



Multichannel STM-1 Service Module Installation and Configuration on Cisco 3900 Series Integrated Services Routers

Product Number: SM-1-STM1-SM-C(=), SM-1-STM1-MM-C(=)

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Preface

This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

- [Objectives, page 4](#)
- [Organization, page 4](#)
- [Related Documentation, page 5](#)
- [Obtaining Documentation, Obtaining Support, and Security Guidelines, page 5](#)

Objectives

This document describes how to install and configure the multichannel STM-1 service module (SM-1-STM1-SM-C and SM-1-STM1-MM-C), hereafter referred to as the SM-1-STM1, which is used in the Cisco Integrated Services Routers Generation 2 (ISR G2), which include Cisco 3925, Cisco 3945, Cisco 3925E and Cisco 3945E routers.

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Overview	Describes the SM-1-STM1 and its LED displays, cables, and receptacles.
Chapter 2	Preparing for Installation	Describes safety considerations, tools required, and procedures you should perform before the actual installation.
Chapter 3	Removing and Installing Service Modules	Describes the procedures for installing and removing SM-1-STM1 service modules in the supported platform.
Chapter 4	Configuring the SM-1-STM1	Provides instructions for configuring the SM-1-STM1 on the supported platform.

Related Documentation

Your router and the Cisco IOS software running on it contain extensive features and functionality, which are documented in the following resources:

- Cisco IOS software configuration and hardware installation and maintenance documentation at <http://www.cisco.com> or <http://www-china.cisco.com>.
- Cisco 3925 and Cisco 3945 integrated services routers:
 - To quickly access documents for the Cisco 3900 series ISRs, refer to the following URL: http://www.cisco.com/en/US/products/ps10536/prod_installation_guides_list.html
- For international agency compliance, safety, and statutory information, refer to the following document:
 - [Regulatory Compliance and Safety Information for Cisco 3900 Series Integrated Services Routers](#)

Obtaining Documentation, Obtaining Support, and Security Guidelines

For information on obtaining documentation, obtaining support, providing documentation feedback, security guidelines, and recommended aliases and general Cisco documents, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised technical documentation at: <http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html>



CHAPTER 1

Overview

This chapter describes the SM-1-STM1 service modules (SM) and contains the following sections:

- [Service Module Overview, page 1-1](#)
- [SDH Overview, page 1-4](#)
- [SM-1-STM1 Multiplexing Hierarchy, page 1-5](#)
- [Features, page 1-5](#)
- [SM-1-STM1 Optical Fiber Specifications, page 1-6](#)
- [LEDs and Ports, page 1-7](#)
- [Cables, Connectors, and Pinouts, page 1-8](#)
- [Network Management, page 1-9](#)
- [Service Module Slot Locations on the Cisco 3900 Series Integrated Services Routers, page 1-10](#)
- [Identifying Interface Addresses, page 1-10](#)

Service Module Overview

The SM-1-STM1-SM-C, shown in [Figure 1-1](#), is a single-mode, high-speed, single-port multichannel STM-1 service module. SM-1-STM1-MM-C, shown in [Figure 1-2](#), is a multi-mode, high-speed, single-port multichannel STM-1 service module. You can configure the SM-1-STM1 as a multichannel E1 STM-1 port, which can be configured into 63 individual E1 links. Each E1 link can carry a single channel at full or fractional rates, or it can be broken down into multiple DS0 rates.

The following restrictions exist:

- The maximum number of channels is limited to 226 per SM-1-STM1.
- This Cisco IOS software (Cisco IOS version 15.1(2)T) does not support more than two SM-1-STM1 SMs in the 3900 series ISRs.
- For OIR support, the STM-1 controller needs to be in a shutdown state before hot-swapping the module.
- Loopback support on the SONET controller is used for diagnostics only with no functional impact to the loopback feature. The following behavior is noted: Link is flapped on the peer interface when the SONET controller is set to loopback [local | network]. Using the **shutdown/no shutdown** command will overcome the link flap. Refer to [“Shutting Down an Interface” section on page 4-2](#) for details on using the **shutdown/no shutdown** command.

- The maximum number of FIFO buffers is 2048. The FIFO buffers are shared among the interfaces; how they are shared is determined by speed. If all the FIFO buffers have been assigned to existing interfaces, a new interface cannot be created, and the “%Insufficient FIFOs to create channel group” error message is seen. FIFO allocation information is provided in [Table 1-1](#), and examples of supported and unsupported configurations are provided in [Table 1-2](#) and [Table 1-3](#).

Table 1-1 *FIFO Allocation*

Number of Timeslots	Number of FIFO Buffers
1	3
2	3
2	3
4	4
5	5
6	6
7	7
8	9
9	9
10	10
11	12
12	12
13	16
14	16
15	16
16	16
17	17
18	18
19	20
20	20
21	21
22	22
23	24
24	24
25	25
26	26
27	28
28	28
29	29
30	30
31	32
Full E1	32

Following are three examples of supported and unsupported configurations.

Table 1-2 Supported Configurations

Supported Configurations	Total FIFO Buffers
63 E1s → x 32 FIFOs =	2016
226 DSOs → 226 x 3 FIFOs =	678
62 E1s + 21 DSOs → (62 x 32) + (21 x 3) =	2047

Table 1-3 Unsupported Configurations

Unsupported Configurations	Result
228 DSOs →	226 interface limit is exceeded
62 E1s with 31 DSOs → (62 x 32) + (31 x 3) =	2077 FIFOs (exceeds 2048 FIFO limit)

The SM-1-STM1 supports up to three TUG-3/AU-3 transport slots numbered 1 to 3.

