



# Connecting Cisco Enhanced EtherSwitch Service Modules to the Network

---

**Revised: March 15, 2009, OL-18327-02**

This guide describes how to connect Cisco enhanced EtherSwitch service modules to your network. It contains the following sections:

- [Cisco Enhanced EtherSwitch Services Modules, page 2](#)
- [Power Considerations, page 11](#)
- [Connecting to the Enhanced EtherSwitch Service Module Ports, page 11](#)
- [Obtaining Documentation, Obtaining Support, and Security Guidelines, page 12](#)



## Note

For information about other Cisco Ethernet switch network modules, see the “Connecting Ethernet Switch Network Modules to a Network” at the following URL:

<http://www.cisco.com/en/US/docs/routers/access/interfaces/nm/hardware/installation/guide/connswht.html>



## Note

For information about other Cisco EtherSwitch service modules, see the “Connecting Cisco EtherSwitch Service Modules” at the following URL:

<http://www.cisco.com/en/US/docs/routers/access/interfaces/nm/hardware/installation/guide/conneths.html>



---

**Americas Headquarters:**

**Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA**

# Cisco Enhanced EtherSwitch Services Modules

Cisco enhanced EtherSwitch service modules are complete switching platforms with increased switch to switch traffic load capacity, with Power over Ethernet (PoE) capability, and capable of supporting the following features:

- Dynamic addition and removal of individual Cisco enhanced EtherSwitch service modules
- Integrated management through all management interfaces (command-line interface [CLI], Simple Network Management Protocol [SNMP], and HTTP)
- Features such as UplinkFast, EtherChannel, and equal-cost routing across the switch that provide redundancy and reduce network disruption from individual component failure
- GE HIMI backplane connection (using the **connect (module)** command) provides interface support, which allows the Cisco enhanced EtherSwitch service module to route ingress or egress packets directly to or from the Cisco enhanced EtherSwitch service module from or to other GE enabled modules without going through the router CPU.

For information about these and other features available in Cisco enhanced EtherSwitch service modules, see the *Cisco Enhanced EtherSwitch Service Modules Configuration Guide* at the following URL:

[http://www.cisco.com/en/US/docs/routers/access/interfaces/software/feature/guide/eesm\\_sw.html](http://www.cisco.com/en/US/docs/routers/access/interfaces/software/feature/guide/eesm_sw.html)



## Note

For release note information about Cisco Ethernet switch network modules, see the *Release Notes for the Enhanced EtherSwitch Service Modules, Cisco IOS Release 12.5* at the following URL:

[http://www.cisco.com/en/US/docs/ios/12\\_5/12\\_5/release/notes/EtherSwitch\\_Service\\_Modules\\_ReleaseNotes.html](http://www.cisco.com/en/US/docs/ios/12_5/12_5/release/notes/EtherSwitch_Service_Modules_ReleaseNotes.html)

This section describes the Cisco enhanced EtherSwitch service modules. It contains the following sections:

- [Accessibility](#)
- [Cisco Enhanced EtherSwitch Service Module Overview](#)
- [Cisco Enhanced EtherSwitch Service Module Ports](#)
- [Cisco Enhanced EtherSwitch Service Module LEDs](#)

## Accessibility

These Cisco enhanced EtherSwitch service modules can be configured using the Cisco command-line interface (CLI). The CLI conforms to code 508 because it is text based and it relies on a keyboard for navigation. All functions of the router can be configured and monitored through the CLI.

For a complete list of guidelines and Cisco products' adherence to accessibility, see Cisco Accessibility Products at the following URL:

<http://www.cisco.com/web/about/responsibility/accessibility/products>

## Cisco Enhanced EtherSwitch Service Module Overview

The Cisco enhanced EtherSwitch service modules are switch modules to which you can connect Cisco IP phones, Cisco wireless access point workstations, and other network devices such as servers, routers, switches, and other network switch modules.

