



Power IQ

User Guide
Release 4.3.0

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What's New in the Power IQ Help

The following sections have changed or information has been added to the Power IQ User Guide based on enhancements and changes to the software and/or user documentation.

- **Configuring PDU Display Settings - View PDUs by IP or Name** (on page 40)
- **Customizing Your View of PDUs, Devices, and Events** (on page 41)
- **Adding Raritan PDUs in Port Forwarding Configuration** (on page 30)
- **View Events** (on page 70)
- **Geist RCX Supported Events** (on page 50)
- **Raritan PX/PX2/PX3 Supported Events** (on page 55)
- **Power IQ Role Definitions** (on page 83)
- **Sharing a Dashboard** (on page 92)
- **Enabling the Web API User Account** (on page 125)
- **Active Power Trends for Devices** (on page 177)
- **Search for PDUs** (see "**Search for PDUs and Devices**" on page 181)
- **Sensor Assignment Guideline** (on page 210)
- **Sharing Reports on the Analytics Page** (on page 228)
- **Create a Rack Failover Report** (on page 245)
- **Downloading Daily Sensor Readings** (on page 267)
- **Trap Support in Dynamic Plugins - Structured or Custom** (on page 288)
- **Managing Removed or Out of Service Objects** (on page 343)
- **Enable or Disable the Root Accounts for Support** (on page 354)
- **Configuring ODBC User Credentials** (on page 358)

Please see the Release Notes for a more detailed explanation of the changes applied to this version of the Power IQ.

The Term "PDU" in Power IQ

For simplicity in the GUI, Power IQ uses the term PDU to encompass any device that Power IQ polls to gather power or sensor data.

When you see the term PDU in the product interface, remember that it includes every polled object: rack PDUs, CRACs, floor PDUs, floor UPSs, power panels, standalone meters, and environmental sensor aggregators.

In this guide, the following terms are also used:

- Rack PDU
- Facilities Objects: CRAC, floor PDU, floor UPS, power panel, and standalone meter.

Chapter 1 Installing the Power IQ Application

If you obtained Power IQ as a VMware application, you must install it on a VMware ESX/ESXi Server.

In This Chapter

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Preparing to Install Power IQ.....	1
Creating the Power IQ Virtual Machine	2
Loading Power IQ onto the Virtual Machine	2

Virtual Machine Requirements

Minimum Configuration (Number of PDUs)*	RAM (GB)	CPU (Cores)	Datastore (GB)	OS	VMware
Up to 50	4	4	160 or more	CentOS 64-Bit	ESX/ESXi
51-100	8	4	160 or more	CentOS 64-Bit	ESX/ESXi
101-500	8	6	160 or more	CentOS 64-Bit	ESX/ESXi
501-1000	8	8	160 or more	CentOS 64-Bit	ESX/ESXi
1001-1500	16	8	160 or more	CentOS 64-Bit	ESX/ESXi
More than 1500	24	8	160 or more	CentOS 64-Bit	ESX/ESXi

*Based on 30 outlets per PDU

Preparing to Install Power IQ

- Verify that you have the DVD containing the Power IQ .ISO file.
- Verify the datastore has at least 160GB free for a new virtual machine.
- If you plan to install the virtual machine from the datastore, verify that there is sufficient extra space free for the installation ISO file, and copy the file from the DVD to the datastore.
- If you plan to install from a remote server, copy the ISO file from the DVD to the server.

Note: The instructions in this guide refer to the vSphere client, which is compatible with ESX/ESXi 4.0 and higher.


Creating the Power IQ Virtual Machine

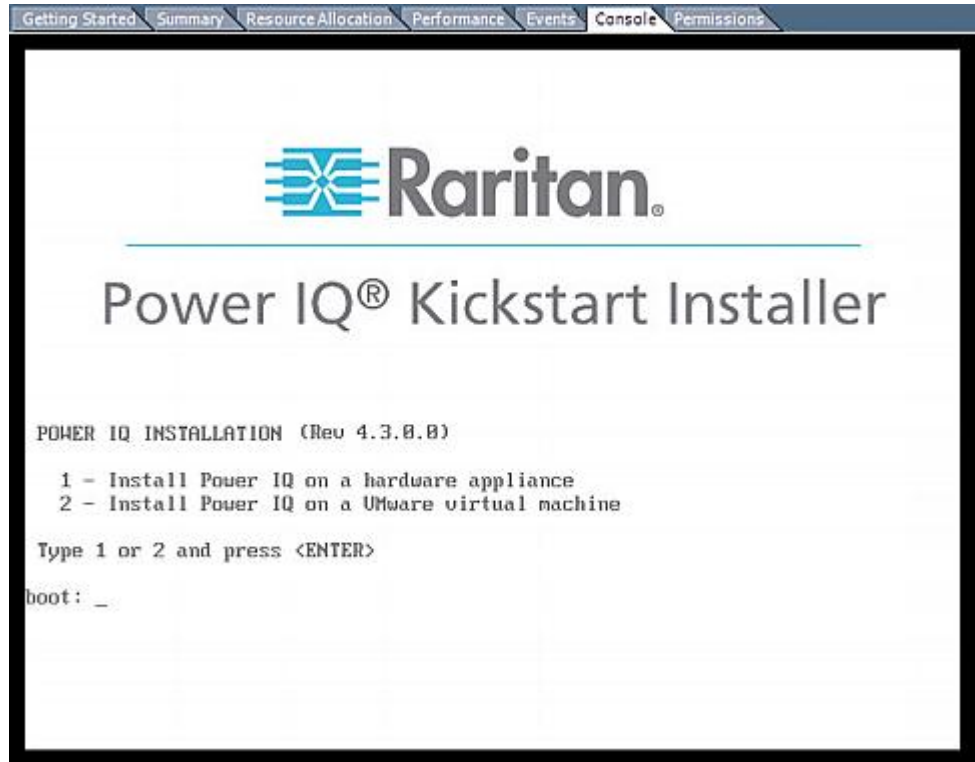
1. Connect to the VMware server using vSphere client. Log in as a user that has permission to create, start, and stop virtual machines.
2. In the Summary tab, click New Virtual Machine in the Command box.
3. Choose Custom. Click Next.
4. Enter a name for the virtual machine. Click Next.
5. Choose a Datastore with at least 160GB of free space available. Click Next.
6. You may need to select the Virtual Machine Version, depending on your host. Select the version. Click Next.
7. Select Linux for the Guest Operating System, then select CentOS 64-bit, if available, from the Version drop-down. If CentOS 64-bit is not available, select Other Linux (64-bit). Click Next.
8. Set the number of virtual processor cores to 4, 6 or 8, depending on the size of your configuration. See **Virtual Machine Requirements** (on page 1). Click Next.
9. Adjust the amount of memory allocated for the virtual machine, depending on the size of your configuration. See **Virtual Machine Requirements** (on page 1). Click Next.
10. Set the number of NICs to one or two. If there are two NICs, one can be used for external access to the web interface and the other can be used as a private LAN for communication with the PDUs and other data center devices.

In either case, make sure Connect at Power On is checked, and leave all other settings at default. Click Next.
11. Select LSI Logic for the SCSI Controller. Click Next.
12. Select "Create a new virtual disk." Click Next.
13. Set the Disk Capacity to 160GB minimum. Select a disk provisioning option. Select "Store with the virtual machine". Click Next.
14. Leave all advanced options at default. Click Next.
15. Select the "Edit virtual machine settings before completion" checkbox, then click Continue. Select New CD/DVD, then select a Device Type option to map the CD/DVD drive on the virtual machine. Click Finish to save the drive and return to the main dialog.
16. Click Finish to create the virtual machine.

Loading Power IQ onto the Virtual Machine

1. From the tree in the left pane, select the Power IQ Virtual Machine.

2. Select the Console tab. Click  to power up the virtual machine. After a few moments, the Power IQ kickstart page opens.



3. Type 2 for a VMware installation and press Enter to begin installation. Installation takes 20 minutes. When it completes, press Enter to reboot the Power IQ virtual machine.
4. The virtual machine reboots and displays a console prompt.

Chapter 2 Initial Configuration of Power IQ

After installing Power IQ®, you must configure the system for access over the network.

Note: Hardware versions only: Connect a keyboard, mouse, and monitor to the Power IQ device.

In This Chapter

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Open Port Requirements	5

Configuring Power IQ for Access over Network

► **To configure Power IQ for access over network:**

1. Power on Power IQ.
2. When prompted to log in, use the username *config* and the password *raritan*. The Power IQ configuration page opens.

```
Network Configuration: Main Menu
-----
-Appliance Configuration-
Networking Setup >>
Security Setup >>
Ping Network Test
Routing Network Test
System Services
Restart Appliance
Shutdown Appliance
Exit

LAN 1: Enabled: no  DHCP: yes
      IP Addr
      Net Mask
      Gateway
LAN 2: Enabled: no  DHCP: yes
      IP Addr
      Net Mask
      Gateway

Domain: raleigh.raritan.com
DNS 1: 192.168.42.1
DNS 2:
DNS 3:

SSH: running

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UP/DOWN ARROW KEYS: highlight menu selection, ENTER: select
```

3. Select Networking Setup, then select Setup LAN 1 to configure the primary Ethernet port.
4. Press the Space bar to select Enable this LAN Port.
5. To manually assign the network settings to Power IQ, leave Use DHCP deselected. Type the IP address, network masks, and gateway into the appropriate fields.
6. Select Accept to reset the network interface with the new values.
7. If you are using a second network interface, select Setup LAN 2 from the Network Configuration menu and configure the secondary Ethernet port in the same manner as the first. **Optional.**

8. Select Ping Network Test to ensure that Power IQ can communicate over the network. **Optional.**
9. To disable SSH remote access to Power IQ, select System Services. Then deselect Enable SSH. By default, the config account has access to Power IQ. SSH is re-enabled if a support connection is created. **Optional.**
10. Select Exit from the main menu. You can now access Power IQ from any client on the network.

Open Port Requirements

You must ensure that certain ports are open for Power IQ to work.

See **Support Connections** (on page 353) for details about open port requirements for support connections to Raritan Technical Support.

Ports Open Between Power IQ and PDUs

- Port 161 (UDP): Required for all PDUs
- Port 162 (UDP): Required for Raritan PX PDU traps to be sent to Power IQ
- Port 443 (TCP): Required for Raritan PX PDU firmware upgrades performed through Power IQ
- Port 623 (UDP): Required for Raritan PX PDUs. Standard IPMI communication port.

Ports Open Between Clients and Power IQ

- Port 443 (TCP): allows the web interface
- Port 5432 (TCP): allows ODBC access. **Optional.**
- Port 22 (SSH): allows Raritan technical support to log into the shell
- 80 (HTTP): insecure connection to the web UI that immediately forwards to 443 (HTTPS)
- 111 (rpcbind):

Chapter 3 Connecting to Power IQ

1. Connect to Power IQ using a web browser on any machine on the network.
2. In the browser's address bar, enter the IP address or hostname assigned to Power IQ. For example: `https://192.168.1.10`
3. Answer yes to any security alerts and accept all certificates. If this is your first time connecting to Power IQ, you must upload your license and accept the End User Licensing Agreement before logging in. If this is not your first time connecting to Power IQ, skip to step 4.

Licenses are .LIC files. Repeat this step to add incremental licenses if needed.

Note: Your license file can be retrieved from the Raritan web site after you have activated your registration. To activate your registration, click the link in the "Thank you for registering" email from Raritan and create your user account. Once you create your account, look for a "Your Raritan software license key is available" email containing a link to your license file download page.

4. Log in with the default username `admin` and password `raritan`.

The Power IQ dashboard opens.

Chapter 4 Additional Configuration Tasks

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Configuring Logging through Syslog

External Syslog servers can be used to record events occurring on Power IQ. Using a Syslog provides a separate external log of events.

All servers listed under Current Syslog Destinations record events on Power IQ. Recorded events include new users, configuration changes, and failed login attempts.

▶ To configure logging through Syslog:

1. In the Settings tab, click Server Settings in the Appliance Administration section.
2. In the Syslog Destinations box, click Add, then type the IP address of a Syslog server in the "Syslog server address" field. This must be in the form of a numeric address.
3. Click OK. The server appears on the list of current Syslog Destinations.

▶ To stop a syslog server from recording events:

- Select the checkbox next to the server you want to remove then click Remove.

Configuring Polling Intervals

At each polling interval Power IQ collects data from PDUs under its management.

► **To configure the polling interval:**

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.
2. In the Polling Settings box, select a time period from the "Polling interval" drop-down list. The time period indicates how much time passes before Power IQ starts a new polling cycle
3. Click Save Poller Settings.

*Note: When managing a large number of PDUs you may need to configure a longer time period for the polling interval. Setting a longer time period helps ensure that all PDUs are polled within a given cycle. A warning message appears if Power IQ is unable to poll all PDUs within the configured time period. See **Recommended Polling Intervals** (on page 9) for details on settings that help Power IQ poll faster.*

Recommended Polling Intervals

The optimal polling interval depends on your business needs, the number of PDUs you have deployed, their types and the platform you are running Power IQ on. Outlet metered PDUs are a larger system load than unit-level metered PDUs. Raritan PDUs have a unique feature to store readings. Storing readings gives you the added flexibility to set a poll rate and a sample rate. See **Buffered Data Retrieval** (on page 12) for more detail.

Start with a longer polling and sample interval to ensure system operation. Gradually shorten the polling and sample interval as business needs require.

Your actual results may vary based upon local conditions. PDUs that provide less data than the Raritan PDU have a lower system load. You can therefore likely poll those PDUs at the stated sample rate for a given configuration.

To allow faster polling, disable the storage of raw sensor readings in CSV files to the Power IQ disk. Disabling this setting allows Power IQ to poll more devices at a faster polling interval, but you won't have access to raw readings in CSV format. See **Configure Raw Sensor Readings Storage** (on page 10) for details.

See **Configuring Polling Intervals** (on page 8) for details on changing these settings.

▶ Polling Intervals with buffered data retrieval:

Number of PDUs	Sample Rate	Polling Interval	Memory
▪ 1,000 outlet metered PDUs	▪ 5 minutes	▪ 30 minutes	▪ 8 GB RAM
▪ 1,500 outlet metered PDUs	▪ 5 minutes	▪ 30 minutes	▪ 16 GB RAM
▪ 2,000 outlet metered PDUs	▪ 5 minutes	▪ 30 minutes	▪ 24 GB RAM
▪ 3,200 unit metered PDUs	▪ 10 minutes	▪ 30 minutes	▪ 8 GB RAM

▶ Polling Intervals without buffered data retrieval:

Number of PDUs	Polling Interval	Memory
▪ 2,100 outlet metered PDUs	▪ 10 minutes	▪ 8 GB RAM

Configure Raw Sensor Readings Storage

In Power IQ releases before 4.0.0, raw sensor readings collected by Power IQ are automatically stored in daily CSV files which are compressed into ZIP files at the end of each day. Power IQ retains a maximum of eight full days of compressed CSV files depending on available disk space.

Power IQ 4.0.0 is capable of polling at faster rates than older Power IQ releases. The more sensor readings that Power IQ collects, the more likely it becomes that the disk partition where these CSV files are stored will run out of space. This could prevent the Power IQ poller from functioning properly.

In Power IQ 4.0.0, if you require access to the raw sensor readings in CSV format, you must enable this feature. Depending on your Power IQ polling configuration, such as number of managed PDUs, polling interval, sample rate, Power IQ may not be able to store eight full days of readings. In some configurations, it may not be possible to write sensor readings to CSV because the number of raw sensor readings in a day will consume too much disk space.

If you do not require access to raw sensor readings in CSV format, the feature should remain disabled. Disabling this feature will improve the performance of the Power IQ poller and will free system resources for other tasks.

When the feature is disabled, you can still access two hours of raw sensor data stored in the database before values are rolled up, and the raw data deleted from the database. This raw sensor data can be retrieved using ODBC access and reporting tools. See **ODBC Access** (on page 357).

See **Data Storage Configuration Calculator** (on page 10) for details on a tool you can use to determine if your system configuration is compatible with writing raw sensor readings to CSV.

See **Enable or Disable Storing Raw Readings in CSV Files on Disk** (on page 11) for instructions on changing the setting.

Data Storage Configuration Calculator

The Data Storage Configuration Calculator is a tool that can help you determine if storing raw readings in CSV files is supported for your configuration.

You can download the Power IQ 4.0.0 version from the Raritan website.

<http://www.raritan.com/support/power-iq/v4.0.0/data-storage-configurator/>

Enable or Disable Storing Raw Readings in CSV Files on Disk

Depending on your configuration, storage of raw sensor readings in CSV files may not be supported, and could lead to performance issues with the Power IQ poller.

Use the Power IQ data storage configuration calculator tool to determine if storage of raw sensor readings is supported with your configuration.

Power IQ Data Storage Configuration Calculator:

<http://www.raritan.com/support/power-iq/v4.0.0/data-storage-configurator/>

► To enable or disable storing raw readings in CSV files on disk:

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.
 - To enable storage of daily sensor readings, select the "Store raw readings in CSV files on disk" checkbox. This option enables raw readings to be stored in CSV files on disk.
 - To disable storage of daily sensor readings, deselect the "Store raw readings in CSV files on disk" checkbox. This option will not store raw readings on disk, and frees up resources for faster polling.
2. Click Save Poller Settings.

Buffered Data Retrieval

Raritan PX PDUs version 1.2.5 and higher have the ability to temporarily buffer power measurements. This allows Power IQ to receive more data with less frequent polling. Enabling buffered data retrieval instructs Power IQ to retrieve these buffered measurements instead of collecting a single point of data at the time of polling. This results in increased efficiency when gathering data from Raritan PX PDUs.

See ***Enabling Buffered Data Retrieval from Raritan PX 1.2.5 or Higher*** (on page 13) for instruction on enabling the feature.

You must set a Sample Interval when using buffered data retrieval. The polling interval controls how often Power IQ requests buffered data from Raritan PX PDUs, the sample interval controls how granular the buffered data is.

For example: With a polling interval of 1 hour, and a sample interval of 1 minute, Raritan PX PDUs under Power IQ management collect measurements each minute and store the data in the Raritan PX's data buffer. Every hour, Power IQ then retrieves the data buffer with the last hour's measurements from each Raritan PX.

Shorter sample intervals cause Raritan PX PDUs to fill their buffers more quickly. As a result, Power IQ may limit the polling interval to prevent data loss due to filled buffers.

When buffered data retrieval is in use, Power IQ polls other PDUs that do not support this feature at the Sample Interval. This helps maintain a consistent granularity of measurements across all readings.

The Buffered Data Retrieval feature may consume the space available for data storage rapidly since it allows Power IQ to retrieve a great deal of data at once.

Note: To configure Raritan PX sampling rates, Power IQ must have SNMP write access to those PDUs. First make sure the Raritan PX SNMP agents are enabled. Then ensure that they have been added to Power IQ management using an SNMP community string that has write access.

Set Polling Intervals and Sample Rates at Even Multiples

Set your sample rate at even multiple of your polling interval, when data buffering is enabled. This enables Power IQ to collect an even number of data points.

Enabling Buffered Data Retrieval from Raritan PX 1.2.5 or Higher

Note: All Power IQ's using buffered data retrieval that are polling the same PDU must use the same Sample Interval setting to prevent each instance of Power IQ from attempting to change the sample interval to its own setting.

See **Buffered Data Retrieval** (on page 12) for more details.

► To retrieve buffered data from Raritan PX 1.2.5 or higher:

Make sure that Raritan PX PDUs have been added to Power IQ with a Write Community String, or buffered data retrieval will not work. See **Editing PDUs under Power IQ Management** (on page 22) for details on editing PDU credentials.

1. In the Settings tab, click Power IQ Settings.
2. In the Polling Settings section, select the "Enable buffered data retrieval on Raritan PDUs" checkbox.
3. Select a sample period from the Sample Interval drop-down list. This configures the sample interval that Raritan PX PDUs use to buffer power measurements.

For example: If 1 minute is selected, every minute, Raritan PX PDUs takes a power measurement and stores it in its internal buffer for retrieval.

*Note: The polling interval and sample interval should not be set to the same time period. Set the polling interval to a longer time period than the sample interval. For example: 30 minute polling interval with a 10 minute sample interval. See **Configuring Polling Intervals** (on page 8).*

4. Click Save Poller Settings.

External Sensor Data from Raritan PX

Raritan PX model PDUs version 1.6 and higher support buffered data for external sensors.

For Raritan PX model PDU versions earlier than 1.6, external sensor data is not recorded at the sample interval when Buffered Data Retrieval is enabled. The external sensor data is recorded at the polling interval.

See **Buffered Data Retrieval** (on page 12).

Use NTP Servers with Buffered Data Retrieval

If you enable Buffered Data Retrieval, Raritan strongly suggests enabling NTP and configuring Power IQ and your Raritan PX PDUs to use the same NTP servers. This ensures that all recorded data is in sync, whether generated by Power IQ or Raritan PX.

Difference in time between Power IQ and PDUs can cause incorrect values on the capacity gauges on the dashboard.

Advanced Polling Settings

WARNING: Advanced Polling Settings, including Advanced SNMP Settings and Advanced Thread Pooling Settings, should only be used with Raritan Technical Support guidance, or by expert users. Changes to these values can negatively affect Power IQ performance, or result in loss of data.

If you have PDUs in the Lost Comm state, changing the default SNMP settings may help. Do not proceed without Raritan Technical Support guidance. See ***Troubleshooting Lost Communication Status in PDUs*** (on page 16) for details on possible causes. See ***Advanced SNMP Settings*** (on page 15) for details on the settings.

Advanced SNMP Settings

Changing the SNMP settings may help if you have too many PDUs in Lost Communication (LostComm) state.

See ***Troubleshooting Lost Communication Status in PDUs*** (on page 16) for details on possible causes and other solutions.

Warning: You should only change these settings if you are an expert SNMP user, or with Raritan Technical Support's help. Changes to these values can negatively affect Power IQ performance, or result in loss of data.

► Recommended changes:

Increase how many times Power IQ will attempt an individual SNMP request and how long Power IQ will wait for an individual SNMP request. A poll of a PDU can potentially involve hundreds of individual SNMP requests. It is recommended to gradually increase the "Read timeout" and Retries settings and allow several poll intervals to pass to gauge the impact of the change before making additional changes.

If you see a large number of unexplained outages for Raritan PX1 or PX2 PDUs, it may also be necessary to decrease the "Maximum rows per request (PX)" setting. In a small number of cases the default value of 10 may result in SNMP response packets that are too large for customer networks to handle correctly due to packet fragmentation. This is related to PDUs being managed remotely over a WAN. Decreasing this value results in some loss of efficiency because Power IQ has to send more SNMP requests to the target PDU, given that a smaller set of data is sent back in each SNMP response.

By default, Power IQ uses the following default SNMP settings:

- Read timeout: 5000 milliseconds
- Write timeout: 5000 milliseconds
- SNMPv3 timeout: 20000 milliseconds
- Retries: 2
 - Total number of attempts= retries + 1. The default number of attempts is 3.
- Maximum rows per request (default): 1
 - This value is used for non-Raritan PDUs
- Maximum columns per request (default): 5=
 - This value is used for non-Raritan PDUs
- Maximum rows per request (PX): 10
 - This value is used for Raritan PDUs

- Maximum columns per request (PX): 15
 - This value is used for Raritan PDUs

Troubleshooting Lost Communication Status in PDUs

A PDU in "LostComm" state usually has one of these problems.

1. The user has configured Power IQ with the wrong community string for the PDU.
2. There is a network connectivity issue between Power IQ and the PDU.
3. The PDU is powered off or not connected to the network.

If you have checked and corrected these problems, and the status does not change, there may be an SNMP setting that is causing the problem. These problems are much less common. These problems may be solved by changing the SNMP settings, but you should only change these settings if you are an expert SNMP user, or with Raritan Technical Support's help. See ***Advanced SNMP Settings*** (on page 15)

1. The configured SNMP timeout and retry value are insufficient for your use case. For example, you need to manage remote PDUs over a WAN. Network latency or bandwidth do not work well with the default SNMP settings, resulting in a large number of SNMP timeouts that show up as LostComm state PDUs.
2. The SNMP agent on the PDU is not responding to requests. The PDU's processor may be busy handling other tasks and is temporarily unable to respond to SNMP requests.

Advanced Thread Pooling Settings

Warning! The configured thread pool settings determine how many Power IQ resources are allocated to polling PDUs. The default settings are designed to work for most use cases and should not need to be changed. If you are experiencing performance issues related to polling, Raritan Technical support can work with you to determine if changing the thread pool settings will be beneficial.

Warning! Do not change these settings without the guidance of Raritan Technical Support.

- Enable dynamic thread pool sizing: Determines if dynamic thread pool sizing is enabled (default: true)
- Threads per core: If dynamic sizing is disabled, this value will be used to calculate thread pool size. (default value: 10) This parameter affects poller operation when dynamic thread pool sizing is enabled or disabled.
- Dynamic thread pool size: Dynamically calculated ideal thread pool size (default: 0)
- Maximum CPU utilization: Target CPU utilization for polling PDUs. (default: .80)
- Maximum size of dynamic thread pool: Defines the maximum possible size of the dynamic poller thread pool. (default: 225 threads)
- Maximum number of active database connections: Defines the maximum size of the database connection pool that is shared by the entire Poller JVM.
- Dynamic restart threshold: Defines how large the delta between the configured max pool size and the calculated ideal pool size must be before a Poller JVM restart is justified. (default: 5)
- Minimum time between restarts (in minutes): Defines minimum time between Poller restarts due to thread pool resizing (default: 1440, that is, only allow Poller to restart once every 24 hours to adjust thread pool size)
- Interval between thread pool evaluations (in minutes): Defines how frequently the Poller service will evaluate the thread pool size to determine if resizing is needed. (default: 60)
- Low water mark: Thread pool scheduler low water mark. Low water mark controls how aggressively threads are removed from the thread pool. This water mark represents the ratio of threads to items in the queue. The higher the value the more likely a thread will be removed from the pool. (default: .01)

- High water mark: Thread pool scheduler high water mark. High water mark controls how aggressively threads are added to the thread pool. This water mark represents the ratio of threads to items in the queue. The smaller the value the more likely a thread will be added to the pool. (default: .10)

Setting the Default SNMP Version for PDUs

► **To set the default SNMP version for PDUs:**

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.
2. In the Polling Settings box, select 1/2c or 3 as the default SNMP version for new PDUs added to Power IQ.
3. Click Save Poller Settings.

You can change the default value when you add the PDU.

SNMPv3 May Require Longer Polling Interval

Enabling SNMPv3 represents about twice the load on Power IQ as SNMPv1/2.

You may need to increase the polling interval to enable Power IQ to poll all pdus when SNMPv3 is enabled.

See **Setting the Default SNMP Version for PDUs** (on page 18).

See **Configuring Polling Intervals** (on page 8).

Setting Default Estimated Voltages

Power IQ can estimate active power for PDUs that do not directly provide Active Power measurements.

If a PDU does not provide one of the following values, the default estimated voltage will be applied.

- Inlet Voltage
- Outlet Voltage
- Active Power

This default value can be changed per PDU, in the Edit PDU page. These voltage values are only editable when they are NOT coming from the PDU. See **Configure Estimated Voltages** (on page 24).

► **To set the default estimated voltages:**

1. In the Settings tab, click Power IQ Settings.

2. In the Polling Settings box, enter a default estimated voltage for single phase PDUs and a default estimated inlet and outlet voltage for three phase PDUs. **Optional.**
3. Click Save Poller Settings.

Note on Geist and Rittal PDUs

Geist and Rittal PDUs are marked as single or three phase at the second polling interval after discovery.

If a PDU is not marked after two polls, mark the phase manually.

Support for IPv6

You can assign Power IQ an IPv6 address.

Power IQ supports IPv6 communication for the following functions.

- Add PDUs with IPv6 addresses
- Add PDUs with IPv6 addresses using CSV import
- Add IT devices with IPv6 addresses
- Enable access controls using IPv6 address
- Use SNMP diagnostics over IPv6 network.
- Allow IPv6 hosts to connect to the ODBC database
- Configuring NTP servers with IPv6 addresses
- Do network diagnostics using ping, traceroute over IPv6 network. Serial console only.
- Enable static routes using IPv6 addresses. Serial console only.

Valid IPv6 Address Formats

Power IQ accepts IPv6 addresses written in any of the valid formats.

IPv6 addresses need to be enclosed in square brackets when used in the browser.

These examples show several valid versions of the same IPv6 address, and one invalid example.

▶ **Valid IPv6 address formats:**

FE00:0000:0000:0001:0000:0000:0000:0056

FE00::1:0:0:0:56

FE00:0:0:1::56

In a browser: `https://[FE07:2fa:6cff:2113::101]/login`

▶ **Invalid IPv6 address formats:**

Note: The :: abbreviation, meaning one or more quartets of all 0s, cannot be used twice.

The abbreviation FE00::1::56 is not valid.

Adding PDUs to Power IQ Management

Once Power IQ is configured, add Raritan PX or other PDUs to its management. Power IQ can then gather data from these PDUs. If you're adding a PDU that uses a custom dynamic plugin, see **Adding PDUs with Custom Dynamic Plugins** (on page 29).

You can also add PDUs to Power IQ by uploading a CSV file containing the information. See **Adding PDUs in Bulk with CSV Files** (on page 25) in the Power IQ User Guide.

▶ **To add PDUs to Power IQ management:**

1. In the PDUs tab, click Add.
2. Enter the IP address of the PDU.
3. If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number in the Proxy Index field. For example, this field is mandatory for a *slave* Raritan PDU in the port forwarding configuration. See **Adding Raritan PDUs in the Port Forwarding Configuration** (see "**Adding Raritan PDUs in Port Forwarding Configuration**" on page 30).

You can also specify branch circuit monitors using the Proxy Index field. See **Adding Veris Branch Circuit Monitors with Acquisuite** (on page 28).

Note: If the PDU is not in this type of configuration, leave the Proxy Index field blank.

4. Enter an asset tag number or other asset management code in the External Key field. **Optional.**
5. Enter data in Custom Field 1 and Custom Field 2. **Optional.** The labels may have been changed in Power IQ to identify these fields.
6. If the PDU is a Raritan PX, enter a valid Username and Password for the PDU in the PDU Administrative Credentials section. Re-enter the password in the Password Confirm field.
7. Select the SNMP Version.
 - For SNMP version 1/2c PDUs, enter an SNMP Community String that has at least READ permissions to this PDU. This enables polling the PDU for data. Enter an SNMP community string that has both READ and WRITE permissions to the PDU to enable power control, outlet naming, sensor naming, and buffered data retrieval.
 - For SNMP version 3 PDUs, enter the Username and select an Authorization Level. The authorization levels are:
 - noAuthNoPriv - No Authentication Passkey, No Encoding Passkey
 - authNoPriv - Authentication Passkey, No Encoding Passkey
 - authPriv - Authentication Passkey, Encoding Passkey
 - a. Depending on the Authorization Level selected, you must enter additional credentials for Authorization and Privacy.
 - b. Authorization Protocol: Select MD5 or SHA.
 - c. Enter the PDU's Authorization Passkey, then re-enter the passkey in the Authorization Passkey Confirm field.
 - d. Privacy Protocol: Select DES or AES.
 - e. Enter the PDU's Privacy Passkey, then re-enter the passkey in the Privacy Passkey Confirm field.

Note: You must enable the SNMP agent on all PDUs added to Power IQ.

8. Select "Validate and wait for discovery to complete before proceeding" to check credentials and view the discovery process status as you add this PDU. **Optional.** See **Validating PDU Credentials** (on page 22) in the Power IQ User Guide.
9. Click Add.

Note: PDU discovery is complete once the PDU model type is determined. SNMP fields such as contact or location values are not determined until this device is polled for the first time.

Once added, the PDU appears in the PDU list. Power IQ begins polling the PDU for sensor data. You can configure how often Power IQ polls PDU. See **Configuring Polling Intervals** (on page 8) in the Power IQ User Guide.

Discovery Progress Status

Viewing the discovery process displays a status result for each PDU. See **PDU Status** (see "**PDU Connectivity Health Statuses**" on page 173).

Validating PDU Credentials

When adding PDUs to Power IQ individually, you can specify whether the admin credentials are validated.

Check the "Validate and wait for discovery to complete before proceeding" checkbox on the Add a New PDU page. See **Adding PDUs to Power IQ Management** (on page 20) for details on adding PDUs.

When you specify validation, the PDU will not be added if the credentials are incorrect. If you opt not to validate, all PDUs will be added, and those added with incorrect credentials will trigger an event called PDUcredentialsInvalid.

When adding PDUs to Power IQ with a CSV file, the admin credentials are not validated before the PDU is added. When credentials are found to be incorrect, an event is logged.

Power IQ can poll PDUs without the correct credentials. You cannot upgrade PDUs or use bulk configuration without the correct credentials.

Editing PDUs under Power IQ Management

Editing a PDU allows you to reconfigure the SNMP community string for a PDU, or change the username and password used to access that PDU.

If you need to maintain the PDU or physically remove it without deleting its data from Power IQ, you have to edit the PDU to change its connectivity state. See **Managing Removed or Out of Service Objects** (on page 343).

► **To edit PDUs under Power IQ management:**

1. In the PDUs tab, click a PDU link to open the PDU Details.
2. Choose Actions > Edit.

3. Enter an asset tag number or other asset management code in the External Key field. **Optional.**
4. To set the PDU to the maintenance mode, select the Maintenance Mode checkbox. To decommission the PDU, select the Decommissioned checkbox. If both checkboxes are selected, the PDU is considered decommissioned.
5. Enter data in Custom Field 1 and Custom Field 2. **Optional.** The labels may have been changed in Power IQ to identify these fields.
6. Select the SNMP Version. Then, use the fields that display to enter the credentials. To delete previous credentials for either SNMP version, select the "Delete SNMP v2 community credentials" checkbox.
 - For SNMP version 1/2c PDUs, enter an SNMP Community String that has at least READ permissions to this PDU. Use an SNMP community string that has both READ and WRITE permissions to the PDU to enable power control, outlet renaming, and buffered data retrieval. Re-enter the string in the Community String Confirm field.
 - For SNMP version 3 PDUs, enter the Username and select an Authorization Level. The authorization levels are:
 - noAuthNoPriv - No Authentication Passkey, No Encoding Passkey
 - authNoPriv - Authentication Passkey, No Encoding Passkey
 - authPriv - Authentication Passkey, Encoding Passkey
 - a. Depending on the Authorization Level selected, you must enter additional credentials for Authorization and Privacy.
 - b. Authorization Protocol: Select MD5 or SHA.
 - c. Enter the PDU's Authorization Passkey, then re-enter the passkey in the Authorization Passkey Confirm field.
 - d. Privacy Protocol: Select DES or AES.
 - e. Enter the PDU's Privacy Passkey, then re-enter the passkey in the Privacy Passkey Confirm field.
7. PDU Phase:
 - When Power IQ can detect the phase, the Automatic option is selected, and the phase displays. For example, "Automatic (determined to be single phase)."
 - When a PDU does not report phase, the Ignored option is selected. You can keep this setting to ignore phase, or set the phase manually.
 - To set the phase manually, either if it cannot be determined automatically, or is incorrect, select the "Manually set to single phase" or "Manually set to three phase" option.

8. If the PDU is a Raritan PX/PX2/PX3/EMX, enter a valid Username and Password for the PDU in the PDU Administrative Credentials section. Re-enter the password in the Password Confirm field. Leave the fields blank to keep using the password already configured. If you want to use a blank password, select the "Delete PX credentials" checkbox.
9. Click Save.

Configure Estimated Voltages


Power IQ can estimate Active Power for PDUs that do not directly provide Active Power measurements.

If a PDU does not provide one of the following values, the default estimated voltage will be applied. See **Setting Default Estimated Voltages** (on page 18).

- Inlet Voltage
- Outlet Voltage
- Active Power

These voltage values are only editable when they are NOT coming from the PDU.

► To configure estimated voltages:

1. In the PDUs tab, select a PDU then click the Edit this PDU icon  in the Actions column.
2. For three-phase PDUs, enter the voltages in the Manually Configured Inlet Voltage and Manually Configured Outlet Voltage fields.
3. For single-phase PDUs, enter the inlet voltage in the Manually Configured Voltage field.
If no value is entered, the default value is used.
4. Click Save.

Adding PDUs in Bulk with CSV Files

You can add PDUs in bulk by uploading a CSV file.

Power IQ does not check the credentials of the PDU while adding it during a CSV import. If the credentials are incorrect, an event called PDUcredentialsInvalid is logged.

Importing more than 100 PDUs at a time causes polling to suspend while the import is in progress.

You can download a step-by-step CSV template file in the Support section of Raritan's website, under Firmware and Documentation. See <http://www.raritan.com/support/power-iq/>.

See **Structure of the Add PDUs CSV File** (on page 25) for file requirements.

► To add PDUs in bulk with CSV files:

1. In the PDUs tab, choose Activities > Import PDUs from CSV file. The Import PDUs page opens.
2. Click Browse and select the CSV file.
3. Select "View progress of the import as each PDU is discovered" to view the discovery progress and the resulting status. **Optional.**
4. Click Begin Import.

Structure of the Add PDUs CSV File

The structure of the CSV file is as follows:

- One line per PDU to import.
- No header row.
- Each line has only the following value columns, in the following order:
 1. IP address
 2. Proxy index: If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number. See **Proxy Index Details** (on page 27).

Leave blank if the PDU is not in this type of configuration.

3. Raritan PX username
4. Raritan PX password

Leave the Raritan PX username and Raritan PX password fields blank for other PDUs.

5. SNMP Community String

Leave the SNMP Community String blank if it does not apply for a PDU.

6. SNMPv3 enabled: `true` or `false`.

Leave columns 7-12 blank if SNMPv3 is set to false.

7. SNMPv3 username

8. SNMPv3 authorization level: `noAuthNoPriv`, `authNoPriv` or `authPriv`.

9. Authorization protocol: `MD5` or `SHA`.

10. Authorization passkey: no commas allowed

11. Privacy protocol: `DES` or `AES`

12. Privacy passkey: no commas allowed

13. External key

14. Custom field 1

15. Custom field 2

► **For example:**

```
192.168.43.184,,admin,raritan,private
```

```
192.168.44.101,,,,PDUread
```

The first line in this example represents a Raritan PX PDU. The second line represents a PDU from another vendor. Uploading this CSV file would instruct Power IQ to add two PDUs to management. The first PDU is located at 192.168.43.184, and uses the login/password combination admin/raritan for authentication. Its SNMP Community String is set to private. The second PDU is located at 192.168.44.101 and does not use a user name and password for authentication. Its SNMP Community String is set to PDUread.

Proxy Index Details

For stand-alone PDUs, the proxy index field should be left blank.

For PDUs acting in a daisy-chain, or for PDUs that are being proxied through another PDU, the proxy index field should contain the number of the PDU's position.

For daisy chained systems, the proxy index field should be set to the PDU's position within the chain. The head-end or master system should have a proxy index value of 1. The second system in the chain would have a proxy address of 2 and so on.

For element managed systems, such as PDUs behind a serial proxy, the proxy index field should contain the serial port number to which the PDU is attached on the management console.

Adding MRV PDUs

For MRV PDUs, make sure you have configured the get and set clients with the same community string, and use that community string when adding the PDU to Power IQ.

Adding Raritan EMX

You can add a Raritan EMX to Power IQ the same way you add a PDU. All information in this help that refers to PDUs can be applied to EMX, with a few exceptions.

Power IQ collects and displays sensor and asset strip data from a EMX in the same way as other PDUs with attached sensors or asset strips. EMX does not have any outlets.

You cannot upgrade or use bulk configuration for EMX through Power IQ.

See ***Adding PDUs to Power IQ Management*** (on page 20)

Adding Rack Transfer Switches

You can add a supported Rack Transfer Switch to Power IQ the same way you add a PDU.

You can upgrade or use bulk configuration for Raritan PX3TS transfer switches through Power IQ.

See ***Adding PDUs to Power IQ Management*** (on page 20).

See ***Transfer Switch*** (see "***Rack Transfer Switches***" on page 169).

Adding Veris Branch Circuit Monitors with Acquisuite

Use the Add a PDU function to add a Veris branch circuit monitor (BCM) connected to a Veris or Obvius Acquisuite modbus to Power IQ.

See **Adding PDUs to Power IQ Management** (on page 20).

Specify the following information when adding the Veris BCM to ensure Power IQ connects to the correct panel.

Field name in Add a PDU page	Modbus/BCM information
IP Address	IP address of the Acquisuite modbus.
Proxy Index REQUIRED	Device number of the BCM panel. Example: The device number of the panel as configured in the Acquisuite. This information can be found in the Acquisuite web client.

Each panel displays as a PDU with up to 42 outlets. Each branch displays as an outlet.

Each single-phase branch is monitored independently as a single-phase circuit.

Groupings into multi-phase circuits is not supported.

Adding PDUs Managed by Dominion SX

You can add PDUs that are managed by a Dominion SX serial console to Power IQ.

Specify the following information when adding the PDU to ensure Power IQ connects to the correct SX-managed PDU.

See **Adding PDUs to Power IQ Management** (on page 20).

Field name in Add a PDU page	Modbus/BCM information
IP Address	IP address of the Dominion SX
Proxy Index	Dominion SX port number that the PDU is connected to
PDU Administrative Credentials Username, Password, Password Confirm	Dominion SX username and password
SNMP fields	Leave blank.

Adding PDUs with Custom Dynamic Plugins

When adding a PDU that uses a custom dynamic plugin, use the same Add a PDU feature as any other addition. See **Adding PDUs to Power IQ Management** (on page 20).

When Power IQ detects that there is at least one custom dynamic plugin configured, a Plugin drop-down field displays.

- Automatic: Use Automatic to allow Power IQ to determine the correct plugin for the PDU you are adding. Automatic attempts to find an exact match between the PDU and the plugin for SysObjectID, PDU Model name, and Proxy ID.
 - If there is no exact match, but several dynamic plugins are eligible to manage the PDU, based on sysObjectID, then Power IQ selects from among the eligible plugins. If automatic mode does not select the desired dynamic plugin, delete the PDU and add it again, selecting the specific custom dynamic plugin from the list.
- Or, select the specific custom dynamic plugin from the list.

Adding Raritan PDUs in Port Forwarding Configuration

Raritan PDUs can be cascaded via USB cables to share an Ethernet connection. The first PDU in the chain is the master device, and all PDUs connected to it are slave devices. Power IQ only supports USB-cascading chains with a total of two PDUs: one master and one slave.

*Note: Only Raritan "PX2" and "PX3" PDU models support the USB-cascading feature. For details, see the USB-Cascading Solution Guide on the **PX2 web page** (<http://www.raritan.com/support/product/px2/>) of the Raritan website.*

Power IQ only supports Port Forwarding mode for USB-cascading chains. In Port Forwarding mode, all PDUs share one IP address.

Add master and slave PDUs in Port Forwarding mode the same way you add a standalone Raritan PDU. See **Adding PDUs to Power IQ Management** (on page 20).

Specify the following information when adding master and slave PDUs in Port Forwarding mode.

Field name in Add a PDU page	Master PDU	Slave PDU
IP Address	IP address of the master PDU	Same IP address as the master PDU
Proxy Index REQUIRED	1	2
External Key	Any unique entry different from the IP address	Any unique entry different from the IP address
PDU Administrative Credentials Username, Password, Password Confirm	The master PDU's credentials	The slave PDU's credentials
SNMP fields	The master PDU's SNMP strings	The slave PDU's SNMP strings

Bulk Configuration of Raritan PX PDUs

By leveraging Raritan PX's ability to create a backup of its configuration, Power IQ can configure additional PX PDUs of the same model type. This is helpful for large scale deployments.

This applies to Raritan PX version 1.2 and later, only.

Requirements for Bulk Configuration

Prerequisites for bulk configuration:

- Each PX must be of the same model type.

NOTE: For Raritan PX2's running firmware 2.5.30 or higher, the same bulk configuration file can be used on PDUs where the only differences are the length of the line cord (option A or L), the color of line cord (option B), or the PDU Color (option K).

- Each PX must have the same firmware version (1.2 or later).
- Each PX must be configured with an IP address and be under Power IQ management.
- A configuration backup file from a configured PX.

Plan a New Rollout

► To plan a new rollout:

1. In the PDUs tab, choose Activities > Bulk Configuration.
2. Click "Plan a new rollout." The bulk pdu configuration rollout planning wizard starts.
3. Enter a name for the plan and click Continue.

A summary of plan options appears at the top of the page. Continue adding details of your plan at the bottom of the page, or click the links in the summary list to add details.

4. In the Choose a PDU Configuration File section, you can add a new PX backup file or select a previously uploaded file. Configuration backup files are .XML files for PX2 configurations, and do not show a file extension for PX1 configurations.
 - To add a new file, click the Upload a New File tab, then click Browse to select the file. Enter comments. Click Upload. The file is automatically selected for the plan.
 - To select a previously uploaded file, click the Available Files tab, then select a file from the list, and click Continue.
5. All PX PDUs available for the rollout appear in a list. Select the checkboxes for the PDUs you want to configure, then click Selected PDUs to add them to the "PDUs selected for this plan" list at the bottom of the page. Or, click All PDUs to add all available PX PDUs to the list.
 - To remove PDUs from the plan, click Selected PDUs or All PDUs in the bottom list. Only PDUs in the bottom list will be configured.
6. Click Continue. Click the Plan Options link in the summary at top.
7. On the Plan Options page, edit the plan name, if needed, and set other preferences.

- a. Select the "Abort on failure" checkbox if you want Power IQ to cancel all remaining configurations in the plan if a configuration failure occurs. This could help prevent a configuration problem from affecting other Raritan PX PDUs in the plan.
 - b. Select the "Allow simultaneous rollouts" checkbox if you want Power IQ to configure multiple Raritan PX PDUs at once. This makes batch configurations faster by allowing up to 25 configurations to run at the same time.
8. Click Continue. Review the summary of the plan. Click Add Comment if you want add notes to the plan. Click Add or Remove PDUs if you want to edit the list of PDUs to configure.
 9. Click Save. The completed plan summary page opens.
 10. Click Start Rollout to execute the plan immediately. The rollout starts, and the status page displays. You can also execute the saved plan later. See **Execute Saved Configuration Plans** (see "**Execute a Saved Rollout Plan**" on page 33).
 - See **View Status of Rollout Plans in Progress** (on page 33) for details on checking rollouts in progress.
 - See **View Completed Rollout Plans** (on page 34) for details on checking completed rollouts.

View Saved Rollout Plans

View saved rollout plans to verify and edit their details before executing a plan.

► **To view saved rollout plans:**

1. In the PDUs tab, choose Activities > Bulk Configuration.
2. Click "View saved plans." All plans display in a list.
3. Click the Plan name link to view the details and edit if needed.

Edit a Saved Rollout Plan

Saved rollout plans can be edited to change details, add or remove PDUs, or change the configuration file.

You can only edit rollout plans that you created.

► **To edit a saved rollout plan:**

1. In the PDUs tab, choose Activities > View Status of Current Rollouts.
2. All plans display in a list. Click the Plan name's link to view the details.
3. Click the blue links in the plan summary to edit the plan. Or, scroll down to click Edit and use the wizard to edit.

See **Plan a New Rollout** (on page 31) for details of plan settings.

Execute a Saved Rollout Plan

► **To execute a saved configuration plan:**

1. In the PDUs tab, choose Activities > Bulk Configuration.
2. Click "View saved plans." All plans display in a list.
3. Click the Plan name link for the plan you want to execute.
4. Click Start Roll Out to execute the plan.
 - See **View Status of Rollout Plans in Progress** (on page 33) for details on checking rollouts in progress.
 - See **View Completed Rollout Plans** (on page 34) for details on checking completed rollouts.

Rollout Timing

Each PX PDU configuration takes approximately 30 seconds.

If you select "Allow simultaneous rollouts" in the plan options, 25 configurations will begin simultaneously, and each batch of 25 will take approximately 30 seconds.

View Status of Rollout Plans in Progress

Rollout plans in progress have 3 possible statuses.

- Init: Initializing to prepare the PDU for configuration
- Login: Logging in to the PDU
- Verify: Verifying the PDU is responsive after configuration is complete

► **To view status of upgrade plans in progress:**

The status page for plans in progress displays when you execute the plan. You can return to the status page at any time, even after the plan has finished.

1. In the PDUs tab, choose Activities > Bulk Configuration.
2. Click "View saved plans." All saved plans display in a list.
3. Click the Status link for the plan you executed to view the status page.

View Completed Rollout Plans

When a plan has been executed, you can view details of the plan status and results of each PDU included in the plan.

▶ **To view completed rollouts:**

1. In the PDUs tab, choose Activities > Bulk Configuration.
2. Click "View previously completed rollouts." All completed plans display in a list.
3. Click the Plan name link to view the details.
 - If the plan completed successfully, a success message displays at the top of the plan details.
 - The list of PDUs included in the plan includes a Success or Failure message.
 - Click the "View detailed upgrade status messages" link for more information about each PDU.

Manage Configuration Files

You can upload different configuration files for use in rollout plans, and view previously uploaded configurations.

Configuration files are .DAT files. Configuration files are created by backing up a Raritan PX.

▶ **To view uploaded configuration files:**

1. In the PDUs tab, choose Activities > Bulk Configuration.
2. Click Manage Configuration Files. The link is not available if you do not have any uploaded configuration files. The PDU Configuration Files page opens.
3. All configuration files previously uploaded appear in a list.

▶ **To delete a configuration file:**

- Select the checkbox for the configuration file you want to delete, then click Delete.

▶ **To upload a new configuration file:**

1. Scroll down to the Upload New Configuration File section.
2. Enter the model name that the file is for in the Model Name field.
3. Click Browse to select the .DAT file.

4. Click Upload. The file is added to the list and will be available to select when creating a new rollout plan. See **Plan a New Rollout** (on page 31).

PDU Outlet Naming and Setting System Attributes

Power IQ enables you to export all the current PDU Outlet and System Attribute names to a CSV file that you can edit, and then re-import new names. See **Naming Outlets in Bulk with CSV Files** (on page 36). Change individual names manually by clicking a field and editing. See **Naming Individual Outlets** (on page 35).

Raritan PDU outlet names can be up to 32 characters in length, with no character restrictions. See the manufacturer's specification for naming requirements for other brands of PDUs.

Note: PDUs must be configured in Power IQ with an SNMP community string that has write-level access to allow outlet naming.

The following PDUs have manufacturer limitations that affect renaming via SNMP: Outlet and system attribute naming is not available via SNMP for Avocent or Geist PDUs. Outlet naming via SNMP is not available for Tripp Lite PDUs or the Eaton Pulluzi model PDU. The standard Eaton model does support outlet naming. System attribute naming via SNMP is not available for Baytech PDUs. Names for Servertech PDUs cannot contain spaces.

Naming Individual Outlets

► **To name individual outlets:**

1. In the PDUs tab, click the link for a PDU to open the smart view.
2. Scroll down to the Outlets list.
3. Double-click the outlet name, then enter the new name in the field. Use only UTF-8 characters.
4. Press Enter to save the name.

The names are written back to the PDU. If you connect to the PDU directly, the outlets appear there with their new names.

Naming Outlets in Bulk with CSV Files

When you import an outlet name CSV file, Power IQ names the outlets according to the values in the file. The names are written back to the PDU. If you connect to the PDU directly, the outlets appear there with their new names.

For details on creating the outlet name CSV file, see **Structure of the Outlet Name CSV File** (on page 37).

► **To name outlets in bulk with CSV files:**

1. In the PDUs tab, choose Activities > Outlet Naming.
2. Click Browse, then select the CSV file.
3. Click Import.

Setting SNMP System Attributes for PDUs

In addition to naming the outlets of PDUs, this CSV file can be used to set three SNMP system attributes. These attributes are SYS_CONTACT, SYS_NAME and SYS_LOCATION. These settings are optional values in the CSV file.

- **SYS_CONTACT:** is used to identify a person to contact regarding the PDU. For example, the IT administrator.
- **SYS_NAME:** is used to set the name of the PDU.
- **SYS_LOCATION:** is used to describe where the PDU is located. For example, "Sales Rack - Server Closet 2."

Note: Setting SNMP system attributes is not available for Raritan PX versions lower than 1.3, Baytech, Eaton, Geist, Liebert, or Avocent PDUs. Leave these fields blank for those PDUs.

Structure of the Outlet Name CSV File

The CSV file used for outlet naming and setting SNMP system attributes uses the following structure. There is one PDU per line/row.

Use only UTF-8 characters.

Note: The following PDUs have manufacturer limitations that affect renaming via SNMP: Outlet and system attribute naming is not available via SNMP for Avocent or Geist PDUs. Outlet naming via SNMP is not available for Tripp Lite PDUs or the Eaton Pulluzi model PDU. The standard Eaton model does support outlet naming. System attribute naming via SNMP is not available for Baytech PDUs. Names for Servertech PDUs cannot contain spaces. Setting SNMP system attributes is not available for Raritan PX versions lower than 1.3, Baytech, Eaton, Geist, Liebert, or Avocent PDUs. Leave these fields blank for those PDUs.

- The first column is an IP address identifying a PDU.
- The second column is the Proxy Index value. Leave this value blank if the PDU does not support or is not using this configuration. You cannot change the Proxy Index value via CSV import. See **Proxy Index Details** (on page 27).
- The third column is the SNMP SYS_CONTACT value. **Optional.**
- The fourth column is for the SNMP SYS_NAME value. **Optional.**
- The fifth column is for the SNMP SYS_LOCATION value. **Optional.**
- Each value/column following the SYS_LOCATION represents an outlet on that PDU. Outlets start at 1 and increase sequentially with each column.

These values indicate only what is changed by the naming operation:

- If an IP address does not appear in the file, no naming operations occur on that PDU.
- If an outlet value is blank, its name does not change.

For example:

```
192.168.77.102,,Michael,Test PX2,RACK1,KVMSwitch1,KVMSwitch2,,Sales FTP Server
```

A PDU at 192.168.77.102 would receive the system name "Test PX2". Its first outlet would be renamed to "KVMSwitch1" and its second outlet renamed to "KVMSwitch2." The third outlet would not be renamed. The fourth outlet would be renamed to "Sales FTP Server."

Exporting Outlet Names to a CSV File

You can export the outlet names in Power IQ to a CSV file.

You can edit the file to change outlet names, then import it. See **Naming Outlets in Bulk with CSV Files** (on page 36).

Note: The following PDUs have manufacturer limitations that affect renaming via SNMP: Outlet and system attribute naming is not available via SNMP for Avocent or Geist PDUs. Outlet naming via SNMP is not available for Tripp Lite PDUs or the Eaton Pulluzi model PDU. The standard Eaton model does support outlet naming. System attribute naming via SNMP is not available for Baytech PDUs. Names for Servertech PDUs cannot contain spaces. Setting SNMP system attributes is not available for Raritan PX versions lower than 1.3, Baytech, Eaton, Geist, Liebert, or Avocent PDUs. Leave these fields blank for those PDUs.

► **To export outlet names to a CSV file:**

1. In the PDUs tab, choose Activities > Outlet Naming.
2. Click the export link.

Bulk Change PDU IP Addresses

You can update the IP addresses of multiple PDUs, including facilities objects such as Floor PDUs, Floor UPS, Power Panels, and so on, using a CSV import. This is useful if you need to repartition a network and move PDUs from one subnet to another.

Power IQ will report lost connectivity events until the systems are aligned after the bulk IP address change is complete.

Polling will be interrupted by the bulk IP address change.

The CSV file is validated at import:


- IP addresses must be properly formatted.
- Existing IP addresses cannot be reused as new IP addresses.
- If the existing IP address in your CSV file is not found in Power IQ, that change is rejected.
- New IP addresses that already exist in Power IQ are rejected.

► **To bulk change PDU IP addresses:**

1. Create the CSV import file. See **Bulk Change PDU IP Address File Requirements** (on page 39).
2. In the PDUs tab, choose Activities > Import IP Address Changes.
3. Click Browse, then select the CSV file.

4. Click Begin Import. A progress bar displays.
 - If all changes are successful, Power IQ redirects to the PDUs list.
 - If any changes fail, the errors are listed in the Import page, and **nothing is imported**. Correct the errors in the file, and try the import again.

Upload new PDU IP addresses

CSV File: 

ERRORS IN CSV FILE

Line: 2 - Source IP Address 192.168.47.241 does not exist in system.

192.168.47.241,192.168.45.241

Line: 3 - Source IP Address 192.168.47.242 does not exist in system.

192.168.47.242,192.168.45.242

Line: 4 - Source IP Address 192.168.47.243 does not exist in system.

192.168.47.243,192.168.45.243

Line: 5 - Source IP Address 192.168.47.244 does not exist in system.

192.168.47.244,192.168.45.244


Bulk Change PDU IP Address File Requirements

The CSV import file for changing PDU IP address should follow this format.

Column 1	Column 2
Old IP address	New IP address

To help you create the CSV file, you can export your PDU IP addresses from Power IQ, then edit the file to prepare it for import.

► **To export IP addresses:**

1. In the PDUs tab, make sure the IP column is visible.
 - To display the IP column, click any column header, then click Columns, and select the IP checkbox. The column displays.
2. In the PDUs tab, click the Export/Save icon  in the upper right corner of the grid.

Save or open the file using the dialog that appears.
3. Edit the exported file to contain only the old IP addresses in column 1, and the new IP addresses in column 2.
4. Save the file as .CSV.

Configuring Proxy Connections to Power IQ

If network restrictions prevent some users from connecting directly to Power IQ®, they may need access through a proxy server that is authorized to make the connection. Check your firewall and security settings to ensure that communication between the proxy server and Power IQ is allowed.

► **To configure proxy connections to Power IQ:**

1. In the Settings tab, click Server Settings in the Application Administration section.
2. In the Proxy Configuration section, select the web protocol the proxy server communicates over, HTTP or HTTPS.
3. Enter the IP address of the proxy server in the Proxy Host field. Power IQ only accepts proxy communication from this address.
4. Enter the communications port the proxy server uses in the Proxy Port field.
5. If the proxy server is required to authenticate with Power IQ, select Yes in the Authentication Required field, and enter a Username and Password. These fields must use a valid Power IQ username and password combination.
6. Click Save Proxy Settings.

Configuring PDU Display Settings - View PDUs by IP or Name

Select whether you want all PDUs in the system to be identified by PDU name or IP address in the Settings tab. This setting affects all pages where PDUs are listed, and is used in email notifications when identifying PDUs. This setting applies to all users in the system.

PDU names are retrieved from the PDU, via SNMP, NOT from the network. PDU name is not guaranteed to be unique. If a PDU name is not available, the PDU label is set to "Unnamed" and the IP address is included.

The PDU display setting affects the Quick Search feature. If IP address is selected in the display settings, you can search PDUs by either name or IP address. If PDU name is selected, only searching by PDU name is permitted. Devices can always be searched by either name or IP address regardless of the PDU display preference. See **Search for PDUs** (see "**Search for PDUs and Devices**" on page 181).

► **To configure PDU display settings:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.

- In the Display Settings box, select Show PDU IP Address or Show PDU Name, then click Save Display Settings.

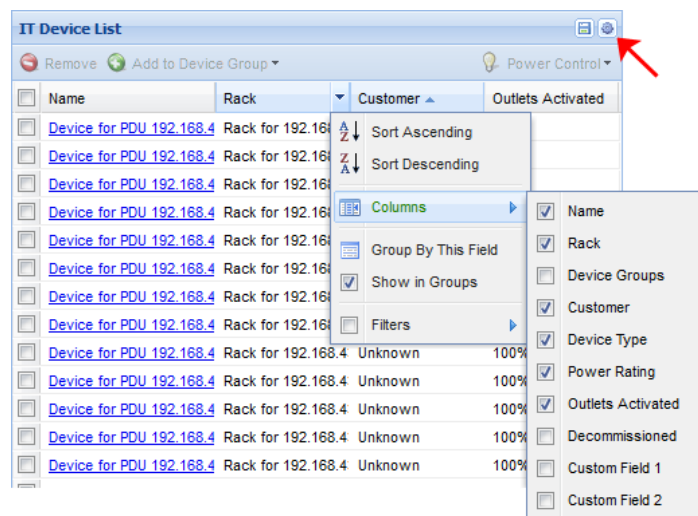
Customizing Your View of PDUs, Devices, and Events

Each user can save their own customized views of PDU, Device and Events lists in Power IQ. Once you save a customized view, it is retained even if you leave the tab and return, or use a different browser or client.

Note: If you open the PDU list by clicking on a health chart, your view will be filtered by the chart. For example, click the red bar of a health chart to view only the PDUs with red health status.

► To customize your view of PDUs, Devices and Events:

- In the PDUs, Devices, or Events tab, drag and drop columns to customize your view. Hover the mouse on a column heading then click the arrow to view a drop-down list of other options. You can hide or show each column, set the ascending or descending order of data, or enter a search term to filter the column to include only items that match the search term.
 - See **Filter the Events List** (on page 70).
 - See **Filter the PDUs List** (on page 178).
- Click the Panel Options button in the upper right corner of the list view, then select Save Current Grid Configuration to save your view.



► To return to the default view:

- In the PDUs, Devices or Events tab, click the Panel Options button in the upper right corner of the list view, then select Use Default Grid Configuration.

Chapter 5 **Configuring Event Management**

Power IQ can receive SNMP traps from supported PDUs and display them as events. You can also set power thresholds for racks based on capacity, and Power IQ will generate events when the thresholds are exceeded. See **Rack Thresholds** (on page 67).

You can also enable notifications, so that Power IQ sends an email message for specific events.

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User Permissions for Event Management

You must have the Event Manager role to view the Events tab. See **Assign Roles to a User** (on page 86).

Prepare PDUs for Power IQ Event Management

Power IQ receives and displays supported events in the Events tab, and sends notifications if enabled.

You must configure PDUs to send the supported SNMP traps to Power IQ. SNMP v1 and SNMP v2 trap types are supported. See **Supported Events** (on page 43).

PDU trap names differ by vendor, so Power IQ maps the trap names to common event names to highlight the common traps across PDUs.

Supported Events

Power IQ supports SNMP traps from the following vendors, and converts the traps into Power IQ events. See the vendor name for supported events.

- **APC** (see "**APC Supported Events**" on page 43)
- **APC Netbotz** (see "**APC Netbotz Supported Events**" on page 44)
- **Aphel** (see "**Aphel Supported Events**" on page 45)
- **Avocent** (see "**Avocent Supported Events**" on page 45)
- **Baytech** (see "**Baytech Supported Events**" on page 46)
- **Cyberswitching** (see "**Cyberswitching Supported Events**" on page 47)
- **Geist** (see "**Geist Supported Events**" on page 47)
- **Geist EM** (see "**Geist EM Supported Events**" on page 48)
- **Geist V3** (see "**Geist V3 Supported Events**" on page 49)
- **Hewlett Packard** (see "**Hewlett Packard Supported Events**" on page 51)
- **Knurr** (see "**Knurr Supported Events**" on page 52)
- **Liebert** (see "**Liebert Supported Events**" on page 54)
- **MRV** (see "**MRV Supported Events**" on page 54)
- **Raritan PX/PX2/PX3** (see "**Raritan PX/PX2/PX3 Supported Events**" on page 55)
- **Rittal** (see "**Rittal Supported Events**" on page 63)
- **Servotech** (see "**Servotech Supported Events**" on page 65)

APC Supported Events

APC Supported Events		
Event description	Trap name	Common event name
Underload Threshold	rPDULowLoad	inletCurrentLowerWarning
Underload Condition Cleared	rPDULowLoadCleared	inletCurrentLowerWarningClear
Low Overload Threshold	rPDUNearOverload	inletCurrentUpperWarning
Low Overload Threshold cleared	rPDUNearOverloadCleared	inletCurrentUpperWarningClear
Overload Threshold	rPDUOverload	inletCurrentUpperCritical
Overload Threshold cleared	rPDUOverloadCleared	inletCurrentUpperCriticalClear
Outlet Turned on	rPDUOutletOn	outletPowerOn
Outlet Turned off	rPDUOutletOff	outletPowerOff

APC Supported Events		
Event description	Trap name	Common event name
High temperature threshold violated on the probe	envHighTempThresholdViolation	envTemperatureUpperCritical
High temperature threshold violation cleared on the probe	envHighTempThresholdViolationCleared	envTemperatureUpperCriticalClear
Low temperature threshold violated on the probe	envLowTempThresholdViolation	envTemperatureLowerCritical
Low temperature threshold violation cleared on the probe	envLowTempThresholdViolationCleared	envTemperatureLowerCriticalClear
High humidity threshold violated on the probe	envHighHumidityThresholdViolation	envHumidityUpperCritical
High humidity threshold violation cleared on the probe	envHighHumidityThresholdViolationCleared	envHumidityUpperCriticalClear
Low humidity threshold violated on the probe	envLowHumidityThresholdViolation	envHumidityLowerCritical
Low humidity threshold violation cleared on the probe	envLowHumidityThresholdViolationCleared	envHumidityLowerCriticalClear

APC Netbotz Supported Events

APC Netbotz Supported Events		
Event description	Trap name	Common event name
Temp Env Sensor High Threshold	netBotzTempTooHigh	envTemperatureUpperCritical
Temp Env Sensor High Threshold Cleared	netBotzTempTooHighRTN	envTemperatureUpperCriticalClear
Temp Env Sensor Low Threshold	netBotzTempTooLow	envTemperatureLowerCritical
Temp Env Sensor Low Threshold Cleared	netBotzTempTooLowRTN	envTemperatureLowerCriticalClear
Humidity Env Sensor High Threshold	netBotzHumidityTooHigh	envHumidityUpperCritical
Humidity Env Sensor High Threshold Cleared	netBotzHumidityTooHighRTN	envHumidityUpperCriticalClear

APC Netbotz Supported Events

Event description	Trap name	Common event name
Humidity Env Sensor Low Threshold	netBotzHumidityTooLow	envHumidityLowerCritical
Humidity Env Sensor Low Threshold Cleared	netBotzHumidityTooLowRTN	envHumidityLowerCriticalClear

APC Transfer Switch Supported Events**APC Transfer Switch Supported Events**

Event description	Trap name	Common event name
Transfer Switch Active Inlet Changed	atsSourceSwitched	transferSwitchActiveInletChangedCritical transferSwitchActiveInletChangedWarning
Transfer Switch Operating State Change	atsLostRedundancy atsLostRedundancy atsRedundancyRestored	transferSwitchOperatingStateNonRedundant transferSwitchOperatingStateStandby transferSwitchOperatingStateNormal

Aphel Supported Events**Aphel Supported Events**

Event description	Trap name	Common event name
Inlet Current Upper Critical Threshold	ampsCT1TRAP ampsCT8TRAP	inletCurrentUpperCritical

Avocent Supported Events**Avocent Supported Events**

Event description	Trap name	Common event name
Outlet Turned on	avctPmOutletStatusOnTrap avctPmOutletCmdOnTrap	outletPowerOn

Avocent Supported Events		
Event description	Trap name	Common event name
Outlet Turned off	avctPmOutletStatusOffTrap avctPmOutletCmdOffTrap	outletPowerOff
Inlet Current Upper Critical Threshold	avctPmPduMaxLoadHighTrap	inletCurrentUpperCritical
Inlet Current Upper Critical Threshold Cleared	avctPmPduMaxLoadBackTrap	inletCurrentUpperCriticalClear
Inlet Current Low Critical Threshold	avctPmPduMinLoadLowTrap	inletCurrentLowerCritical
Inlet Current Low Critical Threshold Cleared	avctPmPduMaxLoadBackTrap	inletCurrentLowerCriticalClear
Inlet Current Upper Warning Threshold	avctPmPduWarnLoadTrap	inletCurrentUpperWarning
Inlet Current Upper Warning Threshold Cleared	avctPmPduMaxLoadBackTrap	inletCurrentUpperWarningClear

Baytech Supported Events

Baytech Supported Events		
Event description	Trap name	Common event name
Outlet Turned on	outletOn	outletPowerOn
Outlet Turned off	outletOff	outletPowerOff
Inlet Current Upper Critical Threshold	currentThresholdViolation	inletCurrentUpperCritical
Inlet Current Upper Critical Threshold Cleared	currentThresholdViolationCleared	inletCurrentUpperCriticalClear
Inlet Current Low Critical Threshold	currentUnderThresholdViolation	inletCurrentLowerCritical
Inlet Current Low Critical Threshold Cleared	currentUnderThresholdViolationCleared	inletCurrentLowerCriticalClear
Inlet Voltage Upper Critical Threshold	voltageOverThresholdViolation	inletVoltageUpperCritical
Inlet Voltage Upper Critical Threshold Cleared	voltageOverThresholdViolationCleared	inletVoltageUpperCriticalClear

Baytech Supported Events		
Event description	Trap name	Common event name
Inlet Voltage Lower Critical Threshold	voltageUnderThresholdViolation	inletVoltageLowerCritical
Inlet Voltage Lower Critical Threshold Cleared	voltageUnderThresholdViolationCleared	inletVoltageLowerCriticalCleared
Circuit Breaker Tripped	circuitBreakerAlarm	cbTripped
Circuit Breaker Recovered	circuitBreakerAlarmClearTrap	cbRecovered
Temp Env Sensor High Threshold	sensorTempThreshHiAlarmTrap	envTemperatureUpperCritical
Temp Env Sensor High Threshold Cleared	sensorTempThreshHiAlarmClearedTrap	envTemperatureUpperCriticalCleared
Temp Env Sensor Low Threshold	sensorTempThreshLoAlarmTrap	envTemperatureLowerCritical
Temp Env Sensor Low Threshold Cleared	sensorTempThreshLoAlarmClearedTrap	envTemperatureLowerCriticalCleared

Cyberswitching Supported Events

Cyberswitching Supported Events		
Event description	Trap name	Common event name
Inlet Current Upper Critical Threshold	tricomG2UnitCurrentCritical	inletCurrentUpperCritical
Inlet Current Upper Warning Threshold	tricomG2UnitCurrentWarning	inletCurrentUpperWarning
Outlet Current Upper Warning Threshold	tricomG2OutletHighCurrentWarning	outletCurrentUpperWarning
Outlet Current Lower Warning Threshold	tricomG2OutletLowCurrentWarning	outletCurrentLowerWarning
Circuit Breaker Tripped	tricomG2OutletTripped	cbTripped

Geist Supported Events

Geist Supported Events		
Event description	Trap name	Common event name
Inlet Current Upper Critical Threshold	totalDeciAmpsPhaseATRAP totalDeciAmpsPhaseBTRAP totalDeciAmpsPhaseCTRAP	inletCurrentUpperCritical
Inlet Current Upper Critical Threshold Cleared		inletCurrentUpperCriticalClear
Circuit Breaker Current Upper Critical Threshold	outlet1ADeciAmpsTRAP outlet12CDeciAmpsTRAP	CBCurrentUpperCritical
Circuit Breaker Current Upper Critical Threshold Cleared		CBCurrentUpperCriticalClear
Outlet Current Upper Critical Threshold	outlet1ADeciAmpsTRAP outlet12CDeciAmpsTRAP	OutletCurrentUpperCritical
Outlet Current Upper Critical Threshold Cleared		OutletCurrentUpperCriticalClear

Geist EM Supported Events

Geist EM Supported Events		
Event description	Trap name	Common event name
Circuit Breaker Current Threshold Warning Event	mainChannelDeciAmps01WARN mainChannelDeciAmps07WARN	
Circuit Breaker Current Threshold Critical Event	mainChannelDeciAmps01ALARM mainChannelDeciAmps07ALARM	
Outlet Current Threshold Warning Event	auxChannelDeciAmps01WARN auxChannelDeciAmps32WARN outlet1AB-1DeciAmpsWarningTRAP outlet24CA-8DeciAmpsWarningTRAP	OutletCurrentUpperCritical
Outlet Current Threshold Warning Event Cleared		

Geist EM Supported Events		
Event description	Trap name	Common event name
Outlet Current Threshold Critical Event	auxChannelDeciAmps01ALARM auxChannelDeciAmps32ALARM outlet1AB-1DeciAmpsTRAP outlet24CA-8DeciAmpsTRAP	OutletCurrentUpperCritical
Outlet Current Threshold Critical Event Cleared		OutletCurrentUpperCriticalClear
Phase Current Threshold Warning Event	totalDeciAmpsPhaseAWarningTRAP totalDeciAmpsPhaseCWarningTRAP	inletCurrentUpperWarning
Phase Current Threshold Warning Event Cleared		inletCurrentUpperWarningClear
Phase Current Threshold Critical Event	totalDeciAmpsPhaseATRAP totalDeciAmpsPhaseCTRAP	inletCurrentUpperCritical
Phase Current Threshold Critical Event Cleared		inletCurrentUpperCriticalClear

Geist V3 Supported Events

Geist V3 Supported Events		
Event description	Trap name	Common event name
Temperature Threshold High Violation	gstTempSensorTempCNOTIFY gstTempSensorTempFNOTIFY gstClimateTempCNOTIFY gstClimateTempFNOTIFY (alarmTripType = 2)	
Temperature Threshold Low Violation	gstTempSensorTempCNOTIFY gstTempSensorTempFNOTIFY gstClimateTempCNOTIFY gstClimateTempFNOTIFY (alarmTripType = 1)	

Geist V3 Supported Events		
Event description	Trap name	Common event name
Temperature Threshold Clear	gstTempSensorTempCNOTIFY gstTempSensorTempFNOTIFY gstClimateTempCNOTIFY gstClimateTempFNOTIFY (alarmTripType = 0)	
Humidity Threshold High Violation	gstClimateHumidityNOTIFY (alarmTripType = 2)	
Humidity Threshold Low Violation	gstClimateHumidityNOTIFY (alarmTripType =)1	
Humidity Threshold Clear	gstClimateHumidityNOTIFY (alarmTripType = 0)	
Outlet Current Threshold High Violation	gstCtrlOutletDeciAmpsNOTIFY (alarmTripType = 2)	
Outlet Current Threshold Low Violation -	gstCtrlOutletDeciAmpsNOTIFY (alarmTripType = 1)	
Outlet Current Threshold Violation Clear	gstCtrlOutletDeciAmpsNOTIFY (alarmTripType = 0)	

Geist RCX Supported Events

Geist RCX Supported Events		
Event description	Trap name	Common event name
Ctrl3ChDELTAdeciAmpsA = Three Phase Inlet Phase A Current	gstCtrl3ChDELTAdeciAmpsANOTIFY (10606)	
Ctrl3ChDELTAdeciAmpsB = Three Phase Inlet Phase B Current	gstCtrl3ChDELTAdeciAmpsBNOTIFY (10607)	
Ctrl3ChDELTAdeciAmpsC = Three Phase Inlet Phase C Current	gstCtrl3ChDELTAdeciAmpsCNOTIFY (10608)	
Pow3ChDeciAmpsA = Three Phase Inlet Phase A Current	gstPow3ChDeciAmpsANOTIFY (11110)	
Pow3ChDeciAmpsB = Three Phase Inlet Phase B Current	gstPow3ChDeciAmpsBNOTIFY (11119)	
Pow3ChDeciAmpsC = Three Phase Inlet Phase C Current	gstPow3ChDeciAmpsCNOTIFY (11128)	
Ctrl3ChIECDeciAmpsA =Three Phase Inlet Phase A Current	gstCtrl3ChIECDeciAmpsANOTIFY (12508)	
Ctrl3ChIECDeciAmpsB =Three Phase Inlet Phase B Current	gstCtrl3ChIECDeciAmpsBNOTIFY (12516)	
Ctrl3ChIECDeciAmpsC =Three Phase Inlet Phase C Current	gstCtrl3ChIECDeciAmpsCNOTIFY (12524)	

Hewlett Packard Supported Events

Hewlett Packard Supported Events		
Event description	Trap name	Common event name
Voltage High Critical	trapCritical	inletOverVoltageCritical
Voltage High Critical Clear	trapCleared	inletOverVoltageCriticalClear
Voltage Low Critical	trapCritical	inletUnderVoltageCritical
Voltage Low Critical Clear	trapCleared	inletUnderVoltageCriticalClear
Current Critical	trapCritical	inletOverCurrentCritical

Hewlett Packard Supported Events		
Event description	Trap name	Common event name
Current Critical Clear	trapCleared	inletOverCurrentCriticalClear
Voltage High Warning	trapWarning	inletOverVoltageWarning
Voltage High Warning Clear	trapCleared	inletOverVoltageWarningClear
Voltage Low Warning	trapWarning	inletUnderVoltageWarning
Voltage Low Warning Clear	trapCleared	inletUnderVoltageWarningClear
Current Warning	trapWarning	inletOverCurrentWarning
Current Warning Clear	trapCleared	inletOverCurrentWarningClear

Knurr Supported Events

Knurr Supported Events		
Event description	Trap name	Common event name
Inlet Pole Current Upper Warning Threshold	pdu-M1TrapPreWarnPh1 pdu-M1TrapPreWarnPh2 pdu-M1TrapPreWarnPh3 pdu-M2TrapPreWarnPh1 pdu-M2TrapPreWarnPh2 pdu-M2TrapPreWarnPh3 pdu-M3TrapPreWarnPh1 pdu-M3TrapPreWarnPh2 pdu-M3TrapPreWarnPh3 pdu-M4TrapPreWarnPh1 pdu-M4TrapPreWarnPh2 pdu-M4TrapPreWarnPh3	inletOverCurrentWarning
Inlet Pole Current Upper Critical Threshold	pdu-M1TrapAlarmPh1 pdu-M1TrapAlarmPh2 pdu-M1TrapAlarmPh3 pdu-M2TrapAlarmPh1 pdu-M2TrapAlarmPh2 pdu-M2TrapAlarmPh3	inletOverCurrentCritical

Knurr Supported Events		
Event description	Trap name	Common event name
	pdu-M3TrapAlarmPh1 pdu-M3TrapAlarmPh2 pdu-M3TrapAlarmPh3 pdu-M4TrapAlarmPh1 pdu-M4TrapAlarmPh2 pdu-M4TrapAlarmPh3	
Inlet Pole Current Lower Warning Threshold	pdu-M1TrapInfoPh1 pdu-M1TrapInfoPh2 pdu-M1TrapInfoPh3 pdu-M2TrapInfoPh1 pdu-M2TrapInfoPh2 pdu-M2TrapInfoPh3 pdu-M3TrapInfoPh1 pdu-M3TrapInfoPh2 pdu-M3TrapInfoPh3 pdu-M4TrapInfoPh1 pdu-M4TrapInfoPh2 pdu-M4TrapInfoPh3	inletUnderCurrentWarning
Inlet Pole Current Threshold Clear - All	pdu-M1TrapRetToNormPh1 pdu-M1TrapRetToNormPh2 pdu-M1TrapRetToNormPh3 pdu-M2TrapRetToNormPh1 pdu-M2TrapRetToNormPh2 pdu-M2TrapRetToNormPh3 pdu-M3TrapRetToNormPh1 pdu-M3TrapRetToNormPh2 pdu-M3TrapRetToNormPh3 pdu-M4TrapRetToNormPh1 pdu-M4TrapRetToNormPh2 pdu-M4TrapRetToNormPh3	inletOverCurrentWarningClear inletOverCurrentCriticalClear inletUnderCurrentWarningClear

Knurr Supported Events		
Event description	Trap name	Common event name
Inlet Unbalanced Current Upper Warning Threshold	pdu-M1TrapOutOfBal pdu-M2TrapOutOfBal pdu-M3TrapOutOfBal pdu-M4TrapOutOfBal	inletOverUnbalancedCurrentWarning

Note: Power IQ only supports SNMPv2 traps of Knurr PDUs as of release 4.3.0.