Figure 1-1 SM-1-STM1-SM-C—Faceplate View

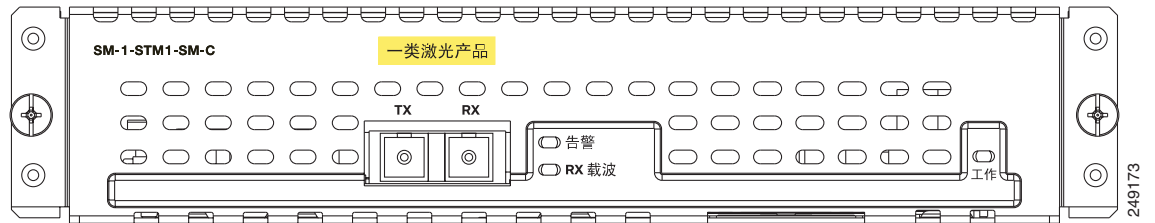


Figure 1-2 SM-1-STM1-MM-C—Faceplate View

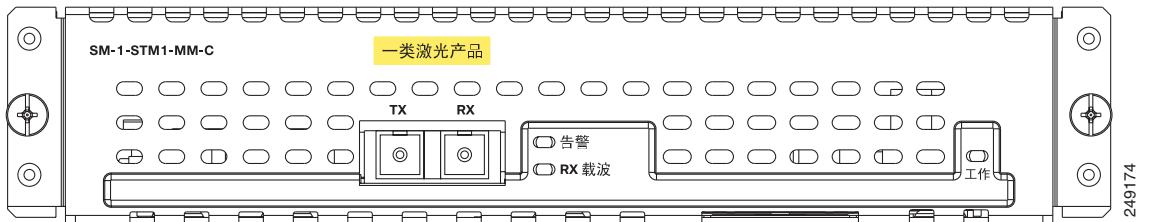
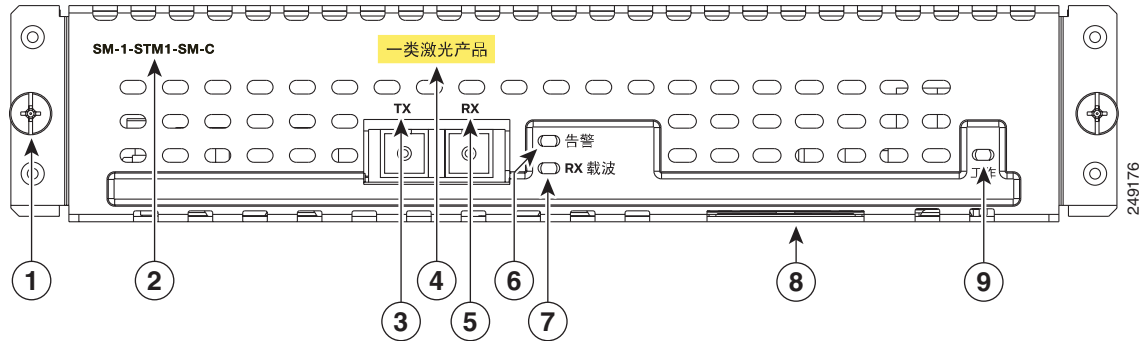


Figure 1-3 SM-1-STM1 Elements



1	Captive installation screw	2	Service module product name
3	Transmit out port	4	Laser warning label
5	Receive in port	6	Alarm LED
7	Rx Carrier LED	8	Product ID card
9	Enabled LED		

SDH Overview

Synchronous Digital Hierarchy (SDH) is the international standard for optical digital transmission at hierarchical rates from 155.520 Mbps (STM-1) to 2.5 Gbps (STM-16) and greater.

The International Telecommunications Union Telecommunication Sector (ITU-T) defines a series of SDH transmission rates beginning at 155.520 Mbps as follows:

Table 1-4 SDH Transmission Rates

SDH	Transmission Rate
STM-1	155.520 Mbps
STM-4	622.080 Mbps
STM-16	2,488.320 Mbps
STM-64	9,953.280 Mbps

The SM-1-STM1 currently allows transmission over single-mode and multimode optical fiber only. Transmission rates are integral multiples of 51.840 Mbps, which can be used to carry E3 bit-synchronous signals.



Warning

No user-serviceable parts inside. Do not open. Statement 1073



Warning

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



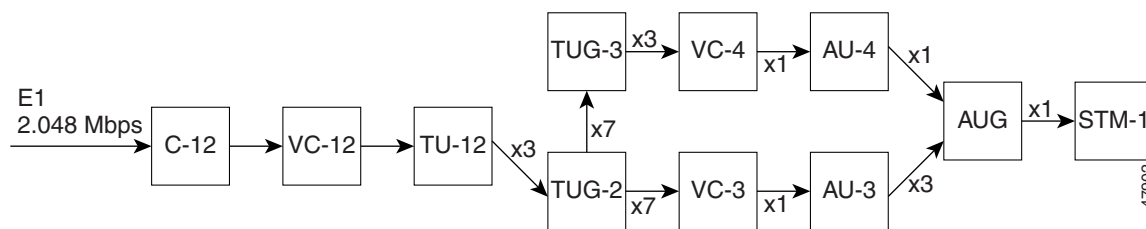
Warning

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

SM-1-STM1 Multiplexing Hierarchy

Figure 1-4 illustrates the SDH multiplexing structure supported on the SM-1-STM1. The SM-1-STM1 multiplexing structure is a subset of that defined in ITU-T G.707. At the lowest level, containers (Cs) are input into virtual containers (VCs) with stuffing bits to create a uniform VC payload with a common bit-rate, ready for synchronous multiplexing. Then, the VCs are aligned into tributary units (TUs) where pointer processing operations are implemented, allowing the TUs to be multiplexed into TU groups (TUGs). Three TU-12s can be multiplexed into one TUG-2.

Figure 1-4 SM-1-STM1 Multiplexing Structure



The TUGs are then multiplexed into higher level VCs, which in turn are multiplexed into administration units (AUs). The AUs are then multiplexed into an AU group (AUG) and the final payload from the AUG is then multiplexed into the Synchronous Transport Module (STM).

Features

The following is a list of features provided with the SM-1-STM1 service module:

- One channelized STM-1 port
- Channelized E1, fractional E1, and full-rate E1 supported
- Up to 226 usable channels allocated among the 63 E1 ports
- Internal or network clocking selectable on each E1
- 64 kbps DS0 time slots
- Line and payload loopback capabilities—local and network at the E1 and STM-1 level
- Full bit-error-rate testing capabilities on any E1
- Programmable pseudo-random pattern up to 32 bits in length, including 2 11-1; 2 15-1; and 2 20-1, 0153, and QRSS
- 32-bit error count and bit-count registers
- Detect test patterns conform to ITU-T 0.151 and 0.152 standards
- Online insertion and removal (OIR)
- Support for the following serial encapsulation protocols:
 - Frame Relay

- PPP
- HDLC
- IP protocol support
- 16-bit or 32-bit CRC4 supported
- SDH / E1 functionality offered on the SM-1-STM1



Note SDH/E1 functionality may not be fully supported on the 3900 series ISRs.

SM-1-STM1 Optical Fiber Specifications

The SM-1-STM1 specification for optical fiber transmission defines two types of fiber: single-mode and multimode. Within the single-mode category, two types of transmission are defined: intermediate reach and long reach. Within the multimode category, only short reach is available. (See [Table 1-5](#) for specifications.)

Modes can be thought of as bundles of light rays entering the fiber at a particular angle. Single-mode fiber allows only one mode of light to propagate through the fiber at one wavelength and polarization, and multimode fiber allows multiple modes of light to propagate through the fiber for each wavelength and polarization.

Multiple modes of light propagating through the fiber travel different distances depending on the entry angles, which causes them to arrive at the destination at different times (a phenomenon called *modal dispersion*). Modal dispersion limits propagation distance in multimode fiber before attenuation does. Therefore, single-mode fiber is capable of higher bandwidth and greater cable run distances than multimode fiber is. [Table 1-5](#) lists nominal OC-3 optical parameters for single-mode and multimode optical fiber transmission.



Note If the distance between two connected stations is greater than the maximum distances listed, significant signal loss can result, making transmission unreliable.

Table 1-5 OC-3 Optical Parameters

Transceiver Type ¹	Transmit Power	Maximum Power to Receiver ²	Receiver Sensitivity	Loss Budgets	Nominal Distance Between Stations
Single-mode ³ intermediate reach	-15 dBm min. to -8 dBm max. at 1280–1335 nm	-8 dBm	-28 dBm	0 to 12 dB	Up to 9 mi (15 km)
Multimode ⁴ short reach	-20 dBm min. to -14 dBm max. at 1280–1335 nm	-8 dBm	-23 dBm	0 to 7 dB	Up to 1.2 mi (2 km)

1. This table gives nominal OC-3 optical parameters.
2. This value represents the maximum power to which any receiver can be exposed.
3. Complies with ITU-T G.957 standard S.1-1 specification.
4. Complies with Short-Reach OC-3 Specification SR-OC-3.

