



Environmental Monitoring and PoE Management

The Cisco 4000 series Integrated Services routers have hardware and software features that periodically monitor the router's environment. For more information, see the [Hardware Installation Guide for the Cisco 4000 Series Integrated Services Routers](#).

This chapter provides information on the environmental monitoring features on your router that allow you to monitor critical events and generate statistical reports on the status of various router components and, includes the following sections:

- [Environmental Monitoring, on page 1](#)
- [Environmental Monitoring and Reporting Functions, on page 2](#)
- [Configuring Power Supply Mode, on page 16](#)
- [Managing PoE, on page 21](#)
- [Additional References, on page 26](#)

Environmental Monitoring

The router provides a robust environment-monitoring system with several sensors that monitor the system temperatures. Microprocessors generate interrupts to the HOST CPU for critical events and generate a periodic status and statistics report. The following are some of the key functions of the environmental monitoring system:

- Monitoring temperature of CPUs, motherboard, and midplane
- Monitoring fan speed
- Recording abnormal events and generating notifications
- Monitoring Simple Network Management Protocol (SNMP) traps
- Generating and collecting Onboard Failure Logging (OBFL) data
- Sending call home event notifications
- Logging system error messages
- Displaying present settings and status

Environmental Monitoring and Reporting Functions

Monitoring and reporting functions allow you to maintain normal system operation by identifying and resolving adverse conditions prior to loss of operation.

- [Environmental Monitoring Functions, on page 2](#)
- [Environmental Reporting Functions, on page 4](#)

Environmental Monitoring Functions

Environmental monitoring functions use sensors to monitor the temperature of the cooling air as it moves through the chassis.

The local power supplies provide the ability to monitor:

- Input and output current
- Output voltage
- Input and output power
- Temperature
- Fan speed

The router is expected to meet the following environmental operating conditions:

- Operating Temperature Nominal—32°F to 104°F (0°C to 40°C)
- Operating Humidity Nominal—10% to 85% RH noncondensing
- Operating Humidity Short Term—10% to 85% RH noncondensing
- Operating Altitude—Sea level 0 ft to 10,000 ft (0 to 3000 m)
- AC Input Range—85 to 264 VAC

In addition, each power supply monitors its internal temperature and voltage. A power supply is either within tolerance (normal) or out of tolerance (critical). If an internal power supply's temperature or voltage reaches a critical level, the power supply shuts down without any interaction with the system processor.

The following table displays the levels of status conditions used by the environmental monitoring system.

Table 1: Levels of Status Conditions Used by the Environmental Monitoring System

Status Level	Description
Normal	All monitored parameters are within normal tolerance.
Warning	The system has exceeded a specified threshold. The system continues to operate, but operator action is recommended to bring the system back to a normal state.

Status Level	Description
Critical	An out-of-tolerance temperature or voltage condition exists. Although the system continues to operate, it is approaching shutdown. Immediate operator action is required.

The environmental monitoring system sends system messages to the console, for example, when the conditions described here are met:

Fan Failure

When the system power is on, all the fans should be operational. Although the system continues to operate if a fan fails, the system displays the following message:

```
%IOSXE_PEM-3-FANFAIL: The fan in slot 2/0 is encountering a failure condition
```

Sensors Out of Range

When sensors are out of range, the system displays the following message:

```
%ENVIRONMENTAL-1-ALERT: V: 1.0v PCH, Location: R0, State: Warning, Reading: 1102 mV
```

```
%ENVIRONMENTAL-1-ALERT: V: PEM Out, Location: P1, State: Warning, Reading: 0 mV
```

```
%ENVIRONMENTAL-1-ALERT: Temp: Temp 3, Location R0, State : Warning, Reading : 90C
```

Fan Tray (Slot P2) Removed

When the fan tray for slot P2 is removed, the system displays the following message:

```
%IOSXE_PEM-6-REMPER_FM: PEM/FM slot P2 removed
```

Fan Tray (Slot P2) Reinserted

When the fan tray for slot P2 is reinserted, the system displays the following message:

```
%IOSXE_PEM-6-INSPEM_FM: PEM/FM slot P2 inserted
```

Fan Tray (Slot 2) is Working Properly

When the fan tray for slot 2 is functioning properly, the system displays the following message:

```
%IOSXE_PEM-6-PEMOK: The PEM in slot P2 is functioning properly
```

Fan 0 in Slot 2 (Fan Tray) is Not Working

When Fan 0 in the fan tray of slot 2 is not functioning properly, the system displays the following message:

```
%IOSXE_PEM-3-FANFAIL: The fan in slot 2/0 is encountering a failure condition
```

Fan 0 in Slot 2 (Fan Tray) is Working Properly

When Fan 0 in the fan tray of slot 2 is functioning properly, the system displays the following message:

```
%IOSXE_PEM-6-FANOK: The fan in slot 2/0 is functioning properly
```

Main Power Supply in Slot 1 is Powered Off

When the main power supply in slot 1 is powered off, the system displays the following message:

```
%IOSXE_PEM-3-PEMFAIL: The PEM in slot 1 is switched off or encountering a
failure condition.
```

Main Power Supply is Inserted in Slot 1

When the main power supply is inserted in slot 1, the system displays the following messages:

```
%IOSXE_PEM-6-INSPEM_FM: PEM/FM slot P1 inserted
%IOSXE_PEM-6-PEMOK: The PEM in slot 1 is functioning properly
```

Temperature and Voltage Exceed Max/Min Thresholds

The following example shows the warning messages indicating the maximum and minimum thresholds of the temperature or voltage:

```
Warnings :
-----
For all the temperature sensors (name starting with "Temp:") above,
the critical warning threshold is 100C (100C and higher)
the warning threshold is 80C (range from 80C to 99C)
the low warning threshold is 1C (range from -inf to 1C).

For all voltage sensors (names starting with "V:"),
the high warning threshold starts at that voltage +10%. (voltage + 10% is warning)
the low warning threshold starts at the voltage -10%. (voltage - 10% is warning)
```

Environmental Reporting Functions

You can retrieve and display environmental status reports using the following commands:

- **debug environment**
- **debug platform software cman env monitor polling**
- **debug ilpower**
- **debug power [inline | main]**
- **show diag all eeprom**
- **show diag slot R0 eeprom detail**
- **show environment**
- **show environment all**
- **show inventory**
- **show platform all**
- **show platform diag**
- **show platform software status control-processor**
- **show version**
- **show power**
- **show power inline**

These commands show the current values of parameters such as temperature and voltage.

