



PA-MC-T3 Port Adapter Installation and Configuration

Product Number: PA-MC-T3(=)

Platforms Supported: Catalyst 5000 Family Switches with RSM/VIP2, Catalyst 6000 Family Switches with Catalyst 6000 Family FlexWAN Module, Cisco 7200 Series Routers, Cisco uBR7200 Series Routers, Cisco 7200 VXR Routers, Cisco 7201 Router, Cisco 7301 Router, Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7304 Router, Cisco 7401ASR Router, and VIP in the Cisco 7000 Series and Cisco 7500 Series Routers

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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:

- [Document Revision History, page vii](#)
- [Objectives, page vii](#)
- [Organization, page viii](#)
- [Related Documentation, page viii](#)
- [Obtaining Documentation, Obtaining Support, and Security Guidelines, page xi](#)

Document Revision History

The Document Revision History table below, beginning with version OL2695-05, records technical changes to this document.

| Document Version | Date | Change Summary |
|------------------|-------------|-------------------------------------|
| OL-2695-05 | April, 2007 | Adds Cisco 7201 router information. |

Objectives

This document describes how to install and configure the PA-MC-T3 multichannel T3 port adapter, hereafter referred to as the PA-MC-T3, which is used in the following platforms:

- Catalyst 5000 family switches with the Route Switch Module (RSM)/second-generation Versatile Interface Processor (VIP2)
- Catalyst 6000 family FlexWAN module in the Catalyst 6000 family switches
- Cisco 7200 series routers and Cisco 7200 VXR routers, consisting of the two-slot Cisco 7202, four-slot Cisco 7204 and Cisco 7204VXR, and the six-slot Cisco 7206 and Cisco 7206VXR
- Cisco uBR7200 series universal broadband routers, consisting of the three-slot Cisco uBR7223 and the six-slot Cisco uBR7246
- Cisco 7201 router
- Cisco 7301 router
- Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7304 router

- Cisco 7401ASR router
- Versatile Interface Processor (VIP) in Cisco 7000 series and Cisco 7500 series routers with the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI)

Organization

This document contains the following chapters:

| Section | Title | Description |
|-----------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Chapter 1 | Overview | Describes the PA-MC-T3 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 Port Adapters | Describes the procedures for installing and removing PA-MC-T3 port adapters in the supported platforms. |
| Chapter 4 | Configuring the PA-MC-T3 | Provides instructions for configuring your port adapter on the supported platforms. |

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:

For configuration information and support, refer to the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.



Note You can access Cisco IOS software configuration and hardware installation and maintenance documentation on the World Wide Web at <http://www.cisco.com>, <http://www-china.cisco.com>, or <http://www-europe.cisco.com>.

- Catalyst 5000 family switches with RSM/VIP2:
 - For an online directory to quickly access documents for Cisco Catalyst 5000 series switches, refer to the *Cisco Catalyst 5000 Series Switches Install and Upgrade Guides* index at the following URL:
http://www.cisco.com/en/US/products/hw/switches/ps679/prod_installation_guides_list.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Route Switch Module Catalyst VIP2-15 and VIP2-40 Installation and Configuration Note*
 - *Catalyst 5000 Series Route Switch Module Installation and Configuration Note*
 - The installation and configuration guide and quick start for your Cisco Catalyst 5000 series switch
- Catalyst 6000 family switches with FlexWAN module:
 - For an online directory to quickly access documents for Cisco Catalyst 6000 family switches, refer to the *Cisco Catalyst 6500 Series Switches Documentation Roadmaps* index at the following URL:
http://www.cisco.com/en/US/products/hw/switches/ps708/products_documentation_roadmaps_list.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Catalyst 6000 Family FlexWAN Module Installation and Configuration Note*
 - The hardware and software publications for your Catalyst 6000 family switch
- Cisco 7000 series routers:
 - For an online directory to quickly access documents for Cisco 7000 series routers, refer to the *Cisco 7000 Series Routers Introduction* index at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps332/tsd_products_support_eol_series_home.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Cisco 7000 Hardware Installation and Maintenance* for your router.
 - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
 - *Fourth-Generation Versatile Interface Processor (VIP4) Installation and Configuration*
 - *Versatile Interface Processor (VIP6-80) Installation and Configuration Guide*
- Cisco 7200 series routers:
 - For an online directory to quickly access documents for Cisco 7200 series routers, refer to the *Cisco 7200 Series Routers Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html
 - For hardware installation and configuration information, refer to the online installation and configuration guide and quick start for your Cisco 7200 series router.
 - For port adapter hardware and memory configuration guidelines, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines*.
 - For information on network processing engines or network services engines, refer to the *Network Processing Engine and Network Services Engine Installation and Configuration* document.

- Cisco 7200 VXR routers:
 - For an online directory to quickly access documents for Cisco 7200 VXR routers, refer to the *Cisco 7200 Series Routers Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps341/products_documentation_roadmap09186a00801c0915.html
 - For hardware installation and maintenance information, refer to the *Cisco 7200 VXR Installation and Configuration Guide* or the *Cisco 7200 VXR Routers Quick Start Guide*.
- Cisco uBR7200 routers:
 - For an online directory to quickly access documents for Cisco uBR7200 Universal Broadband routers, refer to the *Cisco uBR7200 Universal Broadband Router Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/cable/ps2217/products_documentation_roadmap09186a00805e0d0c.html
- Cisco 7201 router:
 - For an online directory to quickly access documents for the Cisco 7201 router, refer to the *Cisco 7201 Router Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/customer/products/hw/routers/ps341/products_documentation_roadmap09186a00807f635a.html
 - For hardware installation and maintenance information, refer to the *Cisco 7201 Installation and Configuration Guide* or the *Cisco 7201 Router Quick Start Guide*.
- Cisco 7301 router:
 - For an online directory to quickly access documents for the Cisco 7301 router, refer to the *Cisco 7301 Internet Router Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps352/products_documentation_roadmap09186a00801c0f21.html
 - For hardware installation and maintenance information, refer to the *Cisco 7301 Installation and Configuration Guide* or the *Cisco 7301 Router Quick Start Guide*.
- Cisco 7304 PCI port adapter carrier card in Cisco 7304 router:
 - For an online directory to quickly access documents for the Cisco 7304 PCI Port Adapter Carrier Card in the Cisco 7301 router, refer to the *Cisco 7304 Router Line Card, Carrier Card, Port Adapter, Modular Services Card, and Shared Port Adapter Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps352/products_documentation_roadmap09186a00801c0f5e.html
 - For hardware installation and maintenance information, refer to the *Cisco 7304 PCI Port Adapter Carrier Card Installation and Configuration Guide*.
- Cisco 7401ASR router:
 - For an online directory to quickly access documents for the Cisco 7401ASR router, refer to the *Cisco 7401ASR Router Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps354/products_documentation_roadmap09186a00801c0fd5.html
 - For hardware installation and maintenance information, refer to the *Cisco 7401ASR Installation and Configuration Guide* or the *Cisco 7401ASR Router Quick Start Guide*.

- Cisco 7500 series routers:
 - For an online directory to quickly access documents for the Cisco 7500 series routers, refer to the *Cisco 7500 Series Routers Documentation Roadmap* at the following URL:
http://www.cisco.com/en/US/products/hw/routers/ps359/products_documentation_roadmap09186a00801c0f9b.html
 - For hardware installation and maintenance information, refer to the following documents:
 - *Cisco 7500 Series Installation and Configuration Guide* or the quick start for your Cisco 7500 series router.
 - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
 - *Fourth-Generation Versatile Interface Processor (VIP4) Installation and Configuration*
 - *Versatile Interface Processor (VIP6-80) Installation and Configuration Guide*
- For international agency compliance, safety, and statutory information for WAN interfaces, refer to the following documents. Use the documentation roadmap for your particular router to link to the appropriate documents for your router:
 - *Regulatory Compliance and Safety Information for the Catalyst 5000 Family Switches*
 - *Regulatory Compliance and Safety Information for the Catalyst 6500 Series Switches*
 - *Regulatory Compliance and Safety Information for the Cisco 7000 Series Routers*
 - *Regulatory Compliance and Safety Information for Cisco 7200 Series Routers*
 - *Regulatory Compliance and Safety Information for the Cisco uBR7200 Series Universal Broadband Routers*
 - *Regulatory Compliance and Safety Information for the Cisco 7301 Internet Router*
 - *Regulatory Compliance and Safety Information for the Cisco 7304 Internet Router*
 - *Regulatory Compliance and Safety Information for the Cisco 7401ASR Internet Router*
 - *Regulatory Compliance and Safety Information for the Cisco 7500 Series Routers*

Obtaining Documentation, Obtaining Support, and Security Guidelines

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

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



CHAPTER 1

Overview

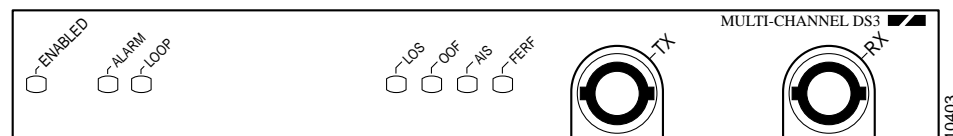
This chapter describes the PA-MC-T3 port adapter and contains the following sections:

- [Port Adapter Overview, page 1-1](#)
- [Multichannel T3 Overview, page 1-2](#)
- [Features, page 1-3](#)
- [Interface Specifications, page 1-3](#)
- [LEDs, page 1-4](#)
- [Cables, Connectors, and Pinouts, page 1-5](#)
- [Port Adapter Slot Locations on the Supported Platforms, page 1-7](#)
- [Identifying Interface Addresses, page 1-17](#)

Port Adapter Overview

The PA-MC-T3 is a single-width single-port, port adapter that provides one T3 interface connection using BNC connectors. (See [Figure 1-1](#).) The interface can provide up to 28 T1 lines (a single T3 group). Each T1 line is presented to the system as a serial interface that can be configured individually.

Figure 1-1 PA-MC-T3 —Faceplate View



Multichannel T3 Overview

The PA-MC-T3 T3 link is channelized into 28 independent T1 data lines. Each T1 line can be unchannelized or channelized for serial transmission of data.

Each of the T1 lines can use the whole T1 bandwidth, a portion of the T1 bandwidth, or the T1 bandwidth in channelized form for data transmission. Usable bandwidths for each T1 line are $n \times 56$ kbps or $n \times 64$ kbps, where n is a number representing time slots 1 to 24. Channelized T1 allows up to 24 time slots (56 kbps/64 kbps) per T1 line. The unused portion of the T1 bandwidth, when not running at full T1 speeds, cannot be used and is filled with idle channel data. Aggregation of multiple T1 lines is not supported. The PA-MC-T3 can support a maximum of 128 logical channels.

**Note**

T1 lines on the PA-MC-T3 are numbered 1 to 28 instead of the more traditional zero-based scheme (0 to 27) used with other Cisco products. This is to ensure consistency with telco numbering schemes for T1 lines within channelized (multi-channel) T3 equipment.

The T3 section of the PA-MC-T3 supports the maintenance data link channel (when using *c*-bit parity) as well as payload and network loopbacks. The T1 section of the PA-MC-T3 supports facilities data link (FDL) in Extended Superframe (ESF) framing, as well as various loopbacks. Bit error rate (BER) testing is supported on each of the T1 lines. Testing is typically done over an unframed T1 signal.

The PA-MC-T3 supports Cisco High-Level Data Link Control (HDLC), Frame Relay, PPP, and SMDS Data Exchange Interface (DXI) encapsulations over each T1 link. For Switched Multimegabit Data Service (SMDS) only, DXI is sent on the T1 line, so it needs to connect to an SMDS switch that has direct DXI input.

**Note**

The PA-MC-T3 does *not* support the aggregation of multiple T1 lines (called *inverse multiplexing*, or *bonding*) for higher bandwidth data rates.

The physical T3 link on the PA-MC-T3 consists of two female BNC connectors, one for receive (RX) and one for transmit (TX). You must use 75-ohm RG-59 coaxial interface cables with male BNC connectors to connect the PA-MC-T3 interface with external T3 equipment. (For cable information, refer to the “[Cables, Connectors, and Pinouts](#)” section on page 1-5.)

Any of the 28 T1 lines can be configured as channelized T1 lines. You can group the time slots in these T1 lines into several individual logical channel groups, each of which carries data with different data-link layer protocol encapsulations.

Each logical channel group can be composed of individual 56-kbps or 64-kbps time slots, or individual time slots plus *ranges* of time slots; for example, a channel group might be composed of time slots 1, 9, and 12–14. Each logical channel group can contain from 1 to 24 time slots maximum; the same time slot cannot be used in more than one logical channel group. Any unused time slots are filled with programmable idle-channel data.

Each T1 line contains onboard T1 bit error rate test (BERT) circuitry. With this, the port adapter software can send and detect programmable patterns, and you can run a BERT on any T1 line or all of the 28 T1 lines simultaneously.

**Note**

Onboard T3 BER testing is not supported.

Features

The PA-MC-T3 contains the following features:

- Transmits and receives data bidirectionally at the T3 rate of 44.736 Mbps (digital signal carried on a T3 line, digital signal level 3 [DS3]).
- The T3 connection, provided by way of two female BNC connections for transmit (TX) and receive (RX), requires RG-59 coaxial cable that has an impedance of 75 ohms.
- Supports RFC 1406 and RFC 1407 (CISCO-RFC-1407-CAPABILITY.my). For RFC 1406, Cisco supports all tables except the Frac table. For RFC 1407, Cisco supports all tables except the FarEnd tables. (For information on accessing Cisco MIB files, refer to the *Cisco Management Information Base (MIB) User Quick Reference*)
- PA-MC-T3 microcode is loaded into and operates from DRAM (or SDRAM) configuration and is determined by the VIP model on which the PA-MC-T3 is installed.
- On the Catalyst RSM/VIP2, PA-MC-T3 microcode is loaded into and operates from DRAM on the Catalyst RSM/VIP2-40.

Interface Specifications

The PA-MC-T3 T3 port is designed to receive and transmit at the DSX-3 level while driving and receiving from a 75-ohm coaxial cable (ATT 728A type coax). The T3 port connects directly to any equipment with DSX-3-level BNC connectors.

[Table 1-1](#) lists the specifications the T3 front end is designed to meet.

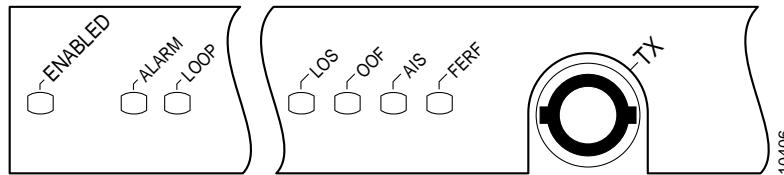
Table 1-1 **Specifications for the T3 Front End**

| Parameter | Specification |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Line rate | 44.736 Mbps (± 20 ppm) |
| Line code | B3ZS (bipolar with three-zero substitution) |
| Impedance | 75 ohms |
| Pulse shape | ANSI T1.102, pulse amplitude is between 0.36 and 0.85 volts (V) peak |
| Input signal | DSX-3 (9.7 dB to -11.8 dB) |
| Output signal | DSX-3, able to drive 450 feet (135 meters) of 75-ohm coaxial cable (728A or equivalent) and meet pulse shape template at the line side |

LEDs

The PA-MC-T3 has one row of six status LEDs and one ENABLED LED. (See [Figure 1-2](#).)

Figure 1-2 PA-MC-T3 LEDs



[Table 1-2](#) lists port LED colors and indications.

Table 1-2 PA-MC-T3 LEDs

| LED Label | Color | State | Meaning |
|-----------|--------|----------|----------------------------------------------------------------------------------------------------------------|
| ENABLED | Green | On | Port adapter is enabled for operation. |
| ALARM | Yellow | On | An alarm condition ¹ is received on any configured T1 line or the T3 link. |
| | | Blinking | A port adapter boot failure has occurred. ² |
| LOOP | Yellow | On | A T1 line or the T3 link is in a loopback state and is not enabled for normal data traffic. |
| LOS | Yellow | On | A loss of the received signal on the T3 link is detected by the line interface unit (LIU) on the port adapter. |
| OOF | Yellow | On | A DS3 out-of-frame condition. |
| AIS | Yellow | On | An alarm indication signal is received on the T3 link. |
| FERF | Yellow | On | A far-end receive failure signal is detected by the receiver. ³ |

- Alarms include: T1 loss of frame (LOF), T1 alarm indication signal (AIS), T1 yellow alarm indication, T3 loss of signal (LOS), T3 AIS, and a T3 far-end receive failure (FERF) yellow alarm.
- This LED blinks momentarily during port adapter initialization.
- When the OOF LED is on, the FERF LED is latched to its state prior to the out-of-frame condition; that is, it reflects the last known state of the far-end receiver. When the OOF LED is off, the FERF LED reflects the live state of the far-end receiver.

After system initialization, the ENABLED LED goes on to indicate that the port adapter is enabled for operation.

The following conditions must be met before the PA-MC-T3 is enabled:

- The port adapter is correctly connected to and receiving power from one of the following:
 - Catalyst RSM/VIP2 motherboard
 - Catalyst 6000 family FlexWAN module
 - VIP
- A valid system software image for the port adapter has been downloaded successfully.

- The system bus recognizes one of the following:
 - PA-MC-T3
 - Catalyst RSM/VIP2 with a PA-MC-T3
 - Catalyst 6000 family FlexWAN module with a PA-MC-T3
 - VIP with a PA-MC-T3

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

**Note**

In addition to the interface status information provided by the LEDs, you can also retrieve detailed interface status information either through the router's console port or through Telnet or Simple Network Management Protocol (SNMP).

Cables, Connectors, and Pinouts

The interface connectors on the PA-MC-T3 are RG-59 coaxial BNC types, with one connector and cable for transmit (TX) and one for receive (RX). The BNC connectors are transformer-coupled to the PA-MC-T3 line interface unit (LIU), which is the analog physical interface on the PA-MC-T3.

The pinout and signal descriptions for the BNC connectors on the PA-MC-T3 are as follows:

- Transmit (TX)—Transmitted signals appear on the center contact, and the outer shield is ground for the 75-ohm RG-59 coaxial cable you attach to the TX BNC connector.
- Receive (RX)—Received signals appear on the center contact, and the outer shield is ground for the 75-ohm RG-59 coaxial cable you attach to the RX BNC connector.

**Caution**

To prevent problems, you *must* check your 75-ohm RG-59 coaxial cable specifications when long cable lengths are required to connect the PA-MC-T3 to your external DS3 (T3) equipment.

You must install a ferrite sleeve (also called a common-mode choke) on each 75-ohm coaxial cable to reduce the effects of electromagnetic interference (EMI). (Cisco Systems supplies two ferrite sleeves with your PA-MC-T3, one for each of the two 75-ohm coaxial cables.)

**Note**

You must attach the ferrite sleeve on the end of each coaxial cable, nearest the PA-MC-T3, as close to the BNC connector as possible. (See [Figure 1-3](#).)

**Caution**

The ferrite sleeve prevents electromagnetic interference (EMI) from affecting the T3-equipped system and is a required component for proper system operation.

Figure 1-3 Attaching the Ferrite Sleeve Around a Coaxial Cable

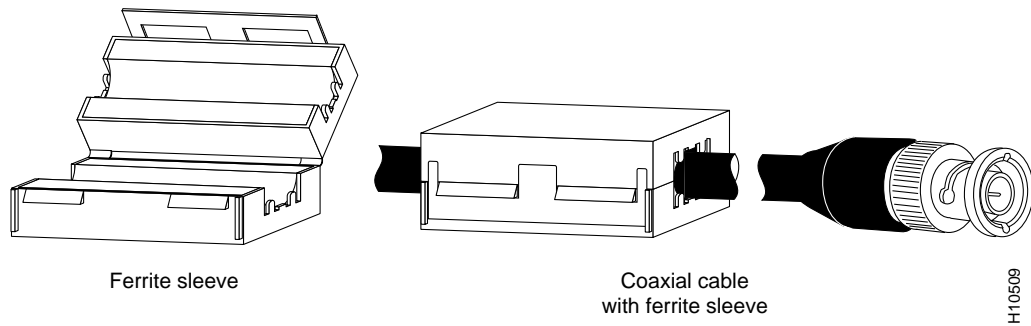
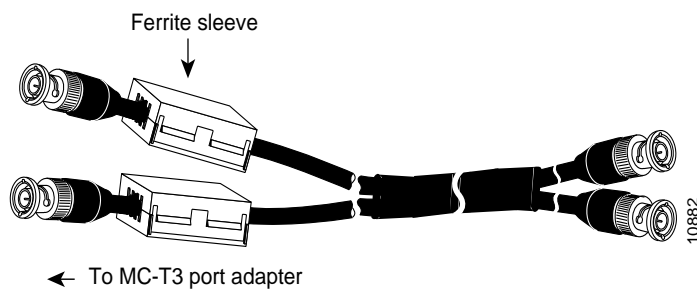


Figure 1-4 shows the typical 75-ohm RG-59 coaxial cable pair that you supply and should use with the PA-MC-T3. Use only this type of coaxial cable pair for your PA-MC-T3 connections. Use one 75-ohm coaxial cable for each PA-MC-T3 connection: RX and TX.

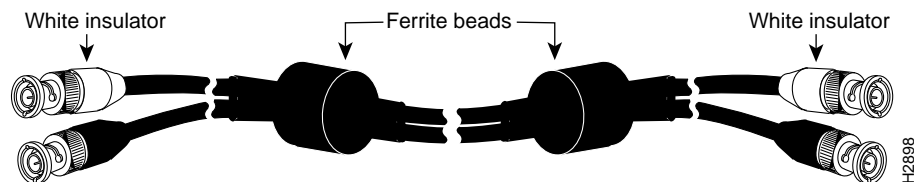
We strongly recommend that you fasten together your transmit and receive cables along their entire length, as shown in Figure 1-4, which reduces the effects of EMI. You can use standard heat-activated shrink tubing or cable ties for this purpose.

Figure 1-4 75-Ohm RG-59 Coaxial Cable Pair with Ferrite Sleeves Attached



You can also order from Cisco Systems a 75-ohm coaxial cable pair with ferrite beads attached (Cisco Product Number CAB-ATM-DS3/E3). (See Figure 1-5.) This 75-ohm coaxial cable pair is *not* available from outside commercial cable vendors.