To calculate link losses and dispersion losses for your application, refer to the following specifications and documents:

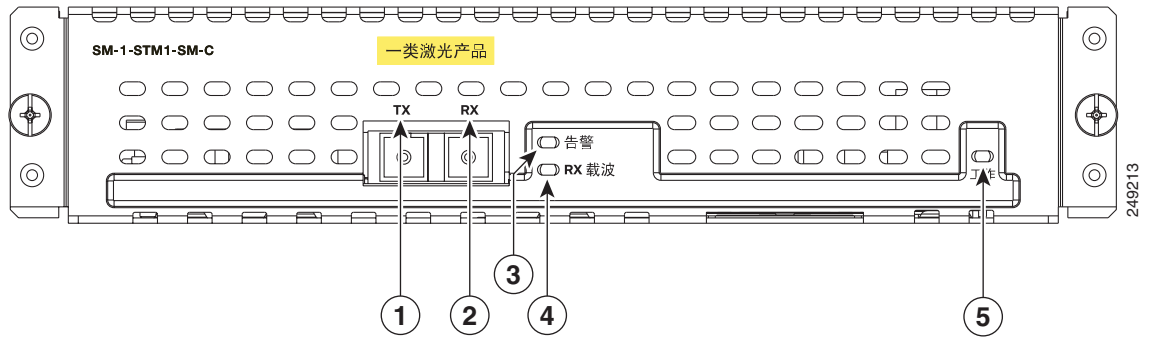
- EIA/TIA-IVa Dispersion Unshifted Single-Mode Fiber
- EIA-TIA-IVb Dispersion Shifted Single-Mode Fiber
- GR-20-CORE *Generic Requirements for Optical Fiber and Fiber-Optic Cable*
- ITU-T Recommendation G.957 *Optical Interfaces for Equipment and Systems Relating to the Synchronous Digital Hierarchy*

LEDs and Ports

Figure 1-5 shows the LEDs and Tx and Rx ports for the SM-1-STM1.

The green- or yellow-colored LEDs indicate service module status.

Figure 1-5 SM-1-STM1 LEDs



1	Transmit out port	2	Receive in port
3	Alarm LED	4	Rx Carrier LED
5	Enabled LED		

After system initialization, the ENABLED LED goes on to indicate that the SM has been enabled for operation.

The following conditions must be met before the SM-1-STM1 is enabled:

- The SM-1-STM1 is correctly connected and is receiving power.
- A valid system software image for the SM has been downloaded successfully.
- The system recognizes the SM-1-STM1.

If any of the above conditions are not met, or if the initialization fails for other reasons, the ENABLED LED does not go on.

Table 1-6 lists LED colors and indications.

Table 1-6 SM-1-STM1 LEDs

LED Label	Color	State	Meaning
ENABLED	Green	On	Service module is enabled for operation.

Table 1-6 SM-1-STM1 LEDs

RxCXR	Green	On	Indicates the SM-1-STM1 is receiving a good SDH signal.
Alarm	Yellow	On	Indicates an SDH/E1 signal error such as LOS ¹ or LOF ² .

1. LOS = loss of signal

2. LOF = loss of frame

Cables, Connectors, and Pinouts

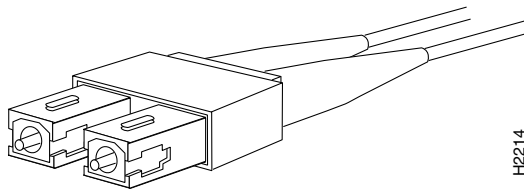
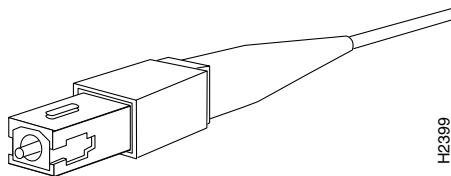
Use a single-mode or multimode optical fiber interface cable to connect your router or switch to another router or switch. In general, multimode cables are gray or orange, and single-mode cables are yellow.



Note

These cables are not available from Cisco Systems.

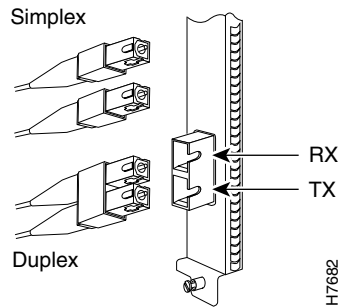
For SDH single-mode and multimode optical fiber connections, use one duplex SC-type connector (see [Figure 1-6](#)) or two simplex SC-type connectors (see [Figure 1-7](#)).

Figure 1-6 Duplex SC Cable Connector**Figure 1-7 Simplex SC Cable Connector**

Attach either one duplex optical fiber cable or two simplex optical fiber cables between the service module and the device to which the service module is connected. Observe the receive (RX) and transmit (TX) cable relationship shown in [Figure 1-8](#).

Figure 1-8 Attaching Simplex or Duplex Optical Fiber Cables

SONET/SDH with simplex
or duplex SC connectors



The following warnings apply when you work with optical fiber cable ports.



Warning

Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. Statement 1056



Warning

Class 1 Laser Product. Statement 1008



Warning

Class 1 LED Product. Statement 1027

Network Management

To locate MIBs and system messages associated with the SM-1-STM1 service module, see the following sites:

- The Error Message Decoder website allows you to determine the explanation and recommended action for an existing Cisco syslog message. You must be a registered Cisco.com user to access this document. To visit the Error Message Decoder website, go to this URL:

<http://www.cisco.com/cgi-bin/Support/Errordecoder/home.pl>

- You can find information about MIBs and OIDs at the Cisco IOS MIB Locator and SNMP Object Identifier website. The MIB Locator finds MIBs in Cisco IOS software releases. The SNMP Object Navigator translates OID's into SNMP names. To visit the Cisco IOS MIB Locator and SNMP Object Identifier website, go to this URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

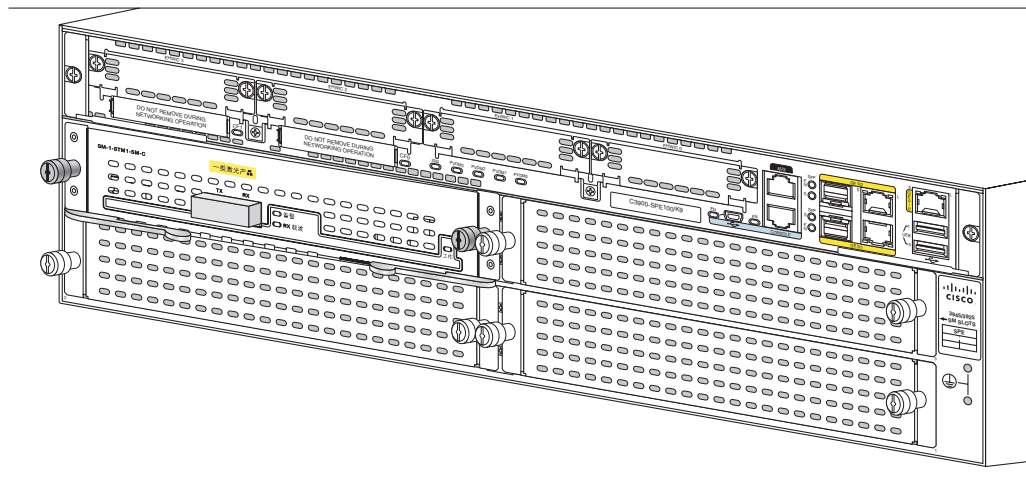
Service Module Slot Locations on the Cisco 3900 Series Integrated Services Routers

This section discusses service module slot locations on the supported platforms. The illustrations that follow summarize slot location conventions on each platform.

