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Cisco MDS 9200 Series Hardware Installation Guide

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Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
<http://www.cisco.com>
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Text Part Number: OL-21515-01

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New and Changed Information

The *Cisco MDS 9200 Series Hardware Installation Guide* applies to Cisco MDS NX-OS Release 4.2(1) and earlier Cisco MDS SAN-OS releases.

[Table 1](#) lists the new and changed features available with each supported Cisco MDS NX-OS release and SAN-OS release for the Cisco MDS 9200 Series, with the latest release first.



Note

As of NX-OS Release 4.1(1b), SAN-OS has been changed to NX-OS. References to SAN-OS releases before 4.1(1b) still apply.

Table 1 Documented Features for the Cisco MDS 9200 Series

Feature	Description	Changed in Release	Where Documented
Cisco MDS 48-port		5.0	
Cisco MDS 8-port		5.0	
Cisco MDS 16-Port Storage Services Node (SSN-16)	Added Cisco MDS 16-Port Storage Services Node (SSN-16). The SSN-16 module has 16 1-Gigabit Ethernet ports.	4.2(1)	“Product Overview” chapter.
Cisco MDS 16-Port Storage Services Node (SSN-16) technical specifications	Added Cisco MDS 16-Port Storage Services Node (SSN-16) technical specifications.	4.2(1)	“Technical Specifications” section on page B-1
4/44-port 8-Gbps Host-Optimized Fibre Channel switching module	Added 4/44-port 8-Gbps Host-Optimized Fibre Channel switching module. The switching module offers 48 autosensing 1-, 2-, 4- and 8-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9222i Switches, when running NX-OS 4.1(1b).	4.1(1b)	“Product Overview” chapter.
SFP+ Transceivers	Added the SFP+ transceivers information.	4.1(1b)	“Technical Specifications” section on page B-1

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Table 1 Documented Features for the Cisco MDS 9200 Series (continued)

Feature	Description	Changed in Release	Where Documented
18/4-port Multiservice (MSM-18/4) module	Added information on IPv6 support.	3.3(1a)	The “18/4-Port Multiservice Module” section on page 1-23.
18/4-port Multiservice (MSM-18/4) module	Added information on SAN extension support.	3.3(1a)	The “18/4-Port Multiservice Module” section on page 1-23.
18/4-port Multiservice (MSM-18/4) module	Added the Storage Media Encryption information.	3.2(1)	The “18/4-Port Multiservice Module” section on page 1-23.
Cisco MDS 9222i Mutiservice Modular Switch	Added the new 18/4 Fibre Channel port and 4 Gigabit Ethernet IP services port Multiservice Modular Switch.	3.2(1)	The “Product Overview” section on page 1-1, the “Chassis” section on page 1-3, “Cisco MDS 9222i Integrated Supervisor Module” section on page 1-5, and the “Technical Specifications” section on page B-1.
18/4-port Multiservice (MSM-18/4) module	Added the new 18/4-port Multiprotocol Services module.	3.2(1)	The “18/4-Port Multiservice Module” section on page 1-23 and the “Technical Specifications” section on page B-1.
48-port 4-Gbps Fibre Channel switching module	Added 48-port 4-Gbps Fibre Channel switching module. The switching module offers 48 autosensing 1-, 2-, and 4-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9200 Series Switches.	3.0(1)	The “48-Port 4-Gbps Fibre Channel Switching Module” section on page 1-13 and the “Technical Specifications” section on page B-1.
24-port 4-Gbps Fibre Channel switching module	Added 24-port 4-Gbps Fibre Channel switching module. The switching module offers 24 autosensing 1-, 2-, and 4-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9200 Series Switches.	3.0(1)	The “24-Port 4-Gbps Fibre Channel Switching Module” section on page 1-14 and the “Technical Specifications” section on page B-1.

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Table 1 Documented Features for the Cisco MDS 9200 Series (continued)

Feature	Description	Changed in Release	Where Documented
12-port 4-Gbps Fibre Channel switching module	Added 12-port 4-Gbps Fibre Channel switching module. The switching module can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9200 Series Switches.	3.0(1)	The “12-Port 4-Gbps Fibre Channel Switching Module” section on page 1-15 and the “Technical Specifications” section on page B-1.
4-port 10-Gbps Fibre Channel switching module	Added 4-port 10-Gbps Fibre Channel switching module. The switching module offers four dedicated bandwidth Fibre Channel ports running at 10 Gbps with no oversubscription.	3.0(1)	The “4-Port 10-Gbps Fibre Channel Switching Module” section on page 1-16 and the “Technical Specifications” section on page B-1.
X2 transceiver	Added X2 transceiver. The X2 transceiver is a small form-factor pluggable optimized for 10-Gbps applications.	3.0(1)	The “X2 Fibre Channel Transceivers” section on page 1-38 and the “X2 Transceiver Specifications” section on page B-7.
Fibre Channel SFP transceiver	Added 4-Gbps Fibre Channel SFP transceiver.	3.0(1)	The “Fibre Channel SFP Transceivers” section on page 1-38 and the “Cisco Fibre Channel SFP and SFP+ Transceivers” section on page B-10.
Gigabit Ethernet SFP transceiver	Added Gigabit Ethernet SFP transceiver.	Not release specific	The “Supported Transceivers” section on page 1-37 and the “Cisco Gigabit Ethernet Transceivers” section on page B-22.
32-port Fibre Channel Storage Services Module (SSM)	Added 32-port Fibre Channel Storage Services Module (SSM).	2.0(2b)	The “32-Port Fibre Channel Storage Services Module” section on page 1-28.
14/2-port Multiprotocol Services (MPS-14/2) module	Added 14/2-port Multiprotocol Services module.	2.0(1b)	The “14/2-Port Multiprotocol Services Module” section on page 1-24.

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Preface

This preface describes the audience, organization, and conventions of the *Cisco MDS 9200 Series Hardware Installation Guide*. It also provides information on how to obtain related documentation.

Audience

To use this installation guide, you must be familiar with electronic circuitry and wiring practices and preferably be an electronic or electromechanical technician.

Organization

This guide is organized as follows:

Chapter	Title	Description
Chapter 1	Product Overview	Provides an overview of the Cisco MDS 9200 Series and its components.
Chapter 2	Installing the Cisco MDS 9200 Series	Describes how to install the Cisco MDS 9200 Series, and how to install modules, power supplies, and fan assemblies.
Chapter 3	Connecting the Cisco MDS 9200 Series	Describes how to connect the Cisco MDS 9200 Series, including the modules.
Appendix A	Cabinet and Rack Installation	Provides guidelines for selecting an enclosed cabinet, the procedure for installing a switch using the optional telco and EIA Shelf Bracket Kit.
Appendix B	Technical Specifications	Lists specifications for the Cisco MDS 9200 Series switches and components including modules, power, and transceivers.
Appendix C	Cable and Port Specifications	Lists cable and port specifications for the Cisco MDS 9200 Series.
Appendix D	Site Planning and Maintenance Records	Provides site planning and maintenance records.

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Conventions

This document uses the following conventions for notes, cautions, and safety warnings.

Notes and Cautions contain important information that you should be aware of.



Note

Means *reader take note*. Notes contain helpful suggestions or references to material that are not covered in the publication.



Caution

Means *reader be careful*. You are capable of doing something that might result in equipment damage or loss of data.

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, can cause physical injuries. A warning symbol precedes each warning statement.



Warning

This warning symbol 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. Statement 1071

Waarschuwing

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

Varoitus

Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

Attention

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant causer des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers posés par les circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions d'avertissements figurant dans cette publication, consultez le document *Regulatory Compliance and Safety Information* (Conformité aux règlements et consignes de sécurité) qui accompagne cet appareil.

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Warnung	Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument <i>Regulatory Compliance and Safety Information</i> (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.
Avvertenza	Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento <i>Regulatory Compliance and Safety Information</i> (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.
Advarsel	Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet <i>Regulatory Compliance and Safety Information</i> (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.
Aviso	Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento <i>Regulatory Compliance and Safety Information</i> (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.
¡Advertencia!	Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado <i>Regulatory Compliance and Safety Information</i> (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.
Varning!	Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förekommer i denna publikation i dokumentet <i>Regulatory Compliance and Safety Information</i> (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

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Related Documentation

The documentation set for the Cisco MDS 9000 Family includes the following documents. To find a document online, use the Cisco MDS NX-OS Documentation Locator at:

http://www.cisco.com/en/US/docs/storage/san_switches/mds9000/roadmaps/doclocator.htm

Release Notes

- *Cisco MDS 9000 Family Release Notes for Cisco MDS NX-OS Releases*
- *Cisco MDS 9000 Family Release Notes for MDS SAN-OS Releases*
- *Cisco MDS 9000 Family Release Notes for Storage Services Interface Images*
- *Cisco MDS 9000 Family Release Notes for Cisco MDS 9000 EPLD Images*
- *Release Notes for Cisco MDS 9000 Family Fabric Manager*

Regulatory Compliance and Safety Information

- *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*

Compatibility Information

- *Cisco Data Center Interoperability Support Matrix*
- *Cisco MDS 9000 NX-OS Hardware and Software Compatibility Information and Feature Lists*
- *Cisco MDS NX-OS Release Compatibility Matrix for Storage Service Interface Images*
- *Cisco MDS 9000 Family Switch-to-Switch Interoperability Configuration Guide*
- *Cisco MDS NX-OS Release Compatibility Matrix for IBM SAN Volume Controller Software for Cisco MDS 9000*
- *Cisco MDS SAN-OS Release Compatibility Matrix for VERITAS Storage Foundation for Networks Software*

Hardware Installation

- *Cisco MDS 9500 Series Hardware Installation Guide*
- *Cisco MDS 9100 Series Hardware Installation Guide*
- *Cisco MDS 9124 and Cisco MDS 9134 Multilayer Fabric Switch Quick Start Guide*

Software Installation and Upgrade

- *Cisco MDS 9000 NX-OS Release 4.1(x) and SAN-OS 3(x) Software Upgrade and Downgrade Guide*
- *Cisco MDS 9000 Family Storage Services Interface Image Install and Upgrade Guide*
- *Cisco MDS 9000 Family Storage Services Module Software Installation and Upgrade Guide*

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Cisco NX-OS

- *Cisco MDS 9000 Family NX-OS Licensing Guide*
- *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*
- *Cisco MDS 9000 Family NX-OS System Management Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Fabric Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Quality of Service Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Security Configuration Guide*
- *Cisco MDS 9000 Family NX-OS IP Services Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Intelligent Storage Services Configuration Guide*
- *Cisco MDS 9000 Family NX-OS High Availability and Redundancy Configuration Guide*
- *Cisco MDS 9000 Family NX-OS Inter-VSAN Routing Configuration Guide*

Cisco Fabric Manager

- *Cisco Fabric Manager Fundamentals Configuration Guide*
- *Cisco Fabric Manager System Management Configuration Guide*
- *Cisco Fabric Manager Interfaces Configuration Guide*
- *Cisco Fabric Manager Fabric Configuration Guide*
- *Cisco Fabric Manager Quality of Service Configuration Guide*
- *Cisco Fabric Manager Security Configuration Guide*
- *Cisco Fabric Manager IP Services Configuration Guide*
- *Cisco Fabric Manager Intelligent Storage Services Configuration Guide*
- *Cisco Fabric Manager High Availability and Redundancy Configuration Guide*
- *Cisco Fabric Manager Inter-VSAN Routing Configuration Guide*
- *Cisco Fabric Manager Online Help*
- *Cisco Fabric Manager Web Services Online Help*

Command-Line Interface

- *Cisco MDS 9000 Family Command Reference*

Intelligent Storage Networking Services Configuration Guides

- *Cisco MDS 9000 I/O Acceleration Configuration Guide*
- *Cisco MDS 9000 Family SANTap Deployment Guide*
- *Cisco MDS 9000 Family Data Mobility Manager Configuration Guide*
- *Cisco MDS 9000 Family Storage Media Encryption Configuration Guide*

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- *Cisco MDS 9000 Family Secure Erase Configuration Guide*
- *Cisco MDS 9000 Family Cookbook for Cisco MDS SAN-OS*

Troubleshooting and Reference

- *Cisco NX-OS System Messages Reference*
- *Cisco MDS 9000 Family NX-OS Troubleshooting Guide*
- *Cisco MDS 9000 Family NX-OS MIB Quick Reference*
- *Cisco MDS 9000 Family NX-OS SMI-S Programming Reference*
- *Cisco MDS 9000 Family Fabric Manager Server Database Schema*



CHAPTER 1

Product Overview

The Cisco MDS 9200 Series of multilayer modular fabric switches supports storage area network (SAN) applications. The Cisco MDS 9200 Series switches provide scalability, multitransport capability, security, and manageability to enterprise SANs. The Cisco MDS 9200 Series shares a consistent architecture with the Cisco MDS 9500 Series of multilayer directors, making it an intelligent and flexible fabric switch series. The Cisco MDS 9200 Series includes the Cisco MDS 9222i Multiservice Modular Switch, the Cisco MDS 9216i Multilayer Fabric Switch, and the Cisco MDS 9216A Multilayer Fabric Switch.

The Cisco MDS 9200 Series switch provides the following features:

- An interface module providing local and remote management interfaces for the supervisor module.
- A spare slot for an optional hot-swappable switching or services module.
- Redundant and hot-swappable power supplies and fan modules.
- Power and cooling management and environmental monitoring.
- Switch module port interfaces that support field-replaceable, hot-swappable X2 transceivers.
- Switch module port interfaces that support field-replaceable, hot-swappable small form-factor pluggable (SFP) and enhanced small form-factor pluggable (SFP+) transceivers.
- Nondisruptive code load and activation.
- Redundant and self-monitoring system clocks.

The Cisco MDS 9222i Multiservice Modular Switch provides an 18-port Fibre Channel switching and 4-port Gigabit Ethernet IP services module, and a modular expansion slot to host Cisco MDS 9000 Family Switching and Services modules.

The Cisco 9216i Switch includes a nonremovable supervisor module with an integrated 14-port Fibre Channel and 2-port Gigabit Ethernet switching module. The integrated supervisor module supports IP services on the 2 Gigabit Ethernet ports. It also provides switching and local and remote management.

The Cisco 9216A Switch includes a nonremovable supervisor module with an integrated 16-port Fibre Channel switching module. The integrated supervisor module provides switching and local and remote management.

The Cisco MDS 9200 Series enhances the Cisco MDS 9216 Switch with a flexible backplane that is designed to meet the requirements of future modules in the Cisco MDS 9000 Family, while maintaining backward compatibility with all existing modules. The Cisco MDS 9200 Series is also compatible with all existing Cisco MDS 9216 power supplies and fan trays, and provides a COM1 port interface that is compatible with a standard RJ-45 to DB-9 adapter.

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Note

The Cisco MDS 9200 Series requires Cisco MDS SAN-OS Release 2.x, 3.x, and NX-OS Release 4.1(1b). The Cisco MDS 9222i Switch requires MDS SAN-OS Release 3.x and NX-OS Release 4.1(1b).

The following hot-swappable, field-replaceable modules are supported by the Cisco MDS 9200 Series:

- 48-port 1-, 2-, 4, and 8-Gbps Fibre Channel switching module (**Huashan, DS-X**)
- 16-port Storage Services module (DS-X9316-SSNK9) (available only on the Cisco MDS 9222i Switch)
- 4/44-port 8-Gbps Host-Optimized Fibre Channel switching module (DS-X9248-48K9) (available only on the Cisco MDS 9222i Switch)
- 48-port 4-Gbps Fibre Channel switching module (DS-X9148)
- 24-port 4-Gbps Fibre Channel switching module (DS-X9124)
- 12-port 4-Gbps Fibre Channel switching module (DS-X9112)
- 4-port 10-Gbps Fibre Channel switching module (DS-X9704)
- 32-port 2-Gbps Fibre Channel switching module (DS-X9032)
- 16-port 2-Gbps Fibre Channel switching module (DS-X9016)
- 8-port 1-, 2-, 4-, and 8-Gbps Fibre Channel switching module (**Cassino DS-X**)
- 18/4-port Multiservice (MSM-18/4) module (DS-X9304-18K9)
- 14/2-port Multiprotocol Services (MPS-14/2) module (DS-X9302-14K9)
- 8-port IP Storage Services (IPS-8) module (DS-X9308-SMIP)
- 4-port IP Storage Services (IPS-4) module (DS-X9304-SMIP)
- Storage Services Module (SSM) (DS-X9032-SSM)
- Advanced Services Module (ASM) (DS-X9032-SMV)
- Caching Services Module (CSM) (DS-X9560-SMC)

This chapter includes the following sections:

- [Chassis, page 1-3](#)
- [Integrated Supervisor Modules, page 1-5](#)
- [Interface Modules, page 1-9](#)
- [Cisco MDS 9000 Family Module Compatibility, page 1-11](#)
- [Switching Modules, page 1-11](#)
- [Services Modules, page 1-21](#)
- [Fan Module, page 1-37](#)
- [Supported Transceivers, page 1-37](#)

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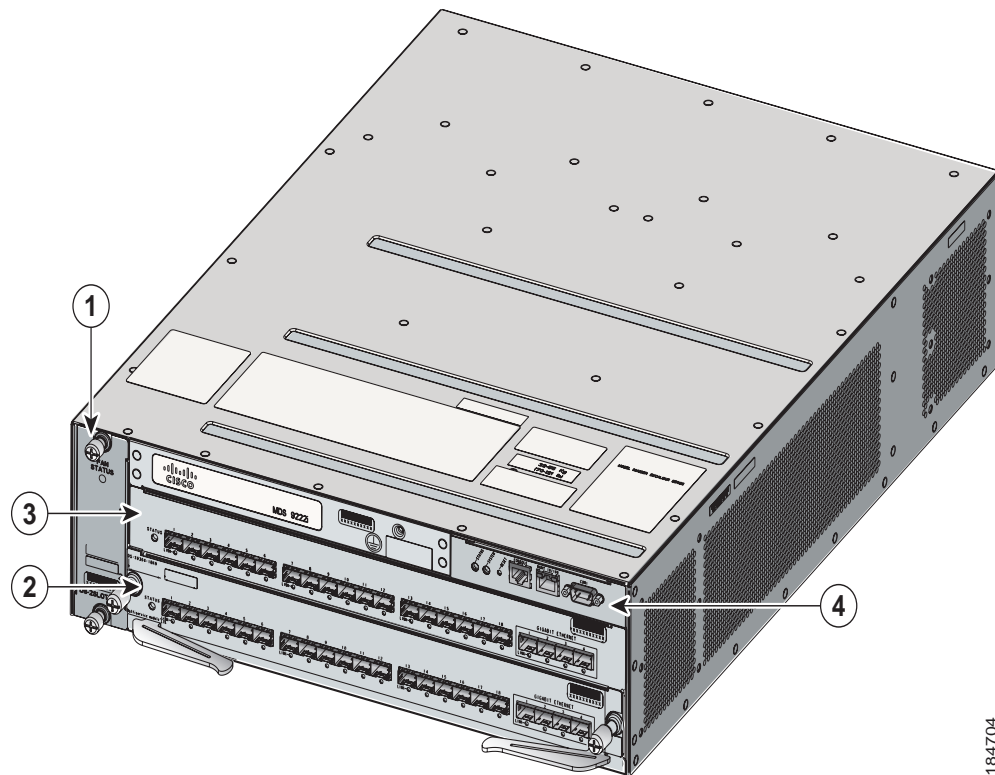
Chassis

The Cisco MDS 9200 Series switches have a two-slot chassis. The Cisco MDS 9222i (see [Figure 1-1](#)) has a nonremovable supervisor module (in slot 1) with an integrated 18-port Fibre Channel switching and 4-port Gigabit Ethernet IP services module, and a modular expansion slot to host Cisco MDS 9000 Family Switching and Services modules. See the “[Cisco MDS 9222i Integrated Supervisor Module](#)” section on page 1-5.

The Cisco MDS 9216i (see [Figure 1-2](#)) has a nonremovable supervisor module (in slot 1) with an integrated 14-port Fibre Channel and 2-port Gigabit Ethernet switching module. See the “[Cisco MDS 9216i Integrated Supervisor Module](#)” section on page 1-6.

The Cisco MDS 9216A (see [Figure 1-3](#)) has a nonremovable supervisor module (in slot 1) with an integrated 16-port Fibre Channel switching module. See the “[Cisco MDS 9216A Integrated Supervisor Module](#)” section on page 1-7.

Figure 1-1 Cisco MDS 9222i Chassis

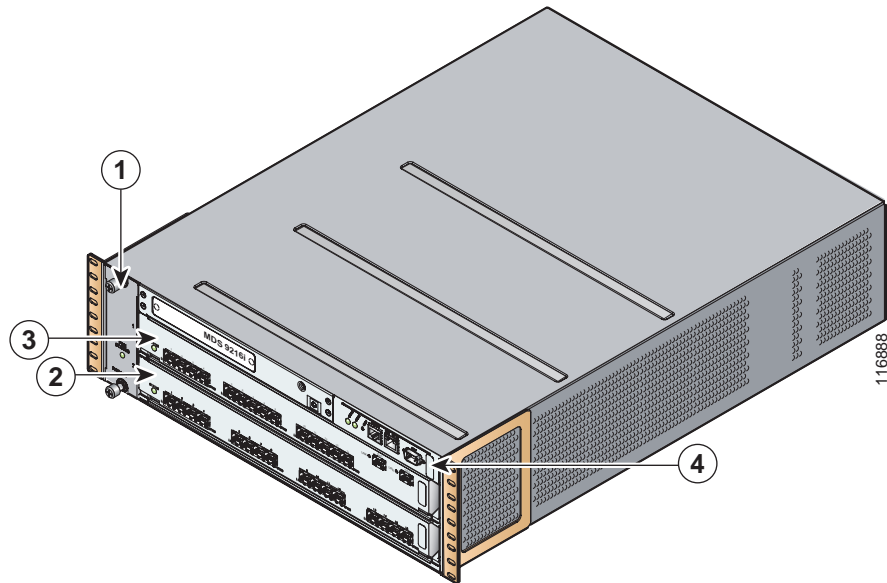


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1	Fan module	3	Supervisor module with integrated 18-port Fibre Channel switching and 4-port Gigabit Ethernet IP Storage Services module
2	Switching module or the services module	4	Interface module

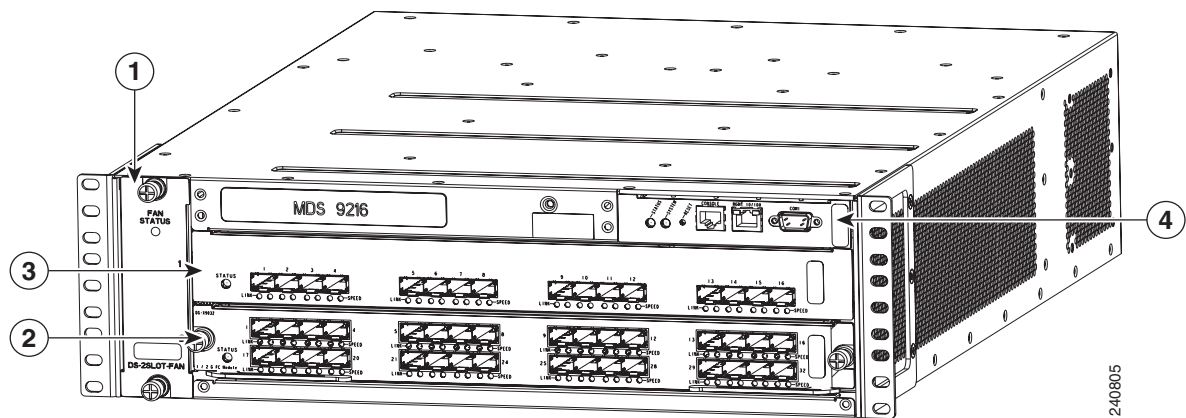
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Figure 1-2 Cisco MDS 9216i Chassis



1	Fan module	3	Supervisor module with integrated 14-port Fibre Channel and 2-port Gigabit Ethernet switching module
2	Switching module or Services module (such as the IPS module)	4	Interface module

Figure 1-3 Cisco MDS 9216A Chassis



1	Fan module	3	Supervisor module with integrated 16-port Fibre Channel switching module
2	Switching module or Services module (such as the IPS module)	4	Interface module

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The Cisco MDS 9200 Series supports the following additional modules:

- The nonremovable interface module (located above the integrated supervisor module), provides the console port (COM1 port) and the MGMT 10/100 Ethernet port for the integrated supervisor module. See the [“Interface Modules” section on page 1-9](#).
- An optional module in the open slot (slot 2).
- Two power supplies that are redundant by default and can be configured to be combined if desired.
- A hot-swappable fan module with four fans provides redundancy. See the [“Fan Module” section on page 1-37](#).

Integrated Supervisor Modules

The Cisco MDS 9200 Series switches have nonremovable integrated supervisor modules in each chassis. These modules include the following:

- [Cisco MDS 9222i Integrated Supervisor Module, page 1-5](#)
- [Cisco MDS 9216i Integrated Supervisor Module, page 1-6](#)
- [Cisco MDS 9216A Integrated Supervisor Module, page 1-7](#)

Cisco MDS 9222i Integrated Supervisor Module

The nonremovable Cisco MDS 9222i integrated supervisor module provides the control and management functions of the Cisco MDS 9222i Switch, and it includes an integrated 18-port Fibre Channel switching and 4-port Gigabit Ethernet IP services module. The Cisco MDS 9222i integrated supervisor module provides multiple communication and control paths to avoid a single point of failure.

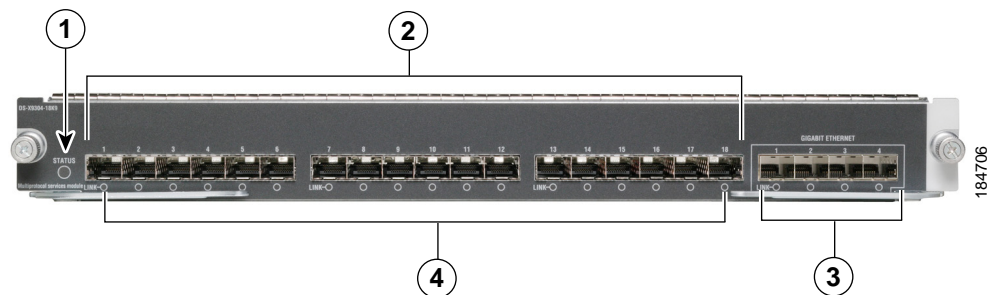


Note

For description of the integrated 18/4-port Multiservice and their capabilities, see the [“18/4-Port Multiservice Module” section on page 1-23](#).

[Figure 1-4](#) shows the Cisco MDS 9222i integrated supervisor module with an integrated 18-port Fibre Channel and 4-port Gigabit Ethernet module.

Figure 1-4 *Cisco MDS 9222i Supervisor Module with Integrated 18-Port Fibre Channel and 4-Port Gigabit Ethernet Module*



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1	Status LED	3	Gigabit Ethernet ports
2	4-Gbps Fibre Channel ports	4	Link LEDs

The Cisco MDS 9222i integrated supervisor module has a PowerPC PowerQUICC III class processor, 1 GB of DRAM, and an internal CompactFlash card that provides 1 GB of storage for software images.

Cisco MDS 9216i Integrated Supervisor Module

The nonremovable Cisco MDS 9216i integrated supervisor module provides the control and management functions for the Cisco MDS 9216i Switch, and it includes an integrated 14-port Fibre Channel switching and 2-port Gigabit Ethernet with IP services module. The Cisco MDS 9216i integrated supervisor module provides multiple communication and control paths to avoid a single point of failure.

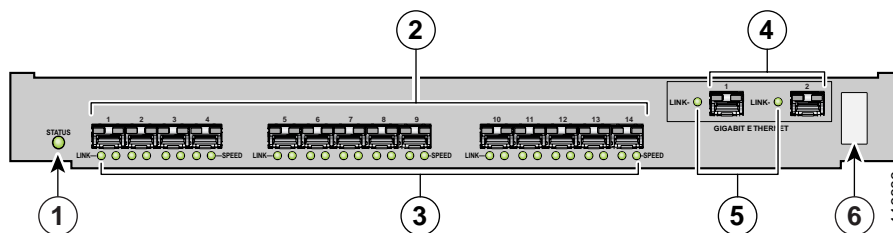


Note

For a description of the integrated 14/2-port Multiprotocol Services module and its capabilities, see the [“14/2-Port Multiprotocol Services Module”](#) section on page 1-24.

Figure 1-5 shows the Cisco MDS 9216i integrated supervisor module with an integrated 14-port Fibre Channel and 2-port Gigabit Ethernet module.

Figure 1-5 Cisco MDS 9216i Supervisor Module with Integrated 14-Port Fibre Channel and 2-Port Gigabit Ethernet Module



1	Status LED	4	Gigabit Ethernet ports
2	1-Gbps/2-Gbps Fibre Channel ports	5	Link LEDs
3	Link LEDs (under ports, on left) and Speed LEDs (under ports, on right)	6	Asset tag

The Cisco MDS 9216i integrated supervisor module has a Pentium III class processor, 1 GB of DRAM, and an internal CompactFlash card that provides 256 MB of storage for software images.

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Cisco MDS 9216A Integrated Supervisor Module

The nonremovable Cisco MDS 9216A integrated supervisor module provides the control and management functions for the Cisco MDS 9216A Switch, and it includes an integrated 16-port switching module. The Cisco MDS 9216A integrated supervisor module provides multiple communication and control paths to avoid a single point of failure.

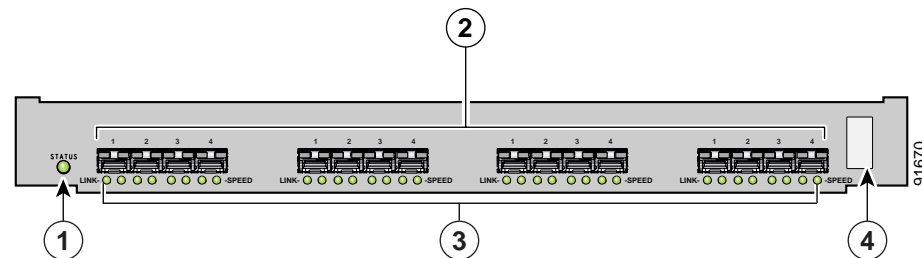


Note

For a description of the integrated 16-port switching module and its capabilities, see the [“16-Port 2-Gbps Fibre Channel Switching Module”](#) section on page 1-18.

Figure 1-6 shows the Cisco MDS 9216A supervisor module with an integrated 16-port Switching module.

Figure 1-6 Cisco MDS 9216A Supervisor Module with Integrated 16-Port Switching Module



1	Status LED	3	Link LEDs (under ports, on left) and Speed LEDs (under ports, on right)
2	1-Gbps/2-Gbps Fibre Channel ports	4	Asset tag

The Cisco MDS 9216A integrated supervisor module has a Pentium III class processor, 1 GB of DRAM, and an internal CompactFlash card that provides 256 MB of storage for software images.

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LEDs on the Cisco MDS 9200 Series Integrated Supervisor Modules

Table 1-1 describes the LEDs for the Cisco MDS 9200 Series integrated supervisor modules.

Table 1-1 LEDs for the Cisco MDS 9200 Series Integrated Supervisor Modules

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage. The system will be shut down after two minutes if this condition is not cleared.
Speed ¹	On	2/4-Gbps mode.
	Off	1-Gbps mode.
Link	Solid green	Link is up.
	Flashing green	Link is up (beacon used to identify port).
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

1. The Speed LEDs are available only on Cisco MDS 9216i and Cisco MDS 9216A Supervisor Modules.

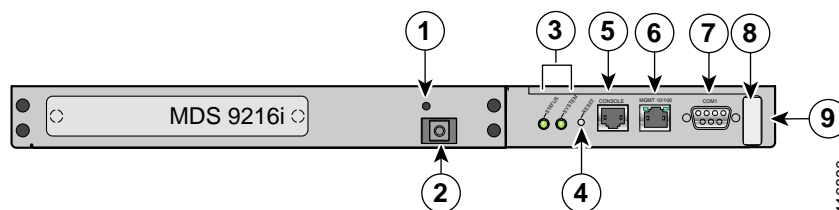
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Interface Modules

The nonremovable interface module is located above slot 1 (see [Figure 1-7](#)) and is identical for all Cisco MDS 9200 Series switches. It provides the following local and remote management interfaces:

- RS-232 (EIA/TIA-232) console port with an RJ-45 connection that you can use to:
 - Configure the switch from the CLI.
 - Monitor network statistics and errors.
 - Configure SNMP agent parameters.
- MGMT 10/100 Ethernet port with an RJ-45 connection that provides network management capabilities.
- RS-232 COM1 port with a DB-9 connector that can be attached to a modem.

Figure 1-7 Nonremoveable Interface Module of the Cisco MDS 9200 Series



1	ESD socket (for ESD strap)	6	MGMT 10/100 Ethernet port (with integrated Link and Activity LEDs)
2	Grounding pad (beneath tape)	7	COM1 port
3	Status and System LEDs	8	Asset tag
4	Reset button	9	Interface module
5	Console port		

The clock module is also part of the interface module.



Note

The system clocks in the Cisco MDS 9200 Series have a field-measured mean time between failures (MTBF) of approximately 3.2 million hours or 365 years. In the event of a clock module failure, the system generates an error message.

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LEDs on the Interface Module

Table 1-2 describes the LEDs for the Cisco MDS 9200 Series interface module.

Table 1-2 LEDs on the Cisco MDS 9200 Series Interface Module

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage.
System	Green	All chassis environmental monitors are reporting OK.
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The power supply failed or the power supply fan failed. Incompatible power supplies are installed. The redundant clock failed.
	Red	The temperature of the supervisor module exceeded the major threshold.
MGMT 10/100 Ethernet Link LED	Green	Link is up.
	Off	No link.
MGMT 10/100 Ethernet Activity LED	Green	Traffic is flowing through port.
	Off	No link or no traffic.

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Cisco MDS 9000 Family Module Compatibility

Table 1-3 lists the hardware modules available and the chassis compatibility associated with them.