Figure 1-5 CAB-ATM-DS3/E3 Cable—75-Ohm RG-59 Coaxial Cable with BNC Connectors



Port Adapter Slot Locations on the Supported Platforms

This section discusses port adapter slot locations on the supported platforms. The illustrations that follow summarize slot location conventions on each platform:

- [Catalyst RSM/VIP2 Slot Numbering, page 1-7](#)
- [Catalyst 6000 Family FlexWAN Module Slot Numbering, page 1-9](#)
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers Slot Numbering, page 1-10](#)
- [Cisco uBR7200 Series Router Slot Numbering, page 1-11](#)
- [Cisco 7201 Router Slot Numbering, page 1-13](#)
- [Cisco 7301 Router Slot Numbering, page 1-13](#)
- [Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering, page 1-14](#)
- [Cisco 7401ASR Router Slot Numbering, page 1-15](#)
- [Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Slot Numbering, page 1-15](#)

Catalyst RSM/VIP2 Slot Numbering

The Catalyst RSM/VIP2 can be installed in any slot in a Catalyst 5000 family switch except the top slots, which contain the supervisor engines. The Catalyst RSM/VIP2 does not use interface processor slot numbering; therefore, the slots in which it is installed are not numbered. A port adapter can be installed into either port adapter slot 0 or slot 1 on a Catalyst RSM/VIP2. [Figure 1-6](#) shows a Catalyst 5000 family switch with two port adapters installed in a Catalyst RSM/VIP2.

Figure 1-6 Catalyst 5000 Family Switch with Port Adapters Installed on Catalyst RSM/VIP2

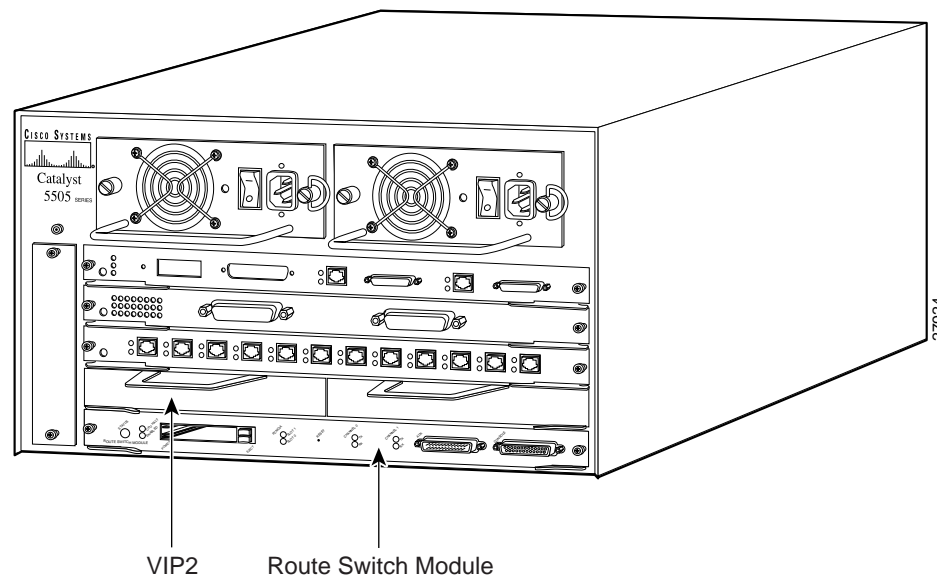
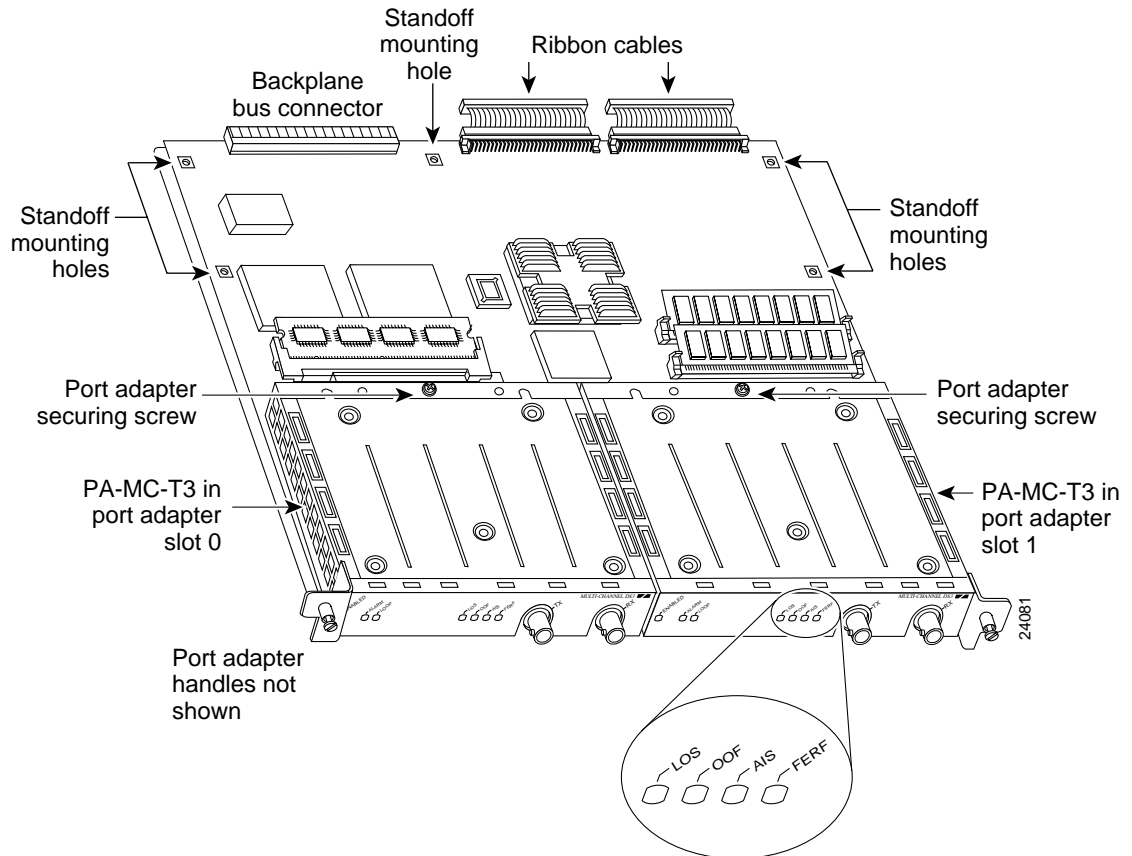


Figure 1-7 shows two PA-MC-T3s installed in port adapter slot 0 and slot 1 on a Catalyst RSM/VIP2-40.

Figure 1-7 Catalyst RSM/VIP2-40 with Two PA-MC-T3s



Catalyst 6000 Family FlexWAN Module Slot Numbering

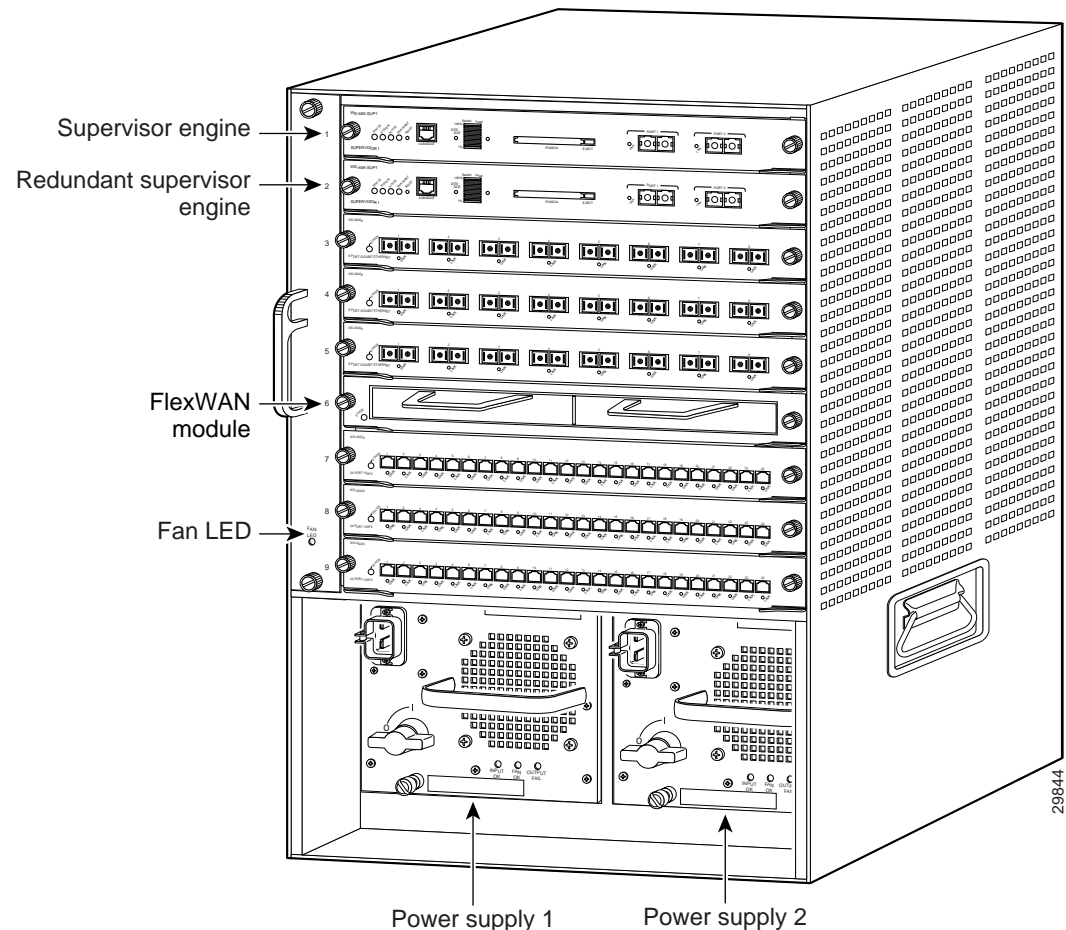
The Catalyst 6000 family FlexWAN module can be installed in any slot in a Catalyst 6000 family switch except slot 1, which is reserved for the supervisor engine. A port adapter can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. [Figure 1-8](#) shows a Catalyst 6000 family switch with two blank port adapters installed in a FlexWAN module.



Note

Slot 1 is reserved for the supervisor engine. If a redundant supervisor engine is used, it would go in slot 2; otherwise, slot 2 can be used for other modules.

Figure 1-8 Catalyst 6000 Family Switch with Port Adapters Installed on FlexWAN Module



Cisco 7200 Series Routers and Cisco 7200 VXR Routers Slot Numbering

Cisco 7202 routers have two port adapter slots. The slots are numbered from left to right. You can place a port adapter in either of the slots (slot 1 or slot 2). The Cisco 7202 router is not shown.

Cisco 7204 routers and Cisco 7204VXR routers have four slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 4. You can place a port adapter in any of the slots (slot 1 through slot 4). Slot 0 is always reserved for the I/O controller. The Cisco 7204 router and Cisco 7204VXR are not shown.

Cisco 7206 routers and Cisco 7206VXR routers (including the Cisco 7206 and Cisco 7206VXR routers as router shelves in a Cisco AS5800 Universal Access Server) have six slots for port adapters, and one slot for an input/output (I/O) controller. The slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 6. You can place a port adapter in any of the six slots (slot 1 through slot 6). Slot 0 is always reserved for the I/O controller.

Figure 1-9 shows the slot numbering on a Cisco 7206 router.

Figure 1-9 Port Adapter Slots in the Cisco 7206 Router

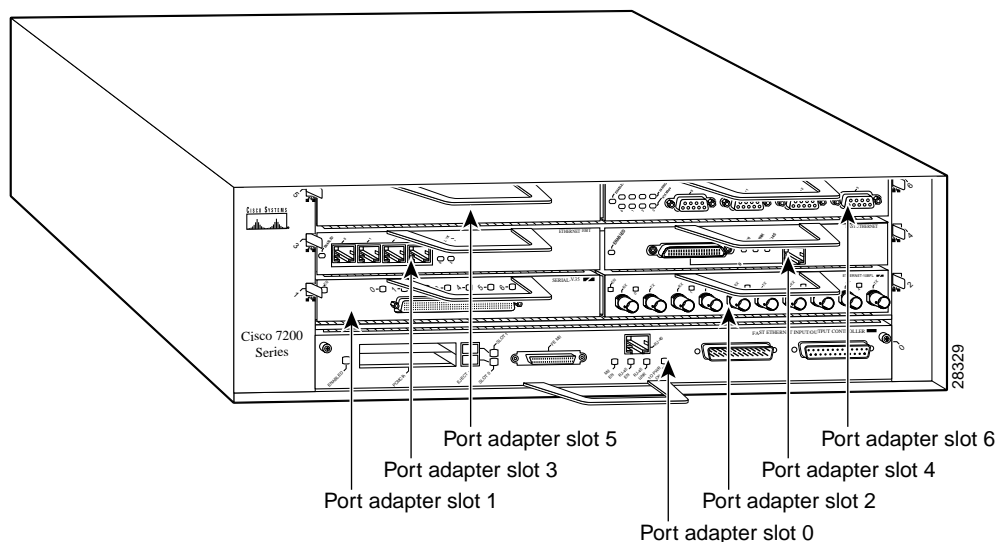
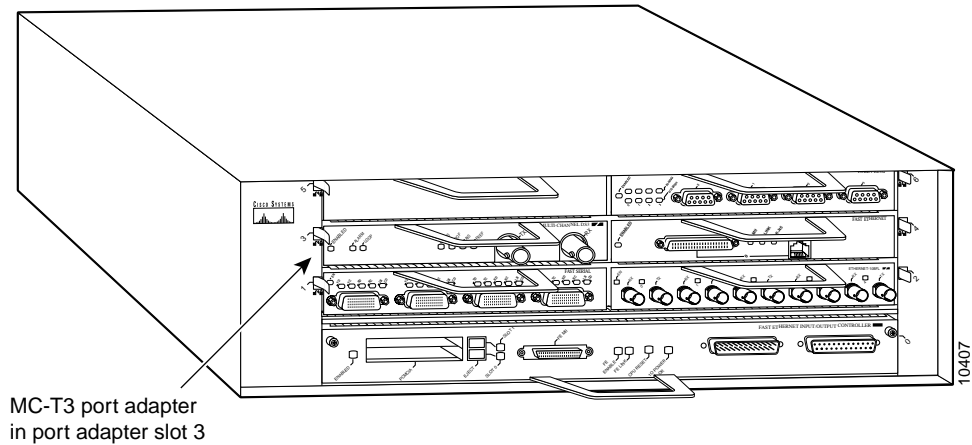


Figure 1-10 shows a PA-MC-T3 in port adapter slot 3 of the Cisco 7206 router.

Figure 1-10 Cisco 7206 with a PA-MC-T3



The Cisco 7206VXR router is not shown.

Cisco uBR7200 Series Router Slot Numbering

The Cisco uBR7223 router has one port adapter slot (slot 1). Slot 0 is always reserved for the I/O controller—if present. The Cisco uBR7223 router is not shown.

The Cisco uBR7246 router and Cisco uBR7246VXR router have two port adapter slots (slot 1 and slot 2). Slot 0 is always reserved for the I/O controller—if present.

Figure 1-11 shows the slot numbering of port adapters on a Cisco uBR7246 router or Cisco uBR7246VXR router.

Figure 1-11 Port Adapter Slots in the Cisco uBR7246 and Cisco uBR7246VXR Routers

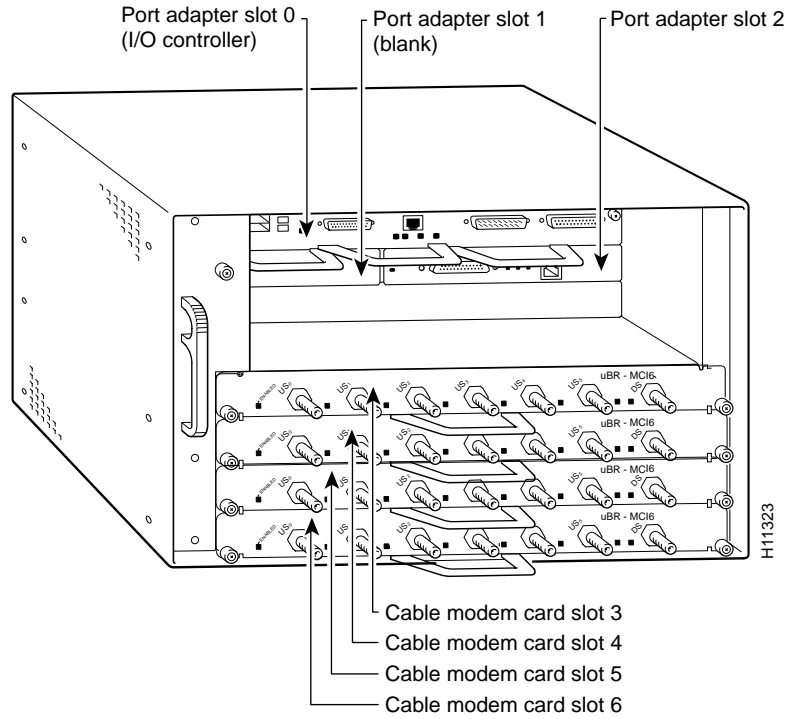
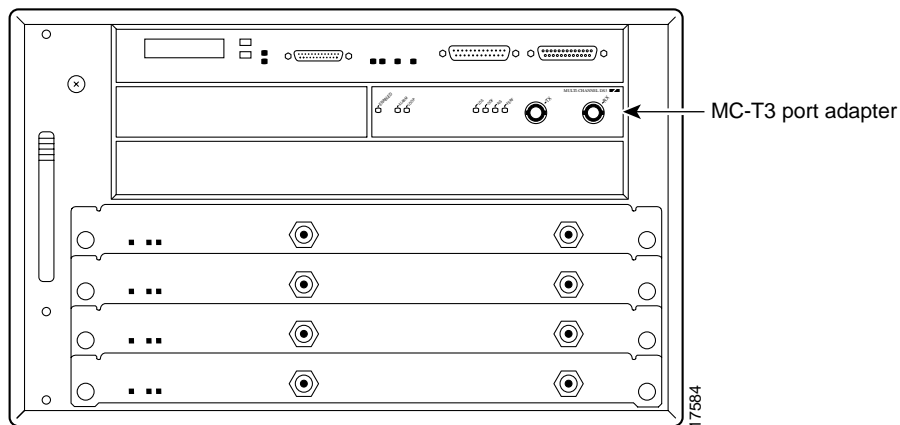


Figure 1-12 shows a PA-MC-T3 installed in port adapter slot 2 of a Cisco uBR7246 router.

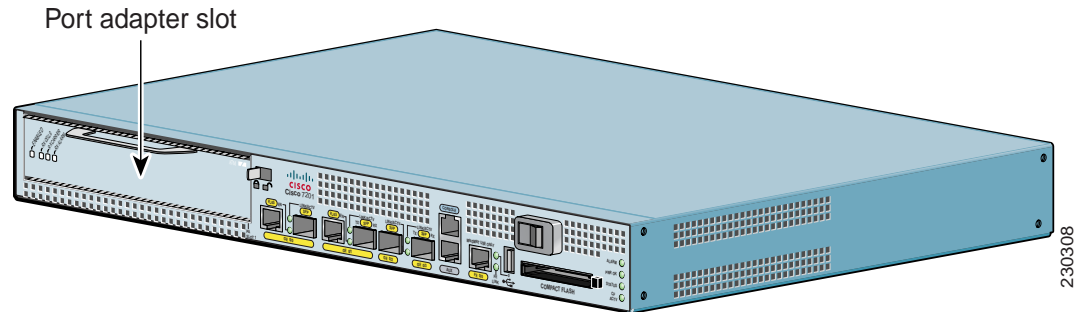
Figure 1-12 Cisco uBR7246 With a PA-MC-T3



Cisco 7201 Router Slot Numbering

Figure 1-13 shows the front view of a Cisco 7201 router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7201 router.

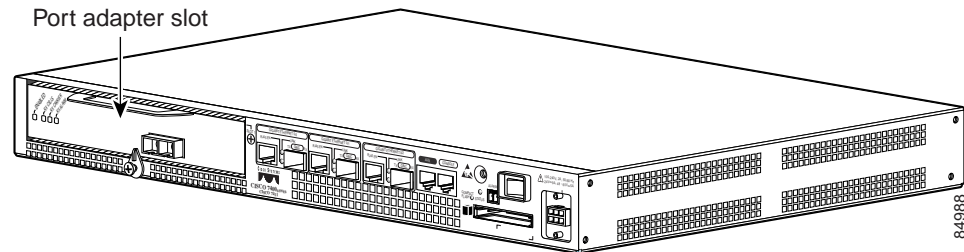
Figure 1-13 Port Adapter Slot in the Cisco 7201 Router



Cisco 7301 Router Slot Numbering

Figure 1-14 shows the front view of a Cisco 7301 router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7301 router.

Figure 1-14 Port Adapter Slot in the Cisco 7301 Router



Cisco 7304 PCI Port Adapter Carrier Card Slot Numbering

The Cisco 7304 PCI port adapter carrier card installs into Cisco 7304 router module slots 2 through 5. [Figure 1-15](#) shows the module slot numbering on a Cisco 7304 router. The port adapter slot number is the same as the module slot number. Slot 0 and slot 1 are reserved for the NPE module or NSE module.

[Figure 1-16](#) shows a Cisco 7304 PCI port adapter carrier card with a port adapter installed. The Cisco 7304 PCI port adapter carrier card accepts one single-width port adapter.