Cisco 3900 Series Routers Slot Numbering

See [Overview of Cisco Network Modules and Service Modules for Cisco Access Routers](#) general information and single- and double-wide slot numbering.

Figure 1-9 Cisco 3900 Series Router with Service Module Installed



Cisco 3945 series routers have four slots for service modules. You can place the service modules in any of the four slots.

Identifying Interface Addresses

This section describes how to identify interface addresses for the SM-1-STM1. Interface addresses specify the actual physical location of each interface on the router.

Interfaces on a SM-1-STM1 installed in a router maintain the same address regardless of whether other service modules are installed or removed. However, when you move a service module to a different slot, the first number in the interface address changes to reflect the new service module slot number.



Note

Interface ports on the Cisco 3945 series routers are numbered from bottom right to top left starting with 1.

[Table 1-7](#) summarizes the interface address formats for the supported platforms.

Table 1-7 *Identifying Interface Addresses*

Platform	Interface Address Format	Numbers	Syntax
Cisco 3945 series ISRs	SM/slot-number	Service module slot—1 through 4 Interface port—0	1/0
Cisco 3925 series ISRs	SM/slot-number	Service module slot—1 through 2 Interface port—0	1/0



CHAPTER 2

Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing the SM-1-STM1. This chapter contains the following sections:

- [Required Tools and Equipment, page 2-1](#)
- [Minimum Software and Hardware Requirements, page 2-1](#)
- [Checking Hardware and Software Compatibility, page 2-2](#)
- [Safety Guidelines, page 2-2](#)
- [Laser and LED Safety, page 2-8](#)
- [FCC Class A Compliance, page 2-10](#)

Required Tools and Equipment

You need the following tools and parts to install a SM-1-STM1. If you need additional equipment, contact a service representative for ordering information.

- SM-1-STM1SMI or SM-1-STM1MM
- One SC-type duplex or two SC-type simplex, multimode or single-mode optical fiber cables to connect the interface with the network. (Single-mode and multimode optical fiber cables for the SM-1-STM1 are not available from Cisco Systems but are available from commercial cable vendors. For information about optical fiber cables, see the [“Cables, Connectors, and Pinouts”](#) section on [page 1-8](#).)
- Number 2 Phillips or a 3/16-inch flat-blade screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares
- Antistatic mat
- Antistatic container

Minimum Software and Hardware Requirements

This section indicates the recommended minimum Cisco IOS software release required to use the SM-1-STM1 in supported platforms.

For the latest releases supporting the SM-1-STM1, refer to the “[Checking Hardware and Software Compatibility](#)” section on page 2-2.

Checking Hardware and Software Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether modules within a system are compatible, but it does provide the minimum IOS requirements for individual hardware modules or components.

**Note**

Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, go to:

http://www.cisco.com/en/US/support/tsd_most_requested_tools.html.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

Safety Guidelines

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Warning Definition

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, may cause bodily harm. A warning symbol precedes each warning statement.



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

Waarschuwing

BELANGRIJKE VEILIGHEIDSINSTRUCTIES

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 de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus

TÄRKEITÄ TURVALLISUUSOHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelyyn liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET

Attention

IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung

WICHTIGE SICHERHEITSHINWEISE

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza IMPORTANTI ISTRUZIONI SULLA SICUREZZA

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI**Advarsel VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE**Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES**¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES**Varning! VIKTIGA SÄKERHETSANVISNINGAR**

Denna varningssignal 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 vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR

Figyelem FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmeztető jel veszélyre utal. Sérülésveszélyt rejtő helyzetben van. Mielőtt bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!**Предупреждение ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ**

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ**警告 重要的安全性说明**

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

주의 중요 안전 지침

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다. 장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치와 함께 제공되는 번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

Aviso INSTRUÇÕES IMPORTANTES DE SEGURANÇA

Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.

GUARDE ESTAS INSTRUÇÕES**Advarsel VIGTIGE SIKKERHEDSANVISNINGER**

Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemeskade. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.

GEM DISSE ANVISNINGER

تحذير

إرشادات الأمان الهامة

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل، احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم رقم البيان الموجود في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز. قم بحفظ هذه الإرشادات

Upozorenje VAŽNE SIGURNOSNE NAPOMENE

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se nalazi uz pojedino upozorenje pronaći i njegov prijevod.

SAČUVAJTE OVE UPUTE**Upozornění DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY**

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

USCHOVEJTE TYTO POKYNY

Προειδοποίηση	<p>ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ</p> <p>Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κινδύνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθειες πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.</p> <p>ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ</p>
אזהרה	<p>הוראות בטיחות חשובות</p> <p>סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במגעלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.</p> <p>שמור הוראות אלה</p>
Opomena	<p>ВАЖНИ БЕЗБЕДНОСНИ НАПАТСТВИЈА</p> <p>Симболот за предупредување значи опасност. Се наоѓате во ситуација што може да предизвика телесни повреди. Пред да работите со опремата, бидете свесни за ризикот што постои кај електричните кола и треба да ги познавате стандардните постапки за спречување на несреќни случаи. Искористете го бројот на изјавата што се наоѓа на крајот на секое предупредување за да го најдете неговиот период во преведените безбедносни предупредувања што се испорачани со уредот.</p> <p>ЧУВАЈТЕ ГИ ОБИЕ НАПАТСТВИЈА</p>
Ostrzeżenie	<p>WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA</p> <p>Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.</p> <p>NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ</p>
Upozornenie	<p>DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY</p> <p>Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodymi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.</p> <p>USCHOVAJTE SI TENTO NÁVOD</p>

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Service modules and processor modules comprise 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, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed circuit board component-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.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.