Liebert Supported Events

Liebert Supported Events		
Event description	Trap name	Common event name
Outlet turned on	lgpEventRcpPowerStateChangeOn	outletPowerOn
Outlet turned off	lgpEventRcpPowerStateChangeOff	outletPowerOff

MRV Supported Events

MRV Supported Events		
Event description	Trap name	Common event name
Temp Env Sensor High Threshold	irTempHighTholdAlarmRaised	envTemperatureUpperCritical
Temp Env Sensor High Threshold Cleared	irTempHighTholdAlarmCleared	envTemperatureUpperCriticalClear
Temp Env Sensor Low Threshold	irTempLowTholdAlarmRaised	envTemperatureLowerCritical
Temp Env Sensor Low Threshold Cleared	irTempLowTholdAlarmCleared	envTemperatureLowerCriticalClear
Humidity Env Sensor High Threshold	irHumidityHighTholdAlarmRaised	envHumidityUpperCritical
Humidity Env Sensor High Threshold Cleared	irHumidityHighTholdAlarmCleared	envHumidityUpperCriticalClear
Humidity Env Sensor Low Threshold	irHumidityLowTholdAlarmRaised	envHumidityLowerCritical

MRV Supported Events		
Event description	Trap name	Common event name
Humidity Env Sensor Low Threshold Cleared	irHumidityLowTholdAlarmCleared	envHumidityUpperCriticalClear

Raritan PX/PX2/PX3 Supported Events

Some Raritan PX models support Event Rules, so that you can specify which events will be sent to Power IQ.

Set up rules to reduce the number of traps sent to Power IQ. Optional.

Once rules are created, associate the rule with the SNMP Trap Action, with Power IQ as the trap destination.

See Event Rules or Actions in the Raritan PX User Guide.

Note: Model numbers that begin with "PX2" support Event Rules.

Raritan PX Supported Events		
Event description	Trap name	Common event name
Peak Current	inletSensorStateChange	inletOverPeakCurrentCriticalClear inletOverPeakCurrentCritical inletOverPeakCurrentWarningClear inletOverPeakCurrentWarning inletUnderPeakCurrentCriticalClear inletUnderPeakCurrentCritical inletUnderPeakCurrentWarningClear inletUnderPeakCurrentWarning inletPeakCurrentSensorUnavailable InletPeakCurrentSensorUnavailableClear
Unbalanced Current	inletSensorStateChange	inletOverUnbalancedCurrentCriticalClear InletOverUnbalancedCurrentCritical inletOverUnbalancedCurrentWarningClear inletOverUnbalancedCurrentWarning inletUnderUnbalancedCurrentCriticalClear inletUnderUnbalancedCurrentCritical

Raritan PX Supported Events		
Event description	Trap name	Common event name
		inletUnderUnbalancedCurrentWarningClear inletUnderUnbalancedCurrentWarning inletUnbalancedCurrentSensorUnavailable
Active Power	inletSensorStateChange	inletOverActivePowerCriticalClear inletOverActivePowerCritical inletOverActivePowerWarningClear inletOverActivePowerWarning inletUnderActivePowerCriticalClear inletUnderActivePowerCritical inletUnderActivePowerWarningClear inletUnderActivePowerWarning inletActivePowerSensorUnavailable InletActivePowerSensorUnavailableClear
Apparent Power	inletSensorStateChange	inletOverApparentPowerCriticalClear inletOverApparentPowerCritical inletOverApparentPowerWarningClear inletOverApparentPowerWarning inletUnderApparentPowerCriticalClear inletUnderApparentPowerCritical inletUnderApparentPowerWarningClear inletUnderApparentPowerWarning InletApparentPowerSensorUnavailable

Raritan PX Supported Events		
Event description	Trap name	Common event name
Power Factor	inletSensorStateChange	inletOverPowerFactorCriticalClear inletOverPowerFactorCritical inletOverPowerFactorWarningClear inletOverPowerFactorWarning inletUnderPowerFactorCriticalClear inletUnderPowerFactorCritical inletUnderPowerFactorWarningClear inletUnderPowerFactorWarning inletPowerFactorSensorUnavailable InletPowerFactorSensorUnavailableClear
Frequency	inletSensorStateChange	inletOverFrequencyCriticalClear inletOverFrequencyCritical inletOverFrequencyWarningClear inletOverFrequencyWarning inletUnderFrequencyCriticalClear inletUnderFrequencyCritical inletUnderFrequencyWarningClear inletUnderFrequencyWarning inletFrequencySensorUnavailable InletFrequencySensorUnavailableClear
Phase Angle	inletSensorStateChange	inletOverPhaseAngleCriticalClear inletOverPhaseAngleCritical inletOverPhaseAngleWarningClear inletOverPhaseAngleWarning inletUnderPhaseAngleCriticalClear inletUnderPhaseAngleCritical inletUnderPhaseAngleWarningClear inletUnderPhaseAngleWarning inletPhaseAngleSensorUnavailable InletPhaseAngleSensorUnavailableClear

Raritan PX Supported Events		
Event description	Trap name	Common event name
Residual Current	inletSensorStateChange	inletOverResidualCurrentCriticalClear inletOverResidualCurrentCritical inletOverResidualCurrentWarningClear inletOverResidualCurrentWarning inletUnderResidualCurrentCriticalClear inletUnderResidualCurrentCritical inletUnderResidualCurrentWarningClear InletUnderResidualCurrentWarning
Power Quality	inletSensorStateChange	powerQualityUnavailable powerQualityUnavailableClear powerQualityWarning powerQualityWarningClear powerQualityCritical PowerQualityCriticalClear
Voltage Line to Neutral	InletPoleSensorStateChange	inletOverVoltageLnCriticalClear inletOverVoltageLnCritical inletOverVoltageLnWarningClear inletOverVoltageLnWarning inletUnderVoltageLnCriticalClear inletUnderVoltageLnCritical inletUnderVoltageLnWarningClear inletUnderVoltageLnWarning inletVoltageLnSensorUnavailable InletVoltageLnSensorUnavailableClear
Peak Current	outletSensorStateChange	outletOverPeakCurrentCriticalClear outletOverPeakCurrentCritical outletOverPeakCurrentWarningClear outletOverPeakCurrentWarning outletUnderPeakCurrentCriticalClear outletUnderPeakCurrentCritical

Raritan PX Supported Events		
Event description	Trap name	Common event name
		outletUnderPeakCurrentWarningClear outletUnderPeakCurrentWarning outletPeakCurrentSensorUnavailable OutletPeakCurrentSensorUnavailableClear
Unbalanced Current	outletSensorStateChange	outletOverUnbalancedCurrentCriticalClear outletOverUnbalancedCurrentCritical outletOverUnbalancedCurrentWarningClear outletOverUnbalancedCurrentWarning outletUnderUnbalancedCurrentCriticalClear outletUnderUnbalancedCurrentCritical outletUnderUnbalancedCurrentWarningClear outletUnderUnbalancedCurrentWarning outletUnbalancedCurrentSensorUnavailable OutletUnbalancedCurrentSensorUnavailableClear
Active Power	outletSensorStateChange	outletOverActivePowerCriticalClear outletOverActivePowerCritical outletOverActivePowerWarningClear outletOverActivePowerWarning outletUnderActivePowerCriticalClear outletUnderActivePowerCritical outletUnderActivePowerWarningClear outletUnderActivePowerWarning outletActivePowerSensorUnavailable OutletActivePowerSensorUnavailableClear
Apparent Power	outletSensorStateChange	outletOverApparentPowerCriticalClear

Raritan PX Supported Events		
Event description	Trap name	Common event name
		outletOverApparentPowerCritical outletOverApparentPowerWarningClear outletOverApparentPowerWarning outletUnderApparentPowerCriticalClear outletUnderApparentPowerCritical outletUnderApparentPowerWarningClear outletUnderApparentPowerWarning outletApparentPowerSensorUnavailable OutletApparentPowerSensorUnavailableClear
Power Factor	outletSensorStateChange	inletOverPowerFactorCriticalClear inletOverPowerFactorCritical inletOverPowerFactorWarningClear inletOverPowerFactorWarning inletUnderPowerFactorCriticalClear inletUnderPowerFactorCritical inletUnderPowerFactorWarningClear inletUnderPowerFactorWarning inletPowerFactorSensorUnavailable InletPowerFactorSensorUnavailableClear
Frequency	outletSensorStateChange	outletOverPowerFactorCriticalClear outletOverPowerFactorCritical outletOverPowerFactorWarningClear outletOverPowerFactorWarning outletUnderPowerFactorCriticalClear outletUnderPowerFactorCritical outletUnderPowerFactorWarningClear outletUnderPowerFactorWarning outletPowerFactorSensorUnavailable

Raritan PX Supported Events		
Event description	Trap name	Common event name
		OutletPowerFactorSensorUnavailableClear
Phase Angle	outletSensorStateChange	outletOverPhaseAngleCriticalClear outletOverPhaseAngleCritical outletOverPhaseAngleWarningClear outletOverPhaseAngleWarning outletUnderPhaseAngleCriticalClear outletUnderPhaseAngleCritical outletUnderPhaseAngleWarningClear outletUnderPhaseAngleWarning outletPhaseAngleSensorUnavailable OutletPhaseAngleSensorUnavailableClear
Voltage Line to Neutral	outletPoleSensorStateChange	outletOverVoltageLnCriticalClear outletOverVoltageLnCritical outletOverVoltageLnWarningClear outletOverVoltageLnWarning outletUnderVoltageLnCriticalClear outletUnderVoltageLnCritical outletUnderVoltageLnWarningClear outletUnderVoltageLnWarning outletVoltageLnSensorUnavailable OutletVoltageLnSensorUnavailableClear
Outlet Power State On/Off	outletSensorStateChange	outletPowerStateUnavailable outletPowerStateUnavailableClear outletPowerStateOff outletPowerStateOffClear outletPowerStateOn OutletPowerStateOnClear

Raritan PX Supported Events		
Event description	Trap name	Common event name
Circuit Breaker Peak Current	overCurrentProtectorSensorStateChange	cbOverPeakCurrentCriticalClear cbOverPeakCurrentCritical cbOverPeakCurrentWarningClear cbOverPeakCurrentWarning cbUnderPeakCurrentCriticalClear cbUnderPeakCurrentCritical cbUnderPeakCurrentWarningClear cbUnderPeakCurrentWarning cbPeakCurrentSensorUnavailable CbPeakCurrentSensorUnavailableClear

Raritan EMX Supported Events

Raritan EMX Supported Events		
Event description	Trap name	Common event name
Numeric sensor threshold crossing events	External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'above upper critical'. External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'above upper warning'. External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'below lower warning'. External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' asserted 'below lower critical'.	envTemperatureUpperCritical envTemperatureUpperCriticalClear envTemperatureLowerCritical envTemperatureLowerCriticalClear envHumidityUpperCritical envHumidityUpperCriticalClear envHumidityLowerCritical envHumidityLowerCriticalClear
External Sensor Slot State Change	External sensor '[EXTSENSORNAME]' in slot '[EXTSENSORSLOT]' is closed.	SensorContactOpen SensorContactClosed

Raritan PX3TS Transfer Switch Supported Events

Raritan PX3TS Supported Events

See *Raritan PX Supported Events* (see "*Raritan PX/PX2/PX3 Supported Events*" on page 55) for events related to functions other than the transfer switch.

Event description	Trap name	Common event name
Transfer Switch Active Inlet Changed	transferSwitchStateChange	transferSwitchActiveInletChangedCritical transferSwitchActiveInletChangedCriticalClear transferSwitchActiveInletChangedWarning
Transfer Switch Operating State Change	transferSwitchStateChange	transferSwitchOperatingStateNormal transferSwitchOperatingStateStandby

Rittal Supported Events

Rittal Supported Events

Event description	Trap name	Common event name
Inlet Current Upper Critical Threshold	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletCurrentUpperCritical
Inlet Current Upper Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletCurrentUpperCriticalClear
Inlet Current Lower Critical Threshold	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletCurrentLowerCritical
Inlet Current Lower Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3	inletCurrentLowerCriticalClear

Rittal Supported Events		
Event description	Trap name	Common event name
	alarmUnit4	
Inlet Voltage Upper Critical Threshold	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageUpperCritical
Inlet Voltage Upper Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageUpperCriticalClear
Inlet Voltage Lower Critical Threshold	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageLowerCritical
Inlet Voltage Lower Critical Threshold Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	inletVoltageLowerCriticalClear
Temp Env Sensor Upper Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureUpperCritical
Temp Env Sensor Upper Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureUpperCriticalClear
Temp Env Sensor Low Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureLowerCritical

Rittal Supported Events		
Event description	Trap name	Common event name
Temp Env Sensor Low Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envTemperatureLowerCriticalClear
Humidity Env Sensor Upper Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityUpperCritical
Humidity Env Sensor Upper Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityUpperCriticalClear
Humidity Env Sensor Lower Critical	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityLowerCritical
Humidity Env Sensor Lower Critical Cleared	alarmUnit1 alarmUnit2 alarmUnit3 alarmUnit4	envHumidityLowerCriticalClear

Servertech Supported Events

Servertech Supported Events		
Event description	Trap name	Common event name
Infeed Current High Threshold	infeedLoadEvent	inletCurrentUpperCritical inletCurrentUpperCriticalClear
Infeed Current Low Threshold	infeedLoadEvent	inletCurrentLowerCritical inletCurrentLowerCriticalClear
Outlet Current High	outletLoadEvent	outletCurrentUpperCritical

Servertech Supported Events		
Event description	Trap name	Common event name
Thresholds		outletCurrentUpperCriticalClear
Outlet Current Low Thresholds	outletLoadEvent	outletCurrentLowerCritical outletCurrentLowerCriticalClear
Outlet Current Status Change	outletChangeEvent	outletPowerOn outletPowerOff
Temp Env Sensor High Threshold	tempHumidSensorTempEvent	envTemperatureUpperCritical envTemperatureUpperCriticalClear
Temp Env Sensor Low Threshold	tempHumidSensorTempEvent	envTemperatureLowerCritical envTemperatureLowerCriticalClear
Humidity Env Sensor High Thresholds	tempHumidSensorHumidEvent	envHumidityUpperCritical envHumidityUpperCriticalClear
Humidity Env Sensor Low Thresholds	tempHumidSensorHumidEvent	envHumidityLowerCritical envHumidityLowerCriticalClear

PDU Connectivity Lost and Restored Events

Power IQ generates PDU connectivity events when connectivity is lost or restored with a PDU. The PDU's health status will change to red when connectivity is lost. Loss of connectivity is a critical severity event.

Power IQ checks PDUs that it has lost communication with every 15 minutes. If a PDU remains inaccessible for 1 hour, the Connectivity Lost event is generated. Once communication with the PDU is restored, the Connectivity Restored event is generated, and the health status will update.

To configure email notifications for this event, see **Configure Notification Filters** (on page 73). Event notifications must be enabled. See **Enable or Disable Event Notifications** (on page 72).

The event details are in the table.

Event description	Trap name
Loss of connectivity detected. A timestamp is associated with the event.	Connectivity Lost
Connectivity with the PDU is	Connectivity Restored

Event description	Trap name
restored.	

Rack Thresholds

Rack thresholding creates events and event notifications when a rack reaches a set percentage of the rack's capacity, measured using active power (kW).

Calculations use the maximum active power reading found for each inlet, during each polling period. The maximum values are summed to determine the rack active power. If the summed value exceeds a set threshold, an event is triggered.

The threshold calculation interval is based on the configured polling interval. For example, with a polling interval of 15 minutes, Power IQ will also run a rack threshold calculation every 15 minutes.

Note: Calculations are estimates. Raritan PDUs with buffered data retrieval ("data logging") enabled will give more accurate maximum readings. Other PDU types may have less accurate maximum readings, which can cause false negatives or false positives.

Warning or critical rack threshold events are not cleared unless all inlets on all PDUs in a rack are responding. A new warning or critical event will still be issued even when a rack has PDUs that are not responding, if the collected readings from the PDUs that are responding are enough to exceed the configured capacity threshold.

► **To configure rack thresholds:**

1. **Configure Global Threshold Settings** (see "**Configure Default Threshold Settings**" on page 68)
2. **Set Rack Capacity and Override Threshold Percentages** (on page 69)
3. To receive event notifications, configure notification filters to include Rack events. See **Configure Notification Filters** (on page 73).

Configure Default Threshold Settings

When you enable calculating of rack thresholds, Power IQ calculates each rack's active power at the polling interval. The calculation uses the inlet active power of each PDU. For PDUs with buffered data retrieval, the maximum active power reading is used.

Power IQ uses the threshold percentages to determine when a rack is nearing capacity.

- Default upper warning threshold: 80%
- Default upper critical threshold: 90%

These percentages apply to all racks, unless you set an override at the rack level. See **Set Rack Capacity and Override Threshold Percentages** (on page 69).

Events are triggered when the calculated capacity of the rack equals or exceeds the threshold.

Each rack must have a configured capacity for rack thresholds to be calculated. See **Set Rack Capacity and Override Threshold Percentages** (on page 69).

► **To configure default threshold settings:**

1. In the Settings tab, click Power IQ Settings.
2. In the Threshold Settings section, select the "Enable calculating of rack thresholds" checkbox.
3. Change the default percentages for upper warning and upper critical if desired. **Optional.**
4. Click Save Threshold Settings.

Set Rack Capacity and Override Threshold Percentages

Power IQ uses the rack capacity to calculate when a threshold has been exceeded, and generate an event. Power IQ uses the default threshold unless you set a different percentage at the rack level, to override the default setting.

To set capacity and override threshold percentages for multiple racks simultaneously, use the EDM import function. See **Import EDM Object Mappings** (on page 140).

Configure Rack Details

Name:

Location:

External key:

An external key is a unique identifier of this object that is used when importing and exporting enterprise relationships through a CSV file.

Capacity (kW):

Threshold Override Percentages

Critical: Default: 90.0%

Warning: Default: 80.0%

Cancel Save

► **To set rack capacity and override threshold percentages:**

1. In the Data Centers tab, select the rack. The Rack smart view opens.
2. Click Actions, then choose Edit Details.
3. Enter the capacity for the rack in kW.
4. Enter a percentage in the Critical or Warning level fields to override the default global thresholds. When these fields are blank, the defaults are used. See **Configure Default Threshold Settings** (on page 68).

View Events

The Events tab displays all events that Power IQ receives from configured PDUs.

For PX, PX2 and EMX, Power IQ also displays the actual measured reading values for the event whenever that information is available in notifications.

▶ **To view events:**

- Click the Events tab. The Events browser page opens.

▶ **To view event details:**

1. Click the Events tab. The Events browser page opens.
2. Click the links in the Events column to open the Event details page.

Filter the Events List

You can customize your view of the Events list by using filters and sorting.

See ***Customizing Your View of PDUs, Devices, and Events*** (on page 41).

▶ **To filter the events list:**

In the Events tab, all events in the system display in a list.

Most columns of data contain a filter criteria selection. Click the arrow in the column header to open the options. Filter is the last option.


- Filter by date: In the Occurred on column filter, select the checkbox for Before, After or On, then select a date in the calendar to view events that occurred before, after or on the date you select.
- Filter by event severity: In the Severity column filter, select the checkbox for the severity of events you want to view. Select multiple options as needed.
- Filter by event name: In the Event column filter, enter an event name to view.
- Filter by PDU associated with the event: In the Associated PDU column filter, enter a PDU name or IP address to view events associated with a PDU.
- Filter by event status: In the Status column filter, select the checkbox for the status of events you want to view, either active, or cleared. Select multiple options as needed.

Export the Events List to CSV

Export the Events list to create a CSV file that contains all the information in the grid on the Events tab.

The exported file contains the same columns as the page in Power IQ. If you have applied filters, the same filters will apply to the exported information. Export includes all records matching the filter criteria. The export is not limited by the number of events shown in the list grid.

▶ **To export the Events list to CSV:**

1. In the Events tab, click the Export/Save icon  in the upper right corner of the grid.
2. Save or open the file using the dialog that appears.

Clear Events

Events can be automatically cleared by other events, or you can clear them manually.

▶ **To clear events in the Events browser view:**

1. In the Events tab, select the checkbox for an event in the list. Select multiple checkboxes to choose multiple events to clear.
2. Click Clear Selected Events.

▶ **To clear an event from the Events details page:**

1. In the Events tab, click the link for an event to open the Event details page. The link to open Event details is in the Events column.
2. In the Event details page, click "Clear this event".

Automatic Delete of Cleared Events

Power IQ automatically deletes cleared events from the system hourly.

Cleared events will only be deleted when there are more than 100,000 events in the database.

The oldest events in the system are eligible to be deleted first. If there are 100,000 or fewer events in the database at the hourly check, then no events will be deleted.

Only cleared events are eligible to delete. Power IQ will not delete active events.

You can access events and event configurations via ODBC views. If you need to keep a log of all generated events, run a script periodically that retrieves event data via ODBC before Power IQ deletes cleared events automatically.

Enable or Disable Event Notifications

If you would like to receive email notification for events that Power IQ receives, you must enable event notifications. When event notification is enabled, Power IQ sends an email message for every event. Set up notification filters if you do not want to receive emails for every event. See **Configure Notification Filters** (on page 73).

► **To enable or disable event notifications:**

1. In the Settings tab, click Power IQ Settings in the Application Administration section.
2. In the Event Notification Settings box, select the "Enable e-mail delivery of event notifications" checkbox to enable event notifications.

or

Deselect the "Enable e-mail delivery of event notifications" checkbox to disable event notifications.
3. Click Save.
 - After enabling event notifications, the "Configure event notifications for your account" link appears. Click this link to use filters to manage your notifications.
 - After enabling, configure the SMTP settings for your system. See **SMTP Server Settings** (on page 74).

Configure Notification Filters

When event notification is enabled, Power IQ sends an email message for every event. Set up notification filters if you do not want to receive emails for every event.

► **To add notification filters:**

1. Click your username link, next to the Logoff link in the upper right corner of Power IQ.
2. Click Manage Event Notifications.
3. Click "Add a filter."
4. Select the Enable this Filter checkbox.
5. Select the Severity levels of the events for which you want Power IQ to send email notifications: Critical, Warning, and Informational.
6. Select the Sources of the events for which you want Power IQ to send email notifications: Outlet, Inlet, Circuit Breaker, Environmental Sensors, PDU Connectivity, Rack, and Internal Power IQ Services.
 - Power IQ generates PDU connectivity events when connectivity is lost or restored with a PDU.
 - Rack sources is for rack capacity threshold events.
 - Power IQ Internal services is for Enterprise Power IQ extraction failure events.
7. Select "Send notifications for all PDUs" to receive email notifications for all PDUs that meet the Severity level and Source criteria selected.

or

Select "Send notifications only for the following PDUs" and then enter IP addresses for PDUs or values for Custom Fields associated with PDUs.

- Enter a value in either or both custom fields to receive email notifications only for PDUs that have those custom field values assigned. Custom Field 1 and Custom Field 2 may be renamed in your system. See **Configuring Custom Fields** (on page 153).
- Click Add to enter the IP addresses of the PDUs for which email notifications should be sent. Enter a partial IP address to specify a group of PDUs in sequence. For example, enter 192.168.45 to specify all IP addresses beginning with that sequence. Click See Matching PDUs to verify the list of PDUs for which Power IQ will send email notifications.

Note: IP address filters do not apply to rack events or internal Power IQ service events.

8. Click Save.

Manage Event Notifications for Users

Users with the Site Administrator role can manage other user's event notification settings.

► **To manage event notifications for users:**

1. In the Settings tab, click User Accounts in the Authorization and Authentication section.
2. Click the username link for the user whose event notification settings you want to view.
3. Click "Manage event notifications."
4. Change the settings as needed and click Save. See **Configure Notification Filters** (on page 73) for details.

SMTP Server Settings

Configure the SMTP server settings to determine how email notifications are sent when Power IQ receives events.

You must reboot Power IQ after changing the encryption method in the SMTP server settings. See **Shutting Down and Restarting Power IQ** (on page 268).

► **To configure SMTP server settings:**

1. In the Settings tab, click Server Settings in the Appliance Administration section.
2. In the SMTP Server Settings section, enter the basic settings for the SMTP server.
 - a. Server name/IP address: Enter the email server's domain name or IP address.
 - b. Port: The default port is 25. Change this number if you use a different port.
 - c. "Sender email address": Enter the Power IQ's IP address.
3. In the Authentication and Encryption Settings section, select the method for your SMTP server.
 - a. Authentication type: Select None or Password. If you select Password, enter the Username, Password, and Confirm password.
 - b. Select an Encryption method.
4. Click Send a Test Email to enter your email address and try sending an email message using the settings you configured. If you see a success message, click Save SMTP Settings.

If you see a failure message, edit your settings and try again. A password must be entered in the page to test the settings. Once saved, passwords do not display in the page for security.

Event Fuse Handling

The event fuse will not be de-activated until the trap rate drops 30% below the 15 traps/sec threshold and the trap rate is re-calculated each time a trap is received. Therefore the fuse will not be de-activated until Power IQ receives a trap and determines that the trap rate is 30% below 15 traps/sec.

If the event fuse is tripped and then no more traps are received, the event fuse will remain tripped until the next event is received.

Events That Clear Quickly

If two events occur, active and cleared, within 30 seconds, only one event notification is sent, for the cleared event. For example, if a PDU experiences a temperature spike, but the temperature returns to normal within one second, only the event notification for the cleared event is sent.

The event notification contains information indicating when the original event occurred and when that event was cleared.

Chapter 6 User Configuration

You can add both LDAP and locally authenticated users. All user permissions are authorized locally.

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Change the Administrator Password

It is important to change the default admin account password as soon as possible. This helps prevent unauthorized administrator access to Power IQ.

The password must follow the requirements selected in Settings > Password Requirements. See **Configuring Password Requirements** (on page 123).

► **To change the administrator password:**

1. Click the Settings tab.
2. Click User Accounts. The User Configuration page opens, displaying a list of all the user accounts created for the system.
3. Click Edit for the admin user.
4. Type a new password for the admin account in the Password field, then type it again in the Confirm Password field.
5. Click Save.

Adding, Editing, and Deleting Users

Add a User

► **To add a user:**

1. In the Settings tab, click User Accounts. The User Configuration page opens displaying a list of all the user accounts created for the system.

2. Choose Add > Add User. A blank user information page opens.
3. Enter the Common User Information.
 - a. Enter a username with at least 3 characters, but not more than 40 characters. **Required**
 - b. Enter the user's first name, last name, and email address.
 - c. Password and Confirm Password: Enter a password for this user. Default password strength requires at least 8 characters, including one numerical character, one uppercase character, one lowercase character, and one of the following special characters: ~!@#%\$%^&*()_+{}|:"<>?/.,';[=-'"). See **Configuring Password Requirements** (on page 123). **Required**
 - d. In the Description field, enter comments about the user.

Editing and Deleting Users - Local and LDAP

Edit Users

You can view and edit all users, including local and LDAP, in the User Accounts page.

Edited information is saved only to Power IQ, not to your LDAP server.

For information on editing user permissions, see **Assigning Roles for User Permissions** (on page 83).

► To edit a user:

1. In the Settings tab, click User Accounts.
2. Click the blue Login for the user you want to edit.
3. Click Edit and edit the information as needed.
 - Login: 3 characters minimum. 40 characters maximum.
 - First Name: 1 character minimum.
 - Last Name: 1 character minimum.
 - Email: Must contain a correctly formatted email address.
 - Description: **Optional**.

Delete Users

You can delete users that no longer need access to Power IQ. Both local and LDAP users can be deleted. When a user is deleted, all data, roles, and public shared reports that may be used by other users, are deleted. Only one user can be deleted at a time.

► **To delete users:**

1. In the Settings tab, click User Accounts.
2. Select the checkbox for the user you want to delete.
3. Click Remove. A confirmation message appears. Click Delete User to confirm.

Configuring LDAP Authentication

Repair an LDAP Configuration After Upgrade - Release 4.0 and Earlier ONLY

When you upgrade Power IQ **from release 4.0 or earlier only**, your previously configured LDAP settings require a repair process to be run. The Repair finds the DN of each user and stores that information in the database. Power IQ needs the DN of each user to be able to authenticate in Power IQ 4.1 and later.

You must run the repair function once after upgrade. LDAP users will not be able to login to Power IQ until you run the repair. Only the "admin" user account will be able to login before the repair is run.

Your LDAP server configuration, Bind DN and Base DN are retained. Your Bind Password is not retained, and you must enter it to run the repair. Search settings are not retained, but they are not needed to run the repair. You must enter them after repair if you need to find and add new LDAP users.

The screenshot shows a dialog box titled "Find LDAP Users". It is divided into two main sections: "Authentication" and "Search".

- Authentication:**
 - Bind DN:
 - Bind Password:
- Search:**
 - Base DN:
 - Filter:
 - Scope: Base One Subtree
 - Follow Referrals:

At the bottom right of the dialog, there are two buttons: "Find" and "Repair". A mouse cursor is pointing at the "Repair" button.

► **To repair an LDAP configuration after upgrade:**

1. In the Settings tab, click User Accounts.
2. Click Add > Find LDAP Users.

3. Enter your Bind Password and click Repair.
4. When the repair process completes, a message appears showing how many users were repaired.
5. To view any users that were not repaired, go to the User Accounts list, and check the LDAP DN column.
 - a. In the Settings tab, click User Accounts.
 - b. Click the LDAP DN column header to sort the list by LDAP DN value. Sort again if needed to find users with a blank LDAP DN value.

Configuring the LDAP Server Settings

The LDAP server settings enable Power IQ to connect to your LDAP server. To configure the LDAP search settings, go to Settings > User Accounts. See **Find LDAP Users** (on page 80)

► To configure the LDAP server settings:

1. In the Settings tab, click LDAP Server Settings.
2. Complete the fields with your LDAP information.
 - LDAP Server: Enter the IP address or hostname.
 - LDAP Port: Enter the port number.
 - Port 389 is the standard, unencrypted and TLS-encrypted LDAP communication port.
 - Port 636 is the standard, SSL-encrypted LDAP communication port.
 - Transport Security: Select Unencrypted, SSL Encryption, or TLS Encryption.
3. Click Save.
 - Next steps: See **Find LDAP Users** (on page 80).

Finding and Adding LDAP Users

Find LDAP Users

Enter search and filter criteria to find LDAP users you want to add.

► **To find LDAP users:**

1. Make sure your LDAP server settings are configured. See **Configuring the LDAP Server Settings** (on page 79).
2. In the Settings tab, click User Accounts.
3. Click Add > Find LDAP Users.
4. Enter the Bind DN and Bind Password for an LDAP user that has permissions to perform search queries in the LDAP server.
5. Specify a Base DN (directory level/entry) under which the authentication search query will be executed. Power IQ can do a recursive search downward from this Base DN.

Example	Description
dc=raritan,dc=com	The search query for the user entry will be made over the whole directory structure.
cn=Administrators,cn=Users,dc=raritan,dc=com	The search query for the user entry will be performed only in the Administrators sub-directory (entry).

6. Type a user's attributes in the Filter field so the search query will be restricted to only those entries that meet this criterion. For example, (objectClass=user) or (objectClass=person) depending on how LDAP is configured.
7. Select the Scope. Select Subtree to allow a recursive search starting at the Base DN.
8. Select the Follow Referrals checkbox to allow LDAP to follow referrals to complete a search if referral objects are encountered while Power IQ is searching the LDAP server.
9. Click Find to search the LDAP server. A list of users displays in the Results section. Search results include a limited number of records. See **LDAP Search Results Limits** (on page 81).
10. You can edit the user account details, and add the LDAP users shown in the Results list. See **Add and Edit LDAP Users** (on page 81).

LDAP Search Results Limits

Power IQ's Find LDAP Users search result size is limited to the LDAP server's search limit. The number of records returned depends on the type of LDAP server being queried, and whether the server is configured with the default limit or some other value.

If your search results don't return the needed users due to the limit, refine your search configuration using more specific Base DN, Filter, and Scope. See **Find LDAP Users** (on page 80).

Add and Edit LDAP Users

Using an LDAP server search results list, you can edit user account details, and add the users to Power IQ.

▶ LDAP users results list details:

<input type="checkbox"/>	Login	Common Name	Distinguished Name	Mail	Given Name	Surname	Messages
<input type="checkbox"/>	bill	Bill E. Youngblood	CN=Bill E. Youngblood,CN=...	bill.youngblood@ra...	Bill	Youngblood	
<input type="checkbox"/>	kphill2	keith phillips	CN=keith phillips,CN=User...		keith	phillips	
<input type="checkbox"/>	event_man	Event_Manager	CN=Event_Manager,CN=...		Event_	Manager	
<input type="checkbox"/>	brandan	Brandan Lennox	CN=Brandan Lennox,CN=...		Brandan	Lennox	

▶ To add and edit LDAP users:

1. Complete a search for LDAP users. See **Find LDAP Users** (on page 80).
2. Select the checkboxes for the users you want to add. Users without a checkbox have already been added.
3. Edit the user information as needed. User information can also be edited after users are added. To edit, click in the field to activate it. The Login, Mail, Given Name, and Surname columns are editable. Edits are saved to Power IQ only, not to the LDAP server. Edited fields display a triangle indicator.
 - Login is required and must contain the username. 3 characters minimum. 40 characters maximum.
 - Mail is required and must contain a correctly formatted email address.
4. Click Add. Successfully added users no longer have a checkbox. Check the Messages column to see errors for users who could not be added. Correct the information and click Add.

Adding, Editing, and Deleting User Groups

Default User Groups

There are two default user groups, All Users and Site Administrators.

The All Users group contains every user you add to Power IQ, and has the View role assigned to it.

The Site Administrators group contains the Admin user, and has the Site Administrator role assigned to it. The Site Administrator role allows users to do all tasks in Power IQ.

You can change the roles assigned to both groups.

Add a User Group

► **To add a user group:**

1. Click Settings.
2. Click User Groups.
3. Click Add, then enter a name. Click Next. The Group Information page opens.
4. In the Group Members section, select users in the drop-down list, then click Add. Users in the group appear in the list by login, name, and email.
5. In the Group Roles section, select roles in the drop-down list, then click Add to assign the permission to the group. Roles assigned to the group appear in the list. See **Role Definitions** (see "**Power IQ Role Definitions**" on page 83).

Edit a User Group Name

► **To edit a user group name:**

1. Click Settings.
2. Click User Groups.
3. Select a group then click Edit.
4. Click Edit to change the group name.
5. Click Save.

Delete a User Group

► **To delete a user group:**

1. In the Settings tab, click User Groups.

2. Select a group and click Remove.

Limiting View Permissions

By default in Power IQ, all users are assigned to a group called All Users. You cannot remove users from this group.

The All Users group includes the View role by default. If you wanted to limit the viewing permissions of your users, you must remove the View role from the All Users group.

Your users will need to be assigned view permissions in some other way. There are several ways to do this.

- Make sure each user is in a group with the View role assigned at the appropriate EDM node.
- Make sure each user is in a group with another role assigned that includes View permissions, such as Operator.
- Assign the View role, or another role that includes View permissions, such as Operator, directly to the user.

Assigning Roles for User Permissions

Power IQ Role Definitions

Assign these roles to users or user groups to allow the permissions for operations within Power IQ.

You can assign any role to apply globally, meaning access to perform the tasks will be granted for every object in Power IQ. For example, a user assigned a global Power Control role can perform power control on any PDU or IT device, no matter where it is in the enterprise data model.

See **Assign Roles to a User Group** (on page 87) and **Assign Roles to a User** (on page 86).

Or, you can assign the Administrator, Operator, View, and Power Control roles to apply only to a certain object in your enterprise data model, such as a rack. See **Assign Roles within a Data Center** (on page 88). When these roles are assigned to the user or user group directly at the EDM-node-level via the Data Centers tab, the permission allowed will be limited to the selected enterprise data object, and all levels beneath it.

Role	Tasks	Applies To
<p>Site Administrator</p> <ul style="list-style-type: none"> The Site Administrators group is assigned this role by default, and contains the Admin user. "Super user" 	<p>Every task in Power IQ.</p> <ul style="list-style-type: none"> Full permissions to Settings tab. Full permissions to Dashboards tab. Full permissions to create Tags in the Reports tab, and to tag nodes in the EDM. Full permissions of View, Power Control, Create Reports and Dashboards, and Event Manager. 	<ul style="list-style-type: none"> Power IQ Global only.
Role	Tasks	Applies To
<p>Administrator</p>	<ul style="list-style-type: none"> Administrator role includes the permissions of View, Power Control, Create Reports and Dashboards, and Event Manager. Full permissions to Dashboards tab. Permission to tag nodes in the EDM. Excludes the Settings tab, other than personal user profile settings. 	<ul style="list-style-type: none"> Global, when applied in Settings > User Accounts page. Selected EDM node and down, when applied in Data Centers tab. NOTE: Applying Administrator in the Data Centers tab also excludes permission to view the Analytics tab and the Events tab.
Role	Tasks	Applies To
<p>Operator</p>	<ul style="list-style-type: none"> Operator role includes the permissions of View. View permissions to Dashboards tab reports; upload drawing permission for Floor Maps in Dashboards tab. Excludes creating reports in Dashboards tab. Permission to tag nodes in the EDM. Excludes the Settings tab other than personal user profile settings, Power Control, Create Reports and Dashboards, Event Manager 	<ul style="list-style-type: none"> Global, when applied in Settings > User Accounts page. Selected EDM node and down, when applied in Data Centers tab

Role	Tasks	Applies To
View	View role has permission to: <ul style="list-style-type: none"> View EDM in the Data Centers tab View EDM nodes in Floor Maps View data from EDM nodes in Reports tab View all other tabs in Power IQ View personal user profile settings in the Settings tab. 	<ul style="list-style-type: none"> Global, when applied in Settings > User Accounts page. Selected EDM node and down, when applied in Data Centers tab
Role	Tasks	Applies To
Power Control	Power Control role has permission to: <ul style="list-style-type: none"> Power control Create device groups View devices, device groups, PDUs, Data Centers tab, and Dashboards tab. 	<ul style="list-style-type: none"> Global, when applied in Settings > User Accounts page. Selected EDM node and down, when applied in Data Centers tab See Permissions for Power Control on a Device Group (on page 89) for details on this task.
Role	Tasks	Applies To
Create Reports and Dashboards	Create Reports and Dashboards role has permission to: <ul style="list-style-type: none"> Create reports and charts in the Analytics tab Create dashboards in the Dashboards tab 	<ul style="list-style-type: none"> Global only, applied in Settings > User Accounts page. The information a user can include or view in a report, chart, or dashboard is based on View permissions. A user with this role also needs the View role, or another role that includes View permission.
Role	Tasks	Applies To
Event Manager	Event Manager role has permission to: <ul style="list-style-type: none"> View the Events tab Create event notification filters View and clear events View events in the Smart views View Floor Maps in the Dashboard 	<ul style="list-style-type: none"> Global only, applied in Settings > User Accounts page.

Assign Roles to a User

Roles assigned to groups or users in the Settings tab give permissions that apply to all Data Centers, PDUs and Devices in Power IQ. These are sometimes referred to as "global" roles. See **Power IQ Role Definitions** (on page 83).

You can also assign the Administrator, Operator, Power Control, and View roles to a user or user group, but limit the role to only a specific level of a data center. To limit the permission, assign the role in the Data Centers tab, in the Permissions section of the data center level the role should cover. See **Assign Roles within a Data Center** (on page 88).

You must be assigned the Site Administrator role to assign roles.

▶ To assign roles to a user:

1. In the Settings tab, click User Accounts. Select a user then click Edit.
2. In the User Roles section, select roles in the drop-down list, then click Add to assign the permission to the user. Roles assigned to the user appear in the list.

Users can perform the tasks allowed by the roles assigned.

Remove Roles from a User

▶ To remove roles from a user:

1. Click Settings.
2. Click User Accounts.
3. Select a user and click Edit.
4. In the User Roles list, select a role, then click Remove. The user can no longer perform the tasks allowed by the role.

Assign Roles to a User Group

Roles assigned to users or user groups in the Settings tab give permissions that apply to all Data Centers, PDUs and Devices in Power IQ. See **Role Definitions** (see "**Power IQ Role Definitions**" on page 83).

You can also assign the Administrator, Operator, Power Control, and View roles to a user or user group, but limit the role to only a specific level of a data center. To limit the permission, assign the role in the Data Centers tab, in the Permissions section of the data center level the role should cover. See **Assign Roles within a Data Center** (on page 88).

You must be assigned the Site Administrator role to assign roles.

► To assign roles to a user group:

1. In the Settings tab, click User Groups.
2. Select a user group, then click Edit.
3. In the Group Roles section, select roles in the drop-down list, then click Add to assign the permission to the group. Roles assigned to the group appear in the list.

Users can perform the tasks allowed by the roles assigned to the group.

Remove Roles from a User Group

► To remove roles from a user group:

1. In the Settings tab, click User Groups.
2. Select a user group then click Edit.
3. Select a role, then click Remove. Users in the group can no longer perform the tasks allowed by the role.

► To remove all roles from a user group:

1. In the Settings tab, click User Groups.
2. Select a user group then click Edit.
3. In the Group Roles section, click Empty.

Assign Roles within a Data Center

You can control what individual users or user groups can see and do in Power IQ at each level in each data center. Permissions extend to levels nested below the selected level.

You can also assign global permissions for users and user groups for all levels of all data centers in Power IQ, and to PDUs not mapped into a data center. See **Assign Roles to a User** (on page 86) and **Assign Roles to a User Group** (on page 87).

Permissions are included in different roles that you assign. See **Role Definitions** (see "**Power IQ Role Definitions**" on page 83).

You must be assigned the Site Administrator role to assign roles.

► To assign roles within a data center:

1. In the Data Centers tab, select a data center level, such as a rack. The details page opens. At the Rack and PDU levels, the Smart Rack or Smart PDU view opens. See Smart Rack View and Smart PDU View
2. Permissions are accessed differently for Racks and PDUs than all other enterprise data model levels.
 - For Data Centers, Rooms, Aisles, and Rows, use the Permissions section in the Data Centers tab to view or assign roles.
 - For Racks, click Configure Rack Details in the Smart Rack view to open a dialog that contains permissions settings.
 - For PDUs, click Configure PDU Details in the Smart PDU view to open a dialog that contains permissions settings.
3. Click Add Role to > Add User Role or Add Role to > Add Group Role. Adding a Group Role will give permissions selected to all users in the group. Then, select the user or group who needs permission to this object. level of the data center.
4. Select the role to allow in the Roles list. Click OK.

Permissions for Power Control on a Device Group

To perform power control operations on a device group, your permissions must satisfy one of the following.

- You have the global power control role.

OR

- You are the creator of the device group **AND** you have the power control role assigned within the Data Centers tab for every device in the device group.

Chapter 7 Dashboard

The Power IQ dashboard allows each user to customize collections of charts and widgets in a single view. You can create multiple versions of your dashboard and select which one to view, or start a slideshow for all or selected dashboards.

The default dashboard configuration includes 2 rows. The top row includes a health chart that shows overall PDU health. The second row is a device chart that shows average active power over the past 24 hours.

You must have the Create Reports and Dashboards role to edit the dashboard.

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Viewing the Dashboard

You can configure multiple versions of the dashboard as needed.

Other users can share their dashboards with you, as a shared report. You can also share your dashboards with other users.

If you have more than 1 dashboard, follow either procedure below to view a dashboard.

► **Use the dashboard links under the Dashboards tab:**


1. Click the Dashboards tab.

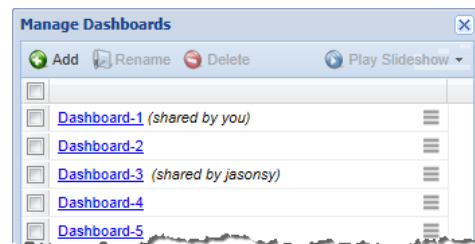
- If more than 1 dashboard is configured, links to available dashboards are displayed across the top of the dashboard page. If the dashboard you want to view is not listed, click the arrow icon **>>** at the end of the links to show additional ones.



- Click a dashboard link. The selected dashboard loads in the Dashboards tab.

► **Use the Manage Dashboards dialog:**

- In the Dashboards tab, click the button  **Manage Dashboards** in the top right corner. The Manage Dashboards dialog appears.



- Click a dashboard link. The selected dashboard loads in the Dashboards tab.

Sharing a Dashboard


Choose to share a dashboard when you want to make it public. Sharing dashboards gives other Power IQ users access to your dashboards, and the widgets it contains.

Users must have the View and the Create Reports and Dashboards role assigned to view your shared dashboards.

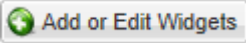
The data that displays in a dashboard is based on each individual user's permissions in Power IQ. If another user does not have permission to see information about a rack or datacenter, for example, that you have shared a dashboard about, the user will not see the data.

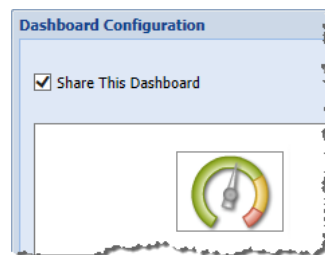
Users that you share a dashboard with cannot edit your dashboard. You cannot edit dashboards that you did not create.

► To share a dashboard:

- In the Dashboards tab, select a dashboard.
 - If you only have 1 dashboard, it will be displayed already.
 - If you have multiple dashboards, select it from the list across the top of the dashboard, or from the Manage Dashboards dialog after clicking . See *Viewing the Dashboard* (on page 90).

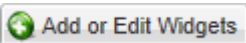
Click a dashboard link. The selected dashboard loads in the Dashboards tab.

- Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
- Select the Share This Dashboard checkbox to make this dashboard and widgets public.



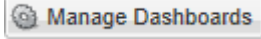
- Click Save.

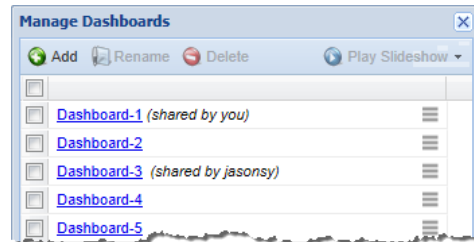
► To make a dashboard private:

- Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.

2. Deselect the Share This Dashboard checkbox to remove the dashboard from public view.
3. Click Save.

► **To check which dashboards are shared:**

1. In the Dashboards tab, click the button  in the top right corner. The Manage Dashboards dialog appears.




2. Dashboards that you are sharing are marked as "shared by you." Dashboards that have been shared by other users are marked as "shared by username."

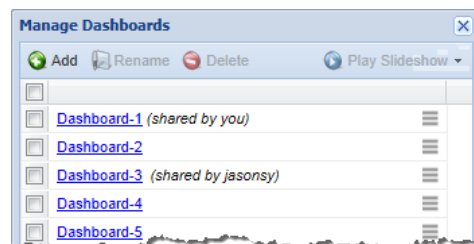
Adding or Deleting a Dashboard

You can configure more than one version of the dashboard so that each has different widgets, charts or layouts.

If any dashboard version is not needed anymore, you can remove it, but you can only remove the dashboards that you created.

► **To add or delete a dashboard:**

1. In the Dashboards tab, click the button  in the top right corner. The Manage Dashboards dialog appears.



2. To add a new dashboard, click Add and then type a name for the new dashboard.
 - To configure the new dashboard, such as adding widgets or charts, see **Setting the Dashboard Layout** (on page 94).
3. To delete any dashboards, select the checkboxes for the dashboards you want to remove, and click Delete.

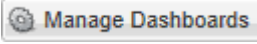
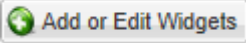
- A confirmation message appears. Click Delete Selected Dashboards to confirm.

Setting the Dashboard Layout

You can set the number of rows of widgets on your dashboard, drag and drop widgets into the rows, and resize each widget and row.

You can only edit the dashboards that you created.

► **To set the dashboard layout:**

1. In the Dashboards tab, select a dashboard.
 - If you only have 1 dashboard, it will be displayed already.
 - If you have multiple dashboards, select it from the list across the top of the dashboard, or from the Manage Dashboards dialog after clicking . See **Viewing the Dashboard** (on page 90).
2. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
3. Select the Share This Dashboard checkbox to make this dashboard and widgets public.
4. Click a Layout to view the configuration in the dialog. The layouts are 1 row, 2 rows, 3 rows, or 4 rows.
5. Resize the rows by clicking and dragging the edges of a row. You can resize the width of a widget in a row, and the height of an entire row.
6. Drag and drop widgets from the bottom of the dialog into the rows. Drag and drop widgets from row to row to rearrange them. The row you're dropping into highlights green.
7. Drop a widget back into the bottom of the dialog to remove it from the layout.
8. Click Save. The dashboard layout you selected displays in the tab.

Configuring Widgets

Widgets are the configurable tools and charts you can add to the dashboard layout.

- **Active Events Widget** (on page 95)
- **Device Chart Widget** (on page 96)
- **PDU Health Chart Widget** (on page 97)
- **Capacity Forecast Chart Widget** (on page 98)
- **Capacity Gauge Widget** (on page 99)
- **Image Widget** (on page 100)
- **Dashboard Heading Widget** (on page 101)
- **HTML Widget** (on page 102)
- **Cooling Chart Widget** (on page 103)
- **PUE Trend Chart Widget** (on page 109)
- **Latest PUE Reading Gauge Widget** (on page 110)
- **Facilities Chart Widget** (on page 112)
- **Floor Map Widget** (on page 113)

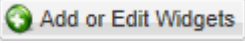
Active Events Widget

The active events widget displays the 10 highest severity, active events in a list.

You must have the Event Manager role assigned to view events. See **Assign Roles to a User** (on page 86).

The list refreshes automatically every 30 seconds.

► To configure the active events widget:

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the Active Events widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. Click Save. The widget is added to the dashboard.

► **To use the active events widget:**

- Click an event link to open the event details page, where you can clear the event. See **Clear Events** (on page 71).
- See **Enable or Disable Event Notifications** (on page 72) for details on receiving email notifications of events.

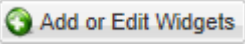
Device Chart Widget

The device chart widget displays a default setting of average active power over the past 24 hours.

You can configure the device chart to display power measurements for different parts of the data center. Devices must be mapped to rack PDU outlets or circuits in the EDM before the data can be charted. See **Creating Your EDM** (on page 135).

*Note: Use the Facilities Chart widget to display power measurements for your facilities objects. See **Facilities Chart Widget** (on page 112).*

► **To configure the device chart widget:**

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the Device Chart widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. See **Device Chart Settings** (on page 229) for details on configuring this chart.
4. Click Save. The widget is added to the dashboard.

► **To use the device chart widget:**

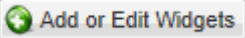
- Click the export icon  to export all data in the chart to a .CSV file.
- The chart will automatically refresh at each polling interval. Click the refresh icon to refresh the chart manually.

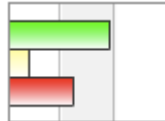
PDU Health Chart Widget


The default PDU health chart widget shows overall health of all PDUs in the system.

You can configure the chart to show overall health, which includes connectivity and active events, or active events only, or connectivity only. You can also set the chart to include all PDUs in the system, or just the PDUs in a specific level of a data center. The chart refreshes automatically every minute.

► To configure the PDU health chart widget:

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the PDU health chart widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. Click the Settings icon .
4. Enter a name for the chart in the Title field in the Basics section.
5. In the Data From field, select All to include all PDUs in the system in the chart. Select Data Center or other section of the data center to filter the next field's selections. For example, select Racks to filter the Contained In field to include the racks in your system.
6. In the Contained In field, select the location of the PDUs you want to include in the Health chart.
7. In the Options section, select the health measurement.
 - Select Overall Health to view a health chart that combines connectivity and active events to create an overall health status of the selected PDUs.
 - Select Event Health Only to exclude connectivity from the health status.
 - Select Connectivity Health Only to exclude active events from the health status.
8. Click Save.

► To use the PDU health chart widget:

- See **Overall PDU Health** (on page 235) for details on how health status is determined.

- Click a color-coded bar in the graphic to view the list of PDUs with the selected health status.
- The chart will automatically refresh to show the new health status based on any new and cleared events. Click the refresh icon to refresh the chart manually.

Capacity Forecast Chart Widget


The capacity forecast chart widget tracks maximum active power of a data center. Based on the capacity settings, the chart displays how many days of supply remain before your data center reaches capacity, or it will indicate that you have adequate capacity.

You must have configured the enterprise data model and have a minimum of 2 days of daily rollup of KW data. 30 days of daily rollup data is recommended for more accurate forecasts. The capacity field must be set for the data center node selected. Power capacity is set in KW with granularity of 2 decimal places, such as 5.04 KW. You can configure the capacity for different locations in your data center as part of your enterprise data model configuration. See **Enterprise Relationships** (see "**Enterprise Relationships and the EDM**" on page 132). To set individual capacities, see **Set a Capacity** (on page 99).

► To configure the capacity forecast chart widget:

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the Capacity Forecast Chart widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. Click the Settings icon .
4. Enter a name in the Title field.
5. In the Show field, click the browse button, then select the data center node whose capacity you want to show in the chart. Expand or collapse the nodes by clicking the plus and minus signs. The name of the node selected displays in the field at the bottom on the dialog. Click Select Node.
6. In the Period field, select the time period to include in the forecast.
7. Click Save. The widget is added to the dashboard.

► **To use the capacity forecast chart widget:**

- The blue line shows the observed data.
- The purple line is the linear trend line.
- The red line following the trend line shows the projected data.
- The chart legend will indicate "Adequate Capacity" when the trend does not cross the capacity line for the time period. If the trend line crosses the capacity line, the chart legend will indicate the number of days of supply remaining until capacity is reached: "Projected X days of capacity remaining."

Set a Capacity

Capacity in kilowatts can be set with up to 2 decimal places.

Capacity for Racks can only be set in the Data Centers tab. Capacity for data center, room, aisle, and row can be set either in the Data Center tab, or by importing the enterprise data model .CSV file. See **Importing Object Mappings** (see "**Import EDM Object Mappings**" on page 140).

► **To set a capacity:**

1. In the Data Centers tab, select a data center level, such as a room. The details page opens.
2. Enter the capacity in the Capacity (kW) field. On the Data Center level, first expand the Ratings and Settings section to find the Capacity field.

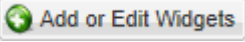
*Note: For the Rack level, choose Actions > Edit Details in the Rack smart view to find the Capacity field. See **Set Rack Capacity and Override Threshold Percentages** (on page 69).*

3. Click Save.

Capacity Gauge Widget

The capacity gauge widget shows how much power a selected node of your data center has consumed over a specified time period. The gauge shows a tick mark for minimum, maximum and average power consumed during the time period. The dial points to the real time active power reading.

► **To configure the capacity gauge widget:**

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.

2. Drag and drop the Capacity Gauge widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.




3. Click the Settings icon .
4. Enter a name in the Title field.
5. In the Show field, click the browse button, then select the data center node whose power consumption you want to show in the dial. Expand or collapse the nodes by clicking the plus and minus signs. The name of the node selected displays in the field at the bottom on the dialog. Click Select Node.
6. In the Period field, select the time period of power consumption to include in the dial.
7. Click Save. The widget is added to the dashboard.

Image Widget

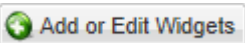
The image widget displays an image that you upload on the dashboard.

The maximum images size is 800 pixels high by 800 pixels wide. The maximum file size is 2MB for dashboard images. Images uploaded for logo usage can be up to 512KB.


Uploading a new image to an image widget removes the previously uploaded image.

For details on adding a logo to every page in Power IQ, see **Display a Logo on Every Page** (on page 270).

► **To configure the image widget:**

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the Image widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.

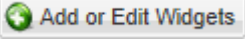


3. Click the Settings icon .
4. Click the Browse button, select the image and click Open.
5. Click Save. The widget is added to the dashboard.

Dashboard Heading Widget

The dashboard heading widget allows you to add and format text on the dashboard. Position the report heading widget above or next to other widgets to use it as a heading. See **Setting the Dashboard Layout** (on page 94).

► **To configure the dashboard heading widget:**

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the Dashboard Heading widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. In the Text field, enter the text you would like to display in the dashboard. Maximum title length is 64 characters.
4. Select the font type in the Font field.
5. Select the font size in the Size drop-down list.
6. Select the text color in the Color drop-down list.
7. In the Align field, select Left, Center or Right to specify how text will be oriented in the widget space on the dashboard.
8. Select the Bold or Italic checkboxes to format the text.
9. Click Save. The widget is added to the dashboard.

► **To edit text only:**

Once added to the dashboard, you can edit the text only, without changing style or layout, directly from the dashboard.

- In the Dashboards tab, double click heading text and edit in the text box that appears. Press Enter to save changes.

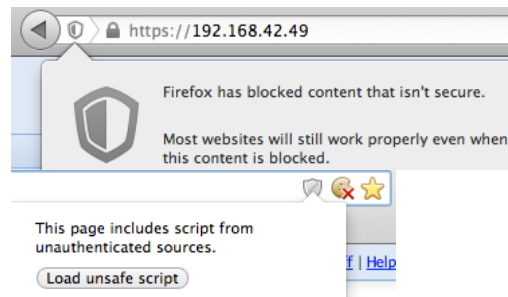
HTML Widget

The HTML widget enables you to add your custom HTML portlet to the dashboard. Use this widget to add a weather tool, maps, a video camera, or anything you can code using HTML.

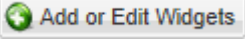
HTML portlets may have security implications. You must allow them before you can add an HTML widget to the Dashboards tab. See **Allow HTML Widgets on Dashboard** (on page 270).

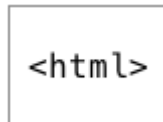
In Internet Explorer, you must accept a security warning the first time you view a dashboard containing an HTML widget.

Note: If your HTML widget contains active content, newer versions of Firefox and Chrome may block the content. Click the shield icon in the address bar to allow the content.




► To configure the HTML widget:

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the HTML widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



*If you don't see the HTML widget icon, you must allow HTML portlets. See **Allow HTML Widgets on Dashboard** (on page 270).*

3. Click the Settings icon .
4. Enter your HTML code in the HTML field.
5. Click Save. The widget is added to the dashboard.

*Note: If you see unexpected changes in your dashboard after adding an HTML widget, you can reset it by disabling HTML portlets in the Settings tab. See **Allow HTML Widgets on Dashboard** (on page 270).*

Cooling Chart Widget

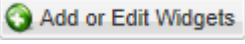
Cooling charts enable you to compare your data center's sensor readings against industry recommendations.

American Society of Heating, Refrigerating and Air-Conditioning® (ASHRAE) is an industry consortium that provides guidelines for energy efficient data center operations.


ASHRAE recommends certain safe and energy-efficient operating temperatures and humidity levels. This data displays on the psychrometric chart in Power IQ. ASHRAE offers two different sets of recommendations, one from 2004, and one from 2008. The 2008 recommendations allow for slightly higher temperatures. When viewed on the chart, ASHRAE refers to these recommended regions of data as "envelopes."

In Power IQ, you configure the chart to display your data center's humidity and temperature readings on the same psychrometric chart as ASHRAE's recommendations. You can also specify smaller sections within a data center, such as a room or rack. This allows you to determine how your readings compare to an ASHRAE recommendation. You can also specify your own custom target operating zones. See [Create a Custom Region](#).

► To configure the cooling chart widget:


1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the cooling chart widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. Click the Settings icon .
4. In the Show field, click the browse button to select a node from your enterprise data model. You can select any level, up to and including the data center. Potential energy savings is calculated only when a data center is selected.

5. In the Sensor Position field, select Inlet, Outlet, or Outside Air. Inlet specifies a "cold aisle" chart, and uses data from inlet located sensors. Outlet specifies a "hot aisle" chart, and uses data from outlet located sensors. Outside air uses data from outside located sensors. See **Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors** (on page 205).
6. Select the region to display on the chart. See **ASHRAE® Envelope Descriptions** (on page 105) for details of each region.
 - All regions display in blue on the chart. Custom regions have default settings you can change. Select Custom, then select the Min Temperature and Max Temperature and the Min Humidity and Max Humidity.
7. Select Zoom In or Zoom Out to specify a more or less detailed view of the chart to display.
8. Enter a name for the chart, or check the Auto Name checkbox to accept the system name. The system name for a cooling chart contains the level of the enterprise data model, such as data center, and the sensor location information.
9. Click Save. The widget is added to the dashboard.

► **To use the cooling chart widget:**

- Hover your mouse over the sensor data points to view details. See **View Sensor Data Point Details** (on page 106).
- Click the export icon  to export sensor data in the chart to a .CSV file. See **Export Sensor Data** (on page 107).
- The chart will automatically refresh at each polling interval. Click the refresh icon to refresh the chart manually.
- To calculate savings, see **Calculate Potential Cooling Energy Savings** (on page 108)

Requirements for Cooling Charts

Cooling charts use data from the humidity and temperature sensors in your data center.

You must have at least 1 temperature sensor and at least 1 humidity sensor connected to use Cooling charts.

ASHRAE® Envelope Descriptions

ASHRAE® operating envelopes comprise the following settings.

- X-Axis: Temperature
- Y-Axis: Humidity Ratio, with the relative humidity percentage calculated along curves on the chart

The area inside the region created by plotting the thresholds for these data points are recommended by ASHRAE to be safe and energy-efficient zones of operation for a data center.

There are two ASHRAE® envelopes available for display in Power IQ, based on recommendations issued by ASHRAE in 2004 and in 2008.

You can also create a custom region to display on the chart, in addition to ASHRAE regions. See [Create a Custom Region](#).

▶ ASHRAE 2004 Envelope:

The ASHRAE 2004 recommended operating envelope is a rectangular area with the following coordinates.

- 20 Celsius (68 F), 40% RH
- 20 Celsius (68 F), 55% RH
- 25 Celsius (77 F), 40% RH
- 25 Celsius (77 F), 55% RH

▶ ASHRAE 2008 Envelope:

The ASHRAE 2008 recommended operating envelope is a pentagon-shaped area with the following coordinates.

- 18 Celsius (64.4 F), 42% RH
- 18 Celsius (64.4 F), 60% RH
- 22.7 Celsius (73 F), 60% RH
- 27 Celsius (80.6 F), 49% RH
- 27 Celsius (80.6 F), 25%RH

View Sensor Data Point Details

On a cooling chart, the data points for your sensors display as green points.

You can verify whether the points are inside the recommended region you chose to display. The cooling chart allows you to view the details of each data point, and access the associated PDU details page.

*Note: If more than one sensor has the same reading, the points will appear stacked, so that 2 points appear to be 1. Hover the mouse over the point to view the details of each stacked point. Export the sensor data to view the details of each point in a text file. See **Export Sensor Data** (on page 107)*

► **To view sensor data point details:**

1. In the Dashboards tab, locate your cooling chart. Hover the mouse over a green data point.
2. The sensor data point details display in a pop-up.
 - Humidity Sensor Reading
 - Humidity Sensor Location - (EDM Hierarchy Rack location)
 - Temperature Sensor Reading
 - Temperature Sensor Location - (EDM Hierarchy Rack location)
3. Click the green data point. The Sensor List For Data Point dialog appears.
4. Click a row of data to open the PDU details page for the PDU where the sensor is located. Pop-up blockers may prevent this page from opening.

Cooling Chart Details - How Your Sensor Data is Charted

By default, Power IQ considers all environmental sensors to be inlet located. You can specify a sensor as outlet, inlet, or outside air located in the PDU details page. See ***Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors*** (on page 205).

For each sensor data point, the cooling chart will display the details of the associated humidity and temperature sensors. See ***View Sensor Data Point Details*** (on page 106).

Each data point requires two coordinates: temperature and humidity. For each temperature measurement, Power IQ correlates the corresponding humidity value. If the same sensor does not support both humidity and temperature readings, then the nearest humidity sensor is used to correlate temperature measurement with humidity measurement. The determination of the nearest humidity sensor is based on the Power IQ Enterprise Data Model hierarchy. For example, Floor -> Room -> Aisle -> Row ->Rack.

Export Sensor Data

To view pairs of sensor readings in a CSV file, export the data. The exported file contains a column called In Region, and a list of points. Points inside the region are listed as TRUE. Points outside the region are listed as FALSE.

Calculate Potential Cooling Energy Savings

Power IQ calculates the estimated cost savings you may experience by raising the temperature of your data center to a higher temperature while remaining within the guidelines of a selected ASHRAE® or custom region.

The potential cooling energy savings displays at the bottom of a cooling chart automatically when a data center is selected as the EDM node included.

- Potential cooling energy savings can only be calculated at the data center level, not at lower levels, such as room, or rack.
- All temperature sensor data points must be below the upper temperature limit for the region selected, or the calculation will show as 0%. The calculation works by showing you a potential estimated savings based on raising your highest temperature to the maximum allowed by the selected region.

Industry estimates show that you could save 3.9% for each 1 degree Fahrenheit that you raise the data center temperature; or 7% for each 1 degree Celsius that you raise the data center temperature. Your actual savings will vary. You can adjust the savings percentage used in the calculation.

► To adjust the savings percentage used:

1. In the Data Centers tab, select the data center node.
2. In the Ratings and Settings section, enter the percentage to use in the calculation in the Savings % per degrees C field.
 - The Savings % is set to a default: 7% for Celsius readings. Readings for Fahrenheit are calculated based on the Celsius percentage, and estimated at 3.9%.
3. Click Save. Go back to the cooling chart in the Dashboard to view updated potential cooling energy savings.

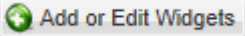
PUE Trend Chart Widget

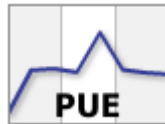
The PUE trend chart allows you to see how your data center's PUE has changed over a time period you select. Either daily or monthly calculations may be used. The length of the trend depends on how much data Power IQ has collected, as well as your selection.


Monthly data comes from a rollup conducted on the first of each month, using the previous month's data. Monthly data charts will update after each rollup. Monthly adjustments will affect this chart. See **List PUE Calculations and Adjustments** (on page 239). Note that daily values cannot include adjustments. A daily chart may be significantly different than a monthly chart when monthly adjustments are used.

You must configure your system before PUE is calculated. See **Requirements for PUE** (on page 237).

► To configure the PUE trend chart widget:

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the PUE trend chart widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. Click the Settings icon .
4. In the Granularity field, select the data you want plotted in the chart, either Monthly or Daily .
5. In the Time Selection section, select Period or Range.
6. Select Period to show constantly updated measurement.
7. Select Range to show measurements from a custom Start Date and End Date. Select the start and end dates using the calendar dialogs.
8. Enter a name for the chart, or check the Auto Name checkbox to accept the system name.
9. Select the Include Legend checkbox to display a legend with the data center names included on the chart.
10. To select or deselect any data center, click the Data Centers tab, and select or deselect any checkbox of a data center.
11. Click Save. The widget is added to the dashboard.

