



CHAPTER 11

Configuring Power over Ethernet



Note

Before reading this chapter, read the "Preparing for Installation" section of the *Catalyst 4500 Series Installation Guide*. You must ensure that your installation site has enough power and cooling to accommodate the additional electrical load and heat introduced by PoE.

This chapter describes how to configure Power over Ethernet (PoE) on the Catalyst 4500 series switch.

This chapter contains the following sections:

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Note

For complete syntax and usage information for the switch commands used in this chapter, look at the *Cisco Catalyst 4500 Series Switch Command Reference* and related publications at this location:

<http://www.cisco.com/en/US/products//hw/switches/ps4324/index.html>

If the command is not found in the Catalyst 4500 Command Reference, it will be found in the larger Cisco IOS library. Refer to the *Cisco IOS Command Reference* and related publications at this location:

<http://www.cisco.com/en/US/products/ps6350/index.html>

Overview

The Catalyst 4500 series switch provides support for Power over Ethernet (PoE) for both Cisco Prestandard PoE and the IEEE 802.3af standard (ratified in 2003). PoE is supported by all Catalyst 4500 series chassis and requires a PoE module and power supply. The amount of PoE power available depends

on the PoE capabilities of individual power supplies. Support for PoE enables the system to power inline devices, such as IP phones, IP video phones, and wireless access points over standard copper cabling (Category 5, 5e, or 6 cabling).

In addition, with PoE, you do not need to provide wall power for each PoE enabled device. This eliminates the cost for additional electrical cabling that would otherwise be necessary for connected devices. Moreover, PoE enables you to isolate critical devices on a single power system, enabling the entire system to be supported by UPS backup.

You typically deploy a Catalyst 4500 series switch in one of two deployment scenarios. The first scenario is data-only, which requires power to operate the switch and the associated modules. The second scenario supports data and PoE (also termed “inline power”) for deployments where the attached device derives power from the Ethernet port.

Catalyst 4500 series switches can sense if a powered device is connected to a PoE module. They can supply PoE to the powered device if there is no power on the circuit. (If there is power on the circuit, the switch does not supply it.) The powered device can also be connected to an AC power source and supply its own power to the voice circuit.

**Note**

You should select the amount of PoE desired using the Cisco Power Calculator:

<http://tools.cisco.com/cpc/>

Hardware Requirements

To power a device using PoE, your chassis must use at least one of the power supplies listed in [Table 11-1](#), and connect the device to at least one of the switching modules listed in [Table 11-1](#).

Table 11-1 *Hardware Requirements*

| Switching Modules | Power Supplies |
|-------------------|------------------|
| WS-X4148-RJ45V | PWR-C45-1300ACV= |
| WS-X4224-RJ45V | PWR-C45-1400DCV= |
| WS-X4248-RJ21V | PWR-C45-2800ACV= |
| WS-X4248-RJ45V | PWR-C45-4200ACV= |
| WS-X4506-GB-T | |
| WS-X4524-GB-RJ45V | |
| WS-X4548-RJ45V+ | |
| WS-X4548-GB-RJ45V | |
| WS-X4648-RJ45V-E | |
| WS-X4648-RJ45V+E | |

Power Management Modes

If your switch has a module capable of providing PoE to end stations, you can set each interface on the module to automatically detect and apply PoE if the end station requires power.

The Catalyst 4500 series switch has three PoE modes:

- **auto**—PoE interface. The supervisor engine directs the switching module to power up the interface *only* if the switching module discovers the phone and the switch has enough power. You can specify the maximum wattage that is allowed on the interface. If you do not specify a wattage, then the switch will deliver no more than the hardware-supported maximum value. This mode has no effect if the interface is not capable of providing PoE.
- **static**—High priority PoE interface. The supervisor engine preallocates power to the interface, even when nothing is connected, guaranteeing that there will be power for the interface. You can specify the maximum wattage that is allowed on the interface. If you do not specify a wattage, then the switch preallocates the hardware-supported maximum value. If the switch does not have enough power for the allocation, the command will fail. The supervisor engine directs the switching module to power up the interface *only* if the switching module discovers the powered device.
- **never**—Data interface only. The supervisor engine never powers up the interface, even if an unpowered phone is connected. This mode is only needed when you want to make sure power is never applied to a PoE-capable interface.