Table 1-3 MDS 9000 Modules and Platform Compatibility Matrix

Module	9513	9509	9506	9222i	9216A	9216i	9216
Supervisor-2 module	X	X	X				
Supervisor-1 module		X	X				
16-port Storage Services module (SSN-16)	X	X	X	X			
4/44-port 8-Gbps Host-Optimized Fibre Channel switching module	X	X	X	X			
48-port 1-, 2-, 4, and 8-Gbps Fibre Channel switching modul	X	X	X	X	X	X	X
48-port 4-Gbps Fibre Channel switching module	X	X	X	X	X	X	
24-port 4-Gbps Fibre Channel switching module	X	X	X	X	X	X	
12-port 4-Gbps Fibre Channel switching module	X	X	X	X	X	X	
4-port 10-Gbps Fibre Channel switching module	X	X	X	X	X	X	
32-port 1-Gbps/2-Gbps Fibre Channel module	X	X	X		X	X	X
16-port 1-Gbps/2-Gbps Fibre Channel module	X	X	X		X	X	X
8-port 1-, 2-, 4-, and 8-Gbps Fibre Channel switching modules	X	X	X	X	X	X	X
8-port Gigabit Ethernet IP Storage Services module	X	X	X	X	X	X	X
4-port Gigabit Ethernet IP Storage Services module	X	X	X		X	X	X
32-port Fibre Channel Advanced Services Module (ASM)		X	X		X	X	X
32-port 1-Gbps/2-Gbps Fibre Channel Storage Services Module (SSM)	X	X	X	X	X	X	X
Caching Services Module (CSM)		X	X		X	X	X
18-port Fibre Channel /4-port Gigabit Ethernet Multiservice (MSM-18/4) module	X	X	X	X	X	X	
14-port Fibre Channel/2-port Gigabit Ethernet Multiprotocol Services (MPS-14/2) module	X	X	X		X	X	X

Switching Modules

The Cisco MDS 9200 Series supports the following hot-swappable Fibre Channel switching modules:

- Generation 3 Modules
 - [48-port 8-Gbps Fibre Channel Switching Module](#)
 - [8-port 8-Gbps Fibre Channel Switching Module](#)
 - [4/44-Port 8-Gbps Host-Optimized Fibre Channel Switching Module](#)
- Generation 2 Modules
 - [48-Port 4-Gbps Fibre Channel Switching Module](#)

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- [24-Port 4-Gbps Fibre Channel Switching Module](#)
- [12-Port 4-Gbps Fibre Channel Switching Module](#)
- [4-Port 10-Gbps Fibre Channel Switching Module](#)
- Generation 1 Modules
 - [32-Port 2-Gbps Fibre Channel Switching Module](#)
 - [16-Port 2-Gbps Fibre Channel Switching Module](#)

The Cisco MDS 9200 Series supports one hot-swappable switching or services module in addition to the integrated module that is part of the supervisor module.

The Fibre Channel switching modules provide system-wide power management and autonegotiation, which allows ports to negotiate for speed at the other end of the link. Each module has temperature sensors and an EEPROM that stores serial number and model number information.

The Fibre Channel port interfaces support hot-swappable Fibre Channel SFP and SFP+ transceivers, which can be short wavelength (SWL) or long wavelength (LWL). The port interfaces also support coarse wavelength-division multiplexing (CWDM) and dense wavelength-division multiplexing (DWDM) SFP transceivers, which can be used for extended long wavelength (ELWL) transmission or for coarse wavelength-division multiplexing (CWDM) and dense wavelength-division multiplexing (DWDM). See the [“Supported Transceivers” section on page 1-37](#).

**Note**

The internal bootflash installed on the modules are not field-replaceable units. Do not remove or replace internal bootflash on the modules. Modifying the factory-installed bootflash is not supported.

48-port 8-Gbps Fibre Channel Switching Module

The 48-port 8-Gbps Fibre Channel switching module offers 48 autosensing 1-, 2-, 4- and 8-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9000 Series chassis when running NX-OS 5.0 or later releases.

Major componets of this switch are:

- A Freescale PPC 8548E 1.3GHz processor
- 1 GBDDR2 synchronous DRAM module (VLP MiniDIMM) running at 266MHz with ECC

[Figure 1-8](#) shows a 48-port 8-Gbps Fibre Channel switching module. The front panel connectors are standard modular SFP and the speed detection is autosensing.

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Figure 1-8 **48-port 8-Gbps Fibre Channel Switching Module**

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8-port 8-Gbps Fibre Channel Switching Module

The 8-port 8-Gbps Fibre Channel switching module offers 8 autosensing 1-, 2-, 4- and 8-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9000 Series chassis when running NX-OS 5.0 or later releases.

Figure 1-9 shows an 8-port 8-Gbps Fibre Channel switching module. The front panel connectors are standard modular SFP and the speed detection is autosensing.

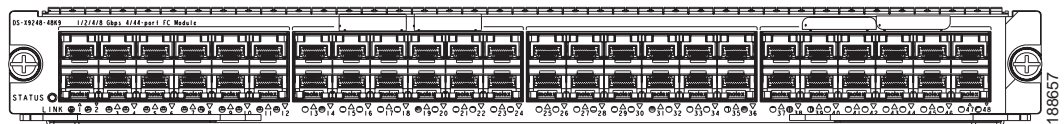
Figure 1-9 8-port 8-Gbps Fibre Channel Switching Module

4/44-Port 8-Gbps Host-Optimized Fibre Channel Switching Module

The 4/44-port 8-Gbps Host-Optimized Fibre Channel switching module offers 48 autosensing 1-, 2-, 4- and 8-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9222i Switches. The 4/44-port switching module can be configured in one of two operational modes: shared bandwidth mode (default) and dedicated bandwidth mode.

Figure 1-10 shows a 4/44-port 8-Gbps Host-Optimized Fibre Channel switching module. The front panel connectors support standard modular SFP and SFP+ transceivers and the speed detection is autosensing.

Figure 1-10 4/44-port 8-Gbps Host-Optimized Fibre Channel Switching Module



48-Port 4-Gbps Fibre Channel Switching Module

The 48-port 4-Gbps Fibre Channel switching module offers 48 autosensing 1-, 2-, and 4-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9222i, 9216i, and 9216A Switches. The 48-port switching module can be configured in one of two operational modes: shared bandwidth mode (default) and dedicated bandwidth mode.

Figure 1-11 shows a 48-port 4-Gbps Fibre Channel switching module. The front panel connectors are standard modular SFP and the speed detection is autosensing.

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Figure 1-11 48-Port 4-Gbps Fibre Channel Switching Module

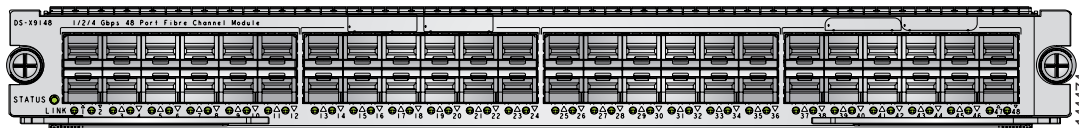
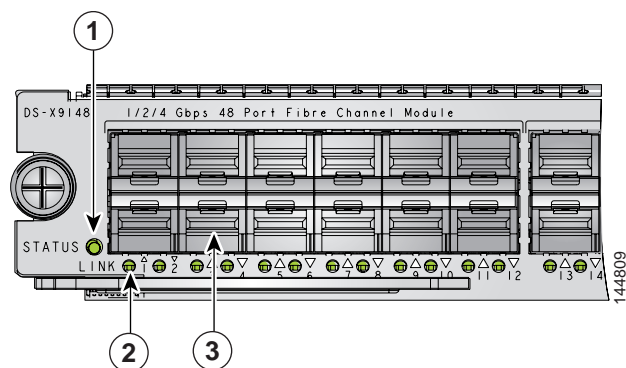


Figure 1-12 shows the port numbering and LEDs on the 48-port 4-Gbps Fibre Channel switching module.

Figure 1-12 48-Port 4-Gbps Fibre Channel Switching Module LEDs



1	Status LED	3	Fibre Channel ports
2	Link LEDs		

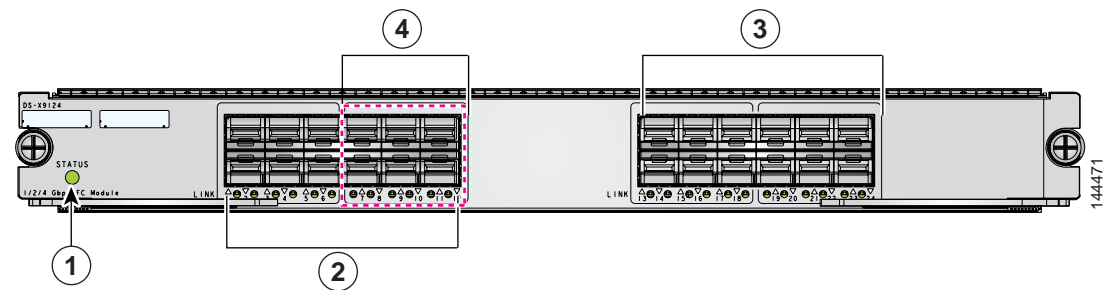
24-Port 4-Gbps Fibre Channel Switching Module

The 24-port 4-Gbps Fibre Channel switching module offers 24 autosensing 1-, 2-, and 4-Gbps Fibre Channel ports and can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9216i and 9216A Switches. The 24-port switching module can be configured in one of two operational modes: shared bandwidth mode (default) and dedicated bandwidth mode.

Figure 1-13 shows a 24-port 4-Gbps Fibre Channel switching module. The front panel connectors are standard modular SFP and the speed detection is autosensing.

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Figure 1-13 24-Port 4-Gbps Fibre Channel Switching Module



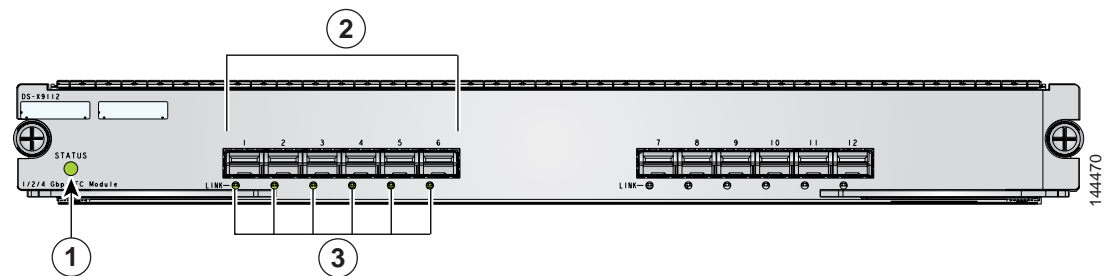
1	Status LED	3	Fibre Channel ports
2	Link LEDs	4	Port Group

12-Port 4-Gbps Fibre Channel Switching Module

The 12-port 4-Gbps Fibre Channel switching module can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9216i and 9216A Switches. The 12-port 4-Gbps switching module is a full-rate mode module providing 12 SFP-based Fibre Channel interfaces. Each interface can support full-line rate operation at 4 Gbps interface speed. The module delivers a sustained data rate of up to 4-Gbps in each direction, on all ports simultaneously, and up to 96-Gbps of continuous, aggregate bandwidth when attached to high-performance servers and storage subsystems.

Figure 1-14 shows a 12-port 4-Gbps Fibre Channel switching module. The front panel connectors are standard modular SFP and the speed detection is autosensing.

Figure 1-14 12-Port 4-Gbps Fibre Channel Switching Module



1	Status LED	3	Link LEDs
2	Fibre Channel ports		

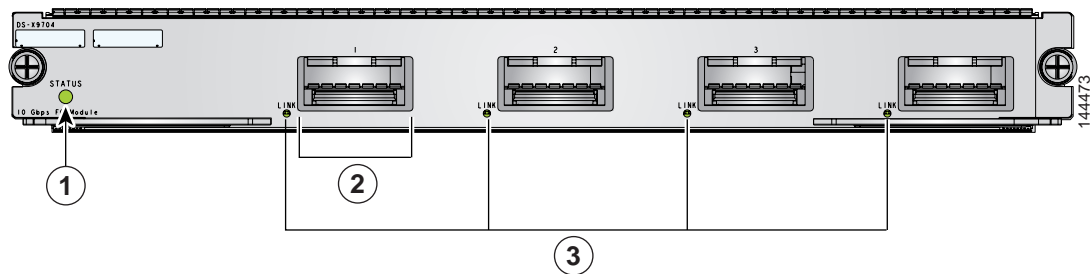
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4-Port 10-Gbps Fibre Channel Switching Module

The 4-port 10-Gbps Fibre Channel switching module offers four dedicated bandwidth Fibre Channel ports running at 10 Gbps with no oversubscription. This module can be used in any of the Cisco MDS 9500 Series chassis and in the Cisco MDS 9216i and 9216A Switches. The module delivers a sustained data rate of up to 10 Gbps in each direction, on all ports simultaneously, and up to 80 Gbps of continuous, aggregate bandwidth.

Figure 1-15 shows a 4-port 10-Gbps switching module. The front panel connectors are standard modular X2 interfaces and the speed is fixed at 10 Gbps.

Figure 1-15 4-Port 10-Gbps Fibre Channel Switching Module



1	Status LED	3	Link LED
2	X2 port interfaces		

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LEDs on the Generation 2 Switching Modules

Table 1-4 describes the LEDs for the 48-port, 24-port, and 12-port 4-Gbps Fibre Channel Switching Modules and the 4-port 10-Gbps Fibre Channel Switching Module.

Table 1-4 LEDs for the Cisco MDS 9000 Family Generation 2 Fibre Channel Switching Modules

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system has exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurs or occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system has exceeded the safe operating temperature limits of the card (a major environmental warning). The card has been shut down to prevent permanent damage.
Link	Solid green	Link is up.
	Intermittent flashing green	Link is up (traffic on port).
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

32-Port 2-Gbps Fibre Channel Switching Module

The 32-port 2-Gbps Fibre Channel switching module can be used to allocate bandwidth optimally. The module is organized into eight four-port groups. Only the first port in each four-port group can be an ISL. If the first port is an ISL, the other three ports in the group are disabled. The four ports within a port group share a single internal channel resulting in a subscription ratio of approximately 3.2:1. The 32-port 2-Gbps switching module provides more ports at a lower price per port. Figure 1-16 shows a 32-port switching module.

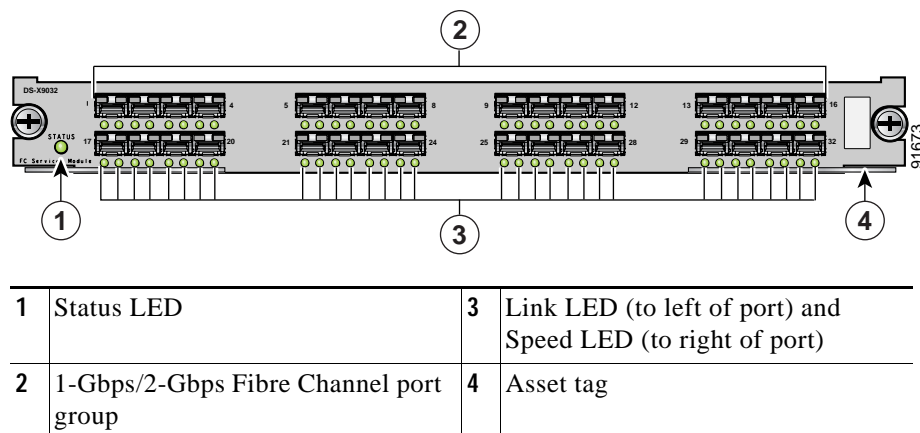
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Tip

For a full 2-Gbps bandwidth between two hosts, connect one host to the first port group and the second host to the second port group.

Figure 1-16 Cisco MDS 9000 Family 32-Port 1-Gbps/2-Gbps Switching Module

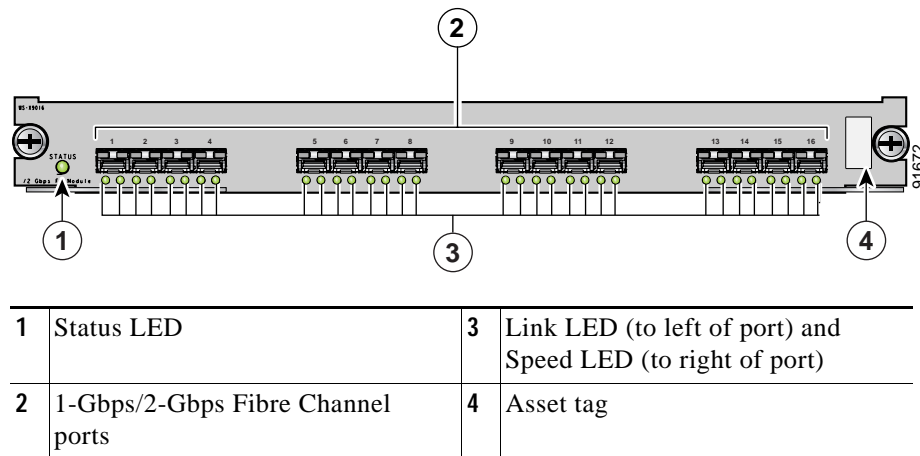


16-Port 2-Gbps Fibre Channel Switching Module

The 16-port 2-Gbps switching module is best used for applications requiring high bandwidth; for example, Inter-Switch Link (ISL) connections between switches and high-performance host or storage controllers. The 16-port switching module supports a sustained data rate of up to 2 Gbps in each direction, on all ports simultaneously. [Figure 1-17](#) shows a 16-port 2-Gbps switching module.

The autosensing 1-Gbps/2-Gbps ports of the 16-port Fibre Channel switching module deliver up to 64 Gbps of continuous, aggregate bandwidth when attached to high-performance servers and storage subsystems.

Figure 1-17 Cisco MDS 9000 Family 16-Port 2-Gbps Switching Module



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Switching Module Features

Each switching module draws its power from the 42 V supplied on the backplane with local DC/DC power converters and regulators.

The control processor on the switching module provides power-on, offline, and online diagnostics. The control processor can be used to configure devices on the switching module and to gather statistical data from each port.

The control processor can determine which slot it is plugged into, and it can monitor its DC/DC power source and temperature. The control processor signals the supervisor module and displays an alarm on its front panel when a problem is detected.

The front panel on the switching module provides basic status information, such as power-on, self-test running, self-test passed, alarm, and ready.

The binary image for the switching module is downloaded from the supervisor module. Prior to the image download, the control processor on the switching module runs from code stored on its local CompactFlash card.



Note

Routine software downloads are not required.

The integrated supervisor module can force a reset on the switching module and controls whether power is applied to the switching module.

If a single component or a set of components on the switching module fails, this does not disable other switching modules if that is the only failure in the system.

Each switching module has a hardware watchdog timer to detect most component failures. The watchdog timer resets the card if it is not serviced periodically.

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LEDs on the Generation 1 Switching Module

Table 1-5 describes the LEDs for the 16-port and 32-port switching modules.

Table 1-5 LEDs for the Cisco MDS 9000 Family Generation 1 Fibre Channel Switching Modules

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system has exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurs or occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system has exceeded the safe operating temperature limits of the card (a major environmental warning). The card has been shut down to prevent permanent damage.
Speed	On	2-Gbps mode.
	Off	1-Gbps mode.
	Steady flashing green	Link is up (beacon used to identify port). ¹
Link	Solid green	Link is up.
	Intermittent flashing green	Link is up (traffic on port).
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

1. The flashing green light turns on automatically when an external loopback is detected that causes the interfaces to be isolated. The flashing green light overrides the beacon mode configuration. The state of the LED is restored to reflect the beacon mode configuration after the external loopback is removed.

The Fibre Channel switching modules provide auto-configuring Fibre Channel ports that support Fibre Channel speeds of 1.0625 Gbps and 2.125 Gbps.

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Services Modules

The Cisco MDS 9200 Series supports the following hot-swappable services modules:

- [16-Port Storage Services Module](#)
- [18/4-Port Multiservice Module](#)
- [14/2-Port Multiprotocol Services Module](#)
- [IP Storage Services Modules](#)
- [32-Port Fibre Channel Storage Services Module](#)
- [32-Port Fibre Channel Advanced Services Module](#)
- [Caching Services Module](#)

The Cisco MDS 9200 Series supports one hot-swappable switching or services module in addition to the integrated module that is part of the supervisor module. Each module has temperature sensors and an EEPROM that stores serial number and model number information.



Note

The internal bootflash installed on the modules are not field-replaceable units. Do not remove or replace internal bootflash on the modules. You cannot modify the factory installed bootflash.

16-Port Storage Services Module

The Cisco MDS 9000 Family 16-port Storage Services module (SSN-16) provides 16-Gigabit Ethernet IP services ports. The SSN-16 module provides 16 1-Gigabit Ethernet ports, and supports features such as I/O Accelerator, Storage Media Encryption and Fiber Channel over IP.

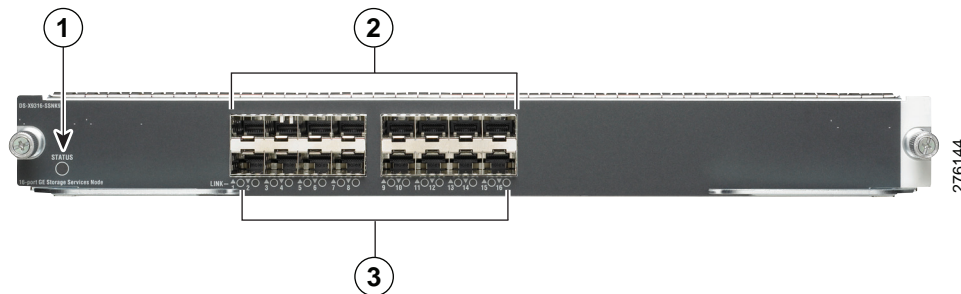
The SSN-16 module acts as a service blade for the storage applications. The module provides 16-Gigabit front panel ports for IPS and for the management of the ISAPI applications. For ISAPI, up to four Gigabit Ethernet ports are used for management of the application. The SSN-16 module provides transparent services to any port in a fabric and does not require additional SAN reconfiguration and rewiring. The module does not require the host or target to be directly attached and provides high availability with multimodule clustering and balancing.

By running four separate, concurrent applications on the SSN-16 module, it can provide the following functions:

- Provides better disaster recovery and continuity solutions for mission-critical applications.
- Minimizes the number of devices required, which improves the reliability.
- Consolidates the management with a single module, which provides end-to-end visibility.
- Provides optimized performance.

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Figure 1-18



1	Status LED	3	Link LEDs
2	16-Gigabit Ethernet IP services ports		

The SSN-16 module provides the following features:

- FCIP for remote SAN extension
 - Simplifies data protection and business continuance strategies by enabling backup, remote replication, and other disaster-recovery services over WAN distances using open-standard FCIP tunneling.
 - Optimizes utilization of WAN resources for backup and replication by enabling hardware-based compression, hardware-based encryption, FCIP write acceleration, and FCIP tape read and write acceleration.
 - Preserves the Cisco MDS 9000 Family switch enhanced capabilities, including VSANs, advanced traffic management, and security, across remote connections.
- Integrated IP storage services in a high density form factor

The module supports 16-Gigabit Ethernet ports for FCIP. Individual ports can be configured with hot-swappable shortwave, longwave small form-factor pluggables (SFPs).

- Integrated hardware-based virtual SANs (VSANs) and Inter-VSAN Routing (IVR)

The module enables deployment of large-scale multisite and heterogeneous SAN topologies. Integration into port-level hardware allows any port within a system or fabric to be partitioned into any VSAN. Integrated hardware-based IVR provides line-rate routing between any ports within a system or fabric without the need for external routing appliances.

- Intelligent network services

The module uses VSAN technology for hardware-enforced, isolated environments within a single physical fabric, access control lists (ACLs) for hardware-based intelligent frame processing, and advanced traffic management features such as Fibre Channel congestion control and fabric-wide quality of service (QoS) to facilitate migration from SAN islands to enterprise-wide storage networks.

- Sophisticated diagnostics

The module provides intelligent diagnostics, protocol decoding, and network analysis tools as well as integrated Call Home capability for added reliability, faster problem resolution, and reduced service costs.

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- Comprehensive network security framework

The module supports RADIUS and TACACS+, Fibre Channel Security Protocol (FC-SP), Secure File Transfer Protocol (SFTP), Secure Shell (SSH) Protocol, and Simple Network Management Protocol Version 3 (SNMPv3) implementing AES, VSANs, hardware-enforced zoning, ACLs, and per-VSAN role-based access control (RBAC). RBAC provides separate control over management functions and access on a per-VSAN basis, enabling separation of duties among administrators on the same physical switch. Gigabit Ethernet ports support IPsec authentication, data integrity, and hardware-assisted data encryption.

- IP version 6 (IPv6) support

The module supports IPv6 as mandated by the U.S. Department of Defense (DoD), Japan, and China. IPv6 support is provided for FCIP and management traffic routed in-band and out-of-band.

18/4-Port Multiservice Module

The Cisco MDS 9000 Family 18/4-Port Multiservice (MSM-18/4) module provides 18 autosensing 1-, 2-, and 4-Gbps Fibre Channel ports and four Gigabit Ethernet IP services ports. The MSM-18/4 module provides multiprotocol capabilities such as Fibre Channel, Fibre Channel over IP (FCIP), Small Computer System Interface over IP (iSCSI), IBM Fiber Connectivity (FICON), and FICON Control Unit Port (CUP) management.

The MSM-18/4 module provides 18 4-Gbps Fibre Channel interfaces for high-performance SAN and mainframe connectivity and four Gigabit Ethernet ports for FCIP and iSCSI storage services. Individual ports can be configured with hot-swappable short wavelength, long wavelength, extended-reach, coarse wavelength-division multiplexing (CWDM) or dense wavelength-division multiplexing (DWDM) Small Form-Factor Pluggables (SFPs) for connectivity up to 125 miles (200 km).

The MSM-18/4 module can minimize latency for disk and tape through FCIP write acceleration and FCIP tape write and read acceleration. The MSM-18/4 module provides up to 16 virtual Inter-Switch Link (ISL) connections on the four 1-Gigabit Ethernet ports through tunneling, and provides up to 4095 buffer-to-buffer credits that can be assigned to a single Fibre Channel port.

The MSM-18/4 supports hardware-based encryption and it is required to run the Storage Media Encryption (SME), which is a part of the Cisco NX-OS. For more information on SME, see the *Cisco MDS 9000 Family Storage Media Encryption Guide*.

The MSM-18/4 supports SAN extension over IP and is compatible with current SAN extension products, such as, MPS-14/2, 9216i, and IPS. The MSM-18/4 provides an integrated next generation 4-Gbps FC platform for SAN extension. The MSM-18/4 module supports Internet Protocol version 6 (IPv6) as mandated by the U.S. Department of Defense (DoD), Japan, and China. The IPv6 support is provided for FCIP, iSCSI, and management traffic routed in-band and out-of-band.

The MSM-18/4 module provides intelligent diagnostics, protocol decoding, and network analysis tools with the integrated Call Home capability.

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LEDs on the 18/4-Port Multiservice Module

Table 1-6 describes the LEDs for the Cisco MDS 9000 Family 18/4-Port Multiservice module.

Table 1-6 LEDs for the Cisco MDS 9000 Family 18/4-Port Multiservice Modules

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage.
Link	Solid green	Link is up.
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

14/2-Port Multiprotocol Services Module

The 14/2-port Multiprotocol Services (MPS-14/2) module provides 14 1-Gbps/2-Gbps Fibre Channel autosensing ports and two 1-Gigabit Ethernet ports for iSCSI and FCIP over Gigabit Ethernet. The MPS-14/2 module supports the intelligent features available on other modules, including VSANs, security, and traffic management.

The 14 1-Gbps/2-Gbps autosensing Fibre Channel ports (labeled 1 through 14) are best used for applications requiring high bandwidth; for example, Inter-Switch Link (ISL) connections between switches and high-performance host or storage controllers. Each Fibre Channel port supports a sustained data rate of up to 2 Gbps in each direction.

The Cisco MDS 9216 Switch supports one MPS-14/2 module. The two Gigabit Ethernet ports (labeled 1 and 2) provide 1-Gbps throughput for IP services, including iSCSI and FCIP over Gigabit Ethernet. The MPS-14/2 also supports hardware-based encryption and compression for these Gigabit Ethernet ports. This hardware-based encryption handles the computationally intensive IPsec feature for IP services.

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The MPS-14/2 modules support FCIP compression to maximize the effective WAN bandwidth of SAN extension solutions. It achieves up to a 30-to-1 compression ratio, with typical ratios of 2-to-1 over a wide variety of data sources. With the addition of hardware-based compression, the MPS-14/2 module is able to provide optimal levels of compressed throughput for implementations across low-to-high-bandwidth links.

The Gigabit Ethernet ports on the MPS-14/2 module support the iSCSI protocol, the FCIP protocol, or both protocols simultaneously. For information about configuring the ports, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

The Fibre Channel port interfaces support hot-swappable Fibre Channel SFP transceivers, which can be short wavelength (SWL) for connectivity up to 1640 feet (500 meters), or long wavelength (LWL) for connectivity up to 6.2 miles (10 km). All interfaces are autosensing 1-Gbps or 2-Gbps compatible. The port interfaces also support coarse wavelength-division multiplexing (CWDM) SFP transceivers, which can be used for extended long wavelength (ELWL) transmission or for CWDM. See the “[Supported Transceivers](#)” section on page 1-37.

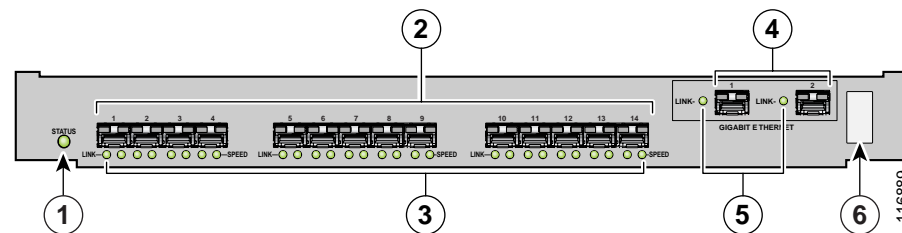


Note

Cisco MDS 9200 Series switches running Cisco MDS SAN-OS Release 2.x, 3.x, and NX-OS Release 4.1(1b) support the MPS-14/2 module.

Figure 1-19 Cisco MDS 9000 Family MPS-14/2 module.

Figure 1-19 Cisco MDS 9000 Family MPS-14/2 Module



1	Status LED	4	Gigabit Ethernet ports
2	1-Gbps/2-Gbps Fibre Channel ports	5	Link LEDs
3	Link LEDs (under ports, on left) and Speed LEDs (under ports, on right)	6	Asset tag

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LEDs on the 14/2-Port Multiprotocol Services Module

Table 1-7 describes the LEDs for the MPS-14/2 modules.

Table 1-7 LEDs for the Cisco MDS 9000 Family MPS-14/2 Modules

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage.
Speed	On	2-Gbps mode.
	Off	1-Gbps mode.
	Flashing green	Link is up (beacon used to identify port).
Link	Solid green	Link is up.
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

IP Storage Services Modules

The 8-port and 4-port IP Storage services (IPS-8 and IPS-4) modules provide eight or four 1-Gigabit Ethernet ports for iSCSI as well as FCIP over Gigabit Ethernet, and they support the intelligent features available on other modules, including VSANs, security, and traffic management.

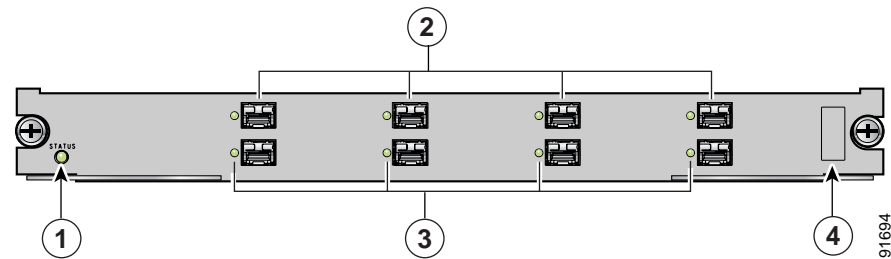
The IPS module ports support the iSCSI protocol, the FCIP protocol, or both protocols simultaneously. For information about configuring the ports, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

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The Fibre Channel port interfaces support hot-swappable Fibre Channel SFP transceivers, which can be short wavelength (SWL) for connectivity up to 1640 feet (500 meters), or long wavelength (LWL) for connectivity up to 6.2 miles (10 km). The port interfaces also support coarse wavelength-division multiplexing (CWDM) SFP transceivers, which can be used for extended long wavelength (ELWL) transmission or for CWDM. See the “Supported Transceivers” section on page 1-37.

Figure 1-20 shows an IPS-8 module.

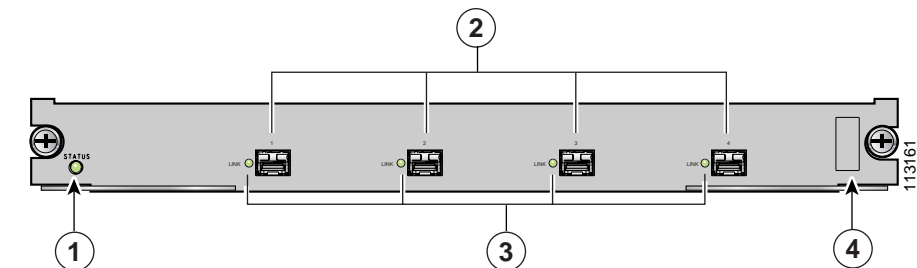
Figure 1-20 Cisco MDS 9000 Family IPS-8 Module



1	Status LED	3	Link LEDs
2	Gigabit Ethernet ports	4	Asset tag

Figure 1-21 shows an IPS-4 module.

Figure 1-21 Cisco MDS 9000 Family IPS-4 Module



1	Status LED	3	Link LEDs
2	Gigabit Ethernet ports	4	Asset tag

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LEDs on IP Storage Services Module

Table 1-8 describes the LEDs for the IPS module.

Table 1-8 LEDs for the Cisco MDS 9000 Family IPS Modules

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage.
Link	Solid green	Link is up.
	Flashing green	Link is up (beacon used to identify port).
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

32-Port Fibre Channel Storage Services Module

The 32-port Fibre Channel Storage Services Module (SSM) for the Cisco MDS 9000 Family supports up to 32 Fibre Channel ports, provides distributed intelligent storage services, and supports future storage services.



