Cisco IE 2000U Switch Hardware Installation Guide

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Contents

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Preface

Audience

This guide is for the networking or computer technician responsible for installing Cisco IE 2000U series switches. We assume that you are familiar with the concepts and terminology of Ethernet and local area networking.

Purpose

This guide documents the hardware features of the Cisco IE 2000U series switches. It describes the physical and performance characteristics of each switch, explains how to install a switch, and provides troubleshooting information.

This guide does not describe system messages that you might receive or how to configure your switch. For more information, see the *Cisco IE 2000U Switch Getting Started Guide* and the *Cisco Connected Grid Switches System Management Software Configuration Guide* at www.cisco.com/go/ie2000u-docs. For the Cisco IOS 15.2M&T command references, go to: http://www.cisco.com/en/US/products/ps11746/prod_command_reference_list.html

Conventions

This document uses the following conventions.

Conventions	Indication
bold font	Commands and keywords and user-entered text appear in **bold** font.
italic font	Document titles, new or emphasized terms, and arguments for which you supply values are in *italic* font.
[ ]	Elements in square brackets are optional.
{x	y	z }	Required alternative keywords are grouped in braces and separated by vertical bars.
[x	y	z]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
courier font	Terminal sessions and information the system displays appear in courier font.
< >	Nonprinting characters such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Note: Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.

Caution: Means *reader be careful.* In this situation, you might perform an action that could result in equipment damage or loss of data.

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Warning: IMPORTANT SAFETY INSTRUCTIONS

Means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device.

SAVE THESE INSTRUCTIONS

Regulatory: Provided for additional information and to comply with regulatory and customer requirements.

The safety warnings for this product are translated into several languages in the *Regulatory Compliance and Safety Information for the Cisco IE 2000U Switch* that ships with the product. The EMC regulatory statements are also included in that guide.

Communications, Services, and Additional Information

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Product Overview

This section describes the Cisco IE 2000U Industrial Ethernet *Switch (IE 2000U)*, hereafter referred to as *the switch*. The *switch* provides a Gigabit Ethernet aggregation and small form factor switch for the substation automation family of Connected Grid switches. It is suitable for Connected Energy applications such as grid automation, distributed generation, integrated renewable energy, trackside substations, and water applications.

You can connect these switches to devices such as servers, routers, and other switches. In connected grid environments, you can connect any Ethernet-enabled industrial communication devices, including field area routers (FARs), connected grid routers (CGRs), programmable logic controllers (PLCs), human-machine interfaces (HMIs), drives, sensors, video devices, traffic signal controllers, and intelligent electronic devices (IEDs).

You can mount the switch on a DIN rail in an industrial enclosure. Its components are designed to withstand extremes in temperature, vibration, and shock that are common in an industrial environment.

The Cisco IE 2000U Industrial Ethernet *switch* has six models, which are grouped according to five different port configurations. The IE 2000U-16TC-G-X model is the only model available with a conformal coating (Humiseal AR/UR UV40).

Note: The switch does not have cooling fans.

- Switch Models, page 9

- Front Panel, page 11

- Rear Panel, page 26

- Management Options, page 27

- Network Configurations, page 28

Switch Models

Table 1 on page 9 describes the switch models.

Table 1   Switch Descriptions

Model	Description	Software Image
IE 2000U-4S-G	4 100 Mb/s SFP module slots and 2 100/1000 Mb/s SFP module slots	LAN Base
IE 2000U-4T-G	4 10/100BASE-T ports and 2 10/100/1000BASE-T ports	LAN Base
IE 2000U-4TS-G	4 10/100BASE-T ports and 2 100/1000 Mb/s SFP module slots	LAN Base

Table 1   Switch Descriptions

Model	Description	Software Image
IE 2000U-8TC-G	8 10/100BASE-T ports, 2 Gigabit Ethernet (GE) dual-purpose ports (2 10/100/1000BASE-T ports and 2 SFP module slots) Supports the IEEE-1588 standard.	LAN Base with 1588
IE 2000U-16TC-G	16 10/100BASE-T ports, 2 GE dual-purpose ports (2 10/100/1000BASE-T ports and 2 SFP module slots) and 2 Fast Ethernet (FE) dual-purpose ports (2 10/100BASE-T ports and 2 SFP module slots) Supports the IEEE-1588 standard.	LAN Base with 1588
IE 2000U-16TC-G-X	16 10/100BASE-T ports, 2 GE dual-purpose ports (2 10/100/1000BASE-T ports and 2 SFP module slots), and 2 FE dual-purpose ports (2 10/100BASE-T ports and 2 SFP module slots) Supports the IEEE-1588 standard.	LAN Base with 1588 and conformal coat
IE 2000U-16TC-GP	16 10/100BASE-T ports, 4 Power over Ethernet (PoE) ports, and 2 GE dual-purpose ports (2 10/100/1000BASE-T ports and 2 SFP module slots) Supports the IEEE-1588 standard. **Note:** The four PoE ports can operate as PoE, or as PoE+ ports with certain constraints.	LAN Base with 1588

Front Panel

This section describes the front panel components:

- 4, 8, or 16 10/100BASE-T Ethernet ports.

- Two 10/100/1000 ports (available on some models). See .

- Two or four dual-purpose ports (available on some models). See .

- Two or four SFP module slots (available on some models). See .

- Four PoE ports (available on some models). See .

Note: You can also configure the four PoE ports as PoE+ ports. The PoE ports require that a separate DC power source be connected to the switch (optional). The switch has a terminal block on its front panel to connect to a power supply module or to a site source.

- RJ-45 console port

- USB mini-Type B (console) port

- LEDs

- Power connectors

- Alarm connector

- Flash memory card slot

All of the switches have similar components. See for examples.

Figure 1   IE 2000U-4S-G Front Panel View
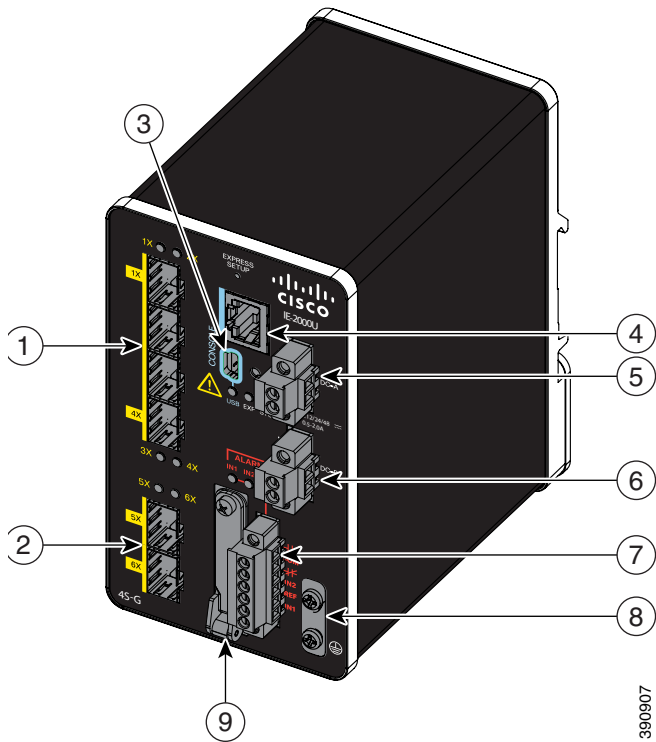
1	100 Mb/s SFP module slots	6	Power connector DC-B
2	100/1000 Mb/s SFP module slots	7	Alarm connector
3	USB mini-Type B (console) port	8	Protective ground connection
4	RJ-45 console port	9	Flash memory card slot
5	Power connector DC-A		

Figure 2   IE 2000U-4TS-G Front Panel View
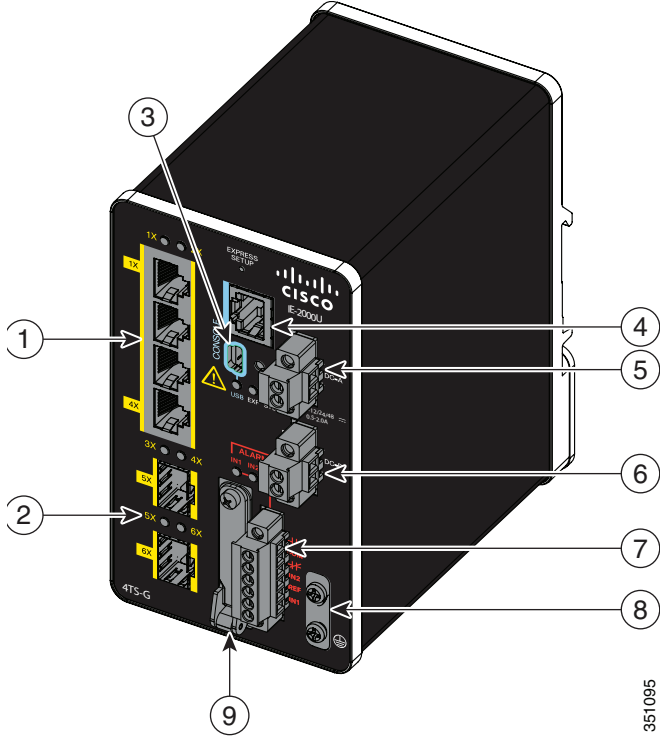
1	10/100 Ethernet ports	6	Power connector DC-B
2	SFP module slots	7	Alarm connector
3	USB mini-Type B (console) port	8	Protective ground connection
4	RJ-45 console port	9	Flash memory card slot
5	Power connector DC-A		

Figure 3   IE 2000U-8TC-G Front Panel View
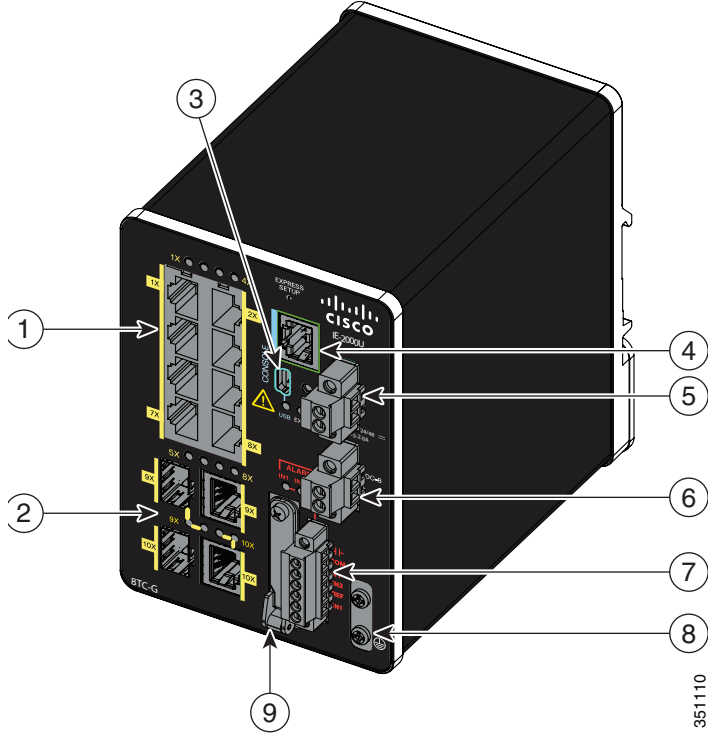
1	10/100 Ethernet ports	6	Power connector DC-B
2	Dual-purpose ports	7	Alarm connector
3	USB mini-Type B (console) port	8	Protective ground connection
4	RJ-45 console port	9	Flash memory card slot
5	Power connector DC-A		

Figure 4   IE 2000U-16TC-G Front Panel View
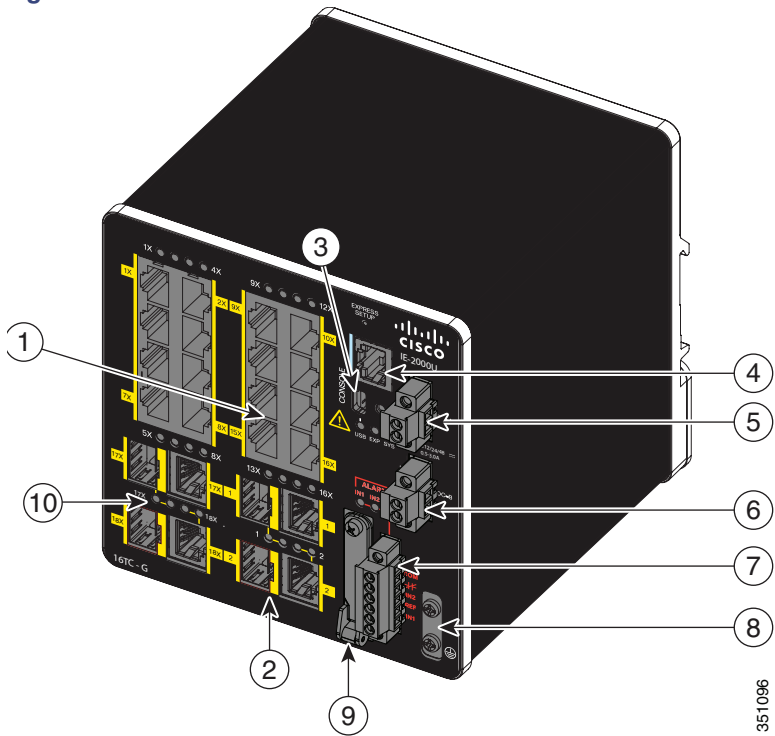
1	10/100 Ethernet ports	6	Power connector DC-B
2	Dual-purpose ports (Gigabit Ethernet)	7	Alarm connector
3	USB mini-Type B (console) port	8	Protective ground connection
4	RJ-45 console port	9	Flash memory card slot
5	Power connector DC-A	10	Dual-purpose ports (Fast Ethernet)

Figure 5   IE 2000U-16TC-GP Front Panel View
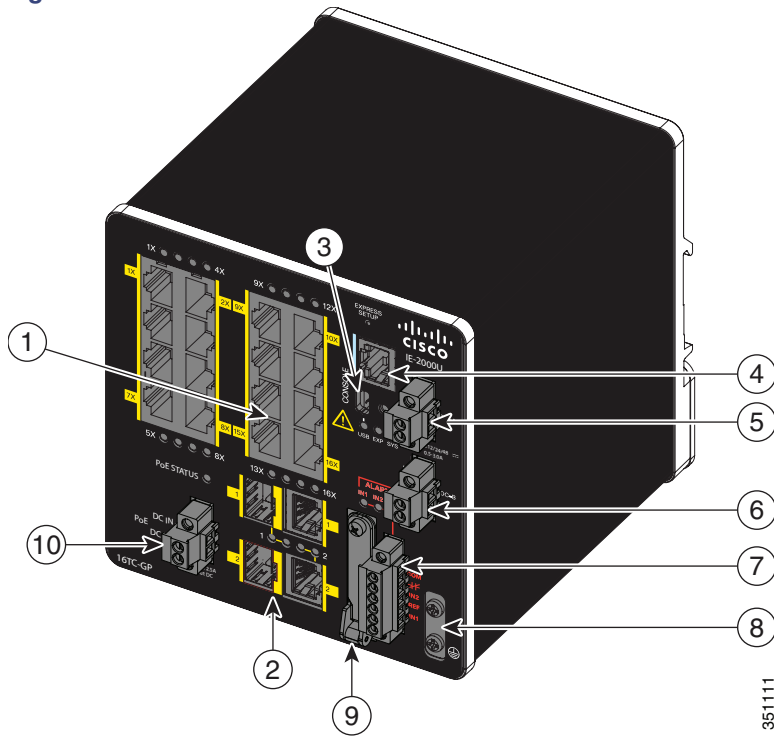
1	10/100 Ethernet ports	6	Power connector DC-B
2	Dual-purpose ports	7	Alarm connector
3	USB mini-Type B (console) port	8	Protective ground connection
4	RJ-45 console port	9	Flash memory card slot
5	Power connector DC-A	10	PoE power connector

Figure 6   IE 2000U Switches Front Panel View
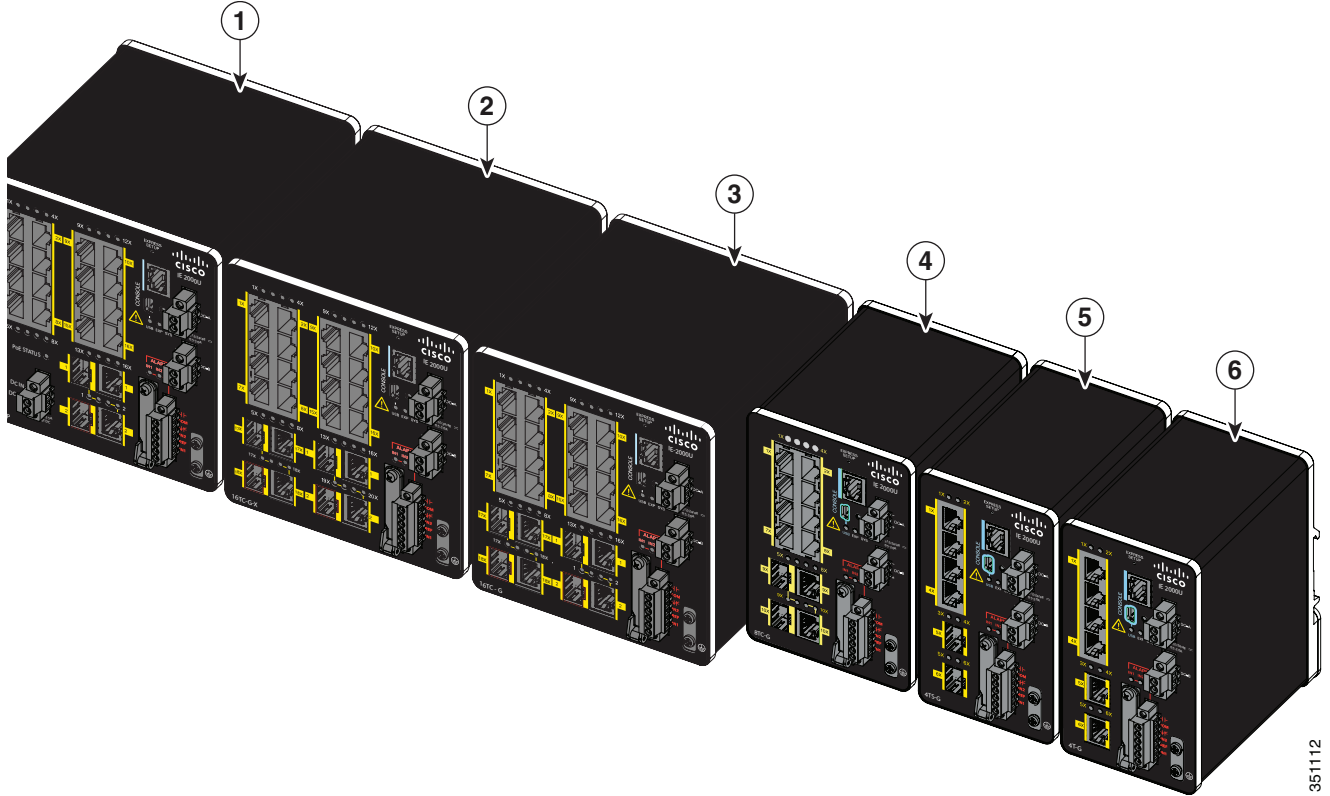
1	IE 2000U-16TC-GP	4	IE 2000U-8TC-G
2	IE 2000U-16TC-G-X[1]	5	IE 2000U-4TS-G
3	IE 2000U-16TC-G	6	IE 2000U-4T-G

1.   The IE-2000U-16TC-G-X model has a conformal coating (Humiseal AR/UR UV40).

10/100BASE-T Ports

You can set the 10/100BASE-T 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 CAT5 cables or better. 10BASE-T traffic can use Category 3 cables or better.

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

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.

Power over Ethernet Ports

On the IE 2000U-16TC-GP model of the IE 2000U switch, four of the 10/100BASE-T ports are available as PoE ports. The four ports can operate either as PoE (IEEE 802.3af) ports or can be configured to operate as PoE+ (IEEE 802.at) ports. In order to operate 10/100 ports as PoE ports, a separate DC power source is required. For more information, see Connecting Power to the Switch PoE DC-Input (Optional), page 53.

Cable lengths of up to 328 feet (100 m) are supported.

10/100/1000BASE-T Ports

The IEEE 802.3u 10/100/1000BASE-T ports provide full-duplex 10, 100 or 1000 Mb/s connectivity over CAT5 unshielded twisted pair (UTP) copper cabling. The default setting is autonegotiate.

Cable lengths of up to 328 feet (100 m) are supported.

100 Mb/s SFP Module Slots

The IEEE 802.3u 100 Mb/s SFP module slots provide full-duplex 100 Mb/s connectivity over multi-mode (MM) fiber cables or single-mode (SM) fiber cables. These ports use a SFP fiber-optic transceiver module that accepts a dual local connector (LC). Check the SFP specifications for the cable type and length.

100/1000 Mb/s SFP Module Slots

The IEEE 802.3u 100/1000 Mb/s SFP module slots provide full-duplex 100 or 1000 Mb/s connectivity over multi-mode (MM) fiber cables or single-mode (SM) fiber cables. These ports use a SFP fiber-optic transceiver module that accepts a dual LC connector. Check the SFP specifications for the cable type and length.

Dual-Purpose Fast Ethernet Ports

You can configure the dual-purpose Fast Ethernet ports on the switch as either 10/100BASE-T ports or as 100 Mb/s SFP-module ports. You can set the 10/100BASE-T ports to autonegotiate, or you can configure them as fixed 10 or 100 Mb/s (Fast) Ethernet ports.

By default, the switch selects the medium for each dual-purpose port (10/100BASE-T or SFP). When a link is achieved on one media type, the switch disables the other media type until the active link goes down. If links are active on both media, the SFP-module port has priority, but you can use the **media-type** interface configuration command to manually designate the port as an RJ-45 port or an SFP port.

You can configure the speed and duplex settings consistent with the selected media type. For information on configuring interfaces, see the *Cisco Connected Grid Switches Interfaces Software Configuration Guide*.

Dual-Purpose Gigabit Ethernet Ports

You can configure the dual-purpose Gigabit Ethernet ports on the switch as either 10/1001000BASE-T ports or as 100/1000 Mb/s SFP-module ports. You can set the 10/100/1000BASE-T ports to autonegotiate, or you can configure them as fixed 10, 100, or 1000 Mb/s (Gigabit) Ethernet ports.

By default, the switch selects the medium for each dual-purpose port (10/100/1000BASE-T or SFP). When a link is achieved on one media type, the switch disables the other media type until the active link goes down. If links are active on both media, the SFP-module port has priority, but you can use the **media-type** interface configuration command to manually designate the port as an RJ-45 port or an SFP port.

You can configure the speed and duplex settings consistent with the selected media type. For information on configuring interfaces, see the *Cisco Connected Grid Switches Interfaces Software Configuration Guide*.

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 2 on page 19.