The switch can measure the actual PoE consumption for an 802.3af-compliant PoE module, and displays this in the **show power module** command.

PoE consumption cannot be measured on the WS-X4148-RJ45V PoE module. Therefore, for all PoE calculations, the PoE consumption on this module is presumed to be equal to its administrative PoE.

For more information, see the [“Displaying the PoE Consumed by a Module” section on page 11-8](#).

For most users, the default configuration of “auto” works well, providing plug and play capability. No further configuration is required. However, to make an interface higher priority or data only, or to specify a maximum wattage, perform this task:

| | Command | Purpose |
|--------|--|--|
| Step 1 | Switch(config)# interface {fastethernet gigabitethernet} slot/port | Selects the interface to configure. |
| Step 2 | Switch(config-if)# power inline {auto [max milli-watts] never static [max milli-watts]} | <p>The auto keyword sets the interface to automatically detect and supply power to the powered device. This is the default configuration.</p> <p>The static keyword sets the interface to higher priority than auto.</p> <p>If necessary, you can use the max keyword to specify the maximum wattage allowed on the interface (4000 to 15400 milliwatts for most switching modules. As of Cisco IOS release 12.2(44)SG the WS-X4648-RJ45V+E can support up to 30 W available per port and the WS-X4648-RJ45V-E will support up to 20 W. For more information, see “Enhanced Power PoE Support on the E-Series Chassis” on page 15).</p> <p>Use the never keyword to disable detection and power for the PoE capable interface.</p> |
| Step 3 | Switch(config-if)# end | Exits configuration mode. |
| Step 4 | Switch# show power inline {fastethernet gigabitethernet} slot/port | Displays the PoE state for the switch. |

**Note**

If you set a non-PoE-capable interface to automatically detect and apply power, an error message indicates that the configuration is not valid.

The following example shows how to set the Fast Ethernet interface 4/1 to automatically detect PoE and send power through that interface, and to verify the PoE configuration:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 4/1
Switch(config-if)# power inline auto
Switch(config-if)# end
Switch# show power inline fastethernet 4/1
Available:677(w) Used:11(w) Remaining:666(w)

Interface Admin Oper          Power (Watts)      Device          Class
          From PS   To Device
-----
Fa4/1     auto   on           11.2             10.0           Ieee PD         0

Interface AdminPowerMax AdminConsumption
          (Watts)           (Watts)
-----
Fa4/1           15.4                 10.0
Switch#
```

The following example shows how to configure an interface so that it never supplies power through the interface:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface fastethernet 5/2
Switch(config-if)# power inline never
Switch(config-if)# end
Switch#
```

Intelligent Power Management

All Catalyst 4500 PoE-capable modules use Intelligent Power Management to provide power on each interface. When a powered device (PD) is attached to a PoE-capable port, the port will detect the PD and provision power accordingly. If a Cisco PD is used, the switch and PD negotiate power using CDP packets to determine the precise amount of power needed by the PD. If the PD is 802.3af compatible, the difference between what is mandated by the 802.3af class and what is actually needed by the PD is returned to the power budget for use by additional devices. In this way, power negotiation enables customers to stretch their power budget and use it more effectively.

Power negotiation also enables the interoperability of newer Cisco powered devices with older legacy PoE-capable ports from Cisco. Newer Cisco PDs do not consume more than what the switch port can provide.

Configuring Power Consumption for Powered Devices on an Interface

By default, when the switch detects a powered device on an interface, it assumes the powered device consumes the maximum the port can provide (7 W on a legacy Power over Ethernet (PoE) module and 15.4W on the IEEE PoE modules introduced in Cisco IOS Release 12.2(18)EW). Then, when the switch receives a CDP packet from the powered device, the wattage automatically adjusts downward to the specific amount required by that device. Normally, this automatic adjustment works well, and no further configuration is required or recommended. However, you can specify the powered device's consumption for the entire switch (or for a particular interface) to provide extra functionality from your switch. This is useful when CDP is disabled or not available.



