



Overview

This chapter describes the Cisco Industrial Ethernet (IE) 3000 switch, hereafter referred to as *the switch*, and covers these topics:

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- [Switch Models, page 1-2](#)
- [Front-Panel Description, page 1-2](#)
- [Compact Flash Memory Card, page 1-18](#)
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- [Power Converter \(Optional\), page 1-20](#)
- [Management Options, page 1-22](#)
- [Network Configurations, page 1-23](#)

Overview

The Cisco IE 3000 switch provides a rugged and secure switching infrastructure for harsh environments. It is suitable for industrial Ethernet applications, including factory automation, intelligent transportation systems (ITSs), substations, and other deployments in harsh environments.

You can connect these switches to office networking devices like Cisco IP Phones, Cisco Wireless Access Points workstations, and other devices such as servers, routers, and other switches. In industrial environments, you can connect any Ethernet-enabled industrial communication devices, including programmable logic controllers (PLCs), human-machine interfaces (HMIs), drives, sensors, traffic signal controllers, and intelligent electronic devices (IEDs).

You can mount the switch on a DIN rail in an industrial enclosure, on a wall or panel, and with some restrictions, in a standard 19-inch rack. Its components are designed to withstand extremes in temperature, vibration, and shock that are common in an industrial environment.



Note

The switch does not have cooling fans.

Switch Models

Table 1-1 describes the switch and the expansion modules. The Cisco IE-3000-4TC and the Cisco IE-3000-8TC are the switch models, and the Cisco IEM-3000-8TM and the Cisco IEM-3000-8FM are expansion modules that you can connect to increase the number of ports. For instructions on how to connect the expansion modules to the switch, see the “Adding Modules to the Switch” section on page 2-5.

Table 1-1 Cisco IE 3000 Switch Models and Expansion Modules

Switch Model	Description
Cisco IE-3000-4TC	4 10/100BASE-T Ethernet ports and 2 dual-purpose ports, each with a 10/100/1000BASE-T copper port and an SFP (small form-factor pluggable) module slot
Cisco IE-3000-8TC	8 10/100BASE-T Ethernet ports and 2 dual-purpose ports
Cisco IE-3000-4TC-E	4 10/100BASE-T Ethernet ports and 2 dual-purpose ports (supports the IP services software feature set)
Cisco IE-3000-8TC-E	8 10/100BASE-T Ethernet ports and 2 dual-purpose ports (supports the IP services software feature set)
Expansion Modules	
Cisco IEM-3000-8TM	Expansion module with 8 10/100BASE-T copper Ethernet ports
Cisco IEM-3000-8FM	Expansion module with 8 100BASE-FX fiber-optic Ethernet ports
Cisco IEM-3000-4SM	Expansion module with 4 100BASE-X SFP Ethernet ports
Cisco IEM-3000-8SM	Expansion module with 8 100BASE-X SFP Ethernet ports
Cisco IEM-3000-4PC ¹	Expansion module with 4 PoE ports
Cisco IEM-3000-4PC-4TC	Expansion module with 4 PoE ports and 4 non-PoE FE ports

1. The IEM-3000-4PC expansion module and the IEM-3000-4PC-4TC expansion module require a separate DC power source. This source can be either the PWR-IE65W-PC-DC DC-input power supply or the PWR-IE65W-PC-AC AC-input power supply or you can use site source DC power.

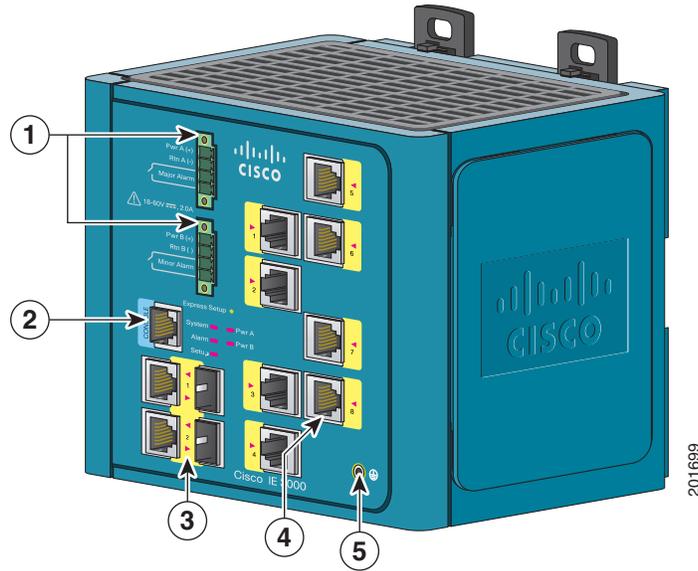
Front-Panel Description

This section describes the front panel and includes these sections:

- [10/100 Ports, page 1-8](#)
- [Dual-Purpose Ports, page 1-8](#)
- [100BASE-FX Ports, page 1-10](#)
- [Power and Relay Connector, page 1-10](#)
- [Console Port, page 1-11](#)
- [LEDs, page 1-11](#)

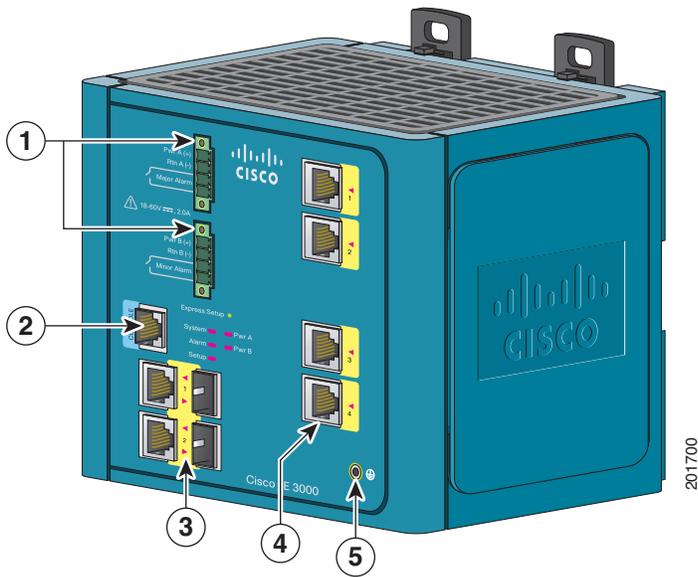
The switch front panel contains the ports, the LEDs, and the power and relay connectors. [Figure 1-1](#) to [Figure 1-6](#) show the switch and expansion module front panels.