**Caution**

To comply with the Telcordia GR-1089 NEBS standard for electromagnetic compatibility and safety, connect the enhanced EtherSwitch service modules only to intra-building or unexposed wiring or cable. The intra-building port(s) of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring. The intrabuilding cable must be shielded and the shield must be grounded at both ends.

The following modules are available with this release of the hardware:

- SM-ES2-16-P—15 10/100 Ethernet ports, 1 10/100/1000 Ethernet port, single-wide Layer 2 enhanced EtherSwitch service module, with PoE support (see [Figure 1](#))
- SM-ES3-16-P—15 10/100 Ethernet ports, 1 10/100/1000 Ethernet port, single-wide Layer 2 and Layer 3 enhanced EtherSwitch service module, with PoE support (see [Figure 2](#))
- SM-ES3G-16-P—16 10/100/1000 Ethernet port, single-wide Layer 2 and Layer 3 enhanced EtherSwitch service module, with PoE support (see [Figure 3](#))
- SM-ES2-24—23 10/100 Ethernet ports, 1 10/100/1000 Ethernet port, single-wide Layer 2 enhanced EtherSwitch service module, with no PoE support (see [Figure 4](#))
- SM-ES2-24-P—23 10/100 Ethernet ports, 1 10/100/1000 Ethernet port, single-wide Layer 2 enhanced EtherSwitch service module, with PoE support (see [Figure 5](#))
- SM-ES3-24-P—23 10/100 Ethernet ports, 1 10/100/1000 Ethernet port, single-wide Layer 2 and Layer 3 enhanced EtherSwitch service module, with PoE support (see [Figure 6](#))
- SM-ES3G-24-P—24 10/100/1000 Ethernet port, single-wide Layer 2 and Layer 3 enhanced EtherSwitch service module, with PoE support (see [Figure 7](#))
- SM-D-ES2-48—48 10/100 Ethernet port, double-wide Layer 2 enhanced EtherSwitch service module (see [Figure 8](#))
- SM-D-ES3-48-P—48 10/100 Ethernet port, double-wide Layer 2 and Layer 3 enhanced EtherSwitch service module, with PoE support (see [Figure 9](#))
- SM-D-ES3G-48-P—48 10/100/1000 Ethernet port, double-wide Layer 2 and Layer 3 enhanced EtherSwitch service module, with PoE support (see [Figure 10](#))

**Note**

To install double-wide service modules in the Cisco 3900 series routers, remove the slot divider between slots SM3 and SM4 (3945), and remove the blank panel to the right of SM2 (3925).

**Note**

You can install one Cisco enhanced EtherSwitch service module into a Cisco Integrated Services Routers Generation 2 (ISR G2) router including a single Cisco 2911 or Cisco 2921 router, up to two Cisco enhanced EtherSwitch service modules into a single Cisco 2951, and Cisco 3925 router, or up to four

Cisco enhanced EtherSwitch service modules in the Cisco 3945 router. You can install one double-wide Cisco enhanced EtherSwitch service module into a single Cisco 2921, Cisco 2951, Cisco 3925 or Cisco 3945 router.

Table 1 shows the Cisco router platforms that support the Cisco enhanced EtherSwitch service modules.

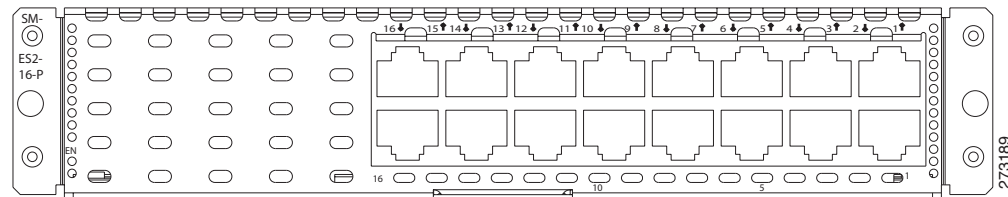
**Table 1 Router Platforms Supporting Cisco Enhanced EtherSwitch Service Modules**