Figure 1-15 Module Slots on the Cisco 7304 Router

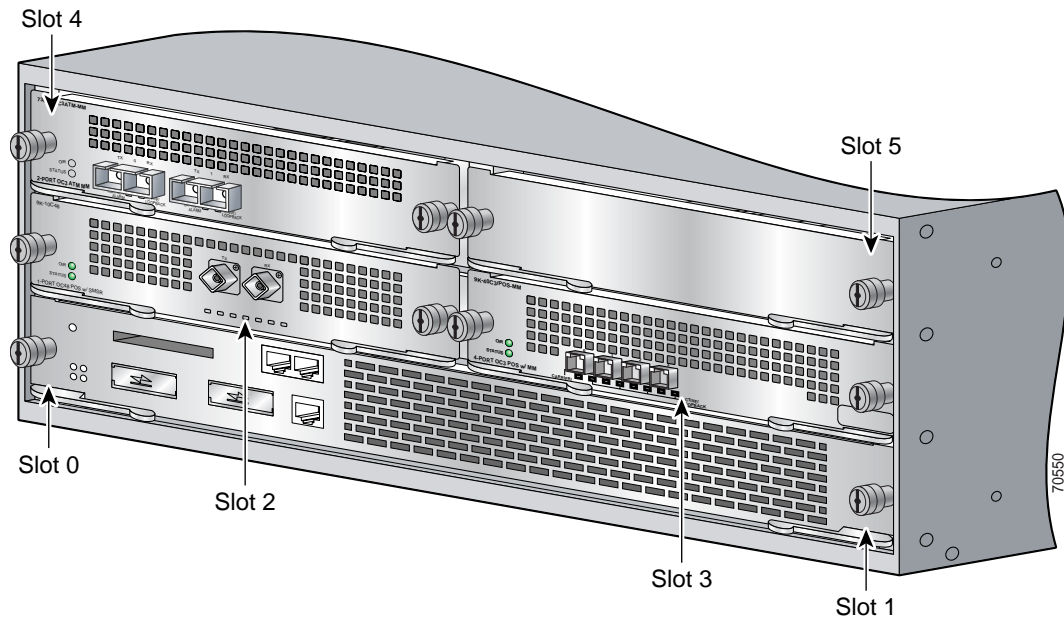
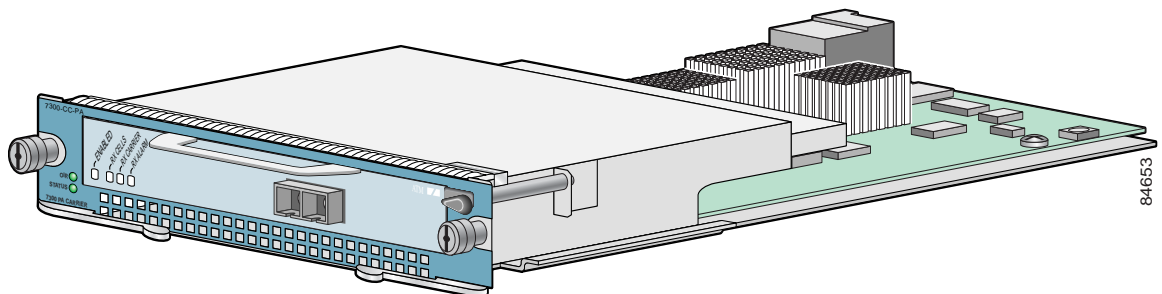


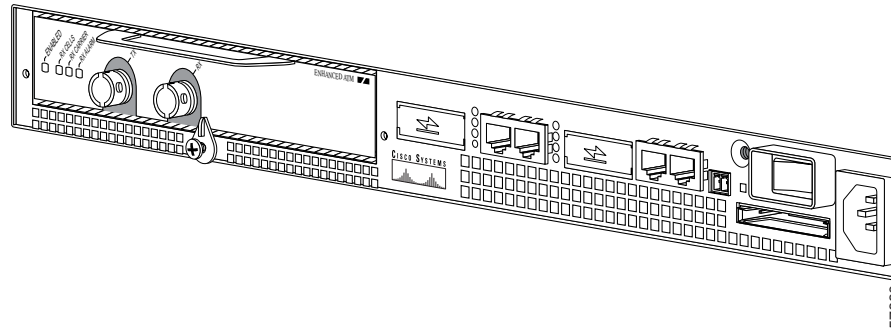
Figure 1-16 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Installed



Cisco 7401ASR Router Slot Numbering

Figure 1-17 shows the front view of a Cisco 7401ASR router with a port adapter installed. There is only one port adapter slot (slot 1) in a Cisco 7401ASR router.

Figure 1-17 Port Adapter Slot in Cisco 7401ASR Router



Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Slot Numbering

The PA-MC-T3 is supported on the VIP2 and VIP4 versatile interface processors used in Cisco 7000 series and Cisco 7500 series routers. In the Cisco 7010 router and Cisco 7505 router, the VIP motherboard is installed horizontally in the VIP slot. In the Cisco 7507 router and Cisco 7513 router, the VIP motherboard is installed vertically in the VIP slot. The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. The bays are numbered from left to right on the VIP.

Figure 1-18 shows the slot numbering on a VIP2.

Figure 1-18 VIP2 Slot Locations

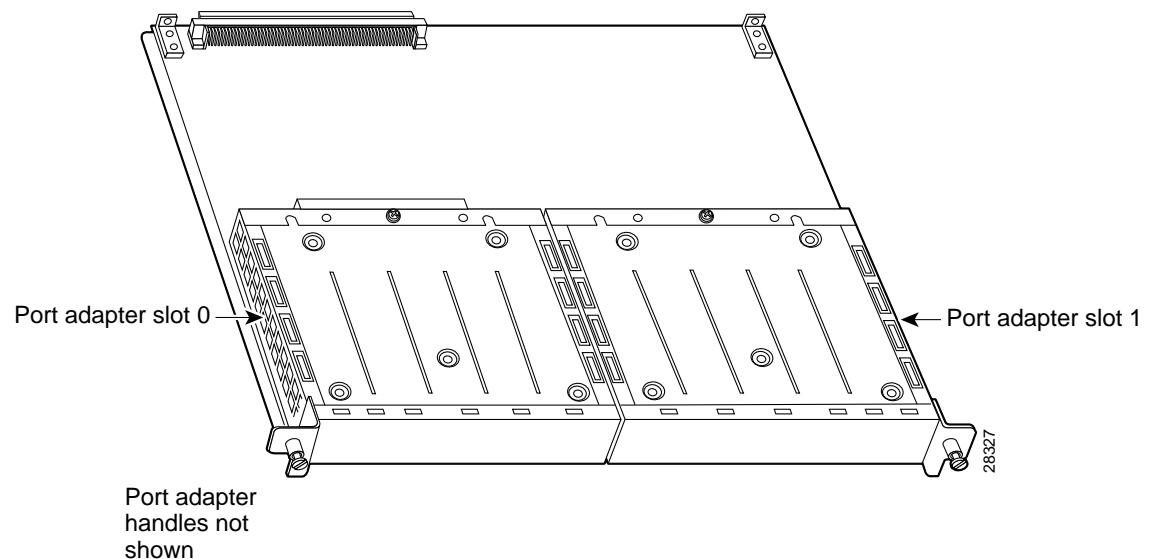


Figure 1-19 shows the slot numbering on a VIP4.

Figure 1-19 *VIP4 Slot Locations*

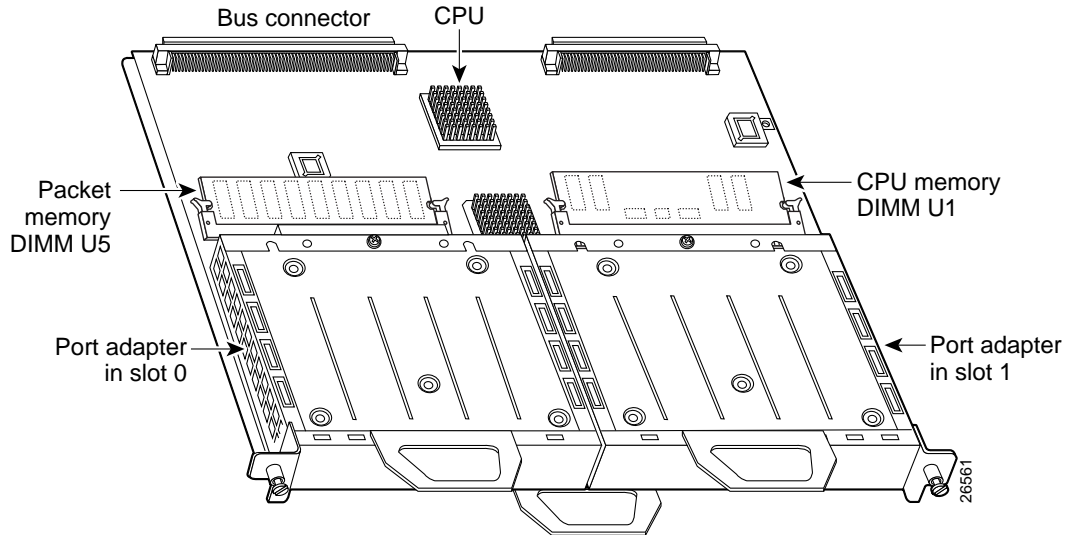
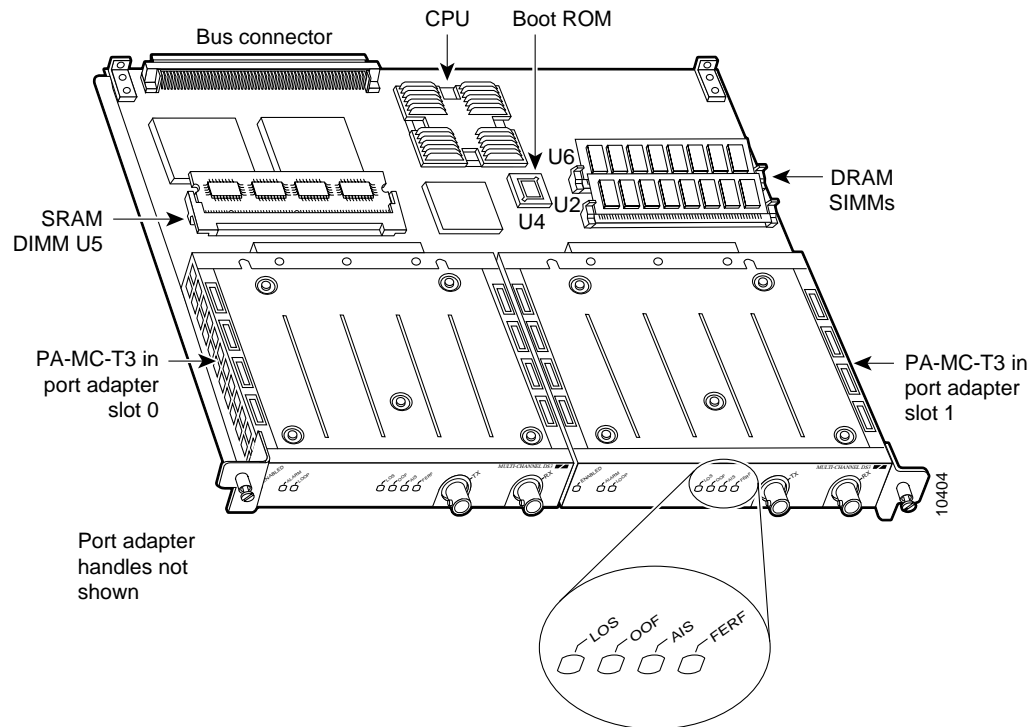


Figure 1-20 shows two PA-MC-T3 port adapters in slot 0 and slot 1 of a VIP2-40.

Figure 1-20 *Two PA-MC-T3s in Port Adapter Slot 0 and Slot 1 of a VIP2-40*



Cisco 7010 routers have three slots for port adapters, and two slots for Route Switch Processors (RSPs). The slots are numbered from bottom to top. You can place the port adapter in any of the VIP interface slots (slot 0 through 2). Slots 3 and 4 are always reserved for RSPs. The Cisco 7010 router is not shown.

Cisco 7505 routers have four slots for port adapters, and one slot for an RSP. The slots are numbered from bottom to top. You can place the port adapter in any of the VIP interface slots (slot 0 through 3). One slot is always reserved for the RSP. The Cisco 7505 router is not shown.

Cisco 7507 routers have five slots for port adapters, and two slots for RSPs. The slots are numbered from left to right. You can place the port adapter in any of the VIP interface slots (slot 0, 1, 4, 5, or 6). Slots 2 and 3 are always reserved for RSPs. The Cisco 7507 router is not shown.

Cisco 7513 routers have eleven slots for port adapters, and two slots for RSPs. The slots are numbered from left to right. You can place the port adapter in any of the VIP interface slots (slots 0 through 5, or slots 9 through 12). Slots 6 and 7 are always reserved for RSPs. The Cisco 7513 router is not shown.

Identifying Interface Addresses

This section describes how to identify interface addresses for the PA-MC-T3 in supported platforms. Interface addresses specify the actual physical location of each interface on a router or switch.

Note that PA-MC-T3 interface addresses always end with *t1-line-number:channel-group-number* where:

- *t1-line-number* identifies the T1 line number on the PA-MC-T3 and is a number from 1 through 28.
- *channel-group-number* identifies the logical channel group on the T1 line and is a number from 0 through 23.

Interfaces on a PA-MC-T3 installed in a router maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the interface address changes to reflect the new port adapter slot number.

Interfaces on a PA-MC-T3 installed in a VIP or FlexWAN module maintain the same address regardless of whether other interface processors or modules are installed or removed. However, when you move a VIP or FlexWAN module to a different slot, the interface processor or module slot number changes to reflect the new interface processor or module slot.



Note

The Cisco IOS software recognizes a configured logical channel group as a serial interface; therefore, you can use all configuration commands that are available for serial interfaces with configured logical channel groups. You can configure a logical channel group to carry data traffic using the following encapsulation methods: PPP, HDLC, SMDS, and Frame Relay. Set the encapsulation method you want using the serial interface configuration commands. For configured logical channel groups, you can use all command switches that apply to a serial interface (including optimum switching).



Note

Interface ports are numbered from left to right starting with 0.

The following subsections describe the interface address formats for the supported platforms:

- [Catalyst RSM/VIP2 Interface Addresses in the Catalyst 5000 Family Switches](#), page 1-20
- [Catalyst 6000 Family FlexWAN Module Interface Addresses](#), page 1-20
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers Interface Addresses](#), page 1-21
- [Cisco uBR7200 Series Routers Interface Addresses](#), page 1-21
- [Cisco 7201 Router Interface Addresses](#), page 1-21
- [Cisco 7301 Router Interface Addresses](#), page 1-21
- [Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses](#), page 1-22
- [Cisco 7401ASR Router Interface Addresses](#), page 1-22
- [Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Interface Addresses](#), page 1-22

Table 1-3 summarizes the interface address formats for the supported platforms.

Table 1-3 Identifying Interface Addresses

| Platform | Interface Address Format | Numbers | Syntax |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Catalyst RSM/VIP in Catalyst 5000 family switches | Port-adapter-slot-number/interface-port-number/ t1-line-number:channel-group-number | Port adapter slot—0 or 1 Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 0/0/1:0 |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | Module-slot-number/port-adapter-bay-number/ interface-port-number/t1-line-number:channel- group-number | Module slot—2 ¹ through 13 (depends on the number of slots in the switch) Port adapter bay—0 or 1 Interface port—0 T1 line number—1 though 28 Logical channel group on the T1 line—0 through 23 | 3/0/0/1:0 |
| Cisco 7200 series routers and Cisco 7200 VXR routers | Port-adapter-slot-number/interface-port-number/ t1-line-number:channel-group-number | Port adapter slot—1 through 6 (depends on the number of slots in the router) ² Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 1/0/1:0 |
| Cisco 7201 router | Port-adapter-slot-number/interface-port-number/ t1-line-number:channel-group-number | Port adapter slot—Always 1 Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 1/0/1:0 |

Table 1-3 Identifying Interface Addresses (continued)

| Platform | Interface Address Format | Numbers | Syntax |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Cisco uBR7223 router | Port-adapter-slot-number/interface-port-number/ t1-line-number:channel-group-number | Port adapter slot—Always 1 ² Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 1/0/1:0 |
| Cisco uBR7246 router | Port-adapter-slot-number/interface-port-number/ t1-line-number:channel-group-number | Port adapter slot—1 or 2 ² Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 1/0/1:0 |
| Cisco 7301 router | Port-adapter-slot-number/interface-port-number/ t1-line-number:channel-group-number | Port adapter slot—Always 1 Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 1/0/1:0 |
| Cisco 7304 PCI port adapter carrier card in Cisco 7304 router | Module-slot-number/interface-port-number/ t1-line-number:channel-group-number | Module slot— 2 through 5 Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 3/0/1:0 |
| Cisco 7401ASR router | Port-adapter-slot-number/interface-port-number/ t1-line-number:channel-group-number | Port adapter slot—Always 1 Interface port—0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 1/0/1:0 |
| VIP in Cisco 7000 series routers or Cisco 7500 series router | Interface-processor-slot-number/port-adapter-slot- number/interface-port-number/t1-line-number: channel-group-number | Interface processor slot—0 through 12 (depends on the number of slots in the router) Port adapter slot— 0 or 1 Interface port— 0 T1 line number—1 through 28 Logical channel group on the T1 line—0 through 23 | 3/1/0/1:0 |

- Slot 1 is reserved for the supervisor engine. If a redundant supervisor engine is used, it must go in slot 2; otherwise, slot 2 can be used for other modules.
- Port adapter slot 0 is reserved for the Fast Ethernet port on the I/O controller (if present).

Catalyst RSM/VIP2 Interface Addresses in the Catalyst 5000 Family Switches

In Catalyst 5000 family switches, the Catalyst RSM/VIP2 can be installed in any slot except the top slots, which contain the supervisor engine modules. The Catalyst RSM/VIP2 in a Catalyst 5000 family switch does not use interface processor slot numbering; therefore, the slots in which it is installed are not numbered. A port adapter can be installed into either port adapter slot 0 or slot 1 on a Catalyst RSM/VIP2. See [Figure 1-6](#) and [Figure 1-7](#).

The interface address is composed of a four-part number in the format *port-adapter-slot number/interface-port number/t1-line-number:channel-group-number*. See [Table 1-3](#). For example, if a PA-MC-T3 is installed in port adapter slot 1 of a Catalyst RSM/VIP2 in a Catalyst 5000 family switch, the interface address would be 1/0/1/0 (port adapter slot 1, interface port 0, T1 line 1, and channel group 0).

Catalyst 6000 Family FlexWAN Module Interface Addresses

The Catalyst 6000 family FlexWAN module can be installed in module slots 2 through 9 (depending on the number of slots in the router). Slot 1 is reserved for the supervisor engine. A port adapter can be installed into either port adapter bay 0 or bay 1 on a FlexWAN module. See [Figure 1-8](#).

The interface address is composed of a five-part number in the format *module-number/port-adapter-bay-number/interface-port-number/t1-line-number:channel-group-number*. See [Table 1-3](#).

The first number identifies the module slot of the chassis in which the FlexWAN module is installed (slot 2 through slot 3, 6, or 9 depending on the number of slots in the chassis). These module slots are generally numbered from top to bottom, starting with 1.

The second number identifies the bay of the FlexWAN module in which the port adapter is installed (0 or 1). The bays are numbered from left to right on the FlexWAN module.

The third number identifies the physical port number on the port adapter. The PA-T3+ is a single-port port adapter, therefore the port number is always 0. The PA-MC-T3 is a single-port port adapter, therefore the port is always 0.

The fourth number identifies the T1 line number on the PA-MC-T3 and is a number from 1 through 28.

The fifth number identifies the logical channel group on the T1 line and is a number from 0 through 23.

For example, if a PA-MC-T3 is installed in the FlexWAN module in module slot 3, port adapter bay 0, the interface address would be 3/0/0/1:0 (module slot 3, port adapter bay 0, interface port 0, T1 line 1, logical channel group 0). If the port adapter was in port adapter bay 1 on the FlexWAN module, the interface address would be 3/1/0/1:0.

**Note**

If you remove the FlexWAN module with the PA-MC-T3 from module slot 3 and install it in module slot 6, port adapter bay 0, the interface address would become 6/0/0/1:0.

**Note**

The FlexWAN module physical port address begins with slot 0, which differs from the conventional Catalyst 6000 family port address, which begins with slot 1.

Cisco 7200 Series Routers and Cisco 7200 VXR Routers Interface Addresses

In Cisco 7200 series routers and Cisco 7200 VXR routers, port adapter slots are numbered from the lower left to the upper right, beginning with slot 1 and continuing through slot 2 for the Cisco 7202, slot 4 for the Cisco 7204 and Cisco 7204VXR, and slot 6 for the Cisco 7206 and Cisco 7206VXR. Port adapters can be installed in any available port adapter slot from 1 through 6 (depending on the number of slots in the router). (Slot 0 is reserved for the I/O controller.) See [Figure 1-9](#) and [Figure 1-10](#).

The interface address is composed of a four-part number in the format *port-adapter-slot-number/interface-port-number/t1-line-number:channel-group-number*. See [Table 1-3](#). For example, if a PA-MC-T3 is installed in slot 1 of a Cisco 7200 series router, the interface address would be 1/0/1:0 (port adapter slot 1, interface port 0, T1 line 1, and logical channel group 0). If a PA-MC-T3 were installed in slot 4, the interface address would be 4/0/1:0.

Cisco uBR7200 Series Routers Interface Addresses

In the Cisco uBR7223 router, only one slot accepts port adapters and it is numbered slot 1.

In the Cisco uBR7246 router and Cisco uBR7246VXR router, port adapters can be installed in two port adapter slots (slot 1 and slot 2). Slot 0 is always reserved for the I/O controller—if present. See [Figure 1-11](#) and [Figure 1-12](#).

The interface address is composed of a four-part number in the format *port-adapter-slot-number/interface-port-number/t1-line-number:channel-group-number*. See [Table 1-3](#). For example, if a PA-MC-T3 is installed in slot 1 of a Cisco uBR7223 router, the interface address would be 1/0/1/0 (port adapter slot 1 interface port 0, T1 line 1, and channel group 0). If the PA-MC-T3 were installed in slot 2 of a Cisco uBR7246 router, the interface address would be 2/0/1/0 (port adapter slot 2, interface port 0, T1 line 1 and channel group 0).

Cisco 7201 Router Interface Addresses

In the Cisco 7201 router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-13](#).

The interface address is composed of a four-part number in the format *port-adapter-slot-number/interface-port-number/t1-line-number:channel-group number*. See [Table 1-3](#). For example, if a PA-MC-T3 is installed in a Cisco 7201 router, the interface address would be 1/0/1/0 (port adapter slot 1 interface port 0, T1 line 1, and channel group 0).

Cisco 7301 Router Interface Addresses

In the Cisco 7301 router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-14](#).

The interface address is composed of a four-part number in the format *port-adapter-slot-number/interface-port-number/t1-line-number:channel-group number*. See [Table 1-3](#). For example, if a PA-MC-T3 is installed in a Cisco 7301 router, the interface address would be 1/0/1/0 (port adapter slot 1 interface port 0, T1 line 1, and channel group 0).

Cisco 7304 PCI Port Adapter Carrier Card Interface Addresses

In the Cisco 7304 router, port adapters are installed in a Cisco 7304 PCI port adapter carrier card, which installs in Cisco 7304 router module slots 2 through 5. The port adapter slot number is the same as the module slot number. See [Figure 1-15](#) and [Figure 1-16](#).