Figure 1-1 Cisco IE-3000-8TC Switch



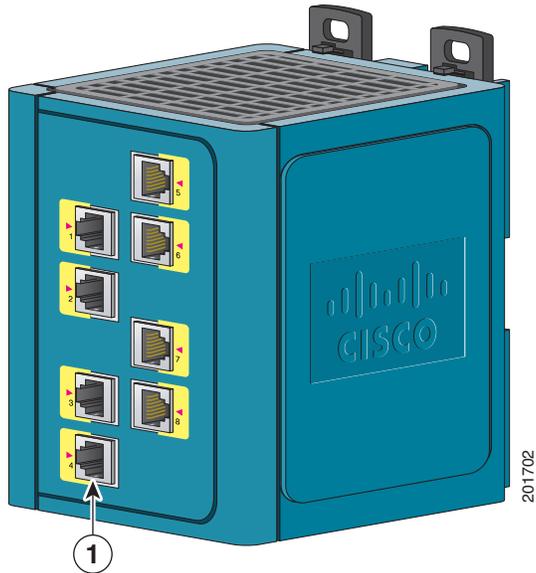
1	Power and relay connectors	4	10/100 ports
2	Console port	5	Protective ground connection
3	Dual-purpose ports		

Figure 1-2 Cisco IE-3000-4TC Switch



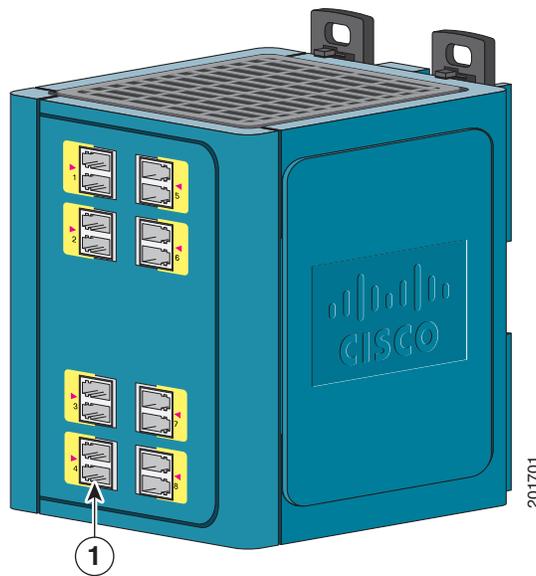
1	Power and relay connectors	4	10/100 ports
2	Console port	5	Protective ground connection
3	Dual-purpose ports		

Figure 1-3 Cisco IEM-3000-8TM Expansion Module



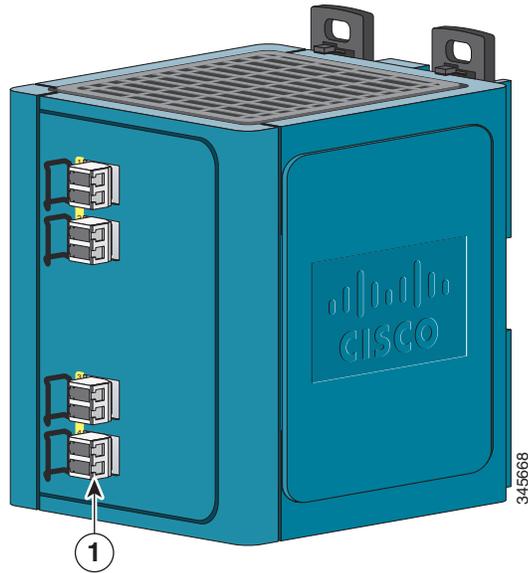
1	10/100 ports
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Figure 1-4 Cisco IEM-3000-8FM Expansion Module



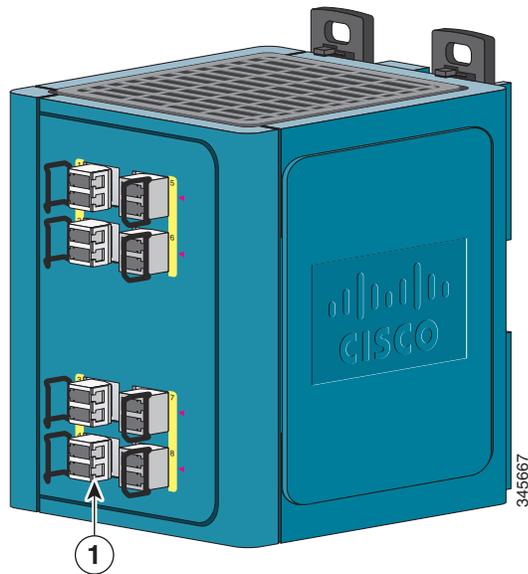
1	100BASE-FX ports
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Figure 1-5 Cisco IEM-3000-4SM Expansion Module