Router	SM-ES2-16-P	SM-ES3-16-P	SM-ES3G-16-P	SM-ES2-24	SM-ES2-24-P	SM-ES3-24-P	SM-ES3G-24-P	SM-D-ES-2-48	SM-D-E-S3-48-P	SM-D-ES3-G-48-P
Cisco 3945	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cisco 3925	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cisco 2951	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cisco 2921	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cisco 2911	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Cisco 2901	No	No	No	No	No	No	No	No	No	No
Cisco 1941	No	No	No	No	No	No	No	No	No	No

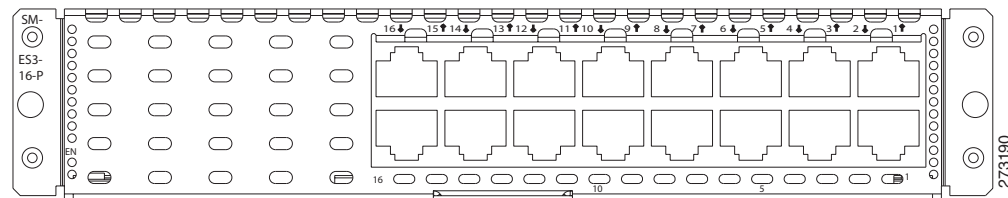
## 16-Port Cisco Enhanced EtherSwitch Service Modules

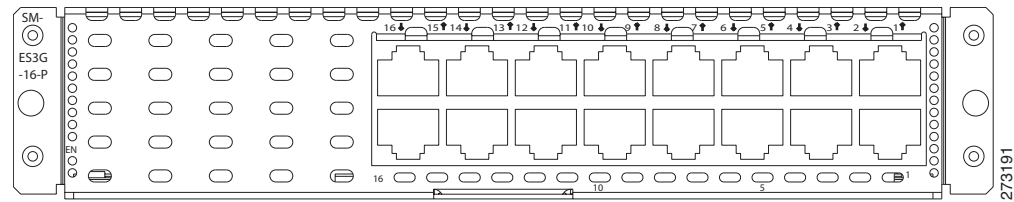
Figure 1, Figure 2, and Figure 3 show the 16-port Cisco enhanced EtherSwitch service modules.

**Figure 1 SM-ES2-16-P Enhanced EtherSwitch Service Module**



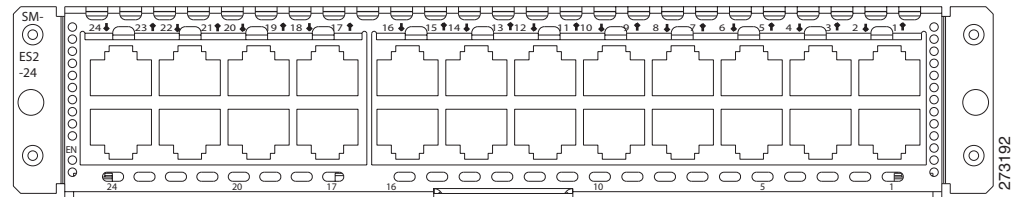
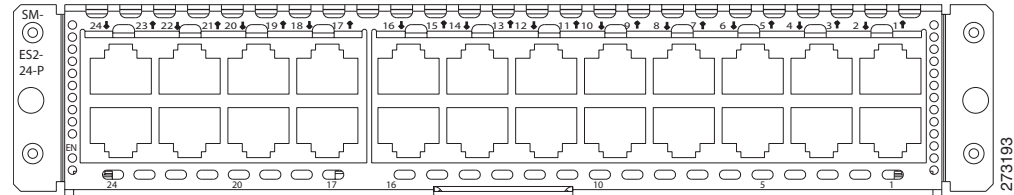
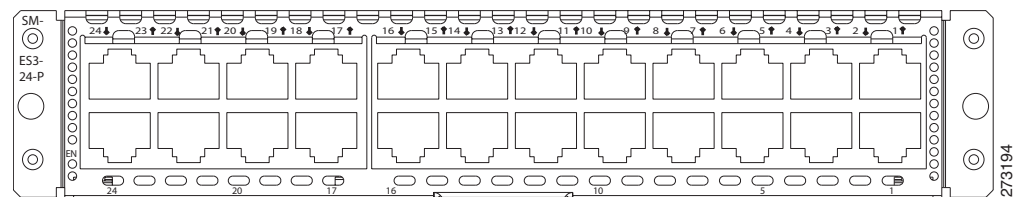
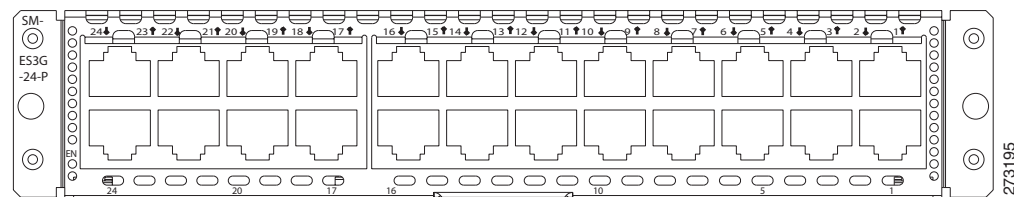
**Figure 2 SM-ES3-16-P Enhanced EtherSwitch Service Module**



