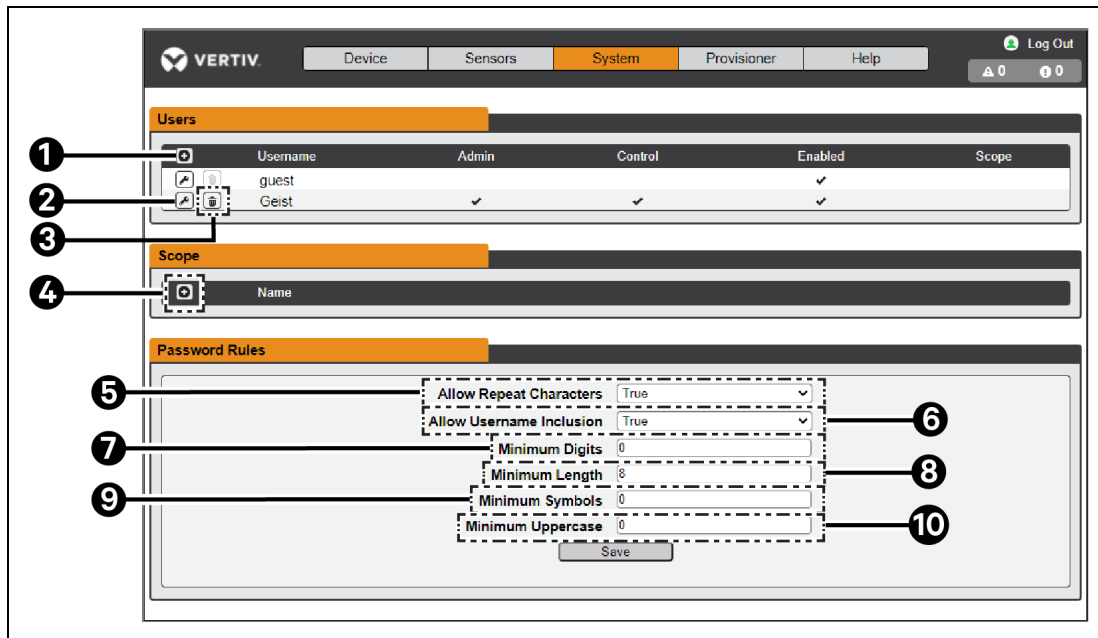


Table 3.10 User Page Descriptions

Number	Descriptions
1	Add new user account
2	Modify user account
3	Delete user account
4	Add user scope – only visible when logged in as an Administrator
5	Allow Repeat Characters: restrict the use of more than 2 repeat characters (default false)
6	Allow Username Inclusion: restrict the inclusion of the user name in the password (default false)
7	Minimum Digits: enter the minimum numerical digit characters (default 0)
8	Minimum Length: enter the minimum number of password characters (default 8, minimum 6)
9	Minimum Symbols: enter the minimum symbol characters (default 0)
10	Minimum Uppercase: enter the minimum uppercase characters (default 0)

NOTE: Only an Administrator-level account can add, modify or delete users as well as add, modify or delete scopes. Control-level and Enabled accounts can change their own passwords using the Modify User icon, but cannot add, delete or modify other accounts. The Guest account cannot add, delete or modify any account, not even itself.

To add or modify a user account:

1. Click the *Add or Modify User* icon.
2. Create or modify the account information as needed.
 - a. **Username:** The name of the account. User names may be up to 24 characters long, are case-sensitive and may not contain spaces or any of these prohibited characters: \$& ` :<>[] { } "+%@/ ; =? \ | ~ ,

NOTE: A username cannot be changed after the account is created.

- b. **Administrator:** If set to *True*, this account has Administrator level access to the unit and can change any setting.
 - c. **Control:** If set to *True*, this account has Control-level access. Setting Administrator to *True* will automatically set Control to *True* as well. Setting this to *False* makes the account an Enabled account, which is view-only.
 - d. **Scope:** If a user scope has been created, select applicable scope for the account. See step “To add or modify a user scope”.
 - e. **New Password:** Account password may be up to 24 characters long, are case-sensitive and may not contain spaces.
 - f. **Account Status:** Set the account to *Enabled* or *Disabled*. Disabling an account prevents it from being used to log in, but does not delete it from the account list.
3. Click *Save*.

User Account Types

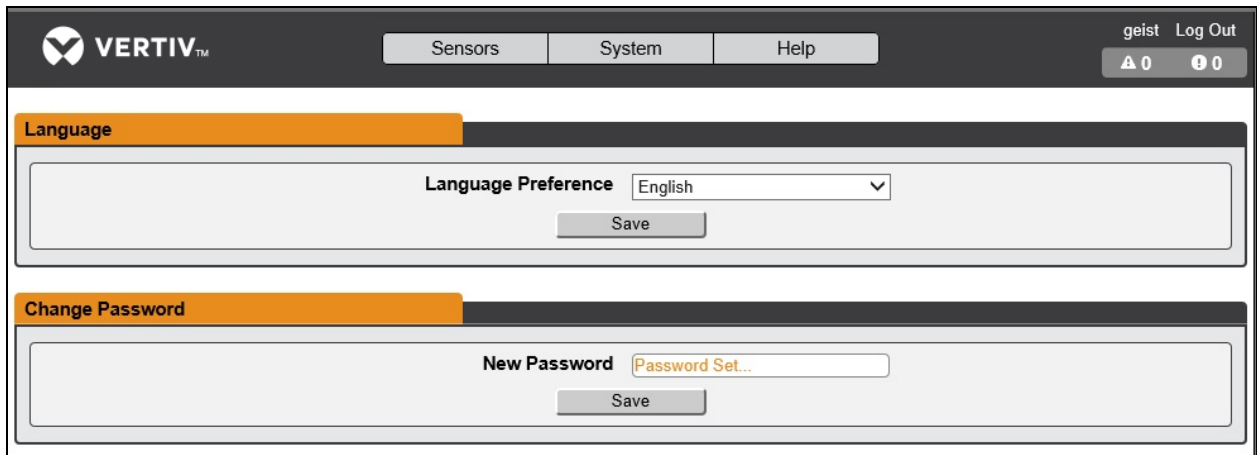
- **Administrator:** Administrator accounts (accounts with both administrator and control authority set to *True*, as above) have full control over all available functions and settings on the device, including the ability to modify system settings and add, modify or delete other users' accounts.

- **Control:** Control accounts (accounts with only control set to *True*) have control over all settings pertaining to the device's sensors. They can add, modify or delete alarms and warning events and notification actions and can change the names or labels of the device and its sensors. Control accounts cannot modify system settings or make changes to other users' accounts.
- **Enabled:** If both administrator and control are set to *False*, the account is an Enabled account, which is view-only. The only changes an Enabled account is permitted to make are changing its own account's password and changing the preferred language for its own account. Enabled accounts cannot change any device or system settings.
- **Guest:** Any user that views the unit's web page without logging in is automatically viewing the unit as Guest. By default, the Guest account is a View-only account and cannot make changes to any settings, allowing anyone to make changes to names, labels, alarm events and notifications without logging in. The Guest account cannot be deleted but can be disabled to require log in for viewing system status.

To change a user password:

1. Log in to your account.
2. Click your *Username* in the top right corner of the page.
3. Enter a new password and click *Save*.

Figure 3.13 Change User Password Page



To add or modify a user scope:

1. Click the *Add or Modify Scope icon*. Reference Figure Add Scope
2. Create or modify the scope information as needed.
 - a. Label: Enter the desired name of the selected scope
 - b. Remote Authentication Attribute: Used for LDAP Remote Authentication
 - c. Click applicable Outlets for a specified User. (Highlight in Green)
3. Click *OK* to save changes.

Figure 3.14 Add Scope

NOTE: A user will be logged out automatically after 10 minutes of inactivity.

3.5.2 Network

The unit's network configuration is set on the *Network Tab* of the System menu. Settings pertaining to the unit's network connection are:

- **Hostname:** The hostname may be used as a method for device identification on the network.
- **Protocol:** Click on the IPv6 drop-down menu, select *Enabled* or *Disabled* and click on *Save*.
- **Interfaces:** Used to configure the IP address of the Vertiv™ Geist™ rPDU, enable/disable DHCP and to view Link State and Uptime. The device supports up to eight user-configured IP address entries.
- **Ports:** Used to view and/or modify Ethernet Port settings and RSTP status of each port on the Geist™ rPDU.
- **Routes:** Displays configured routes and is where you will set your Gateway address for the Geist™ rPDU. Default routes are distinguished by a *destination* of 0.0.0.0 or ":::", with a Prefix of "0" and Interface of "all". Only one default route can exist for IPv4 and one for IPv6.
- **DNS:** Allows the unit to resolve hostnames for email, "NTP" and "SNMP" servers.

Figure 3.15 Network Configuration Page

The screenshot displays the network configuration interface for a Vertiv device. At the top, there is a navigation bar with 'Sensors', 'System' (selected), and 'Help' tabs, along with a 'Log In' button and notification icons. The main content area is divided into several sections:

- Hostname:** A text input field contains 'R00198500ad32' with a 'Save' button below it.
- Protocol:** A dropdown menu for 'IPv6' is set to 'Enabled' with a 'Save' button below it.
- Interfaces:** A table showing interface details for 'Bridge 0'.

Label	MAC Address	DHCP	Link state	Uptime
Bridge 0	00:19:85:00:ad:32	Enabled	Up	157

IP Address	Prefix
192.168.123.123	24
fe80::219:85ff:fe00:ad32	64
- Ports:** A table showing port configurations for 'Bridge 0'.

Label	Interface	RSTP Role	STP State	Link state	Uptime	Enabled
Port 1	Bridge 0	Unknown	Disabled	Down	345276	Enabled
Port 0	Bridge 0	Designated	Forwarding	Up	159	Enabled
- Routes:** A table with columns for Destination, Prefix, Gateway, and Interface.
- DNS:** A table for DNS Server Address.

DNS Server Address
8.8.8.8
8.8.4.4
- RSTP:** Configuration fields for RSTP: Enable (Enabled), Mode (RSTP), Bridge Priority (24576), Max Hops (40), Hello Time (2), Max Age (40), and Forward Delay (21). A 'Save' button is at the bottom.

To edit the interface parameters:

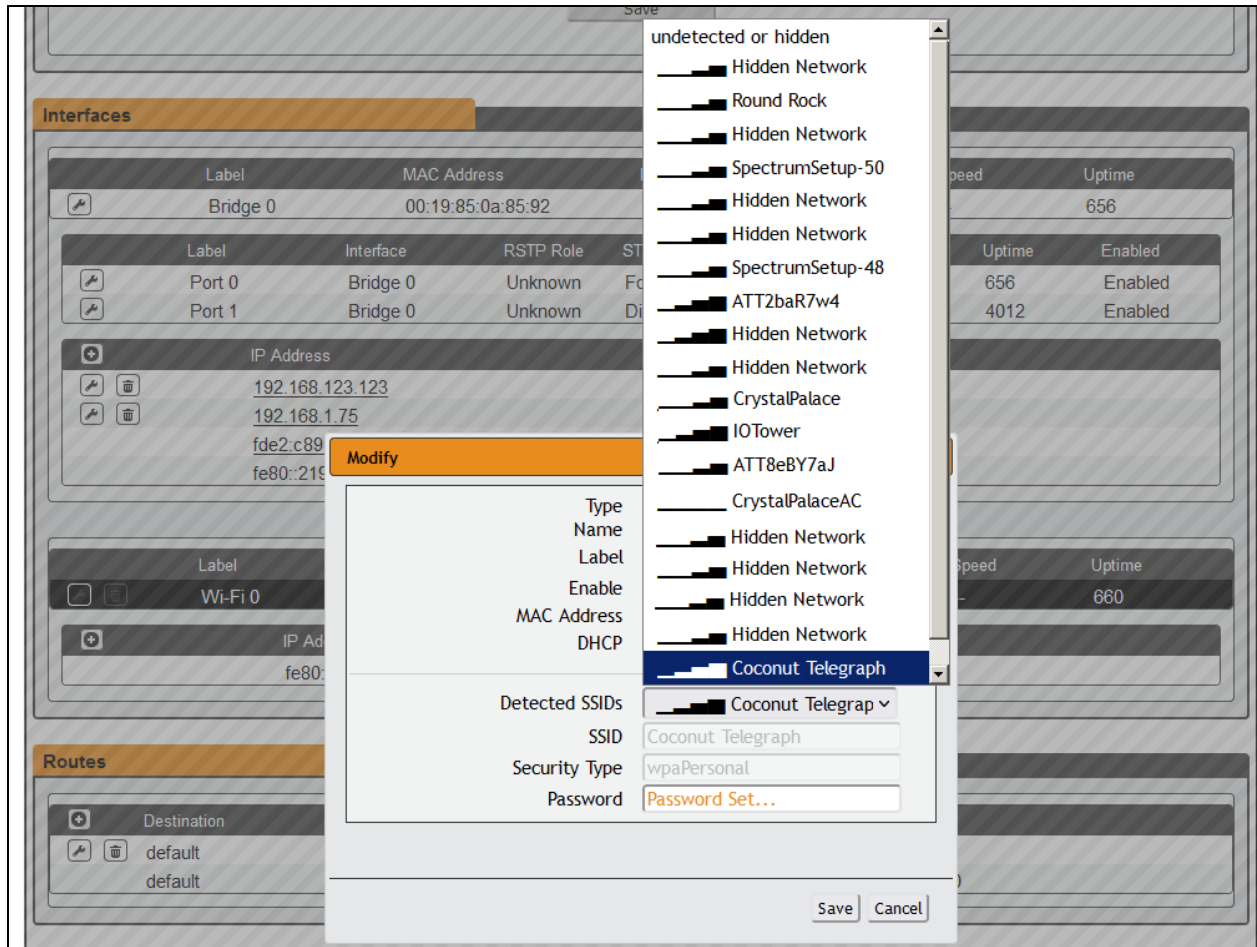
1. Click the *Modify* icon
2. Modify the desired fields.
 - a. **Label** - *Change* the desired name of the selected interface.
 - b. **Enable** - *Enable/Disable* the selected interface. If only one interface is available, disabling the interface restricts access to the device requiring a network reset.
 - c. **DHCP** - *Enable/Disable* DHCP on the selected interface.
3. Click *Save*.

NOTE: Any changes made to the network interface settings take effect once the *Save* button is clicked. If you have changed the IP address, it will appear as if the unit is no longer responding because the browser will not be able to reload the web page. Close the browser window, type the new IP address into the browser's address bar and the unit will be accessible.

To add an interface for a wireless USB adapter:

1. Insert the wireless USB adapter into the USB port. (The rPDU will be inaccessible for a few seconds while the network stack reconfigures itself.)
2. After the adapter is auto detected, a WI-FI interface will appear.
3. Click the *Modify* icon. Select the applicable SSID from the Detected SSIDs drop down menu. See **Figure 3.16** on the next page .

Figure 3.16 Select from Network List



NOTE: See Appendix E for listing of TP-Link wireless.

To add a new IP Address:

1. Click the *Add* icon.
2. Enter the IPv4 or IPv6 address and Prefix/Subnet Mask into appropriate fields. Up to eight IP addresses can be statically assigned.
3. Click *Save*.

To modify an existing IP address:

1. Click the *Modify* icon.
2. Edit the IP address and Prefix/Subnet Mask fields as needed.
3. Click *Save*.

To modify port settings:

1. Click the *Modify* icon.
2. Enter the appropriate information.
 - a. Change port label if desired.
 - b. Select either Bridged/Independent Mode.
 - c. Enable/Disable port.

- d. Assign STP cost. This designates this interface's contribution to the root path cost when it serves as the root port.
3. Click *Save*.

To add a new route:

1. Click the *Add* icon.
2. Enter the appropriate information.
 - a. Destination IP address for desired route.
 - b. Enter *Prefix* for the desired route
 - c. Enter the Gateway IP address.
 - d. Select the *Interface* that route applies.
3. Click *Save*.

To modify an existing route:

1. Click the *Modify* icon
2. Edit the desired fields.
3. Click *Save*.

To add a new DNS Server Address:

1. Click the *Add* icon.
2. Enter the IP of the desired DNS server. Up to two DNS servers can be added.
3. Click *Save*.

To modify an existing DNS Server address:

1. Click the *Modify* icon.
2. Edit the DNS Server Address field as required.
3. Click *Save*.

To change RSTP settings:

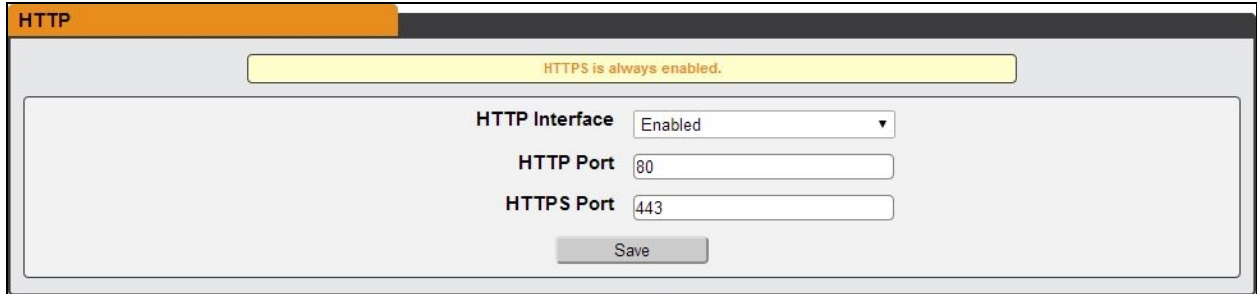
1. Change the settings, as desired.
 - a. **Enable:** Enable or Disable RSTP protocol.
 - b. **Mode:** RSTP mode supports falling back to STP when necessary.
 - c. **Bridge Priority:** Click the drop-down menu, select the appropriate value and click *Save*.
 - d. **Max Hops:** Used when mode enabled to RSTP.
 - e. **Hello Time:** The interval, in seconds, between periodic transmissions of configuration messages by designated ports.
 - f. **Max Age:** The maximum age, in seconds, of the information transmitted by this interface, when it serves as the root bridge. Set at 2 seconds.
 - g. **Forward Delay:** The delay, in seconds, used by bridges to transition the root bridge and designated ports into forwarding mode. Set at 21 seconds.
2. Click *Save*.

3.5.3 Web server

The unit's Web Server configuration can be updated on the Web Server tab of the System menu.

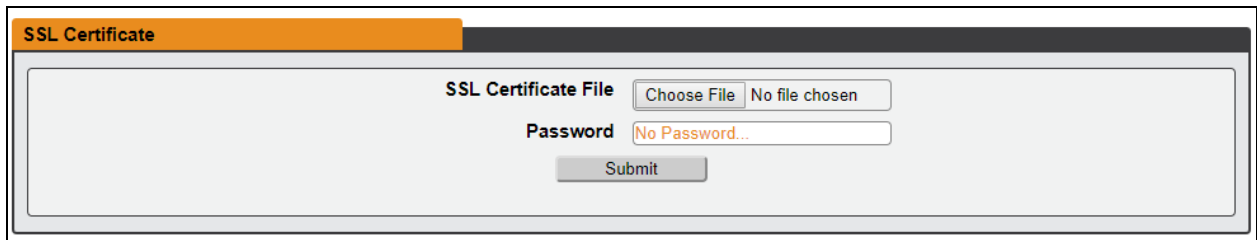
- **HTTP Interface:** Enables or disables access via HTTP. HTTPS interface is always enabled. Available options are *Enabled* and *Disabled*. It is not possible to disable the web interface completely.
- **HTTP/HTTPS Server Port:** Allows you to change the TCP ports that the HTTP and HTTPS services listen to for incoming connections. The defaults are Port 80 for HTTP and Port 443 for HTTPS.