Note

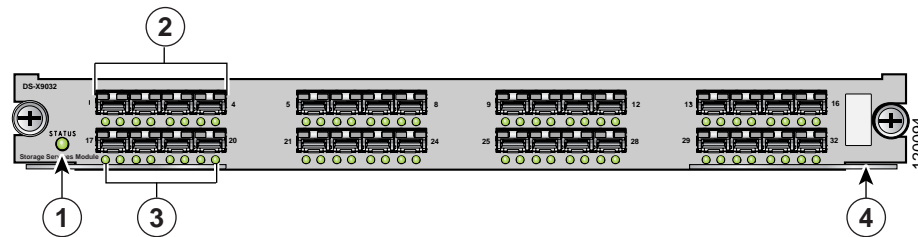
Cisco MDS 9200 Series switches running Cisco MDS SAN-OS Release 2.x, 3.x, and NX-OS Release 4.1(1b) support the SSM.

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The Fibre Channel ports support hot-swappable Fibre Channel SFP transceivers, which can be short wavelength (SWL) for connectivity up to 1050 feet (500 m), or long wavelength (LWL) for connectivity up to 6.2 miles (10 km). All interfaces are autosensing 1-Gbps or 2-Gbps compatible. The ports also support coarse wavelength-division multiplexing (CWDM) SFP transceivers, which can be used for extended long wavelength (EWL) transmission or for CWDM. For more information about SFP transceivers, see the “Supported Transceivers” section on page 1-37.

Figure 1-22 shows the SSM, which has the part number DS-X9032-SSM on the left side.

Figure 1-22 Cisco MDS 9000 Family SSM



1	Status LED	3	Link and speed LEDs
2	1-Gbps/2-Gbps Fibre Channel port group	4	Asset tag

Each module draws power from the 42 V supplied on the backplane with local DC/DC power converters and regulators.

The control processor on the module provides power-on, offline, and online diagnostics. The control processor can be used to configure devices on the switching module and to gather statistical data from each port.

The control processor monitors the DC/DC power source and temperature. The control processor signals the supervisor module and displays an alarm on its front panel when it detects a problem.

The front panel on the services module provides basic status information, such as power-on, self-test running, self-test passed, alarm, and ready.

The binary image for the services module is downloaded from the supervisor module. Prior to the image download, the control processor on the services module runs from the code stored on its local CompactFlash card. The image for an SSM can be specified using the SSI boot variable. For more information on how to specify the SSI boot variable, see the *Cisco MDS 9000 Family NX-OS High Availability and Redundancy Configuration Guide*.



Note

Software downloads are only necessary when a revision of the code is needed.

The supervisor module can force a reset on the services module and controls whether or not power is applied to the switching module.

If a single component or a set of components on the switching module fails, this failure does not disable another switching module if that is the only failure in the system.

For the detection of most component failures, each switching module has a hardware watchdog timer that resets the card if it is not serviced periodically.

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LEDs on the Storage Services Module

Table 1-9 describes the LEDs for the Cisco MDS 9000 Family Storage Services Module.

Table 1-9 LEDs for the Cisco MDS 9000 Family Storage Services Module

LED	Status	Description
Status	Green	All diagnostics pass. The module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To assure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurs or occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage.
Speed	On	2-Gbps mode.
	Off	1-Gbps mode.
Link	Solid green	Link is healthy.
	Steady flashing green	Link is healthy and beacon is enabled.
	Intermittent flashing green	Link is up and traffic is flowing through port.
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

32-Port Fibre Channel Advanced Services Module

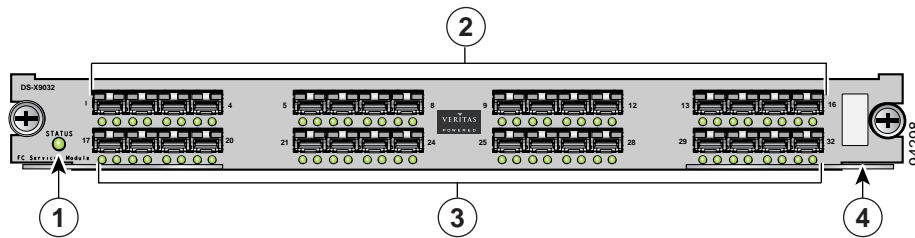
The Cisco MDS 9000 Family 32-Port Fibre Channel Advanced Services Module (ASM) enables pooling of heterogeneous storage for increased storage utilization, simplified storage management, and reduced total cost of storage ownership. The ASM incorporates all the capabilities of the Cisco MDS 9000 DS-X9032 Fibre Channel switching module and also provides scalable, in-band storage virtualization services. The ASM module makes it possible to allocate bandwidth optimally.

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The Fibre Channel port interfaces support hot-swappable Fibre Channel SFP transceivers, which can be SWL for connectivity up to 1640 feet (500 meters), or LWL for connectivity up to 6.2 miles (10 km). All interfaces are autosensing 1-Gbps or 2-Gbps compatible. The port interfaces also support CWDM SFP transceivers, which can be used for extended long wavelength (ELWL) transmission or for CWDM. See the “Supported Transceivers” section on page 1-37.

Figure 1-23 shows the Cisco MDS 9000 Family Fibre Channel ASM.

Figure 1-23 Cisco MDS 9000 Family ASM



1	Status LED	3	Link and Speed LEDs
2	1-Gbps/2-Gbps Fibre Channel port group	4	Asset tag

Each module draws power from the 42 V supplied on the backplane with local DC/DC power converters and regulators.

The control processor on the module provides power-on, offline, and online diagnostics. The control processor can be used to configure devices on the switching module and to gather statistical data from each port.

The control processor monitors the DC/DC power source and temperature. The control processor signals the supervisor module and displays an alarm on its front panel when a problem is detected.

The front panel on the services module provides basic status information, such as power-on, self-test running, self-test passed, alarm, and ready.

The binary image for the services module is downloaded from the supervisor module. Prior to the image download, the control processor on the switching module runs from code stored on its local CompactFlash card. The image for an ASM-SFN can be specified using the ASM-SFN boot variable. For more information on how to specify the SSI boot variable, see the *Cisco MDS 9000 Family NX-OS High Availability and Redundancy Configuration Guide*.



Note

Software downloads are only necessary when a revision of the code is needed.

The supervisor module can force a reset on the services module and controls whether power is applied to the switching module.

If a single component or a set of components on the switching module fails, this failure does not disable another switching module if that is the only failure in the system.

Each ASM has a hardware watchdog timer to detect most component failures. The watchdog timer resets the card if it is not serviced periodically.

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LEDs on the Fibre Channel Advanced Services Module

Table 1-10 describes the LEDs for the Cisco MDS 9000 Family ASM.

Table 1-10 LEDs for the Cisco MDS 9000 Family ASM

LED	Status	Description
Status	Green	All diagnostics pass and the module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurs or occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage.
Speed	On	2-Gbps mode.
	Off	1-Gbps mode.
Link	Solid green	Link is up.
	Steady flashing green	Link is up (beacon used to identify port).
	Intermittent flashing green	Link is up (traffic on port).
	Solid yellow	Link is disabled by software.
	Flashing yellow	A fault condition exists.
	Off	No link.

Caching Services Module

The Caching Services Module (CSM) provides virtualization services that allow the Cisco MDS 9000 Family switches to reallocate physical resources as virtual resources for increased efficiency. The CSM receives and sends data through the switch backplane. It has two disk drives, two internal batteries for backup in case of power failure, and no external ports.

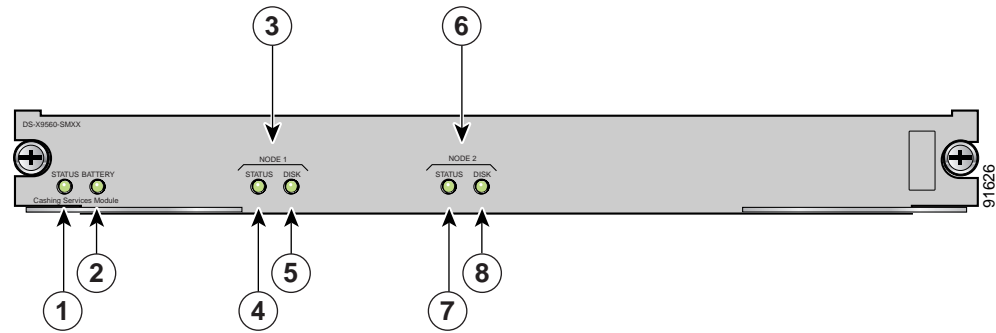
CSMs must be implemented in pairs in the fabric to provide redundancy and backup. Only two or more CSMs in a fabric are supported. However, the CSMs need not to be installed in the same switch.

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The CSM shuts down if the software failure or an external power failure occurs, or if the module is separated from the backplane while it is still powered on. The CSM automatically backs up the data in memory to the disk drives and then shuts down. The CSM batteries provide adequate power to back up data without external power.

Figure 1-24 shows the Cisco MDS 9000 Family CSM.

Figure 1-24 Cisco MDS 9000 Family CSM



1	Status LED	5	Disk 1 Status LED
2	Battery LED	6	Node 2 LEDs
3	Node 1 LEDs	7	Node 2 Status LED
4	Node 1 Status LED	8	Disk 2 Status LED

Figure 1-25 shows the location of the disk drives and batteries on the CSM.

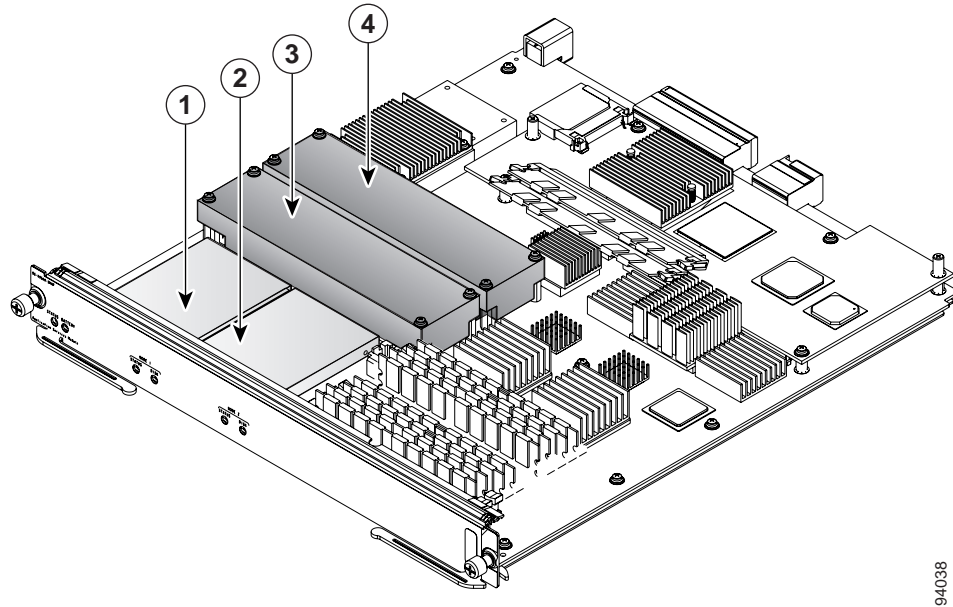


Caution

The batteries are shipped fully charged and should be handled accordingly.

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Figure 1-25 Cisco MDS 9000 Family CSM (Internal View)



1	Disk drive 2	3	Battery 2
2	Disk drive 1	4	Battery 1

See the [“Removing and Installing Switching and Services Modules”](#) section on page 2-28 for information about removing and installing the CSM and maintaining the CSM batteries.

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LEDs on the Caching Services Module

Table 1-11 describes the LEDs for the CSM.

Table 1-11 LEDs for the Cisco MDS 9000 Family CSM

LED	Status	Description
Status	Green	All diagnostics pass, and the module is operational (normal initialization sequence).
	Orange	One of the following occurs or occurred: <ul style="list-style-type: none"> The module is booting or running diagnostics (normal initialization sequence). The inlet air temperature of the system exceeded the maximum system operating temperature limit (a minor environmental warning). To ensure maximum product life, you should immediately correct the environmental temperature and restore the system to normal operation.
	Red	One of the following occurs or occurred: <ul style="list-style-type: none"> The diagnostic test failed. The module is not operational because a fault occurred during the initialization sequence. The inlet air temperature of the system exceeded the safe operating temperature limits of the card (a major environmental warning). The card shut down to prevent permanent damage.
Node	Green	Node is fully operational.
	Flashing green	Node is not yet part of a cluster.
	Orange	The module is booting or node is administratively down.
	Flashing orange	Node is in service mode.
	Red	Node failure.
	Off	Node does not have power.
Battery	Green	Battery has sufficient charge to dump cache.
	Flashing green	Battery is charging and has sufficient charge to dump cache. Battery conditioning in progress.
	Flashing orange	Battery is charging but has insufficient charge to dump cache.
	Red	Battery failure or battery is charged to the extent possible but insufficient to dump cache; replace CSM.
	Off	Battery does not have power and is not charged.
Disk	Solid green	Disk is operational.
	Flashing orange	Dumping cache to disk.
	Flashing green	Restoring cache from disk.
	Red	Disk failure.
	Off	Disk does not have power.

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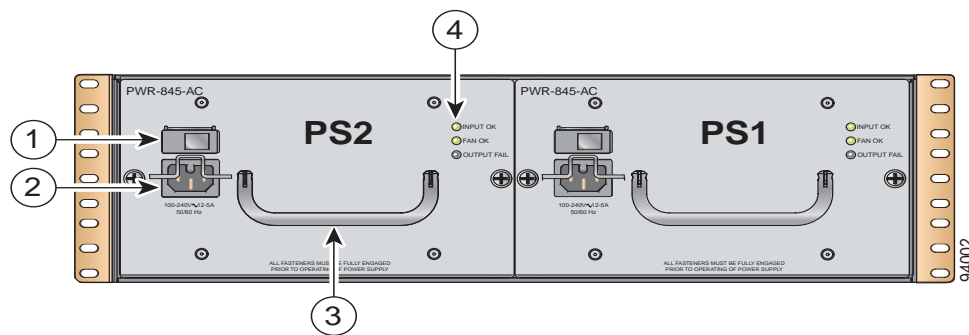
Power Supplies

The Cisco MDS 9200 Series supports dual hot-swappable 845-W AC power supplies, each of which can supply sufficient power to the entire chassis should one power supply fail. The power supplies monitor their output voltage and provide status to the supervisor module. To prevent the unexpected shutdown of an optional module, power management software only allows a module to power up if adequate power is available.

The Cisco MDS 9200 Series power supplies can be configured to be redundant or combined. By default, they are configured as redundant, so that if one fails, the remaining power supply can still power the entire system. For information on how to configure the power supplies, see the *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*.

The power supplies, which are accessed from the rear of the chassis, are illustrated in [Figure 1-26](#).

Figure 1-26 Cisco MDS 9200 Series with 845-W Dual Power Supplies



1	Power supply switch	3	Power supply handle
2	AC power connection	4	Power supply LEDs

[Table 1-12](#) describes the LEDs for the Cisco MDS 9200 Series power supplies.

Table 1-12 LEDs for the Cisco MDS 9200 Series Power Supplies

LED	Status	Description
Input OK	Green	AC input is good and power supply is functioning normally.
	Off	Power supply is turned off or is not seated properly in the chassis.
Fan OK	Green	Power supply fans are operating properly.
	Off	Fan is not operating or power supply is off.
Output Fail	Red	Power supply is not in a stable state. If this indication continues after initial power on, check that all connections are secure, including the system fan tray.
	Off	Normal operation or power supply is turned off.

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Fan Module

The Cisco MDS 9200 Series supports a hot-swappable fan module with four fans. The fan module provides 80 cfm (cubic feet per minute) of cooling per slot, allowing 400 W of power dissipation per slot. Sensors on the supervisor module monitor the internal air temperature. If the air temperature exceeds a preset lower-level threshold, the environmental monitor displays warning messages. If the air temperature exceeds a preset higher-level threshold, the switch will shut down.

If one or more fans within the fan module fail, the Fan Status LED turns red and the module must be replaced. Individual fans cannot be replaced, you must replace the entire fan module. If the higher-level temperature threshold is not exceeded, the switch continues to run for five minutes after the fan module is removed. This means you can swap out a fan module without having to bring the system down. To replace a fan module, see the [“Removing and Installing the Fan Module” section on page 2-38](#). The fan module has one Status LED that indicates the following conditions:

- Green—Fan module is operating normally.
- Red—One or more fans failed. Fan module should be replaced.
- Off—Fan module is not properly seated in the chassis or power supply has failed.



Caution

The Cisco MDS 9000 Family switches have internal temperature sensors that are capable of shutting down the system if the temperature at different points within the chassis exceed certain safety thresholds. To be effective, the temperature sensors require the presence of airflow; therefore, in the event a fan module is removed from the chassis, the Cisco MDS 9000 Family switches shut down after five minutes to prevent potentially undetectable overheating. However, the switches shut down sooner if the higher-level temperature threshold is exceeded.

Supported Transceivers

The following types of transceivers are available from Cisco and are supported on the Cisco MDS 9200 Series:

- X2 Fibre Channel transceivers
- Fibre Channel SFP and SFP+ transceivers, in either SWL or LWL
- Combination Fibre Channel/Gigabit Ethernet SFP transceivers, in either SWL or LWL
- Combination Fibre Channel/Gigabit Ethernet CWDM SFP transceivers, which can be used for ELWL transmission or for CWDM
- Gigabit Ethernet SFP transceiver, 1-Gbps copper
- Fibre Channel DWDM SFP transceiver, which can be used for ELWL transmission or for DWDM



Note

Switches running Cisco MDS SAN-OS Release 2.x, 3.x, and NX-OS 4.1(1b) support combination Fibre Channel/Gigabit Ethernet SFP transceivers.

The transceivers are field-replaceable and hot-swappable. You can use any combination of SFP transceivers that are supported by the switch. The only restrictions are that SWL transceivers must be paired with SWL transceivers, and LWL transceivers with LWL transceivers, and the cable must not exceed the stipulated cable length for reliable communications.

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For more information about the X2 transceiver, see the [“X2 Transceiver Specifications” section on page B-7](#).

For more information about a specific Cisco SFP transceiver, see the [“SFP and SFP+ Transceiver Specifications” section on page B-10](#). SFP transceivers can be ordered separately or with the Cisco MDS 9200 Series.

**Note**

Use only Cisco transceivers in the Cisco MDS 9200 Series. Each Cisco transceiver is encoded with model information that enables the switch to verify that the transceiver meets the requirements for the switch.

X2 Fibre Channel Transceivers

The X2 Fibre Channel transceiver is a small form-factor optimized for 10-Gbps applications and uses an SC connector. The X2 transceiver is ideally suited for Ethernet, Fibre Channel and telecom switches, and standard peripheral component interconnect (PCI)-based server and storage connections. The X2 provides robust thermal performance and electromagnetic shielding.

For more information on X2 transceiver specifications, see the [“X2 Transceiver Specifications” section on page B-7](#).

Fibre Channel SFP Transceivers

Cisco Fibre Channel SFP transceivers are available in SWL or LWL versions. Both of these versions are 1-Gbps/2-Gbps/4-Gbps capable. Cisco Fibre Channel SFP+ transceivers are available in SWL or LWL versions. Both of these versions are 2-Gbps/4-Gbps/8-Gbps capable.

Cisco Fibre Channel SFP transceivers have LC connectors and comply with 1-Gbps/2-Gbps/4-Gbps Fibre Channel standards as defined in FC-PH 10.0 2. Cisco Fibre Channel SFP+ transceivers have LC connectors and comply with 2-Gbps/4-Gbps/8-Gbps Fibre Channel standards as defined in FC-PH 4.

For more information about Fibre Channel SFP and SFP+ transceiver specifications, see the [“SFP and SFP+ Transceiver Specifications” section on page B-10](#).

Combination Fibre Channel/Gigabit Ethernet SFP Transceivers

The combination Fibre Channel/Gigabit Ethernet SFP transceivers from Cisco Systems are available in SWL or LWL versions. Both of these versions are 1-Gbps/2-Gbps capable.

The combination SFP transceivers from Cisco Systems have LC connectors and comply with 1-Gbps/2-Gbps Fibre Channel as defined in FC-PH 10.0 2 and Gigabit Ethernet as defined in IEEE 802.3z.

For more information on the Fibre Channel/Gigabit Ethernet SFP transceiver specifications, see the [“SFP and SFP+ Transceiver Specifications” section on page B-10](#).

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CWDM Combination Fibre Channel/Gigabit Ethernet SFP Transceivers

All Fibre Channel and Gigabit Ethernet ports in the Cisco MDS 9200 Series support 1-Gbps/2-Gbps CWDM SFP transceivers. In addition, the Fibre Channel ports on Cisco MDS 9222i also support 4-Gbps CWDM SFP transceivers.

The Cisco CWDM SFP transceivers have LC connectors and support both Gigabit Ethernet and Fibre Channel (1-Gbps/2-Gbps). They match the wavelength plan of Cisco CWDM GBICs and Cisco CWDM optical add/drop multiplexers (OADMs).

CWDM SFP transceivers can be used in two ways:

- CWDM transmission can send and receive up to eight laser wavelengths carrying different signals simultaneously on the same optical fiber using an OADM.
- ELWL signals can transmit over longer distances than LWL SFP transceivers.

There are eight different “colors” of CWDM SFP transceivers, one for each fixed wavelength. The fiber optic cables from the CWDM SFP transceivers must be connected to an OADM. The OADM combines the wavelengths of the different outgoing signals into one composite send signal. The OADM also separates the received transmissions into the different wavelengths and sends them to the corresponding CWDM SFP transceiver.

For more information on the CWDM SFP transceiver specifications, see the [“SFP and SFP+ Transceiver Specifications” section on page B-10](#).

Gigabit Ethernet SFP Transceivers

The 4-port and 8-port IP Storage services (IPS-4 and IPS-8) modules provide four or eight 1-Gigabit Ethernet ports that support Gigabit Ethernet SFP transceivers. The Gigabit Ethernet SFP transceivers have RJ-45 connectors and support Gigabit Ethernet (1-Gbps).

For more information on the Gigabit Ethernet SFP transceiver specifications, see the [“SFP and SFP+ Transceiver Specifications” section on page B-10](#).

DWDM Fibre Channel SFP Transceivers

Fibre Channel ports on Cisco MDS 9222i support 2-Gbps DWDM SFP transceivers. The Cisco DWDM Fibre Channel SFP transceivers have LC connectors and support Fibre Channel (1-Gbps/2-Gbps). The DWDM SFP transceivers match the International Telecommunications Union (ITU) 100-Ghz wavelength grid and the wavelength plan of Cisco 100-Ghz ONS product family.

The DWDM SFP transceivers have the following capabilities:

- DWDM transmission can send and receive up to 32 laser wavelengths carrying different signals simultaneously on the same optical fiber by using an optical filter.
- ELWL signals can transmit over longer distances than LWL SFP transceivers.

For more information on the DWDM SFP transceiver specifications, see the [“SFP and SFP+ Transceiver Specifications” section on page B-10](#).

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CHAPTER 2

Installing the Cisco MDS 9200 Series

This chapter describes how to install the Cisco MDS 9200 Series and its components, and it includes the following information:

- [Preinstallation, page 2-2](#)
- [Installing the Chassis in a Cabinet or Rack, page 2-5](#)
- [Installing the Switch in a Cabinet with Insufficient Front Clearance, page 2-11](#)
- [System Grounding, page 2-19](#)
- [Grounding the Chassis, page 2-24](#)
- [Starting Up the Switch, page 2-26](#)
- [Removing and Installing Components, page 2-28](#)



Note

Before you install, operate, or service the system, read the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family* for important safety information.



Warning

IMPORTANT SAFETY INSTRUCTIONS

This warning symbol 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.
Statement 1071

SAVE THESE INSTRUCTIONS



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



Warning

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

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**Warning**

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

**Note**

Each new switch requires a license. For information on licensing, see the *Cisco MDS 9000 Family NX-OS Fundamentals Configuration Guide*.

Preinstallation

This section includes the following topics:

- [Installation Options, page 2-2](#)
- [Installation Guidelines, page 2-3](#)
- [Required Equipment, page 2-4](#)
- [Unpacking and Inspecting the Switch, page 2-4](#)

Installation Options

The Cisco MDS 9200 Series can be installed using the following methods:

- In an open EIA rack, using:
 - The rack-mount kit shipped with the switch
 - The telco and EIA Shelf Bracket Kit (an optional kit, purchased separately) in addition to the rack-mount kit shipped with the switch
- In a perforated or solid-walled EIA cabinet, using:
 - The rack-mount kit shipped with the switch
 - The telco and EIA Shelf Bracket Kit (an optional kit, purchased separately) in addition to the rack-mount kit shipped with the switch
- In a two-post telco rack, using:
 - The telco and EIA Shelf Bracket Kit (an optional kit, purchased separately) in addition to the front brackets shipped with the switch

For instructions on installing the switch using the rack-mount kit shipped with the switch, see the [“Installing the Chassis in a Cabinet or Rack”](#) section on page 2-5.

For instructions on installing the switch using the optional, separately purchased telco and EIA Shelf Bracket Kit, see the [“Cisco MDS 9000 Family telco and EIA Shelf Bracket”](#) section on page A-4.

**Note**

The optional telco and EIA Shelf Bracket Kit is not provided with the switch. To order the kit, contact your switch provider.

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Installation Guidelines

Follow these guidelines when installing the Cisco MDS 9200 Series:

- Plan your site configuration and prepare the site before installing the chassis. [Appendix D, “Site Planning and Maintenance Records,”](#) lists the recommended site planning tasks.
- Record the information listed in [Appendix D, “Site Planning and Maintenance Records,”](#) as you install and configure the switch.
- Ensure that there is adequate space around the switch to allow for servicing the switch and for adequate airflow ([Appendix B, “Technical Specifications,”](#) lists airflow requirements).
- Ensure that the air-conditioning meets the heat dissipation requirements listed in [Appendix B, “Technical Specifications.”](#)
- Ensure that the cabinet or rack meets the requirements listed in [Appendix A, “Cabinet and Rack Installation.”](#)



Note Jumper power cords are available for use in a cabinet. See the [“Jumper Power Cord”](#) section on [page C-11](#).

- Ensure that the chassis is adequately grounded. If the switch is not mounted in a grounded rack, Cisco recommends connecting both the system ground on the chassis and the power supply ground to an earth ground.
- Ensure that the site power meets the power requirements listed in [Appendix B, “Technical Specifications.”](#) If available, you can use an uninterruptible power supply (UPS) to protect against power failures.



Caution Avoid UPS types that use ferroresonant technology. These UPS types can become unstable with systems like the Cisco MDS 9000 Family, which can have substantial current draw fluctuations because of fluctuating data traffic patterns.

- Ensure that circuits are sized according to local and national codes. For North America, the 845-W power supply requires a 15-A or 20-A circuit.

If you are using a 200- or 240-VAC power source in North America, the circuit must be protected by a two-pole circuit breaker.



Caution To prevent loss of input power, ensure the total maximum loads on the circuits supplying power to the switch are within the current ratings for the wiring and breakers.

- Use the following screw torques when installing the switch:
 - Captive screws: 4 in-lb
 - M3 screws: 4 in-lb
 - M4 screws: 12 in-lb
 - 10-32 screws: 20 in-lb
 - 12-24 screws: 30 in-lb

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Required Equipment

Before beginning the installation, ensure that the following items are ready:

- Number 1 and number 2 Phillips screwdrivers with torque capability
- 3/16-in. flat-blade screwdriver
- Tape measure and level
- ESD wrist strap or other grounding device
- Antistatic mat or antistatic foam

The following additional items (not found in the accessory kit) are required to ground the chassis:

- Grounding cable (6 AWG recommended), sized according to local and national installation requirements; the required length depends on the proximity of the Cisco MDS 9200 Series to proper grounding facilities
- Crimping tool large enough to accommodate girth of lug
- Wire-stripping tool

Unpacking and Inspecting the Switch



Caution

When handling switch components, wear an ESD strap and handle modules by the carrier edges only. An ESD socket is provided on the chassis. For the ESD socket to be effective, the chassis must be grounded through the power cable, the chassis ground, or the metal-to-metal contact with a grounded rack.



Tip

Keep the shipping container in case the chassis requires shipping in the future.



Note

If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco Systems, contact Cisco Technical Support at this URL:
<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>



Note

The switch is thoroughly inspected before shipment. If any damage occurred during transportation or any items are missing, contact your customer representative immediately.

To inspect the shipment, follow these steps:

Step 1

Compare the shipment to the equipment list provided by your customer service representative and verify that you have received all items, including the following:

- Print documentation and CD-ROMs
- Grounding lug kit
- Rack-mount kit
- ESD wrist strap

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- Cables and connectors
- Any optional items ordered

Step 2 Check for damage and report any discrepancies or damage to your customer service representative. Have the following information ready:

- Invoice number of shipper (see packing slip)
- Model and serial number of the damaged unit
- Description of damage
- Effect of damage on the installation

Installing the Chassis in a Cabinet or Rack

This section describes how to use the rack-mount kit provided with the switch to install the Cisco MDS 9200 Series into a cabinet or rack that meets the requirements described in [Appendix A, “Cabinet and Rack Installation.”](#) All Cisco MDS 9200 Series switches use the same installation procedure.



Caution

If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized.

The rack-mount kit provided with the switch contains the items listed in [Table 2-1](#). If you do not find all the parts listed in [Table 2-1](#), you may have an older version of the rack-mount kit, which only included the front rack-mount brackets. If this is the case, you can either install the switch in the rack with just the front rack-mount brackets, or contact your customer service representative for a current version of the rack-mount kit.



Note

If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco, contact Cisco Technical Support at this URL:
<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

Table 2-1 Contents of Cisco MDS 9200 Series Rack-Mount Kit

Quantity	Part Description
Front rack-mount bracket kit	
2	Front rack-mount brackets
12	M4 x 6-mm Phillips countersunk screws
Cable management bracket kit	
2	Cable guide
6	12-24 x 3/4-inch Phillips binder-head screws
6	10-32 x 3/4-inch Phillips binder-head screws
Rear rack-mount bracket kit	
2	Long slider rails
2	Short slider rails

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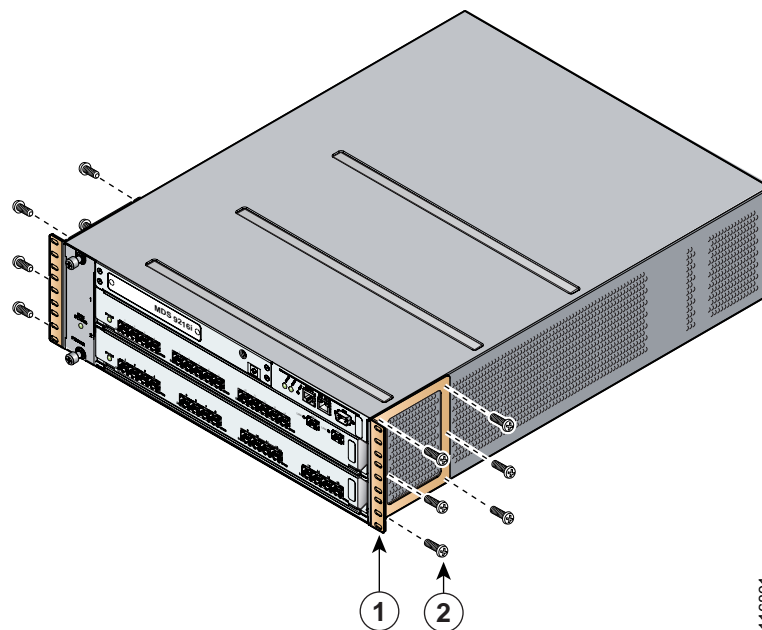
Table 2-1 Contents of Cisco MDS 9200 Series Rack-Mount Kit (continued)

Quantity	Part Description
2	C brackets
6	12-24 x 3/4-inch Phillips binder-head screws
6	10-32 x 3/4-inch Phillips binder-head screws
4	M4 x 6-mm, Phillips countersunk screws

To install the switch in a cabinet or rack using the rack-mount kit provided with the switch, follow these steps:

- Step 1** Install the front rack-mount brackets as follows:
- Position a front rack-mount bracket against the chassis and align the screw holes as shown in [Figure 2-1](#). Then attach the front rack-mount bracket to the chassis with six of the M4 screws.
 - Repeat with the other front rack-mount bracket on the other side of the switch.

Figure 2-1 Attaching Front Rack-Mount Bracket to the Cisco MDS 9200 Series



1	Front rack-mount bracket	2	Screws, M4
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Step 2 Install the C brackets on the switch as follows:

- a. Position one of the C brackets against the side of the switch and align the screw holes as shown in [Figure 2-2](#) and [Figure 2-3](#). Then attach the bracket to the switch with two of the flat-head M4 screws.

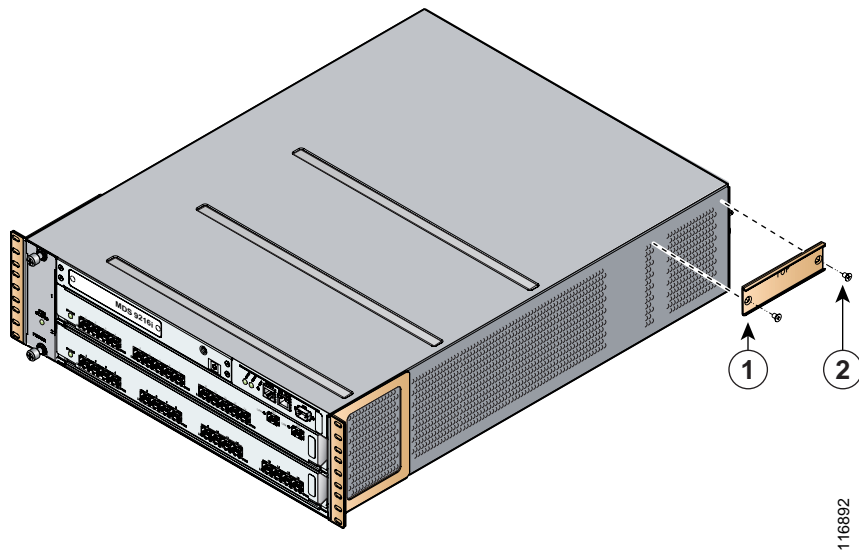


Note

Ensure the C bracket is oriented so that it blocks the fewest airflow holes on the chassis; the holes should be slightly closer to the bottom of the brackets and the text on the back of the bracket should be right side up.