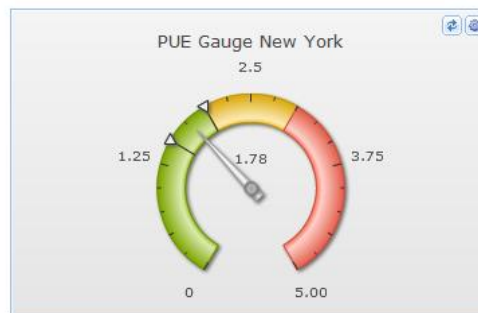
Latest PUE Reading Gauge Widget

The latest PUE reading gauge allows you to see where your data center's PUE falls in the threshold range you have configured. You can set a warning and critical threshold level for each data center. Warning and critical threshold levels are displayed as yellow and red in the gauge. See **Set PUE Thresholds** (on page 111).

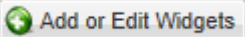
The gauge also shows the minimum PUE calculation and the maximum PUE calculation for a time period you specify. This data displays as tick marks, and may overlap.

Either daily or monthly calculations may be used. The latest PUE calculation is used. For daily gauges, the previous day is used. For monthly gauges, the previous full month is used. Monthly data comes from a rollup conducted on the first of each month, using the previous month's data. Monthly gauges will update after each rollup.


You must configure your system before PUE is calculated. See **Requirements for PUE** (on page 237).



► To configure the latest PUE reading gauge widget:

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the latest PUE reading gauge widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. Click the Settings icon .
4. Enter a Title for the gauge.
5. Select the Data Center whose PUE you want to display.

6. In the Granularity field, select the calculation you want to display, either Monthly or Daily .
7. In the Min/Max Period field, select the time period to include in the gauge calculation. The gauge displays the minimum and maximum of PUE values over the time period selected. The values are indicated with tick marks.
8. Click Save. The widget is added to the dashboard.

Set PUE Thresholds

An ideal PUE is 1.0. You can set warning and critical thresholds for your data center, and Power IQ uses those values to help visualize your PUE in the dashboard. See **Latest PUE Reading Gauge Widget** (on page 110) for details on the widget that displays this data.

PUE is calculated only at the data center level.

► To set PUE thresholds:

1. In the Data Centers tab, click a data center node.
2. In the Ratings and Settings section, set the threshold values for PUE Warning Threshold and PUE Critical Threshold.

Ratings and settings	
Capacity (kW):	25.5
Peak rate (\$/kWh):	0.1
Off-peak rate (\$/kWh):	0.06
Peak begin:	07:00
Peak end:	19:00
CO2 factor:	0.6
PUE Warning Threshold:	2
PUE Critical Threshold:	3
Cooling factor:	1
Savings % per °C:	7

3. Click Save. See **Latest PUE Reading Gauge Widget** (on page 110) for details on configuring the widget that uses these values.

Facilities Chart Widget

The facilities chart widget enables you to display active power or energy readings for one or more facilities objects, such as a CRAC, floor PDU, floor UPS, power panel, or standalone meter, in your data center.

Rack PDUs are excluded from this chart.

Facilities objects must be mapped in the EDM before the data can be charted. See **Create Your EDM** (see "**Creating Your EDM**" on page 135).

► To configure the facilities chart widget:

1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the Facilities Chart widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.



3. Configure the settings.
 - Measurement: Active Power or Energy
 - Time Range: Period or Custom
 - Period shows preconfigured time options, such as Past hour, Past week, Past month, and so on. Select the time period from the drop-down list. See **What's the difference between "Past" and "Last" time periods?** (on page 232)
 - Custom show measurements between the Start Date and End Date chosen in the calendar dialogs.
 - Granularity: Monthly, Daily, Hourly, Poll Interval
 - Monthly, Daily, and Hourly show 1 data point per month/day/hour for the time period the chart includes. The time period must be longer than the granularity.
 - Poll Interval shows 1 data point per poll interval for the time period the chart includes. The Poll Interval must be set to 5 minutes or longer to use Poll Interval granularity.
 - Statistic: Minimum, Maximum, or Average readings for each data point.
 - Title: Automatic or Custom. Automatic chart title is Statistic + Measurement + Time Range. For example, Average Active Power - Past 24 Hours.

- Lines: Show one line per data source, or Sum all data sources into one line. A data source is one facility object selected in the Data Sources table.
4. In the Data Sources table, click Add, then select the facilities objects to include. Use Control-Click to select multiple objects. Click Select Nodes. The table displays your selections.
 5. Click Save. The widget is added to the dashboard.

Floor Map Widget

The floor map widget uses a drawing of your data center, combined with information from your EDM and events, to create a color-coded health map of your data center.

The floor map widget supports the display of information regarding racks and facilities objects.

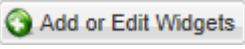
Power IQ supports the following facilities objects:

- CRAC
- Floor PDU
- Floor UPS
- Power panel
- Standalone meter

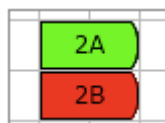
Objects represented in the drawing must be mapped in the EDM before they can display health in the floor map. See **Create Your EDM** (see "**Creating Your EDM**" on page 135).


- Make sure your data center drawing is a .DWG file that follows the requirements. See **Supported Drawing File Software and File Format** (on page 440), and **Floor Map Drawing Files** (on page 439).
- Object names in the drawing must be unique and match the object names in the EDM.

► To configure the floor map widget:

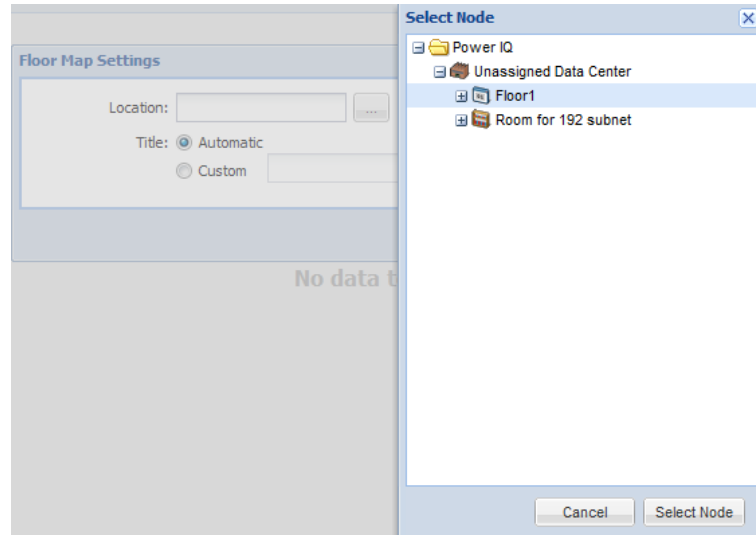
1. Click the  button in the upper right corner of the Dashboards tab. The Dashboard Configuration dialog appears.
2. Drag and drop the Floor Map widget icon into a row. See **Setting the Dashboard Layout** (on page 94) for details.

Tip: Floor Maps may look better as the only widget in a dashboard. You can create multiple dashboards.

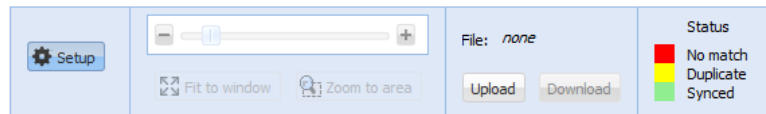


- Once the layout is saved, the blank floor map displays. Click the  icon in the upper right corner of the widget to open the Floor Map Settings. Choose the location in the EDM for the floor map drawing you want to use. Click Select Node.

You can create one floor map per Data Center, Floor, or Room. If a drawing has already been associated with a node, it will appear automatically when the location is chosen.



- In the Title field, select Automatic, or select Custom and add a name for the floor map. Click Save.
- Click Setup to toggle to the setup options, then click Upload.



- Click Browse, select the .dwg file, and click Upload. A success message displays when the drawing loads. The drawing displays with color-coded objects, indicating whether each object name has synced to the EDM. See **Syncing Floor Map Drawing with EDM** (see "**Syncing the Floor Map Drawing with EDM**" on page 115).

Syncing the Floor Map Drawing with EDM

In Setup mode, check the color-coding of each object in your floor map drawing to make sure it is synced to the EDM.

- GREEN: Objects in drawing that uniquely match an object in the EDM.
- YELLOW: Objects in drawing that have duplicate names, or that cannot be matched to a unique object in EDM
- RED: Objects in drawing not found in EDM.

The screenshot shows the software interface with the following components:

- Top Bar:** Includes a 'Setup' button (circled 3), a file name 'FMap_1000Rack.dwg', and a status legend (circled 1). The legend indicates: Red for 'No match', Yellow for 'Duplicate', and Green for 'Synced'.
- Objects in DB List (circled 2):** A table with columns 'Name' and 'Status'. The list includes objects like R004 (Synced), R025 (Synced), and many others (1A-3F) with 'No match' status.
- Floor Map Drawing:** A grid of objects represented by colored rectangles. Most are red (No match), but one object (R004) is green (Synced).

①	Status legend
②	<p>Objects in DB list: This list contains all objects found in the EDM for the location selected. The status reports whether the object was found in the drawing, and aligns with the colors and statuses in the legend.</p> <p>Click a drawing object or a list object to highlight the matching object, if any.</p>
③	<p>The Setup button toggles to show Setup mode, or View mode. This is Setup mode. You can upload or download the drawing and check sync status. To view Health, Rack Inspector, and click through to smart views, toggle to View mode.</p>

Using the Floor Map

In View mode, racks and facilities objects are color coded based on event severity. If a facility object, the rack itself, or any PDUs or sensors contained in the rack have warning or critical active events, the facility object or rack is shown as warning or critical level.

- GREEN: Normal. No warning or critical events.
- YELLOW: Warning. Warning level events reported.
- RED: Critical. Critical level events reported.
- GRAY: No Data. Object not found in EDM, or you do not have permission to view this object.



①	Status legend
②	<p>Rack Inspector: Select an object in the floor map to view readings and active events.</p> <p>Click the rack, facility object or PDU link in the Rack Inspector to go to the smart view.</p>

3	The selected object has a blue outline.
4	The Setup button toggles to show Setup mode, or View mode. This is View mode. You can view Health, Rack Inspector, and click through to smart views. To upload or download the drawing and check sync status, toggle to Setup mode.

Floor Map Data Refresh Rates

Rack threshold events appear and clear at the polling interval. See **Rack Thresholds** (on page 67).

The drawing and the Rack Inspector refresh at 30-second intervals.

Floor Map User Permissions

▶ User permissions required to upload a drawing to a floor map:

- Administrator, Site Administrator, or Operator


▶ User permissions required to view a floor map:

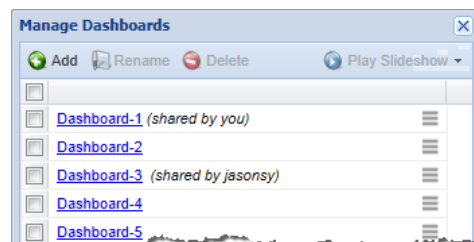
- View permissions to objects represented in the map. If user does not have View permission for a rack, for example, the rack appears gray in the drawing, and none of its data is included.
- Events Manager


View Dashboards as a Slideshow

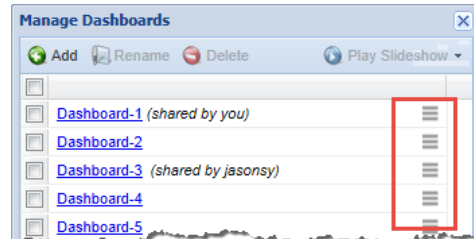
When you have more than 1 dashboard configured, you can view them as a slideshow. Slideshows play in full screen mode. To enhance the full screen effect, set your browser to full screen mode, too.

▶ To view dashboards as a slideshow:

1. In the Dashboards tab, click the button  in the top right corner. The Manage Dashboards dialog appears.



2. All configured dashboards display in a list. The first dashboard listed will display as your default dashboard. Move your mouse pointer to the  area, then drag and drop the entries in the list to set a new default, and to choose the order the entries will display in the slideshow.



3. Select the checkboxes for the dashboards you want to include in the slideshow. Select the first checkbox to automatically select all configured dashboards.
4. In the Play Slideshow drop-down list, select the length of time each dashboard will display in the slideshow before moving to the next dashboard. When you select the time, the slideshow starts.

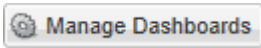
► **To exit the slideshow:**

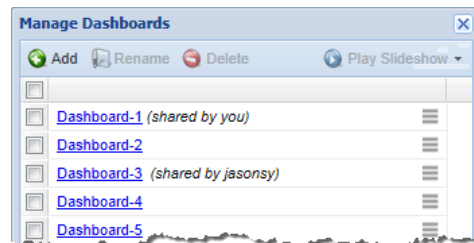
- Click the "Exit full-screen mode" link in the top right corner, or click the Raritan logo.

Renaming a Dashboard

You can only rename the dashboard that you created.

► **To rename a dashboard:**

1. In the Dashboards tab, click the button  in the top right corner. The Manage Dashboards dialog appears.



2. Select the checkbox for a dashboard.
3. Click Rename, and then modify the name in the text box that appears.

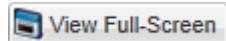
- The other alternative is to double click the dashboard's row to edit its name. Double-clicking should be performed in the space following the name link.

View Dashboard in Full Screen Mode

You can view the dashboard in full screen mode, which removes all other borders and controls.

▶ **To view dashboard in full screen mode:**

- In the Dashboards tab, click the full screen mode button



in the top right corner of the dashboard.

▶ **To exit full screen mode:**

- Click the "Exit full-screen mode" link in the top right corner, or click the Raritan logo.

How Does Power IQ Calculate the Sum of a Data Center Node?

Power IQ uses a formula for charting a whole data center node, such as a Room, that prevents duplication of data.

The sum of a node is the sum of the inlets of all rack PDUs under the node, plus the sum of all non-duplicate Circuits in all Power Panels, Floor PDUs, and UPSs contained by the node. See Floor PDUs, Power Panels, UPS, Standalone Meters in the Data Center Browser

If a node contains a rack that contains an IT device mapped to a floor PDU outside that node, the IT device is not part of the sum of that node.

An HVAC system's power is part of the sum of the power for charts drawn for the physical location it serves, as position in the Data Center browser. See **CRACs in the Data Center Browser** (on page 183)

Chapter 8 Security and Encryption

In This Chapter

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Installing an HTTPS Certificate

A PEM file upload is required to replace the current certificate and private key. The PEM file needs to contain both an RSA private key and an X509 certificate.

Note: Power IQ® does not provide a Certificate Signing Request (CSR). OpenSSL or any other utility can be used to generate CSR. Power IQ does not use encrypted private keys. You must remove the password from the Private key before it can be used. To remove the encryption from the key, issue a command like: "openssl rsa -in server.key -out server2.key". Use "server2.key" when using openssl utility.

It is not required to provide root certificate of CA signing Power IQ certificate signing request (CSR).

► Step 1: Generate a private key

This example procedure is for generating a private key using OpenSSL on a Linux server.

1. This command creates an RSA key with Triple DES 1024 byte encryption.

```
openssl genrsa -des3 -out server.key 1024
```
2. Remember the key password from this command.
3. Generate a Certificate Signing Request. Be prepared to complete the following information:
 - private key password
 - two character country code
 - full state or province name

- city name
 - company name
 - organizational unit or leave it blank
 - servers common name or fully qualified domain name
 - admin email address
 - other attributes can be left blank
4. Create the request.


```
openssl req -new -key server.key -out server.csr
```
 5. Display the CSR request.


```
cat server.csr
```
 6. Copy the CSR request and send it to the certificate authority to be signed. Make sure to copy everything between the first "-----" and the last "-----".
 7. Submit CSR to certificate authority and receive signed X.509 certificate.
 8. Modify the server key to remove the password


```
cp server.key server.key.secure
openssl rsa -in server.key.secure -out server.key
```

Warning: The server.key file must be kept private and secure. If this key file is compromised, the certificate should be removed and then reissued.

9. Create PEM file.
 - The PEM file should contain both the RSA private key without password and the X.509 certificate.
 - Concatenate the unprotected private key to the signed X.509 certificate file from the top level certificate authority.
 - Use this file in the upload in Step 2.

► **Step 2: Upload the PEM file to Power IQ:**

You may want to manually load the certificate in your browser first to prevent issues while everything loads and refreshes in Power IQ. If you see any issues, such as bad labels or a partially loaded UI, refresh your browser to resolve.

1. In the Settings tab, click HTTPS Certificate in the Security and Encryption section.
2. If uploaded, the currently HTTPS certificate displays. To replace it or add a new certificate, click Browse and select the PEM file.
3. Click Upload.

Restricting Web and Shell Access Based on IP Address

To increase security, Power IQ® can be configured to restrict web interface and SSH access by IP address.

When trusted hosts are specified, Power IQ blocks attempts to connect from addresses not specified.

When no hosts are specified, ports 22, 80, 443, 5432 are open to all hosts.

► **To restrict web and shell access:**

1. In the Settings tab, click IP based Access Control in the Security and Encryption section.
2. The global options will override any options that allow access to the SSH and ODBC service.
 - Allow ICMP ping responses
 - Block all SSH access
 - Block all ODBC access: See **ODBC Access** (on page 357).
3. Identify the hosts to allow access to in the Trusted Hosts fields.

You can enter an IP address, or a subnet using CIDR notation such as 192.168.45.0/24.
4. For each address, select how it is permitted to access Power IQ.
 - Select the Enable SSH to allow SSH access checkbox.
 - Select the Enable HTTP/HTTPS checkbox to enable access through the web interface.
 - Select Enable ODBC to allow third party access.
5. Click Save.

Configuring Password Requirements

To specify password strength for Power IQ users, select from a list of password requirements. Users that are locally authenticated will be required to use passwords that comply with the settings. For example, you may require that all passwords contain a number and are longer than 8 characters.

Password requirements apply to locally authenticated users only. If LDAP is enabled, the password requirements selected are not followed.

Changes to the password requirements apply only to future new and changed passwords. Users whose passwords were created before the password requirement change will not be forced to change passwords to comply with the requirements.

► **To configure password requirements:**

1. In the Settings tab, click Password Requirements in the Security and Encryption section.
2. In the Minimum Password Length field, select the minimum number of characters a password must include.
3. In the Maximum Password Length field, select the maximum number of characters a password may include.
4. Select the checkboxes for each requirement you want included in locally-authenticated user passwords.
 - a lowercase character: Password must contain any lowercase letter.
 - an uppercase character: Password must contain any capital letter.
 - a numeric character: Password must contain a number.
 - a special character: Password must contain any special character, including: `~!@#$$%^&*()_+{}|:"<>?/.,';][=-\``
5. Click Save.

Encrypting Data Backup Files

Power IQ encrypts data backup files using a GnuPG/PGP public key that you generate.

You can generate PGP Encryption Keys using free tools. Go to <https://www.gnupg.org> and look for a binary for your operating system on the Downloads page.

Important! Make sure to save both the public and private keys that you generate. You need the public key for backup file encryption and the

private key for backup file decryption. See *Decrypt Backup Files Before Restoring* (on page 130)

▶ **To encrypt the data backup files:**

1. In the Settings tab, click Data Backup Encryption in the Security and Encryption section.
2. Select the Encrypt Backups checkbox.
3. Click Browse, then select and upload a GnuPG/PGP Public Key to Power IQ.
4. Click Save.

Enabling Single Sign On for Raritan Products

You can launch the web interface of a Raritan PX1 or PX2 PDUs or a Raritan EMX by clicking the Launch link on the PDU details page. When single sign on is not enabled, users must then login manually.

Enable single sign on to allow users to automatically authenticate with their Power IQ credentials.

Users must have identical credentials on Power IQ and on the target Raritan product, and be logged in to Power IQ with those credentials for single sign on to succeed. Single sign on must be enabled in Settings > Single Sign On.

See ***Launch the Web Interface for a Raritan PX PDU*** (on page 181).

▶ **To enable or disable single sign on for Raritan Products:**

1. In the Settings tab, click Single Sign on in the Security and Encryption section.
2. Select the "Enable single sign on to Raritan PDUs" checkbox to enable, or deselect the checkbox to disable single sign on.
3. Click Save.

Enabling the WS API

To get started with the WS API, the API needs to be enabled through the Settings Tab. It is disabled by default.

▶ **To enable the Web API:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.
2. In the Web API Settings, select the Enable Web API checkbox, then click Save.

Enabling the Web API User Account

The Web API user account is a locally authenticated user that can be used for Web API scripts that require user credentials. The username is "web_api." The password for the account can be configured.

The Web API account is configurable only on the Settings > Other Security Settings page. The Web API user is always authenticated locally, even when LDAP is enabled.

The Web API account is assigned the administrator role. This role assignment cannot be changed.

▶ **To enable the Web API user account:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.
2. In the Web API Settings, select the "Enable web API user web_api" checkbox.
3. In the Web API user password field and the Confirm password field, enter a password.
 - The password must follow the requirements selected in Settings > Password Requirements. See **Configuring Password Requirements** (on page 123).
4. Click Save SOAP Web API Settings.

Change Web User Session Timeouts

You can set Power IQ™ to log out any web users who have been inactive for a certain period of time.

▶ **To change web user session timeouts:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.
2. In the User Session Timeout box, select a time from the "Log users out" list. The time indicates how long users can remain idle on the Power IQ web interface before being logged out. Select Never to disable this feature.
3. Click Save Timeout.

Configuring the Authorization Warning Message

The authorization warning message displays on the Power IQ login page. You can change the default message.

► **To configure the authorization warning message:**

Warning: Do not use html scripts in the message. Some scripts could cause the system to lock you out.

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.
2. In the Authorization Warning message section, enter the message you want to display on the login page.
 - Header: Text entered in this field displays on the login page in a bold font, as the heading to the message
 - Body: Text entered in this field displays in a normal font, as the main content of the message.
3. Click Save. Log out of Power IQ to return to the login page and view the message.

Configuring Enterprise Power IQ Settings

Enterprise Power IQ must use the password configured to communicate with a local Power IQ installation.

► **To configure Enterprise Power IQ settings:**

1. In the Settings tab, click Other Security Settings in the Security and Encryption section.
2. Enter the password that will be required in Enterprise Power IQ to communication with this local Power IQ.
3. Enter the password again to confirm.
4. Click Save Enterprise Power IQ Settings.

Chapter 9 Data Management

In This Chapter

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Configuring Data Rollup Retention

Power IQ performs periodic roll-ups. During a roll-up, the values over that period are averaged and stored along with the minimum and maximum values that were measured. As time passes, the stored roll-up data itself is rolled up into larger sets of data. Raw data measurements are rolled up every hour, and 24 hourly roll-ups are rolled up every day, and so on.

Data does not have to be purged immediately after a roll-up occurs. For example, raw data is rolled up every hour but a set of raw data can still be made available five hours later. You can configure how long Power IQ retains each level of data.

Ideally, you should adjust the data retention periods before adding PDUs to Power IQ management. You should also revisit these settings after adding a large number of PDUs.

*Note: Power IQ collects a lot of data. Keeping this data for long periods of time consumes large amounts of storage space and may affect performance. If you need long term access to the raw poll data, you should download daily sensor readings regularly. See **Downloading Daily Sensor Readings** (on page 267).*

Before making any changes to this configuration, enter your settings in the data storage calculator to ensure adequate database capacity. Improper configuration may result in data loss. Access the data storage calculator by clicking the link on the Settings > Data Rollup Retention page in Power IQ.

► **To configure data rollup retention:**

1. In the Settings tab, click Data Rollup Retention, in the Data Management section.
2. Start with the "Retain raw data" row. Use the drop-down lists in that row to select how long Power IQ should keep this raw data.

3. In the Retain hourly averages of data row, configure how long hourly roll-ups are stored.
4. In the Retain daily averages of data row, configure how long daily roll-ups should be stored.
5. In the Retain monthly averages of data row, configure how long monthly roll-ups should be stored by Power IQ.

Data Backups

Power IQ creates a daily system configuration backup file.

You can download the files to another location. **Downloading System Configuration Backup Files** (on page 128).

To automatically download daily backup files, setup a remote storage location. See **Configuring Remote Storage of Archive Files** (on page 131).

You can also create a new system configuration backup file at any time. See **Create a System Configuration Backup File** (on page 128).

If needed, you can use a backup file to restore your Power IQ to an earlier, backed-up configuration. See **Restoring System Configuration Backups** (on page 129).

Downloading System Configuration Backup Files

The configuration of your Power IQ is backed up and archived once each day. Administrators should periodically copy these backup files to an external server for redundancy purposes.

Note: You can also manually create an archive of the system configuration by clicking Create at any time.

► **To download the system configuration backup file:**

1. In the Settings tab, click Data Backups in the Data Management section. The Data Backups page opens.
2. Select a backup entry from the list and click its name to download the backup file to your computer.

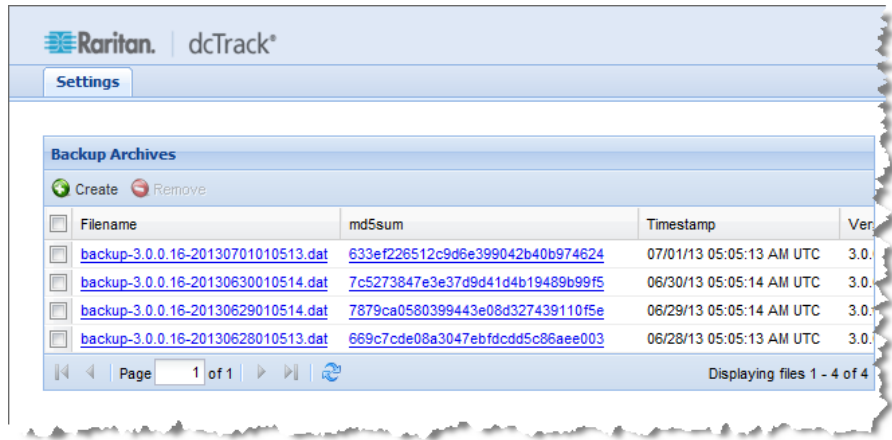
Create a System Configuration Backup File

Power IQ creates a daily backup file. You can create a new backup file at any time.

► **To create a system configuration backup file:**

1. In the Settings tab, click Data Backups in the Data Management section.

- In the Backup Archives section, click Create. The file is created and added at the top of the list. An MD5 file is also created along with the backup file for verification purposes.



-

Restoring System Configuration Backups

If your system configuration backup file is encrypted, see ***Decrypt Backup Files Before Restoring*** (on page 130).

Restoring a system configuration backup file returns Power IQ's configuration to the settings captured when the backup was made.

Note: If you restore a backup containing an SSL security certificate that is different from the one currently installed on the system, the progress bar for "Restoring the system and restarting..." will not complete. This happens because the browser will not accept any messages from Power IQ until you establish a secure connection using the restored certificate. Start a new browser session and you can log into the system once the former certificate has been restored.

► To restore a system configuration:

- In the Settings tab, click Data Backups in the Data Management section. The Data Backups page opens.
- In the Restore a Backup Archive section, click Browse, then select a backup file.

Click Upload. The Power IQ data and configuration settings are restored to the backup's configuration settings, and the server is rebooted.

Decrypt Backup Files Before Restoring

You must decrypt encrypted backup files before they can be used to restore a Power IQ system.

► **To decrypt X.509/MIME encrypted backup file:**

Use the openssl Linux command to decrypt a X.509/MIME encrypted backup file.

- Example:

```
[root@localhost ~]# openssl smime -decrypt -in
/root/backup-3.1.0.30-20111118010513.dat -inkey
user-private-key -inform DER -recip
user-public-key >unencrypted-backup.dat
```

► **To decrypt a PGP encrypted backup file:**

Use the gpg Linux commands to decrypt a PGP encrypted backup file.

- Example:

```
[root@dhcp-209 ~]# gpg --import PGP_private_key2.txt
gpg: directory `/root/.gnupg' created
gpg: new configuration file `/root/.gnupg/gpg.conf'
created
gpg: WARNING: options in `/root/.gnupg/gpg.conf' are not
yet active during this run
gpg: keyring `/root/.gnupg/secring.gpg' created
gpg: keyring `/root/.gnupg/pubring.gpg' created
gpg: key 41965311: secret key imported
gpg: /root/.gnupg/trustdb.gpg: trustdb created
gpg: key 41965311: public key "username@email.com"
imported
gpg: Total number processed: 1
gpg: imported: 1 (RSA: 1)
gpg: secret keys read: 1
gpg: secret keys imported: 1

[root@dhcp-209 ~]# gpg --decrypt --output
/root/unencrypted.dat
/root/backup-4.0.2.8-20130220153455.dat
```

```

You need a passphrase to unlock the secret key for
user: "username@email.com"

1024-bit RSA key, ID 41965311, created 2013-02-19

can't connect to `/root/.gnupg/S.gpg-agent': No such file
or directory

gpg-agent[9705]: directory
`/root/.gnupg/private-keys-v1.d' created

gpg: encrypted with 1024-bit RSA key, ID 41965311, created
2013-02-19

"username@email.com"

gpg: WARNING: message was not integrity protected

```

System Configuration Backup File Retention

Power IQ retains backup for four days. A file older than four days is deleted automatically, unless it is the only stored backup file. One backup file is always kept, regardless of age.

Configuring Remote Storage of Archive Files

Configure a remote storage server to automatically store your archive files. All files that are not being actively written to are automatically stored on the configured server. Sensor reading archives are often being actively written to, so their storage may be approximately one day delayed.

Two file types are eligible for automatic remote storage.

- System configuration archives, that is, system configuration backup files, including daily automatic backups and manually created backups Note: When using SCP remote storage service, only automatic backups are moved, not manually created backups.
- Sensor reading archive files

► **To configure remote storage of backup files:**

1. In the Settings tab, click Remote Storage in the Data Management section.
2. Select the remote storage service type.
 - None: to stop automatic remote storage
 - Amazon Web Services

- SCP
 - SFTP
 - FTP
3. Select the checkboxes for the file types you want to automatically store on a remote server.
 - Store backup archives
 - Store sensor reading archives
 4. Complete the authentication and location information for your selected remote server.
 5. Click Save.

Configuring Remote Access to Database

Power IQ's ODBC interface allows ODBC compliant applications access to the power data of managed devices. For example, an ODBC compliant reporting application like Crystal Reports can access Power IQ data to create customized reports.

See **ODBC Access** (on page 357) for details on configuration and queries.

Enterprise Relationships and the EDM

One of Power IQ's advanced features is the ability to model the IT equipment infrastructure within your data center. Power IQ can model something as simple as a single rack, or as large as a building with multiple server rooms.

In Power IQ, this hierarchical representation of your data center is called the enterprise data model, or EDM. The EDM shows the relationships between objects in your data center and enables Power IQ to:

- Display a representation of your equipment in the Data Centers tab.
- Generate charts in the Analytics tab.
- Generate charts and gauges on the Dashboard.
- Calculate PUE.

What is an Enterprise Data Model (EDM) Object?

An object is an item that is a part of your data center.

The objects are mapped by relationships of parent and child, creating a hierarchy.

Higher-level objects contain and organize lower-level objects. For example, a Rack is an object that contains Devices, a Row is an object that can contain Racks, and an Aisle is an object that can contain Rows. See ***Object Types and their Hierarchy*** (on page 134)

The lowest-level objects are called Devices. Devices are items such as servers, KVM drawers, network switches, or other equipment commonly installed in server racks. Generally speaking, these are items you provide power to.

There are a couple of special exceptions. You can map circuits and outlets as part of your EDM, but these objects don't show in the main hierarchy in the Data Centers tab. Since their associations are to your IT devices, circuits display in the device details pages, and outlets display in both the device details pages, and rack PDU smart pages.

What are Mappings and Relationships?

All objects, except for the Data Center, must have a larger object as a parent. Generally speaking, a parent object is a larger object that contains a smaller object.

The Data Center object is the largest object. It has no parent object.

This ability to identify an object's parent is a single mapping. Mapping each object to its parent describes a model of equipment and how it is organized to Power IQ.

Your model does not have to include every level, as long as it follows the rules for parent-child relationships. See ***Object Types and their Hierarchy*** (on page 134).

Object Types and their Hierarchy

From the top of the hierarchy to the bottom:

- DATA_CENTER - The data center object type. This object has no parent.
- FLOOR - The floor object type. This object can only have a DATA_CENTER as a parent.
- ROOM - The room object type. This object can have a DATA_CENTER or FLOOR as a parent.
- AISLE - The aisle object type. This object can have a DATA_CENTER, FLOOR, or ROOM as a parent.
- ROW - The row object type. This object can have a DATA_CENTER, FLOOR, ROOM, or AISLE as a parent.
- RACK - The rack object type. This object can have a DATA_CENTER, FLOOR, ROOM, AISLE, ROW, or RACK as a parent.
- DEVICE - The IT Device object type. This object can only have a RACK as a parent.

These objects represent outlets, circuits, PDUs, and sensors:

- PDU - The PDU object type. This object represents all types of PDUs in Power IQ, including Rack PDUs, Rack Transfer Switches, CRACs, Floor PDUs, Floor UPS, Power Panels, and Standalone Meters. This object can have a DATA_CENTER, FLOOR, ROOM, AISLE, ROW, or RACK as a parent.
- SENSOR - The sensor object type. This object can have a DATA_CENTER, FLOOR, ROOM, AISLE, ROW, or RACK as a parent.
- OUTLET - The outlet object type. This object can only have a DEVICE as a parent.
- CIRCUIT - The circuit object type. This object can only have a DEVICE as a parent.

Requirements for Creating EDM

- All PDUs included in your EDM must already be added to Power IQ. See ***Adding PDUs to Power IQ Management*** (on page 20).

Creating Your EDM

There are several ways to create your EDM:

- Import a CSV file containing the EDM object mappings. See ***Import EDM Object Mappings*** (on page 140).
- Add objects manually in the Data Centers tab, using drag-and-drop to arrange the hierarchy. See ***Create an EDM Manually*** (on page 136).
- Generate a default EDM. A default EDM gives you a starting point for customization using the other methods, and enables you to start using dashboard charts immediately. See ***Generate a Default EDM*** (on page 148).

Create an EDM Manually

The Data Centers tab has menu options to add each EDM object manually, and associate PDUs and sensors. Once objects are added, drag and drop them to arrange the hierarchy that represents your data center. See **Object Types and their Hierarchy** (on page 134) for details on each object and how it can be used in the EDM.

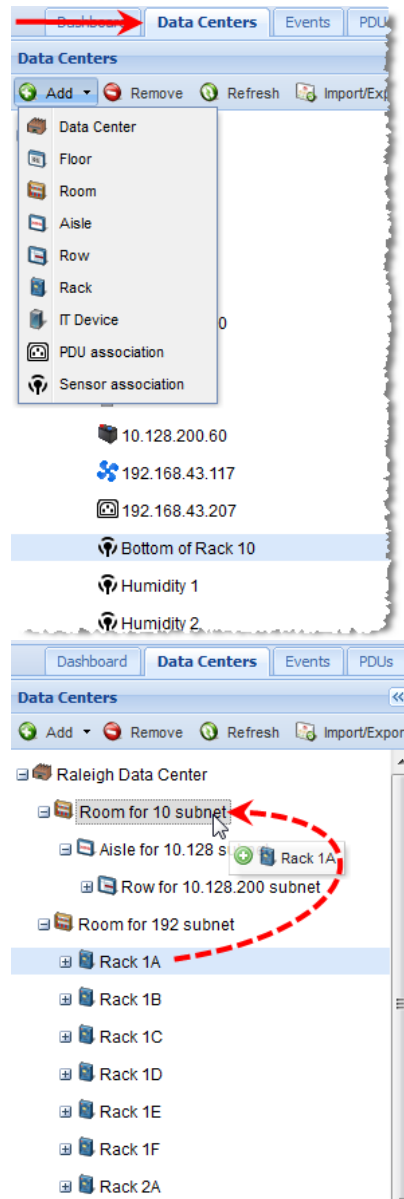
See **Importing EDM Object Mappings** (see "**Import EDM Object Mappings**" on page 140) for an alternative to creating the EDM manually.

Prerequisite: PDUs must be added to Power IQ before creating an EDM. See **Adding PDUs to Power IQ Management** (on page 20).

► To add EDM objects:

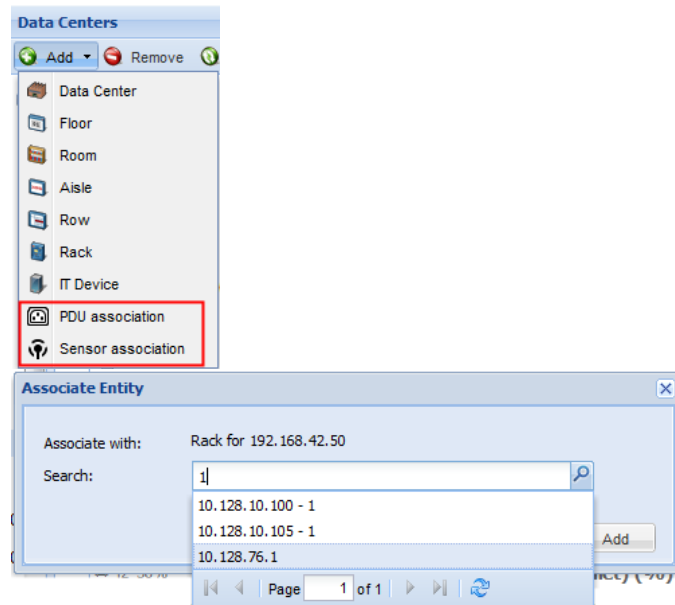
You can add Data Center, Floor, Room, Aisle, Row, Rack, and IT Device objects.

Click Add, then select the object and name it when it appears in the tab.



► **To associate PDUs and sensors:**

To associate PDUs in the EDM, you must add them to Power IQ first. Use the PDU Association menu option to find PDUs that are not yet in the EDM, and place them in the hierarchy. Power IQ automatically adds your sensors to the EDM when you associate their PDUs. And, Power IQ moves your sensors when they have the same parent as the PDU. See ***Automatically Associate Sensors in the EDM*** (on page 139).



Note: Only PDUs and sensors that are unassociated will appear as options. PDUs include facilities objects.

► **To associate outlets and circuits with IT devices:**

Outlets and circuits can be associated with IT Device objects only. See ***Associate a Circuit or Outlet with an IT Device*** (on page 149).

Automatically Associate Sensors in the EDM

Power IQ automatically associates your sensors into the EDM. See **Enterprise Relationships and the EDM** (on page 132).

Every five minutes, Power IQ checks for sensors that are not part of the EDM. If the sensor's PDU is in the EDM, Power IQ adds the sensor to the PDU's parent object, usually a rack. Click Refresh in the Data Centers tab to view the updated EDM.

When you associate a PDU in the EDM, Power IQ adds the sensors to the PDU's parent object.

When you remove a PDU from the EDM, Power IQ unassociates sensors that are associated with the PDU's parent object. But, any sensor that were associated to other EDM objects stay where they are.










When you move a PDU in the EDM, Power IQ moves the sensors that had the same parent to the new parent. But, any sensors that were associated to other EDM objects stay where they are.







Note: Because unassociated sensors attached to an associated PDU will be re-associated every five minutes, you cannot remove a sensor from the EDM if its PDU is in the EDM.

You can also associate sensors manually and by import. See **Create an EDM Manually** (on page 136) and **Import EDM Object Mappings** (on page 140).

Icons for EDM Objects

The following icons are used to represent each object in the EDM.

Icon	Object
	Data Center
	Floor
	Room
	Aisle
	Row
	Rack
	IT Device
	Rack PDU
	Sensor

Icon	Object
	CRAC
	Floor PDU
	Floor UPS
	Power Panel
	Standalone Meter
	Rack Transfer Switch

Import EDM Object Mappings

One method to create or add to an EDM is to import the objects and their mappings. These mappings are imported as one or more Comma Separated Value (CSV) files. Additional CSV files append to the EDM, except when objects are duplicated in the CSV files. In the case of duplicates, the last uploaded object updates the previous entries.

If an EDM already exists, you can export it as a single CSV file. This file can then be edited to make additions, or used as a template to create a new file. See **Exporting an EDM** (on page 149).

For details on creating the CSV file, see **Structure of the EDM Import File** (on page 141).

*Note: All PDUs must be added to Power IQ first, before importing an EDM. Importing a CSV file that lists a PDU not added to Power IQ results in an error. See **Adding PDUs to Power IQ Management** (on page 20).*

► To import EDM object mappings:

1. In the Settings tab, click Enterprise Relationships.
2. In the CSV Data Mapping Actions area, click Browse, and select the CSV file.
3. Click Import.

A status window indicates any issues that occurred when the upload completes. If any errors have occurred, none of the objects in the file are added. Edit the CSV file to correct any issues and try again.

Structure of the EDM Import File

The EDM import file must be in .CSV format.

▶ General structure:

- One Object per line.
- All Objects except for a Data Center list another valid object as a parent.
- All Objects have a unique key for their type.
- Within a single CSV file, object order is not important. All objects are processed at the same time.
- The CSV file has a maximum length of 2500 lines, meaning a maximum of 2500 objects can be imported at one time. See **Importing More than 2500 Objects** (on page 148) for details on importing multiple files. Object order and import order are important in this case.

▶ Object key:

An object's unique identity is a combination of its object type and its object key, which is called an external key. This means you could have two objects with the same name, as long as they are different types of objects.

However, if two lines are both type "DEVICE" and both have an external key "Sales1", Power IQ sees only one device object with the key "Sales1". In this case, it uses the last DEVICE object identified as "Sales1" as the description for that device.

The columns required for each object varies, depending on the object type.

All columns are separated by a comma.

- Most columns containing text information can be up to 64 characters long. These columns can contain any character except for a comma.
- The `custom_field_1`, `custom_field_2`, `external_key` and `parent_external_key` fields can be up to 255 characters long. These columns can contain any character except for a comma.

CSV Columns for DATA_CENTER Objects

A line that describes a Data Center object has the following attribute columns in the order listed.

All columns are separated by a comma.

Note the attribute columns toward the end. For example: by providing the cost of energy for the data center, Power IQ can calculate the cost of running the data center in an Analytics report. Report can be filtered to include only a smaller object, such as a Rack. See **Configuring Charts** (on page 229).

- `object_type` - this value is always "DATA_CENTER"
- `external_key` - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.
- `name` - The name of the data center.
- `contact_name` - The name of the contact for this data center.
- `contact_phone` - The phone number for the contact for this data center.
- `contact_email` - The email address of the contact for this data center.
- `company_name` - The name of the company that owns this data center
- `city` - The city where the data center resides.
- `state` - The state/province where the data center resides.
- `country` - The country where the data center resides.
- `peak_kwh_rate` - The cost per kilowatt hour during peak hours
- `off_peak_kwh_rate` - The cost per kilowatt hour during off-peak hours
- `peak_begin` - The time the peak hours begin.
- `peak_end` - The time the peak hours end.
- `co2_factor` - The co2 factor for this site. This indicates thse amount of carbon dioxide produced per kWh.
- `cooling_factor` - The cooling factor per kw energy used. This is the energy used for cooling, or how many kilowatts of energy are used to cool 100 kilowatts of power consumption.
- `custom_field_1` - A custom field for the user to specify.
- `custom_field_2` - A second custom field for the user to specify.
- `capacity` - The peak capacity in kilowatts, specified with up to two decimal places.

CSV Columns for FLOOR, ROOM, AISLE, and ROW Objects

Lines that describe a Floor, Room, Aisle, or Row have the following attribute columns in this order:

- `object_type` - One of the following values: FLOOR, ROOM, AISLE, ROW
- `external_key` - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.
- `name` - The name of the object.
- `parent_object_type` - One of DATA_CENTER, FLOOR, ROOM, or AISLE, as described previously.
- `parent_external_key` - The unique identifier for the parent object. It can be a name, number, or any other kind of text. This field must be unique to that parent object (however, many "child" objects may have the same parent).
- `capacity` - The peak capacity in kilowatts, specified with up to two decimal places.

CSV Columns for RACK Objects

A line that describes a Rack has the following attribute columns in this order:

- object_type - RACK
- external_key - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.
- name - The name of the object.
- parent_object_type - One of DATA_CENTER, FLOOR, ROOM, AISLE, or ROW, as described previously.
- parent_external_key - The unique identifier for the parent object. It can be a name, number, or any other kind of text. This field must be unique to that parent object (however, many "child" objects may have the same parent).
- location - an optional field that can be used to identify where rack sits in a row or aisle.
- capacity - The peak capacity in kilowatts, specified with up to two decimal places.
- override_upper_critical_percent - Value to override the default upper critical percent for rack threshold. See **Set Rack Capacity and Override Threshold Percentages** (on page 69).
- override_upper_warning_percent - Value to override the default upper warning percent for rack threshold. See **Set Rack Capacity and Override Threshold Percentages** (on page 69).

The Rack model object is similar to the Floor, Room, Aisle and Row objects. The exception is the location value. This value is intended to make the rack easier to identify, and can be given a location value. For example: "3rd Rack" to indicate the third rack in a particular row.

It can also use some other identifying trait. For example: "Yellow" if the rack has a yellow color.

CSV Columns for DEVICE Objects

A line that describes a Device object has the following attribute columns in this order:

- `object_type` - this value is always "DEVICE"
- `external_key` - The unique identifier for this object. It can be a name, number, or any other kind of text. This field must be unique.
- `name` - The name of the data center.
- `parent_object_type` - This value is always "RACK".
- `parent_external_key` - The external key for the parent rack.
- `customer` - The customer using this device.
- `device_type` - The type of device. For example: "exchange server" or "test unit".
- `power_rating` - The power rating of this device in watts or VA.
- `decommissioned` - Indicates whether this device has been decommissioned or not. This value is either "true" or "false".
- `custom_field_1` - A custom field for the user.
- `custom_field_2` - A second custom field for the user.
- `device_ip` - The IP address of the device. Required when also importing a graceful shutdown command.
- `shutdown_command_name` - The name of the shutdown command assigned to this device. See **Add Shutdown Commands** (on page 217).
- `shutdown_wait_time` - The number of seconds Power IQ should wait for the shutdown to complete before powering off the associated outlet. See **Enable Graceful Shutdown for an IT Device** (on page 218).

► **Sample CSV for a device with a graceful shutdown command:**

```
DEVICE,Device -- 54,Web Server 7,RACK,Rack -- 12,Marketing,Linux
Server,,false,Dell PowerEdge R910,Tag#
336549,192.168.43.142,Marketing Linux Servers Shutdown
Commands,5
```

► **Sample CSV for a device without a graceful shutdown command:**

```
DEVICE,Device -- 55,Router,RACK,Rack -- 12,Marketing,Cisco
Router,,false,Cisco 7600 Router,Tag#044142,,
```

CSV Columns for OUTLET Objects

A line that describes an Outlet object has the following attribute columns in this order:

- `object_type` - this value is always "OUTLET"
- `pdu_ip` - The IP address of the PDU that this is attached to.
- `pdu_proxy_address` - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.
- `outlet_number` - The outlet number on the side of the PDU for this outlet.
- `parent_object_type` - This value is always "DEVICE"
- `parent_external_key` - The unique identifier for the DEVICE that this outlet serves.

Power IQ automatically creates Outlet objects when Raritan PX PDUs are placed under its management. If you create an Outlet object with a `pdu_ip` not under Power IQ management, the CSV file generates an error.

CSV Columns for PDU Objects

You must add all PDUs to Power IQ before you can map them in the EDM.

A line that describes a PDU object has the following attribute columns in this order:

- `object_type` - This value is always `PDU`.
- `pdu_ip` - The IP address of the PDU.
- `pdu_proxy_address` - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.
- `parent_object_type` - One of `DATA_CENTER`, `FLOOR`, `ROOM`, `aisle`, `ROW`, `RACK`.
- `parent_external_key` - The unique identifier for the parent object. It can be a name, number, or any other kind of text. This field must be unique to that parent object. Many "child" objects may have the same parent.

CSV Columns for CIRCUIT Objects

You must add all PDUs to Power IQ before you can map them in the EDM.

A line that describes a CIRCUIT object has the following attribute columns in this order:

- `object_type` - This value is always `CIRCUIT`.
- `pdu_ip` - The IP address of the PDU.
- `pdu_proxy_address` - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.
- `panel_number` - If the circuit is located in a panel, enter the panel number.
- `circuit_number` - The circuit's number
- `parent_object_type` - A circuit's `parent_object` is always `DEVICE`.
- `parent_external_key` - The parent `DEVICE`'s external key. This field must be unique to that parent object. Many "child" objects may have the same parent.

CSV Columns for SENSOR Objects

Sensors must have unique labels.

A line that describes a SENSOR object has the following attribute columns in this order:

- `object_type` - This value is always `SENSOR`.
- `pdu_ip` - The IP address of the PDU the sensor is attached to.
- `pdu_proxy_address` - If the PDU is in a daisy-chained configuration or console server configuration, enter the PDU's position number in the chain or serial port number.
- `type` - One of the following values: `AIR_FLOW`, `AIR_PRESSURE`, `CONTACT_CLOSURE`, `HUMIDITY`, `SMOKE`, `TEMPERATURE`, `VIBRATION`, `WATER`.
- `ordinal`: The number of the sensor's position on the PDU.
- `parent_object_type` - A sensor's `parent_object` is one of the following: `DATA_CENTER`, `FLOOR`, `ROOM`, `aisle`, `ROW`, `RACK`.
- `parent_external_key` - The parent `DEVICE`'s external key. This field must be unique to that parent object. Many "child" objects may have the same parent.

Importing More than 2500 Objects

The EDM import file may contain a maximum of 2500 lines, one line per object. If you have an EDM with more than 2500 objects, create multiple CSV files.

In this case, the contents of each CSV file, and the order in which you import them is important.

All objects except for Data Center must have a valid parent when added. Importing a child object in file #1, and the parent object in file #2, results in an error.

Make sure each file contains a parent object for each object, or import all high-level parent objects first, such as Data Center and Room, then import the lower-level child objects in subsequent files.

Generate a Default EDM

If you've added PDUs to Power IQ, you can generate a default EDM. You can customize the default EDM using the menu options in the Data Centers tab, or use export, edit the file, and re-import.

Generating a default EDM deletes all mappings already configured.

The default EDM contains:

- 1 data center
- 1 room
- 1 aisle
- 1 row per facilities object types of PDU, that is CRAC, floor PDU, floor UPS, power panel, standalone meter
- 1 rack per rack PDU

► To generate a default EDM:

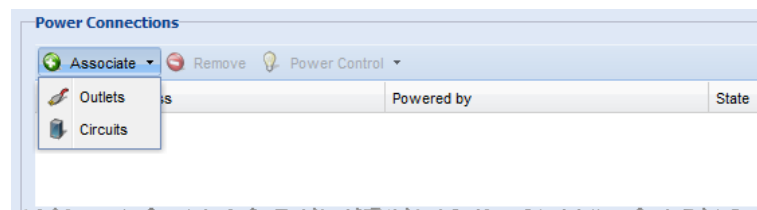
1. In the Settings tab, click Enterprise Relationships in the Data Management section.
2. Click Generate Default Enterprise Relationships in the CSV Data Mapping Actions section.
3. Click OK to confirm.

Associate a Circuit or Outlet with an IT Device

To allow for power control functions for outlets, you must associate your IT devices with their outlet. To allow for charting devices, the IT devices must be associated to their circuits or outlets.

► **To associate a circuit or outlet with an IT device:**

1. In the Data Centers tab, select the IT device in its rack. The IT device details page opens.
2. In the Power Connections section, click Associate, then choose Outlets or Circuits.



3. The Associate Entity dialog opens. Begin typing the circuit or outlet name in the Search field. A list of unassociated circuits or outlets appears that match your search.

Note: If a list does not appear, there are no unassociated outlets or circuits in Power IQ.

4. Select the circuit or outlet in the list, then click Add.

Exporting an EDM

Power IQ can export the existing EDM, as well as any unmapped PDUs, circuits, and sensors, as a CSV file. Use the file to edit and re-import, as a backup, or as a template for creating a new file.

Power IQ exports all object mappings as a single CSV file, regardless of how many objects it contains. If you want to re-import a file that contains more than 2500 objects, separate them into multiple CSV files.

Note: To find unmapped PDUs, circuits, and sensors in the exported file, look for objects with a blank "parent_external_key".

► **To export an EDM:**

1. In the Settings tab, click Enterprise Relationships.
2. In the CSV Data Mapping Actions area, click Export Relationships.

Clearing Enterprise Relationships

Clearing the enterprise relationships deletes the EDM. Deleting the EDM will disrupt all configured charts that are based on EDM relationships.

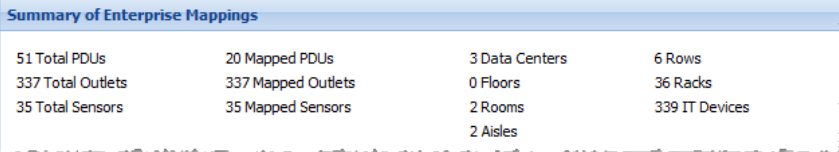
► **To clear enterprise relationships:**

1. In the Settings tab, click Enterprise Relationships in the Data Management section.
2. In the CSV Data Mapping Actions box, click Clear Enterprise Relationships.
3. Click "Clear all enterprise relationships" in the warning message to confirm.

Viewing Enterprise Relationship Summaries

The summary of enterprise mappings provides an overview of the EDM configured in Power IQ.

In the Settings tab, click Enterprise Relationships. The summary is in the top left corner.



Summary of Enterprise Mappings			
51 Total PDUs	20 Mapped PDUs	3 Data Centers	6 Rows
337 Total Outlets	337 Mapped Outlets	0 Floors	36 Racks
35 Total Sensors	35 Mapped Sensors	2 Rooms	339 IT Devices
		2 Aisles	

Viewing Orphaned Systems Information

The Orphaned Systems information shows whether there are any PDUs in Power IQ that are not mapped to a parent object in the EDM. PDUs that are not in the EDM cannot be included in charts.

► **To view orphaned systems information:**

- In the Settings tab, click Enterprise Relationships in the Data Management section of the page.

The Orphaned Systems information is in the top right section of the page that opens.

See the table for explanations and possible action required.

Outlets Mapped	Outlets Not Mapped
----------------	--------------------

	Outlets Mapped	Outlets Not Mapped
PDU Mapped	<p>The number of PDUs that are mapped to a parent object such as a rack, and have at least one outlet mapped to an IT device.</p> <p>No action is required.</p>	<p>The number of PDUs that are mapped to a parent object such as a rack, but do not have any outlets mapped to IT devices.</p> <p>No action is required.</p>
PDU Not Mapped	<p>The number of PDUs that are not mapped to a parent object such as a rack, but have 1 or more outlets mapped to IT devices.</p> <p>Action required!</p> <p>If you have unmapped PDUs, you must assign them to a parent object for analytics to perform correctly.</p> <p>See <i>Find and Map Unmapped PDUs</i> (see "<i>Finding Unmapped PDUs</i>" on page 151).</p>	<p>The number of PDUs that are not mapped to a parent object such as a rack, and have zero outlets mapped to a device.</p> <p>Action required!</p> <p>If you have unmapped PDUs, you must assign them to a parent object for analytics to perform correctly.</p> <p>See <i>Find and Map Unmapped PDUs</i> (see "<i>Finding Unmapped PDUs</i>" on page 151).</p>

Finding Unmapped PDUs

There are several ways to find unmapped PDUs so that you can map them to parent objects in the EDM.

All PDUs must be mapped to a parent object, such as a rack. PDUs that are not in the EDM cannot be included in charts.

► **To view the number of unmapped PDUs:**

See ***Viewing Orphaned Systems Information*** (on page 150).

► **To find unmapped PDUs in CSV file export:**

1. In the Settings tab, click Enterprise Relationships.
2. Click Export Relationships.
3. In the CSV file, find the section labeled "# The following section contains the current list of PDUs and the PDU column headers for use during import."

4. In that section, find the "parent_object_type" column. Rows without data in the "parent_object_type" column are unmapped PDUs.
5. Map the unmapped PDUs to parent objects in a data center.

► **To find unmapped PDUs in a default Enterprise Data Model:**

This method maps unmapped PDUs to an "Unassigned Data Center" parent object so that you can view the PDUs in the Data Centers tab. Then, you can drag and drop the PDUs to the correct position beneath a parent object, such as a rack.

1. In the Settings tab, click Enterprise Relationships.
2. Click Generate Default Enterprise Relationships.
3. When the generation completes successfully, click the Data Centers tab and find the Unassigned Data Center.
4. Expand the Unassigned Data Center. All the previously unmapped PDUs are assigned to this data center object.
5. Drag and drop the PDU objects to assign them to the correct parent objects, such as racks, within the correct data center.

► **To manually assign PDUs to a parent object:**

When you attempt to manually associate PDUs to a parent object in the Data Centers tab, only unmapped PDUs are available in the search tool.

1. In the Data Centers tab, select the parent object, such as a rack, that you want to associate an unmapped PDU with.
2. Click Add > PDU Association.
3. In the Associate a PDU dialog, select an unmapped PDU in the PDU IP Address field, and click OK. The PDU is mapped to the data center parent object.

Configuring Custom Fields

The Data Center, Device, and PDU objects each contain two custom field values.

Custom fields display in the Data Centers tab's hierarchy on the object page, for all 3 types of custom field. PDU custom fields also display in the PDUs tab, in the PDU Details. IT Device custom fields also display in the Devices tab, in the Device Details. You can use custom field values as filters when configuring charts. See **Configuring Charts** (on page 229).

By default, these are named:

- Data Center Custom Field 1 and Data Center Custom Field 2
- IT Device Custom Field 1 and IT Device Custom Field 2
- PDU Custom Field 1 and PDU Custom Field 2

Rename the field to specify the information it will contain. For example, to add data about the department that uses a group of devices, rename the IT Device Custom field "Department," and enter department names in the field for each device in Power IQ.

► To configure custom fields:

1. In the Settings tab, click Enterprise Relationships in the Data Management section.
2. In the Configure Custom Fields box, enter the new field name next to each custom field.
3. To assign data to the field, enter the data in the newly renamed custom field in either the Data Centers tab, on the objects page, or in the PDUs or Devices tab, in the details page. Data Center custom fields can only be accessed in the Data Centers tab. Or, you can use CSV import to update the information. See **Importing Object Mappings** (see "**Import EDM Object Mappings**" on page 140).

Chapter 10 PDUs

For simplicity in the GUI, Power IQ uses the term PDU to encompass any device that Power IQ polls to gather power or sensor data.

When you see the term PDU in the product interface, remember that it includes every polled object: rack PDUs, CRACs, floor PDUs, floor UPSs, power panels, standalone meters, and environmental sensor aggregators.

In this guide, the following terms are also used:

- Rack PDU

Facilities Objects: CRAC, floor PDU, floor UPS, power panel, and standalone meter.

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Viewing a PDU

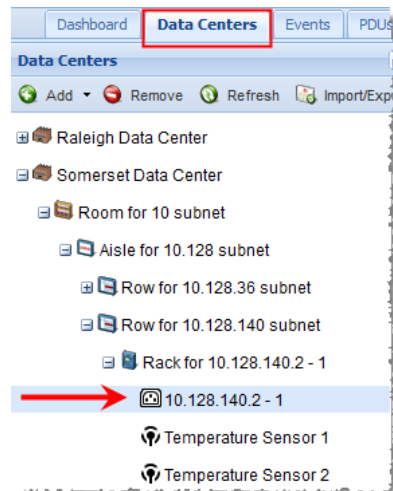
All PDUs have a smart view page, which you can access from different tabs.

For details on the smart views:

- **Rack PDU Smart View** (on page 156)
- **Rack Smart View** (on page 163)
- **CRAC Smart View** (on page 184)
- **Floor PDUs Smart View** (on page 187)
- **Floor UPS Smart View** (on page 192)
- **Power Panels Smart View** (on page 196)
- **Standalone Meters Smart View** (on page 200)

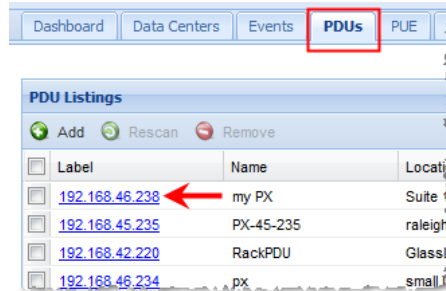
► **View a PDU in the Data Centers tab:**

The Data Centers tab displays your EDM. See **Enterprise Relationships and the EDM** (on page 132). Find your PDU within the EDM hierarchy, and click it to access the smart view.



► **View a PDU in the PDUs tab:**

The PDUs tab lists all PDUs in Power IQ, even if they are not in the EDM. To go to the smart view, find your PDU in the list, and click the Label link.



- If the PDU is not in the EDM, the smart view opens in the PDUs tab.
- If the PDU is in the EDM, the smart view opens in the Data Centers tab, and you'll see the EDM hierarchy expand to show you where the PDU is organized in the EDM.

Rack PDU Smart View

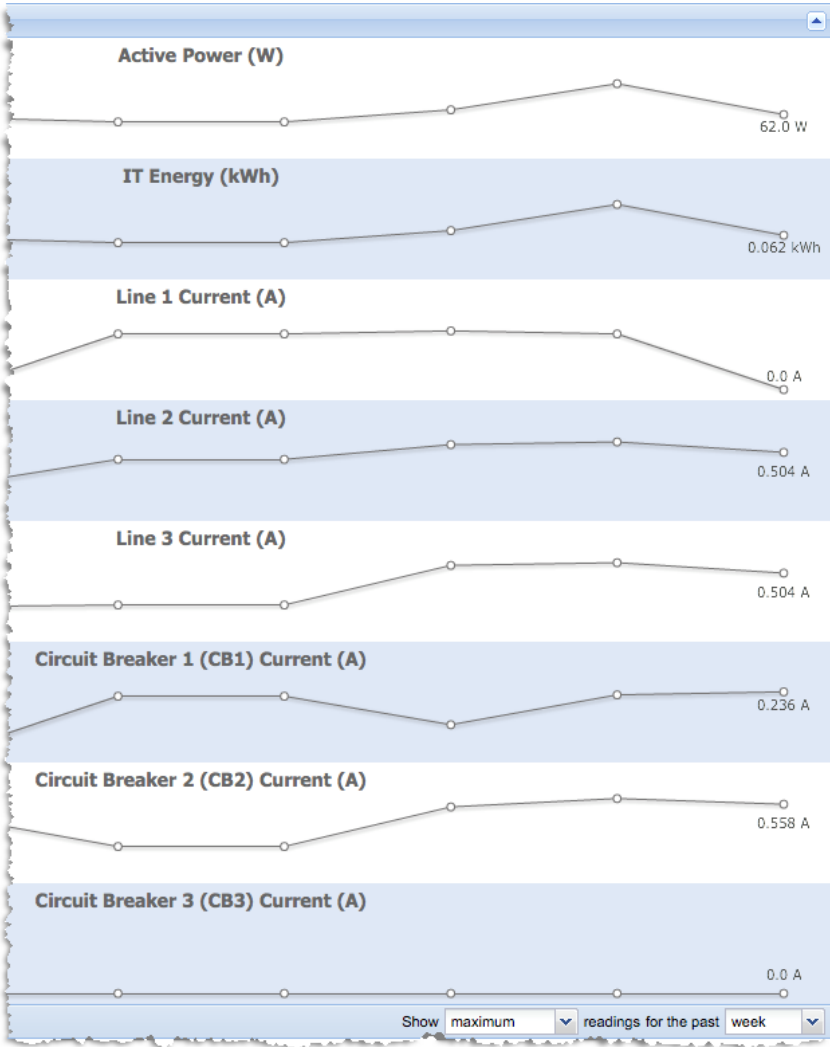
A rack PDU smart view may contain the following sections, depending on the PDU:

- **Rack PDU Energy Trends** (on page 157)
- **PDU Elements - Rack Smart View and Rack PDU Smart View** (on page 167)
- **Rack PDU Readings** (on page 158)
- **Rack PDU Sensors** (on page 160)
- **Rack PDU Details** (on page 161)
- **Rack PDU Event Listing** (on page 162)
- **Rack PDU Asset Strips** (on page 162)

Rack PDU Energy Trends

Energy Trends display at the top of the rack PDU smart view.

- Active Power
- IT Energy
- Line Current - one trend-line for each line in the PDU
- Circuit Breaker Current - one trend-line for each circuit breaker in the PDU



Rack PDU Readings

The Readings section of the Smart PDU view contains the power readings for the PDU.

- The Inlet Readings shows the Voltage, Current, Active Power, Apparent Power, Power Factor, and Energy for each inlet of the PDU. Readings are shown for each inlet on a multiple inlet PDU.
- The Inlet/Outlet Readings section for an inline meter shows the Voltage, Current, Active Power, Apparent Power, Power Factor, and Energy for each inlet/outlet.
- The Line Readings section shows Voltage, Current, and the available current for each line.
- The Circuit Breakers Readings section shows the Current in amps and the available current for each circuit breaker.
- The Sensor Readings section shows the latest reading for each attached sensor, and the ordinal number of the sensor on the PDU.
- The status at the bottom of the Readings section shows the latest reading time.

Readings						
Inlet Readings						
PDU Element	Voltage (V)	Current (A)	Active Power (W)	Apparent Power (VA)	Power Factor	Energy (Wh)
Inlet 1	207	1.9	161.0	280.0	0.58	3,524,321
Line Readings						
PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)			
Inlet 1						
L1	209	0.3	N/A			
L2	207	0.2	N/A			
L3	207	1.9	N/A			
Circuit Breaker Readings			Sensors			
Circuit Breaker	Current (A)	Unutilized Capacity (A)	Or...	Label	Type	Latest Reading
Circuit Breaker 1...	0.3	19.7	1	Temperature 1	Temperature	77.5°F
Circuit Breaker 2...	0	20	2	Humidity 1	Humidity	30.0%
Circuit Breaker 3...	0	20	3	Temperature 2	Temperature	75.0°F
Circuit Breaker 4...	0.2	19.8	4	Humidity 2	Humidity	34.0%
Circuit Breaker 5...	0.7	19.3				
Circuit Breaker 6...	1.2	18.8				
Latest reading taken 10 minutes ago						

Inlet Readings and Line Readings for Three Phase PDUs

For three phase PDUs, the Inlet Current and Voltage readings are maximum current and minimum voltages of the individual line readings of the inlet.

The line readings voltages are "line-to-line."

Inlet Readings						
PDU Element	Voltage (V)	Current (A)	Active Power (W)	Apparent Power (VA)	Power Factor	Active Energy (Wh)
Inlet 1	206.00	0.90	60.00	108.00	0.56	2,204,230

Line Readings			
PDU Element	Current (A)	Unutilized Capacity (A)	Voltage (V)
Inlet 1			
L1	0.00	24.00	208.00
L2	0.90	23.10	206.00
L3	0.00	24.00	207.00

1	The inlet voltage reading is the Minimum of the line voltages.	Min Line Voltage
2	The inlet current reading is the maximum of the line currents.	Max Line Current
3	The line voltage readings are from line to line.	L1 = L1-L2 L2 = L2-L3 L3 = L3-L1

Multi-Inlet PDU Readings

A multi-inlet PDU displays readings for each inlet, and for each line of each inlet, the same as single inlet PDUs.

The Readings section of the rack PDU smart view contains this information.

Readings							
Inlet/Outlet Readings							
PDU Element	IT Device	Voltage (V)	Current (A)	Active Po...	Apparent P...	Power Factor	Active Ene...
Infeed 1	infeed_1	204	7.213	1,664	1,897	0.877174	3,736,620
Infeed 2	infeed_2	205	3.459	795	987	0.805471	1,816,650
Infeed 3	infeed_3	203	3.084	542	748	0.724599	1,105,940
Totals:				3,001	3,632		6,659,210
Line Readings							
PDU Element		Voltage (V)	Current (A)				Unutilized Capacity (A)
Inlet/Outlet 1							
L1		207	5.161				26.839
L2		204	3.667				28.333
L3		204	7.213				24.787
Inlet/Outlet 2							
L1		207	3.459				28.541
L2		205	2.455				29.545
L3		205	2.453				29.547
Inlet/Outlet 3							
L1		207	0.319				31.681
L2		203	2.945				29.055
L3		204	3.084				28.916

Rack PDU Sensors

A sensors list displays in the rack PDU smart view when attached sensors are detected.



The sensor label is clickable and opens the sensor smart view. If the sensor is not associated in the EDM, the label is not clickable, and there is no smart view. See **Sensors** (on page 204).

Sensors			
Ordinal	Label	Type	Latest Reading
1	Humidity EPIQ6 (Inlet)	Humidity	36.0%
2	Temperature EPIQ6 (Inlet)	Temperature	75.2°F

Rack PDU Details

The Details section contains all information about the PDU except for the IP address, which may or may not display depending on the PDU display setting. See **Configuring PDU Display Settings - View PDUs by IP or Name** (on page 40).

Click the Belongs To link to view the rack, or other parent object in the EDM.

Details	
Type	Rack PDU
IP Address	192.168.42.50
External Key	192.168.42.50
Name	px130
Manufacturer	Raritan
Model	DPCS20-20
Firmware	1.5.5-10603
Contact	
Location	Rack 5
Serial Number	
Rated Voltage	120V
Rated Current	20.00A
Rated VA	1.9KVA
Custom Field 1	15
Custom Field 2	15
SNMP Version	1/2c
Inlet Phase	 Single Phase
Belongs to	 Rack for 192.168.42.50
Health	Connectivity: OK Most recent poll of the target PDU was successful. Active events: Good No active events.

Rack PDU Event Listing

The Event Listing section of the rack PDU smart view shows all events for the PDU.

- Click an Event link to open the Event details page.
- Select the checkbox for one or more events, then click Clear Selected Events to clear them. See **Clear Events** (on page 71).

<input type="checkbox"/>	Occurred at	Severity	Event	Summary
<input type="checkbox"/>	10/28/11 03:30:02 PM E...	Informational	Outlet power on	Outlet "Fail tree" switched on by
<input type="checkbox"/>	10/28/11 03:25:01 PM E...	Informational	Outlet power off	Outlet "Fail tree" switched off by
<input type="checkbox"/>	10/24/11 03:05:17 PM E...	Informational	Outlet power on	Outlet "Fail tree" switched on by
<input type="checkbox"/>	10/24/11 03:00:16 PM E...	Informational	Outlet power off	Outlet "Fail tree" switched off by
<input type="checkbox"/>	10/21/11 03:31:52 PM E...	Informational	Outlet power on	Outlet "Pass tree" switched on b
<input type="checkbox"/>	10/21/11 02:00:03 PM E...	Informational	Outlet power on	Outlet "Fail tree" switched on by
<input type="checkbox"/>	10/21/11 01:55:50 PM E...	Warning	Admin credentials invalid	Admin credentials failed to valid

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Rack PDU Asset Strips

Power IQ can detect asset management strips connected to rack PDUs.

The asset strip information displays in the rack PDU smart view.

► To change the color of an LED:

1. In the row of the asset tag whose color you want to change, double click the hexadecimal color code.
2. Select the new color from the chart of colors.
3. The LED color on the strip changes.

► To associate an asset tag with an IT device:

1. Copy the asset tag ID number from the PDU smart view for the PDU connected to the asset strip.
2. In the Devices tab, select the device you want to associate with the asset tag.
3. In the Device details page, paste the code into the Asset Tag Id field then click Save.

Asset Strip and Tag Events

Power IQ can receive an event whenever an asset strip or tag is moved.

See **Raritan PX Supported Events** (see "**Raritan PX/PX2/PX3 Supported Events**" on page 55).

Rack Smart View

The rack smart view combines data from objects mapped to each rack in your EDM to give you perspective on a whole rack, including trends, elements like outlets and circuit breakers, and IT devices.

Racks are part of your EDM, so you cannot see the rack smart view until you've added PDUs and created an EDM. See **Creating Your EDM** (on page 135).

You must have View permissions or a role that includes View permissions for the chosen rack. Otherwise the rack smart view is unavailable. See **Assigning Roles for User Permissions** (on page 83).

► **To open the rack smart view:**

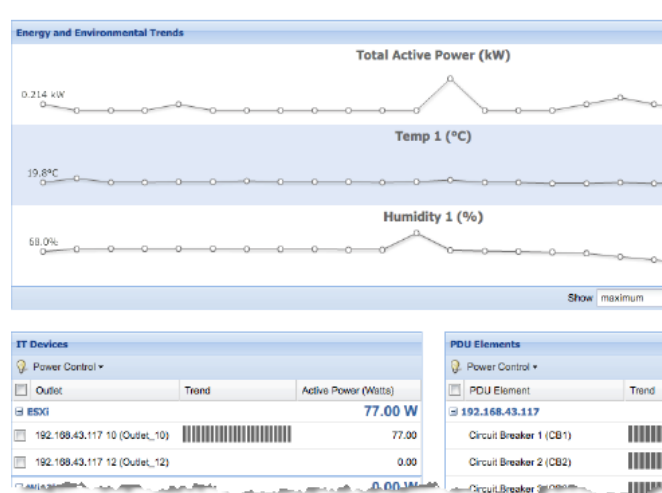
- In the Data Centers tab, select a rack. The rack smart view opens if you have View permissions for that rack.