Table 2   Supported SFP Models

Type of SFP Module	Model
Rugged and Industrial SFPs –40 to 185° F (–40 to 85° C)	■ GLC-SX-MM-RGD ■ GLC-LX-SM-RGD ■ GLC-ZX-SM-RGD ■ GLC-FE-100FX-RGD ■ GLC-FE-100LX-RGD ■ GLC-FE-T-I
Commercial SFPs 32 to 131° F (0 to 55° C)	■ GLC-BX-U with digital optical monitoring with DOM support ■ GLC-BX-D with DOM support ■ GLC-FE-100FX ■ GLC-FE-100LX ■ GLC-FE-100EX ■ GLC-FE-100ZX ■ GLC-FE-100BX-U ■ GLC-FE-100BX-D ■ GLC-T ■ CWDM-SFP with DOM support
Extended temperature SFPs 23 to 185° F (–5 to 85° C)	■ SFP-GE-S with DOM support ■ SFP-GE-L with DOM support ■ SFP-GE-Z with DOM support ■ SFP-GE-T ■ GLC-EX-SMD with DOM support ■ GLC-TE

For minimum software requirements, refer to the Release Notes for your platform.

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#wp1
38176

For information about SFP modules, see your SFP module documentation and the Installing SFP Modules into SFP Module
Slots, page 65. For cable specifications, see SFP Module Cables, page 86.

Power Connectors

You connect the DC power to the switch through the front panel connectors. The switch has a dual-feed DC power
supply; two connectors provide primary and secondary DC power (DC-A and DC-B). The DC power connectors are near
the top right of the front panel. See Figure 1 on page 12. Each power connector has an LED status indicator.

The switch power connectors are attached to the switch chassis. Each power connector has screw terminals for
terminating the DC power (see Figure 7 on page 20). All connectors are attached to the switch front panel with the
provided captive screws.

The power connector labeling is on the panel. The positive DC power connection is labeled "+", and the return
connection is labeled "−".

Figure 7   Power Connector
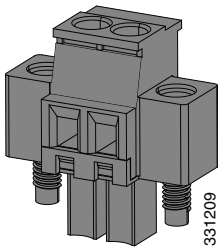
The switch can operate with a single power source or with dual power sources. When both power sources are
operational, the switch draws power from the DC source with the higher voltage. If one of the two power sources fails,
the other continues to power the switch.

In systems configured with the redundant power option, connect each of the two power supplies to separate
independent power sources. If you fail to do this, your system might be susceptible to total power failure due to a fault
in the external wiring or a tripped circuit breaker.

The switch can be powered from a site source or a 50 Watt AC-input power supply module (part number
PWR-IE50W-AC=). For more information on wiring the DC power source, see Wiring the DC Power Source, page 45. For
information on power consumption, see Table 16 on page 79 in the Technical Specifications, page 79 chapter.

PoE Power Connector

The IE 2000U switch model with PoE capability (IE 2000U-16TC-GP) is equipped with an additional DC input terminal
block. This DC terminal block allows the connection of a power supply, either the PWR-IE65W-PC-AC= or PWR-IE170W-
PC-AC= AC Input power supply or the PWR-IE65W-PC-DC= or PWR-IE170W- PC-DC= DC Input power supply, or an
input from site source DC that is used to provide dedicated external power to operate the PoE or PoE+ ports. The PoE
terminal block accepts 48 VDC or 54 VDC at 2.5 A.

Alarm Connector

You connect the alarm signals to the switch through the alarm connector. The switch supports two alarm inputs and one
alarm output relay. The alarm connector is on the bottom right of the front panel. See Figure 1 on page 12.

The alarm connector provides six alarm wire connections. The connector is attached to the switch front panel with the provided captive screws.

Figure 8   Alarm Connector
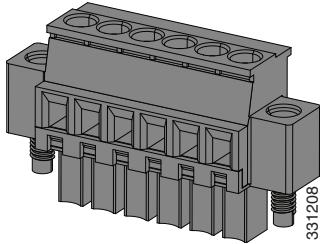
Both alarm input circuits can sense if the alarm input is open or closed. The alarm inputs can be activated for environmental, power supply, and port status alarm conditions. From the CLI, you can configure each alarm input as an open or closed contact.

The alarm output circuit is a relay with a normally open and a normally closed contact. The switch is configured to detect faults that are used to energize the relay coil and change the state on both of the relay contacts: normally open contacts close, and normally closed contacts open. The alarm output relay can be used to control an external alarm device, such as a bell or a light.

See the *Cisco Connected Grid Switches System Management Software Configuration Guide* for instructions on configuring the alarm relays.

For more information about the alarm connector, see Cable and Connectors, page 83

Management Ports

You can connect the switch to a PC running Microsoft Windows or to a terminal server through either the RJ-45 console port or the USB mini-Type B console port, also referred to as the USB-mini console port. These ports use the following connectors:

- RJ-45 console port uses an RJ-45-to-DB-9 female cable.

- USB-mini console port (5-pin connector) uses a USB Type A-to-5-pin mini-Type B cable.

The USB-mini console interface speeds are the same as the RJ-45 console interface speeds.

To use the USB-mini console port, you must install the Cisco Windows USB device driver on the device that is connected to the USB-mini console port and that is running Microsoft Windows.

Note: For information about downloading the Cisco USB device driver, see the Installing the Cisco Microsoft Windows USB Device Driver, page 97.

With the Cisco Windows USB device driver, connecting and disconnecting the USB cable from the console port does not affect Windows HyperTerminal operations. Mac OS X or Linux requires no special drivers.

Note: The 5-pin mini-Type B connectors resemble the 4-pin mini-Type B connectors, but they are not compatible. Use only the 5-pin mini-Type B. See Figure 9 on page 22.

Figure 9   USB Mini-Type B Port
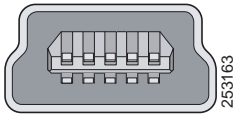
The configurable inactivity timeout reactivates the RJ-45 console port if the USB-mini console port is activated, but no input activity occurs for a specified time period. When the USB-mini console port deactivates due to a timeout, you can restore its operation by disconnecting and reconnecting the USB cable. For information on using the CLI to configure the USB-mini console interface, see the *Cisco Connected Grid Switches Interfaces Software Configuration Guide*.

LEDs

You can use the LEDs to monitor the switch status, activity, and performance. Figure 10 on page 22 and Figure 11 on page 25 show the front panel LEDs.

Figure 10   LEDs on the IE 2000U Switch
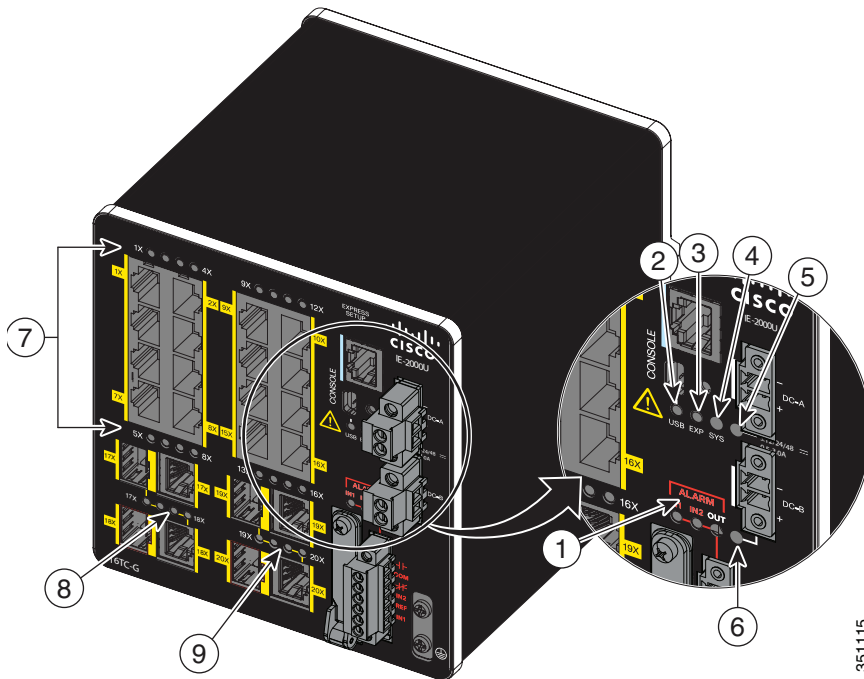
1	Alarm LEDs	6	Power connector DC-B LED
2	USB mini-Type B (console) port LED	7	10/100BASE-T port LEDs
3	Express Setup LED (not currently supported by software)	8	Dual-purpose (Gigabit Ethernet) port LEDs
4	System LED	9	Dual-purpose (Fast Ethernet) port LEDs
5	Power connector DC-A LED		

System LED

The System LED shows whether the system is receiving power and is functioning properly.

Table 3 on page 23 lists the system LED colors and their meanings.

Table 3   System LED

Color	System Status
Off	System is not powered on.
Blinking green	Boot fast is in progress.
Green	System is operating normally.
Red	Switch is not functioning properly.

USB-Mini Console LED

The USB-mini console LED shows which console port is in use. See Figure 10 on page 22 for the LED location.

If you connect a cable to a console port, the switch automatically uses that port for console communication. If you connect two console cables, the USB-mini console port has priority. Table 4 on page 23 describes the system LED colors and their meanings.

Table 4   USB-Mini Console Port LED

Color	Description
Green	USB-mini console port is active. RJ-45 console port LED is not active.
Off	Port is not active. RJ-45 console port is active.

Alarm LEDs

Table 5 on page 23 and Table 6 on page 23 list the alarm LED colors and their meanings.

Table 5   Alarm OUT Status LED

Color	System Status
Off	Alarm OUT is not configured, or the switch is off.
Green	Alarm OUT is configured, no alarm detected.
Blinking red	Switch has detected a major alarm.
Red	Switch has detected a minor alarm.

Table 6   Alarm IN1 and IN2 Status LEDs

Color	System Status
Off	Alarm IN1 or IN2 not configured.
Green	Alarm IN1 or IN2 configured, no alarm detected.
Blinking red	Major alarm detected.
Red	Minor alarm detected.

Power Status LEDs

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 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 7 on page 24 lists the power status LED colors and meanings.

Table 7   Power Status LEDs

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

Note: The Power A and Power 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.

For information about the power LED colors during the boot fast sequence, see the Verifying Switch Operation, page 35.

Port Status LEDs

Each 10/100BASE-T port, 10/100/1000BASE-T port, dual-purpose port, and SFP module slot has a port status LED, also called a port LED, as shown in Figure 10 on page 22 and Figure 11 on page 25. Table 8 on page 24 displays LED information about the switch and the individual ports.

Table 8   Port Status LEDs

Color	System Status
Off	No link.
Solid green	Link present.
Blinking green	Activity. Port is sending or receiving data.
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. |

Dual-Purpose Port LEDs

Figure 11 on page 25 shows the LEDs on a dual-purpose port. You can configure each port as either a 10/100/1000BASE-T port through the RJ-45 connector or as an SFP module, but not both at the same time.

There is one LED for each port and each media type (Ethernet or SFP module). Each port LED acts independently for the particular port and media. The LED colors have the same meanings as described in Table 8 on page 24.

Figure 11   Dual-Purpose Port LEDs
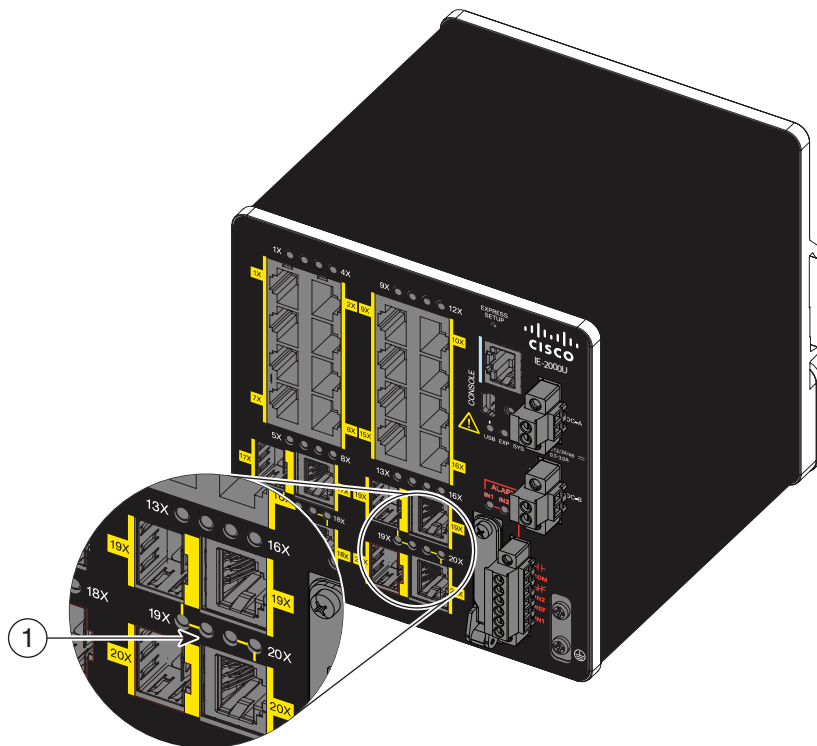
| 1 | Dual-purpose port LEDs |

PoE Status LED

The PoE STATUS LED is located on the front panel of the IE 2000U switch models that are equipped with PoE ports (IE 2000U-TC-GP).The LED displays the functionality and status of the PoE ports. The LED colors and meanings are listed in Table 9 on page 25

Table 9   PoE Status LED

Color	PoE Status
Off	PoE is not enabled.
Green	PoE function is enabled and all of the PoE-enabled ports are functioning correctly.
Flashing Amber	PoE function is enabled, but one of the PoE port's power is disconnected or has failed.
Amber	PoE function is enabled, but all of the PoE ports have failed.

Flash Memory Card

The switch supports a flash memory card that makes it possible to replace a failed switch without reconfiguring the new switch. The slot for the flash memory card is on the front of the switch. See Figure 12 on page 26.

The flash card is hot swappable and can be accessed on the front panel. A cover protects the flash card and holds the card firmly in place. The cover is hinged and closed with a captive screw. This prevents the card from coming loose and protects against shock and vibration.

Note: For more information on inserting and removing the flash memory card, see the Installing or Removing the Flash Memory Card, page 33.

Figure 12   Flash Memory Card Slot
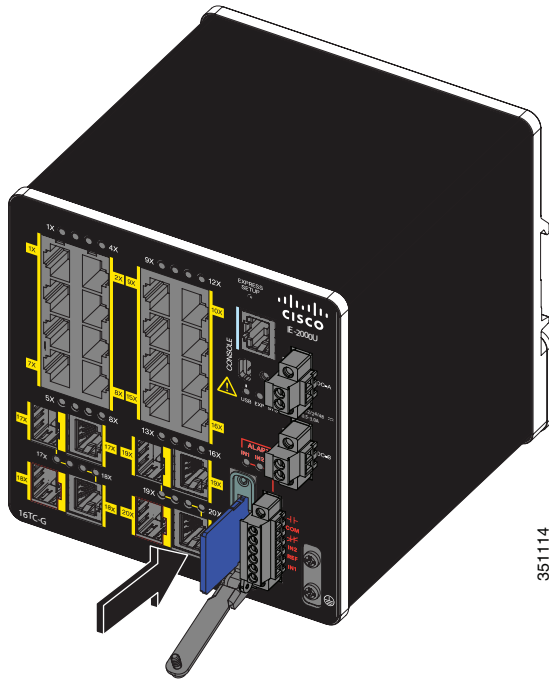
Note: You can obtain replacement flash memory cards (SD-IE-1GB=) by calling Cisco Technical Assistance Center (TAC).

Rear Panel

The rear panel of the switch has a latch for installation on a DIN rail. See Figure 13 on page 27. The latch is spring-loaded to move down to position the switch over a DIN rail and return to the original position to secure the switch to a DIN rail.

Figure 13   IE 2000U Switch Rear Panel
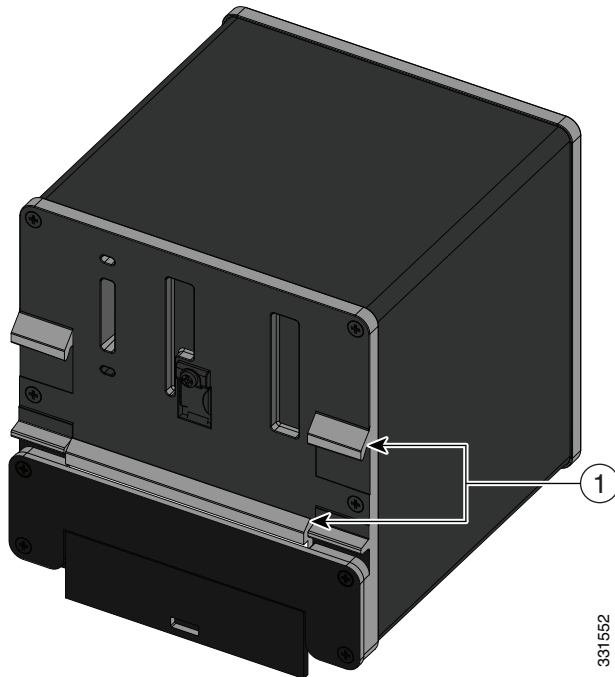
331552

| 1 | Latch |

Management Options

The switch supports these management options:

- Cisco Configuration Professional

   Cisco Configuration Professional is a PC-based application that provides device management for switches and routers. It simplifies configuration of features through easy-to-use wizards.

- 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 *Cisco IOS Basics and File Management for Connected Grid Switches* on Cisco.com for more information.

- SNMP network management

   You can manage switches from an 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 *Cisco Connected Grid Switches System Management Software Configuration Guide* on Cisco.com and the documentation that came with your SNMP application for more information.

Network Configurations

See the guides 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. For more information, go to: www.cisco.com/go/ie2000u-docs

Switch Installation

This section describes how to install your switch, verify boot fast, and connect the switch to other devices. It also includes information specifically for installations in hazardous environments.

Read these topics, and perform the procedures in this order:

Preparing for Installation

This section provides information about these topics:

Warnings

These warnings are translated into several languages in the *Regulatory Compliance and Safety Information* for this switch.

Warning: Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals. Statement 43

Warning: Do not work on the system or connect or disconnect cables during periods of lightning activity. Statement 1001

Warning: Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003

Warning: Read the installation instructions before you connect the system to its power source. Statement 1004

Warning: This unit is intended for installation in restricted access areas. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security. Statement 1017

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Warning: This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Warning: This unit might have more than one power supply connection. All connections must be removed to de-energize the unit. Statement 1028

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Warning: Ultimate disposal of this product should be handled according to all national laws and regulations. Statement 1040

Warning: For connections outside the building where the equipment is installed, the following ports must be connected through an approved network termination unit with integral circuit protection. 10/100/1000 Ethernet Statement 1044

Warning: To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of: 140° F (60° C) Statement 1047

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

**Caution: Airflow around the switch must be unrestricted. To prevent the switch from overheating, there must be the following minimum clearances:
- Top and bottom: 2.0 inches (50.8 mm)
- Sides: 2.0 inches (50.8 mm)
- Front: 2.0 inches (50.8 mm)**

Additional Information for Installation in a Hazardous Environment

- Hazardous Area Installation Warnings, page 30

- North American Hazardous Location Approval, page 31

- EMC Environmental Conditions for Products Installed in the European Union, page 32

Hazardous Area Installation Warnings

Warning: Exposure to some chemicals could degrade the sealing properties of materials used in the sealed relay device. Statement 381

Warning: Failure to securely tighten the captive screws can result in an electrical arc if the connector is accidentally removed. Statement 397

Warning: When you connect or disconnect the power and/or alarm connector with power applied, an electrical arc can occur. This could cause an explosion in hazardous area installations. Be sure that all power is removed from the switch and any other circuits. Be sure that power cannot be accidentally turned on or verify that the area is nonhazardous before proceeding. Statement 1058

Warning: In switch installations in a hazardous location, the DC power source could be located away from the vicinity of the switch. Before performing any of the following procedures, locate the DC circuit to ensure that the power is removed and cannot be turned on accidentally, or verify that the area is nonhazardous before proceeding. Statement 1059

Warning: This equipment is supplied as "open type" equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible

only by the use of a tool.

The enclosure must meet IP 54 or NEMA type 4 minimum enclosure rating standards. Statement 1063

Warning: Use twisted-pair supply wires suitable for 86° F (30° C) above surrounding ambient temperature outside the enclosure. Statement 1067

Warning: This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), and at altitudes up to 2000 meters without derating. Statement 1068

Warning: Do not connect or disconnect cables to the ports while power is applied to the switch or any device on the network because an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed from the switch and cannot be accidentally be turned on, or verify that the area is nonhazardous before proceeding. Statement 1070

Warning: If you connect or disconnect the console cable with power applied to the switch or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Statement 1080

Warning: Explosion Hazard—Do not connect or disconnect wiring while the field-side power is on; an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or that the area is nonhazardous before proceeding. Statement 1081

Warning: Explosion Hazard—The area must be known to be nonhazardous before installing, servicing, or replacing the unit. Statement 1082

Warning: Explosion Hazard—Substitution of components may impair suitability for Class I, Division 2/Zone 2. Statement 1083

Warning: Do not insert and remove SFP modules while power is on; an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Statement 1087

Caution: This equipment is only suitable for use in Class I, Division 2, Groups A, B, C, D, or nonhazardous locations.

North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations:

English:	**Products marked "Class I, Div 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.**
Français:	**Informations sur l'utilisation de cet équipement en environnements dangereux:**
	Les produits marqués "Class I, Div 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.

EMC Environmental Conditions for Products Installed in the European Union

This section applies to products to be installed in the European Union.

The equipment is intended to operate under the following environmental conditions with respect to EMC:

- A separate defined location under the user's control.

- Earthing and bonding shall meet the requirements of ETS 300 253 or ITU-T K.27.

- AC-power distribution shall be one of the following types, where applicable: TN-S and TN-C as defined in IEC 60364-3.

In addition, if equipment is operated in a domestic environment, interference could occur.

Installation Guidelines

When determining where to place the switch, observe these guidelines.

Environment and Enclosure Guidelines

Review these environmental and enclosure guidelines before installation:

- This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 6562 feet (2 km) without derating.

- This equipment is considered Group 1, Class A industrial equipment, according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

- This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame-spread rating of 5VA, V2, V1, V0 (or equivalent) if nonmetallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication might contain additional information regarding specific enclosure-type ratings that are required to comply with certain product safety certifications.

General Guidelines

Before installation, observe these general guidelines:

Caution: Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded by using ground straps to eliminate the risk of ESD damage to the switch.

Do not touch connectors or pins on component boards. Do not touch circuit components inside the switch. When not in use, store the equipment in appropriate static-safe packaging.

- If you are responsible for the application of safety-related programmable electronic systems (PES), you need to be aware of the safety requirements in the application of the system and be trained in using the system.

- This product is grounded through the DIN rail to chassis ground. Use zinc-plated yellow-chromate steel DIN rail to assure proper grounding. The use of other DIN rail materials (such as aluminum, plastic, and so on) that can corrode, oxidize, or are poor conductors can result in improper or intermittent grounding. Secure the DIN rail to the mounting surface approximately every 7.8 inches (200 mm), and use end-anchors appropriately.