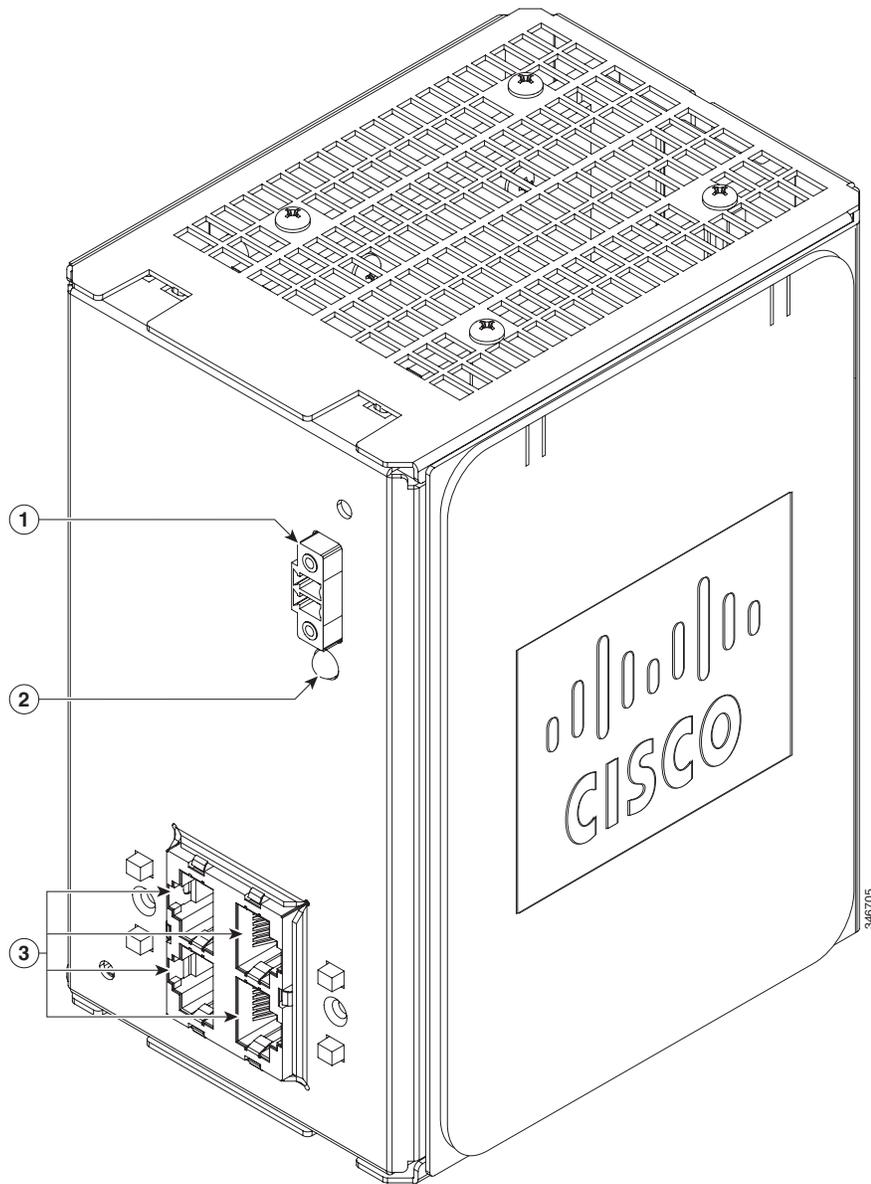
1	100BASE-X SFP ports		
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Figure 1-6 Cisco IEM-3000-8SM Expansion Module



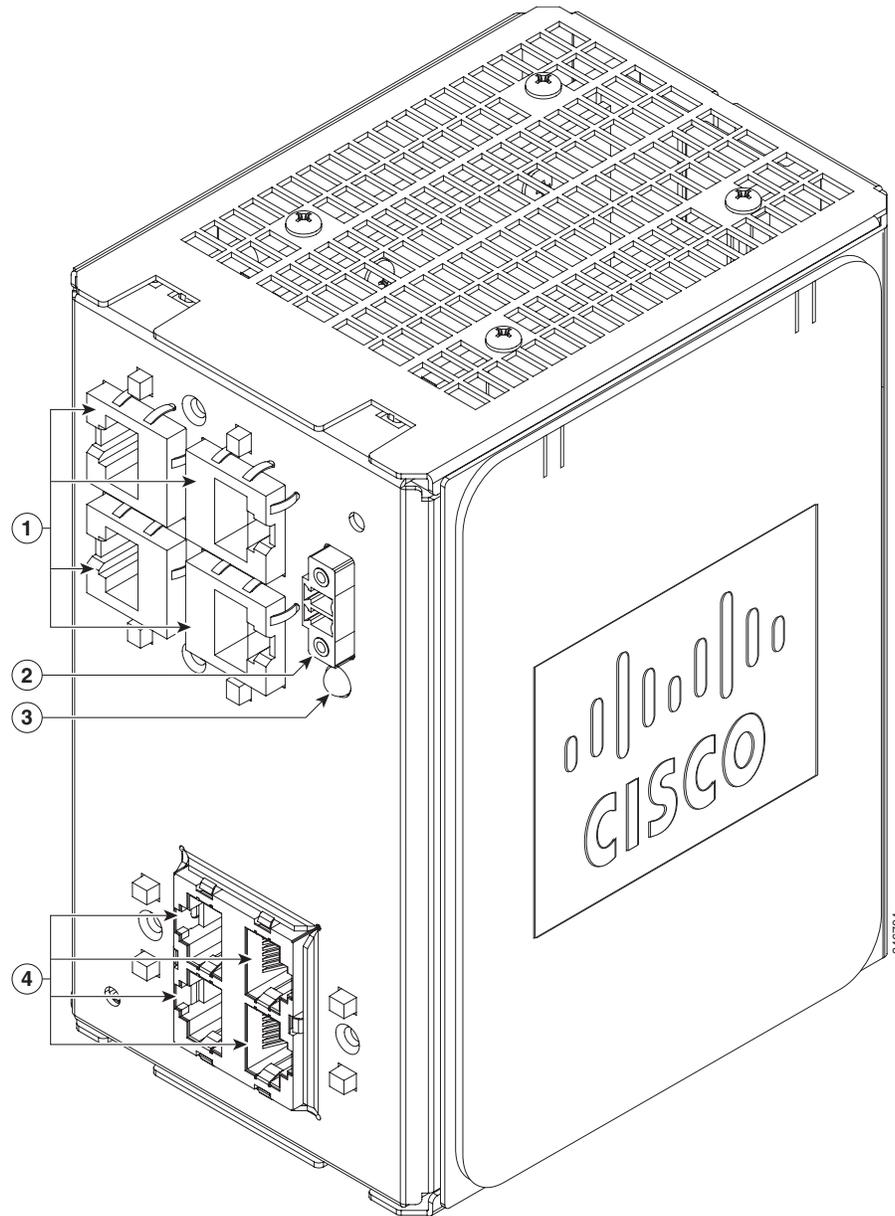
1	100BASE-X SFP ports		
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Figure 1-7 Cisco IEM-3000-4PC PoE Expansion Module



1	DC Input terminal block	3	PoE ports
2	POE STATUS LED		

Figure 1-8 Cisco IEM-3000-4PC-4TC PoE Expansion Module



1	10/100 Non-PoE ports	3	POE STATUS LED
2	DC-Input terminal block	4	PoE ports

10/100 Ports

You can set the 10/100 ports to operate at 10 or 100 Mb/s in full-duplex or half-duplex mode. 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 switch 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 328 feet (100 meters). 100BASE-TX traffic requires Category 5 cable. 10BASE-T traffic can use Category 3 or Category 4 cables.