**Figure 3** *SM-ES3G-16-P Enhanced EtherSwitch Service Module*

## 24-Port Cisco Enhanced EtherSwitch Service Modules

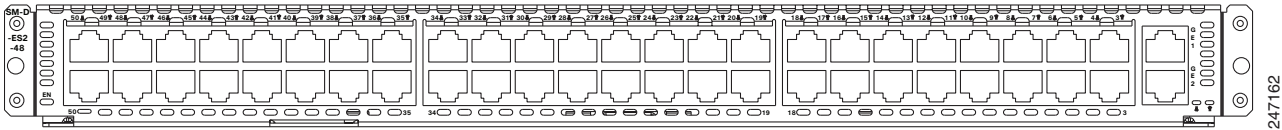
Figure 4, Figure 5, Figure 6, and Figure 7 show the 24-port Cisco enhanced EtherSwitch service modules.

**Figure 4** *SM-ES2-24 Enhanced EtherSwitch Service Module***Figure 5** *SM-ES2-24-P Enhanced EtherSwitch Service Module***Figure 6** *SM-ES3-24-P Enhanced EtherSwitch Service Module***Figure 7** *SM-ES3G-24-P Enhanced EtherSwitch Service Module*

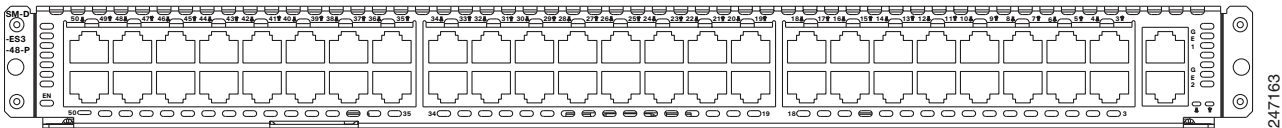
## 48-Port Cisco Enhanced EtherSwitch Service Modules

Figure 8, Figure 9, and Figure 10 show the 48-port Cisco enhanced EtherSwitch service modules.

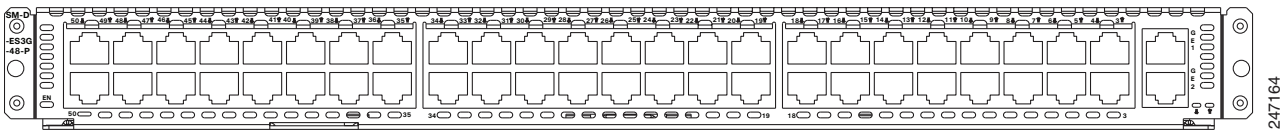
**Figure 8** *SM-D-ES2-48 Cisco Enhanced EtherSwitch Service Module*