When determining where to place the switch, observe these guidelines:

- Before installing the switch, first verify that the switch is operational by powering it on and observing boot fast. Follow the procedures in the .

- For 10/100 ports and 10/100/1000 ports, the cable length from a switch to an attached device cannot exceed 328 feet (100 meters).

- For 100BASE-FX fiber-optic ports, the cable length from a switch to an attached device cannot exceed 6562 feet (2 km).

- Operating environment is within the ranges listed in Technical Specifications, page 79

- Clearance to front and rear panels meets these conditions:

  - Front-panel LEDs can be easily read.

  - Access to ports is sufficient for unrestricted cabling.

  - Front-panel direct current (DC) power connectors and the alarm connector are within reach of the connection to the DC power source.

- Airflow around the switch must be unrestricted. To prevent the switch from overheating, there must be the following minimum clearances:

  - Top and bottom: 2.0 inches (50.8 mm)

  - Exposed side (not connected to the module): 2.0 inches (50.8 mm)

  - Front: 2.0 inches (50.8 mm)

  Contact your Cisco TAC if tighter spacings are required.

- Temperature surrounding the unit does not exceed 140°F (60°C).

  When the switch is installed in an industrial enclosure, the temperature within the enclosure is greater than normal room temperature outside the enclosure.

  The temperature inside the enclosure cannot exceed 140°F (60°C), which is the maximum ambient enclosure temperature of the switch.

- Cabling is away from sources of electrical noise, such as radios, power lines, and fluorescent lighting fixtures.

- Connect the unit only to a Class 2 DC power source.

Installing or Removing the Flash Memory Card

The switches store Cisco IOS software images and switch configurations on a removable flash memory card, which is an SD memory type card. You can replace the switch without reconfiguring it. The SD memory card is orderable. You can order it (SD-IE-1GB=) when you order the switch or by calling Cisco TAC.

Warning: Do not insert or remove the flash card while power is on; an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Statement 379

Verify that the card is in place behind the hinged cover on the front of the switch.

To install or replace the flash memory card:

1. On the front of the switch, locate the door that protects the flash memory card slot. Loosen the captive screw at the top of the door using a Phillips screwdriver to open the door. See Figure 14 on page 34.

Figure 14   Installing the Flash Memory Card in the Switch
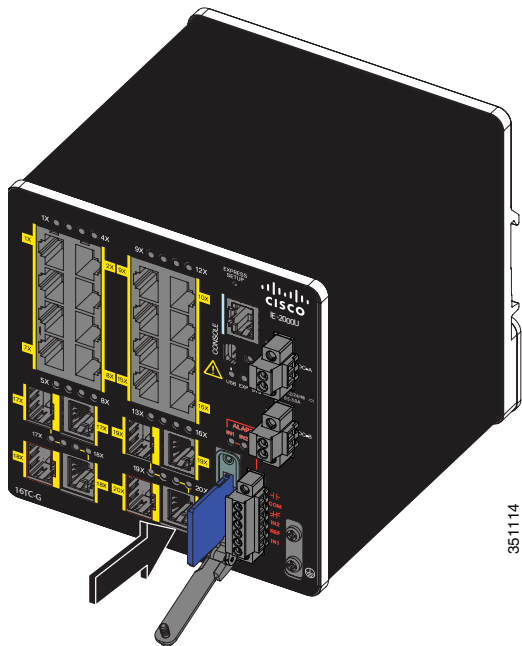
Figure 15   Removing the Flash Memory Card from the Switch
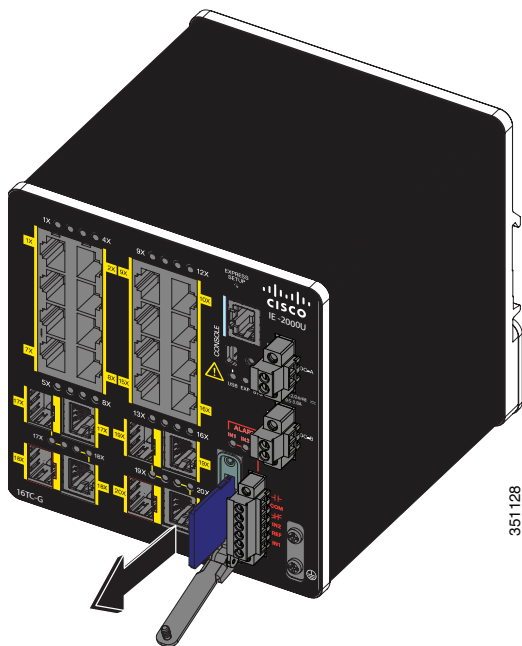
2. Install or remove the card:

   – To install a card, slide it into the slot, and press it in until it clicks in place. The card is keyed so that you cannot insert it the wrong way.

   – To remove the card, push it in until it releases for it to pop out. Place it in an antistatic bag to protect it from static discharge.

3. After the card is installed, close the guard door and fasten the captive screw using a Phillips screwdriver to keep the door in place.

Verifying Switch Operation

Before installing the switch in its final location, power on the switch, and verify that the switch powers up in boot fast mode. The boot fast sequence allows the switch to boot up in less than 60 seconds.

Installing the Switch

This section describes how to install the switch:

- Installing the Switch on a DIN Rail, page 35

- Removing the Switch from a DIN Rail, page 36

Warning: This equipment is supplied as "open type" equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. The enclosure must meet IP 54 or NEMA type 4 minimum enclosure rating standards. Statement 1063

Caution: To prevent the switch from overheating, ensure these minimum clearances:

- **Top and bottom: 2.0 inches (50.8 mm)**

- **Exposed side (not connected to the module): 2.0 inches (50.8 mm)**

- **Front: 2.0 inches (50.8 mm)**

Contact your Cisco TAC if tighter spacings are required.

Installing the Switch on a DIN Rail

The switch ships with a spring-loaded latch on the rear panel for a mounting on a DIN rail.

To attach the switch to a DIN rail:

1. Position the rear panel of the switch directly in front of the DIN rail, making sure that the DIN rail fits in the space between the two hooks near the top of the switch and the spring-loaded latch near the bottom.

2. Hold the bottom of the switch away from the DIN rail, and place the two hooks on the back of the switch over the top of the DIN rail. See Figure 16 on page 36.

Caution: Do not stack any equipment on the switch.

Figure 16   Position the Hooks Over the DIN Rail
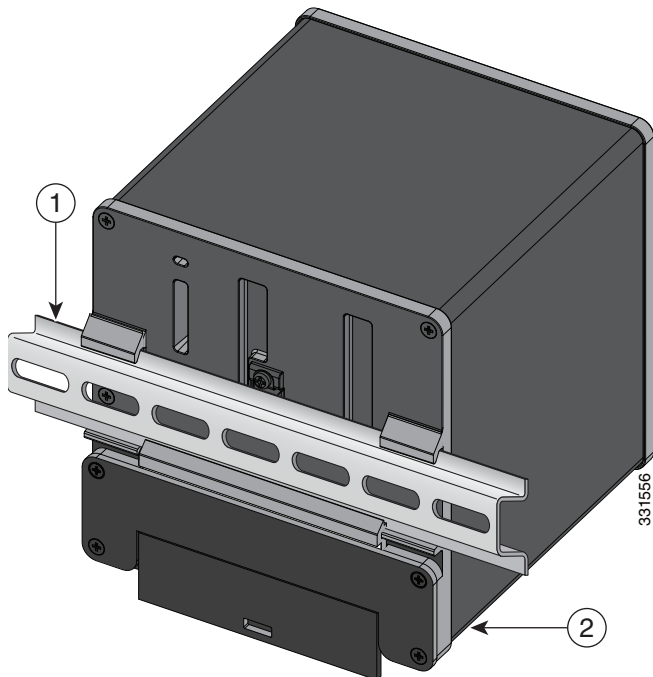
1	DIN Rail	2	Switch

3. Push the switch toward the DIN rail to cause the spring-loaded latch at the bottom rear of the switch to move down, and snap into place.

After the switch is mounted on the DIN rail, connect the power and alarm wires, as described in the Connecting Alarm Circuits, page 58.

For configuration instructions about the CLI setup program, see Configuring the Switch with the CLI-Based Setup Program, page 93

Note: For instructions on how to remove the switch from a DIN rail, see the Removing the Switch from a DIN Rail, page 36.

Removing the Switch from a DIN Rail

To remove the switch from a DIN rail:

1. Ensure that power is removed from the switch, and disconnect all cables and connectors from the front panel of the switch.

2. Insert a tool such as a flathead screwdriver in the slot at the bottom of the spring-loaded latch and use it to release the latch from the DIN rail. See Figure 17 on page 37.

3. Pull the bottom of the switch away from the DIN rail, and lift the hooks off the top of the DIN rail. See Figure 17 on page 37.

Figure 17   Releasing the Spring-Loaded Latch from the DIN Rail
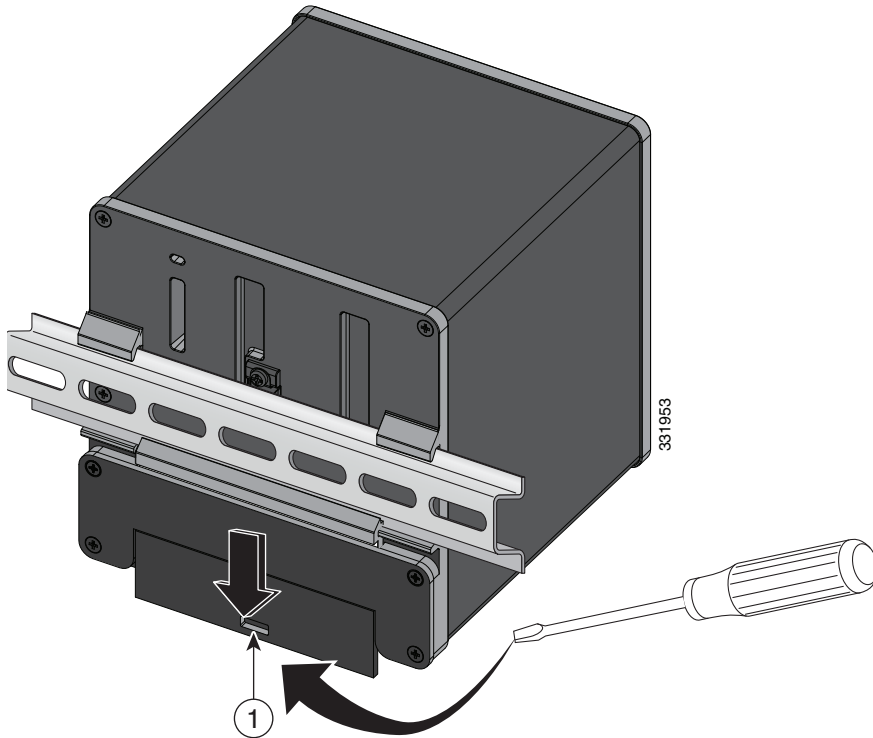
| 1 | Push latch down |

4. Remove the switch from the DIN rail.

Connecting the Protective Ground and DC Power

These sections describe the steps required to connect a protective ground and DC power to the switch:

- Grounding the Switch, page 38

- Selecting a DC Power Source, page 41

- Installing the DC Power Supply Module (Optional), page 42

- Wiring the DC Power Source, page 45

- Attaching the Power Connectors to the Switch, page 50

Obtain these necessary tools and equipment:

- Ratcheting torque flathead screwdriver that exerts up to 15 in-lb (1.69 N-m) of pressure.

- For the protective ground connector, obtain a single or pair of stud size 6 ring terminals (such as Hollingsworth part number R3456B or equivalent).

- Crimping tool (such as Thomas & Bett part number WT2000, ERG-2001, or equivalent).

- 10- to 12-AWG size copper ground wire (such as Belden part number 9912 or equivalent).

37

- For DC power connections, use 16- to 18-AWG, UL- and CSA-rated, twisted-pair copper appliance wire.

- Wire-stripping tools for stripping 10- to 18-AWG size wire.

- A number-2 Phillips screwdriver.

- A flat-blade screwdriver.

Grounding the Switch

Follow any grounding requirements at your site.

Warning: This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024

Warning: This equipment is intended to be grounded to comply with emission and immunity requirements. Ensure that the switch functional ground lug is connected to earth ground during normal use. Statement 1064

Caution: To make sure that the equipment is reliably connected to earth ground, follow the grounding procedure instructions, and use a UL-listed ring terminal lug suitable for number 10-to-12 AWG wire, such as Hollingsworth part number R3456B or equivalent).

Caution: Use at least a 4 mm2 conductor to connect to the external grounding screw.

The ground lug is not supplied with the switch. You can use one of the these options:

- Single ring terminal

- Two single ring terminals

To ground the switch to earth ground by using the ground screw:

1. Use a standard Phillips screwdriver or a ratcheting torque screwdriver with a Phillips head to remove the ground screw from the front panel of the switch. Store the ground screw for later use.

2. Use the manufacturer's guidelines to determine the wire length to be stripped.

3. Insert the ground wire into the ring terminal lug, and using a crimping tool, crimp the terminal to the wire. See Figure 18 on page 39. If two ring terminals are being used, repeat this action for a second ring terminal.

Figure 18   Crimping the Ring Terminal
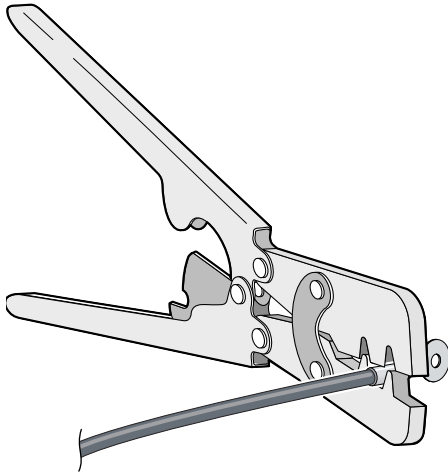
4. Slide the ground screw through the terminal.

5. Insert the ground screw into the functional ground screw opening on the front panel.

6. Use a ratcheting torque screwdriver to tighten the ground screws and ring terminal to the switch front panel to 3.5 in-lb (0.4 N-m). See Figure 19 on page 40 or Figure 20 on page 41.

   Note: Do not exceed 3.5 in-lb (0.4 N-m) torque.

Connecting the Protective Ground and DC Power

Figure 19   Torquing Ground-Lug Screws (Single Ring Terminal)
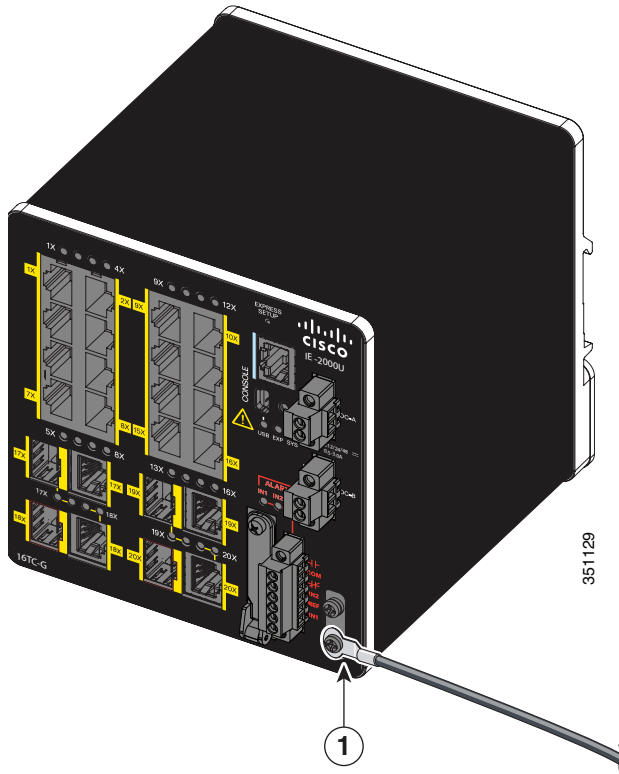
| 1 | Ground cable |

Figure 20   Torquing Ground-Lug Screws (Two Single Ring Terminals)
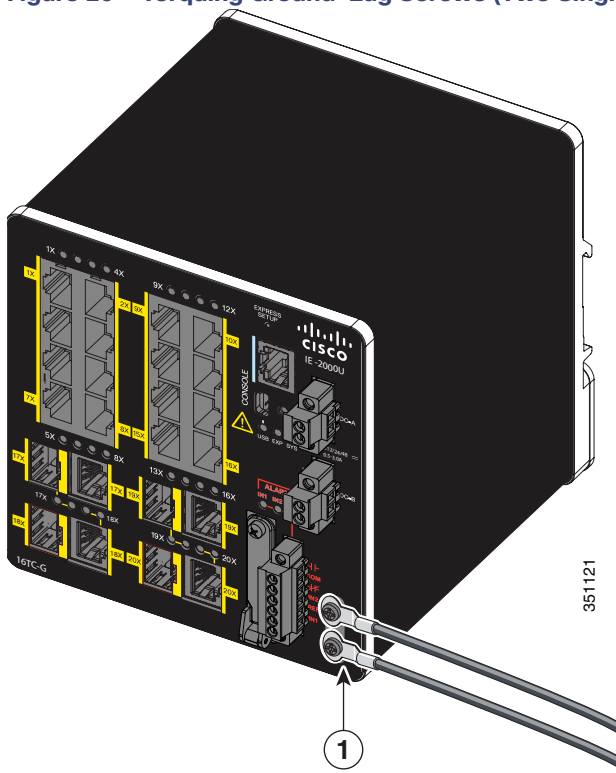
1	Ground cable

7. Attach the other end of the ground wire to a grounded bare metal surface, such as a ground bus, a grounded DIN rail, or a grounded bare rack.

Selecting a DC Power Source

There are two options for supplying DC power to the switch:

- Site Source DC, page 41

- DC Power Supply Module, page 41

Site Source DC

Site source DC can be used to power the switch. You must have a qualified electrician select, prepare, and install the appropriate power cord to the DC source. For more information on the power requirements of the IE 2000U switch, see Table 16 on page 79 of the Technical Specifications, page 79 chapter.

To wire a site source DC, proceed to the Wiring the DC Power Source, page 45.

DC Power Supply Module

A 50-W DC- or AC-input power supply module (PWR-IE50W-AC=) can be used to power the IE 2000U switch. The input terminal block connector of the power supply can accept either a DC or AC source.

Connecting the Protective Ground and DC Power

Table 10 on page 42 describes the supported DC power supply module.

Table 10   Supported DC Power Supply Module

Power Supply Module	Input	Output	Dimensions (H x W x D)	Insulation Class
PWR-IE50W-AC=	88-300 VDC or 110/220 VAC	24 VDC / 2.1 A	5.8 x 2 x 4.4 in. (14.73 x 5.08 x 11.18 cm)	Class I

Note: You can order the IE 2000U DC power supply module from your Cisco sales representative:
- PWR-IE50W-AC=

Installing the DC Power Supply Module (Optional)

This section describes how to install the DC power supply module:

- Installing the DC Power Supply Module on a DIN Rail, page 42

- Connecting the AC Power Cord to the DC Power Supply Module, page 43

Warning: This equipment is supplied as "open type" equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. The enclosure must meet IP 54 or NEMA type 4 minimum enclosure rating standards. Statement 1063

Caution: To prevent the switch assembly from overheating, there must be a minimum of 3 inches (76.19 mm) between any other device and the top, bottom, or sides of the switch assembly.

Installing the DC Power Supply Module on a DIN Rail

To mount the DC-input power supply on a DIN rail:

1. Remove the power supply from the shipping packaging.

2. Position the rear panel of the power supply directly in front of the DIN rail, making sure that the DIN rail fits in the space between the two hooks near the top of the power supply and the spring-loaded latch near the bottom of the power supply chassis.

3. Hold the bottom of the power supply chassis away from the DIN rail, and place the two hooks on the back of the power supply over the top of the DIN rail (see Figure 21 on page 43).

Connecting the Protective Ground and DC Power

Figure 21   Installing the Power Supply Module on a DIN rail
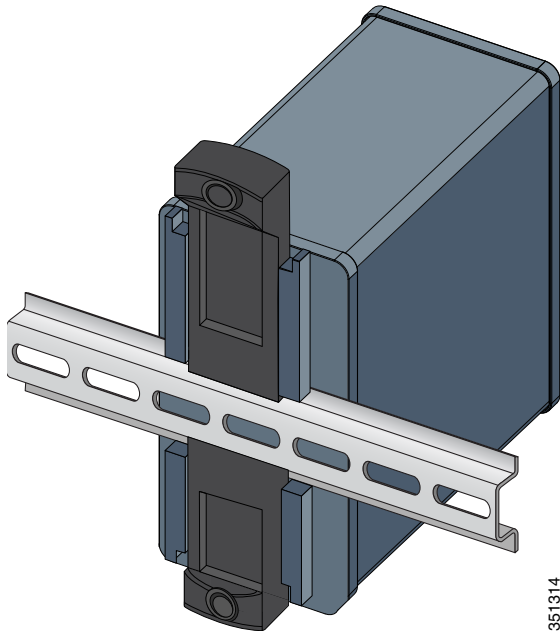
4. Pivot the power supply toward the DIN rail so that the spring-loaded latch snaps into place on the underside of the DIN rail.

Connecting the AC Power Cord to the DC Power Supply Module

This procedure is provided for a qualified electrician to follow when installing an AC power cord to the AC-input connections of the DC power supply module. DC also can be used and both the AC-input and DC-input connections are shown in .

Caution: AC power sources must be on dedicated AC branch circuits. Each branch circuit must be protected by a dedicated two-pole circuit breaker.

Caution: Do not insert the power cord plug into the AC outlet until you have completed wiring the line, neutral, and ground connections.

To connect the AC power cord wires to the power supply terminal block:

1. Remove the plastic cover from the input power terminals and set it aside.

Connecting the Protective Ground and DC Power

Figure 22   AC Power Input Terminal Block
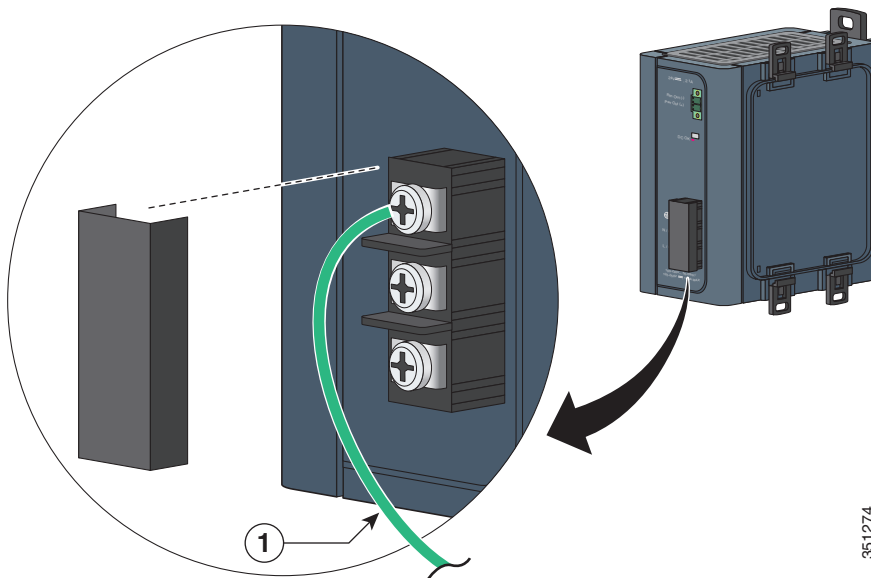
| 1 | Ground wire |

2. Loosen the three Phillips-head terminal screws on the terminal block.

3. Insert the exposed ground wire lead into the power supply ground wire connection on the terminal block.

Ensure that only wire *with insulation* extends from the connector.