The rack smart view contains three sections:

- **Rack Energy and Environmental Trends** (on page 164)
- **Rack IT Devices** (on page 165)
- **PDU Elements - Rack Smart View and Rack PDU Smart View** (see "**PDU Elements - Rack Smart View and Rack PDU Smart View**" on page 167)

- **Rack Details** (on page 166)

Windows Rack – Room H



- ▶ **When you do not have View permissions for the rack:**
 - The following message displays.

You do not have permission for this operation.

Rack Energy and Environmental Trends

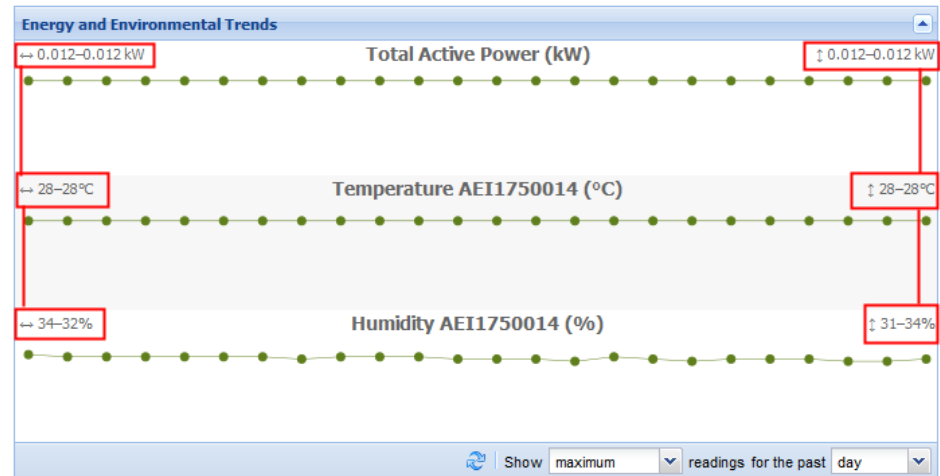
The rack smart view shows Energy and Environmental Trends at the top of the page.

The first and last data points in the trend are shown at the left end of the chart.

The minimum and maximum values in the trend are shown at the right end of the chart.

- Environmental sensor charts
 - Temperature, one chart per sensor.
 - Humidity, one chart per sensor.

- Total Active Power for all devices and PDUs in the rack



Rack IT Devices

The IT Devices section of the Smart Rack view contains a list of all devices that are connected to one or more outlets or circuits.. If a device does not have any associated outlets or circuits, it will not appear in this list. Devices without associated outlets or circuits do still appear in the tree view.

Devices that have associated circuits display the current and active power of the circuit. You cannot control power to circuits.

The outlets associated with each device display beneath the IT device. There is a checkbox for each outlet, to select it for power control operations.

- Each outlet shows a Trend chart showing the active power trend.

Note: In Internet Explorer 7 and 8, click Load Chart to view the trend chart.

- Each device shows an Active Power reading, per device, and per outlet.
- Outlets that are powered on display in black.
- Outlets that are powered off display in gray.

IT Devices		
Power Control ▾		
Outlet	Trend	Active Power (Watts)
ESXi		77.00 W
<input type="checkbox"/> 192.168.43.117 10 (Outlet_10)		77.00
<input type="checkbox"/> 192.168.43.117 12 (Outlet_12)		0.00
Win2k		0.00 W
<input type="checkbox"/> 192.168.43.117 9 (Outlet_9)		0.00
Show <input type="text" value="maximum"/> active power for the past <input type="text" value="day"/>		

► **To change the active power display:**

1. At the bottom of the IT Devices section, select the readings and time period to include in the fields.
2. Trend: minimum, maximum or average readings. Not available for past hour readings.
3. For the past: hour, day, week, month.

► **To perform power control on devices:**

1. Select the checkboxes for each outlet associated with a device. All outlets are grouped beneath the device.
To select all devices in a rack, select the top checkbox.
2. Choose Power Control > On, Power Control > Off, or Power Control > Cycle.

Note: Power Off and Power Cycle operations on this page do not use graceful shutdown, even if it is enabled for a selected device.

Rack Details

The Actions button on the Smart Rack view opens options for changing the rack name, location, external key, and capacity, editing for user permissions on this rack, and tags.

► **To access rack details configuration:**

1. Click the Actions button, then choose an option.
2. Choose Edit Details:

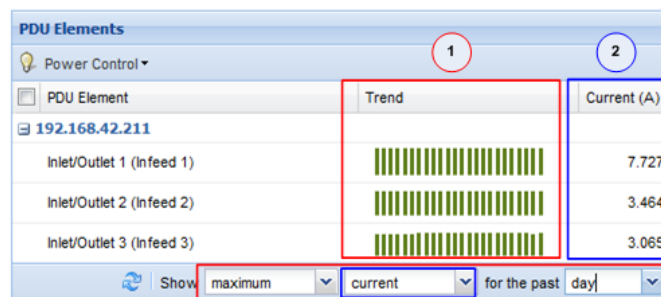
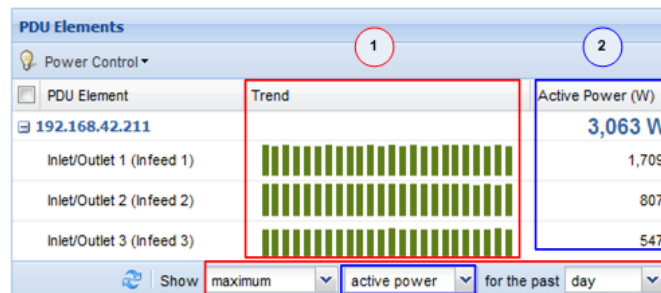
- Enter a new rack name, location, external key, or capacity and overrides. See **Set Rack Capacity and Override Threshold Percentages** (on page 69) for details on these fields. Click OK.
3. Choose Edit Permissions:
 - View and change the roles and permissions assigned for users of this rack. See **Assign Roles within a Data Center** (on page 88) for more details.
 - Click Add Role to > Add User Role or Add Role to > Add Group Role. Adding a Group Role will give permissions selected to all users in the group. Then, select the user or group who needs permission to this object. rack.
 - Select the role to allow in the Roles list. Click OK.
 4. Choose Edit Tags:
 - Tags are used in tabular reports. See **Reports and Tags** (on page 240).

PDU Elements - Rack Smart View and Rack PDU Smart View

The PDU Elements section appears in both the rack and rack PDU smart views.

This section contains a list of all outlets in the rack, or all outlets on the PDU, respectively.

Note: Circuit breaker information is in the rack PDU's Readings section.



Key	Description
1	The trend chart's topics is selected in the blue outlined field: active power or current. Data included in the trend chart is filtered by the minimum/maximum/average selection, and the time period selection fields outlined in red.
2	Last column shows the latest poll data for either Active Power or Current, as selected in the field outlined in blue. The min/max/average and time period selections do not affect this reading. Active Power (W): Latest poll reading is shown. Current (A): Latest poll reading is shown.

- Each outlet shows a Trend chart showing the active power trend, or the current (amps) trend.

Note: In Internet Explorer 7 and 8, click Load Chart to view the trend chart.

- Outlets that are powered on display in black.
- Outlets that are powered off display in gray.
- Apparent Power, Voltage, and Unutilized Capacity columns also display in the Rack PDU Elements section. These columns do not display at the rack level.

► **To change the trend chart display:**

The minimum/maximum/average setting and the time period setting change what data is included in the small trend charts. The last column always displays the latest poll data.

1. At the bottom of the PDU Elements section, select the readings and time period to include in the fields.
2. Trend: minimum, maximum or average readings. Not available for past hour readings.
3. For the past: hour, day, week, month.
4. Select either Active Power or Current in amps.

► **To perform power control on outlets:**

1. Select the checkboxes for each outlet.
To select all outlets in a rack, select the top checkbox.
2. Choose Power Control > On, Power Control > Off, or Power Control > Cycle.

Note: Power Off and Power Cycle operations on this page do not use graceful shutdown, even if it is enabled for a selected device.

3 Phase PDU Outlet Readings for Raritan PX1

Power IQ uses the following algorithm to convert three line readings into one outlet reading for current and voltage only. This algorithm applies only to 3 phase PX1 inline meters.

In the algorithm, "LineX_Readings" is a list of all the readings for a given time period.

```
MAX = MAX(MAX(Line1_Readings), MAX(Line2_Readings),  
MAX(Line3_Readings))
```

```
AVG = MAX(AVG(Line1_Readings), AVG(Line2_Readings),  
AVG(Line3_Readings))
```

```
MIN = MAX(MIN(Line1_Readings), MIN(Line2_Readings),  
MIN(Line3_Readings))
```

PDUs with Fuses

Most Raritan PDUs monitor load at the internal PDU circuit breaker. Some PDUs have fuses instead of circuit breakers.

If a PDU has fuses, information about them displays in Power IQ with the "Circuit Breaker" label.

PX models with an F1 suffix have a fuse instead of a circuit breaker.

- PX2-4656V-F1
- PX2-4863V-F1
- PX2-2496-F1
- PX2-1496-F1
- PX2-4464I2-F1M2
- PX2-4496I2V-F1
- PX2-4656V-F1
- PX2-4863V-F1

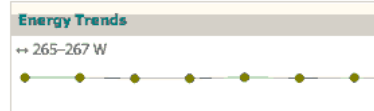
Rack Transfer Switches

Rack Transfer Switches are high speed switches that provide power from one of two sources depending on settings and availability. Power IQ supports several Raritan and APC rack transfer switches.

Transfer Switch Smart View

The header in the transfer switch smart view shows the switch's operating status, such as Normal or Standby.

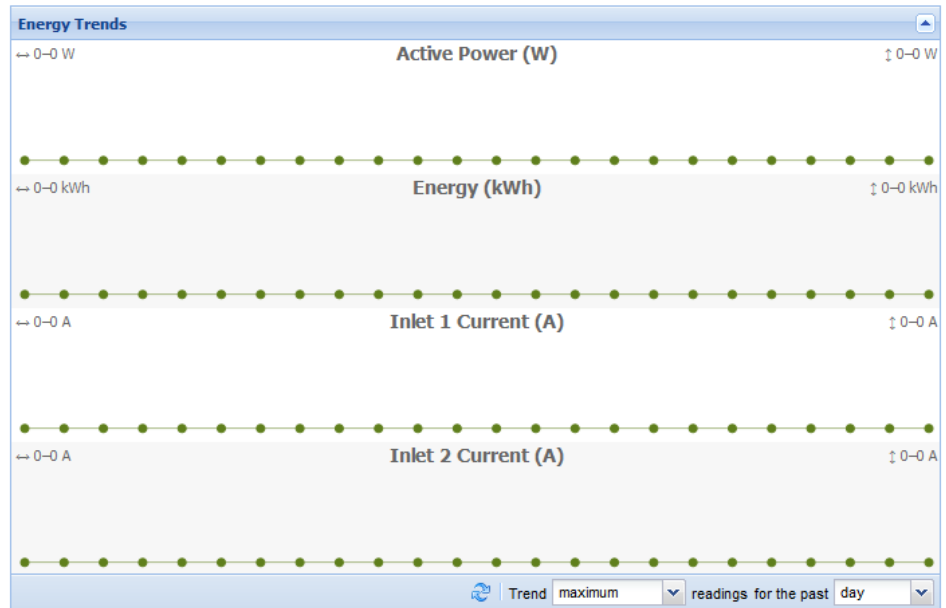
192.168.43.126 (Standby)



Transfer Switch Energy Trends

Energy Trends display at the top of the rack transfer switch smart view.

- Active Power
- Energy
- Inlet Current - one trend-line for each line in the transfer switch
- Circuit Breaker - one trend-line for each circuit breaker in the transfer switch
- Some data may not be supported by your transfer switch model.



Transfer Switch Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

Transfer switch readings come from the inlets, lines, circuit breakers, and sensors.

This sample smart view shows one possible configuration of a transfer switch.

To see details on the transfer switch status, see the Details section of the smart view. See **Transfer Switch Details** (on page 172).

Readings						
Inlet Readings						
PDU Element	Voltage (V)	Current (A)	Active Power (...)	Apparent Pow...	Power Factor	Energy (Wh)
Inlet 1	210	1.422	257.0	298.0	0.86	625,018
Inlet 2	210	0.067	6.0	14.0	0.4	112,296
Totals:			263	312		737,314
Line Readings						
PDU Element	Voltage (V)	Current (A)	Utilized Capacity (A)			
Inlet 1						
L1	210	1.422	N/A			
Inlet 2						
L1	210	0.067	N/A			
Circuit Breaker Readings			Sensors			
Circuit Breaker	Current (A)	Utilized Capacit...	Or...	Label	Type	Latest Reading
Circuit Breaker 1 (...)	1.422	23.578	1	Temperature_1	Temperature	65.8°F
Circuit Breaker 2 (...)	0.067	24.933				

Transfer Switch Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.




The default Elements view for transfer switches includes this information:

- PDU Element: outlets
- IT Device: IT devices associated with outlets include a link to the IT device page.
- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.
- Active Power (W): latest poll reading for active power. Change the latest poll reading to Current using the field below it.

Transfer Switch Details

Details are the fourth section in the smart view.

See the details section for the ordinal of the Active and Preferred Inlet of the transfer switch.

Details	
Type	Rack Transfer Switch
IP Address	192.168.43.126
External Key	192.168.43.126
Name	my PX
Manufacturer	Raritan
Model	PX3TS-1876R
Firmware	2.6.0.5-41003
Contact	Owen Clark
Location	Raleigh, Data Center
Serial Number	QGZ3992178
Rated Voltage	200-240V
Rated Current	16A
Rated VA	3.2-3.8kVA
Custom Field 1	
Custom Field 2	
SNMP Version	1/2c
Inlet Phase	 Single Phase
Preferred Inlet	2
Active Inlet	2
Belongs to	 2G
Health	Connectivity: OK Most recent poll of the target PDU was successful. Active events: Warning Transfer switch active inlet changed (warning) 

Transfer Switch Event Listing

Event listing is the fifth section in the smart view.

Events are created from transfer switch traps. For transfer switch functions, state change traps are supported. For Raritan PX3TS transfer switches, additional traps are supported for other functions.

See supported traps here:

APC Transfer Switch Supported Events (on page 45)

Raritan PX3TS Transfer Switch Supported Events (on page 63)

Occurred at	Severity	Event	Summary	Status
05/08/14 02:05...	Critical	Inlet under voltage	Inlet "1": voltage is under critical threshold	Cleared by system event
05/08/14 02:05...	Critical	Circuit breaker trip sensor...	Circuit breaker FUSE 1 trip sensor unava...	Cleared by system event
05/08/14 02:03...	Warning	Transfer switch active inlet...	Transfer switch active inlet changed fro...	Active
05/08/14 01:41...	Critical	Inlet under voltage	Inlet "2": voltage is under critical threshold	Cleared by system event
05/08/14 01:41...	Critical	Circuit breaker trip sensor...	Circuit breaker FUSE 2 trip sensor unava...	Cleared by system event
05/08/14 01:34...	Critical	Inlet under voltage	Inlet "2": voltage is under critical threshold	Cleared by system event
05/08/14 01:34...	Critical	Circuit breaker trip sensor...	Circuit breaker FUSE 2 trip sensor unava...	Cleared by system event

- To export the events to CSV, click the Save icon at upper right.
- To clear events, select the checkboxes, then click Clear selected events.
- To view event details, click the Event link.

PDU Connectivity Health Statuses

These statuses may appear in the mouse-over text when your mouse hovers over the Health column for a PDU on the PDU listings page. The statuses also appear in the Health section of the PDU smart view.

Status	Explanation
OK	Most recent poll of the target PDU was successful.
New	The system has not yet completed a successful scan or poll of the PDU. This is typical for systems that have been recently added.
Unknown	The system has not yet completed a successful scan or poll of the PDU. This is typical for systems that have been recently added.
Lost Communication	This status indicates that Power IQ can no longer collect power data from the PDU. Most PDUs are managed via the SNMP protocol, and in this case, Power IQ can't communicate with the PDU over

Status	Explanation
	SNMP. See <i>Troubleshooting Connectivity Health</i> (on page 175).
Degraded	This status indicates certain non-critical aspects of the poll failed. The issue is most commonly caused when data-buffered data retrieval is enabled in Power IQ but is configured with a "read" SNMP community string instead of a "write" community string. In this case, Power IQ can still perform a poll, but it won't be able to enable data buffering and set the appropriate sample rate on PDUs that support data buffering, such as Raritan PX. Other possible causes of this error are incompatibility issues with Raritan PX running older firmware revisions, or if Power IQ is unable to persist sensor readings data to CSV file.
Poll incomplete	Certain aspects of the scan or poll failed, such as retrieving the model name, persisting outlet sensor data to CSV file, or retrieving information via SNMP. This can be due to an incompatibility with this version of the PDU or because the SNMP is misconfigured or the agent is disabled on the target PDU. <ul style="list-style-type: none"> ▪ Make sure the PDU's SNMP settings are correct. See <i>Editing PDUs under Power IQ Management</i> (on page 22).
Application error	If the PDU is associated with a dynamic plugin, an index mapping may have failed to resolve. Check the dynamic plugin log for mapping resolution errors. If the PDU is not associated with a dynamic plugin, this indicates an unexpected application error. Contact Raritan Technical Support: http://www.raritan.com/support/contact-support
No auth	This indicates invalid or missing credentials. <ul style="list-style-type: none"> ▪ Correct the PDU's credentials. See <i>Editing PDUs under Power IQ Management</i> (on page 22).
No contact	This indicates that Power IQ was unable to communicate with the PDU over any of the supported management protocols and so can't discover and manage the PDU. The most often used protocol is SNMP, but a few PDU models are managed using other protocols like HTTP. There are a number of possible root causes for this. This may indicate that the IP address is incorrect. <ul style="list-style-type: none"> ▪ Correct the PDU's IP address. See <i>Editing PDUs</i>

Status	Explanation
	under Power IQ Management (on page 22).
Badadmcred	This indicates that the PDU was configured with an invalid administrative username or password. SNMP communication is still possible and Power IQ can manage the PDU, but firmware upgrades will not work.
Missing credentials	This indicates invalid or missing credentials. <ul style="list-style-type: none"> Correct the PDU's credentials. See Editing PDUs under Power IQ Management. (see "Editing PDUs under Power IQ Management" on page 22)
Unmanageable	This indicates that Power IQ contains no plug-in capable of managing the PDU. The target PDU is not supported by this version of Power IQ, or the plug-in requires a proxy index and one was not specified. <ul style="list-style-type: none"> Specify an appropriate proxy index if one is required but was not specified. Make sure Power IQ supports the PDU. See the list of supported PDUs at http://www.raritan.com/resources/power-iq-rack-pdu-support/ Create a dynamic plugin for the PDU. See Dynamic Plugins (on page 272).

Troubleshooting Connectivity Health

A PDU's Lost Communication or No Contact connectivity health status may be caused by one of these common problems. Troubleshoot using the following checklist.

Cause	Solution
The user has configured Power IQ with the wrong community string for the PDU.	Verify that Power IQ is configured with the correct SNMP community string.
The user has configured Power IQ with the wrong IP address for the PDU.	Verify that Power IQ is configured with the correct IP address.
There is an actual network connectivity issue between Power IQ and the target PDU.	<ul style="list-style-type: none"> Make sure the required ports are open between Power IQ and the PDU. See Ports Open Between Power IQ and PDUs (on page 5). Verify that there aren't any other network issues preventing communication between Power IQ and the target PDU.
The PDU is powered off or not connected to the network.	Confirm that the PDU is powered on and is responding to requests over the network. For

Cause	Solution
	example, responding to ICMP echo or PING requests.
SNMP support is disabled on the PDU.	Some PDUs allow the SNMP agent to be started and stopped through the PDU's management interface. Verify that SNMP is running on the PDU and that it is responding to SNMP requests by running SNMP diagnostics from Power IQ or through 3rd party tools.
The configured SNMP timeout and retry value are insufficient for your use case. For example, managing remote PDUs over a WAN and due to network latency or bandwidth limitations, the default SNMP settings result in a large number of SNMP timeouts.	If you suspect that the default SNMP settings used by Power IQ are insufficient it may be possible to correct the issue by modifying the default SNMP settings used by Power IQ. See Advanced Thread Pooling Settings (on page 17).
The SNMP agent on the target PDU is not responding to requests. One possible reason is that the PDU's processor is busy handling other tasks and is temporarily unable to respond to SNMP requests.	Verify that SNMP is running on the PDU and that it is responding to SNMP requests by running SNMP diagnostics from Power IQ or through 3rd party tools. If the SNMP agent on the PDU is the issue, restarting the SNMP agent on the PDU or rebooting the PDU may correct the problem.

Trend Chart Settings in Smart Views

The large trend charts at the top of each smart view are configurable.

► **To change the trend chart settings:**

1. At the bottom of the trend charts section, select the readings and time period to include in the fields.
2. Trend: minimum, maximum or average readings. Not available for past hour readings.
3. For the past: hour, day, week, month.

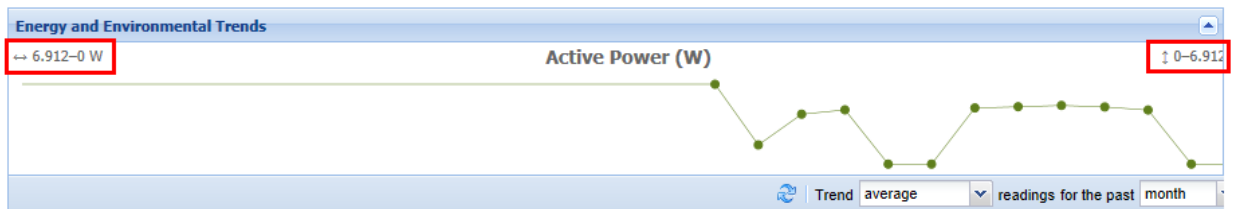
Active Power Trends for Devices

In the Data Centers tab, an IT device displays the Energy and Environmental Trends at the top of its page. Only Active Power data is available in the trend chart.

- If the device has zero or only one connection to outlets or circuits, the trend chart displays the total active power only.
- If the device has more than one connection to outlets or circuits, the trend chart displays both the total active power and one active power chart per connection.

The first and last data points in the trend are shown at the left end of the chart.

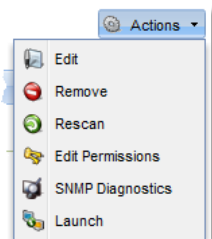
The minimum and maximum values in the trend are shown at the right end of the chart.



To change the trend chart settings, see *Trend Chart Settings in Smart Views* (on page 176).

Actions Menu in Smart Views

Smart views for rack PDUs and facilities objects include an Actions menu in the top right corner.



- Choose Actions> Edit to open the edit page for PDU credentials. See **Editing PDUs under Power IQ Management** (on page 22)
- Choose Actions> Remove to delete the PDU from Power IQ. The PDU and all data collected from it are deleted when you remove a PDU. Click Remove PDU(s) and Data to confirm.
- Choose Actions> Rescan to poll the PDU.
- Choose Actions> Edit Permissions to view and change the roles and permissions assigned for users of this PDU. See **Assign Roles within a Data Center** (on page 88) for more details.
 - Click Add Role to > Add User Role or Add Role to > Add Group Role. Adding a Group Role will give permissions selected to all users in the group. Then, select the user or group who needs permission to this object.
- Choose Actions> SNMP Diagnostics to run SNMP walk on the PDU.
- Choose Actions> Launch to open the web interface for Raritan PX PDUs only. See **Launch the Web Interface for a Raritan PX PDU** (on page 181).

Using the PDUs Tab

The PDUs tab contains a list of all PDUs added to Power IQ, even if they have not been mapped in the EDM. See **Creating Your EDM** (on page 135).

The PDUs list can be configured to meet your needs:

- **Filter the PDUs List** (on page 178)
- **Configure the Number of PDUs in the List** (on page 179)

Filter the PDUs List

You can customize your view of the PDUs list by using filters, sorting, and hiding or displaying columns of data.

See **Customizing Your View of PDUs, Devices, and Events** (on page 41).

► To filter the PDUs list:

In the PDUs tab, all PDUs in the system display in a list.

Most columns of data contain a filter criteria selection. Click the arrow in the column header to open the options. Filter is the last option.

- Most columns can be filtered by entering a search term in the column's filter.
 - Label, Name, Location, Manufacturer, Model, Firmware, Belongs To are filtered by search terms.

- Belongs To refers to the PDUs parent object in the EDM. For example, a PDU probably belongs to a Rack object in the EDM. To check, look for the level directly above the PDU in the Data Centers tab hierarchy.
- Filter by PDU health: In the Health column filter, select the health statuses you want to view, Good, Warning or Critical, then select the source for each status, either Connectivity or Active Events. Select multiple options for each as needed.
- Filter by power readings, including Current (Amps), Active Power (Watts), or Apparent Power (VA): In the Current, Active Power or Apparent Power column filter, enter the number of amps, watts, or volt amperes in the Greater Than (>), Less Than (<) or Equal To (=) field to view only PDUs with readings in the correct range.
 - If a PDU has multiple line readings in the Current column, all values are shown separated by commas. When filtering by Greater Than (>), the highest number is used. When filtering by Less Than (<), the lowest number is used.
- Filter by inlet temperature: In the Inlet Temperature (C) column filter, enter the number of degrees Celsius in the Greater Than (>), Less Than (<) or Equal To (=) field to view only PDUs with inlet temperature sensor readings in the correct range.
 - The inlet temperature shown is the maximum reading for all inlet-positioned temperature sensors associated with the PDU.
- Filter by PDU Type: Types of PDU include rack PDUs, and facilities objects managed by dynamic plugin, such as CRACs or Floor PDUs. Add the Type column by selecting the checkbox.

Configure the Number of PDUs in the List

You can configure how many PDUs appear at a time in the PDUs list. This preference is set per user.

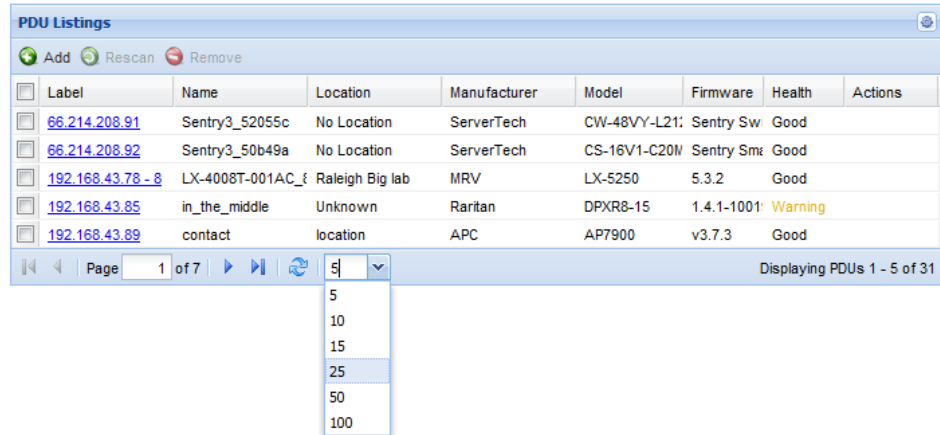
You can configure the default number of PDUs that appear in the list, and you can change the number of PDUs that appear at any time from the PDUs list.

► To configure the default number of PDUs in the list:

1. Click your user name link in the top right corner of the page, next to the Logoff link.
2. In the User Information page, click the Prefs tab.
3. Enter the number of PDUs to list in the Grid Rows field.
4. Click Save.

► **To change the number of PDUs in the list:**

1. In the PDUs tab, select the number of PDUs to display from the number drop-down list at the bottom of the page. The list refreshes.




Export the PDUs List to CSV

Export the PDU list to create a CSV file containing all the data listed in the grid on the PDUs tab.

The exported file contains the same columns as the page in Power IQ. If you have applied filters, the same filters will apply to the exported information.

The export PDUs CSV file is not the same as the file used for importing PDUs into Power IQ. See **Adding PDUs in Bulk with CSV Files** (on page 25).

► **To export the PDUs list to CSV:**

1. In the PDUs tab, click the Export/Save icon  in the upper right corner of the grid.
2. Save or open the file using the dialog that appears.

Launch the Web Interface for a Raritan PX PDU

You can launch the web interface for a Raritan PX PDU in Power IQ.

Users must have identical credentials on Power IQ and on the target Raritan product, and be logged in to Power IQ with those credentials for single sign on to succeed. Single sign on must be enabled in Settings > Single Sign On. See **Enabling Single Sign On for Raritan PDUs** (see "**Enabling Single Sign On for Raritan Products**" on page 124).

► **To launch the web interface for a PX:**

1. In the PDUs tab, select a Raritan PX PDU.
2. Hover your mouse on the Actions column, then click the center icon to go directly to this PDU in a new window. If single sign on is not enabled, log in.

Search for PDUs and Devices

Use the Quick Search tool at the top of the Power IQ interface to search for a PDU or device.



Type the name or IP address of a PDU or device into the Quick Search field. If a match is found, Power IQ displays the smart view.

*Note: The PDU display setting affects the Quick Search feature. If IP address is selected in the display settings, you can search PDUs by either name or IP address. If PDU name is selected, only searching by PDU name is permitted. Devices can always be searched by either name or IP address regardless of the PDU display preference. See **Configuring PDU Display Settings - View PDUs by IP or Name** (on page 40).*

Chapter 11 Facilities Objects

Power IQ can manage your data center's facilities objects, including CRACs, UPSs, Floor PDUs, Standalone Meters, and Power Panels.

You can work with these objects in Power IQ the same way you work with rack PDUs. The PDUs tab, which lists all rack PDUs, also contains all facilities objects.

When you flag your facilities objects as part of your data center's total power, Power IQ calculates your Power Usage Effectiveness (PUE). See **PUE - Power Usage Effectiveness** (on page 236).

Note: Screenshots of smart pages are for illustration purposes only, and do not contain real, polled data.

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Adding Facilities Objects to Power IQ Management

You can add facilities objects to Power IQ using the dynamic plugins function. The process for adding facilities objects is:

1. Create a dynamic plugin capable of managing your object. See **Dynamic Plugins** (on page 272).
2. Add the object using the Add a PDU function. See **Adding PDUs to Power IQ Management** (on page 20). If you use a custom mapping dynamic plugin, see **Adding PDUs with Custom Dynamic Plugins** (on page 29).
3. Make sure the object is included in your enterprise data model (EDM), which displays in the Data Centers tab. Objects must be in the EDM for inclusion in PUE calculations and Dashboard charts. See **Enterprise Relationships and the EDM** (on page 132). See also **Organizing Facilities Objects in the Data Center Browser** (on page 183).

Note: Some rack transfer switches are supported, and you do not need to create a dynamic plugin.

See the list at
<http://www.raritan.com/support/product/poweriq/power-iq-rack-monitored-devices-support>

Organizing Facilities Objects in the Data Center Browser

Some facilities objects you want to manage in Power IQ, such as floor PDUs, power panels, and UPSs may provide power to multiple locations.

Objects may only have one location in the hierarchical Data Centers browser, so associate the object in the enterprise data model using its physical location. Standalone meters may be placed where it best helps you understand their data.

► **For example:**

- A floor PDU is physically located on Floor A, but provides power to several locations, not all on that floor. Organize the floor PDU on Floor A.

CRACs in the Data Center Browser

You can add a Computer Room Air Conditioner (CRAC) as a node in the Data Centers browser. Place the CRAC in the EDM in the location where it manages air, rather than the physical location of the CRAC controls.

- For example:
 - A CRAC serves Rooms 1, 2, and 3 of your data center. Organize the CRAC in the EDM at the Floor level that contains these rooms.

CRACs

Computer Room Air Conditioners (CRAC) refers to any HVAC system that manages the temperature or humidity of a computer room. It does not refer to a standalone raised-floor unit that sits on the data center floor.

CRAC Smart View

Power IQ gathers power readings from the CRAC's inlet and inlet lines.

*Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** (on page 272).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

Power IQ displays all information gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated CRAC smart view includes:

- **CRAC Energy Trends** (on page 184)
- **CRAC Readings** (on page 185)
- **CRAC Details** (on page 186)

CRAC Energy Trends

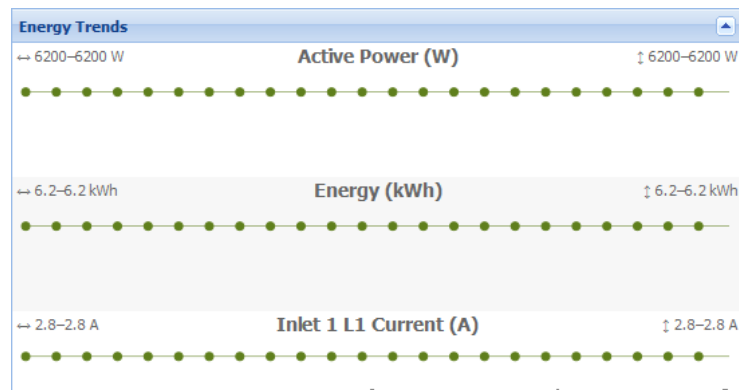
Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

CRAC energy trends show a trend line for two readings.

- Active power
- Energy
- Current for each inlet pole



CRAC Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

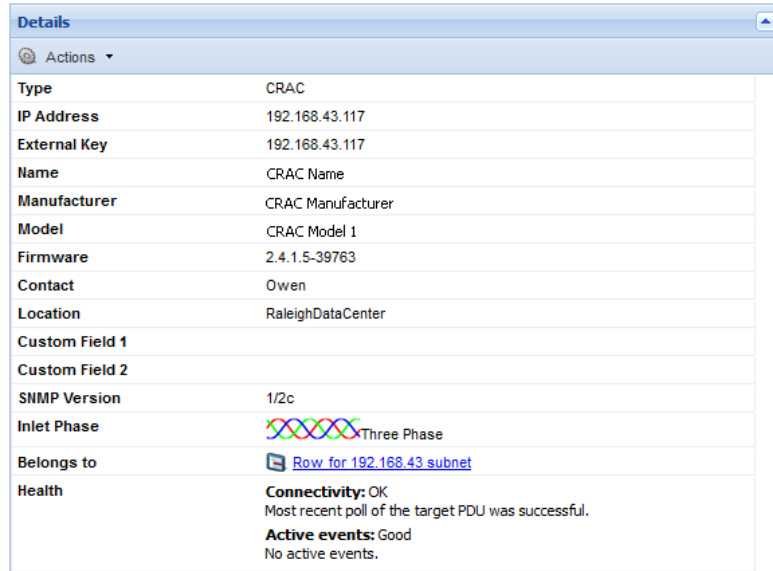
CRAC readings include the inlet and the inlet lines.



- CRAC Inlet Readings shows the Voltage, Current, Active Power, Apparent Power, Power Factor, and Energy.
- CRAC Inlet Line Readings for each line shows the Voltage, Current, and Unutilized Capacity
- The status at the bottom of the Readings section shows the latest reading time.

Readings						
Inlet Readings						
PDU Element	Voltage (V)	Current (A)	Active Pow...	Apparent P...	Power Factor	Energy (Wh)
Inlet 1	206	1.9	133.0	226.0	0.59	3,406,842
Line Readings						
PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)			
Inlet 1						
L1	208	0	N/A			
L2	206	0	N/A			
L3	206	1.9	N/A			
Latest reading taken 5 minutes ago						

CRAC Details

Details are the fourth section in the smart view.



Details	
Actions ▾	
Type	CRAC
IP Address	192.168.43.117
External Key	192.168.43.117
Name	CRAC Name
Manufacturer	CRAC Manufacturer
Model	CRAC Model 1
Firmware	2.4.1.5-39763
Contact	Owen
Location	RaleighDataCenter
Custom Field 1	
Custom Field 2	
SNMP Version	1/2c
Inlet Phase	 Three Phase
Belongs to	 Row for 192.168.43 subnet
Health	Connectivity: OK Most recent poll of the target PDU was successful. Active events: Good No active events.

Floor PDUs

Floor PDUs refers to an intelligent floor PDU system with inlets, panels, and branch circuits.

Floor PDUs Smart View

Power IQ gathers power readings from the FPDU inlets, panel inlets, circuits, and circuit poles.

The mapping of the inlets to panels to circuits and circuit poles is achieved through your dynamic plugin configuration.

*Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** (on page 272).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated FPDU smart view includes:

- **FPDU Energy Trends** (see "**Floor PDU Energy Trends**" on page 188)
- **FPDU Elements** (see "**Floor PDU Elements**" on page 191)
- **FPDU Readings** (see "**Floor PDU Readings**" on page 189)
- **FPDU Details** (see "**Floor PDU Details**" on page 192)

Floor PDU Energy Trends

Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Floor PDU energy trends include a trend line for several types of readings.

- Active Power
- Energy
- Current for each line of the master inlet, if applicable. If the FPDU does not have a master inlet, trend line for current does not display.



Floor PDU Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

Floor PDU readings come from the inlets, panel inlets, circuits and circuit poles. floor PDUs come in many different configurations. Your configuration may vary.

This sample smart view shows one possible configuration of a three-phase floor PDU

- 1 master inlet with 3 lines
- 2 panels
- Each panel has a panel inlet with 3 lines, and 2 circuits
- Each circuit has 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

The master inlet of this floor PDU has three lines.

Readings

Inlet Readings

PDU Element	Voltage (V)	Current (A)	Active Po...	Apparent ...	Power Fac...	Energy (Wh)
Inlet 1	121	13	240.0	480.0	0.5	11,520

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacity (A)
Inlet 1			
L1	121	11	N/A
L2	122	12	N/A
L3	123	13	N/A

Panel Readings: Panel 1

Below the master inlet, the panel inlets display, grouped by panel. Panel readings are collapsed by default, see Panel 1 in the image.

This floor PDU's Panel 2 has one panel inlet with three lines.

Below the line readings for the panel inlet, the circuit readings display.

This floor PDU's Panel 2 has 2 circuits, each with 3 circuit poles.

Panel Readings: Panel 1

Panel Readings: Panel 2

Inlet Readings

PDU Ele...	Voltage ...	Current ...	Active P...	Appare...	Power ...	Energy ...
Inlet 1	211	21.3	62.0	124.0	0.5	2,882

Line Readings

PDU Element	Voltage (V)	Current (A)	Unutilized Capacit...
Inlet 1			
L1	211	21.1	N/A
L2	212	21.2	N/A
L3	213	21.3	N/A

Circuit Readings

Circuit	Ordina...	Voltag...	Curre...	Active...	Appar...	Power...	Energ...
Panel2...	1	211	21.3	31.0	62.0	0.5	1441.0
Panel2...	2	221	22.3	32.0	64.0	0.5	1442.0

Circuit Pole Readings

Ordinal	Phase	Name	Voltage (V)	Current (A)
Circuit 1: Panel2_Circuit1				
1	A	Panel2_Circu...	211	21.1
2	B	Panel2_Circu...	212	21.2
3	C	Panel2_Circu...	213	21.3

Floor PDU Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The floor PDU's circuits are grouped by panel if mapped accordingly. The Elements section is blank for floor PDUs that do not have circuits.

The default Elements view for floor PDU includes this information:



- PDU Element: circuits grouped by panel
- IT Device: IT devices associated with circuits include a link to the IT device page.
- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.
- Active Power (W): latest poll reading for active power. The last column can be changed from latest poll reading for active power (W) to latest poll reading for current (A) by selecting Current from the drop-down list below the PDU Elements section.
- Apparent Power, Voltage, and Unutilized Capacity

The screenshot shows the 'PDU Elements' interface. It features a table with the following columns: PDU Element, IT Device, Trend, and Active Power (W). The data is organized into four panels, each containing two circuits. The 'Trend' column displays a bar chart for each circuit, and the 'Active Power (W)' column shows numerical values. Below the table, there is a control panel with a refresh icon, a 'Trend' dropdown menu set to 'maximum', an 'active power' dropdown menu, and a 'for the past' dropdown menu set to 'day'.

PDU Element	IT Device	Trend	Active Power (W)
Panel 1			63 W
Circuit 1 (Panel1_Circuit1)		[Bar Chart]	31.0
Circuit 2 (Panel1_Circuit2)		[Bar Chart]	32.0
Panel 2			63 W
Circuit 1 (Panel2_Circuit1)		[Bar Chart]	31.0
Circuit 2 (Panel2_Circuit2)		[Bar Chart]	32.0
Panel 3			63 W
Circuit 1 (Panel3_Circuit1)		[Bar Chart]	31.0
Circuit 2 (Panel3_Circuit2)		[Bar Chart]	32.0
Panel 4			63 W
Circuit 1 (Panel4_Circuit1)		[Bar Chart]	31.0
Circuit 2 (Panel4_Circuit2)		[Bar Chart]	32.0

PDU Element	IT Device
Panel 1	
Circuit 1 (Panel1_Circuit1)	Device for 10.128.200.1 pan...
Circuit 2 (Panel1_Circuit2)	Device for 10.128.200.1 pan...
Panel 2	

Floor PDU Details

Details	
Type	Floor PDU
IP Address	10.128.200.10
External Key	10.128.200.10
Name	Floor PDU1
Manufacturer	Acme Electronics
Model	FPDU-3phase-4panel-pole-position
Firmware	1.1.1
Contact	
Location	Raleigh Data Center
Custom Field 1	
Custom Field 2	
SNMP Version	1/2c
Inlet Phase	 Three Phase
Belongs to	 Row for 10.128.200 subnet
Health	<p>Connectivity: OK Most recent poll of the target PDU was successful.</p> <p>Active events: Good No active events.</p>

Floor UPS

Floor UPS refers to an intelligent, standalone Uninterruptible Power Supply (UPS) device. Rack UPS is not supported.

Floor UPS Smart View

Power IQ gathers power readings from the Floor UPS inlets and inlet lines, circuits, and circuit poles.

The mapping of the circuit poles to circuits is achieved through your dynamic plugin configuration.

*Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** (on page 272).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated Floor UPS smart view includes:

- **Floor UPS Energy Trends** (on page 193)
- **Floor UPS Elements** (on page 195)
- **Floor UPS Readings** (on page 193)
- **Floor UPS Details** (on page 195)

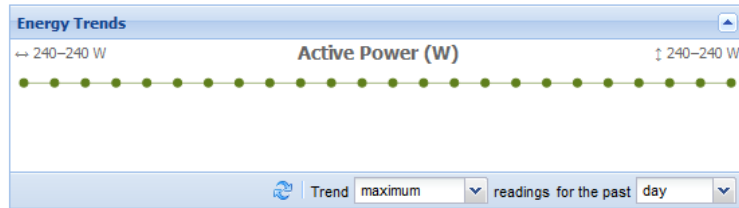
Floor UPS Energy Trends

Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Floor UPS energy trends includes a trend line for active power.



Floor UPS Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

This sample smart view shows one possible configuration of a three-phase Floor UPS

- 1 inlet with 3 lines
- 2 circuits
- Each circuit has 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

The inlet of this Floor UPS has three lines.

Readings come from the whole inlet, and from each line for three-phase inlets.

Below the inlet and line readings, the circuit and circuit pole readings display.

This Floor UPS has 2 circuits.

Circuit1 has 3 circuit poles.

Readings							
Inlet Readings							
PDU Element	Voltage (V)	Current (A)	Active Po...	Apparent ...	Power Fa...	Energy (Wh)	
Inlet 1	121	1.3	240.0	480.0	0.5	11,520	
Line Readings							
PDU Element	Voltage (V)	Current (A)	Unused Capacity (A)				
Inlet 1							
L1	121	1.1	N/A				
L2	122	1.2	N/A				
L3	123	1.3	N/A				
Circuit Readings							
Circuit	Ordinal ▲	Voltage ...	Current ...	Active P...	Appare...	Power F...	Energy (...)
Circuit1	1	111	11.3	31.0	62.0	0.5	1,441
Circuit2	2	121	12.3	32.0	64.0	0.5	1,442
Circuit Pole Readings							
Ordinal ▲	Phase	Name	Voltage (V)	Current (A)			
Circuit 1: Circuit1							
1	A	Circuit1_Pole1	111	11.1			
3	B	Circuit1_Pole2	112	11.2			
5	C	Circuit1_Pole3	113	11.3			
Circuit 2: Circuit2							

Floor UPS Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The default Elements view for Floor UPS includes this information:

- PDU Element: circuits
- IT Device: IT devices associated with circuits include a link to the IT device page.
- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.
- Active Power (W): latest poll reading for active power. Change the latest poll reading to Current using the field below it.
- Apparent Power, Voltage, and Unutilized Capacity

PDU Elements			
PDU Element	IT Device	Trend	Active Power (W)
Circuit 1 (Circuit1)			31.0
Circuit 2 (Circuit2)			32.0

Trend maximum active power for the past day

Floor UPS Details

Details are the fourth section in the smart view.

Details	
Type	Floor UPS
IP Address	10.128.200.60
External Key	10.128.200.60
Name	UPS - Room 1
Manufacturer	Acme Electronics
Model	UPS-3phase
Firmware	1.1.1
Contact	facilitiesmanager@raritan.com
Location	Raleigh Data Center
Custom Field 1	
Custom Field 2	
SNMP Version	1/2c
Inlet Phase	Three Phase
Belongs to	Row for 10.128.200 subnet
Health	<p>Connectivity: OK Most recent poll of the target PDU was successful.</p> <p>Active events: Good No active events.</p>

Power Panel

Power Panel refers to a single intelligent power panel on a wall that may contain inlets, circuits and circuit poles.

Anything with multiple panels should be added as a floor PDU, not a power panel.

Power Panels Smart View

Power IQ gathers power readings from the Power Panel's inlets, circuits, and circuit poles.

The mapping of the panels to circuits and circuit poles is achieved through your dynamic plugin configuration.

*Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** (on page 272).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated Power Panels smart view includes:

- **Power Panels Energy Trends** (on page 197)
- **Power Panels Elements** (on page 199)
- **Power Panels Readings** (on page 197)
- **Power Panels Details** (on page 199)

Power Panels Energy Trends

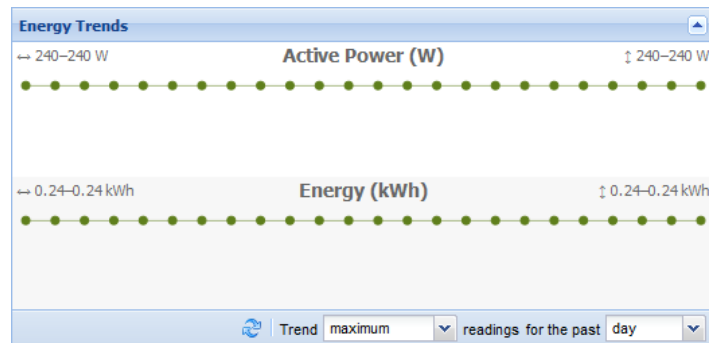
Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Power panel energy trends include a trend line for several types of readings.

- Active Power
- Energy
- Current, when the power panel has inlet poles



Power Panels Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

Power Panel readings come from the inlets, circuits, and circuit poles. Power panels come in many different configurations. Your configuration may vary.

This sample smart view shows one possible configuration of a three-phase Power Panel.

- 1 inlet with 3 lines
- 2 circuits
- Each circuit has 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

The inlet of this Power Panel has three lines.

Readings come from the whole inlet, and from each line for three-phase inlets.

Below the inlet and line readings, the circuit and circuit pole readings display.

This Power Panel has 2 circuits.

Circuit1 has 3 circuit poles.

Readings							
Inlet Readings							
PDU Element	Voltage (V)	Current (A)	Active Po...	Apparent ...	Power Fa...	Energy (Wh)	
Inlet 1	121	1.3	240.0	480.0	0.5	11,520	
Line Readings							
PDU Element	Voltage (V)	Current (A)	Unused Capacity (A)				
Inlet 1							
L1	121	1.1	N/A				
L2	122	1.2	N/A				
L3	123	1.3	N/A				
Circuit Readings							
Circuit	Ordinal ▲	Voltage ...	Current ...	Active P...	Appare...	Power F...	Energy (...)
Circuit1	1	111	11.3	31.0	62.0	0.5	1,441
Circuit2	2	121	12.3	32.0	64.0	0.5	1,442
Circuit Pole Readings							
Ordinal ▲	Phase	Name	Voltage (V)	Current (A)			
Circuit 1: Circuit1							
1	A	Circuit1_Pole1	111	11.1			
3	B	Circuit1_Pole2	112	11.2			
5	C	Circuit1_Pole3	113	11.3			
Circuit 2: Circuit2							

Power Panels Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The default Elements view for Power Panels includes this information:

- PDU Element: circuits
- IT Device: IT devices associated with circuits include a link to the IT device page.
- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.
- Active Power (W): latest poll reading for active power. Change the latest poll reading to Current using the field below it.
- Apparent Power, Voltage, and Unutilized Capacity

PDU Elements			
PDU Element	IT Device	Trend	Active Power (W)
Circuit 1 (Circuit1)			31.0
Circuit 2 (Circuit2)			32.0

Refresh Trend maximum active power for the past day

Power Panels Details

Details are the fourth section in the smart view.

Details	
Type	Power Panel
IP Address	10.128.200.4
External Key	10.128.200.4
Name	PP - Floor 3
Manufacturer	Acme Electronics
Model	RPP-1phase
Firmware	1.1.1
Contact	facilitiesmanager@raritan.com
Location	Raleigh Data Center
Custom Field 1	
Custom Field 2	
SNMP Version	1/2c
Inlet Phase	Single Phase
Belongs to	Row for 10.128.200 subnet
Health	<p>Connectivity: OK Most recent poll of the target PDU was successful.</p> <p>Active events: Good No active events.</p>

Standalone Meters

Standalone Meters refers to a standalone power meter that may be used throughout the data center.

Standalone Meters Smart View

Power IQ gathers power readings from the Standalone Meter's circuits and circuit poles.

The mapping of the circuits and circuit poles is achieved through your dynamic plugin configuration.

*Note: The data Power IQ can gather depends on how you configure the dynamic plugin that manages the object. See **Dynamic Plugins** (on page 272).*

Power IQ displays all data gathered in a smart view. Access the smart view by clicking on the object either in the PDUs tab, or in the Data Centers browser.

A fully populated Standalone Meter smart view includes:

- **Standalone Meter Energy Trends** (on page 201)
- **Standalone Meter Elements** (on page 203)
- **Standalone Meter Readings** (on page 202)
- **Standalone Meter Details** (on page 203)

Standalone Meter Energy Trends

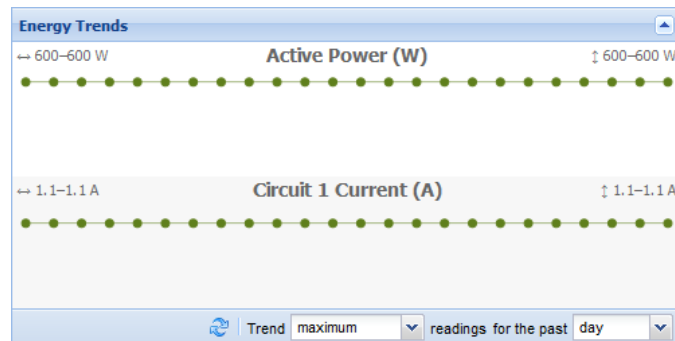
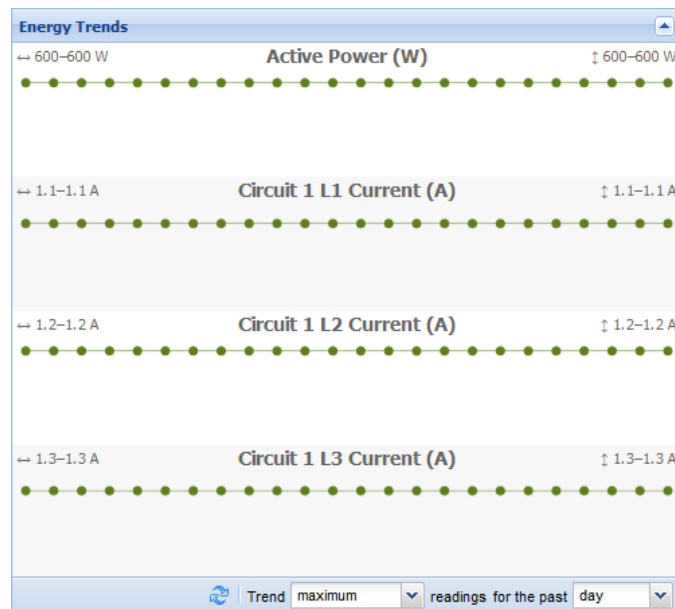
Energy Trends display in the top section of the smart view.

Trend charts display data for the whole unit.

The trend can be configured to show minimum, maximum, or average over a selected time period, using the fields below it.

Standalone Meter energy trends include a trend line for several types of readings.

- Active Power
- Current: one trend line for single phase circuits and one trend for each line of three-phase circuits



Standalone Meter Readings

Readings display in the second section of the smart view.

Configure the columns by clicking the arrow in a heading, then selecting options to display, hide, or sort.

Standalone Meter readings come from the circuits and circuit poles. Your configuration may vary.

This sample smart view shows one possible configuration of a three-phase Standalone Meter.

- 1 circuit with 3 circuit poles

Readings start from the "highest level" or top of the power chain. The top of the power chain is the first section of readings, progressing down the page to lower points in the power chain.

The circuit of this Standalone Meter has 3 circuit poles.

Readings come from the whole circuit, and from each line for three-phase circuits.

The screenshot shows a 'Readings' window with two main sections: 'Circuit Readings' and 'Circuit Pole Readings'. The 'Circuit Readings' section contains a table with columns for Circuit, Ordinal, Voltage, Current, Active Power, Apparent Power, Power Factor, and Energy. The 'Circuit Pole Readings' section contains a table with columns for Ordinal, Phase, Name, Voltage (V), and Current (A). A status bar at the bottom indicates 'Latest reading taken 9 minutes ago'.

Circuit Readings							
Circuit	Ordinal ▲	Voltage (...)	Current (...)	Active P...	Apparen...	Power F...	Energy (...)
Circuit1	1	121	1.3	600.0	1,200	0.5	1,441

Circuit Pole Readings				
Ordinal ▲	Phase	Name	Voltage (V)	Current (A)
[-] Circuit 1: Circuit1				
1	A	Circuit1_Pole1	121	1.1
2	B	Circuit1_Pole2	122	1.2
3	C	Circuit1_Pole3	123	1.3

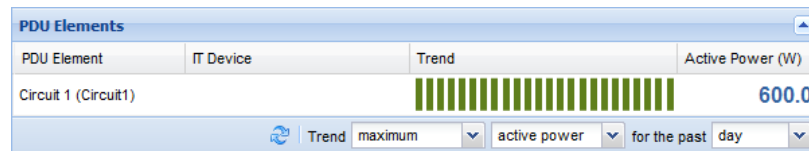
Latest reading taken 9 minutes ago

Standalone Meter Elements

Elements display in the third position in the smart view. The title "PDU Elements" is used for all types of PDUs and facilities objects.

The default Elements view for Standalone Meters includes this information:

- PDU Element: circuits
- IT Device: IT devices associated with circuits include a link to the IT device page.
- Trend: small trend chart for active power. Change the trend to min/max/average active power or current using the fields below it.
- Active Power (W): latest poll reading for active power. Change the latest poll reading to Current using the field below it.



Standalone Meter Details

Details are the fourth section in the smart view.

Details	
Type	Standalone Meter
IP Address	10.128.200.2
External Key	10.128.200.2
Name	Standalone Meter - ABC Data Center
Manufacturer	Acme Electronics
Model	SAM-SinglePhase
Firmware	1.1.1
Contact	facilitiesmanager@raritan.com
Location	Raleigh Data Center
Custom Field 1	
Custom Field 2	
SNMP Version	1/2c
Inlet Phase	Single Phase
Belongs to	Row for 10.128.200 subnet
Health	<p>Connectivity: OK Most recent poll of the target PDU was successful.</p> <p>Active events: Good No active events.</p>

Chapter 12 Sensors

When you add a PDU to Power IQ, the attached sensors are discovered.

You can view the list of sensors attached to a PDU in the PDU's smart view. See **Rack PDU Smart View** (on page 156).

Power IQ automatically associates your sensors into the EDM when their PDU is in the EDM. See **Automatically Associate Sensors in the EDM** (on page 139).

You can change this automatic association to place a sensor in the EDM at any room, row, aisle, or rack level. View your sensors in the EDM hierarchy in the Data Centers tab. See **Creating Your EDM** (on page 135).

Once associated in the EDM, you can access the sensor smart view. In the smart view, you can edit sensor label and position. The sensor smart view also has a configurable trend line. See **Sensor Smart View** (on page 204).

In This Chapter

Sensor Smart View	204
Sensors Connected to PX1 and PX2 PDUs	206

Sensor Smart View

Once a sensor is associated in the EDM, you can access the smart view.

All environmental sensor smart views contain:

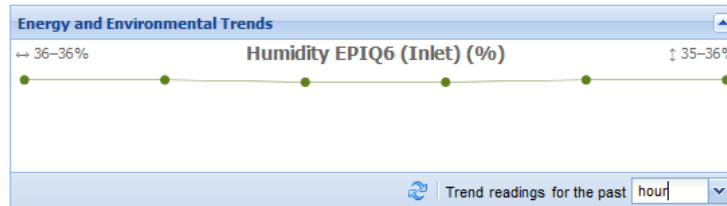
- **Sensor Environmental Trends** (on page 205)

A sensor smart view may contain the following options, depending on the sensor type:

- **Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors** (on page 205)
- **Naming Environmental Sensors** (on page 206)

Sensor Environmental Trends

The top section of the sensors smart view is a trend line. Configure the trend time period using the field below the trend.



*Note: If you need to release and then re-manage a sensor associated with a Raritan PDU, always use the manual assignment option to ensure the accuracy of sensor environmental trends. See **Sensor Assignment Guideline** (on page 210).*

Specify Inlet, Outlet, or Outside Air Location for Environmental Sensors

You can specify whether a sensor is inlet or outlet located or if the sensor is for outside air. By default, Power IQ considers all environmental sensors to be inlet located.

Sensors are editable only when included in the EDM. See **Creating Your EDM** (on page 135).

All sensor types can be included in Cooling charts on the dashboard. See **Cooling Chart Widget** (on page 103).

► To specify inlet or outlet location for environmental sensors:

- In the sensors smart view, select the Sensor Location: Inlet, Outlet, or Outside Air.

The screenshot shows a "Sensor" configuration window. The "Label" field contains "HumiditySensor1 Inlet". The "Type" is "HUMIDITY". The "Sensor Location" is set to "inlet" (selected with a radio button). The "Ordinal" is "1". The "PDU" is "192.168.42.50". A "Save" button is visible at the bottom right.

Naming Environmental Sensors

Environmental sensors have sensor labels that you can change in Power IQ.

The following PDUs support naming environmental sensors, depending on model: APC, Eaton, Baytech, Liebert, Raritan, Servertech, Sinetica.

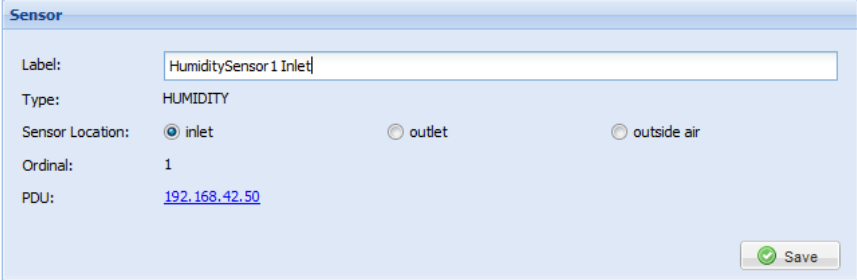
Sensor names cannot include only white space characters. The maximum name length is 256 characters. The maximum name length for PX1 sensors is 33 characters.

Sensor labels must be unique. During polling, if Power IQ finds two sensors of the same type with the same name, the sensor readings for those sensors are not saved. Power IQ adds an error message to the audit log.

SNMP read and write access to the PDU is required to name sensors. See **Adding PDUs to Power IQ Management** (on page 20).

► **To name environmental sensors:**

- In the sensors smart view, enter a unique name in the label field, then click Save.



The screenshot shows a 'Sensor' configuration window. It contains the following fields and values:

- Label:** HumiditySensor1 Inlet
- Type:** HUMIDITY
- Sensor Location:** inlet (selected), outlet, outside air
- Ordinal:** 1
- PDU:** 192.168.42.50

A 'Save' button with a green checkmark icon is located at the bottom right of the form.

Sensors Connected to PX1 and PX2 PDUs

Raritan PX1 and PX2 PDUs support environmental and contact closure sensors, which you can poll through Power IQ.

The sensors must be setup and configured correctly via PX1 or PX2 before they will work correctly with Power IQ.

See the online help for your PX model PDU here:

<http://www.raritan.com/support/product/px/>

<http://www.raritan.com/support/product/px2/>

States of Managed Sensors

An environmental sensor shows the state after being managed.

Available sensor states vary depending on the sensor type -- numeric or discrete sensors. For example, a contact closure sensor is a discrete (on/off) sensor so it switches between three states only -- unavailable, alarmed and normal.

Note: Numeric sensors show both numeric readings and sensor states to indicate environmental or internal conditions while discrete (on/off) sensors show sensor states only to indicate state changes.

Sensor state	Applicable to
unavailable	All sensors
alarmed	Discrete sensors
normal	Discrete sensors
ok	Numeric sensors
below lower critical	Numeric sensors
below lower non-critical	Numeric sensors
above upper non-critical	Numeric sensors
above upper critical	Numeric sensors

Note: The state change of a contact closure sensor occurs only if the sensor enters the new state for at least 1 consecutive sample.

"unavailable" State

The *unavailable* state means the connectivity or communications with the sensor is lost.

The Raritan PX pings all managed sensors at regular intervals in seconds. If it does not detect a particular sensor for three consecutive scans, the *unavailable* state is displayed for that sensor.

When the communication with a contact closure sensor's processor is lost, all detectors (that is, all switches) connected to the same sensor package show the "unavailable" state.

Note: When the sensor is deemed unavailable, the existing sensor configuration remains unchanged. For example, the ID number assigned to the sensor remains associated with it.

The Raritan PX continues to ping unavailable sensors, and moves out of the *unavailable* state after detecting the sensor for two consecutive scans.

Connected sensors always show *unavailable* if they are NOT under management.

For DPX2 or DX sensor packages, all of the connected sensor packages also enter the *unavailable* states if any of them is upgrading its sensor firmware.

"normal" State

This state indicates the sensor is in the normal state.

For a contact closure sensor, usually this state is the normal state you have set.

- If the normal state is set to Normally Closed, the *normal* state means the contact closure switch is closed.
- If the normal state is set to Normally Open, the *normal* state means the contact closure switch is open.

For a Raritan's floor water sensor, the normal state must be set to Normally Closed, which means no water is detected.

*Note: See Environmental Sensors Guide for information on setting the normal state or dip switch. This guide can be downloaded from the Raritan website's **PX2 Support Files page** (<https://www.raritan.com/support/product/px2/px2-support-files>).*

"alarmed" State

This state means a discrete (on/off) sensor is in the "abnormal" state.

Usually for a contact closure sensor, the meaning of this state varies based on the sensor's normal state setting.

- If the normal state is set to Normally Closed, the *alarmed* state means the contact closure switch is open.
- If the normal state is set to Normally Open, the *alarmed* state means the contact closure switch is closed.

For a Raritan's floor water sensor, the normal state must be set to Normally Closed, which means no water is detected. The *alarmed* state indicates that the presence of water is detected.

*Note: See Environmental Sensors Guide for information on setting the normal state or dip switch. This guide can be downloaded from the Raritan website's **PX2 Support Files page** (<https://www.raritan.com/support/product/px2/px2-support-files>).*

Tip: A contact closure sensor's LED is lit after entering the alarmed state. Determine which contact closure switch is in the "abnormal" status according to the corresponding LED.

"ok" State

Only a numeric sensor shows this state. This state means the sensor reading is within the acceptable range as indicated below:

$$\text{Lower Non-Critical threshold} \leq \text{Reading} < \text{Upper Non-Critical threshold}$$

Note: The symbol \leq means smaller than ($<$) or equal to ($=$).

"below lower critical" State

This state means a numeric sensor's reading is below the lower critical threshold as indicated below:

$$\text{Reading} < \text{Lower Critical Threshold}$$

"below lower non-critical" State

Only a numeric sensor shows this state.

This state means the sensor reading is below the lower non-critical threshold as indicated below:

$$\text{Lower Critical Threshold} \leq \text{Reading} < \text{Lower Non-Critical Threshold}$$

Note: The symbol \leq means smaller than ($<$) or equal to ($=$).

"above upper non-critical" State

Only a numeric sensor shows this state.

This state means the sensor reading is above the upper non-critical threshold as indicated below:

$$\text{Upper Non-Critical Threshold} \leq \text{Reading} < \text{Upper Critical Threshold}$$

Note: The symbol \leq means smaller than ($<$) or equal to ($=$).

"above upper critical" State

This state means a numeric sensor's reading is above the upper critical threshold as indicated below:

$$\text{Upper Critical Threshold} \leq \text{Reading}$$

Note: The symbol \leq means smaller than ($<$) or equal to ($=$).

Sensor Assignment Guideline

A Raritan PDU allows users to release managed sensors and then bring them back under management, using either automatic or manual assignment option.

- Automatic assignment: This option may change the sensor ID on the PDU. Therefore, sensor indexes of the same sensor type are likely to swap in Power IQ, causing the sensor readings to swap as well. Power IQ users must not use this option.
- Manual assignment: This option permits users to specify the original sensor ID so that no sensor indexes and readings are swapped in Power IQ. Always use this option to ensure the sensor data accuracy in Power IQ.

Chapter 13 Power Control

Power control is only available for PDUs that support this feature.

Power IQ must have valid SNMP write access to the PDU for power control to work.

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Configure Power Control Options.....	211
Control Power to Outlets in a Data Center	212
Control Power to Devices in a Group	213
Power Cycle a Device	214
Scheduling Power Control.....	215
Configuring Graceful Shutdown	216
Preparing Servers for Graceful Shutdown.....	220
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Create Device Groups for Power Control.....	222
Set a Different Power On Delay for a Device	224

Enable or Disable Power Control

Only authorized users can control power. See **Role Definitions** (see "**Power IQ Role Definitions**" on page 83).

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.
2. In the Power Control Settings box, select the "Enable power control" checkbox to enable power control.
3. Click Save Power Control Settings.

Configure Power Control Options

► **To configure power control options:**

1. In the Settings tab, click Power IQ Settings in the Appliance Administration section.
2. In the Power Control Settings box:
 - a. Select the "Enable power control" checkbox to enable power control.
 - b. Select the "Require reason message for power control operations" checkbox to require users to log a reason for all power control operations.

- c. Select the "Allow ad hoc power control for rooms, aisles, rows, and racks" to allow authorized users to control power at the room, aisle, row and rack levels of the data center.
 - d. Select the "Allow scheduled power control" checkbox to allow authorized users to schedule power control tasks.
3. Click Save Power Control Settings.

Control Power to Outlets in a Data Center

You must enable power control. See **Enable or Disable Power Control** (on page 211).

Power control is available at the outlet and IT device outlet group level, unless you also enable higher levels, such as all outlets in a rack, row, aisle, or room. See **Configure Power Control Options** (on page 211).

You must be assigned a role that permits power control. See **Power IQ Role Definitions** (on page 83).

For details about controlling power in the Smart Rack and Smart PDU views, see **IT Devices - Smart Rack View** (see "**Rack IT Devices**" on page 165) and **PDU Elements - Smart Views** (see "**PDU Elements - Rack Smart View and Rack PDU Smart View**" on page 167).

Warning: Graceful shutdown is not supported when controlling power from the Smart Rack or Smart PDU pages, which are accessed by clicking the rack or PDU in the EDM/Data Centers tab. Use the right-click option on the rack or PDU in the EDM, or the power control options in the Devices tab for graceful shutdown.

► To control power in the Data Centers tab:

1. In the Data Centers tab, select the data center level, such as a rack, that contains the outlets you want to control.
2. Select the checkboxes of the outlets you want to control in the IT Devices or PDU Elements section.
3. Click Power Control > On or Power Control > Off.
4. If required, enter a reason message for the power control operation, and click OK to confirm.

► To control power with right-click in the Data Centers tab:

1. In the Data Centers tab, right-click an IT device, or higher level, if enabled, then select On or Off.
2. If required, enter a reason message for the power control operation, and click OK to confirm.

► **To control power in the PDUs tab:**

1. In the PDUs tab, select a PDU, then click View.
2. Select the checkboxes of the outlets you want to control in the Readings section.
3. Click Power Control > On, Power Control > Off, or Power Control > Cycle.
4. If required, enter a reason message for the power control operation, and click OK to confirm.

► **To control power in the Devices tab:**

1. In the Devices tab, select a device.
2. Click Power Control > On or Power Control > Off.
3. If required, enter a reason message for the power control operation, and click OK to confirm.

Control Power to Devices in a Group

You can manually control power to devices in a group, or schedule a task to run a power control operation at a specified time.

► **To control power to devices in a group manually:**

1. In the Devices tab, choose Activities > Device Groups.
2. Select the checkbox for the device group you want to control power to.
3. Click Power Control > On or Power Control > Off.
 - All devices in the group are powered on or off sequence specified in the group settings.
 - Devices are powered off in sequence, and powered on in the reverse sequence.
 - See **Create Device Groups for Power Control** (on page 222).
 - Devices in the group that are configured with graceful shutdown will be shutdown when a power off operation is selected here. The configured graceful shutdown delay is used. See **Configuring Graceful Shutdown** (on page 216).

► **To control power to devices in a group via a scheduled task:**

See **Add a Power Control Task** (on page 215).

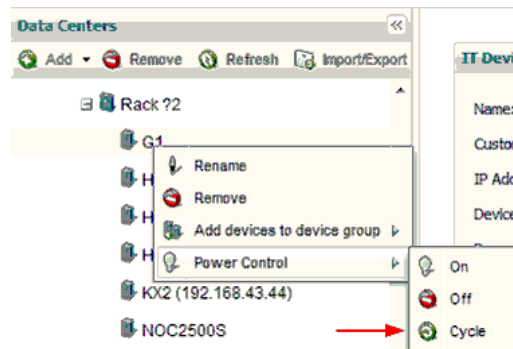
Power Cycle a Device

The power cycle feature enables you to hard power cycle devices that are mapped to one or more outlets. This can be useful in the event of a major software failure.

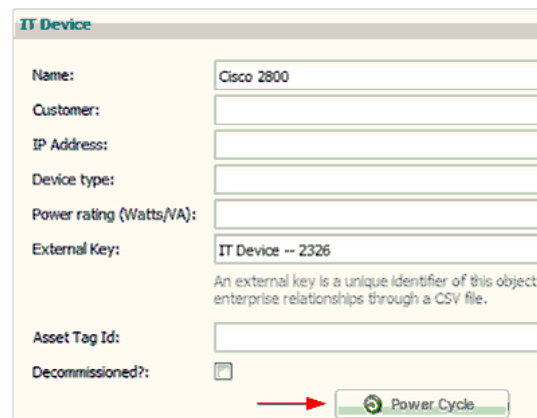
Graceful shutdown does not apply when using power cycle. There is a 30 second delay after the last outlet is turned off before turning the first outlet back on.

▶ To power cycle a device:

1. In the Devices tab, click the IT device name link in the Devices tab to go to the IT device page in the Data Centers tab. The EDM expands to show the IT device.
2. Find the power cycle button in either of these locations.
 - Right-click the IT Device in the EDM, choose Power Control > Cycle.



- Click Power Cycle in the center of the IT Device details page.



3. If required, enter a reason message for the power control operation, and click OK to confirm.

4. A status bar shows progress and success or failure message.

Scheduling Power Control

You can schedule power control for device groups only.

View Power Control Task Results

View the results of power control tasks that have been scheduled.

Note: Make sure that power control and scheduled power control are enabled. See **Enable or Disable Power Control** (on page 211).

► **To view power control task results:**

1. In the Devices tab, choose Activities > View Task Results. The Power Scheduling Task Results page opens.
2. Click a task name link to view the results.

Add a Power Control Task

Schedule a power control task to control power to a device group at a specified time. You can schedule a task that runs only once, or that recurs on a regular schedule.

You must create device groups before you add power control tasks. See **Create Device Groups for Power Control** (on page 222).

► **To add a power control task:**

1. In the Devices tab, choose Activities > Add New Task. The New Power Scheduling Task page opens.
2. Select Power On or Power Off. If Graceful Shutdown is configured for a device in the device group, a power-off task will use graceful shutdown automatically, unless you select the Skip Graceful Shutdown checkbox in the next step.
3. Select the Skip Graceful Shutdown checkbox to force a hard shutdown for all devices in the device group, even if graceful shutdown is enabled.
4. Select the Leave Outlets On checkbox to leave outlets powered on in cases where devices have been powered off using graceful shutdown.
5. Select the Device Group for the power control operation.
6. Specify when the task should run.
 - To schedule a task that runs only once, select the Date from the calendar in the Run Once section.