**Figure 9** *SM-D-ES3-48-P Cisco Enhanced EtherSwitch Service Module*



**Figure 10** *SM-D-ES3G-48-P Cisco Enhanced EtherSwitch Service Module*



## Cisco Enhanced EtherSwitch Service Module Ports

The following sections describes the port types and port numbering on the service modules:

- [Cisco Enhanced EtherSwitch Service Module LEDs](#)
- [Port Types](#)

### Port Numbering

The Ethernet ports are numbered right to left, top to bottom. The port numbering scheme to configure the ports on the Cisco enhanced EtherSwitch service module includes the port type (such as **fa** or **fastethernet** for Fast Ethernet, or **gi** or **gigabitethernet** for Gigabit Ethernet), the module slot number (always 0), and the switch port number.

For example, to configure the Gigabit Ethernet port 3 in slot 0, the interface configuration command would be:

```
switch (config)# interface gi 0/3
```

### Port Types

All Cisco enhanced EtherSwitch service modules, use RJ-45 connectors to provide Fast Ethernet (FE) or Gigabit Ethernet (GE) connections.



#### Note

Both small form-factor pluggable (SFP) and 10/100/1000 Ethernet interfaces can support trunks.

**Note**

Only the 48-port Cisco enhanced EtherSwitch service modules support SFP.

**Note**

Cisco enhanced EtherSwitch service modules do not have a physical console interface, but are accessible for software configuration and other operational procedures through console sessions between the Cisco enhanced EtherSwitch service module and the host router.

## 10/100 and 10/100/1000 Ports

You can set the 10/100 ports on the Cisco enhanced EtherSwitch service module to operate in any combination of half duplex, full duplex, 10 Mbps, or 100 Mbps. You can set the 10/100/1000 ports to operate at 10 Mbps, 100 Mbps, or 1000 Mbps in full duplex. You can also set these ports for speed and duplex autonegotiation in compliance with IEEE 802.3ab. (The default setting is autonegotiate.)

When set for autonegotiation, the port senses the speed and duplex settings of the attached device and advertises its own capabilities. If the connected device also supports autonegotiation, the Cisco enhanced EtherSwitch service module port negotiates the best connection (that is, the fastest line speed that both devices support and full-duplex transmission if the attached device supports it) and configures itself accordingly. In all cases, the attached device must be within 100 meters (328 feet).

Except for SM-ES2-24 modules, all 10/100 ports on the Cisco enhanced EtherSwitch service modules can provide power to IEEE 802.3af-compliant and noncompliant PoE devices. PoE devices are Cisco IP phones, Cisco access points, and some Cisco switches. PoE, formerly referred to as inline power, is available in all network module form factors supported by Cisco modular access routers.

[Table 2](#) provides information on Cisco enhanced EtherSwitch service module port speed and duplex information.

**Table 2** *Port Speed and Duplex*

Port Function	Explanation
Speed	<p>The operating speed of the switch port. You can choose Auto (autonegotiation) if the connected device can negotiate the link speed with the switch port.</p> <p>The default settings are:</p> <ul style="list-style-type: none"> <li>• Auto for the external 10/100-Mbps Fast Ethernet ports</li> <li>• Auto for the external Gigabit Ethernet RJ-45 (10/100/1000-Mbps) ports</li> <li>• 1000 Mbps for the SFP module ports</li> </ul>
Duplex	<p>The duplex mode of the switch port. Choose from one of the following:</p> <ul style="list-style-type: none"> <li>• Auto (autonegotiation) if the connected device can negotiate with the switch</li> <li>• Full (full duplex) if both devices can send data at the same time</li> <li>• Half (half duplex) if one or both devices cannot send data at the same time</li> </ul> <p>The default settings are:</p> <ul style="list-style-type: none"> <li>• Auto for the external 10/100-Mbps Fast Ethernet ports</li> <li>• Auto for the external Gigabit Ethernet RJ-45 (10/100/1000-Mbps) ports</li> <li>• Full for the 1000-Mbps ports (SFP)</li> </ul> <p><b>Note</b> You cannot set the port to half duplex if the port speed is set to Auto.</p>

## SFP Modules

The Cisco EtherSwitch service module supports Gigabit Ethernet SFP modules for fiber-optic connections. These laser optical transceiver modules are field-replaceable, and you can insert them into an SFP module slot. You use fiber-optic cables with local connectors (LC) to connect to an SFP module. You can use the SFP modules for gigabit uplink connections to other devices.