4. Tighten the ground wire terminal block screw.

Note: Do not exceed 2.2 in-lb (0.25 Nm) torque.

5. Insert the line and neutral wire leads into the terminal block line and neutral connections.

Ensure that you cannot see any wire lead, and that only wire *with insulation* extends from the connectors.

Figure 23   Connecting AC Power to the Power Converter
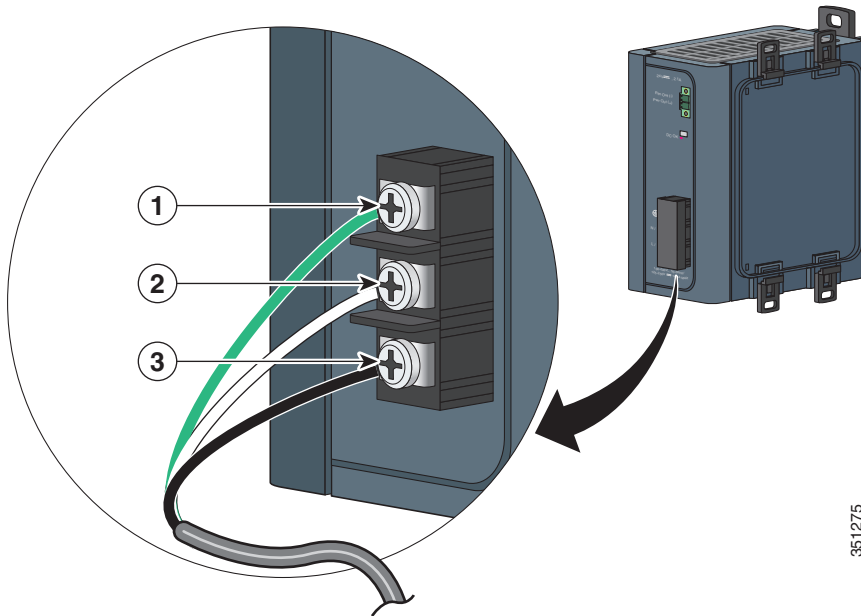
1	Ground	3	AC line (DC+)
2	AC neutral (DC–)		

6. Tighten the line and neutral terminal block screws.

    Note: Do not exceed 2.2 in-lb (0.25 Nm) torque.

7. Replace the plastic cover over the terminal block.

8. Connect the plug end of the AC power cord into the source AC outlet.

Wiring the DC Power Source

Read these warnings before wiring the DC power source:

Caution: This product is intended to be supplied by a Class 2 power source marked with Class 2 and rated from 12, 24, or 48 VDC, 2.5 A.

Warning: A readily accessible two-poled disconnect device must be incorporated in the fixed wiring. Statement 1022

Warning: This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than: 3A. Statement 1005

Warning: Installation of the equipment must comply with local and national electrical codes. Statement 1074

Warning: Before performing any of the following procedures, ensure that power is removed from the DC circuit. Statement 1003

Warning: Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030

Caution: You must connect the switch only to a DC-input power source that has an input supply voltage of 12, 24, or 48 VDC. If the supply voltage is not in this range, the switch might not operate properly or might be damaged.

Caution: For wire connections to the power and alarm connectors, you must use UL- and CSA-rated, style 1007 or 1569 twisted-pair copper appliance wiring material (AWM) wire.

To wire the switch to a DC-input power source:

1. Locate the two power connectors on the switch front panel labeled DC-A and DC-B. (See Figure 24 on page 46.)

   Note: On the PoE-capable models of the switch, there is a third DC-input power connector on the switch front panel labeled PoE. For more information about the PoE power connector, see the Connecting Power to the Switch PoE DC-Input (Optional), page 53.

Figure 24   Power Connector
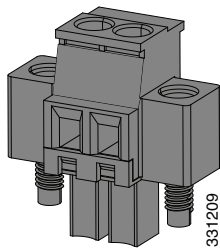
2. Identify the connector positive and return DC power connections.

   The labels for power connectors DC-A and DC-B are on the switch panel as displayed in Table 11 on page 46.

Table 11   DC-A and DC-B Power Connector Labels

Label	Connection
+	Positive DC power connection
–	Return DC power connection

   You can view the switch panel labels in Figure 1 on page 12, Figure 2 on page 13, or Figure 3 on page 14.

3. Measure two strands of twisted-pair copper wire (16 to 18 AWG) long enough to connect to the DC power source.

4. Using a 16- to 18-AWG size wire-stripping tool, strip each of the two twisted-pair wires coming from each DC-input power source to 0.25 inch (6.3 mm) ± 0.02 inch (0.5 mm).

   Note: Do not strip more than 0.27 inch (6.8 mm) of insulation from the wire. Stripping more than the recommended amount of wire can leave exposed wire from the power connector after installation.

Figure 25   Stripping the Power Connection Wire
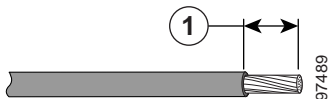
1   0.25 in. (6.3 mm) ± 0.02 in. (0.5 mm)

5. Remove the two captive screws that attach the power connector to the switch, and remove the power connector.

   Remove both connectors if you are connecting to two power sources. See Figure 26 on page 47.

Connecting the Protective Ground and DC Power

Figure 26   Removing the Power Connectors from the Switch
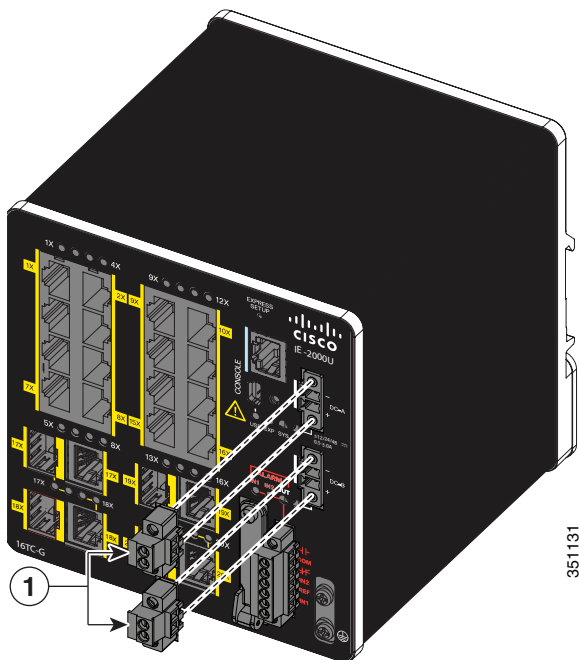
1	Power connectors

6. On the power connector, insert the exposed part of the positive wire into the connection labeled "+" and the exposed part of the return wire into the connection labeled "–". See Figure 27 on page 48.

Ensure that you cannot see any wire lead. Only wire *with insulation* should extend from the connector.

Warning: An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the connector(s) or terminal block(s). Statement 122

47

Connecting the Protective Ground and DC Power

Figure 27   Inserting Wires in the Power Connector
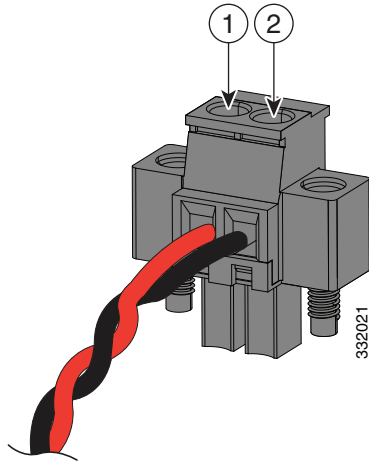
1	Power source positive connection	2	Power source return connection

7. Use a ratcheting torque flathead screwdriver to torque the power connector captive screws (above the installed wire leads) to 2 in-lb (0.23 N-m) torque. See Figure 28 on page 49.

   Note: Do not over-torque the captive screws on the power connector. Do not exceed 2 in-lb (0.23 N-m) torque.

Figure 28   Torquing the Power Connector Captive Screws
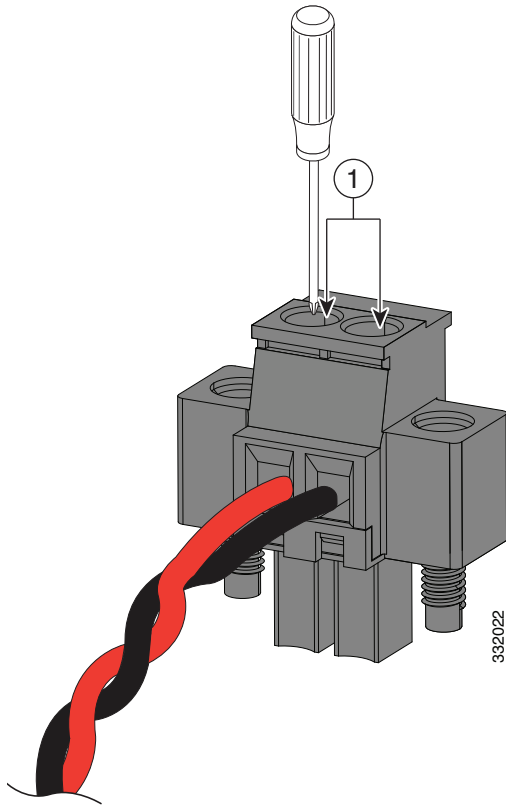
1	Power connector captive screws

8. Connect the other end of the positive wire to the positive terminal on the DC power source, and connect the other end of the return wire to the return terminal on the DC power source.

When you are testing the switch, one power connection is sufficient. If you are installing the switch and are using a second power source, repeat the above steps using the second power connector.

Figure 29 on page 50 shows the completed DC-input wiring on a power connector for a primary power source and an optional secondary power source.

Connecting the Protective Ground and DC Power

Figure 29   Completed DC Power Connections on the Power Connectors
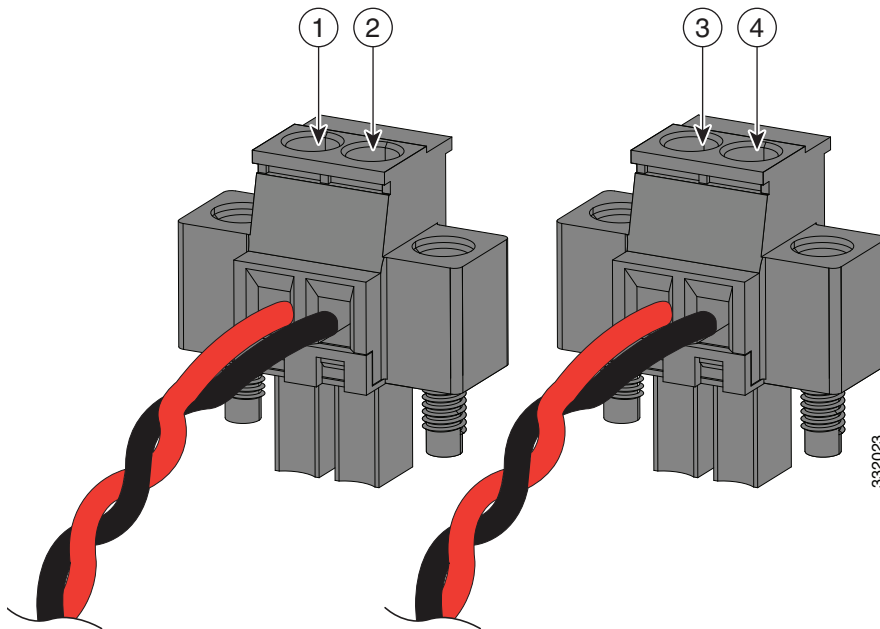
1	Power source A positive connection	3	Power source B positive connection
2	Power source A return connection	4	Power source B return connection

For a –48 VDC power source, this table describes the wiring connections for .

1	Power source A return connection	3	Power source B return connection
2	Power source A –48 VDC connection	4	Power source B –48 VDC connection

Attaching the Power Connectors to the Switch

To attach the power connectors to the front panel of the switch:

1. Insert one power connector into the DC-A receptacle on the switch front panel, and the other into the DC-B receptacle. See .

Warning: Failure to securely tighten the captive screws can result in an electrical arc if the connector is accidentally removed. Statement 397

Warning: When you connect or disconnect the power and/or alarm connector with power applied, an electrical arc can occur. This could cause an explosion in hazardous area installations. Be sure that all power is removed from the switch and any other circuits. Be sure that power cannot be accidentally turned on or verify that the area is nonhazardous before proceeding. Statement 1058

Connecting the Protective Ground and DC Power

Figure 30   Attaching the Power Connectors to the Switch
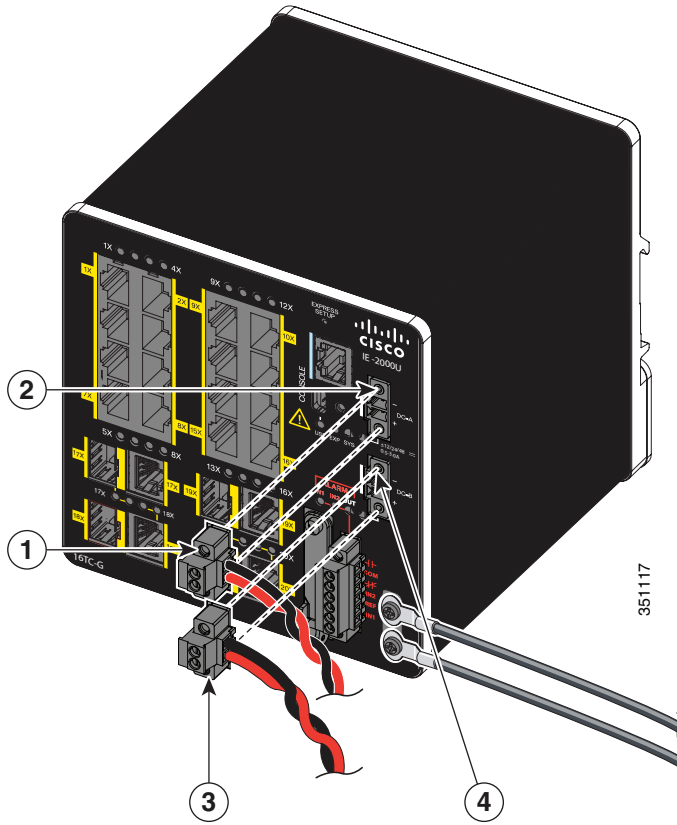
1	DC–A power connector	3	DC–B power connector
2	DC–A power connection	4	DC–B power connection

Figure 31   Connecting the Power Connectors to the Switch
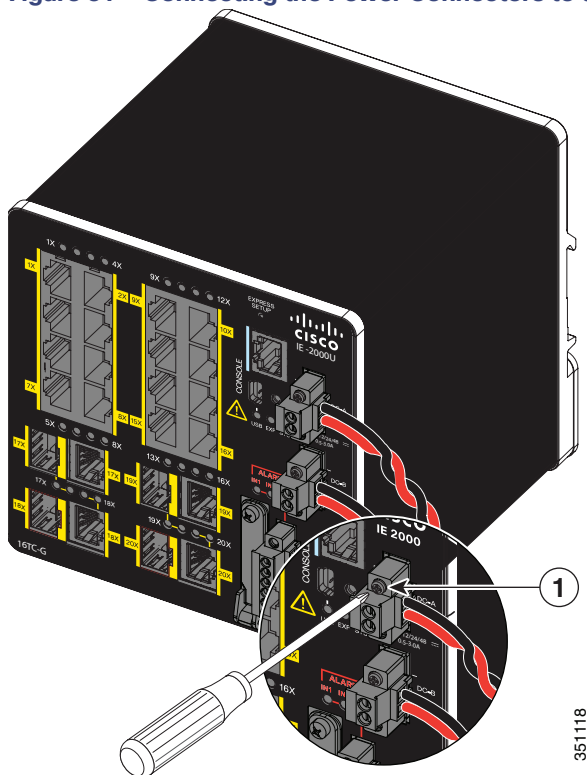
| 1 | DC-A power connector upper captive screw |

2. Use a ratcheting torque flathead screwdriver to tighten the captive screws on the sides of the power connectors.

When you are testing the switch, one power source is sufficient. If you are installing the switch and are using a second power source, repeat this procedure for the second power connector (DC-B), which installs just below the primary power connector (DC-A). Figure 32 on page 53 shows a 50 W AC-input DC power supply module wired as the primary power source.

When you are installing the switch, secure the wires coming from the power connector so that they cannot be disturbed by casual contact. For example, use tie wraps to secure the wires to the rack.

Figure 32   Wired DC Power Supply Module
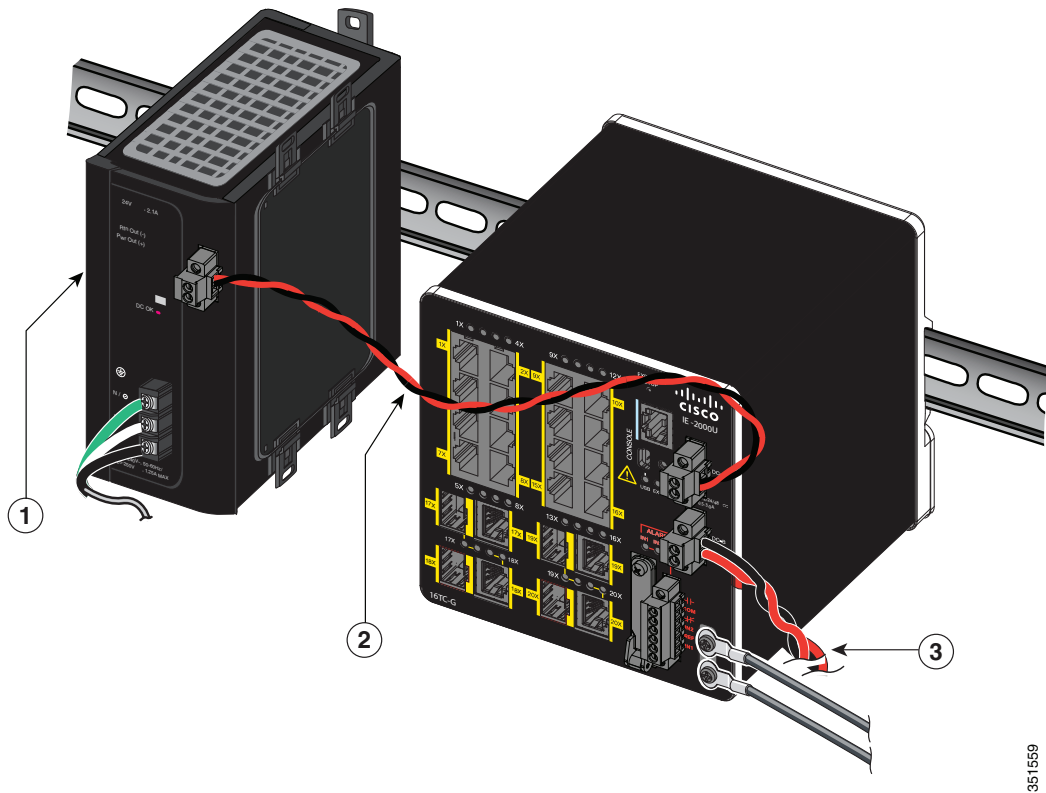
1	DC power supply module (PWR-IE50W-AC=)	3	DC-B power connector cable (Optional)
2	DC-A power connector cable		

Connecting Power to the Switch PoE DC-Input (Optional)

This procedure is applicable only to the IE 2000U switch models that are PoE-capable. If you have a PoE-capable IE 2000U switch and do not plan on using PoE, you do not need to attach power to the PoE DC-input connector; the switch can operate without the connection being made.

The DC-input accepts 48 V DC or 54 V DC at 2.5A. For more information about the PoE power requirements of the IE 2000U switch, see Table 16 on page 79.

There are two PoE power source options:

- Site source DC

- PoE power supply module

Caution: For a site source DC, you must have a qualified electrician select, prepare, and install the appropriate power cord to the DC source.

Connecting the Protective Ground and DC Power

For a PoE power supply module source, you can select a 65 W DC-input, 65 W DC- or AC-input, 170 W DC-input, or 170 W DC- or AC-input PoE power supply module to power the PoE circuit. describes the PoE supported power supply modules.

Table 12   PoE Supported Power Supply Modules

PoE Power Supply Module	Input	Output	Dimensions (H x W x D)	Insulation Class
PWR-IE65W-PC-DC=	18-60 VDC/4.3 A	54 VDC/1.2 A	5.9 x 2.1 x 4.9 in. (14.97 x 5.33 x 12.45 cm)	Class III
PWR-IE65W-PC-AC=	88-300 VDC or 110/220 VAC	54 VDC/1.2 A	5.9 x 2.1 x 4.9 in. (14.97 x 5.33 x 12.45 cm)	Class I
PWR-IE170W-PC-DC=	10.8-60 VDC	54 VDC/3.15 A	5.93 x 4.47 x 5.75 in. (150.6 x 113.5 x 145.8mm)	Class III
PWR-IE170W-PC-AC=	90-264 VAC or 106-300 VDC	54 VDC/3.15 A	5.93 x 3.72 x 5.60 in. (150.6 x 94.5 x 142.2mm)	Class I

Note: If you use site source DC to power the PoE ports, you can operate all four ports either as PoE or as PoE+. Make sure that the site power has 2.5A at 54 VDC to power four PoE+ port. When using PWR-IE170W modules, PoE port can power either 4 PoE or PoE+ ports. When using PWR-IE65W modules, PoE port can power 4 PoE or two PoE+ ports.

To install the PoE power supply module, complete the steps in the Installing the DC Power Supply Module on a DIN Rail, page 42.

Note: You can order these IE 2000U PoE power supply modules from your Cisco sales representative:

■ PWR-IE65W-PC-DC=, PoE 65-W DC-input power supply module

■ PWR-IE65W-PC-AC=, PoE 65-W DC- or AC-input power supply module

■ PWR-IE170W-PC-DC=, PoE 170-W DC-input power supply module

■ PWR-IE170W-PC-AC=, PoE 170-W DC- or AC-input power supply module

Note: The input rating is 48/54VDC 2.5A.

Caution: To prevent the switch from overheating, ensure these minimum clearances:

■ **Top and bottom: 2.0 inches (50.8 mm)**

■ **Exposed side (not connected to the module): 2.0 inches (50.8 mm)**

■ **Front: 2.0 inches (50.8 mm)**

Contact your Cisco TAC if tighter spacings are required.