The interface address is composed of a four-part number in the format *port-adapter-slot-number/interface-port-number/t1-line-number:channel-group number*. See [Table 1-3](#). For example, if a PA-MC-T3 is installed in the Cisco 7304 PCI port adapter carrier card in Cisco 7304 router module slot 3, the interface address would be 3/0/1/0 (port adapter slot 3 interface port 0, T1 line 1, and channel group 0).

Cisco 7401ASR Router Interface Addresses

In the Cisco 7401ASR router, only one slot accepts port adapters and it is numbered as slot 1. See [Figure 1-17](#).

The interface address is composed of a four-part number in the format *port-adapter-slot-number/interface-port-number/t1-line-number:channel-group number*. See [Table 1-3](#). For example, if a PA-MC-T3 is installed in a Cisco 7401ASR router, the interface address would be 1/0/1/0 (port adapter slot 1 interface port 0, T1 line 1, and channel group 0).

Cisco 7000 Series Routers and Cisco 7500 Series Routers VIP Interface Addresses

In Cisco 7000 series routers and Cisco 7500 series routers, port adapters are installed on a versatile interface processor (VIP), which installs in interface processor slots 0 through 12 (depending on the number of slots in the router). The port adapter can be installed in either bay (port adapter slot 0 or 1) on the VIP. See [Figure 1-18](#), [Figure 1-19](#), and [Figure 1-20](#).

The interface address for the VIP is composed of a five-part number in the format *interface-processor-slot-number/port-adapter-slot-number/interface-port-number/t1-line-number:channel-group-number*. See [Table 1-3](#).

The first number identifies the slot in which the VIP is installed (slot 0 through 12, depending on the number of slots in the router).

The second number identifies the bay (port adapter slot) on the VIP in which the port adapter is installed (0 or 1). The bays are numbered from left to right on the VIP.

The third number identifies the physical port number (interface port number) on the port adapter. The port numbers always begin at 0 and are numbered from left to right. The number of additional ports depends on the number of ports on the port adapter. The PA-MC-T3 is a single-port port adapter, therefore the port is always 0.

The fourth number identifies the T1 line number on the PA-MC-T3 and is a number from 1 through 28.

The fifth number identifies the logical channel group on the T1 line and is a number from 0 through 23.

For example, if a PC-MC-T3 is installed in a VIP in interface processor slot 3, port adapter slot 1, the interface address of the PA-MC-T3 is 3/1/0/1:0 (interface processor slot 3, port adapter slot 1, interface port 0, T1 line 1, channel group 0). If the port adapter was in port adapter slot 0 on the VIP, this same interface address would be numbered 3/0/0/1:0.

**Note**

Although the processor slots in the seven-slot Cisco 7507 and the thirteen-slot Cisco 7513 chassis are vertically oriented and those in the five-slot Cisco 7010 and Cisco 7505 chassis are horizontally oriented, all Cisco 7500 series routers use the same method for slot and port numbering.



CHAPTER 2

Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing the PA-MC-T3. This chapter contains the following sections:

- [Required Tools and Equipment, page 2-1](#)
- [Software and Hardware Requirements, page 2-2](#)
- [Checking Hardware and Software Compatibility, page 2-4](#)
- [75-Ohm In-Line Coaxial Attenuator, page 2-4](#)
- [Safety Guidelines, page 2-4](#)

Required Tools and Equipment

You need the following tools and parts to install a PA-MC-T3. If you need additional equipment, contact a service representative for ordering information.

- PA-MC-T3
- Catalyst RSM/VIP2 (for installation in the Catalyst 5000 family switches). For information about the specific VIP2 models that support the PA-MC-T3, see the [“Software and Hardware Requirements” section on page 2-2](#).
- Catalyst 6000 family FlexWAN module (for installation in the Catalyst 6000 family switches)
- VIP (for installation in the Cisco 7000 series or Cisco 7500 series chassis only)
- Cisco 7304 PCI port adapter carrier card (for installation in a Cisco 7304 router)
- The appropriate cables for the PA-MC-T3: RG-59, 75-ohm coaxial cables (one for transmit and one for receive)
- Number 1 Phillips and a 3/16-inch flat-blade screwdriver (for VIP installation only)
- Number 2 Phillips 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
- Attenuator kit (optional)

Software and Hardware Requirements

Table 2-1 lists the recommended minimum Cisco IOS software release required to use the PA-MC-T3 in supported router or switch platforms.

Table 2-1 PA-MC-T3 Software Requirements

| Router Platform | Recommended Minimum Cisco IOS Release |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst 5000 family switches with RSM¹ <ul style="list-style-type: none"> VIP2-40(=) or VIP2-50(=) | Cisco IOS Release 12.0(3)T or a later release of Cisco IOS Release 12.0T |
| Catalyst 6000 family switches with Catalyst 6000 family FlexWAN module <ul style="list-style-type: none"> Catalyst 6000 family MSFC² Supervisor engine software | Cisco IOS Release 12.1(1)EX or later Catalyst 6000 family supervisor engine software release 5.4(1) or later |
| Cisco 7200 series routers and Cisco 7200 VXR routers³ <ul style="list-style-type: none"> Cisco 7204VXR and Cisco 7206VXR Cisco 7202, Cisco 7204, or Cisco 7206 | Cisco IOS Release 12.0(3)T or later releases of 12.0T Cisco IOS Release 12.0(2)XE2 or later releases of 12.0XE Cisco IOS Release 12.2(4)B or a later release of 12.2B Cisco IOS Release 11.1(22)CC or later releases of 11.1CC Cisco IOS Release 12.0(1)S or later releases of 12.0S Cisco IOS Release 12.0(2)XE2 or later releases of 12.0XE Cisco IOS Release 12.2(4)B or a later release of 12.2B |
| Cisco uBR7200 series routers <ul style="list-style-type: none"> Cisco uBR7223 and Cisco uBR7246 | Cisco IOS Release 12.0(3)T or later releases of 12.0T |
| Cisco 7201 router | Cisco IOS Release 12.4(4)XD7 or later releases of 12.4XD Cisco IOS Release 12.2(31)SB5 or later releases of 12.2SB |
| Cisco 7301 router | Cisco IOS Release 12.2(11)YZ or later releases of 12.2YZ |
| Cisco 7304 router <ul style="list-style-type: none"> With Cisco 7304 PCI port adapter carrier card | Cisco IOS Release 12.2(14)SZ or a later release of Cisco IOS Release 12.2SZ |
| Cisco 7401ASR router | Cisco IOS Release 12.2(1)DX or later releases of 12.2DX Cisco IOS Release 12.2(4)B or a later release of 12.2B |
| VIP in the Cisco 7000 series routers and Cisco 7500 series routers^{4,5} | Cisco IOS Release 11.1(20)CC or later releases of 11.1CC Cisco IOS Release 12.0(1)S or later releases of 12.0S Cisco IOS Release 12.0(2)XE2 or later releases of 12.0XE Cisco IOS Release 12.0(10)S or later releases of 12.0S |

1. The specific Catalyst RSM/VIP2 model recommended for the PA-MC-T3 is the VIP2-40, which has 2 MB of SRAM, and 32 MB of DRAM or the VIP2-50, which has 4 MB of SRAM and 128 MB of SDRAM.

2. MSFC = Multilayer Switch Feature Card

3. Cisco IOS Release 11.2(7a)P or later supports half-duplex and binary synchronous communications (Bisync) operation on the PA-MC-T3 in Cisco 7200 series routers.

4. The PA-MC-T3 can be used in the VIP2 in all Cisco 7500 series routers, and in Cisco 7000 series routers using the RSP7000 and RSP7000CI.
5. The PA-MC-T3 can be used in the VIP4 in all Cisco 7500 series routers, and in Cisco 7000 series routers using the RSP7000 and RSP7000CI.

**Caution**

The VIP does *not* operate properly with the Route Processor (RP), Switch Processor (SP), or Silicon Switch Processor (SSP) installed in the host Cisco 7000 series router.

In Cisco 7200 series routers and Cisco uBR7200 series universal broadband routers, the PA-MC-T3 and network processor memory configurations include the following:

Table 2-2 Network Processing Engines (NPE) and Network Service Engine (NSE) Memory Configurations

| NPE and NSE | SRAM (MB) | DRAM (MB) | EOS ¹ |
|-------------------------------------|-----------|---------------|------------------|
| NPE-150 (150-MHz network processor) | 1 | 32–128 | yes |
| NPE-200 (200-MHz network processor) | 4 | 32–128 | yes |
| NPE-225 (262-MHz network processor) | 64 | 64–256 | no |
| NPE-300 (262-MHz network processor) | 32 | 32–256 | yes |
| NPE-400 (350-MHz network processor) | 128 | 128–512 | no |
| NSE-1 (262-MHz network processor) | 128 | 128–256 | yes |
| NPE-G1 (700-MHz network processor) | 128–512 | 128(2)–512(2) | no |

1. EOS—End of Sale

In the Cisco 7204VXR and Cisco 7206VXR routers, the PA-MC-T3 and network processor memory configuration require the NPE-300 (262-MHz network processor)—64 MB to 256 MB of synchronous DRAM (SDRAM).

For configuration guidelines for Cisco 7200 series routers, refer to the *Cisco 7200 Series Port Adapter Hardware Configuration Guidelines* at the following URL:

http://www.cisco.com/en/US/products/hw/modules/ps2033/products_configuration_guide_book09186a00801056ef.html

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, click **Log In** at Cisco.com and go to Support > Tools and Resources. You can also access the tool by pointing your browser directly 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.

75-Ohm In-Line Coaxial Attenuator

A 75-ohm in-line coaxial attenuator may be required to tune the signal between the PA-MC-T3 and the far-end equipment if the port adapter is experiencing line code violations (LCVs). LCVs occur when the far-end equipment transmit signal saturates the front-end receiver of the PA-MC-T3.

Cisco offers an attenuator kit (ATTEN-KIT-PA=) that contains five attenuators with fixed values ranging from 3 dB to 20 dB. For more information on the attenuator kit, refer to *Installing the 75-Ohm In-Line Coaxial Attenuator on Cisco Port Adapters* at the following URL:

http://www.cisco.com/en/US/products/hw/modules/ps2033/prod_module_installation_guide09186a00800a85c0.html

Safety Guidelines

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

Safety Warnings

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

Warning Definition



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 käsittelemiseen 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**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 mellékelte 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 للصدمة 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 ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ**

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 συνήθεις 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.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ**אזהרה****הוראות בטיחות חשובות**

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כדי לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה**Opomena VAŽNI BEZBEDNOSNI NAPATSTVIJA**

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.

ЧУВАЈТЕ ГИ ОБИЕ НАПАТСТВИЈА

Ostrzeżenie WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA

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.

NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ**Upozornenie DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi 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.

USCHOVAJTE SI TENTO NÁVOD

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.

Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

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. Port adapters 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.

Follow these guidelines to prevent 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.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed 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 (Mohm).



CHAPTER 3

Removing and Installing Port Adapters

This chapter describes how to remove the PA-MC-T3 port adapter from supported platforms and also how to install a new or replacement port adapter. This chapter contains the following sections:

- [Handling Port Adapters, page 3-1](#)
- [Online Insertion and Removal, page 3-2](#)
- [Warnings and Cautions, page 3-3](#)
- [Port Adapter Removal and Installation, page 3-4](#)
- [Connecting a PA-MC-T3 Cable, page 3-16](#)



Warning

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

Handling Port Adapters



Caution

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



Caution

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



Warning

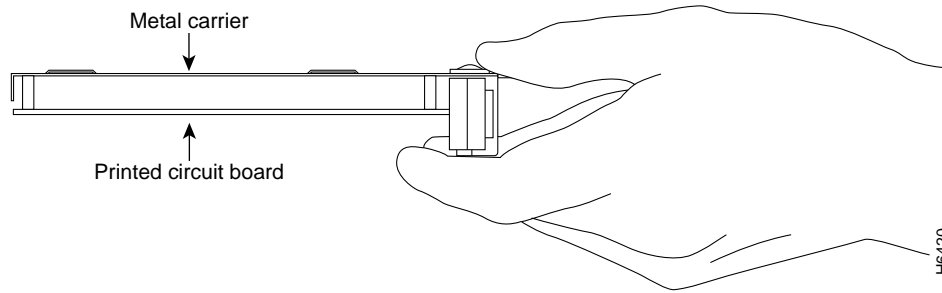
During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the midplane with your hand or any metal tool, or you could shock yourself. Statement 181



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

Figure 3-1 Handling a Port Adapter



Online Insertion and Removal

Several platforms support online insertion and removal (OIR) of port adapters; therefore, you do not have to power down routers when removing and replacing a PA-MC-T3 on the Cisco 7200 series routers, Cisco 7200 VXR routers, Cisco uBR7200 series routers, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router.

Although the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, and VIP support OIR, individual port adapters do not. To replace port adapters, you must first remove the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, or VIP from the router and then install or replace port adapters as required. If a blank port adapter is installed on the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, or VIP on which you want to install a new port adapter, you must first remove the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, or VIP from the router and then remove the blank port adapter.

It is wise to gracefully shut down the system before removing a port adapter that has active traffic moving through it. Removing a port adapter while traffic is flowing through the ports can cause system disruption. Once the port adapter is inserted, the ports can be brought back up.



Caution

To prevent system problems, do not remove the port adapter from the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, or VIP or attempt to install other port adapters when the system is operating. To install or replace port adapters, first remove the Catalyst RSM/VIP2, Catalyst 6000 family FlexWAN module, Cisco 7304 PCI port adapter carrier card, or VIP from the router.



Note

As you disengage the port adapter from the router or switch, OIR administratively shuts down all active interfaces in the port adapter.

OIR allows you to install and replace port adapters while the router is operating; you do not need to notify the software or shut down the system power, although you should not run traffic through the port adapter 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 preserves sessions.

The following is a functional description of OIR for background information only; for specific procedures for installing and replacing a port adapter in a supported platform, refer to the [“Port Adapter Removal and Installation”](#) section on page 3-4.

Each port adapter has a bus connector that connects it to the router. The connector has a set of tiered pins in three lengths that send specific signals to the system as they make contact with the port adapter. The system assesses the signals it receives and the order in which it receives them to determine if a port adapter is being removed from or introduced to the system. From these signals, the system determines whether to reinitialize a new interface or to shut down a disconnected interface.

Specifically, when you insert a port adapter, the longest pins make contact with the port adapter first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them.

When you remove or insert a port adapter, the pins send signals to notify the system of changes. The router then performs the following procedure:

1. Rapidly scans the system for configuration changes.
2. Initializes newly inserted port adapters or administratively shuts down any vacant interfaces.
3. Brings all previously configured interfaces on the port adapter back to their previously installed state. Any newly inserted interface is put in the administratively shutdown state, as if it was present (but not configured) at boot time. If a similar port adapter type is reinserted into a slot, its ports are configured and brought online up to the port count of the originally installed port adapter of that type.

**Note**

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

Warnings and Cautions

Observe the following warnings and cautions when installing or removing port adapters.

**Caution**

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

**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

**Caution**

When powering off the router, wait a minimum of 30 seconds before powering it on again.

**Caution**

Do not slide a port adapter all the way into the slot until you have connected all required cables. Trying to do so disrupts normal operation of the router or switch.

Port Adapter Removal and Installation

In this section, the illustrations that follow give step-by-step instructions on how to remove and install port adapters. This section contains the following illustrations:

- [Catalyst RSM/VIP2—Removing and Installing a Port Adapter, page 3-5](#)
- [FlexWAN Module—Removing and Installing a Port Adapter, page 3-6](#)
- [Cisco 7200 Series Routers and Cisco 7200 VXR Routers—Removing and Installing a Port Adapter, page 3-7](#)
- [Cisco uBR7200 Series Routers—Removing a Port Adapter, page 3-8](#)
- [Cisco uBR7200 Series Routers—Installing a Port Adapter, page 3-9](#)
- [Cisco 7201 Router—Removing and Installing a Port Adapter, page 3-10](#)
- [Cisco 7301 Router—Removing and Installing a Port Adapter, page 3-11](#)
- [Cisco 7304 PCI Port Adapter Carrier Card—Removing and Installing a Port Adapter, page 3-12](#)
- [Cisco 7401ASR Router—Removing and Installing a Port Adapter, page 3-14](#)
- [VIP—Removing and Installing a Port Adapter, page 3-15](#)



Note

The PA-MC-T3 port adapter can be installed in port adapter slots 0 or 1 on the Catalyst RSM/VIP2 motherboard, the Catalyst 6000 family FlexWAN module, or the VIP and in any available port adapter slot in all other systems.



Caution

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



Warning

During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the midplane with your hand or any metal tool, or you could shock yourself. Statement 181



Tip

If a port adapter lever or other retaining mechanism does not move to the locked position, the port adapter is not completely seated in the midplane. Carefully pull the port adapter halfway out of the slot, reinsert it, and move the port adapter lever or other mechanism to the locked position.



Caution

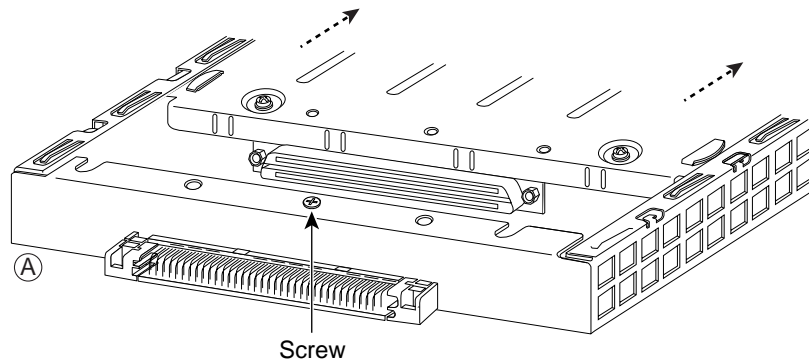
To prevent jamming the carrier between the upper and the lower edges of the port adapter slot, and to ensure that the edge connector at the rear of the port adapter mates with the connection at the rear of the port adapter slot, make certain that the carrier is positioned correctly, as shown in the cutaway in the following illustrations.

Catalyst RSM/VIP2—Removing and Installing a Port Adapter

Note: You must first remove the Catalyst RSM/VIP2 from the chassis before removing a port adapter from the Catalyst RSM/VIP2.

Step 1

To remove the port adapter, remove the screw that secures the port adapter (or blank port adapter). (See A.)

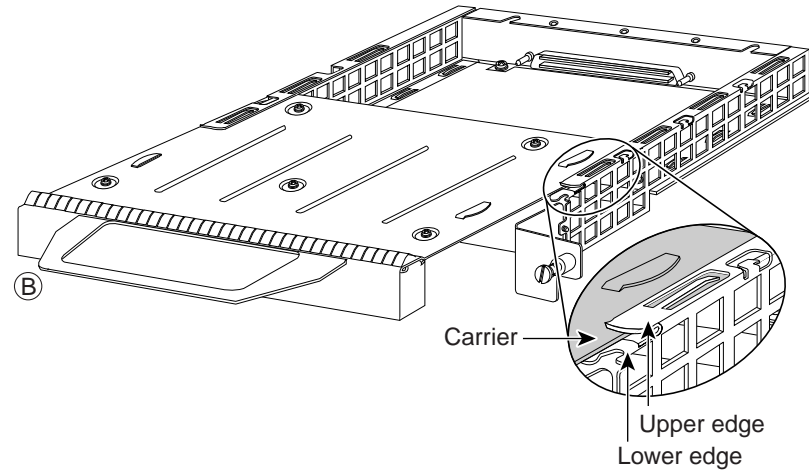


Step 2

With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See A.)

Step 3

To install the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)



Step 4

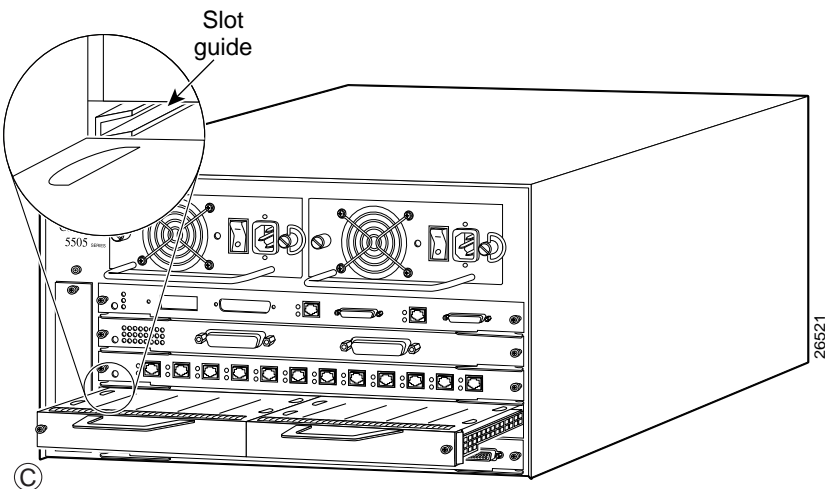
Install the screw in the rear of the port adapter slot. Do not overtighten the screw. (See A.)

Step 5

Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

Step 6

Reinstall the Catalyst RSM/VIP2 motherboard in the chassis and tighten the captive installation screw on each side of the Catalyst RSM/VIP2 faceplate. (See C.)

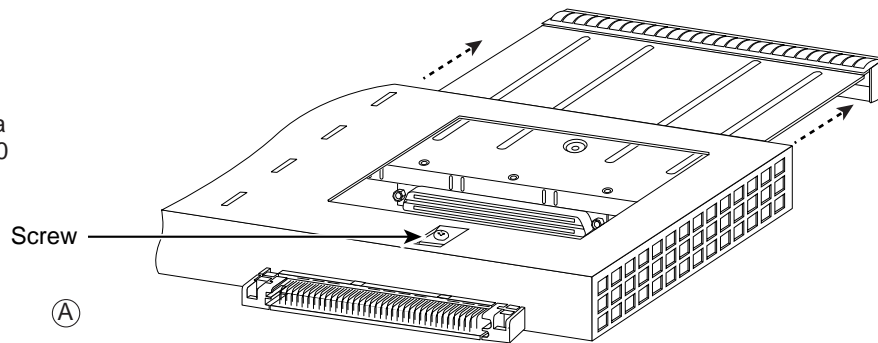


FlexWAN Module—Removing and Installing a Port Adapter

Note: You must first remove the Catalyst 6000 FlexWAN module from the chassis before removing a port adapter from the Catalyst 6000 FlexWAN module.