Note

When manually configuring the consumption for powered devices, you need to account for the power loss over the cable between the switch and the powered device.

To change the power consumption for the entire switch, perform this task:

| | Command | Purpose |
|--------|---|---|
| Step 1 | Switch(config)# [no] power inline consumption default <i>milli-watts</i> | Sets the PoE consumption (in milliwatts) of all powered devices connected to the switch. The power consumption can range from 4000 to 15,400. To re-enable the automatic adjustment of consumption, either use the no keyword or specify 15,400 milliwatts. |
| Step 2 | Switch(config)# end | Exits configuration mode. |
| Step 3 | Switch# show power inline consumption default | Displays the administrative PoE consumption of powered devices connected to the switch. The administrative PoE is not the measured PoE value. |

This example shows how to set the default PoE consumption of all powered devices connected to the switch to 5000 milliwatts, and to verify the PoE consumption:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# power inline consumption default 5000
Switch(config)# end
Switch# show power inline consumption default
Default PD consumption : 5000 mW
Switch#
```

To change the power consumption of a single powered device, perform this task:

| | Command | Purpose |
|--------|--|--|
| Step 1 | Switch(config)# interface { fastethernet gigabitethernet } <i>slot/port</i> | Selects the interface to configure. |
| Step 2 | Switch(config-if)# [no] power inline consumption <i>milli-watts</i> | Sets the PoE consumption (in milliwatts) of the powered device connected to a specific interface. The power consumption can range from 4000 to 15,400. To re-enable the automatic adjustment of consumption, either use the no keyword or specify 15,400 milliwatts. |
| Step 3 | Switch(config-if)# end | Exits configuration mode. |
| Step 4 | Switch# show power inline consumption { fastethernet gigabitethernet } <i>slot/port</i> | Displays the PoE consumption for the interface. |

This example shows how to set the PoE consumption to 5000 milliwatts for interface gi 7/1 regardless what is mandated by the 802.3af class of the discovered device, or by any CDP packet received from the powered device. This example also verifies the PoE consumption on interface gi 7/1.

The following output displays the initial power consumption of the interface.

```
Switch# show power inline gi 7/1
Available:627(w) Used:267(w) Remaining:360(w)

Interface Admin Oper          Power(Watts)   Device          Class
          From PS    To Device
-----
Gi7/1     auto   on           7.9           7.0           IP Phone 7941   3

Interface AdminPowerMax AdminConsumption
          (Watts)           (Watts)
-----
Gi7/1                15.4           15.4

Switch# conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# int gi 7/1
Switch(config-if)# power inline consumption 5000
Switch(config-if)# exit
Switch(config)# exit
```

The following output displays the power consumption after issuing the **power inline consumption** command against the interface:

```
Switch# sh power inline gi 7/1
Available:627(w) Used:265(w) Remaining:362(w)

Interface Admin Oper          Power(Watts)   Device          Class
          From PS    To Device
-----
Gi7/1     auto   on           5.6           5.0           Ieee PD         3

Interface AdminPowerMax AdminConsumption
          (Watts)           (Watts)
-----
Gi7/1                15.4           5.0
```

Displaying the Operational Status for an Interface

Each interface has an operational status which reflects the PoE status for an interface. The operational status for an interface is defined as one of the following:

- **on**—Power is supplied by the port.
- **off**—Power is not supplied by the port. If a powered device is connected to an interface with external power, the switch does not recognize the powered device. The “Device” column in the **show power inline** command displays as n/a.
- **Power-deny**—The supervisor engine does not have enough power to allocate to the port, or the power that is configured for the port is less than the power required by the port; power is not being supplied by the port.
- **err-disable**—The port is unable to provide power to the connected device that is configured in static mode.
- **faulty**—The port failed diagnostics tests.

You can use the **show power inline** command to view the operational status for an interface.

This example shows how to display the operational status for all interfaces on module 3.