The environmental monitoring system updates the values of these parameters every 60 seconds. Brief examples of these commands are shown below:

debug environment: Example

```
Router# debug environment location P0
Environmental sensor Temp: Temp 1 P0 debugging is on
Environmental sensor Temp: Temp 2 P0 debugging is on
Environmental sensor Temp: Temp 3 P0 debugging is on
Environmental sensor V: PEM Out P0 debugging is on
Environmental sensor I: PEM In P0 debugging is on
Environmental sensor I: PEM Out P0 debugging is on
Environmental sensor W: In pwr P0 debugging is on
Environmental sensor W: Out pwr P0 debugging is on
Environmental sensor RPM: fan0 P0 debugging is on

*Sep 12 00:45:13.956: Sensor: Temp: Temp 1 P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=29
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: Temp: Temp 1 P0 State=Normal Reading=29
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: Temp: Temp 2 P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=33
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: Temp: Temp 2 P0 State=Normal Reading=34
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: Temp: Temp 3 P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=34
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: Temp: Temp 3 P0 State=Normal Reading=35
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: V: PEM Out P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=12709
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: V: PEM Out P0 State=Normal Reading=12724
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: I: PEM In P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=1
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: I: PEM In P0 State=Normal Reading=1
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: I: PEM Out P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=4
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: I: PEM Out P0 State=Normal Reading=4
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: W: In pwr P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=92
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: W: In pwr P0 State=Normal Reading=92
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: W: Out pwr P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=46
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: W: Out pwr P0 State=Normal Reading=46
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
```

```
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
*Sep 12 00:45:13.956: Sensor: RPM: fan0 P0, In queue 1
*Sep 12 00:45:13.956: State=Normal Reading=3192
*Sep 12 00:45:13.956: Rotation count=0 Poll period=60000
*Sep 12 00:45:13.956: Sensor: RPM: fan0 P0 State=Normal Reading=3180
*Sep 12 00:45:13.956: Inserting into queue 1 on spoke 173.
*Sep 12 00:45:13.956: Rotation count=60 Displacement=0
```

debug platform software cman env monitor polling: Example

```
Router# debug platform software cman env monitor polling
platform software cman env monitor polling debugging is on
Router#
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback Temp: Temp 1, P0, 29
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback Temp: Temp 2, P0, 34
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback Temp: Temp 3, P0, 35
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback V: PEM Out, P0, 12709
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback I: PEM In, P0, 1
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback I: PEM Out, P0, 4
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback W: In pwr, P0, 93
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback W: Out pwr, P0, 48
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback RPM: fan0, P0, 3192
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback Temp: Temp 1, P1, 33
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback Temp: Temp 2, P1, 32
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback Temp: Temp 3, P1, 36
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback V: PEM Out, P1, 12666
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback I: PEM In, P1, 1
*Sep 12 00:46:13.962: IOS-RP-ENVMON: sensor READ callback I: PEM Out, P1, 4
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback W: In pwr, P1, 55
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback W: Out pwr, P1, 46
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback RPM: fan0, P1, 2892
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback RPM: fan0, P2, 4894
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback RPM: fan1, P2, 4790
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback RPM: fan2, P2, 5025
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback RPM: fan3, P2, 5001
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback W: fan pwr, P2, 8
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback Temp: Inlet 1, R0, 25
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback Temp: Inlet 2, R0, 28
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback Temp: Outlet 1, R0, 30
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback Temp: Outlet 2, R0, 35
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 12v, R0, 12735
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 5v, R0, 5125
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 3.3v, R0, 3352
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.05v, R0, 1052
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 2.5v, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.8v, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.2v, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.15v, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.1v, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.0v, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.8v PCH, R0, 1787
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.5v PCH, R0, 1516
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.5v CPUC, R0, 1526
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.5v CPUI, R0, 1529
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.0v PCH, R0, 1009
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 1.5v QLM, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: VCore, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: VTT, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 0.75v CPUI, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback V: 0.75v CPUC, R0, 0
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback I: 12v, R0, 7
*Sep 12 00:46:13.963: IOS-RP-ENVMON: sensor READ callback W: pwr, R0, 81
```

debug ilpower: Example

```
Router# debug ilpower ?
cdp ILPOWER CDP messages
controller ILPOWER controller
event ILPOWER event
ha ILPOWER High-Availability
port ILPOWER port management
powerman ILPOWER powerman
registries ILPOWER registries
scp ILPOWER SCP messages
```

debug power [inline|main]: Example

In this example, there is one 1000W power supply and one 450W power supply. Inline and main power output is shown.

```
Router# debug power ?
inline ILPM inline power related
main Main power related
<cr>
Router# debug power
POWER all debug debugging is on
```

```
Router# show debugging | include POWER
```

```
POWER:
POWER main debugging is on
POWER inline debugging is on
Router#
..
*Jan 21 01:29:40.786: %ENVIRONMENTAL-6-NOTICE: V: PEM Out, Location: P1, State: Warning,
Reading: 0 mV
*Jan 21 01:29:43.968: %IOSXE_PEM-6-PEMOK: The PEM in slot P1 is functioning properly
*Jan 21 01:29:43.968: %PLATFORM_POWER-6-MODEMATCH: Main power is in Boost mode
*Jan 21 01:29:43.968: Power M: Received Msg for 12V/Main, total power 1450, Run same as cfg
Yes
*Jan 21 01:29:43.968: Power M: Received Msg for POE/ILPM, total power 500, Run same as cfg
No
*Jan 21 01:29:43.968: Power I: Updating pool power is 500 watts
*Jan 21 01:29:43.968: Power I: Intimating modules of total power 500 watts
*Jan 21 01:29:46.488: Power M: Received Msg for 12V/Main, total power 1450, Run same as cfg
Yes
*Jan 21 01:29:46.488: Power M: Received Msg for POE/ILPM, total power 500, Run same as cfg
No
*Jan 21 01:29:46.488: Power I: Updating pool power is 500 watts
*Jan 21 01:29:46.488: Power I: Intimating modules of total power 500 watts
Router#
```

show diag all eeprom: Example

```
Router# show diag all eeprom
MIDPLANE EEPROM data:

Product Identifier (PID) : ISR4451/K9
Version Identifier (VID) : V01
PCB Serial Number : FOC15507S9K
Hardware Revision : 1.0
Asset ID : P1B-R2C-CP1.0
CLEI Code : TDBTDBTDBT
```

Power/Fan Module P0 EEPROM data:

Product Identifier (PID) : XXX-XXXX-XX
Version Identifier (VID) : XXX
PCB Serial Number : DCA1547X047
CLEI Code : 0000000000
Power/Fan Module P1 EEPROM data:

Product Identifier (PID) : XXX-XXXX-XX
Version Identifier (VID) : XXX
PCB Serial Number : DCA1533X022
CLEI Code : 0000000000
Power/Fan Module P2 EEPROM data is not initialized

Internal PoE is not present
Slot R0 EEPROM data:

Product Identifier (PID) : ISR4451/K9
Version Identifier (VID) : V01
PCB Serial Number : FOC15507S9K
Hardware Revision : 1.0
CLEI Code : TDBTDBTDBT
Slot F0 EEPROM data:

Product Identifier (PID) : ISR4451-FP
Version Identifier (VID) : V00
PCB Serial Number : FP123456789
Hardware Revision : 4.1
Slot 0 EEPROM data:

Product Identifier (PID) : ISR4451/K9
Version Identifier (VID) : V01
PCB Serial Number : FOC15507S9K
Hardware Revision : 1.0
CLEI Code : TDBTDBTDBT
Slot 1 EEPROM data:

Product Identifier (PID) : ISR4451/K9
Version Identifier (VID) : V01
PCB Serial Number : FOC15507S9K
Hardware Revision : 1.0
CLEI Code : TDBTDBTDBT
Slot 2 EEPROM data:

Product Identifier (PID) : ISR4451/K9
Version Identifier (VID) : V01
PCB Serial Number : FOC15507S9K
Hardware Revision : 1.0
CLEI Code : TDBTDBTDBT
SPA EEPROM data for subslot 0/0:

Product Identifier (PID) : ISR441-4X1GE
Version Identifier (VID) : V01
PCB Serial Number : JAB092709EL
Top Assy. Part Number : 68-2236-01
Top Assy. Revision : A0
Hardware Revision : 2.2
CLEI Code : CNUIAHSAAA
SPA EEPROM data for subslot 0/1 is not available

SPA EEPROM data for subslot 0/2 is not available

SPA EEPROM data for subslot 0/3 is not available


```
SPA EEPROM data for subslot 0/4 is not available
SPA EEPROM data for subslot 1/0 is not available
SPA EEPROM data for subslot 1/1 is not available
SPA EEPROM data for subslot 1/2 is not available
SPA EEPROM data for subslot 1/3 is not available
SPA EEPROM data for subslot 1/4 is not available
SPA EEPROM data for subslot 2/0 is not available
SPA EEPROM data for subslot 2/1 is not available
SPA EEPROM data for subslot 2/2 is not available
SPA EEPROM data for subslot 2/3 is not available
SPA EEPROM data for subslot 2/4 is not available
```

show environment: Example

In this example, note the output for the slots POE0 and POE1. Cisco IOS XE 3.10 and higher supports an external PoE module.

```
Router# show environment

Number of Critical alarms: 0
Number of Major alarms: 0
Number of Minor alarms: 0

Slot Sensor Current State Reading
----
P0 Temp: Temp 1 Normal 28 Celsius
P0 Temp: Temp 2 Normal 43 Celsius
P0 Temp: Temp 3 Normal 44 Celsius
P0 V: PEM Out Normal 12404 mV
P0 I: PEM In Normal 1 A
P0 I: PEM Out Normal 7 A
P0 P: In pwr Normal 106 Watts
P0 P: Out pwr Normal 87 Watts
P0 RPM: fan0 Normal 2952 RPM
P2 RPM: fan0 Normal 4421 RPM
P2 RPM: fan1 Normal 4394 RPM
P2 RPM: fan2 Normal 4433 RPM
P2 RPM: fan3 Normal 4410 RPM
P2 P: pwr Normal 6 Watts
POE0 Temp: Temp 1 Normal 44 Celsius
POE0 I: 12v In Normal 2 A
POE0 V: 12v In Normal 12473 mV
POE0 P: In pwr Normal 25 Watts
POE1 Temp: Temp 1 Normal 40 Celsius
POE1 I: 12v In Normal 2 mA
POE1 V: 12v In Normal 12473 mV
POE1 P: In pwr Normal 20 Watts
R0 Temp: Inlet 1 Normal 24 Celsius
R0 Temp: Inlet 2 Normal 26 Celsius
R0 Temp: Outlet 1 Normal 33 Celsius
R0 Temp: Outlet 2 Normal 32 Celsius
R0 Temp: core-B Normal 43 Celsius
```

```

R0 Temp: core-C Normal 38 Celsius
R0 V: 12v Normal 12355 mV
R0 V: 5v Normal 5090 mV
R0 V: 3.3v Normal 3331 mV
R0 V: 3.0v Normal 2998 mV
R0 V: 2.5v Normal 2436 mV
R0 V: 1.05v Normal 1049 mV
R0 V: 1.8v Normal 1798 mV
R0 V: 1.2v Normal 1234 mV
R0 V: Vcore-C Normal 1155 mV
R0 V: 1.1v Normal 1104 mV
R0 V: 1.0v Normal 1012 mV
R0 V: 1.8v-A Normal 1782 mV
R0 V: 1.5v-A Normal 1505 mV
R0 V: 1.5v-C1 Normal 1516 mV
R0 V: 1.5v-B Normal 1511 mV
R0 V: Vcore-A Normal 1099 mV
R0 V: 1.5v-C2 Normal 1492 mV
R0 V: Vcore-B1 Normal 891 mV
R0 V: Vcore-B2 Normal 904 mV
R0 V: 0.75v-B Normal 754 mV
R0 V: 0.75v-C Normal 759 mV
R0 I: 12v Normal 8 A
R0 P: pwr Normal 86 Watts
0/1 P: pwr Normal 5 Watts
P1 Temp: Temp 1 Normal 30 Celsius
P1 Temp: Temp 2 Normal 38 Celsius
P1 Temp: Temp 3 Normal 39 Celsius
P1 V: PEM Out Normal 12404 mV
P1 I: PEM In Normal 1 A
P1 I: PEM Out Normal 6 A
P1 P: In pwr Normal 86 Watts
P1 P: Out pwr Normal 68 Watts
P1 RPM: fan0 Normal 2940 RPM