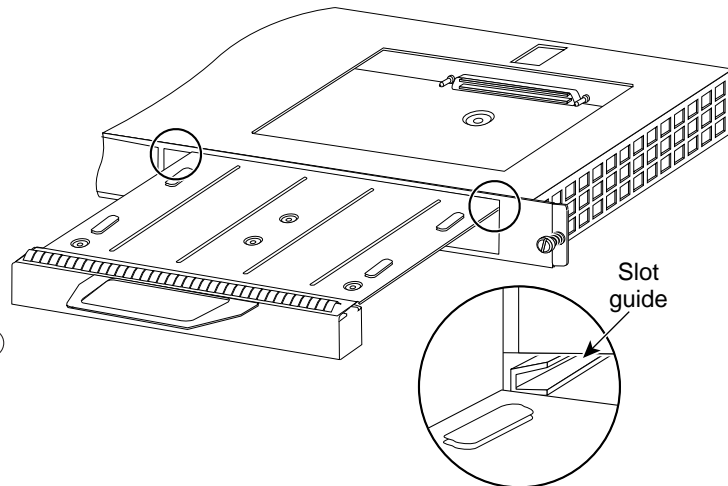
Step 1

To remove the port adapter, remove the screw that secures the port adapter (or blank port adapter). (See A.)



Step 2

With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its bay, away from the edge connector at the rear of the bay. (See A.)



Step 3

To install the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter bay. (See B.)

Step 4

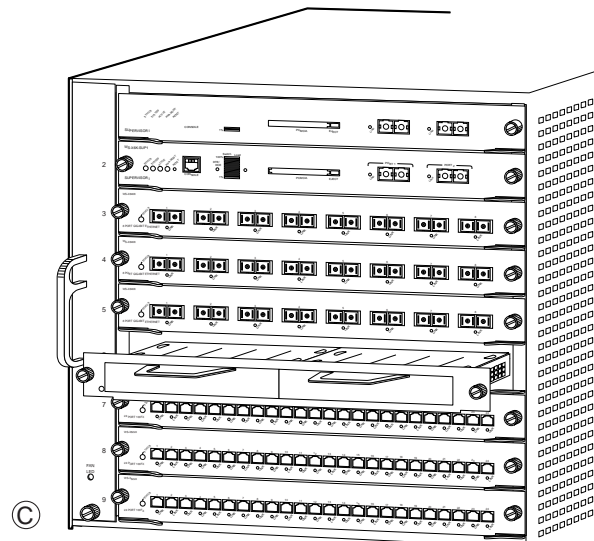
Carefully slide the new port adapter into the port adapter bay until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

Step 5

Install the screw in the rear of the port adapter bay. Do not overtighten the screw. (See A.)

Step 6

Reinstall the Catalyst 6000 FlexWAN module in the chassis, and tighten the captive installation screw on each side of the Catalyst 6000 FlexWAN module faceplate. (See C.)



Cisco 7200 Series Routers and Cisco 7200 VXR Routers—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, place the port adapter lever in the unlocked position. (See A.) The port adapter lever remains in the unlocked position.

Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 3

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Step 4

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)

Step 5

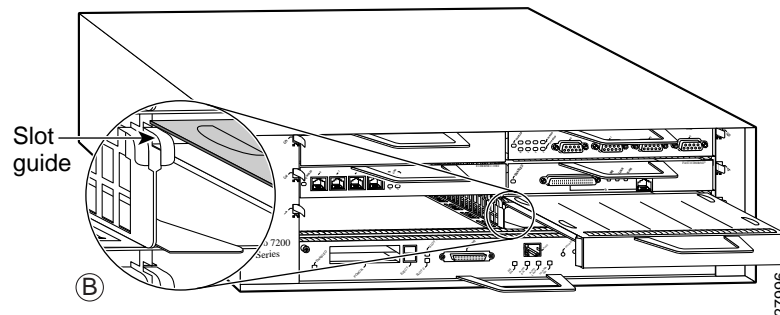
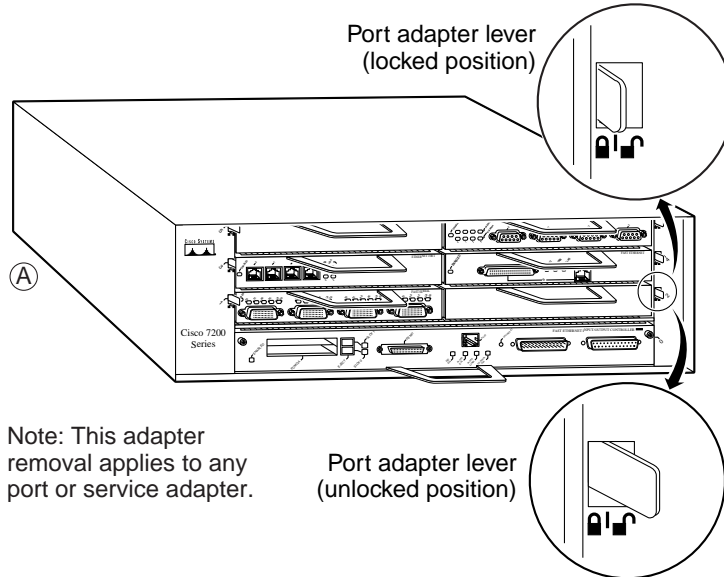
Carefully slide the new port adapter halfway into the port adapter slot. (See B.)

Step 6

With the port adapter halfway into the slot, connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 7

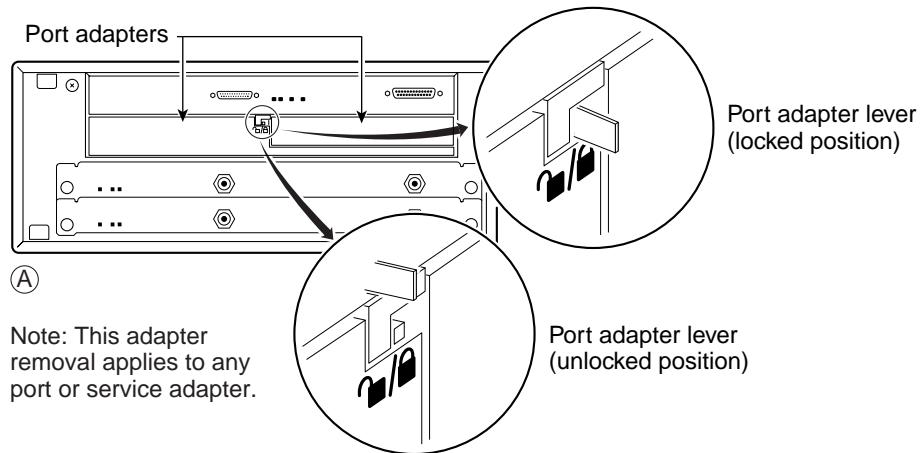
After the port adapter is properly seated, lock the port adapter lever. (See A.)



Cisco uBR7200 Series Routers—Removing a Port Adapter

Step 1

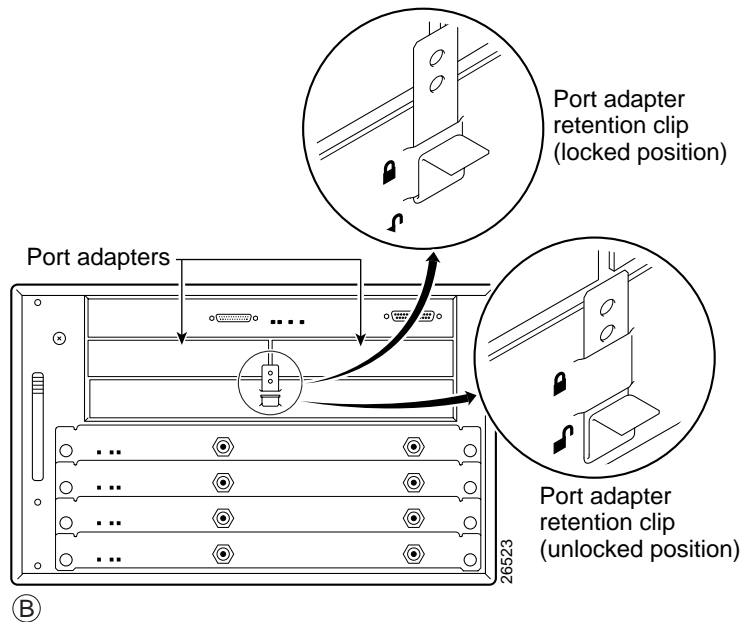
To remove the port adapter, unlock the port adapter retaining mechanism. The port adapter lever remains in the unlocked position.



Place the port adapter lever (Cisco uBR7223, see A), or the port adapter retention clip (Cisco uBR7246 and Cisco uBR7246 VXR, see B) in the unlocked position. Either mechanism remains in the unlocked position.

Step 2

Grasp the handle of the port adapter and pull the port adapter from the router, about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.



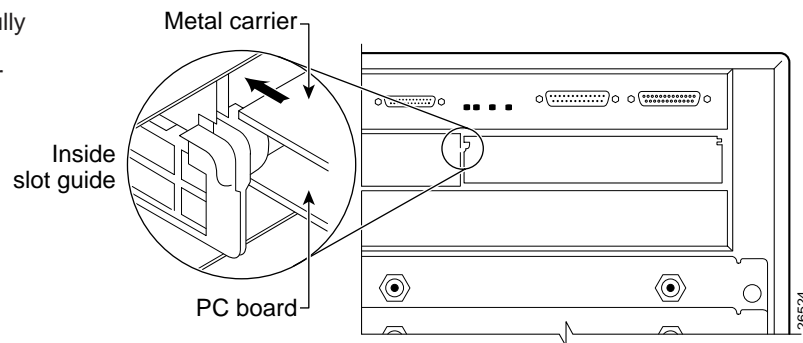
Step 3

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Cisco uBR7200 Series Routers—Installing a Port Adapter

Step 1

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot.



Step 2

Carefully slide the new port adapter halfway into the port adapter slot.

Step 3

With the port adapter halfway into the slot, connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane.

Step 4

After the port adapter is properly seated, lock the port adapter lever or retention clip, depending on your system. (See illustration on preceding page.)

Cisco 7201 Router—Removing and Installing a Port Adapter

Step 1

Use an ESD wrist strap to ground yourself to the router.

Step 2

To remove the port adapter, place the port adapter lever in the unlocked position. The port adapter lever remains in the unlocked position.

Step 3

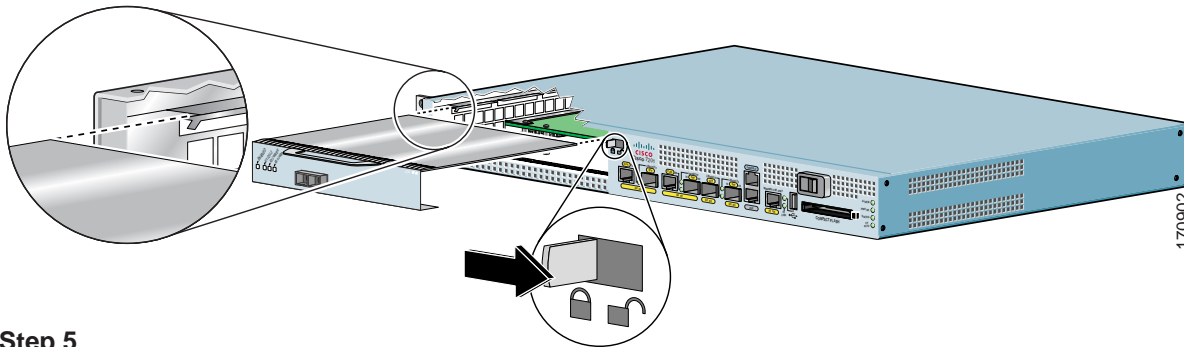
Grasp the handle of the port adapter and pull the port adapter about halfway out of its slot. If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 4

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from the chassis slot.

Caution

The port adapter must slide into the slot guides close to the chassis lid. Do not allow the port adapter components to come in contact with the system board or the port adapter could be damaged.



Step 5

To insert the port adapter, carefully align the port adapter carrier in the slot guides. Slide the new port adapter halfway into the chassis.

Step 6

Connect all the required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the midplane.

Step 7

After the port adapter is properly seated, lock the port adapter lever.

Cisco 7301 Router—Removing and Installing a Port Adapter

Step 1

Use an ESD wrist strap to ground yourself to the router.

Step 2

To remove a port adapter, use a Phillips screwdriver to turn the screw holding the port adapter latch. The screw should be loose enough to allow the latch to rotate to an unlocked position. (See A.) The latch can rotate 360°.

Step 3

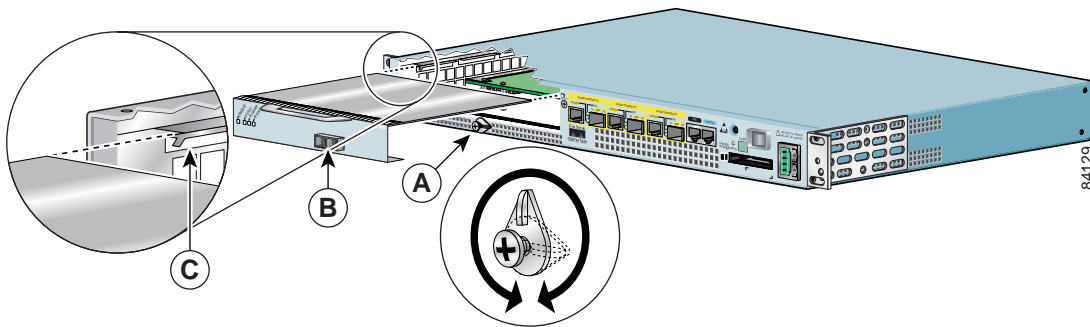
Grasp the handle and pull the port adapter from the router, about halfway out of its slot. (See B.) If you are removing a blank port adapter, pull the blank port adapter completely out of the chassis slot.

Step 4

With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter from its chassis slot.

Caution

The port adapter must slide into the slot guides close to the chassis lid. (See C.) Do not allow the port adapter components to come in contact with the system board or the port adapter could be damaged.



Step 5

To insert the port adapter, carefully align the port adapter carrier in the slot guides. (See C.) Slide the new port adapter halfway into the chassis.

Step 6

Connect all required cables to the port adapter. After connecting all required cables, carefully slide the port adapter all the way into the slot until the port adapter is seated in the midplane.

Step 7

After the port adapter is properly seated, turn and secure the port adapter latch in the upright, locked position. (See A.) Tighten the screw to ensure the port adapter remains firmly in place.

Cisco 7304 PCI Port Adapter Carrier Card—Removing and Installing a Port Adapter

You can install one single-width port adapter in a Cisco 7304 PCI port adapter carrier card. This section provides step-by-step instructions for removing and installing a port adapter in a Cisco 7304 PCI port adapter carrier card.

**Caution**

When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the Cisco 7304 PCI port adapter carrier card. Some platforms have an ESD connector for attaching the wrist strap.

**Warning**

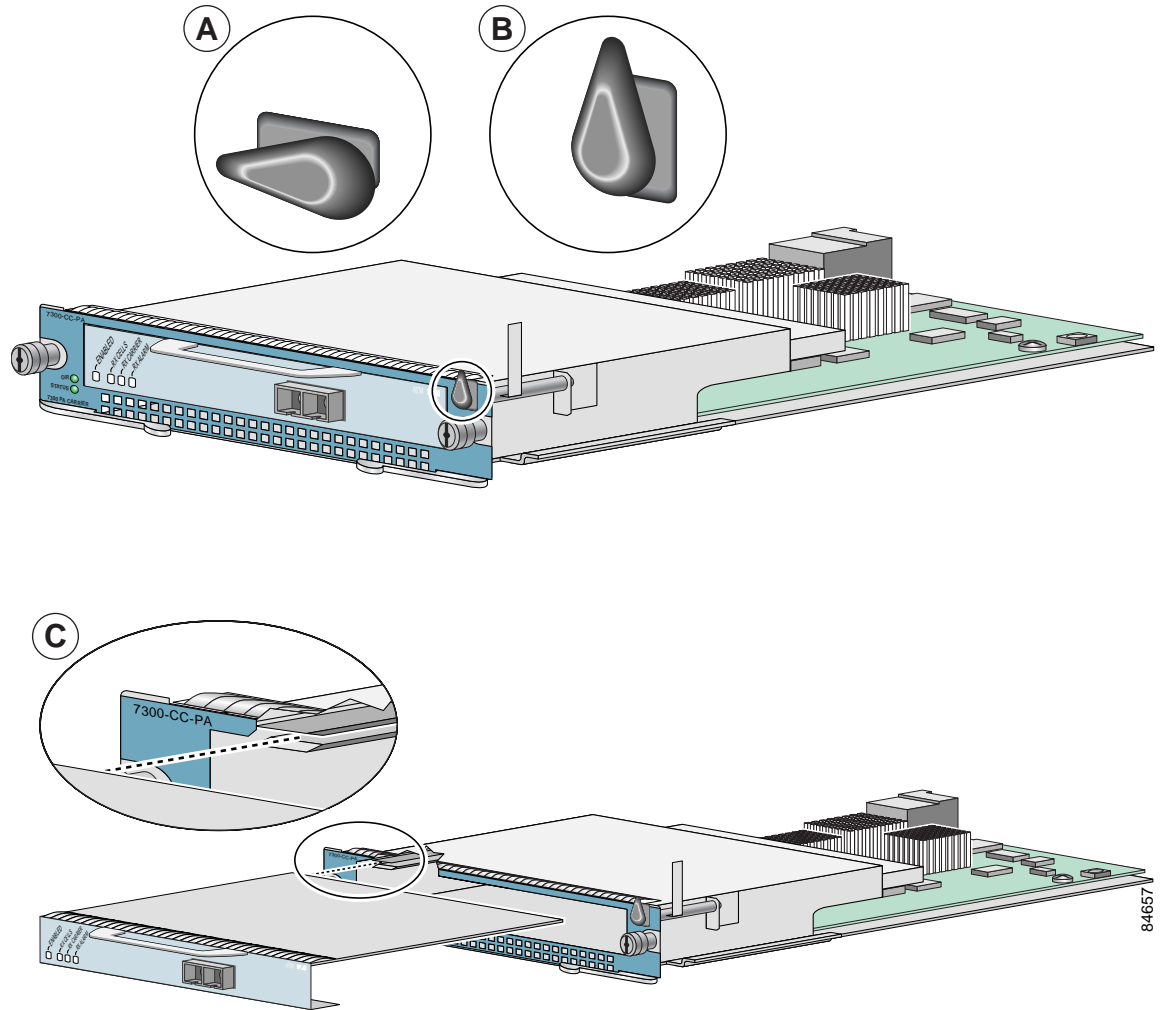
During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself. Statement 94

To remove and install a port adapter in a Cisco 7304 PCI port adapter carrier card, refer to [Figure 3-2](#) and do the following:

- Step 1** If the Cisco 7304 PCI port adapter carrier card is still in the router, you must remove the Cisco 7304 PCI port adapter carrier card before removing a port adapter.
- Step 2** To remove the port adapter from the Cisco 7304 PCI port adapter carrier card, turn the port adapter lock from its locked and horizontal position shown in A of [Figure 3-2](#) to its unlocked and vertical position shown in B of [Figure 3-2](#).
- Step 3** Grasp the handle of the port adapter and pull the port adapter from the Cisco 7304 PCI port adapter carrier card. (You have already disconnected the cables from the port adapter when removing the Cisco 7304 PCI port adapter carrier card.)
- Step 4** To insert the port adapter in the Cisco 7304 PCI port adapter carrier card, locate the guide rails inside the Cisco 7304 PCI port adapter carrier card that hold the port adapter in place. They are at the top left and top right of the port adapter slot and are recessed about an inch, as shown in C of [Figure 3-2](#).
- Step 5** Carefully slide the port adapter in the Cisco 7304 PCI port adapter carrier card until the port adapter makes contact with the port adapter interface connector. When fully seated, the port adapter front panel should be flush with the face of the Cisco 7304 PCI port adapter carrier card.
- Step 6** After the port adapter is properly seated, turn the port adapter lock to its locked and horizontal position, as shown in A of [Figure 3-2](#).

Figure 3-2 illustrates how to remove and install a port adapter in a Cisco 7304 PCI port adapter carrier card.

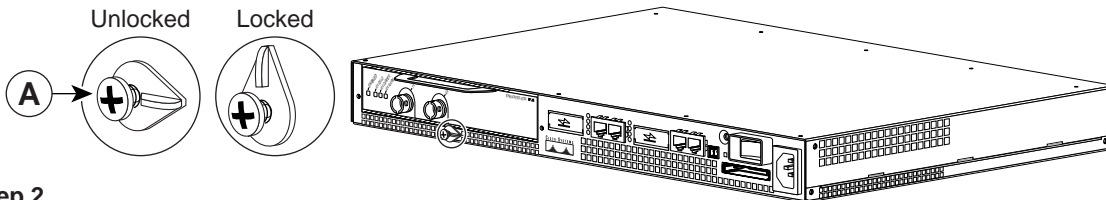
Figure 3-2 Cisco 7304 PCI Port Adapter Carrier Card—Port Adapter Removal and Installation



Cisco 7401ASR Router—Removing and Installing a Port Adapter

Step 1

To remove the port adapter, use a number 2 Phillips screwdriver to loosen the screw on the port adapter latch. Rotate the port adapter latch until it clears the faceplate of the port adapter. (See A.) The latch can rotate 360°.



Step 2

Pull the port adapter from the router, about halfway out of its slot. (If you remove a blank port adapter, keep the blank port adapter for use in the router if you should ever remove the port adapter. The port adapter slot must always be filled.)

Step 3

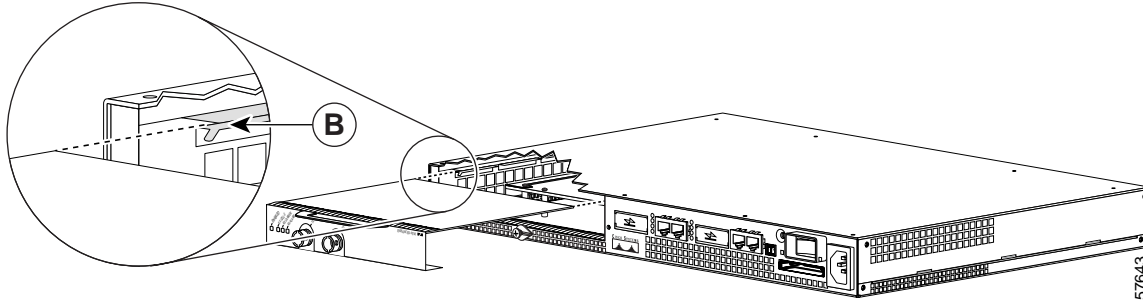
With the port adapter halfway out of the slot, disconnect all cables from the port adapter. After disconnecting the cables, pull the port adapter completely out of the chassis slot.