```
Switch# show power inline module 3
Available:677(w) Used:117(w) Remaining:560(w)
```

| Interface | Admin | Oper | Power(Watts) | | Device | Class |
|-----------|-------|-------|--------------|-----------|---------------------|-------|
| | | | From PS | To Device | | |
| Fa3/1 | auto | on | 17.3 | 15.4 | Ieee PD | 0 |
| Fa3/2 | auto | on | 4.5 | 4.0 | Ieee PD | 1 |
| Fa3/3 | auto | on | 7.1 | 6.3 | Cisco IP Phone 7960 | 0 |
| Fa3/4 | auto | on | 7.1 | 6.3 | Cisco IP Phone 7960 | n/a |
| Fa3/5 | auto | on | 17.3 | 15.4 | Ieee PD | 0 |
| Fa3/6 | auto | on | 17.3 | 15.4 | Ieee PD | 0 |
| Fa3/7 | auto | on | 4.5 | 4.0 | Ieee PD | 1 |
| Fa3/8 | auto | on | 7.9 | 7.0 | Ieee PD | 2 |
| Fa3/9 | auto | on | 17.3 | 15.4 | Ieee PD | 3 |
| Fa3/10 | auto | on | 17.3 | 15.4 | Ieee PD | 4 |
| Fa3/11 | auto | off | 0 | 0 | n/a | n/a |
| Fa3/12 | auto | off | 0 | 0 | n/a | n/a |
| Fa3/13 | auto | off | 0 | 0 | n/a | n/a |
| Fa3/14 | auto | off | 0 | 0 | n/a | n/a |
| Fa3/15 | auto | off | 0 | 0 | n/a | n/a |
| Fa3/16 | auto | off | 0 | 0 | n/a | n/a |
| Fa3/17 | auto | off | 0 | 0 | n/a | n/a |
| Fa3/18 | auto | off | 0 | 0 | n/a | n/a |
| Totals: | | 10 on | 117.5 | 104.6 | | |

```
Switch#
```

This example shows how to display the operational status for Fast Ethernet interface 4/1:

```
Switch# show power inline fa4/1
Available:677(w) Used:11(w) Remaining:666(w)
```

| Interface | Admin | Oper | Power(Watts) | | Device | Class |
|-----------|-------|------|--------------|-----------|--------|-------|
| | | | From PS | To Device | | |

```
Switch#
```

```

Fa4/1      auto   on      11.2      10.0      IEEE PD      0

Interface  AdminPowerMax  AdminConsumption
          (Watts)      (Watts)
-----
Fa4/1                15.4            10.0
Switch#

```

Displaying the PoE Consumed by a Module

A Catalyst 4500 series switch can measure the actual PoE consumption for an 802.3af-compliant PoE module. You can observe this consumption with the **show power module** and **show power detail** commands. For all PoE calculations, presume that the PoE consumption on the WS-X4148-RJ45V module equals its administrative PoE.

The 802.3af-compliant PoE modules can consume up to 20 W of PoE to power FPGAs and other hardware components on the module. To ensure that the system has sufficient power for the PDs connected to the switch, add at least 20 W to your PoE requirements for each 802.3af-compliant PoE module.

The following example uses the **show power module** command to display the PoE consumption for an 802.3af-compliant module:

```
Switch# show power module
```

```

Watts Used of System Power (12V)
Mod  Model                currently  out of reset  in reset
-----
 1   WS-X4013+TS           330        330          330
 2   WS-X4548-GB-RJ45V    60         60           20
 3   WS-X4548-GB-RJ45V    60         60           20
 --  Fan Tray             30         --           --
-----
      Total                480        450          370

Watts used of Chassis Inline Power (-50V)
Inline Power Admin  Inline Power Oper
Mod  Model                PS      Device      PS      Device  Efficiency
-----
 2   WS-X4548-GB-RJ45V    138     123         73     65       89
 3   WS-X4548-GB-RJ45V    0        0          22     20       89
-----
      Total                138     123         95     85

Watts used of Module Inline Power (12V -> -50V)
Inline Power Admin  Inline Power Oper
Mod  Model                PS      Device      PS      Device  Efficiency
-----
 1   WS-X4013+TS           128     128         63     63       100
-----

```