```

show environment all: Example

```

Router# show environment all
Sensor List: Environmental Monitoring
Sensor Location State Reading
Temp: Temp 1 P0 Normal 29 Celsius
Temp: Temp 2 P0 Normal 43 Celsius
Temp: Temp 3 P0 Normal 44 Celsius
V: PEM Out P0 Normal 12404 mV
I: PEM In P0 Normal 1 A
I: PEM Out P0 Normal 8 A
P: In pwr P0 Normal 111 Watts
P: Out pwr P0 Normal 91 Watts
RPM: fan0 P0 Normal 2940 RPM
RPM: fan0 P2 Normal 4419 RPM
RPM: fan1 P2 Normal 4395 RPM
RPM: fan2 P2 Normal 4426 RPM
RPM: fan3 P2 Normal 4412 RPM
P: pwr P2 Normal 6 Watts
Temp: Temp 1 POE0 Normal 44 Celsius
I: 12v In POE0 Normal 2 A
V: 12v In POE0 Normal 12473 mV
P: In pwr POE0 Normal 25 Watts
Temp: Temp 1 POE1 Normal 40 Celsius
I: 12v In POE1 Normal 2 mA
V: 12v In POE1 Normal 12473 mV

```

```

P: In pwr POE1 Normal 20 Watts
Temp: Inlet 1 R0 Normal 24 Celsius
Temp: Inlet 2 R0 Normal 27 Celsius
Temp: Outlet 1 R0 Normal 33 Celsius
Temp: Outlet 2 R0 Normal 32 Celsius
Temp: core-B R0 Normal 49 Celsius
Temp: core-C R0 Normal 37 Celsius
V: 12v R0 Normal 12355 mV
V: 5v R0 Normal 5084 mV
V: 3.3v R0 Normal 3331 mV
V: 3.0v R0 Normal 2998 mV
V: 2.5v R0 Normal 2433 mV
V: 1.05v R0 Normal 1052 mV
V: 1.8v R0 Normal 1798 mV
V: 1.2v R0 Normal 1226 mV
V: Vcore-C R0 Normal 1155 mV
V: 1.1v R0 Normal 1104 mV
V: 1.0v R0 Normal 1015 mV
V: 1.8v-A R0 Normal 1782 mV
V: 1.5v-A R0 Normal 1508 mV
V: 1.5v-C1 R0 Normal 1513 mV
V: 1.5v-B R0 Normal 1516 mV
V: Vcore-A R0 Normal 1099 mV
V: 1.5v-C2 R0 Normal 1492 mV
V: Vcore-B1 R0 Normal 1031 mV
V: Vcore-B2 R0 Normal 901 mV
V: 0.75v-B R0 Normal 754 mV
V: 0.75v-C R0 Normal 754 mV
I: 12v R0 Normal 8 A
P: pwr R0 Normal 97 Watts
P: pwr 0/1 Normal 5 Watts
Temp: Temp 1 P1 Normal 30 Celsius
Temp: Temp 2 P1 Normal 39 Celsius
Temp: Temp 3 P1 Normal 39 Celsius
V: PEM Out P1 Normal 12404 mV
I: PEM In P1 Normal 1 A
I: PEM Out P1 Normal 6 A
P: In pwr P1 Normal 87 Watts
P: Out pwr P1 Normal 66 Watts
RPM: fan0 P1 Normal 2940 RPM

```

show inventory: Example

```

Router# show inventory
NAME: "Chassis", DESCR: "Cisco ISR4451 Chassis"
PID: ISR4451/K9 , VID: V01, SN: FGL160110QZ

NAME: "Power Supply Module 0", DESCR: "450W AC Power Supply for Cisco ISR4450"
PID: XXX-XXXX-XX , VID: XXX, SN: DCA1547X047

NAME: "Power Supply Module 1", DESCR: "450W AC Power Supply for Cisco ISR4450"
PID: XXX-XXXX-XX , VID: XXX, SN: DCA1614Y022

NAME: "Fan Tray", DESCR: "Cisco ISR4450 Fan Assembly"
PID: ACS-4450-FANASSY , VID: , SN:

NAME: "POE Module 0", DESCR: "Single POE for Cisco ISR4451"
PID: PWR-POE-4400 , VID: , SN: FHH1638P00E

NAME: "POE Module 1", DESCR: "Single POE for Cisco ISR4451"
PID: PWR-POE-4400 , VID: , SN: FHH1638P00G

```

```

NAME: "GE-POE Module", DESCR: "POE Module for On Board GE for Cisco ISR4400"
PID: 800G2-POE-2 , VID: V01, SN: FOC151849W9

NAME: "module 0", DESCR: "Cisco ISR4451 Built-In NIM controller"
PID: ISR4451/K9 , VID: , SN:
NAME: "NIM subslot 0/2", DESCR: " NIM-4MFT-T1/E1 - T1/E1 Serial Module"
PID: NIM-4MFT-T1/E1 , VID: V01, SN: FOC16254E6W

NAME: "NIM subslot 0/3", DESCR: "NIM SSD Module"
PID: NIM-SSD , VID: V01, SN: FHH16510032

NAME: "NIM subslot 0/0", DESCR: "Front Panel 4 ports Gigabitethernet Module"
PID: ISR4451-X-4x1GE , VID: V01, SN: JAB092709EL

NAME: "module 1", DESCR: "Cisco ISR4451 Built-In SM controller"
PID: ISR4451/K9 , VID: , SN:

NAME: "SM subslot 1/0", DESCR: "SM-X-1T3/E3 - Clear T3/E3 Serial Module"
PID: SM-X-1T3/E3 , VID: V01, SN: FOC164750RG

NAME: "module 2", DESCR: "Cisco ISR4451 Built-In SM controller"
PID: ISR4451/K9 , VID: , SN:

NAME: "SM subslot 2/0", DESCR: "SM-ES3X-24-P: EtherSwitch SM L3 + PoEPlus + MACSec + 24
10/100/1000"
PID: SM-ES3X-24-P , VID: V01, SN: FHH1629007C

NAME: "module R0", DESCR: "Cisco ISR4451 Route Processor"
PID: ISR4451/K9 , VID: V01, SN: FOC15507S95

NAME: "module F0", DESCR: "Cisco ISR4451 Forwarding Processor"
PID: ISR4451/K9 , VID: , SN:

```

show platform: Example

```

Router# show platform
Chassis type: ISR4451/K9

Slot Type State Insert time (ago)
-----
0 ISR4451/K9 ok 3d11h
0/0 ISR4451-X-4x1GE ok 3d11h
0/2 NIM-4MFT-T1/E1 ok 3d11h
0/3 NIM-SSD ok 3d11h
1 ISR4451/K9 ok 3d11h
1/0 SM-X-1T3/E3 ok 3d11h
2 ISR4451/K9 ok 3d11h
2/0 SM-ES3X-24-P ok 3d11h
R0 ISR4451/K9 ok, active 3d11h
F0 ISR4451/K9 ok, active 3d11h
P0 XXX-XXXX-XX ok 3d11h
P1 XXX-XXXX-XX ok 3d11h
P2 ACS-4450-FANASSY ok 3d11h
POE0 PWR-POE-4400 ok 3d11h
POE1 PWR-POE-4400 ok 3d11h
GE-POE 800G2-POE-2 ok 3d11h

```

show platform diag: Example

```
Router# show platform diag
Chassis type: ISR4451/K9

Slot: 0, ISR4451/K9
Running state : ok
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:04 (3d10h ago)
Software declared up time : 00:01:43 (3d10h ago)
CPLD version : 12121625
Firmware version : 15.3(1r)S

Sub-slot: 0/0, ISR4451-X-4x1GE
Operational status : ok
Internal state : inserted
Physical insert detect time : 00:03:03 (3d10h ago)
Logical insert detect time : 00:03:03 (3d10h ago)

Sub-slot: 0/2, NIM-4MFT-T1/E1
Operational status : ok
Internal state : inserted
Physical insert detect time : 00:03:03 (3d10h ago)
Logical insert detect time : 00:03:03 (3d10h ago)

Sub-slot: 0/3, NIM-SSD
Operational status : ok
Internal state : inserted
Physical insert detect time : 00:03:03 (3d10h ago)
Logical insert detect time : 00:03:03 (3d10h ago)

Slot: 1, ISR4451/K9
Running state : ok
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:04 (3d10h ago)
Software declared up time : 00:01:44 (3d10h ago)
CPLD version : 12121625
Firmware version : 15.3(1r)S

Sub-slot: 1/0, SM-X-1T3/E3
Operational status : ok
Internal state : inserted
Physical insert detect time : 00:03:03 (3d10h ago)
Logical insert detect time : 00:03:03 (3d10h ago)

Slot: 2, ISR4451/K9
Running state : ok
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:04 (3d10h ago)
Software declared up time : 00:01:45 (3d10h ago)
CPLD version : 12121625
Firmware version : 15.3(1r)S

Sub-slot: 2/0, SM-ES3X-24-P
Operational status : ok
Internal state : inserted
Physical insert detect time : 00:03:03 (3d10h ago)
Logical insert detect time : 00:03:03 (3d10h ago)

Slot: R0, ISR4451/K9
```

```

Running state : ok, active
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:04 (3d10h ago)
Software declared up time : 00:01:04 (3d10h ago)
CPLD version : 12121625
Firmware version : 15.3(1r)S

```

```

Slot: F0, ISR4451/K9
Running state : ok, active
Internal state : online
Internal operational state : ok
Physical insert detect time : 00:01:04 (3d10h ago)
Software declared up time : 00:02:39 (3d10h ago)
Hardware ready signal time : 00:00:00 (never ago)
Packet ready signal time : 00:02:48 (3d10h ago)
CPLD version : 12121625
Firmware version : 15.3(1r)S

```

```

Slot: P0, XXX-XXXX-XX
State : ok
Physical insert detect time : 00:01:29 (3d10h ago)

```

```

Slot: P1, XXX-XXXX-XX
State : ok
Physical insert detect time : 00:01:29 (3d10h ago)

```

```

Slot: P2, ACS-4450-FANASSY
State : ok
Physical insert detect time : 00:01:29 (3d10h ago)

```

```

Slot: POE0, PWR-POE-4451
State : ok
Physical insert detect time : 00:01:29 (3d10h ago)

```

```

Slot: POE1, PWR-POE-4451
State : ok
Physical insert detect time : 00:01:29 (3d10h ago)

```

```

Slot: GE-POE, 800G2-POE-2
State : ok
Physical insert detect time : 00:01:29 (3d10h ago)

```

show platform software status control-processor: Example

```

Router# show platform software status control-processor
RP0: online, statistics updated 2 seconds ago
Load Average: health unknown
1-Min: 0.13, status: health unknown, under
5-Min: 0.07, status: health unknown, under
15-Min: 0.06, status: health unknown, under
Memory (kb): healthy
Total: 3971244
Used: 2965856 (75%)
Free: 1005388 (25%)
Committed: 2460492 (62%), status: health unknown, under 0%
Per-core Statistics
CPU0: CPU Utilization (percentage of time spent)
User: 1.00, System: 2.90, Nice: 0.00, Idle: 96.00
IRQ: 0.10, SIRQ: 0.00, IOWait: 0.00
CPU1: CPU Utilization (percentage of time spent)

```

```

User: 10.71, System: 29.22, Nice: 0.00, Idle: 60.06
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU2: CPU Utilization (percentage of time spent)
User: 0.80, System: 1.30, Nice: 0.00, Idle: 97.90
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU3: CPU Utilization (percentage of time spent)
User: 10.61, System: 34.03, Nice: 0.00, Idle: 55.25
IRQ: 0.00, SIRQ: 0.10, IOWait: 0.00
CPU4: CPU Utilization (percentage of time spent)
User: 0.60, System: 1.20, Nice: 0.00, Idle: 98.20
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU5: CPU Utilization (percentage of time spent)
User: 13.18, System: 35.46, Nice: 0.00, Idle: 51.24
IRQ: 0.00, SIRQ: 0.09, IOWait: 0.00
CPU6: CPU Utilization (percentage of time spent)
User: 0.80, System: 2.40, Nice: 0.00, Idle: 96.80
IRQ: 0.00, SIRQ: 0.00, IOWait: 0.00
CPU7: CPU Utilization (percentage of time spent)
User: 10.41, System: 33.63, Nice: 0.00, Idle: 55.85
IRQ: 0.00, SIRQ: 0.10, IOWait: 0.00

```

show diag slot R0 eeprom detail: Example

```

Router# show diag slot R0 eeprom detail
Slot R0 EEPROM data:

```

```

EEPROM version : 4
Compatible Type : 0xFF
PCB Serial Number : FHH153900AU
Controller Type : 1902
Hardware Revision : 0.0
PCB Part Number : 73-13854-01
Top Assy. Part Number : 800-36894-01
Board Revision : 01
Deviation Number : 122081
Fab Version : 01
Product Identifier (PID) : CISCO-----<0A>
Version Identifier (VID) : V01<0A>
Chassis Serial Number : FHH1539P00Q
Chassis MAC Address : 0000.0000.0000
MAC Address block size : 96
Asset ID : REV1B<0A>
Asset ID :

```

show version: Example

```

Router# show version
Cisco IOS XE Software, Version 03.13.00.S - Standard Support Release
Cisco IOS Software, ISR Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Version 15.4(3)S, RELEASE
SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2014 by Cisco Systems, Inc.
Compiled Tue 27-May-14 05:36 by mcpre

```

```

Cisco IOS-XE software, Copyright (c) 2005-2014 by cisco Systems, Inc.
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licensed under the GNU General Public License ("GPL") Version 2.0. The
software code licensed under GPL Version 2.0 is free software that comes
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GPL code under the terms of GPL Version 2.0. For more details, see the

```

documentation or "License Notice" file accompanying the IOS-XE software, or the applicable URL provided on the flyer accompanying the IOS-XE software.