To attach source DC to the PoE DC-input connector:

1. Verify that power is off to the DC circuit that you are going to attach to the switch PoE DC-input connector.

   This can be either of the two power supplies (AC-input or DC-input) or site source DC.

   As an added precaution, place the appropriate safety flag and lockout devices at the source power circuit breaker, or place a piece of adhesive tape over the circuit breaker handle to prevent accidental power restoration while you are working on the circuit.

2. Locate the PoE DC-input power connector, which is labeled PoE, on the switch front panel.

3. Loosen the power connector's two screws and remove the plug portion of the connector from the switch.

4. Measure two strands of twisted-pair copper wire (16- to18-AWG size stranded copper wire that is an appropriate type, wire size, and color-code for your country) long enough to connect the switch to the DC power source.

5. Using a wire-stripping tool, strip each of the two twisted-pair wires coming from each DC-input power source to 0.25 inch (6.3 mm) ± 0.02 inch (0.5 mm).

   Note: Do not strip more than 0.27 inch (6.8 mm) of insulation from the wire. Stripping more than the recommended amount of wire can leave exposed wire from the power connector after installation.

6. Loosen the two captive screws on the PoE power plug and insert the exposed part of the positive wire into the connection labeled "+" and the exposed part of the return wire into the connection labeled "–". See Figure 33 on page 55 below.

   Ensure that you cannot see any wire lead. Ensure that only wire *with insulation* extends from the connector.

   Warning: An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the connector(s) or terminal block(s). Statement 122

Figure 33   Inserting Wires into the PoE Power Connector
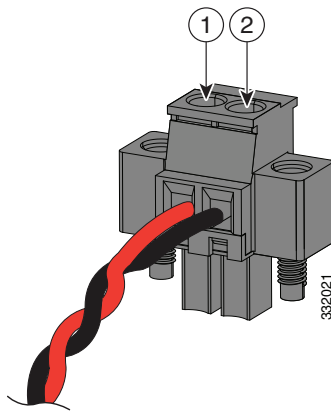
1	Power source positive connection	2	Power source return connection

7. Use a ratcheting torque flathead screwdriver to tighten the power connector captive screws (above the installed wire leads) to 2 in-lb (0.23 N-m) torque, as shown in Figure 34 on page 56.

   Note: Do not over-torque the captive screws of the PoE power connector. Do not exceed 2 in-lb (0.23 N-m) torque.

Connecting the Protective Ground and DC Power

Figure 34   Securing the Power Connector Captive Screws
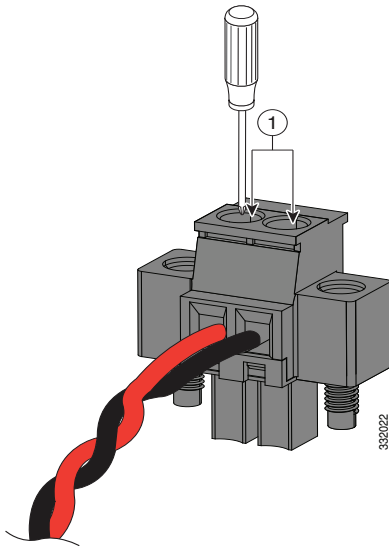
1	Power connector captive screws

8. Connect the other end of the positive wire to the positive terminal on the DC power source, and connect the other end of the return wire to the return terminal on the DC power source.

9. Insert the wired power plug into the switch PoE power connector and tighten the two screws to secure the plug.

   Figure 35 on page 57 shows a PoE-capable switch with a PoE power supply module connected to the PoE DC-input connector. A DC power supply module is connected to the primary power connector (DC-A) also.

Figure 35   PoE-capable Switch with PoE Power Supply Module Connected
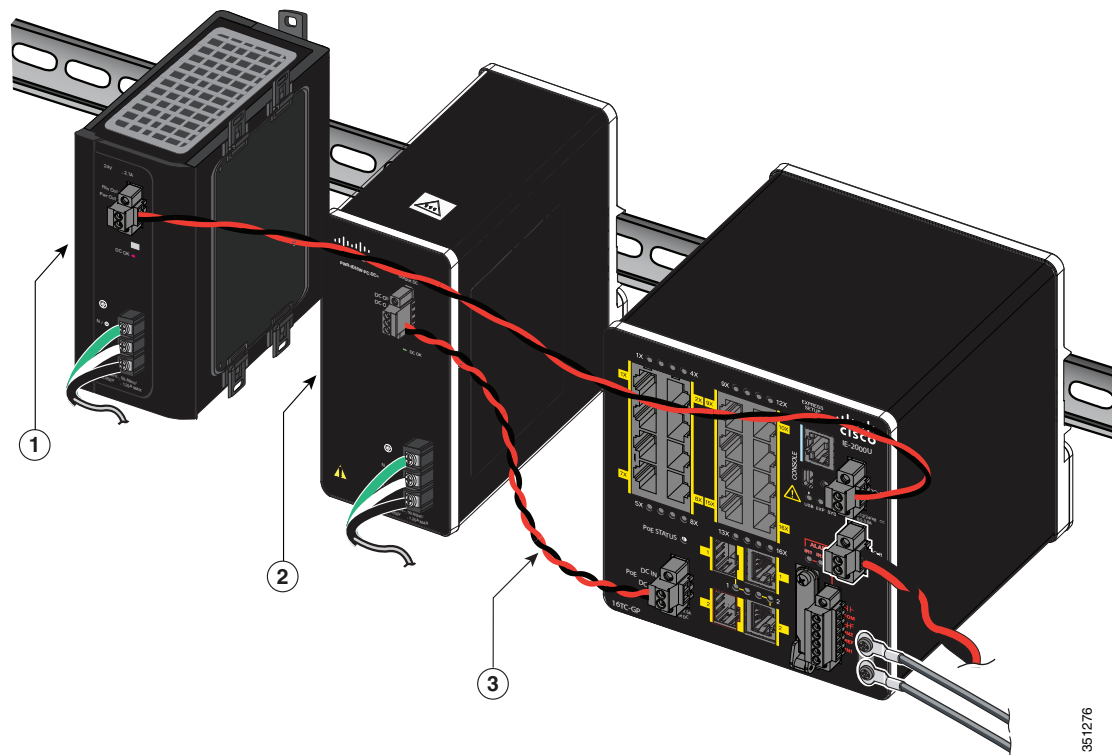
1	DC power supply module (PWR-IE50W-AC=)
2	PoE power supply module (PWR-IE65W-PC-AC=)
3	PoE power connector cable

Running Boot Fast

When the switch powers on, it automatically initiates a boot fast sequence. The boot fast sequence allows the switch to boot up in less than 60 seconds. To test the switch, follow the steps in these sections:

- Powering On the Switch, page 57
- Verifying Boot Fast, page 57
- Disconnecting Power, page 58

Powering On the Switch

To apply power to a switch that is directly connected to a DC power source, locate the circuit breaker on the panel board that services the DC circuit, and switch the circuit breaker to the ON position.

Verifying Boot Fast

When you power on the switch, it automatically begins a boot fast sequence. The System LED blinks green as the Cisco IOS software image loads. If the boot fast sequence fails, the System LED turns red.

Note: Boot fast failures are usually fatal. Call Cisco TAC immediately if your switch does not complete boot fast successfully.

Note: You can disable boot fast and run POST by using the Cisco IOS CLI. See the *Cisco Connected Grid Switches System Management Software Configuration Guide* and the *Cisco IOS Master Command List, All Releases* for more information.

Disconnecting Power

To disconnect power after successfully running boot fast:

1. Turn off power to the switch.

2. Disconnect the cables.

Connecting Alarm Circuits

After the switch is installed and DC power is wired, you are ready to connect the alarm connections.

Wiring the External Alarms

The switch has two alarm input and one alarm output relay circuits for external alarms. The alarm input circuits are designed to sense if the alarm input is open or closed relative to the alarm input reference pin. Each alarm input can be configured as an open or closed contact. The alarm output relay circuit has a normally open and a normally closed contact.

Alarm signals are connected to the switch through the six-pin alarm connector. Three connections are dedicated to the two alarm input circuits: alarm input 1, alarm input 2, and a reference ground. An alarm input and the reference ground wiring connection are required to complete a single alarm input circuit. The three remaining connections are for the alarm output circuit: a normally open output, a normally closed output, and a common signal. An alarm output and the common wiring connection are required to complete a single alarm output circuit.

The labels for the alarm connector are on the switch panel and are displayed in Table 13 on page 58.

Table 13   Alarm Connector Labels (Top to Bottom)

Label	Connection
NO	Alarm Output Normally Open (NO) connection
COM	Alarm Output Common connection
NC	Alarm Output Normally Closed (NC) connection
IN2	Alarm Input 2
REF	Alarm Input Reference Ground connection
IN1	Alarm Input 1

Warning: Explosion Hazard—Do not connect or disconnect wiring while the field-side power is on; an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or that the area is nonhazardous before proceeding. Statement 1081

Caution: The input voltage source of the alarm output relay circuit must be an isolated source and limited to less than or equal to 24 VDC, 1.0 A or 48 VDC, 0.5 A.

Note: Wire connections to the alarm connector must be 16- to 20-AWG, UL- and CSA-rated, style 1007 or 1569 twisted-pair copper appliance wiring material (AWM) wire.

To wire the switch to an external alarm device:

1. Remove the captive screws that hold the alarm connector on the switch, and remove the connector from the switch chassis. See Figure 36 on page 59.

Figure 36   Removing the Alarm Connector
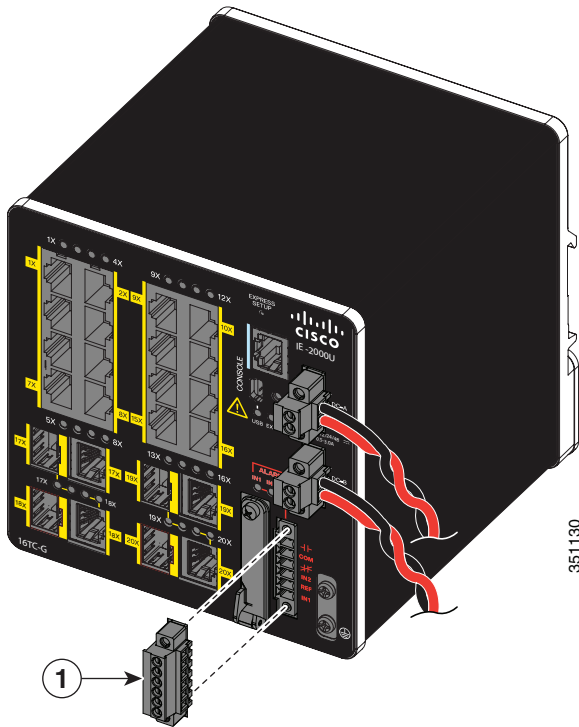
1	Alarm connector

2. Measure two strands of twisted-pair wire (16-to-20 AWG) long enough to connect to the external alarm device.

   Choose between setting up an external alarm input or output circuit.

3. Use a wire stripper to remove the casing from both ends of each wire to 0.25 inch (6.3 mm) ± 0.02 inch (0.5 mm).

   Note: Do not strip more than 0.27 inch (6.8 mm) of insulation from the wires. Stripping more than the recommended amount of wire can leave exposed wire from the alarm connector after installation.

4. Insert the exposed wires for the external alarm device into the connections based on an alarm input or output circuit setup (see Table 13 on page 58).

   For example, to wire an alarm input circuit, complete the IN1 and REF connections (see Figure 37 on page 60).

Figure 37   Inserting Wires into the Alarm Connector (Alarm Input Circuit)
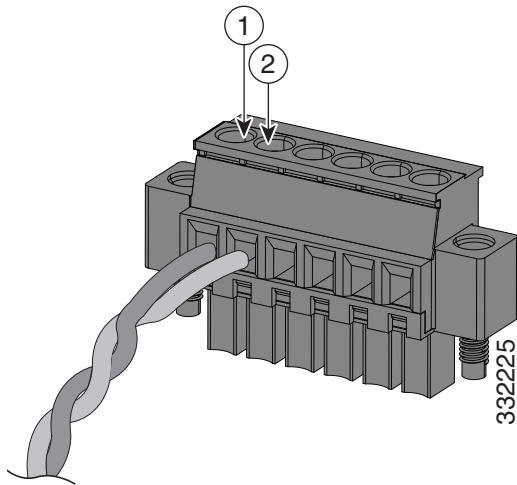
1	IN1 – External device connection 1	2	REF – External device connection 2

5. Use a ratcheting torque flathead screwdriver to tighten the alarm connector captive screw (above the installed wire leads) to 2 in-lb (0.23 N-m) torque. See Figure 38 on page 60 for details.

> **Note:** Do not over-torque the captive screws of the alarm connectors. Do not exceed 2 in-lb (0.23 N-m) torque.

Figure 38   Torquing the Alarm Connector Captive Screws
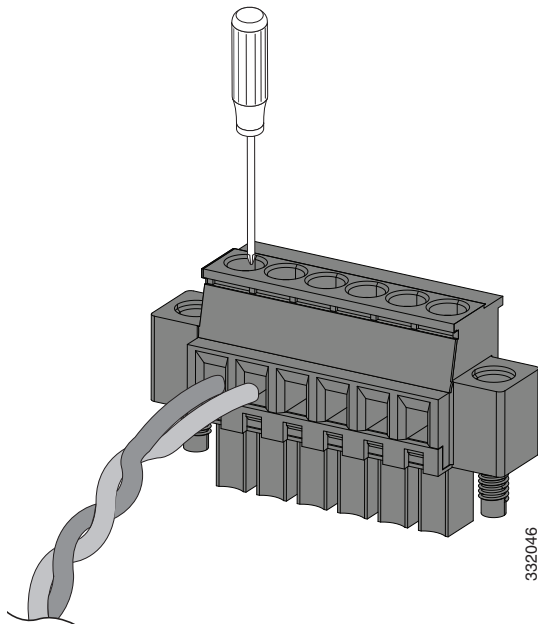
6. Repeat the above steps to insert the input and output wires of one additional external alarm device into the alarm connector.

Figure 39 on page 61 shows the completed wiring for two external alarm devices. The first alarm device circuit is wired as an alarm input circuit; the IN1 and REF connections complete the circuit. The second alarm device circuit is wired as an alarm output circuit that works on a normally open contact basis; the NO and COM connections complete the circuit.

Figure 39   Alarm Connector Wired for Two External Alarm Devices
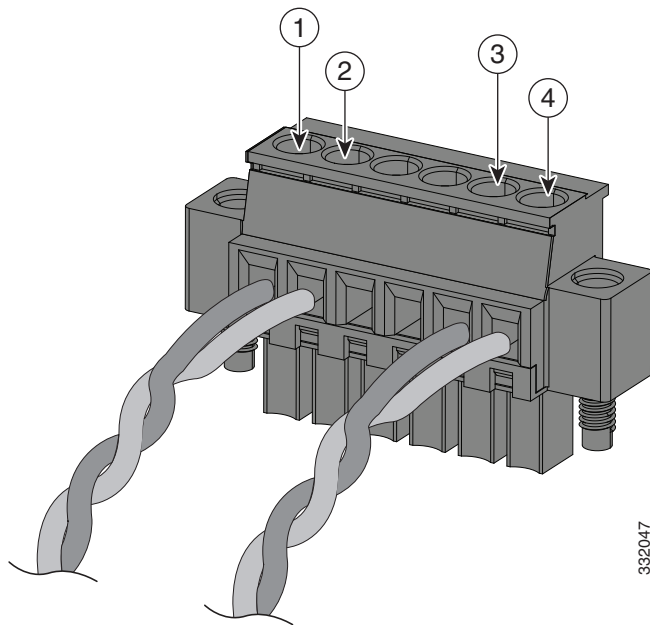
1	IN1 wired connection	3	COM wired connection
2	REF wired connection	4	NO wired connection

Attaching the Alarm Connector to the Switch

Warning: Failure to securely tighten the captive screws can result in an electrical arc if the connector is accidentally removed. Statement 397

Warning: When you connect or disconnect the power and/or alarm connector with power applied, an electrical arc can occur. This could cause an explosion in hazardous area installations. Be sure that all power is removed from the switch and any other circuits. Be sure that power cannot be accidentally turned on or verify that the area is nonhazardous before proceeding. Statement 1058

To attach the alarm connector to the front panel of the switch:

1. Insert the alarm connector into the receptacle on the switch front panel. See Figure 40 on page 62.

Figure 40   Connecting the Alarm Connector to the Switch
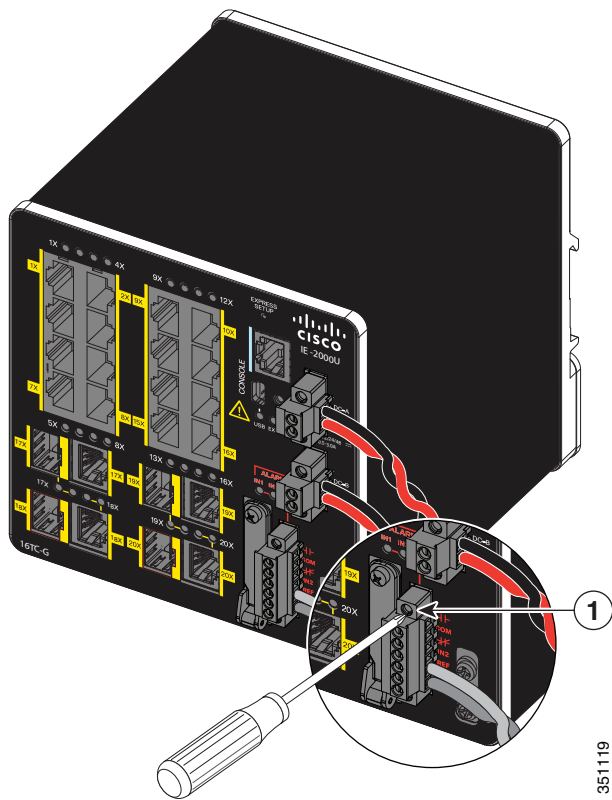
1	Alarm connector upper captive screw

2. Use a ratcheting torque flathead screwdriver to tighten the alarm connector captive screw (above the installed wire leads) to 2 in-lb (0.23 N-m) torque. See for details.

Note: Do not over-torque the captive screws of the alarm connectors. Do not exceed 2 in-lb (0.23 N-m) torque.

Connecting Destination Ports

These sections provide more information about connecting to the destination ports:

- Connecting to 10/100 and 10/100/1000 Ports, page 63

- Installing and Removing SFP Modules, page 64

- Connecting to SFP Modules, page 69

- Connecting to a Dual-Purpose Port, page 70

- Where to Go Next, page 72

Connecting to 10/100 and 10/100/1000 Ports

The switch 10/100/1000 ports automatically configure themselves to operate at the speed of attached devices. If the attached ports do not support autonegotiation, you can explicitly set the speed and duplex parameters. Connecting devices that do not autonegotiate or that have their speed and duplex parameters manually set can reduce performance or result in no linkage.

To maximize performance, choose one of these methods for configuring the Ethernet ports:

◼ Let the ports autonegotiate both speed and duplex.

◼ Set the port speed and duplex parameters on both ends of the connection.

The PoE-capable IE 2000U-16TC-GP model provides up to four ports of either PoE (15.4 W per port; IEEE 802.3af) or PoE+ (30 W per port; IEEE 802.3at). In order to utilize the PoE capability, you must attach a site source DC or power supply module to the PoE power connector on the switch faceplate. For more information about the PoE power connector, see Connecting Power to the Switch PoE DC-Input (Optional), page 53.

Warning: Do not connect or disconnect cables to the ports while power is applied to the switch or any device on the network because an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed from the switch and cannot be accidentally be turned on, or verify that the area is nonhazardous before proceeding. Statement 1070

Caution: To prevent electrostatic-discharge (ESD) damage, follow your normal board and component handling procedures.

To connect to 10BASE-T, 100BASE-TX or 1000BASE-T devices:

1. When connecting to workstations, servers, and routers, connect a straight-through cable to an RJ-45 connector on the front panel. See Figure 41 on page 64.

   When connecting to 1000BASE-T-compatible devices, use a twisted four-pair, Category 5 or higher grade cable.

   The auto-MDIX feature is enabled by default. For configuration information for this feature, see the *Cisco Connected Grid Switches Interfaces Software Configuration Guide* or go to the Cisco IOS 15.2M&T command references, at: http://www.cisco.com/en/US/products/ps11746/prod_command_reference_list.html

Figure 41   Connecting to an Ethernet Port
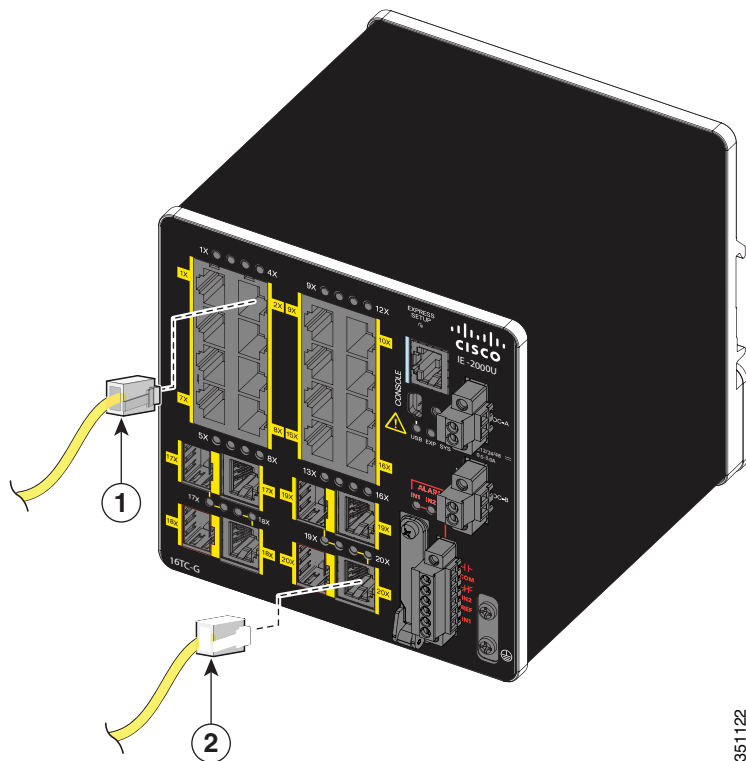
1	10/100 port
2	10/100/100 port

2. Connect the other end of the cable to an RJ-45 connector on the other device.

   The port LED turns on when both the switch and the connected device establish a link.

   The port LED is amber while Spanning Tree Protocol (STP) discovers the topology and searches for loops. This can take up to 30 seconds, and then the port LED turns green.

   If the port LED does not turn on:

   – Check that the device at the other end is turned on.

   – Check the cable and adapter. There might be a cable problem or a problem with the adapter installed on the attached device. See Troubleshooting, page 73 for solutions to cabling problems.

3. Reconfigure and reboot the connected device if necessary.

4. Repeat Steps 1 through 3 to connect each device.

Installing and Removing SFP Modules

These sections describe how to install and remove SFP modules. SFP modules are inserted into SFP module slots on the front of the switch. These field-replaceable modules provide the optical interfaces, send (TX) and receive (RX).