Figure 3.17 HTTP Configuration Page



- **SSL Certificate:** Allows you to upload your own signed SSL Certificate file to replace the default one. The certificate can be either self-signed or signed from a Certification Authority. SSL Certificate must be in either *PEM* or *PFX* (PKCS12) format.

Figure 3.18 SSL Certificate



- **PEM Format:**
 - The public certificate and private key must reside in the same file.
 - The certificate must follow standard x.509.
 - The private key must be generated with the RSA algorithm and in *PEM* format
 - The *PEM* RSA private key may be password-secured.
- **PFX Format:** Support is also available for the PKCS12 standard (*pfx*), which is a binary encrypted combination of a *PEM* public certificate and its *PEM* private key. When generating a *PFX* certificate you are prompted for an optional password.

3.5.4 Reports

The Reports page allows you to schedule the device to send recurring status reports.

NOTE: SMTP email must be set up on the device via the email page.

To Add or Modify a scheduled report:

1. Click the *Add or Modify* icon.
2. Select the Days the report is to be sent.
3. Select the time of the day to Start sending reports.
4. Set the interval (in hours).
5. Select the Target email address for the reports to be sent.
6. Click *OK* to save changes.

To Delete a scheduled report:

1. Click on the *Delete* icon next to the report to delete.
2. Click *OK* on the pop-up window to confirm.

3.5.5 Remote authentication

The Remote Authentication page allows you to designate one of three authentication protocols for remote access to the device. By default, the device uses the local database to authenticate users. Remote authentication allows the device to authenticate a user with a remote server. If remote authentication fails, then it will revert to local authentication.

To change Remote Authentication settings:

1. Select the required mode from the drop-down menu.
 - **Disabled** - Local Authentication
 - **LDAP** - Lightweight Directory Access Protocol
 - **TACACS+** - Terminal Access Controller Access Control System Plus
 - **RADIUS** - Remote Authentication Dial-In User Service

LDAP

The Lightweight Directory Access Protocol (LDAP) can be set up through this menu.

NOTE: Knowledge of your LDAP server settings is required to set up the Vertiv™ Geist™ rPDU device for this remote authentication protocol. If you are not familiar with these settings, consult your LDAP server administrator.

Configuration for remote authentication using LDAP.

- **LDAP Server Address:** Specify the host address for LDAP. The *HOST* can be an IPv4 address, an IPv6 address in brackets (e.g., `[2001:0DB8:AC10:FE01::]`) or a hostname.
- **LDAP Server Port:** Used to set the LDAP port number. The default port for LDAP is 389 - use for Security Type *None* or *StartTLS*. Use 636 for Security Type *SSL*.
- **LDAP Mode:** From the drop-down menu, select *Active Directory* or "OpenLDAP". See [An Example of Configuring LDAP for Active Directory Credentials](#) on page 118 ..
- **Security Type:** From the drop-down menu, select *None*, *SSL* or *StartTLS*
- **Bind DN:** Distinguished Name used to bind to the directory server. Blank string for Bind DN and Password implies anonymous bind.
- **Bind Password:** Password used to bind to the directory server.
- **Base DN:** DN to use for the search base.

The remaining fields come from the NIS schema, defined in RFC2307. They are used to authenticate users in LDAP. Leaving them blank will use the default value.

- **User Filter:** LDAP filter for selecting users.
- **"uid" Mapping:** Name of the server attribute that corresponds to the *uid* attribute in the schema.
- **"uidNumber" Mapping:** Name of the server attribute that corresponds to the *uidNumber* attribute in the schema.
- **Group Filter:** LDAP filter for selecting groups.
- **"gid" Mapping:** Name of the server attribute that corresponds to the *gid* attribute in the schema.
- **"memberUid" Mapping:** Name of the server attribute that corresponds to the *memberUid* attribute in the schema.

NOTE: Users must populate uidNumber. A null or missing value will cause a valid login to fail. The user's uidNumber must be 1000 or greater. A value lower than 1000 will cause a valid login to fail.

- **Enabled Group:** Users in this group have view-only privileges as described in the Users section of this manual.
- **Control Group:** Users in this group have control privileges as described in the Users section of this manual.
- **Admin Group:** Users in this group have admin privileges as described in the Users section of this manual. LDAP users do not count toward the minimum number of required admin users.

Click Save.

The Enabled Group, Control Group and Admin Group fields tell how to map groups to user permissions. A user must belong to one of these groups to access the device. If a user belongs to more than one group, then the group with the highest permission is used.

Figure 3.19 LDAP Menu

The screenshot shows the LDAP configuration interface. It features a title bar labeled 'LDAP' in an orange box. Below the title bar, there are several configuration fields:

- Enable:** A dropdown menu set to 'Enabled'.
- LDAP Server Address:** A text input field containing 'host' with a clear button (x).
- LDAP Server Port:** A text input field containing '389'.
- LDAP Mode:** A dropdown menu set to 'Active Directory'.
- Security Type:** A dropdown menu set to 'None'.
- Bind DN:** An empty text input field.
- Bind Password:** A text input field containing 'No Password...'.
- Base DN:** An empty text input field.
- User Filter:** A text input field containing '(objectClass=posixAccount)'.
- "uid" Mapping:** A text input field containing 'uid'.
- "uidNumber" Mapping:** A text input field containing 'uidNumber'.
- Group Filter:** A text input field containing '(objectClass=posixGroup)'.
- "gid" Mapping:** A text input field containing 'gidNumber'.
- "memberUid" Mapping:** A text input field containing 'memberOf'.
- Enabled Group:** A text input field containing 'enabled'.
- Control Group:** A text input field containing 'control'.
- Admin Group:** A text input field containing 'admin'.

At the bottom of the configuration area, there is a 'Save' button.

TACACS+

The Terminal Access Controller Access-Control Plus Protocol (TACACS+) can be set up through this menu.

NOTE: Knowledge of your TACACS+ server settings is required to set up the Vertiv™ Geist™ rPDU device for this remote authentication protocol. If you are not familiar with these settings, please consult your TACACS+ server administrator.

Configuration for remote authentication using TACACS+.

Figure 3.20 TACACS+ Menu

The screenshot shows a web-based configuration interface for TACACS+. The title bar is orange and labeled 'TACACS+'. Below it, there is a light gray form area with the following fields:

- Primary Authentication Server:
- Alternate Authentication Server:
- Primary Accounting Server:
- Alternate Accounting Server:
- Shared Secret:
- Service:
- Admin Attribute:
- Control Attribute:
- Enabled Attribute:

A 'Save' button is positioned at the bottom center of the form area.

- **Primary Authentication Server:** The primary authentication/authorization server, which can be an IPv4 address, an IPv6 address in square brackets (e.g., `[2001:0DB8:AC10:FE01::]`) or a host name. The Primary Authentication Server is used for both authentication and authorization. This AA server address/host name is required.
- **Alternate Authentication Server:** The alternate authentication/authorization server, which can be an IPv4 address, an IPv6 address in square brackets or a host name. The Secondary Authentication Server is used for both authentication and authorization.
- **Primary Accounting Server:** The primary accounting server, which can be an IPv4 address, an IPv6 address in square brackets or a host name. The Primary Accounting Server is optional. If configured, the server is notified when a user is authorized.
- **Alternate Accounting Server:** The alternate accounting server, which can be an IPv4 address, an IPv6 address in square brackets or a host name. The Secondary Accounting Server is optional. If configured, the server is notified when a user is authorized.
- **Shared Secret:** Enter a secret word or passphrase in the Shared Secret field (applies to both primary and secondary authentication and accounting servers).
- **Service:** The value to use for the service field in TACACS+ requests. Valid options are *PPP* and *raccess*.
- **Admin Attribute:** A user with this attribute will have *admin* privileges as described in the Users section of this manual. TACACS+ users do not count toward minimum number of required admin users.
- **Control Attribute:** Users with this attribute will have control privileges as described in the Users section of this manual.
- **Enabled Attribute:** Users with this attribute will have view-only privileges as described in the Users section of this manual.

Click Save.

NOTE: The Attribute-Value Pairs (AVPs) returned by the server during authentication/authorization determine the user permissions. The Group Attribute field tells the system which AVP contains the user's access group. If the AVP value matches the Admin Group field, then the user has Admin (full) access. If the AVP value matches the Control Group field, the user has control access. If the AVP matches the Enabled Group field, the user has view-only access. If no matches are found, then the user will not have access to the unit. A blank Group field will not match any AVP.

RADIUS

The Remote Authentication Dial-In User Service Protocol (RADIUS) can be set up through this menu.

NOTE: Knowledge of your RADIUS server settings is required to set up the Vertiv™ Geist™ rPDU device for this remote authentication protocol. If you are not familiar with these settings, consult your RADIUS server administrator.

Configuration for remote authentication using RADIUS.

Figure 3.21 RADIUS Menu

- **Primary Authentication Server:** Enter the IP address of the primary authentication/authorization/accounting server. The Primary Authentication Server can be an IPv4 address, an IPv6 address in square brackets (e.g., `[2001:0DB8:AC10:FE01::]`) or a host name. The Primary Authentication Server is used for authentication, authorization and accounting. This AA server is required.
- **Alternate Authentication Server:** If applicable, enter the IP address of the alternate authentication/authorization/accounting server. The Alternate Authentication Server can be an IPv4 address, an IPv6 address in square brackets or a host name. The Secondary Authentication Server is used for authentication, authorization and accounting.
- **Shared Secret:** Enter a secret word or passphrase in the Shared Secret field (applies to both primary and secondary authentication and accounting servers).
- **Group Attribute:** Identifies the Attribute-Value Pair (AVP) that tells which access group the user belongs to. Valid values are *filter-id* and *management-privilege-level*.
- **Admin Group:** A user belonging to this group has Admin privileges as described in the Users section of the manual.
- **Control Group:** A user belonging to this group has Control privileges as described in the Users section of the manual.
- **Enabled Group:** A user belonging to this group has "Enabled" view-only privileges as described in the Users section of the manual.

Click Save.

NOTE: The Attribute-Value Pairs (AVPs) returned by the server during authentication/authorization determine the user permissions. The Group Attribute field tells the system which AVP contains the user's access group. If the AVP value matches the Admin Group field, then the user has Admin (full) Access. If the AVP value matches the Control Group field, the user has Control Access. If the AVP matches the Enabled Group field, the user has view-only access. If no matches are found, then the user will not have access to the unit. A blank Group field will not match any AVP.

3.5.6 Display

The unit's display configuration can be changed via the Display tab of the System menu. Settings pertaining to the unit's display are:

- **Inverted:** When true, the local display is flipped 180 degrees
- **Total Power:** Appears on local display when enabled (displayed as kW).
- **Voltage:** Appears on local display when enabled.
- **Current:** Appears on local display when enabled.
- **VLC:** Allows user to enable or disable VLC mode from GUI (default is *disabled*).

Figure 3.22 Display Mode/VLC Configuration Page

The screenshot displays the configuration interface for the Vertiv Geist Rack Distribution Unit. The top navigation bar includes the VERTIV logo and tabs for Device, Sensors, System (selected), Provisioner, and Help. A Log Out button is located in the top right corner. The main content area is divided into two sections: Display and VLC. The Display section contains three sub-sections: Inverted (set to False), Total Power (set to Disabled), Voltage (set to Disabled), and Current (set to Enabled). Each sub-section has a Save button. The VLC section contains a single sub-section: VLC Mode (set to Disabled), with a Save button.

Section	Setting	Value
Display	Inverted	False
	Total Power	Disabled
	Voltage	Disabled
	Current	Enabled
VLC	VLC Mode	Disabled

3.5.7 Time

The unit's time and date are set on this page.

Figure 3.23 Time Configuration Page

Time

Mode NTP

Date-Time (YYYY-MM-DD hh:mm:ss) 2014-09-17 08:50:20

Time Zone America/Chicago

Primary NTP Server 0.pool.ntp.org

Alternate NTP Server 1.pool.ntp.org

Save

Two modes are available:

- **Network Time Protocol (NTP)** - Synchronizes the unit's time and date to the specified time zone using listed NTP Servers. NTP servers can be reconfigured.
- **Manual** - In this mode, the date and time must be typed as indicated on the left of the field.

3.5.8 SSH

The SSH menu allows you to configure settings for SSH access to the device.

Figure 3.24 SSH Configuration Page

SSH

SSH Access Enabled

Port 22

Save

- **SSH Access:** Enables or disables access via SSH.
- **SSH Port:** Allows you to change the port that the SSH service listens to for incoming connections. The default is Port 22.

NOTE: An SSH user will be logged out automatically after 10 minutes of inactivity.

3.5.9 8

USB

To enable or disable the USB port:

1. Select Enable or Disable from drop-down menu.
2. Click *Submit* button.

When USB port is enabled, the attached USB devices are displayed on the web interface.

NOTE: The USB device must be formatted as FAT32.

If a valid USB storage device is detected and historic data is being logged, this data is also stored in a file on the USB storage drive. If it does not already exist, a file called "log-1.csv" is created under a "log" directory at the top level of the file system. If log files already exist, the one with the highest number identifier in the title is used as a starting point. Every log period, new data is appended to this file in the same format as the CSV retrieval. If data points are created or removed relative to the ones listed in the CSV header, a new file is created named with the next sequential number. If the file system becomes full, this logging will cease.

3.5.10 Serial port

NOTE: Serial connection does not support flow control.

The Serial Port menu allows configuring settings for the serial port, enabling or disabling the port and setting the baud rate.

1. Click on the Serial Port drop-down menu, select *Enabled/Disabled*.
2. Click on Baud Rate drop-down menu, select *Baud Rate* value.
3. Click on *Save*.

Figure 3.25 System drop down, menu – Serial Port

The screenshot displays the 'Serial Port' configuration page within the Vertiv web interface. The interface features a dark header with the Vertiv logo on the left and navigation tabs for 'Sensors', 'System' (which is highlighted), and 'Help' in the center. On the right side of the header, there are links for 'Admin' and 'Log Out', along with status indicators for alerts (0) and users (0). Below the header, the main content area is titled 'Serial Port' and contains the following configuration options:

- Serial Port:** A dropdown menu set to 'Enabled'.
- Baud Rate:** A dropdown menu set to '115200'.
- Data Bits:** A text input field set to '8'.
- Stop Bits:** A text input field set to '1'.
- Parity:** A text input field set to 'none'.

A 'Save' button is positioned at the bottom of the configuration area.

3.5.11 Email

The unit is capable of sending email notifications to up to 10 email addresses when an alarm or warning event occurs.

Figure 3.26 Email Configuration Page

Table 3.11 Email Configuration Page Descriptions

number	description
1	Add new target email address.
2	Modify existing target email address.
3	Delete existing target email address.
4	Send test email.

To send emails, the unit must be configured to access the mail server, as follows:

- **SMTP Server:** The name or IP address of a suitable SMTP or ESMTP server.
- **Port:** The TCP port that the SMTP Server uses to provide mail services. Typical values would be Port 25 for an unencrypted connection or 465 and 587 for a TLS/SSL-encrypted connection, but these may vary depending on the mail server's configuration.
- **Enable SSL:** If Enabled, the unit will attempt to connect to the server using a fully encrypted TLS/SSL connection. Note that when this setting is enabled only fully encrypted sessions are supported; the StartTLS method, where the session starts out as unencrypted and then switches to encrypted part way through the session, is not supported. If using a service that utilizes StartTLS, such as Office365, leave this option disabled.
- **From Email Address:** The address that the unit's emails appear to come from. Many hosted email services, such as Gmail, require this to be the email account of a valid user.
- **Username and Password:** The login credentials for the email server. If your server does not require authentication (open relay), these can be left blank.

Microsoft Exchange servers must be set to allow SMTP relay from the IP address of the unit. In addition, the Exchange server must be set to allow Basic Authentication, so the unit is able to log in with the AUTH LOGIN method of sending its login credentials. Other methods, such as AUTH PLAIN and AUTH MD5 are not supported.

To add or modify a target email address:

1. Click the *Add or Modify* icon.
2. Enter the email address and then click *Save*.

To delete a target email address:

1. Click the *Delete* icon next to the address you wish to delete.
2. Click *Delete* on the pop-up window to confirm.

To send a test email:

1. Click the *Test email* icon next to the address you wish to test.
2. A pop-up window indicates the test email is being sent, click *OK* to dismiss the pop-up.

3.5.12 SNMP

Simple Network Management Protocol (SNMP) can be used to monitor the unit's measurements and status. SNMP V1, V2c and V3 are supported. In addition, alarm traps can be sent to up to two IP addresses.

Click on *ZIP* to download the *mib.zip* file containing both the MIB file and the CSV-formatted spreadsheet.

Figure 3.27 SNMP Configuration Page

The SNMP-V1/V2c and SNMP-V3 Service can be enabled or disabled independently. The service listens for data-read requests on Port 161, which is the usual default for SNMP services; this can also be changed.

The Management Information Base (MIB) can be downloaded from the unit, via the ZIP link at the top of the web page. Clicking this link, downloads a *.zip* archive containing both the MIB file and a CSV format spreadsheet describing the available OIDs in a human-readable form to assist you in setting up your SNMP manager to read data from the unit.

Figure 3.28 SNMP Users Configuration Page

Users				
	Type	Name	Authentication	Privacy
	V1/V2c Read Community	public	—	—
	V1/V2c Write Community	private	—	—
	V1/V2c Trap Community	private	—	—
	V3 Read		None	None
	V3 Read/Write		None	None
	V3 Trap		None	None

The Users section allows you to configure the various Read, Write and Trap communities for SNMP services. You can also configure the authentication types and encryption methods used for the SNMP V3 if desired. Click the *Modify* icon to change settings.

Traps allow defining the SNMP types that you wish to be sent and the IP addresses of recipients.

To configure a Trap Destination:

1. Locate the *Traps* section of the SNMP page and click the *Add* icon.
2. Enter the IP Address where the trap should be sent in the Host field.
3. Change the port number if required.
4. Select the trap version to be used (V1, V2c or V3) and click *Save*.

A test trap may be sent by clicking on the *Test* icon next to the Host IP address. You can also update/change the Trap settings. Click the *Modify* icon next to the Host IP address.

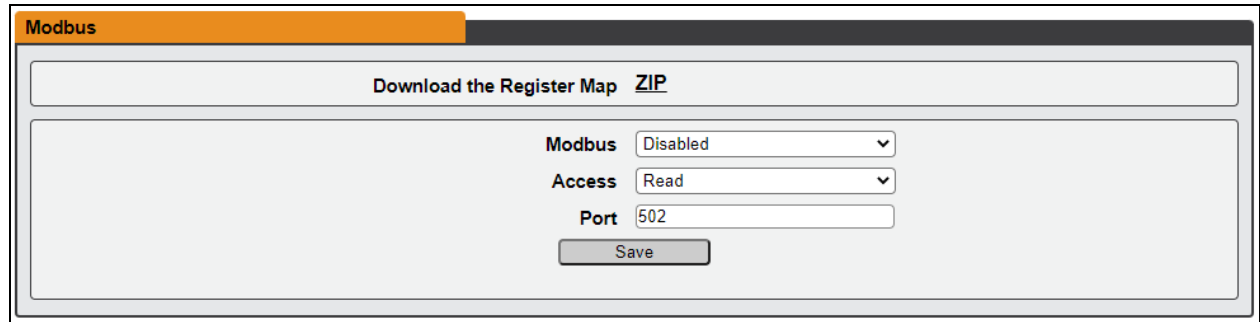
3.5.13 Modbus

Modbus TCP communication protocol can be used to monitor the unit's measurements and status. It also allows the user to adjust the unit's settings.