When connecting the switch to workstations, servers, routers, and Cisco IP Phones, be sure that the cable is a straight-through cable.

For copper ports, you can use the **mdix auto** interface configuration command in the command-line interface (CLI) to enable the automatic medium-dependent interface crossover (auto-MDIX) feature. When the auto-MDIX feature is enabled, the switch detects the required cable type for copper Ethernet connections and configures the interfaces accordingly. For configuration information for this feature, see the switch software configuration guide or the switch command reference.

Dual-Purpose Ports

A dual-purpose port can be configured as either a 10/100/1000 port or as an SFP module port. Only one port can be active at a time. If both ports are connected, the SFP module port has priority.

You can set the 10/100/1000 ports to operate at 10, 100, or 1000 Mb/s in full-duplex or half-duplex mode. You can configure them as fixed 10, 100, or 1000 Mb/s (Gigabit) Ethernet ports and can configure the duplex setting. (See the switch software configuration for more information.)

You can use Gigabit Ethernet SFP modules to establish fiber-optic connections to other switches. These transceiver modules are field-replaceable, providing the uplink interfaces when inserted in an SFP module slot. You use fiber-optic cables with LC connectors to connect to a fiber-optic SFP module.

For more information about these SFP modules, see the [“SFP Modules” section on page 1-8](#), your SFP module documentation or the release note for your switch software.

SFP Modules

The switch Ethernet SFP modules provide connections to other devices. These field-replaceable transceiver modules provide the uplink interfaces. The modules have LC connectors for fiber-optic connections or RJ-45 connectors for copper connections. You can use any combination of the supported SFP modules listed in [Table 1-2](#).

Table 1-2 Maximum Operating Temperature

Type of SFP Module	Model
Rugged and Industrial SFPs –40 to 140°F (–40 to 60°C)	<ul style="list-style-type: none"> • GLC-SX-MM-RGD • GLC-LX-SM-RGD • GLC-FE-100LX-RGD • GLC-FE-100FX-RGD • GLC-ZX-SM-RGD • GLC-BX40-D-I with digital optical monitoring (DOM) support • GLC-BX40-DA-I with DOM support • GLC-BX80-D-I with DOM support • GLC-BX40-U-I with DOM support • GLC-BX80-U-I with DOM support
Commercial SFPs 32 to 113°F (0 to 45°C)	<ul style="list-style-type: none"> • GLC-BX-D with DOM support • GLC-BX-U with DOM support • GLC-FE-100LX • GLC-FE-100BX-D • GLC-FE-100BX-U • GLC-FE-100FX • GLC-FE-100EX • GLC-FE-100ZX • CWDM SFP with DOM support • DWDM SFP with DOM support • GLC-T
Extended temperature SFPs 23 to 140°F (–5 to 60°C)	<ul style="list-style-type: none"> • SFP-GE-L with DOM support • SFP-GE-S with DOM support • SFP-GE-Z with DOM support • GLC-SX-MMD with DOM support • GLC-EX-SMD with DOM support • GLC-LH-MMD with DOM support • GLC-ZX-SMD with DOM support

For the most up-to-date list of supported SFP models for Cisco Industrial Ethernet switches, see http://www.cisco.com/en/US/docs/interfaces_modules/transceiver_modules/compatibility/matrix/OL_6981.html#wp138176

For information about SFP modules, see your SFP module documentation and the “Installing and Removing SFP Transceivers” section on page 2-41. For cable specifications, see Appendix C, “Cable and Connectors.”

100BASE-FX Ports

The IEEE 802.3u 100BASE-FX ports provide full-duplex 100 Mb/s connectivity over multimode fiber (MMF) cables. These ports use a small-form-factor fixed (SFF) fiber-optic transceiver module that accepts a dual LC connector. The cable can be up to 1.24 miles (2 km) in length.

100BASE-X Ports

The IEEE 802.3u 100BASE-X ports provide full-duplex 100 Mb/s connectivity over both single-mode (SMF) and multimode fiber (MMF) cables. These ports use a small-form-factor pluggable (SFP) fiber-optic transceiver module that accepts a dual LC connector (except in the case of the GLC-FE-100BX-U and GLC-FE-100BX-D SFP transceivers). With the GLC-FE-100ZX SFP transceiver installed, cable runs of up to 49.6 miles (80 km) are supported.

PoE Ports

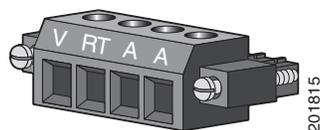
The IEM-3000-4PC and the IEM-3000-4PC-4TC expansion modules provide 10/100BASE-T PoE capability to the IE3000 base switch. Both expansion modules support up to 4 PoE (802.3af) or 4 PoE+ (802.3at) devices. The PoE expansion modules require a dedicated power supply for PoE power.

Power and Relay Connector

You connect the DC power and alarm signals to the switch through two front panel connectors. One connector provides primary DC power (supply A) and the major alarm signal, and a second connector (supply B) provides secondary power and the minor alarm signal. The two connectors are physically identical and are in the upper left side of the front panel. See [Figure 1-2](#).

The switch accessory pack includes the mating power and relay connectors. These connectors provide screw terminals for terminating the DC power and alarm wire and the connector plugs into the power and relay receptacles on the front panel. The positive DC power connection is labeled *V*, and the return connection is labeled *RT* (see [Figure 1-9](#)).

Figure 1-9 Power and Relay Connector



The switch can operate with a single power source or with dual power sources. When both power sources are operational, the switch draws power from the DC source with the higher voltage. If one of the two power sources fail, the other continues to power the switch.

The power and relay connectors also provide an interface for two independent alarm relays: the major and the minor alarms. The relays can be activated for environmental, power supply, and port status alarm conditions and can be configured to indicate an alarm with either open or closed contacts. The relay itself is normally open, so under power failure conditions, the contacts are open. From the CLI, you can associate any alarm condition with one or with both alarm relays.

Alarm relays often control an external alarm device, such as a bell or a light. To connect an external alarm device to the relay, you must connect two relay contact wires to complete an electrical circuit. Both alarm terminals on the power and relay connector are labeled A, and you can connect them without regard to polarity.