You can use any combination of rugged SFP modules. See the *Release Notes for the Cisco IE 2000U Switches* at www.cisco.com/go/ie2000u-docs for the list of supported modules. Each SFP module must be of the same type as the SFP module on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communications. See Table 19 on page 86 for cable stipulations for SFP module connections.

Caution: **When you use commercial SFP modules such as CWDM and 1000BX-U/D, reduce the maximum operating temperature by 59° F (15° C). The minimum operating temperature is 32° F (0° C).**

Warning: **Do not insert and remove SFP modules while power is on; an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding. Statement 1087**

Installing SFP Modules into SFP Module Slots

Figure 42 on page 65 shows an SFP module that has a bale-clasp latch.

Caution: **Do not install or remove the SFP module with fiber-optic cables attached to it because of the potential damage to the cables, the cable connector, or the optical interfaces in the SFP module. Disconnect all cables before removing or installing an SFP module. Removing and installing an SFP module can shorten its useful life. Do not remove and insert SFP modules more often than is absolutely necessary.**

Figure 42   SFP Module with a Bale-Clasp Latch
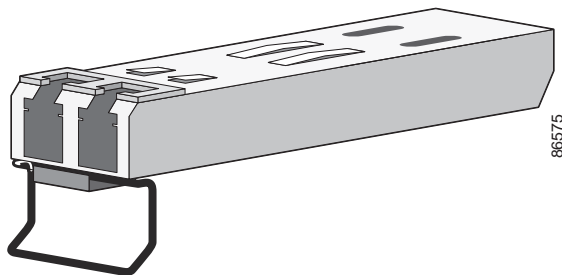
Installing Fiber-Optic SFP Modules

To insert a fiber-optic SFP module into the SFP module slot:

1. Attach an ESD-preventive wrist strap to your wrist and to a grounded bare metal surface.

2. Find the send (TX) and receive (RX) markings that identify the correct side of the SFP module.

   On some SFP modules, the send and receive (TX and RX) markings might be replaced by arrows that show the direction of the connection, either send or receive (TX or RX).

3. Align the SFP module sideways in front of the slot opening.

4. Insert the SFP module into the slot until you feel the connector on the module snap into place in the rear of the slot (Figure 43 on page 66).

Figure 43   Installing an SFP Module into an SFP Module Slot
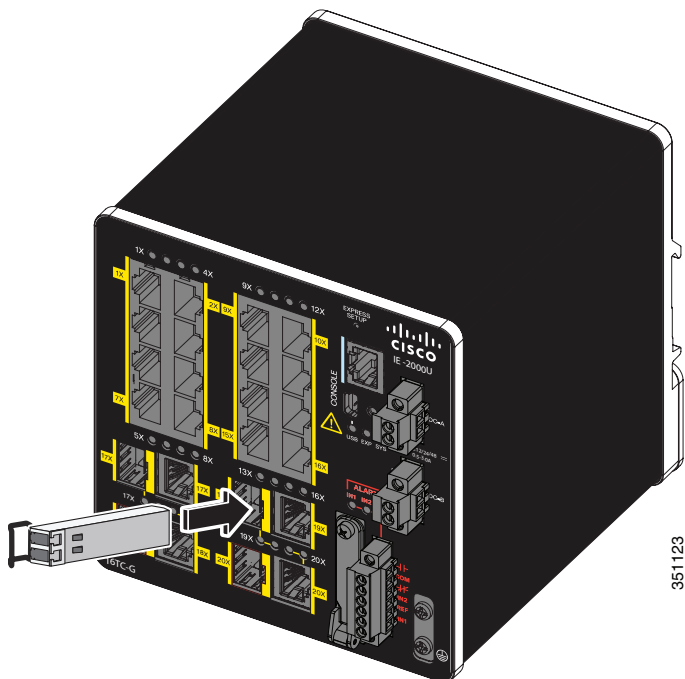
5. Remove the dust plugs from the SFP module optical ports and store them for later use.

   Caution: **Do not remove the dust plugs from the SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light.**

6. Insert the LC cable connector into the SFP module.

Installing 1000BASE-T SFP Modules

The 1000BASE-T (copper) SFP transceiver, see Figure 44 on page 67, has a bale-clasp locking mechanism that secures the transceiver in the module socket. An RJ-45 connector provides the transceiver's interface point to the network.

Figure 44   1000BASE-T SFP Transceiver
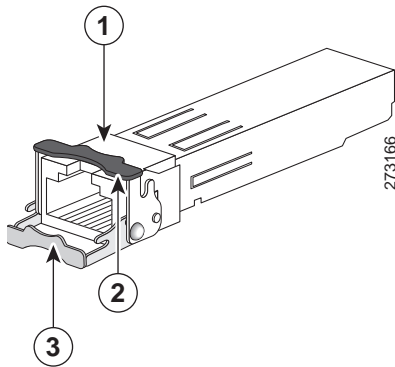
1	RJ-45 connector	**3**	Bale-clasp latching mechanism in the open (unlocked) position.
2	Bale-clasp latching mechanism in the closed (locked) position.		

Caution: **To comply with GR-1089 intrabuilding lightning immunity requirements, you must use grounded, shielded, twisted-pair, CAT5 cabling.**

Note: When connecting to a 1000BASE-T-compatible server, workstation, or router, use four twisted-pair, straight-through CAT5 cabling for the SFP transceiver port. When connecting to a 1000BASE-T-compatible switch or repeater, use four twisted-pair, crossover CAT5 cabling.

To install a 1000BASE-T SFP transceiver:

1. Attach an ESD-preventive wrist strap to your wrist and to the ESD ground connector on the chassis or to a properly grounded bare metal surface.

    Caution: **To avoid ESD damage, handle the SFP by its sides; do not touch the connector pins.**

2. Remove the new 1000BASE-T SFP module from its protective packaging.

3. Check the markings on the SFP transceiver to verify that you have the correct model for your network.

4. Position the SFP transceiver in front of the port socket opening.

    Note: Different Cisco devices have different SFP transceiver socket configurations. Your Cisco device might require that the SFP transceiver be installed with the bale-clasp either in a latch-up or a latch-down orientation. Figure 45 on page 68, left view, shows the SFP installed in a latch-up orientation where the bale-clasp latching mechanism pivots up to the closed (locked) position. Figure 45 on page 68, right view shows the SFP installed in a latch-down orientation where the bale-clasp latching mechanism pivots down to the closed (locked) position. Verify that you have the SFP transceiver oriented correctly when you position it in front of the port socket.

Figure 45   SFP Transceiver Socket Orientation
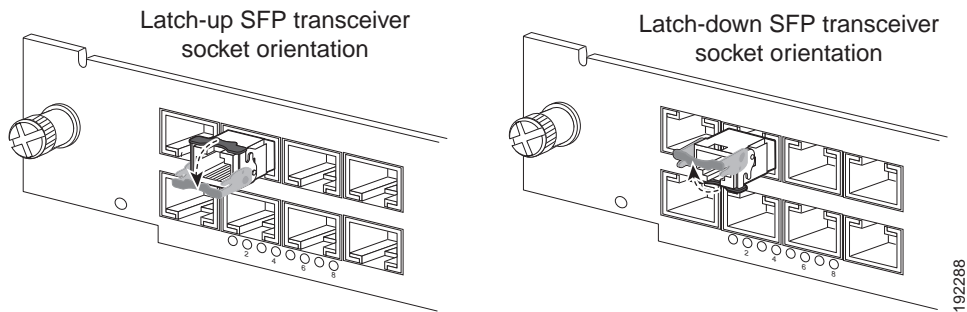
5. With the bale-clasp closed (locked), slide the SFP transceiver into the socket until you feel it snap in place in the socket.

   You may hear an audible click as the SFP transceiver latch engages in the socket (Figure 43 on page 66).

6. Connect the network interface cable RJ-45 plug to the SFP RJ-45 connector.

7. Observe the port status LED:

   – Green indicates that the SFP transceiver and the target device established a link.

   – Amber indicates that the port is discovering the network topology and searching for loops. This process takes about 30 seconds, and then the LED turns green.

   – Off indicates that the target device might not be turned on, there might be a cable problem, or there might be a problem with the adapter installed in the target device. Refer to Troubleshooting, page 73 for solutions to cabling problems.

Removing SFP Modules from SFP Module Slots

To remove an SFP module from a module receptacle:

1. Attach an ESD-preventive wrist strap to your wrist and to a grounded bare metal surface.

2. Disconnect the LC from the SFP module.

3. Insert a dust plug into the optical ports of the SFP module to keep the optical interfaces clean.

4. Unlock and remove the SFP module.

   If the module has a bale-clasp latch, pull the bale out and down to eject the module. If the bale-clasp latch is obstructed and you cannot use your index finger to open it, use a small, flat-blade screwdriver or other long, narrow instrument to open the bale-clasp latch. See Figure 46 on page 69.

Figure 46   Opening a Bale-Clasp Latch on an SFP Module Using a Flat-Blade Screwdriver
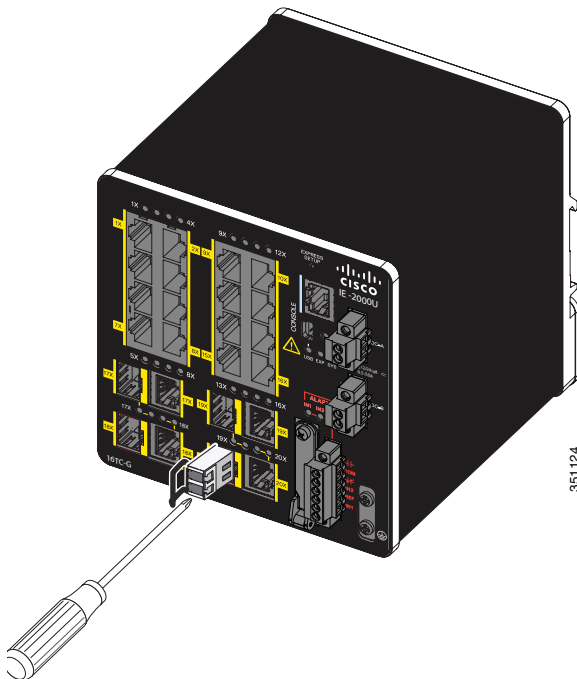
1	Bale clasp

5. Grasp the SFP module between your thumb and index finger, and carefully remove it from the module slot.

6. Place the removed SFP module in an antistatic bag or other protective environment.

Connecting to SFP Modules

This section describes how to connect to a fiber-optic SFP port. To connect to an RJ-45 Gigabit Ethernet port instead of a fiber-optic port, see the Connecting to a Dual-Purpose Port, page 70.

For instructions on how to install or remove an SFP module, see the Installing and Removing SFP Modules, page 64.

Warning: Class 1 laser product. Statement 1008

Warning: Do not connect or disconnect cables to the ports while power is applied to the switch or any device on the network because an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed from the switch and cannot be accidentally be turned on, or verify that the area is nonhazardous before proceeding. Statement 1070

Caution: Do not remove the rubber plugs from the SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light.

Before connecting to the SFP module, be sure that you understand the port and cabling guidelines in the Preparing for Installation, page 29. See Cable and Connectors, page 83 for information about the LC on the SFP module.

To connect a fiber-optic cable to an SFP module:

1. Remove the rubber plugs from the module port and fiber-optic cable, and store them for future use.

2. Insert one end of the fiber-optic cable into the SFP module port. See Figure 47 on page 70.

Figure 47   Connecting to a Fiber-Optic SFP Module Port
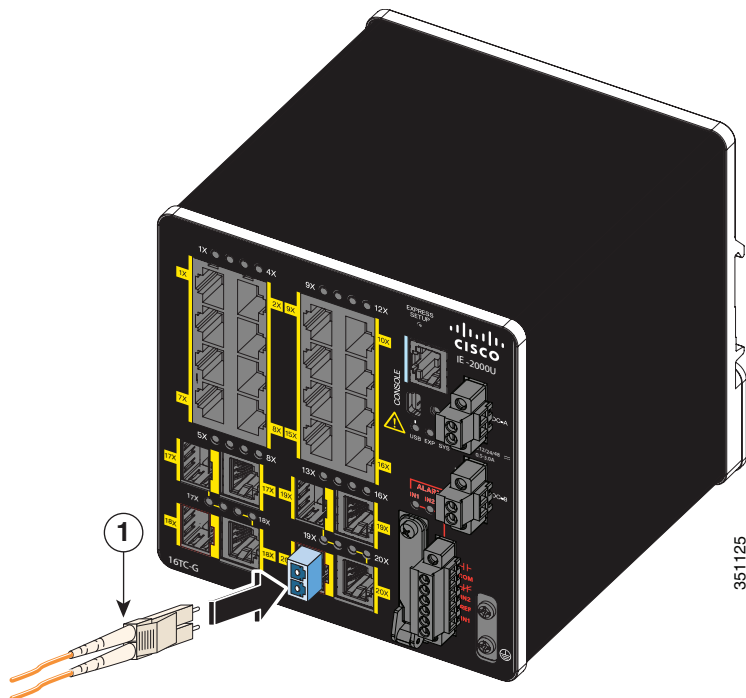
| 1 | LC connector |

3. Insert the other cable end into a fiber-optic receptacle on a target device.

4. Observe the port status LED:

   – Green indicates that the switch and the target device established a link.

   – Amber indicates that the STP is discovering the network topology and is searching for loops. This process takes about 30 seconds, and then the port LED turns green.

   – Off indicates that the target device might not be turned on, there might be a cable problem, or there might be a problem with the adapter installed in the target device. See Troubleshooting, page 73 for solutions to cabling problems.

5. If necessary, reconfigure and restart the switch or the target device.

Connecting to a Dual-Purpose Port

The dual-purpose port is a single port with two interfaces, one for an RJ-45 cable and another for an SFP module. Only one interface can be active at a time. If both interfaces are connected, the SFP module has priority. For more information about dual-purpose ports, see the Power Connectors, page 20.

Warning: Class 1 laser product. Statement 1008

Caution: Do not remove the rubber plugs from the SFP module port or the rubber caps from the fiber-optic cable until you are ready to connect the cable. The plugs and caps protect the SFP module ports and cables from contamination and ambient light. Before connecting to the SFP module, be sure that you understand the port and cabling guidelines in the Preparing for Installation, page 29. See Cable and Connectors, page 83 for information

about the LC on the SFP module.

To connect to a dual-purpose port:

1. Connect an RJ-45 connector to the 10/100/1000 port, or install an SFP module into the SFP module slot, and connect a cable to the SFP module port. See Figure 48 on page 71.

   For more information about RJ-45 connections, SFP modules, and optical connections, see the Connecting to 10/100 and 10/100/1000 Ports, page 63, the Installing and Removing SFP Modules, page 64, and the Connecting to SFP Modules, page 69.

Figure 48   Connecting to a Dual-Purpose Port
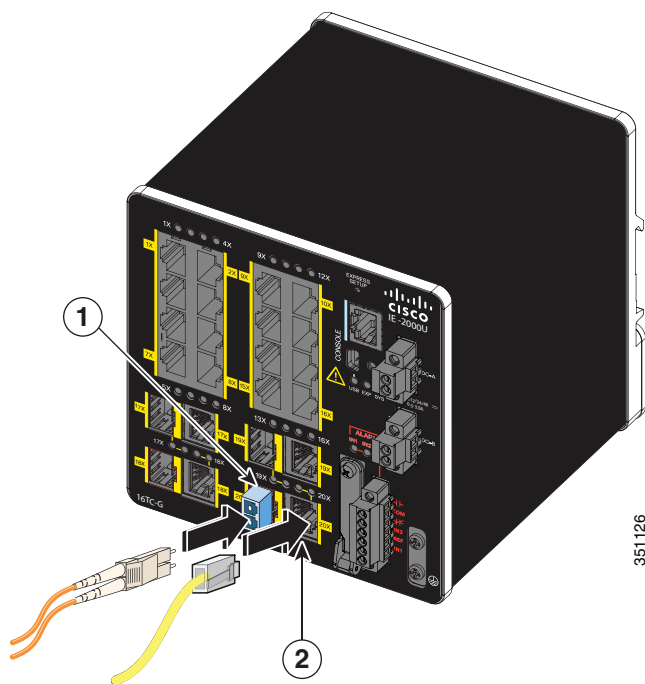
Table 4-14

1	LC connector	2	RJ-45 connector

2. Connect the other end of the cable to the other device.

By default, the switch detects whether an RJ-45 connector or SFP module is connected to a dual-purpose port and configures the port accordingly. You can change this setting and configure the port to recognize only an RJ-45 connector or only an SFP module by using the **media typ**e interface configuration command. For more information, see the Cisco IOS 15.2M&T command references, at:
http://www.cisco.com/en/US/products/ps11746/prod_command_reference_list.html

Where to Go Next

If the default configuration is satisfactory, the switch does not need further configuration. You can use any of these management options to change the default configuration:

■ Start Cisco Configuration Professional, which is a PC-based application that provides device management for switches and routers. It simplifies configuration of features through easy-to-use wizards.

72

- Use the CLI to configure the switch as an individual switch from the console. See the *Cisco IOS Master Command List, All Releases* on Cisco.com for information about using the CLI at:
  http://www.cisco.com/en/US/products/ps11746/products_product_indices_list.html

- Start an SNMP application such as the CiscoView application.

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Troubleshooting

This section provides these topics for troubleshooting problems:

- Diagnosing Problems, page 73
- How to Recover Passwords, page 76
- Finding the Switch Serial Number, page 76

Diagnosing Problems

The switch LEDs provide troubleshooting information about the switch. They show boot fast failures, port-connectivity problems, and overall switch performance. You can also get statistics from the CLI or an SNMP workstation. See the *Cisco Connected Grid Switches System Management Software Configuration Guide* at www.cisco.com/go/ie2000u-docs or the documentation that came with your SNMP application for details. For command information, go to the Cisco IOS 15.2M&T command references at: http://www.cisco.com/en/US/products/ps11746/prod_command_reference_list.html

Switch Boot Fast

See the Verifying Switch Operation, page 35 for information on boot fast.

Note: Boot fast failures are usually fatal. Contact your Cisco TAC representative if your switch does not successfully complete boot fast.

Note: You can disable boot fast and run POST by using the Cisco IOS CLI. See the *Cisco Connected Grid Switches System Management Software Configuration Guide* at www.cisco.com/go/ie2000u-docs and the Cisco IOS 15.2M&T command references at http://www.cisco.com/en/US/products/ps11746/prod_command_reference_list.html.

Switch LEDs

Look at the port LEDs information when troubleshooting the switch. See the LEDs, page 22 for a description of the LED colors and their meanings.

Switch Connections

Bad or Damaged Cable

Always examine the cable for marginal damage or failure. A cable might be just good enough to connect at the physical layer, but it could corrupt packets as a result of subtle damage to the wiring or connectors. You can identify this problem because the port has many packet errors or it constantly flaps (loses and regains link).

- Exchange the copper or fiber-optic cable with a known good cable.
- Look for broken or missing pins on cable connectors.

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■ Rule out any bad patch panel connections or media converters between the source and the destination. If possible, bypass the patch panel, or eliminate media converters (fiber-optic-to-copper).

■ Try the cable in another port to see if the problem follows the cable.

Ethernet and Fiber-Optic Cables

Ensure that you have the correct cable:

■ For Ethernet, use Category 3 copper cable for 10 Mb/s UTP connections. Use either Category 5, Category 5e, or Category 6 UTP for 10/100 or 10/100/1000 Mb/s connections.

■ Verify that you have the correct fiber-optic cable for the distance and port type. Make sure that the connected device ports match and use the same type encoding, optical frequency, and fiber type.

■ Determine if a copper crossover cable was used when a straight-through was required or the reverse. Enable auto-MDIX on the switch, or replace the cable. See Table 11 on page 46 for recommended Ethernet cables.

Link Status

Verify that both sides have a link. A broken wire or a shutdown port can cause one side to show a link even though the other side does not have a link.

A port LED that is on does not guarantee that the cable is functional. It might have encountered physical stress, causing it to function at a marginal level. If the port LED does not turn on:

■ Connect the cable from the switch to a known good device.

■ Ensure that both ends of the cable are connected to the correct ports.

■ Verify that both devices have power.

■ Verify that you are using the correct cable type. See Cables and Adapters, page 86 for information.

■ Look for loose connections. Sometimes a cable appears to be seated but is not. Disconnect the cable, and then reconnect it.

10/100 and 10/100/1000 Port Connections

If a port appears to malfunction:

■ Verify the status of all ports. See Table 8 on page 24 for descriptions of the LEDs and their meanings.

■ Use the **show interfaces** privileged EXEC command to see if the port is error-disabled, disabled, or shut down. Reenable the port if necessary.

■ Verify the cable type. See Cable and Connectors, page 83

SFP Module

Use only Cisco SFP modules. Each Cisco module has an internal serial EEPROM that is encoded with security information. This encoding verifies that the module meets the requirements for the switch.

■ Inspect the SFP module. Exchange the suspect module with a known good module.

■ Verify that the module is supported on this platform. (The switch release notes at www.cisco.com/go/ie2000u-docs list the SFP modules that the switch supports.)

■ Use the **show interfaces** privileged EXEC command to see if the port or module is error-disabled, disabled, or shut down. Reenable the port if needed.

- Make sure that all fiber-optic connections are clean and securely connected.

Interface Settings

Verify that the interface is not disabled or powered off. If an interface is manually shut down on either side of the link, it does not come up until you reenable the interface. Use the **show interfaces** privileged EXEC command to see if the interface is error-disabled, disabled, or shut down on either side of the connection. If needed, reenable the interface.

Ping End Device

Ping from the directly connected switch first, and then work your way back port by port, interface by interface, trunk by trunk, until you find the source of the connectivity issue. Make sure that each switch can identify the end device MAC address in its Content-Addressable Memory (CAM) table.

Spanning Tree Loops

STP loops can cause serious performance issues that look like port or interface problems.

A unidirectional link can cause loops. It occurs when the traffic sent by the switch is received by the neighbor, but the traffic from the neighbor is not received by the switch. A broken cable, other cabling problems, or a port issue can cause this one-way communication.

You can enable UniDirectional Link Detection (UDLD) on the switch to help identify unidirectional link problems. For information about enabling UDLD on the switch, see the *Cisco Layer 2 Switching Software Configuration Guide for Cisco IE 2000U* and the documentation for Cisco Connected Grid Switches on Cisco.com.

Switch Performance

Speed, Duplex, and Autonegotiation

Port statistics that show a large amount of alignment errors, frame check sequence (FCS), or late-collisions errors, might mean a speed or duplex mismatch.

A common issue occurs when duplex and speed settings are mismatched between two switches, between a switch and a router, or between the switch and a workstation or server. Mismatches can happen when manually setting the speed and duplex or from autonegotiation issues between the two devices.

To maximize switch performance and to ensure a link, follow one of these guidelines when changing the duplex or the speed settings:

- Let both ports autonegotiate both speed and duplex.