The register map can be downloaded from the unit, via the ZIP link at the top of the web page. Clicking this link, downloads a .zip archive containing a CSV format spreadsheet describing the Modbus mapping in a human-readable form to assist you in setting up your Modbus manager to read/write data to the unit.

The Modbus communication protocol can be enabled or disabled. Modbus access to the unit can be either *Read* or *Read/Write*. Data-read or data-write requests are made on Port 502, which is the usual default for Modbus protocol; this port can also be changed.

Figure 3.29 Modbus



3.5.14 SYSLOG

Syslog data can be captured remotely but must first be set up and enabled via the Syslog page.

NOTE: This function is primarily useful for diagnostic purposes and should normally be left disabled unless advised to enable it by Vertiv™ technical support for troubleshooting a specific issue.

The use of the Download the Event Log CSV button requires the user to have admin access.

3.5.15 Admin

The Admin page allows the administrator of the device to save their contact information along with the device description and location. Once the information is saved by an administrator, other (non-administrator) users can view it. Also, the System Label can be modified on this page. This label is typically shown in the title bar of the web browser's window and/or on the browser tab(s) currently viewing the device.

3.5.16 Locale

The Locale page sets the default language and temperature units for the device. These settings will become the default viewing options for the device, although individual users can change these options for their own accounts. The guest account will only be able to view the device with the options set here.

3.5.17 Utilities

The Utilities page in the System menu provides the ability to restore defaults, reboot the communication system and perform firmware updates.

Aggregation

Change settings, as desired. (See [Aggregation](#) on page 65)

To change Aggregation setting:

1. Select Enable or Disable from dropdown menu
2. If Aggregation is enabled,
 - a. Array device Username: Defines the username configured on all array devices.
 - b. Array device Password: Defines the password configured on all array devices.
3. Click Submit button

Configuration Backup and Restore

Save current configuration settings and restore previous configuration settings as needed.

Table 3.12 Backup and Restore Options

Option	Description
Download Configuration Backup File	Downloads do not require user authentication. The name of the downloaded file is "backup_XXX.bin" where XXX represents a string representation of the MAC address for the "ethernet" interface of the unit without the ':' characters.
Backup File	Uploads the configuration backup file. This requires user authentication and the user must have administrator privileges. A backup file can only be used to load configuration on units with the same model number.

To save current configuration settings:

1. Select *Download Configuration Backup File*.
2. Click *BIN*.

NOTE: Saving configuration does not require user authentication.

To restore a previous configuration setting:

1. Click *Backup File*.
2. Click *Choose File*.
3. Select the Backup File.
4. Click *Restore*.

NOTE: Restoring configurations requires user authentication and the user must have administrator privileges.

NOTE: A backup file can only be used to load configuration on units with the same model number.

Restore Defaults

Restore the default settings.

Table 3.13 Restore Default Options

Option	Description
All Settings	Resets all configuration on /conf, /alarm, and /dev to factory defaults. Will also clear the event log, data log, and execute the delete command on any devices with a state of "unavailable". This will cause portions of the system to reinitialize. It will return success and then be followed by a short period where access to the system will be unavailable.
All Settings, Except Networks And Users	As the "defaults" option above but does not reset /conf/network, /conf/http, /conf/datalog, /auth, or /conf/ldap and does not clear the event log or data log. This will cause portions of the system to reinitialize. It will return success and then be followed by a short period where access to the system will be unavailable.

To restore default settings:

1. Select from either *All Settings* or *All Settings, Except Networks And Users* from the drop-down menu.
2. Click *Submit*.

Reboot

Reboots the operating system. Resets the IMD processor causing the IMD to reboot.

To reboot the operating system: Click *Reboot*.

NOTE: The power to connected devices is not affected.

Reboot I/O Boards

If the Vertiv™ Geist™ rPDU is not responding or not displaying all values, rebooting the internal boards will reinitialize the system. This will reset the processors on the internal input board and the outlet board(s) causing them to restart.

To reboot the I/O boards: Click *Reboot I/O Boards*.

NOTE: The power to connected devices is not affected.

Firmware Updates

Uploads a firmware file that updates the system. This action requires user authentication and the user must have administrator privileges. Firmware updates typically comes in a .zip archive file containing several files including the firmware package itself, a copy of the SNMP MIB, a readme text file explaining how to install the firmware and various other support files as needed. Be sure to unzip the archive and follow the included instructions.

To update Firmware via Firmware Package File:

1. Click *Choose File* and select the *.firmware* file from the *Open* window.
2. Click *Submit*.
3. If a problem occurs, click *Revert Firmware*.

To update Firmware via a USB flash drive:

1. Download the latest firmware from <https://www.vertiv.com/en-us/support/software-download/power-distribution/geist-upgradeable-series-v5-firmware/> and unzip the folder.
2. Get a USB flash drive and format it as FAT32.
3. Create a directory on the USB flash drive called *FIRMWARE* (must be uppercase).

4. Open the unzipped firmware folder and copy the *.firmware* file.
5. Paste this file into the *FIRMWARE* folder on the flash drive.
6. Plug the USB flash drive into the PDU.

During the update, the IMD will stop scrolling data. After the update is complete, a boot message will appear on the display. After reboot is complete, the IMD will resume scrolling data on the display.

Factory Access

Provides information for technical support.

Table 3.14 Factory Access Options

Option	Description
Download Factory Support Package	Downloads an encrypted diagnostic package that can be sent to technical support personnel.
Factory Access	Allows factory access to unit over SSH (for debugging purposes).

To download a factory support package:

1. Click *Download Factory Support Package*.
2. Click *ENC*.

To enable/disable factory access:

1. Select either *Enable* or *Disable* from the drop-down menu.
2. Click *Submit*.

NOTE: This requires user authentication and the user must have administrator privileges.

3.6 Provisioner Tab

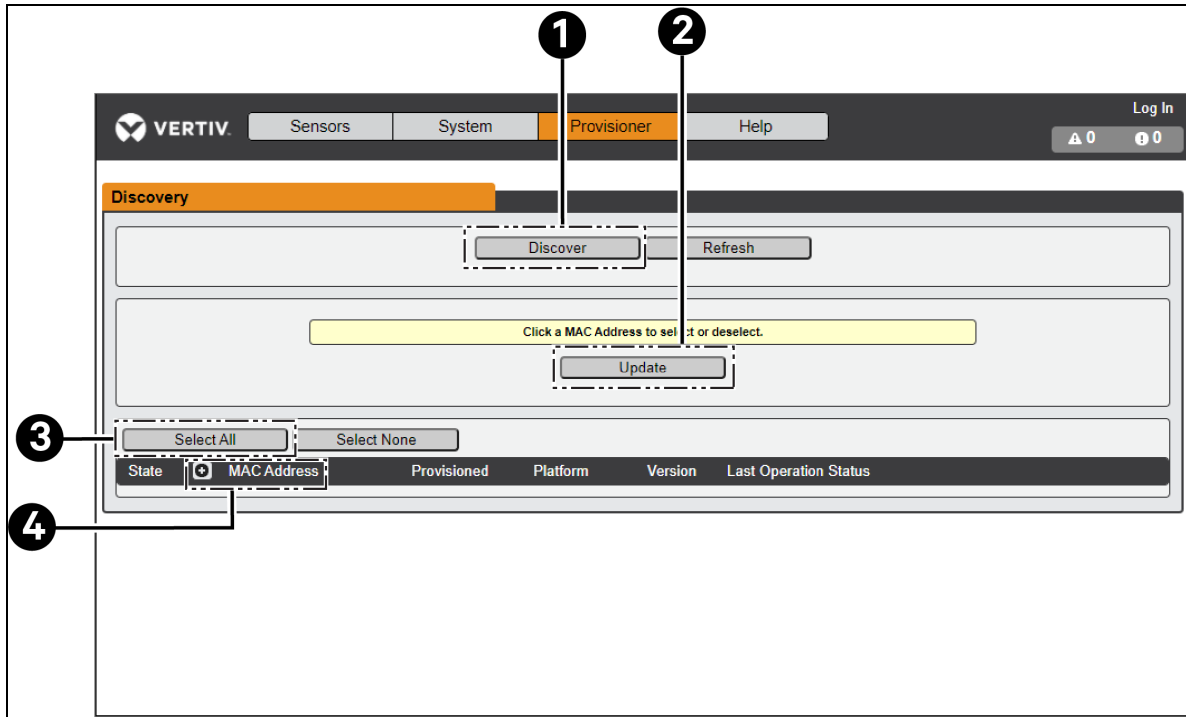
The Provisioner allows the user to discover locally connected Vertiv™ Geist™ rPDUs. The user can update their firmware and configure them by uploading a configuration settings file.

The Provisioner provides the ability to configure device settings (example, alarms) and system settings. This functionality can provision:

- Geist™ U PDUs running 3.x.x or 5.x.x firmware (IMD models 02, 02E, 3E, 03E, 3E-S and 03E-S)
- R-Series Geist™ rPDUs running 5.x.x firmware
- Factory fresh or previously configured Geist™ rPDUs
- Rack PDUs connected directly to the local network or connected as part of a Vertiv Intelligence Director (aggregation) network
- All or selected discovered Geist™ rPDUs

NOTE: You must be logged in as Administrator-level user to utilize the Provisioner. IPV6 must be enabled on the Geist™ rPDUs being discovered It is possible to configure most items in the System user interface menu. Other settings such as sensor settings and alarms cannot be configured with this version of the provisioning tool.

Figure 3.30 Provisioner Page



Number	Name	Description
1	Discover	Identifies local and network connected rack PDUs
2	Update	Updates firmware and/or configuration of selected rPDUs
3	Select All	Selects all connected rPDUs
4	Add MAC address	Allows manually entered rPDUs by MAC address

3.6.1 Discovery

1. Click *Discover* icon to identify locally connected Vertiv™ Geist™ rPDUs.
2. Click all the Geist™ rPDUs in the listing that you would like to update firmware and/or configuration. Those units selected will be highlighted in green. You may also click the *Select All* to update all Geist™ rPDUs in listed.
3. Click *Update* icon to update all selected Geist™ rPDUs with firmware file and/or configuration file.

NOTE: You must load the firmware and configuration files before performing this step in the File Management TAB.

3.6.2 File Management

Firmware Files

1. Click *Choose File* and select the .firmware file from the Open window.
2. Click *Submit* icon. Firmware file will be listed

Configuration Files

1. Click *Choose File* and select the .config file from the Open window.
2. Click *Submit* icon. Configuration file will be listed

Figure 3.31 File Management Page

The screenshot shows the 'Provisioner' tab selected in the top navigation bar. The page is divided into two main sections: 'Firmware Files' and 'Configuration Files'. Each section contains an 'Upload File' form with a 'Choose File' button (showing 'No file chosen'), a 'Name' input field, and a 'Submit' button. Below each form is a table header for file listings.

Firmware Files

File	Version	Platform	Date
------	---------	----------	------

Configuration Files

File	Date
------	------

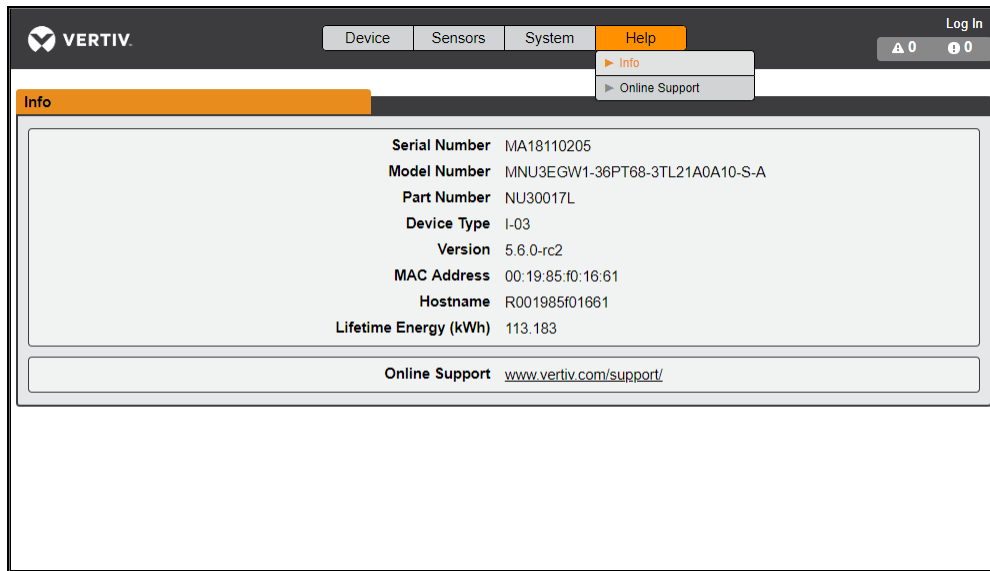
See [Provisioner - Format of the configuration settings file](#) on page 94 for examples of configuration setting files used by the Provisioner and the necessary format for the file.

3.7 Help Tab

Info Page

The Info Page displays the unit's current configuration information, including the device name and ID, the type of IMD installed, the unit's current firmware versions and network information. Manufacturer support information is also here.

Figure 3.32 Info Page



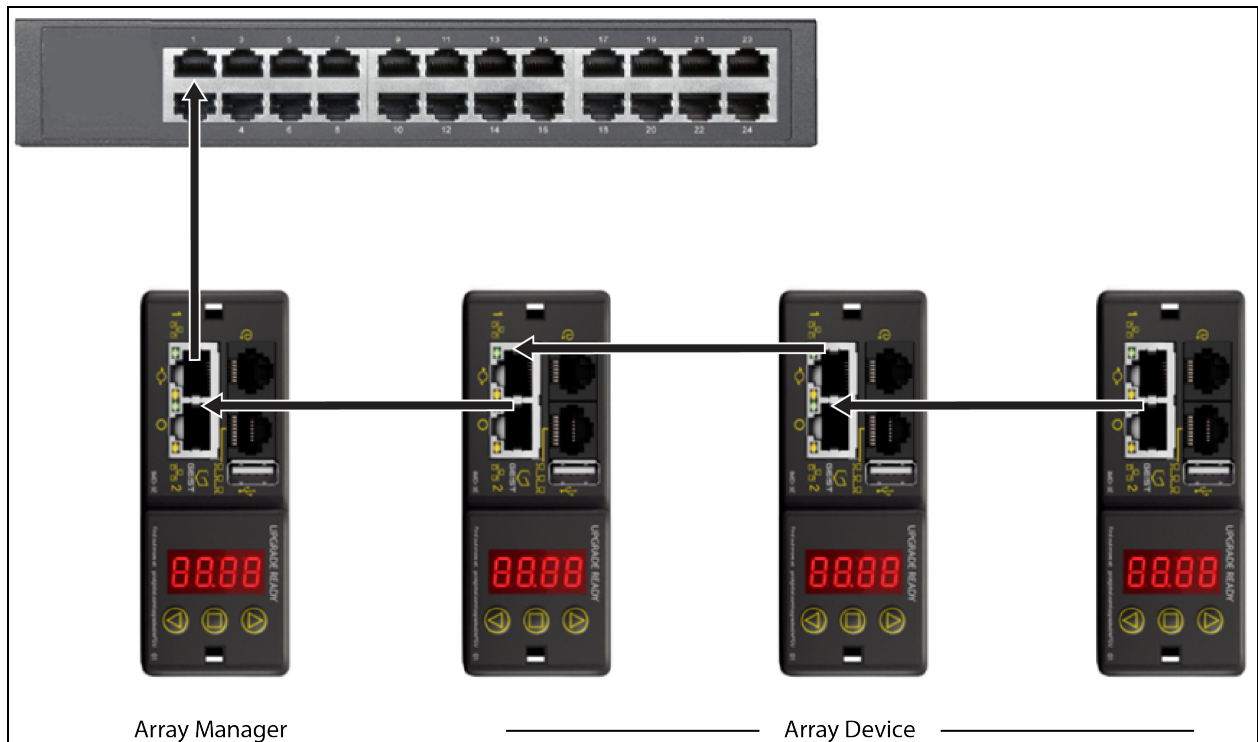
4 Vertiv™ Intelligence Director

Vertiv Intelligence Director brings a single, unified viewing layer for small deployments of the Vertiv™ Geist™ rPDUs, Vertiv™ UPSs, environmental sensors and Geist™ rPDU outlets. When deployed, Vertiv Intelligence Director offers enhanced functionality, using the Geist™ rPDU not as a stand-alone device but as a gateway to understand the broader device ecosystem in which it is installed.

4.1 Aggregation

The initial element of Vertiv Intelligence Director, available with Geist™ rPDUs running firmware 5.3.0 or later, is called Aggregation. This single element allows you to:

- Use aggregation to reduce IP address count, aggregate data from multiple rack PDUs, and enable management of rack PDU outlet groups.
- Rack PDUs are connected using an Ethernet daisy chain as in the daisy-chaining example above.
- The head of the chain rack PDU is configured as the array manager.
- The array device network can include network switches.
- A single IP address assigned to the array manager can be used to access up to 50 devices (the array manager and 49 array devices).
- Array device network settings are automatically configured.
- Array devices are accessed using the array manager IP address and a port number. The port number can be obtained by navigating the *Device-List page* and hovering over the device.
- Users can define groups of devices, Example. representing racks.
- The array manager generates aggregated measurements like total group power and total power, including averages, minimums, and maximums.
- Fault tolerant daisy chaining is not permitted when using Vertiv Intelligence Director.

Figure 4.1 Aggregation

An additional element of Vertiv Intelligence Director, available with Geist™ rPDUs running firmware 5.7.0 or later, is Rack PDU Outlet Grouping. This element allows you to:

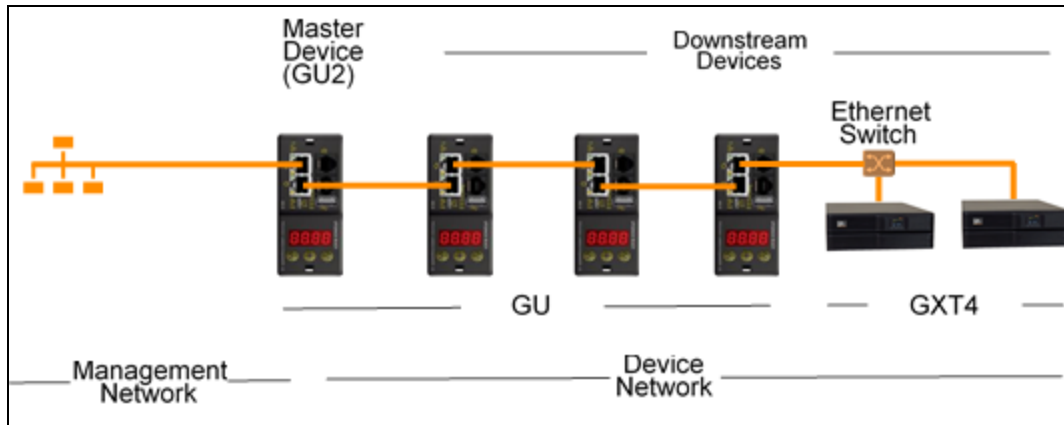
- Create groups of Geist™ rPDU outlets spanning one or more Geist™ rPDUs.
- Report on total power and energy for the outlet group (with Geist™ rPDUs that report per outlet measurements).
- Provide the ability for power off, power on or power cycle the group of outlets with a single command (with Geist™ rPDUs that support outlet switching)

With firmware 5.10.1 or later, full visibility of Vertiv Intelligence Director (Aggregated) devices is available through SSH and serial port CLIs.