Step 4

To insert the port adapter, locate the port adapter slot guides inside the Cisco 7401ASR router. They are near the top, and are recessed about 1/2 inch. (See B.)

Caution

The port adapter must slide into the slot guides under the chassis lid. Do not allow the port adapter components to come in contact with the system board, or the port adapter could be damaged.



Step 5

Insert the port adapter in the slot guides halfway, and then reconnect the port adapter cables.

Step 6

After the cables are connected, carefully slide the port adapter all the way into the slot until the port adapter is seated in the router midplane. When installed, the port adapter input/output panel should be flush with the face of the router.

Step 7

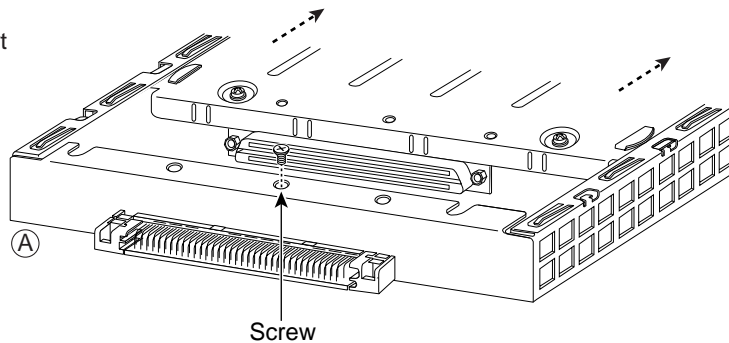
After the port adapter is properly seated, rotate the port adapter latch to the upright locked position and use a number 2 Phillips screwdriver to tighten the latch screw. If needed, loosen the latch screw to rotate the latch over the port adapter. Finish the installation by tightening the latch screw.

VIP—Removing and Installing a Port Adapter

Note: You must first remove the VIP from the chassis before removing a port adapter from the VIP.

Step 1

To remove the port adapter, remove the screw that secures the port adapter (or blank port adapter). (See A.)

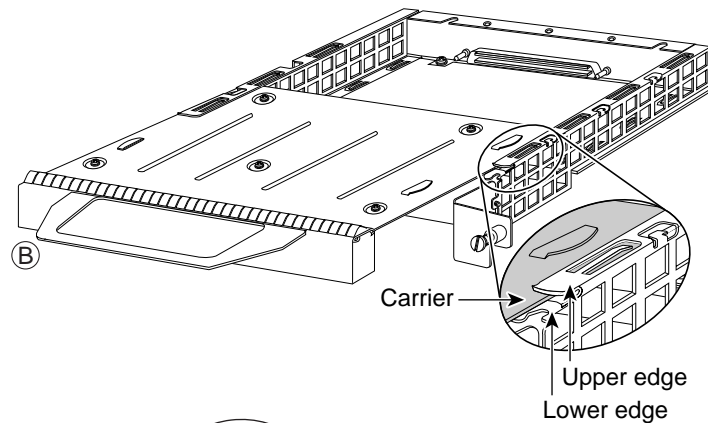


Step 2

With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See A.)

Step 3

To insert the port adapter, carefully align the port adapter carrier between the upper and the lower edges of the port adapter slot. (See B.)

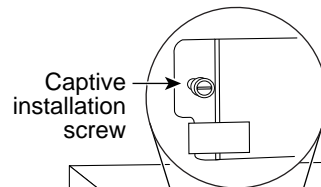


Step 4

Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely seated in the connector at the rear of the port adapter slot. (See B.)

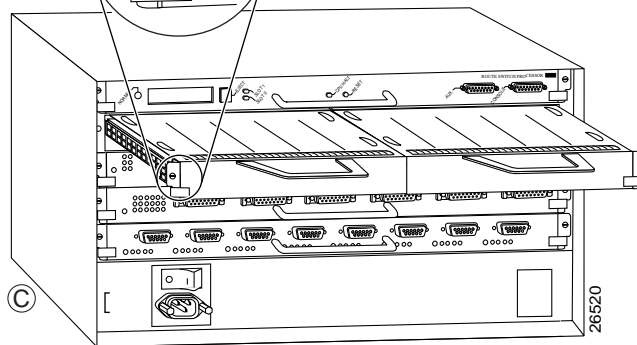
Step 5

Install the screw in the rear of the port adapter slot on the VIP. Do not overtighten the screw. (See A.)



Step 6

Carefully slide the VIP motherboard into the interface processor slot until the connectors at the rear of the VIP are completely seated in the connectors at the rear of the interface processor slot. Use the ejector levers to seat the VIP in the interface processor slot. Tighten the captive installation screws on the VIP. (See C.)



Connecting a PA-MC-T3 Cable

To continue your PA-MC-T3 installation, you must attach the port adapter cables. The instructions that follow apply to all supported platforms.

Use only 75-ohm RG-59 coaxial cables for these connections. You must supply the cables; they do not ship with the PA-MC-T3. For specific cable requirements and options, see the “[Cables, Connectors, and Pinouts](#)” section on page 1-5.



Note

You must attach the ferrite sleeves to 75-ohm coaxial cables that you plan to use for your connection. Attach each ferrite sleeve as close as possible to the port adapter end of each 75-ohm coaxial cable (as shown in [Figure 1-3](#)).

We strongly recommend that you fasten together your transmit and receive cables along their entire length, which reduces the effects of EMI. You can use standard heat-activated shrink tubing or cable ties for this purpose.

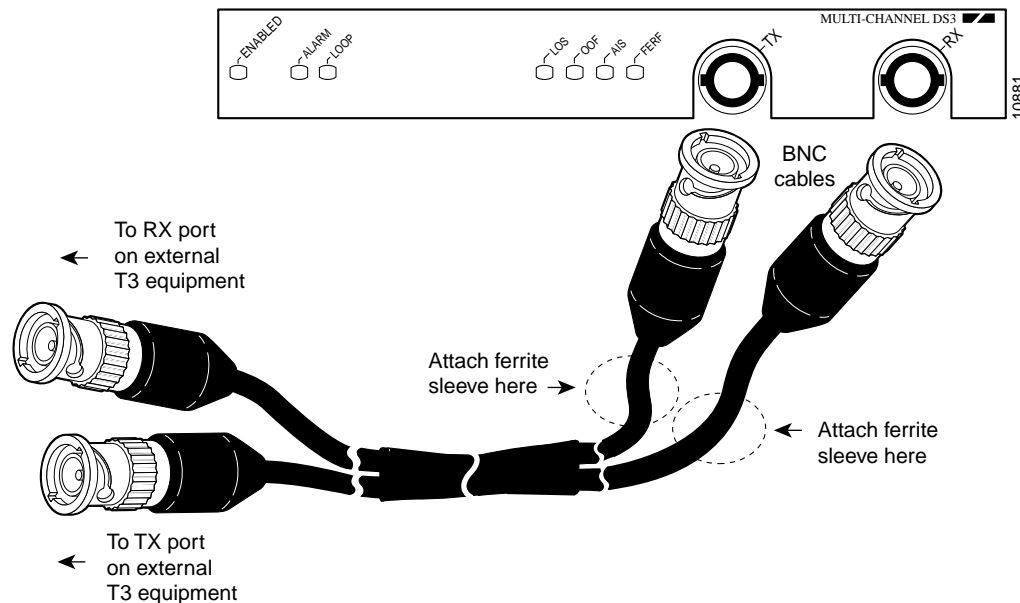
You can also use a 75-ohm coaxial cable pair that is available from Cisco Systems (product number CAB-ATM-DS3/E3).

Each T3 link requires separate receive and transmit connections to your external T3 equipment.

Connect the 75-ohm coaxial cables to the PA-MC-T3 as follows:

- Step 1** Attach the 75-ohm coaxial cables directly to the BNC ports on the PA-MC-T3. Attach one end of a cable to the port labeled TX and one end of a second cable to the port labeled RX. (See [Figure 3-3](#).)

Figure 3-3 Attaching 75-Ohm RG-59 Coaxial Cables to a PA-MC-T3



**Caution**

To prevent system problems and to maintain the proper cable connection sequences, connect the RX and TX ports on your PA-MC-T3 as indicated in Step 2.

Step 2

Attach the network ends of your two 75-ohm coaxial cables to your external T3 equipment as follows:

- Attach the coaxial cable from the PA-MC-T3 TX port to the RX port on your external T3 equipment.
- Attach the coaxial cable from the PA-MC-T3 RX port to the TX port on your external T3 equipment.

This completes the procedure for attaching 75-ohm coaxial cables to a PA-MC-T3. Proceed to [Chapter 4, “Configuring the PA-MC-T3”](#) to configure the interfaces on the PA-MC-T3.



CHAPTER 4

Configuring the PA-MC-T3

To continue your PA-MC-T3 installation, you must configure the MC-T3 interface. The instructions that follow apply to all supported platforms. Minor differences between the platforms—with Cisco IOS software commands—are noted.

This chapter contains the following sections:

- [Using the EXEC Command Interpreter, page 4-1](#)
- [Configuring the Interfaces, page 4-2](#)
- [Checking the Configuration, page 4-26](#)

Using the EXEC Command Interpreter

You modify the configuration of your router through the software command interpreter called the EXEC (also called enable mode). You must enter the privileged level of the EXEC command interpreter with the **enable** command before you can use the **configure** command to configure a new interface or change the existing configuration of an interface. The system prompts you for a password if one has been set.

The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>). At the console terminal, use the following procedure to enter the privileged level:

-
- Step 1** At the user-level EXEC prompt, enter the **enable** command. The EXEC prompts you for a privileged-level password as follows:

```
Router> enable
```

```
Password:
```

- Step 2** Enter the password (the password is case-sensitive). For security purposes, the password is not displayed.

When you enter the correct password, the system displays the privileged-level system prompt (#):

```
Router#
```

To configure the new interfaces, proceed to the [“Configuring the Interfaces” section on page 4-2](#).

Configuring the Interfaces

After you verify that the new PA-MC-T3 is installed correctly (the ENABLED LED goes on), use the privileged-level **configure** command to configure the new interfaces. 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 PA-MC-T3 or if you want to change the configuration of an existing T3 link, you must enter configuration mode to configure the new interfaces. If you replaced a PA-MC-T3 that was previously configured, the system recognizes the new T3 link and brings it up in its existing configuration.

For a summary of the configuration operations available and instructions for configuring interfaces on a PA-MC-T3, refer to the appropriate configuration publications listed in the [“Related Documentation” section on page viii](#).

You execute configuration commands from the privileged-level access of the EXEC command interpreter. Contact your system administrator, if necessary, to obtain password access. (See the [“Using the EXEC Command Interpreter” section on page 4-1](#) for an explanation of the privileged level of the EXEC.)

This section contains the following subsections:

- [Configuring T1 Lines, page 4-2](#)
- [Shutting Down an Interface, page 4-10](#)
- [Performing a Basic Interface Configuration, page 4-15](#)
- [Configuring the T3 Controller, page 4-17](#)

Configuring T1 Lines

This section provides information about configuring T1 lines on the T3 link of the PA-MC-T3 and includes the following subsections:

- [T1 Line Configuration Commands, page 4-3](#)
- [Configuring a BERT on a T1 Line, page 4-4](#)
- [Sending a BERT Pattern on a T1 Line, page 4-5](#)
- [Viewing the Results of a BERT, page 4-7](#)
- [Terminating a BERT, page 4-9](#)

**Note**

For consistency throughout the following configuration examples and whenever possible, the port addresses 1/0/0 and 1/0/0/1:1 are used.

The PA-MC-T3 port addressing might be different depending on the interface processor slot in which the VIP is installed and the VIP port adapter slot in which the PA-MC-T3 is installed.

T1 Line Configuration Commands

You can create a logical channel group on a T1 line using the following controller commands as appropriate for your channelized configuration:

```
t1 t1-line-number channel-group channel-group-number timeslots list-of-timeslots
[speed {56 | 64}]
```

where:

- *t1-line-number* is 1 to 28 (all 28 T1 lines can have more than one logical channel group).
- **channel-group** *channel-group-number* defines a logical channel group with a range of 0 to 23 to be a channelized T1 line (T1 lines 1 to 28 can be channelized).
- **timeslots** *list-of-timeslots* can be 1 to 24 or a combination of subranges within 1 to 24 (each subrange is a list of time slots that makes up the T1 line).
- **speed**{56 | 64} is an optional argument that specifies the speed of a time slot to be either 56 kbps or 64 kbps.

Table 4-1 shows the configuration of logical channel group 20 on T1 line 1 assigning channelized time slots 1 to 5 and 20 to 23.

You can remove a logical channel group from a T1 line with the **no-t1** controller command.

```
no t1 t1-line-number channel-group channel-group-number
```

where:

- *t1-line-number* is 1 to 28.
- *channel-group-number* is 0 to 23.

Table 4-1 shows how to remove logical channel group 10 from channelized T1 line 1.

Table 4-1 T1 Line Configuration Commands

| Purpose | Command | Example | Additional Information |
|---------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Create a logical channel group on a T1 line | t1 <i>t1-line-number</i> channel-group <i>channel-group-number</i> | The example is for interface 0 in port adapter slot 1. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 channel-group 20 timeslots 1-5, 20-23 | |
| Remove a channel group from a T1 line | no t1 <i>t1-line-number</i> channel-group <i>channel-group-number</i> | The example is for interface 0 on a port adapter in port adapter slot 1. Router(config)# controller t3 1/0 Router(config-controller)# no t1 1 channel-group 10 | |
| Set the framing format on a T1 line | t1 <i>t1-line-number</i> framing { esf sf } | The example sets Super Frame (SF) framing for T1 line 6. Router(config)# controller t3 1/0 Router(config-controller)# t1 6 framing sf | Standard framing (SF) Default framing format is Extended Superframe (ESF). |

Table 4-1 T1 Line Configuration Commands (continued)

| Purpose | Command | Example | Additional Information |
|---------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Turn detection or generation of a yellow alarm on and off a T1 line | [no] t1 t1-line-number yellow {detection generation} | The example turns the detection of a yellow alarm off on a T1 line 6. Router (config-controller) # no t1 6 yellow detection | When you select SF framing, consider turning off yellow alarm detection; yellow alarm can be incorrectly detected with SF framing. |
| Set the ESF framing format on a T1 line | t1 16 framing esf | The example sets ESF framing for T1 line 16. Router (config)# controller t3 1/0 Router (config-controller)# t1 6 framing esf | Extended Superframe (ESF) |
| Set internal clock source on a T1 line | t1 t1-line-number clock source {internal line} | The example configures T1 line 1 to use an internal clock source on a VIP in interface processor slot 1. Router (config)# controller t3 1/0/0 Router (config-controller)# t1 1 clock source internal | <i>t1-line-numbers</i> are 1 to 28. The default clock source is internal. You can set the clock source to use internal clocking for testing purposes. One end of a T1 circuit <i>must</i> provide the clock source. |
| Set line clock source on a T1 line | t1 t1-line-number clock source {internal line} | The example configures T1 line 16 using a line clock source on a VIP in interface processor slot 1. Router (config)# controller t3 1/0/0 Router (config-controller)# t1 6 clock source line | |

**Note**

After a T1 line is configured, it appears to the Cisco IOS software as a serial interface; therefore, all the configuration commands for a serial interface are available. However, not all commands apply to the T1 line. All the encapsulation formats, such as PPP, HDLC, SMDS, and Frame Relay are applicable to the configured T1 line. Encapsulation can be set using the serial interface configuration commands. All the switching types that are applicable to a serial interface, including optimum switching, are also applicable to the configured T1 line.

Configuring a BERT on a T1 Line

Bit error rate test (BERT) circuitry is built into the PA-MC-T3. Using BERT you can test cables and signal problems in the field. You can configure individual T1 lines to run an independent BERT; each T1 line has its own BERT circuitry.

Two categories of test patterns can be generated by the onboard BERT circuitry: pseudorandom and repetitive. The former test patterns are exponential numbers and conform to the CCITT/ITU O.151 and O.153 specifications; the latter test patterns are zeros or ones, or alternating zeros and ones.

A description of each type of test pattern follows:

- Pseudorandom test patterns:
 - 2^{11} (per CCITT/ITU O.151)
 - 2^{15} (per CCITT/ITU O.151)
 - 2^{20-153} (per CCITT/ITU O.153)
 - $2^{20-QRSS}$ (per CCITT/ITU O.151)
 - 2^{23} (per CCITT/ITU O.151)
- Repetitive test patterns:
 - All zeros (0s)
 - All ones (1s)
 - Alternating zeros (0s) and ones (1s)

Both the total number of error bits received and the total number of bits received are available for analysis. You can set the testing period from 1 minute to 14,440 minutes (240 hours), and you can also retrieve the error statistics anytime during the BERT.



Note

BERT testing for the T3 link is not supported.

When running a BERT, your system expects to receive the same pattern that it is transmitting. To help ensure this, you can use one of two common options:

- Use a loopback somewhere in the link or network.
- Configure remote testing equipment to transmit the same BERT pattern at the same time.

Sending a BERT Pattern on a T1 Line

You can send a BERT pattern on a T1 line with the following command:

t1 *t1-line-number* **bert** *pattern* *interval* *time* [**unframed**]

where:

- *t1-line-number* is 1 to 28.
- *time* is 1 to 14440 minutes.
- *pattern* is:
 - 0s, repetitive test pattern of all zeros (00000...).
 - 1s, repetitive test pattern of all ones (11111...).
 - 2^{11} , pseudorandom test pattern (2,048 bits long).
 - $2^{15-0.151}$ pseudorandom 0.151 test pattern (32,768 bits long).
 - $2^{20-0.153}$, pseudorandom 0.153 test pattern (1,048,575 bits long).
 - $2^{20-QRSS}$, pseudorandom QRSS 0.151 test pattern (1,048,575 bits long).
 - 2^{23} , pseudorandom 0.151 test pattern (8,388,607 bits long).
 - alt-0-1, repetitive alternating test pattern of zeros (0s) and ones (1s) (01010101....).



Note Use unframed T1 to run BERTs. If you do not specify **unframed**, the port adapter uses the currently configured T1 framing option to run a BERT.

Examples follow:

- Send a BERT pseudorandom pattern of 2²⁰ through T1 line 10 for 5 minutes.

The example that follows is for a port adapter on a Catalyst RSM/VIP2 in slot 1:

```
Router(config)# controller t3 1/0
Router(config-controller)# t1 10 bert pattern 2^20 interval 5 unframed
```

The example that follows is for a port adapter on a Catalyst 6000 family FlexWAN module in interface processor slot 5:

```
Router(config)# controller t3 5/0/0
Router(config-controller)# t1 10 bert pattern 2^20 interval 5 unframed
```

The example that follows is for a port adapter in slot 1 of the Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, Cisco 7301 router, or a Cisco 7401ASR router:

```
Router(config)# controller t3 1/0
Router(config-controller)# t1 10 bert pattern 2^20 interval 5 unframed
```

The example that follows is for a port adapter in slot 3 of a Cisco 7304 PCI port carrier card of a Cisco 7304 router:

```
Router(config)# controller t3 3/0
Router(config-controller)# t1 10 bert pattern 2^20 interval 5 unframed
```

The example that follows is for a port adapter on a VIP in interface processor slot 1:

```
Router(config)# controller t3 1/0/0
Router(config-controller)# t1 10 bert pattern 2^20 interval 5 unframed
```

- Send a repetitive pattern of all ones through T1 line 10 for 14440 minutes (240 hours).

The example that follows is for a port adapter on a Catalyst RSM/VIP2 in slot 1:

```
Router(config)# controller t3 1/0
Router(config-controller)# t1 10 bert pattern 1s interval 14440 unframed
```

The example that follows is for a port adapter on a Catalyst 6000 family FlexWAN module in interface processor slot 5:

```
Router(config)# controller t3 5/0/0
Router(config-controller)# t1 10 bert pattern 1s interval 14440 unframed
```

The example that follows is for a port adapter in slot 1 of the Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, Cisco 7301 router, or a Cisco 7401ASR router:

```
Router(config)# controller t3 1/0
Router(config-controller)# t1 10 bert pattern 1s interval 14440 unframed
```


The example that follows is for a port adapter in slot 3 of a Cisco 7304 PCI port carrier card of a Cisco 7304 router:

```
Router(config)# controller t3 3/0
Router(config-controller)# t1 10 bert pattern 1s interval 14440 unframe
```

The example that follows is for a port adapter on a VIP in interface processor slot 1:

```
Router(config)# controller t3 1/0/0
Router(config-controller)# t1 10 bert pattern 1s interval 14440 unframed
```



Note

You can terminate a BERT during the specified test period with the **no t1 bert** command.

Viewing the Results of a BERT

You can view the results of a BERT using the **show controller** command:

show controllers t3 slot/port-adapter/port/t1-line-number

where: *t1-line-number* is 1 to 28.