- b. Repeat with the other C bracket on the other side of the switch.

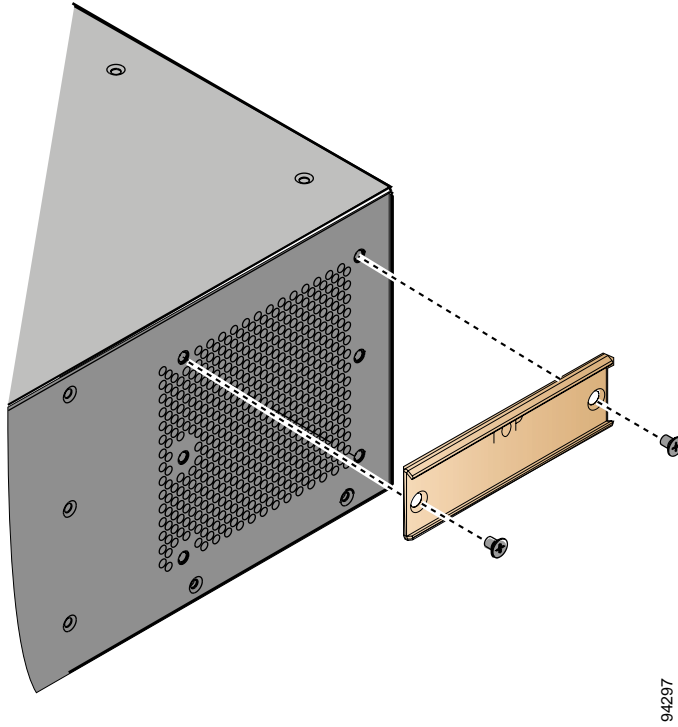
Figure 2-2 *Installing C Brackets onto the Cisco MDS 9200 Series*



1	C bracket	2	Screws, M4
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Figure 2-3 C Brackets for the Cisco MDS 9200 Series (Close-Up View)

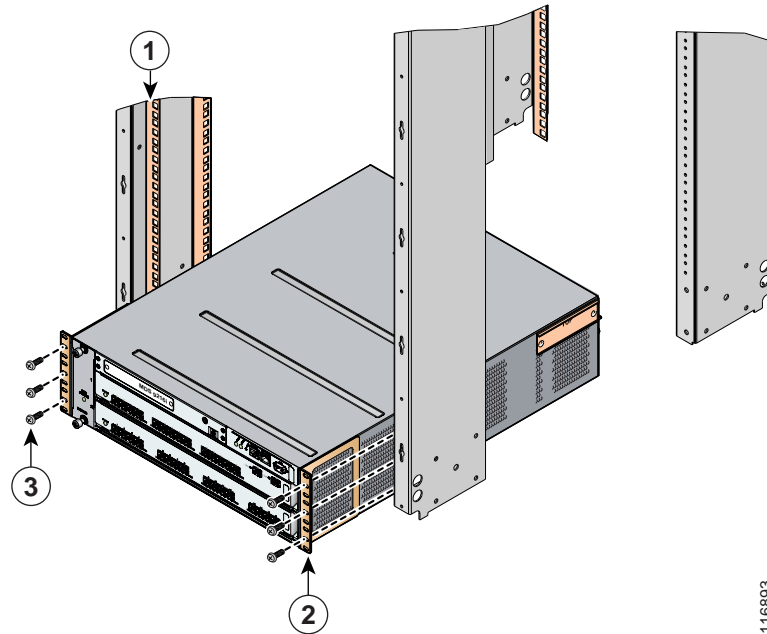


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- Step 3** Position the chassis in the rack, inserting the rear of the chassis between the front mounting rails (see [Figure 2-4](#)). Use the 12-24 x 3/4-in. or 10-32 x 3/4-in. screws (depending on the type of rack) to attach the front rack-mount brackets to the mounting rails (three per side).

If you are installing the optional cable guides, place the cable guides in front of the front rack-mount brackets, and then pass the screws through the cable guides, front rack-mount brackets, and mounting rail. You can install one or both cable guides; if installing a single cable guide, it can be installed on either side.

Figure 2-4 *Installing the Cisco MDS 9200 Series in the Rack*

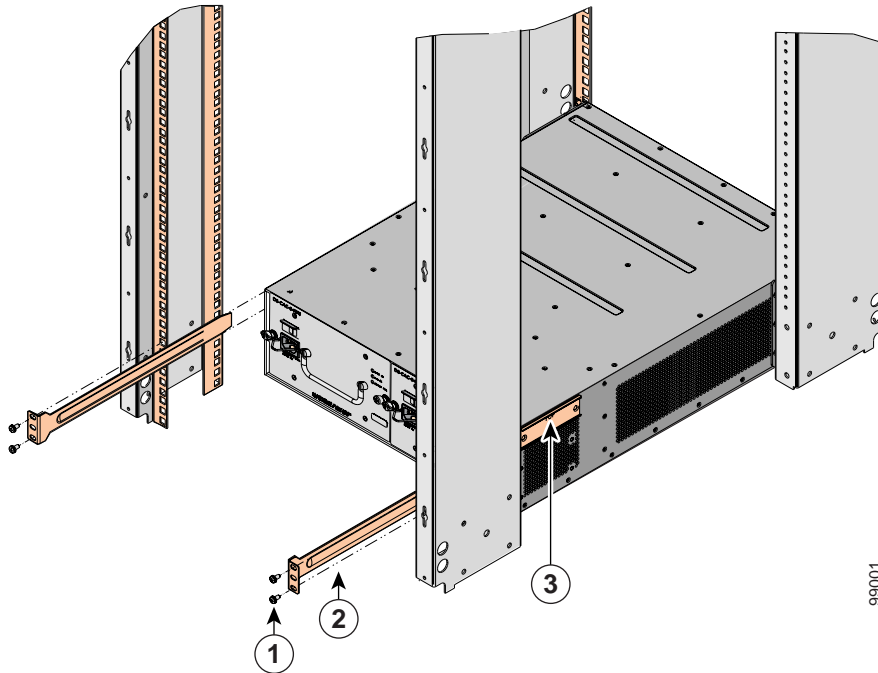


1	Mounting rail	3	Screws, 12-24 or 10-32
2	Front rack-mount bracket		

- Step 4** From the back of the rack, position the longer slider rails with the ears away from the chassis and slide them into the C brackets previously installed on the sides of the chassis (see [Figure 2-5](#)).
- Step 5** Level the chassis (it may sag slightly towards the back) and attach the slider rails to the mounting rails with the 12-24 x 3/4-in. or 10-32 x 3/4-in. screws, three per side.

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Figure 2-5 Inserting and Installing Slider Rails (Back View)



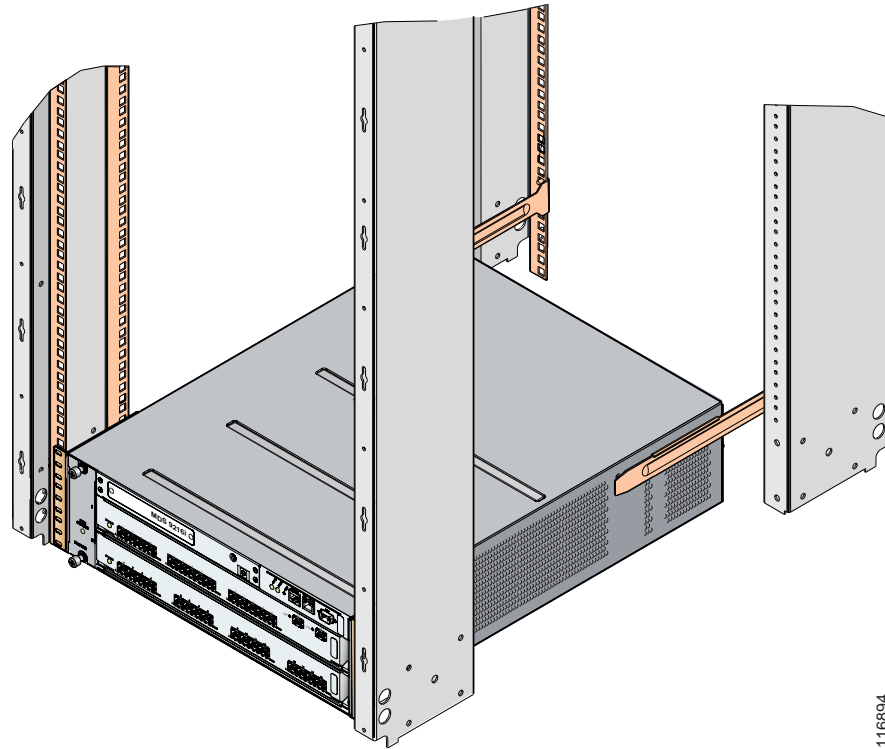
99001

1	Screws, 12-24 or 10-32	3	C bracket
2	Slider rail		

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Figure 2-6 shows the Cisco MDS 9200 Series completely installed in a rack.

Figure 2-6 Cisco MDS 9200 Series Chassis Installed in the Rack



116894

Installing the Switch in a Cabinet with Insufficient Front Clearance

This section describes how to use the rack-mount kit provided with the switch to install the Cisco MDS 9200 Series into a cabinet with insufficient front-facing clearance. The Cisco MDS 9200 Series is installed rear-facing to provide adequate clearance for the fiber-optic cables. This cabinet meets the requirements described in [Appendix A, “Cabinet and Rack Installation,”](#) except the cabinet has less than three inches of clearance between the inside of the front door or bezel panel and the front cabinet mounting rails. This rear-facing installation is necessary to ensure that the minimum bend radius for the fiber-optic cables is maintained. In these cabinets, the Cisco MDS 9200 Series is mounted backwards, with the fiber-optic cables facing toward the rear of the cabinet and the power supplies facing the front of the cabinet.



Caution

If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized.

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The rack-mount kit provided with the switch contains the items listed in [Table 2-1](#). If you do not find all of the parts listed in [Table 2-1](#), you may have an older version of the rack-mount kit, which only included the front rack-mount brackets. If this is the case, you can either install the switch in the rack with just the front rack-mount brackets, or contact your customer service representative for a current version of the rack-mount kit.



Note

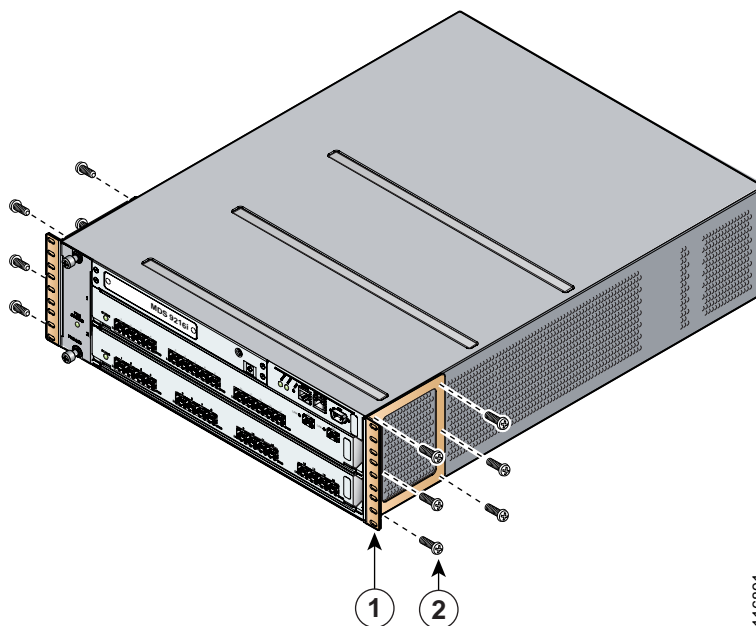
If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco, contact Cisco Technical Support at this URL:
<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>

Installing Front Rack-Mount Brackets for Cabinets with 26 Inches or Greater of Rail Spacings

Before installing the switch into the cabinet, the front rack-mount brackets for the Cisco MDS 9200 Series must be installed onto the switch. To install the brackets for cabinets with front-mounting rail to rear-mounting rail spacing greater than or equal to 26 inches, follow these steps:

- Step 1** Install the front rack-mount brackets as follows:
- Position a front rack-mount bracket against the chassis and align the screw holes as shown in [Figure 2-7](#). Then attach the front rack-mount bracket to the chassis with six of the M4 screws.
 - Repeat with the other front rack-mount bracket on the other side of the switch.

Figure 2-7 Attaching Front Rack-Mount Bracket to the Cisco MDS 9200 Series

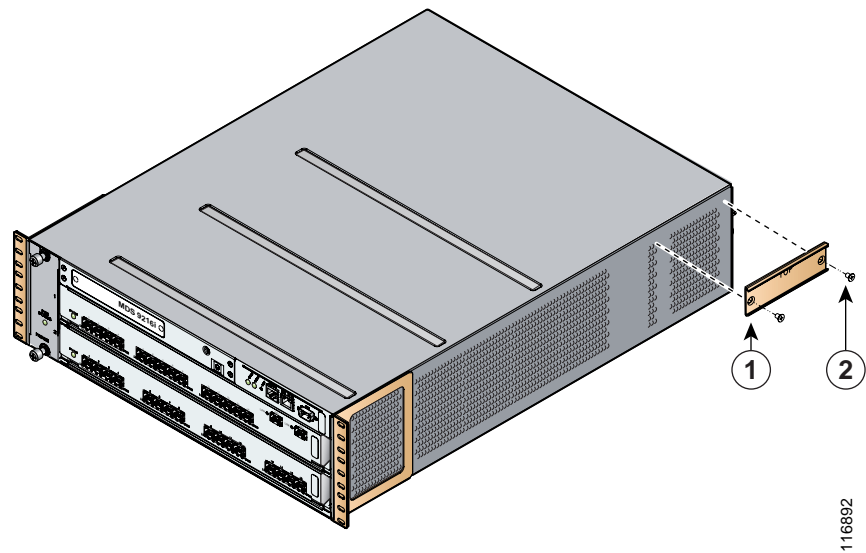


1	Front rack-mount bracket	2	Screws, M4
---	--------------------------	---	------------

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- Step 2** Install the C brackets on the switch as follows:
- Position one of the C brackets against the side of the switch and align the screw holes as shown in [Figure 2-8](#) and [Figure 2-9](#). Then attach the bracket to the switch with two of the flat-head M4 screws.

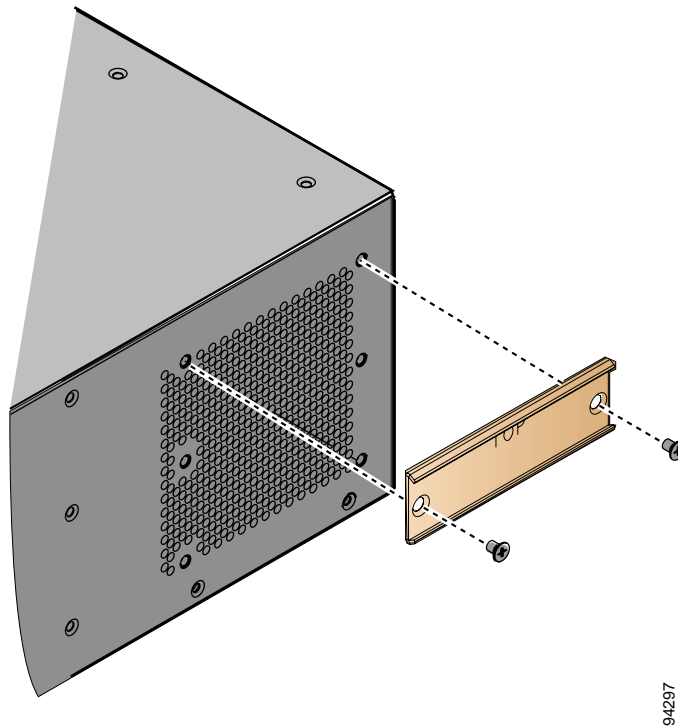
Figure 2-8 *Installing C Brackets onto the Cisco MDS 9200 Series*



1	C bracket	2	Screws, M4
---	-----------	---	------------

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Figure 2-9 C Brackets for the Cisco MDS 9200 Series (Close-Up View)



Note

Ensure the C bracket is oriented so that it blocks the fewest airflow holes on the chassis; the holes should be slightly closer to the bottom of the brackets and the text on the back of the bracket should be right side up.

- b. Repeat with the other C bracket on the other side of the switch.

Installing Front Rack-Mount Brackets for Cabinets with Less Than 26 Inches of Rail Spacings

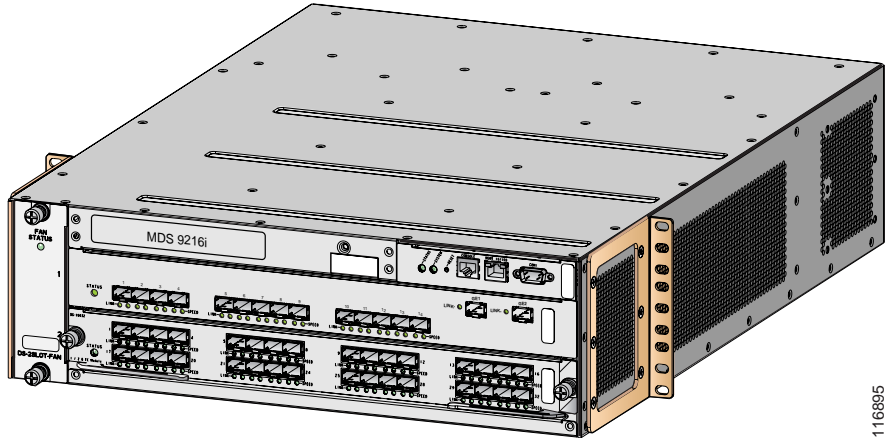
The front rack-mount brackets for the Cisco MDS 9200 Series switch must be installed onto the switch prior to installing the switch into the cabinet. For cabinets with less than 26 inches of rail-to-rail spacing, the front rack-mount bracket must be installed 180 degrees from normal. To install the brackets for cabinets with front-mounting rail to rear-mounting rail spacing of less than 26 inches that need to be mounted backwards to maintain adequate fiber-optic clearance, follow these steps:

Step 1 Install the front rack-mount brackets as follows:

- a. Position one of the front rack-mount brackets against the side of the switch and align the screw holes as shown in [Figure 2-10](#). Then attach the bracket to the switch with the six M4 screws originally provided with the bracket.

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Figure 2-10 Front Rack-Mount Brackets (Rotated) Installed on the Cisco MDS 9200 Series



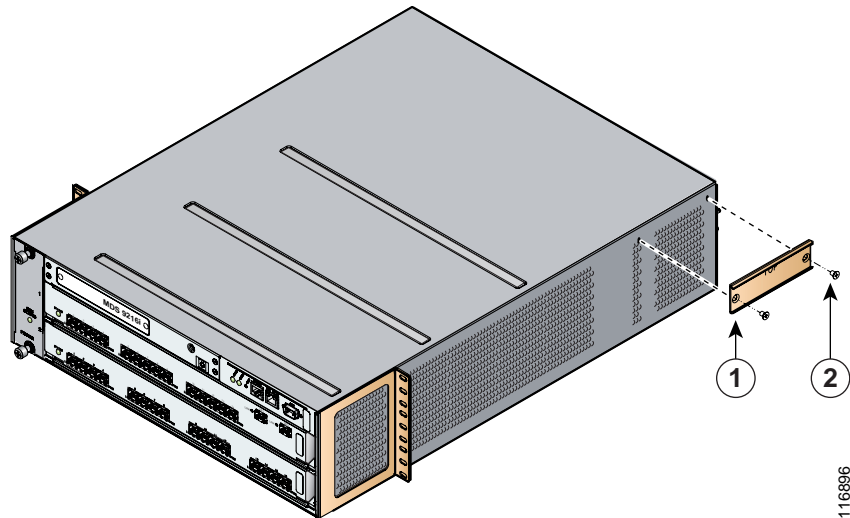
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- b. Repeat with the other front rack-mount bracket on the other side of the switch.

Step 2 Install the C brackets on the switch as follows:

- a. Position one of the C brackets against the side of the switch and align the screw holes as shown in [Figure 2-11](#) and [Figure 2-12](#). Then attach the bracket to the switch with two of the flat-head M4 screws.

Figure 2-11 Installing C Brackets onto the Cisco MDS 9200 Series

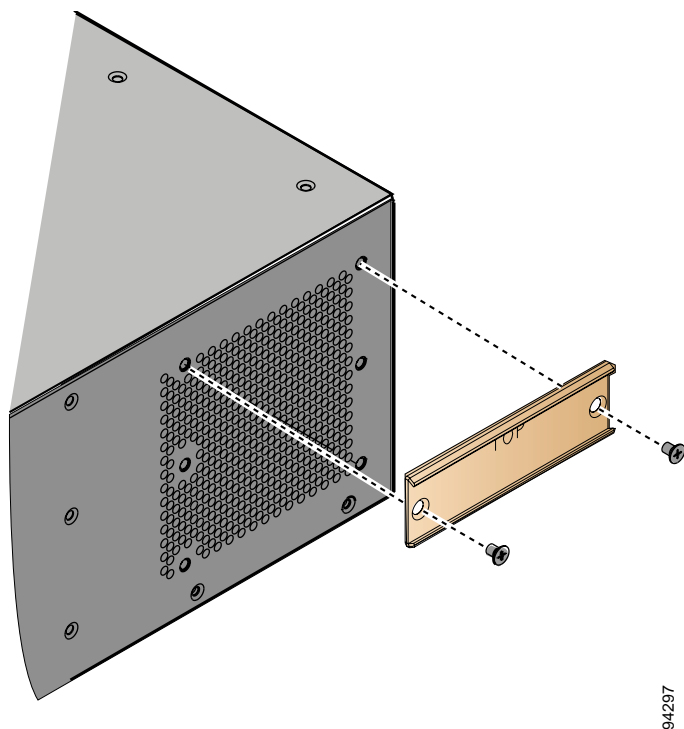


116896

1	C bracket	2	Screws, M4
---	-----------	---	------------

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Figure 2-12 C Brackets for the Cisco MDS 9200 Series (Close-Up View)



Note

Ensure the C bracket is oriented so that it blocks the fewest airflow holes on the chassis; the holes should be slightly closer to the bottom of the brackets and the text on the back of the bracket should be right side up.

- b. Repeat with the other C bracket on the other side of the switch.

Installing the Cisco MDS 9200 Series Rear-Facing into Cabinet

To install the switch rear-facing into a cabinet using the rack-mount kit provided with the switch, for cabinets with insufficient front-facing clearance, follow these steps:

- Step 1** Position the chassis in the rack, inserting the back of the chassis between the rear mounting rails (see [Figure 2-13](#)). Use the 12-24 x 3/4-in. or 10-32 x 3/4-in. screws (depending on the type of rack) to attach the front rack-mount brackets to the mounting rails (three per side).

If you are installing the optional cable guides, place the cable guides in front of the front rack-mount brackets, and then pass the screws through the cable guides, front rack-mount brackets, and mounting rail. You can install one or both cable guides; if installing a single cable guide, it can be installed on either side.

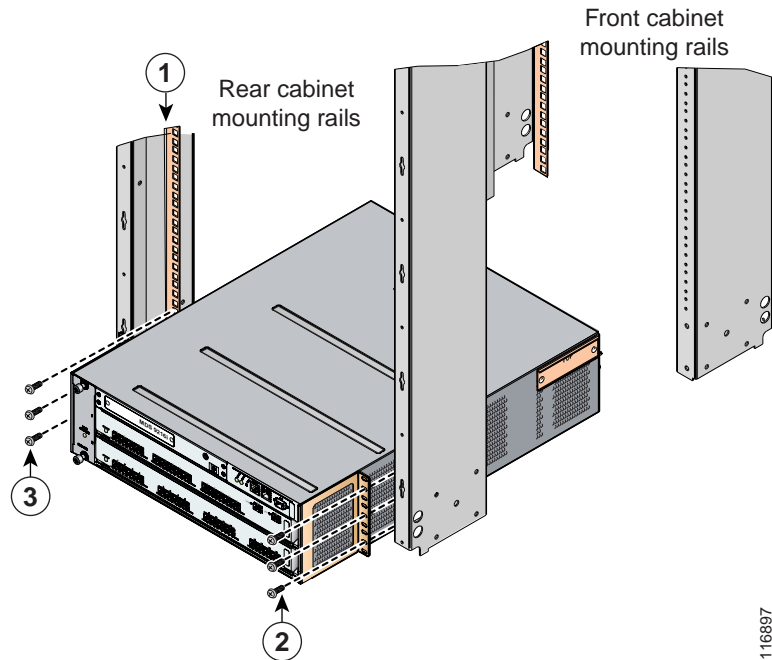
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Note

Figure 2-13 shows the front rack-mount brackets as rotated. Your chassis may have these brackets installed in the normal position.

Figure 2-13 *Installing the Cisco MDS 9200 Series (Rear-Facing) in the Rack*



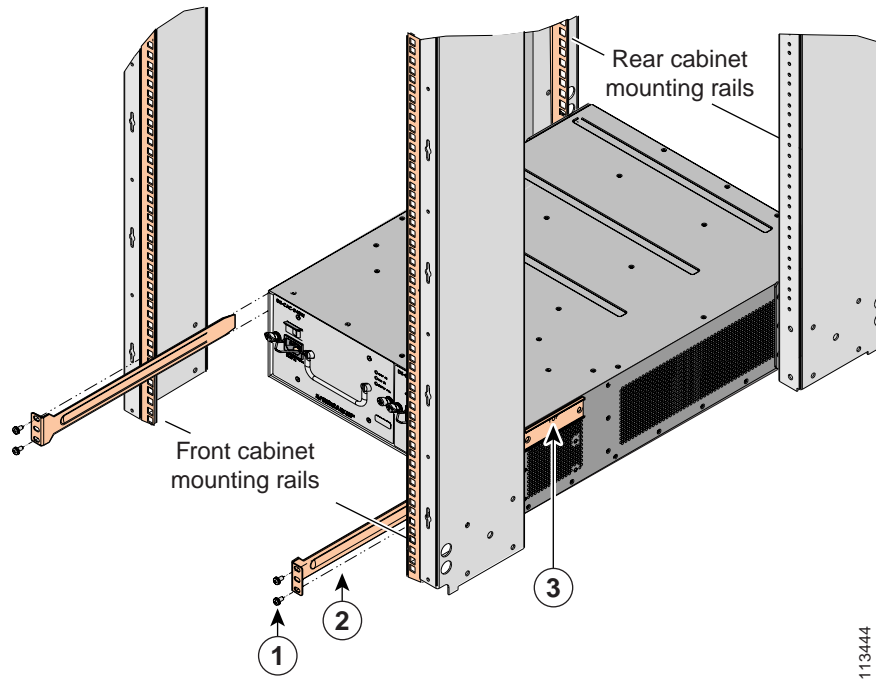
116897

1	Mounting rail	3	Screws, 12-24 or 10-32
2	Front rack-mount bracket		

- Step 2** From the front of the rack, position the longer slider rails with the ears away from the chassis and slide them into the C brackets previously installed on the sides of the chassis (see [Figure 2-14](#)).
- Step 3** Level the chassis (it may sag slightly towards the back) and attach the slider rails to the mounting rails with the 12-24 x 3/4-in. or 10-32 x 3/4-in. screws, three per side.

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Figure 2-14 Inserting and Installing Slider Rails (Front View)



1	Screws, 12-24 or 10-32	3	C bracket
2	Slider rail		

Figure 2-15 shows the Cisco MDS 9200 Series completely installed in a rack.

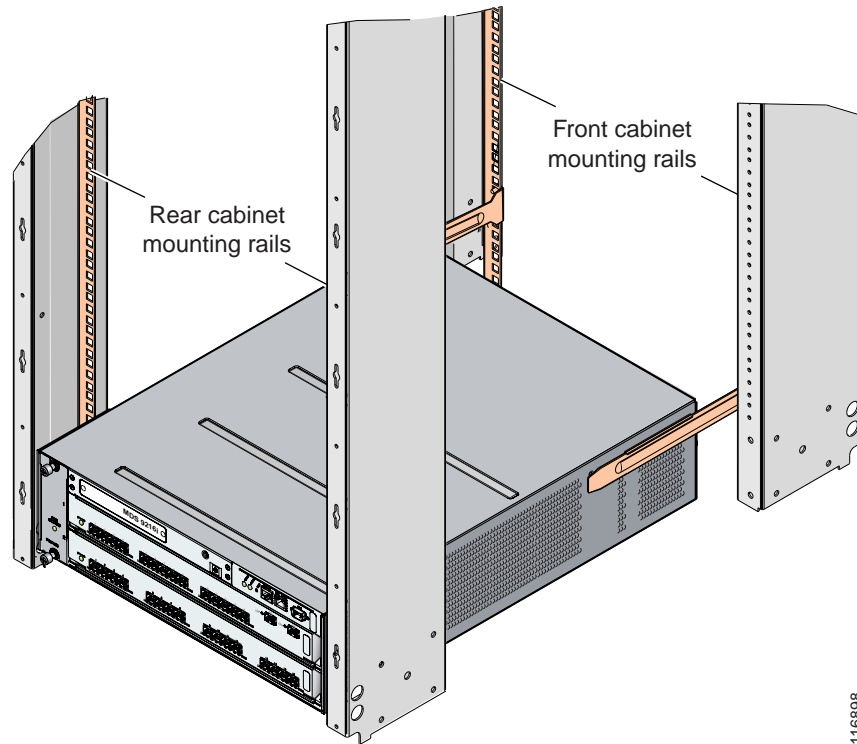


Note

Figure 2-15 shows the front rack-mount brackets as rotated. Your chassis may have these brackets installed in the normal position.

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Figure 2-15 Cisco MDS 9200 Series Installed in the Rack (Back View)



System Grounding

This section describes the need for system grounding and explains how to prevent damage from electrostatic discharge.

Proper Grounding Practices

Grounding is one of the most important parts of equipment installation. Proper grounding practices ensure that the buildings and the installed equipment within them have low-impedance connections and low-voltage differentials between chassis. When you properly ground systems during installation, you reduce or prevent shock hazards, equipment damage due to transients, and data corruption. [Table 2-2](#) lists some general grounding practice guidelines.

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Table 2-2 Grounding Best Practices

Environment	Electromagnetic Noise Severity Level	Grounding Recommendations
Commercial building is subjected to direct lightning strikes. For example, some places in the United States, such as Florida, are subject to more lightning strikes than other areas.	High	All lightning protection devices must be installed in strict accordance with manufacturer recommendations. Conductors carrying lightning current should be spaced away from power and data lines in accordance with applicable recommendations and codes. Best grounding practices must be closely followed.
Commercial building is located in an area where lightning storms frequently occur but is not subject to direct lightning strikes.	High	Best grounding practices must be closely followed.
Commercial building contains a mix of information technology equipment and industrial equipment, such as welding.	Medium to high	Best grounding practices must be closely followed.
Existing commercial building is not subject to natural environmental noise or man-made industrial noise. This building contains a standard office environment. This installation has a history of malfunction due to electromagnetic noise.	Medium	Best grounding practices must be closely followed. Determine source and cause of noise if possible, and mitigate as closely as possible at the noise source or reduce coupling from the noise source to the victim equipment.
New commercial building is not subject to natural environmental noise or man-made industrial noise. This building contains a standard office environment.	Low	Best grounding practices should be followed as closely as possible. Electromagnetic noise problems are not anticipated, but installing a best practice grounding system in a new building is often the least expensive route and the best way to plan for the future.
Existing commercial building is not subject to natural environmental noise or man-made industrial noise. This building contains a standard office environment.	Low	Best grounding practices should be followed as much as possible. Electromagnetic noise problems are not anticipated, but installing a best practice grounding system is always recommended.

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**Note**

In all situations, grounding practices must comply with local National Electric Code (NEC) requirements or local laws and regulations.

**Note**

Always ensure that all of the modules are completely installed and that the captive installation screws are fully tightened. In addition, ensure that all I/O cables and power cords are properly seated. These practices are normal installation practices and must be followed in all installations.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when modules or other FRUs are improperly handled, results in intermittent or complete failures. Modules consist of printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, always use an ESD grounding strap when handling modules.

Follow these guidelines for preventing ESD damage:

- Always use an ESD wrist strap and ensure that it makes maximum contact with bare skin. ESD grounding straps are available with banana plugs, metal spring clips, or alligator clips. All MDS 9200 series chassis are equipped with a banana plug connector (identified by the ground symbol next to the connector) somewhere on the front panel. Cisco recommends that you use a personal ESD grounding strap equipped with a banana plug.
- If you choose to use the disposable ESD wrist strap supplied with most FRUs or an ESD wrist strap equipped with an alligator clip, you must attach the system ground lug to the chassis in order to provide a proper grounding point for the ESD wrist strap.

**Note**

This system ground is also referred to as the network equipment building system (NEBS) ground.

- If your chassis does not have the system ground attached, you must install the system ground lug. See [“Establishing the System Ground” section on page 2-23](#) for installation instructions and location of the chassis system ground pads.

**Note**

You do not need to attach a supplemental system ground wire to the system ground lug; the lug provides a direct path to the bare metal of the chassis.

After you install the system ground lug, follow these steps to correctly attach the ESD wrist strap:

Step 1

Attach the ESD wrist strap to bare skin as follows:

- a. If you are using the ESD wrist strap supplied with the FRUs, open the wrist strap package and unwrap the ESD wrist strap. Place the black conductive loop over your wrist and tighten the strap so that it makes good contact with your bare skin.
- b. If you are using an ESD wrist strap equipped with an alligator clip, open the package and remove the ESD wrist strap. Locate the end of the wrist strap that attaches to your body and secure it to your bare skin.

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Step 2 Grasp the spring or alligator clip on the ESD wrist strap and momentarily touch the clip to a bare metal spot (unpainted surface) on the rack. Cisco recommends that you touch the clip to an unpainted rack rail so that any built-up static charge is then safely dissipated to the entire rack.