See the switch software configuration guide for instructions on configuring the alarm relays.

For more information about the power and relay connector, see [Appendix C, “Cable and Connectors.”](#)

You can get replacement power and relay connectors (PWR-IE3000-CNCT=) by calling Cisco Technical Support.

Console Port

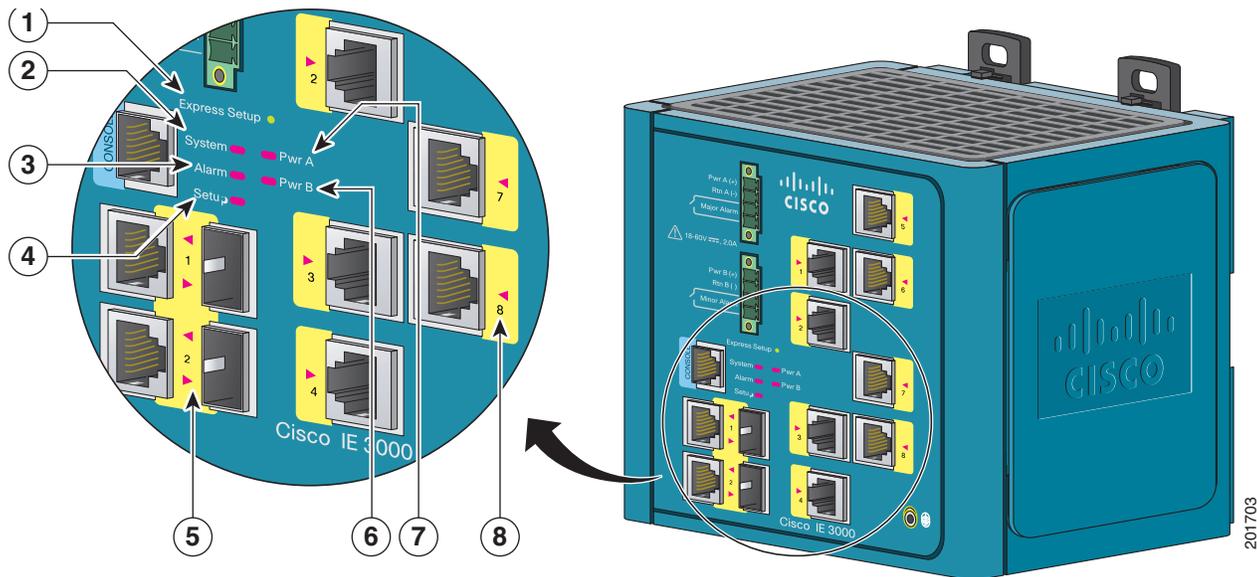
You can connect a switch to a PC through the console port and the supplied RJ-45-to-DB-9 adapter cable. If you want to connect a switch to a terminal, you need to provide an RJ-45-to-DB-25 female DTE adapter. You can order a kit (part number ACS-DSBUASYN=) with that adapter from Cisco Systems. For console-port and adapter-pinout information, see the [“Two Twisted-Pair Cable Pinouts”](#) section on [page C-8](#).

LEDs

You can use the LEDs to monitor the switch status, activity, and performance. [Figure 1-10](#) to [Figure 1-13](#) show the front panel LEDs, and the following sections describe them.

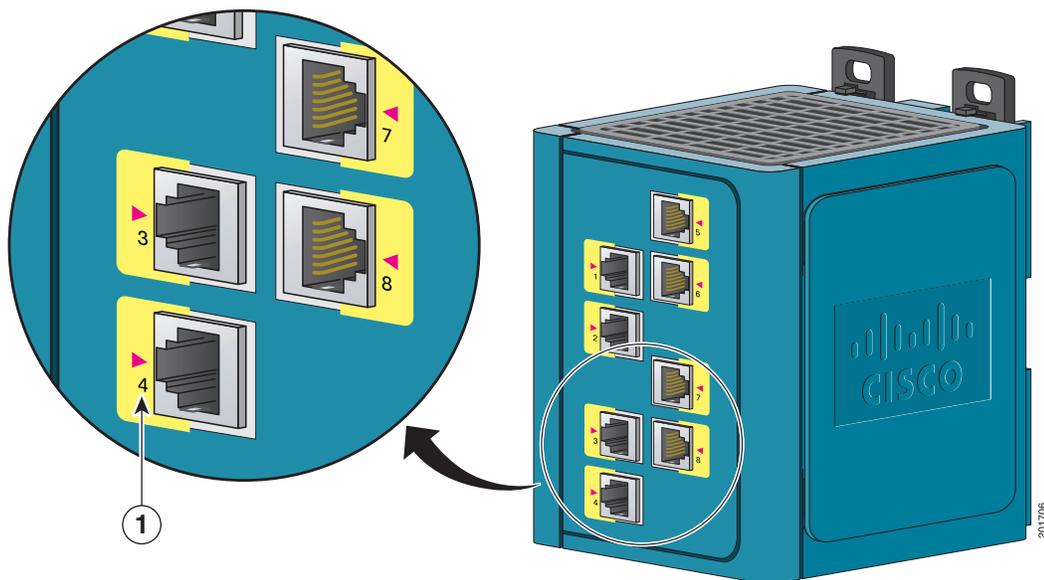
All LEDs are visible through the GUI management applications—the Cisco Network Assistant application for multiple switches and the device manager GUI for a single switch. The switch software configuration guide describes how to use the CLI to configure and to monitor individual switches and switch clusters.