- To schedule a task that recurs, select the checkboxes for the days of the week the task should run in the Recurring section.
 - For both types, select the time the task should run in the Hour and Minute fields.
7. Select the Active checkbox to allow this task to run. Deselect this checkbox to stop the task from running.
 8. Click Save.

Configuring Graceful Shutdown

You can configure Power IQ to send a graceful shutdown command to a server before powering off outlets. Power IQ allows you to define a set of system-wide shutdown commands with credentials to use across multiple devices. Power IQ supports both SSH and NetRPC commands to shutdown either Unix or Windows servers.

► Process for Configuring Graceful Shutdown in Power IQ:

1. Enable power control. See **Enable or Disable Power Control** (on page 211).
2. Prepare your servers for graceful shutdown: check open ports, define accounts for authentication, test authentication methods. See **Open Ports for Graceful Shutdown** (on page 220) and **Preparing Servers for Graceful Shutdown** (on page 220).
3. Add the shutdown commands to Power IQ. See **Add Shutdown Commands** (on page 217).
4. Enable graceful shutdown for the server, known as an IT Device in Power IQ, specify the command and wait time, and test the connection. See **Enable Graceful Shutdown for an IT Device** (on page 218).
5. To shutdown servers, use the power control functions.
 - a. Add a power control task to schedule the power off for a device group. See **Add a Power Control Task** (on page 215).OR
 - b. Power off an individual outlet. See **Control Power to Outlets in a Data Center** (on page 212).

Add Shutdown Commands

Add shutdown commands if you want to enable graceful shutdown to occur on servers before Power IQ switches off outlets. Graceful shutdown will occur both when you manually power outlets off or when a scheduled power control task runs.

You can test the commands you configure when you enable graceful shutdown for a particular device. See **Enable Graceful Shutdown for an IT Device** (on page 218).

► Add shutdown commands using Windows Remote Shutdown

Windows Remote Shutdown is the most common choice for shutting down Windows systems.

1. In the Devices tab, choose Activities > Shutdown Commands. The Add New Shutdown Command page opens.
2. Click Add.
3. Select Using Windows Remote Shutdown and click Next.
4. In the Name field, enter a name to describe this shutdown command. This name appears in the list of shutdown commands to be selected when you enable graceful shutdown for a server. See **Enable Graceful Shutdown for an IT Device** (on page 218).
5. In the Login field, enter the username of the account to be authenticated on each server to be shutdown.
 - Login can include letters, digits, underscores, dots, and hyphens.
6. In the Password and Password Confirmation fields, enter the password for the username in the Login field.
7. In the Comment field, enter the message to display to users of the server when it is shutdown.
8. Click Add.

► Add shutdown commands using SSH:

SSH is the most common choice for shutting down Linux, Unix, or other systems:

1. In the Devices tab, choose Activities > Shutdown Commands. The Add New Shutdown Command page opens.
2. Click Add.
3. Select SSH and click Next.
4. In the Name field, enter a name to describe this shutdown command. This name appears in the list of shutdown commands to be selected when you enable graceful shutdown for a server. See **Enable Graceful Shutdown for an IT Device** (on page 218).

5. In the Login field, enter the username of the account to be authenticated on each server to be shutdown.
 - Login can include letters, digits, underscores, dots, and hyphens.
6. Enter the appropriate credentials for the account specified in the Login field. See **Basic Configuration for SSH Shutdown** (on page 220) for more details on authentication. The following options are valid.
 - a. Password and Password Confirmation
 - b. Private Key
 - c. Private Key and Passcode and Passcode Confirmation
7. In the Command field, enter the command. See **Sample SSH Shutdown Commands** (on page 221) for examples.
8. Click Add.

Enable Graceful Shutdown for an IT Device

Enable graceful shutdown for an IT Device if you want Power IQ to send a shutdown command that you configure to a server before powering it off.

You must add the shutdown commands before enabling graceful shutdown. See **Add Shutdown Commands** (on page 217).

► **To enable graceful shutdown for an IT device:**

1. In the Data Centers tab, select a device that requires graceful shutdown to be enabled.
2. Make sure the IP address for the device is completed in the IP Address field.
3. Expand the Graceful Shutdown section of the IT Device details page and select the Graceful Shutdown checkbox.
4. Select the command to send to the server from the Shutdown Command list. You must add commands to Power IQ before selecting a command here. See **Add Shutdown Commands** (on page 217).
5. In the Shutdown Wait field, enter the number of seconds Power IQ should wait for the shutdown to complete before powering off the associated outlet.
6. Click Test Connection. Power IQ attempts to connect to the device using the selected command. If you see a success message, click Save. If you see an error message, click View Log in the dialog to troubleshoot the failure.
7. Click Save to save all changes.

Disable Graceful Shutdown for an IT Device

There are two methods for disabling graceful shutdown for an IT Device.

► **Remove the IT device from the shutdown command details page:**

1. In the Devices tab, choose Activities > Shutdown Commands.
2. Select the shutdown command that you want to disable for the IT device.
3. Select the IT device in the Devices Using Shutdown Command list and click Remove.
4. Click Yes to confirm. The command is removed from the IT device and graceful shutdown is disabled.

► **Disable graceful shutdown from the Data centers tab:**

1. In the Data Centers tab, select a device that requires graceful shutdown to be disabled.
2. Expand the Graceful Shutdown section of the IT Device details page and deselect the Graceful Shutdown checkbox.
3. Click Save.

View the IT Devices Using a Shutdown Command

View the shutdown command details to see a list of IT Devices using each shutdown command.

► **To view the IT devices using a shutdown command:**

1. In the Devices tab, choose Activities > Shutdown Commands.
2. Select the shutdown command whose usage you want to view and click Edit.
3. The list of IT devices that are using the shutdown command displays below the command details.

Remove a Shutdown Command from Power IQ

When you remove a shutdown command from Power IQ, you can assign a different command to the IT devices that were using the removed command. Or, you can disable graceful shutdown for those devices.

► **To remove a shutdown command from Power IQ:**

1. In the Devices tab, choose Activities > Shutdown Commands link.
2. Select the command you want to remove from Power IQ and click Remove.

3. If the command is being used by any IT devices, a dialog appears. an option and click
 - a. Select Remove Command from Devices and Disable Graceful Shutdown, and click OK to remove the command from Power IQ and not assign a different shutdown command to the IT devices.OR
 - b. Select Assign Another Shutdown Command to Devices, and then select a different shutdown command from the list, and click OK, to assign a different shutdown command to the IT devices.

Preparing Servers for Graceful Shutdown

Servers must be configured to allow the shutdown commands to run when you enable graceful shutdown from Power IQ.

Open Ports for Graceful Shutdown

Servers that will receive graceful shutdown commands from Power IQ must have the following open ports.

▶ **Unix/Linux:**

- TCP 22: For SSH commands only. Custom SSH ports are not supported.

▶ **Windows:**

- TCP 139: NetBIOS Session Service, for Windows systems only.
- TCP 445 : For NetRPC commands only.

Basic Configuration for SSH Shutdown

▶ **Open Ports**

- Open port 22.

▶ **Authentication for SSH:**

- Power IQ can send a shutdown command via SSH to systems that share an authentication method, including the following methods.
 - common user directories
 - common username and password
 - common username and password (users managed by a common LDAP server)
 - common username and encrypted key: Append the public key file as a string to the `~/.ssh/authorized_keys` file of the user on each machine to be shut down.

- The user must have permission to shut down the machines using the authentication method.
- Each authentication method must be tested from the command line.

▶ **Shutdown Commands:**

There are two types of shutdown commands that you can use in Power IQ.

1. A call to the native shutdown command, which varies by Unix type
OR
2. A common shutdown script that carries out a backup
 - Each method must be tested from the command line of each machine to be shut down
 - The command has 30 minutes to complete before Power IQ stops trying. If the time expires, Power IQ closes the SSH connection, logs an error, and does NOT power off the outlet.
 - If the command returns stderr, Power IQ assumes a failure. Power IQ logs stdout and stderr.
 - Error details are written to the Power IQ log.

Sample SSH Shutdown Commands

Resources for information on writing SSH shutdown commands:

<http://www.unix.com/man-page/OpenSolaris/1m/shutdown/>

▶ **Sample Linux command:**

```
/sbin/shutdown -h now
```

▶ **Sample OpenSolaris command:**

```
sudo -E /usr/sbin/shutdown -y -i5 -g5
```

Basic Configuration for Windows Remote Shutdown

NetRPC shutdown commands can be used to shutdown Windows machines remotely.

▶ **Open ports:**

Open port 445.

▶ **Authentication:**

The Windows Remote Shutdown command requires a user account whose security policy allows shutdowns from a remote system.

Each server that will receive graceful shutdown commands must accept the user account's username and password.

▶ **Windows Server Configuration:**

RPC commands must be enabled on each Windows server that you will shutdown via Power IQ.

When Will Graceful Shutdown Abort?

If there is any error between beginning to connect with the server and the server returning from the shutdown script with a non-zero code, that is, no errors in the script, then the attempt is marked as failed and the outlet task does not proceed.

Create Device Groups for Power Control

Create a group of devices when you need to perform a power control task on the whole group. You can control power to the group manually, or by scheduling a power control task to run at a certain time. See **Control Power to Outlets in a Data Center** (on page 212) and **Scheduling Power Control** (on page 215).

Create a Device Group

▶ **To create device groups for power control:**

1. Make sure power control and scheduled power control is enabled. See **Enable or Disable Power Control** (on page 211) and **Configure Power Control Options** (on page 211).
2. In the Devices tab, select the devices you want to add to the group.
3. Click Add to Device Group > Create a new device group.
4. In the "Create a new device group" dialog, enter a name for the group, then click "Create device group".

- The group is created, and the selected devices are added. A success message displays. Click "View device group" to open the device group details, where you can set the default power control delays and sequence of devices for power control operations. See ***Configure the Power Control Settings for a Device Group*** (on page 223).

Add Devices to an Existing Device Group

Once groups have been created, you can add devices to the group in the Devices tab.

- In the Devices tab, select the devices you want to add to the group.
- Click Add to Device Group, and the list of groups that have been created displays beneath the "Create a new group" option. Select the group you want to add the devices to.

Add Devices to a Group in the Data Centers Tab

You can add one device or all devices within a data center, row, rack, and so on, to a group in the Data Centers tab.

► To add devices to a group from the Data Centers tab:

- In the Data Centers tab, select a device to add to the group. To add all devices from a section of the data center, select the room, or aisle, or rack. You can select any level, up to and including the data center.
- Right-click the selected level, select "Add devices to a device group", then select the group. To add a group, select "Create a new device group", enter a device group name then click "Create device group."

Configure the Power Control Settings for a Device Group

Configure each device group to set the default power control delay and the sequence of devices for power control operations.

► To configure the power control settings for a device group:

- In the Devices tab, choose Activities > Device Groups.
- Click a device group Name link. The Edit Device Group page opens.
- Set the Default Power On Delay (sec), which is the number of seconds that Power IQ delays after powering on each device in the sequence of devices in a group. These settings are the default power-on delay for all new devices you add to the group.
- Set the sequence for power control operations. Select a device, then click Up, Down, Top, Bottom, and Move To to arrange the device list in the sequence that power control operations should occur.
 - Devices will power off in the sequence set.

- Devices will power on in the REVERSE sequence set.

Remove a Device from a Group

► **To remove a device from a group:**

1. In the Devices tab, choose Activities > Device groups.
2. Click the device group Name link.
3. Select the device you want to remove, then click Remove. The device is removed from the group, but not removed from Power IQ.

Set a Different Power On Delay for a Device

Power IQ will follow the default delay setting for power-on sequences, unless you specify a different delay setting for a device. Delays are for power-on sequences only. The delay occurs after each power-on operation completes.

1. In the Devices tab, click a device group Name link in the Device Groups column. The Edit Device Group page opens.
2. Select the device in the Devices in This Group list, then double-click the Power On Delay value and enter a new value in the field.

Chapter 14 Analytics

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What are Power IQ Analytics?

The Analytics tab allow you to create and view custom reports based on Power IQ's knowledge of your data center and the power measurements it takes.

Reports are created as a way to organize charts. See ***Adding Reports to the Analytics Page*** (on page 227).

Each report can contain one or more charts. There are two chart types: Device and Health. See ***Creating a Chart*** (on page 229).

- Device charts show power measurements of your devices. See ***Device Chart Settings*** (on page 229).
- Health charts show connectivity and event statuses of your PDUs. See ***PDU Health Chart Settings*** (on page 234).

This list contains some examples of the types of information you can include in charts:

- The Active Power consumed by Test Rack #2 over the past hour.
- How many Kilowatt Hours were used by Rows A, B and C in the Data Center last month.
- If power costs \$0.062 per kWh, what did the IT server room cost to power last year?
- What is the health status of all PDUs in the system, based on connectivity and events received?

You must configure an Enterprise Data Model before using Analytics. The Enterprise Data Model populates the Data Center tab with a hierarchical representation of your data center. See ***Enterprise Relationships*** (see "***Enterprise Relationships and the EDM***" on page 132).



Adding Reports to the Analytics Page

The analytics page can include multiple report pages. A report page is a collection of one or more charts. Creating multiple reports is a good way to organize the Analytics information by category or specific need.

▶ **To add a report to the Analytics page:**

1. Click Add in the Reports column and enter a name for the report.
2. In the Reports toolbar, select the Share This Report checkbox to make the report and charts public.

▶ **To view a report:**

- In the Analytics tab, select a report in the Reports column. The report opens in the main section of the page.
- If the report has been shared by another user, you cannot edit it. Shared reports are marked as "Shared by username."

Sharing Reports on the Analytics Page

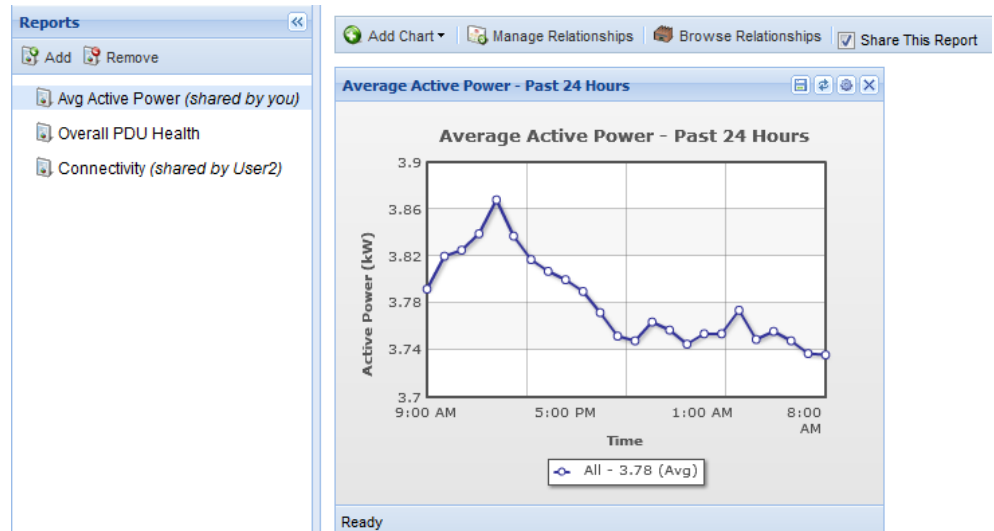
Choose to share a report when you want to make it public. Sharing reports gives other Power IQ users access to the report, and the charts it contains.

Users must have the View and the Create Reports and Dashboards role assigned to view your shared reports.

Reports that are shared are marked in the list as "shared by you." Reports that have been shared by other users are marked as "shared by username."

The data that displays in a report is based on each individual user's permissions in Power IQ. If another user does not have permission to see information about a rack or datacenter, for example, that you have shared a report about, the user will not see the data.

Users that you share a report with cannot edit your report. You cannot edit reports that you did not create.



► To share reports on the Analytics page:

1. In the Analytics tab, select a report on the left side of the page.
2. In the Reports toolbar, select the Share This Report checkbox to make the report and charts public.

► To make reports private on the Analytics page:

1. In the Analytics tab, select a report on the left side of the page.
2. In the Reports toolbar, deselect the Share This Report checkbox to remove the report from public view.

Creating a Chart

You must add a report before you can create a chart. See ***Adding Reports to the Analytics Page*** (on page 227).

► **To create a chart:**

1. In the Analytics tab, select a report on the left side of the page.
2. Click Add Chart, then select Device Chart or Health Chart.
 - Device charts show power measurements of your devices. See ***Device Chart Settings*** (on page 229).
 - Health charts show connectivity and event statuses of your PDUs. See ***PDU Health Chart Settings*** (on page 234).

You can change the location of any chart by clicking on the title bar of the chart and dragging it to its new position.

Configuring Charts

Configure a chart to select the data you want to analyze.

Charts created in the Analytics tab can only be viewed in the Analytics tab. Charts configured in the Dashboards tab can be viewed in the Dashboards tab, or in a Dashboard slide show. See ***Dashboard*** (on page 90).

- For device chart details, see ***Device Chart Settings*** (on page 229).
- For PDU health chart details, see ***PDU Health Chart Settings*** (on page 234).

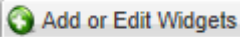
Device Chart Settings

A device chart displays power measurements for the devices in your data centers. Devices must be mapped to rack PDU outlets or circuits in the EDM before the data can be charted. See ***Creating Your EDM*** (on page 135).

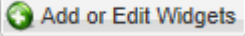
You can configure a device chart on the Analytics tab or on the Dashboards tab.

To chart facilities objects, see ***Facilities Chart Widget*** (on page 112)

► **To configure device chart settings:**

1. In the Analytics tab, select a Report. The charts contained in the Report open. On the chart you want to configure, click the Settings icon . See ***Creating a Chart*** (on page 229) for details on adding a new chart.

OR

In the Dashboards tab, add a device chart widget, then click the Settings icon  in the widget. See **Device Chart Widget** (on page 96).

2. The Device Chart Settings dialog appears.
3. In the Measurement field, select the type of measurement you want to analyze from the drop-down list.
 - The measurement is represented on the y-axis of the chart.
 - See **Device Chart Measurements** (on page 233).
4. In the Time Selection section, select Period or Range.
 - Select Period to show constantly updated measurement, such as power consumption over the Past hour, Past week, Past month, and so on. Select the time period from the drop-down list. See **What's the difference between "Past" and "Last" time periods?** (on page 232)
 - Select Range to show measurements from a custom Start Date and End Date. Select the start and end dates using the calendar dialogs.
 - The time selection is represented on the x-axis of the chart.
5. In the Granularity field, if available, select the level of granularity of data to chart. Hourly will show 1 data point per hour for the time period the chart includes, when the time period is 24 hours or longer. Poll Interval will show 1 data point per poll interval for the time period the chart includes.
 - The Poll Interval must be set to 5 minutes or longer to use Poll Interval granularity.
6. In the Line Configuration field, select an option to determine how many lines are on a chart, and how the lines are configured.
 - Select "Manually define lines" to choose the data for each line individually. You can add data from different sections of the data center to the same chart with this option. See **Manually Define Individual Device Chart Lines** (on page 231). Click the Individual Lines (Advanced) tab to configure the lines.
 - Select "Automatically define lines" then select a node from your enterprise data model in the Show field to show 1 line of data in the chart. Select the "One line per child" checkbox to show 1 line of data per child of the location selected in the Show field. For example, 1 line per child of a data center may show 1 line per room. Parent-child relationships are determined by the structure of your enterprise data model, as configured in the Data Centers tab.

Note: Humidity and Temperature measurements cannot be represented as one line per child. To chart one line per humidity or temperature sensor, use "Manually define lines."

7. In the External Key field, enter the external key of the PDU to filter the chart's data by that value.
8. In the Custom Fields 1 and 2, which may be renamed in your system, enter a PDU custom field value to filter the chart's data by that value.
9. Select Minimum, Maximum, or Average to specify whether you want the lowest values, highest values, or an average of the data for the measurement you selected. Min/Max/Average is not available for all measurements.
10. Click View Matching PDUs to view the list of PDUs to be included in the chart data.
11. The text in the Name field displays as the chart title. Select the Auto Name checkbox to allow the name to configure automatically, based on the criteria of the chart. Deselect the Auto Name checkbox to enter a name manually.
12. The Include Legend checkbox is enabled by default, and a chart legend for the data will be included. Deselect the Include Legend checkbox to remove the legend.
 - Removing the legend can make a chart more readable, depending on how many lines of data are included.
13. Click OK to save the settings and view the chart.

Manually Define Individual Device Chart Lines

You can manually define individual device chart lines to choose the data for each line individually.

You can add data from different sections of the data center to the same chart with this option.

► To manually define individual device chart lines:

See **Device Chart Settings** (on page 229) to start the chart configuration. In the Chart Settings, select "Manually define lines" to enable the Individual Lines (Advanced) tab.

1. In the Individual Lines (Advanced) tab, select a line in the Lines column.
 - By default there is one line, called Power IQ, that represents the whole system.

2. In the "Select what you want to see on this line" field, click the browse button, then select the data center node you want to chart on this line. Expand or collapse the nodes by clicking the plus and minus signs. The name of the node selected displays in the field at the bottom on the dialog. Click Select Node to save the line.
3. To add more lines, click Add, then select the line and repeat step 2 to configure it.
4. To filter a line to a more granular level, select the line in the Lines column, then enter your criteria in the fields in the Filter by Device Properties section.
 - For example, to configure a chart that includes 1 line per rack or row for a certain customer, add 1 line for each rack or row, then enter the name of the customer in the Customer Name field of each line.
 - Note: Filtering for Device Type, Customer, Custom Field 1 and Custom Field 2 will include any match that includes your search term, not just exact matches. For example, "ABC" will include "ABC" and "ABC123".
5. The text in the Name field displays as the line name in the legend of the chart, when legends are enabled. Select the Auto Name checkbox to allow the name to configure automatically, based on the criteria of the line. Deselect the Auto Name checkbox to enter a name manually.
6. Click the Chart Settings tab to finish the other chart configurations. See **Device Chart Settings** (on page 229).
7. Click Save.

What's the difference between "Past" and "Last" time periods?

- A Past measurement indicates the selected period of time up to the current moment.

For example: If you view a device chart on Tuesday, and the period is set to Past Week, the chart includes data from last Tuesday through this Tuesday.
- A Last measurement indicates the most recent completed period of time.

For example: If you view a device chart on Tuesday, and the period is set to Last Week, the chart includes data from last Sunday through last Saturday. The chart shows the last full week.

Device Chart Measurements

Device charts can be configured for many kinds of measurements.

▶ Power Reading Charts:

- Active Power (W)
- Current (amp)
- IT Energy (kWh)
- CO2 Footprint (CO2 Kg)
- IT Energy Cost (\$ or other currency)
- Total Energy Including Cooling (kWh)
- Total Energy Cost Including Cooling (\$ or other currency)

▶ Temperature Charts:

Measurement taken as degrees Celsius or Fahrenheit, based on system setting in Settings > Application Settings > Language and Locale Settings.

- Inlet Temperature
- Outlet Temperature
- Outside Air Temperature

▶ Humidity Charts:

Measurement taken as percentage humidity.

- Inlet Humidity (%)
- Outlet Humidity (%)
- Outside Air Humidity (%)

▶ Air Flow and Pressure Charts:

Measurements taken as meters per second for air flow, and pascals for air pressure.

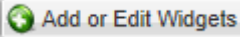
- Air Flow (m/s)
- Air Pressure (Pa)

PDU Health Chart Settings

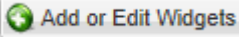
A PDU health chart displays connectivity and event statuses of your PDUs.


You can configure a PDU health chart on the Analytics tab or on the Dashboards tab.

► **To configure device chart settings:**

1. In the Analytics tab, select a Report. The charts contained in the Report open. On the chart you want to configure, click the Settings icon . See **Creating a Chart** (on page 229) for details on adding a new chart.

OR

In the Dashboards tab, add a PDU health chart widget, then click the Settings icon  in the widget. See **PDU Health Chart Widget** (on page 97).

2. The Health Chart Settings dialog appears.
3. Click the Settings icon .
4. Enter a name for the chart in the Title field in the Basics section.
5. In the Data From field, select All to include all PDUs in the system in the chart. Select Data Center or other section of the data center to filter the next field's selections. For example, select Racks to filter the Contained In field to include the racks in your system.
6. In the Contained In field, select the location of the PDUs you want to include in the Health chart.
7. In the Options section, select the health measurement.
 - Select Overall Health to view a health chart that combines connectivity and active events to create an overall health status of the selected PDUs.
 - Select Event Health Only to exclude connectivity from the health status.
 - Select Connectivity Health Only to exclude active events from the health status.
8. Click Save.

Overall PDU Health


Overall health in a PDU Health Chart comprises both connectivity health and active events health. The overall health is determined based on these criteria:

- **Critical: Red** - A PDU is in critical overall health if either its connectivity health is critical or its active events health is critical. The overall health is critical even when only one of these categories is critical.
- **Warning: Yellow** - A PDU is in warning level overall health if either its connectivity health is warning, or its active events health is warning, but neither is critical. This could indicate a warning level active event and good connectivity.
- **Good: Green** - A PDU is in good overall health if both its connectivity health is good and its active events health is good. This indicates no unsuccessful polls, and no active warning or critical severity events.

Exporting Charts

Export a chart to save the chart data to a .CSV file.

► **To export a chart:**

1. In the Analytics tab, select a Report.
2. The charts contained in the Report open. Click the Export icon  in the chart.
3. Use the dialog that appears to save the file.

Chapter 15 PUE - Power Usage Effectiveness

Power Usage Effectiveness (PUE) is the ratio of the total amount of power used by a data center to the power delivered to actual IT equipment. An ideal PUE is 1.0.

$$\text{PUE} = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}}$$

Power usage for anything that is not a computing device, such as lighting and cooling, is considered facility power usage.

Power IQ measures total power and IT power based on the flags set for each inlet, outlet or circuit. Flags indicate whether the kilowatt hours measured count toward total power, IT power, both, or neither. See **Set PUE Flags** (on page 237) and **What PUE Flags Does Power IQ Set Automatically?** (on page 238)

Power IQ sums up the measured values on a daily and monthly basis, then uses the values to calculate PUE. Both daily and monthly PUE calculations are offered. Power IQ does a rollup of daily measurements on the first day of each month, using the previous month's data, to create a monthly PUE calculation for each data center. You can adjust the monthly sums for total power and IT power as needed after the rollup.

All data represents the PUE flags and EDM configuration as set when the data was collected.

Power IQ displays the PUE calculations in several ways.

- **List PUE Calculations and Adjustments** (on page 239): a list of the monthly PUE calculations for each data center that enables you to enter offset values to adjust the monthly total power and IT power readings.
- **PUE Trend Chart Widget** (on page 109): a dashboard chart that shows PUE calculations over time.
- **Latest PUE Reading Gauge Widget** (on page 110): a dashboard gauge that shows your latest PUE reading and where it falls within the thresholds set.

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Requirements for PUE

PUE calculations can begin once your system is set up to include:

- Enterprise data model (EDM) is configured and includes the objects you want to flag as part of the PUE calculation. See **Enterprise Relationships** (see "**Enterprise Relationships and the EDM**" on page 132)
- Objects are flagged as Total Power and IT Power. See **Set PUE Flags** (on page 237)

Set PUE Flags

You must identify the sources of IT power and total power using flags. Power IQ uses the flags to determine which readings to use in the PUE calculation.

IMPORTANT: When setting Total Power, make sure not to flag the same power more than once. Set the flag at the highest level source only.

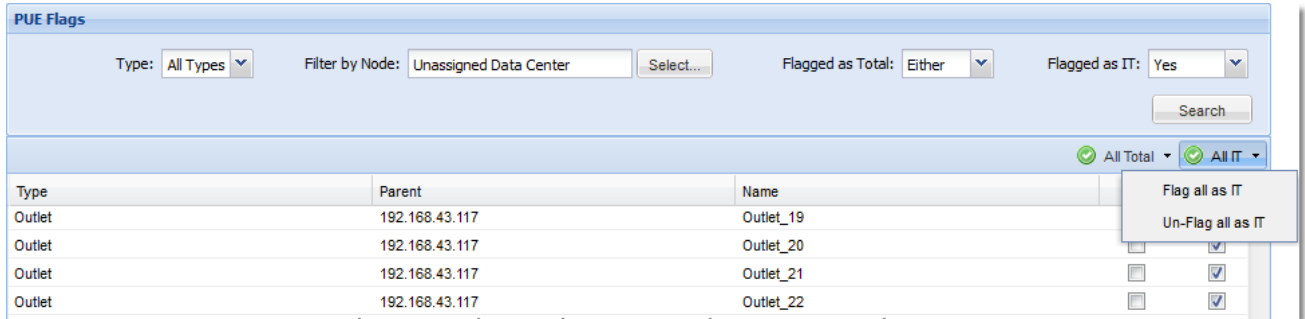
► **Total Power:**

- Set the flag for Total Power if the object supplies power to the data center. Avoid double-flagging Total Power in the stream. For example, flagging Total Power on a standalone meter AND the inlet to a downstream floor PDU would double-flag the same energy.
 - Best practice is to measure Total Power at the main line in to the data center. For example, if you have a standalone meter, flag it as Total Power.
 - Another method is to search for circuits of your Power IQ managed facilities objects, such as floor PDUs, power panels, UPS, and so on, and flag the highest level sources as Total Power.
 - Power IQ does not automatically flag Total Power.

► **IT Power:**

- Set the flag for IT Power if the object supplies power for computing purposes only.
 - Outlets on Rack PDUs
 - Inlets on Rack PDUs without outlet meters
 - Power IQ automatically flags rack PDUs as IT Power.

- See **What PUE Flags Does Power IQ Set Automatically?** (on page 238)



► **To set PUE flags:**

1. In the PUE tab, use the search criteria to list the objects you want to flag.
 - Type: Circuits, Outlets, or Inlets.
 - Filter by Node: Select an EDM node.
 - Flagged as Total: Filters objects by their Total Power flag status.
 - Flagged as IT: Filters objects by their IT Power flag status.
2. Click Search.
3. In the search results list, select the checkboxes under the Total and IT columns for each object to flag it.

Note: Use the All Total and All IT icons to automatically flag all objects in the search results, or to remove a flag from all objects in the search results.

What PUE Flags Does Power IQ Set Automatically?

Power IQ does not automatically flag for Total power.

Power IQ automatically sets some PUE flags for IT power.

When you upgrade to 4.1 or later:	
Object	Flagged as IT Power
Rack PDU or inline meter with outlets	outlets
Rack PDU and inline meter without outlets	inlets

When you add a new object :	
Object	Flagged as IT Power
Rack PDU or inline meter with outlets	outlets
Rack PDU or inline meter without outlets	inlets
Floor PDU, Power Panel, Standalone Meter, UPS, CRAC <ul style="list-style-type: none"> Note: These facilities objects are added as PDUs, and supported using Dynamic Plugins. See Dynamic Plugins (on page 272). 	none

List PUE Calculations and Adjustments

The PUE tab displays the monthly rollup PUE calculations for each data center. Monthly data comes from a rollup conducted on the first of each month, using the previous month's data. You can adjust the monthly values for Total Power and IT Power for the month.

Adjustments can be positive or negative Kilowatt hours.

Daily values are not displayed, and they cannot be adjusted.

Adjustments made will affect all PUE charts in the dashboard that use monthly data.

► To list PUE calculations and adjustments:

- In the PUE tab, choose Activities > List PUE Calculations. The list includes a line for each month of data for each data center in your EDM.
- Enter the number of Kilowatt hours for adjustments to Total Power or IT Power in the fields provided. Use a "-" sign to make a negative adjustment to the number of hours.
 - Total kWh Adj: Adjustment to Total Power
 - IT kWh Adj: Adjustment to IT Power

PUE Calculations						
Month	Data Center	Total kWh	Total kWh Adj	IT kWh	IT kWh Adj	PUE
Jul 2013	Unassigned Data C...	720801	1500	720539	-1000	1

Chapter 16 Reports and Tags

The Reports tab allows users to create reports and administer tags.

- The reporting feature supports the following reports: Power\Energy, Temperature, and Rack Failover simulation.
- Through the Activities menu, users can create and administer Tag Groups and the available Tags for those groups.

You choose the rows and columns you want to include, and how rows are grouped and filtered.

Filters can employ the tags assigned to EDM nodes to determine which PDUs and IT device readings are included in the reports.

See **Create a Report** (on page 241).

Reports are only available to the user who creates them. The data included is limited to the user's permissions to view objects in the EDM. If you do not have permission to view Data Center 1, for example, no data about Data Center 1, or any room , rack and so on contained by it, will be included in your reports.

Reports you create can be emailed to anyone you like. Set up a schedule for the report to be run and emailed, or send an exported report by email. See **Schedule a Report** (on page 250) and **Export a Report to PDF or CSV** (on page 251).

Once a report has been run, the output is saved in the Report History. Report runs are kept in the report history until a report is deleted. See View Report History.

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Create a Report

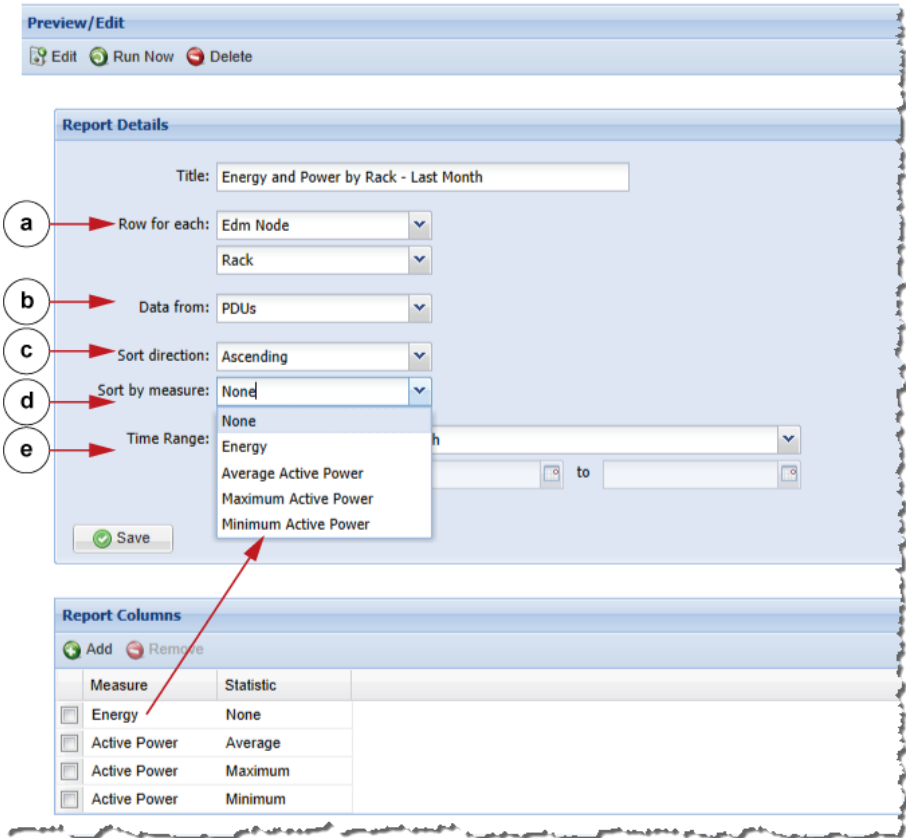
Create a report to set the parameters of the data you want included. You can choose the rows and columns to include, and specify sorting and filtering.

Power IQ supports three types of reports:

- **Power/Energy** (see "Create a Power/Energy Report" on page 241)
- **Temperature** (see "Create a Temperature Report" on page 243)
- **Rack Failover** (see "Create a Rack Failover Report" on page 245)

Create a Power/Energy Report

1. In the Reports tab, click New Report, and select Power/Energy Report.
2. Enter a name for the report in the dialog and click OK. You can change it later if needed.
3. The Preview/Edit page appears. In the Report Details section, select the data you want in the report rows.



a. Row for each:

- Time: each row is a time period. Select Day, Week, Month, or Year
 - Tag: each row is a tag from the selected tag group. Select a Tag Group. See **Add Tag Groups and Tags** (on page 258).
 - EDM Node: each row is a node in your data center, as configured in your EDM. Select Data Center, Floor, Room, Aisle, Row, Rack, PDU, or Device.
- b. Data from:
- PDUs: readings are taken from the PDU inlets.
 - Devices: readings are taken from the PDU outlets or circuits mapped to the IT device.
 - Racks: readings are taken from the rack power data.
- c. Sort direction:
- Ascending or Descending. Rows will be sorted by the Time, Tag, or EDM Node, unless you choose a measurement in Sort by measure. The Sort by measure field becomes active after you add a measurement.
- d. Sort by measure: Select the measurement as defined for the report columns. Select None to sort by the Time, Tag, or EDM Node.
- None, Energy, Average Active Power, Minimum Active Power, or Maximum Active Power, depending on the column settings.
- e. Time range:
- Period: Select a time period to limit the data included in the report. Select Yesterday, Past Week, Last Week, Month to Date, Past Month, Last Month, Year to Date, Past Year, Last Year.
 - Custom: Select a custom date range. Use the calendar tool to select a beginning and ending date.
4. Click Save.
5. In the Report Columns section, select the readings you want to include in the report columns. Click Add, then select Energy or Active Power in the Measure field and specify one statistic type, if available, in the Statistic field. Repeat to add multiple measurements for a multi-column report.
- a. Energy: Readings are kilowatt hours. Data comes from daily rollups. No statistic options are available for this reading.
 - b. Active Power: Readings are active power in kilowatts. Data comes from daily rollups.

Three statistic types are available: Average, Maximum and Minimum.

6. In the Tag Filters section, select tags to filter what sources of data are included in the report. Only data from tagged sources is included. Click Add, then select Tag Group and Tag. Repeat to add more tag filters. If multiple tag filters are applied to a report, an object must have all the tags in order to be included in the report.
7. Click Run Now to run the report. See **Schedule a Report** (on page 250) for adding scheduled email delivery.

Create a Temperature Report

A temperature report shows inlet/outlet temperatures at a rack level. Therefore, the row of the report is always racks and cannot be configured.

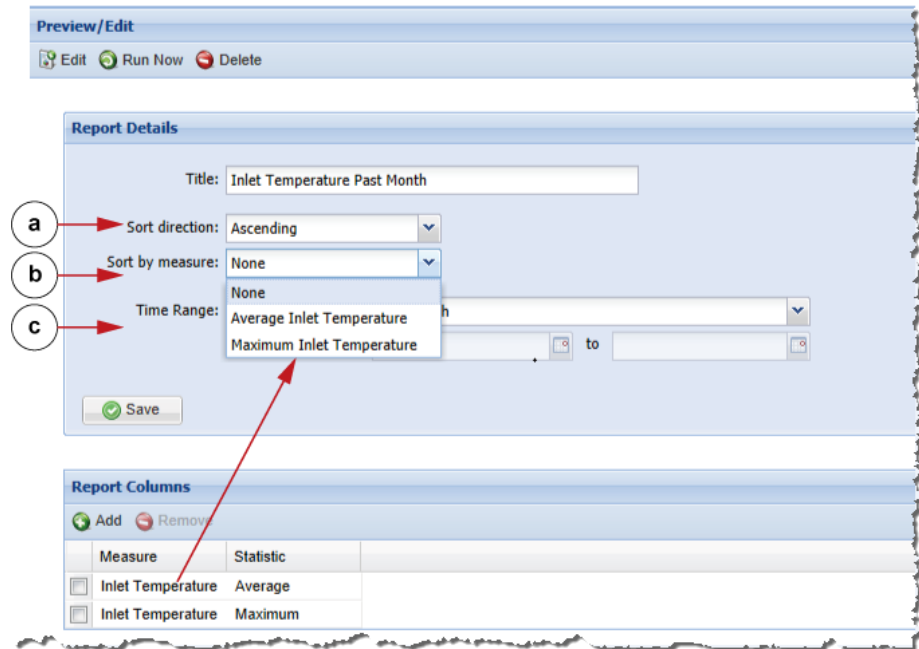
Temperature units are either degrees Celsius or Fahrenheit, based on system settings in Settings > Application Settings > Language and Local Settings.

Users without View permissions or a role that includes View permissions for certain racks cannot retrieve the temperature data from those racks when running the temperature report. See **Assigning Roles for User Permissions** (on page 83).

► To create a temperature report:

1. In the Reports tab, click New Report, and select Temperature Report.
2. Enter a name for the report in the dialog and click OK. You can change it later if needed.
3. The Preview/Edit page appears.

4. In the Report Details section, select how you want the data to be presented.



- a. Sort direction:
 - Ascending or Descending. The report is sorted by the rack names, unless you choose a measurement in Sort by measure. The Sort by measure field becomes active after you add a measurement.
 - b. Sort by measure: Select the measurement as defined for the report columns. Select None to sort by rack names.
 - None, Average Inlet Temperature, Minimum Inlet Temperature, Maximum Inlet Temperature, Average Outlet Temperature, Minimum Outlet Temperature, or Maximum Outlet Temperature, depending on the column settings.
 - c. Time range:
 - Period: Select a time period to limit the data included in the report. Select Yesterday, Past Week, Last Week, Month to Date, Past Month, Last Month, Year to Date, Past Year, Last Year.
 - Custom: Select a custom date range. Use the calendar tool to select a beginning and ending date.
5. Click Save.

6. In the Report Columns section, select the readings you want to include in the report columns. Click Add, then select a temperature type in the Measure field, and a statistic type in the Statistic field. Repeat to add multiple measurements for a multi-column report.
 - a. Measure: Inlet Temperature or Outlet Temperature.
 - b. Statistic: Average, Maximum or Minimum.
7. In the Tag Filters section, select tags to filter what sources of data are included in the report. Only data from tagged sources is included. Click Add, then select Tag Group and Tag. Repeat to add more tag filters. If multiple tag filters are applied to a report, an object must have all the tags in order to be included in the report.
 - Selected tags filter out not only racks but also temperature sensors, based on whether their parent nodes match the selected tags.
8. Click Run Now to run the report. See **Schedule a Report** (on page 250) for adding scheduled email delivery.

Create a Rack Failover Report

A rack failover report shows which racks may completely lose power when one of the two redundant power sources fails or is turned off for maintenance. The report simulates a failover situation, and indicates a prediction for your rack's highest utilization percentage.

The report does not provide notification when a rack loses power, but is rather used to help you preemptively identify racks that are vulnerable in a failover simulation.

Racks that do not meet the rack requirements are excluded from the report automatically, even if they exist in the EDM node selected in the report. See **Rack Requirements** (on page 246). For additional assumptions, see **Report Disclaimer** (on page 249).

► To create a rack failover report:

1. In the Reports tab, click New Report, and select Rack Failover Report.
2. Enter a name for the report in the dialog and click OK. You can change it later if needed.
3. The Preview/Edit page appears.
4. In the Report Details section, select the data you want to include.
5. In Location, click the browse button to select the EDM node containing the racks you want to analyze. You can select EDM nodes from Data Center to Row. Unsupported racks are automatically excluded from the report. See **Rack Requirements** (on page 246).

6. In Time Range, select a period of time, or set a custom range of dates. See **Data Sources for Each Time Range** (on page 247).
7. Select a sorting option in the Sort By and Sort Direction fields. Rack Utilization sorts racks by percentage of utilization. Rack Name shows racks in alphabetical order by name.
8. Click Save.
9. Click Run Now to run the report. See **Schedule a Report** (on page 250) for adding scheduled email delivery.

Rack Requirements

To be included in the rack failover report, a rack must meet all requirements.

- Racks must contain 2 rack PDUs only.
- Rack PDUs must be identical:
 - same number of inlets and circuit breakers
 - same capacity ratings and number of poles on all these elements
- Racks must not contain multi-inlet PDUs
- Racks must not contain Rack Transfer Switch PDUs

Assumptions About Supported Racks

Supported racks are assumed to follow these guidelines.

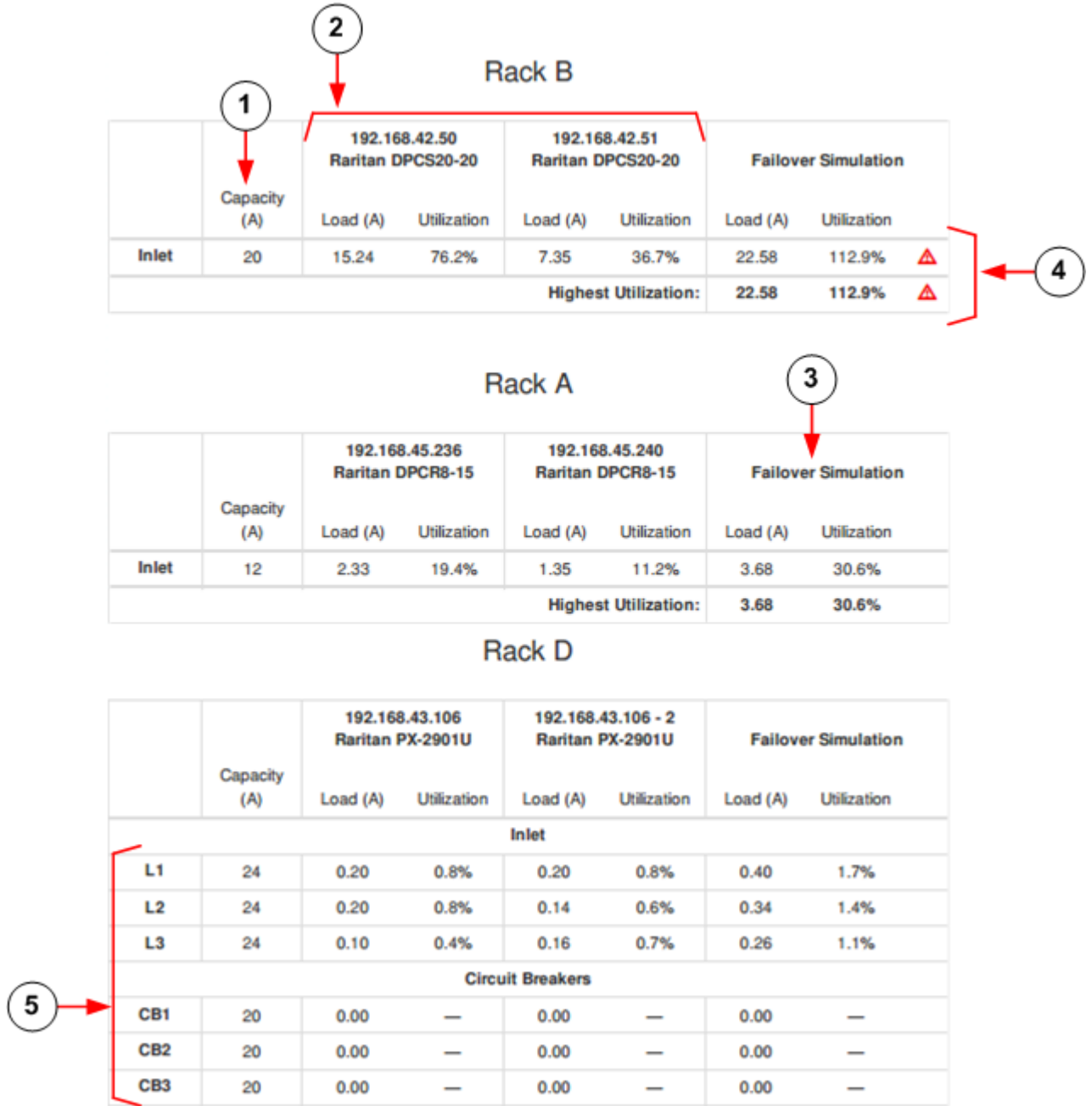
- The load of the servers is split between the two rack PDUs
- IT Devices in the rack have an even number of cords, and half of the cords are connected to one PDU and the other half to the other PDU
- For 3-phase rack PDUs, IT Devices are connected to the same phase legs on both rack PDUs

Data Sources for Each Time Range

A different data source is used for each time interval selection in the Rack Failover report. See **Create a Rack Failover Report** (on page 245).

Time Interval	Data Source
Last Complete Poll	<ul style="list-style-type: none"> ▪ Raw readings from the last completed poll cycle: inlet pole current and circuit breaker pole current
Yesterday Custom range that is 1 or 2 days long	<ul style="list-style-type: none"> ▪ Hourly rollups: Inlet pole average current and circuit breaker pole average current ▪ For each PDU, the average of all the hourly readings for the time period is displayed in the report.
Last Week Past Week Last Month Past Month Custom range that is greater than 2 days and less than or equal to 62 days	<ul style="list-style-type: none"> ▪ Daily rollups: Inlet pole average current and circuit breaker pole average current ▪ For each PDU, the report shows the average of all the daily readings for the time period.
Last Year Past Year Custom range greater than 62 days	<ul style="list-style-type: none"> ▪ Monthly rollups: Inlet pole average current and circuit breaker pole average current ▪ For each PDU, the report shows the average of all the daily readings for the time period.

Rack Failover Report Examples



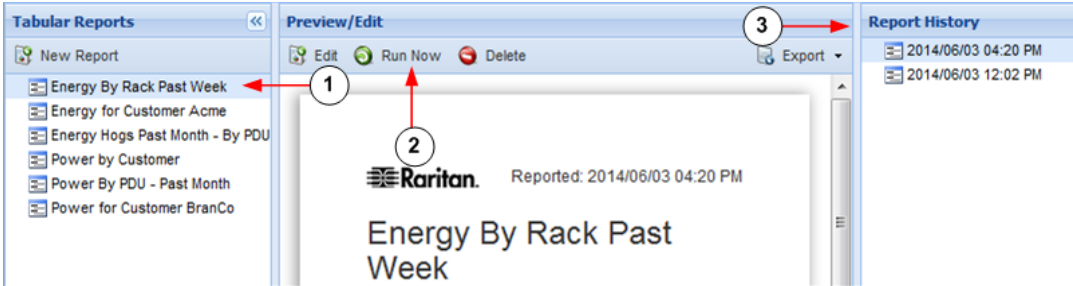
① The Rack PDU Capacity is retrieved from the rack PDU.
 Note: If your PDU does not report this value, Capacity and Utilizations will be blank.

2	The rack PDUs within a supported rack are grouped, and show their amps capacity and current side by side.
3	In the Failover Simulation column, the report shows the sum of the two load values, and compares it to the capacity of either one.
4	When capacity is exceeded, the value is highlighted in red. When the load is within 80% of the capacity, the value is highlighted in yellow.
5	When a rack PDU has three-phase inlets, the report shows a row for each line, and a row for each circuit breaker when available.

Report Disclaimer

This report is designed only for Racks with two identical single inlet Rack PDUs and devices powered by the same outlet numbers on both Rack PDUs. For 3-phase Rack PDUs, a device is assumed to be connected to the same phase legs on both PDUs. This report may not be accurate for racks with Rack PDUs that lost connectivity, lost power or were decommissioned during the time period selected for the report. Reports that specify a time range use average amp readings while reports with Last Complete Poll use a recent reading. The report does not report peak loads such that while the report may indicate that on average your rack would pass a failover situation, it cannot indicate that it will always pass. In general, this report relies on data collected in the past under a set of conditions. If these conditions change, this report will no longer be accurate. This report should not be used as the sole basis for the design of an effective failover plan.

Run a Report



► **To run a report:**

1. In the Reports tab, select the report in the Tabular Reports list. The last-run version of the report displays.

2. Click Run Now. A status message displays while the report generates.
3. The new report appears in the Preview/Edit section.
4. Verify the report version by looking to the Report History column listing all versions of the report. Click other report versions to view.

Schedule a Report

You can schedule a report to run at a selected interval. Scheduled reports are run after 1:30am on the day scheduled. The report is emailed to the recipient list shortly after the report run completes.

Scheduled report runs also appear in the Report History section in the Reports tab.

► **To schedule a report:**

1. In the Reports tab, select the report you want to schedule.
2. Click Edit.
3. In the Schedules section at the bottom of the report parameters, click Add. A report may have more than one schedule.
4. In the Report Schedule dialog, set the schedule parameters:
 - a. Email to: Enter the email addresses for all recipients of the report.
 - b. Frequency: Select Daily, Weekly, or Monthly. For Weekly or Monthly, specify the day or date.
 - c. Attachment: Select the file type for the report, CSV or PDF.
5. Click Save.

Export a Report to PDF or CSV

You can export most report data to either a PDF or CSV file.

Failover reports can only export to PDF.

► **To export a report to PDF or CSV.**



1. In the Reports tab, select the report you want to export.
2. Choose Export > PDF or CSV.
3. Save or open the file. Choices depend on your browser.

Note: If opening a temperature report in CSV with Microsoft applications, such as Excel, a redundant character appears prior to the degree symbol. This character is resulted from the default Microsoft encoding and can be ignored.

Report Examples

- **Monthly Energy Report for One Internal Customer with Scheduled PDF Delivery** (on page 252)
- **Data Center Power Report for Past Week** (on page 254)
- **Load for All B-Side PDUs for Last Month** (on page 256)

Monthly Energy Report for One Internal Customer with Scheduled PDF Delivery

This report shows how to create a monthly energy usage report for a customer, and schedule it for email delivery each month.

Reported: 2014/06/10 05:20 PM

Customer IT
Date Range 2014/05/01 – 2014/05/31

Device	kWh
EPIQ4	124.113
EPIQ3	97.929
EPIQ2	81.217
EPIQ1	49.231

► **Required Tagging:**

- Add a Tag Group for Customer, with tags for each customer's name. See **Add Tag Groups and Tags** (on page 258).
- Assign the customer name tag to each IT device in your EDM. See **Assign Tags in the Data Centers Tab** (on page 262).

Report Details

Title:

Row for each: Sort direction:
 Sort by measure:

Data from:

Time Range: Period
 Custom to

Report Columns

Measure	
<input type="checkbox"/>	Energy

Tag Filters

Tag Group	Tag	
<input type="checkbox"/>	Customer	IT

Schedules

Frequency	Day	Attachment	Email to
<input type="checkbox"/>	Monthly	5th	pdf IT@sample.com

Data Center Power Report for Past Week

This report shows how to quickly find the past week power for your data centers.

The screenshot shows a web interface for a Raritan report. At the top, there is a 'Preview/Edit' header with buttons for 'Edit', 'Run Now', 'Delete', and 'Export'. The report content includes the Raritan logo, the title 'Power by Datacenter Past Week', and the date range '2014/06/03 - 2014/06/09'. A table below shows the power consumption for 'Raleigh DC' as 166.719 kW.

Data Center	kW
Raleigh DC	166.719

► **Required Tagging:**

- None.

Report Details

Title:

Row for each: Sort direction:
Sort by measure:

Data from:

Time Range: Period Custom to

Report Columns

Measure	Statistic	
<input type="checkbox"/> Active Power	None	

Tag Filters

Tag Group	Tag	
-----------	-----	--

Schedules

Frequency	Day	Attachment	Email to
-----------	-----	------------	----------

Load for All B-Side PDUs for Last Month

This report shows how you could find the kW load on all B-side PDUs for the last month.

Preview/Edit

Edit Run Now Delete Export

Raritan. Reported: 2014/06/10 04:13 PM

Load for B-Side PDUs - Last Month

PDU Type B Side
Date Range 2014/05/01 – 2014/05/31

PDU	kW
PX-3370-SysTest	125.984
px130lab0501	48.703
px130lab0502	38.961

- ▶ **Tagging Required:**
 - Add a Tag Group: PDU Type, with tags for A-Side and B-Side. See **Add Tag Groups and Tags** (on page 258).
 - Assign the B-Side tag to each PDU. See **Assign Tags in the Data Centers Tab** (on page 262).

Report Details

Title:

Row for each: Sort direction: Sort by measure:

Data from:

Time Range: Period Custom to

Report Columns

Measure	
<input type="checkbox"/> Active Power	

Tag Filters

Tag Group	Tag	
<input type="checkbox"/> PDU Type	B Side	

Schedules

Frequency	Day	Attachment	Email to
-----------	-----	------------	----------

Add Tag Groups and Tags

Adding tag groups and tags is the first step toward using filtering by tag in reports.

Tag groups and tags help you categorize objects in your data center. When you filter by tag in a report, the report automatically includes readings from only the tagged objects. If multiple tag filters are applied to a report, an object must have all the tags in order to be included in the report.

Some examples of tag groups are Customer, Department, PDU Type, or Device Type. See **Tag Example: Report on Racks by Customer Tag** (on page 259).

Tags must be added before you can assign them to EDM nodes. See **Assign Tags in the Data Centers Tab** (on page 262).

► To add tag groups and tags:

Tag Groups	
Name ▲	Tags
Customer	5
Mission	1
Service	5
UPS Name	2

Tags	
Name ▲	Tagged Items
Tag Group: Customer	
Commercial Bank	1
Investment Bank	1
Online Banking	4
Retail Bank	2
loan dept	0
Tag Group: Mission	
HR	1
Tag Group: Service	
E-Mail	1
On Line Reg	0
Payroll	0

1. In the Reports tab, choose Activities > Tags and Tag Groups.
2. In the Tag Groups section, click Add, then add the names of a group of tags you want to add. Click Add.
For example, if you plan to tag by customer name, add a Tag Group called Customer.
3. In the Tags section, click Add, then select the Tag Group you want to add tags to, and enter the tag name in the Name field. Click Add.
For example, if you have a Tag Group called Customer, enter your customer names as the Tags in that group.
4. Next step: Assign the tags to EDM nodes. See **Assign Tags in the Data Centers Tab** (on page 262).

Tag Example: Report on Racks by Customer Tag

In a colocation facility, you may want to track racks by customer.

- Add a tag group called Customer.
 - Add tags for each customer name.
 - Assign the correct customer name tag to the racks in the EDM that the customer owns.
 - In tabular reports, there are two ways to use tags.
1. Create a report with the Row for Each as Tag, then select Tag Group: Customer, and Tag: "Customer Name". When the report runs, you see one row of data for each customer.

OR

2. Create a report with the Row for Each as Time or EDM Node. Add a Tag Filter, for example, using Tag Group: Customer, then selecting Tag: Customer Name of your choice. When the report runs, you see one row of data for each time or node, but the data is filtered to include only nodes tagged with the specified customer name.

Migrating Existing Data to Tags

You can migrate some existing data in your EDM to tags.

- Data Centers, PDUs and IT Devices: Custom Field 1 and Custom Field 2
- IT Devices: Customer and Device Type

You can find these fields on the Data Center, IT Device, and PDU objects in the Data Centers tab.

Migration creates tag groups from the field names, and creates tags from the data in the fields. Migration also applies the newly created tags to the EDM nodes where they were originally entered.

Note: Migration does not remove the data from the original fields. The original fields are not linked to the new tags in any way, so if you choose to maintain both data locations, you must do so manually. The best practice is to maintain this data as tag groups and tags, going forward.

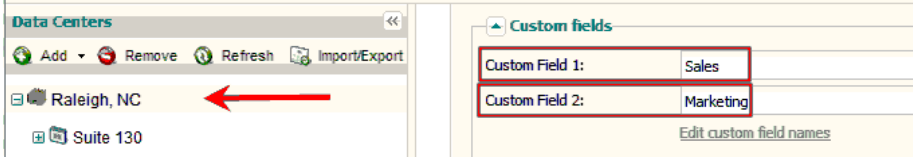
See **Migrate Custom Field Data** (on page 261) for instructions to do the migration.

► IT Devices, Data Centers, and PDUs:

Each IT Device, Data Center and PDU contains two custom fields, Custom Field 1 and Custom Field 2. You may have edited the names.

Upon migration, the name of the custom field becomes the tag group name, with the EDM node in parentheses, to identify where the data came from.

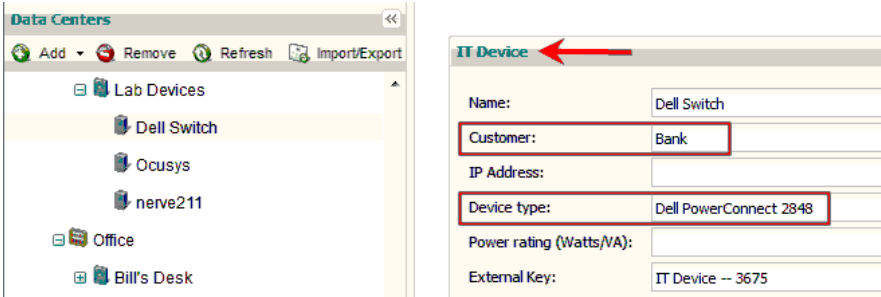
EDM Node	Field Name: Contents	Migration Creates ->	Tag Group: Tag
Data Center	Custom Field 1: Sales Custom Field 2: Marketing		Custom Field 1 (Data Center): Sales Custom Field 2 (Data Center): Marketing
IT Device	Custom Field 1: Colo1 Custom Field 2: Colo2		Custom Field 1 (IT Device): Colo1 Custom Field 2 (IT Device): Colo2
PDU	Custom Field 1: Facilities Custom Field 2: IT		Custom Field 1 (PDU): Facilities Custom Field 2 (PDU): IT



► IT Devices:

In addition to Custom Fields 1 and 2, IT devices also contain fields for Customer and Device Type that you can migrate to tags.

Field Name: Contents	Migration Creates ->	Tag Group: Tag
Customer: Bank		Device Customer: Bank
Device type: Dell PowerConnect 2848		Device Type: Dell PowerConnect 2848



Migrate Custom Field Data

The Migrate Custom Field Data tool creates new tags and tag groups based on existing custom and standard field data for PDUs, devices, and data centers.

See *Migrating Existing Data to Tags* (on page 260) for details.

If you use the migration tool more than once, duplicate tags and tag groups will not be created. If new data is found, new tags will be added to the existing tag groups.

► To migrate custom field data:

1. In the Reports tab, choose Activities > Tags and Tag Groups.
2. Click Migrate.
3. To confirm, click Migrate Custom Field Data in the message that appears.
4. When complete, tag groups and tags appear in the Reports tab. The tags have also been applied to the EDM nodes where they originated.

To view the tags applied, go to the EDM node in the Data Centers tab, then scroll down to the Tags section. For racks and PDUs, there is no Tags section. Choose Actions> Edit Tags to view tags.



Tag Group	Tag
Custom Field 1 (Data Center)	Sales
Custom Field 2 (Data Center)	Marketing

Assign Tags in the Data Centers Tab

You can assign tags to EDM nodes in the Data Centers tab. To assign tags to multiple EDM nodes at once, use the CSV import tool. See **Assigning Tags with CSV Import** (on page 264).

Tags can be assigned to these EDM nodes:

- Data Center
- Floor
- Room
- Row
- Aisle
- Rack
- PDU: rack PDUs only, no facilities objects
- IT Device

► **To assign tags in the Data Centers tab:**

1. In the Data Centers tab, go to the EDM node you want to tag. Scroll down to the Tags section.
2. Click Add, then select the Tag Group and Tag. Click Add. The assigned tags display in the list.

► **To assign tags to a rack or PDU in the Data Centers tab:**

1. In the Data Centers tab, go to the rack or PDU you want to tag.
2. Choose Actions > Edit Tags.
3. Click Add, then select the Tag Group and Tag. Click Add. The assigned tags display in the list.

► **To remove tags:**

Note: This is the only way to remove a tag. You cannot remove a tag using CSV import.

1. In the Data Centers tab, go to the EDM node you want to remove a tag from.
2. Select the tag and click Remove.

Export and Import Tags

Tag import is used to assign tags to EDM nodes. You cannot create tag groups and tags using import. See **Assigning Tags with CSV Import** (on page 264).

To export your existing tag assignments, use the export tool. See **Export Assigned Tags** (see "**Export Existing Tag Assignments**" on page 263)

For help with import errors, see **Import Errors for Tags** (on page 265).

Export Existing Tag Assignments

The tag export file includes all tagged EDM nodes.

You can use the export file as a template to add more tags to EDM nodes. Duplicate tags are not added. Each import adds new tags, and does not change any existing assigned tags. See **Assigning Tags with CSV Import** (on page 264).

► **To export existing tag assignments:**

1. In the Reports tab, choose Activities > Export/Import Tag Entries.
2. Click Export. Save or open the file. Choices depend on your browser.

Assigning Tags with CSV Import

To assign tags to multiple EDM nodes at once, use the CSV import tool. The import uses the tag groups and tags you have already created. Import cannot create new tag groups or tags. To create new, see **Add Tag Groups and Tags** (on page 258).

Duplicate tags are not added. Each import adds new tags, and does not change any existing assigned tags.

The file is validated before import. If any errors are found, the whole file is rejected, and no changes are made. You can view error messages for each line of the file upon rejection. See **Import Errors for Tags** (on page 265)

Tip: To export a CSV file to use as a template, assign one tag manually, then export.

See **Assign Tags in the Data Centers Tab** (on page 262) and **Export Assigned Tags** (see "Export Existing Tag Assignments" on page 263).

► To assign tags with CSV import:

1. Create the CSV file. The CSV file must have 5 columns:

type	external_key	name	tag_group	tag
------	--------------	------	-----------	-----

- type: The EDM node you're assigning the tag to. Not case sensitive. The following entries can be used.
 - DATA_CENTER
 - FLOOR
 - ROOM
 - ROW
 - AISLE
 - RACK
 - PDU
 - DEVICE
- external_key: The EDM node's external key.
- name: Include an EDM node name here for convenience when creating your import file. The import does not use or change the name.
- tag_group: The name of an existing tag group. The import cannot create a new tag group.

- tag: The name of an existing tag in the tag group. The import cannot create a new tag.

	A	B	C	D	E
1	type	external_key	name	tag_group	tag
2	DATA_CENTER	Data Center -- 3	Raleigh, NC	Department	Sales
3	PDU	192.168.46.216	192.168.46.216	PDU Make	#Raritan PX2
4	PDU	192.168.43.164	192.168.43.164	Department	Facilities
5	DEVICE	IT Device -- 2286	KX3 (192.168.45.113)	Status	INSTALLED
6	DEVICE	IT Device -- 2452	lcd panel	Device Type	LCD Panel
7	DEVICE	IT Device -- 2296	ts-10-128	Device Type	V1 Hardware

2. Save the file as .CSV.
3. In the Reports tab, choose Activities > Export/Import Tag Entries.
4. Click Browse then select the .CSV file and click OK. Click Import. The file is validated.

Success: All tags are assigned as described in the file.

Error: If the file does not validate, click View Errors. The Import Errors display in the page. See **Import Errors for Tags** (on page 265).

Import Errors for Tags

Each error includes the line number from the CSV file, the error message, and the details.

IMPORT ERRORS

Line 2 has Error(s): Tag HR does not exist for the specified Tag group in [DATA_CENTER, Data Center -- 3, Custom Field 1 (Data Center), HR]
 Line 3 has Error(s): Tag entry already exists in [DATA_CENTER, Data Center -- 4, Custom Field 1 (Data Center), Sales]
 Line 4 has Error(s): Tag entry already exists in [DATA_CENTER, Unassigned Data Center, Custom Field 1 (Data Center), Sales]
 Line 5 has Error(s): Tag Tech Support does not exist for the specified Tag group in [DATA_CENTER, Data Center -- 3, Custom Field 2 (Data Center), Tech Support]
 Line 6 has Error(s): Tag entry already exists in [DATA_CENTER, Data Center -- 4, Custom Field 2 (Data Center), Marketing]
 Line 7 has Error(s): Tag entry already exists in [DATA_CENTER, Unassigned Data Center, Custom Field 2 (Data Center), Marketing]
 Line 8 has Error(s): Tag entry already exists in [PDU, 192.168.46.216, Custom Field (PDU), #Raritan px1]
 Line 9 has Error(s): Tag entry already exists in [PDU, 192.168.45.252, Custom Field (PDU), #Raritan px1]

▶ Common errors and resolutions:

Error	Resolution
Tag group does not exist	You must add tag groups and tags before you can assign them using the import. See Add Tag Groups and Tags (on page 258).
Tag does not exist	
Tag entry already exists	The tag is already assigned to the EDM node specified in the CSV file.

External key does not exist as an external key	The external key is incorrect for the EDM node. Verify the external key in the EDM node in the Data Centers tab.
Tag can't be blank	You must enter a tag for each line in the CSV file.

▶ **Example error:**

Line number	Error	EDM Node Type	EDM Node External Key	Tag Group	Tag
Line 160 has Error(s):	Tag entry already exists in	[DEVICE,	IT Device -- 3657,	Device Type,	Ethernet Switch]

User Permissions for Reports and Tags

You must have the Site Administrator role to create tag groups and tags. This is the "admin" user role.

You must have Site Administrator, Administrator, or Operator role permissions to a node to assign a tag to it.

The reports you create will be limited based on your permissions to view the EDM.

Chapter 17 Maintenance Tasks

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Downloading Daily Sensor Readings

Storage of daily raw readings in CSV files can be enabled or disabled. When enabled, depending on your configuration, Power IQ can store up to 8 days of CSV files. See **Configure Raw Sensor Readings Storage** (on page 10).

The daily sensor readings CSV file includes the state of the circuit breakers for applicable Raritan PX PDUs. The circuit breaker state is recorded to this file only once every polling interval, even if you enable buffered data retrieval under Polling Options.

Sensor readings include internal sensors and temperature, humidity, airflow, air pressure, and contact closure sensors.

See **Configuring Remote Storage of Archive Files** (on page 131) for details on automatic remote storage of sensor reading archives.

► To download daily sensor readings:

1. In the PDUs tab, choose Activities > Download PDU Sensor Readings. The Sensor Readings Archives page opens.
 - The option is hidden when storage for sensor readings files is disabled. See **Configure Raw Sensor Readings Storage** (on page 10).
2. Click a filename link to download an archive of the sensor readings taken on that day. Filenames include the date and time when the file was created. There may be more than one file per day, because Power IQ creates the file when a reasonable maximum file size is reached, before the file is too large to be usable in Excel. Or, click Download Latest Readings to download the current sensor readings CSV file.

Tip: Use the time stamp of the file to find the beginning of a time period you are looking for, and the time stamp on the next file for the end of this period. Note that with data logging or network outages, readings taken outside the time stamp range may be in the file.

Note: To delete an archived file, select the checkbox next to the filename, then click Remove.

► **To download daily sensor readings via script:**

You can set up an external program to download the latest sensor readings file each day.

Example using `wget`:

```
wget-1.10.2.exe -t 3 --http-user=[username]
--http-passwd=[password] --no-check-certificate
https://[hostname]/sensor_readings_csvs/latest
```

Example using `curl`:

```
curl --user [username]:[password]
https://[hostname]/sensor_readings_csv/latest >
latest-csv-archive.zip
```

Upgrading Power IQ Firmware

When new firmware is released, you can upgrade Power IQ to receive the latest in features and functionality.

See the Release Notes for any special instructions on upgrading.

► **To upgrade Power IQ firmware:**

1. In the Settings tab, click Software Upgrades in the Appliance Administration section. The Upgrade page opens.
2. Click Browse, select the firmware file (usually a *.bin file).
3. Click Upload. The new firmware uploads to the application.

Shutting Down and Restarting Power IQ

You can shut down and power off or restart Power IQ.

► **To shut down and power off Power IQ:**

- In the Settings tab, click System Shutdown in the Appliance Services section.

The Power IQ shuts down and powers off.

▶ **To restart Power IQ:**

- In the Settings tab, click System Restart in the Appliance Services section.

The Power IQ restarts.

Accessing Audit Logs

Power IQ Web Client audit logs can be viewed in a browser, or exported to a file for viewing or storage.

Warning: Audit logs are automatically deleted from the system after 3 calendar months. If you need to maintain a complete audit trail, export logs regularly and store the files outside Power IQ.

▶ **To access audit logs:**

1. In the Settings tab, click Audit Log in the Application Administration section.
2. The Audit Log Entries page opens.

▶ **To export audit logs to a text file:**

1. In the Settings tab, click Audit Log in the Application Administration section.
2. Click the Download Audit Logs link. All audit log entries are exported to a text file.
3. Save the file.

Chapter 18 Appliance Administration

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Allow HTML Widgets on Dashboard

The Dashboards tab can include your custom HTML portlets as a widget. HTML portlets may have security implications. You must allow them before you can add an HTML widget to the Dashboards tab.

► **To allow HTML widgets on dashboard:**

1. In the Settings tab, click Application Settings in the Appliance Settings section.
2. In the Display Settings section, select the "Allow user-created HTML portlets on the dashboard" checkbox.
3. Click Save.

Display a Logo on Every Page

Upload your company logo to display it on every page in Power IQ. This is useful for branding a dashboard presentation.

Logos must not exceed 150 pixels wide, 48 pixels high, or 512KB in size.

For details on adding a logo to the dashboard, see **Image Widget** (on page 100).

► **To display a logo on every page:**

1. In the Settings tab, click Application Settings in the Appliance Administration sections.
2. In the Display Settings box, select the "Show a custom uploaded logo" checkbox.
3. Click Browse to select the logo file, then click Open.
 - If the file does not meet the logo criteria, error messages display. Edit the image as needed, then upload again.

4. Click Save Display Settings. The logo appears in the top right corner of every page in Power IQ.

Configuring the System Clock

Power IQ uses the system clock to time-stamp events and data records. Set the system clock as soon as possible to keep an accurate record of events.

Using an NTP server is recommended to keep the system clock synchronized between Power IQ and the PDUs it manages.