ROM: IOS-XE ROMMON

```
Router uptime is 2 hours, 19 minutes
Uptime for this control processor is 2 hours, 22 minutes
System returned to ROM by reload
System image file is "tftp: isr4400-universalk9.03.13.00.S.154-3.S-std.SPA.bin"
Last reload reason: Reload Command
```

This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at: <http://www.cisco.com/wvl/export/crypto/tool/stqrg.html>

If you require further assistance please contact us by sending email to export@cisco.com.

Technology Package License Information:

```
-----
Technology      Technology-package      Technology-package
                  Current                Type                    Next reboot
-----
appx             None                   None                    None
uc               None                   None                    None
security         None                   None                    None
ipbase          ipbasek9               Permanent               ipbasek9
-----
```

```
cisco 4451 ISR processor with 1213154K/6147K bytes of memory.
Processor board ID FHH1539P00Q
4 Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
4194304K bytes of physical memory.
3391455K bytes of Compact flash at bootflash:.
```

Configuration register is 0x0"

Configuring Power Supply Mode

You can configure the power supplies of both the router and a connected Power over Ethernet (PoE) module.

- [Configuring the Router Power Supply Mode, on page 17](#)
- [Configuring the External PoE Service Module Power Supply Mode, on page 17](#)
- [Examples for Configuring Power Supply Mode, on page 17](#)

- [Available PoE Power, on page 19](#)

Configuring the Router Power Supply Mode

Configure the main power supply on the router using the **power main redundant** command:

- **power main redundant**—Sets the main power supply in redundant mode.
- **no power main redundant**—Sets the main power supply in boost mode.



Note The default mode for the router power supply is redundant mode.

Configuring the External PoE Service Module Power Supply Mode

Configure the power supply of an external PoE service module using the **power inline redundant** command:

- **power inline redundant**—Sets the external PoE service module power supply in redundant mode.
- **no power inline redundant**—Sets the external PoE service module power supply in boost mode.



Note The default mode for the external PoE service module power supply is redundant mode.

The **show power** command shows whether boost or redundant mode is configured and whether this mode is currently running on the system.

Examples for Configuring Power Supply Mode

Example—Configured Mode of Boost for Main PSU and PoE Module

In this example, the **show power** command shows the configured mode as `Boost`, which is also the current runtime state. The `Main PSU` shows information about the main power supply. The `POE Module` shows information about the inline/PoE power. In this example, the current run-time state for the main power supply is the same as the configured state (`Boost` mode).

```
Router# show power
Main PSU :
Configured Mode : Boost
Current runtime state same : Yes
Total power available : 2000 Watts
POE Module :
Configured Mode : Boost
Current runtime state same : Yes
Total power available : 1000 Watts
Router#
```

Example—Configured Mode of Boost for Main PSU and PoE Module

In this example, the **show power** command shows the power supplies that are present in the device. The Main PSU and POE Module are configured to the `Boost` mode, which differs from the current runtime state. The current runtime state is the `Redundant` mode. A likely explanation for this is that there is only one main power supply present in the router. See mode example 4 in the table titled "Modes of Operation" in [Available PoE Power, on page 19](#).

You can enter the **show platform** command to show the power supplies that are present in the device.

```
Router# show power
Main PSU :
Configured Mode : Boost
Current runtime state same : No
Total power available : 1000 Watts
POE Module :
Configured Mode : Boost
Current runtime state same : No
Total power available : 500 Watts
Router#
```

Example—Configured Mode of Redundant for Main PSU and PoE Module

In this example, the **show power** command shows the configured mode is `Redundant` for both the main and inline power. The system has one 450 W and one 100 W power supply.

```
Router# show power
Main PSU :
Configured Mode : Redundant
Current runtime state same : Yes
Total power available : 450 Watts
POE Module :
Configured Mode : Redundant
Current runtime state same : No
Total power available : 0 Watts
Router#
```

Example—Configured Mode of Boost for Main Power

In this example, the main power is configured to be in `boost` mode by using the **no** form of the **power main redundant** command. This sets the main power to `boost` mode with 1450 W and inline power to `redundant` mode with 500 W.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# no power main redundant
Router(config)#
*Jan 31 03:35:22.284: %PLATFORM_POWER-6-MODEMATCH: Inline power is in Redundant mode
Router(config)#
Router(config)# exit
Router#
*Jan 31 03:36:13.111: %SYS-5-CONFIG_I: Configured from console by console
Router# show power
Main PSU :
Configured Mode : Boost
Current runtime state same : Yes
Total power available : 1450 Watts
POE Module :
```

```
Configured Mode : Redundant
Current runtime state same : Yes
Total power available : 500 Watts
Router#
```

Example—Configured Mode of Boost for PoE Power

In this example, an attempt is made to configure the inline power in boost mode by using the **no** form of the **power inline redundant** command. The inline power mode is **not** changed to boost mode because that would require a total power available in redundant mode of 1000 W. The inline power mode is redundant and is shown by the following values for the PoE Module:

- Configured Mode : Boost
- Current runtime state same : No

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# no power inline redundant
Router(config)#
*Jan 31 03:42:40.947: %PLATFORM_POWER-6-MODEMISMATCH: Inline power not in Boost mode
Router(config)#
Router(config)# exit
Router#
*Jan 31 03:36:13.111: %SYS-5-CONFIG_I: Configured from console by console
Router# show power
Main PSU :
Configured Mode : Boost
Current runtime state same : Yes
Total power available : 1450 Watts
POE Module :
Configured Mode : Boost
Current runtime state same : No
Total power available : 500 Watts
Router#
```

Available PoE Power

For the PoE feature to be available on the external PoE module, the total power from the power supplies must be 500 W or higher.