4.2 Array Manager

Aggregation requires the designation of an array manager, deployed with Geist rack PDUs equipped with IMD models 3E, 03E, 3E(-S or -G) or 03E(-S or -G), which are currently running firmware versions 5.3.0 and newer (though the latest firmware version is strongly recommended). The IMD of the array manager facilitates and configures the device network, the interconnected array of Geist™ rPDUs, Vertiv™ UPSs, Vertiv™ cooling, environmental sensors and Geist™ rPDU outlets, while aggregating select data points from these devices. It also interacts with the management network for monitoring and management of itself and its array devices.

Figure 4.2 Sample Configuration



If you wish to use an IMD-02X or IMD-02E equipped rPDU as an array manager, you must first upgrade it to an IMD-3E-S or IMD-3E-G.

4.3 Network Configuration

In the initial release of aggregation, array devices are defined as Geist™ rPDUs within the Geist™ GU1 and GU2 product platforms as well as Vertiv™ MPH2 and MPX rack PDUs, Vertiv™ GXT4, GXT5, PSI5, EXM, APM and ITA2 UPS, Vertiv™ CRV row cooling and USB-connected Vertiv™ VRC cooling.. Each array manager can support up to 49 array devices, so the number of managers depends on the overall size of the installation and the preferred network architecture.

The array manager must be commissioned before it is connected to the primary management network or to the array device network. This commissioning is typically accomplished using a laptop or local machine connected directly to Port 1 on the IMD.

After local connectivity is established, you can commission the array manager.

To commission the array manager:

1. Use the top drop-down menu to navigate to *System>Locale*.
2. Select the appropriate Default Language and Temperature Units from the drop-down menus. These settings are pushed to the array devices in its network.
3. Browse to *System>Network*. In Protocol IPv6, choose *Enabled* from the drop-down menu.
4. Browse to *System>Utilities*. Change the settings as desired.
 - a. **Aggregation:** Choose *Enabled* from the drop-down menu.
 - b. **Array device Username:** Defines the username configured on all array devices.
 - c. **Array device Password:** Defines the password configured on all array devices.
5. Enter the new password, verify the password and click *OK*.

When configuring Aggregation, ensure the Managed Device Password meets all array device password complexity rules. Unless changed by the user, these require a minimum password length of 8 characters with rPDUs running 5.9.0 or later firmware.

6. Click *Submit*. If Aggregation is enabled, the Device Tab appears next to the Sensors Tab on the top navigation bar.

After Aggregation is enabled on the array manager, configure the remaining array manager settings. Connect the array manager to management network (Port 1) on the IMD and the device network (Port 2).

NOTE: The array manager has a built-in DHCP network to assign addresses to its array devices. This DHCP network uses 192.168.123 / 192.168.124 addresses and they cannot be used for the management network.

4.3.1 Array devices

In the initial release of aggregation, array devices are defined as Geist™ rPDUs within the Geist™ GU1 and GU2 product platforms as well as Vertiv™ MPH2 and MPX rack PDUs, Vertiv™ GXT4, GXT5, PSI5, EX, APM and ITA2 UPS, Vertiv™ CRV row cooling and USB-connected Vertiv™ VRC cooling. All Geist™ GU1 rPDUs must be running firmware Version 3.3.3 or later; Geist™ GU2 rPDUs must be running firmware version 5.3.0 or later. In all cases it is strongly recommended that all rPDUs are updated to the latest available firmware version. If the Geist™ rPDUs are newly ordered and have never been configured, they are ready for aggregation out-of-the-box. If the Geist™ rPDUs have been deployed in a computing environment and commissioned with local LAN settings and user accounts, each Geist™ rPDU must be reset to its factory defaults using the Utilities page. The array manager thMen pushes configuration data to the array devices, including:

- Network settings
- Default Language and Temperature Units
- Username
- Password

To set up a new installation with one array manager:

1. Install array devices in racks and power-on the racks.
2. Daisy-chain the array devices to each other where appropriate using ports labeled 1 and 2 on the IMD.
 - If using daisy chained rPDU connections ensure no daisy-chain is longer than 20 rPDUs.
 - Array devices may be networked using daisy chained connections, star connections, or a combination of both.
3. Install the array manager in a rack. Using a laptop or a local machine, connect to Port 1 to configure Aggregation.
4. Connect the array manager to the management network using Port 1.
5. Connect the array manager to the array device network using Port 2.

To set up an existing installation with one array manager:

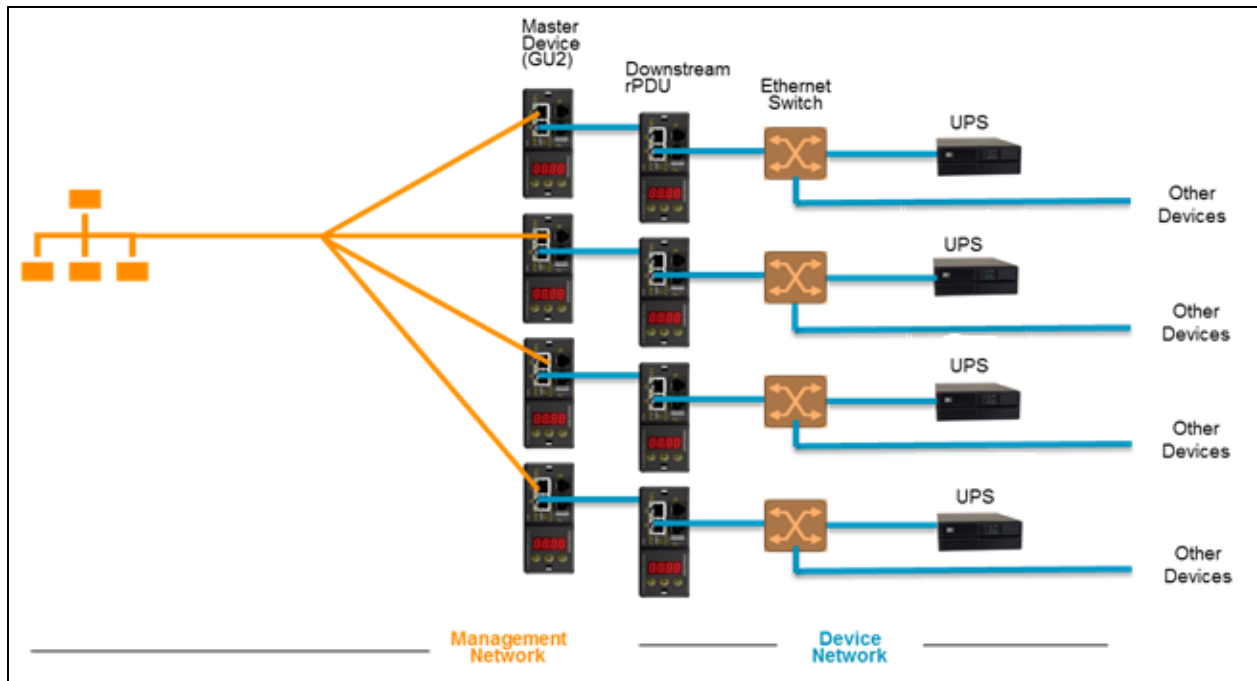
NOTE: Use the following instructions if existing Geist™ rPDUs are connected in a daisy-chain.

1. Designate an array manager and disconnect it from the management network.
2. Reset all the array devices to factory default settings. The physical ETHERNET connections in the daisy-chain can remain the same; however, if previously connected in a looped configuration, the final Geist™ rPDU in the chain should be disconnected from the network switch.
3. Enable Aggregation on the array manager.
4. Connect the array manager to the management network using Port 1.
5. Connect the array manager to the array network using Port 2.

Multiple Array Managers

For installations with multiple array managers, keep in mind that each device network must operate as a stand-alone, isolated network. Consider a 200 rPDU example, represented in the [Sample Network Configuration](#) below. This installation would require a minimum of four array managers, each operating its own stand-alone the device network. Each array manager is visible on the management network and acts as a DHCP server for its array devices. A user on the management network can navigate through each array manager to reach the interface of an array device. Other considerations may affect the quantity of array managers. If you have a row network architecture, you may prefer one array manager at the start of each row, as opposed to an array manager that traverses several rows. Depending on how these 200 cabinets are divided into rows, you may have more than four array managers. When the configuration is decided, follow the appropriate process for aggregation.

Figure 4.3 Sample Network Configuration



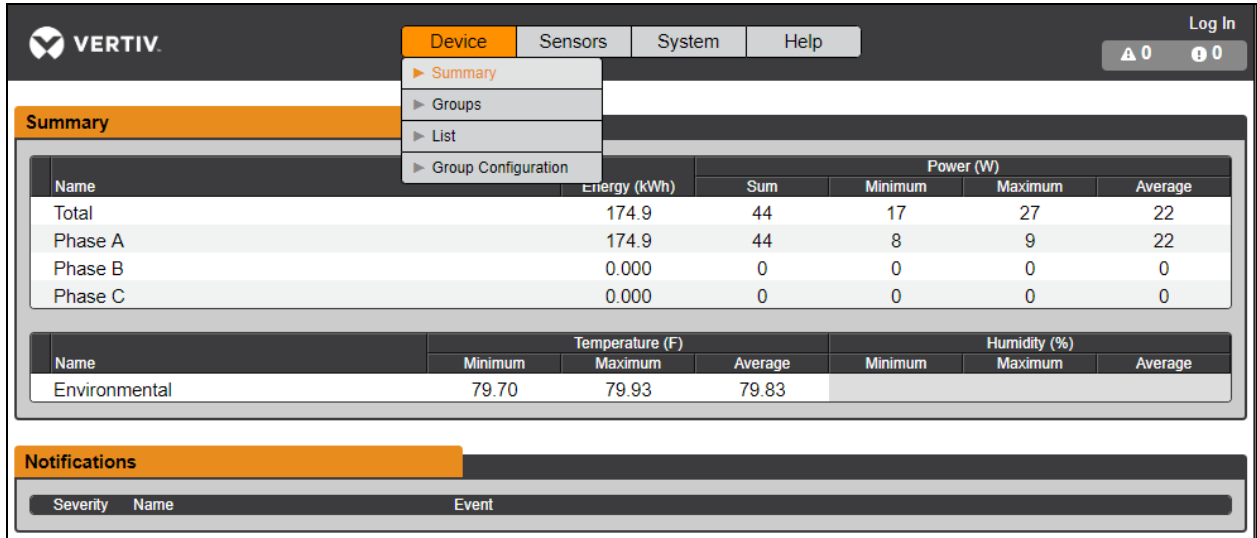
NOTE: A device network Ethernet switch will only be required when connecting more than one single network port device to the end of a rPDU daisy chain or when not using daisy chained connections.

4.4 Views

When communication is established between the array manager and array devices, several views are automatically populated in the user interface. The new views under the Device Tab in the top navigation bar are:

- Summary
- Groups
- List
- Group Configuration

Figure 4.4 Device Tab



4.4.1 Summary

The Summary view aggregates data from all array devices, presenting a concise outline of relevant power, environmental and alarm details.

Rack PDUs

The Vertiv™ Geist™ rPDU network is summarized by the following data points:

- **Energy:** The total Geist™ rPDU energy within the device network.
- **Power Sum:** The total Geist™ rPDU power load within the device network.
- **Power Minimum:** The lowest group Geist™ rPDU power load within the device network.
- **Power Maximum:** The highest group Geist™ rPDU power load within the device network.
- **Power Average:** The average group Geist™ rPDU power load within the device network.

NOTE: These readings are repeated per phase (shown when only 3-phase Geist™ rPDUs present).

UPS

The UPS network is summarized by the following data points:

- **Power Maximum:** The highest group UPS power load within the device network.
- **Power Average:** The average group UPS power load within the device network.
- **Battery Autonomy Minimum:** The lowest UPS battery run time within the device network.
- **Battery Autonomy Average:** The average UPS battery run time within the device network.
- **Battery Charge Minimum:** The lowest UPS battery charge within the device network.
- **Battery Charge Average:** The average UPS battery charge within the device network.

Environmental (Sensors)

The Environmental category is summarized by the following data points:

NOTE: Humidity values will be blank when temperature-only sensors are used.

- **Temperature Minimum:** The lowest temperature within the device network.
- **Temperature Maximum:** The highest temperature within the device network.
- **Temperature Average:** The average temperature within the device network.
- **Humidity Minimum:** The lowest humidity within the device network.
- **Humidity Maximum:** The highest humidity within the device network.
- **Humidity Average:** The average humidity within the device network.

Thermal Cooling

- **Fan Speed (%) Minimum:** The lowest thermal device fan speed within the device network.
- **Fan Speed (%) Maximum:** The highest thermal device fan speed within the device network.
- **Fan Speed (%) Average:** The average thermal device fan speed within the device network.
- **Temperature Minimum:** The lowest thermal device temperature within the device network.
- **Temperature Maximum:** The highest thermal device temperature within the device network.
- **Temperature Average:** The average thermal device temperature within the device network.
- **Capacity (%) Minimum:** The lowest thermal device capacity within the device network.
- **Capacity (%) Maximum:** The highest thermal device capacity within the device network.
- **Capacity (%) Average:** The average thermal device capacity within the device network.

Notifications

Notifications shows outstanding alarms from devices in the device network.

4.4.2 Groups

After the groups are established within the Group Configuration, the Groups view summarizes power and environmental data. The available data points are:

Group rPDU

- **Energy:** The total Geist™ rPDU energy within the group.
- **Power Sum:** The total Geist™ rPDU power load within the group.
- **Power Minimum:** The lowest Geist™ rPDU power load within the group.
- **Power Maximum:** The highest Geist™ rPDU power load within the group.
- **Power Average:** The average Geist™ rPDU power load within the group.

NOTE: These readings are repeated per phase (shown when only 3-phase rPDUs present).


Group rPDU Outlet

- **Energy:** The total Geist™ rPDU Outlet energy within the group.
- **Power Sum:** The total Geist™ rPDU Outlet power load within the group.
- **Power Minimum:** The lowest Geist™ rPDU Outlet power load within the group.
- **Power Maximum:** The highest Geist™ rPDU Outlet power load within the group.
- **Power Average:** The average Geist™ rPDU Outlet power load within the group.

These readings repeat for each group of Vertiv™ Geist™ rPDU outlets present in the group when at least one monitored outlet is present. If a combination of outlet monitored and non-outlet monitored rack PDUs are present in the group, the readings will be the total of the outlet monitored rack PDUs only.

These readings repeated for each phase (shown when only 3-phase PDUs present)

Note: The energy readings reflect the sum of outlet energy readings and resetting each outlet energy reading will also reset the total energy for the outlet group.

The Operations  icon is shown for each group that includes at least one rack PDU outlet with switching capability.

To change outlet group operation:

1. Click the *Operation icon*.
2. Select the operation to perform (applies to only switching capable Rack PDU outlets assigned to the group):
 - On/Off - turns all outlets On or Off.
 - Reboot - for outlets currently On, reboot cycles the outlets Off, then back On after the reboot hold delay.

For outlets currently Off, reboot turns the outlets On.

- Cancel - cancels the current operation if it has not been completed.
3. For operations involving the state of the outlets, setting Delay to True uses the current Delay configuration for each outlet.
 4. Select *Submit* to issue the action.

Group UPS

- **Power Maximum:** The highest UPS power load within the group.
- **Power Average:** The average UPS power load within the group.
- **Battery Autonomy Minimum:** The lowest UPS battery run time within the group.
- **Battery Autonomy Average:** The average UPS battery run time within the group.
- **Battery Charge Minimum:** The lowest UPS battery charge within the group.
- **Battery Charge Average:** The average UPS battery charge for the group.

Group Environmental

- **Temperature Minimum:** The lowest temperature within the group.
- **Temperature Maximum:** The highest temperature within the group.
- **Temperature Average:** The average temperature within the group.
- **Humidity Minimum:** The lowest humidity within the group.
- **Humidity Maximum:** The highest humidity within the group.
- **Humidity Average:** The average humidity within the group.

Group Thermal Cooling

- **Fan Speed (%) Minimum:** The lowest thermal device fan speed within the group.
- **Fan Speed (%) Maximum:** The highest thermal device fan speed within the group.
- **Fan Speed (%) Average:** The average thermal device fan speed within the group.
- **Temperature Minimum:** The lowest thermal device temperature within the group.
- **Temperature Maximum:** The highest thermal device temperature within the group.
- **Temperature Average:** The average thermal device temperature within the group.
- **Capacity (%) Minimum:** The lowest thermal device capacity within the group.
- **Capacity (%) Maximum:** The highest thermal device capacity within the group.
- **Capacity (%) Average:** The average thermal device capacity within the group.

4.4.3 List

The List view presents an inventory of all devices within the array manager's Device network.

The inventory is subdivided into the following categories:

Rack PDUs

All Vertiv™ Geist™ rPDUs in the device network roll into this category and present the following data points:

- **State:** The status of the Geist™ rPDU. Status is either normal or unavailable (loss of connectivity).
- **Name:** Geist™ rPDU label. Clicking on the name opens a browser tab for device access.
- **Group:** The group name. If there is no user created group, the group name is Unassigned.
- **Energy:** Geist™ rPDU energy.
- **Power:** Total Geist™ rPDU power load.

UPS

All UPS devices in the device network roll into this category and present the following data points:

- **State:** The status of the UPS. Status is either normal or unavailable (loss of connectivity).
- **Name:** UPS label. Clicking on the name opens a browser tab for device access.
- **Group:** The group name. If there is no user-created group, the group name is Unassigned.
- **Input Voltage:** UPS input voltage.
- **Output Source:** The UPS operating mode, which can be: Normal, Bypass, Battery, Booster, Reducer, Off or Other.
- **Status:** The battery status, which can be: Normal, Low, Depleted or Unknown
- **Battery Autonomy:** UPS battery run time.

- **Charge:** UPS battery charge.

ENV (Environmental Sensors)

All Environmental Sensors in the device network roll into this category and present the following data points:

- **State:** The status of the Sensor. Status is either normal or unavailable (loss of connectivity).
- **Name:** Sensor label. Clicking on the name opens a browser tab for device access.
- **Group:** The group name. If there is no user-created group, the group name is Unassigned.
- **Device:** Displays the sensor parent Vertiv™ Geist™ rPDU label and MAC address.
- **Temperature:** Temperature reading (main temperature only with GT3HD sensors).
- **Humidity:** Humidity reading. This field is blank if only SRT temperature sensors are deployed.

Environmental sensors, report their values through the MIB of the Geist™ rPDUs to which they are connected. They are not stand-alone sensors with their own IP addresses. In this release, the only valid sensors are Geist™ rPDU-connected Geist™ SRT, GTHD or GTHD3 sensors.

NOTE: The name of any device can be customized by logging into the device and editing through the Configuration icon.

NOTE: To delete a device which has been removed from the network, select the *Trash* icon next to the device. Selecting *Delete* deletes the device and any Environmental Sensors connected to it.