- Manually set the speed and duplex parameters for the interfaces on both ends of the connection.

- If a remote device does not autonegotiate, use the same duplex settings on the two ports. The speed parameter adjusts itself even if the connected port does not autonegotiate.

Autonegotiation and Network Interface Cards

Problems sometimes occur between the switch and third-party network interface cards (NICs). By default, the switch ports and interfaces autonegotiate. Laptops or other devices are commonly set to autonegotiate, yet sometimes issues occur.

To troubleshoot autonegotiation problems, try manually setting both sides of the connection. If this does not solve the problem, there could be a problem with the firmware or software on the NIC. You can resolve this by upgrading the NIC driver to the latest version.

Cabling Distance

If the port statistics show excessive FCS, late-collision, or alignment errors, verify that the cable distance from the switch to the connected device meets the recommended guidelines. See the Cables and Adapters, page 86.

Resetting the Switch

These are reasons why you might want to reset the switch to the factory default settings:

- You installed the switch in your network and cannot connect to it because you assigned the wrong IP address.

- You want to reset the password on the switch.

Note: Resetting the switch deletes the configuration and reboots the switch.

Caution: If you press the Express Setup button when you power on, the automatic boot sequence stops, and the switch enters bootloader mode.

To reset the switch:

1. Power up the switch and wait a couple of minutes for it to boot up completely.

2. Press and hold the Express Setup button for about 10 seconds.

   The configuration is reset and the system reboots.

   The switch now behaves like an unconfigured switch. You can configure the switch by using the CLI setup procedure described in Configuring the Switch with the CLI-Based Setup Program, page 93.

How to Recover Passwords

Password recovery is a feature that a system administrator can enable or disable. If password recovery is disabled, the only way to recover from a lost or forgotten password is to clear the switch configuration entirely.

Cisco Connected Grid Switches Security Software Configuration Guide provides details about disabling the password recovery feature. *Cisco IOS Basics and File Management for Connected Grid Switches* provides information about the procedure for recovering passwords.

Finding the Switch Serial Number

If you contact Cisco Technical Assistance, you need to know the serial number of your switch. The serial number is on the compliance label on the right-hand side of the switch. See Figure 49 on page 77. You can also use the **show version** privileged EXEC command to obtain the switch serial number.

Figure 49   Serial Number Location for the Cisco IE 2000U Switches

SN: XXXNNNNXXXX

390154

Finding the Switch Serial Number
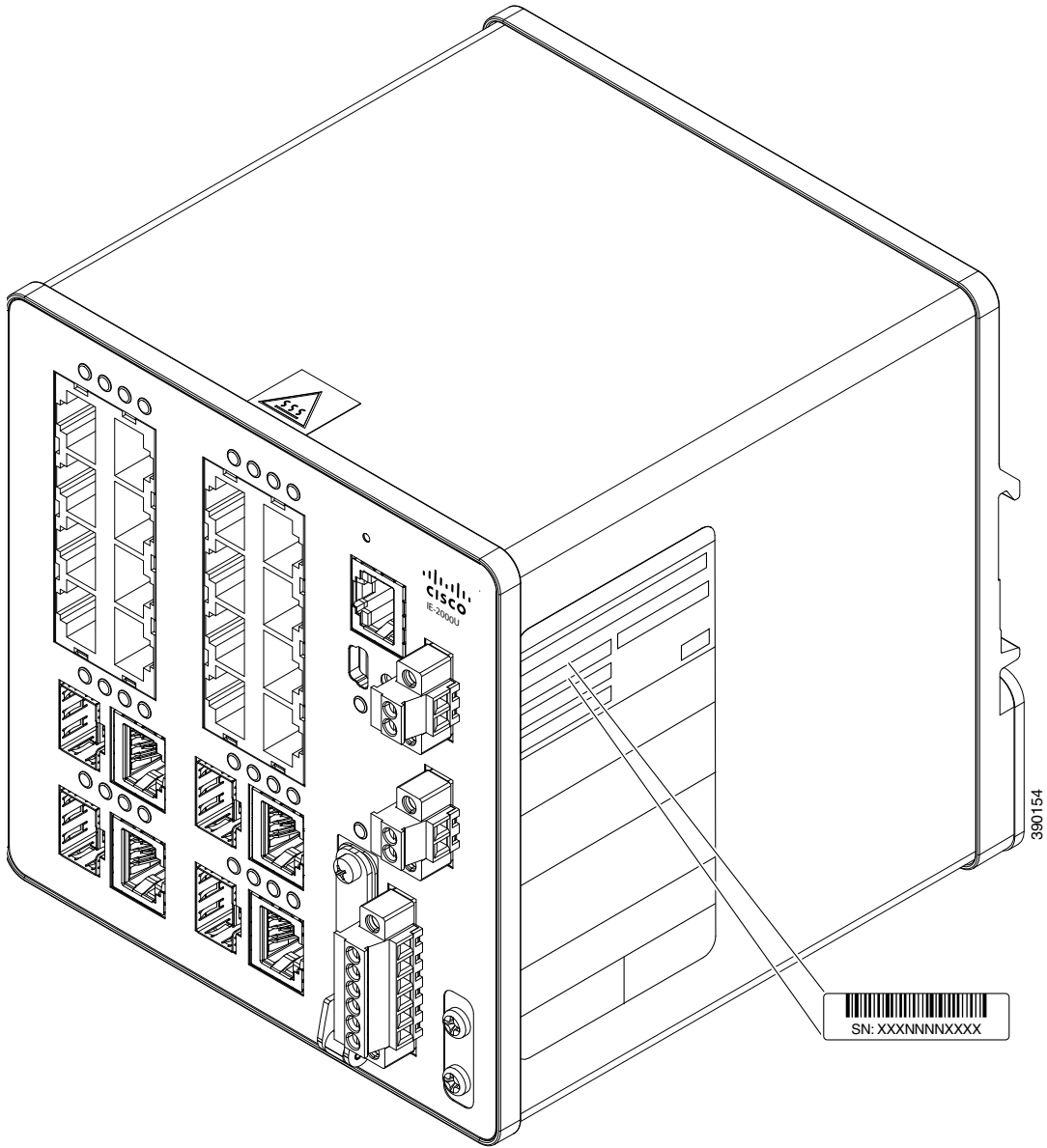
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Technical Specifications

This section provides the technical specification for the Cisco IE 2000U switches.

Operating Temperature Specifications

Table 15 on page 79 lists the operating temperatures for the Cisco IE 2000U switches.

Table 15   Operating Temperature for the Cisco IE 2000U Switches

	Substation
Enclosure types	Vented enclosures For example: NEMA1, IP20, and IP21.
Operating temperature[1] [2]	–40 to 158°F (–40 to 70°C)

1.   Operating temperature ranges provided are based on the stated NEMA standards. The switch is test verified for operation to –40°F/–40°C. There is no safety coverage outside of these parameters.

2.   The IE-2000U-16TC-X model maximum ambient temperature is +65°C due to its conformal coating feature.
The IE-2000U-16TC-GP model maximum ambient temperature is +65°C if powering four PoE+ ports of 30 Watt each.

Note: The safety certifications apply only to ambient temperatures under 140°F (60°C). However, the Cisco IE 2000U switch can function in the substation installations under the environmental conditions shown in Table 16 on page 79.

Technical Specifications

Table 16 on page 79 lists the technical specifications for the Cisco IE 2000U switches.

Table 16   Cisco IE 2000U Switch Technical Specifications

Environmental Ranges	
Operating temperature[1]	-40°C to +74°C ■ -40°C to +70°C (Vented Enclosure Operating) ■ -40°C to +60°C (Sealed Enclosure Operating) ■ -34°C to +74°C (100LFM or more Fan or Blower equipped Enclosure Operating) ■ -40°C to +85°C (Type Tested to +85°C for 16 hours) [2]
Storage temperature	–58 to 185°F (–50 to 85°C)
Operating humidity	5 to 95% (noncondensing)
Operating shock	30 g at 11 ms
Operating altitude[3]	Up to 6562 ft (2000 m)

Technical Specifications

Table 16   Cisco IE 2000U Switch Technical Specifications (continued)

Storage altitude	Up to 40,000 ft (12,192 m)
Power Requirements	

DC input voltage	■ Maximum operating range: 9.6 to 60 VDC
	
	■ Nominal: 12, 24, or 48 VDC
	
	Notes:
	
	■ The DC-input power supply is an SELV circuit, and it can only be connected to another SELV circuit.
	
	■ IE 2000U-16TC-GP may require an additional power input connection to power the PoE ports. This connection requires 48/54 VDC @ 2.5.A.
	
	  – PoE mode: 48 VDC (nominal)/44-57 VDC (absolute range)
	
	  – PoE+ mode: 54VDC (nominal)/50-57 VDC (absolute range)

Maximum DC input current	■ 1 A @ 48 VDC ■ 2 A @ 24 VDC ■ 4 A @ 12 VDC **Note:** Switch models with PoE capability require an additional power input connection to power the PoE ports. This connection requires 48/54 VDC @ 2.5 A.

Power consumption	■ 6-port models—10 W (typical), 13 W (maximum)
	
	  – IE 2000U-4S-G
	
	  – IE 2000U-4T-G
	
	  – IE 2000U-4TS-G
	
	■ 10-port models—14 W (typical), 18 W (maximum)
	
	  – IE 2000U-8TC-G
	
	■ 20-port models—18 W (typical), 23 W (maximum)
	
	  – IE 2000U-16TC-G
	
	  – IE 2000U-16TC-G-X
	
	  – IE 2000U-16TC-GP
	
	Note: Typical power consumption is with a 24 VDC input voltage at a 40° C (104° F) ambient temperature.
	
	Note: Maximum power consumption is the extreme level at any operational DC input voltage over the entire operating temperature range.

Table 16   Cisco IE 2000U Switch Technical Specifications (continued)

Physical Dimensions	
Weight	■ IE 2000U-4S-G: 2.45 lbs (1.11 kg) ■ IE 2000U-4T-G: 2.45 lbs (1.11 kg) ■ IE 2000U-4TS-G: 2.45 lbs (1.11 kg) ■ IE 2000U-8TC-G: 3.45 lbs (1.57 kg) ■ IE 2000U-16TC-G: 4.35 lbs (1.98 kg) ■ IE 2000U-16TC-G-X: 4.35 lbs (1.98 kg) ■ IE 2000U-16TC-GP: 4.35 lbs (1.98 kg)
Dimensions (H x W x D)	For these 6-port models: ■ IE 2000U-4S-G ■ IE 2000U-4T-G ■ IE 2000U-4TS-G The dimensions are: 5.10 x 2.95 x 4.29 in. (13.0 cm x 7.5 cm x 10.9 cm) **Note:** Depth is the distance from the rail; the depth including the rail is 4.51 in. (11.5 cm).
Dimensions (H x W x D)	For this 10-port model: ■ IE 2000U-8TC-G The dimensions are: 5.1 x 3.6 x 5.04 in. (13.0 cm x 9.1 cm x 12.8 cm) **Note:** Depth is the distance from the rail; the depth including the rail is 5.26 in. (13.4 cm).
Dimensions (H x W x D)	For these 20-port models: ■ IE 2000U-16TC-G ■ IE 2000U-16TC-G-X ■ IE 2000U-16TC-GP The dimensions are: 5.1 x 5.0 x 5.04 in. (13.0 cm x 12.7 cm x 12.8 cm) **Note:** Depth is the distance from the rail; the depth including the rail is 5.26 in. (13.4 cm).
Insulation Class	Class III

1. Operating temperatures exceeding 60°C are not covered by the product safety certifications and approvals. However, the switch can function in the installations under the environmental conditions listed.

2. The maximum operating temperature of the switch varies depending on the type of SFP module that you use.

3.   Operating altitude: –200 ft (–60 m) to 10,000 ft (3,000m), de-rate maximum operating temperature per IEEE-1613-2009

Alarm Ratings

Table 17 on page 82 lists the alarm ratings for the Cisco IE 2000 switches.

Table 17   Alarm Input and Output Ratings

Alarm Ratings	Specification
Alarm input electrical specification	No power required—open or closed state detected
Alarm output electrical specification	1.0 A @ 24 VDC or 0.5 A @ 48 VDC

Hazardous Locations Standards

Table 18 on page 82 lists the hazardous location standards for the Cisco IE 2000U switches.

Table 18   Hazardous Locations Standards

Hazardous Locations	Standards
IECEx Test Report	IEC 60079-0 4th Edition IEC 60079-15 5th Edition
ATEX	EN 60079-0:2009 EN 60079-15:2010
North American divisions	ANSI/ISA 12.12.01-2011 CSA C22.2 No. 213-M1987
North American zones	UL 60079-0, 5th Ed, 2009-10-21 UL 60079-15, 3rd Ed, 2009-7-17 CAN/CSA E60079-15: 02

Cable and Connectors

This section provides cable and connector specifications, including the following topics:

Connector Specifications

10/100 Ports

The 10/100 Ethernet ports on switches use RJ-45 connectors. Figure 50 on page 83 shows the pinouts.

Figure 50   10/100 Port Pinouts

Pin	Label	1 2 3 4 5 6 7 8
1	RD+	
2	RD-	
3	TD+	
4	NC	
5	NC	
6	TD-	
7	NC	
8	NC	
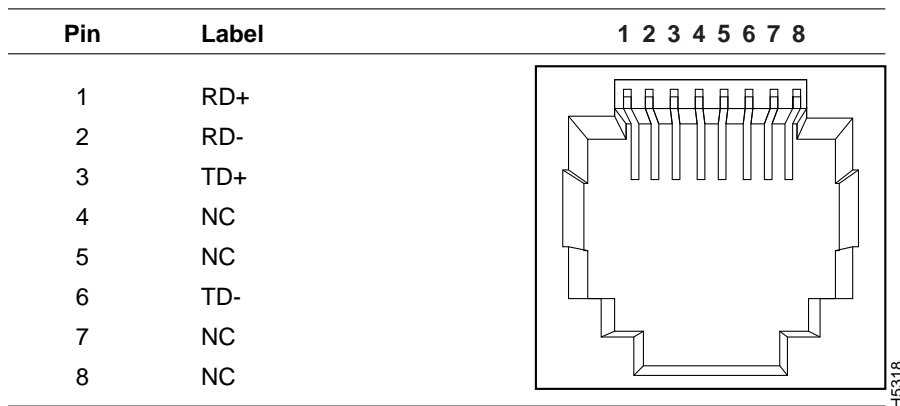
Note: For the IE 2000U model (IE 2000U-16TC-GP) that supports PoE, connector pins 3 and 6 supply +48/+54 VDC and pins 1 and 2 are the DC voltage return lines.

SFP Module Connectors

Figure 51 on page 84 shows the MT-RJ SFP module fiber-optic connector.

Connector Specifications

Figure 51   Fiber-Optic SFP Module LC Connector
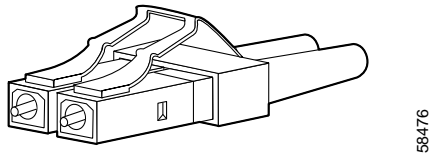
Warning: Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

shows the 1000BASE-T SFP module RJ-45 connector.
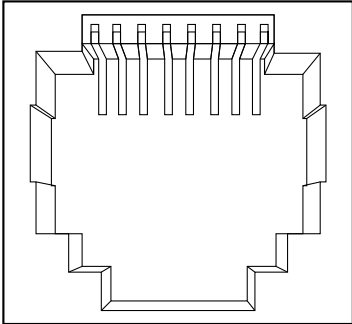
Figure 52   1000BASE-T SFP Module Connector
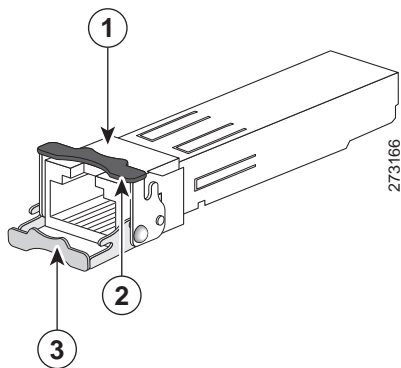
1	RJ-45 connector	**3**	Bale-clasp latching mechanism in the open (unlocked) position
2	Bale-clasp latching mechanism in the closed (locked) position		

Dual-Purpose Ports

The 10/100/1000 Ethernet ports on the dual-purpose ports use RJ-45 connectors. shows the pinouts.

Figure 53   10/100/1000 Port Pinouts

Pin	Label	1 2 3 4 5 6 7 8
1	TP0+	
2	TP0-	
3	TP1+	
4	TP2+	
5	TP2-	
6	TP1-	
7	TP3+	
8	TP3-	

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Console Port

The switch has two console ports: a USB 5-pin mini-Type B port on the front panel (see Figure 54 on page 85) and an RJ-45 console port on the rear panel.

Figure 54   USB Mini-Type B Port

253163
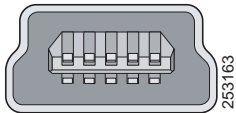
The USB console port uses a USB Type A to 5-pin mini-Type B cable, shown in Figure 55 on page 85. The USB Type A-to-USB mini-Type B cable is not supplied. You can order an accessory kit (part number 800-33434) that contains this cable.

Figure 55   USB Type A-to-USB 5-Pin Mini-Type B Cable

253405
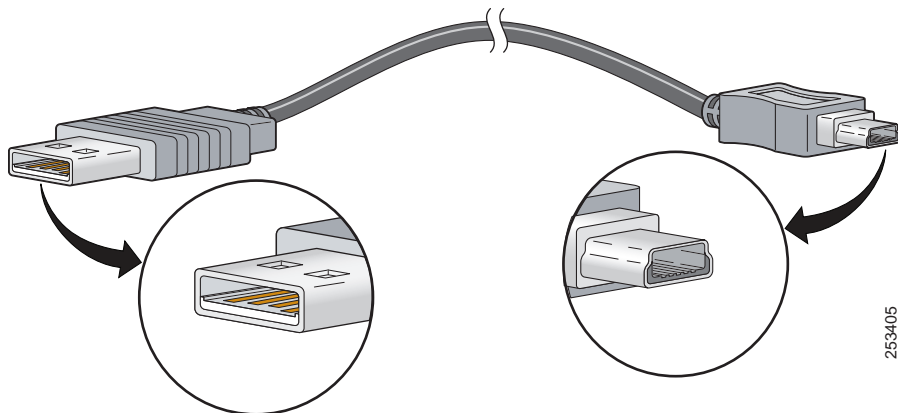
The RJ-45 console port uses an 8-pin RJ-45 connector. (See Table 21 on page 90 and Table 22 on page 91.) The supplied RJ-45-to-DB-9 adapter cable is used to connect the console port of the switch to a console PC. You need to provide an RJ-45-to-DB-25 female DTE adapter if you want to connect the switch console port to a terminal. You can order a kit (part number ACS-DSBUASYN=) containing that adapter. For console port and adapter pinout information, see Table 21 on page 90 and Table 22 on page 91.

Alarm Port

For information on alarm ratings, see the Alarm Ratings, page 82.

The labels for the alarm connector pin-outs are on the switch panel and are displayed in Table 19 on page 86.

Table 19   Alarm Connector Labels (Top to Bottom)

Label	Connection
NO	Alarm Output Normally Open (NO) connection
COM	Alarm Output Common connection
NC	Alarm Output Normally Closed (NC) connection
IN2	Alarm Input 2
REF	Alarm Input Reference Ground connection
IN1	Alarm Input 1

Cables and Adapters

- SFP Module Cables, page 86

- Cable Pinouts, page 89

- Console Port Adapter Pinouts, page 90

SFP Module Cables

Each port must match the wave-length specifications on each end of the cable, and for reliable communications, the cable must not exceed the allowable length. Copper 1000BASE-T SFP transceivers use standard four twisted-pair, CAT5 (or greater) cable at lengths up to 328 feet (100 meters).

Notes

- The maximum operating temperature of the switch varies depending on SFP module type. See Table 2 on page 19 for supported temperature ranges.

- Modal bandwidth applies only to multimode fiber (MMF).

- A mode-field diameter/cladding diameter = 9 micrometers/125 micrometers.

- 1000BASE-LX/LH SFP modules connected with MMF over a short link distance require a mode-conditioning patch cord.

  Ordinary patch cords can cause transceiver saturation, resulting in an elevated bit error rate (BER). Using the 1000BASE-LX/LH SFP module with 62.5-micron diameter multimode fiber (MMF) requires a mode-conditioning patch cord between the single mode fiber (SMF) SFP module and the MMF cable on both the send and receive link ends.

- Link distances greater than 984 feet (300 m) require a mode-conditioning patch cord.

- 1000BASE-ZX SFP modules can send data up to 62 miles (100 km) by using dispersion-shifted SMF or low-attenuation SMF. The distance depends on fiber quality, the number of splices, and the connectors.

- Fiber-optic cable spans less than 15.43 miles (25 km) require a 5-decibel (dB) or 10-dB inline optical attenuator between the fiber-optic cable plant and the receiving port on the 1000BASE-ZX SFP module.