Figure 1-10 LEDs on the Cisco IE 3000 Switch



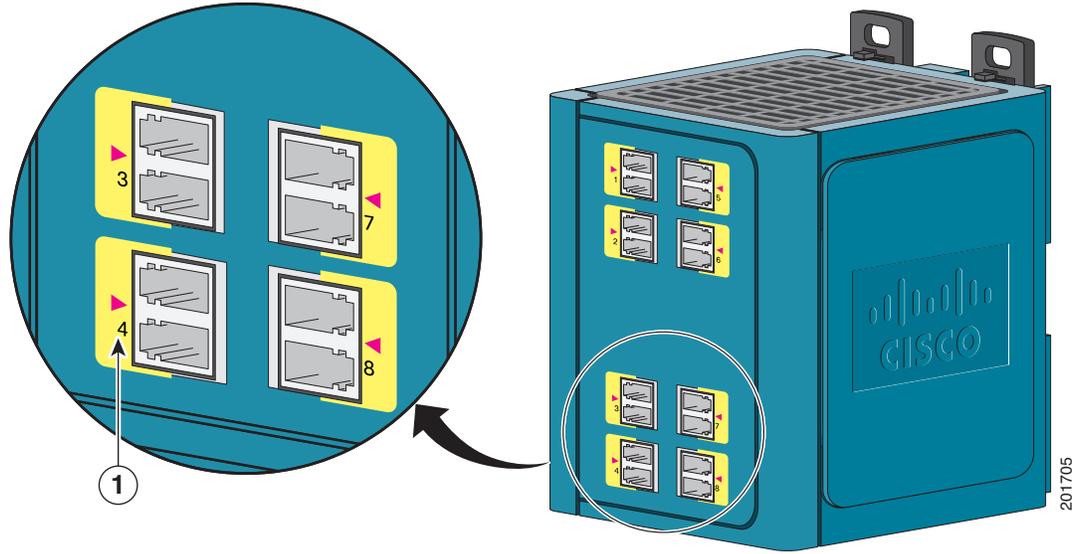
1	Express setup button	5	Dual-purpose uplink port LED
2	System LED	6	Pwr B LED
3	Alarm LED	7	Pwr A LED
4	Setup LED	8	Port LED

Figure 1-11 LEDs on the Cisco IEM-3000-8TM Module



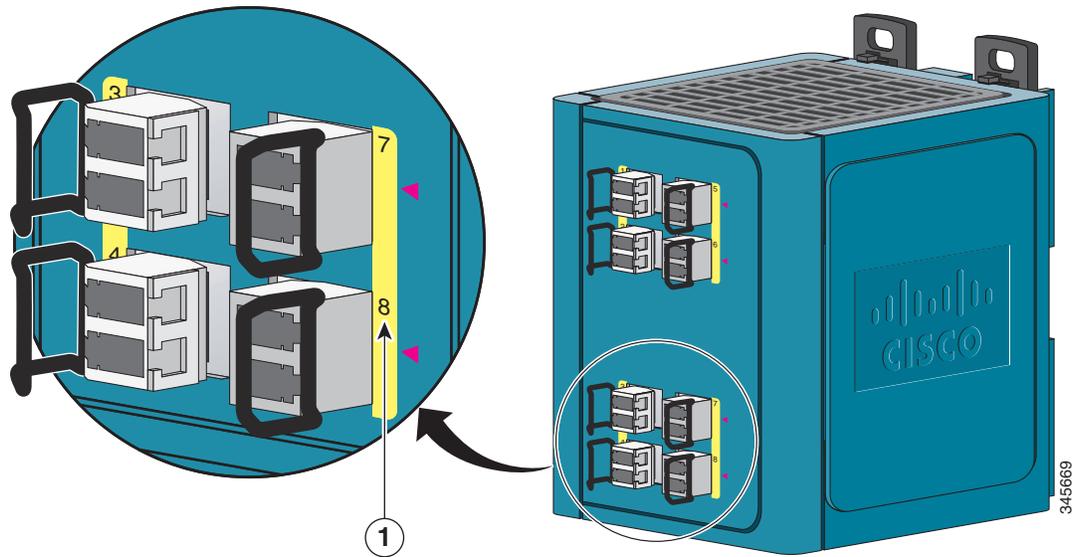
1	10/100 port LED
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Figure 1-12 LEDs on the Cisco IEM-3000-8FM Module



1	100BASE -FX port LEDs
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Figure 1-13 LEDs on the Cisco IEM-3000-8SM Module



1	100BASE-X port LEDs
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Note The port numbering sequence is the same for the IEM-3000-4SM expansion module.

The LED arrangement on the IEM-3000-4PC PoE expansion module is similar to the LED arrangement on the IEM-3000-4PC-4TC PoE expansion module except that the IEM-3000-4PC module does not have the four additional non-PoE ports with their associated port LEDs.

Setup LED

The Setup LED displays the express setup mode for the initial configuration. [Table 1-3](#) lists the LED colors and their meanings.

Table 1-3 Setup LED

Color	Setup Status
Off (dark)	Switch is configured as a managed switch.
Solid green	Switch is in initial setup.
Blinking green	Switch is in initial setup, in recovery, or initial setup is incomplete.
Solid red	Switch failed to start initial setup or recovery because there is no available switch port to which to connect the management station. Disconnect a device from a switch port, and then press the Express Setup button.

System LED

The System LED shows whether the system is receiving power and is functioning properly. [Table 1-4](#) lists the system LED colors and their meanings.

Table 1-4 System LED

Color	System Status
Off	System is not powered on.
Green	System is operating normally.
Red	Switch is not functioning properly.

Alarm LED

[Table 1-5](#) lists the alarm LED colors and their meanings.

Table 1-5 Alarm Status LED

Color	System Status
Off	Alarms are not configured, or the switch is off.
Green	Alarms are configured.
Blinking red	Switch has detected a major alarm.
Red	Switch has detected a minor alarm.

Power Status LED

The switch can operate with one or two DC power sources. Each DC input has an associated LED that shows the status of the corresponding DC input. If power is present on the circuit, the LED is green. If power is not present, the LED color depends on the alarm configuration. If alarms are configured, the LED is red when power is not present; otherwise, the LED is off.

If the switch has dual power sources, the switch draws power from the power source with the higher voltage. If the one of the DC sources fails, the alternate DC source powers the switch, and the corresponding power status LED is green. The power status for the failed DC source is either off or red, depending on the alarm configuration.

Table 1-6 lists the power status LED colors and meanings.

Table 1-6 Power Status LEDs

Color	System Status
Off	Power is not present on the circuit, or the system is not powered up.
Green	Power is present on the associated circuit.
Red	Power is not present on the associated circuit, and the power supply alarm is configured.



Note

The Pwr A and Pwr B LEDs show that power is not present on the switch if the power input drops below the low valid level. The power status LEDs only show that power is present if the voltage at the switch input exceeds the valid level. The difference, or *hysteresis*, ensures that the power status LEDs do not oscillate at values near 18 V.

For information about the power LED colors during the power-on self-test (POST), see the [“Verifying Switch Operation”](#) section on page 2-13.