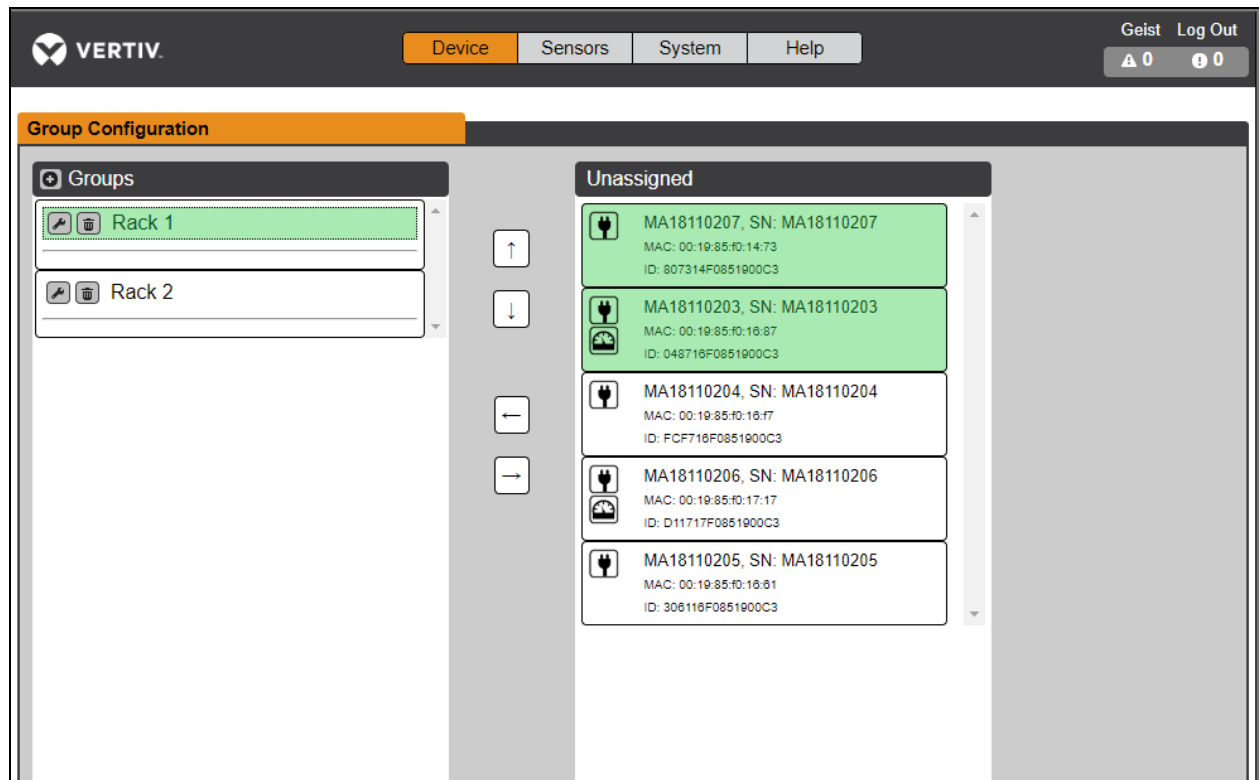
Thermal Cooling

- **State:** The status of the cooling. Status is either Normal or Unavailable (loss of connectivity).
- **Name:** Thermal cooling device label. Clicking on the name opens a browser tab for device access.
- **Group:** The group name. If there is no user created group, the group is Unassigned.
- **Host:** MAC address
- **Fan Speed (%):** Thermal device fan speed.
- **Temperature:** Thermal device temperature.
- **Capacity (%):** Thermal device capacity.

4.4.4 Group configuration

On the Group Configuration page, you can define groups of devices for data aggregation and analytic purposes. A group often refers to a unit of measure within a computing environment that includes multiple array devices, such as a rack with two Geist™ rPDUs, UPS devices and environmental sensors or a row that includes multiple racks.

Figure 4.5 Group Configuration



The Group Configuration page lists the automatically discovered devices under the *Unassigned* column showing:

- One or more icons defining the type of device such as, Vertiv™ Geist™ rPDU, Environmental Sensor, UPS or Geist™ rPDU Outlet.
- Device label
- Serial number
- MAC address
- ID

Configured groups of devices (typically representing racks) are shown on the left.

To create a new group:

1. Click the *plus sign (+)* to the left of Groups, to add a new group, under Groups.
2. Click the *Configuration* icon to change the name of the group label.
3. Edit the label, if desired, and click *Save*.
4. To assign devices to the group, highlight the desired group (within Groups category) and highlight the desired devices within the Unassigned category.

NOTE: You must click on the down arrow below the PDU to see the list of its outlets.

5. Click the *Right Arrow* to assign the devices to the group.
6. Repeat the process for other groups, as needed.

NOTE: Groups can be reordered by clicking the up or down arrows.

To remove devices from a group:

Highlight the devices and click the *Right Arrow*.

To delete a group:

Click the *Trash* icon next to the group name.

NOTE: Deleting a group returns all of its devices to the Unassigned group.

4.5 Interfaces

Array devices are combined to form groups; each device retains its own stand alone user interface and SNMP data.

To access the Array Device User Interface:

1. From the List View, use your mouse to hover over the entries in the table. A yellow highlight and text box appear as you pause on the devices. The text box reveals the IP address of the device.
 2. Navigate to an IP address to access the web server interface of the device.
- or-
3. Click the name of the device to access the hyperlink to the web server.

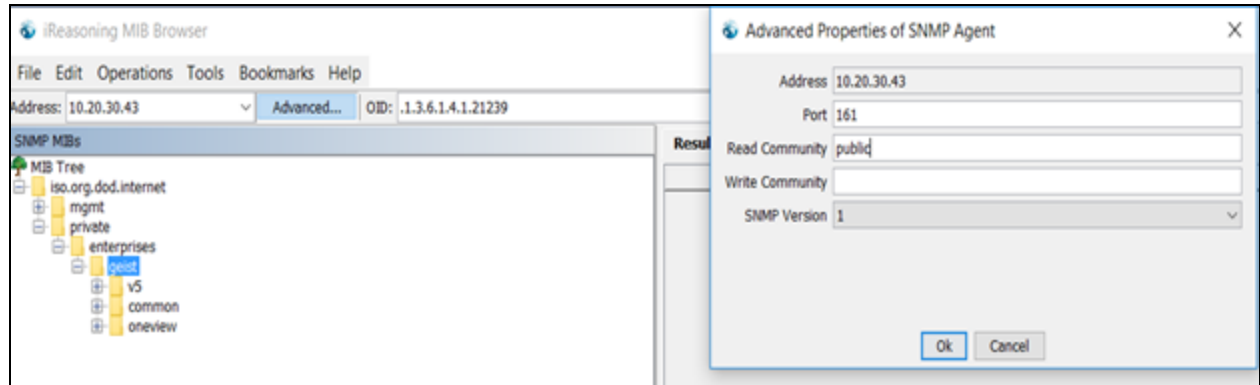
To access Array Device SNMP Data:

SNMP Data is available using port-mapped access through the array manager device IP address using the Geist™_v5 MIB. The MIB file is downloadable from the array manager SNMP page.

1. From the List view, use your mouse to hover over the entries in the table. As you pause over a device, a yellow highlight and text box appear with the the SNMP port of the device.
2. In the MIB browser, enter the SNMP port listed.

NOTE: Software to monitor individual array devices must be capable of accepting a unique SNMP port number per monitored device.

Figure 4.6 MIB Browser



4.5.1 Group SNMP data

Aggregated data, both summary (such as total kWh and maximum kW) and group data, is available through the master Vertiv™ Geist™ rPDU IP address and default SNMP Port 161. Within the MIB structure, the folders differentiate the data points available from the Master Geist™ rPDU:

- **v5:** Contains data points for the individual Master Geist™ rPDU.
- **Oneview:** Contains data points for aggregated data across all array devices.

4.5.2 Tips and troubleshooting

- It is recommended that all devices are updated to the latest firmware version before configuring aggregation.
- Ensure that the rack PDU nominated as the array manager is fully configured and aggregation is enabled before connecting any array devices.
- Ensure all array devices are in a factory default state before connecting them to the array manager. If settings have previously been changed or if any users have been defined on a device, the device must be reset to factory defaults before the device is connected to the array manager.
- If resetting a rack PDU to the factory default settings, ensure you use the *Utilities-Restore defaults-All Settings* function. Using the IMD center button or pinhole reset switch under network port 2 to reset settings does not reset all settings and may cause array devices to not be identified correctly.
- After resetting a rack PDU to factory default settings and before connecting it as an array device, disconnect the rack PDU from the network and restart it using the button beneath network port 1. This ensures any DHCP address allocated during the reset to factory defaults procedure is released.
- It can take up to 20 minutes for array device devices to be recognized after initial setup.
- Summary and group aggregated data cannot be alarmed upon.
- The Provisioner Tool (*Provisioner-Discovery and Provisioner-File Management*) can be used to easily update array manager and array device rack PDU firmware.
- Summary and Group aggregated data cannot be used to generate SNMP traps.
- SNMP community names are configured on each device. Follow the device links displayed on the List page under the Devices menu and logging into each device to configure SNMP.
- Do not change the default SNMP port number when logged into an array device.
- SNMP traps and alarms are routed from a device to the management network through the master device.

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Appendices

Appendix A: Technical Support

A.1 Resetting an Vertiv™ Geist™ rPDU

If a Geist™ rPDU loses communication, the processor may be manually rebooted without affecting power to the outlets. Pressing the reboot button on the face of the IMD will reboot the processor. The web interface will remain offline during boot-up. For more information, see [Interchangeable Monitoring Device](#) on page 21

A.2 Service and Maintenance

No service or maintenance is required. Opening the Geist™ rPDU may void the warranty. There are no user-serviceable parts inside the Geist™ rPDU other than the field-replaceable Interchangeable Monitoring Device (IMD). Geist™ recommends removing power from the unit before installing or removing any equipment.

The IMD is designed to be field-replaceable by properly trained and qualified service personnel only. The IMD is designed to be replaced while the Geist™ rPDU is still connected to utility power. Refer the Geist™ rPDU IMD Modules Replacement Guide for more information.

A.3 More Technical Support

Technical support can be found at www.Vertiv.com/support.

Americas

- **Website:** www.Vertiv.com/geist
- **Email:** geistsupport@vertiv.com
- **Telephone:** 1-888-630-4445

Europe and Middle East

- **Technical Support:** www.Vertiv.com/en-emea/support
- **Email:** eoc@Vertiv.com
- **Telephone:** 44 1823 275100

Asia

- **Telephone (English):** 1-888-630-4445 (US number)
- **Telephone (Chinese):** +86 755 23546462

A.4 Using Microsoft Exchange as an SMTP Server

If your facility uses a Microsoft Exchange email server, it can be used by the IMD Geist™ rPDU to send Alarm and Warning notification emails. However, the Exchange server may need to be configured to allow SMTP connections from the unit first, as later versions of Exchange server often have SMTP services or basic authentication disabled by default. If you encounter difficulties in getting your IMD Geist™ rPDU to send emails through your Exchange server, the following notes may help.

NOTE: These suggestions apply only if you are using your own, physical Exchange server. Microsoft's hosted Office 365 service is not compatible with the IMD Vertiv™ Geist™ rPDU using firmware versions prior to v3.0.0, as Office 365 requires a StartTLS connection. Firmware versions 3.0.0 and beyond have support for StartTLS and are compatible with Office 365.

First, since the IMD Geist™ rPDU cannot use IMAP or Microsoft's proprietary MAPI/RPC Exchange/Outlook protocols to send messages, you must enable SMTP by setting up an SMTP Send Connector in the Exchange server. More information on setting up an SMTP Send Connector in Exchange can be found at this Microsoft TechNet article:

<http://technet.microsoft.com/en-us/library/aa997285.aspx>

Second, you may need to configure your Exchange server to allow messages to be relayed from the monitoring unit. Typically, this will involve turning on the *Reroute incoming SMTP mail* option in the Exchange server's Routing properties, then adding the IMD Geist™ rPDU's IP address as a domain that is permitted to relay mail through the Exchange server. More information about enabling and configuring SMTP relaying in Exchange can be found at this Microsoft TechNet article:

<http://technet.microsoft.com/en-us/library/dd277329.aspx>

The SMTP AUTH PLAIN and AUTH LOGIN authentication methods for logging in to the server are often no longer enabled by default in Exchange Server; only Microsoft's proprietary NTLM authentication method is enabled.

To re-enable the AUTH LOGIN method:

1. In the Exchange console, select *Server Configuration - Hub Transport*.
2. Right-click the *Client Server* and select *Properties*.
3. Select the *Authentication* Tab and click the *Basic Authentication* checkbox.
4. Deselect the *Offer Basic only after TLS* checkbox.
5. *Apply* or *Save* and click *Exit*.

NOTE: You may need to restart the Exchange service after making these changes.

Finally, once you have enabled SMTP, relaying and the AUTH LOGIN Basic Authentication method, you may also need to create a user account specifically for the IMD Geist™ rPDU to log into. If you created an account prior to enabling the SMTP Send Connector or if you are trying to use an account created for another user and the IMD Geist™ rPDU still cannot connect to the Exchange server, the account probably did not properly inherit the new permissions when you enabled them as above. This tends to happen more often on Exchange servers that have been upgraded since the account(s) you are trying to use were created, but can sometimes happen with accounts when new connectors and plug-ins are added, regardless of the Exchange version. Delete the user account, then create a new one for the monitoring unit to use and the new account should inherit the SMTP authentication and mail-relaying permissions correctly.

If none of the above suggestions succeed in getting your IMD Geist™ rPDU to send mail through your Exchange server, then you may need to contact Microsoft's technical support for assistance in configuring your Exchange server to allow SMTP emails to be sent from a third-party, non-Windows device through your network.

Appendix B: Visible Light Communication (VLC)

The VLC feature on Upgradeable Vertiv™ Geist™ PDUs allows the user to unobtrusively upload product information into a database management system via the embedded LED display. This product feature provides new opportunities to monitor and enable larger amounts of Geist™ rPDU power data to be obtained via the unit's display and all without physically connecting to the Geist™ rPDU.

Using a smart device, such as a smart phone or tablet with the Vertiv™ Mobile application installed, it is possible to capture data from the LED display when running in VLC mode, which can be enabled/disabled with the display buttons on the device or using the GUI on monitored units.

By default, the Upgradeable LED display will provide the current (Amps) per input and circuit breaker. By enabling the VLC feature, the LED display will scroll through a set of alphanumeric characters. Utilizing the Vertiv Mobile app, the user can scan the LED display and retrieve additional power metrics including Volts, Amps, Watts, Volt-Amps and Kilowatt Hours. Before VLC, the power data was available only on network-connected PDUs by viewing the GUI or using external software to collect and display the data. The VLC feature provides this data on local metered-only devices, as well as on monitored units without the need to connect them to the network.



WARNING! This feature, when enabled, causes the unit to emit flashing lights, text or number sets at frequencies that can induce adverse reactions. Persons susceptible to adverse reactions as a result of such emissions or persons who have been diagnosed with epilepsy should not utilize or enable this feature.

To enable VLC:

Press the center button 3 times in less than 2 seconds.

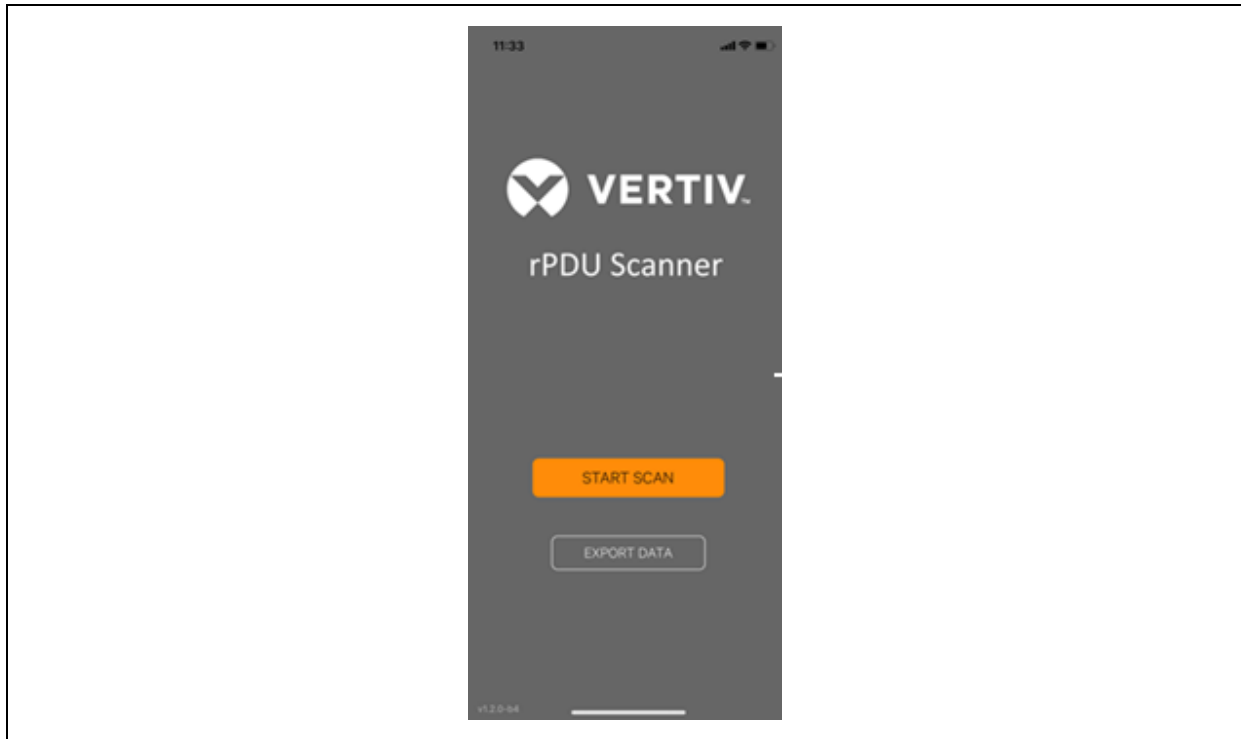
NOTE: With the release of firmware Version 3.3.0, Vertiv™ has added support for the VLC feature to all standard Metered and Monitored Upgradeable products, as well as a significant majority of its engineered-to-order range. Certain custom models of Upgradeable PDUs may not have VLC support within the Vertiv™ Mobile app. If your custom product is not supported by the Vertiv™ Mobile app it will be noted in the product specification sheet. Contact your sales representative if you would like assistance with this. The latest firmware updates can be found at [Vertiv.com/Firmware-Support](https://www.vertiv.com/Firmware-Support). Vertiv™ Mobile app is available in the App Store for iOS devices.

Appendix C: Vertiv™ Mobile App

The Home screen allows the user to initiate a device scan or export data to a CSV file.

- **Scan:** Turns on scan mode to allow the app to capture VLC data from the Upgradeable Vertiv™ Geist™ rPDU.
- **Export:** Pressing the *Export* button will launch the smart device's email app and attach the *Database.csv* file to be emailed to desired recipients.