Step 3 Attach either the spring clip or the alligator clip to the ground lug screw as follows (See [Figure 2-16](#)):

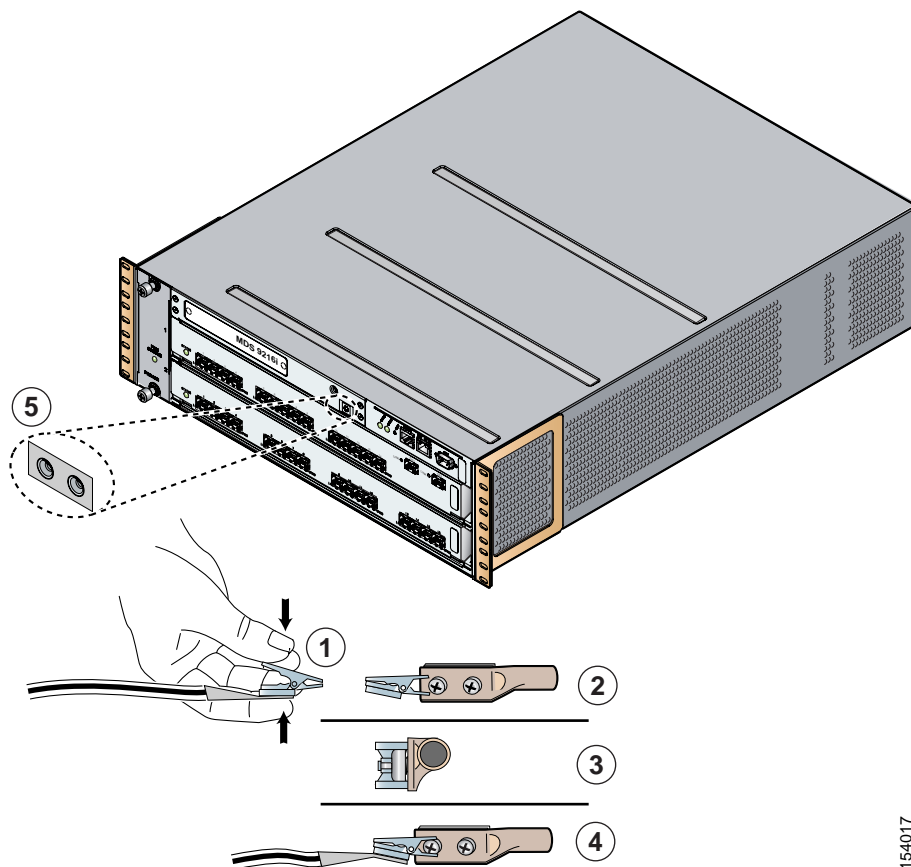
- a. If you are using the ESD wrist strap that is supplied with the FRUs, squeeze the spring clip jaws open, position the spring clip to one side of the system ground lug screw head, and slide the spring clip over the lug screw head so that the spring clip jaws close behind the lug screw head.



Note The spring clip jaws do not open wide enough to fit directly over the head of the lug screw or the lug barrel.

- b. If you are using an ESD wrist strap that is equipped with an alligator clip, attach the alligator clip directly over the head of the system ground lug screw or to the system ground lug barrel.

Figure 2-16 Attaching the ESD Wrist Strap to the System Ground Lug Screw



1	ESD ground strap	3	Side view of grounding lug (clip slid behind screw)
2	Clip and grounding lug	4	Clip installed (behind screw)
5	System ground connector		

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In addition, follow these guidelines when handling modules:

- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed component board-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Never attempt to remove the printed circuit board from the metal carrier.

**Caution**

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohm (Mohm).

Establishing the System Ground

This section describes how to connect a system ground to the MDS 9200 series switches.

**Note**

This system ground is also referred to as the network equipment building system (NEBS) ground.

You must use the system (NEBS) ground on AC-powered systems if you are installing this equipment in a U.S. or European Central Office.

The system (NEBS) ground provides additional grounding for EMI shielding requirements and grounding for the low voltage supplies (DC-DC converters) on the modules and is intended to satisfy the telcordia Technologies NEBS requirements for supplemental bonding and grounding connections. You must observe the following system grounding guidelines for your chassis:

- You must install the system (NEBS) ground connection with any other rack or system power ground connections that you make. The system ground connection is required if this equipment is installed in a U.S. or European Central Office.
- You must connect both the system (NEBS) ground connection and the power supply ground connection to an earth ground. The system (NEBS) ground connection is required if this equipment is installed in a U.S. or European Central Office.
- You do not need to power down the chassis because the MDS 9200 series chassis are equipped with AC-input power supplies.

Required Tools and Equipment

To connect the ground system, you need the following tools and materials:

- Grounding lug—A two holes standard barrel lug. Supports up to 6 AWG wire. Supplied as part of accessory kit.
- Grounding screws—Two M4 x 8mm (metric) pan-head screws. Supplied as part of the accessory kit.
- Grounding wire—Not supplied as part of accessory kit. The grounding wire should be sized according to local and national installation requirements. Depending on the power supply and system, a 12 AWG to 6 AWG copper conductor is required for U.S. installations. Commercially available 6 AWG wire is recommended. The length of the grounding wire depends on the proximity of the switch to proper grounding facilities.
- No. 1 Phillips screwdriver.

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- Crimping tool to crimp the grounding wire to the grounding lug.
- Wire-stripping tool to remove the insulation from the grounding wire.

Grounding the Chassis

The chassis has a grounding pad with two threaded M4 holes for attaching a grounding lug. [Figure 2-17](#) shows the system ground location on the Cisco MDS 9200 Series.



Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046



Caution

Cisco recommends grounding the chassis, even if the rack is already grounded.

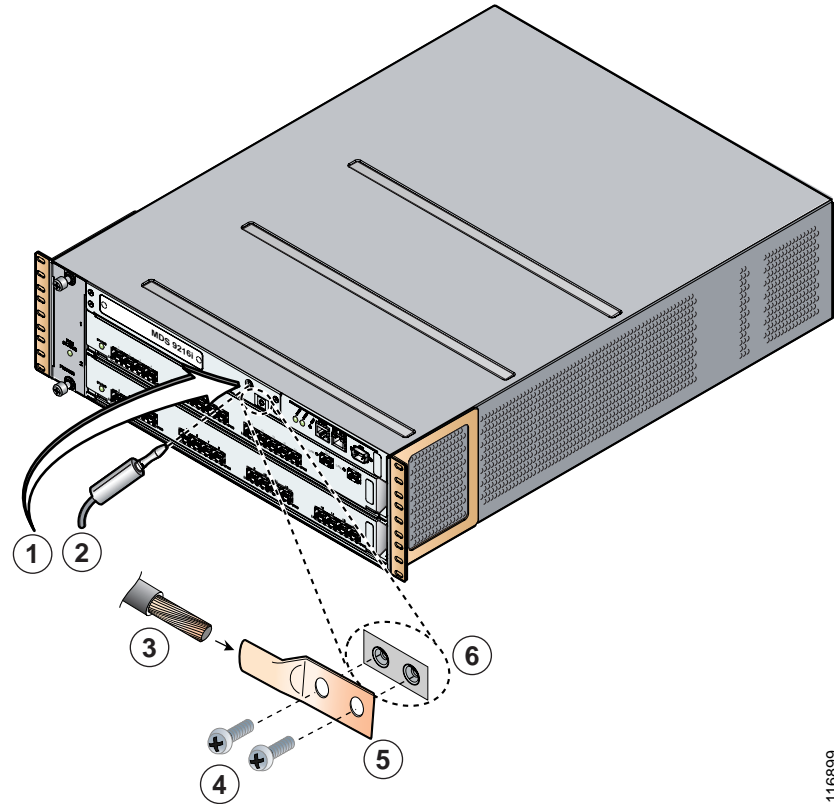


Caution

All power supplies must be grounded. The receptacles of the AC power cables used to provide power to the chassis must be the grounding type, and the grounding conductors should connect to protective earth ground at the service equipment.

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Figure 2-17 Location of System Ground on the Cisco MDS 9200 Series



1	ESD socket (on switch)	4	Screws, M4, with square cone washers
2	ESD plug	5	NRTL listed grounding lug
3	Grounding cable	6	Close-up of grounding pad on switch

Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

Caution

Grounding the chassis is required if you are using DC power supplies, even if the rack is already grounded. A grounding pad with two threaded M4 holes is provided on the chassis for attaching a grounding lug. The ground lug must be NRTL listed. In addition the copper conductor (wires) must be used and the copper conductor must comply with NEC code for ampacity.

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To attach the grounding lug and cable to the chassis, follow these steps:

-
- Step 1** Use a wire-stripping tool to remove approximately 0.75 in. (19 mm) of the covering from the end of the grounding cable.
 - Step 2** Insert the stripped end of the grounding cable into the open end of the grounding lug.
 - Step 3** Use the crimping tool to secure the grounding cable in the grounding lug.
 - Step 4** Remove the adhesive label from the grounding pad on the chassis.
 - Step 5** Place the grounding lug against the grounding pad so that there is solid metal-to-metal contact, and insert the two M4 screws with washers through the holes in the grounding lug and into the grounding pad.
 - Step 6** Ensure that the lug and cable do not interfere with other equipment.
 - Step 7** Prepare the other end of the grounding cable and connect it to an appropriate grounding point in your site to ensure adequate earth ground.
-

Starting Up the Switch

This section provides instructions for powering up the switch and verifying component installation.



Warning

Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing. Statement 1034



Warning

Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. During this procedure, wear grounding wrist straps to avoid ESD damage to the switch. Statement 1029



Note

Do not connect the MGMT 10/100 Ethernet port to the LAN until the initial switch configuration has been performed. For instructions on configuring the switch, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*. For instructions on connecting to the console port, see the [“Connecting to the Console Port” section on page 3-2](#).



Warning

When installing or replacing the unit, the ground connection must always be made first and disconnected last. Statement 1046

To power up the switch and verify hardware operation, follow these steps:

-
- Step 1** Verify that empty module slots have filler panels installed, the faceplates of all modules are flush with the front of the chassis, the ejector levers are fully closed and approximately parallel to the front of the module, and the captive screws of the power supplies, fan module, and all supervisor, switching, or services modules are tight.

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Step 2 Verify that both power supplies and the fan module are installed.

Step 3 Verify that the power switches on both power supplies are off, and then plug the power cables into the power supplies and tighten the screws on the power cable retainers to ensure the cables cannot be pulled out.



Note Depending on the outlet receptacle on your power distribution unit, you may need the optional jumper power cord to connect the Cisco MDS 9200 Series to your outlet receptacle. See the [“Jumper Power Cord” section on page C-11](#).

Step 4 Connect the other end of the power cables to an AC power source.

Step 5 Ensure that the switch is adequately grounded as described in the [“Installing the Switch in a Cabinet with Insufficient Front Clearance” section on page 2-11](#), and that the power cables are connected to outlets that have the required AC power voltages (see the [“Weight of Modules” section on page B-3](#)).

Step 6 Flip the power switches on the power supplies to the on (I) position. The switch boots automatically.

Step 7 Listen for the fans; they should begin operating when the switch is powered on.



Caution Do not operate the switch without a functioning fan module except for during the brief fan module replacement procedure. Cisco MDS 9000 Family switches can operate for only a few minutes without any functioning fan modules before they begin to overheat.

Step 8 After the switch boots, verify that the LED behavior is as follows:

- Fan module: Status LED is green.
- Power supplies:
 - Input Ok LED is green.
 - Fan Ok LED is green.
 - Output Fail LED is off.
- Supervisor, switching, or services modules:
 - During initialization, the status LED on the module flashes orange once, remains orange during diagnostic boot tests, then turns green when the module is operational (online). If the system software is unable to start up, this LED remains orange or turns red.
 - After initialization, the status LED is green, indicating that all chassis environmental monitors are reporting that the system is operational. If this LED is orange or red, then one or more environmental monitor is reporting a problem.
- The Link LEDs for the Ethernet port should not be on unless the cable is connected.



Note The link LEDs for the Fibre Channel ports remain yellow until the ports are enabled, and the LED for the MGMT 10/100 Ethernet port remains off until the port is connected.

Step 9 Try removing and reinstalling a component that is not operating correctly. If it still does not operate correctly, contact your customer service representative for a replacement.

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Note

If you purchased this product through a Cisco reseller, contact the reseller directly for technical support. If you purchased this product directly from Cisco, contact Cisco Technical Support at this URL: <http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>.

- Step 10** Verify that the system software has booted and the switch has initialized without error messages. If any problems occur, see the *Cisco MDS 9000 Family Troubleshooting Guide* or the *Cisco MDS 9000 Family System Messages Guide*. If you cannot resolve an issue, contact your customer service representative.
- Step 11** Complete the worksheets provided in [Appendix D, “Site Planning and Maintenance Records”](#) for future reference.



Note

A setup utility automatically launches the first time you access the switch and guides you through the basic configuration. For instructions on how to configure the switch and check module connectivity, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

Removing and Installing Components

This section includes the following topics:

- [Removing and Installing Switching and Services Modules, page 2-28](#)
- [Maintaining a Caching Services Module, page 2-35](#)
- [Removing and Installing Power Supplies, page 2-36](#)
- [Removing and Installing the Fan Module, page 2-38](#)
- [Removing the Cisco MDS 9200 Series, page 2-40](#)



Warning

Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing. Statement 1034



Caution

To prevent ESD damage, wear grounding wrist straps during these procedures and handle modules by the carrier edges only.

Removing and Installing Switching and Services Modules

Slot 1 is reserved for the supervisor module with its integrated multiport switching or IP services module. Slot 2 can contain an optional module. See [Figure 1-2](#) for slot locations.



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

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Use of controls, adjustments, or performing procedures other than those specified may result in hazardous radiation exposure. Statement 1057



Hazardous voltage or energy is present on the backplane when the system is operating. Use caution when servicing. Statement 1034



To prevent ESD damage, wear grounding wrist straps during these procedures and handle modules by the carrier edges only.



Note

Install the Cisco MDS 9200 Series in the rack before installing modules. For information about installing the chassis, see the “[Installing the Chassis in a Cabinet or Rack](#)” section on page 2-5.

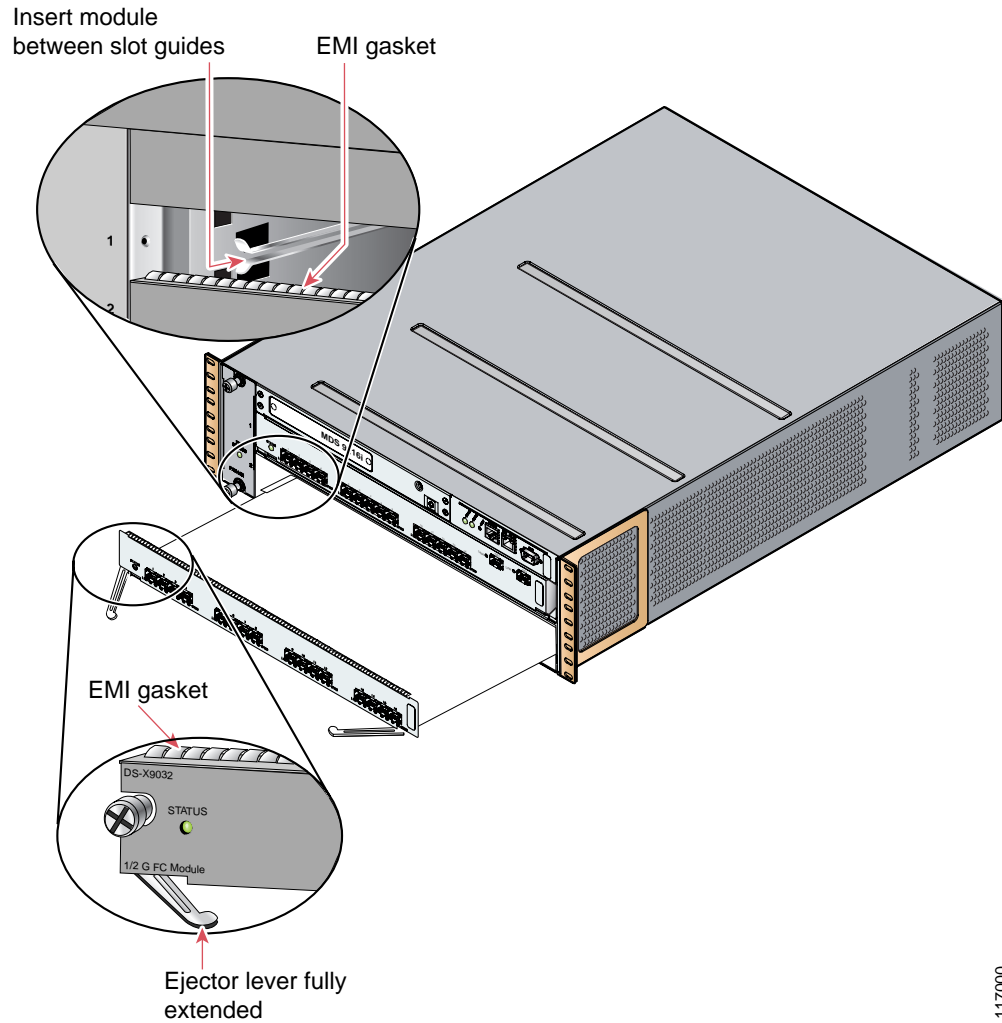
This section includes the following topics:

- [Removing a Caching Services Module, page 2-31](#)
- [Removing Other Switching or Services Modules, page 2-32](#)
- [Installing a Switching or Services Module, Including Caching Services Modules, page 2-33](#)
- [Verifying Installation of a Switching or Services Module, page 2-34](#)

[Figure 2-18](#) and [Figure 2-19](#) show the positioning of a module in the chassis.

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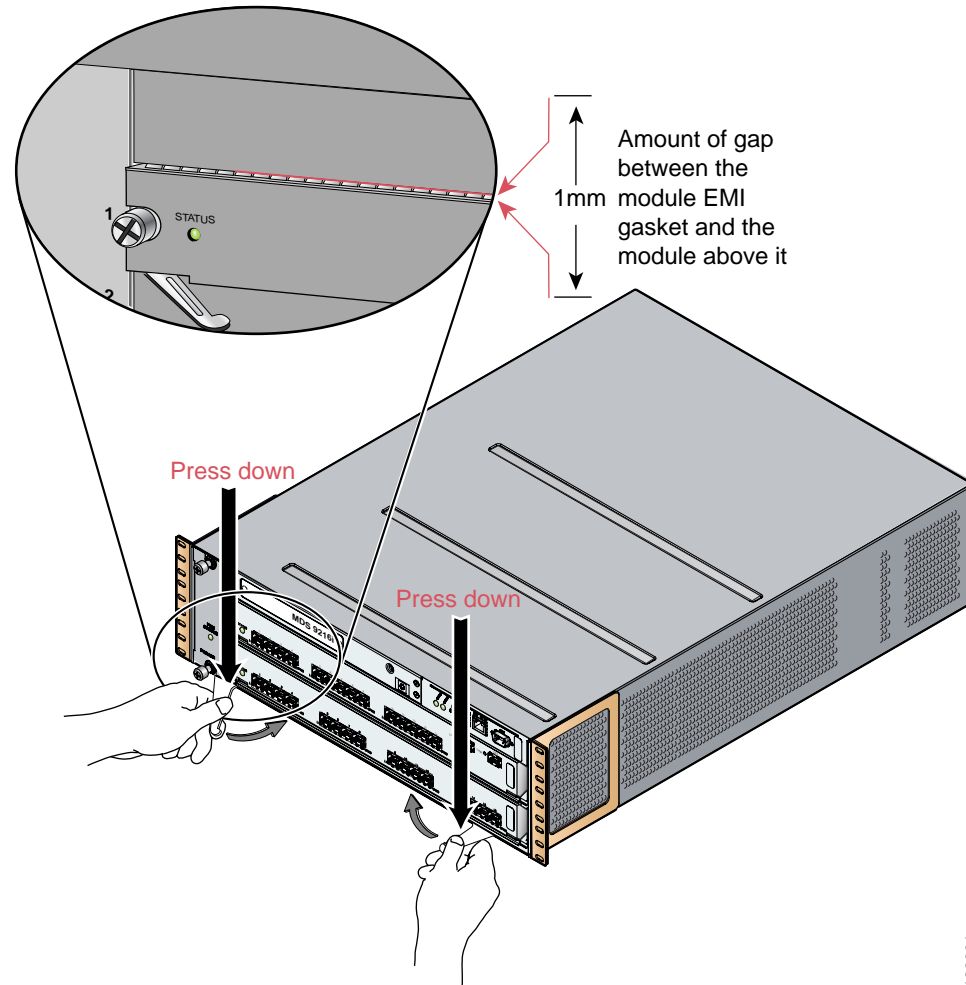
Figure 2-18 Positioning the Module in the Chassis



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Figure 2-19 Clearing the EMI Gasket



Removing a Caching Services Module



Note

A minimum of two CSMs in each fabric are required for redundancy and data backup.



Warning

Do not touch or bridge the metal contacts on the battery. Unintentional discharge of the batteries can cause serious burns. Statement 341



Warning

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



Caution

Wait for all LEDs to turn off before removing the module from the chassis. If the LEDs are on, the module still has power.

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To remove a CSM module from the chassis, follow these steps:

-
- Step 1** Power off the module from the CLI. For information about the correct command to use, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide*.
- Step 2** Ensure that the backup process has completed by verifying that all LEDs on the module have turned off. This requires up to 10 minutes.
- Step 3** Loosen the two captive screws on the module.
- Step 4** Remove the module from the chassis as follows:
- Place your thumbs on the left and right ejector levers (shown in [Figure 2-18 on page 2-30](#)) and simultaneously rotate the levers outward to unseat the module from the backplane connector.
 - Grasp the front edge of the module and slide the module part of the way out of the slot. Place your other hand under the module to support the weight of the module. Do not touch the module circuitry.
- Step 5** Place the module on an antistatic mat or antistatic foam if not immediately reinstalling it in another slot.
- Step 6** Install a filler panel to keep dust out of the chassis and maintain consistent airflow if the slot will remain empty.



Warning

Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029

Removing Other Switching or Services Modules

To remove a switching or services module from the chassis, follow these steps:

-
- Step 1** Disconnect any network interface cables attached to the module.
- Step 2** Loosen the two captive screws on the module.
- Step 3** Remove the module from the chassis as follows:
- Place your thumbs on the left and right ejector levers (shown in [Figure 2-18 on page 2-30](#)) and simultaneously rotate the levers outward to unseat the module from the backplane connector.
 - Grasp the front edge of the module and slide the module part of the way out of the slot. Place your other hand under the module to support the weight of the module. Do not touch the module circuitry.
- Step 4** Place the module on an antistatic mat or antistatic foam if not immediately reinstalling it in another slot.
- Step 5** Install a filler panel to keep dust out of the chassis and maintain consistent airflow if the slot will remain empty.

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**Warning**

Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place. Statement 1029

Installing a Switching or Services Module, Including Caching Services Modules

The following warning applies only to the Caching Services Module:

**Warning**

Do not touch or bridge the metal contacts on the battery. Unintentional discharge of the batteries can cause serious burns. Statement 341

**Note**

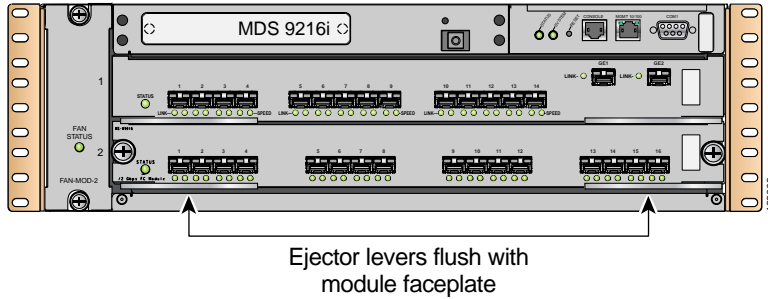
Before installing any modules in the chassis, Cisco recommends installing the chassis in the rack. See the [“Installing the Chassis in a Cabinet or Rack”](#) section on page 2-5.

To install a module in slot 2 of the chassis, follow these steps:

- Step 1** Verify that there is enough clearance to accommodate any interface equipment that you connect directly to the nearby components.
- Step 2** If a filler panel is installed, remove the two Phillips pan-head screws from the filler panel and remove the panel. To remove a currently installed module, see the [“Removing and Installing Switching and Services Modules”](#) section on page 2-28.
- Step 3** Open fully both ejector levers on the new or replacement module (see [Figure 2-18 on page 2-30](#)).
- Step 4** Position the module in the chassis as follows:
 - a. Position the module in the slot, aligning the sides of the module carrier with the slot guides on each side of the slot.
 - b. Slide the module carefully into the slot until the EMI gasket along the top edge of the module makes contact with the supervisor module above it and both ejector levers have closed to approximately 45 degrees with respect to the module faceplate (see [Figure 2-19 on page 2-31](#)).
 - c. Grasp the two ejector levers using the thumb and forefinger of each hand and press down to create a small 0.040-in. (1 mm) gap between the module's EMI gasket and the module above it (see [Figure 2-20](#)).

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Figure 2-20 Closing the Ejector Levers



Caution

Do not press down too forcefully on the levers because they can bend.

- d. Press down and simultaneously close the left and right ejector levers to fully seat the module in the backplane connector. The ejector levers are fully closed when they are flush with the module faceplate.



Note

Ensure that the ejector levers are fully closed before tightening the captive screws. Failure to fully seat the module in the backplane connector can result in error messages.

- e. Tighten the two captive screws on the module.

Verifying Installation of a Switching or Services Module

To verify the module installation in slot 2, follow these steps:

- Step 1** Verify that the ejector levers of the module are fully closed (parallel to the faceplate) to ensure that the module is fully seated in the backplane connectors.
- Step 2** Check the captive screws of the module, the power supply, and the fan module, and tighten any loose captive screws.
- Step 3** Verify that a filler panel is installed and that the screws holding the panel in place are tightened if the slot is to remain empty.
- Step 4** Turn on the power supply switches to power up the system and check the LEDs on the module.



Note

For information on how to check connectivity of the module, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

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Maintaining a Caching Services Module



Caution

Maintenance should only be performed by qualified service personnel.



Note

A minimum of two CSMs in each fabric are required for redundancy and data backup.

This section includes the following topics:

- [Maintaining the Batteries on the Caching Services Module, page 2-35](#)
- [Maintaining the Disk Drives on the Caching Services Module, page 2-35](#)

Maintaining the Batteries on the Caching Services Module

The CSM batteries last approximately three years. The following message displays in the system log when a battery fails:

```
Dec 5 17:14:36 sw-90.21 %SVC_BATTERY-SLOT8-4-BATTERY_CAPACITY_LOW:  
Battery capacity is below the required threshold.
```

A message also appears in the output of the **show interface** command.

If you see this message, contact your support provider for assistance. If a battery fails, the CSM must be replaced.



Caution

The CSM batteries are shipped fully charged and should be handled accordingly.



Warning

Do not touch or bridge the metal contacts on the battery. Unintentional discharge of the batteries can cause serious burns. Statement 341



Warning

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

The batteries are automatically charged on a periodic basis with an SMBus-compliant Level III smart charger located on the CSM. The smart charger measures the charge and recharges the battery to full if it is less than 90 percent of capacity.

The batteries are also automatically reconditioned on a periodic basis, one battery at a time. During reconditioning all power is drained from the battery and the battery is completely recharged, requiring approximately six hours. The Battery Status LED flashes green during the reconditioning.

Maintaining the Disk Drives on the Caching Services Module

A message displays in the system log when a disk drive requires replacement. If you see this message, contact your support provider for assistance.

If a disk drive fails, the CSM must be replaced. The other CSM(s) in the fabric contain the same data, and they can continue to provide caching services during the replacement period.

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Removing and Installing Power Supplies

The Cisco MDS 9200 Series supports dual 845-W AC power supplies that monitor output voltage and provide status to the supervisor module.

This section includes the following topics:

- [Removing a Power Supply, page 2-36](#)
- [Installing a Power Supply, page 2-36](#)

A flat-blade or Phillips screwdriver is required to perform these procedures.



Warning

Voltage is present on the backplane when the system is operating. To reduce risk of an electric shock, keep hands and fingers out of the power supply bays and backplane areas. Statement 166



Warning

Power supply captive installation screws must be tight to ensure protective grounding continuity. Statement 289



Note

You can replace a faulty power supply while the system is operating provided the other power supply is functioning.

Removing a Power Supply

To remove a power supply, follow these steps:

- Step 1** Turn the power switch to the off (0) position.
- Step 2** Loosen the screw on the power cable retainer and disconnect the power cable from the power supply being removed.
- Step 3** Loosen the captive screw on the power supply.
- Step 4** Grasp the power supply handle with one hand and slide it out of the chassis.
- Step 5** Install a blank filler panel if the power supply bay is to remain empty.

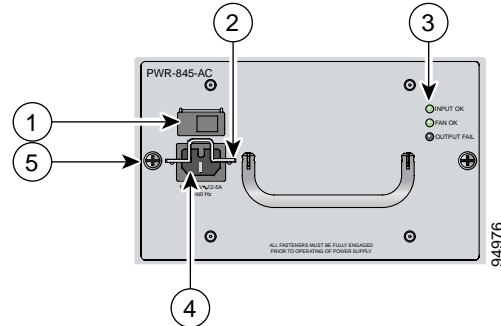
Installing a Power Supply

To install a power supply, follow these steps:

- Step 1** Ensure that the system (earth) ground connection has been made. For ground connection instructions, see the [“Installing the Switch in a Cabinet with Insufficient Front Clearance” section on page 2-11](#).
- Step 2** If the power supply bay has a filler panel, loosen the screws holding the panel and remove the panel.
- Step 3** Verify that the power switch is in the off (0) position on the power supply you are installing. See [Figure 2-21](#) for the location of the power switch.

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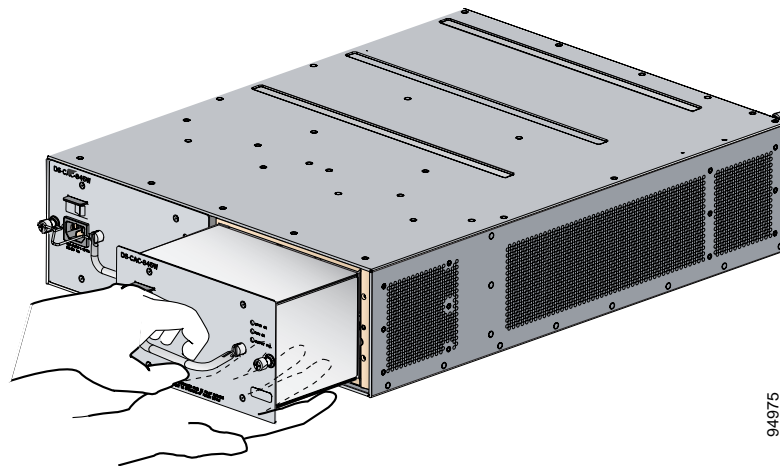
Figure 2-21 845-W AC Power Supply Front Panel



1	Power switch	4	AC power connection
2	Power cable retainer	5	Captive screw
3	Power supply LEDs		

- Step 4** Hold the power supply by the handle and orient it as shown in [Figure 2-22](#), and then slide it into the power supply bay, ensuring that it is fully seated in the bay.

Figure 2-22 Handling an 845-W AC Power Supply



- Step 5** Tighten the power supply captive screws.
- Step 6** Plug the power cable into the power supply, and tighten the screw on the power cable retainer to ensure the cable cannot be pulled out.



Note Depending on the outlet receptacle on your power distribution unit, you may need the optional jumper power cord to connect the Cisco MDS 9200 Series to your outlet receptacle. See the [“Jumper Power Cord”](#) section on page C-11.

- Step 7** Connect the other end of the power cable to an AC power source.

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**Caution**

In a system with dual power supplies, connect each power supply to a separate power source. In case of a power source failure, the second source will most likely still be available.

- Step 8** Turn the power switch to the on (I) position on the power supply.
- Step 9** Verify power supply operation by checking that the power supply LEDs are in the following states:
- Input Ok LED is green.
 - Fan Ok LED is green.
 - Output Fail LED is off.

Removing and Installing the Fan Module

The fan module is designed to be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system, provided the replacement is performed promptly.

This section includes the following topics:

- [Removing a Fan Module, page 2-39](#)
- [Installing a Fan Module, page 2-39](#)

You will need a flat-blade or number 2 Phillips screwdriver to perform these procedures.

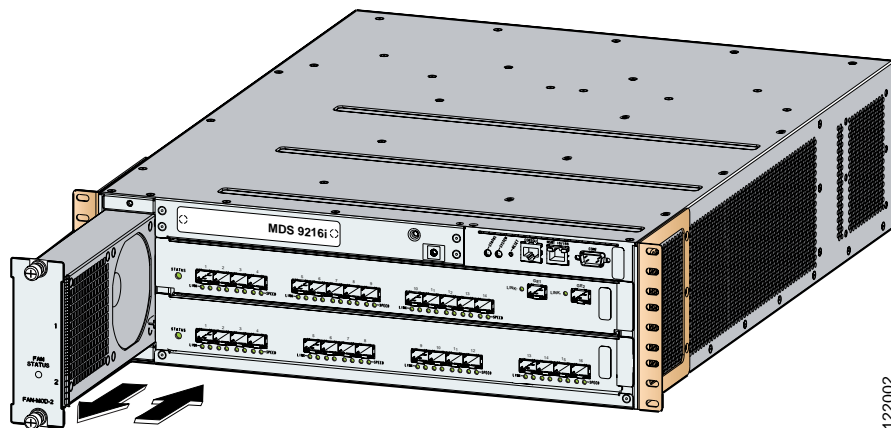
**Caution**

The Cisco MDS 9000 Family switches have internal temperature sensors that are capable of shutting down the system if the temperature at different points within the chassis exceed certain safety thresholds. To be effective, the temperature sensors require the presence of airflow; therefore, in the event a fan module is removed from the chassis, the Cisco MDS 9000 Family switches will be shut down after five minutes to prevent potentially undetectable overheating. However, the switches will shut down sooner if the higher-level temperature threshold is exceeded.