Important! You must use the same NTP server for Power IQ and all Raritan PX PDUs managed to get accurate readings from PX.

Configuring NTP Server Settings

The Configure Time Servers table lists the NTP servers Power IQ contacts to get date and time information. NTP must be enabled first.

▶ **To enable NTP and configure NTP servers:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.
2. In the Time Settings box, click the arrow to expand the NTP Settings
3. Select the Enable NTP checkbox.
4. Click Add.
5. Type the time server's IP address in the Time Server field then click OK.
6. Click Save Time Settings.

▶ **To edit NTP server settings:**

1. Select the server in the table and click Edit.
2. Type the time server's IP address in the Time Server field
3. Click Save Changes.

▶ **To remove an NTP server:**

1. Select the server in the table.
2. Click Remove.
3. Click Yes in the confirmation message.

Configuring the System Clock Manually

► **To configure the system clock manually:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.
2. In the Time Settings section, select the Time Zone Power IQ server resides in from the Time Zone drop-down list.
3. Select the date and time using the tools in the "Set time manually" fields. Select the date from the pop-up calendar. Select the 24-hour time from the drop-down list.
4. Click Save Time Settings.

Dynamic Plugins

The dynamic plugins feature enables you to add data collection support for external PDUs and facilities objects that Power IQ does not support by default.

For a full list of supported devices, go to <http://www.raritan.com/support/product/poweriq/power-iq-rack-monitored-devices-support>

<http://www.raritan.com/resources/power-iq-rack-pdu-support/>

Dynamic plugins work by mapping SNMP OIDs to Power IQ's database, so that Power IQ can find and retrieve data from the device.

There are two types of dynamic plugins, structured and custom. See ***Types of Dynamic Plugins: Structured and Custom*** (on page 274)

The following device types are supported in each type of dynamic plugin:

- CRAC
- Floor PDU
- Floor UPS
- Power Panel
- Rack PDU
- Standalone Meter

Limitations of Dynamic Plugins

Buffered data retrieval is not supported for PDUs added with dynamic plugins.

Plugins Created Before Power IQ Release 4.1

All dynamic plugins created before Power IQ release 4.1 were structured dynamic plugins. Upon upgrade, the dynamic plugin type for these existing plugins will be set to "Rack PDU". You cannot change the type, but the rest of the dynamic plugin can be edited.

Types of Dynamic Plugins: Structured and Custom

There are two types of dynamic plugins: structured and custom.

The structure of the PDU's SNMP MIB typically determines whether a structured or a custom dynamic plugin is most appropriate.

Generally, if the MIB you are working with supports it, you should choose the structured dynamic plugin option.

► Structured dynamic plugin:

A structured dynamic plugin is derived from hierarchically structured MIBs. Typically the values are organized in tables in the MIB. For example, a hierarchical MIB for a rack PDU typically has separate tables for elements such as inlets, circuit breakers, and outlets.

In a structured dynamic plugin, you define mappings that represent a series of OID values to be collected. You do not have to provide a mapping for every single SNMP OID that you want Power IQ to collect. If the MIB supports values that can be retrieved that indicate the number of inlets, outlets, circuits, and so on, it is possible to create a structured dynamic plugin that is capable of managing a variety of PDU models. This is not possible with a custom dynamic plugin.

► Custom dynamic plugin:

A custom dynamic plugin requires a mapping for every desired reading. For example, you would map values for outlet 1 voltage, outlet 1 current, outlet 2 voltage, outlet 2 current. You must manually specify each object id you want Power IQ to collect, and then map each object id into the Power IQ PDU/electrical device data model.

Custom dynamic plugins are useful when:

- You want to monitor a PDU that does not use SNMP for remote communication. These PDUs may use Modbus or Bacnet protocols for remote communication. You can monitor these PDUs with an SNMP gateway. The SNMP gateway gives the ability to convert Modbus, or other protocols, to SNMP. The custom dynamic plugin can use a combination of the SNMP OIDs and hard-coded values mapped to the data model of the PDU type to support your specific PDU. See **SNMP Gateways and Custom Mappings** (see "**SNMP Gateways and Custom Dynamic Plugins**" on page 335)
- The device's MIB does not contain data in tables, also known as a "flat" or "unstructured" MIB.

Mappings for Each PDU Type

CRAC Mappings

A CRAC may contain inlets and inlet poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ **Mappings:**

- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy

Floor PDU Mappings

A Floor PDU may contain inlets, inlet poles, power panels, panel inlets, panel inlet poles, circuits and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

► Floor PDU Mappings:

- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy
- Panel Index
- Panel Name
- Panel Inlet Index
- Panel Inlet Apparent Power
- Panel Inlet Active Power
- Panel Inlet Power Factor
- Panel Inlet Energy
- Panel Inlet Voltage
- Panel Inlet Current
- Circuit Index
- Circuit Apparent Power
- Circuit Active Power
- Circuit Power Factor
- Circuit Voltage
- Circuit Current
- Circuit Energy
- Circuit Pole Index

- Circuit Pole Name
- Circuit Pole Phase
- Circuit Pole Position
- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.
- Circuit Pole Voltage
- Circuit Pole Current

Floor UPS Mappings

A Floor UPS (Uninterruptible Power Supply) may contain inlets, inlet poles, circuits, and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

► Floor UPS Mappings:

- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy
- Circuit Index
- Circuit Apparent Power
- Circuit Active Power
- Circuit Power Factor
- Circuit Voltage
- Circuit Current
- Circuit Energy
- Circuit Pole Index
- Circuit Pole Name
- Circuit Pole Phase
- Circuit Pole Position
- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.
- Circuit Pole Voltage
- Circuit Pole Current

Power Panel Mappings

A Power Panel may contain inlets, inlet poles, circuits and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

► Power Panel Mappings:

- Inlet Index
- Inlet Apparent Power
- Inlet Active Power
- Inlet Power Factor
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Inlet Voltage
- Inlet Current
- Inlet Energy
- Circuit Index
- Circuit Apparent Power
- Circuit Active Power
- Circuit Power Factor
- Circuit Voltage
- Circuit Current
- Circuit Energy
- Circuit Pole Index
- Circuit Pole Name
- Circuit Pole Phase
- Circuit Pole Position
- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.
- Circuit Pole Voltage
- Circuit Pole Current

Rack PDU Mappings

A Rack PDU may contain inlets, inlet poles, circuit breakers, outlets, and outlet poles.

"Index" mappings are supported in structured dynamic plugins only.

▶ Rack PDU Mappings:

- PDU Name
- PDU Firmware
- Inlet Index
- Inlet Active Power
- Inlet Apparent Power
- Inlet Current
- Inlet Power Factor
- Inlet Voltage
- Inlet Energy
- Inlet Pole Index
- Inlet Pole Active Power - not displayed in Power IQ, but data is rolled up to provide Inlet Active Power. Use this mapping if your PDU does not provide Active Power data at the Inlet level.
- Inlet Pole Voltage
- Inlet Pole Current
- Circuit Breaker Index
- Circuit Breaker Current
- Circuit Breaker Name
- Circuit Breaker State
- Outlet Index
- Outlet Active Power
- Outlet Apparent Power
- Outlet Name
- Outlet Power Control
- Outlet Power Factor
- Outlet State
- Outlet Voltage
- Outlet Energy
- Outlet Current
- Outlet Pole Index

- Outlet Pole Current: not displayed in Power IQ, but data is rolled up to provide Outlet Current. Use this mapping if your PDU does not provide Current data at the Outlet level.
- Outlet Pole Voltage: not displayed in Power IQ, but data is rolled up to provide Outlet Voltage. Use this mapping if your PDU does not provide Voltage data at the Outlet level.
- External Temperature and Humidity Sensors: See **External Temperature and Humidity Sensor Mappings for Rack PDUs** (on page 282)

Standalone Meter Mappings

A Standalone Meter may contain circuits and circuit poles.

"Index" mappings are supported in structured dynamic plugins only.

► Standalone Meter Mappings:

- Circuit Index
- Circuit Apparent Power
- Circuit Active Power
- Circuit Power Factor
- Circuit Voltage
- Circuit Current
- Circuit Energy
- Circuit Pole Index
- Circuit Pole Name
- Circuit Pole Phase
- Circuit Pole Position
- Circuit Pole Active Power: not displayed in Power IQ, but data is rolled up to provide Circuit Active Power. Use this mapping if your PDU does not provide Active Power data at the Circuit level.
- Circuit Pole Voltage
- Circuit Pole Current

External Temperature and Humidity Sensor Mappings for Rack PDUs

External temperature and humidity sensor mappings are available for rack PDUs only. Examine your MIB to determine how the external sensor data is arranged and choose the correct mapping.

► Generic sensor mappings:

Generic sensor mappings do not include the "temperature" or "humidity" term in the mapping. Generic sensor mappings are useful when you have an OID to determine the type of sensor, and all sensor data is encoded in a single MIB table.

For extra details when mapping sensors in a custom dynamic plugin, see **Generic Sensor Mappings for Custom Dynamic Plugins** (on page 284).

- External Sensor Index: external_sensor_index
- External Sensor Type: external_sensor_type
- External Sensor Name: external_sensor_name
- External Sensor Value: external_sensor_value
- External Sensor Unit: external_sensor_unit
- External Sensor Scale Factor: external_sensor_decimal_digits
 - The "decimal digits" mapping works as a multiplier. Use this mapping when the MIB table contains multiple sensor types and each type has a different scaling. If the scalings are the same, using a multiplier as needed will work, and the multiplier is applied to all sensors.

► **Sensor specific mappings for temperature:**

Use a sensor-specific mapping for temperature when all temperature readings are isolated in separate MIB tables from other sensor types, or the MIB table contains both temperature and humidity readings in each row, or a single MIB table contains both temperature and humidity readings (one reading per row) but there is no column OID that indicates the sensor type.

Note: Sensor specific mappings for temperature cannot be used in custom dynamic plugins. Use the generic sensor mappings instead.

- Temperature Sensor Index: external_sensor_temperature_index
- Temperature Sensor Name: external_sensor_temperature_name
- Temperature Sensor Value: external_sensor_temperature_value
- Temperature Sensor Unit: external_sensor_temperature_unit

► **Sensor specific mappings for humidity:**

Use a sensor-specific mapping for humidity when all humidity readings are isolated in separate MIB tables from other sensor types, or the MIB table contains both temperature and humidity readings in each row, or a single MIB table contains both temperature and humidity readings (one reading per row) but there is no column OID that indicates the sensor type.

Note: Sensor specific mappings for humidity cannot be used in custom dynamic plugins. Use the generic sensor mappings instead.

- Humidity Sensor Index: external_sensor_humidity_index
- Humidity Sensor Name: external_sensor_humidity_name
- Humidity Sensor Value: external_sensor_humidity_value

Temperature Unit Configuration Precedence

For flexibility to support many kinds of MIB structures, there are several ways of indicating what unit temperature readings are displayed in.

They will be applied in the following order of precedence:

1. If external_sensor_unit (generic) or external_sensor_temperature_unit (specific) mappings are configured and corresponding Temperature Unit (Celsius) and Temperature Unit (Farhreneheit) metadata types are configured then the unit information retrieved from the SNMP agent of the target PDU will be used to determine temperature unit.
2. If a Temperature Unit metadata type is configured then it will be used to determine the temperature reading units.

3. If no other means to determine temperature reading units is available then Celsius will be assumed.

The screenshot shows a 'Metadata' configuration panel with the following fields:

- Circuit Breaker State OK:
- Circuit Breaker State Tripped:
- Outlet State On:
- Outlet State Off:
- Outlet Power On:
- Outlet Power Off:
- Humidity Sensor Type:
- Temperature Sensor Type:
- Temperature Unit: (highlighted with a red box and '2')
- Temperature Unit (Celsius): (highlighted with a red box and '1')
- Temperature Unit (Fahrenheit): (highlighted with a red box and '1')

Generic Sensor Mappings for Custom Dynamic Plugins

In custom dynamic plugins, only the generic sensor mappings are supported.

The generic sensor mappings can be used to identify both external temperature and humidity sensors. Mappings specific to temperature and humidity are not required for custom dynamic plugins because you have the ability to control each OID that is collected, and you can hard code any value that is not available through the MIB. If the MIB does not provide a sensor type value, you must hard code it.

- External Sensor Index: external_sensor_index: Not supported for custom dynamic plugins.
- External Sensor Type: external_sensor_type
- External Sensor Name: external_sensor_name
- External Sensor Value: external_sensor_value
- External Sensor Unit: external_sensor_unit
 - For temperature only, to specify Fahrenheit or Celsius. The unit for humidity is always assumed to be a percentage. When all readings are given in the same unit, it's easier to set the Temperature Unit metadata value.
 - This mapping is needed only in the unlikely case that a MIB gives some temperature readings in Fahrenheit and some in Celsius. If so, you must define this mapping for all temperature and humidity sensors identified, because the plugin requires the same total number of mappings for each data model element. For example, if a plugin has 5 external sensor name mappings defined, then it must have exactly 0 or 5 unit mappings defined.

- External Sensor Scale Factor: external_sensor_decimal_digits
 - This mapping must be used when the MIB table contains multiple sensor types and each type has a different scaling. If the scalings are the same, using a multiplier as needed will work, and the multiplier is applied to all sensors.

Wildcard Index Mappings - Structured Dynamic Plugins Only

Wildcard index mappings are valid for structured dynamic plugins only.

When a MIB has related OIDs grouped together and in a sequential order, but not in perfectly structured tables, wildcard index mappings can help you make the information work in a structured dynamic plugin.

Use a wildcard index mapping when you need an index and the relevant stock index mappings have already been used, or do not make sense. See Wildcard Index Mapping Example

▶ Wildcard index mappings:

- Wildcard Index 1
- Wildcard Index 2
- Wildcard Index 3
- Wildcard Index 4

Wildcard Index Mapping Example

Wildcard index mappings are useful for creating a structured dynamic plugin when the MIB is not logically organized into tables. A wildcard index mapping can be used as a substitution value in any structured dynamic plugin mapping.

For example, a structured MIB that supports outlet names and outlet current will typically have an outlet table where each row contains one outlet's name and its current (amperage) reading. However, imagine a scenario where the MIB supports outlet names and outlet current, but these values are not accessible through a table. Instead the values are organized as consecutive OIDs in the MIB.

► **For example:**

The MIB's outlet name OIDs:

- 1.3.6.1.4.1.999.1.2.1
- 1.3.6.1.4.1.999.1.2.2
- 1.3.6.1.4.1.999.1.2.3
- 1.3.6.1.4.1.999.1.2.4

The MIB's outlet current OIDs:

- 1.3.6.1.4.1.999.1.2.5
- 1.3.6.1.4.1.999.1.2.6
- 1.3.6.1.4.1.999.1.2.7
- 1.3.6.1.4.1.999.1.2.8


The last decimal value of the OID is the "index" for that value. The index values for the outlet name OIDs are: 1,2,3,4. The index values for the outlet current OIDs are: 5,6,7,8.

With a single 'outlet_index' mapping, you could not collect both outlet name and outlet current. To solve this problem, you can use a wildcard index to generate a second series of index values needed, so that both sets of values can be collected.


Mappings

PDU System OID:

Model OID:


Outlet Index: 

Start: Step:



Outlet Name: 

Wildcard Index 1: 

Start: Step:

Outlet Current: 

Multiplier:

Add Another Mapping:  

Trap Support in Dynamic Plugins - Structured or Custom

Trap support applies to both structured and custom dynamic plugins.

Power IQ can convert incoming SNMPv1 and SNMPv2 traps from a PDU managed with a dynamic plugin into a Power IQ event. To support this ability, you must add trap mappings to your dynamic plugin.

Note: Trap mapping is supported for proxied PDUs only when managed through custom dynamic plugins. Each proxied PDU is managed by a unique dynamic plugin mapping. You must add an event filter on whatever trap parameter uniquely identifies the proxied PDU which is the target of the event.

Trap mapping is not supported for proxied PDUs managed through a structured dynamic plugin mapping.

Traps can be mapped to one of these events:

- genericInfo
- genericWarning
- genericCritical

The Power IQ events are generic. Because of this, it is necessary to define event summary text for each trap mapping to give meaning to the event. Most of the information passed in an SNMP trap is encoded in what are called variable bindings, or "varbinds" for short. Variable bindings are a key value pair, where the key is an object identifier and the value is typically an integer or string. In this guide, for simplicity, trap variable bindings are referred to as trap parameters.

When configuring a trap mapping in Power IQ, the event summary text supports parameter expansion for any SNMP trap parameter contained in the trap. This means any relevant information encoded in a trap's parameters may be displayed in the Power IQ event listing or event details pages through the event summary text. See **Trap Mapping Variables and Format** (on page 291).

The best practice is to create a detailed, meaningful event summary text. Use filtering to map traps with values matching the filter to a specific event severity level and summary text.

For examples, see:

Example: Trap Mapping with Filters (on page 292)

Example: Event Summary Message with Variables (on page 295)

Traps can also be added to custom dynamic plugins based on SNMP-gateway managed devices. There are some setup requirements. See **Example: Trap Mapping with Filters for SNMP Gateways** (see "Example: Trap Mapping with Filters for Babel Buster SPX SNMP Gateway" on page 297)

Identify Trap OIDs and Parameters

To create a dynamic plugin with trap support, follow this process to prepare your trap mappings.

1. Identify the trap OIDs that you are interested in mapping.
2. Identify the key parameters in each trap that will be used to create event filters and the event summary text in the trap mapping.

▶ Trap OIDs:

Trap OIDs are used to identify the alarm or condition being reported. When creating the trap mapping in the dynamic plugin, you will specify the trap OID:

- The trap OID is specified in the Enterprise OID field for an SNMPv2 trap.
- The trap OID is specified in the Enterprise OID and Enterprise Specific ID field for an SNMPv1 trap.

▶ Trap Parameters:

Trap parameters are typically useful for:

- uniquely identifying the alarm or condition which is being reported. This is necessary if a single trap can actually describe more than one alarm or condition.
- providing sensor reading values and possibly the threshold value that was exceeded
- uniquely identifying the specific PDU that the alarm pertains to in a proxied or gateway scenario. Custom mappings only.
- any other trap details that may be useful to the Power IQ user

▶ Tools To Help With Trap Mapping:

A number of tools can be useful while trying to learn enough about a PDU's traps and their parameters to be able to define trap mappings in Power IQ.

1. The vendor's MIB.
 - The MIB defines the traps that the device can generate, as well as the variable bindings, that is, trap parameters, that will be sent in each trap. The order of the parameters is specified in the MIB as well. Parameter order is important because you must know the order to define the parameter expansion values in the event summary text. The event summary text defines the message that will be generated for the Power IQ event that the trap is mapped to.
2. A MIB browser.

- A MIB browser, such as the free iReasoning MIB browser, is useful for viewing the contents of the MIB, and it has a trap receiver that you can use to listen for and decode SNMPv1 and SNMPv2 traps. One good method is to first configure your PDU to sent traps to the computer running the iReasoning browser, and then cause the alarm condition that generates the trap. The iReasoning browser receives and decodes the trap. You can see exactly what traps your PDU is generating, what parameters are being sent, and in what order.
- See **Use a MIB Browser** (on page 300).

Trap OID Wildcards

An OID wildcard is an asterisk (*) used in place of an object-identifier decimal value in an event filter OID value. OID wildcards are useful when a trap parameter's OID value contains an index value, and the trap mapping being defined should apply to all index values.

For example, assume that a type of PDU can generate an 'outletSensorChange' trap. This trap can be used to indicate an over current or an over voltage condition on an outlet. One of the trap's parameters indicates whether the alarm is for an "over current" or an "over voltage" condition. The OID associated with this trap parameter has a decimal value that indicates the outlet number that the alarm pertains to. The OIDs for this scenario would look similar to these sample OIDs:

Outlet 1: 1.3.6.1.4.1.9999.1.9.1

Outlet 2: 1.3.6.1.4.1.9999.1.9.2

and so on, up to the final outlet

Outlet 30: 1.3.6.1.4.1.9999.1.9.30

Instead of creating a separate trap mapping in PIQ for each and every outlet, use the OID wildcard in place of the index parameter and specify a filter with the OID:

1.3.6.1.4.1.9999.1.9.*

The filter will include all outlets without needing to map a trap for each outlet.

See **Example: Trap Mapping with Filters for Babel Buster SPX SNMP Gateway** (on page 297)

Trap Mapping Variables and Format

When creating trap mappings in Power IQ, the event summary message is important to give a detailed description of the event that occurred.

To create the most useful event summary text, you can write a message that uses parameter expansion for any SNMP trap parameter contained in the trap.

Identify the trap parameters you want to include in your message. Use a trap receiver to view the list of parameters. Identify the parameters by number using the format shown.

The following format is supported: {trap.1}, {trap.2} and so on.

For example, the following table shows the first five trap parameters (varbinds) for a Raritan PX2 'inletSensorStateChange' trap. Two sets of parameters are shown to demonstrate how the SNMPv1 format trap works differently from the SNMPv2 format trap. Note that this is for illustration purposes only--a PX2 PDU cannot be configured to send SNMPv1 traps.

SNMPv2 traps will always have a timestamp and a trap OID parameter as the first two parameters in the trap. SNMPv1 traps do not. If the MIB indicates that a particular trap has five parameters, when it is sent as an SNMPv2 trap, it will actually have seven parameters.

Number	SNMPv1 Parameters	SNMPv2 Parameters	Expansion Value
1	pduName	Timestamp	{trap.1}
2	pduNumber	Trap OID	{trap.2}
3	pxInetAddressType	pduName	{trap.3}
4	pxInetAddress	pduNumber	{trap.4}
5	inletLabel	pxInetAddressType	{trap.5}

See **Example: Event Summary Message with Variables** (on page 295).

Example: Trap Mapping with Filters

This example uses Raritan PX2 details as a reference. Dynamic plugins are not needed for PX2 PDUs.

In this example, assume a dynamic plugin has been created for a Raritan PX2 PDU. The dynamic plugin will support trap mapping for one trap, with filtering added to create events with two severity levels.

► **Example Goal:**

To add trap mappings that show a Warning level event when the PX2's inlet sensor state is above the upper warning level, and to show a Critical level event when the inlet sensor state is above the upper critical level.

PX2 MIB - Trap Information	
inletSensorStateChange	<pre> NOTIFICATION-TYPE OBJECTS { pduName, pduNumber, pxInetAddressType, pxInetIPAddress, inletLabel, typeOfSensor, measurementsInletSensorTimeStamp, measurementsInletSensorValue , measurementsInletSensorState , oldSensorState, sysContact, sysName, sysLocation } STATUS current DESCRIPTION "Inlet Sensor State Change" ::= { traps 61 }</pre>

► **Steps:**

1. Select SNMP v2c.

Enterprise OID: + **2**

Enterprise Specific ID:

Event Type: **3**

Event Summary: **4**

Filter: + **5**

OID:

Value:

2	To add the Critical level mapping, click Add Trap, and add the Enterprise OID for the "inletSensorStateChange" trap for the PDU. Use the {pdu_system_oid} variable if desired.
3	Select Generic Critical for the Event Type.
4	<p>Write an event summary message that describes the critical event. Use variables for the trap parameters to be included. The trap parameters expand when the message displays in the event details.</p> <p>For example, the first variable specified in the MIB for this trap is 'pduName'. This is the user-assigned name of the PDU that generated the trap. This example shows an SNMPv2 trap, so the 'pduName' variable is sent as the third variable in the trap. The first two varbinds of all SNMPv2 traps are 'timestamp' and 'trap oid'. See Identify Trap OIDs and Parameters (on page 289) and Trap Mapping Variables and Format (on page 291).</p>
5	To make sure that only critical-level, inlet state events are mapped to this message, add a filter that looks for the "above upper critical" value for the inlet sensor state. Click Add Filter. Enter a descriptive name for the filter. Enter the OID for Inlet Sensor State, then enter the value for a critical event. This filter requires a value of "6", which means "AboveUpperCritical".

Enterprise OID: {pdu_system_oid}.0.61

Enterprise Specific ID:

Event Type: Generic Warning

Event Summary: On PDU {trap.3} inlet voltage on inlet {trap.7} exceeded upper warning voltage threshold. Voltage reading: {trap.10} volts. Negative test: 15 varbinds in this trap: Trap OID: {trap.2}, This is a SNMPv2 trap.

Filter: Inlet Sensor State

OID: {pdu_system_oid}.5.2.3.1.3


Value: 5

- 6 To add the Warning level trapping, repeat the Add Trap and Add Filter process, with these changes:
- Event Type: Generic Warning
 - Event Summary: write text to describe warning condition, rather than critical
 - Filter Value: change from "6" to "5". A value of "5" for inlet sensor state means "AboveUpperWarning".


Example: Event Summary Message with Variables

Example of a trap mapping with trap parameters as variables in the Event Summary message, and the resulting Event Details with complete summary shown.


SNMP Version: v1 v2c

Enterprise OID: 

Enterprise Specific ID:


Event Type: 

Event Summary:

Filter: 

OID:

Value:

 Add Filter

Event Details			
Event	Informational Event		
Status	Active	Severity	Informational
Occurred at	11/02/14 01:07:56 PM EST	Target	192.168.43.177
Summary	User admin turned off outlet 12 on PDU Bill Y PX2. Trap OID: 1.3.6.1.4.1.13742.6.0.23,		
Cleared events	None		

The event summary text that is displayed in the Events tab list and in the event details is generated at the time of the event creation. Any configured {trap.N} substitutions defined in the event summary text of the matching trap mapping are expanded from the event's SNMP parameter values.

Event Details

Event	Informational Event		
Status	Active	Severity	Informational
Occurred at	11/14/14 12:16:26 PM EST	Target	10.33.1.2
Summary	No matching plugin trap definition was found		
Cleared events	None		

If event summary text cannot be generated because the relevant trap mapping was deleted or modified such that it is no longer a match, then an error message displays, indicating that no matching trap mapping could be found.

Example: Trap Mapping with Filters for Babel Buster SPX SNMP Gateway

Power IQ can receive threshold traps from SNMP gateways, such as Babel Buster, and convert them into meaningful events.

You must configure the Babel Buster to send traps before the traps can be mapped in the dynamic plugin.

To configure a Babel Buster device to generate traps that can be converted to Power IQ events, you must:

- Create uniquely named events
- Configure threshold rules for the event
- Associate the event with a register you want to monitor the value of
- See *Tips for Babel Buster Configuration* (on page 299).

▶ Example:

To configure the dynamic plugin to be capable of mapping these traps to Power IQ events, follow these examples. Check the numbers in the screenshot with the list that follows for an example of each item.

The screenshot displays a configuration form with the following fields and values:

- Enterprise OID:** 1.3.6.1.4.1.3815.1.2.2.2.0.1
- Enterprise Specific ID:** (empty)
- Event Type:** Generic Critical
- Event Summary:** SAM-2, Over Current Alarm on phase A: RegNum={trap.3}, EventName={trap.6}, RegName={trap.5}, RegData={trap.4}, EventTestType={trap.7}, EventTestVal={trap.8}, EventState={trap.9}
- Filter 1:**
 - Event Name: (empty)
 - OID: 1.3.6.1.4.1.3815.1.2.2.1.2.1.1.5.*.0
 - Value: SAM-2, Crrnt_A Ovr Alrm
- Filter 2:**
 - Register Number: (empty)
 - OID: 1.3.6.1.4.1.3815.1.2.2.1.2.1.1.2.*.0
 - Value: 25
- Filter 3:**
 - Event State: (empty)
 - OID: 1.3.6.1.4.1.3815.1.2.2.1.2.1.1.8.*.0
 - Value: 1

①	<p>Configure the Enterprise OID with the Babel Buster 'eventStateChange' trap OID: 1.3.6.1.4.1.3815.1.2.2.2.0.1</p> <p>Babel Buster only supports a single trap OID, so the enterprise trap OID will always have this value for any threshold trap you configure.</p>
②	<p>Select the appropriate Event Type based on the alarm condition being reported by the specific trap you are mapping.</p>
③	<p>Configure meaningful Event Summary text using desired trap parameter expansion elements: {trap.1}, {trap.2}...{trap.N}</p> <p>See Trap Mapping Variables and Format (on page 291).</p>
④	<p>Add an Event Name filter. Use the unique event name as configured on the Babel Buster as the filter's Value.</p>
⑤	<p>Each filter OID must be specified such that it is an exact match for the OID of the targeted trap parameter.</p> <p>One or more asterisks (*) may be substituted in any position in the OID in place of a decimal value. This asterisk acts as a wildcard and will cause the Power IQ trap handler to ignore that particular portion of the OID when performing matching. See Trap OID Wildcards (on page 290).</p> <p>This is helpful in the Babel Buster scenario because the second to last decimal value is an 'eventIndex' value which indicates the row in 'eventTable' in the Babel Buster MIB. The 'eventIndex' value is dynamic and will change based on the Babel Buster configuration. Specifying an asterisk in your filter OID mappings will prevent your configuration from having to be modified in the event that the Babel Buster threshold configuration changes in the future.</p>
⑥	<p>Add a 'Register Number' filter. Use the number of the register associated with the threshold configured on the Babel Buster as the Filter's Value. This step is optional if the 'Event Name' filter value is unique.</p>
⑦	<p>Add an 'Event State' filter. The event state trap parameter value indicates whether the alarm condition is active (asserted) or not active (de-asserted). An event state value of (1) indicates an active event, and a value of (0) indicates that the condition is not active. This means that an event state value of (0) indicates that the alarm condition has been cleared.</p> <p>A common scenario would be to create two trap mappings for each Babel Buster Action Rule or Event Name. One trap mapping would be used to map the active trap, where EventState value is 1, and one trap mapping would be used to map the clearing trap, where EventState value is 0.</p>

Tips for Babel Buster Configuration

For help with configuring Babel Buster to send SNMP traps, go to the Control System help:

http://www.csimn.com/CSI_pages/bbsp_faq1.html

► **BabelBuster Event State Change reference information:**

eventStateChange

Babel Buster devices allow you to configure a named threshold that will generate an eventStateChange trap.

Trap

eventStateChange NOTIFICATION-TYPE

OBJECTS {

eventRegNum,
eventRegName,
eventRegData,
eventName,
eventTestType,
eventTestVal,
eventState

}

STATUS current

DESCRIPTION

"This trap is sent when an event changes state
if notifications are enabled for the object that changed."

::= { bbx2Traps 1 }

VariablesEdit section

eventRegNum - (Integer) Register number referenced by this event.

eventRegName - (DisplayString) Name of register referenced by this event.

eventRegData - (DisplayString) Floating point ASCII string representation of register data.

eventName - (DisplayString) Name given to this event for identification purposes.

eventTestType - (Integer - undefined(0), greaterThan(1), greaterOrEqual(2), lessThan(3), lessOrEqual(4), equal(5), notEqual(6)) Event test type, comparison of register data against test value.

eventTestVal - (DisplayString) Floating point ASCII string representation of event test value.

eventState - (Integer - false(0), true(1)) State of event, true means register meets test defined by threshold rule, true may imply alarm condition active

Structured Dynamic Plugins

Requirements for Structured Dynamic Plugins

- MIB file for the device you want to manage. See **Find the MIB File** (on page 300).
- Ability to correctly identify OIDs in a MIB file.

Find the MIB File

To add a PDU using dynamic plugins, you must have the MIB file for the PDU.

► To find the MIB file:

MIBs are usually available in one of the following locations.

- The product interface. For example, Raritan PX PDUs have a menu option to save the MIB file. Note: PX PDUs are supported. You do not need to add dynamic plugins for Raritan PDUs.
- The product's website.
- The product's technical support department.

Use a MIB Browser

A MIB browser is useful when creating your dynamic plugins. When adding traps to dynamic plugins, a trap receiver is also helpful.

iReasoning MIB Browser free personal edition is suggested. iReasoning also includes a trap receiver.

See **Identify Trap OIDs and Parameters** (on page 289) for details on using a MIB browser to help with trap mapping.

Go to <http://ireasoning.com/download.shtml>

Identify the OIDs for Mapping

Power IQ provides the ability to map OIDs for many components, attributes, and details of power devices. Power IQ can collect and display data from the device based on the mappings you provide.

OIDs are documented in a product's MIB file.

In SNMP, the object identifier (OID) that uniquely identifies the make and model of an SNMP-managed device is the MIB-II System Object Identifier, commonly referred to as "sysObjectID", which is 1.3.6.1.2.1.1.2.0.

Within Power IQ, the value for "sysObjectID" is referred to as the "PDU System OID".

For example, the sysObjectID or "PDU System OID" for a Raritan model PX PDU is "1.3.6.1.4.1.13742.4". The "PDU System OID" is commonly used as the prefix for additional OIDs used to retrieve PDU attribute and component information.

See ***Mappings for Each PDU Type*** (on page 275) for lists of values that you can map from your PDU to Power IQ.

For each feature that you want to map, you must find the OID, and enter it in the mapping form to create the dynamic plugin. See ***Create a Structured Dynamic Plugin*** (on page 301).

Create a Structured Dynamic Plugin

Select the data you want to collect from your PDU and add the OID mappings for it to create the structured dynamic plugin.

When adding OIDs, you can use variables to simplify data entry and reduce errors. You must use the correct formatting, which is validated when you save the plugin. See ***OID Variables and Format*** (on page 305) for details.

For a full list of available data you can map, see ***Mappings for Each PDU Type*** (on page 275).

For help with mapping external sensors on rack PDUs, see ***External Temperature and Humidity Sensor Mappings*** (see "***External Temperature and Humidity Sensor Mappings for Rack PDUs***" on page 282).

For help with mapping traps, see ***Trap Support in Dynamic Plugins - Structured or Custom*** (on page 288)

► To add a dynamic plugin:

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.

2. Click Add, then click the type of device: CRAC, Floor PDU, Floor UPS, Power Panel, Rack PDU, Standalone Meter. Do not select Custom when using a structured MIB to create the plugin. See **Create a Custom Mapping Dynamic Plugin** (on page 309).
 - For environmental sensor aggregators, use Rack PDU.
 - Type cannot be changed once the dynamic plugin is created.
3. The new dynamic plugin page displays.
4. Enter a name to identify this dynamic plugin, in the Name field.
 - Lowercase letters and underscores only.
5. Enter a description to identify this dynamic plugin in the Description field.
6. Enter the manufacturer of the device you want to add using this dynamic plugin in the Manufacturer field.
7. The Model field can be used as a filter to specify a specific model number string, when the "PDU Model OID" returns more than one model number. This is useful when the MIB supports multiple different models and it is not possible to design a single dynamic plugin capable of supporting them all.
8. Phase: Select Automatic to allow Power IQ to determine the phase of the device by counting the number of poles on the inlets. Or, make a selection to hard-code the phase as Single Phase or Three Phase.
9. Check the Always Use SNMPv1 checkbox if the target device only supports SNMPv1. Leave the checkbox blank to use the default, SNMPv2 communication.
10. In the Metadata section, enter the value used in the MIB to indicate each status or control value. Common MIB value pairs are Yes/No, On/Off, 1/2. See **Metadata for Circuit Breakers and Outlets** (on page 306) for details.
 - Circuit Breaker State OK
 - Circuit Breaker State Tripped
 - Outlet State On
 - Outlet State Off
 - Outlet Power On
 - Outlet Power Off

11. Enter values for the Sensors Metadata. These values work with external sensor mappings. See **Metadata for Sensors** (on page 307).

Humidity Sensor Type:	<input type="text"/>
Temperature Sensor Type:	<input type="text"/>
Temperature Unit:	<input type="text"/>
Temperature Unit (Celsius):	<input type="text"/>
Temperature Unit (Fahrenheit):	<input type="text"/>

12. Enter the PDU System OID and PDU Model OID for the devices that will use this dynamic plugin. See **OID Variables and Format** (on page 305) for details. Required. See step 7 for the Model filtering field, if you expect multiple models to be returned.
13. To add features of the PDU, select an item from the "Add another mapping" drop-down list, then click Add. These links contain the list of supported mappings for each device type.
- **CRAC Mappings** (on page 275)
 - **Floor PDU Mappings** (on page 276)
 - **Floor UPS Mappings** (on page 278)
 - **Power Panel Mappings** (on page 279)
 - **Rack PDU Mappings** (on page 280)
 - **Standalone Meter Mappings** (on page 281)
 - **Wildcard Index Mappings - Structured Dynamic Plugins Only** (on page 285)
14. For each mapping you add, enter the OID. If the MIB does not have an OID for an Index item, enter an integer value. See **Index Mapping Format** (on page 308) for details about mapping indices.
- Some mappings require extra information, below the main mapping field.
- a. Start and Step for Index mappings:
 - Some MIBs number indices starting at a number other than 1, and in increments greater than 1. If your MIB shows this, enter the starting number in the Start field, and the increment in the Step field.
 - b. Multipliers for measurement mappings:

- Power IQ expects power readings to be in the following units: Amps, Volts, Watts, VoltAmps, Degrees Fahrenheit/Celsius, and so on.
 - Many MIBs report power readings in different units than what Power IQ requires. The multiplier field is used to scale the retrieved readings to the units required. For example, if the MIB reports readings in KiloWatts a multiplier value of 1000 must be specified to scale KiloWatts to Watts. A value of 5KW reported by the SNMP agent is converted to 5000 Watts when the multiplier is applied.
15. To add mappings for traps sent by the PDU, select SNMP Version, v1 or v2c, then click Add Trap to display the fields. To add multiple traps, click Add Trap to display another set of fields.
- a. For SNMP v1 traps, enter the Enterprise OID and the Enterprise Specific ID for the trap. For SNMP v2 traps, only the Enterprise OID for the trap is required.
 - b. Select the generic event this trap will map to: Generic Info, Generic Warning, Generic Critical.
 - c. In the Event Summary, write the message that will appear in the event details. Use the trap's parameters as variables to create a complete, detailed summary of the event. See **Trap Mapping Variables and Format** (on page 291) for syntax. See **Example: Event Summary Message with Variables** (on page 295) for a sample summary.
 - d. To filter the incoming traps, click Add Filter to display the fields. If a trap defined by the PDU's MIB can describe multiple alarm conditions, and you would like to map an incoming trap to one of several Power IQ events based on a specific alarm condition, then you must define event filters. The filters determine which Power IQ event an incoming trap should be mapped to.
 - Enter a name for the filter.
 - Enter OID of the trap parameter that this filter applies to.
 - Enter the value that the trap parameter must match. The trap parameter value must match exactly to be considered a match.
 - See **Example: Trap Mapping with Filters** (on page 292).
16. When you've finished with mappings, click Create Plugin.
17. Add the PDU that uses the dynamic plugin. See **Adding PDUs to Power IQ Management** (on page 20).
- See **Check PDUs Added with Dynamic Plugins** (on page 330).

OID Variables and Format

When creating mappings in Power IQ, you can use a variable to represent some OIDs, when the number is part of another OID. For example, many OIDs contain the PDU System OID.

The following variables are supported.

OID	Variable
PDU System OID	{pdu_system_oid}
PDU Proxy Index	{proxy_index}
Circuit Breaker Index	{circuit_breaker_index}
Inlet Index	{inlet_index}
Inlet Pole Index	{inlet_pole_index}
Outlet Index	{outlet_index}
Outlet Pole Index	{outlet_pole_index}
Panel Index	{panel_index}
Panel Inlet Index	{panel_inlet_index}
Panel Inlet Pole Index	{panel_inlet_pole_index}
Circuit Index	{circuit_index}
Circuit Pole Index	{circuit_pole_index}
Sensor Indexes	{external_sensor_index} {external_sensor_temperature_index} {external_sensor_humidity_index}
Wildcard Indexes	{wildcard_one_index} {wildcard_two_index} {wildcard_three_index} {wildcard_four_index}

► **To use a variable in an OID:**

To use a variable in an OID, substitute the variable text for the numbers. You must use the curly brackets before and after, and the period after the final bracket. Follow the examples in the table.

OID with variable substitution	Fully Expanded OIDs
{pdu_system_oid}.1.1.13.0	PDU Name for a PX1: 1.3.6.1.4.1.13743.4.1.1.13.0

{pdu_system_oid}.1.1.1.0	PDU Firmware for a PX1 1.3.6.1.4.1.13743.4.1.1.1.0
{pdu_system_oid}.1.2.2.1.7.{outlet_index}	Outlet Active Power OIDs for an 8-outlet PX1 1.3.6.1.4.1.13742.4.1.2.2.1.7.1 1.3.6.1.4.1.13742.4.1.2.2.1.7.2 1.3.6.1.4.1.13742.4.1.2.2.1.7.3 1.3.6.1.4.1.13742.4.1.2.2.1.7.4 1.3.6.1.4.1.13742.4.1.2.2.1.7.5 1.3.6.1.4.1.13742.4.1.2.2.1.7.6 1.3.6.1.4.1.13742.4.1.2.2.1.7.7 1.3.6.1.4.1.13742.4.1.2.2.1.7.8

Metadata for Circuit Breakers and Outlets

The screenshot shows a configuration window titled "Metadata" with the following fields and values:

Circuit Breaker State OK:	1
Circuit Breaker State Tripped:	2
Outlet State On:	ON
Outlet State Off:	OFF
Outlet Power On:	ON
Outlet Power Off:	OFF

► **Circuit Breaker State and Outlet State metadata:**

The dynamic plugin uses the Circuit Breaker State and Outlet State metadata values to interpret values retrieved from a target PDU during polling. The values entered must be based on information in the target PDU's MIB.

For example, if the MIB indicates that an integer value of 1 indicates that an outlet is ON, and 2 indicates that an outlet is OFF, you must specify those values in the metadata section so that Power IQ can interpret the 1 as ON, and the 2 as OFF when those values are retrieved in polling.

► **Outlet Power metadata:**

The dynamic plugin uses the Outlet Power metadata values when performing outlet power control on a target PDU. Some MIBs will use the same value to indicate both the outlet state and power control operations. Some MIBs use different values. All four Outlet State and Power metadata values must be configured properly for outlet power control to work.

Metadata for Sensors

Humidity Sensor Type:	<input type="text"/>
Temperature Sensor Type:	<input type="text"/>
Temperature Unit:	<input type="text"/>
Temperature Unit (Celsius):	<input type="text"/>
Temperature Unit (Fahrenheit):	<input type="text"/>

In the Metadata for sensors, the fields work together with the mappings you add to determine your sensor types, and the units used to interpret readings. See **External Temperature and Humidity Sensor Mappings for Rack PDUs** (on page 282) for details. See **External Temperature and Humidity Sensor Mappings Example Screenshots** (on page 326) for examples.

- Humidity Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the humidity sensor type.
- Temperature Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the temperature sensor type.
- Temperature Unit: set the value to C or F to hard code the units used to interpret readings, when the MIB does not have sensor reading unit information, or when Temperature Unit (Celsius)/Temperature Unit (Fahrenheit) values are not found in this metadata section. This field is only used when a units value is not specified on a per reading basis using the `external_sensor_unit` (generic) or `external_sensor_temperature_unit` (specific) mappings.
- Temperature Unit (Celsius) and Temperature Unit (Fahrenheit): These fields work with the `external_sensor_unit`, or `external_sensor_temperature_unit` mappings. Your readings unit is determined by a match between the value specified here, and the value returned from the MIB for either `external_sensor_unit` or `external_sensor_temperature_unit`.

Index Mapping Format

Structured dynamic plugins use index mappings to determine the number of PDU elements that a particular PDU has. PDU elements are inlets, inlet poles, circuit breakers, outlets, and so on.

There are 2 options for specifying a index mapping values.

- Specify an SNMP OID whose retrieved value indicates the PDU element's count.
- Specify a hard-coded integer value to indicate the PDU element's count

The advantage of specifying an OID value that the dynamic plugin can use to retrieve the PDU element count is that a single dynamic plugin is capable of supporting a variety of different PDU models with different numbers of inlets, inlet poles, circuit breakers, outlets, and so on.

If the MIB does not support OIDs that can be used to find the count, you must provide a hard-coded integer value. In this case, the dynamic plugin will likely only work for a specific model. You may also need to specify a Model name filter to ensure the dynamic plugin is only used with the appropriate model type.

► To specify a count object OID for index mappings:

Find a count object in the MIB that specifies the number of a particular component, such as outlets, that the target PDU has. Specify the OID for the count as the value of the index.

When an OID is a scalar object, that is, not part of a table, add a ".0" to the end of the OID.

For example, the Raritan PX MIB supports an "outletCount" object with an OID of 1.3.6.1.4.1.13742.4.1.2.1.

Add a ".0" to the end of the OID to arrive at an OID of 1.3.6.1.4.1.13742.4.1.2.1.0.

Power IQ can then use this OID to perform an SNMP get request for the number of outlets on a specific PDU.

To map this value in the dynamic plugin, enter "1.3.6.1.4.1.13742.4.1.2.1.0" in the Outlet Index field.

Custom Mapping Dynamic Plugins

Requirements for Custom Mapping Dynamic Plugins

▶ **For custom mappings based on flat MIBs:**

- MIB file for the device you want to manage. See ***Find the MIB File*** (on page 300).
- Ability to correctly identify OIDs in a MIB file.

▶ **For custom mappings based on SNMP-gateway managed devices:**

- A SNMP gateway device that converts Modbus/Bacnet to SNMP
- A list of the registers for the PDU you want to manage. See ***Find the Modbus Register List*** (on page 309).
- Ability to correctly convert the registers to SNMP OIDs, using your SNMP-gateway device

Find the Modbus Register List

To add a Modbus device using a custom mapping dynamic plugin, you must have the register list for the device.

▶ **To find the Modbus register list:**

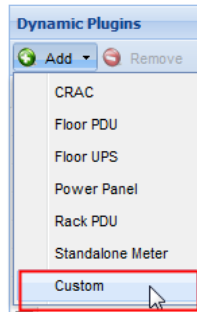
Modbus register lists are usually available in one of the following locations.

- The product's user guide
- The product's website.
- The product's technical support department.

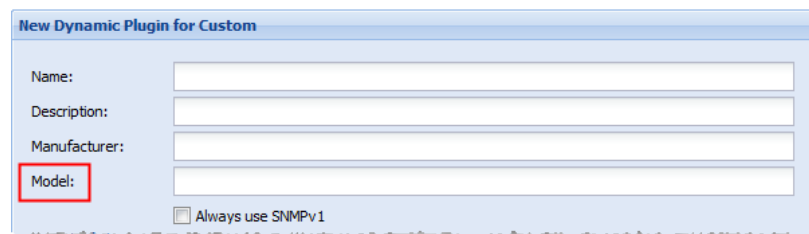
Create a Custom Mapping Dynamic Plugin

▶ **To create a custom mapping dynamic plugin:**

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.
2. Click Add, then click Custom. Do not select the type of device now.



3. The new dynamic plugin page displays.
4. Enter a name to identify this dynamic plugin, in the Name field.
 - Lowercase letters and underscores only.
 - Tip for SNMP gateway use cases: When you have multiple devices using the same gateway, include proxy information in the name. This will help you identify the correct plugin when adding devices. See Proxy ID field.
5. Enter a description to identify this dynamic plugin in the Description field.
6. Enter the manufacturer of the device you want to add using this dynamic plugin in the Manufacturer field.
7. The Model field can be used as a filter to specify a specific model number string, when the "PDU Model OID" returns more than one model number. This allows you to create a dynamic plugin for a specific model, even when multiple models are contained in the MIB.



8. Check the Always Use SNMPv1 checkbox if the target PDU only supports SNMPv1. Leave the checkbox blank to use the default, SNMPv2 communication.
9. In the Metadata section, enter the value used in the MIB to indicate each status or control value. Common MIB value pairs are Yes/No, On/Off, 1/2. See **Metadata for Circuit Breakers and Outlets** (on page 306) for details.
 - Circuit Breaker State OK
 - Circuit Breaker State Tripped
 - Outlet State On

- Outlet State Off
- Outlet Power On
- Outlet Power Off

Metadata	
Circuit Breaker State OK:	1
Circuit Breaker State Tripped:	2
Outlet State On:	ON
Outlet State Off:	OFF
Outlet Power On:	ON
Outlet Power Off:	OFF

10. Enter values for the Sensors Metadata. These values work with external sensor mappings. See **Metadata for Sensors** (on page 307).

Humidity Sensor Type:	
Temperature Sensor Type:	
Temperature Unit:	
Temperature Unit (Celsius):	
Temperature Unit (Fahrenheit):	

11. In the Mappings section, select the type of device: CRAC, Floor PDU, Floor UPS, Power Panel, Rack PDU, Standalone Meter.
- Type cannot be changed once the plugin is created.

Mappings	
Type:	Floor PDU
PDU Name:	
System OID:	
Proxy ID:	
Model ID:	
PDU Firmware:	

12. Enter the device's name in the PDU Name field.
13. Enter the System OID for the PDU.
- For SNMP gateway use cases, enter the gateway's System OID.
14. The Proxy ID field is used to identify PDUs in daisy chained configurations, or managed by a serial device. In an SNMP gateway use case, use this field to assign a proxy id to each PDU managed by the gateway. Best practice is to start with 1 for gateways, entering a unique proxy id for each PDU managed through the gateway.

Note: When you add the PDUs managed by the SNMP gateway to Power IQ, you will indicate the proxy index for each one. This is how Power IQ differentiates the separate PDUs behind the same IP address.

15. Enter the PDU Model OID for the PDU that will use this dynamic plugin. **Required.** See step 7 for the Model filtering field, if the MIB you are working with supports multiple models and you want this custom mapping to apply to a specific model. Hard code a value if the MIB does not provide a value.
16. Enter an OID for the firmware version in the PDU Firmware field.
17. Enter or import Custom Mappings. See **Sensor Mappings** (on page 315).

Object Mapping	Data Model Element	Sensor Type
Enter OID	Enter Identity	Enter Sensor Type

18. Enter Sensor Multipliers. See **Sensor Multipliers** (on page 321).

Data Model Element	Sensor Type	Multiplier
Enter Element Type	Enter Sensor Type	Enter Multiplier

19. To add mappings for traps sent by the PDU, select SNMP Version, v1 or v2c, then click Add Trap to display the fields. To add multiple traps, click Add Trap to display another set of fields.
 - a. For SNMP v1 traps, enter the Enterprise OID and the Enterprise Specific ID for the trap. For SNMP v2 traps, only the Enterprise OID for the trap is required.
 - b. Select the generic event this trap will map to: Generic Info, Generic Warning, Generic Critical.
 - c. In the Event Summary, write the message that will appear in the event details. Use the trap's parameters as variables to create a complete, detailed summary of the event. See **Trap Mapping Variables and Format** (on page 291) for syntax. See **Example: Event Summary Message with Variables** (on page 295) for a sample summary.

- d. To filter the incoming traps, click Add Filter to display the fields. If a trap defined by the PDU's MIB can describe multiple alarm conditions, and you would like to map an incoming trap to one of several Power IQ events based on a specific alarm condition, then you must define event filters. The filters determine which Power IQ event an incoming trap should be mapped to.
 - Enter a name for the filter.
 - Enter OID of the trap parameter that this filter applies to.
 - Enter the value that the trap parameter must match. The trap parameter value must match exactly to be considered a match.
 - See **Example: Trap Mapping with Filters** (on page 292).
 - See **Example: Trap Mapping with Filters for Babel Buster SPX SNMP Gateway** (on page 297).
20. When you've finished with mappings, multipliers, and traps, click Create Plugin.
21. Add the PDU that uses the dynamic plugin. See **Adding PDUs to Power IQ Management** (on page 20).
See **Check PDUs Added with Dynamic Plugins** (on page 330).

Metadata for Circuit Breakers and Outlets

Metadata	
Circuit Breaker State OK:	1
Circuit Breaker State Tripped:	2
Outlet State On:	ON
Outlet State Off:	OFF
Outlet Power On:	ON
Outlet Power Off:	OFF

► **Circuit Breaker State and Outlet State metadata:**

The dynamic plugin uses the Circuit Breaker State and Outlet State metadata values to interpret values retrieved from a target PDU during polling. The values entered must be based on information in the target PDU's MIB.

For example, if the MIB indicates that an integer value of 1 indicates that an outlet is ON, and 2 indicates that an outlet is OFF, you must specify those values in the metadata section so that Power IQ can interpret the 1 as ON, and the 2 as OFF when those values are retrieved in polling.

► **Outlet Power metadata:**

The dynamic plugin uses the Outlet Power metadata values when performing outlet power control on a target PDU. Some MIBs will use the same value to indicate both the outlet state and power control operations. Some MIBs use different values. All four Outlet State and Power metadata values must be configured properly for outlet power control to work.

Metadata for Sensors

Humidity Sensor Type:	<input type="text"/>
Temperature Sensor Type:	<input type="text"/>
Temperature Unit:	<input type="text"/>
Temperature Unit (Celsius):	<input type="text"/>
Temperature Unit (Fahrenheit):	<input type="text"/>

In the Metadata for sensors, the fields work together with the mappings you add to determine your sensor types, and the units used to interpret readings. See **External Temperature and Humidity Sensor Mappings for Rack PDUs** (on page 282) for details. See **External Temperature and Humidity Sensor Mappings Example Screenshots** (on page 326) for examples.

- Humidity Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the humidity sensor type.
- Temperature Sensor Type: When the MIB contains a single sensor reading table, and there is a value you can use to determine sensor type, use this field to set the value of the temperature sensor type.

- **Temperature Unit:** set the value to C or F to hard code the units used to interpret readings, when the MIB does not have sensor reading unit information, or when Temperature Unit (Celsius)/Temperature Unit (Fahrenheit) values are not found in this metadata section. This field is only used when a units value is not specified on a per reading basis using the external_sensor_unit (generic) or external_sensor_temperature_unit (specific) mappings.
- **Temperature Unit (Celsius) and Temperature Unit (Fahrenheit):** These fields work with the external_sensor_unit, or external_sensor_temperature_unit mappings. Your readings unit is determined by a match between the value specified here, and the value returned from the MIB for either external_sensor_unit or external_sensor_temperature_unit.

Sensor Mappings

Sensor mappings are used in the custom dynamic plugin to identify each power sensor, or data point, you want Power IQ to support for your PDU.

Sensor mappings can be entered manually, by entering and selecting values. Or, you can create a CSV file with the information formatted correctly, and import the file.

To understand sensor mappings, and view instructions for manual entry, see:

- ***Object Identifier*** (on page 316)
- ***Data Model Element*** (on page 316)
- ***Sensor Type*** (on page 318)
- ***Custom Dynamic Plugin Example Screenshots*** (on page 323)

To see instructions and an example of the CSV file for importing mappings, see:

- ***Sensor Mapping CSV Import File Structure*** (on page 320)

To see rules that apply to mappings, see:

- ***Additional Custom Mapping Rules*** (on page 322)

Object Identifier

The object identifier is the SNMP OID for the sensor, such as an attribute or reading, you want to collect.

In some cases, when an OID is not available in the MIB, you can hard code a value.

Valid values:

- SNMP OID for the sensor

OR

- A hard-coded value for some sensor types. See **Sensor Type** (on page 318).

Hard code a value when an OID is not available in the MIB. You can hard code circuit pole phase, circuit pole position on a panel, names, and any sensor type where a positive decimal number value would be returned. Hard coding for numeric values makes sense in some cases, such as voltage. Some other numeric values, such as active power, may be hard coded but will not result in meaningful data.

Data Model Element

The data model element specifies where this sensor is associated in the model of the PDU.

Each device type support different data model elements. The data model elements have hierarchical parent-child relationships. See **Data Model Elements by PDU Type** (on page 317).

You must identify the precise association of each sensor.

► To identify the data model element:

1. In the list of data model elements, find the data model element you want to associate a sensor type with. See **Data Model Elements by PDU Type** (on page 317).
2. Append the number of the element to the end of each element's name. Leave one space between elements.

► Example:

An amperage sensor for pole 3 on circuit 10 of a Floor PDU's second panel.

```
panel2 circuit10 circuitpole3
```

Data Model Elements by PDU Type

Data model elements have hierarchical parent-child relationships.

▶ Rules for all PDU types:

- A panel may directly contain inlets and circuits or circuitpoles
- An inlet may contain inletpoles
- An outlet may contain outletpoles
- A circuit may contain circuitpoles

▶ CRAC

- inlet
- inlet inletpole

▶ FLOOR_PDU

- inlet
- inlet inletpole
- panel
- panel inlet
- panel inlet inletpole
- panel circuit
- panel circuit circuitpole
- panel circuitpole
- circuit
- circuit circuitpole
- circuitpole

▶ FLOOR_UPS

- inlet
- inlet inletpole
- circuit
- circuit circuitpole

▶ POWER_PANEL

- inlet
- inlet inletpole
- circuit
- circuit circuitpole
- circuitpole

▶ RACK_PDU

- inlet

- inlet inletpole
- circuitbreaker
- outlet
- outlet outletpole
- externalsensor

▶ **STANDALONE_METER**

- circuit
- circuit circuitpole

Sensor Type

The sensor type identifies the type of reading expected from the sensor.

Valid values	Valid for these data model elements	Valid hard coded value in Object Identifier Field
<ul style="list-style-type: none"> active_power 	<ul style="list-style-type: none"> inlet, inletpole, outlet, circuit, circuitpole 	<ul style="list-style-type: none"> positive decimal number
<ul style="list-style-type: none"> apparent_power 	<ul style="list-style-type: none"> inlet, outlet, circuit 	<ul style="list-style-type: none"> positive decimal number
<ul style="list-style-type: none"> current 	<ul style="list-style-type: none"> inlet, outlet, circuit, any pole 	<ul style="list-style-type: none"> positive decimal number
<ul style="list-style-type: none"> decimal_digits 	<ul style="list-style-type: none"> external sensor 	<ul style="list-style-type: none"> positive decimal number used to scale external sensor readings
<ul style="list-style-type: none"> name 	<ul style="list-style-type: none"> outlet, circuit, circuitpole, circuitbreaker 	<ul style="list-style-type: none"> name of the data model element
<ul style="list-style-type: none"> phase 	<ul style="list-style-type: none"> circuitpole 	<ul style="list-style-type: none"> L1, L2, L3 A, B, C X, Y, Z 1,2,3 See Set Phase Labels for Circuit Pole Phase (on page 336).
<ul style="list-style-type: none"> position 	<ul style="list-style-type: none"> circuitpole 	<ul style="list-style-type: none"> Number greater than 0. Specifies the circuit pole position on the panel.
<ul style="list-style-type: none"> power_control 	<ul style="list-style-type: none"> outlet 	<ul style="list-style-type: none"> Hard coding not supported for power control.
<ul style="list-style-type: none"> power_factor 	<ul style="list-style-type: none"> inlet, outlet, circuit 	<ul style="list-style-type: none"> positive decimal number between 0 - 1. Example: Power factor 98% is hard coded as .98. 100% is 1.0.
<ul style="list-style-type: none"> state 	<ul style="list-style-type: none"> outlet, circuit breaker 	<ul style="list-style-type: none"> Hard coded value must match the configured metadata value. See Metadata for Circuit Breakers and Outlets (on page 306).
<ul style="list-style-type: none"> type 	<ul style="list-style-type: none"> externalsensor 	<ul style="list-style-type: none"> Example: T for Temperature, H for Humidity. Hard coded value must match the configured metadata value for Humidity Sensor Type or Temperature Sensor Type. See Metadata for Sensors (on page 307).

Valid values	Valid for these data model elements	Valid hard coded value in Object Identifier Field
<ul style="list-style-type: none"> ▪ unit 	<ul style="list-style-type: none"> ▪ externalsensor 	<ul style="list-style-type: none"> ▪ Example: C for Celsius. ▪ Hard coded value must match the configured metadata value for Temperature Unit (Celsius) or Temperature Unit (Fahrenheit). ▪ See Metadata for Sensors (on page 307).
<ul style="list-style-type: none"> ▪ value 	<ul style="list-style-type: none"> ▪ externalsensor 	<ul style="list-style-type: none"> ▪ decimal number
<ul style="list-style-type: none"> ▪ voltage 	<ul style="list-style-type: none"> ▪ inlet, outlet, circuit, any pole 	<ul style="list-style-type: none"> ▪ positive decimal number
<ul style="list-style-type: none"> ▪ watt_hour 	<ul style="list-style-type: none"> ▪ inlet, panelinlet, circuit, outlet 	<ul style="list-style-type: none"> ▪ positive decimal number

Sensor Mapping CSV Import File Structure

To include sensor mappings for a custom dynamic plugin, you may import a CSV file containing the information, instead of entering and selecting the information manually.

These links include instructions and valid values for each column:

- **Object Identifier** (on page 316)
- **Data Model Element** (on page 316)
- **Sensor Type** (on page 318)

► To import the sensor mapping CSV file:

1. In the custom plugin form, click Import in the Sensor Mappings section.
2. Select the file and click Upload. If the file validates, the entries appear in the fields.

► **The structure of the CSV file:**

- One line per sensor mapping
- No header row
- Each line has only the value columns, in the following order

Column 1:	Column 2:	Column 3:
Object Identifier	Data Model Element	Sensor Type

► **Example:**

A	B	C
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.25	Circuit1	active power
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.24	Circuit1	watt hour
HVAC Feed	Circuit1	name
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.7	Circuit1 CircuitPole1	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.8	Circuit1 CircuitPole2	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.9	Circuit1 CircuitPole3	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.6	Circuit1 CircuitPole4	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.10	Circuit1 CircuitPole1	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.11	Circuit1 CircuitPole2	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.12	Circuit1 CircuitPole3	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.12	Circuit1 CircuitPole4	voltage
A	Circuit1 CircuitPole1	phase
B	Circuit1 CircuitPole2	phase
C	Circuit1 CircuitPole3	phase
N	Circuit1 CircuitPole4	phase
HVAC Feed Pole1	Circuit1 CircuitPole1	name
HVAC Feed Pole2	Circuit1 CircuitPole2	name
HVAC Feed Pole3	Circuit1 CircuitPole3	name
HVAC Feed Neutral Pole	Circuit1 CircuitPole4	name

Sensor Multipliers

Power IQ expects power readings to be in the following units: Amps, Volts, Watts, VoltAmps, Degrees Fahrenheit/Celsius, and so on.

Many MIBs report power readings in different units than what Power IQ requires. The multiplier field is used to scale the retrieved readings to the units required.

► **To enter sensor multiplier mappings:**

1. In the custom dynamic plugin form, click Add to add a row to the Sensor Multipliers list.
 - The list has three fields for each entry.
 - Double-click the Data Element and Sensor Type fields to access a drop-down list of values.
 - Double-click the Multiplier field to access a text field.

Data Element	Sensor Type:	Multiplier Value:
Select the data model element this multiplier is used on.	Select the sensor type this multiplier is used on.	Enter the decimal value the dynamic plugin will use to normalize the readings into units supported by Power IQ.
<ul style="list-style-type: none"> ▪ circuit ▪ circuit_breaker ▪ circuit_breaker_pole ▪ inlet ▪ inlet_pole ▪ outlet ▪ outlet_pole ▪ external_sensor ▪ external_sensor_humidity ▪ external_sensor_temperature ▪ panel_inlet ▪ panel_inlet_pole 	<ul style="list-style-type: none"> ▪ active_power ▪ apparent_power ▪ current ▪ power_factor ▪ voltage ▪ watt_hour ▪ value 	<ul style="list-style-type: none"> ▪ For example: If an active power sensor OID returns a value of 5 kilowatts, enter a multiplier of 1000 to normalize to 5000 watts.

Additional Custom Mapping Rules

When creating your plugin, remember these additional rules to ensure your plugin validates, and that you get the best possible data collection.

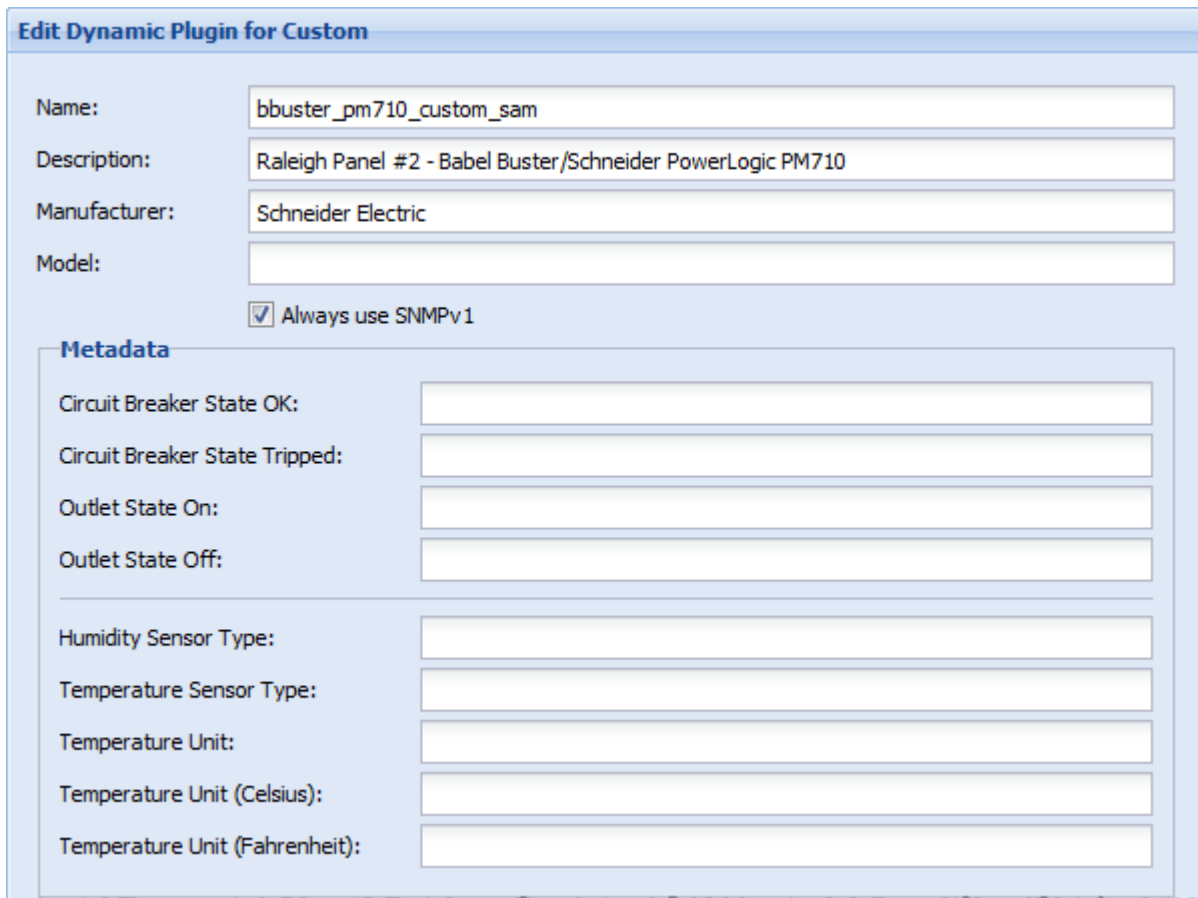
- Make sure you correctly map the phase of your circuit poles to the phase of the building.
- Add inlet poles in order (A, B, C).
- In a group of like elements, for example, inlet_poles, each element must have the same type of sensors mapped, and must indicate the same total number of the element.
 - Example: If an inlet_pole has voltage mapped, than all inlet_poles for that plugin must have voltage mapped.
 - Example: If there are mappings for 3 voltage sensors for 'inlet_pole' then there must be exactly 3 current sensors configured, or 0 current sensors if current readings are not desired or available.
- For a given sensor type and data model element, all mappings must be OIDs or hard-coded. A mix is not permitted.

Showing Accurate Circuit Pole Positions

To show accurate circuit pole positions, add the OIDs for each pole to the custom mapping in the correct order, or hard code the circuit pole positions in the custom mapping.

Custom Dynamic Plugin Example Screenshots

This custom dynamic plugin example shows a Babel Buster SNMP gateway managing a Schneider PowerLogic PM710 standalone meter.



Edit Dynamic Plugin for Custom

Name:

Description:

Manufacturer:

Model:

Always use SNMPv1

Metadata

Circuit Breaker State OK:

Circuit Breaker State Tripped:

Outlet State On:

Outlet State Off:

Humidity Sensor Type:

Temperature Sensor Type:

Temperature Unit:

Temperature Unit (Celsius):

Temperature Unit (Fahrenheit):

Mappings

Type: Standalone Meter

PDU Name: raleigh_panel2_meter

System OID: 1.3.6.1.4.1.3815.2.2.2.1

Proxy ID: 1

Model ID: PM710

PDU Firmware: v2.36



Sensor Mappings

Object Mapping	Data Model Element	Sensor Type
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.25	circuit1	active_power
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.24	circuit1	watt_hour
HVAC Feed	circuit1	name
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.7	circuit1 circuitpole1	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.8	circuit1 circuitpole2	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.9	circuit1 circuitpole3	current
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.10	circuit1 circuitpole1	voltage

Object Mapping	Data Model Element	Sensor Type
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.11	circuit1 circuitpole2	voltage
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.2.12	circuit1 circuitpole3	voltage
A	circuit1 circuitpole1	phase
B	circuit1 circuitpole2	phase
C	circuit1 circuitpole3	phase
HVAC Feed Pole1	circuit1 circuitpole1	name
HVAC Feed Pole2	circuit1 circuitpole2	name

HVAC Feed Pole1	circuit1 circuitpole1	name
HVAC Feed Pole2	circuit1 circuitpole2	name
HVAC Feed Pole3	circuit1 circuitpole3	name
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.26	circuit1	apparent_power
1.3.6.1.4.1.3815.1.2.2.1.1.1.1.1.2.22	circuit1	power_factor

Sensor Multipliers

 Add
  Remove

Data Model Element	Sensor Type	Multiplier
circuit	active_power	100
circuit	watt_hour	1000
circuit	apparent_power	100
circuit	power_factor	0.0001
circuit_pole	current	0.1
circuit_pole	voltage	0.1

External Temperature and Humidity Sensor Mappings Example Screenshots

- ▶ If temperature and humidity sensor information is available in a single table AND there is a way to uniquely determine the type of the sensor:

If temperature and humidity information is available in a single table AND there is an OID that can be queried to determine the type of the sensor, use the generic set of external_sensor_* mappings to collect sensor data.

For example, a PX1 192.168.45.236 has environmental sensor data available in a single table called 'externalSensors'. There is an OID 'externalSensorType' that determines the type of each sensor. In this scenario, the generic set of external_sensor_* mappings can collect the environmental sensor data.

MIB for the PX1:

The screenshot shows a network management interface with a tree view on the left and a table on the right. The tree view shows the hierarchy of MIB objects under 'externalSensors', including 'externalSensorCount', 'reorderexternalSensorTableEntries', 'externalSensorTable', and 'externalSensorEntry'. The 'externalSensorEntry' is expanded to show various attributes like 'sensorID', 'externalSensorType', 'externalSensorSerialNumber', 'externalSensorName', 'externalSensorChannelNumber', 'externalSensorXCoordinate', 'externalSensorYCoordinate', 'externalSensorZCoordinate', 'externalBinarySensorSubtype', 'externalSensorUnits', 'externalSensorDecimalDigits', 'externalSensorLowerCriticalThreshold', 'externalSensorLowerWarningThreshold', 'externalSensorUpperCriticalThreshold', 'externalSensorUpperWarningThreshold', 'externalSensorHysteresis', 'externalSensorState', and 'externalSensorValue'.

Name/OID	Value	Type
externalSensorType.1	humidity (11)	Integer
externalSensorType.2	temperature (10)	Integer
externalSensorType.3	humidity (11)	Integer
externalSensorType.4	temperature (10)	Integer
externalSensorName.1	Humidity AE11B60410	OctetSt...
externalSensorName.2	Temperature AE11B60410	OctetSt...
externalSensorName.3	Humidity AE11B60409	OctetSt...
externalSensorName.4	Temperature AE11B60409	OctetSt...
externalSensorUnits.1	percent (9)	Integer
externalSensorUnits.2	degreeC (7)	Integer
externalSensorUnits.3	percent (9)	Integer
externalSensorUnits.4	degreeC (7)	Integer
externalSensorDecimalDigits.1	0	Gauge
externalSensorDecimalDigits.2	1	Gauge
externalSensorDecimalDigits.3	0	Gauge
externalSensorDecimalDigits.4	1	Gauge
externalSensorValue.1	36	Integer
externalSensorValue.2	260	Integer
externalSensorValue.3	35	Integer
externalSensorValue.4	265	Integer

Sensor Metadata and Mappings Using the PX1 MIB:

Humidity Sensor Type:	<input type="text" value="11"/>
Temperature Sensor Type:	<input type="text" value="10"/>
Temperature Unit:	<input type="text" value="C"/>
Temperature Unit (Celsius):	<input type="text" value="7"/>
Temperature Unit (Fahrenheit):	<input type="text"/>

Mappings	
PDU System OID:	<input type="text" value="1.3.6.1.4.1.13742.4"/>
PDU Model OID:	<input type="text" value="{pdu_system_oid}.1.1.12.0"/>
External Sensor Index:	<input type="text" value="{pdu_system_oid}.3.1.0"/>
Start:	<input type="text" value="1"/>
Step:	<input type="text" value="1"/>
External Sensor Type:	<input type="text" value="{pdu_system_oid}.3.3.1.2.{external_sensor_index}"/>
External Sensor Value:	<input type="text" value="{pdu_system_oid}.3.3.1.41.{external_sensor_index}"/>
Multiplier:	<input type="text" value="1"/>
External Sensor Unit:	<input type="text" value="{pdu_system_oid}.3.3.1.16.{external_sensor_index}"/>
External Sensor Scale Factor:	<input type="text" value="{pdu_system_oid}.3.3.1.17.{external_sensor_index}"/>
Add Another Mapping:	<input type="text" value="Select mapping..."/>

- ▶ **If there is no OID to determine the sensor type, but there are separate OIDs for temperature and humidity sensor values:**

When the temperature and humidity sensor information is available in a single table AND there is no OID to determine the sensor type, BUT there are separate OIDs for temperature and humidity sensor values, use the temperature_sensor_* and humidity_sensor_* mappings to collect sensor data.