10/100 Port Status LEDs

Each 10/100 port has a port status LED, also called a port LED, as shown in [Figure 1-10](#), [Figure 1-11](#), and [Figure 1-12](#). Table 1-7 displays LED information about the switch and the individual ports.

Table 1-7 10/100 Port Status LEDs

Color	System Status
Off	No link.
Solid green	Link present.
Blinking green	Activity. Port is sending or receiving data.
Blinking amber	A link blocked by Spanning Tree Protocol (STP) is sending or receiving data.

Table 1-7 10/100 Port Status LEDs (continued)

Color	System Status
Alternating green-amber	Link fault. Error frames can affect connectivity, and errors such as excessive collisions, CRC errors, and alignment and jabber errors are monitored for a link-fault indication.
Solid amber	Port is not forwarding. Port was disabled by management, an address violation, or STP. Note After a port is reconfigured, the port LED can remain amber for up to 30 seconds while STP checks the switch for possible loops.

100Base-FX Port Status LEDs

These LEDs display information about the individual ports. See [Table 1-8](#).

Table 1-8 100BASE-FX MM Uplink Port Status LEDs

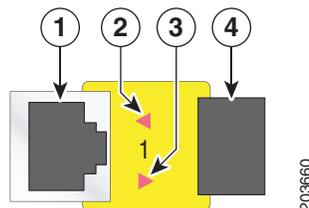
Color	System Status
Off	No link.
Solid green	Link is present.
Blinking green	Activity. Port is sending or receiving data.
Blinking amber	A link blocked by Spanning Tree Protocol (STP) is sending or receiving data.
Alternating green-amber	Link is faulty.
Solid amber	Link is disabled.

Dual-Purpose Port LEDs

[Figure 1-14](#) shows the LEDs on a dual-purpose port. You can configure each port as either a 10/100/1000 port through the RJ-45 connector or as an SFP module, but not both at the same time. The LEDs show how the port is being used (Ethernet or SFP module).

The LED colors have the same meanings as described in [Table 1-7](#).

Figure 1-14 Dual-Purpose Port LEDs



1	RJ-45 connector	3	SFP module port in-use LED
2	RJ-45 port in-use LED	4	SFP module slot

100BASE-X SFP Port LEDs

The 100BASE-X SFP port LEDs are located on the two SFP expansion modules. The LED colors have the same meanings as described in [Table 1-7](#).

PoE Status LED

The PoE status LED on the front panel of the IEM-3000-4PC and the IEM-3000-4PC-4TC PoE expansion modules displays the functionality and status of the PoE ports. The LED colors and meanings are listed in [Table 1-9](#).

Table 1-9 PoE Status LED Colors and Meanings

Color	PoE Status
Off	PoE is off. If the powered device is receiving power from an AC power source, the port LED is off even if the powered device is connected to the switch port.
Green	PoE is on. The port LED is green only when the switch port is providing power.
Alternating green and amber	PoE is denied because providing power to the powered device will exceed the power capacity of the expansion module.
Flashing amber	PoE is off due to a fault.  Caution Noncompliant cabling or powered devices can cause a PoE port fault. Use only standard-compliant cabling to connect Cisco prestandard IP Phones and wireless access points or IEEE 802.3af-compliant devices. You must remove any cable or device that causes a PoE fault.
Amber	PoE for the port is disabled. (PoE is enabled by default.)

10/100BASE-T PoE and Non-PoE Port LEDs

The 10/100BASE-T PoE and non-PoE port status LEDs on the front panel of the IEM-3000-4PC and the IEM-3000-4PC-4TC PoE expansion modules display the functionality and status of the individual ports on the expansion modules.

Table 1-10 10/100BASE-T Port Status LEDs for the PoE Expansion Modules

Color	Port Status
Off	Port is not connected.
Flashing amber	Link negotiation in progress on the port.
Flashing green	Link is up and there is data transfer in progress on the port.
Amber	Link negotiation failure on the port.
Green	Link is up but there is no data transfer.

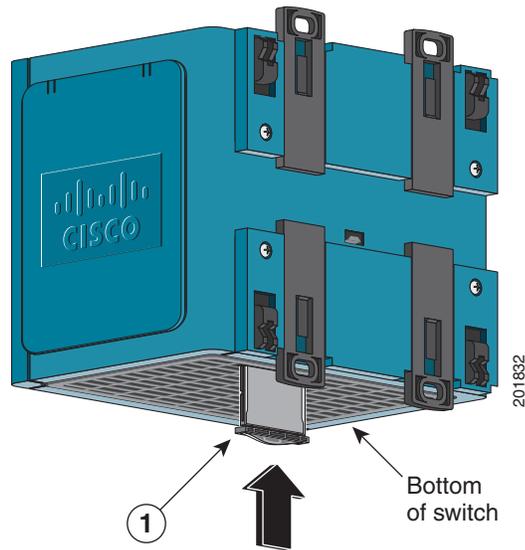
Compact Flash Memory Card

The switch supports a compact flash memory card that makes it possible to replace a failed switch without reconfiguring the new switch. The slot for the compact flash memory card is on the bottom of the switch. See [Figure 1-15](#).

**Note**

For more information on inserting and removing the compact flash memory card, see the [“Installing or Removing the Compact Flash Memory Card”](#) section on page 2-12.

Figure 1-15 Compact Flash Memory Card Slot



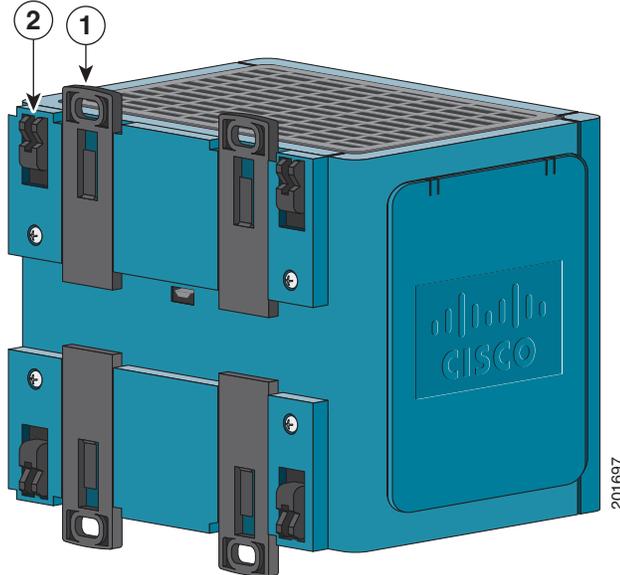
Note

You can obtain replacement flash memory cards (CF-IE3000=) by calling Cisco Technical Support.