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Figure 2-23 shows a fan module partially installed in the Cisco MDS 9200 Series.

Figure 2-23 Fan Module



Removing a Fan Module



Warning

When removing the fan tray, keep your hands and fingers away from the spinning fan blades. Let the fan blades completely stop before you remove the fan tray. Statement 258

To remove a fan module, follow these steps:

- Step 1** Loosen the two captive screws on the fan module by turning them counterclockwise, using a flat-blade or number 2 Phillips screwdriver if required.
- Step 2** Grasp the fan module with both hands and pull it outward; rock it gently, if necessary, to unseat the power connector from the backplane.
- Step 3** Pull the fan module clear of the chassis.



Caution

If the switch is powered on, you must hot-swap another fan module into this switch within five minutes.

Installing a Fan Module

To install a fan module, follow these steps:

- Step 1** Hold the fan module with the Fan Status LED at the top (see Figure 2-23).
- Step 2** Place the fan module into the front chassis cavity so it rests on the chassis, lift the fan module up slightly to align the top and bottom chassis guides, then push the fan module into the chassis until it seats in the backplane and the captive screws make contact with the chassis, and tighten the captive screws.

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Step 3 Listen for the fans if the switch is powered on. You should immediately hear them operating. If you do not hear them, ensure that the fan module is inserted completely in the chassis and the faceplate is flush with the outside surface of the chassis.

Step 4 Verify that the Fan Status LED is green. If the LED is not green, one or more fans are faulty. If this occurs, contact your customer service representative for a replacement part.

**Note**

If you purchased this product through a Cisco reseller, contact the reseller directly for technical support. If you purchased this product directly from Cisco, contact Cisco Technical Support at this URL:
<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml>.

Removing the Cisco MDS 9200 Series

When removing the Cisco MDS 9200 Series from the rack, remove the slider brackets first, and then the front screws fastening the front rack-mount brackets to the rack.

**Note**

The slider rail and C brackets do not have a stop mechanism when sliding in and out. If the front of the chassis is unfastened from the rack and the chassis slides forward on the slider rails, it may slip off the end of the rails and fall out of the rack.

To remove the Cisco MDS 9200 Series from the rack, follow these steps:

-
- Step 1** Remove the screws fastening the slider bracket to the mounting rails.
 - Step 2** Slide the slider brackets out of the C brackets on the sides of the Cisco MDS 9200 Series.
 - Step 3** Ensure the weight of the Cisco MDS 9200 Series is supported; for example, being held by another person.
 - Step 4** Remove the screws fastening the front rack-mount brackets on the Cisco MDS 9200 Series to the mounting rails, and remove the Cisco MDS 9200 Series from the rack.
-



CHAPTER 3

Connecting the Cisco MDS 9200 Series

The Cisco MDS 9200 Series provides the following types of ports:

- Console port (interface module)—An RS-232 port that you can use to create a local management connection.
- COM1 port (interface module)—An RS-232 port that you can use to connect to an external serial communication device such as a modem.
- MGMT 10/100 Ethernet port (interface module)—An Ethernet port that you can use to access and manage the switch by IP address, such as through the CLI or Cisco Fabric Manager.
- Fibre Channel ports (supervisor and switching modules)—Fibre Channel ports that you can use to connect to the SAN, or for in-band management.
- Other port types provided by the optional module, if installed, such as the iSCSI and/or FCIP over Gigabit Ethernet ports on the 4-port or 8-port IPS modules.



Caution

When running power and data cables in overhead or subfloor cable trays, Cisco strongly recommends that power cables and other potential noise sources must be located as far away as practical from network cabling that terminates on Cisco equipment. In situations where long parallel cable runs cannot be separated by at least 3.3 ft (1 m), Cisco recommends shielding any potential noise sources by housing them in a grounded metallic conduit.

This chapter includes the following topics:

- [Preparing for Network Connections, page 3-2](#)
- [Connecting to the Console Port, page 3-2](#)
- [Connecting to the COM1 Port, page 3-4](#)
- [Connecting to the MGMT 10/100 Ethernet Port, page 3-5](#)
- [Connecting to a Fibre Channel Port, page 3-6](#)

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Preparing for Network Connections

When preparing your site for network connections to the Cisco MDS 9200 Series, consider the following for each type of interface, and gather all the required equipment before connecting the ports:

- Cabling required for each interface type
- Distance limitations for each signal type
- Additional interface equipment required

Connecting to the Console Port

The console port (labeled Console) is an RS-232 port with an RJ-45 interface. (See [Figure 3-1](#).) The console port is an asynchronous (async) serial port; any device connected to this port must be capable of asynchronous transmission.

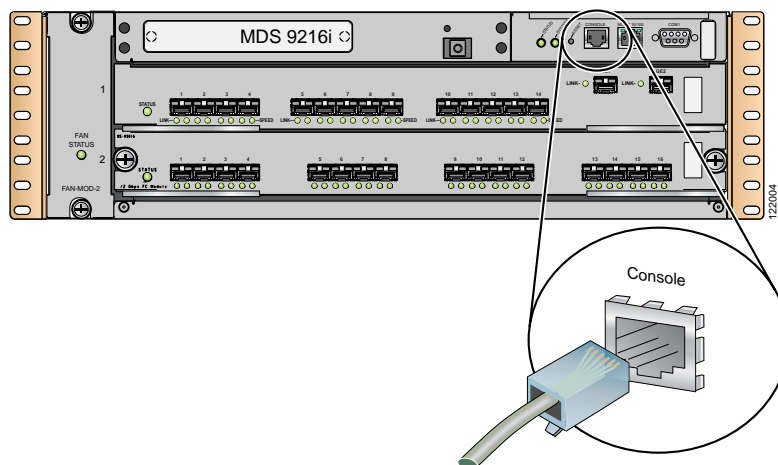
Cisco recommends using this port to create a local management connection to set the IP address and other initial configuration settings before connecting the switch to the network for the first time.



Caution

The console port can be used to connect to a modem, however, Cisco recommends using the COM1 port for this purpose. If you decide to connect the console port to a modem, do not connect it while the switch is booting; connect either before powering the switch on or after the switch has completed the boot process.

Figure 3-1 Connecting to the Console Port on the Cisco MDS 9200 Series



You can use the console port to perform the following:

- Configure the Cisco MDS 9200 Series from the CLI.
- Monitor network statistics and errors.
- Configure SNMP agent parameters.
- Download software updates.

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**Note**

To connect the console port to a computer terminal, the computer must support VT100 terminal emulation. The terminal emulation software—frequently an application such as HyperTerminal or Procomm Plus—makes communication between the Cisco MDS 9200 Series and a computer possible during setup and configuration.

To connect the console port to a computer terminal, follow these steps:

-
- Step 1** Configure the terminal emulator program to match the following default port characteristics: 9600 baud, 8 data bits, 1 stop bit, no parity.
- Step 2** Connect the supplied RJ-45 to DB-9 female adapter or RJ-45 to DB-25 female adapter (depending on your computer serial port) to the computer serial port. Cisco recommends using the adapter and cable provided with the switch.
- Step 3** Connect the console cable (a rollover RJ-45 to RJ-45 cable) to the console port (see [Figure 3-1](#)) and to the RJ-45 to DB-9 adapter or RJ-45 to DB-25 adapter at the computer serial port.

**Note**

For configuration instructions, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

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Connecting to the COM1 Port

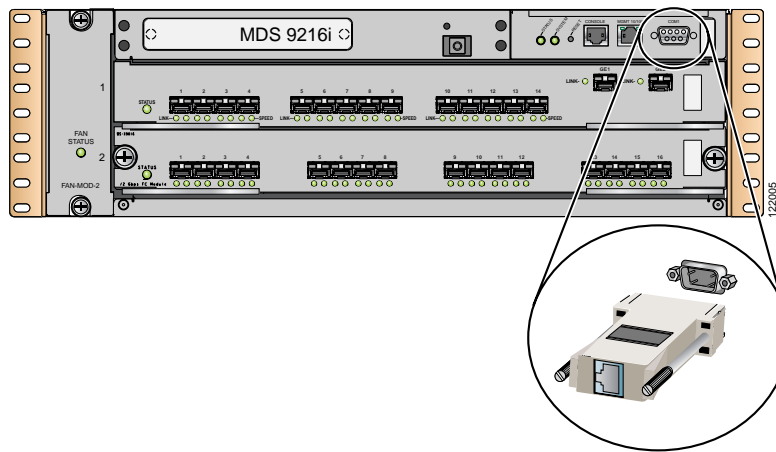


Note

The COM1 port is not supported for connection to a console.

The COM1 port (labeled COM1) is an RS-232 port with a DB-9 interface. (See [Figure 3-2](#).) You can use this port to connect to an external serial communication device such as a modem. For information about how to turn off hardware flow control, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

Figure 3-2 Connecting to the COM1 Port on the Cisco MDS 9200 Series



To connect the COM1 port to a modem, follow these steps:

- Step 1** Connect the DB-9 serial adapter to the COM1 port.



Note

Connect the modem to the COM1 port using the adapters and cables provided with the accessory kit.

- Step 2** Connect the RJ-45 to DB-25 modem adapter to the modem.
- Step 3** Connect these two adapters using the RJ-45 to RJ-45 rollover cable (or equivalent crossover cable).
- Step 4** If the default settings for the COM1 port were modified, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide* for information on this feature.

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The default COM1 settings are as follows:

```
line Aux:
Speed: 9600 bauds
Databits: 8 bits per byte
Stopbits: 1 bit(s)
Parity: none
Modem In: Enable
Modem Init-String -
default : ATE0Q1&D2&C1S0=1\015
Statistics: tx:17 rx:0 Register Bits:RTS|DTR
```

Connecting to the MGMT 10/100 Ethernet Port

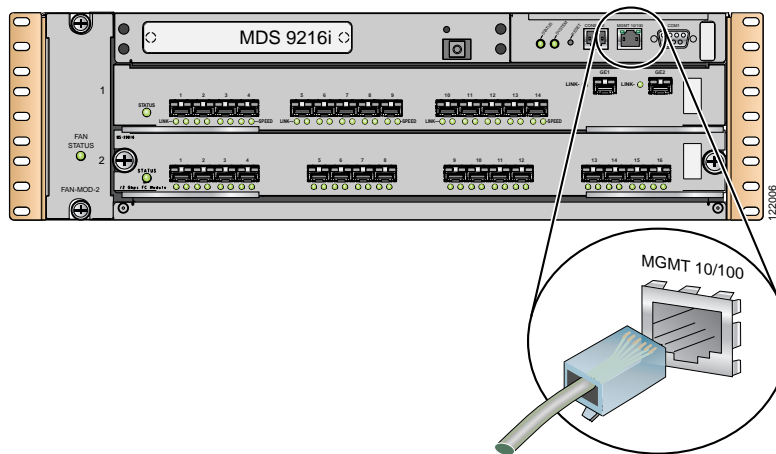


Caution

To prevent an IP address conflict, do not connect the MGMT 10/100 Ethernet port to the network until the initial configuration is complete. For configuration instructions, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

The MGMT 10/100 Ethernet port is autosensing and has an RJ-45 interface. (See [Figure 3-3](#).) You can use this port to access and manage the switch by its IP address, such as through the Cisco Fabric Manager.

Figure 3-3 Connecting to the MGMT 10/100 Ethernet Port on the Cisco MDS 9200 Series



To connect the MGMT 10/100 Ethernet port to an external hub, switch, or router, follow these steps:

- Step 1** Connect the appropriate modular cable to the MGMT 10/100 Ethernet port:
 - Use modular, RJ-45, straight-through UTP cables to connect the 10/100 management port to an Ethernet switch port or hub.
 - Use a cross-over cable to connect to a router interface.
- Step 2** Connect the other end of the cable to the device.

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Connecting to a Fibre Channel Port

The Fibre Channel ports on the switch modules are compatible with LC-type fiber-optic SFP transceivers and cables. You can use the Fibre Channel ports to connect to the SAN or for in-band management. For information about configuring the switch for in-band management, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

The Cisco MDS 9000 Family supports both Fibre Channel and Gigabit Ethernet protocols for SFP transceivers. Each transceiver must match the transceiver on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communications. SFP transceivers can be ordered separately or with the Cisco MDS 9200 Series.



Warning

Class 1 laser product. Statement 1008



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



Caution

Wear an ESD wrist strap connected to the chassis when handling transceivers. Keep optical connectors covered when not in use, and do not touch connector ends. The fiber-optic connectors must be free of dust, oil, and other contaminants.

This section includes the following topics:

- [Removing and Installing X2 Transceivers, page 3-6](#)
- [Removing and Installing SFP Transceivers, page 3-8](#)
- [Removing and Installing Cables into SFP Transceivers, page 3-11](#)
- [Maintaining SFP Transceivers and Fiber-Optic Cables, page 3-13](#)

Removing and Installing X2 Transceivers



Caution

Excessively removing and installing an X2 transceiver can shorten its life. Do not remove and insert X2 transceivers more often unless it is absolutely necessary. Cisco recommends disconnecting cables before installing or removing SFP transceivers to prevent damage to the cable or transceiver.



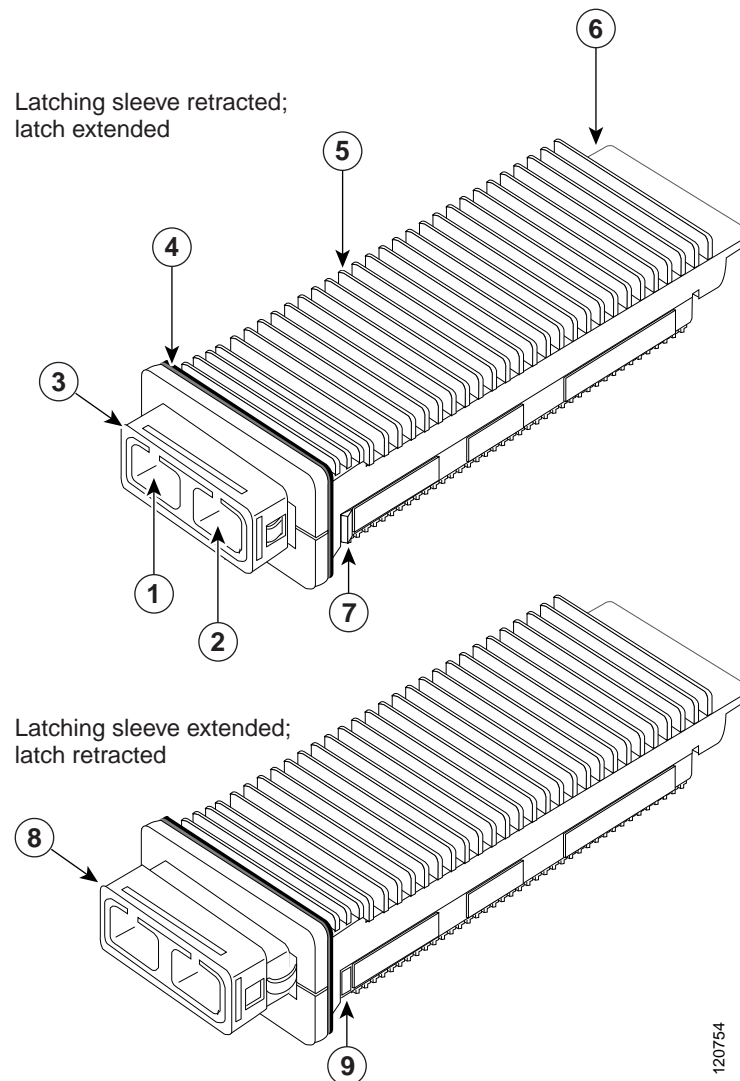
Note

Use only Cisco X2 transceivers listed in [Table B-10 on page B-8](#) on the Cisco MDS 9200 Series. Each X2 transceiver is encoded with model information that enables the switch to verify that the X2 transceiver meets the requirements for the switch. For instructions specific to the transceiver type, see the [“X2 Transceiver Specifications” section on page B-7](#).

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The Cisco MDS 9000 Family supports X2 transceivers with SC connectors. (See [Figure 3-4](#).)

Figure 3-4 Cisco MDS 9000 Family X2 Transceivers



1	Transmit optical bore	6	Module connector
2	Receive optical bore	7	Latch (extended)
3	Latching sleeve (retracted)	8	Latching sleeve (extended)
4	EMI gasket	9	Latch (retracted)
5	Transceiver heat sink		

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Installing an X2 Transceiver

To install an X2 transceiver, follow these steps:

-
- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.



Caution If the transceiver does not install easily, ensure that it is correctly oriented before continuing.

- Step 2** Remove the dust cover from the port end of the transceiver.

- Step 3** Insert the transceiver into the port. ensure the transceiver is fully seated.



Note If you cannot install the cable into the transceiver, insert or leave the dust plug in the cable end of the transceiver.

Removing an X2 Transceiver

To remove an X2 transceiver, follow these steps:

-
- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.

- Step 2** If a cable is installed in the transceiver:

- a. Record the cable and port connections for later reference.
- b. Press the release latch on the cable, grasp the connector near the connection point, and gently pull the connector from the transceiver.
- c. Insert a dust plug into the cable end of the transceiver.



Caution If the transceiver does not remove easily in the next step, push the transceiver completely in and then ensure that the latch is in the correct position before continuing.

- Step 3** Remove the transceiver from the port.

- Step 4** Insert a dust cover into the port end of the transceiver and place the transceiver on an antistatic mat or into a static shielding bag if you plan to return it to the factory.
-

Removing and Installing SFP Transceivers



Caution

Excessively removing and installing an SFP transceiver can shorten its life. Do not remove and insert SFP transceivers more often unless it is absolutely necessary. Cisco recommends disconnecting cables before installing or removing SFP transceivers to prevent damage to the cable or transceiver.

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Note

Use only Cisco SFP transceivers on the Cisco MDS 9200 Series. Each Cisco SFP transceiver is encoded with model information that enables the switch to verify that the SFP transceiver meets the requirements for the switch. For instructions specific to the transceiver type, see the “[SFP and SFP+ Transceiver Specifications](#)” section on page B-10.

The Cisco MDS 9000 Family supports SFP transceivers with the following two types of latching devices:

- Mylar tab latch ([Figure 3-5](#))
- Bale-clasp latch ([Figure 3-6](#))

Figure 3-5 SFP Transceiver with Mylar Tab Latch

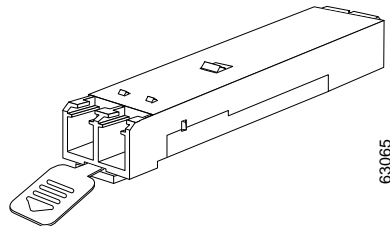
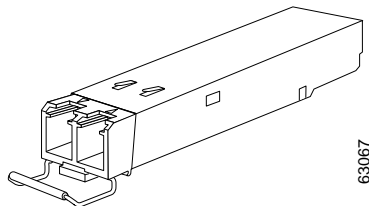


Figure 3-6 SFP Transceiver with Bale-Clasp Latch



Installing an SFP Transceiver

To install an SFP transceiver, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.
- Step 2** Remove the dust cover from the port cage.
- Step 3** Remove the dust cover from the port end of the transceiver.
- Step 4** Insert the transceiver into the port:
 - If the transceiver has a Mylar tab, orient the transceiver with the tab on the bottom, and then gently insert the transceiver into the port until it clicks into place.
 - If the transceiver has a bale clasp, orient the transceiver with the clasp on the bottom, close the clasp by pushing it up over the transceiver, and then gently insert the transceiver into the port until it clicks into place.



Caution

If the transceiver does not install easily, ensure that it is correctly oriented and the tab or clasp are in the correct position before continuing.

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**Note**

If you cannot install the cable into the transceiver, insert or leave the dust plug in the cable end of the transceiver.

Removing an SFP Transceiver

To remove an SFP transceiver, follow these steps:

Step 1 Attach an ESD-preventive wrist strap and follow its instructions for use.

Step 2 If a cable is installed in the transceiver:

- a. Record the cable and port connections for later reference.
- b. Press the release latch on the cable, grasp the connector near the connection point, and gently pull the connector from the transceiver.
- c. Insert a dust plug into the cable end of the transceiver.

**Caution**

If the transceiver does not remove easily in the next step, push the transceiver completely in and then ensure that the latch is in the correct position before continuing.

Step 3 Remove the transceiver from the port:

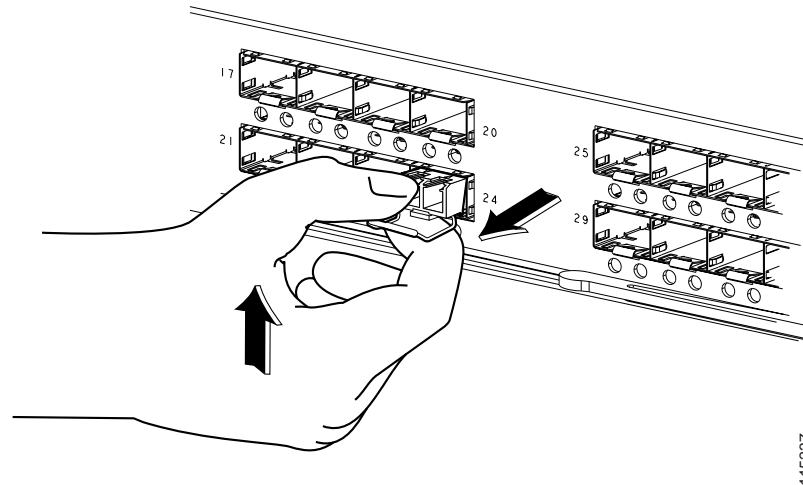
- If the transceiver has a Mylar tab latch, gently pull the tab straight out (do not twist), and then pull the transceiver out of the port.
- If the transceiver has a bale clasp latch, open the clasp by pressing it downwards, and then pull the transceiver out of the port.

**Note**

If you have difficulty removing a bale clasp SFP transceiver, you should reseal the SFP by returning the bale clasp in the up position. Then press the SFP inward and upward into the cage. Next, lower the bale clasp and pull the SFP straight out with a slight upward lifting force (see [Figure 3-7](#)). Be careful not to damage the port cage during this process.

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Figure 3-7 Alternate Removal Method for Bale Clasp SFP Transceivers



- Step 4** Insert a dust cover into the port end of the transceiver and place the transceiver on an antistatic mat or into a static shielding bag if you plan to return it to the factory.
- Step 5** If another transceiver is not being installed, protect the optical cage by inserting a clean cover.

Removing and Installing Cables into SFP Transceivers



Caution

To prevent damage to the fiber optic cables, do not place more tension on them than the rated limit and do not bend to a radius of less than 1 inch if there is no tension in the cable, or 2 inches if there is tension in the cable.

Installing a Cable into an SFP Transceiver



Caution

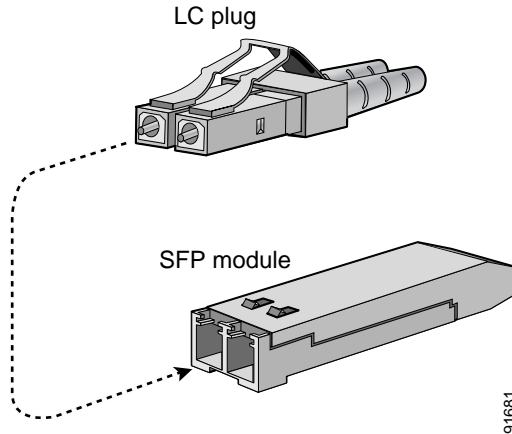
To prevent possible damage to the cable or transceiver, install the transceiver in the port before installing the cable in the transceiver.

To install a cable into a transceiver, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.
- Step 2** Remove the dust cover from the connector on the cable.
- Step 3** Remove the dust cover from the cable end of the transceiver.
- Step 4** Align the cable connector with the transceiver and insert the connector into the transceiver until it clicks into place. (See [Figure 3-8](#)).

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Figure 3-8 Connecting the LC-Type Cable to a Fibre Channel Port



Caution If the cable does not install easily, ensure that it is correctly oriented before continuing.

For instructions on verifying connectivity, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

Removing a Cable from an SFP Transceiver



Caution

When pulling a cable from a transceiver, grip the body of the connector. Do not pull on the jacket sleeve, because this can compromise the fiber-optic termination in the connector.



Caution

If the cable does not remove easily, ensure that any latch present on the cable has been released before continuing.

To remove the cable, follow these steps:

- Step 1** Attach an ESD-preventive wrist strap and follow its instructions for use.
- Step 2** Press the release latch on the cable, grasp the connector near the connection point, and gently pull the connector from the transceiver.
- Step 3** Insert a dust plug into the cable end of the transceiver.
- Step 4** Insert a dust plug onto the end of the cable.

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Maintaining SFP Transceivers and Fiber-Optic Cables

SFP transceivers and fiber-optic cables must be kept clean and dust-free to maintain high signal accuracy and prevent damage to the connectors. Attenuation (Loss of Light) is increased by contamination and should be below 0.35 dB.

Consider the following maintenance guidelines:

- SFP transceivers are static sensitive. To prevent ESD damage, wear an ESD-preventive wrist strap that is connected to the chassis.
- Do not remove and insert a transceiver more often than is necessary. Repeated removals and insertions can shorten its useful life.
- Keep all optical connections covered when not in use. If they become dusty, clean before using to prevent dust from scratching the fiber-optic cable ends.
- Do not touch ends of connectors to prevent fingerprints and other contamination.
- Clean regularly; the required frequency of cleaning depends upon the environment. In addition, clean connectors if they are exposed to dust or accidentally touched. Both wet and dry cleaning techniques can be effective; refer to your site's fiber-optic connection cleaning procedure.
- Inspect routinely for dust and damage. If damage is suspected, clean and then inspect fiber ends under a microscope to determine if damage has occurred.

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Cabinet and Rack Installation

This appendix provides information on how to install cabinet and rack, and includes the following sections:

- [Cabinet and Rack Requirements, page A-1](#)
- [Cisco MDS 9000 Family telco and EIA Shelf Bracket, page A-4](#)

Cabinet and Rack Requirements

This section provides the Cisco MDS 9000 Family requirements for the following types of cabinets and racks, assuming an external ambient air temperature range of 0 to 104°F (0 to 40°C):

- Standard perforated cabinets
- Solid-walled cabinets with a roof fan tray (bottom to top cooling)
- Standard open racks
- telco racks



Note

If you are selecting an enclosed cabinet, Cisco recommends one of the thermally validated types: standard perforated or solid-walled with a fan tray.



Note

Do not use racks that have obstructions (such as power strips), because the obstructions could impair access to field-replaceable units (FRUs).

General Requirements for Cabinets and Racks

The cabinet or rack must be one of the following types:

- Standard 19-in. (48.3 cm) (four-post EIA cabinet or rack, with mounting rails that conform to English universal hole spacing per section 1 of ANSI/EIA-310-D-1992. See the [“Requirements Specific to Perforated Cabinets”](#) section on page A-2 and the [“Requirements Specific to Solid-Walled Cabinets”](#) section on page A-3.
- Standard two-post telco rack, with mounting rails that conform to English universal hole spacing per section 1 of ANSI/EIA-310-D-1992. See the [“Requirements Specific to telco Racks”](#) section on page A-3.

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The cabinet or rack must also meet the following requirements:

- The minimum vertical rack space per chassis must be three RU (rack units), equal to 5.25 in. (13.3 cm).
- The width between the rack-mounting rails must be at least 17.75 in. (45.1 cm) if the rear of the switch is not attached to the rack. For four-post EIA racks, this is the distance between the two front rails.
- For four-post EIA cabinets (perforated or solid-walled):
 - The minimum spacing for the bend radius for fiber-optic cables should have the front mounting rails of the cabinet offset from the front door by a minimum of 3 in. (7.6 cm), and a minimum of 5 in. (12.7 cm) if cable management brackets are installed on the front of the chassis.
 - The distance between the outside face of the front mounting rail and the outside face of the back mounting rail should be 23.5 to 34.0 in. (59.7 to 86.4 cm) to allow for rear bracket installation.
 - A minimum of 2.5 in. (6.4 cm) of clear space should exist between the side edge of the chassis and the side wall of the cabinet. No sizeable flow obstructions should be immediately in the way of chassis air intake or exhaust vents.

**Note**

Optional jumper power cords are available for use in a cabinet. See the [“Jumper Power Cord” section on page C-11](#).

Requirements Specific to Perforated Cabinets

A perforated cabinet is defined here as a cabinet with perforated front and rear doors and solid side walls. In addition to the requirements listed in the [“General Requirements for Cabinets and Racks” section on page A-1](#), perforated cabinets must meet the following requirements:

- The front and rear doors must have at least a 60 per cent open area perforation pattern, with at least 15 square inches of open area per rack unit of door height.
- Cisco recommends that the roof be perforated with at least a 20 percent open area.
- Cisco recommends an open or perforated cabinet floor to enhance cooling.

A perforated cabinet that conforms to these requirements is available from Rittal Corporation:

Rittal Corporation

One Rittal Place

Springfield, OH 45504

Contact: (800) 477-4220

Cabinet P/N: Rittal 9969427

Cabinet description: PS-DK/OEM Cabinet Assembly, (78.7 in.) 1998 mm X 23.6 in. (600 mm) X 39.4 in. (1000 mm) (H x W x D) (42 RU)

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Requirements Specific to Solid-Walled Cabinets

A solid-walled cabinet is defined here as a cabinet with solid front and rear doors and solid side walls. In addition to the requirements listed in the [“General Requirements for Cabinets and Racks”](#) section on [page A-1](#), solid-walled cabinets must meet the following requirements:

- A roof-mounted fan tray and an air cooling scheme in which the fan tray pulls air in at the bottom of the cabinet and exhausts it out the top, with a minimum of 500 cfm of airflow exiting the cabinet roof through the fan tray.
- Nonperforated (solid and sealed) front and back doors and side panels so that air travels predictably from bottom to top.
- A recommended cabinet depth of 36 to 42 in. (91.4 to 106.7 cm) to allow the doors to close and for adequate airflow.
- A minimum of 150 sq. in. (968 sq. cm) of open area at the floor air intake of the cabinet.
- The lowest piece of equipment should be installed a minimum of 1.75 in. (4.4 cm) above the floor openings to prevent blocking the floor intake.

Requirements Specific to Standard Open Racks

In addition to the requirements listed in the [“General Requirements for Cabinets and Racks”](#) section on [page A-1](#), if mounting the chassis in an open rack (no side panels or doors), ensure that the rack meets the following requirements:

- The minimum width between two front mounting rails must be 17.75 in. (45.1 cm).
- The minimum vertical rack space per chassis must be three RU (rack unit), equal to 5.25 in. (13.3 cm).
- The distance between the outside face of the front mounting rail and the outside face of the back mounting rail should be 23.5 to 34.0 in. (59.7 to 86.4 cm) to allow for rear bracket installation.
- The horizontal distance between the chassis and any adjacent chassis should be 6 in. (15.2 cm), and the distance between the chassis air vents and any walls should be 2.5 in. (6.4 cm).

Requirements Specific to telco Racks

In addition to the requirements listed in the [“General Requirements for Cabinets and Racks”](#) section on [page A-1](#), telco racks should meet the following requirements:

- The width of the rack between the two rack-mounting rails should be at least 17.75 in. (45.1 cm).
- The distance between the chassis air vents and any walls should be 2.5 in. (6.4 cm).

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Cisco MDS 9000 Family telco and EIA Shelf Bracket

The optional telco and EIA Shelf Bracket Kit (part number DS-SHELF=) can temporarily or permanently support the Cisco MDS 9200 Series during installation. Once the front rack-mount brackets are securely attached to the rack-mounting rails, the shelf bracket can be removed. This kit supports the following configurations:

- A Cisco MDS 9200 Series in a two-post telco rack
- A Cisco MDS 9200 Series in a four-post EIA rack

This section describes the procedure for installing a Cisco MDS 9000 Family switch in a rack or cabinet using the optional telco and EIA Shelf Bracket Kit. It includes the following topics:

- [Rack-Mounting Guidelines, page A-4](#)
- [Before Installing the Shelf Brackets, page A-5](#)
- [Installing the Shelf Bracket Kit into a Two-Post telco Rack, page A-6](#)
- [Installing the Shelf Bracket Kit into a Four-Post EIA Rack, page A-7](#)
- [Installing the Switch on the Shelf Brackets, page A-8](#)
- [Removing the Shelf Bracket Kit \(Optional\), page A-9](#)

**Note**

This optional kit is not provided with the switch; to order the kit, contact your switch supplier.

**Note**

For additional support after removing the shelf brackets, ensure that the C brackets on the Cisco MDS 9200 Series are attached to the rear rack-mounting rails.

Rack-Mounting Guidelines

**Caution**

If the rack is on wheels, ensure that the brakes are engaged or the rack is otherwise stabilized.

**Caution**

If installing this kit in an EIA rack, attach the switch to all four rack-mounting rails; the EIA rails might not be thick enough to prevent flexing of the shelf brackets if only two rails are used.

Before rack-mounting the chassis, ensure that the cabinet or rack meets the following requirements:

- The specifications listed in the [“Cabinet and Rack Requirements” section on page A-1](#).
- The depth of the rack between the front and rear mounting rails is at least 18 in. (45.7 cm) but less than or equal to 30 in. (76.2 cm). This is specific to four-post EIA cabinets or racks.
- The airflow and cooling are adequate and there is sufficient clearance around the air vents on the switch, as described in [Appendix B, “Technical Specifications.”](#) This is particularly important to verify if you are installing the switch in an enclosed cabinet.

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- The rack has sufficient vertical clearance for the chassis plus 2 RU for the shelf brackets, and any desired clearance for the installation process.
- The rack meets the minimum rack load ratings per rack unit listed in the following table:

Rack Type	MDS 9513	MDS 9509	MDS 9506	MDS 9222i MDS 9216i MDS 9216A	MDS 9100
EIA (4-Post)	45 lb (20.41 kg)	45 lb (20.41 kg)	30 lb (13.61 kg)	15 lb (6.8 kg)	7.5 lb (3.4 kg)
telco (2-Post)	Do not use.	Do not use.	60 lb (27.22 kg)	30 lb (13.61 kg)	15 lb (6.8 kg)

Before Installing the Shelf Brackets

Before installing the shelf brackets, check the contents of your kit. [Table A-1](#) lists the contents of the optional shelf bracket kit.