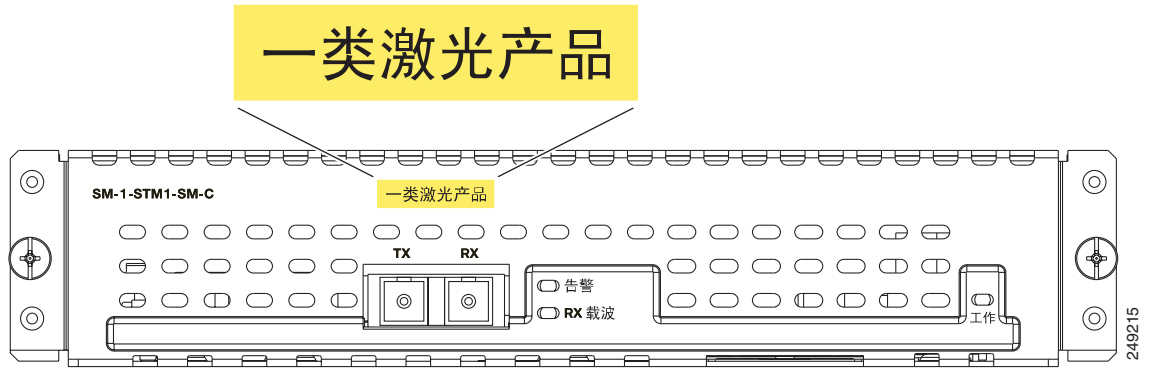
**Caution**

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

Laser and LED Safety

The single-mode transmitter in the module uses a small laser to transmit the light signal to the network ring. Keep the transmit port covered whenever a cable is not connected to it. Although multimode transceivers typically use LEDs for transmission, it is good practice to keep open ports covered and avoid staring into open ports or apertures. The single-mode aperture port contains a laser warning label, as shown in [Figure 2-1](#).

Figure 2-1 Laser Warning Labels for the SM-1-STM1-SM-C



 **Warning**

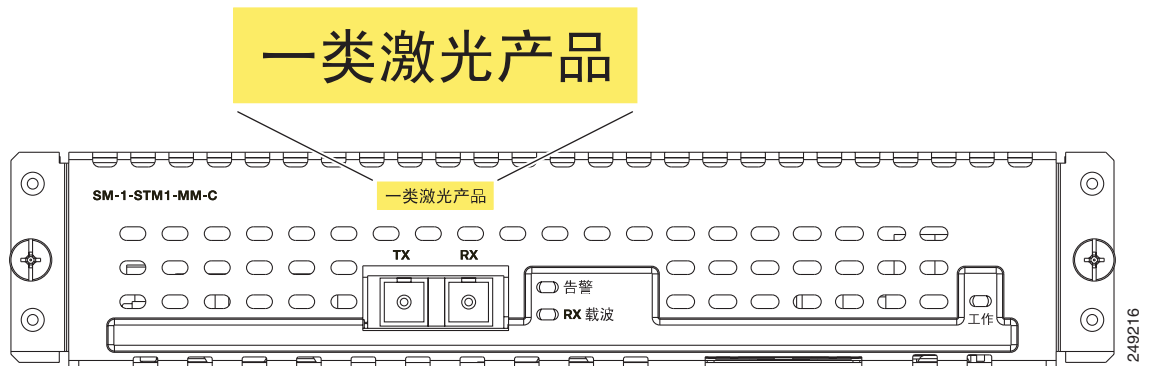
Class 1 laser product. Statement 1008.

 **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.

The multimode aperture contains a Class 1 LED warning label, as shown in [Figure 2-2](#).

Figure 2-2 Laser Warning Labels for the SM-1-STM1-MM-C



 **Warning**

Class 1 LED product. Statement 1027.

 **Warning**

Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. Statement 1056

FCC Class A Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and radiates radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users are required to correct the interference at their own expense.

You can determine whether your equipment is causing interference by turning it off. If the interference stops, it was probably caused by the Cisco equipment or one of its peripheral devices. If the equipment causes interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the equipment to one side of the television or radio.
- Move the equipment farther away from the television or radio.
- Plug the equipment into an outlet that is on a different circuit from the television or radio. (That is, make certain the equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)

**Caution**

This product has been designed to meet FCC Class A compliance requirements. Modifications to this product that are not authorized by Cisco Systems, Inc. could void the various approvals and negate your authority to operate the product.



CHAPTER 3

Removing and Installing Service Modules

This chapter describes how to remove the SM-1-STM1 service module. This chapter contains the following sections:

- [Handling Service Modules, page 3-1](#)
- [Online Insertion and Removal, page 3-2](#)
- [Warnings and Cautions, page 3-2](#)
- [Service Module Removal and Installation, page 3-3](#)
- [Connecting a SM-1-STM1 Cable, page 3-3](#)

Handling Service Modules

Each service module circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage.



Note

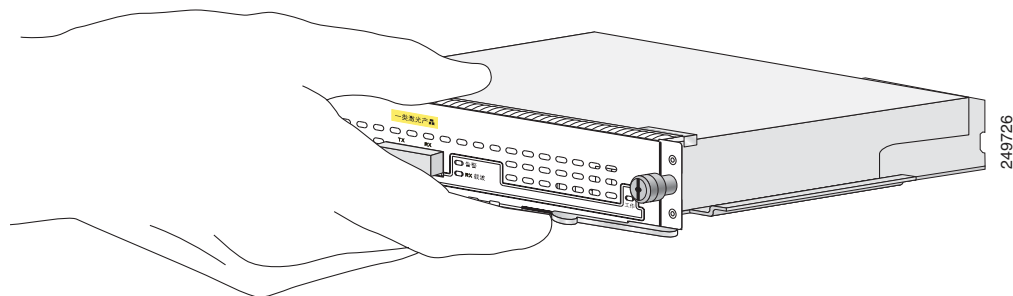
When a slot is not in use, a blank service module must fill the empty slot to allow the router to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the service modules. If you plan to install a new service module in a slot that is not in use, you must first remove the blank service module.



Caution

Always handle the service module by the carrier edges and handle; never touch the SM components or connector pins. (See [Figure 3-1](#).)

Figure 3-1 Handling a Service Module



Online Insertion and Removal


Note

As you disengage the service module from the router or switch, online insertion and removal (OIR) administratively shuts down all active interfaces in the service module. To properly perform OIR, follow the steps in the following URL:

<http://www.cisco.com/en/US/docs/routers/access/2900/hardware/installation/guide/appendix.html#wpxref68698>

OIR allows you to install and replace service modules while the system is operating; you do not need to notify the software or reset the system power, although you should not run traffic through the service module you are removing while it is being removed. OIR is a method that is seamless to end users on the network, maintains all routing information, and ensures session preservation.


Note

Before you begin installation, read [Chapter 2, “Preparing for Installation,”](#) for a list of parts and tools required for installation.


Warning

Read the installation instructions before connecting the system to the power source. Statement 1004

Warnings and Cautions

Observe the following caution when installing or removing modules:


Caution

Be sure the service module is firmly seated in the router.