```
Switch#
```

The Inline Power Oper column displays the amount of PoE consumed by the powered devices that are attached to the module, in addition to the PoE consumed by the FPGAs and other hardware components on the module.

The Inline Power Admin column displays only the amount of PoE allocated by the powered devices attached to the module.

**Note**

The operating PoE consumption for an 802.3af-compliant module can be non-zero, even when there are no powered devices attached to the module, because of the PoE consumed by FPGAs and other hardware components on the module. In addition, the operating PoE can vary because of fluctuations in the PoE consumed by the hardware components.

The following example uses the **show power detail** and **show power inline** commands to display the PoE consumption for an 802.3af-compliant module:

```
Switch# show power detail
```

| Power Supply | Model No | Type | Status | Fan Sensor | Inline Status |
|--------------|-----------------|----------|--------|------------|---------------|
| PS1 | PWR-C45-1300ACV | AC 1300W | good | good | good |
| PS2 | none | -- | -- | -- | -- |

Power supplies needed by system : 1
Power supplies currently available : 1

| Power Summary (in Watts) | Used | Maximum Available |
|--------------------------|------------|---|
| System Power (12V) | 480 | 1000 |
| Inline Power (-50V) | 138 | 800 |
| Backplane Power (3.3V) | 0 | 0 |
| Total | 618 | (not to exceed Total Maximum Available = 1300) |

Module Inline Power Summary (Watts)
(12V -> -48V on board conversion)

| Mod | Used | Maximum Available |
|-----|------|-------------------|
| 1 | 128 | 158 |

| Mod | Model | Watts Used of System Power (12V) | | |
|--------------|-------------------|----------------------------------|--------------|------------|
| | | currently | out of reset | in reset |
| 1 | WS-X4013+TS | 330 | 330 | 330 |
| 2 | WS-X4548-GB-RJ45V | 60 | 60 | 20 |
| 3 | WS-X4548-GB-RJ45V | 60 | 60 | 20 |
| -- | Fan Tray | 30 | -- | -- |
| Total | | 480 | 450 | 370 |

| Mod | Model | Watts used of Chassis Inline Power (-50V) | | | | Efficiency |
|--------------|-------------------|---|------------|-------------------|-----------|------------|
| | | Inline Power Admin | | Inline Power Oper | | |
| | | PS | Device | PS | Device | |
| 2 | WS-X4548-GB-RJ45V | 138 | 123 | 73 | 65 | 89 |
| 3 | WS-X4548-GB-RJ45V | 0 | 0 | 22 | 20 | 89 |
| Total | | 138 | 123 | 95 | 85 | |

| Mod | Model | Watts used of Module Inline Power (12V -> -50V) | | | | Efficiency |
|-----|-------------|---|--------|-------------------|--------|------------|
| | | Inline Power Admin | | Inline Power Oper | | |
| | | PS | Device | PS | Device | |
| 1 | WS-X4013+TS | 128 | 128 | 64 | 64 | 100 |

■ Displaying the PoE Consumed by a Module

```

-----
Switch# show power inline g1/1
Module 1 Inline Power Supply: Available:158(w) Used:128(w) Remaining:30(w)

Interface Admin Oper          Power(Watts)   Device          Class
          From PS    To Device
-----
Gi1/1     auto   on           10.3          10.3           CNU Platform    3

Interface AdminPowerMax AdminConsumption
          (Watts)          (Watts)
-----
Gi1/1                15.4                15.4

switch# show power inline g2/1
Chassis Inline Power Supply: Available:800(w) Used:138(w) Remaining:662(w)

Interface Admin Oper          Power(Watts)   Device          Class
          From PS    To Device
-----
Gi2/1     auto   on           11.5          10.2           CNU Platform    n/a

Interface AdminPowerMax AdminConsumption
          (Watts)          (Watts)
-----
Gi2/1                15.4                15.4

Switch# show power inline module 1
Module 1 Inline Power Supply: Available:158(w) Used:128(w) Remaining:30(w)