Table A-1 Contents of Shelf Bracket Kit

Quantity	Part Description
2	Slider brackets
2	Shelf brackets
1	Crossbar
2	10-32 x 3/8-inch Phillips pan-head screws
16	12-24 x 3/4-inch Phillips screws
16	10-24 x 3/4-inch Phillips screws

Required Equipment

You need the following equipment for this installation:

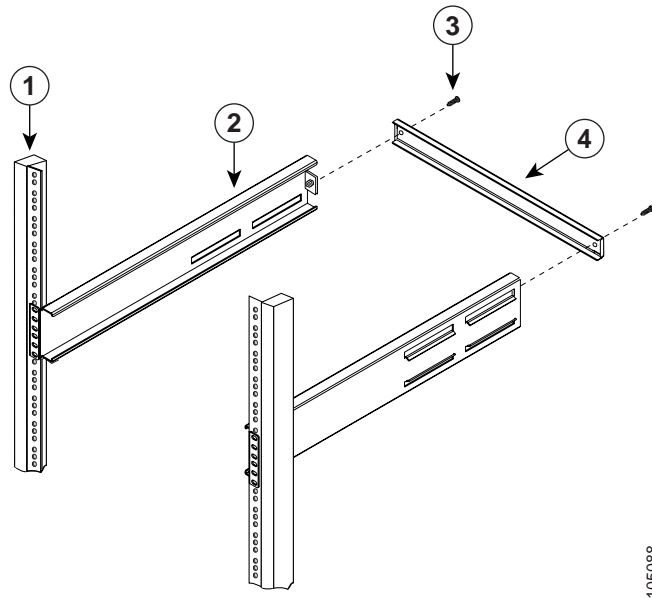
- Number 2 Phillips screwdriver
- Tape measure and level (to ensure shelf brackets are level)

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Installing the Shelf Bracket Kit into a Two-Post telco Rack

Figure A-1 shows the installation of the shelf bracket kit into a two-post telco rack.

Figure A-1 *Installing the Shelf Bracket Kit into a telco Rack*



1	Rack-mounting rail (2x)	3	10-32 screws (2x)
2	Shelf bracket (2x)	4	Crossbar

To install the shelf brackets in a telco rack, follow these steps:

- Step 1** Position a shelf bracket inside a rack-mounting rail as shown in Figure A-1. Align the screw holes at the front of the shelf bracket with the holes in the rack-mounting rail. Then, attach the shelf bracket to the rack-mounting rail using a minimum of four 12-24 or 10-24 screws.



Note The bottom hole of the shelf bracket should align with the bottom hole of a rack unit on the rack-mounting rail (the hole immediately above the 1/2-in. spacing).

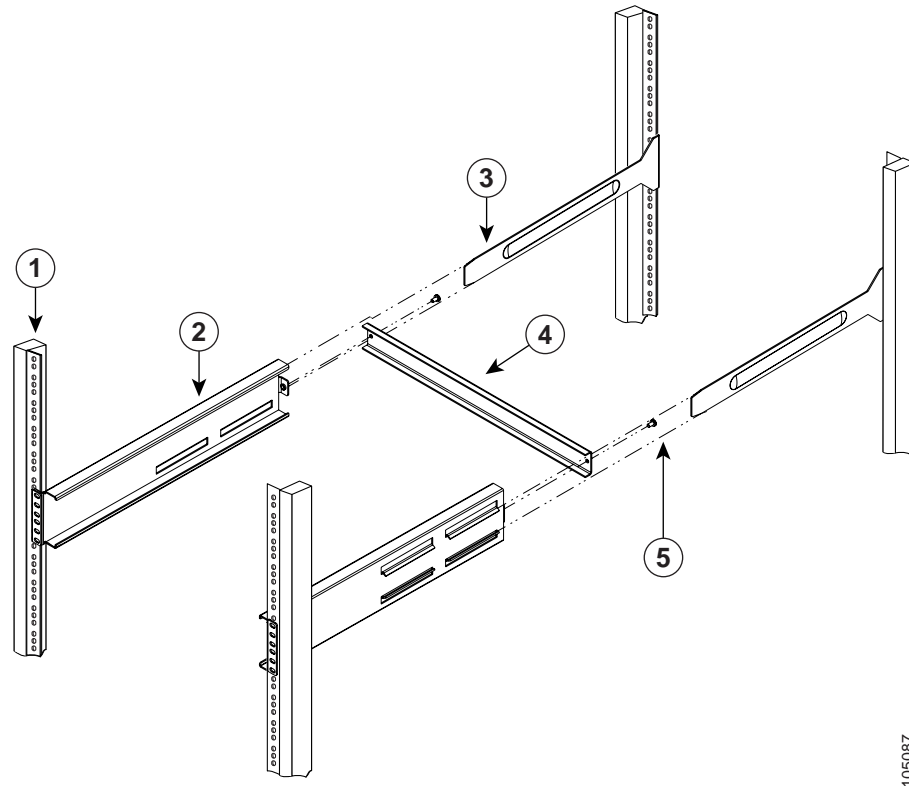
- Step 2** Repeat with the other shelf bracket.
- Step 3** Verify that the shelf brackets are at the same height (using the level or tape measure as desired).
- Step 4** Attach the crossbar to the rear of the shelf brackets as shown in Figure A-1, using the 10-32 screws.

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Installing the Shelf Bracket Kit into a Four-Post EIA Rack

Figure A-2 shows the installation of the shelf bracket kit into a four-post EIA rack.

Figure A-2 Installing the Shelf Bracket Kit into an EIA Rack



105087

1	Rack-mounting rail (4x)	4	Crossbar
2	Shelf bracket (2x)	5	10-32 screws (2x)
3	Slider rail (2)		

To install the shelf brackets in an EIA rack, follow these steps:

- Step 1** Position a shelf bracket inside the rack-mounting rails as shown in Figure A-2. Align the screw holes at the front of the shelf bracket with the holes in the front rack-mounting rail. Then, attach the shelf bracket to the front rack-mounting rail using a minimum of four 12-24 or 10-24 screws.



Note The bottom hole of the shelf bracket should align with the bottom hole of a rack unit on the rack-mounting rail (the hole immediately above the 1/2-in. spacing).

- Step 2** Repeat with the other shelf bracket.
- Step 3** Verify that the shelf brackets are at the same height (using the level or tape measure as desired).

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- Step 4** Attach the crossbar to the shelf brackets as shown in [Figure A-2](#), using the 10-32 screws.
- Step 5** Insert the slider rails into the shelf brackets as shown in [Figure A-2](#). Then, attach them to the rear rack-mounting rails using a minimum of four 12-24 or 10-24 screws.
-

Installing the Switch on the Shelf Brackets

This section provides general instructions for installing the switch on top of the shelf brackets. For installation instructions, see the [“Installing the Chassis in a Cabinet or Rack” section on page 2-5](#).



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



Warning

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



Note

Before you install, operate, or service the system, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family* for important safety information.

To install the switch on top of the shelf brackets, follow these steps:

- Step 1** Ensure that the shelf brackets are level and securely attached to the rack-mounting rails, the crossbar is securely attached to the shelf brackets, and the rack is stabilized.
- Step 2** Slide the switch onto the shelf brackets, ensuring it is squarely positioned.
- Step 3** Attach the switch to the rack-mounting rails. See the [“Installing the Chassis in a Cabinet or Rack” section on page 2-5](#).



Caution

We recommend grounding the chassis, even if the rack is already grounded. There is a grounding pad with two threaded M4 holes on the chassis for attaching a grounding lug.

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Removing the Shelf Bracket Kit (Optional)

The shelf bracket kit can be removed once the Cisco MDS 9200 Series has been installed in a two-post telco or four-post EIA rack, and the front rack-mount brackets are securely attached to the rack-mounting rails. For additional support in an EIA rack, ensure that the C brackets on the Cisco MDS 9200 Series are attached to the rear rack-mounting rails.

To remove the shelf bracket kit, follow these steps:

-
- | | |
|---------------|---|
| Step 1 | Remove the screws fastening the slider brackets to the rear rack-mounting rails. Then, slide the slider brackets out of the shelf brackets. |
| Step 2 | Remove the screws fastening the crossbar to the shelf brackets and remove the crossbar. |
| Step 3 | Remove the screws fastening the shelf brackets to the front rack-mounting rails. Then, remove the shelf brackets from the rack. |
-

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APPENDIX B

Technical Specifications

This appendix includes the following sections:

- [Switch Specifications, page B-1](#)
- [Module Specifications, page B-2](#)
- [Power Specifications, page B-4](#)
- [X2 Transceiver Specifications, page B-7](#)
- [SFP and SFP+ Transceiver Specifications, page B-10](#)



Note

Specifications for cables and connectors are provided in [Appendix C, “Cable and Port Specifications.”](#)

Switch Specifications

This section provides switch specifications for the Cisco MDS 9200 Series.

[Table B-1](#) lists the environmental specifications for the Cisco MDS 9200 Series.

Table B-1 *Environmental Specifications for the Cisco MDS 9200 Series*

Description	Specification
Temperature, certified for operation	32 to 104°F (0 to 40°C)
Temperature, designed and tested for operation	32 to 130°F (0 to 55°C)
Temperature, ambient nonoperating and storage	-40 to 158°F (-40 to 70°C)
Humidity (RH), ambient (noncondensing) operating	10 to 90%
Humidity (RH), ambient (noncondensing) nonoperating and storage	5 to 95%
Altitude, certified for operation	0 to 6500 ft (0 to 2000 m)
Altitude, designed and tested for operation	-200 to 10000 ft (-60 to 3000 m)
Noise levels	70 dB

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Table B-2 lists the physical specifications for the Cisco MDS 9200 Series.

Table B-2 *Physical Specifications for the Cisco MDS 9200 Series*

Description	Specification
Dimensions (HxWxD)	5.25 x 17.5 x 22.75 in. (13.3 x 44.5 x 57.8 cm) Chassis requires 3 RU ¹ . Chassis depth including cable guide is 27.75 in. (70.3 cm).
Weight	Chassis only: 31 lb (14.1 kg). Chassis configured with one supervisor module, fan module, and two power supplies: 53.3 lb (24.3 kg).
Power supply	845-W AC input for each power supply
Airflow	300 lfm ² through system fan module, or 80 cfm ³ per supervisor, switching, or services module. Total of 160 cfm if slot 2 is filled. Spacing requirements: <ul style="list-style-type: none"> • If installed in a cabinet, a minimum of 2.5 in. (6.4 cm) is required between the chassis air vents and the cabinet walls. • If installed in an open rack (no side panels), the horizontal distance required between the chassis and any devices that exhaust air towards the chassis is a minimum of 6 in. (15.2 cm), and the distance required between the chassis air vents and any walls is a minimum of 2.5 in. (6.4 cm).

1. RU = rack unit; 1 RU = 1.75 inches (4.45 cm)

2. lfm = linear feet per minute

3. cfm = cubic feet per minute

Table B-3 lists the specifications for the Cisco MDS 9200 Series supervisor module (which is fixed in the chassis) and the switching and services modules.

Module Specifications

This section provides the Cisco MDS 9200 Series module specifications.

Table B-3 *Cisco MDS 9200 Series Module Specifications*

Description	Specification
Environmental Requirements	
Temperature, certified for operation	32 to 104°F (0 to 40°C)
Temperature, designed and tested for operation	32 to 130°F (0 to 55°C)
Temperature, ambient nonoperating and storage	-40 to 167°F (-40 to 75°C)
Humidity (RH), ambient (noncondensing) operating	10 to 90%
Altitude, certified for operation	0 to 6500 ft (0 to 2000 m)

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Table B-3 Cisco MDS 9200 Series Module Specifications (continued)

Description	Specification
Altitude, designed and tested for operation	-200 to 10000 ft (-60 to 3000 m)
Physical Characteristics	
Dimensions	1.75 x 15.5 x 16.5 in. (4.4 x 39.4 x 41.9 cm)
	Note These are the maximum dimensions of faceplate and board, and include connectors on board.
Weight	8 to 11.5 lb (1.4 to 5.2 kg)

Table B-4 lists the specifications for the batteries on the Cisco MDS 9000 Family Caching Services Module.

Table B-4 Caching Services Module Battery Specifications

Description	Specification
Nominal voltage	9.6 V
Rated capacity	Typical discharge capacity at 0.2C rate: 2100 mAh
	Minimum discharge capacity at 0.2C rate: 2000 mAh
	Minimum discharge capacity at 5C rate: 1800 mAh (1V/cell discharge cut-off)
Discharge	The battery is capable of continuous discharge from (41 to 140°F (5 to +60°C) at 5C-rate
Charge	From 32 to 59°F (0 to 15°C) at C/10 rate and from 59 to 104°F (15 to 40°C) at C/2-rate
Storage temperature	32 to 95°F (0 to 35°C)
Relative humidity range	From 5 to 90%

Weight of Modules

Table B-5 lists the weight for each module in the Cisco MDS 9000 Family.

Table B-5 Weight of Modules in the Cisco MDS 9000 Family

Module	Weight
16-port Storage Services Node (DS-X9316-SSNK9)	10.0 lb (4.5kg)
4/44-port 8-Gbps Host-Optimized switching module	9.75 lb (4.42 kg)
48-port 4-Gbps switching module	11.0 lb (4.99 kg)
24-port 4-Gbps switching module	7.75 lb (3.5 kg)
12-port 4-Gbps switching module	7.5 lb (3.40 kg)
4-port 10-Gbps switching module	8.5 lb (3.86 kg)
32-port FC switching module	9 lb (4.1 kg)

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Table B-5 *Weight of Modules in the Cisco MDS 9000 Family (continued)*

Module	Weight
16-port FC switching module	9 lb (4.1 kg)
SSM	11 lb (5 kg)
CSM	11.5 lb (5.2 kg)
ASM	11 lb (5 kg)
IPS-8	10 lb (4.5 kg)
IPS-4	9 lb (4.1 kg)
MSM-18/4	8.5 lb (3.86 kg)
MPS-14/2	10 lb (4.5 kg)
Supervisor-2 for MDS 9500 Series	7.25 lb (kg)
Supervisor-1 for MDS 9500 Series	9 lb (4.1 kg)
Supervisor for MDS 9200 Series	9 lb (4.1 kg)
Module blank panels	0.50 lb (0.25 kg)

Power Specifications

This section includes the following topics:

- [Specifications for the Cisco MDS 9200 Series Power Supplies, page B-4](#)
- [Component Power Requirements and Heat Dissipation Specifications, page B-5](#)

Specifications for the Cisco MDS 9200 Series Power Supplies

[Table B-6](#) lists the specifications for the Cisco MDS 9200 Series power supply, which is 845 W and accepts AC input.

Table B-6 *Specifications for the Cisco MDS 9200 Series Power Supply*

Description	Specification ¹
Voltage	100 to 240 VAC ($\pm 10\%$)
Current rating	12 A at 100 to 120 VAC 5 A at 200 to 240 VAC
Frequency	50/60 Hz (nominal) (± 3 Hz for full range)
Output capacity	845 W
Output voltage	+3.3 V at 10 A +50 V at 16.2 A

1. Autoranging input with power factor corrector

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Component Power Requirements and Heat Dissipation Specifications

Consider heat dissipation when sizing the air-conditioning requirements for an installation. The power and heat associated with a Cisco MDS 9200 Series varies based upon the following considerations:

- Switching module type and number of switching modules installed
- Average switching traffic levels

Table B-7 lists the power requirements and heat dissipation for the components of the Cisco MDS 9200 Series.



Note

Unless noted otherwise, the data in **Table B-7** is based on worst-case conditions. Typical numbers are approximately 30 percent below the numbers listed here.

Table B-7 Power Requirements and Heat Dissipation for the 845-W Power Supply

Module Type / Product Number	NX-OS Release	SAN-OS Release	Power Required (watts)	Heat Dissipation (BTU/hr)	Input Current			
					90 VAC (amps)	120 VAC (amps)	180 VAC (amps)	240 VAC (amps)
Cisco MDS 9222i chassis with fan module DS-C9222i-K9		3.2(1)	60	256	0.83	0.63	0.42	0.31
Cisco MDS 9222i fixed supervisor module (18-port Fibre Channel and 4-port Gigabit Ethernet module)		3.2(1)	200	855	2.78	2.08	1.39	1.04
Cisco MDS 9216i chassis with fan module DS-C9216i-K9		3.x	60	256	0.83	0.63	0.42	0.31
		2.x and 1.x	38	164	0.53	0.40	0.27	0.20
Cisco MDS 9216A chassis with fan module DS-C9216A-K9		3.x	60	256	0.83	0.63	0.42	0.31
		2.x and 1.x	38	164	0.53	0.40	0.27	0.20
Cisco MDS 9216i fixed supervisor module (14-port Fibre Channel and 2-port Gigabit Ethernet module)		3.x	200	854	2.78	2.08	1.39	1.04
		2.x and 1.x	227	970	3.15	2.37	1.57	1.19
Cisco MDS 9216A fixed supervisor module (16-port Fibre Channel module, 1Gbps/2Gbps)		3.x	210	897	2.92	2.19	1.46	1.09
		2.x and 1.x	220	940	3.05	2.29	1.53	1.15
4/44-port 8-Gbps Host-Optimized switching module, DS-X9248-48K9	4.1(1b)		214	915	2.98	2.23	1.49	1.12
48-port 4-Gbps switching module, DS-X9148		3.x	185	790	2.57	1.93	1.28	0.96
		2.x and 1.x	—	—	—	—	—	—
16-port Storage Services Node, DS-X9316-SSNK9	4.2(1)		298	1273	4.14	3.11	2.08	1.55

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Table B-7 **Power Requirements and Heat Dissipation for the 845-W Power Supply (continued)**

Module Type / Product Number	NX-OS Release	SAN-OS Release	Power Required (watts)	Heat Dissipation (BTU/hr)	Input Current			
					90 VAC (amps)	120 VAC (amps)	180 VAC (amps)	240 VAC (amps)
24-port 4-Gbps switching module, DS-X9124		3.x	147	628	2.04	1.53	1.02	0.77
		2.x and 1.x	—	—	—	—	—	—
12-port 4-Gbps switching module, DS-X9112		3.x	132	564	1.83	1.38	0.92	0.69
		2.x and 1.x	—	—	—	—	—	—
4-Port 10-Gbps switching module, DS-X9704		3.x	172	734	2.39	1.79	1.19	0.90
		2.x and 1.x	—	—	—	—	—	—
32-port 1-Gbps/2-Gbps Fibre Channel module, DS-X9032		3.x	191	816	2.65	1.99	1.33	0.99
		2.x and 1.x	200	855	2.78	2.08	1.39	1.04
16-port 1-Gbps/2-Gbps Fibre Channel module, DS-X9016		3.x	210	897	2.92	2.19	1.46	1.09
		2.x and 1.x	200	940	3.05	2.29	1.53	1.15
MSM-18/4 module DS-X9304-18K9		3.2(1)	200	855	2.78	2.08	1.39	1.04
MPS-14/2 DS-X9302-14K9		3.x	200	854	2.78	2.08	1.39	1.04
		2.x and 1.x	227	970	3.15	2.37	1.57	1.19
8-port IPS module DS-X9308-SMIP		3.x	200	854	2.78	2.08	1.39	1.04
		2.x and 1.x	220	940	3.05	2.29	1.53	1.15
4-port IPS module DS-X9304-SMIP		3.x	160	683	2.22	1.67	1.11	0.83
		2.x and 1.x	185	789	2.57	1.93	1.28	0.96
32-port SSM, DS-X9032-SSM		3.x	281	1200	3.90	2.93	1.95	1.46
		2.x and 1.x	295	1260	4.10	3.07	2.05	1.54
32-port ASM DS-X9032-SMV		3.x	281	1200	3.90	2.93	1.95	1.46
		2.x and 1.x	295	1260	4.10	3.07	2.05	1.54
CSM, DS-X9560-SMC		3.x	200	854	2.78	2.08	1.39	1.04
		2.x and 1.x	210	907	2.95	2.22	1.48	1.11

The “—” indicates that values are not available or not applicable.

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X2 Transceiver Specifications

The Cisco MDS 9200 Series is compatible with X2 transceivers and cables that have SC connectors. Each transceiver must match the transceiver on the other end of the cable in terms of wavelength, and the cable must not exceed the stipulated cable length for reliable communications.

Use only Cisco X2 transceivers on the Cisco MDS 9200 Series. Each Cisco X2 transceiver is encoded with the model information that enables the switch to verify that the SFP transceiver meets the requirements for the switch.

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

Cisco 10-Gbps Fibre Channel X2 Transceivers

Table B-8 lists the Cisco 10-Gbps Fibre Channel X2 transceivers.

Table B-8 Cisco 10-Gbps Fibre Channel X2 Transceivers

Transceiver Module Product Number	Description	Type
DS-X2-FC10G-SR	10-Gbps Fibre Channel SR, X2, SC	Short Reach
DS-X2-FC10G-LR	10-Gbps Fibre Channel LR, X2, SC	Long Reach
DS-X2-FC10G-ER	10-Gbps Fiber Channel ER, X2, SC	Extended Reach
DS-X2-FC10G-CX4	10-Gbps Fiber Channel Copper, X2, CX4	—

The “—” indicates that values are not available or not applicable.

General Specification for Cisco 10-Gbps Fibre Channel X2 Transceivers

Table B-9 provides the general specifications for Cisco 10-Gbps Fibre Channel X2 transceivers.

Table B-9 General Specifications for the Cisco 10-Gbps Fibre Channel X2 Transceivers

X2	Wavelength (nanometer)	Fibre Type	Core Size (micon)	Baud Rate (GBd)	Cable Distance
DS-X2-FC10G-SR	850	MMF	62.5	10.51875	33 m (108 ft)
			50.0 (OM3)	10.51875	300 m (984 ft)
DS-X2-FC10G-LR	1310	SMF	9.0	10.51875	24.8 miles (40 km)
DS-X2-FC10G-ER	1550	SMF	9.0	10.51875	6.2 miles (10 km)
DS-X2-FC10G-CX4	—	Copper	—	10.51875	15 m (49.2 ft)

The “—” indicates that values are not available or not applicable.



Note

The minimum cable distance for all the transceivers, such as multimode fiber (MMF) and single-mode fiber (SMF), except CX4 is 2 meters (6.5 feet).

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Environmental Conditions and Power Requirement Specifications for Cisco 10-Gbps Fibre Channel X2 Transceivers

[Table B-10](#) provides the power requirement specifications for Cisco 10-Gbps Fibre Channel X2 transceivers.

Table B-10 Power Requirement Specifications for Cisco 10-Gbps Fibre Channel X2 Transceivers

X2	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Maximum	Minimum	Maximum	Minimum	
DS-X2-FC10G-SR	-1.2	-7.3	-1.0	-9.9	2.6 (50.0 micron-OM3)
DS-X2-FC10G-LR	0.5	-8.2	0.5	-14.4	6.2
DS-X2-FC10G-ER	4.0	-4.7	-1.0	-15.8	11.1



Note

DS-X2-FC10G-CX4 is not an optical module; therefore, it is not listed in [Table B-10](#).

[Table B-11](#) provides the environmental specifications for the Cisco 10-Gbps Fibre Channel X2 transceivers.

Table B-11 Environmental Specifications for the Cisco 10-Gbps Fibre Channel X2 Transceivers

X2	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-X2-FC10G-SR	40°C	0°C	85°C	-40°C
DS-X2-FC10G-LR	40°C	0°C	85°C	-40°C
DS-X2-FC10G-ER	40°C	0°C	85°C	-40°C
DS-X2-FC10G-CX4	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

Cisco 10-Gbps Ethernet X2 Transceivers

[Table B-12](#) lists the Cisco 10-Gbps Ethernet X2 transceivers.

Table B-12 Cisco 10-Gbps Ethernet X2 Transceivers

Transceiver Module Product Number	Description	Type
DS-X2-E10G-SR	10-Gbps Ethernet Short Reach, X2, SC	Short reach

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General Specification for Cisco 10-Gbps Ethernet X2 Transceivers

Table B-13 provides the general specifications for Cisco 10-Gbps Ethernet X2 transceivers.

Table B-13 General Specifications for the Cisco 10-Gbps Ethernet X2 Transceivers

X2	Wavelength (nanometer)	Fiber Type	Core Size (micon)	Baud Rate (GBd)	Cable Distance
DS-X2-E10G-SR	850	MMF	62.5	10.3125	33 (108 ft)
			50.0 (OM3)	10.3125	300 (984 ft)



Note

The minimum cable distance for the MMF transceiver listed above is 2 meters (6.5 feet).

Environmental and Power Requirements Specifications for Cisco 10-Gbps Ethernet X2 Transceiver

Table B-14 provides the power requirement specifications for the Cisco 10-Gbps Ethernet X2 transceiver.

Table B-14 Power Requirement Specification for Cisco 10-Gbps Ethernet X2 Transceivers

X2	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Maximum	Minimum	Maximum	Minimum	
DS-X2-E10G-SR	-1.2	-7.3	-1.0	-9.9	2.6 (50.0 micron-OM3)

Table B-15 provides the environmental specifications for the Cisco 10-Gbps Ethernet X2 transceivers.

Table B-15 Environmental Specifications for Cisco 10-Gbps Ethernet X2 Transceiver

X2	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-X2-E10G-SR	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

Cisco 10-Gbps Ethernet DWDM X2 Transceiver

The Cisco 10-Gbps Ethernet DWDM X2 Transceiver pluggable module (DWDM-X2-xx.xx=) provides high-performance Fibre Channel connectivity for the Cisco MDS 9000 Family 10-Gbps Fibre Channel switching module to an existing Ethernet DWDM infrastructure. The data format transmitted by the Ethernet DWDM X2 transceiver on the fiber is identical to that transmitted by the Fibre Channel X2 transceiver, except that the Fibre Channel packets are clocked at the 10-Gigabit Ethernet rate.

The main features of the Cisco 10-Gbps Ethernet DWDM X2 Transceiver include:

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- Support for 32 nontunable ITU 100-GHz wavelengths compatible with the Cisco ONS DWDM channel plan.
- Support for digital optical monitoring capability.

For more information, refer to the data sheet at:

<http://www.cisco.com/en/US/products/ps6576/index.html>

SFP and SFP+ Transceiver Specifications

The Cisco MDS 9200 Series is compatible with SFP and SFP+ transceivers and cables that have LC connectors. The wavelength of each transceiver must match the transceiver on the other end of the cable, and the cable must not exceed the stipulated cable length for reliable communications.

Cisco SFP and SFP+ transceivers provide the uplink interfaces, laser transmit (TX) and laser receive (RX), and support 850 to 1610 nm nominal wavelengths, depending upon the transceiver.

Use only Cisco SFP transceivers on the Cisco MDS 9200 Series. Each Cisco SFP transceiver is encoded with model information that enables the switch to verify that the SFP transceiver meets the requirements for the switch.



Note

Generation 2 modules will not support 1-Gbps/2-Gbps SFPs. Generation 2 modules only support 4-Gbps SFPs.

This section provides the following topics:

- [Cisco Fibre Channel SFP and SFP+ Transceivers, page B-10](#)
- [Cisco Fibre Channel/Gigabit Ethernet Transceivers, page B-16](#)
- [Cisco CWDM SFP Transceivers, page B-18](#)
- [Cisco Gigabit Ethernet Transceivers, page B-22](#)
- [DWDM SFP Transceivers, page B-23](#)

Cisco Fibre Channel SFP and SFP+ Transceivers

[Table B-16](#) lists the Cisco 2-Gbps and 4-Gbps SFP, and 8-Gbps SFP+ Fibre Channel transceivers.

Table B-16 Cisco 2-Gbps and 4-Gbps SFP, and 8-Gbps SFP+ Fibre Channel Transceivers

Transceiver Module Product Number	Description	Type
DS-SFP-FC4G-SW	1/2/4-Gbps Fibre Channel SW, SFP, LC	Short wavelength
DS-SFP-FC4G-MR	1/2/4-Gbps Fibre Channel LW 4-km, SFP, LC	Long wavelength
DS-SFP-FC4G-LW	1/2/4-Gbps Fibre Channel LW 10-km, SFP, LC	Long wavelength
DS-SFP-FC-2G-SW	1/2-Gbps Fibre Channel SW, SFP, LC	Short wavelength
DS-SFP-FC-2G-LW	1/2-Gbps Fibre Channel LW, SFP, LC	Long wavelength
DS-SFP-FC8G-SW	2/4/8-Gbps Fibre Channel SW, SFP+, LC	Short wavelength
DS-SFP-FC8G-LW	2/4/8-Gbps Fibre Channel LW, SFP+, LC	Long wavelength

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General Specifications for Cisco 8-Gbps Fibre Channel SFP+ Transceivers

Table B-17 provides the general specifications for Cisco Fibre Channel SFP+ transceivers.

Table B-17 General Specifications for Cisco 8-Gbps Fibre Channel SFP+ Transceivers

SFP	Wavelength (nanometer)	Fiber Type	Core Size (micron)	Baud Rate (GBd)	Cable Distance (meter)
DS-SFP-FC8G-SW	850	MMF	62.5	2.125	150 m (492 ft)
			62.5	4.250	70 m (230 ft)
			62.5	8.500	21 m (69 ft)
			50.0 (OM2)	2.125	300 m (984 ft)
			50.0 (OM2)	4.250	150 m (492 ft)
			50.0(OM2)	8.500	50 m (164 ft)
			50.0 (OM3)	2.125	500 m (1640 ft)
			50.0 (OM3)	4.250	380 m (1246 ft)
			50.0 (OM3)	8.500	150 m (492 ft)
DS-SFP-FC8G-LW	1310	SMF	9.0	2.125	6.2 miles (10 km)
			9.0	4.250	6.2 miles (10 km)
			9.0	8.500	6.2 miles (10 km)

Environmental and Power Requirements for Cisco 8-Gbps Fibre Channel SFP+ Transceivers

Table B-18 provides the power specification for the Cisco 8-Gbps Fibre Channel SFP+ transceivers.

Table B-18 Power Requirements Specification for Cisco 8-Gbps Fibre Channel SFP+ Transceivers

SFP	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)		
	Maximum	Minimum	Maximum	Minimum			
DS-SFP-FC8G-SW	-1.3	-10 (2 Gbps) -9 (4 Gbps) -8.2 (8 Gbps)	0	—	62.5 microns	50.0 microns [OM2]	50.0 microns [OM3]

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Table B-18 **Power Requirements Specification for Cisco 8-Gbps Fibre Channel SFP+ Transceivers (continued)**

SFP	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)		
	Maximum	Minimum	Maximum	Minimum			
					2.10 (2 Gbps)	2.62 (2 Gbps)	3.31 (2 Gbps)
					1.78 (4 Gbps)	2.06 (4 Gbps)	2.88 (4 Gbps)
					1.58 (8 Gbps)	1.68 (8 Gbps)	2.04 (8 Gbps)
DS-SFP-FC8G-LW	-3 (2 Gbps)	-11.7 (2 Gbps)	-3 (2 Gbps)	—	7.8 (2 Gbps)		
	-1 (4 Gbps)	-8.4 (4 Gbps)	-1 (4 Gbps)		7.8 (4 Gbps)		
	+0.5 (8 Gbps)	-8.4 (8 Gbps)	+0.5 (8 Gbps)		6.4 (8 Gbps)		

The “—” indicates that values are not available or not applicable.

[Table B-19](#) provides the environment specification for the Cisco 8-Gbps Fibre Channel SFP+ transceivers.

Table B-19 **Environmental Specifications for Cisco 8-Gbps Fibre Channel SFP+ Transceivers**

SFP	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-SFP-FC8G-SW	40°C	0°C	85°C	-40°C
DS-SFP-FC8G-LW	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

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General Specifications for Cisco 4-Gbps Fibre Channel SFP Transceivers

Table B-20 provides the general specifications for Cisco Fibre Channel SFP transceivers.

Table B-20 General Specifications for Cisco 4-Gbps Fibre Channel SFP Transceivers

SFP	Wavelength (nanometer)	Fibre Type	Core Size (micon)	Baud Rate (GBd)	Cable Distance (meter)
DS-SFP-FC4G-SW	850	MMF	62.5	1.0625	300 m (984 ft)
			62.5	2.125	150 m (492 ft)
			62.5	4.250	70 m (230 ft)
			50.0 (OM2)	1.0625	500 m (1640 ft)
			50.0 (OM2)	2.125	300 m (984 ft)
			50.0(OM2)	4.250	150 m (492 ft)
			50. 0 (OM3)	1.0625	860 m (2821 ft)
			50. 0 (OM3)	2.125	500 m (1640 ft)
			50. 0 (OM3)	4.250	380 m (1246 ft)
DS-SFP-FC4G-MR	1310	SMF	9.0	1.0625	6.2 miles (10 km)
			9.0	2.125	2.4 miles (4 km)
			9.0	4.250	2.4 miles (4 km)
DS-SFP-FC4G-LW	1310	SMF	9.0	1.0625	6.2 miles (10 km)
			9.0	2.125	6.2 miles (10 km)
			9.0	4.250	2.4 miles (4 km)



Note

The minimum cable distance for all the transceivers, such as MMF and SMF, is 2 meters (6.5 feet).

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Environmental and Power Requirement for Cisco 4-Gbps Fibre Channel SFP Transceivers

Table B-21 provides the power specification for the Cisco 4-Gbps Fibre Channel SFP transceivers.

Table B-21 Power Requirement Specification for Cisco 4-Gbps Fibre Channel SFP Transceivers

SFP	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Maximum	Minimum	Maximum	Minimum	
DS-SFP-FC4G-SW	-1.2	-9	0	—	1.78 (62.5 micron), 2.06 (50 micron - OM2), 4.48 (50 micron - OM3)
DS-SFP-FC4G-MR	-3	-11.2	-1	—	4.8
DS-SFP-FC4G-LW	-3	-8.4	-1.0	—	7.8

The “—” indicates that values are not available or not applicable.

Table B-22 provides the environment specification for the Cisco 4-Gbps Fibre Channel SFP transceivers.

Table B-22 Environmental Specifications for Cisco 4-Gbps Fibre Channel SFP Transceivers

SFP	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-SFP-FC4G-SW	40°C	0°C	85°C	-40°C
DS-SFP-FC4G-MR	40°C	0°C	85°C	-40°C
DS-SFP-FC4G-LW	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

General Specifications for Cisco 2-Gbps Fibre Channel SFP Transceivers

Table B-23 provides general specification for the 4-Gbps Fibre Channel SFP transceiver.