The SFP modules support 850- to 1550-nm nominal wavelengths.

You can install the following SFP module types in the Cisco EtherSwitch service modules that have SFP module slots:

- 1000BASE-LH
- 1000BASE-LX
- 1000BASE-SX
- 1000BASE-T
- 1000BASE-ZX
- GLC-GE-100FX
- GLC-100BX-D
- GLC-100BX-U

**Note**

Only the 48-port Cisco enhanced EtherSwitch service modules support SFP.

## Cisco Enhanced EtherSwitch Service Module LEDs

Cisco enhanced EtherSwitch service module LEDs provide green, amber, and off states for system and port status. The following sections describe LEDs on the service modules:

- [EN LED](#)
- [Port LEDs](#)

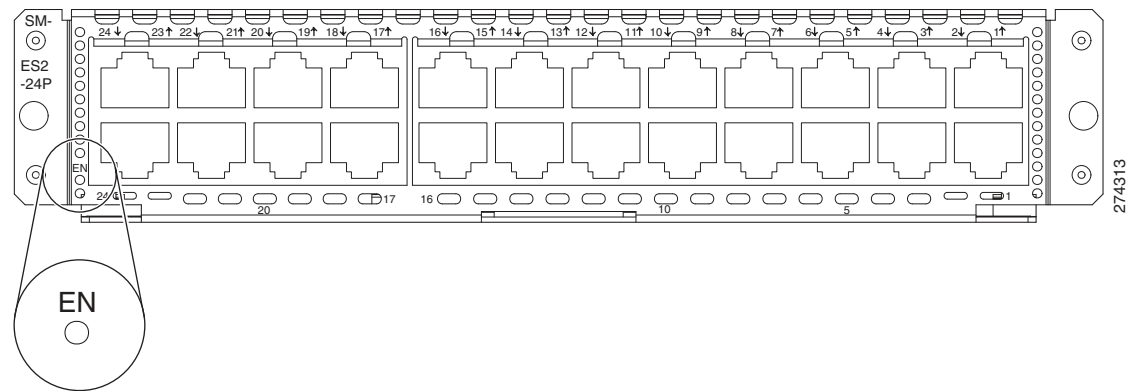
**Note**

Port LEDs on nonstacking Cisco enhanced EtherSwitch service modules only show link status.

### EN LED

All Cisco enhanced EtherSwitch service modules have an enable (EN) LED. This LED indicates that the module has passed its self-test and is available to the router. (See [Figure 11.](#)) [Table 3](#) lists the EN LED colors and their meanings.



**Figure 11** EN LED**Table 3** EN LED

State	System Status
Off	The Cisco enhanced EtherSwitch service module is not yet operational.
Green	The Cisco enhanced EtherSwitch service module is operational.
Amber	An error has occurred.

## Port LEDs

Each port has a port LED. These port LEDs, as a group or individually, display information about the module and about the individual ports.

[Table 4](#) explains how to interpret the port LED colors for link status on the Cisco enhanced EtherSwitch service modules.

**Table 4** Port LED on the Cisco Enhanced EtherSwitch Service Modules

Port LED Color	Description
Off	No link, or the port was administratively shut down. On PoE ports, no inline powered device (PD) detected, or the port is not connected.
Green	A link is present. The port or system is functioning normally. On PoE ports, the Cisco enhanced EtherSwitch service module is providing power to a PD.
Flashing green	Activity is occurring. The port is transmitting or receiving data. Module POST is in progress.
Alternating green-amber	Link fault. On PoE ports, the Cisco enhanced EtherSwitch service module is denying power to a PD, or is experiencing a power delivery fault.