Equipment Installation Warning


Warning

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


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

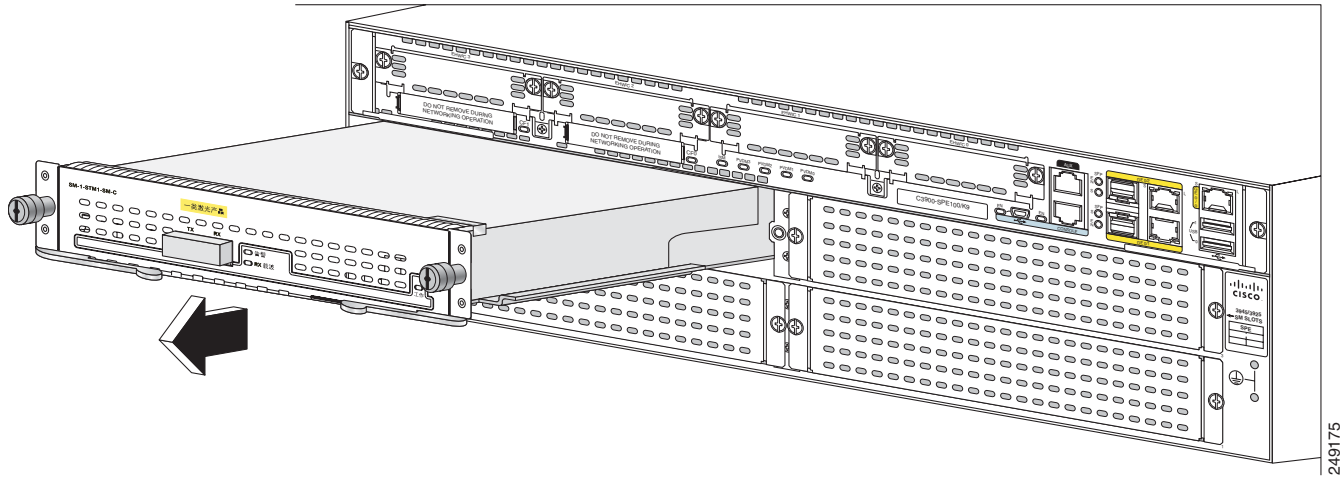

Warning

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

Service Module Removal and Installation

This section describes how to remove and install service modules.

Figure 3-2 Removing the SM-1-STM1 from the Cisco 3945 ISR



-
- Step 1** Unscrew the the service module captive screws.
 - Step 2** Pull the service module out of the service module slot.
 - Step 3** Insert the service module into the service module slot until it is fully seated.
 - Step 4** Tighten the captive screws on the service module.
-

Connecting a SM-1-STM1 Cable

To continue your SM-1-STM1 service module installation, you must connect the interface cables. The instructions that follow apply to all supported platforms.



Note

Optical fiber cables are not available from Cisco Systems; they are available from outside commercial cable vendors. (For more information on the cables you should use with this service module, see the “SM-1-STM1 Optical Fiber Specifications” section on page 1-6 and the “Cables, Connectors, and Pinouts” section on page 1-8.)

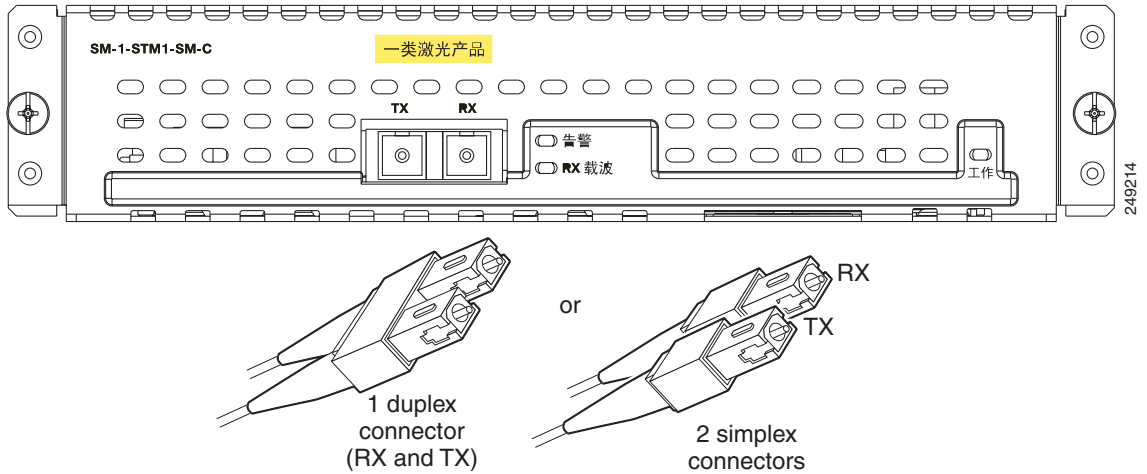
To connect cables to the SM-1-STM1, attach either one duplex optical fiber cable or two simplex optical fiber cables between the SM-1-STM1 interface port and your network. (See [Figure 3-3](#).)



Note

Ensure that you observe the proper relationship of receive (RX) cable to RX SC-type receptacle and transmit (TX) cable to TX SC-type receptacle on the SM-1-STM1.

Figure 3-3 Connecting Simplex or Duplex Optical Fiber Cables to the SM-1-STM1



Warning

Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments (for example, eye loupes, magnifiers, and microscopes) within a distance of 100 mm may pose an eye hazard. Statement 1056



Warning

Class 1 Laser Product. Statement 1008.



Warning

Class 1 LED Product. Statement 1027.



CHAPTER 4

Configuring the SM-1-STM1

To continue your SM-1-STM1 service module installation, you must configure the STM-1 interface. This chapter contains the following sections:

- [Configuring the Interface, page 4-1](#)
- [Checking the Configuration, page 4-5](#)

Configuring the Interface

After you verify that the new SM-1-STM1 is installed correctly (the ENABLED LED is lit), use the privileged-level **configure** command to configure the new interface. Have the following information available:

- Protocols you plan to route on each new interface
- IP addresses, if you plan to configure the interfaces for IP routing
- Bridging protocols you plan to use

If you installed a new SM-1-STM1, or to change the configuration of an existing interface, you must enter configuration mode to configure the new interfaces. If you replaced a SM-1-STM1 that was previously configured, the system recognizes the new interfaces and brings each of them up in their existing configurations.

For a summary of the configuration options available and instructions for configuring interfaces on a SM-1-STM1, refer to the appropriate configuration publications listed in the [“Related Documentation” section on page 5](#).

This section contains the following subsections:

- [Shutting Down an Interface, page 4-2](#)
- [Performing a Basic Interface Configuration, page 4-3](#)
- [Configuring the AU-3s and TUG-3s of a SM-1-STM1, page 4-4](#)
- [Configuring an E1 Unframed Channel, page 4-5](#)
- [Using show Commands to Verify the New Interface Status, page 4-5](#)
- [Using the ping Command to Verify Network Connectivity, page 4-12](#)
- [Using loopback Commands, page 4-12](#)

Shutting Down an Interface

Before you remove an interface that you will not replace, or replace service modules, use the **shutdown** command to shut down (disable) the interfaces to prevent anomalies when you reinstall the new or reconfigured SM. When you shut down an interface, it is designated *administratively down* in the **show** command displays.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface serial *slot/port***
4. **shutdown**
5. **copy running-config startup-config**
6. **show interfaces serial *slot/port***

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router# <code>enable</code>	Enters privileged EXEC mode.
Step 2	<code>configure terminal</code> Example: Router# <code>configure terminal</code>	Enters global configuration mode.
Step 3	<code>interface serial slot/port</code> Example: Router(config-if)# <code>interface serial 3/0</code>	Enters interface configuration mode, and specifies an interface for configuration.
Step 4	<code>shutdown</code> Example: Router(config-if)# <code>shutdown</code>	Shuts down the selected interface.
Step 5	<code>copy running-config startup-config</code> Example: Router# <code>copy running-config startup-config</code>	Copies the new configuration to NVRAM.
Step 6	<code>show interfaces serial slot/port</code> Example: Router# <code>show interfaces serial 3/0</code>	Confirms the interfaces have been shut down.