You can view the results of a BERT at the following times:

- After you terminate the test using the **no t1 bert** command
- After the test runs completely
- Anytime during the test (in real time)

Examples:

- The example that follows is for a port adapter on a Catalyst RSM/VIP2 in slot 1:

```
Router# show controllers t3 1/0/1
T3 1/0 is up.
CT3 H/W Version : 3, CT3 ROM Version : 0.79, CT3 F/W Version : 0.29.0
T3 1/0 T1 1
No alarms detected.
Clock Source is internal.
BERT test result (running)
  Test Pattern : 2^11, Status : Sync, Sync Detected : 1
  Interval : 5 minute(s), Time Remain : 5 minute(s)
  Bit Errors(Since BERT Started): 6 bits,
  Bits Received(Since BERT start): 8113 Kbits
  Bit Errors(Since last sync): 6 bits
  Bits Received(Since last sync): 8113 Kbits
```

- The example that follows is for a port adapter in slot 1 of the Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, Cisco 7301 router, or a Cisco 7401ASR router:

```
Router# show controllers t3 1/0/1
T3 1/0 is up.
CT3 H/W Version : 3, CT3 ROM Version : 0.79, CT3 F/W Version : 0.29.0
T3 1/0 T1 1
No alarms detected.
Clock Source is internal.
BERT test result (running)
  Test Pattern : 2^11, Status : Sync, Sync Detected : 1
  Interval : 5 minute(s), Time Remain : 5 minute(s)
  Bit Errors(Since BERT Started): 6 bits,
  Bits Received(Since BERT start): 8113 Kbits
  Bit Errors(Since last sync): 6 bits
```

```
Bits Received(Since last sync): 8113 Kbits
```

- The example that follows is for a port adapter in slot 3 of a Cisco 7304 PCI port carrier card of a Cisco 7304 router:

```
Router# show controllers t3 3/0/1
T3 3/0 is up.
CT3 H/W Version : 3, CT3 ROM Version : 0.79, CT3 F/W Version : 0.29.0
T3 3/0 T1 1
No alarms detected.
Clock Source is internal.
BERT test result (running)
  Test Pattern : 2^11, Status : Sync, Sync Detected : 1
  Interval : 5 minute(s), Time Remain : 5 minute(s)
  Bit Errors(Since BERT Started): 6 bits,
  Bits Received(Since BERT start): 8113 Kbits
  Bit Errors(Since last sync): 6 bits
  Bits Received(Since last sync): 8113 Kbits
```

- The example that follows is for a port adapter on a VIP in interface processor slot 1:

```
Router# show controllers t3 1/0/0/1
T3 1/0/0 is up.
CT3 H/W Version : 3, CT3 ROM Version : 0.79, CT3 F/W Version : 0.29.0
T3 1/0/0 T1 1
No alarms detected.
Clock Source is internal.
BERT test result (running)
  Test Pattern : 2^11, Status : Sync, Sync Detected : 1
  Interval : 5 minute(s), Time Remain : 5 minute(s)
  Bit Errors(Since BERT Started): 6 bits,
  Bits Received(Since BERT start): 8113 Kbits
  Bit Errors(Since last sync): 6 bits
  Bits Received(Since last sync): 8113 Kbits
```

- The example that follows is for a port adapter on a VIP4 in interface processor slot 1:

```
Router#show controllers
T3 8/0/0 is down. Hardware is CT3 single wide port adapter
CT3 H/W Version:1.0.1, CT3 ROM Version:1.1, CT3 F/W Version:2.3.0
FREEDM version:1, reset 0
Applique type is Channelized T3
Transmitter is sending remote alarm.
Receiver has loss of signal.
FEAC code received:No code is being received
Framing is M23, Line Code is B3ZS, Clock Source is Internal
Rx throttle total 0, equipment customer loopback
Data in current interval (96 seconds elapsed):
  0 Line Code Violations, 0 P-bit Coding Violation
  0 C-bit Coding Violation, 0 P-bit Err Secs
  0 P-bit Severely Err Secs, 0 Severely Err Framing Secs
  106 Unavailable Secs, 0 Line Errored Secs
  0 C-bit Errored Secs, 0 C-bit Severely Errored Secs

T1 1
  Not configured.
...
T1 28
  Not configured.
```

The following explains the output of the preceding command, line by line:

| Output Display Line | Explanation |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BERT test result (running) | This line indicates the current state of the test. In this case, “running” indicates that the BERT is still in process. After a test is completed, “done” is displayed. |
| Test Pattern : 2^11, Status : Sync, Sync Detected : 1 | This line indicates the test pattern you selected for the test (2^11), the current synchronization state (sync), and the number of times synchronization has been detected during this test (1). |
| Interval : 5 minute(s), Time Remain : 5 minute(s) | This line indicates the time the test takes to run and the time remaining for the test to run. |
| Interval : 5 minute(s), Time Remain : 2 minute(s) (unable to complete) | For a BERT that you terminate, this line indicates the time the test would have taken to run and the time remaining for the test to run had you not terminated it; “unable to complete” signifies that you interrupted the test. |
| Bit Errors(Since BERT Started): 6 bits, Bits Received(Since BERT start): 8113 Kbits Bit Errors(Since last sync): 6 bits Bits Received(Since last sync): 8113 Kbits | These four lines show the bit errors that have been detected versus the total number of test bits that have been received since the test started and since the last synchronization was detected. |



Note

The BERT runs over the currently configured framing option for the specified T1 line (ESF or SF). Before running a BERT, you should configure the framing option that is appropriate to your application. You can run the BERT unframed by specifying **unframed**.

Terminating a BERT

You can terminate a BERT with the following command:

```
no t1 t1-line-number bert
```

where: *t1-line-number* is 1 to 28.

The following examples show how to terminate the BERT running on T1 line 10 in different platforms.

- The example that follows is for a port adapter on a Catalyst RSM/VIP2 in slot 1:

```
Router(config)# controller t3 1/0  
Router(config-controller)# no t1 10 bert
```

- The example that follows is for a port adapter on a Catalyst 6000 family FlexWAN module in interface processor slot 5:

```
Router(config)# controller t3 5/0/0  
Router(config-controller)# no t1 10 bert
```

- The example that follows is for a port adapter in slot 1 of the Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, Cisco 7301 router, or a Cisco 7401ASR router:

```
Router(config)# controller t3 1/0
Router(config-controller)# no t1 10 bert
```

- The example that follows is for a port adapter in slot 3 of of a Cisco 7304 PCI port carrier card of a Cisco 7304 router:

```
Router(config)# controller t3 3/0
Router(config-controller)# no t1 10 bert
```

- The example that follows is for a port adapter on a VIP in interface processor slot 1:

```
Router(config)# controller t3 1/0/0
Router(config-controller)# no t1 10 bert
```

This completes the procedures for configuring and testing T1 lines.

To check your configurations using **show** commands, proceed to the [“Checking the Configuration” section on page 4-26](#); otherwise, proceed to the following sections to perform a basic interface configuration and T3 controller configurations:

- [Shutting Down an Interface, page 4-10](#)
- [Performing a Basic Interface Configuration, page 4-15](#)
- [Configuring the T3 Controller, page 4-17](#)

Shutting Down an Interface

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

Follow these steps to shut down an interface:

Step 1 Enter the privileged level of the EXEC command interpreter (also called enable mode). (See [“Using the EXEC Command Interpreter” section on page 4-1](#) for instructions.)

Step 2 At the privileged-level prompt, enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

- Step 3** Shut down interfaces by entering the **interfaces serial** subcommand (followed by the interface address of the interface), and then enter the **shutdown** command.

This step assumes you have already configured the logical channel group. For channelized T1 lines, *channel-group-number* can be 0 to 23.

When you have finished, press **Ctrl-Z**—hold down the **Control** key while you press **Z**— or enter **end** or **exit** to exit configuration mode and return to the EXEC command interpreter.



Note If you need to shut down additional interfaces, enter the **interface serial** command (followed by the address of the interface) for each of the interfaces on your port adapter. Use the **no shutdown** command to enable the interface.

Table 4-2 shows the **shutdown** command syntax for the supported platforms.

Table 4-2 Syntax of the **shutdown** Command for the Supported Platforms

| Platform | Commands | Example |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | interface , followed by the <i>type (serial) slot/port (port-adapter-slot-number/interface-port-number)/ t1-line-number: channel-group-number</i> shutdown | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in port adapter slot 1. Router(config)# interface serial 1/0/1:1 Router(config-if)# shutdown Ctrl-Z Router# |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | interface , followed by the <i>type (serial) module/bay/port (module-slot-number/port-adapter-bay-number/interface-port-number)/t1-line-number: channel-group-number</i> shutdown | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface processor slot 5 in port adapter bay 0. Router(config)# interface serial 5/0/0/1:1 Router(config-if)# shutdown Ctrl-Z Router# |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | interface , followed by the <i>type (serial) slot/port (port-adapter-slot-number/interface-port-number)/ t1-line-number: channel-group-number</i> shutdown | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in port adapter slot 1. Router(config)# interface serial 1/0/1:1 Router(config-if)# shutdown Ctrl-Z Router# |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | interface , followed by the <i>type (serial) slot/port (port-adapter-slot-number/interface-port-number)/ t1-line-number: channel-group-number</i> shutdown | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in port adapter slot 1. Router(config)# interface serial 1/0/1:1 Router(config-if)# shutdown Ctrl-Z Router# |

Table 4-2 Syntax of the shutdown Command for the Supported Platforms (continued)

| Platform | Commands | Example |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | interface , followed by the <i>type (serial) slot/port (module-slot-number/interface-port-number)/ t1-line-number: channel-group-number</i> shutdown | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in a Cisco 7304 PCI port adapter carrier card in port adapter slot 1 of the Cisco 7304 router: Router (config)# interface serial 3/0/1:1 Router (config-if)# shutdown Ctrl-Z Router# |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | interface , followed by the <i>type (serial) and slot/port-adapter/port (interface-processor-slot-number/port-adapter-slot-number/interface-port-number)/ t1-line-number: channel-group-number</i> shutdown | The example is for logical channel group 1 on T1 line 1 of the T3 link on interface 0 on a port adapter in port adapter slot 1 of a VIP installed in interface processor slot 1. Router (config-if)# interface serial 1/1/0/1:1 Router (config-if)# shutdown Ctrl-Z Router# |

Step 4 Write the new configuration to NVRAM as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

The system displays an OK message when the configuration has been stored in NVRAM.

- Step 5** Verify that new interfaces are now in the correct state (shut down) using the **show interfaces** command (followed by the interface type and interface address of the interface) to display the specific interface.

Table 4-3 shows the **show interfaces serial** command syntax for the various supported platforms.

Table 4-3 Examples of the **show interfaces serial** Command for the Supported Platforms

| Platform | Command | Example |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number)/ <i>t1-line-number:channel-group-number</i> | The example is for T1 line 1, channel group number 0 and interface 0 on a port adapter in port adapter slot 1. Router# show interfaces serial 1/0/1:0 Serial 1/0/1:0 is administratively down, line protocol is down [Additional display text omitted from this example] |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | show interfaces serial , followed by <i>module/bay/port</i> (module-slot-number/port-adapter-bay-number/interface-port-number)/ <i>t1-line-number:channel-group-number</i> | The example is for T1 line 1, channel group number 0 and interface 0 on a port adapter in port adapter slot 0 in module number 5. Router# show interfaces serial 5/0/0/1:0 Serial 5/0/0/1:0 is down, line protocol is down [Additional display text omitted from this example] |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number)/ <i>t1-line-number:channel-group-number</i> | The example is for T1 line 1, channel group number 0 and interface 0 on a port adapter in port adapter slot 1. Router# show interfaces serial 1/0/1:0 Serial 1/0/1:0 is administratively down, line protocol is down [Additional display text omitted from this example] |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | show interfaces serial , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number)/ <i>t1-line-number:channel-group-number</i> | The example is for T1 line 1, channel group number 0 and interface 0 on a port adapter in port adapter slot 1. Router# show interfaces serial 1/0/1:0 Serial 1/0/1:0 is administratively down, line protocol is down [Additional display text omitted from this example] |

Table 4-3 Examples of the `show interfaces serial` Command for the Supported Platforms (continued)

| Platform | Command | Example |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | show interfaces serial , followed by <i>slot/port</i> (module-slot-number/interface-port-number)/ <i>t1-line-number</i> : <i>channel-group-number</i> | The example is for T1 line 1, channel group number 0, interface 0 on a port adapter in a Cisco 7304 PCI port adapter carrier card in port adapter slot 3 of the Cisco 7304 router Router# show interfaces serial 3/0/1:0 Serial 3/0/1:0 is administratively down, line protocol is down [Additional display text omitted from this example] |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | show interfaces serial , followed by <i>slot/port adapter/port</i> (interface-processor-slot-number/port-adapter-slot-number/interface-port-number)/ <i>t1-line-number:channel-group-number</i> | The example is for T1 line 1, channel group number 0, interface 0 on a port adapter in port adapter slot 0 of a VIP in interface processor slot 1. Router# show interfaces serial 1/0/0/1:0 Serial 1/0/0/1:0 is administratively down, line protocol is down [Additional display text omitted from this example] |

- Step 6** Re-enable the interfaces by doing the following:
- Repeat Step 3 to re-enable an interface. Substitute the **no shutdown** command for the **shutdown** command.
 - Repeat Step 4 to write the new configuration to memory. Use the **copy running-config startup-config** command
 - Repeat Step 5 to verify that the interfaces are in the correct state. Use the **show interfaces** command followed by the interface type and interface address of the interface.

For complete descriptions of software configuration commands, refer to the publications listed in the [“Related Documentation”](#) section on page viii.

Performing a Basic Interface Configuration

Following are instructions for a basic configuration, which include enabling an interface, specifying IP routing, and configuring the T3 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 serial interfaces, refer to the appropriate software documentation.

In the following procedure, press the **Return** 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>
```

- Step 1** Enter configuration mode and specify that the console terminal is the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

- Step 2** Specify the first interface to configure by entering the **interface serial** subcommand, followed by the interface address of the interface you plan to configure.

Table 4-4 shows the **interface serial** command syntax for the supported platforms:

Table 4-4 Examples of the interface serial Subcommands for the Supported Platforms

| Platform | Command | Example |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM VIP2 in Catalyst 5000 family switches | interface , followed by the <i>type (serial) slot/port (port-adapter-slot-number/interface-port-number)/t1-line-number:channel-group-number</i> | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in port adapter slot 1. Router(config)# interface serial 1/0/1:1 Router(config-if)# |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | interface , followed by the <i>type (serial) module/bay/port (module-slot-number/port-adapter-bay-number/interface-port-number)/t1-line-number:channel-group-number</i> | The example is for logical channel group 1 on T1 line 1 of the T3 link on interface 0 of a port adapter in port adapter slot 0 in module slot 5. Router(config)# interface serial 5/0/0/1:1 |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | interface , followed by the <i>type (serial) slot/port (port-adapter-slot-number/interface-port-number)/t1-line-number:channel-group-number</i> | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in port adapter slot 1. Router(config)# interface serial 1/0/1:1 Router(config-if)# |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | interface , followed by the <i>type (serial) slot/port (port-adapter-slot-number/interface-port-number)/t1-line-number:channel-group-number</i> | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in port adapter slot 1. Router(config)# interface serial 1/0/1:1 Router(config-if)# |

Table 4-4 Examples of the interface serial Subcommands (continued) for the Supported Platforms (continued)

| Platform | Command | Example |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | interface , followed by the <i>type (serial) slot/port (module-slot-number/interface-port-number)/t1-line-number:channel-group-number</i> | The example is for logical channel group 1 on T1 line 1 of the T3 link on a port adapter on interface 0 in a Cisco 7304 PCI port adapter carrier card in port adapter slot 3 of the Cisco 7304 router. Router (config)# interface serial 3/0/1:1 Router (config-if)# |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | interface , followed by the <i>type (serial) and slot/port adapter/port (interface-processor-slot-number/port-adapter-slot-number/interface-port-number)/t1-line-number:channel-group-number</i> | The example is for logical channel group 1 on T1 line 1 of the T3 link on interface 0 on a port adapter in port adapter slot 1 of a VIP installed in interface processor slot 1. Router (config-if)# interface serial 1/1/0/1:1 Router (config-if)# |

- Step 3** Assign an IP address and subnet mask to the interface (if IP routing is enabled on the system) by using the **ip address** subcommand, as in the following example:

```
Router (config-if)# ip address 10.0.0.0 10.255.255.255
```

- Step 4** Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.
- Step 5** Re-enable the interfaces using the **no shutdown** command. (See the [“Shutting Down an Interface” section on page 4-10.](#))
- Step 6** Configure all additional port adapter interfaces as required.
- Step 7** After including all of the configuration subcommands to complete your configuration, press **Ctrl-Z**—hold down the **Control** key while you press **Z**—or enter **end** or **exit** to exit configuration mode and return to the EXEC command interface prompt.
- Step 8** Write the new configuration to NVRAM as follows:

```
Router# copy running-config startup-config  
[OK]  
Router#
```

This completes the procedure for creating a basic configuration.

Configuring the T3 Controller

This section provides procedures and examples for configuring the T3 controller on the PA-MC-T3, and includes information on the following topics:

- [T3 Controller Configuration Commands, page 4-17](#)
- [Configuring MDL Messages, page 4-18](#)
- [Configuring Idle Patterns, page 4-19](#)
- [Configuring the Loopback Mode for the T3 Controller, page 4-22](#)
- [Configuring the T3 Controller To Enable Remote Loopback, page 4-24](#)
- [Shutting Down the T3 Controller, page 4-25](#)

T3 Controller Configuration Commands

[Table 4-5](#) summarizes T3 controller configuration commands.

Table 4-5 T3 Controller Configuration Commands

| Purpose | Command | Example | Additional Information |
|------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Select a T3 controller | controller t3 <i>slot/port-adapter/port</i> | The example shows a port adapter on a Cisco 7200 series router in port adapter slot 1. Router# controller t3 1/0 | You must enter this command before any other T3 configuration commands. |
| Set the framing type for a T3 controller | framing [c-bit m23 auto-detect] | The example sets c-bit framing. Router(config-controller)# framing c-bit The example sets m23 framing. Router(config-controller)# framing m23 | You can request the PA-MC-T3 to detect the framing type it is to receive from the far end as follows: router(config-controller)# framing auto-detect |

Table 4-5 T3 Controller Configuration Commands (continued)

| Purpose | Command | Example | Additional Information |
|--------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Specify the cable length ¹ | cablelength <i>feet</i> | The example sets cable length. Router(config-controller)# cablelength 40 ² | <i>Feet is a number from 0 to 450.</i> The default value is 49 feet. |
| Set the clock source for the T3 controller | clock source { internal line } | The example instructs a PA-MC-T3 on a VIP in interface processor slot 1 to use a line clock source. Router(config)# controller t3 1/0/0 Router(config-controller)# clock source line The example instructs a PA-MC-T3 on a Cisco 7200 series router to use an internal clock source. Router(config)# controller t3 1/0 Router(config-controller)# clock source internal | |

1. User-specified T3 cable lengths are structured into ranges as follows: 0–49 and 50–450. If you enter a cable length value that falls into one of these ranges, the range within which that applies is used.
2. Since a cable length of 40 is specified, the 0–49 range is used. If you change the cable length to 45, the 0–49 range still applies. Further, if you specify a cable length of 100 and then change it to 200, the 50–450 range applies in each case; therefore, these changes have no effect. Only moving from one range (0–49) to the other range (50–450) has an effect. The actual cable-length number you enter is stored in the configuration file.

Configuring MDL Messages

You can configure Maintenance Data Link (MDL) messages (which are defined in the ANSI T1.107a-1990 specification) on the PA-MC-T3.



Note

MDL messages are only supported when the T3 framing is set for c-bit parity. (See [Table 4-5](#) for T3 controller configuration commands.)

To configure MDL messages, use the commands:

```
mdl { transmit { path | idle-signal | test-signal } | string { eic | lic | fic | unit | pfi | port | generator } string }
```