Figure C.1 Vertiv™ Mobile App Home Screen



To scan a Geist™ rPDU

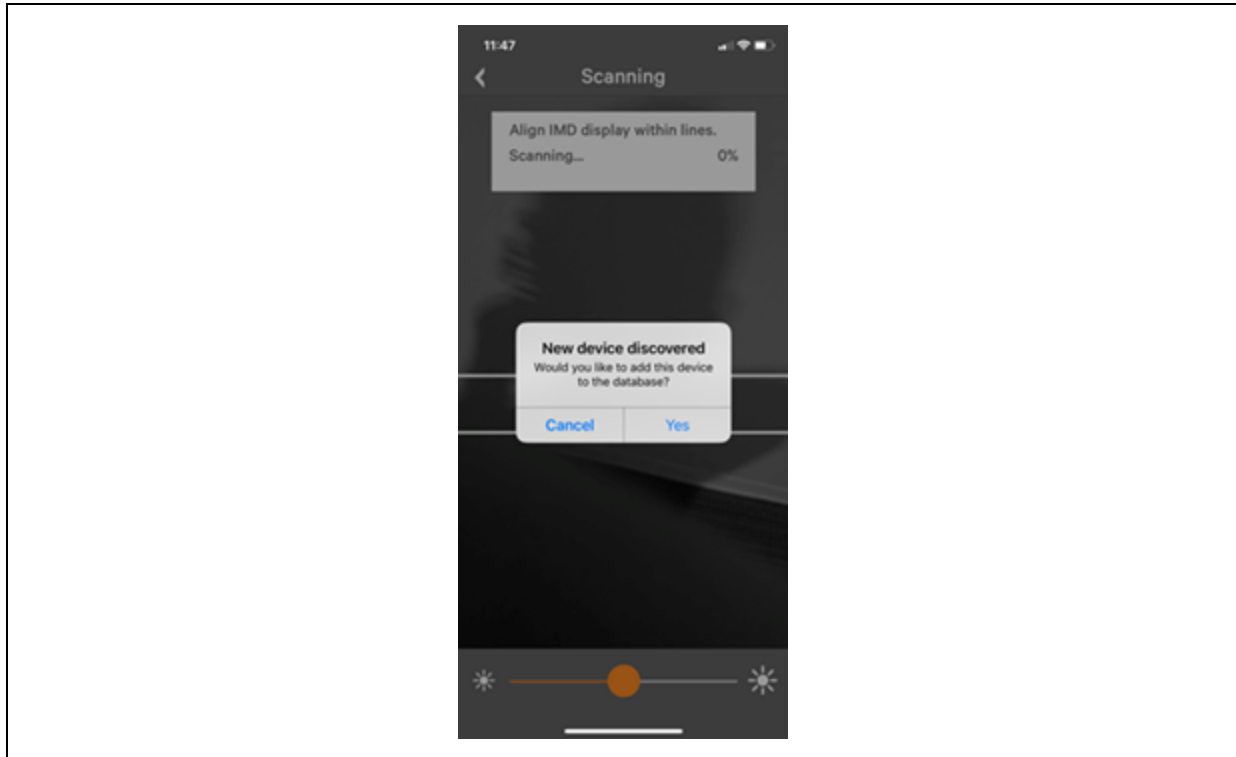
1. Press *Scan* on the Home screen to load the Vertiv Mobile App scanning engine.

Figure C.2 Vertiv™ Mobile App Scanning Screen

2. Position the smart device so that the characters on the LED display are between the lines on the screen. The LED characters should be clear and in focus. If the characters appear too bright or too dark, the exposure setting can be adjusted with the sliding bar at the bottom of the screen. The app captures data as soon as it can see the LED characters inside the horizontal lines. Scan progress is displayed as a percentage. If the scan percentage is increasing slowly or resetting, the device has trouble in reading the data properly. In this case, try repositioning the device to improve results. After the scan reaches 100%, the app loads the Readings page.

NOTE: When a device is scanned for the first time, the Vertiv™ Mobile app recognizes the serial number as being new and asks if it should be added to the database as shown in the following image. If the device is added to the database, all future scanned data is added to the device serial number record.

Figure C.3 Vertiv™ Mobile App New Device Screen



C.1 Scanning Tips

The VLC feature relies on the light for its communication. If the lighting around the display or the lighting going through the lens of the smart device is not optimal, then the OCR (Optical Character Recognition) will struggle to capture the data. When looking at the smart device screen during capture, you can see if the characters of the LED display are in focus and bright. If they are blurred, with a surrounding glow or are faint, then the VLC capture will fail to work quickly and may be unable to scan at all.

Proper capture methods

- High contrast between LED display and background
- No glow around LED display characters
- LED display characters between horizontal guidelines

Improper capture methods

- Blurry image
- Overexposed image
- Glow around LED display characters
- LED display characters not between horizontal guidelines

C.2 Failure Modes and Errors

The Vertiv™ Mobile App retries a scan 2 times if the scan cannot be completed. The scan fails, if the smart device is unable to correctly capture all the VLC data correctly. One of the following messages is displayed:

- **Scan failed:** Incorrect set of configuration.

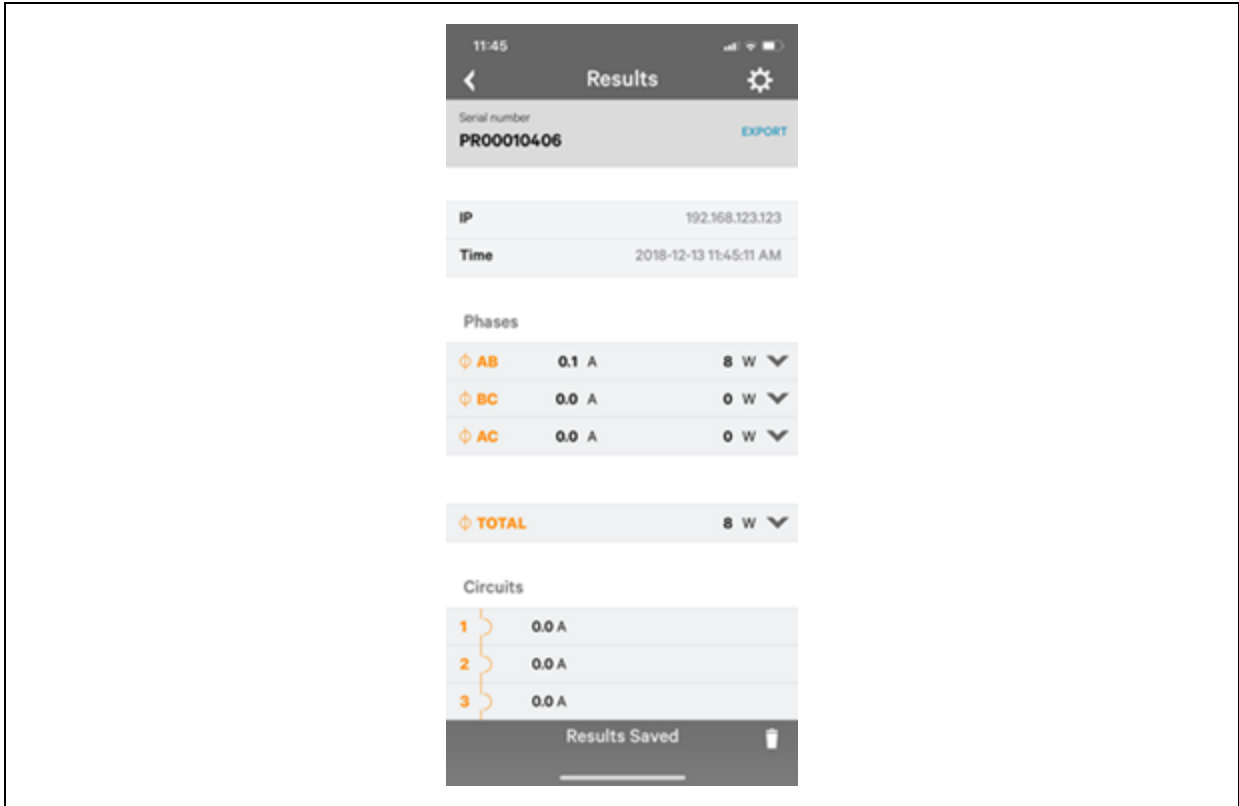
- **Scan failed:** Incorrect data sequence.
- **Scan failed:** Adjust your position or the exposure and try again.

Press *Cancel* to return to the Home screen or *Retry* to return to the Scan page.

C.3 Readings

The Readings screen displays scan results for each Vertiv™ Geist™ rPDU scanned using VLC.

Figure C.4 Vertiv™ Mobile App Readings Screen

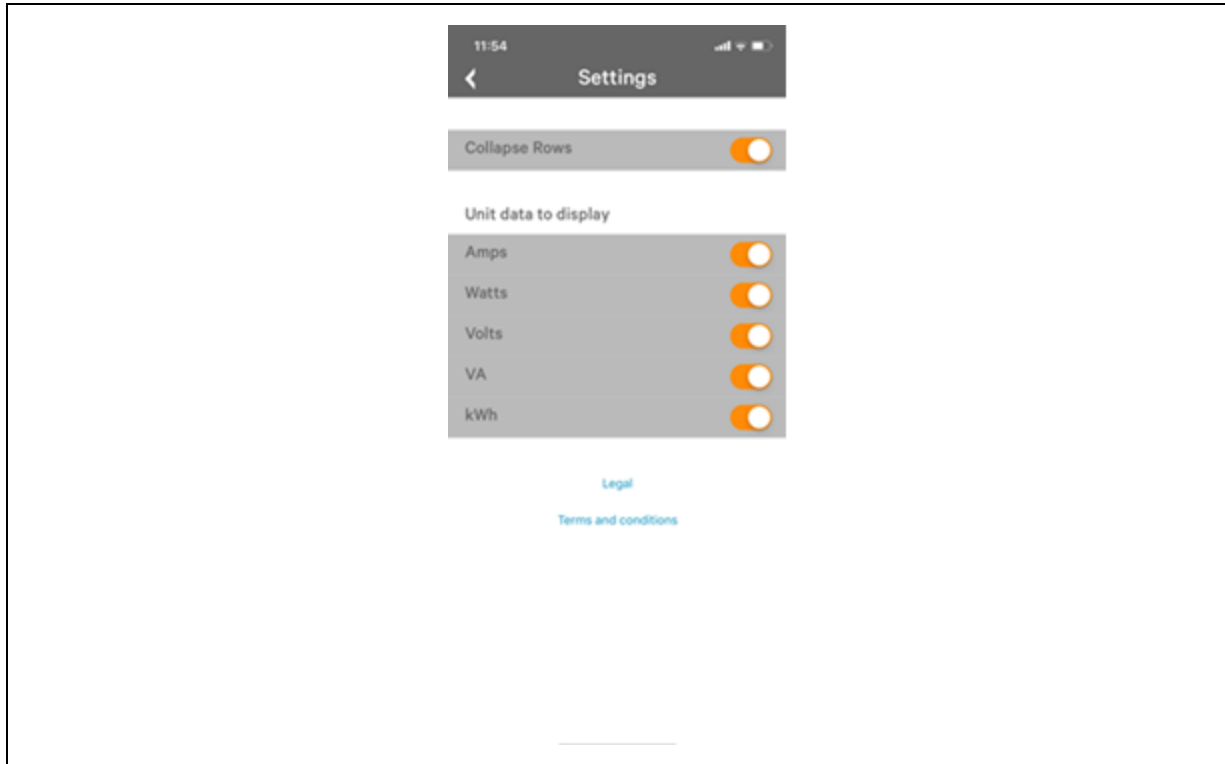


NOTE: The unit serial number is displayed in the title bar of the Readings screen. This serial number matches the serial number displayed on the surface of the Geist™ rPDU.

Pressing the *Settings* icon enables the user to customized the data that is displayed in the scan results.

- **Collapse Rows:** Allows user to collapse or expand the Readings screen to help properly display data on smart devices with smaller screens.
- **Unit Data to Display:** Selects which data is shown on the Readings screen. All data is stored within the database regardless of settings here. These settings are global and will apply to any scanned unit.

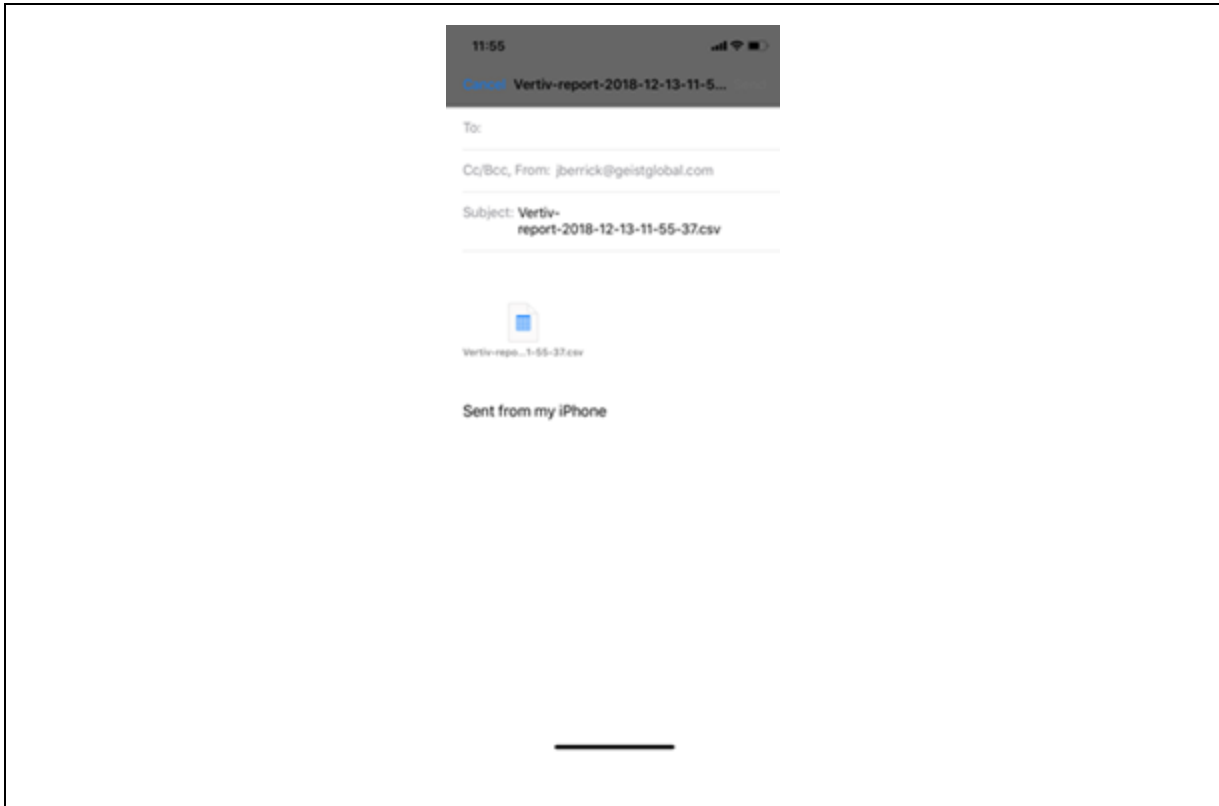
Figure C.5 Vertiv™ Mobile App Settings Screen



C.4 Export

The Export button on the Home screen opens the smart device's default email app to send the database of scanned devices in .csv format to the desired recipients.

Figure C.6 Vertiv™ Mobile App Export Screen



NOTE: An email app must be properly configured on the smart device to utilize the Export function. The Vertiv™ Mobile App does not directly support email functionality. Vertiv cannot troubleshoot email errors as this could be an issue with either the device or with the email service being used.

Each Vertiv™ Geist™ rPDU you scan adds a new entry to the database. There is no limit to the number of individual Geist™ rPDU that can be added, but the database has a limit of 10 scans per Geist™ rPDU. Additional scans of the unit will overwrite the oldest data for that unit.

The .csv data output organizes data first by serial number and then by date and time. You can further organize the data by using the filter option in Microsoft Excel. The data structure is split into two sections: Geist™ rPDU Configuration and power data.

The Geist™ rPDU Configuration Data includes:

- Serial Number
- Frame Definition
- Date/Time stamp
- IPv4 address

The Power Data includes:

- Power Readings
- Totals

Table C.1 Geist™ rPDU Configuration Data

Serial number	FrameDef	yyyy-mm-dd-hh-mm-ss	IP add
Product's unique serial number. This is the same serial number present on the units label.	Part of the VLC configuration data and used for debugging.	Time stamp of when the scan occurred.	The IPv4 address of the unit. Locally Metered units will show Null IP address.

Table C.2 Power Data

Volts	Amps	Watts	VA	kWh
1 Volt	1 Amp	1 Watt	1 VA	1 kWh
Input Phase for Single Phase units. Phase A or Phase AB if 3-Phase	Phase Amperes	Phase Real Power	Phase Apparent Power	Phase Kilowatt-Hours
2 Volts	2 Amps	2 Watts	2VA	2 kWh
Phase B or Phase BC if 3-Phase	Phase Amperes	Phase Real Power	Phase Apparent Power	Phase Kilowatt-Hours
3 Volts	3 Amps	3 watts	3 va	3 Kwh
Phase C or Phase AC if 3-Phase	Phase Amperes	Phase Real Power	Phase Apparent Power	Phase Kilowatt-Hours
4 Volts	4 Amps	4 Watts	4 VA	4 kWh
Secondary Input Phase for Single Phase units. Phase A or Phase AB if 3-Phase	Phase Amperes	Phase Real Power	Phase Apparent Power	Phase Kilowatt-Hours
5 Volts	5 Amps	5 Watts	5 VA	5 kWh
Secondary Phase B or Phase BC if 3-Phase	Phase Amperes	Phase Real Power	Phase Apparent Power	Phase Kilowatt-Hours
6 Volts	6 Amps	6 Watts	6 VA	6 kWh
Secondary Phase C or Phase AC if 3-Phase	Phase Amperes	Phase Real Power	Phase Apparent Power	Phase Kilowatt-Hours

NOTE: Some Geist™ GU models have dual inputs with monitoring or dual Inline Monitoring: these units can have up to three additional power readings.

Table C.3 Breakers/Circuits

Breaker 1	breaker 2	breaker 3	breaker 4	breaker 5	breaker 6
Breaker/Circuit 1 Amps	Breaker / Circuit 2 Amps	Breaker / Circuit 3 Amps	Breaker / Circuit 4 Amps	Breaker / Circuit 5 Amps	Breaker / Circuit 6 Amps

Table C.4 Totals

Total Watts (Real Power)	Total VA (Apparent Power)	Total kWh
The total of Watts shown in sections 1-6	The total of VA shown in sections 1-6	The total kWh shown in sections 1-6

NOTE: The tables above are an outline of data that is present in the database CSV file as is not representative of the actual format of the CSV file. Data stored will vary based on product configuration.

Appendix D: Available Sensors

D.1 Remote Sensors

- **SRT:** Stainless Remote Temperature.
- **GTHD:** Temperature/Humidity/Dew Point.
- **GT3HD:** Temperature/Humidity/Dew Point with two SRT sensors.
- **RTAFHD3:** Temperature/Air Flow/Humidity/Dew Point.
- **A2D:** Converts Analog I/O Sensors to Remote Digital Sensors.

D.2 Analog I/O Sensors

- **FS-15:** Flood (Water) Sensor.
- **PFS-100 US / PFS-100 UN:** Power Failure Sensor.
- **RPDS:** Door Switch Kit.

D.3 Liebert® Integrated and Modular Sensors

NOTE: An adapter is required to use any of the following sensors.

- **SN-T:** One Temperature Probe.
- **SN-TH:** One Temperature Probe and one Humidity Probe.
- **SN-Z01:** Integrated Cable with one Temperature Probe.
- **SN-Z02:** Integrated Cable with three Temperature Probes.
- **SN-Z03:** Integrated Cable with four Probes (three Temperature and one Humidity).
- **SN-2D:** Two-Door Switch Monitor Sensor.