For example, an APC 192.168.42.216-1 has one environmental probe that has both temperature and humidity sensors. The information is available in a single table and there are separate OIDs for temperature and humidity readings. In this scenario, the temperature_sensor_* and humidity_sensor_* mappings can collect the sensor data.

MIB for the APC:

Name/OID	Value	Type	IP
rPDU2SensorTempHumidityStatusName.1	T1H1 - temp & humidity	OctetSt...	192
rPDU2SensorTempHumidityStatusType.1	temperatureHumidity (2)	Integer	192
rPDU2SensorTempHumidityStatusTempF.1	739	Integer	192
rPDU2SensorTempHumidityStatusTempC.1	234	Integer	192
rPDU2SensorTempHumidityStatusRelativeHumidity.1	40	Integer	192

Sensor Metadata and Mappings Using the APC MIB:

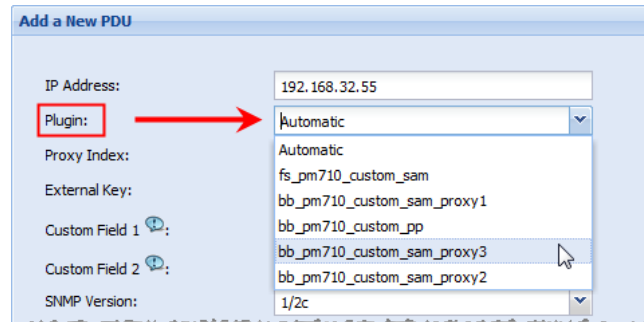
Humidity Sensor Type:	<input type="text"/>
Temperature Sensor Type:	<input type="text"/>
Temperature Unit:	F <input type="button" value="v"/>
Temperature Unit (Celsius):	<input type="text"/>
Temperature Unit (Fahrenheit):	<input type="text"/>

Mappings	
PDU System OID:	<input type="text" value="1.3.6.1.4.1.318.1.3.4.6"/>
PDU Model OID:	<input type="text" value="1.3.6.1.4.1.318.1.1.26.2.1.8.{proxy_id}"/>
Humidity Sensor Index:	<input type="text" value="1.3.6.1.4.1.318.1.1.26.10.1.0"/> <input type="button" value="⊖"/>
Start:	<input type="text" value="1"/>
Step:	<input type="text" value="1"/>
Humidity Sensor Name:	<input type="text" value="1.3.6.1.4.1.318.1.1.26.10.2.2.1.3.{external_sensor_humidity_index}"/> <input type="button" value="⊖"/>
Humidity Sensor Value:	<input type="text" value="1.3.6.1.4.1.318.1.1.26.10.2.2.1.10.{external_sensor_humidity_index}"/> <input type="button" value="⊖"/>
Multiplier:	<input type="text" value="1"/>
Temperature Sensor Index:	<input type="text" value="1.3.6.1.4.1.318.1.1.26.10.1.0"/> <input type="button" value="⊖"/>
Start:	<input type="text" value="1"/>
Step:	<input type="text" value="1"/>
Temperature Sensor Name:	<input type="text" value="1.3.6.1.4.1.318.1.1.26.10.2.2.1.3.{external_sensor_temperature_ind}"/> <input type="button" value="⊖"/>
Temperature Sensor Value:	<input type="text" value="1.3.6.1.4.1.318.1.1.26.10.2.2.1.7.{external_sensor_temperature_ind}"/> <input type="button" value="⊖"/>
Multiplier:	<input type="text" value="0.1"/>

Adding PDUs with Custom Dynamic Plugins

When adding a PDU that uses a custom dynamic plugin, use the same Add a PDU feature as any other addition. See **Adding PDUs to Power IQ Management** (on page 20).

When Power IQ detects that there is at least one custom dynamic plugin configured, a Plugin drop-down field displays.



- Automatic: Use Automatic to allow Power IQ to determine the correct plugin for the PDU you are adding. Automatic attempts to find an exact match between the PDU and the plugin for SysObjectID, PDU Model name, and Proxy ID.
 - If there is no exact match, but several dynamic plugins are eligible to manage the PDU, based on sysObjectID, then Power IQ selects from among the eligible plugins. If automatic mode does not select the desired dynamic plugin, delete the PDU and add it again, selecting the specific custom dynamic plugin from the list.
- Or, select the specific custom dynamic plugin from the list.

Check PDUs Added with Dynamic Plugins

After you add a PDU using a dynamic plugin, you should check the data collected to verify accuracy.

► To check PDUs added with dynamic plugins:

1. In the PDUs tab, click the PDU link. The PDU details page opens.
2. Examine the page to verify that all the data you created mappings for is available. If you do not see data you expected, check your mappings.
3. Check power measurement values to make sure that multipliers were entered correctly.
4. If you see issues, check all mappings and the log file to troubleshoot.

▶ **To access the dynamic plugins log:**

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.
2. Click View Log.

View PDUs Using a Dynamic Plugin

When a dynamic plugin is in use, you can view the PDUs that are associated with it.

▶ **To view PDUs using a dynamic plugin:**

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.
2. All dynamic plugins display in a list. In the PDU Count column, the number link shows how many PDUs use this dynamic plugin. Click the link to view a list of the PDUs associated with the plugin.

Troubleshooting Dynamic Plugins

For each scenario, check the Dynamic Plugin Log file to help troubleshoot errors.

► Add PDU fails with error "Unmanageable", or PDU connectivity is "Unmanageable":

The wrong PDU System OID, or the wrong PDU Model OID is specified in the dynamic plugin.

- Dynamic Plugin Log file excerpt sample when PDU System OID is wrong:

```
2011-05-12 13:44:40,394 INFO
[DiscoverTask-192.168.100.100] PduDiscovery:
supportsSystemObjectId: target
sysObjectId=1.3.6.1.4.1.13742.4
```

```
2011-05-12 13:44:40,450 INFO
[DiscoverTask-192.168.100.100] PduDiscovery:
supportsSystemObjectId: no dynamic plugin capable of
managing PDU w/ sysObjectID 1.3.6.1.4.1.13742.4
```

- Dynamic Plugin Log file excerpt sample when PDU Model OID is wrong:

```
2011-05-12 12:23:36,836 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.1.120.0,
```

```
2011-05-12 12:23:36,836 WARN
[DiscoverTask-192.168.100.100] PduDiscovery:
getModelName: failed to retrieve model name
```

```
2011-05-12 12:23:36,837 INFO
[DiscoverTask-192.168.100.100] PduDiscovery: discover:
Model Name not Found
```

► Information on PDU details page is wrong or missing:

If adding the PDU is successful, but information on the PDU details page is missing or wrong, an incorrect OID for outlet active power may be specified in the dynamic plugin, for example.

- Dynamic Plugin Log file excerpt sample when Outlet Active Power is wrong:

```
2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.1,
```

```

2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.2,

2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.3,

2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.4,

2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.5,

2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.6,

2011-05-12 14:14:24,647 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.7,

2011-05-12 14:14:24,648 INFO
[DefaultUDPTransportMapping_127.0.0.1/0] SnmpUtils:
onResponse: got an exception varbind for oid
1.3.6.1.4.1.13742.4.1.2.2.1.56.8,

2011-05-12 14:14:24,648 WARN [PollScheduler
Scheduler-10 Pool-fiber09] SnmpOutletCollector: collect:
failed to retrieve data for mapping symbol
'outlet_active_power'

```

► **Add PDU fails with error "Application Error" or PDU connectivity is "Application Error":**

The dynamic plugin encountered an unexpected error that it cannot recover from while attempting to add the PDU to Power IQ. The PDU health shows as Critical in this case, if the PDU is added.

When the PDU state is "Application Error", this may indicate that one or more index mappings is failing to resolve. Check the dynamic plugin log output for mapping resolution errors.

When to Delete and Rediscover a PDU Using a Dynamic Plugin

Certain changes, either to a PDU, or to a plugin, may require you to delete and rediscover the PDU.

- Change mapping and PDU enters "Application Error" state.
- Change mapping and the new mapping is not reflected in the PDU's details or smart page. For example, changes to multiplier, sensor unit, number of circuit poles.

Troubleshooting Dynamic Plugin Trap Mapping

▶ **Problem: An incoming trap is mapped to the wrong event in Power IQ:**

When mapping an incoming SNMP trap to a dynamic plugin trap mapping, Power IQ always takes the FIRST possible match. The dynamic plugin UI will attempt to alert a plugin author of duplicate trap mappings but it is possible for the author to configure multiple trap mappings that match a particular trap. This may occur when OID wildcards (*) are used.

To resolve, verify that the trap mappings are unique with the plugin.

▶ **Problem: In a custom dynamic plugin with proxied PDUs, such as in a Babel Buster gateway scenario, an incoming trap is associated to the wrong PDU:**

The incoming trap will have the IP address of the proxy and Power IQ must determine which of the proxied PDUs the trap is actually for. Power IQ iterates through each of the custom plugin's trap mappings used to manage the proxied PDUs and will take the FIRST possible match.

To resolve, verify that the configured trap mappings are unique across each of the proxy's custom plugins.

▶ **Problem: The event summary text for a particular event on the event listing or event details is not available:**

Check the dynamic plugin to determine if the relevant trap mapping has been modified or deleted. Either scenario will prevent Power IQ from generating the desired event summary text when requested.

SNMP Gateways and Custom Dynamic Plugins

The custom dynamic plugin works with SNMP-gateway devices to convert other protocols, such as Modbus or Bacnet, to SNMP. The SNMP gateway allows you to get the information you need to monitor an intelligent power device that does not have an SNMP agent. Examples of SNMP gateways include Control Solutions Babel Buster SPX and FieldServer DCC1075 gateways.

For example, Modbus can communicate data about your PDU. Each piece of data has a 16-bit integer register, and each register has an address. A Modbus register address is similar to an SNMP OID. Each uniquely identifies a data point.

A SNMP-gateway works with Modbus devices in a serial master-slave setup. The gateway device polls the slave devices, reads the register data back, and stores it into the gateway device. The gateway makes the register data available as SNMP OIDs.

Configuring the SNMP Gateway

Configuring your SNMP gateway device to prepare for creating a custom dynamic plugin should include:

- Getting the Modbus register list for the PDU you want to monitor from the PDU manufacturer.
- Configuring the gateway with the necessary registers to allow for data collection. This may include mappings for line to line voltages, active power, apparent power, power factor, pole current, and other types supported by Power IQ.
- Using your gateway to convert the registers to SNMP OIDs.
- Understanding the units that each data point is reported in. The register list will specify the scaling factor for each value. For example, watts or kilowatts, degrees or degrees multiplied by 100.

Import and Export Plugin Files

Once you have created a dynamic plugin, you can export it to a .JSON file. Use the file to share the plugin with another Power IQ installation, by importing it there. Or, use the file as a template to edit to create other dynamic plugins, and re-import.

► To export a plugin file:

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.
2. The list of dynamic plugins displays. Click Download on the plugin you want to export.
3. Open or save the file.

► **To import a plugin file:**

Only .JSON files can be imported.

1. In the Settings tab, click Dynamic Plugins in the Appliance Administration section.
2. Click Import, then click Browse and select the .JSON file. Click Import.
3. When the file imports, it displays in the list.

Set Phase Labels for Circuit Pole Phase

Specify how circuit pole phases are labeled in Power IQ.

► **To set phase labels for circuit pole phase:**

1. In the Settings tab, click Application Settings in the Appliance Administration section.
2. In the Language and Locale Settings, select your Phase Label preference.
 - A, B, C
 - L1, L2, L3
 - X, Y, Z
 - 1, 2, 3
3. Click Save Locale Settings.

Set Fahrenheit or Celsius Temperature

Specify your system temperature unit to Fahrenheit or Celsius. This setting is used wherever temperatures are shown in Power IQ.

► **To display temperatures in Fahrenheit or Celsius:**

Temperature settings are global in Power IQ.

1. In the Settings tab, click Application Settings in the Appliance Administration section.
2. In the Language and Locale Settings, set Temperature Unit to Celsius or Fahrenheit.
3. Click Save Locale Settings.

Chapter 19 Upgrading Raritan PX and EMX

Upgrading Raritan PX PDUs or Raritan EMX devices managed by Power IQ consists of three steps.

- Uploading firmware to Power IQ
- Creating an upgrade plan to distribute the firmware to the units.
- Executing the plan.

You can use the plans immediately or save them for later.

Warning: Never downgrade a PX to a lower version number. Downgrading causes damage to the PDU.

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Plan a New Upgrade

Bulk upgrade plans are only applicable to Raritan PX PDUs and Raritan EMX units.

When adding any PDU in a port forwarding configuration, it is NOT required to add all PDUs in the chain to the upgrade plan.

If the plan includes all PDUs in a port forwarding configuration, Power IQ automatically orders them so that the slave PDU is upgraded first and then the master PDU. This order is to prevent the slave PDU from losing communications with Power IQ due to the master PDU's reset during the upgrade process. It is recommended to put all PDUs into maintenance mode to prevent any PDU from entering communication lost state during the upgrade. See **Maintenance Mode** (on page 343).

Note: If a slave PDU is polled when the master PDU resets, the slave PDU shows the communication lost state. Restart the poller in Settings > Appliance Administration > Restart Poller.

Appropriate firmware versions for supporting the port forwarding configuration are available in the *USB-Cascading Solution Guide*, which can be downloaded from the **PX2 web page** (<http://www.raritan.com/support/product/px2/>) of the Raritan website

► **To plan a new upgrade:**

1. In the PDUs tab, choose Activities > Upgrade firmware.
2. Choose Activities > Plan a new upgrade. The upgrade planning wizard starts.
3. Enter a name for the plan and click Continue.
4. A summary of plan options appears at the top of the page. Continue adding details of your upgrade plan at the bottom of the page, or click the links in the summary list to add details.
5. In the Choose Firmware Version section, you can add a new firmware file or select a previously uploaded firmware file. Firmware files are .BIN files. If the file is zipped, unzip and upload the .BIN file.
 - To add a new file, click the Upload a New File tab, then click Browse to select the file. Enter comments. Click Upload. The file is automatically selected for the plan.
 - To select a previously uploaded file, click the Available Files tab, then select a file from the list, and click Continue.
6. All PX PDUs available for the upgrade appear in a list. Select the checkboxes for the PDUs you want to upgrade, then click Selected PDUs to add them to the "PDUs selected to this upgrade" list at the bottom of the page. Or, click All PDUs to add all available PX PDUs to the list.

- To remove PDUs from the plan, click Selected PDUs or All PDUs in the bottom list. Only PDUs in the bottom list will be upgraded.
- 7. Click Continue. Click the Plan Options link in the summary at top.
- 8. On the Plan Options page, edit the plan name, if needed, and set other preferences.
 - a. Select the "Abort on failure" checkbox if you want Power IQ to cancel all remaining upgrades in the plan if an upgrade failure occurs. This could help prevent an upgrade problem from affecting other PDUs in the plan.
 - b. Select the "Allow simultaneous rollouts" checkbox if you want Power IQ to upgrade the firmware of multiple Raritan PX PDUs at once. This makes batch upgrades faster by allowing up to 25 upgrades to run at the same time.
- 9. Click Continue. Review the summary of the plan. Click Add Comment if you want add notes to the plan. Click Add or Remove PDUs if you want to edit the list of PDUs to upgrade.
- 10. Click Save. The completed plan summary page opens.
- 11. Click Start Upgrade to execute the plan immediately. The upgrade starts, and the status page displays. You can also execute the saved plan later. See **Execute a Saved Upgrade Plan** (on page 340).
 - See **View Status of Upgrade Plans in Progress** (on page 341) for details on checking upgrades in progress.
 - See **View Completed Upgrade Plans** (on page 341) for details on checking completed upgrades.

View Saved Upgrade Plans

View saved upgrade plans to verify and edit their details before executing a plan.

► **To view saved upgrade plans:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click "View saved plans." All plans display in a list.
3. Click the Plan name link to view the details and edit if needed.

Edit a Saved Upgrade Plan

Saved upgrade plans can be edited to change details, add or remove PDUs, or change the firmware version.

You can only edit upgrade plans that you created.

► **To edit a saved upgrade plan:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click "View saved plans." All plans display in a list.
3. Click the Plan name's link to view the details.
4. Click the blue links in the plan summary to edit the plan. Or, scroll down to click Edit and use the wizard to edit.

See **Plan a New Upgrade** (on page 338) for details of plan settings.

Execute a Saved Upgrade Plan

Once a plan is saved, execute it to start the upgrade process.

If the plan includes all PDUs in a port forwarding configuration, Power IQ automatically orders them so that the slave PDU is upgraded first and then the master PDU. This order is to prevent the slave PDU from losing communications with Power IQ due to the master PDU's reset during the upgrade process. It is recommended to put all PDUs into maintenance mode to prevent any PDU from entering communication lost state during the upgrade. See **Maintenance Mode** (on page 343).

Note: If a slave PDU is polled when the master PDU resets, the slave PDU shows the communication lost state. Restart the poller in Settings > Appliance Administration > Restart Poller.

► **To execute an upgrade plan:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click "View saved plans." All plans display in a list.
3. Click the Plan name link for the plan you want to execute.
4. Click Start Upgrade to execute the plan.
 - See **View Status of Upgrade Plans in Progress** (on page 341) for details on checking upgrades in progress.
 - See **View Completed Upgrade Plans** (on page 341) for details on checking completed upgrades.

Upgrade Timing

Each PX PDU upgrade takes approximately 5-10 minutes.

If you select "Allow simultaneous rollouts" in the plan options, 25 upgrades will begin simultaneously, and each batch of 25 will take approximately 10 minutes.

View Status of Upgrade Plans in Progress

Upgrade plans in progress have 3 possible statuses.

- Init: Rebooting the PDU
- Login: Logging in to the PDU
- Verify: Verifying the new firmware version on the PDU

► **To view status of upgrade plans in progress:**

The status page for plans in progress displays when you execute the plan. You can return to the status page at any time, even after the plan has finished.

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click "View saved plans." All saved plans display in a list.
3. Click the Status link for the plan you executed to view the status page.

View Completed Upgrade Plans

When a plan has been executed, you can view details of the plan status and results of each PDU included in the plan.

► **To view completed upgrades:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click "View previously completed upgrades." All completed plans display in a list.
3. Click the Plan name link to view the details.
 - If the plan completed successfully, a success message displays at the top of the plan details.
 - The list of PDUs included in the plan includes a Success or Failure message.
 - Click the "View detailed upgrade status messages" link for more information about each PDU.

Manage Firmware Versions

You can upload different versions of firmware for use in upgrade plans, and view previously uploaded firmware.

Firmware files are .BIN files. You can download firmware versions from the Raritan website, in the Support section. If the file is zipped, unzip and use only the .BIN file.

▶ **To view uploaded firmware versions:**

1. In the PDUs tab, choose Activities > Upgrade Firmware.
2. Click Manage Firmware Versions. This link is not available if you do not have any uploaded firmware files. The Manage Firmware Versions page opens.
3. All firmware versions previously uploaded appear in a list.

▶ **To delete a firmware version:**

- Select the checkbox for the firmware version you want to delete, then click Delete.

▶ **To upload a new firmware version:**

1. Scroll down to the Upload New Firmware File section.
2. Click Browse to select the .BIN file.
3. Enter comments in the Comment box.
4. Click Upload. The file is added to the list and will be available to select when creating a new upgrade plan. See **Plan a New Upgrade** (on page 338).

Chapter 20 **Managing Removed or Out of Service Objects**

Once an object is physically removed, replaced, or being maintained, you can mark it as removed or out of service rather than deleting it from Power IQ so that its historic data remains available in Power IQ.

Power IQ does not poll an object that is marked as removed or out of service.

An object can be a PDU, device or sensor.

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Available Setting Options

Power IQ provides two options for marking a PDU that is not in service: Maintenance Mode and Decommissioned. If both options are enabled for a PDU, that PDU is considered decommissioned.

You can set any PDU in the USB-cascading configuration to the maintenance mode or decommission it.

For devices and sensors, only the decommissioning option is available. They do not have the maintenance mode option in Power IQ.

Maintenance Mode

Maintenance mode applies to PDUs only. Use this mode when a PDU is out of service due to maintenance.

A PDU in maintenance mode is not polled and its traps are not acknowledged. This mode is helpful for preventing a PDU from generating connectivity loss events in Power IQ.

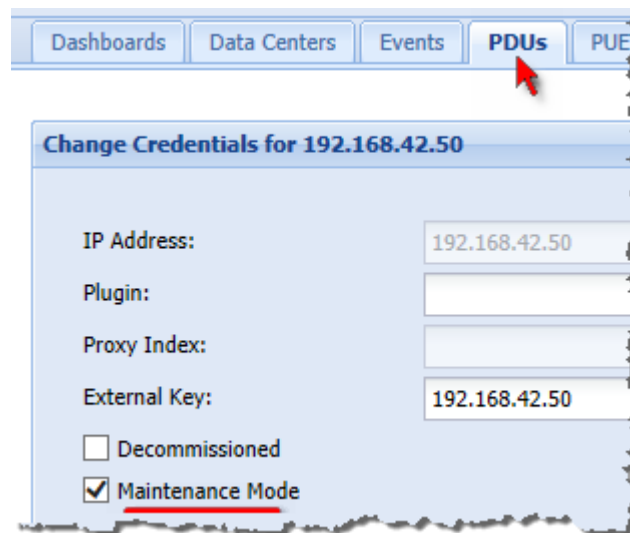
You still can upgrade the PDU's firmware and change the configuration while in maintenance mode. Historic data for PDUs in maintenance mode is included in tabular reports.

Enable the Maintenance Mode

Before performing any maintenance task, such as firmware upgrade, set the PDU to the maintenance mode. After the maintenance task is completed, disable the maintenance mode.

► **To enable the maintenance mode:**

1. In the PDUs tab, click a PDU link to open the PDU Details.
2. Choose Actions > Edit.
3. Select the Maintenance Mode checkbox.



*Note: If you also select the Decommissioned checkbox, the PDU is considered decommissioned instead of being in the maintenance mode. See **Decommissioning an Object** (on page 346).*

4. Click Save.



Identify a Maintenance Mode PDU

The Details section of the rack PDU smart view indicates the maintenance mode.

► **To check a PDU's mode:**

1. In the PDUs tab, click the PDU link.

- Examine the Health field of the Details section.

Details	
Type	Rack PDU
IP Address	192.168.42.50
External Key	192.168.42.50
Maintenance Mode:	true
Name	px130lab0501
Manufacturer	Raritan
Model	DPCS20-20
Firmware	1.5.5-10603
Contact	Brian Weaver
Location	Rack 5
Serial Number	ADA8600063
Rated Voltage	120V
Rated Current	20.00A
Rated VA	1.9kVA
Test 1	Finance
Custom Field 2	John Doe
SNMP Version	1/2c
Belongs to	 Rack A6
Health	<p>Connectivity: In Maintenance Mode </p> <p>This indicates that the PDU is in maintenance mode. It is not being polled and no traps from this PDU will be acknowledged.</p> <p>Active events: Warning Admin credentials invalid (warning)</p>

Decommissioning an Object

You can decommission PDUs, devices and sensors. Decommission an object when you physically remove, replace or hot swap it with another one.

► Decommissioned PDUs:

After a PDU is decommissioned, Power IQ stops polling it, and it does not receive this PDU's traps or events.

A decommissioned PDU's historical data remains to be included in the tabular report or PUE search, and its configuration data can be changed.

All but not limited to the following features are prevented on a decommissioned PDU.

- No Polling
- No rescanning
- No reception of traps or events associated with the decommissioned PDU
- No power control through the decommissioned PDU

Note: Power control on the IT devices mapped to the outlets of the decommissioned PDU must be performed through a newly commissioned PDU which replaces the decommissioned one and is associated with the IT devices.

- All associated sensors become decommissioned and no longer display in the rack PDU smart view
- No firmware upgrade

► Decommissioned devices:

Configuration can be changed but no power control permitted for a decommissioned device.

► Decommissioned sensors:

Configuration data is visible but cannot be changed. All sensor historical data is lost. Besides, decommissioned sensors no longer display in the rack PDU smart view.

Decommission a PDU

You can decommission a PDU and then add a new one to replace it by using the same IP address. The replacement PDU can be a different model. See **Add a Replacement PDU** (on page 348).

If you are using the dcTrack integration which does not support decommissioned PDUs, you have to modify the decommissioned PDU's external key, which by default is the IP address.

After decommissioning a PDU, all sensors associated with it also get decommissioned.

► To decommission a PDU:

1. In the PDUs tab, click a PDU link to open the PDU Details.
2. Choose Actions > Edit.
3. Modify the External Key field to make it different from the IP address. This is required if you are using the dcTrack integration which does not support decommissioned PDUs.
4. Select the Decommissioned checkbox.

The screenshot shows a web interface with a navigation bar containing 'Dashboards', 'Data Centers', 'Events', 'PDU's, and 'PUE'. The 'PDU's' tab is active, indicated by a red arrow. Below the navigation bar is a form titled 'Change Credentials for 192.168.42.50'. The form contains the following fields and options:

IP Address:	192.168.42.50
Plugin:	
Proxy Index:	
External Key:	192.168.42.50
<input checked="" type="checkbox"/> Decommissioned	
<input type="checkbox"/> Maintenance Mode	

5. Click Save.

Do all of the following when using a newly commissioned PDU to replace a decommissioned one:

- Assign the IP address used by the decommissioned PDU to the new PDU.
- Manually associate the new PDU with the original parent object of the decommissioned PDU, such as the rack.
- Manually associate outlets of the new PDU with all IT devices. Outlet associations of the new PDU can be different from the outlet associations of the decommissioned PDU, and it is NOT required to remove old outlet associations.
- Manually add mappings for IT devices connected to the new PDU in the EDM.

Decommission a Device

1. In the Devices tab, click the IT device name link in the Devices tab to go to the IT device page in the Data Centers tab. The EDM expands to show the IT device.
2. Select the Decommissioned checkbox.

IT Device

Name: SMTP server, outlet 6

Customer:

IP Address:

Device type:

Power rating (Watts/VA):

External Key: IT Device -- 3688

An external key is a unique identifier of this object that is used for exporting enterprise relationships through a CSV file.

Asset Tag Id:

Decommissioned?:

Power Cycle

3. Click Save.

Decommission a Sensor

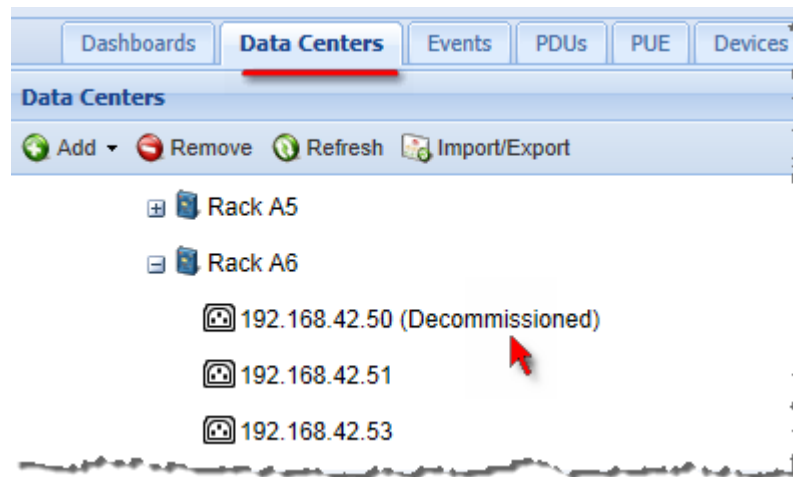
There are two ways to decommission a sensor:

- Physically disconnect a sensor from the PDU.
- Decommission the PDU with which the sensor is associated.

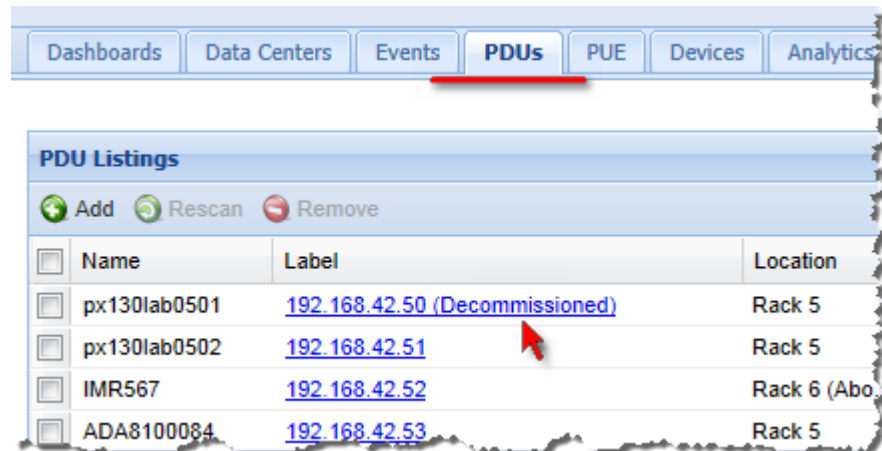
Identify a Decommissioned PDU

After decommissioning a PDU, it is marked as decommissioned everywhere throughout Power IQ. The following are a few illustrations.

► In the Data Centers tab:



► In the PDUs tab:



► In the Rack smart view:

IT Devices			
Power Control ▾			
<input type="checkbox"/> PDU Element	Trend	A...	
<input checked="" type="checkbox"/> Big Bertha		0 W	
<input type="checkbox"/> 192.168.42.50 (Decommissioned)...	N/A	N...	
<input type="checkbox"/> 192.168.42.51 18 (big bertha)	N/A	N...	
<input checked="" type="checkbox"/> EPIQ1		0 W	

PDU Elements			
Power Control ▾			
<input type="checkbox"/> PDU Element	Trend	Act...	
<input checked="" type="checkbox"/> 192.168.42.50 (Decommissioned)		0 W	
<input type="checkbox"/> Outlet 1 (nerve120)	N/A	N/A	
<input type="checkbox"/> Outlet 2 (honeypot-10-128)	N/A	N/A	
<input type="checkbox"/> Outlet 3 (nerve124)	N/A	N/A	

Identify a Decommissioned Device

Unlike decommissioned PDUs, a decommissioned device is *not* marked as decommissioned. There are two ways to identify a decommissioned device.

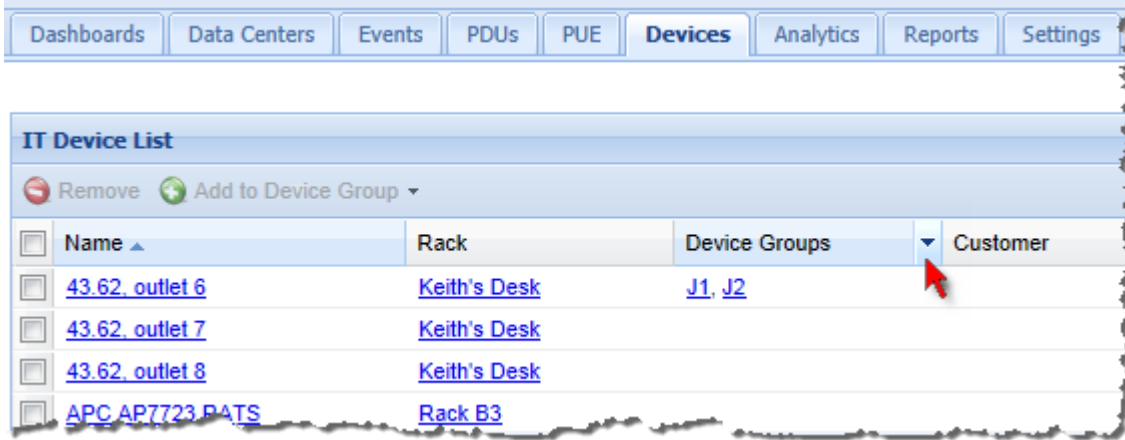
► In the Data Centers tab:

1. Select the IT device to open the IT device page.
2. Examine whether the Decommissioned checkbox has been selected. For details, see **Decommission a Device** (on page 348).

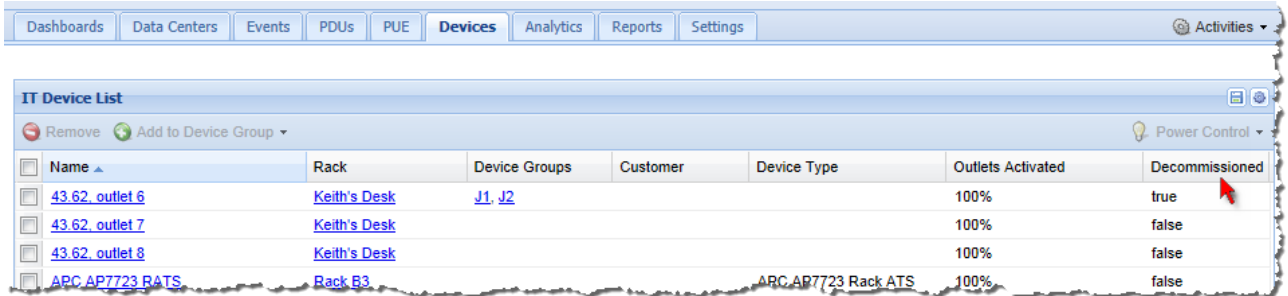
► In the Devices tab:

1. Make the Decommissioned column visible in this tab.

- a. To display the Decommissioned column, move the mouse pointer to any column header, and click the arrow which appears in the column header.



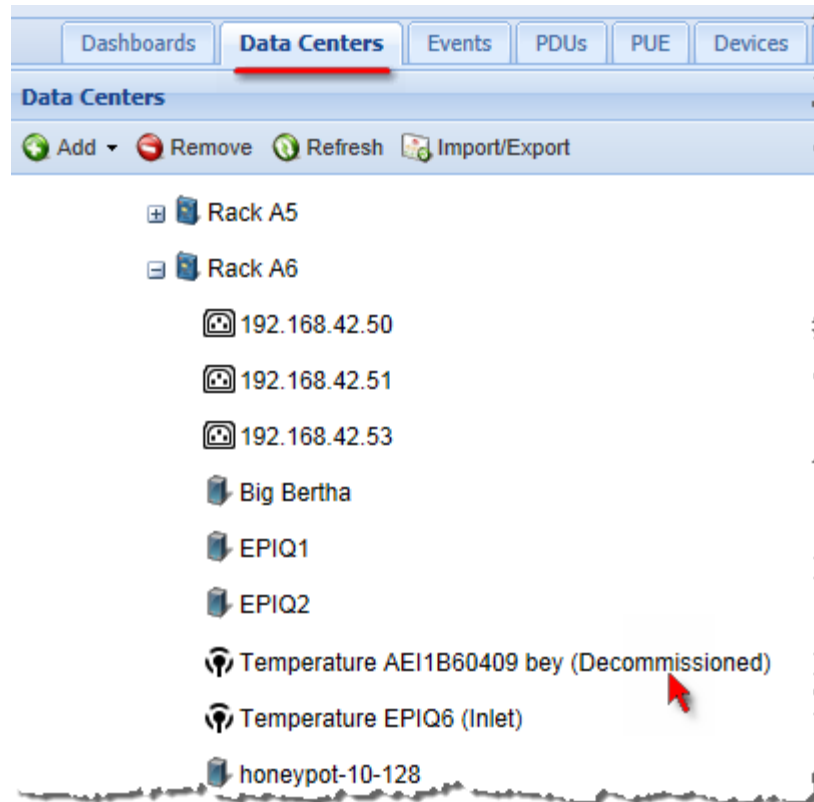
- b. Click the Columns, and select the Decommissioned checkbox. The Decommissioned column then displays.
2. Examine the value shown in the Decommissioned column.
 - true: Decommissioned.
 - false: Commissioned.



Identify a Decommissioned Sensor

A decommissioned sensor is marked as decommissioned in Power IQ, and it is no longer associated with its original PDU.

► **In the Data Centers tab:**



Chapter 21 Support and Licensing

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Support Connections

A support connection allows Raritan technical support to access your Power IQ to diagnose a problem.

You should open a support connection only when Raritan technical support requests one.

Prerequisites for Support Connections

1. The Power IQ device must be able to use DNS to resolve `poweriq-access.raritan.com`. The DNS server must be able to do name resolution for external host names.
2. The Power IQ device must be able to make an outbound HTTPS request on port 443 to `poweriq-access.raritan.com`. You may have to require your firewall to allow this connection.
3. The Power IQ device must be able to make an outbound SSH request on port 22 to `poweriq-access.raritan.com`. You may have to require your firewall to allow this connection.

Create a Support Connection

Make sure your Power IQ device meets the prerequisites before creating a support connection. See ***Prerequisites for Support Connections*** (on page 353).

► **To create a support connection:**

1. In the Settings tab, click Get Support in the Appliance Services section.
2. Click Start. A log appears.
3. Make sure the final line of the log includes this text: `support connection initialization complete`.

4. Contact Raritan Technical Support with your Appliance ID number. The Appliance ID number is on the Settings tab, in the Appliance Information section. For example: e3b123f8-669e-4007-97bf-ca9d85c431f8. Raritan Technical Support uses his number to identify your support connection.

Stop a Support Connection

Once Raritan technical support has finished using the support connection, you can stop it. Stopping the support connection will close the SSH connection from your Power IQ device to `poweriq-access.raritan.com`.

▶ **Stop a support connection:**

1. In the Settings tab, click Get Support in the Appliance Services section.
2. Click Stop.

Save Support Logs

If you have trouble creating a support connection, the support logs may help Technical Support find the problem.

▶ **To save support logs:**

1. In the Settings tab, click Get Support in the Appliance Services section.
2. Choose Activities > Download All System Logs.
3. Click Save, then save the file using the dialog that appears.

Enable or Disable the Root Accounts for Support

Power IQ has "root" and "sudoroot" user accounts in place for Raritan use when supporting the product. You may be asked to access the console as the "config" user to enable these accounts during the support process. You cannot change the passwords for these accounts. When disabled, there is no external access to the system using those accounts.

New installations of Power IQ have these accounts disabled by default. Upgrading will not change the enable/disable status of these accounts.

Licensing

Power IQ requires a license. Licenses allow you to add a certain number of rack PDUs and facilities objects to Power IQ. You may need more than one license file to be allowed to add your full number of PDUs.

View Licenses

The licenses that you have uploaded to Power IQ are available to view.

▶ To view licenses:

1. If you have not already done so, get a Power IQ license file by contacting Raritan Customer Support.
 2. In the Web Client, click Admin > Appliance Settings. The Settings window opens.
 3. Click Product Licensing in the Application Administration panel.
 4. Click Add in the Licenses section.
- Use the browse function to locate and add the license file. The Licenses list contains all license files that you have uploaded to Power IQ.

Feature	The feature that is allowed by this license.
Type	Initial: A required license to activate Power IQ and set the initial PDU capacity allowed. Incremental: A secondary license type that allows you to add to the initial license's PDU capacity.
Count	The number of PDUs that you can add to Power IQ under this license.
Licensee	Your company name.

▶ To view licensing summary:

- Licensing Summary contains information about how many PDUs your combined licenses allow you to add to Power IQ.

Customer Name	Your company name.
PDU License Capacity	The total number of PDUs allowed by all your licenses.
PDU Licenses Available	The number of PDUs remaining that you are allowed to add.

Add a License File

If this is your first time logging in and you need to add a license file, see **Connecting to Power IQ** (on page 6). Once you add a license file and log in for the first time, you can follow the instructions in this topic to add or remove license files as needed.

► **To add a license file:**

1. If you have not already done so, get a Power IQ license file by contacting Raritan Customer Support.
2. In the Web Client, click Admin > Appliance Settings. The Settings window opens.
3. Click Product Licensing in the Application Administration panel.
4. Click Add in the Licenses section.
5. Use the browse function to locate and add the license file.

Licenses are .LIC files. Repeat this step to add incremental licenses if needed.

Note: Your license file can be retrieved from the Raritan web site after you have activated your registration. To activate your registration, click the link in the "Thank you for registering" email from Raritan and create your user account. Once you create your account, look for a "Your Raritan software license key is available" email containing a link to your license file download page.

6. If you see error messages AND you're unable to use Power IQ or to add the total licensed number of PDUs, contact Raritan Technical Support. There may be a problem with your license file.

License Count Rules for Rack PDUs and Facilities Objects

Your license count defines how many rack PDUs you can add to Power IQ under your purchased license.

Different types of facility objects count against your license count at higher rates.

CRAC	5
Floor PDU	5
Floor UPS	5
Power Panel	5
Standalone Meter	1

Appendix A ODBC Access

Power IQ's ODBC interface allows ODBC compliant applications access to the power data of managed devices. For example, an ODBC compliant reporting application like Crystal Reports can access Power IQ data to create customized reports.

- The Power IQ ODBC server listens on TCP Port 5432
- Roll-up tables summarize data over one hour, twenty four hours, and one month. Upon summarization, detailed readings are purged. For example, when you create a daily roll-up, the hourly poll data is purged from the database. You can configure the data retention settings. See **Configuring Data Rollup Retention** (on page 127).
- Power IQ ODBC Interface is backed by an PostgreSQL database.

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Configuring ODBC Access to Power IQ

Specify the IP addresses that you authorize to make connections to the database.

► **To enable ODBC access to Power IQ:**

1. Click Settings.
2. Click ODBC Access in the Data Management section. The ODBC Access page opens.
3. Click Add, then double-click the 0.0.0.0/0 addresses to enter edit mode and type the ODBC network address with the mask in CIDR format.
 - CIDR format example: 192.168.43.0/24 instead of 192.168.43.0 and 255.255.255.0.
 - Use the network mask value to specify a single address or a range of addresses.
 - Use the default value 0.0.0.0/0 to allow access from all IP addresses.

4. Repeat to add new addresses as needed. Select an address and click Remove to remove authorization from the address.
5. Click Save when all authorized addresses have been added. The Power IQ database restarts.

After the restart, ODBC compliant applications are allowed to access the database from the authorized IP addresses.

Configuring ODBC User Credentials

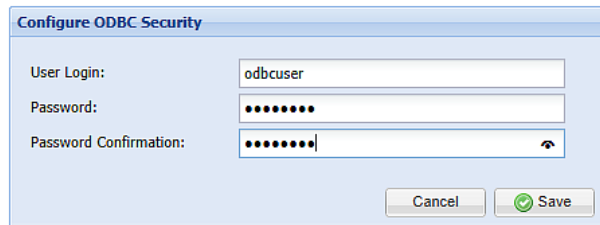
Factory default user credentials for ODBC access in Power IQ are:

- Username: odbcuser
- Password: raritan

The ODBC user credentials can be customized as needed. After ODBC user credentials are modified, you must also change the user credentials entered in the ODBC Client and driver.

► **To change the ODBC user credentials:**

1. Click Settings.
2. Click ODBC Access in the Data Management section. The ODBC Access page opens.
3. In the Configure ODBC Security section, type the user name and password intended for ODBC authentication.



The screenshot shows a dialog box titled "Configure ODBC Security". It has three input fields: "User Login" containing "odbcuser", "Password" containing seven dots, and "Password Confirmation" containing seven dots and a small circular arrow icon. At the bottom right, there are two buttons: "Cancel" and "Save".

*Note: For restrictions that apply to the ODBC user credentials, see **Restrictions of ODBC User Credentials** (on page 359).*

4. Click Save.

Restrictions of ODBC User Credentials

The ODBC user name is NOT subject to the restrictions applied to a Power IQ user name.

Certain restrictions apply to the ODBC user name and password.

▶ **ODBC user name:**

- Support 1 to 63 characters long
- Consist of alphanumeric characters and/or underscores only, including 0 to 9, a to z, and _
- No number used for the first character
- No uppercase alphabets contained
- No support for multi-byte characters
- No use of certain names, such as *public*, *postgres*, *raritan*, *odbc* and *floormaps*

▶ **ODBC password:**

- The password must follow the requirements selected in Settings > Password Requirements. See **Configuring Password Requirements** (on page 123).

ODBC Client Configuration

1. ODBC Client must install and configure a suitable PostgreSQL driver. PostgreSQL drivers are available at <http://www.postgresql.org/ftp/odbc/versions/msi/>.
2. ODBC Client must configure Power IQ as a ODBC Data Source with the following credentials:

Database Name	raritan
User ID and Password	Same as the ODBC user credentials specified in Power IQ*
Port Number	5432
Server	Power IQ IP Address

* For information on ODBC user credentials, see **Configuring ODBC User Credentials** (on page 358).

Timezone Configuration for ODBC Data

ODBC tables use the Power IQ® system time setting, which is EST/EDT. This setting is converted to your selected timezone when you are using the Power IQ web interface, but this conversion is not applied to ODBC connections.

The time data available via the ODBC connection can be changed on a per session basis. By using a specific SQL statement to adjust the client session, you can run reports and view information in the desired timezone.

This link contains documentation on setting the timezone for the database using an SQL statement. Use the "SET SESSION" syntax, because Power IQ ODBC users do not have super user privileges.

<http://www.postgresql.org/docs/9.2/static/sql-set.html>

Advanced Reporting with Database and Reporting Programs

Create advanced reports and charts with reporting programs such as SQL report writer, Crystal Reports®, and Microsoft Access®. Follow these instructions to use Microsoft Access.

ODBC Access must be enabled. See **Configuring ODBC Access to Power IQ** (on page 357).

You must install a PostgreSQL driver first. See **Install and Configure a PostgreSQL Driver**

Install and Configure a PostgreSQL Driver

You must install and configure a PostgreSQL driver before you can use Microsoft® Access® to create table reports of your Power IQ™ data.

► **To install and configure a PostgreSQL driver:**

1. Configure Power IQ to allow ODBC access from your client IP address. See **Configuring ODBC Access to Power IQ** (on page 357).
2. Go to <http://www.postgresql.org/ftp/odbc/versions/msi/> and download the latest driver .ZIP file. Run the .MSI file contained in the .ZIP to install the driver on your client.
3. Go to Control Panel > Administrative Tools > Data Sources (ODBC).
4. Click Add then select the driver, PostgreSQL Unicode, and click Finish.
5. In the dialog that appears, enter the Power IQ database information:
 - Database: raritan

- Server: Power IQ IP address
- Description: Enter a name for this data source
- SSL Mode: disable
- Port: 5432
- User Name and Password: Same as the ODBC user credentials specified in Power IQ*

* For information on ODBC user credentials, see **Configuring ODBC User Credentials** (on page 358).

6. Click Test. If the test is successful, click Save.
7. Click OK.

Link Database Tables in Microsoft® Access®

Use Microsoft Access to create links between the Power IQ database tables you want to query. See **Correlated Fields in ODBC Tables** (on page 362) for details on which Power IQ tables can be linked.

These instructions refer to Access 2003. Other versions may vary.

► To link database tables in Microsoft Access:

Note: You only have to link database tables once in Microsoft Access, and the links are retained. You do not have to repeat this task each time you want to create queries or run reports.

1. Choose File > New then select Blank Database.
2. Name the file and click Create.
3. In the dialog that appears, Tables is selected by default in the Object list. Click New.
4. Select Link Table and click OK.
5. In the dialog that appears, select ODBC Databases in the "Files of type" list.
6. In the dialog that appears, click the Machine Data Source tab, select the ODBC driver you installed, and click OK.
7. A list of all ODBC tables appears. Select the table you want to link and click OK.
8. Select the unique record identifier for the table and click OK. The unique record identifier is typically the first item in the list. See the table details in this guide to check. See **Power IQ ODBC Schema** (on page 362).
9. The linked table appears in the list. Repeat these steps to add other tables you want to query.
10. Identify the relationships between the linked tables.

- a. Choose Tools > Relationships.
- b. Select all the tables in the list and click Add. The tables appear with lists of their fields. Resize the tables to view the field names.
- c. Link the fields that relate by dragging and dropping a field from one table to the field it relates to in another table. See the Microsoft Access help on "Define relationships between tables" for details.

*Note: Fields that have relationships are marked as "foreign key relationships" in the ODBC schema. See **Power IQ ODBC Schema** (on page 362) view the lists of fields. See **Correlated Fields in ODBC Tables** (on page 362) for details and an example.*

Correlated Fields in ODBC Tables

To find how tables in Power IQ relate to each other, look for the foreign key reference fields in each table. The tables are listed in this help. See **Power IQ ODBC Schema** (on page 362).

► **Example - the relationship between the PDUOutlets table and the PDUs table:**

The PDUOutlets table has a relationship to the PDUs table, via the PDUID field in the PDUOutlets table.

PDUID	Integer	Foreign key reference to PDUs table
-------	---------	-------------------------------------

See **PDUOutlets** (on page 364) and **PDUs** (on page 362).

Both tables contain a field called PDUID. Link these fields in Microsoft® Access® to enable these tables to be queried together. See **Link Database Tables in Microsoft® Access®** (on page 361).

Power IQ ODBC Schema

Power IQ makes a number of its data views available through the ODBC interface.

PDUs

The PDUs view contains information about the PDU device.

Field	Type	Notes
ID	Integer	Unique PDU number
Caption	VarChar (64)	PDU Name
Description	TEXT	MIB II SysDescr

Field	Type	Notes
IPAddress	inet	IP Address
PDUType	VarChar (64)	Rack PDU or facilities objects
ProxyIndex	Integer	Subtending unit ID applicable only to daisy-chained and console server connected PDU units
NameFormat	VarChar (64)	
ModelName	TEXT	PDU Model
Manufacturer	TEXT	PDU Manufacturer
Location	TEXT	MIB II SysLocation
Contact	VarChar (256)	Contact name
PDUName	TEXT	PDU Name
Firmware	TEXT	PDU Firmware version
Serial Number	TEXT	PDU Serial Number
CurrentStatus	TEXT	PDU overall health status: Good, Warning, or Critical
EventHealth	TEXT	PDU active events health status: Good, Warning, or Critical
ConnectivityHealth	TEXT	PDU connectivity health status: OK, LostComm, NoContact, NoPlugin, and others.
PrimaryOwnerName	VarChar (64)	Owner name
PrimaryOwnerContact	VarChar (256)	MIB II SysContact
InletTemperature	Float	Temperature at the inlet of the PDU. Latest reading in Celsius from the first temperature sensor attached to the PDU
External Key	TEXT	An external key, such as asset tag number, associated with the PDU.

Field	Type	Notes
Custom Field 1	TEXT	A custom field for the user to specify.
Custom Field 2	TEXT	A custom field for the user to specify.
Current	Float	Latest line current reading for the PDU, or the maximum of the line currents for three-phase PDUs
RatedVoltage	TEXT	The PDU's rated voltage.
RatedAmps	TEXT	The PDU's rated current.
RatedVoltAmps	TEXT	The PDU's rated volt-amps.
DefaultAssetStripConnectedLEDColor	VarChar	The color of the LED in hex when asset is connected.
DefaultAssetStripDisconnectedLEDColor	VarChar	The color of the LED in hex when asset is disconnected.

PDUOutlets

The PDUOutlets view shows the outlets associated with a PDU.

Field	Type	Notes
PDUOutletsID	Integer	Unique outlet number
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	PDU outlet number
OutletName	VarChar(64)	Outlet name
OutletState	VarChar(64)	Outlet state
ITDeviceID	Integer	Associated IT Device ID foreign key
PDUOutletNumber	Integer	PDU outlet number
OutletRatedAmps	Integer	The rated amps of the outlet

PDUCircuitPoles

Field	Type	Notes
PDUCircuitPoleID	Integer	Unique circuit pole ID
PDUCircuitID	Integer	Foreign key reference to PDUCircuits table
PDUPanelID	Integer	Foreign key reference to PDUPanels table
PDUID	Integer	Foreign key reference to PDUs table
CircuitPoleOrdinal	Integer	The circuit pole's number
Phase	VarChar(64)	The circuit pole's phase

PDUCircuits

Field	Type	Notes
PDUCircuitID	Integer	Unique circuit ID
PDUID	Integer	Foreign key reference to PDUs table
PDUPanelID	Integer	Foreign key reference to the PDUPanels table
CircuitOrdinal	Integer	Circuit number on the PDU
CircuitName	VarChar (64)	Name of the circuit
RatedAmps	Integer	Rated amps of the circuit

PDUCircuitBreakers

The PDUCircuitBreakers view shows the circuit breakers associated with a PDU.

Field	Type	Notes
PDUCircuitBreakersID	Integer	Unique CB Number
PDUID	Integer	Foreign key reference to PDUs table
CircuitBreakerOrdinal	Integer	Circuit breaker number on the PDU

Field	Type	Notes
CircuitBreakerState	Integer	0 (closed) 1 (open) 3 (unknown)
CircuitBreakerLabel	VarChar(64)	Label assigned to a CB
CircuitBreakerRating	Integer	The rated amps of the circuit breaker in amps
CircuitBreakerRatedAmps	Integer	The rated amps of the circuit breaker in amps

PDULines

Field	Type	Notes
PDULinesID	Integer	Primary key for the table.
PDUInletsID	Integer	Foreign key reference to PDUInlets table
PDUID	Integer	Foreign key reference to PDUs table
LineNumber	Integer	The inlet line number on the PDU

PDUInlets

Field	Type	Notes
PDUInletsID	Integer	Primary key for the PDUInlets table.
PDUID	Integer	Foreign key reference to PDUs table
InletNumber	Integer	The number of the inlet on the PDU.
InletRatedAmps	Integer	The rated amps on the inlet.
PDUPanelID	Integer	Foreign key reference to PDUPanels
Source	Boolean	Whether main inlet

PDUPanels

Field	Type	Notes
PDUPanelID	Integer	Unique ID for each panel
PDUID	Integer	Foreign key reference to PDUs table
PanelOrdinal	Integer	The panel's number on the floor PDU.
PanelName	VarChar (255)	The panel's name, only for floor PDU panels, not standalone power panels.

PDUReadings

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUInletReadings table. See ***PDUInletReadings*** (on page 368).

The PDUReadings view shows the raw power data collected from PDUs. A data record is added for each PDU polled. This data is summarized hourly in a PDUReadingsRollup view, and the readings in this view are purged.

Field	Type	Notes
PDUReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
Time	Timestamp with Timezone	Local timestamp
ActivePower	Real	Active power drawn by PDU
ApparentPower	Real	Apparent power drawn by PDU
WattHour	Real	Cumulative watt-hours consumed by the PDU, if available for the PDU
MaxActivePower	Real	Maximum active power drawn by PDU
MinActivePower	Real	Minimum active power drawn by PDU

Field	Type	Notes
MaxApparentPower	Real	Maximum apparent power drawn by PDU
MinApparentPower	Real	Minimum apparent power drawn by PDU

PDUInletReadings

A PDU can have multiple inlets. To get a total reading for the PDU, you must request the values for all inlets on a PDU.

Field	Type	Notes
PDUInletReadingsID	bigint	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
InletID	Integer	Foreign key reference to PDUInlets table
InletNumber	Integer	Inlet number on the PDU
Time	timestamp with time zone	Local timestamp
Voltage	Real	Voltage at the inlet
MinVoltage	Real	Minimum voltage reading over the sample period. Applies to devices with data buffering enabled.
MaxVoltage	Real	Maximum voltage reading over the sample period. Applies to devices with data buffering enabled.
Current	Real	Current (Amps) drawn by the inlet
MinCurrent	Real	Minimum current (Amps) reading over the sample period. Applies to devices with data buffering enabled.

Field	Type	Notes
MaxCurrent	Real	Maximum current (Amps) reading over the sample period (applies to devices with data buffering enabled).
PowerFactor	Real	Power factor of the inlet
MinPowerFactor	Real	Minimum power factor reading over the sample period. Applies to devices with data buffering enabled)
MaxPowerFactor	Real	Maximum power factor reading over the sample period. Applies to devices with data buffering enabled.
ActivePower	Real	Active power (Watts) drawn by the inlet
MinActivePower	Real	Minimum active power (Watts) reading over the sample period. Applies to devices with data buffering enabled.
MaxActivePower	Real	Maximum active power (Watts) reading over the sample period. Applies to devices with data buffering enabled.
ApparentPower	Real	Apparent power (VA) drawn by the inlet
MinApparentPower	Real	Minimum apparent power (VA) reading over the sample period (applies to devices with data buffering enabled)
MaxApparentPower	Real	Maximum apparent power (VA) reading over the sample period. Applies to devices with data buffering enabled.

Field	Type	Notes
VoltAmpHours	Real	Cumulative volt-amp-hours consumed by the inlet, if available for the PDU
WattHours	Real	Cumulative watt-hours consumed by the inlet, if available for the PDU

PDUInletReadingHourlyRollups

Field	Type	Notes
PDUInletReadingsRollupID	Bigint	Primary key for the table
PDUID	Integer	Foreign key reference to PDUs table
InletID	Integer	Foreign key reference to PDUInlets table
InletNumber	Integer	The number of the inlet on the PDU.
Time	Timestamp	Local timestamp
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval

Field	Type	Notes
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval

Field	Type	Notes
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUInletReadingDailyRollups

Field	Type	Notes
PDUInletReadingsRollupID	Bigint	Primary key for the table
PDUID	Integer	Foreign key reference to PDUs table
InletID	Integer	Foreign key reference to PDUInlets table
InletNumber	Integer	The number of the inlet on the PDU.
Time	Timestamp	Local timestamp
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval

Field	Type	Notes
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUInletReadingMonthlyRollups

Field	Type	Notes
PDUInletReadingsRollupID	Bigint	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
InletID	Integer	Foreign key reference to PDUInlets table
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp	Local timestamp for the first day of the month over which the rollup was calculated.
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval

Field	Type	Notes
ActivePower	Real	Active power drawn by the inlet in Watts
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Apparent power (VA) drawn by the inlet
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHours	Real	Cumulative volt-amp-hours consumed by the inlet, if available for the PDU
WattHours	Real	Cumulative watt-hours consumed by the inlet, if available for the PDU

PDUOutletReadings

The PDUOutletReadings view shows the raw power data collected from PDU outlets. A data record is added for each outlet polled. This data is summarized hourly in a PDUOutletReadingsRollup view, and the outlet records in this view are purged.

Field	Type	Notes
PDUOutletReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	PDU outlet number
Time	Timestamp with	Local timestamp

Field	Type	Notes
	Timezone	
CurrentAmps	Real	Amps drawn by the outlet
ActivePower	Real	Active power drawn by the outlet
ApparentPower	Real	Apparent power drawn by the outlet
WattHour	Real	Cumulative watt-hours consumed by the outlet, if available for the PDU
MaxCurrentAmps	Real	Maximum amps drawn by the outlet
MinCurrentAmps	Real	Minimum amps drawn by the outlet
MaxActivePower	Real	Maximum active power drawn by the outlet
MinActivePower	Real	Minimum amps drawn by the outlet
MaxApparentPower	Real	Maximum apparent power drawn by the outlet
MinApparentPower	Real	Minimum apparent power drawn by the outlet
Voltage	Real	Voltage drawn by the outlet
MinVoltage	Real	Minimum voltage reading
MaxVoltage	Real	Maximum voltage reading
PowerFactor	Real	Power factor of the outlet
MinPowerFactor	Real	Minimum power factor
MaxPowerFactor	Real	Maximum power factor
VoltAmpHours	Real	Cumulative volt-amp-hours consumed by the outlet, if available for the PDU

PDULineReadings

The PDULineReadings view shows the power data collected from PDU current-carrying lines. A data record is added for each line polled. Single-phase PDUs have 1 line. Three-phase PDUs have 3 lines. This data is summarized hourly in a PDULineReadingsRollup view, and the line readings in this view are purged.

Field	Type	Notes
PDULineReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign Key Reference To PDUs table
InletNumber	Integer	Inlet number on the PDU
LineNumber	Integer	Line number on this PDU
Time	Timestamp with Timezone	Local timestamp
CurrentAmps	Real	Amps drawn on this line
UnutilizedCapacity	Real	Available amps remaining on this line
MaxCurrentAmps	Real	Maximum amps drawn on this line
MinCurrentAmps	Real	Minimum amps drawn on this line
Voltage	Real	Voltage for the line
MinVoltage	Real	Minimum voltage reading over the sample period. Applies to devices with data buffering enabled.
MaxVoltage	Real	Maximum voltage reading over the sample period. Applies to devices with data buffering enabled.

PDUCircuitReadings

Field	Type	Notes
PDUCircuitReadingsID	Big Integer	Unique circuit number
PDUID	Integer	Foreign key reference to PDUs table

Field	Type	Notes
PDUcircuitID	Integer	Circuit number on the PDU
Time	timestamp with time zone	Local timestamp
Voltage	Real	Voltage drawn by the circuit
MinVoltage	Real	Minimum voltage reading
MaxVoltage	Real	Maximum voltage reading
Current	Real	Amps drawn by the circuit
MinCurrent	Real	Minimum amps drawn by the circuit
MaxCurrent	Real	Maximum amps drawn by the circuit
UnutilizedCapacity	Real	Available amps remaining on this circuit
MinUnutilizedCapacity	Real	Minimum amps remaining on this circuit
MaxUnutilizedCapacity	Real	Maximum amps remaining on this circuit
PowerFactor	Real	Power factor of the circuit
MinPowerFactor	Real	Minimum power factor
MaxPowerFactor	Real	Maximum power factor
ActivePower	Real	Active power drawn by the circuit
MinActivePower	Real	Minimum active power drawn by the circuit
MaxActivePower	Real	Maximum active power drawn by the circuit
ApparentPower	Real	Apparent power drawn by the circuit
MinApparentPower	Real	Minimum apparent power drawn by the circuit
MaxApparentPower	Real	Maximum apparent power drawn by the circuit

Field	Type	Notes
VoltAmpHour	Real	Cumulative volt-amp-hours consumed by the circuit
WattHour	Real	Cumulative watt-hours consumed by the circuit

PDUCircuitPoleReadings

Field	Type	Notes
PDUCircuitPoleReadin gsID	Big Integer	Unique circuit pole number
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table
Time	timestamp with time zone	Local timestamp
Voltage	Real	Voltage drawn by the circuit pole
MinVoltage	Real	Minimum voltage reading
MaxVoltage	Real	Maximum voltage reading
Current	Real	Amps drawn by the circuit pole
MinCurrent	Real	Minimum amps drawn by the circuit pole
MaxCurrent	Real	Maximum amps drawn by the circuit pole
UnutilizedCapacity	Real	Available amps remaining on this circuit pole
MinUnutilizedCapacity	Real	Minimum amps remaining on this circuit pole
MaxUnutilizedCapacity	Real	Maximum amps remaining on this circuit pole

PDUCircuitBreakersReadings

The PDUCircuitBreakerReadings view shows the power data collected from circuit breakers on the PDU. This view does not contain any data for PDUs that do not have circuit breakers. A data record is added for each circuit breaker polled. This data is summarized hourly in a PDUCircuitBreakerReadingsRollup view, and the circuit breaker readings in this view are purged.

Field	Type	Notes
PDUCircuitBreakerReadingsID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Local timestamp
CurrentAmps	Real	Current value in Amps
UnutilizedCapacity	Real	Available amps remaining on this circuit breaker
MaxCurrentAmps	Real	Maximum amps drawn on the circuit breaker
MinCurrentAmps	Real	Minimum amps drawn on the circuit breaker

PDUSensorReadings

The PDUSensorReadings view shows the data collected from PDU sensors. A data record is added for each sensor polled. This data is summarized hourly in a PDUSensorReadingsRollup view and the sensor readings in this view are purged.

Field	Type	Notes
PDUSensorReadingsID	Integer	Unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors

Field	Type	Notes
Time	Timestamp with Timezone	Local timestamp when the reading occurred
Value	Real	Sensor value
MinimumValue	Real	Minimum sensor value over the sample period. Applies to devices with data buffering enabled.
MaximumValue	Real	Maximum sensor value over the sample period. Applies to devices with data buffering enabled.

PDUOutletReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUOutletReadingsHourlyRollup, PDUOutletReadingsDailyRollup, and PDUOutletReadingsMonthlyRollup tables. If you experience any performance issues, move to the new tables.

The PDUOutletReadingsRollup view summarizes the outlet readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUOutletReadingsRollup view are purged.

Field	Type	Notes
PDUOutletReadingsRollup ID	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup

Field	Type	Notes
		interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval
AverageActivePower	Real	Average power factor reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval

Field	Type	Notes
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUOutletReadingHourlyRollups

Field	Type	Notes
PDUOutletReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup

Field	Type	Notes
		interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval
AveragePowerFactor	Real	Average power factor reading during rollup interval
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval

PDUOutletReadingDailyRollups

Field	Type	Notes
PDUOutletReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to

Field	Type	Notes
		PDU's table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval

Field	Type	Notes
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval
AveragePowerFactor	Real	Average power factor reading during rollup interval
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval

PDUOutletReadingMonthlyRollups

Field	Type	Notes
PDUOutletReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
OutletID	Integer	Foreign key reference to PDUOutlets table
OutletNumber	Integer	Outlet number on the PDU
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup

Field	Type	Notes
		interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinimumVoltage	Real	Minimum voltage reading during rollup interval
MaximumVoltage	Real	Maximum voltage reading during rollup interval
AverageVoltage	Real	Average voltage reading during rollup interval
VoltAmpHours	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval
AveragePowerFactor	Real	Average power factor reading during rollup interval

Field	Type	Notes
MinimumPowerFactor	Real	Minimum power factor reading during rollup interval
MaximumPowerFactor	Real	Maximum power factor reading during rollup interval

PDUReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUInletReadings tables.

The PDUReadingsRollup view summarizes the PDU readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUReadingsRollup are purged.

Field	Type	Notes
PDUReadingsRollup	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumActivePower	Real	Lowest active power (Watts) reading during rollup interval
MaximumActivePower	Real	Maximum active power (Watts) reading during rollup interval
AverageActivePower	Real	Average active power (Watts) reading during rollup interval
MinimumApparentPower	Real	Lowest apparent power (VA) reading during rollup interval
MaximumApparentPower	Real	Maximum apparent

Field	Type	Notes
		power (VA) reading during rollup interval
AverageApparentPower	Real	Average apparent power (VA) reading during rollup interval
WattHours	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDULineReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDULineReadingsHourlyRollup, PDULineReadingsDailyRollup, PDULineReadingsMonthlyRollup tables.

The PDULineReadingsRollup view summarizes the line readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDULineReadingsRollup is purged.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps)

Field	Type	Notes
		reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDULineReadingHourlyRollups

The PDULineReadingsHourlyRollup view summarizes the line readings power data over the hourly roll-up interval.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during

Field	Type	Notes
		rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDULineReadingDailyRollups

The PDULineReadingsDailyRollup view summarizes the line readings power data over the daily roll-up interval.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDULineReadingMonthlyRollups

The PDULineReadingsMonthlyRollup view summarizes the line readings power data over the monthly roll-up interval.

Field	Type	Notes
PDULineReadingsRollupID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
LineNumber	Integer	Line number on the PDU
InletNumber	Integer	Inlet number on the PDU
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitReadingHourlyRollups

Field	Type	Notes
PDUCircuitReadingHourlyRollupsID	Big Integer	Unique ID for each reading

Field	Type	Notes
PDUID	Integer	Foreign key reference to PDUs table
PDUCircuitID	Integer	Foreign key reference to the PDUCircuits table
Time	timestamp with time zone	Timestamp when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval

Field	Type	Notes
MaxPowerFactor	Real	Maximum power factor reading during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHour	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHour	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUCircuitReadingDailyRollups

Field	Type	Notes
PDUCircuitReadingDailyRollupsID	Big Integer	
PDUID	Integer	Foreign key reference to PDUs table
PDUCircuitID	Integer	Foreign key reference to

Field	Type	Notes
		the PDUcircuits table
Time	timestamp with time zone	Timestamp when rollup was created
Date	date	Date when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval

Field	Type	Notes
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHour	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHour	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUCircuitReadingMonthlyRollups

Field	Type	Notes
PDUCircuitReadingMonthlyRollupsID	Big Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDUs table
PDUCircuitID	Integer	Foreign key reference to the PDUCircuits table
Time	timestamp with time zone	Timestamp when rollup was created

Field	Type	Notes
Year	double precision	Year when rollup was created
Month	double precision	Month when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval
PowerFactor	Real	Average Power factor reading during rollup interval
MinPowerFactor	Real	Minimum power factor reading during rollup interval
MaxPowerFactor	Real	Maximum power factor reading during rollup interval

Field	Type	Notes
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval
VoltAmpHour	Real	Maximum of the cumulative volt-amp-hour meter readings over the rollup interval
WattHour	Real	Maximum of the cumulative watt-hour meter readings over the rollup interval

PDUCircuitPoleReadingHourlyRollups

Field	Type	Notes
PDUCircuitPoleReadingHourlyRollupsID	Big Integer	Unique ID for each reading
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table
Time	timestamp with time zone	Timestamp when rollup was created

Field	Type	Notes
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval

PDUCircuitPoleReadingDailyRollups

Field	Type	Notes
PDUCircuitPoleReadingDailyRollupsID	Big Integer	Unique ID for each reading
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table
Time	timestamp with time zone	Timestamp when rollup was created

Field	Type	Notes
Date	date	Date when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval

PDUCircuitPoleReadingMonthlyRollups

Field	Type	Notes
PDUCircuitPoleReadingMonthlyRollupsID	Big Integer	Unique ID for each reading
PDUCircuitPoleID	Integer	Circuit pole number on the PDU
PDUID	Integer	Foreign key reference to PDUs table

Field	Type	Notes
Time	timestamp with time zone	Timestamp when rollup was created
Year	double precision	Year when rollup was created
Month	double precision	Month when rollup was created
Voltage	Real	Average voltage reading during rollup interval
MinVoltage	Real	Minimum voltage reading during rollup interval
MaxVoltage	Real	Maximum voltage reading during rollup interval
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
UnutilizedCapacity	Real	Average unutilized capacity (rated amps minus current) reading during rollup interval
MinUnutilizedCapacity	Real	Minimum unutilized capacity (rated amps minus current) reading during rollup interval
MaxUnutilizedCapacity	Real	Maximum unutilized capacity (rated amps minus current) reading during rollup interval

PDUCircuitBreakerReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUCircuitBreakerReadingsHourlyRollup, PDUCircuitBreakerReadingDailyRollups, and PDUCircuitBreakerReadingMonthlyRollups tables. If you experience any performance issues, move to the new tables.

The PDUCircuitBreakerReadingsRollup view summarizes the circuit breaker readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUCircuitBreakerReadingsRollup view are purged.

Field	Type	Notes
PDUCircuitBreakerReadingsRollup ID	Integer	Non-unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval

Field	Type	Notes
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitBreakerReadingHourlyRollups

The PDUCircuitBreakerReadingHourlyRollup view summarizes the circuit breaker readings power data over the hourly roll-up interval.

Field	Type	Notes
PDUCircuitBreakerReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitBreakerReadingDailyRollups

The PDUCircuitBreakerReadingsDailyRollup view summarizes the circuit breaker readings power data over the daily roll-up interval.

Field	Type	Notes
PDUCircuitBreakerReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUCircuitBreakerReadingMonthlyRollups

The PDUCircuitBreakerReadingsMonthlyRollup view summarizes the circuit breaker readings power data over the monthly roll-up interval.

Field	Type	Notes
PDUCircuitBreakerReadingsRollup ID	Integer	Unique ID for each reading
PDUID	Integer	Foreign key reference to PDU
CircuitBreakerNumber	Integer	Circuit breaker number on the PDU
CircuitBreakerID	Integer	Foreign key reference to PDUCircuitBreakers table
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumCurrent	Real	Lowest current (Amps) reading during rollup interval
MaximumCurrent	Real	Maximum current (Amps) reading during rollup interval
AverageCurrent	Real	Average current (Amps) reading during rollup interval
MinimumUnutilizedCapacity	Real	Lowest unutilized capacity (Amps) during rollup interval
MaximumUnutilizedCapacity	Real	Maximum unutilized capacity (Amps) during rollup interval
AverageUnutilizedCapacity	Real	Average unutilized capacity (Amps) during rollup interval

PDUSensorReadingsRollup - To Be Deprecated

Note: This table will be deprecated soon. It is recommended to stop using it, and use the new PDUSensorReadingsHourlyRollups, PDUSensorReadingsDailyRollups, and PDUSensorReadingsMonthlyRollups tables. If you experience any performance issues, move to the new tables.

The PDUSensorReadingsRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Non-unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
RollupInterval	Integer	1: one hour 2: one day 3: one month
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumValue	Real	Lowest sensor reading during rollup interval
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensorReadingHourlyRollup

The PDUSensorReadingsHourlyRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Unique ID for each reading

Field	Type	Notes
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumValue	Real	Lowest sensor reading during rollup interval
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensorReadingDailyRollup

The PDUSensorReadingsDailyRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
Time	Timestamp with Timezone	Timestamp when rollup was created
MinimumValue	Real	Lowest sensor reading during rollup interval
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensorReadingMonthlyRollup

The PDUSensorReadingsMonthlyRollup view summarizes the sensor readings power data over the roll-up interval. Hourly roll-ups are rolled up once a day. Daily roll-ups are rolled up once a month. When data is rolled up, shorter interval roll-up entries in the PDUSensorReadingsRollup view are purged.

Field	Type	Notes
PDUSensorReadingsRollupID	Integer	Unique ID for each reading
SensorID	Integer	Database ID of the sensor as seen in PDUSensors
Time	Timestamp with Timezone	Local timestamp for the first day of the month over which the rollup was calculated
MinimumValue	Real	Lowest sensor reading during rollup interval
MaximumValue	Real	Maximum sensor reading during rollup interval
AverageValue	Real	Average sensor reading during rollup interval

PDUSensors

The PDUSensors view contains information about sensors attached to PDUs that Power IQ manages.

Field	Type	Notes
SensorID	Integer	Auto-generated ID
PDUID	Integer	Foreign key reference to PDUs table
PDUSensorID	Integer	ID of the sensor on the PDU, as gathered from the pdu
SensorNumber	Integer	Sensor number on the PDU
AttributeName	VarChar(64)	Type of sensor
Label	VarChar(255)	Sensor's label as

Field	Type	Notes
		gathered from the PDU
Removed	VarChar(64)	When the sensor was removed from the system, or null for current sensors
Position	VarChar(10)	Sensor position on the PDU: inlet, outlet or outside air

PDUTransferSwitchStates

This view represents the state of a Transfer Switch at a particular moment in time, normally recorded when the state of the switch has changed.

Field	Type	Notes
PDUTransferSwitchStatesID	BigInt	The primary key for this view
PDUTransferSwitchesID	Integer	Foreign key reference to the PDUTransferSwitches view.
ActivePDUInletNumber	VarChar(32)	The ordinal of the active inlet.
OperatingStatus	VarChar(32)	A string representing the operating status reported by the PDU's MIB.
Time	Timestamp with Timezone	Local timestamp

PDUTransferSwitches

This view represents the physical transfer switch inside of a PDU of type 'Rack Transfer Switch'.

Field	Type	Notes
PDUTransferSwitchesID	Integer	The primary key for this view
PDUID	Integer	Foreign key reference to the

		PDUs view.
CreatedAt	Timestamp with Timezone	The date and time that the Transfer Switch was added to the system.
UpdatedAt	Timestamp with Timezone	The date and time this Transfer Switch was last updated.

TagEntries

This view shows all of the tags that have been applied to an entity.

Field	Type	Notes
TagEntriesID	Integer	The primary key for this view
TagsID	Integer	Foreign key reference to the Tags view.
TaggableType	VarChar(255)	The type of EDM entity that was tagged (Room, Rack, PDU, etc.)
TaggableID	Integer	Foreign key reference to the appropriate entity view.
CreatedAt	Timestamp with Timezone	The date and time this Tag Entry was created.
UpdatedAt	Timestamp with Timezone	The date and time this Tag Entry was last updated.

TagGroups

This view lists all of the tag groups in Power IQ.

Field	Type	Notes
TagGroupsID	Integer	The primary key for this view
Name	VarChar(255)	Name of the Tag Group
CreatedAt	Timestamp with Timezone	The date and time this Tag Group was created.
UpdatedAt	Timestamp with Timezone	The date and time this Tag Group was last updated.

Tags

This view lists all of the tags in Power IQ and the shows which tag group they belong to.

Field	Type	Notes
TagsID	Integer	The primary key for this view
TagGroupsID	Integer	Foreign key reference to the TagGroups view.
Name	VarChar(255)	Name of the Tag
CreatedAt	Timestamp with Timezone	The date and time this Tag was created.
UpdatedAt	Timestamp with Timezone	The date and time this Tag was last updated.

DataCenters

The DataCenters view contains information about data center objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
DataCenterID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this data center object
CompanyName	VarChar(255)	Name of the company that owns this data center
ContactName	VarChar(255)	Name of the person to contact regarding data center
ContactPhone	VarChar(255)	Phone number for contact
ContactEmail	VarChar(255)	Email for contact
City	VarChar(255)	City location of data center
State	VarChar(255)	State location of data center
Country	VarChar(255)	Country location of data center
PeakKWHRate	Double	Energy cost per Kilowatt

Field	Type	Notes
		Hour during peak hours
OffPeakKWHRate	Double	Energy cost per Kilowatt Hour during off-peak hours
PeakBegin	Double	Time of day peak hours begin For example 19.5 = 19:30 hours
PeakEnd	Double	Time of day peak hours end
CO2Factor	Double	CO2 computational factor
CoolingFactor	Double	Cooling factor for data center
CustomField1	VarChar(255)	A user-defined field
CustomField2	VarChar(255)	A user-defined field
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this data center

Floors

The Floors view contains information about Floor objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
FloorID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this Floor object.
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Floor.

Rooms

The Rooms view contains information about Room objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
RoomID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this Room object.
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Room.

Aisles

The Aisles view contains information about Aisle objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
AisleID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this Aisle object.
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Aisle.

Rows

The Rows view contains information about Row objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
RowID	Integer	Auto-generated ID
Name	VarChar(64)	Human-assigned name for this Row object.
ExternalKey	VarChar(256)	The unique code used by the Enterprise Model to identify this Row.

Racks

The Racks view contains information about Rack objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
RackID	Integer	Auto-generated ID
Name	VarChar (255)	Human-assigned name for this Rack object.
SpaceIdentifier	VarChar(255)	Optional human-assigned value to identify this rack.
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this Rack.

Rack Readings Rollups

The rack readings rollups views contain rollups of raw readings.

RackReadingHourlyRollups

Field	Type	Notes
RackReadingHourlyRollupsID	Bigint	Unique ID for each reading
RackID	Integer	ID of the rack
Time	Timestamp with time zone	Timestamp when rollup was created
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval

RackReadingDailyRollups

Field	Type	Notes
RackReadingDailyRollupsID	bigint	Unique ID for each reading
RackID	integer	ID of the rack
Date	date	Date when rollup was created
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval

RackReadingMonthlyRollups

Field	Type	Notes
RackReadingMonthlyRollupsID	bigint	Unique ID for each reading
RackID	integer	ID of the rack
Year	double precision	Year when rollup was created
Month	double precision	Month when rollup was created
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval

ITDevices

The ITDevices view contains information about IT Device objects as part of the Enterprise Relationship Model. The fields in this view correspond to the item attributes in the model.

Field	Type	Notes
ITDeviceID	Integer	Auto-generated ID
Name	VarChar(255)	Human-assigned name for this IT Device object
Customer	VarChar(255)	Name of the customer that owns this object
DeviceType	VarChar(255)	Type of device
PowerRating	Integer	Power in watts that this device is rated for
Decommissioned	Boolean	Whether this device should be considered decommissioned
CustomField1	VarChar(255)	A user-defined field
CustomField2	VarChar(255)	A user-defined field
ExternalKey	VarChar(255)	The unique code used by the Enterprise Model to identify this IT Device

IT Device Readings Rollups

The IT device readings rollups views contain rollups of raw readings.

The following limitations apply:

- IT devices associated with Raritan PX1 and PX2 outlets only.
- Data buffering must be enabled on the PDU.
- Outlets from other PDUs are excluded from the rollups.

ITDeviceReadingHourlyRollups

See *IT Device Readings Rollups* (on page 416) for details on this view.

Field	Type	Notes
ITDeviceReadingHourlyRollupsID	Bigint	Unique ID for each reading
ITDeviceID	Integer	ID of the IT Device

Field	Type	Notes
Time	Timestamp with time zone	Timestamp when rollup was created
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval

ITDeviceReadingDailyRollups

See *IT Device Readings Rollups* (on page 416) for details on this view.

Field	Type	Notes
ITDeviceReadingDailyRollupsID	bigint	Unique ID for each reading
ITDeviceID	integer	ID of the IT Device
Date	date	Date when rollup was created

Field	Type	Notes
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval

ITDeviceReadingMonthlyRollups

See *IT Device Readings Rollups* (on page 416) for details on this view.

Field	Type	Notes
ITDeviceReadingMonthlyRollupsID	bigint	Unique ID for each reading
ITDeviceID	integer	ID of the IT Device
Year	double precision	Year when rollup was created

Field	Type	Notes
Current	Real	Average current reading (Amps) during rollup interval
MinCurrent	Real	Minimum current reading (Amps) during rollup interval
MaxCurrent	Real	Maximum current reading (Amps) during rollup interval
ActivePower	Real	Average active power (Watts) reading during rollup interval
MinActivePower	Real	Minimum active power (Watts) reading during rollup interval
MaxActivePower	Real	Maximum active power (Watts) reading during rollup interval
ApparentPower	Real	Average apparent power (VA) reading during rollup interval
MinApparentPower	Real	Minimum apparent power (VA) reading during rollup interval
MaxApparentPower	Real	Maximum apparent power (VA) reading during rollup interval

EDMNodes

The EDMNodes view contains the relationship between EDM entities arranged as nested sets. EDM entities are part of a data hierarchy. Hierarchical data can be efficiently searched when arranged as a Nested set tree structure.

Field	Type	Notes
ID	Integer	Auto-generated EDMNodes ID
Lft	Integer	Auto-generated EDMNode Left ID
Rgt	Integer	Auto-generated

Field	Type	Notes
		EDMNode Right ID
edm_entity_type	VarChar(40)	Entity Type. For example, DataCenter, Floor, Rack, Device, ComputerSystem, Sensors. Entity Type ComputerSystem represents a PDU system.
edm_entity_id	Integer	Entity ID of the entity.
create_at	Timestamp	Create time stamp.
Updated_at	Timestamp	Update time stamp.
ParentID	Integer	Entity ID of the parent entity

AssetStrips

The AssetStrips view contains information about asset management strips attached to PDUs that Power IQ manages.

Field	Type	Notes
AssetStripID	Integer	Database id of the asset strip
PDUID	Integer	Database id of the attached PDU
Name	VarChar (255)	Name of the asset strip
State	VarChar (64)	ok, upgrading, unavailable, unsupported
AssetStripCreationTime	Timestamp with time zone	Time asset strip was created in the database
AssetStripLastUpdateTime	Timestamp with time zone	Time the asset strip last changed in the database
AssetStripOrdinal	Integer	The id of the asset strip on the PDU: 1 to n

RackUnits

The RackUnits view contains information about the rack units on asset strips connected to PDUs that Power IQ manages.

Field	Type	Notes
RackUnitID	Integer	Database id of rack unit
AssetStripID	Integer	Database id of asset strip. See AssetStrips (on page 420).
AssetTagIDString	VarChar (255)	Asset tag id string of any attached asset tag that plugs into the asset strip. Unique from the factory.
RackUnitOrdinal	Smallint	1-n the number of the rack unit within the asset strip
RackUnitLEDState	VarChar (64)	LED state: on, off, blinking
RackUnitLEDMode	VarChar (64)	LED mode: automatic or manual
RackUnitLEDColor	VarChar (6)	LED color: hexadecimal code for the color
RackUnitCreationTime	Timestamp with time zone	When the rack unit was created in the database
RackUnitLastUpdateTime	Timestamp with time zone	When the rack unit was last changed in the database

PUECalculations

Field	Type	Notes
PUECalculationsID	bigint	Unique ID for each reading
DataCenterID	integer	Foreign key reference to DataCenters table
TotalEnergy	integer	PUE facility energy
TotalAdjustment	integer	Facility Energy manual adjustment value

Field	Type	Notes
ITEnergy	integer	PUE IT energy
ITAdjustment	integer	IT Energy manual adjustment value
MeasuredOn	date	The date when rollup was created
Granularity	text	whether daily or monthly rollup

Sample ODBC Queries

This section contains sample ODBC queries that can be used to generate custom reports.

Obtain Active Power and Apparent Power Data for a PDU With IP Address 66.214.208.92

```
Select "PDUs"."IPAddress", "PDUs"."PDUName",
"PDUReadings"."ActivePower", "PDUReadings"."ApparentPower" ,
"PDUReadings"."Time" from "PDUs", "PDUReadings" where
"PDUs"."IPAddress"='66.214.208.91' AND
"PDUs"."ID"="PDUReadings"."PDUID";
```

The table shows a sample custom report.

IP Address	PDU Name	Active Power	Apparent Power	Time
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 12:46:21.753-05
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 12:58:23.871-05
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 16:29:26.032-05
66.214.208.91	Sentry3_511c 15	8	8	2009-12-08 16:32:36.868-05

Obtain Active Power and Apparent Power for an IT Device With Name “DBServer”

raritan

```
Select "ITDevices"."Name", "PDUOutletReadings"."Time",
"PDUOutletReadings"."ActivePower",
"PDUOutletReadings"."ApparentPower",
"PDUOutletReadings"."CurrentAmps" from "ITDevices", "PDUOutlets",
"PDUOutletReadings" where "ITDevices"."Name"='DBServer' AND
"PDUOutletReadings"."OutletID" = "PDUOutlets"."PDUOutletsID" AND
"PDUOutlets"."ITDeviceID" = "ITDevices"."ITDeviceID";
```

The table shows a sample custom report.

Name	Time	Active Power	Apparent Power	Current Amps
DBServer	2009-12-08 14:16:31.759-05	0	0	0
DBServer	2009-12-08 16:11:27.017-05	0	0	0

Report Maximum Power Reading for Each IT Device Since Added to Power IQ

To obtain the maximum power reading for an IT device since it was added to Power IQ, three queries are needed. These sample queries group data by device name. This assumes that device names are unique. If your device names are not unique, use IT Device ID for grouping.

1. Query for all devices with all readings for all outlets.
2. Group, per device, per hour, all outlets of a device and sum up the outlet usage
3. Find the maximum power per device of the total power consumption.

► **List all outlet readings for all devices:**

```
SELECT odbc_ITDevices.Name,
odbc_PDUOutletReadingsRollup.Time,
odbc_PDUOutlets.PDUOutletsID,
odbc_PDUOutletReadingsRollup.MaximumActivePower
FROM odbc_ITDevices, odbc_PDUOutlets,
odbc_PDUOutletReadingsRollup
WHERE
(((odbc_PDUOutletReadingsRollup.RollupInterval)=1) AND
((odbc_PDUOutletReadingsRollup.OutletID)=[odbc_PDUOutlets].[PDUOutletsID]) AND
((odbc_PDUOutlets.ITDeviceID)=[odbc_ITDevices].[ITDeviceID]))
ORDER BY odbc_ITDevices.Name,
odbc_PDUOutletReadingsRollup.Time,
odbc_PDUOutlets.PDUOutletsID;
```

Name	Time	PDUOutletsID	MaximumActivePower
AD SRV .136 port 7	10/29/2010 6:00:00 AM	77	117
AD SRV .136 port 7	10/29/2010 7:00:00 AM	77	112
AD SRV .136 port 7	10/29/2010 8:00:00 AM	77	112
AD SRV .136 port 7	10/29/2010 9:00:00 AM	77	112
BLADE CHASSIS 1	10/27/2010 10:00:00 AM	60	0
BLADE CHASSIS 1	10/27/2010 10:00:00 AM	104	133
BLADE CHASSIS 1	10/27/2010 10:00:00 AM	112	311
BLADE CHASSIS 1	10/27/2010 11:00:00 AM	60	0
BLADE CHASSIS 1	10/27/2010 11:00:00 AM	104	128
BLADE CHASSIS 1	10/27/2010 11:00:00 AM	112	297
BLADE CHASSIS 1	10/27/2010 12:00:00 PM	60	0
BLADE CHASSIS 1	10/27/2010 12:00:00 PM	104	128
BLADE CHASSIS 1	10/27/2010 12:00:00 PM	112	297

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► **Group hourly outlet readings per IT device:**

```
SELECT [List of all Devices with all readings for all outlets].Name, [List of all Devices with all readings for all outlets].Time, Sum([List of all Devices with all readings for all outlets].MaximumActivePower) AS SumOfMaximumActivePower
FROM [List of all Devices with all readings for all outlets]
GROUP BY [List of all Devices with all readings for all outlets].Name, [List of all Devices with all readings for all outlets].Time
ORDER BY [List of all Devices with all readings for all outlets].Name;
```

Name	Time	SumOfMaximumActivePower
AD SRV .136 port 7	10/29/2010 8:00:00 AM	112
AD SRV .136 port 7	10/29/2010 9:00:00 AM	112
AD SRV .136 port 7	10/29/2010 10:00:00 AM	112
BLADE CHASSIS 1	10/27/2010 11:00:00 AM	425
BLADE CHASSIS 1	10/27/2010 12:00:00 PM	425
BLADE CHASSIS 1	10/27/2010 1:00:00 PM	425
BLADE CHASSIS 1	10/27/2010 2:00:00 PM	444
BLADE CHASSIS 1	10/27/2010 3:00:00 PM	430
BLADE CHASSIS 1	10/27/2010 4:00:00 PM	439
BLADE CHASSIS 1	10/27/2010 5:00:00 PM	444
BLADE CHASSIS 1	10/27/2010 6:00:00 PM	439
BLADE CHASSIS 1	10/27/2010 7:00:00 PM	439
BLADE CHASSIS 1	10/27/2010 8:00:00 PM	439

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► **Find the maximum power reading per IT device:**

```
SELECT [Summation per Device of hourly readings].Name,
Max([Summation per Device of hourly
readings].SumOfMaximumActivePower) AS
MaxOfSumOfMaximumActivePower
FROM [Summation per Device of hourly readings]
GROUP BY [Summation per Device of hourly readings].Name;
```

Name	MaxOfSumOfMaximumActivePower
AD SRV .136 port 7	117
Adobe Flex KX2.139 PORT 11	117
Adobe Photoshop KX2.139 PORT 9	139
BLADE CHASSIS 1	444
BLADE CHASSIS 2	945
Cisco .151	21
► Cisco 2500 .151	20
Cisco 2500 Router .136	22
CISCO SX.117 PORT 1	20
CISCO SX.117 PORT 2	23
CISCO SX.129 PORT 1	22
CISCO SX.129 PORT 2	107
CISCO SX.129 PORT 3	57

Finding All Entities in a Rack

The following query shows all the entities, such as IT Devices and PDUs, contained in a specific rack. The example uses "Rack 4."

- Retrieve the EDMNodes id for a rack with RackId=4.
 - oculan=> select id from "EDMNodes" where edm_entity_type='Rack' and edm_entity_id=4;

```
id
----
14
(1 row)
```
- Use the EDMNodes id =14 to retrieve entities contained under this rack.
 - oculan=> select "EDMNodes".* FROM "EDMNodes", "EDMNodes" AS parent where (("EDMNodes".id != parent.id) AND ("EDMNodes".lft >parent.lft AND "EDMNodes".rgt <=parent.rgt AND parent.id=14)) ORDER BY "EDMNodes".lft;

The table shows a sample custom report.

ID	Lft	Rgt	EDM_Entity_Type	EDM_Entity_ID	Created_at	Updated_at
1	4	5	Device	3	2009-06-19 11:16:48.257348-0	2009-06-19 11:16:48.257348-04
2	6	7	Device	4	2009-06-19 11:16:48.274988-0	2009-06-19 11:16:48.274988-04
3	8	9	Device	5	2009-06-19 11:16:48.276324-0	2009-06-19 11:16:48.276324-04

ODBC Configuration and Sample Query for Apple Users

This section contains instructions for configuring ODBC and creating custom reports for Apple users.

These instructions apply to the following Apple products:

1. Mac OS 10.7.x or higher. These instructions were tested in Lion.
2. Microsoft Excel 2011

The sample report provides the Max/Min/Avg power consumption of every rack in the data center.

Download and Install ODBC Client Driver for Mac

1. Go to http://www.actualtech.com/product_opensourcedatabases.php (see http://www.actualtech.com/product_opensourcedatabases.php - http://www.actualtech.com/product_opensourcedatabases.php), to download the ODBC Pack for Mac OSX.

Note: The driver is free to try. You can confirm that it works for you first, by following the steps in this guide.

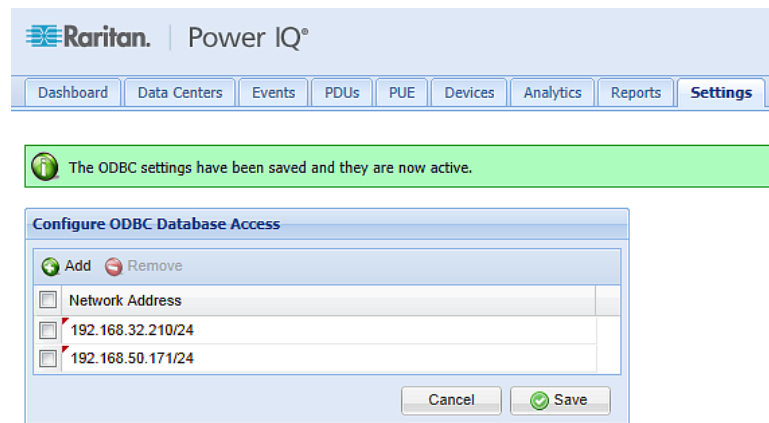
2. Follow the usual Mac steps to install the "Actual ODBC Pack.pkg"

Download and Install Microsoft Query for Mac (included in Office 2011 v14.1.2)

1. Make sure you have the latest updates for your version of Microsoft Excel.
2. If you are using Mac OS X Lion or higher, you must use Microsoft Office 2011 v14.1.2 or higher.

Allow Your Mac to Access Power IQ via ODBC

1. Login to Power IQ.
2. In the Settings tab, click ODBC Access in the Data Management section. The Configure ODBC Database Access page opens.
3. Click Add. Double-click the 0.0.0.0/0 Network Address, then enter the IP Address information of your Mac. Or, leave the default 0.0.0.0/0 to allow access from all IP addresses.
4. Click Save.



Add Power IQ as an ODBC Information Source to your Mac

1. On your Mac, launch /Applications/Utilities/ODBC Manager.app.

Note: ODBC Manager may need to be installed. It is not included with the operating system. You can download it from www.odbcmanager.net.

2. Select the tab "User DSN", and click Add.
3. Select Actual Open Source Databases and click OK. The Actual Open Source Databases DSN Configuration wizard opens.
4. Click Continue.

5. Name the Power IQ that you are connecting to, and select PostgreSQL as the database type. Click Continue.

Actual Open Source Databases DSN Configuration

Enter the data source name

This Assistant will help you create an ODBC data source that you can use to connect to your database.

What name do you want to use to refer to the data source?
Name:

How do you want to describe the data source?
Description:

Which type of database do you want to connect to?
 MySQL
 PostgreSQL
 SQLite

Introduction
Data Source
Connection
Database
Conclusion

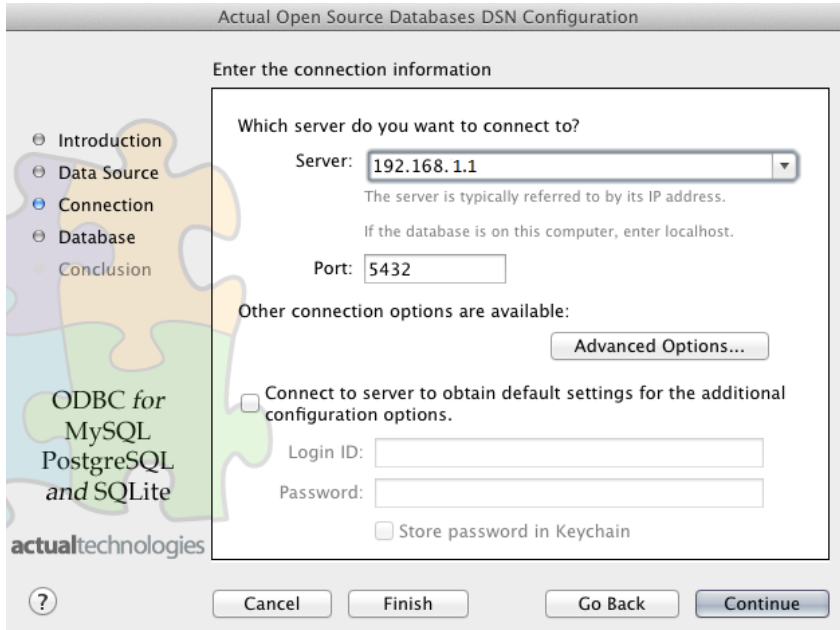
ODBC for
MySQL
PostgreSQL
and SQLite

actualtechnologies

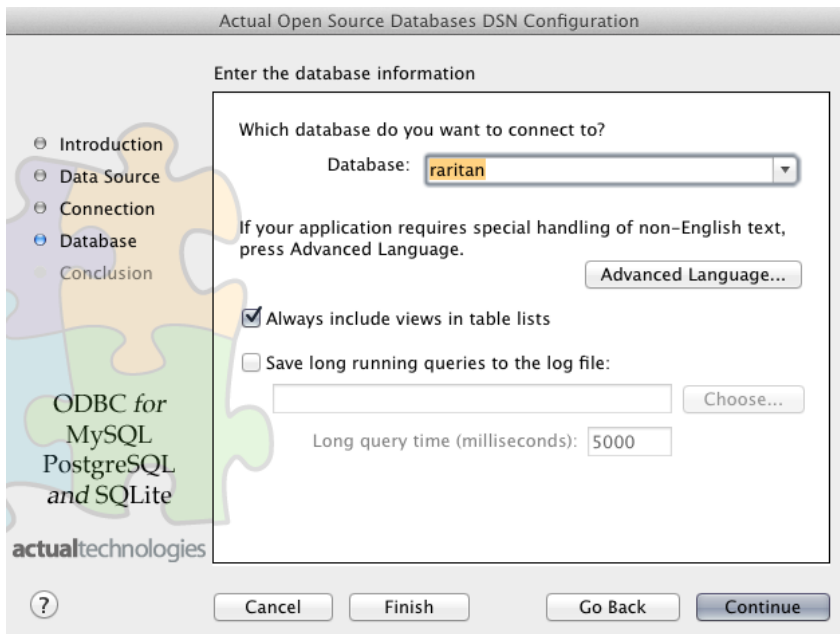
? Cancel Finish Go Back Continue

6. Enter the IP address of your Power IQ server, and copy the rest of the settings exactly as pictured here. Click Continue.
 - Server: IP address of Power IQ
 - Port: 5432

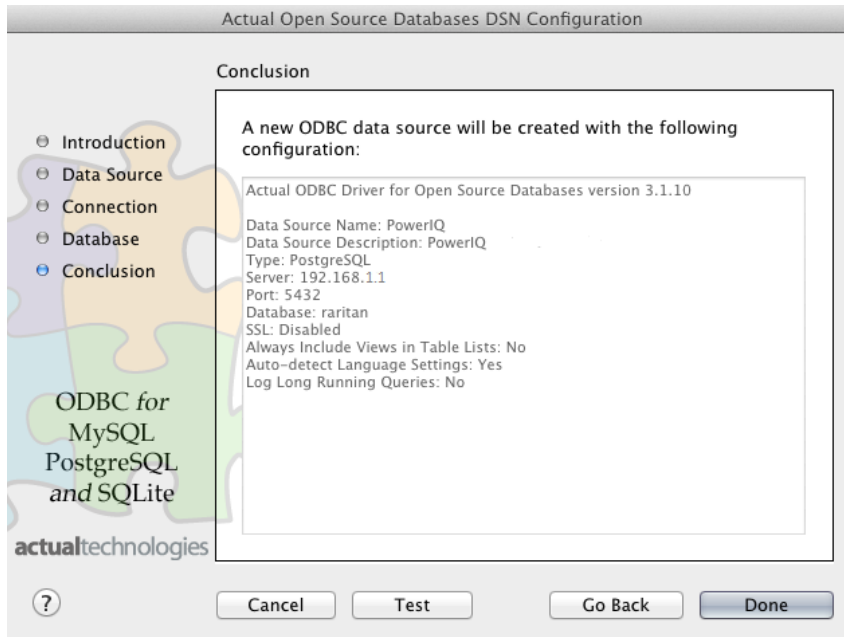
- Do NOT select "Connect to server to obtain default settings for the additional configuration options"



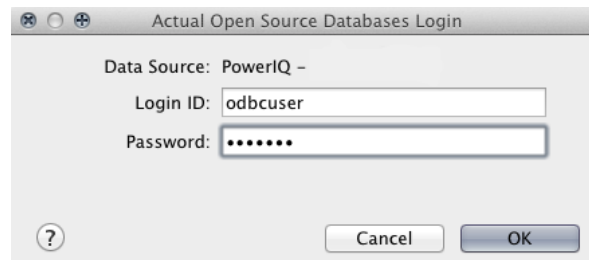
7. Enter "raritan" as the database name. Make sure to select the checkbox labeled "Always include views in table lists". Click Continue.



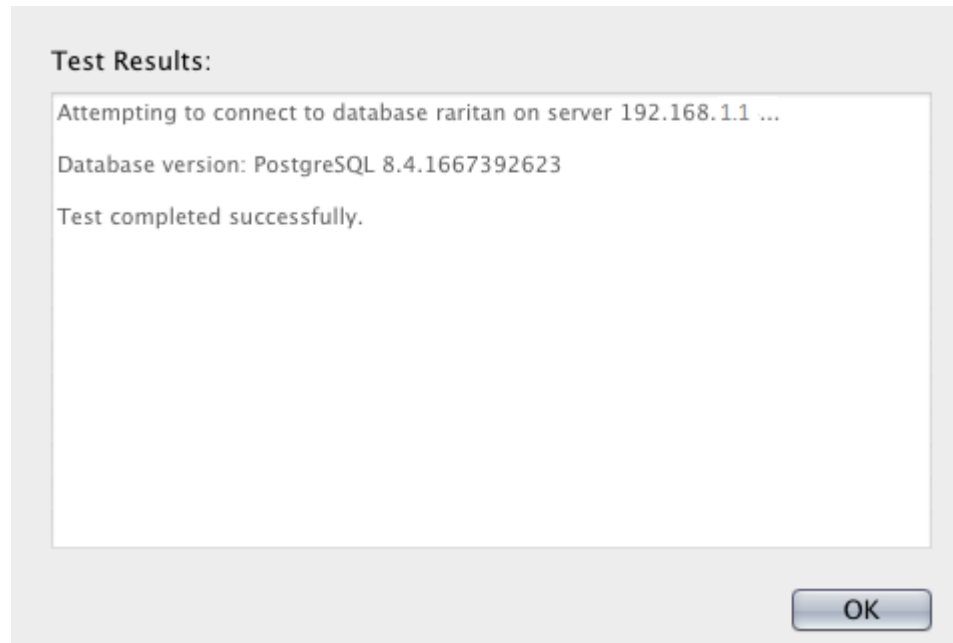
8. Click Test.



9. At the next prompt, enter the username and password based on the ODBC user credentials specified in Power IQ, and click OK. See **Configuring ODBC User Credentials** (on page 358).



10. The test results should be successful. Click OK.

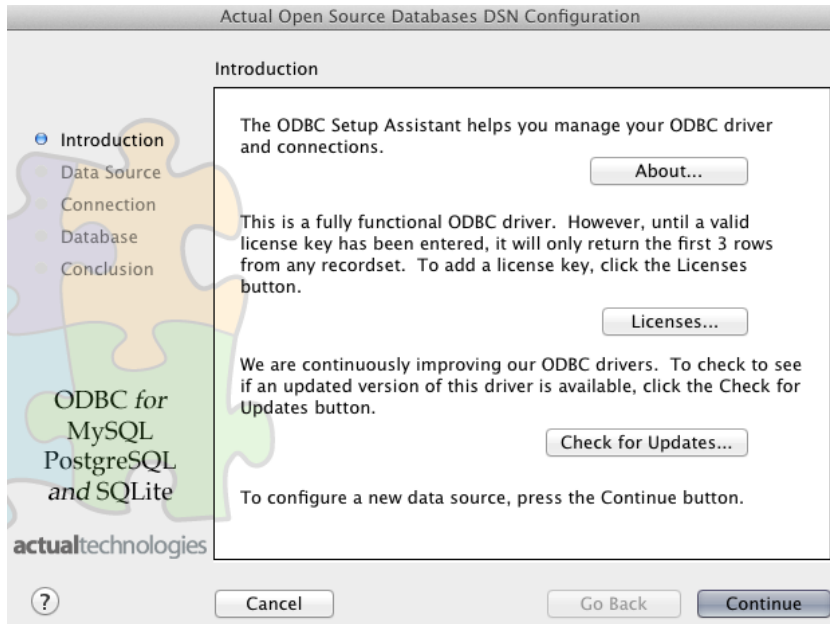


11. Click Done.

Note: If the test was successful, the ODBC driver works, and you can purchase it.

12. Launch /Applications/Utilities/ODBC Manager.app again. Select User DSN and highlight the Power IQ entry you just created.
13. Click Configure.

14. Click Licenses and follow instructions to buy and enter a license key.



Remember, the license you want to buy is the "Actual ODBC Driver for Open Source Databases."

Actual ODBC Driver for Open Source Databases

for MySQL, PostgreSQL and SQLite

① Personal Edition (up to 5 connections) ▾ [more connections](#)

34.95

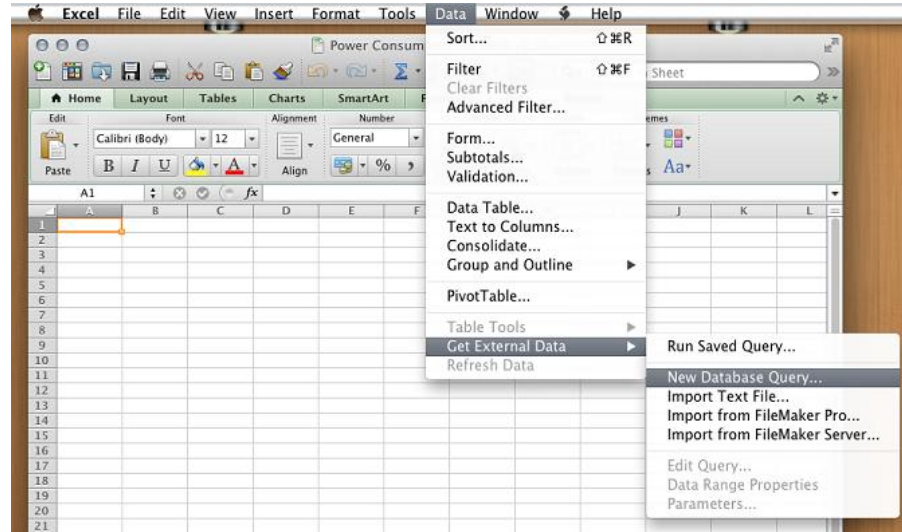
Your Mac now can access all the data on the Power IQ server, and you can create reports using Microsoft Excel, FileMaker Pro, or any ODBC-compliant reporting tool.

See **Create Database Connection in Excel** (on page 433) for instructions on using Microsoft Excel.

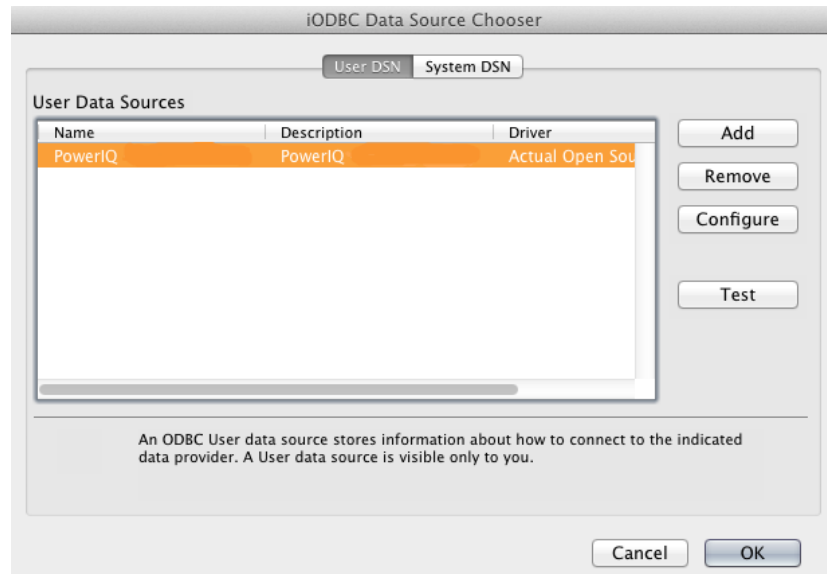
Create Database Connection in Excel

1. On your Mac, launch Excel.
2. Choose Excel > About Excel. If you are running Mac Lion or higher, make sure you have Excel version 14.1.2 or higher.
3. Create a new Workbook and save it. For example, "Power Consumption by Rack.xlsx"

4. In the Excel toolbar, choose Data > Get External Data > New Database Query.



5. The "iODBC Data Source Chooser" dialog appears. In the User DSN tab, select the Power IQ data source that you created previously. Click OK.

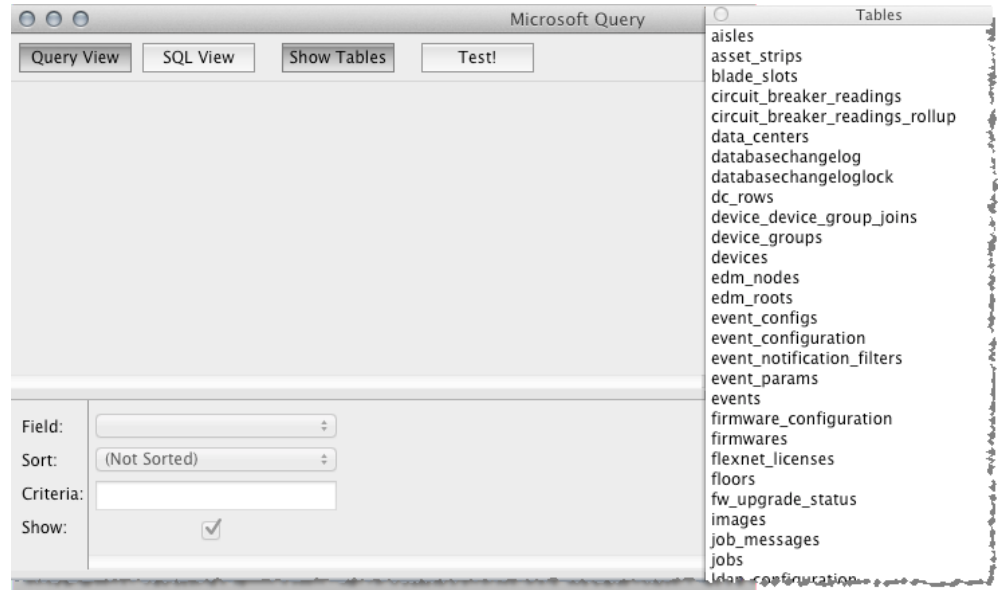


6. If this is the first time you are using the data source in Excel, enter the username and password according to the ODBC user credentials specified in Power IQ, and click Store password in Keychain then click OK.

For information on Power IQ's ODBC user credentials, see **Configuring ODBC User Credentials** (on page 358).

Formulate a Database Query

After creating the database connection, Microsoft Excel ("Microsoft Query") shows a list of all data tables that Power IQ makes available. See **Power IQ ODBC Schema** (on page 362)



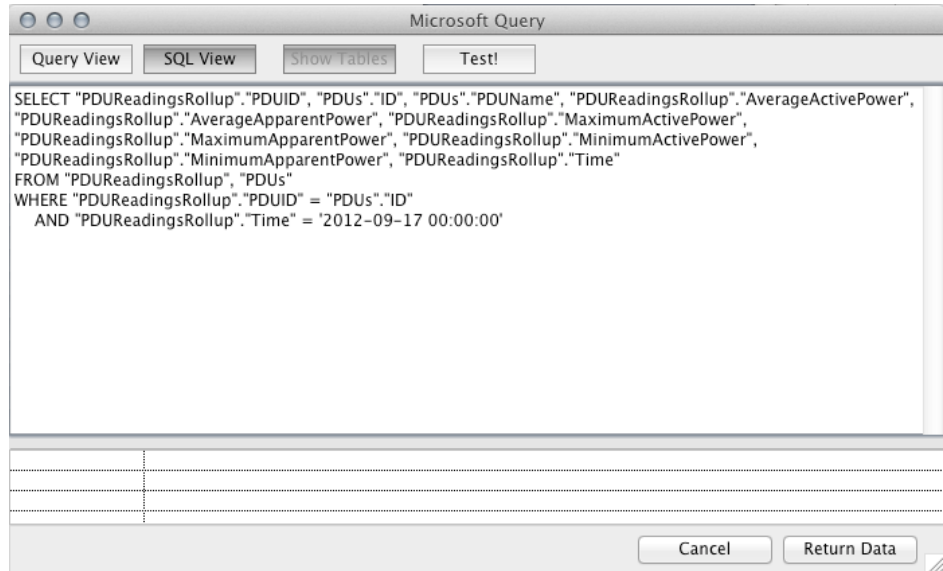
► To formulate a database query:

These instructions will create a report providing the max/min/average power utilization of every PDU in Power IQ.

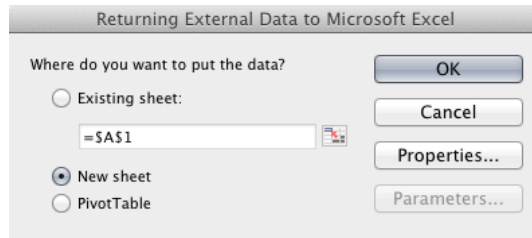
1. Click SQL View.
2. Copy and paste this EXACT string, including every quotation mark, every capitalization, and so on. The string must be used Exactly as shown.

```
SELECT "PDUReadingsRollup"."PDUID", "PDUs"."ID",
"PDUReadingsRollup"."AverageActivePower",
"PDUReadingsRollup"."AverageApparentPower",
"PDUReadingsRollup"."MaximumActivePower",
"PDUReadingsRollup"."MaximumApparentPower",
"PDUReadingsRollup"."MinimumActivePower",
"PDUReadingsRollup"."MinimumApparentPower",
"PDUReadingsRollup"."Time"
FROM "PDUReadingsRollup", "PDUs"
WHERE "PDUReadingsRollup"."PDUID" = "PDUs"."ID"
```

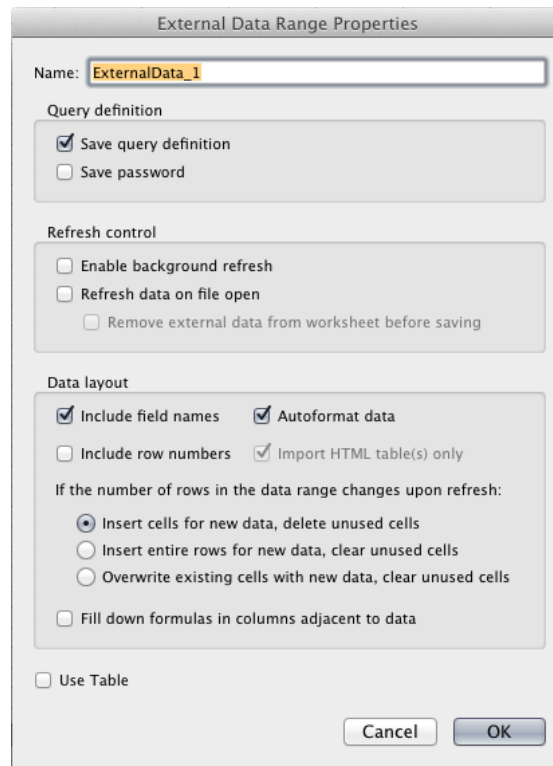
```
AND "PDUReadingsRollup"."Time" = '2012-09-10  
00:00:00'
```



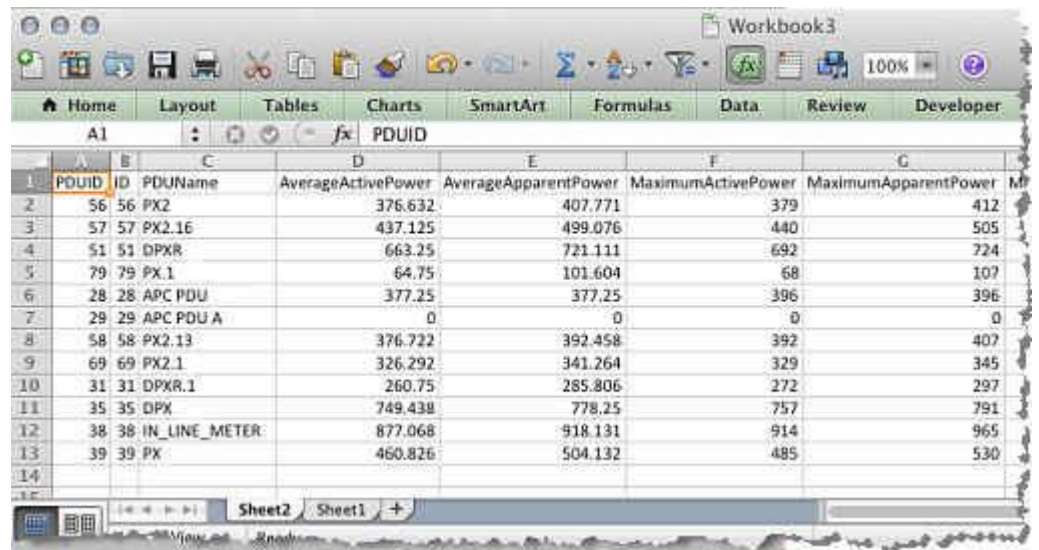
3. Click Return Data. A new window opens. Select "New Sheet", then click Properties.



4. Deselect the checkboxes for "Enable background refresh" and Use Table.



5. Click OK, then click OK again on the previous "New Sheet" dialog.
6. The report is generated. The query shows rollups from September 10, 2012. Change the query date in the string you copied and pasted for data from other days.



Appendix B Floor Map Drawing Files

To create floor map drawing files for Power IQ, you may find the dcTrack drawing file templates useful. This appendix contains information about downloading and using those templates.

Because a dcTrack floor map may require more information in the drawing file than a Power IQ floor map, you'll notice extra details in the template.

► **Power IQ Floor Map Drawing Files Must:**

- Be a supported file type. **Supported Drawing File Software and File Format** (on page 440)
- Represent a data center, floor or room in your EDM.
- Contain all racks that you want to display in the floor map.
- Include unique rack names that are exactly the same as the rack names in the EDM in Power IQ. Duplicate rack names will not work.
- Follow all drawing file requirements in either Visio or AutoCAD. See **Microsoft Visio Drawing File Requirements** (on page 443) and **AutoCAD Drawing File Requirements** (on page 450).

In This Chapter

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Create Drawing Files or Download Raritan Templates.....	440
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AutoCAD Drawing Object File Recommendations	451

Terminology - Objects vs. Shapes

When discussing drawing files, 'objects' refers to graphical representations of cabinets, floor PDUs, UPS units and CRAC units in an AutoCAD® drawing file.

'Shapes' is used when referring to these same items in a Microsoft Visio® drawing file.

Supported Drawing File Software and File Format

Power IQ® supports either AutoCAD® 2012 (and earlier) or Microsoft Visio®.

Note: Drawings created in AutoCAD® 2013 and 2014 are not supported by dcTrack.

Both AutoCAD and Microsoft Visio drawing files must be saved as .DWG files in order to upload them to dcTrack.

Create Drawing Files or Download Raritan Templates

For the floor map widget, you can:

- **Use Your Existing Drawing Files** (on page 440)
- OR
- **Download Raritan Drawing File Templates** (see "**Raritan Drawing File Templates**" on page 440)

A Visio stencil with Raritan designed shapes and connectors is available as a download from the Raritan support website. The visio stencil is designed for both Power IQ and dcTrack use. Use the stencil with the Raritan Visio templates, or with your own Visio files. See Microsoft Visio Floor Map Stencil.

Whether you use your own file or a Raritan template, review the information in this section to help ensure your file is formatted correctly.

Use Your Existing Drawing Files

Use your existing .DWG drawing files as long as they are created using a supported version of Microsoft Visio® or AutoCAD®. See **Supported Drawing File Software and File Format** (on page 440).

Raritan Drawing File Templates

Raritan provides generic Microsoft Visio® and AutoCAD® drawing files to use as templates, or as examples to follow when creating your own Visio or AutoCAD drawing files.

The Raritan designed Visio stencil can be used with the Visio template. See **Microsoft Visio Floor Map Stencil** (on page 442).

Templates and stencils are downloaded from the Raritan Support website.

Microsoft Visio Drawing File Default Layers - Usage in Power IQ

Raritan's Microsoft Visio® drawing file template provides predefined layers with various drawing shapes and elements.

You can download the template from the Raritan Support website.

Go to: <https://www.raritan.com/support/product/poweriq>

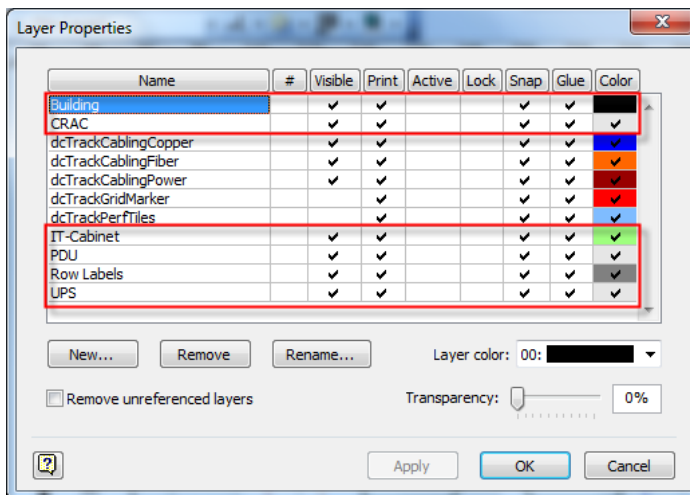
The Microsoft Visio floor map stencil is in a zip file.

Note: The stencil can be used for dcTrack or Power IQ drawings.

This includes:

- Individual layers for buildings, row labels, cabinet (rack) shapes, floor PDU shapes, UPS shapes and CRAC shapes.

Layers are provided, but you are not required to create them for each of these elements and shapes in a drawing a file.



Microsoft Visio Floor Map Stencil

Raritan provides a Microsoft Visio® stencil containing the shapes and connectors used to create shapes in a data center drawing file.

If needed, download the stencil from the Raritan Support website.

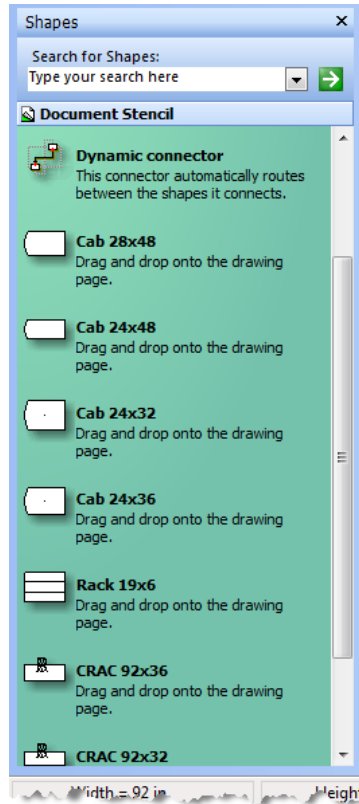
Go to: <https://www.raritan.com/support/product/poweriq>

The Microsoft Visio floor map stencil is in a zip file.

Note: The stencil can be used for dcTrack or Power IQ drawings.

Use the stencil in the Raritan template, or your own Visio drawing file.

Add the stencil to your Visio My Shapes folder so it is available as needed. See Add the dcTrack Stencil to Microsoft Visio



Microsoft Visio Drawing File Requirements

The following Microsoft Visio® drawing file requirements must be met to successfully save the file in AutoCAD® file format (.DWG), and visualize the floor map properly in the Power IQ® Web Client and Classic View once the drawing file is uploaded.

The file must be converted to a .DWG file to upload it to Power IQ.

Shapes in Visio represent objects on a floor map in Power IQ.

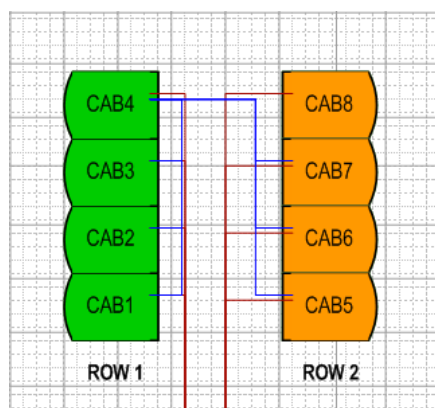
Shape Outline Requirements - Visio Files

- A shape's border must be closed
- Unless a shape is on a layer, the border outline can be black or any other color of your choosing.

For more information on border color when working with layers, see **Shape Border Layer Requirements - Visio Files** (on page 446)

Shape Fill Requirements - Visio Files

- Each shape created in a Microsoft Visio® file must use a solid fill color, but the fill color *cannot* be 01:White.
- Aside from the colors used by the objects on the floor map generated from the drawing file, the shape's fill color does not impact Power IQ®.



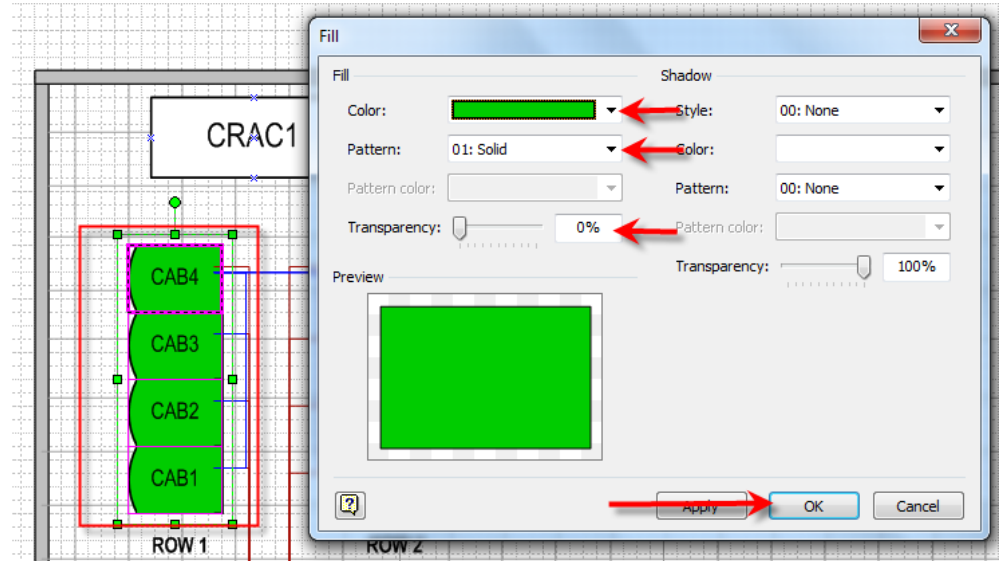
Add a Fill Color to a Visio Shape

► **To add a fill color to a shape in Visio:**

1. In the Microsoft Visio® file, right-click the shape and select Format > Fill.

Tip: Select multiple shapes at once and apply a fill at the same time.

2. Select a color from the Color drop-down, or apply a custom color. See Create a Custom Color for Visio Shapes
3. Select 01:Solid from the Pattern drop-down. Even if it is selected by default, you must click on it to apply it.
4. Click OK to apply the fill and close the dialog.



Shape Name Requirements for Power IQ - Visio Files

The rack shapes in your drawing file must include unique rack names that are exactly the same as the rack names in the EDM in Power IQ. Duplicate rack names will not work.

Facilities object shapes in your drawing file must also include unique names that are the same as the facilities objects in the EDM. Power IQ supports the following facilities objects:

- CRAC
- Floor PDU
- Floor UPS
- Power panel
- Standalone meter

All racks and facilities objects in the drawing file will be synced to the EDM.

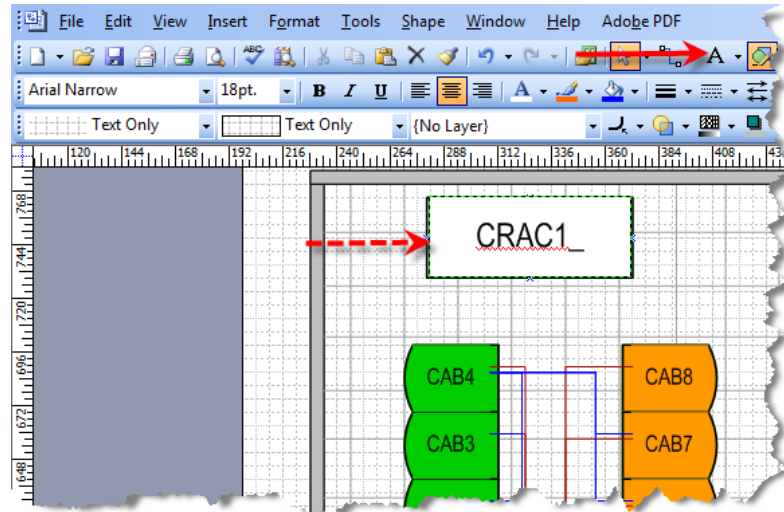
- Give each shape a unique name that matches the name in the EDM using the Text tool, or entering it directly into the shape.
- Shape names cannot contain the characters ' \ ? &

Add Text to a Visio Shape

► **To add a text ID to a Visio object:**

1. Double-click on the object to put it in edit mode.
2. Type the text ID, or use the Text Tool to add a text box and type the ID.

Make sure the text box is inside the floor plan shape.



Shape Border Layer Naming Requirements - Visio Files

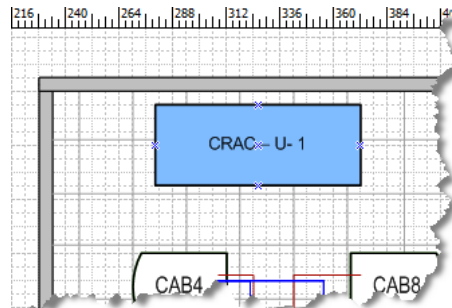
- Do not begin Microsoft Visio® layer names with the word "dcTrack" unless you are directed to do so.
- Microsoft Visio® layer names cannot contain spaces. Use underscores or dashes to separate words if needed. For example, Layer1, Layer-1, or Layer_1

Shape Border Layer Requirements - Visio Files

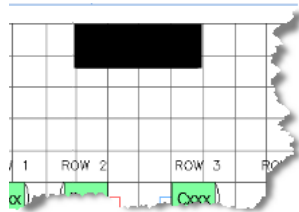
When using layers in a Microsoft Visio® drawing file, a shape on a layer cannot have a black border.

If it does, when the file is converted from a .VSD file to a .DWG AutoCAD® file and then uploaded to Power IQ®, the shape's fill is changed to black even if another fill color is applied to it.

For example, you create a rectangle with a black border and blue fill on a layer in a Visio file to represent a CRAC unit object on the floor map.



When the file is converted to a .DWG and then uploaded to Power IQ, when the CRAC unit object appears on the floor map in Power IQ its fill is black, not blue.



Avoid this by setting the shape's fill, border and layer to the same color - see **Set a Shape's Border, Fill and Visio Layer to the Same Color** (on page 446)

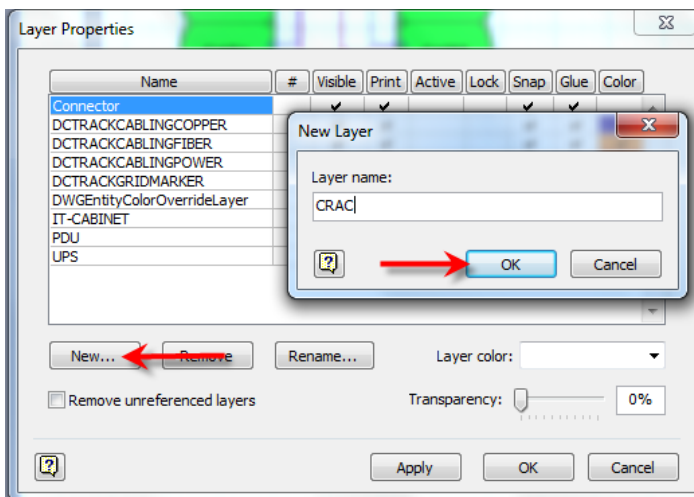
Set a Shape's Border, Fill and Visio Layer to the Same Color

► **To set a shape's border, fill and layer to the same color:**

1. In Microsoft Visio®, select View > Layer Properties.
The Layer Properties dialog appears.
2. Create a new layer for the objects by selecting the New... button, naming the layer in the New Layer dialog and clicking OK.

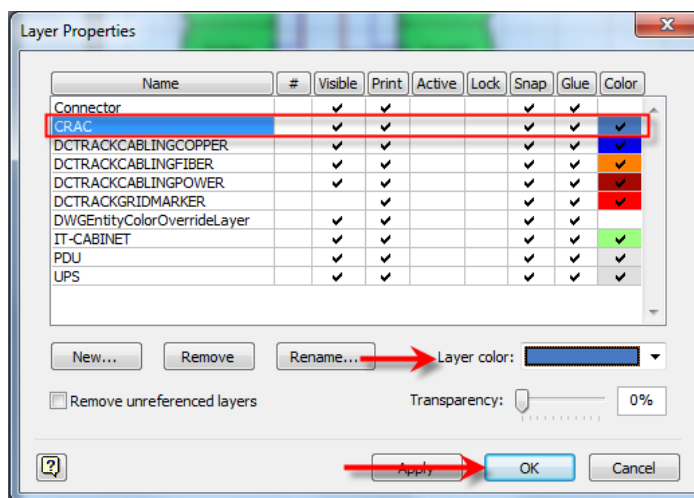
Visio layer names cannot contain spaces. Use underscores or dashes if spaces are required.

Important: Do not begin Visio layer names with the word "dcTrack" unless you are directed to do so.



3. In the Layer Properties dialog, locate the row containing the layer you just created, then click on the layer's field under the Color column. A checkmark appears in the field.
4. Select a color for the layer from the "Layer color:" drop-down, then click Apply.

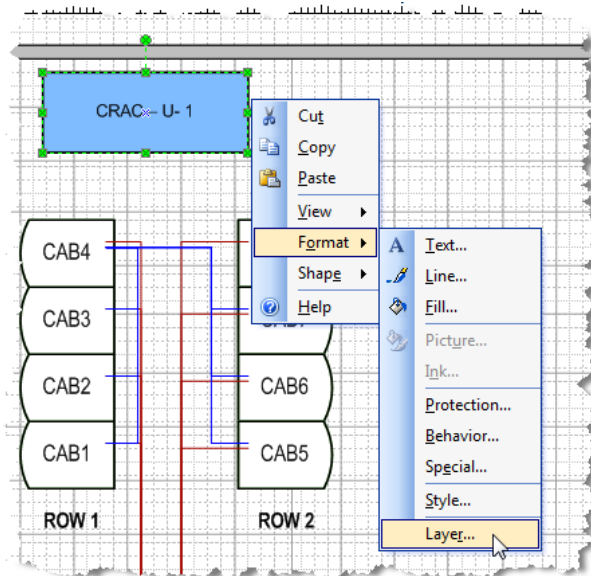
The color is applied to the layer, and the Color field changes to the selected color.



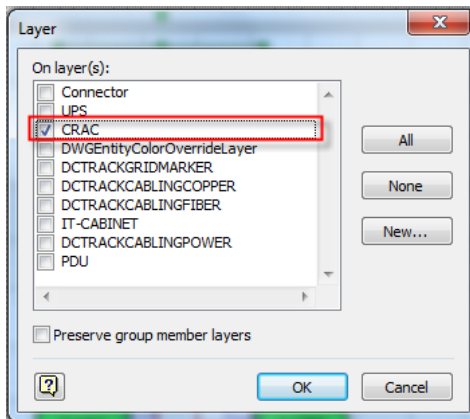
Alternatively, create a custom color. See Create a Custom Color for Visio Shapes

5. Click OK.
6. Next, assign the shape to the layer.

- a. Right-click on the shape, then click Format > Layer to open the Layers dialog.



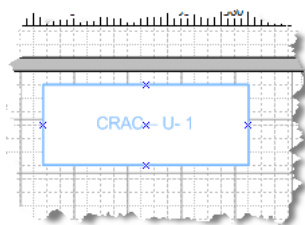
- b. Select the layer, then click OK.



The shape is assigned to the layer, and its border and fill are the same color as the layer.

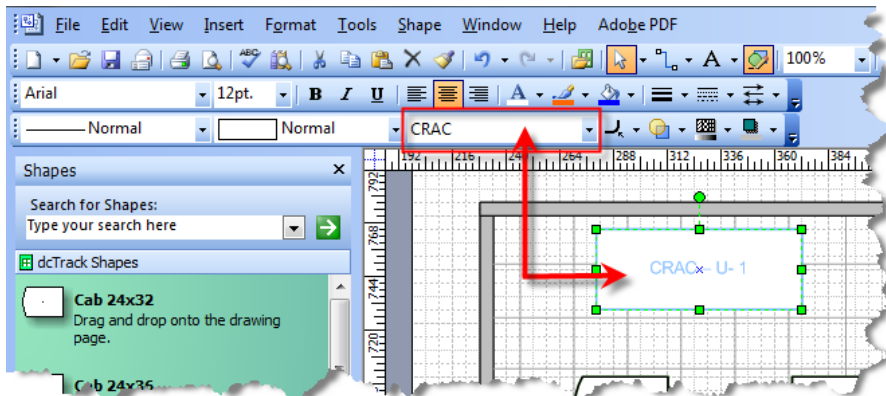
Since the shape and layer colors are the same, in order to see the shape, a negative (or inverse) image may be displayed.

If this is the case, the shape may appear as if it has no fill even though it does.



7. Finally, verify only the shape(s) you want are assigned to the layer.
 - a. Click View > Toolbars then check the Format Shape option to enable that Format Shape toolbar.

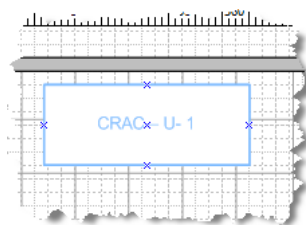
Click on an object that is on the layer you just created. The layer is displayed in the Layer drop-down on the Format Shape toolbar.



*Note: If you want shapes to have a black border even though their border and fill color are the same as their layer, there is a workaround. See **Create a Border for Visio Shapes on a Layer (Workaround)** (on page 449)*

Create a Border for Visio Shapes on a Layer (Workaround)

Once a shape's border and fill are changed to the same color as the layer, the shapes do not have a black border to define them from each other in the Microsoft Visio® file.



If you want the Visio shapes to use a border that is a different color than the fill, do the following as a workaround.

► **To create a border for the objects:**

1. Draw an additional rectangle that has no fill (Pattern = None) around each object that is not assigned to a layer (Layer = {No Layer}).

Note: This is similar to the way it would be done in AutoCAD®, where the rectangle and the hatch are two separate objects.

2. To easily distinguish classes of objects, create separate layers and colors for each type of floor-standing object in the data center such as a cabinet, floor PDU, CRAC or UPS.
3. Text labels should be modified if the text wraps to multiple lines. Text wrapping causes AutoCAD® to insert a dash at the end of each line.

The workaround to this issue is to size the text box of the label to be wide enough so that the text does not wrap. Reducing the font size also helps prevent wrapping.

AutoCAD Drawing File Requirements

Following are Power IQ's® minimum, AutoCAD® drawing file requirements.

Object Outlines - AutoCAD Files

- An object's outline must be closed

Object Name Requirements for Power IQ - AutoCAD Files

The rack shapes in your drawing file must include unique rack names that are exactly the same as the rack names in the EDM in Power IQ. Duplicate rack names will not work.

Facilities object shapes in your drawing file must also include unique names that are the same as the facilities objects in the EDM. Power IQ supports the following facilities objects:

- CRAC
- Floor PDU
- Floor UPS
- Power panel
- Standalone meter

All racks and facilities objects in the drawing file will be synced to the EDM.

- Give each object a unique name that matches the name in the EDM
- Object names cannot contain the characters ' \ ? &

Drawing File Layer Requirements - AutoCAD Files

- Do not begin AutoCAD® layer names with the word "dcTrack" unless you are directed to do so.

AutoCAD Drawing Object File Recommendations

When using AutoCAD® to create your floor map drawings, follow these recommendations.

Rack Object Recommendations - AutoCAD Drawing Files

Rack Object - Commands

- Use the Pline command or the Rectangle command to draw a rack outline
- Make the Pline width of a rack outline equal to 0.75" or 1"
- When creating a rack with a curved front, use a single Pline and draw the rack starting at the center rear.

Then, to create the curved front, draw several shorter straight lines while varying the angle each time to achieve the curved look.

Rack Object - Layers

- Draw rack outlines on separate layers in the drawing file to make future modifications and global changes easier.

Object Outline Recommendations - AutoCAD Drawing Files

Object Outline - Command

- Create objects using a polyline

Object Outline - Layers

- Create the object outline on a different layer than the hatch

Object Outline - Color

- Set the color of the object outline by layer

Object Hatch Recommendations - AutoCAD Drawing Files

Object Hatch - Layers

- Draw solid hatches on separate layers in the drawing file so it is easier to make future modifications and global changes.
- Create the hatch on a different layer than the object outline

Object Hatch - Pattern

- Use a solid pattern for the hatch within an outline

Object Hatch - Color

- Set the color of the hatch by layer
- Raritan recommends using the following colors for hatch layers:
 - Color 81 for a cabinet Solid Hatch
 - Color 254 for PDU and CRAC Solid Hatches
 - Color 151 for PT Solid Hatches

Object Label and Text Recommendations - AutoCAD Drawing Files

Object Labels - Text Formatting

- Object labels should use Arial Bold set to 9 inch height. The text height assumes the AutoCAD® drawing is drawn on a 1:1 scale
- Use Multiline Text for object labels, and make sure they are contained within the object outline
- Create either a Standard Text label or Multiline Text label to identify each data center row represented in the drawing file
- See **Object Name Requirements for Power IQ - AutoCAD Files** (on page 451)

Appendix C Frequently Asked Questions

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Security Questions

Question	Answer
Are failed login attempts recorded?	The audit log records all login attempts. You can also configure Power IQ to send syslog notifications for entries in the audit log.
Does Power IQ support LDAP lock-out settings?	Power IQ respects the lock-out settings of an LDAP server. If a user attempts multiple invalid logins, and the LDAP server set the account to be blocked, Power IQ no longer allows access.
Do session timeouts work in an LDAP setting?	Session timeouts are applicable to LDAP users and local users.

PDU Questions

Question	Answer
The status of my PDU says "Degraded."	<ul style="list-style-type: none">▪ Check to see if the SNMP agent is enabled on the PDU.▪ If enabled, check to see if the matching SNMP read strings are configured for the PDU and Power IQ.▪ Check to see if you are running the latest PX firmware. For Raritan PX PDUs.▪ If you have enabled Buffered Data Collection, make sure the PX has been configured with an SNMP write string. For Raritan PX PDUs.▪ Reduce the poll rate or increase the number of CPUs (VMware).
How do I configure my MRV PDU so that it will work with Power IQ's power control feature?	<ul style="list-style-type: none">▪ Make sure that the SNMP community string you use to configure the MRV PDU in Power IQ supports both SNMP v1 and v2c Gets and Sets. The community string must be configured for v1 and v2c access in both the Get Clients section and the Set

Question	Answer
	Clients section on the MRV PDU.

Unable to Collect IPv4 Routing Table

The error "Unable to collect IPv4 routing table" may display when you attempt to launch a Power IQ virtual machine with multiple NIC cards, using ESXi 5.1.

Renaming two files may be a workaround to this VMware Tools issue.

```
mv
/usr/lib/vmware-tools/plugins32/vmsvc/libtimeSync.so
/usr/lib/vmware-tools/plugins32/vmsvc/libtimeSync.so.
renamed
```

```
mv
/usr/lib/vmware-tools/plugins64/vmsvc/libtimeSync.so
/usr/lib/vmware-tools/plugins64/vmsvc/libtimeSync.so.
renamed
```


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Email for CommandCenter NOC: tech-ccnoc@raritan.com
Email for all other products: tech@raritan.com

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Monday - Friday
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Phone: +86-21-5425-2499

GuangZhou

Monday - Friday
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9 a.m. - 6 p.m. local time
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Email: support.japan@raritan.com

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Europe

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8:30 a.m. - 5 p.m. GMT+1 CET
Phone: +31-10-2844040
Email: tech.europe@raritan.com

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France

Monday - Friday
8:30 a.m. - 5 p.m. GMT+1 CET
Phone: +33-1-47-56-20-39

Germany

Monday - Friday
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Phone: +49-20-17-47-98-0
Email: rg-support@raritan.com

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9:00 a.m. - 6 p.m. local time
Phone: +61-3-9866-6887

▶ **Taiwan**

Monday - Friday
9 a.m. - 6 p.m. GMT -5 Standard -4 Daylight
Phone: +886-2-8919-1333
Email: support.apac@raritan.com