Note To ensure the PoE feature is functional on the external PoE module, verify the availability of PoE power on your router using the **show platform** and **show power** commands.

To determine there is enough PoE power for use by an external PoE service module, use the **show platform** and **show power** commands to calculate the available PoE power based on the wattage values of the main power supplies and PoE inverters.

Take the values of your main P0 and P1 power supplies to give the Total Power (for main power supplies.) Then take the values of your PoE1 and PoE2 power inverters to calculate the Total PoE Power.

The following table shows example modes of operation, which may be similar to your configuration.

The Total PoE Power value, in the final column of the table needs to be 500 W or higher for the PoE feature to be functional on a connected PoE service module.



Note Add power inverters to the router before inserting an external PoE module. Otherwise, even if the Total PoE Power is sufficient, the PoE power will not be used by the external PoE module and the module will need to be re-booted for the PoE feature to be functional.

Configuring a power mode of boost or redundant on the main power supplies, or PoE inverters, may affect the value for Total PoE Power.

The following table shows all power values in Watts. The wattage ratings of the main power supplies are shown in columns Main P0 and Main P1. The wattage ratings of the PoE inverters are shown in columns PoE0 and PoE1.

Table 2: Modes of Operation

Mode Example	Main P0	Main P1	Config Mode	Total Power (Main)	PoE0	PoE1	Config Mode	Total PoE Power
1	450	None	Redundant or Boost	450	None	500	Redundant or Boost	0 (None)
2	450	450	Boost	900	None	500	Redundant or Boost	0 (None)
3	450	450	Redundant	450	500	None	Redundant or Boost	0 (None)
4	1000	None	Redundant or Boost	1000	500	None	Redundant or Boost	500
5	1000	450	Redundant	450	500	500	Redundant or Boost	0 (None)
6	1000	450	Boost	1450	500	500	Boost	500
7	1000	1000	Redundant	1000	500	500	Boost	500
8	1000	1000	Boost	2000	500	500	Boost	1000



Note In the table above, for 500 W or higher Total PoE Power to be available, the "Total Power" (of the main power supplies) must be 1000 W or higher.

For 1000 W Total PoE Power (see Mode Example 8 above), there must be two 1000 W main power supplies (in `Boost` mode) and two PoE inverters (also in `Boost` mode).

**Caution**

Care should be taken while removing the power supplies and power inverters (especially in `Boost` mode of operation). If the total power consumption is higher than can be supported by one power supply alone and in this condition a power supply is removed, the hardware can be damaged. This may then result in the system being unstable or unusable.

Similarly, in the case where there is only one PoE inverter providing PoE power to a service module, and in this condition the PoE inverter is removed, the hardware may be damaged, and may result in the system being unstable or unusable.

Managing PoE

The Power over Ethernet (PoE) feature allows you to manage power on the FPGE ports. By using PoE, you do not need to supply connected PoE-enabled devices with wall power. This eliminates the cost for additional electrical cabling that would otherwise be necessary for connected devices. The router supports PoE (802.3af) and PoE+ (802.3at). PoE provides up to 15.4 W of power, and PoE+ provides up to 30 W of power.

- [PoE Support for FPGE Ports, on page 21](#)
- [Monitoring Your Power Supply, on page 21](#)
- [Enabling Cisco Discovery Protocol](#)
- [Configuring PoE for FPGE Ports, on page 24](#)

PoE Support for FPGE Ports

A PoE module supports PoE on the front panel gigabit ethernet ports (FPGE) such as `gig0/0/0` and `gig0/0/1`. You can configure the PoE service module for the FPGE using the **power inline** command, which allows you to turn on or turn off the power to a connected device such as an IEEE phone or device. For more information, see [Configuring PoE for FPGE Ports, on page 24](#).

Monitoring Your Power Supply

You can monitor the total available power budget on your router using the **show power inline [GigabitEthernet detail]** command in privileged EXEC mode.

This command allows you to check the availability of sufficient power for the powered device type before it is connected to the router.

Example—Inline power where there is no PoE module

In this example, there is no module present that supports PoE. Power is being supplied to an IP phone and a switch.

```
Router# show power inline
Available:31.0(w)  Used:30.3(w)  Remaining:0.7(w)

Interface Admin  Oper      Power   Device      Class Max
              (Watts)
-----
```

```

Gi0/0/0 auto on 14.9 IP Phone 7971 3 30.0
Gi0/0/1 auto on 15.4 WS-C2960CPD-8PT-L 4 30.0
Router#

```

In this example, the command includes the following information:

Available:31.0(w)—Available PoE power

Used:30.3(w)—PoE power used by all the router's ports

Oper—PoE power state of each connected powered device (on/off)

Power—PoE power used by each connected powered device

Class—PoE power classification

Example—Inline power for one PoE module

In this example, one module that supports PoE is present. Cisco IOS XE 3.10 and higher supports an external PoE module.

```

Router# show power inline
Available:31.0(w) Used:30.3(w) Remaining:0.7(w)

Interface Admin Oper Power Device Class Max
-----
Gi0/0/0 auto on 14.9 IP Phone 7971 3 30.0
Gi0/0/1 auto on 15.4 WS-C2960CPD-8PT-L 4 30.0

Available:500.0(w) Used:11.7(w) Remaining:488.3(w)

Interface Admin Oper Power Device Class Max
-----
Et2/0/0 auto off 11.7 n/a n/a 750.0
Router#

```

Example—Inline power to connected IP phones

```

Router# show power inline
Available:31.0(w) Used:30.8(w) Remaining:0.2(w)

Interface Admin Oper Power Device Class Max
-----
Gi0/0/0 auto on 15.4 Ieee PD 4 30.0
Gi0/0/1 auto on 15.4 Ieee PD 4 30.0

```

Example—Inline power to one Gigabit Ethernet port

```

Router# show power inline gigabitEthernet 0/0/0
Interface Admin Oper Power Device Class Max
-----
Gi0/0/0 auto on 15.4 Ieee PD 4 30.0

```

Example—Inline power to one Gigabit Ethernet port-detail

```

Router# show power inline gigabitEthernet 0/0/0 detail
Interface: Gi0/0/0
  Inline Power Mode: auto
  Operational status: on
  Device Detected: yes
  Device Type: Ieee PD
  IEEE Class: 4
  Discovery mechanism used/configured: Ieee
  Police: off

Power Allocated
Admin Value: 30.0
Power drawn from the source: 15.4
Power available to the device: 15.4

Absent Counter: 0
Over Current Counter: 0
Short Current Counter: 0
Invalid Signature Counter: 0
Power Denied Counter: 0

```

Example—Inline power to an external PoE service module

In this example, after the output lines for Gi0/0/0, and Gi0/0/1, there are output lines for the external PoE service module. Cisco IOS XE 3.10 and higher supports an external PoE module. Et1/0/0 indicates the internal port (slot 1/0) for the first PoE service module. Et2/0/0 indicates the internal port (slot 2/0) in a second PoE service module.