D.4 Connecting Remote Sensors

Up to 16 plug-and-play remote sensors can be attached to the unit at any time via the RJ-12 connectors on the front of the unit. In some cases, splitters may be required to add additional sensors. Each sensor has a unique serial number and is automatically discovered and added to the web page. The sensors' serial number determines their display order on the web. Sensor names can be customized on the Sensors Overview page.

NOTE: Sensors use Cat 5, CMP wire and RJ-12 connectors. Wiring must be straight-through. Reverse polarity temporarily disables all of the sensors until corrected. Sensors use a serial communication protocol and are subject to network signaling constraints dependent on shielding, environmental noise and length of wire. Typical installations allow runs of up to 600 ft. (180m) of sensor wire

Appendix E: TP-Link Wireless USB adapters

- Archer T2U Nano (AC600 Nano Wireless USB Adapter)
- Archer T2U Plus (AC600 High Gain Wireless Dual Band USB Adapter)
- Archer T2U v3 (AC600 Wireless Dual Band USB Adapter)
- Archer T3U (AC1300 Mini Wireless MU-MIMO USB Adapter)
- Archer T3U Plus (AC1300 High Gain Wireless Dual Band USB Adapter)
- Archer T4U v3 (AC1300 Wireless Dual Band USB Adapter)

NOTE: These devices are auto detected when connected and can be configured as an additional network interface.

Appendix F: Outlet LEDs

NOTE: This appendix applies to Outlet Monitored / Outlet Switched Vertiv™ Geist™ rPDUs only.

Outlet LEDs provide a visual indication of outlet power status (On, Off or Error). The LEDs are sequentially numbered with easy-to-read white numbers on a black background. Depending on outlet power status, the LEDs illuminate in solid colors or blinking colors.

Table E.1 LED Outlets

LED	Description
Green	Outlet voltage is present and above minimum threshold limit
Red	Outlet voltage is not present
Amber	Power output error condition has been detected

Table E.2 LED Status Description

Measured voltage	Relay state	State	LED	
On	On or Unknown	Solid	Green	
Off	Off or Unknown	Solid	Red	
Off	On	Blinking ¹	Amber	Red
On	Off	Blinking ²	Amber	Green

¹ Outlet is sensed to be Off but should be On.

² Outlet is sensed to be On but should be Off.

Error Code

LEDs illuminate in Solid Amber during the following:

- Power failure (all relays are forced open in the event of power failure to allow for power-on sequencing)
- Circuit breaker open
- No input voltage detected

Appendix G: IMD Display Codes

Table F.1 IMD Display Codes

Display	IMD Type	Explanation
<i>Err1</i>	IMD-01 (Metered only)	The IMD discovered either none or more than one input board. This may be caused by internal cabling issues or an unresponsive input board. This is also displayed if there is a measurement error reported by the input board.
<i>8888</i>	IMD-02, IMD-03, IMD-3	IMD is booting and has yet to discover the simple display and shows <i>boot</i> on it. If this is displayed for more than a few seconds there is a problem the display board or with internal cabling.
"--" (Two dashes on the right-most display position)	IMD-02, IMD-03, IMD-3	The IMD cannot communicate with the input board. This may also be shown intermittently for individual measurements. There is a problem with the input board or with internal cabling.
<i>boot</i>	IMD-01	IMD is booting and discovering the input board.
<i>boot</i>	IMD-02, IMD-03, IMD-3	Firmware is initializing. This will be displayed while firmware is being updated in internal boards.
<i>updt</i>	IMD-02, IMD-03, IMD-3	Firmware update in progress.
<i>rset dflt</i>	IMD-02, IMD-03, IMD-3	Following user action, <i>rset</i> (Reset) will appear during a parameter reset sequence. During a parameter reset, <i>dflt</i> (Default) will appear briefly.
<i>bcup</i>	IMD-02, IMD-03, IMD-3	<i>bcup</i> (Backup) will appear during a configuration backup.
<i>rest conf</i>	IMD-02, IMD-03, IMD-3	<i>rest</i> (Restore) and <i>Conf</i> (Configuration) will appear during a configuration restore .
"____" (Four underscores on the bottom of the display)	IMD-03 IMD-3	The IMD display has been configured such that Total Power, Voltage and Current has been disabled.

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Appendix H: Provisioner - Format of the configuration settings file

NOTE: The following describes the format of the configuration settings file used by the Provisioner. The examples broadly follow the settings available in the Vertiv™ Geist™ rPDU web user interface.

1. In the examples below, the text in blue can be copied to a text file and updated as required. The text file can then be uploaded to the provisioning tool.
2. When editing configuration files, use a text editor such as notepad which can save files in .txt format.
3. The indentations shown in the examples can be omitted.
4. Ensure the correct double quote is used when editing configuration.
5. If a setting is omitted from the settings file, the value of that setting will remain unchanged.
6. When configuring a previously unconfigured (i.e. factory fresh) Geist™ rPDU, the first configuration setting should be the definition of an admin user, See [Local Users](#) below .
7. To combine several settings (other than local users) into one file (see also [Example 1](#) on page 105 at the end of this document):
 - Append together the required settings into one file
 - Delete all occurrences of `{ "conf":{` except for the first line of the file
 - Replace all lines that contain only `}}` by a `,` (comma) except for the last line of the file
8. If combining local user settings with other settings in one file, please refer to [Example 2](#) on page 106 at the end of this document.
9. After selecting Provisioner>Discovery>Update, enter the user name and password only when configuring previously configured Geist™ rPDUs (the user name and password being that of the Geist™ rPDUs being provisioned). Do not enter a user and password when configuring factory fresh units (identified by Provisioned attribute equalling False).

Local Users

```
{ "auth": {
  "username": {
    "password": "userpw",
    "enabled": true,
    "control": false,
    "admin": false,
    "language": "en"}
}}
```

username	The user name to be created (in quotes)
password	Password (in quotes)
enabled	Options true or false determines whether the user is enabled
control	Options true or false determines whether the user will have control privileges
admin	Options true or false determines whether the user will have admin privileges
language	Overrides default language for this user, valid options are "de", "en", "es", "fr", "ja", "ko", "pt", "zh"

LDAP

```

{"conf":{
  "remoteAuth": {
    "mode": "ldap",
    "ldap": {
      "host": "192.168.123.1",
      "port": 389,
      "mode": "activeDirectory",
      "securityType": "ssl",
      "bindDn": "",
      "password": null,
      "baseDn": "",
      "userFilter": "(objectClass=posixAccount)",
      "userId": "uid",
      "userIdNum": "uidNumber",
      "groupFilter": "(objectClass=posixGroup)",
      "groupId": "gidNumber",
      "groupMemberUid": "memberOf",
      "enabledGroup": "enabled",
      "controlGroup": "control",
      "adminGroup": "admin"}}
}}

```

host	LDAP URL (ref RFC4516 > RFC2255) (in quotes), required if LDAP is enabled.
port	Port for protocol communication
mode	Determines default compatibility among the different LDAP types, options are "openLdap or activeDirectory"
securityType	Encryption to be used in connecting to LDAP server, options are "ssl" and "starttls"
bindDn	Distinguished Name (in quotes) (ref RFC4514 > RFC2253), used to bind to the directory server, blank string implies anonymous bind
password	Password (in quotes) used to bind to the directory server
baseDn	Distinguished Name (in quotes) (ref RFC4514 > RFC2253) to use for the search base
userFilter	LDAP Search Filter (in quotes) (ref RFC4515 > RFC2254), objectClass equivalent to posixAccount (ref RFC2307)
userId	Equivalent to attribute "uid" (in quotes) ref (RFC2307)
userIdNum	Equivalent to attribute "uidNumber" (in quotes) (ref RFC2307)
groupFilter	LDAP Search Filter (in quotes) (ref RFC4515 > RFC2254), objectClass equivalent to posixGroup (RFC2307)
groupId	Equivalent to attribute "gidNumber" (ref RFC2307) (in quotes)
groupMemberUid	Equivalent to attribute "memberUid" (ref RFC2307) (in quotes)
enabledGroup	User (in quotes) in this group will have the "enabled" privilege
controlGroup	User (in quotes) in this group will have the "control" privilege
adminGroup	User (in quotes) in this group will have the "admin" privilege

```

{"conf":{
  "remoteAuth": {
    "mode": "tacacs",
    "tacacs": {
      "authenticationServer1": "10.20.30.21",
      "authenticationServer2": "10.20.30.70",
      "accountingServer1": "10.20.30.21",
      "accountingServer2": "10.20.30.70",
      "sharedSecret": "secret",
      "service": "raccess",
      "adminAttribute": "admin=true",
      "controlAttribute": "control=true",
      "enabledAttribute": "enabled=true"}}
}}

```

authenticationServer1	Primary authentication/authorization server (in quotes)
authenticationServer2	Alternate authentication/authorization server (in quotes)
accountingServer1	Primary accounting server (in quotes)
accountingServer2	Alternate accounting server (in quotes)
sharedSecret	Secret (in quotes) shared by client and server (null deletes secret)
service	Value for the service field in TACACS requests. Options are "ppp" and "raccess"
adminAttribute	User (in quotes) with this Attribute-Value Pair will have "admin" privilege
controlAttribute	User (in quotes) with this Attribute-Value Pair will have "control" privilege
enabledAttribute	User (in quotes) with this Attribute-Value Pair will have "enabled" privilege

Radius

```

{"conf":{
  "remoteAuth": {
    "mode": "radius",
    "radius": {
      "authenticationServer1": "",
      "authenticationServer2": "",
      "accountingServer1": "",
      "accountingServer2": "",
      "sharedSecret": "Secret",
      "groupAttribute": "filter-id",
      "adminGroup": "admin",
      "controlGroup": "control",
      "enabledGroup": "enabled"}}
}}

```

authenticationServer1	Primary authentication server (in quotes)
authenticationServer2	Alternate authentication server (in quotes)
accountingServer1	Primary accounting server (in quotes)
accountingServer2	Alternate accounting server (in quotes)
sharedSecret	Secret shared by client and server in quotes)
groupAttribute	Identifies the AVP that tells which access group the user belongs to, valid values are "filter-id" and "management-privilege-level".
adminGroup	User (in quotes) that belongs to this group has "admin" privilege
controlGroup	User (in quotes) that belongs to this group has "control" privilege
enabledGroup	User (in quotes) that belongs to this group will have "enabled" privilege

Network Hostname and IP Addresses

```

{"conf":{
  "system": {
    "hostname": "rPDUhostname",
    "ip6Enabled": true,
    "network": {
      "ethernet": {
        "label": "Bridge 0",
        "enabled": true,
        "dhcpOn": false,
        "address": {
          "0": {"address": "192.168.123.123", "prefix": 24},
          "1": {"address": "10.20.30.43", "prefix": 24}}}
      }}
}

```

Hostname	Name (in quotes) to identify the unit in a network
ip6Enabled	Options are true or false to enable or disable IPV6 support
label	Bridge label (in quotes)
enabled	Options are true or false to enable or disable the network bridge
dhcpOn	Options are true or false to enable or disable DHCP
address	IP address (in quotes) of the interface
prefix	Prefix of the interface IP address

Network Ports

```

{"conf":{
  "network": {
    "port0": {
      "label": "Port 0",
      "enabled": true,
      "stp": {"cost": 0}},

```

```
"port1": {
  "label": "Port 1",
  "enabled": true,
  "stp": {"cost": 0}}
}}
```

label Port label (in quotes)

enabled Options are true or false to determine whether the port is enabled

cost Spanning tree cost for this port

Network Routes

```
{"conf":{
  "network": {
    "ethernet": {
      "route": {
        "0": {
          "gateway": "10.20.30.254",
          "prefix": 0,
          "destination": "0.0.0.0"}}}}
}}
```

gateway Gateway address (in quotes) for the route

prefixDestination Network prefix, 0 for default gateway

destination Destination network address (in quotes), "0.0.0.0" for default network

Network DNS

```
{"conf":{
  "network": {
    "ethernet": {
      "dns": {
        "0": {"address": "8.8.8.8"},
        "1": {"address": "8.8.4.4"}}}}
}}
```

address The DNS server address (in quotes). Second occurrence is for the alternate DNS server.

Network RSTP

```
{"conf":{
  "network": {
    "ethernet": {
      "stp": {
        "enabled": false,
```

```

"mode": "rstp",
"bridgePriority": 24576,
"helloTime": 2,
"maxAge": 40,
"maxHops": 40,
"forwardDelay": 21}}}
}}
```

enabled	Options are true or false, determines whether spanning tree protocol is enabled
mode	Options are "stp" or "rstp", RSTP mode supports falling back to STP when necessary
bridgePriority	This interface's spanning tree bridge priority
helloTime	The interval in seconds between periodic transmissions of configuration message
maxAge	The maximum age of the information transmitted by this interface, when it serves as the root bridge. Used when "mode" is set to "stp". Should be at least 2 * (helloTime + 1)
maxHops	The maximum number of bridge traversals of the information transmitted by this interface when it serves as the root bridge, used when "mode" is set to "rstp"
forwardDelay	The delay used by bridges to transition the root bridge and designated ports into forwarding mode, should be at least (maxAge / 2) + 1

Web Server

```

{"conf":{
  "http": {
    "httpEnabled": true,
    "httpPort": 80,
    "httpsPort": 443}
}}
```

httpEnabled	Options are true or false to allow unencrypted communications
httpPort	Port number for HTTP communication
httpsPort	Port number for HTTPS communication

Reports

```

{"conf":{
  "report": {
    "0": {
      "start": "00:00",
      "days": "MTWTFSS",
      "targets": ["1", "2"],
      "interval": 1},
    "1": {
      "start": "00:00",
      "days": "MT-----",
      "targets": ["1"],

```

```
"interval": 1}}
}}
```

- start** Time of day from which interval is applied. Format is "(00-23):(00-59)" configurable in 15 minute increments
- days** First letter of selected days (in quotes) in order Monday - Sunday. A '-' is used to represent unselected days targets
- List of keys referencing email targets (in quotes)
- interval** Number of hours between reports, can be 1, 2, 3, 4, 6, 8, 12, and 24

Display

```
{"conf":{
  "display": {
    "gmsd": {
      "mode": "currentAndTotalPower",
      "inverted": false,
      "vlc": {"enabled": false}}}
}}
```

- mode** Selects a set of data to present on the display, options are "current", "totalPower", and "currentAndTotalPower"
- inverted** Options are true or false to describe the current orientation of the display
- enabled** Options are true or false to determine rPDU VLC display mode

Time

```
{"conf":{
  "time": {
    "mode": "ntp",
    "datetime": "2021-03-09 12:05:36",
    "zone": "UTC",
    "ntpServer1": "0.pool.ntp.org",
    "ntpServer2": "1.pool.ntp.org"}
}}
```

- mode** Mode, valid options are "ntp" and "manual"
- datetime** Date and time, format is "YYYY-MM-DD HH:MM:SS" with hours ranging from 0-23 (This field is displayed in local time), must only be used with mode="manual"
- Zone** This must be a valid name (in quotes) from the tz database
- ntpServer1** Primary NTP server address (in quotes), must only be used with mode="ntp"
- ntpServer2** Backup NTP server address (in quotes), must only be used with mode="ntp"

SSH

```

{"conf":{
  "ssh": {
    "enabled": true,
    "port": 22}
}}

```

enabled Options are true or false to enable or disable SSH

port Port number for SSH communication

USB

```

{"conf":{
  "usb": {"enabled": true}
}}

```

enabled Options are true or false, enables or disabled the USB port

Serial Port

```

{"conf":{
  "serial": {
    "baudRate": 115200,
    "dataBits": 8,
    "enabled": true,
    "parity": "none",
    "stopBits": 1}
}}

```

baudRate Baud rate, options are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200

dataBits Number of bits of data in one frame, options 7 and 8

enabled Options are true or false, enables or disabled the serial CLI on a device

parity Parity bit type used in the frame, options "none", "even" and "odd"

stopBits Number of stop bits used to terminate each frame, options 1 and 2

Email

```

{"conf":{
  "email": {
    "server": "Example-server",
    "port": 25,
    "sender": "From email address",
    "username": "username",
    "password": "password",

```

```
"target": {
  "0": {"name": "email1@domain.com"},
  "1": {"name": "email2@domain.com"}}
}}
```

Server	SMTP sever address (in quotes)
port	SMTP port number
sender	Senders email address (in quotes)
username	SMTP user name (in quotes)
password	SMTP password (in quotes)
name	Destination email address (in quotes)

SNMP v1 or v2c

```
{"conf":{
  "snmp": {
    "v1v2cEnabled": true,
    "port": 161,
    "readCommunity": "public",
    "writeCommunity": "private",
    "trapCommunity": "private",
    "target": {
      "0": {
        "port": 162,
        "name": "10.20.30.10",
        "trapVersion": "1"},
      "1": {
        "port": 162,
        "name": "10.20.30.11",
        "trapVersion": "1"},
      "2": {
        "port": 162,
        "name": "10.20.30.12",
        "trapVersion": "2c"}}}
}}
```

v1v2cEnabled	Options are true or false, enables or disables SNMP version 1 and 2c
port	Port number for SNMP communication
readCommunity	Read community name (in quotes), must be different from writeCommunity
writeCommunity	Write community name (in quotes), must be different from readCommunity
trapCommunity	Trap community name (in quotes)
port	Port number for SNMP traps
name	Address (in quotes) for the SNMP trap destination
trapVersion	SNMP trap version, "1" or "2c"

SNMP v3

```

{"conf":{
  "snmp": {
    "v3Enabled": true,
    "port": 161,
    "user": {
      "0": {
        "privPassword": "password",
        "type": "read",
        "username": "name",
        "privType": "aes",
        "authPassword": "password",
        "authType": "sha1"},
      "1": {
        "privPassword": "password",
        "type": "write",
        "username": "name",
        "privType": "none",
        "authPassword": "password",
        "authType": "none"},
      "2": {
        "privPassword": "password",
        "type": "trap",
        "username": "name",
        "privType": "none",
        "authPassword": "password",
        "authType": "none"}}}
}}

```

v3Enabled	Options are true or false, enable or disable SNMP version 1 and 2c
port	Port number for SNMP communication
type	Permission type, possible values "read", "write" or "trap"
username	SNMPv3 user name (in quotes)
privPassword	Privacy password (in quotes)
privType	Privacy encryption type, values "aes", "des" or "none"
authPassword	Authentication password (in quotes)
authType	Authentication type, values "sha1", "md5" or "none"

Syslog

```

{"conf":{
  "syslog": {
    "enabled": true,
    "target": "10.20.30.40",
    "port": 514}
}}

```

- enabled** Options are true or false, enable the transmission of syslog messages to a remote destination
- target** Address (in quotes) of the remote destination for syslog messages
- port** Destination port number for messages

Admin

```

{"conf":{
  "contact": {
    "description": " Geist GU PDU ",
    "location": "Example Location",
    "contactName": "Example Contact",
    "contactEmail": "email@example.com",
    "contactPhone": "123 456 789"},
  "system": {"label": "System Label"}
}}
```

- description** Unit description (in quotes)
- location** Unit location (in quotes)
- contactName** Unit contact name (in quotes)
- contactEmail** Unit contact email (in quotes)
- contactPhone** Unit contact phone number (in quotes)
- label** Unit system label (in quotes)

Locale

```

{"conf":{
  "locale": {
    "defaultLang": "en",
    "units": "metric"}
}}
```

- defaultLang** Language, valid options are "de", "en", "es", "fr", "ja", "ko", "pt", "zh"
- units** Units, valid options are "metric" and "imperial"