Rear-Panel Description

The rear panel of the switch, modules, and power converter have latches for installation on either a DIN rail or a wall. See [Figure 1-16](#). The latches slide outward to position the switch over a DIN rail and slide inward to secure the switch to a DIN rail. The feet stabilize the switch when it is mounted on the wall.

Figure 1-16 Cisco IE 3000 Switch Rear Panel



1	DIN rail latch	2	Foot in recessed position
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Power Converter (Optional)

The switch can be used with an optional AC/DC power converter. The power converter (PWR-IE3000-AC) can supply 24-VDC power to one switch and up to two modules. The power converter is mounted on the side of a switch and provides power to the switch through a preassembled power cable.



Note

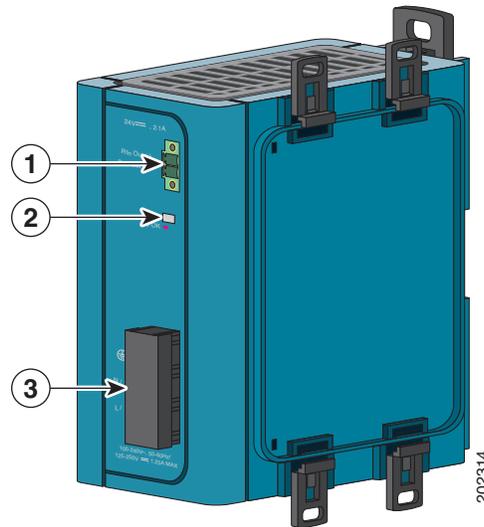
The power converter (PWR-IE3000-AC=) is sold separately.

You can get a replacement power cable (PWR-IE3000-CLP=) by calling Cisco Technical Support.

For installation and connection procedures for the power converter, see the [“Connecting the Switch to the Power Converter”](#) section on page 2-48.

Figure 1-17 displays the power converter.

Figure 1-17 Cisco IE 3000 Switch AC/DC Power Converter



1	DC output connector	3	AC/DC input power connector
2	Status LED		

AC-Input Power Supply (Optional)

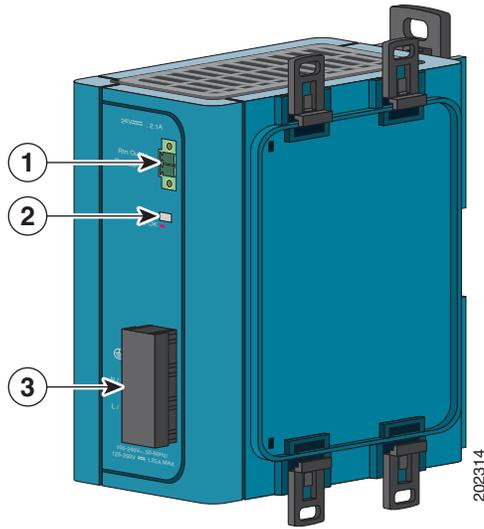
A 50 W AC-input power supply is available as an option for the IE 3000 switch. The power supply comes in two styles:

- PWR-IE50W-AC—An AC-input power supply with a terminal block connector for the source AC cable.
- PWR-IE50W-AC-IEC— An AC-input power supply with an IEC C14 appliance connector for a detachable AC power cord.

Figure 1-18 shows the AC-input power supply.

The power supply is designed to operate from source AC range of 85 to 264 VAC (115 VAC nominal at 60 Hz or 230 VAC nominal at 50 Hz) and provides 24 VDC to one switch and up to two modules. The power supply attaches to the side of a switch and provides power to the switch through a preassembled power cable (PWR-IE3000-CLP=).

Figure 1-18 AC-Input Power Supply (PWR-IE50W-AC= Shown)



1	DC out connector	3	Source AC terminal block (Cover shown installed)
2	STATUS LED		<p>Note The source AC terminal block shown in the illustration is replaced by an IEC C14 appliance connector on the PWR-50W-AC-IEC= power supply.</p>

Management Options

The switch supports these management options:

- Cisco Network Assistant

Cisco Network Assistant is a PC-based network management GUI application optimized for LANs of small and medium-sized businesses. Through a GUI, users can configure and manage switch clusters or standalone switches. Cisco Network Assistant is available at no cost and can be downloaded from this URL:

http://www.cisco.com/en/US/products/ps5931/tsd_products_support_series_home.html

For information on starting the Cisco Network Assistant application, see the *Getting Started with Cisco Network Assistant* guide on Cisco.com.

- Device Manager

You can use the device manager, which is in the switch memory, to manage individual and standalone switches. This web interface offers quick configuration and monitoring. You can access the device manager from anywhere in your network through a web browser. For more information, see the getting started guide and the device manager online help.

- Cisco IOS CLI

The switch CLI is based on Cisco IOS software and is enhanced to support desktop-switching features. You can fully configure and monitor the switch. You can access the CLI either by connecting your management station directly to the switch management port, or a console port, or by using Telnet from a remote management station. See the switch command reference on Cisco.com for more information.

- CiscoWorks application

The CiscoWorks device-management application displays the switch image that you can use to set configuration parameters and to view the switch status and performance information. The CiscoView application, which you purchase separately, can be a standalone application or part of a Simple Network Management Protocol (SNMP) platform. See the CiscoView documentation for more information.

- SNMP network management

You can manage switches from a SNMP-compatible management station that is running platforms such as HP OpenView or SunNet Manager. The switch supports a comprehensive set of Management Information Base (MIB) extensions and four Remote Monitoring (RMON) groups. See the switch software configuration guide on Cisco.com and the documentation that came with your SNMP application for more information.

- Common Industrial Protocol

The Common Industrial Protocol (CIP) management objects are supported. The Cisco IE 3000 can be managed by CIP-based management tools, allowing the user to manage an entire industrial automation system with one tool.

Network Configurations

See the switch software configuration guide on Cisco.com for network configuration concepts and examples of using the switch to create dedicated network segments and interconnecting the segments through Gigabit Ethernet connections.