Although both slots are capable of drawing 750 W of PoE power, in this device only 500 W of PoE power is available. Slot 2/0 (Et2/0/0) has been allocated 369.6 W of PoE power.

```

Router# show power inline
Available:31.0(w) Used:15.4(w) Remaining:15.6(w)
Interface Admin Oper Power Device Class Max
          (Watts)
-----
Gi0/0/0 auto on 15.4 Ieee PD 4 30.0
Gi0/0/1 auto off 0.0 n/a n/a 30.0

Available:500.0(w) Used:369.6(w) Remaining:500.0(w)
Interface Admin Oper Power Device Class Max
          (Watts)
-----
Et1/0/0 auto off 0.0 n/a n/a 750.
Et2/0/0 auto off 369.6 n/a n/a 750.

```

Enabling Cisco Discovery Protocol

Cisco Discovery Protocol (CDP) is enabled by default on the router.



Note CDP is not enabled by default on Cisco Aggregation Services Routers or on the Cisco CSR 1000v.

For more information on using CDP, see [Cisco Discovery Protocol Configuration Guide, Cisco IOS XE Release 3S](#).

Configuring PoE for FPGE Ports

SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `cdp run`
4. `interface gigabitethernet slot/subslot/port`
5. `cdp enable`
6. `power inline {auto { auto [max milli-watts] | never}}`
7. `exit`

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3	cdp run Example: <pre>Router(config)# cdp run</pre>	Enables Cisco Discovery Protocol (CDP) on your router.
Step 4	interface gigabitethernet slot/subslot/port Example: <pre>Router(config)# interface gigabitEthernet 0/0/0</pre>	Allows to configure PoE on ports 0 and 1. <ul style="list-style-type: none"> • PoE can be configured on ports 0 and 1.
Step 5	cdp enable Example: <pre>Router(config-if)# cdp enable</pre>	Enables CDP in the interface configuration mode.
Step 6	power inline {auto { auto [max milli-watts] never}} Example: <pre>Router(config-if)# power inline auto</pre>	Allows you to set the power inline options for FPGE ports. <ul style="list-style-type: none"> • auto—The auto keyword automatically detects the power inline devices and supplies power to such devices.

	Command or Action	Purpose
		<ul style="list-style-type: none"> • max <i>milli-watts</i>—The max keyword sets the maximum power allowed on the interface. • never—The never keyword disables the detection and ceases the application of inline power.
Step 7	exit Example: Router(config-if)# exit	Exits the interface configuration mode.

Verifying if PoE Is Enabled on FPGE Port

show platform: Example

show diag chassis eeprom: Example

You can verify whether the PoE is enabled on the FPGE port by looking at the external LED for this port. The external LED for the FPGE port is labelled as GE POE. The GE POE emits a green light when the internal PoE module is plugged in and functioning properly. The GE POE LED is yellow when the internal PoE is plugged in but not functioning properly. The GE POE LED is off when there are no PoE modules plugged in. For more information on LEDs, see the [Hardware Installation Guide for the Cisco 4000 Series Integrated Services Routers](#).

You can also detect PoE using the **show platform** and **show diag** commands.

For more information, see the following examples.

```
Router# show platform
Chassis type: ISR4451/K9

Chassis type: ISR4451/K9
```

Slot	Type	State	Insert time (ago)
0	ISR4451/K9	ok	3d11h
0/0	ISR4451-X-4x1GE	ok	3d11h
0/2	NIM-4MFT-T1/E1	ok	3d11h
0/3	NIM-SSD	ok	3d11h
1	ISR4451/K9	ok	3d11h
1/0	SM-X-1T3/E3	ok	3d11h
2	ISR4451/K9	ok	3d11h
2/0	SM-ES3X-24-P	ok	3d11h
R0	ISR4451/K9	ok, active	3d11h
F0	ISR4451/K9	ok, active	3d11h
P0	XXX-XXXX-XX	ok	3d11h
P1	XXX-XXXX-XX	ok	3d11h
P2	ACS-4451-FANTRAY	ok	3d11h
POE0	PWR-POE-4451-X	ok	3d11h
POE1	PWR-POE-4451-X	ok	3d11h
GE-POE	800G2-POE-2	ok	3d11h

Slot	CPLD Version	Firmware Version
0	12090323	15.3(01r)S [ciscouser-ISRRO...

```

1          12090323          15.3(01r)S          [ciscouser-ISRRO...
2          12090323          15.3(01r)S          [ciscouser-ISRRO...
R0         12090323          15.3(01r)S          [ciscouser-ISRRO...
F0         12090323          15.3(01r)S          [ciscouser-ISRRO...

```

Router# **show diag chassis eeprom**

MIDPLANE EEPROM data:

```

Product Identifier (PID) : ISR-4451/K9
Version Identifier (VID) : V01
PCB Serial Number       : FOC16145VL8
Hardware Revision       : 1.0
Asset ID                : P1C-R03-CP1.0-UMT-RVC
CLEI Code               : TBD

```

Power/Fan Module P0 EEPROM data:

```

Product Identifier (PID) : PWR-4450-AC
Version Identifier (VID) : V01
PCB Serial Number       : DCA1547X02U
CLEI Code               : 0000000000

```

Power/Fan Module P1 EEPROM data is not initialized

Power/Fan Module P2 EEPROM data is not initialized

Internal PoE EEPROM data:

```

Product Identifier (PID) : PWR-GE-POE-4400
Version Identifier (VID) : V01
PCB Serial Number       : FOC151849VD
Hardware Revision       : 1.0
CLEI Code               : 0000000000

```

Additional References

The following sections provide references related to the power efficiency management feature.

MIBs

MIBs	MIBs Link
CISCO-ENTITY-FRU-CONTROL-MIB	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use the Cisco MIB Locator at: http://www.cisco.com/go/mibs . Also see MIB Specifications Guide for the Cisco 4451-X Integrated Services Router .

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<p>http://www.cisco.com/cisco/web/support/index.html</p>