Data Logging Interval

```

{"conf":{
  "datalog": {"interval": 15}
}}
```

- interval** The interval in minutes for data logging

Aggregation

```

{"conf":{
  "oneview": {
    "enabled": true,
    "username": "x",
    "password": "pass"}
}}

```

enabled Options are true or false, determines whether aggregation is enabled

username User name (in quotes) to be set array devices

password Password (in quotes) to set for array devices (null deletes password)

Example 1

File to configure a hostname, IP address, gateway, SNMP v1 community names and locale:

```

{"conf":{
  "system": {
    "hostname": "hostname1"},
  "network": {
    "ethernet": {
      "dhcp0n": false,
      "address": {
        "0": {"address": "10.20.30.40", "prefix": 24}}}}
  ,
  "network": {
    "ethernet": {
      "route": {
        "0": {
          "gateway": "10.20.30.254",
          "prefix": 0,
          "destination": "0.0.0.0"}}}}
  ,
  "network": {
    "ethernet": {
      "dns": {
        "0": {"address": "8.8.8.8"},
        "1": {"address": "8.8.4.4"}}}}
  ,
  "snmp": {
    "v1v2cEnabled": true,
    "port": 161,
    "readCommunity": "public",
    "writeCommunity": "private",
    "trapCommunity": "private",
    "target": {
      "0": {
        "port": 162,
        "name": "10.20.30.60",
        "trapVersion": "1"}}}
  ,
  "locale": {
    "defaultLang": "en",

```

```
"units": "metric"}
}}
```

Example 2

File to configure an admin user, disable HTTP, and configure a NTP server:

```
{ "auth": {
  "username": {
    "password": "userpw",
    "enabled": true,
    "control": false,
    "admin": false,
    "language": "en"}
},
"conf":{
  "http": {
    "httpEnabled": false}
,
"time": {
  "mode": "ntp",
  "zone": "UTC",
  "ntpServer1": "0.pool.ntp.org", "ntpServer2": "1.pool.ntp.org"} }}
```

Sensor Settings and Alarms

```
{"dev": {
  "0000000000000000": {
    "label": "PDU 22A",
    "type": "i03",
    "conf": {"outletControlEnabled": true},
    "outlet": {
      "0": {
        "poaAction": "last",
        "rebootHoldDelay": 10,
        "rebootDelay": 5,
        "poaDelay": 1.25,
        "onDelay": 5,
        "mode": "manual",
        "offDelay": 5,
        "label": "Outlet 1"
      },
      "1": {
        "poaAction": "last",
        "rebootHoldDelay": 10,
        "rebootDelay": 5,
        "poaDelay": 1.50,
        "onDelay": 5,
        "mode": "manual",
```

```

        "offDelay": 5,
        "label": "Outlet 2"
    }
},
"entity": {
    "total0": {"label": "Total"},
    "breaker0": {"label": "Circuit 1"},
    "breaker1": {"label": "Circuit 2"},
    "phase0": {"label": "Phase A"},
    "phase1": {"label": "Phase B"},
    "phase2": {"label": "Phase C"},
    "line3": {"label": "Neutral Line"}
}
},
"alarm": {
    "action": {
        "0": {
            "target": "trap0",
            "delay": 0,
            "repeat": 0
        },
        "1": {
            "target": "email0",
            "delay": 0,
            "repeat": 0
        }
    }
},
"trigger": {
    "0": {
        "path": "0000000000000000/entity/phase0/measurement/0",
        "severity": "alarm",
        "type": "high",
        "threshold": 222.0,
        "tripDelay": 0,
        "clearDelay": 1,
        "latching": false,
        "selectedActions": ["0", "1"]
    },
    "1": {
        "path": "0000000000000000/outlet/0/measurement/0",
        "severity": "alarm",
        "type": "low",
        "threshold": 55.0,
        "tripDelay": 2,
        "clearDelay": 0,
        "latching": false,
        "selectedActions": ["0"]
    },
    "2": {
        "path": "0000000000000000/entity/breaker0/measurement/4",
        "severity": "alarm",
        "type": "high",
        "threshold": 12.0,
        "tripDelay": 0,
        "clearDelay": 0,
        "latching": false,
        "selectedActions": ["0"]
    },
    "3": {

```

```
    "path": "000000000000000000000000/entity/total0/measurement/0",  
    "severity": "alarm",  
    "type": "high",  
    "threshold": 7200.0,  
    "tripDelay": 0,  
    "clearDelay": 0,  
    "latching": false,  
    "selectedActions": ["0"]  
  }  
}  
}}
```


0000000000000000	The device-id (found on the sensors>overview page) of the rPDU to be configured. If this device-id does not match any of the selected devices being provisioned, all selected devices will be provisioned. Setting device-id to 0000000000000000 ensures all selected devices are configured.
label	The rPDU label (shown on the sensors>overview page)
type	Must have the value "i03". If omitted, prevents any selected rPDUs being configured when the device-id does not match that of any rPDU.
outletControlEnabled	Applies to outlet switched rPDUs only and determines whether it is possible to control outlets on an outlet switched rPDU. The value true allows outlets to be controlled, the value false prevents outlets from being controlled.
outlet	The outlet section applies to outlet switched rPDUs only and defines settings for each rPDU outlet. Note that outlet numbering starts with 0 (rPDU outlet number 1). Individual outlets (or the entire Outlet section) can be omitted if these settings do not require change.
poaAction	Defines the state the outlet will start when powered on ("on", "off" or "last").
rebootHoldDelay	Time, in seconds, the unit waits after switching the outlet off, before switching an outlet back on during a reboot. Can be any whole number between 0 and 14400.
rebootDelay	Time, in seconds, the unit waits before rebooting an outlet. Can be any whole number between 0 and 14400.
poaDelay	Time, in seconds, the unit waits after being powered on before powering on the outlet. Can be any whole number between 0 and 14400.
onDelay	Time, in seconds, the unit waits before switching an outlet on. Can be any whole number between 0 and 14400.
mode	Should have the value "manual" for use-controlled outlets.
offDelay	Time, in seconds, the unit waits before switching an outlet off. Can be any whole number between 0 and 14400.
label	The outlet label.
entity	The entity section is used to label non-outlet measurements on the sensors>overview page.
total0 label	Label for the rPDU total on the sensors>overview page
breaker0 label	Label for the first circuit (if present). Further circuits if present can be labelled using breaker1, breaker2 etc.

phase0 label	Label for the first phase. Further phases if present can be labelled using phase1 and phase2.
line3 label	Label for the neutral line.
alarm	<p>The alarm section defines the methods that can be used to send alarms. Each method is numbered starting from 0 defines:</p> <p>For SNMP trap alarm delivery the target can have the values "trap0", "trap1" etc. which refers to the first, second etc. SNMP traps defined on the System>SNMP page.</p>
target	<p>For email alarm delivery the target can have the values "email0", "email1" etc. which refers to the first, second etc. target email defined on the System>Email page.</p> <p>Note that the target must not specifies SNMP traps or email targets that have not been configured.</p>
delay	Determines how long this event must remain tripped before this action's first vertical notification is sent.
repeat	Determines whether multiple notifications will be sent for this event action.
trigger	This section defines which alarms have been configured, starting with the first alarm which is numbered 0.
Path	<p>Defines the measurement to be alarmed upon. The format of this field is:</p> <p>"0000000000000000/entity/phase0/measurement/0"</p> <p>defines alarms for rPDU inlet phase measurements, where phase0 refers to the first rPDU input phase, phase1 refers to the second phase (if present) etc. The number immediately following measurement indicates the type of measurement to be alarmed as defined below:</p> <p>0: Voltage</p> <p>4: Current</p> <p>8: Real power</p> <p>9: Apparent power</p> <p>10: Power Factor</p> <p>11: Energy</p> <p>14: Current crest factor</p>

"0000000000000000/outlet/0/measurement/0" defines outlet alarms for rPDUs with outlet monitoring where the number immediately following outlet specifies the outlet number (starting at zero). The number immediately following measurement indicates the type of measurement to alarmed as defined below:

- 0: Voltage
- 4: Current
- 8: Real power
- 9: Apparent power
- 10: Power Factor
- 11: Energy
- 12: Balance
- 14: Current crest factor

"0000000000000000/entity/total0/measurement/0" defines alarms for rPDU phase total inlet measurements. The number immediately following measurement indicates the type of measurement to alarmed as defined below:

- 0: Real power
- 1: Apparent power
- 2: Power Factor
- 3: Energy

"0000000000000000/entity/breaker0/measurement/4" defines alarms for rPDU circuit alarms where the first circuit is indicated by breaker0, second by breaker1 etc. The number immediately following measurement indicates the type of measurement to alarmed as defined below:

- 4: Current

"0000000000000000/entity/line3/measurement/4" defines alarms for rPDU neutral current alarms. The number immediately following measurement indicates the type of measurement to alarmed as defined below:

- 0: Current

severity Can be "warning" or "alarm" describing the severity of the generated alarm.

type Can be "high" or "low" which defines whether this is a high or low threshold.

threshold	Threshold value which can be any number between -999.0 through 999.0. Neutral line current can be specified with up to two decimal places.
tripDelay	The measurement must exceed the threshold for this many seconds before the event will be tripped, can be any whole number between 0 and 14400.
clearDelay	The measurement must return to normal for this many seconds before the event will clear and reset. can be any whole number between 0 and 14400.
latching	Can be true or false. If true, the event and its associated actions remain active until the event is acknowledged, even if the measurement subsequently returns to normal.
selectedActions	Defines which actions defined above to use to send the alarm. E.g. ["0","1"] defines actions 0 and 1 which are defined as actions using trap0 and email0 in the example above.

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Appendix I: Provisioner Error Codes

I.1 Success

Code	Explanation
Success	Operation has succeeded

Authentication Errors

Code	Explanation
No Admin user configured	At least one Admin user must be configured on the system
Not Authorized	The current user is not authorized
Not Authorized: Session expired	The token used is no longer valid
Not Authorized: Not enough permissions	The current user does not have enough permissions to perform the operation
Invalid credential combination	Both username/password and token were provided or only one of username or password was provided
Must have at least one admin user	At least one Admin user must be configured on the system

JSON Format Errors

Code	Explanation
Malformed JSON	Received JSON is not valid or corrupt
Missing field	An expected field was not found in the JSON structure
Duplicate fields	The same field was set multiple times, e.g. in the HTTP body and query string

Path Errors

Code	Explanation
Invalid path	Supplied path does not fulfill system requirements
Path not found	Supplied path was not found
Identifier not found	One of the fields in the received JSON structure does not exist
Field not applicable	A field in the JSON structure exists but should not have been sent

Data Validation Errors

Code	Explanation
Invalid input	An input field is invalid but does not fit in other data validation categories
Input too long	An input field exceeds the maximum allowed length
Invalid characters	An input field contains invalid characters for the field
Invalid serial	An input field is an invalid serial number
Invalid Boolean	An input field is an invalid Boolean value

Code	Explanation
Out of range	An input field falls outside the valid range for the field
Invalid integer	An input field is not an integer when one is expected
Invalid number	An input field is not a number when one is expected
Invalid URL	An input field is not a valid URL when one is expected
Invalid IP	An input field is not a valid IP address when one is expected
Paths not allowed	An input field contains a path when one is not expected
Invalid username	An input field is an unsupported user name
Invalid email address	An input field is not a valid email address when one is expected
Invalid option	An input field contains an invalid option selection
Invalid datetime	An input field is not a valid date or time when one is expected
Out of bounds	An input field is out of the allowed bounds for the field
Invalid week	An input field represents an invalid days of the week selection
Duplicate entry	An input field would create a duplicate when one is not allowed
Invalid Route	A network route was misconfigured

Other Errors

Code	Explanation
Unknown error	A system error occurred for which no other error code applies
Command not allowed	The received command is not allowed at the specified path
System busy	The action attempted cannot be currently executed and should be retried

Data Consistency Errors

Code	Explanation
Inconsistent state	The command will leave the system in an inconsistent state, so it is rejected
Syslog enabled requires target	Enabling remote syslog requires a target host be specified
NTP mode requires servers	Enabling NTP requires servers to query
Start time must come before end time	Time was received for which the end came before the start
Invalid SNMPv3 auth/priv combination	SNMPv3 privacy cannot be used without authentication
Port not available	There was an attempt to set a port number to one already in use
OneView missing credentials	Enabling OneView requires that a OneView username and password be set
Time not settable	Setting datetime requires manual time mode

Upload Errors

Code	Explanation
Invalid firmware package	The package is formatted incorrectly or corrupt
Invalid file key	The package specifies a wrong OEM key and cannot be used with this unit
Invalid version	The version is too old or otherwise unsupported
Invalid product	The package is meant for a different hardware architecture
Invalid certificate file	The SSL certificate provided could not be parsed
Invalid certificate password	The password did not work with the SSL certificate provided

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Appendix J: An Example of Configuring LDAP for Active Directory Credentials

The following pages provide an example of configuring LDAP for active directory credentials.

OVERVIEW

Active Directory integration with the Vertiv-branded and Geist-branded Interchangeable Monitoring Device (IMD) allows users to authenticate and authorize at the IMD's web and CLI interface using their enterprise Active Directory credentials. The user will also be authorized into one of three IMD roles based upon an Active Directory security group the user is a member of. These roles are:

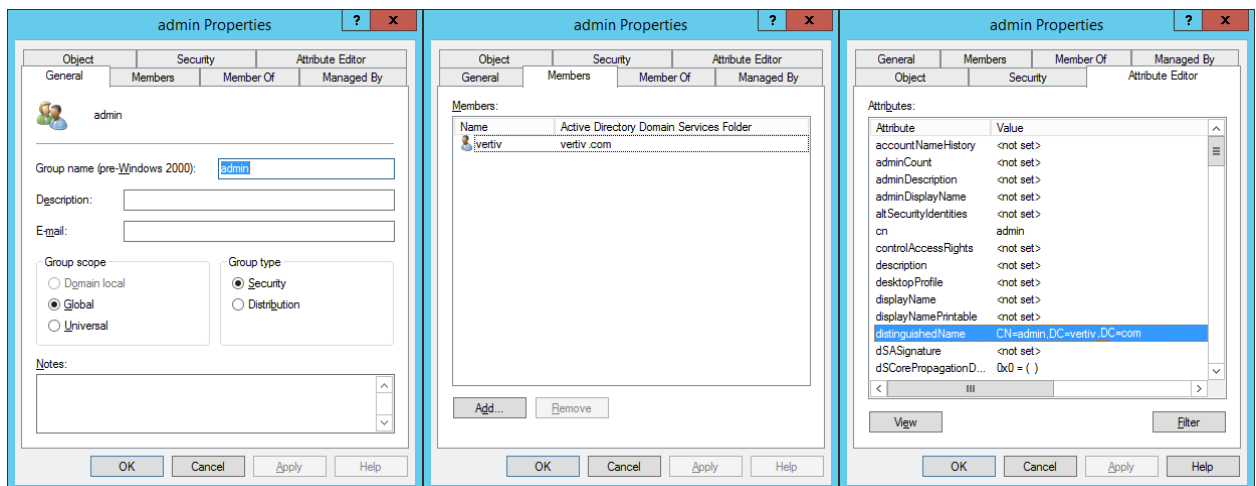
- Admin – Full configuration rights including Control role permissions
- Control – Ability to control outlet state if applicable, change device names and alarm/event settings
- Enabled – Read-only of the configuration settings and no outlet control rights

GENERAL REQUIREMENTS AND NOTES

- IMD v5.3.3 or new firmware can be used for this procedure.
- Examples are represented in green

ACTIVE DIRECTORY CONFIGURATION PROCEDURE

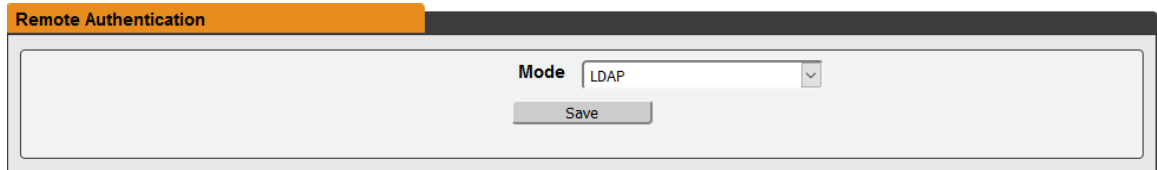
- Create or utilize an existing AD bind account for the IMD. This account will be used by the IMD to search the AD domain and authenticate users. The password for this account should be set to never expire.
- Create one or more AD security groups to represent the Admin, Control and Enabled IMD roles
- Make the AD user a member of the applicable security group
 - AD account "vertiv" has been assigned a member of security group "admin" in example shown below. As a result, the "vertiv" AD user account will assume the IMD Admin role upon login.
- **NOTE: The naming of the security group is at your discretion. The security group name and DN should match what is defined in the IMD's LDAP "Group" section.**
- **NOTE: An AD user belonging to more than one of these IMD role mapped security groups will inherit the highest role privileges**



IMD CONFIGURATION PROCEDURE (WEB INTERFACE)

- Open a web browser to the IP or DNS name of the IMD and login as the local admin account
- Navigate to System -> Remote Authentication

- Set Remote Authentication Mode to “LDAP” and save



The screenshot shows a configuration window titled "Remote Authentication". Inside the window, there is a "Mode" dropdown menu currently set to "LDAP". Below the dropdown is a "Save" button.

- Refer to the illustration below for descriptions of the LDAP section settings

The image shows a configuration form for LDAP settings. The fields and their corresponding callout boxes are as follows:

- LDAP Server Address:** Callout: Active Directory Server's IP Address
- LDAP Server Port:** Callout: Active Directory TCP Port² (389 - Non SSL, 636 - SSL)
- LDAP Mode:** Set to 'Active Directory'
- Security Type:** Set to 'None'. Callout: Active Directory Security² (None - SSL - StartTLS)
- Bind DN:** Callout: AD Account Used to Bind to AD Server (Must be in full DN path notation: CN=adbindacct,CN=Users,DC=vertiv,DC=com; Account password should not expire)
- Bind Password:** Callout: Set AD Bind Account Password
- Base DN:** Callout: Base Domain Path to Search AD Users¹ (Must be in full DN path notation: DC=vertiv,DC=com)
- User Filter:** Callout: AD User ObjectClass Attribute Filter (objectClass=user)
- "uid" Mapping:** Callout: AD User Account Name Filter (samaccountname)
- "uidNumber" Mapping:** Set to 'uidNumber'
- Group Filter:** Callout: AD Group ObjectClass Attribute Filter (objectClass=group)
- "gid" Mapping:** Set to 'gidNumber'
- "memberUid" Mapping:** Set to 'memberOf'
- Enabled Group:** Callout: AD Security Group Map to Enabled Role (Must be in full DN path notation: CN=enabled,DC=vertiv,DC=com)
- Control Group:** Callout: AD Security Group Map to Control Role (Must be in full DN path notation: CN=control,DC=vertiv,DC=com)
- Admin Group:** Callout: AD Security Group Map to Admin Role (Must be in full DN path notation: CN=admin,DC=vertiv,DC=com)

A 'Save' button is located at the bottom of the form.

¹Best practice is to reduce the scope of AD domain traversal to search for authenticated users. Try to avoid just specifying the base domain when there is a large and nested AD schema.

- Ideal: OU=Enabled Users,OU=User Accounts,DC=vertiv,DC=com
- Not Ideal: DC=vertiv,DC=com

²StartTLS uses TCP port 389. It initially establishes the session unencrypted but will encrypt the session from that point forward if the LDAP_START_TLS_OID request is accepted by the Active Directory server

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