Table 20   Fiber-Optic SFP Module Port Cabling Specifications

SFP Module	Wavelength (nanometers)	Fiber Type	Core Size/Cladding Size (micron)	Modal Bandwidth (MHz/km)	Cable Distance
Industrial and Rugged SFPs					
1000BASE-SX (GLC-SX-MM-RGD)	850	MMF	62.5/125	160	722 feet (220 m)
			62.5/125	200	902 feet (275 m)
			50/125	400	1640 feet (500 m)
			50/125	500	1804 feet (550 m)
1000BASE-LX/LH (GLC-LX-SM-RGD)	1310	MMF	62.5	500	1804 feet (550 m)
			50.0	400	1804 feet (550 m)
			50.0	500	1804 feet (550 m)
		SMF	G.652	–	32,810 feet (10 km)
1000BASE-ZX (GLC-ZX-SM-RGD)	1550	SMF	G.652	–	43.4 to 62 miles (70 to 100 km)
100BASE-FX GLC-FE-100FX-RGD	1310	MMF	50/125	500	6,562 feet (2 km)
			62.5/125	500	6,562 feet (2 km)
100BASE-LX GLC-FE-100LX-RGD	1310	SMF	G.652	–	32,810 feet (10 km)
Commercial SFPs					
1000BASE-BX10-D (GLC-BX-D)	1490 TX 1310 RX	SMF	G.652	–	32,810 feet (10 km)
1000BASE-BX10-U (GLC-BX-U)	1490 TX 1310 RX	SMF	G.652	–	32,810 feet (10 km)
100BASE-FX GLC-FE-100FX	1310	MMF	50/125	500	6,562 feet (2 km)
			62.5/125	500	6,562 feet (2 km)
100BASE-LX GLC-FE-100LX	1310	SMF	G.652	–	32,810 feet (10 km)
100BASE-ZX GLC-FE-100EX	1310	SMF	G.652	–	131,240 feet (40 km)
100BASE-ZX GLC-FE-100ZX	1550	SMF	G.562	–	262,480 feet (80 km)

Cables and Adapters

Table 20   Fiber-Optic SFP Module Port Cabling Specifications (continued)

SFP Module	Wavelength (nanometers)	Fiber Type	Core Size/Cladding Size (micron)	Modal Bandwidth (MHz/km)	Cable Distance
100BASE–BX GLC–FE–100BX–D GLC–FE–100BX–U	1310 TX 1550 RX	SMF	G.562	–	32,810 feet (10 km)
CWDM	1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610	SMF	G.652	–	62 miles (100 km)
Extended temperature SFPs					
100BASE–LX/LH (SFP–GE–L)	1300	MMF or SMF	62.2 50 50 9/10	500 400 500 –	1804 feet (550 m) 1804 feet (550 m) 1804 feet (550 m) 6.2 miles (10 km)
100BASE–SX (SFP–GE–S)	850	MMF	62.5 62.5 50.0 50.0	160 200 400 500	722 feet (220 m) 902 feet (275 m) 1640 feet (500 m) 1804 feet (550 m)
100BASE–ZX (SFP–GE–Z)	1550	SMF SMF	9/10 8	– 	43.5 miles (70 km) 62 miles (100 km)
100BASE–EX (GLC–EX–SMD)	1310	SMF	G.652	–	24.9 miles (40 km)

View the CWDM data sheet at
http://www.cisco.com/en/US/prod/collateral/modules/ps5455/ps6575/product_data_sheet09186a00801a557c_ps4999_Products_Data_Sheet.html

Cable Pinouts

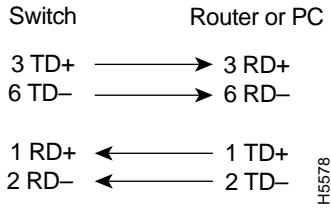**Figure 56   Two Twisted–Pair Straight–Through Cable Schematic for 10/100 Ports**

Switch   Router or PC

3 TD+ ————————➤ 3 RD+
6 TD– ————————➤ 6 RD–

1 RD+ ◀———————— 1 TD+
2 RD– ◀———————— 2 TD–   H5578

Figure 57   Two Twisted–Pair Crossover Cable Schematic for 10/100 Ports

Switch   Switch

3 TD+ ———————— 3 TD+
6 TD– ———————— 6 TD–

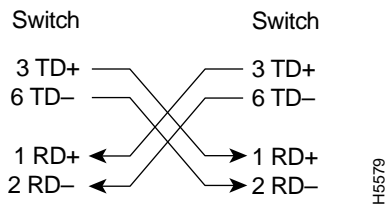1 RD+ ◀———————➤ 1 RD+
2 RD– ◀———————➤ 2 RD–   H5579

Figure 58   Four Twisted–Pair Straight–Through Cable Schematic for 1000BASE-T Ports

Switch   Router or PC

1 TP0+ ◀————————➤ 1 TP0+

2 TP0- ◀————————➤ 2 TP0-

3 TP1+ ◀————————➤ 3 TP1+

6 TP1- ◀————————➤ 6 TP1-

4 TP2+ ◀————————➤ 4 TP2+

5 TP2- ◀————————➤ 5 TP2-

7 TP3+ ◀————————➤ 7 TP3+

8 TP3- ◀————————➤ 8 TP3-   65271
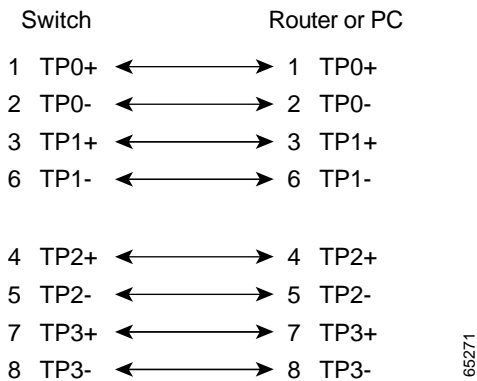
Figure 59   Four Twisted–Pair Crossover Cable Schematics for 1000BASE-T Ports

Switch   Switch

1 TP0+ ◀————————➤ 1 TP0+

2 TP0- ◀————————➤ 2 TP0-

3 TP1+ ◀————————➤ 3 TP1+

6 TP1- ◀————————➤ 6 TP1-

4 TP2+ ◀————————➤ 4 TP2+

5 TP2- ◀————————➤ 5 TP2-

7 TP3+ ◀————————➤ 7 TP3+

8 TP3- ◀————————➤ 8 TP3-   65274

Cables and Adapters
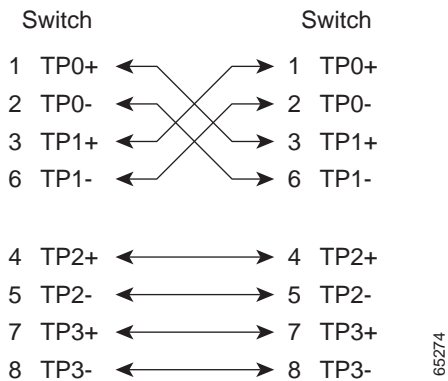
To identify a crossover cable, hold the cable ends side-by-side, with the tab at the back. The wire connected to pin 1 on the left end should be the same color as the wire connected to pin 3 on the right end. The wire connected to pin 2 on the left end should be the same color as the wire connected to pin 6 on the right end.

Figure 60   Identifying a Crossover Cable
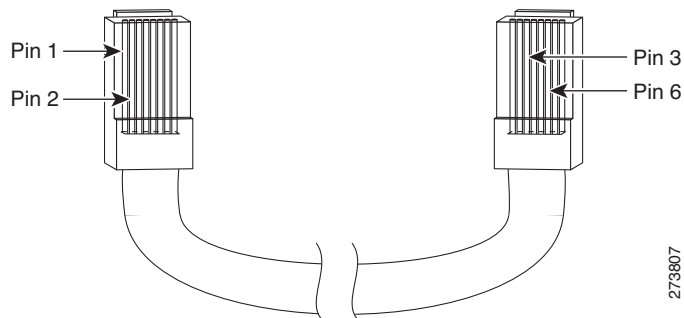
Console Port Adapter Pinouts

The console port uses an 8-pin RJ-45 connector, which is described in Table 21 on page 90 and Table 22 on page 91. If you did not order a console cable, you need to provide an RJ-45-to-DB-9 adapter cable to connect the switch console port to a PC console port. You need to provide an RJ-45-to-DB-25 female DTE adapter if you want to connect the switch console port to a terminal. You can order an adapter (part number ACS-DSBUASYN=). For console port and adapter pinout information, see Table 21 on page 90 and Table 22 on page 91.

Table 21 on page 90 lists the pinouts for the console port, the RJ-45-to-DB-9 adapter cable, and the console device.

Table 21   Console Port Signaling Using a DB-9 Adapter

Switch Console Port (DTE)	RJ-45-to-DB-9 Terminal Adapter	Console Device
Signal	DB-9 Pin	Signal
RTS	8	CTS
DTR	6	DSR
TxD	2	RxD
GND	5	GND
RxD	3	TxD
DSR	4	DTR
CTS	7	RTS

Table 22 on page 91 lists the pinouts for the switch console port, RJ-45-to-DB-25 female DTE adapter, and the console device.

Note: The RJ-45-to-DB-25 female DTE adapter is not supplied with the switch. You can order this adapter from Cisco (part number ACS-DSBUASYN=).

Cables and Adapters

Table 22   Console Port Signaling Using a DB-25 Adapter

Switch Console Port (DTE)	RJ-45-to-DB-25 Adapter	Console Device
Signal	DB-25 Pin	Signal
RTS	5	CTS
DTR	6	DSR
TxD	3	RxD
GND	7	GND
RxD	2	TxD
DSR	20	DTR
CTS	4	RTS

Cables and Adapters

Configuring the Switch with the CLI-Based Setup Program

This section provides a command-line interface (CLI)-based setup procedure for a switch.

Before connecting the switch to a power source, review the safety warnings in Switch Installation, page 29

For installation procedures for mounting your switch, connecting to the switch ports, or connecting to the small form-factor pluggable (SFP) modules, see Switch Installation, page 29

Accessing the CLI Through the Console Port

You can enter Cisco IOS commands and parameters through the CLI. Use one of these options to access the CLI:
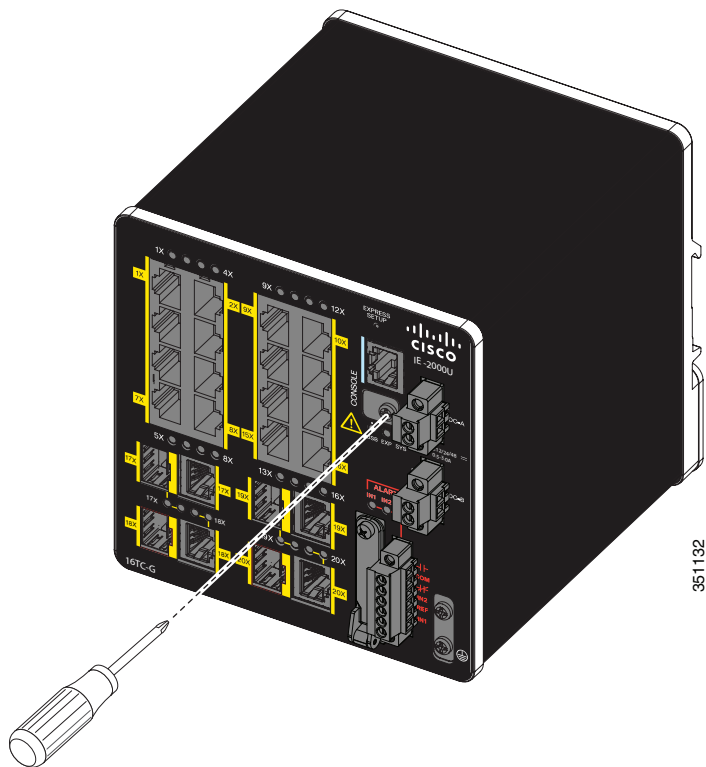
- RJ-45 Console Port, page 94

- USB Mini-Type B Console Port, page 95

Removing the USB Mini-Type B Console Port Cover

To remove the cover from the USB mini-type B console port:

1. Use a Phillips screwdriver to loosen the captive screw on the USB mini-type B console port cover. See Figure 61 on page 94.

2. Remove the cover.

Figure 61   Removing the USB Mini-Type B Console Port Cover

RJ-45 Console Port

1. Connect the RJ-45-to-DB-9 adapter cable to the 9-pin serial port on the PC. Connect the other end of the cable to the switch console port.

2. Start the terminal-emulation program on the PC or the terminal.

   The program, frequently a PC application such as HyperTerminal or ProcommPlus, makes communication between the switch and your PC or terminal possible.

Figure 62   Connecting the Console Cable
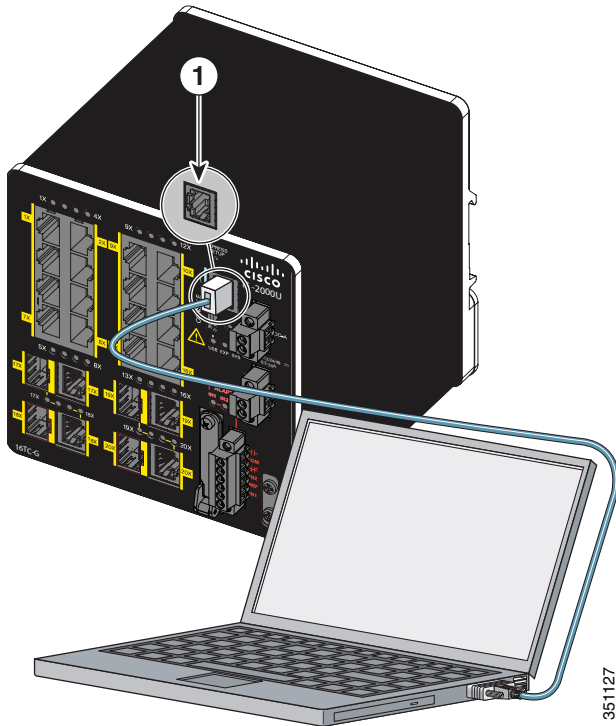
1	RJ-45 console port	2	Console cable (RJ-45-to-DB-9 adapter cable)

3. Configure the baud rate and character format of the PC or terminal to match the console port characteristics:

   – 9600 baud

   – 8 data bits

   – 1 stop bit

   – No parity

   – None (flow control)

4. Connect power to the switch as described in Switch Installation, page 29

   The PC or terminal displays the bootloader sequence.

5. Press **Enter** to display the setup prompt.

6. Follow the steps in the Completing the Setup Program, page 99.

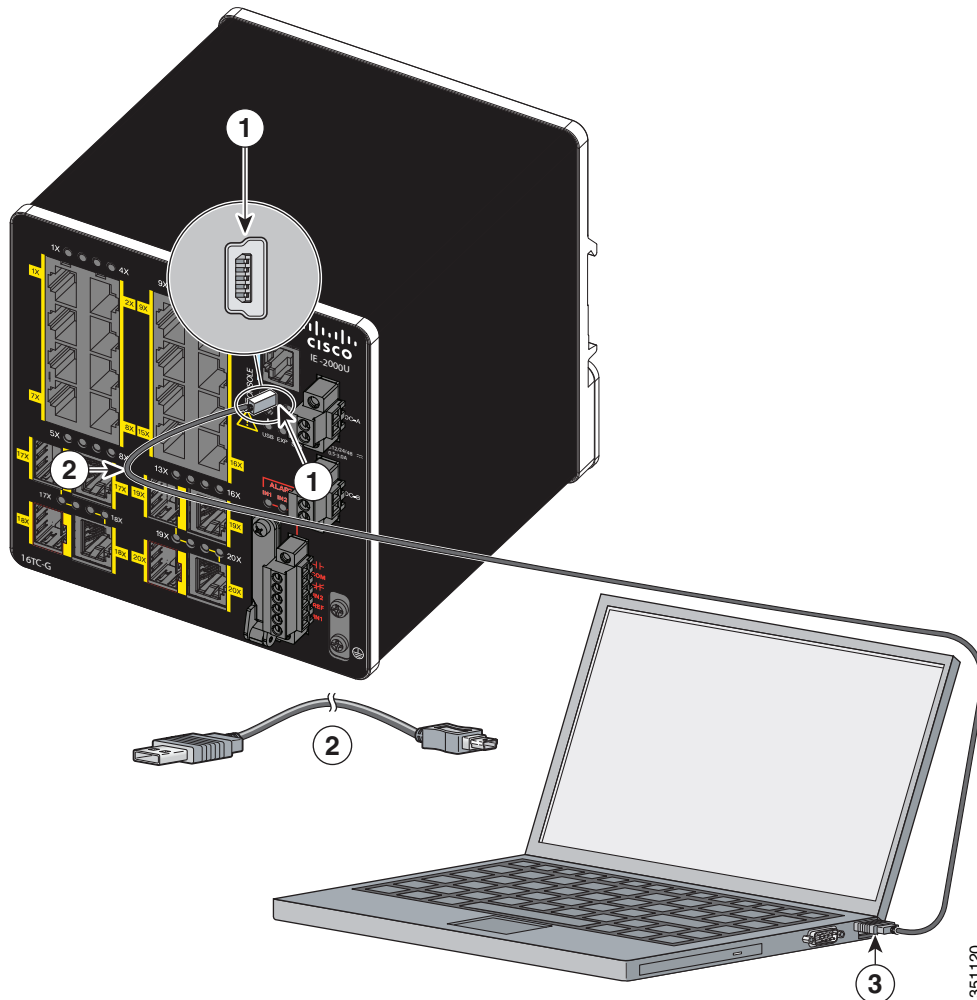# USB Mini-Type B Console Port

If you are connecting the switch USB console port (see Figure 63 on page 96) to a Windows-based PC for the first time, install the USB driver. For installation instructions, see the Installing the Cisco Microsoft Windows USB Device Driver, page 97.

To connect the switch to the USB console port:

1. Connect an USB cable to the PC USB port. See .

Figure 63   Connecting the USB-Mini Console Cable

1	USB-mini console port	3	USB port on the PC
2	USB cable		

2. Connect the other end of the cable to the switch mini-B (5-pin-connector) USB-mini console port.

3. Identify the COM port assigned to the USB-mini console port:

   a. Choose **Start** > **Control Panel** > **Systems.**

   b. Click the **Hardware** tab and choose **Device Manager**. Expand the **Ports** section. The assigned COM port appears in parenthesis at the end of the line with this entry: Cisco USB System Management Console.

4. Start the terminal-emulation program on the PC or the terminal.

   The program, frequently a PC application such as HyperTerminal or ProcommPlus, makes communication possible between the switch and your PC or terminal.

5. Configure the COM port.

6. Configure the baud rate and character format of the PC or terminal to match the console port characteristics:

   – 9600 baud

   – 8 data bits

   – 1 stop bit

   – No parity

   – None (flow control)

7. Connect power to the switch as described in

   The PC or terminal displays the bootloader sequence.

8. Press **Enter** to display the setup prompt.

9. Follow the steps in the .

Installing the Cisco Microsoft Windows USB Device Driver

A USB device driver must be installed the first time a Microsoft Windows-based PC is connected to the USB console port on the switch.

To install the Microsoft Windows USB Device driver:

1. Obtain the Cisco USB console driver file from the Cisco.com web site and unzip it.

   Note: You can download the driver file from the Cisco.com site for downloading the switch software.

2. Follow the documentation included with the driver.

3. Connect the USB cable to the PC and the switch console port.

The USB console port LED turns green, and the Found New Hardware Wizard appears. Follow the instructions to complete the driver installation.

Uninstalling the Cisco Microsoft Windows USB Driver

Use the Windows Add or Remove Programs utility or the setup.exe file:

■

■

Uninstalling the Cisco Microsoft Windows USB Driver Using the Add or Remove Programs Utility

■

■

Uninstalling the Cisco Microsoft Windows XP USB Driver

Note: Disconnect the switch console terminal before uninstalling the driver.

1. Click **Start** > **Control Panel** > **Add or Remove Programs**.

2. Scroll to Cisco Virtual Com, and click **Remove**.

3. When the Program Maintenance window appears, select the **Remove** radio button.

4. Click **Next**.

Uninstalling the Cisco Microsoft Windows Vista and 7 USB Driver

Note: Disconnect the switch console terminal before uninstalling the driver.

1. Click **Start** > **Control Panel** > **Uninstall or change a program**.

2. Select Cisco Virtual Com and click **Uninstall**.

3. When the Programs and Features window appears, click **Yes** to confirm.

Uninstalling the Cisco Microsoft Windows USB Driver Using the Setup.exe Program

Note: Disconnect the switch console terminal before uninstalling the driver.

1. Run setup.exe for Windows 32-bit or setup(x64).exe for Windows 64-bit.

2. Click **Next**.

3. When the InstallShield Wizard for Cisco Virtual Com appears, click **Next**.

4. When the Program Maintenance window appears, select the **Remove** radio button. Click **Next**.

5. When the Remove the Program window appears, click **Remove**.

   Note: For Windows Vista or 7, if a User Account Control warning appears, click **Allow - I trust this program** to proceed.

6. When the InstallShield Wizard Completed window appears, click **Finish**.

Entering the Initial Configuration Information

To set up the switch, you need to complete the setup program, which runs automatically after the switch is powered on. You must assign an IP address and other configuration information necessary for the switch to communicate with the local routers and the Internet. This information is also required if you plan to use Cisco Network Assistant to configure and manage the switch.

IP Settings

You need this information from your network administrator before you complete the setup program:

- Switch IP address

- Subnet mask (IP netmask)

- Default gateway (router)

■ Enable secret password

■ Enable password

■ Telnet password

Completing the Setup Program

To complete the setup program and to create an initial configuration for the switch:

1. Enter **Yes** at these two prompts:

```
Would you like to enter the initial configuration dialog? [yes/no]: yes

At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.

Basic management setup configures only enough connectivity
for management of the system, extended setup will ask you
to configure each interface on the system.

Would you like to enter basic management setup? [yes/no]: yes
```

2. Enter a hostname for the switch, and press **Return**.

On a command switch, the hostname is limited to 28 characters; on a member switch, it is limited to 31 characters. Do not use -*n*, where *n* is a number, as the last character in a hostname for any switch.

```
Enter host name [Switch]: host_name
```

3. Enter an enable secret password, and press **Return**.

The password can be from 1 to 25 alphanumeric characters, can start with a number, is case sensitive, allows spaces, but ignores leading spaces.

The secret password is encrypted, and the enable password is in plain text.

```
Enter enable secret: secret_password
```

4. Enter an enable password, and press **Return**.

```
Enter enable password: enable_password
```

5. Enter a virtual terminal (Telnet) password, and press **Return**.

The password can be from 1 to 25 alphanumeric characters, is case sensitive, allows spaces, but ignores leading spaces.

```
Enter virtual terminal password: terminal-password
```

6. (Optional) Configure Simple Network Management Protocol (SNMP) by responding to the prompts.

You can also configure SNMP later through the CLI or the Cisco Network Assistant application. To configure SNMP later, enter **no**.

```
Configure SNMP Network Management? [no]: no
```

7. Enter the interface name (physical interface or VLAN name) of the interface that connects to the management network, and press **Return**.

For this release, always use **vlan1** as that interface.

```
Enter interface name used to connect to the
management network from the above interface summary: vlan1
```

8. Configure the interface by entering the switch IP address and subnet mask and pressing **Return**.

   Note: The IP address and subnet masks shown here are examples.

```
Configuring interface vlan1:
Configure IP on this interface? [yes]: yes
IP address for this interface: 10.4.120.106
Subnet mask for this interface [255.0.0.0]: 255.0.0.0
```

9. **Enter Y to configure the switch as the cluster command switch. Enter N to configure it as a member switch or as a standalone switch.**

   You can configure the switch as a command switch later through the CLI. To configure it later, enter **no**.

```
Would you like to enable as a cluster command switch? [yes/no]: no
```

   You have now completed the initial configuration of the switch, and the switch displays its initial configuration script:

```
The following configuration command script was created:

hostname Switch
enable secret 5 $1$ZQRe$DPulYXyQLm77v/a4Bmu6Y.
enable password cisco
line vty 0 15
password cisco
no snmp-server
!
!
interface Vlan1
no shutdown
ip address 10.4.120.106 255.0.0.0
!
interface FastEthernet1/1
!
interface FastEthernet1/2
!
interface FastEthernet1/3
!
...(output abbreviated)
!
interface GigabitEthernet1/1
!
interface GigabitEthernet1/2
!
end
```

   These choices appear:

```
[0] Go to the IOS command prompt without saving this config.

[1] Return back to the setup without saving this config.

[2] Save this configuration to nvram and exit.

If you want to save the configuration and use it the next time the switch reboots, save it in NVRAM
by selecting option 2.

Enter your selection [2]:2
```

10. Enter your selection, and press **Return**.

After you complete the setup program, the switch can run the default configuration that you created. If you want to change this configuration or want to perform other management tasks, use the Command-line interface (CLI). To use the CLI, enter commands at the *Switch>* prompt through the console port by using a terminal emulation program or through the network by using Telnet. For configuration information, see the *Cisco Connected Grid Switches System Management Software Configuration Guide*.