**Note**

To shut down additional interfaces, enter the **interface serial** command (followed by the interface address of the interface) for each of the interfaces on your SM. Use the **no shutdown** command to enable the interface.

Performing a Basic Interface Configuration

Following are instructions for a basic configuration, which include enabling an interface and configuring the SONET controller. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. For complete descriptions of configuration subcommands and the configuration options available for SONET interfaces, refer to the appropriate software documentation.

In the following procedure, press the **Enter** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable
```

```
Router>
```

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **controller sonet *slot/port***
4. **clock source {internal | line}**
5. **end**
6. **copy running-config startup-config**

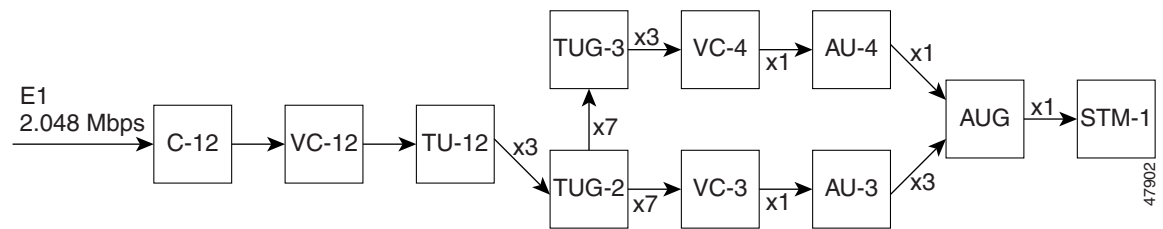
DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router# enable	Enters privileged EXEC mode.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	controller sonet <i>slot/port</i> Example: Router(config)# controller sonet 3/0	Configures the SONET controller. Note Follow this command by entering the interface address of the controller you plan to configure.
Step 4	clock source {internal line} Example: Router(config-controller)# clock source internal	Determines if clocking will be obtained locally from the SM-1-STM1 or from the network or line.
Step 5	end Example: Router(config-controller)# end	Returns you to privileged EXEC mode.
Step 6	copy running-config startup-config Example: Router# copy running-config startup-config	Copies the new configuration to NVRAM.

Configuring the AU-3s and TUG-3s of a SM-1-STM1

You can configure each of the administrative unit groups (AUGs) and tributary unit groups (TUGs) of a SM-1-STM1 to carry a set of E1 links that are mapped into TU-12s (see [Figure 4-1](#)).

Figure 4-1 SM-1-STM1 Multiplexing Structure



Configuring an E1 Unframed Channel

To create an unframed or clear channel logical channel group on an E1 line, use the **tug-2 tug-2# e1 e1# unframed** command, as shown in the example below:

```
Router(config)# controller sonet 3/0
Router(config-controller)# au-4 1 tug-3 2
Router(config-controller-tug3)# tug-2 4 e1 1 unframed
```



Note

The channel group is always 0 for unframed E1 lines.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces, and use the **ping** and **loopback** commands to check connectivity. This section includes the following subsections:

- [Using show Commands to Verify the New Interface Status, page 4-5](#)
- [Using the ping Command to Verify Network Connectivity, page 4-12](#)
- [Using loopback Commands, page 4-12](#)

Using show Commands to Verify the New Interface Status

This section demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the module appears in them correctly. Sample displays of the output of selected **show** commands appear in the sections that follow. For complete command descriptions and examples, refer to the publications listed in the “[Related Documentation](#)” section on [page 5](#).

If an interface is shut down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the interface is properly connected and terminated. If you still have problems bringing up the interface, contact a service representative for assistance.

This section includes the following subsections:

- [Using the show controllers Commands, page 4-6](#)
- [Using the show protocols Command, page 4-6](#)
- [Using the show running-config Command, page 4-7](#)

- Using the [show startup-config Command](#), page 4-7
- Using the [show version or show hardware Commands](#), page 4-9
- Using the [show diag Command](#), page 4-10
- Using the [show interfaces Command](#), page 4-11

Using the show controllers Commands

Display all the current interface processors and their interfaces using the **show controllers** command.



Note

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

The following is an example of the **show controllers** command:

```
Router# show controllers sonet 1/0

SONET 1/0 is up.
  Hardware is single mode intermediate reach SM
  H/W Version : 24.257.2.5, ROM Version : 1.2, F/W Version : 1.19.0
  FREEDM version: 2, reset 0
  Applique type is Channelized Sonet/SDH
  Clock Source is Internal, AUG mapping is AU4.

Medium info:
  Type: SDH, Line Coding: NRZ, Line Type: Short SM

Regenerator Section Status:
  No alarms detected.

Multiplex Section Status:

  No alarms detected.
  No BER failure/degrade detected
  BER_SF threshold power : 3
  BER_SD threshold power : 6

Higher Order Path Status:
  Path# 1 has no defects

Lower Order Path Status:
  VC-12 1/1/1/1 has no defects
```

Using the show protocols Command

Display protocols configured for the entire system and for specific interfaces using the **show protocols** command.



Note

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

The following is an example of the **show protocols** command:

```
Router# show protocols
line protocol is up
```


Using the show running-config Command

Display the running configuration file using the **show running-config** command.

**Note**

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

The following is an example of the **show running-config** command:

```
Router# show running-config

controller SONET 1/0
  framing sdh
  !
  au-4 1 tug-3 1
    tug-2 1 e1 1 channel-group 1 timeslots 1-3

interface Serial1/0.1/1/1/1:1
  ip address 1.1.1.1 255.255.255.0
```

Using the show startup-config Command

Display the configuration stored in the NVRAM using the **show startup-config** command.

**Note**

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

The following is an example of the **show startup-config** command:

```
Router# show startup-config
Building configuration...

Current configuration : 27478 bytes
!
! Last configuration change at 13:23:45 IST Mon Jun 21 2010
!
version 15.1
service timestamps debug datetime msec localtime show-timezone
service timestamps log datetime msec localtime show-timezone
no service password-encryption
!
hostname 3945_PGIRI
!
boot-start-marker
boot-end-marker
!
!
enable password lab
!
no aaa new-model
clock timezone IST 5 0
!
no ipv6 cef
ip source-route
```

```

ip cef
!
!
!
!
!
multilink bundle-name authenticated
!
!
energywise domain cisco security shared-secret 0 cisco
!
crypto pki token default removal timeout 0
!
!
license udi pid C3900-SPE150/K9 sn FOC13522K4K
!
!
!
!
controller SHDSL 0/0/0
  termination co
  dsl-group pairs 0
!
controller SONET 1/0
  framing sdh
  clock source internal
!
  au-4 1 tug-3 1
    tug-2 1 e1 1 channel-group 1 timeslots 1-31
!
  au-4 1 tug-3 2
    tug-2 2 e1 1 unframed
!
  au-4 1 tug-3 3
    tug-2 1 e1 3 channel-group 30 timeslots 1
    tug-2 3 e1 2 channel-group 17 timeslots 17
!
interface GigabitEthernet0/0
  ip address 209.165.200.225 255.255.255.224
  duplex auto
  speed auto
!
interface GigabitEthernet0/1
  mtu 1600
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface GigabitEthernet0/2
  mtu 1600
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface Ethernet0/0/0
  no ip address
  tx-ring-limit 1
  tx-queue-limit 1
!
interface Serial0/3/0
  ip address 209.165.200.254 255.255.255.224
!

```