Interface Admin Oper          Power(Watts)   Device          Class
          From PS    To Device
-----
Gi1/1     auto   on           10.3          10.3           CNU Platform    3
Gi1/2     auto   on           10.3          10.3           CNU Platform    3
Gi1/3     auto   on           10.3          10.3           CNU Platform    3
Gi1/4     auto   on           10.3          10.3           CNU Platform    3
Gi1/5     auto   on           10.3          10.3           CNU Platform    3
Gi1/6     auto   on           10.3          10.3           CNU Platform    3
Gi1/7     auto   on           10.3          10.3           CNU Platform    3
Gi1/8     auto   on           10.3          10.3           CNU Platform    3
Gi1/9     auto   on           10.3          10.3           CNU Platform    3
Gi1/10    auto   on           15.4          15.4           Cisco/Ieee PD   3
Gi1/11    auto   on           10.3          10.3           CNU Platform    3
Gi1/12    auto   on           10.3          10.3           CNU Platform    3
-----

Totals:                12   on   128.2    128.2
switch#

switch# show power inline module 2
Chassis Inline Power Supply: Available:800(w) Used:138(w) Remaining:662(w)
Interface Admin Oper          Power(Watts)   Device          Class
          From PS    To Device
-----
Gi2/1     auto   on           11.5          10.2           CNU Platform    n/a
Gi2/2     auto   on           11.5          10.2           CNU Platform    n/a

```

| | | | | | | |
|-----------|-------|-------|---------------|-----------|--------------|-------|
| Gi2/3 | auto | on | 11.5 | 10.2 | CNU Platform | n/a |
| Gi2/4 | auto | on | 11.5 | 10.2 | CNU Platform | n/a |
| Gi2/5 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/6 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/7 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/8 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/9 | auto | on | 11.5 | 10.2 | CNU Platform | 3 |
| Gi2/10 | auto | on | 11.5 | 10.2 | CNU Platform | n/a |
| Gi2/11 | auto | on | 11.5 | 10.2 | CNU Platform | n/a |
| Gi2/12 | auto | on | 11.5 | 10.2 | CNU Platform | n/a |
| Gi2/13 | auto | on | 11.5 | 10.2 | CNU Platform | 3 |
| Gi2/14 | auto | on | 11.5 | 10.2 | CNU Platform | 3 |
| Gi2/15 | auto | on | 11.5 | 10.2 | CNU Platform | 3 |
| Gi2/16 | auto | on | 11.5 | 10.2 | CNU Platform | 3 |
| Gi2/17 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/18 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Interface | Admin | Oper | Power (Watts) | | Device | Class |
| | | | From PS | To Device | | |
| ----- | | | | | | |
| Gi2/19 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/20 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/21 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/22 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/23 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/24 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/25 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/26 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/27 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/28 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/29 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/30 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/31 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/32 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/33 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/34 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/35 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/36 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/37 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/38 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/39 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/40 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Interface | Admin | Oper | Power (Watts) | | Device | Class |
| | | | From PS | To Device | | |
| ----- | | | | | | |
| Gi2/41 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/42 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/43 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/44 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/45 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/46 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/47 | auto | off | 0.0 | 0.0 | n/a | n/a |
| Gi2/48 | auto | off | 0.0 | 0.0 | n/a | n/a |
| ----- | | | | | | |
| Totals: | | 12 on | 138.2 | 123.0 | | |
| Switch# | | | | | | |

PoE Policing and Monitoring

**Note**

This functionality is supported on the WS-X4548-RJ45V+, WS-X4648-RJ45V-E, and WS-X4648-RJ45V+E linecards.

PoE policing protects a switch from faulty inline powered devices that may draw more current than they were designed for. When a device is connected to a port, a linecard detects the type of device connected and allocates the appropriate amount of power. It sets a PoE policing threshold to a value 5 per cent greater than the allocated power. If the device consumes more power than specified by the policing threshold for a more than 1 second, the port shuts down. Depending on the policing action configured, the port may then be error-disabled, or a message might be logged to the console and the port restarted.

PoE monitoring lets you display the true power consumption of inline powered devices attached to the switch, allowing you determine your actual power consumption.

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PoE Policing Modes

PoE policing comprises two modes, which determine the action to take on the interface after a port shuts down because of an inline-power policing violation:

Logging - An error message is logged to the console and the interface restarts; the device powers up.

Errdisable (Default) - In addition to logging an error message to the console, the interface is placed in an errdisable state so that the device attached to the port does not receive inline-power until you restart the port or configure an errdisable autorecovery mechanism.

**Note**

After an inline-power policing violation occurs and the port shuts down, PoE policing automatically turns on again when the port restarts. So, if the connected device exceeds its allocated power again, the port once again shuts down.

Configuring Power Policing on an Interface

The default policing levels are determined by the discovery and power allocation methods (listed in order of priority):

- Configured consumption values, in case any exist
- CDP allocated values (for Cisco devices using CDP)
- Allocated power from IEEE discovery (for devices using this mechanism)

To activate default PoE policing, enter the following:

```
Switch# conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# int g2/1
Switch(config-if)# power inline police
Switch(config-if)# end
Switch# show power inline police g2/1
Available:800(w) Used:32(w) Remaining:768(w)

Interface Admin Oper      Admin      Oper      Cutoff Oper
          State State      Police     Police     Power  Power
-----
Gi2/1    auto  on        errdisable ok         17.2  16.7
```

The default action for power policing is to set the port to errdisable; the **power inline police** command is equivalent to the **power inline police action errdisable** command, as the above example illustrates. The following example illustrates how to configure the logging policing action:

```
Switch# conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# int g2/1
Switch(config-if)# power inline police action log
Switch(config-if)# end
Switch# show power inline police g2/1
Available:800(w) Used:32(w) Remaining:768(w)

Interface Admin Oper      Admin      Oper      Cutoff Oper
          State State      Police     Police     Power  Power
-----
Gi2/1    auto  on        log        ok         17.2  16.7
```

When a PD consumes more than its allocated power, the port shuts down and a warning message similar to the following appears on the console.

For the WS-X4648-GB-RJ45V and WS-X4648-GB-RJ45V+:

```
*Sep 12 09:15:28.583: %C4K_ETHPORTMAN-3-INLINEPOWEROVERDRAWN: Inline powered
device connected on port Gi3/25 exceeded its policed threshold.
```

For the WS-X4548-RJ45V+:

```
*Sep 26 09:23:21.355: %C4K_SWITCHMANAGER-3-INLINEPOWEROVERDRAWN: Inline
powered device connected on port Gi2/1 exceeded its policed threshold.
```

For actions of Log type, the port restarts itself and the device reboots. In contrast, when the action is to set the port in an errdisable state, a log message like the following appears:

```
*Sep 26 09:30:20.463: %PM-4-ERR_DISABLE: inline-power error detected on Gi2/1, putting
Gi2/1 in err-disable state
```

```
Switch# show power inline police g2/1
Available:800(w) Used:16(w) Remaining:784(w)

Interface Admin Oper      Admin      Oper      Cutoff Oper
          State State      Police     Police     Power  Power
-----
Gi2/1    auto  errdisable errdisable overdrawn 0.0  0.0
```

Displaying Power Policing on an Interface

You can display power policing on an interface, on a module, or for all the PoE-capable linecards in a chassis.

The following example shows output for the **show power inline police** command:

```
Switch# show power inline police
Available:623(w)  Used:6(w)  Remaining:617(w)