Table B-23 General Specifications for Cisco 4-Gbps Fibre Channel SFP Transceivers

SFP	Wavelength (nanometer)	Fibre Type	Core Size (micron)	Baud Rate (GBd)	Cable Distance (meter)
DS-SFP-FC-2G-SW	850	MMF	62.5	1.0625	300 m (984 ft)
			62.5	2.125	150 m (492 ft)
			50.0 (OM2)	1.0625	500 m (1640 ft)
			50.0 (OM)	2.125	300 m (984 ft)
DS-SFP-FC-2G-LW	1310	SMF	9.0	1.0625	6.2 miles (10 km)
			9.0	2.125	6.2 miles (10 km)

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Note

The minimum cable distance for both the transceivers such as MMF and SMF is 2 meters (6.5 feet).

Environmental and Power Requirement for Cisco 2-Gbps Fibre Channel SFP Transceivers

Table B-24 provides the power specification for Cisco 2-Gbps Fibre Channel SFP transceivers.

Table B-24 Power Requirement Specification for Cisco 2-Gbps Fibre Channel SFP Transceivers

SFP	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Maximum	Minimum	Maximum	Minimum	
DS-SFP-FC-2G-SW	-1.2	-10.0	0	—	2.1 (62.5 micron), 2.62 (50 micron -OM2)
DS-SFP-FC-2G-LW	-3	-11.7	-3	—	7.8

The “—” indicates that values are not available or not applicable.

Table B-25 provides the environmental specification for Cisco 2-Gbps Fibre Channel SFP transceivers.

Table B-25 Environmental Specifications for Cisco 2-Gbps Fibre Channel SFP Transceivers

SFP	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-SFP-FC-2G-SW	40°C	0°C	85°C	-40°C
DS-SFP-FC-2G-LW	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

Maximum Environmental and Electrical Ratings for Cisco Fibre Channel SFP Transceivers

Table B-26 provides the maximum environmental and electrical ratings for Cisco Fibre Channel SFP transceivers.

Table B-26 Maximum Environmental and Electrical Ratings for Cisco Fibre Channel SFP Transceivers

Parameter ¹	Symbol	Min.	Max. ²	Unit	Notes
Storage temperature	T _S	-40	85	°C	1
Case temperature	T _C	0	70	°C	1, 2
Relative humidity	RH	5	95	%	1

1. Do not operate outside the recommended operating conditions. Device reliability may be affected and damage to the device may occur over an extended period of time.

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2. Absolute maximum ratings are those values beyond which damage to the device may occur if these limits are exceeded for other than a short period of time.

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

Cisco Fibre Channel/Gigabit Ethernet Transceivers

[Table B-27](#) lists the combination Fibre Channel/Gigabit Ethernet SFP transceivers.

Table B-27 Cisco Fibre Channel/Gigabit Ethernet SFP Transceivers

Transceiver Module Product Number	Description	Type
DS-SFP-FCGE-LW	1-Gbps Ethernet and 1-Gbps/2-Gbps Fibre Channel-LW SFP, LC	Long wavelength
DS-SFP-FCGE-SW	1-Gbps Ethernet and 1-Gbps/2-Gbps Fibre Channel-SW SFP, LC	Short wavelength

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General Specifications for Cisco Fibre Channel/Gigabit Ethernet SFP Transceivers

Table B-28 provides general specification for Cisco Fibre Channel/Gigabit Ethernet SFP transceiver.

Table B-28 General Specifications for Cisco Fibre Channel/Gigabit Ethernet SFP Transceivers

SFP	Wavelength (nanometer)	Fibre Type	Core Size (micon)	Baud Rate (GBd)	Cable Distance (meter)
DS-SFP-FCGE-SW	850	MMF	62.5	1.0625	300 m (984 ft)
			62.5	2.125	150 m (492 ft)
			50.0 (OM2)	1.0625	500 m (1640 ft)
			50.0 (OM2)	2.125	300 m (984 ft)
DS-SFP-FCGE-LW	1310	SMF	9.0	1.0625	6.2 miles (10 km)
			9.0	2.125	6.2 miles (10 km)



Note

The minimum cable distance for both the transceivers listed above (multi-mode fiber (MMF)) and single-mode fiber (SMF) is 2 meters (6.5 feet).

Environmental and Power Requirement Specifications for Cisco Fibre Channel/Gigabit Ethernet SFP Transceivers

Table B-29 provides the power requirement specification for Cisco Fibre Channel/Gigabit Ethernet SFP transceivers.

Table B-29 Power Requirement Specification for Cisco Fibre Channel/Gigabit Ethernet SFP Transceivers

SFP	Average Transmit Power (dBm)		Average Receive Power (dBm)		Fiber Loss Budget (dBm)
	Maximum	Minimum	Maximum	Minimum	
DS-SFP-FCGE-SW	-1.2	-10.0 (FC) -9.5 (GE)	0	-17 (GE)	2.1 (FC - 62.5 micron), 2.62 (FC - 50.0 micron) 2.38 (GE - 62.5 micron), 3.37 (FC - 50.0 micron)
DS-SFP-FCGE-LW	-3	-11.0	-3	-19 (GE)	7.8 (FC) 4.57 (GE)

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Table B-30 provides the environmental specification for Cisco Fibre Channel/Gigabit Ethernet SFP transceivers.

Table B-30 *Environmental Specifications for Cisco Fibre Channel/Gigabit Ethernet SFP Transceivers*

SFP	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-SFP-FCGE-SW	40°C	0°C	85°C	-40°C
DS-SFP-FCGE-LW	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

Cisco CWDM SFP Transceivers

Table B-31 lists the Cisco 1-Gbps and 2-Gbps CWDM SFP transceivers.

Table B-31 *Cisco 1-Gbps and 2-Gbps CWDM SFP Transceivers*

Description	Color
Cisco CWDM SFP 1470 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Gray
Cisco CWDM SFP 1490 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Violet
Cisco CWDM SFP 1510 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Blue
Cisco CWDM SFP 1530 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Green
Cisco CWDM SFP 1550 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Yellow
Cisco CWDM SFP 1570 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Orange
Cisco CWDM SFP 1590 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Red
Cisco CWDM SFP 1610 nm; Gigabit Ethernet and 1-Gbps/2-Gbps FC	Brown

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Table B-32 lists the Cisco 4-Gbps CWDM SFP transceivers available through Cisco.

Table B-32 Cisco 4-Gbps CWDM SFP Transceivers

Description	Color
DS-CWDM4G1470: Cisco MDS9000 1470 nm; CWDM 4-Gbps FC	Gray
DS-CWDM4G1490: Cisco MDS9000 1490 nm; CWDM 4-Gbps FC	Violet
DS-CWDM4G1510: Cisco MDS9000 1510 nm; CWDM 4-Gbps FC	Blue
DS-CWDM4G1530: Cisco MDS9000 1530 nm; CWDM 4-Gbps FC	Green
DS-CWDM4G1550: Cisco MDS9000 1550 nm; CWDM 4-Gbps FC	Yellow
DS-CWDM4G1570: Cisco MDS9000 1570 nm; CWDM 4-Gbps FC	Orange
DS-CWDM4G1590: Cisco MDS9000 1590 nm; CWDM 4-Gbps FC	Red
DS-CWDM4G1610: Cisco MDS9000 1610 nm; CWDM 4-Gbps FC	Brown

Environmental and Optical Specifications for Cisco 2-Gbps CWDM SFP Transceivers

Table B-33 provides the environmental specifications for the Cisco 2-Gbps CWDM SFP transceivers.

Table B-33 Environmental Specifications for Cisco 2-Gbps CWDM SFP Transceivers

SFP	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
All Cisco 2-Gbps CWDM SFP Transceivers	40°C	0°C	85°C	-40°C

Table B-34 provides the optical specifications for the Cisco 2-Gbps CWDM SFP transceivers.

Table B-34 Optical Specification for Cisco 2-Gbps CWDM SFP Transceivers

Parameters	Symbol	Minimum	Typical	Maximum	Units	Notes/Conditions
Transmitter Center Wavelength	λ_c	x-4	—	x+7	nm	Available center wavelengths are 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm
Side-mode Suppression Ratio	SMSR	30	—	—	dB	—
Transmitter Optical Output Power	P_{out}	0.0	—	5.0	dBm	Average power coupled into single-mode fiber
Receiver Optical Input Power (BER <10 ⁻¹² with PRBS 2-7-1)	P_{in}	-28.0	—	-7.0	dBm	At 2.12 Gbps, 140°F (60°C) case temperature

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Table B-34 **Optical Specification for Cisco 2-Gbps CWDM SFP Transceivers (continued)**

Parameters	Symbol	Minimum	Typical	Maximum	Units	Notes/Conditions
Receiver Optical Input Power (BER <10 ⁻¹² with PRBS 2-7-1)	P _{in}	-29.0	—	-7.0	dBm	At 1.25 Gbps, 140°F (60°C) case temperature
Receiver Optical Input Wavelength	λ _{in}	1450	—	1620	nm	—
Transmitter Extinction Ratio	OMI	9	—	—	dB	—
Dispersion Penalty at 62.1 miles (100 km)	—	—	—	3	dB	At 2.12 Gbps
Dispersion Penalty at 62.1 miles (100 km)	—	—	—	2	dB	At 1.25 Gbps

The character “—” denotes that there are no values to be entered.



Note

- Parameters are specified over temperature and at end of life unless otherwise noted.
- When shorter distances of single-mode fiber are used, it is necessary to insert an in-line optical attenuator in the link to avoid overloading the receiver.

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

Environmental and Optical Specifications for Cisco 4-Gbps CWDM SFP Transceivers

Table B-35 provides the environmental specifications for the Cisco 4-Gbps CWDM SFP transceivers.

Table B-35 **Environmental Specifications for Cisco 4-Gbps CWDM SFP Transceivers**

SFP	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
All Cisco 4-Gbps CWDM SFP Transceivers	40°C	0°C	85°C	-40°C

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Table B-36 provides the optical specifications for Cisco 4-Gbps CWDM SFP transceivers.

Table B-36 *Optical Specification for Cisco 4-Gbps CWDM SFP Transceivers*

Parameters	Symbol	Minimum	Typical	Maximum	Units	Notes/Conditions
Transmitter Center Wavelength	λ_c	(x-6)	x	x+6	nm	Available center wavelengths are 1470, 1490, 1510, 1530, 1550, 1570, 1590, and 1610 nm
Side-mode Suppression Ratio	SMSR	30	—	—	dB	—
Transmitter Optical Output Power	P_{out}	1.0	—	5.0	dBm	Average power coupled into single-mode fiber
Receiver Optical Input Power (BER <10 ⁻¹² with PRBS 2-23-1)	P_{in}	-15.7	—	0.0	dBm	140°F (60°C) case temperature
Link Budget	—	17.8	—	—	dB	—
Receiver Optical Input Wavelength	λ_{in}	1450	—	1620	nm	—
Transmitter Extinction Ratio	OMI	4	—	—	dB	—
Dispersion Penalty at 15.5 miles (25 km)	—	—	—	3	dB	—

The “—” indicates that values are not available or not applicable.



Note

- In typical point-to-point deployments, all wavelengths have a minimum reach of 24.8 miles (40 km).
- Parameters are specified over temperature and at end of life unless otherwise noted.
- When shorter distances of single-mode fiber are used, it is necessary to insert an in-line optical attenuator in the link to avoid overloading the receiver.
- A maximum of 24 4-Gbps CWDM SFPs are supported in a single MDS switching module.
- When interoperating a Cisco 4-Gbps CWDM SFP transceiver with a Cisco 1/2-Gbps CWDM transceiver, the speed of ports on the Cisco 4-Gbps CWDM SFP transceiver must be manually configured to 1-Gbps or 2-Gbps.

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

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Cisco Gigabit Ethernet Transceivers

Cisco Systems provides a 1-Gbps Gigabit Ethernet SFP transceiver used on the Cisco MDS 9000 IPS modules. [Table B-37](#) lists the transceiver supported on the Cisco MDS 9216.

Table B-37 Cisco Gigabit Ethernet SFP Transceivers

Transceiver Module Product Number	Description
DS-SFP-GE-T	1-Gbps Ethernet SFP

General Specifications for Cisco Gigabit Ethernet Transceivers

[Table B-38](#) provides the general specification for the Cisco Gigabit Ethernet SFP transceiver.

Table B-38 General Specification for the Cisco Gigabit Ethernet SFP Transceivers

SFP	Cable Type	Cable Distance
DS-SFP-GE-T	Category 5 UTP	100 m (328 ft)

Environmental and Power Requirement Specifications for Cisco Gigabit Ethernet Transceivers

[Table B-39](#) provides the environmental specifications for the Cisco Gigabit Ethernet transceivers.

Table B-39 Environmental Specifications for Cisco Gigabit Ethernet Transceivers

SFP	Operating		Storage	
	Maximum	Minimum	Maximum	Minimum
DS-SFP-GE-T	40°C	0°C	85°C	-40°C

For information about safety, regulatory, and standards compliance, refer to the *Regulatory Compliance and Safety Information for the Cisco MDS 9000 Family*.

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DWDM SFP Transceivers

The Cisco 2-Gbps DWDM SFP modules enable enterprises and service providers to provide scalable, easy-to-deploy DWDM Fibre Channel services in their networks.

The main features of the Cisco DWDM SFP include:

- Support for International Telecommunication Union (ITU) 100-GHz wavelength grid.
- Match for wavelength plan of Cisco ONS 100-GHz product family.
- Fixed-wavelength SFP with 32 SFP models.



Note

A single Cisco MDS 9000 family switching module supports up to eight 2-Gbps DWDM SFPs.

For more information, refer to the data sheet at:

http://www.cisco.com/en/US/prod/collateral/modules/ps5455/ps6576/product_data_sheet0900aecd80582763.html.

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APPENDIX C

Cable and Port Specifications

This appendix provides cable and port specifications, and includes the following sections:

- [Cables and Adapters Provided, page C-1](#)
- [Console Port, page C-2](#)
- [COM1 Port, page C-3](#)
- [MGMT 10/100/1000 Ethernet Port, page C-4](#)
- [MGMT 10/100 Ethernet Port, page C-6](#)
- [Supported Power Cords and Plugs, page C-7](#)

Cables and Adapters Provided

The Cisco MDS 9200 Series accessory kit includes the following items:

- RJ-45 rollover cable
- DB-9F/RJ-45F PC—RJ-45 to DB-9 female DTE adapter (labeled “Terminal”)
- RJ-45/DSUB F/F adapter—RJ-45 to DB-25 female DTE adapter (labeled “Terminal”)
- RJ-45/DSUB R/P adapter—RJ-45 to DB-25 male DCE adapter (labeled “Modem”)



Note

Additional cables and adapters can be ordered from your customer service representative.



Note

If you purchased Cisco support through a Cisco reseller, contact the reseller directly. If you purchased support directly from Cisco Systems, contact Cisco Technical Support at this URL:
<http://www.cisco.com/warp/public/687/Directory/DirTAC.shtm>

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Console Port

The console port is an asynchronous RS-232 serial port with an RJ-45 connector. You can use the RJ-45 rollover cable and the RJ-45/DSUB F/F adapter or the DB-9F/RJ-45F PC terminal adapter to connect the console port to a computer running terminal emulation software.

Console Port Pinouts

[Table C-1](#) lists the pinouts for the console port on the Cisco MDS 9200 Series.

Table C-1 Console Port Pinouts

Pin	Signal
1 ¹	RTS
2	DTR
3	TxD
4	GND
5	GND
6	RxD
7	DSR
8	CTS

1. Pin 1 is connected internally to pin 8.

Connecting the Console Port to a Computer Using the DB-25 Adapter

You can use the RJ-45 rollover cable and RJ-45/DSUB F/F adapter (labeled “Terminal”) to connect the console port to a computer running terminal emulation software. [Table C-2](#) lists the pinouts for the console port, the RJ-45 rollover cable, and the RJ-45/DSUB F/F adapter.

Table C-2 Port Mode Signaling and Pinouts with the DB-25 Adapter

Console Port	RJ-45 Rollover Cable		RJ4-5/DSUB F/F Terminal Adapter	Console Device
Signal	RJ-45 Pin	RJ-45 Pin	DB-25 Pin	Signal
RTS	1	8	5	CTS
DTR	2	7	6	DSR
TxD	3	6	3	RxD
GND	4	5	7	GND
GND	5	4	7	GND
RxD	6	3	2	TxD
DSR	7	2	20	DTR
CTS	8	1	4	RTS

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Connecting the Console Port to a Computer Using the DB-9 Adapter

You can use the RJ-45 rollover cable and DB-9F/RJ-45F PC terminal (labeled “Terminal”) to connect the console port to a computer running terminal emulation software. [Table C-3](#) lists the pinouts for the console port, the RJ-45 rollover cable, and the DB-9F/RJ-45F PC terminal.

Table C-3 Port Mode Signaling and Pinouts with the DB-9 Adapter

Console Port	RJ-45 Rollover Cable		DB9F/RJ45F PC Terminal	Console Device
Signal	RJ-45 Pin	RJ-45 Pin	DB-9 Pin	Signal
RTS	1	8	8	CTS
DTR	2	7	6	DSR
TxD	3	6	2	RxD
GND	4	5	5	GND
GND	5	4	5	GND
RxD	6	3	3	TxD
DSR	7	2	4	DTR
CTS	8	1	7	RTS

COM1 Port

The COM1 port is a serial port with a DB-9 connector. The COM1 port can be connected to a modem using the cable and adapters provided in the accessory kit.

COM1 Port Pinouts

[Table C-4](#) lists the pinouts for the COM1 port on the Cisco MDS 9200 Series.



Note

Additional cables and adapters can be ordered from your customer service representative.

Table C-4 COM1 Port Pinouts

Pin	Signal
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS

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Table C-4 *COM1 Port Pinouts (continued)*

Pin	Signal
8	CTS
9	RI

Connecting the COM1 Port to a Modem

You can use the DB-9F/RJ-45F PC terminal (labeled “Terminal”) to connect to the COM1 port, and the RJ-45/DSUB R/P adapter (labeled “Modem”) to connect to the modem. You can use the RJ-45 rollover cable to connect these adapters.

[Table C-5](#) lists the pinouts for the COM1 port, the DB-9F/RJ-45F PC terminal, RJ-45 rollover cable, and the RJ-45/DSUB R/P adapter.

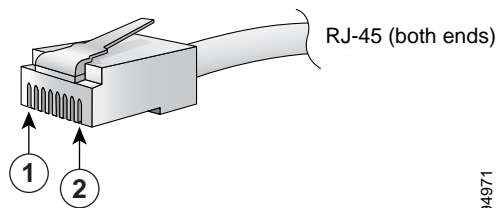
Table C-5 *Port Mode Signaling and Pinouts for Modem with DB-25 Connection*

COM1 Port	DB-9F/RJ45F PC terminal	RJ-45 Rollover Cable		RJ-45/DSUB R/P Adapter	Modem
Signal	DB-9 Pin	RJ-45 Pin	RJ-45 Pin	DB-25 Pin	Signal
CTS	8	8	1	5	CTS
DSR	6	7	2	8	DCD
RxD	2	6	3	3	RxD
GND	5	5	4	7	GND
GND	5	4	5	7	GND
TxD	3	3	6	2	TxD
DTR	4	2	7	20	DTR
RTS	7	1	8	4	RTS

MGMT 10/100/1000 Ethernet Port

The MGMT 10/100/1000 Ethernet port is an Ethernet port with an RJ-45 connector. You can use a modular, RJ-45, straight-through UTP cable to connect the management port to an external hub, switch, or router (see [Figure C-1](#)).

Figure C-1 *RJ-45 Interface Cable Connector*



1	Pin 1	2	Pin 8
---	-------	---	-------

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Table C-6 lists the connector pinouts and signal names for a 10/100/1000BASE-T management port (MDI) cable.



Note

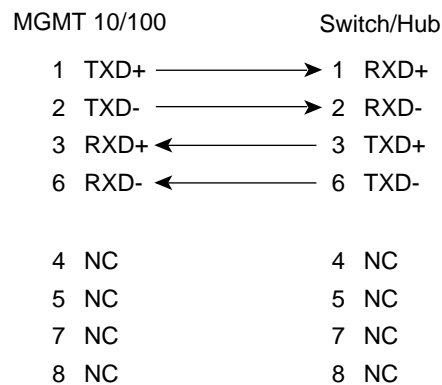
The RJ-45 interface only uses pins 1, 2, 3, and 6.

Table C-6 10/100/1000BASE-T Management Port Cable Pinout (MDI)

Pin	Signal
1	TD+
2	TD-
3	RD+
6	RD-
4	Not used
5	Not used
7	Not used
8	Not used

Figure C-2 shows a schematic of the 10/100/1000BASE-T cable required to connect the management port to a switch or hub (not provided with the switch).

Figure C-2 Twisted-Pair 10/100/1000BASE-T Cable Schematic



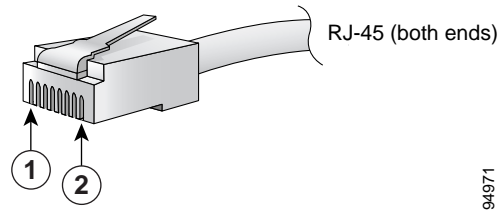
99343

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MGMT 10/100 Ethernet Port

The MGMT 10/100 Ethernet port is an Ethernet port with an RJ-45 connector. You can use a modular, RJ-45, straight-through UTP cable to connect the management port to an external hub, switch, or router (see [Figure C-3](#)).

Figure C-3 *RJ-45 Interface Cable Connector*



1	Pin 1	2	Pin 8
---	-------	---	-------

[Table C-7](#) lists the connector pinouts and signal names for a 10/100BASE-T management port (MDI) cable.

Table C-7 *10/100BASE-T Management Port Cable Pinout (MDI)*

Pin	Signal
1	TD+
2	TD-
3	RD+
6	RD-
4	Not used
5	Not used
7	Not used
8	Not used



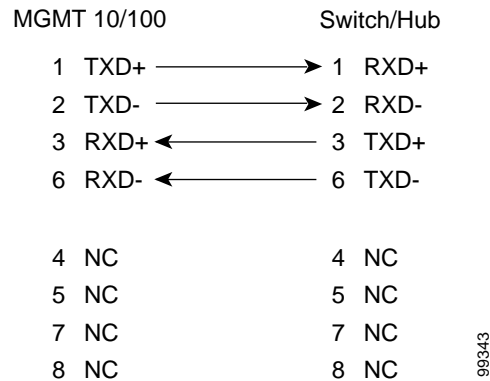
Note

The RJ-45 interface only uses pins 1, 2, 3, and 6.

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Figure C-4 shows a schematic of the 10/100BASE-T cable required to connect the management port to a switch or hub (not provided with the switch).

Figure C-4 Twisted-Pair 10/100BASE-T Cable Schematic



Supported Power Cords and Plugs

Each power supply has a separate power cord. Standard power cords or jumper power cords are available for connection to a power distribution unit having IEC 60320 C19 outlet receptacles. The jumper power cords, for use in cabinets, are available as an optional alternative to the standard power cords.

Power Cords

The standard power cords have an IEC C19 connector on the end that plugs into the switch. The optional jumper power cords have an IEC C19 connector on the end that plugs into the switch, and an IEC C20 connector on the end that plugs into an IEC C19 outlet receptacle.



Note

Only the regular power cords or jumper power cords provided with the switch are supported.

Table C-8 lists the power cords for the Cisco MDS 9200, 9100, and 9020 series of switches and provides their lengths in feet and meters.

Table C-8 Power Cords for the MDS 9200, 9100, and 9020 Series of Switches

Description	Length	
	Feet	Meters
Power Cord, 125 VAC 13 A NEMA 5-15 Plug, North America	8.2	2.5
Power Cord, 250 VAC 10 A 3112 Plug, Australia	8.2	2.5
Power Cord, 250 VAC 10 A CEE 7/7 Plug, EU	8.2	2.5

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Table C-8 *Power Cords for the MDS 9200, 9100, and 9020 Series of Switches (continued)*

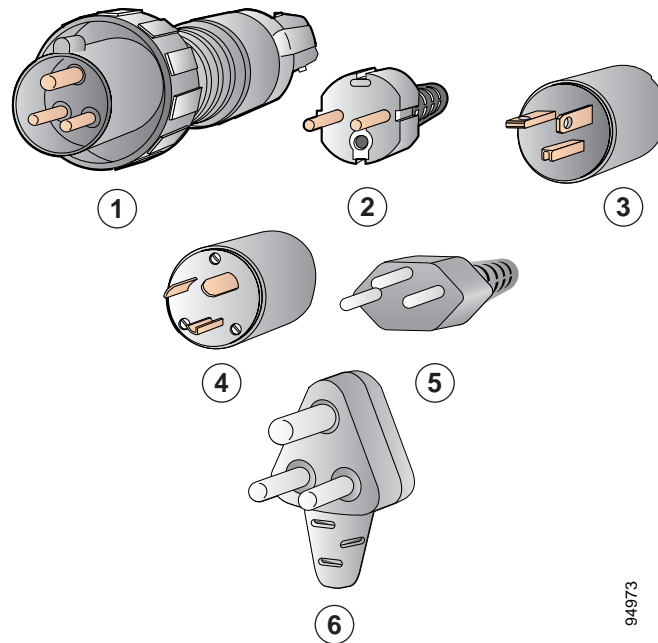
Description	Length	
	Feet	Meters
Power Cord, 250 VAC 10 A CEI 23-16/VII Plug, Italy	8.2	2.5
Power Cord, 250 VAC 10 A BS1363 Plug (13 A fuse), UK	8.2	2.5
Power Cord, 250 VAC 10 A IRAM 2073 Plug, Argentina	8.2	2.5
Power Cord, 250 VAC 10 A MP232 Plug, Switzerland	8.2	2.5
Power Cord, 250 VAC 10 A SABS 164/1 Plug, South Africa	6	1.83
Power Cord, 250 VAC 10 A SI32 Plug, Israel	14.76	4.5
Power Cord, 250 VAC 15 A CNS10917-2 Plug, Taiwan	13.94	4.25
Cabinet Jumper Power Cord, 250 VAC 13 A, C14-C15 Connectors	4	1.22

Supported Plugs for 6000-W AC, 2500-W AC, and 1900-W AC Power Supplies

Figure C-5 shows the supported plugs for the 6000-W AC, 3000-W AC, 2500-W AC, and 1900-W AC power supplies.

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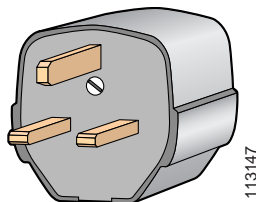
Figure C-5 6000-W AC, 3000-W AC, 2500-W AC, and 1900-W AC Power Supply Plugs



1	International (6000 W, 3000 W, 2500 W, and 1900 W) IEC 309 (20 A)	4	North America (locking) (6000 W, 3000 W, 2500 W, and 1900 W) NEMA L6-20 plug (20 A)
2	Europe (6000 W, 3000 W, 2500 W, and 1900 W) CEE 7/7 (16 A)	5	Switzerland (6000 W, 3000 W, 2500 W, and 1900 W) 23 G SEV 1011 (16 A)
3	North America (non-locking) (6000 W, 3000 W, 2500 W, and 1900 W) NEMA 6-20 plug (20 A)	6	South Africa (6000 W, 3000 W, 2500 W, and 1900 W) EL 208, SABS 164-1 (16 A)

Figure C-6 shows an additional plug that is supported for the 1900-W AC power supply only.

Figure C-6 Additional Power Supply Plug Supported for 1900-W Only



1	United Kingdom BS89/13, BS 1363/A (13 A; replaceable fuse)
---	--

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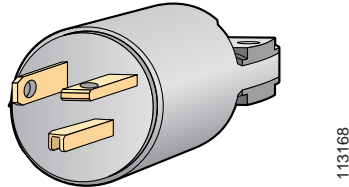
Figure C-7 shows an additional plug that is supported for the 3000-W and 2500-W power supply, using 110 VAC.



Note

Using the plug in Figure C-7 at 110 VAC results in 1300 W available to the system.

Figure C-7 Additional Power Supply Plug Supported for 3000-W and 2500-W 110 VAC Only

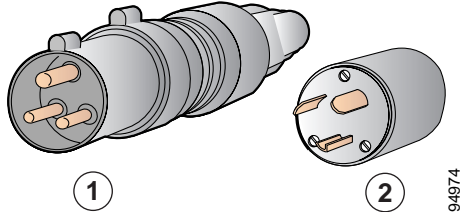


1	NEMA 5-20P North American power cord product ID: CAB-7513AC 110 VAC (20 A)
---	--

Supported Plugs for the 4000-W AC Power Supply

Figure C-8 shows the supported plugs for the 4000-W AC power supply. The power cable on the 4000 W power supply is nondetachable.

Figure C-8 4000-W Power Supply Plugs



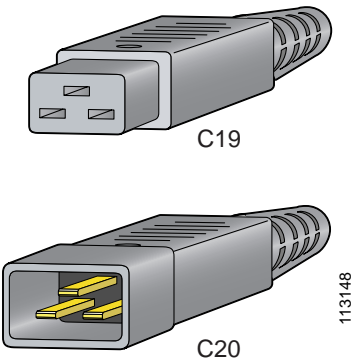
1	International (4000-W power supply) IEC 60309 (3 0A, 250 V)	2	North America (Locking) (4000-W power supply) NEMA L6-30 plug (30 A, 250 V)
---	---	---	---

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Jumper Power Cord

Figure C-9 shows the C19 and C20 connectors on the optional jumper power cord for the Cisco MDS 9200 Series. The C19 connector plugs into the C20 inlet on the Cisco MDS 9200 Series power supply, while the C20 connector plugs into the C19 receptacle of a power distribution unit for a cabinet.

Figure C-9 *End of C19 and C20 Connectors on Jumper Power Cord for Cisco MDS 9200 Series*



1	C19 and C20 connectors on jumper power cord for Cisco 9200 Series Power cord product ID:CAB-C19-CBN 250 VAC 16 A, C20-C19 connectors
---	--

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APPENDIX D

Site Planning and Maintenance Records

This appendix includes the following records to use when installing the Cisco MDS 9200 Series:

- [Site Preparation Checklist, page D-1](#)
- [Contact and Site Information, page D-3](#)
- [Chassis and Module Information, page D-4](#)



Note

For information about how to query the switch for configuration information, see the *Cisco MDS 9000 Family NX-OS Interfaces Configuration Guide* or the *Cisco Fabric Manager Interfaces Configuration Guide*.

Site Preparation Checklist

Planning the location and layout of your equipment rack or wiring closet is essential for successful switch operation, ventilation, and accessibility. [Table D-1](#) lists the site planning tasks that we recommend completing before installing the Cisco MDS 9200 Series.

Consider heat dissipation when sizing the air-conditioning requirements for an installation. See [Table B-1 on page B-1](#) for the environmental requirements, and the “[Weight of Modules](#)” section on [page B-3](#) for power and heat ratings.

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Table D-1 Site Planning Checklist

Task No.	Planning Activity	Verified By	Time	Date
1	Space evaluation: <ul style="list-style-type: none"> • Space and layout • Floor covering • Impact and vibration • Lighting • Maintenance access 			
2	Environmental evaluation: <ul style="list-style-type: none"> • Ambient temperature • Humidity • Altitude • Atmospheric contamination • Air flow 			
3	Power evaluation: <ul style="list-style-type: none"> • Input power type • Power receptacles¹ • Receptacle proximity to the equipment • Dedicated circuit for power supply • Dedicated (separate) circuits for redundant power supplies • UPS² for power failures 			
4	Grounding evaluation: <ul style="list-style-type: none"> • Circuit breaker size • CO ground (AC- powered systems) 			
5	Cable and interface equipment evaluation: <ul style="list-style-type: none"> • Cable type • Connector type • Cable distance limitations • Interface equipment (transceivers) 			
6	EMI ³ evaluation: <ul style="list-style-type: none"> • Distance limitations for signaling • Site wiring • RFI⁴ levels 			

1. Verify that the power supply installed in the chassis has a dedicated AC source circuit.

2. UPS = uninterruptible power supply.

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3. EMI = electromagnetic interference.
4. RFI = radio frequency interference.

Contact and Site Information

Use the following worksheet ([Table D-2](#)) to record contact and site information.

Table D-2 **Contact and Site Information**

Contact person	
Contact phone	
Contact e-mail	
Building/site name	
Data center location	
Floor location	
Address (line 1)	
Address (line 2)	
City	
State	
Zip code	
Country	

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Chassis and Module Information

Use the following worksheets ([Table D-3](#) and [Table D-4](#)) to record information about the chassis and modules.

Contract Number _____

Chassis Serial Number _____

Product Number _____

Table D-3 *Network-Related Information*

Switch IP address	
Switch IP netmask	
Host name	
Domain name	
IP broadcast address	
Gateway/router address	
DNS address	
Modem telephone number	

Table D-4 *Module Information*

Slot	Module Type	Module Serial Number	Notes
1	Supervisor		
2			



Note

The supervisor module and the interface module are not removable.



I N D E X

Numerics

12-port 4-Gbps Fibre Channel switching modules

description [1-14](#)

figure [1-14](#)

16-Port Storage Services Module [1-20](#)

16-port switching modules

description [1-17](#)

figure [1-17](#)

LEDs (table) [1-16, 1-19](#)

18/4-Port Multiservice Module [1-22](#)

18/4-port Multiservice module [1-22](#)

24-port 4-Gbps Fibre Channel switching modules

description [1-13](#)

figure [1-13](#)

32-port Fibre Channel Advanced Services Module. See ASM

32-port Fibre Channel Storage Services Module. See SSM

32-port switching modules

description

[1-16](#)

figure [1-17](#)

LEDs (table) [1-16, 1-19](#)

4 [1-12](#)

4/44-port 8-Gbps Host Optimized Fibre Channel Switching Module [1-12](#)

4/44-Port 8-Gbps Host-Optimized Fibre Channel switching modules

description [1-12](#)

4/44-port 8-Gbps Host-Optimized Fibre Channel switching modules

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