```

!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 GigabitEthernet0/0
ip route 2209.165.201.1 255.255.255.224 209.165.201.30
!
!
!
snmp-server community public RW
!
control-plane
!
!
line con 0
  exec-timeout 0 0
line aux 0
line vty 0 4
  login
  transport input all
!
!
exception data-corruption buffer truncate
scheduler allocate 20000 1000
end

```

Using the show version or show hardware Commands

Display the configuration of the system hardware, the number of each interface type installed, the Cisco IOS software version, the names and sources of configuration files, and the boot images, using the **show version** (or **show hardware**) command.



Note

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 3945 ISR router with a SM-1-STM1 installed:

```

Router# show version

Cisco IOS Software, C3900 Software (C3900-UNIVERSALK9-M), 15.1(20100617:043914)
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Thu 17-Jun-10 11:54 by anybody

ROM: System Bootstrap, Version 15.0(1r)M1, RELEASE SOFTWARE (fc1)

3945_PGIRI uptime is 5 hours, 5 minutes
System returned to ROM by reload at 08:16:36 IST Mon Jun 21 2010
System image file is "flash:c3900-universalk9-mz.SSA.last"
Last reload type: Normal Reload
Last reload reason: Reload Command

```

This product contains cryptographic features and is subject to United States and local country laws governing import, export, transfer and use. Delivery of Cisco cryptographic products does not imply third-party authority to import, export, distribute or use encryption. Importers, exporters, distributors and users are responsible for compliance with U.S. and local country laws. By using this product you agree to comply with applicable laws and regulations. If you are unable to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
<http://www.cisco.com/wwl/export/crypto/tool/stqrg.html>

If you require further assistance please contact us by sending email to export@cisco.com.

```
Cisco CISCO3945-CHASSIS (revision 1.0) with C3900-SPE150/K9 with 980992K/67584K bytes of
memory.
Processor board ID FHK1402F1YL
1 DSL controller
1 Ethernet interface
3 Gigabit Ethernet interfaces
231 Serial interfaces
2 Channelized STM-1 ports
DRAM configuration is 72 bits wide with parity enabled.
255K bytes of non-volatile configuration memory.
126448K bytes of USB Flash usbflash0 (Read/Write)
254464K bytes of ATA System CompactFlash 0 (Read/Write)
```

License Info:

License UDI:

```
-----
Device#   PID                SN
-----
*0        C3900-SPE150/K9    FOC13522K4K
```

Technology Package License Information for Module:'c3900'

```
-----
Technology   Technology-package   Technology-package
Current      Type                 Next reboot
-----
ipbase       ipbasek9            Permanent          ipbasek9
security     None                 None                None
uc           None                 None                None
data         None                 None                None
```

Configuration register is 0x0

Using the show diag Command

Display the types of service modules installed in your system (and specific information about each) using the **show diag slot** command, where *slot* is the *service module slot* in a Cisco 3925 router or Cisco 3945 router.

**Note**

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Using the show interfaces Command

Display status information (including the physical slot and interface address) for the interfaces you specify using the **show interfaces** command.

For complete descriptions of interface subcommands and the configuration options available for the supported interfaces, refer to the publications listed in the “[Related Documentation](#)” section on page 5.

**Note**

The outputs that appear in this document may not match the output you receive when running these commands. The outputs in this document are examples only.

Example Output of the show interfaces Command

Following is an example of the **show interfaces** command from a Cisco 3945 ISR with a SM-1-STM1 installed:

```
Router> show interface serial

Router#sh int Serial1/0.1/1/1/1:1
Serial1/0.1/1/1/1:1 is up, line protocol is up
  Hardware is Channelized STM-1 controller
  Internet address is 1.1.1.2/24
  MTU 1500 bytes, BW 192 Kbit/sec, DLY 20000 usec,
    reliability 255/255, txload 1/255, rxload 65/255
  Encapsulation HDLC, crc 16, loopback not set
  Keepalive set (10 sec)
  Last input 00:00:00, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/1000/64/0 (size/max total/threshold/drops)
    Conversations 0/1/16 (active/max active/max total)
    Reserved Conversations 0/0 (allocated/max allocated)
    Available Bandwidth 144 kilobits/sec
  5 minute input rate 49000 bits/sec, 23 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
  5507 packets input, 1785932 bytes, 0 no buffer
  Received 30 broadcasts (0 IP multicasts)
  0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  35 packets output, 2995 bytes, 0 underruns
  0 output errors, 0 collisions, 1 interface resets
  0 unknown protocol drops
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions no alarm present
  Timeslot(s) Used: 1-3, subrate: 192Kb/s, transmit delay is 0 flags
  non-inverted data
Router#
```

Using the ping Command to Verify Network Connectivity

Using the **ping** command, you can verify that an interface port is functioning properly. This section provides a brief description of this command. Refer to the publications listed in the [“Related Documentation” section on page 5](#) for detailed command descriptions and examples.

The **ping** command sends echo request packets out to a remote device at an IP address that you specify. After sending an echo request, the system waits a specified time for the remote device to reply. Each echo reply is displayed as an exclamation point (!) on the console terminal; each request that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate a bad connection.

Following is an example of a successful **ping** command to a remote server with the address 10.0.0.10:

```
Router# ping 10.0.0.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.0.0.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the destination and that the device is active (powered on), and repeat the **ping** command.

Proceed to the, [“Using loopback Commands” section on page 4-12](#), to finish checking network connectivity.

Using loopback Commands

With the loopback test, you can detect and isolate equipment malfunctions by testing the connection between the SM-1-STM1 interface and a remote device such as a multiplexer interface. The **loopback** subcommand places an interface in loopback mode, which enables test packets that are generated from the **ping** command to loop through a remote device. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device in the path of the loopback test.

The SM-1-STM1 supports two loopback modes at the sonet controller level: local and network.

Use the **loopback {local | network}** command to set the loopback mode, as shown below:

```
Router(config)# controller sonet 3/0
Router(config-controller)# loopback network
```

When the **loopback local** command is used, all data transmitted to the network is internally looped back to the receiver. In this loopback mode, the serial interfaces should go into up/up looped state.

When the **loopback network** command is used, all data received from the connected device is transmitted back unchanged. In this loopback mode, T1 serial interfaces are not working.

The SM-1-STM1 also supports loopback on E1 lines mapped to a TUG-3 or AU-3.

To specify a loopback on an E1 line that has been mapped to a TUG-3, use the **tug-2 e1 loopback** command in configuration controller tug3 mode.

To specify a loopback on an E1 line that has been mapped to an AU-3, use the **tug-2 e1 loopback** command in configuration controller au3 mode.

The complete **tug-2 e1 loopback** command syntax is:

```
tug-2 tug-2 number e1 e1-number loopback {local | network} {line | payload}
```

To disable the loopback, use the **no** form of this command:

```
[no] tug-2 tug-2 number e1 e1-number loopback {local | network {line | payload}}
```




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