**Table 4**      **Port LED on the Cisco Enhanced EtherSwitch Service Modules (continued)**

Port LED Color	Description
Amber	<p>The port is blocked by the Spanning-Tree Protocol (STP) and is not forwarding data.</p> <p><b>Note</b>    After a port is reconfigured, the port LED can remain amber for up to 30 seconds.</p> <p>On a PoE port, indicates that the port is denied power and that the port is administratively disabled.</p> <p>The system is receiving power but is not functioning properly.</p>
Flashing amber	<p>The port is blocked by STP and is transmitting or receiving packets.</p> <p>On a PoE port, indicates an inline power delivery fault.</p>

# Power Considerations

This section describes the power considerations for the router and Cisco enhanced EtherSwitch service modules:

- [Power Considerations for the Router](#)
- [Power Considerations for the Service Module](#)



## Warning

**Voltages that present a shock hazard may exist on Power over Ethernet (PoE) circuits if interconnections are made using uninsulated exposed metal contacts, conductors, or terminals. Avoid using such interconnection methods, unless the exposed metal parts are located within a restricted access location and users and service people who are authorized within the restricted access location are made aware of the hazard. A restricted access area can be accessed only through the use of a special tool, lock and key or other means of security. Statement 1072**

## Power Considerations for the Router

Cisco 2900 series and Cisco 3900 series routers supply –48 V power internally (with AC-PoE power supplies) to the Cisco enhanced EtherSwitch service modules.

## Power Considerations for the Service Module

The Cisco enhanced EtherSwitch service module supports inline powering of IP phones with –48 V power. This allows IP phones to be plugged into a standard RJ-45 jack and be powered from the switch rather than from an AC wall outlet.

The Cisco enhanced EtherSwitch service module distributes the –48 V power to each of the Ethernet ports that are configured for PoE. Each port can be independently configured for PoE.

# Connecting to the Enhanced EtherSwitch Service Module Ports

Both FE and GE ports are used to connect PCs or workstations to the network.

A 10/100/1000 Gigabit Ethernet (GE) port or a SFP module port can be used as an uplink port to connect to another router or a server, or can trunk to another Cisco enhanced EtherSwitch service module or switch located in the same chassis or in a separate installation.



## Note

Only the 48-port Cisco enhanced EtherSwitch service modules support SFP.

Connecting a FE or GE port to the network requires a Category 5 cable with RJ-45 male connectors, not provided with the switch module. Category 5 cables are widely available.

## Related Documents

Related Topic	Document Title
Hardware installation instructions for network modules	<a href="#"><i>Cisco 2900 Series and 3900 Series Hardware Installation</i></a>
General information about configuration and command reference.	<a href="#"><i>Cisco 3900 Series, 2900 Series, and 1900 Series Integrated Services Routers Software Configuration Guide</i></a>
Regulatory compliance information for Cisco 2900 series routers.	<a href="#"><i>Regulatory Compliance and Safety Information for Cisco 2900 Series Integrated Services Routers</i></a>
Regulatory compliance information for Cisco 3900 series routers.	<a href="#"><i>Regulatory Compliance and Safety Information for Cisco 3900 Series Integrated Services Routers</i></a>

## Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and also recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

<http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>

Cisco and the Cisco Logo are trademarks of Cisco Systems, Inc. and/or its affiliates in the U.S. and other countries. A listing of Cisco's trademarks can be found at [www.cisco.com/go/trademarks](http://www.cisco.com/go/trademarks). Third party trademarks mentioned are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1005R)

Any Internet Protocol (IP) addresses used in this document are not intended to be actual addresses. Any examples, command display output, and figures included in the document are shown for illustrative purposes only. Any use of actual IP addresses in illustrative content is unintentional and coincidental.

© 2009 Cisco Systems, Inc. All rights reserved.