Interface Admin Oper      Admin      Oper      Cutoff Oper
          State State      Police     Police     Power  Power
-----
Gi2/1    auto  off       none       n/a       n/a    0.0
Gi2/2    auto  on        none       n/a       n/a    16.7
Gi2/3    auto  off       errdisable n/a       0.0    0.0
Gi2/4    auto  on        errdisable ok        16.6   11.4
Gi2/5    auto  on        log        ok        16.6   11.2
Gi2/6    auto  on        errdisable overdrawn 0.0    0.0
```

The following table lists the interface and the status.

| Interface Configuration | State |
|-------------------------|---|
| Gi2/1 | No PD connected, no policing configured. |
| Gi2/2 | PD connected, no policing configured. |
| Gi2/3 | No PD connected, policing configured (will get enabled when PD is connected). Policing action is errdisable. |
| Gi2/4 | PD connected, policing configured. Configured policing action is errdisable. Port is currently operating within policing limits. |
| Gi2/5 | PD connected, policing configured. Configured policing action is log. Port is currently operating within policing limits. |
| Gi2/6 | PD connected, policing configured. Configured policing action is errdisable. Port is currently in "errdisable" state as it has overdrawn its policed power level. |

If you enter the **show power inline** command at the global level (**show power inline police**), the last line of the output under the Oper Power field displays the total of true inline power consumption of all devices connected to the switch.

Configuring Errdisable Recovery

By default, errdisable auto recovery for inline-power is disabled; when an interface is placed in an errdisable state because of an inline-power policing violation, it remains in that state. You must enter **shut** and **no shut** on the affected interface to revive it.

The errdisable autorecovery mechanism allows you to configure a timer for errdisable recovery so that when an interface enters errdisable state (after the timer expires), the interface returns from the errdisable state.

errdisable detection

By default, errdisable detection for inline-power is enabled, as the following example illustrates:

```
Switch# show errdisable detect
ErrDisable Reason      Detection      Mode
-----
inline-power           Enabled        port
```

**Note**

If detection is disabled (through the **errdisable detect cause inline-power** command), the port is not placed in errdisable state when it exceeds its power policing threshold.

errdisable recovery

By default, errdisable recovery for inline-power is disabled. To enable errdisable recovery, enter the **errdisable detect cause line-power** command:

```
Switch# conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)# errdisable detect cause inline-power
Switch(config)# end
Switch# show errdisable recovery
ErrDisable Reason      Timer Status
-----
inline-power           Enabled
```

Enhanced Power PoE Support on the E-Series Chassis

The WS-X4648-RJ45V-E, WS-X4648-RJ45V+E, and WS-X4548-RJ45V+ switching modules support IEEE 802.3af PoE as well as the Cisco proprietary Inline Power standard. With Cisco IOS Release 12.2(44)SG, the WS-X4648-RJ45V+E linecard can also support the IEEE 802.3at standard with up to 30 W available per port. Furthermore, the WS-X4648-RJ45V-E linecard will support up to 20 W. The WS-X4548-RJ45V+ switching module is supported with Cisco IOS Release 12.2(50)SG and can provide up to 30 W of inline power per port.

For these switching modules, the valid milliwatt ranges for the **power inline** command have been increased appropriately for the module, as the following table illustrates:

| Linecard | Standard | Max Power/Port | Cisco IOS Release |
|------------------|--------------|----------------|-------------------|
| WS-X4648-RJ45V-E | IEEE 802.3af | 20 W | 12.2(44)SG |
| | IEEE 802.3at | | |
| WS-X4648-RJ45V+E | IEEE 802.3af | 30 W | 12.2(44)SG |
| | IEEE 802.3at | | |
| WS-X4548-RJ45V+ | IEEE 802.3af | 30 W | 12.2(50)SG |
| | IEEE 802.3at | | |

Ordinarily, the default power inline configurations suffice; no additional configuration is required even for high power consumption Cisco powered devices (for example, a Cisco AP1250 Wireless Access Point). When a high power consumption device is attached to a port on a WS-X4648-RJ45V-E or WS-X4648-RJ45V+E linecard, the switch and device negotiate power using CDP packets to automatically determine the extended amount of power needed by the device.

Depending on the deployment requirements and design, you specify a specific configuration with the **power inline** command.

The following example shows how to pre-allocate PoE allocation to 16500 mW for Gi 2/1, regardless of what is mandated either by the 802.3af class of the discovered device or by any CDP packet that is received from the powered device:

```
Switch# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)# interface gigabitethernet 2/1
Switch(config-if)# power inline static max 16500
Switch(config-if)# end
Switch#
```