```
no mdl { transmit { path | idle-signal | test-signal } | string { eic | lic | fic | unit | pfi | port | generator } string }
```

where:

- **eic** is the equipment identification code (up to 10 characters).
- **lic** is the location identification code (up to 11 characters).
- **fic** is the frame identification code (up to 10 characters).
- **unit** is the unit identification code (up to 6 characters).
- **pfi** is the facility identification code to send in the MDL path message (up to 38 characters).

- **port** is the equipment port, which initiates the idle signal, to send in the MDL idle signal message (up to 38 characters).
- **generator** is the generator number to send in the MDL test signal message (up to 38 characters).

Use the **no** form of the **mdl** command to remove MDL messages. The default is that no MDL message is configured.

Table 4-6 summarizes the MDL message configuration controller commands.

Table 4-6 MDL Message Configuration Commands

| Purpose | Command | Example |
|------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------|
| Enable the MDL path message transmission | mdl transmit path | Router(config-controller)# mdl transmit path |
| Enable the MDL idle signal message transmission | mdl transmit idle-signal | Router(config-controller)# mdl transmit idle-signal |
| Enable the MDL test signal message transmission | mdl transmit test-signal | Router(config-controller)# mdl transmit test-signal |
| Enter the equipment identification code | mdl string eic <i>router A</i> | Router(config-controller)# mdl string eic <i>router A</i> |
| Enter the location identification code | mdl string eic <i>router A</i> | Router(config-controller)# mdl string lic <i>test network</i> |
| Enter the frame identification code | mdl string fic <i>building b</i> | Router(config-controller)# mdl string fic <i>building b</i> |
| Enter the unit identification code | mdl string unit <i>abc</i> | Router(config-controller)# mdl string unit <i>abc</i> |
| Enter the facility identification code to send in the MDL path message | mdl string pfi <i>string</i> | Router(config-controller)# mdl string pfi <i>string</i> |
| Enter the port number to send in the MDL idle signal message | mdl string port <i>string</i> | Router(config-controller)# mdl string port <i>string</i> |
| Enter the generator number to send in the MDL test signal message | mdl string generator <i>string</i> | Router(config-controller)# mdl string generator <i>string</i> |

Configuring Idle Patterns

You can set a specific pattern to be transmitted for unused time slots on all T1 lines. Unused time slots are time slots that have not been assigned to any logical channel group on channelized T1 lines. To set an idle pattern, use the controller command:

idle pattern *patterns*

where:

- *patterns* is a hexadecimal number in the range of 0x0 to 0xFF (hexadecimal) or 0 to 255 (decimal); you can enter this value in either hexadecimal or decimal.
- The default idle pattern is 0x7F (or 127).

Table 4-7 shows the hexadecimal **idle pattern** controller command syntax for the supported platforms.

Table 4-7 Examples of Hexadecimal Idle Pattern Commands for the Supported Platforms

| Platform | Purpose | Example |
|-------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | Set a hexadecimal idle pattern | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# idle pattern 0x10 |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | Set a hexadecimal idle pattern | FlexWAN module in interface processor slot 5: Router(config)# controller t3 5/0/0 Router(config-controller)# idle pattern 0x10 |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | Set a hexadecimal idle pattern | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# idle pattern 0x10 |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | Set a hexadecimal idle pattern | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# idle pattern 0x10 |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | Set a hexadecimal idle pattern | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router(config)# controller t3 3/0 Router(config-controller)# idle pattern 0x10 |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | Set a hexadecimal idle pattern | Port adapter on a VIP in interface processor slot 1: Router(config)# controller t3 1/0/0 Router(config-controller)# idle pattern 0x10 |

Table 4-8 shows the decimal **idle pattern** controller command syntax for the supported platforms.

Table 4-8 Examples of Decimal Idle Pattern Commands for the Supported Platforms

| Platform | Purpose | Example |
|-------------------------------------------------------------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | Sets a decimal idle pattern | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# idle pattern 23 |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | Sets a decimal idle pattern | FlexWAN module in interface processor slot 5: Router(config)# controller t3 5/0/0 Router(config-controller)# idle pattern 23 |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | Sets a decimal idle pattern | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# idle pattern 23 |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | Sets a decimal idle pattern | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# idle pattern 23 |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | Sets a decimal idle pattern | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router(config)# controller t3 3/0 Router(config-controller)# idle pattern 23 |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | Sets a decimal idle pattern | Port adapter on a VIP in interface processor slot 1: Router(config)# controller t3 1/0/0 Router(config-controller)# idle pattern 23 |

Configuring the Loopback Mode for the T3 Controller

You can configure the T3 controller for loopback modes using the controller command:

loopback [local | network | remote]

The default is no loopback.

To return the T3 controller to its default condition, use the **no** form of the command:

no loopback

Local loopback simultaneously loops all channels toward the router and loops the T3 link back toward the network. You can use local loopback to diagnose problems with cables between the T3 controller and the central switching office at the T3 link level.

Table 4-9 shows the **loopback local** command syntax for the supported platforms.

Table 4-9 Examples of Local Loopback Mode Commands for the T3 Controller for the Supported Platforms

| Platform | Purpose | Example |
|-------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | Configure the T3 controller for local loopback | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback local |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | Configure the T3 controller for local loopback | Port adapter in a FlexWAN module in interface processor slot 5: Router(config)# controller t3 5/0/0 Router(config-controller)# loopback local |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | Configure the T3 controller for local loopback | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback local |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | Configure the T3 controller for local loopback | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback local |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | Configure the T3 controller for local loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router(config)# controller t3 3/0 Router(config-controller)# loopback local |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | Configure the T3 controller for local loopback | Port adapter on a VIP in interface processor slot 1: Router(config)# controller t3 1/0/0 Router(config-controller)# loopback local |

Table 4-10 shows the **loopback network** command syntax for the supported platforms.

Table 4-10 Examples of Network Loopback Mode Commands for the T3 Controller for the Supported Platforms

| Platform | Purpose | Example |
|-------------------------------------------------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | Configure the T3 controller for network loopback | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback network |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | Configure the T3 controller for network loopback | Port adapter in a FlexWAN module in interface processor slot 5: Router(config)# controller t3 5/0/0 Router(config-controller)# loopback network |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | Configure the T3 controller for network loopback | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback network |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | Configure the T3 controller for network loopback | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback network |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | Configure the T3 controller for network loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router(config)# controller t3 3/0 Router(config-controller)# loopback network |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | Configure the T3 controller for network loopback | Port adapter on a VIP in interface processor slot 1: Router(config)# controller t3 1/0/0 Router(config-controller)# loopback network |

Table 4-11 shows the **loopback remote** command syntax for the supported routers.

Table 4-11 Examples of Remote Loopback Mode Commands for the T3 Controller for Supported Routers

| Platform | Purpose | Example |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | Configure the T3 controller for remote loopback ¹ | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback remote |
| Catalyst 6000 family FlexWAN module and Catalyst 6000 family switches | Configure the T3 controller for remote loopback | Port adapter in a FlexWAN module in interface processor slot 5: Router(config)# controller t3 5/0/0 Router(config-controller)# loopback remote |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | Configure the T3 controller for remote loopback ² | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback remote |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | Configure the T3 controller for remote loopback ³ | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# loopback remote |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | Configure the T3 controller for remote loopback ⁴ | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router(config)# controller t3 3/0 Router(config-controller)# loopback remote |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | Configure the T3 controller for remote loopback | Port adapter on a VIP in interface processor slot 1: Router(config)# controller t3 1/0/0 Router(config-controller)# loopback remote |

1. Remote loopbacks are only available when you use c-bit parity framing.
2. Remote loopbacks are only available when you use c-bit parity framing.
3. Remote loopbacks are only available when you use c-bit parity framing.
4. Remote loopbacks are only available when you use c-bit parity framing.

Configuring the T3 Controller To Enable Remote Loopback

You can configure whether or not the port adapter responds to remote T3 loopback and T1 loopback requests it receives from the remote site using the controller command:

equipment [customer | network] loopback

You can configure the port adapter to respond to remote T3 loopback and T1 loopback requests it receives from the remote site using the **equipment customer loopback** command; you can configure the port adapter to ignore remote T3 and T1 loopback commands using the **equipment network loopback** command.

Shutting Down the T3 Controller

You can shut down the T3 controller on the PA-MC-T3 using the **shutdown** controller command.

This command sends a DS3 idle signal toward the network. You can bring the T3 controller back up with the **no shutdown** controller command.

Table 4-12 shows the T3 controller **shutdown** command syntax for the supported routers.

Table 4-12 Examples of T3 Controller shutdown Commands for Supported Routers

| Platform | Command | Example |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | controller t3 , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number) | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# shutdown |
| Catalyst 6000 family FlexWAN Module in Catalyst 6000 family switches | controller t3 , followed by <i>module/bay/port</i> (module-slot-number/port- adapter-bay-number/interface- port-number) | Port adapter on a FlexWAN module in interface processor slot 5: Router(config)# controller t3 5/0/0 Router(config-controller)# shutdown |
| Cisco 7200 series routers, Cisco 7200 VXR routers, and Cisco uBR7200 series routers | controller t3 , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number) | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# shutdown |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | controller t3 , followed by <i>slot/port</i> (port-adapter-slot-number/ interface-port-number) | Port adapter in slot 1: Router(config)# controller t3 1/0 Router(config-controller)# shutdown |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | controller t3 , followed by the <i>slot/port</i> (module-slot-number/ interface-port-number) | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router(config)# controller t3 3/0 Router(config-controller)# shutdown |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | controller t3 , followed by the <i>slot/port adapter/port</i> (interface-processor-slot-number/ port-adapter-slot-number/ interface-port-number) | Port adapter on a VIP in interface processor slot 1: Router(config)# controller t3 1/0/0 Router(config-controller)# shutdown |

Checking the Configuration

After configuring the T1 lines and T3 controller, use the **show** commands to display the status of the new T1 lines, the T3 controller, and the new interface or all interfaces, and use the **ping** and **loopback** commands to verify network connectivity. This section includes information on the following subsections:

- [Using show Commands to Display New Interface Status, page 4-26](#)
- [Enabling Performance Reports, page 4-41](#)
- [Displaying Remote Performance Reports, page 4-41](#)
- [Using the ping Command to Verify Network Connectivity, page 4-44](#)
- [Using loopback Commands \(t1\), page 4-44](#)

Using show Commands to Display New Interface Status

[Table 4-13](#) demonstrates how you can use **show** commands to verify that the new interfaces are configured and operating correctly and that the PA-MC-T3 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 viii](#).

Table 4-13 Using show Commands

| Command | Function | Example |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| show version show hardware | Displays system hardware configuration, the number of each interface type installed, Cisco IOS software version, names and sources of configuration files, and boot images | Router# show version |
| show controllers | Displays all the current interface processors and their interfaces | Router# show controllers |
| show diag slot Note—The slot argument is not required with Catalyst 5000 family switches. | Displays types of port adapters installed in your system and information about a specific port adapter slot, interface processor slot, or chassis slot | Router# show diag 2 |
| show interfaces type <i>port-adapter-slot-number/interface-port-number/t1-line-number:</i> <i>channel-group-number</i> | Displays status information about a specific type of interface (for example, serial) on a Catalyst RSM/VIP2 | Router# show interfaces serial 1/0/1:0 |
| show interfaces type <i>module-number/port-adapter-bay-number/</i> <i>interface-port-number/t1-line-number:</i> <i>channel-group-number</i> | Displays status information about a specific type of interface (for example, serial) on a Catalyst 6000 family FlexWAN module | Router# show interfaces serial 5/0/0/1:0 |

Table 4-13 Using show Commands (continued)

| Command | Function | Example |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| show interfaces <i>type port-adapter-slot-number//interface-port-number/t1-line-number: channel-group-number</i> | Displays status information about a specific type of interface (for example, serial) in a Cisco 7200 series routers, Cisco 7200 VXR routers, Cisco uBR7200 series, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router | Router# show interfaces serial 1/0/1:0 |
| show interfaces <i>type port-adapter-slot-number//interface-port-number/t1-line-number: channel-group-number</i> | Displays status information about a specific type of interface (for example, serial) on a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router | Router# show interfaces serial 3/0/1:0 |
| show interfaces <i>type interface-processor-slot-number/port-adapter-slot-number/interface-port-number/t1-line-number: channel-group-number</i> | Displays status information about a specific type of interface (for example, serial) on a VIP in a Cisco 7000 series router or Cisco 7500 series router | Router# show interfaces serial 1/0/0/1:0 |
| show controllers t3 | Displays information for all 28 T1 lines within each T3 port adapter in the router | Router# show controllers t3 |
| show controllers t3 <i>slot/port-adapter/port</i> | Displays all information for the specified T3 line. | Router# show controllers t3 |
| show controllers t3 <i>slot/port-adapter/port</i> brief | Displays a list of configurations for all T1 lines within a PA-MC-T3 | The example is for a PA-MC-T3 in port adapter slot 0 on a VIP installed in interface processor slot 1: Router# show controllers t3 1/0/0 brief |
| show controllers t3 <i>slot/port-adapter/port</i> tabular | Displays a list of configurations and MID data in a tabular format for all T1 lines within a PA-MC-T3 | The example is for a PA-MC-T3 in port adapter slot 0 on a VIP installed in interface processor slot 1: Router# show controllers t3 1/0/0 tabular |
| show controllers t3 <i>slot/port-adapter/port</i> remote performance | Displays a list of performance data from the remote end of a T1 connection | The example is for a PA-MC-T3 in port adapter slot 0 on a VIP installed in interface processor slot 1: Router# show controllers t3 1/0/0 remote performance |
| show controllers t3 <i>slot/port-adapter/port/t1-line-number</i> brief | Displays a list of configurations for a specific T1 line within a PA-MC-T3 | The example is for T1 line 1 in port adapter slot 0 on a VIP installed in interface processor slot 1: Router# show controllers t3 1/0/0/1 brief |

Table 4-13 Using show Commands (continued)

| Command | Function | Example |
|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| show controllers t3 <i>slot/port-adapter/port/t1-line-number</i> tabular | Displays a list of configurations and MID data in a tabular format for all T1 lines within a PA-MC-T3 | The example is for T1 line 1 in port adapter slot 0 on a VIP installed in interface processor slot 1: Router# show controllers t2 1/0/0/1 tabular |
| show controllers t3 <i>slot/port-adapter/port/t1-line-number</i> remote performance | Displays a list of performance data from the remote end of a T1 connection | The example is for T1 line 1 in port adapter slot 0 on a VIP installed in interface processor slot 1: Router# show controllers t2 1/0/0/1 remote performance |
| show protocols | Displays protocols configured for the entire system and for specific interfaces | Router# show protocols |
| show running-config | Displays the running configuration file | Router# show running-config |
| show startup-config | Displays the configuration stored in NVRAM | Router# show startup-config |

If an interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network 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 and offers some platform-specific output examples:

- [Using the show version or show hardware Commands, page 4-28](#)
- [Using the show diag Command, page 4-34](#)
- [Using the show interfaces Command, page 4-38](#)

Using the show version or show hardware Commands

Display the configuration of 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.

The following sections provide platform-specific output examples using the **show version** command:

- [Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show version Command, page 4-29](#)
- [Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show version Command, page 4-30](#)
- [Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show version Command, page 4-30](#)
- [Cisco 7201 Router—Example Output of the show version Command, page 4-31](#)
- [Cisco 7401ASR Router—Example Output of the show version Command, page 4-32](#)
- [VIP in Cisco 7500 Series Routers—Example Output of the show version Command, page 4-32](#)

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show version Command

Following is an example of the **show version** command from a Catalyst 5000 family switch with the PA-MC-T3 installed:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) C5RSM Software (c5rsm-jsv-m), Released Version 11.1(20)CC [biff 128]
CE3_branch Synced to mainline version: 11.1(17.3)CA
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Wed 22-Apr-98 15:23 by biff
Image text-base: 0x60010900, data-base: 0x60A56000

ROM: System Bootstrap, Version 11.1(8)CA1, RELEASE SOFTWARE (f)

Router uptime is 18 hours, 38 minutes
System restarted by reload
System image file is "slot1:rsp-jv-mz.111.20", booted via console

cisco RSP4 (R5000) processor with 131072K/2072K bytes of memory.
R5000 processor, Implementation 35, Revision 2.1 (512KB Level 2 Cache)
Last reset from power-on
G.703/E1 software, Version 1.0.
G.703/JT2 software, Version 1.0.
SuperLAT software copyright 1990 by Meridian Technology Corp).
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Primary Rate ISDN software, Version 1.0.
Chassis Interface.
1 VIP2 R5K controller (2 Channelized T3).
56 Serial network interfaces.
2 Channelized T3 ports.
123K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
16384K bytes of Flash PCMCIA card at slot 1 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x100
```

Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show version Command

Following is an example of the **show version** command from a Catalyst 6000 family switch with a PA-MC-T3 installed:

```
Router(config)# show version
Cisco Internetwork Operating System Software
IOS (tm) MSFC Software (C6MSFC-JSV-M), Experimental Version 12.1(20000209:134547)
[amcrae-cosmos_e_nightly 163]
Copyright (c) 1986-2000 by cisco Systems, Inc.
Compiled Wed 09-Feb-00 07:10 by
Image text-base: 0x60008900, data-base: 0x6140E000

ROM: System Bootstrap, Version 12.0(3)XE, RELEASE SOFTWARE

const-uut uptime is 5 minutes
System returned to ROM by reload
System image file is "bootflash:c6msfc-jsv-mz.Feb9"

cisco Cat6k-MSFC (R5000) processor with 122880K/8192K bytes of memory.
Processor board ID SAD03457061
R5000 CPU at 200Mhz, Implementation 35, Rev 2.1, 512KB L2 Cache
Last reset from power-on
Channelized E1, Version 1.0.
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
Primary Rate ISDN software, Version 1.1.
6 FlexWAN controllers (13 Serial)(8 E1)(8 T1)(2 HSSI)(2 ATM)(1 Channelized T3)(1
Channelized E3)(2 POS).
1 Virtual Ethernet/IEEE 802.3 interface(s)
17 Serial network interface(s)
2 HSSI network interface(s)
2 ATM network interface(s)
2 Packet over SONET network interface(s)
1 Channelized T3 port(s)
1 Channelized E3 port(s)
123K bytes of non-volatile configuration memory.
4096K bytes of packet SRAM memory.

16384K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x1
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7200 series router with a PA-MC-T3 installed:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(22)CC [biff 104]
IPATM_CT3_branch Synced to mainline version: 11.1(21.1)CC
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Wed 30-Sep-98 05:45 by biff
Image text-base: 0x600088E0, data-base: 0x60876000

ROM: System Bootstrap, Version 11.1(13)CA, RELEASE SOFTWARE (f)
ROM: 7200 Software (C7200-BOOT-M), Version 11.1(17.5)CC, RELEASE MAINT

7206_1 uptime is 3 days, 19 hours, 4 minutes
```



```

System restarted by reload
System image file is "biff/c7200-j-mz.111_CE.0930", booted via tftp from 224

cisco 7206 (NPE200) processor with 122880K/8192K bytes of memory.
R5000 processor, Implementation 35, Revision 2.1 (512KB Level 2 Cache)
Last reset from power-on
Bridging software.
SuperLAT software copyright 1990 by Meridian Technology Corp).
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).

28 Serial network interfaces.
1 Channelized T3 port.

125K bytes of non-volatile configuration memory.
4096K bytes of packet SRAM memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0

```

Cisco 7201 Router—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7201 router:

```

Router# show version
Cisco IOS Software, 7200 Software (C7200P-ADVENTERPRISEK9-M), Version
12.4(biffDEV.061001), INTERIM SOFTWARE Copyright (c) 1986-2006 by Cisco Systems, Inc.
Compiled Sun 01-Oct-06 23:42 by biff
ROM: System Bootstrap, Version 12.4(4r)XD5, RELEASE SOFTWARE (fc1)
BOOTLDR: Cisco IOS Software, 7200 Software (C7200P-KBOOT-M), Version 12.4(TAZ3DEV.060927),
INTERIM SOFTWARE
c7201alpha1 uptime is 5 days, 18 hours, 32 minutes System returned to ROM by power-on
System image file is "disk0:c7200p-adventerprisek9-mz.2006-10-01.biffdev"
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 7201 (c7201) processor (revision A) with 917504K/65536K bytes of memory.
Processor board ID 222222222222
MPC7448 CPU at 1666Mhz, Implementation 0, Rev 2.2
1 slot midplane, Version 2.255
Last reset from power-on
1 FastEthernet interface
4 Gigabit Ethernet interfaces
2045K bytes of NVRAM.
62443K bytes of USB Flash usbflash0 (Read/Write)
250880K bytes of ATA PCMCIA card at slot 0 (Sector size 512 bytes).
65536K bytes of Flash internal SIMM (Sector size 512K).
Configuration register is 0x2

```

Cisco 7401ASR Router—Example Output of the show version Command

Following is an example of the **show version** command from a Cisco 7401ASR router with a PA-MC-T3 installed:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) 7401ASR Software (C7401ASR-J-M), Version 11.1(22)CC [biff 104]
IPATM_CT3_branch Synced to mainline version: 11.1(21.1)CC
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Wed 30-Sep-98 05:45 by biff
Image text-base: 0x600088E0, data-base: 0x60876000

ROM: System Bootstrap, Version 11.1(13)CA, RELEASE SOFTWARE (f)
ROM: 7401ASR Software (C7401ASR-BOOT-M), Version 11.1(17.5)CC, RELEASE MAINT

7206_1 uptime is 3 days, 19 hours, 4 minutes
System restarted by reload
System image file is "biff/c7401ASR-j-mz.111_CE.0930", booted via tftp from 224

cisco 7206 (NPE200) processor with 122880K/8192K bytes of memory.
R5000 processor, Implementation 35, Revision 2.1 (512KB Level 2 Cache)
Last reset from power-on
Bridging software.
SuperLAT software copyright 1990 by Meridian Technology Corp).
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).

28 Serial network interfaces.
1 Channelized T3 port.

125K bytes of non-volatile configuration memory.
4096K bytes of packet SRAM memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
4096K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

VIP in Cisco 7500 Series Routers—Example Output of the show version Command

Following is an example of the **show version** command from a VIP2 with a PA-MC-T3 installed:

```
Router# show version
Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-JV-M), Released Version 11.1(20)CC [biff 128]
CE3_branch Synced to mainline version: 11.1(17.3)CA
Copyright (c) 1986-1998 by cisco Systems, Inc.
Compiled Wed 22-Apr-98 15:23 by biff
Image text-base: 0x60010900, data-base: 0x60A56000

ROM: System Bootstrap, Version 11.1(8)CA1, RELEASE SOFTWARE (f)

Router uptime is 18 hours, 38 minutes
System restarted by reload
System image file is "slot1:rsp-jv-mz.111.20", booted via console

cisco RSP4 (R5000) processor with 131072K/2072K bytes of memory.
R5000 processor, Implementation 35, Revision 2.1 (512KB Level 2 Cache)
Last reset from power-on
G.703/E1 software, Version 1.0.
G.703/JT2 software, Version 1.0.
SuperLAT software copyright 1990 by Meridian Technology Corp).
```

```

Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Primary Rate ISDN software, Version 1.0.
Chassis Interface.
1 VIP2 R5K controller (2 Channelized T3).
56 Serial network interfaces.
2 Channelized T3 ports.
123K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
16384K bytes of Flash PCMCIA card at slot 1 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x100

```

Following is an example of the **show version** command from a VIP4 with a PA-MC-T3 installed:

```

Router# show version
Cisco Internetwork Operating System Software
IOS (tm) RSP Software (RSP-JV-M), Released Version 12.0(8)S
Copyright (c) 1986-1999 by cisco Systems, Inc.
Compiled Wed 06-Oct-99 14:30 by biff
Image text-base:0x60010900, data-base:0x60FE2000

ROM:System Bootstrap, Version 11.1(2) [nitin 2], RELEASE SOFTWARE (fc1)
BOOTFLASH:RSP Software (RSP-BOOT-M), Released Version 12.0(8)S [biff-vip4-0628 115]

router uptime is 18 hours, 12 minutes
System returned to ROM by reload at 17:21:25 PDT Wed Oct 13 1999
System restarted at 17:25:09 PDT Wed Oct 13 1999

cisco RSP2 (R4600) processor with 65536K/1072K bytes of memory.
R4600 CPU at 100Mhz, Implementation 32, Rev 2.0
Last reset from power-on
G.703/E1 software, Version 1.0.
G.703/JT2 software, Version 1.0.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
Bridging software.
TN3270 Emulation software.
Chassis Interface.
1 EIP controller (6 Ethernet).
2 VIP2 controllers (1 FastEthernet)(2 Fddi).
2 VIP2 R5K controllers (2 Fddi).
1 VIP4 RM7000 controller (1 Serial)(1 Channelized T3).
6 Ethernet/IEEE 802.3 interface(s)
1 FastEthernet/IEEE 802.3 interface(s)
1 Serial network interface(s)
4 FDDI network interface(s)
1 Channelized T3 port(s)
123K bytes of non-volatile configuration memory.

8192K bytes of Flash internal SIMM (Sector size 256K).
No slave installed in slot 7.
Configuration register is 0x0

```

Using the show diag Command

Display the types of port adapters installed in your system (and specific information about each) using the **show diag slot** command, where *slot* is the *port adapter slot* in a Catalyst 5000 family switch, Cisco 7200 series router, Cisco 7200 VXR router, Cisco uBR7200 series router, Cisco 7201 router, Cisco 7301 router, or Cisco 7401ASR router, the *module slot* in a Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router, and the *interface processor slot* in a Cisco 7000 series or Cisco 7500 series router with a VIP. In the FlexWAN module, the **show diag** command is used without the *slot* designation.



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.



Note

The *slot* argument is not required for Catalyst 5000 family switches.

The following sections provide platform-specific output examples using the **show diag** command:

- [Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show diag Command, page 4-34](#)
- [Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show diag Command, page 4-35](#)
- [Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show diag Command, page 4-35](#)
- [Cisco 7201 Router—Example Output of the show diag Command, page 4-36](#)
- [Cisco 7401ASR Router—Example Output of the show diag Command, page 4-36](#)
- [VIP in Cisco 7000 Series Routers and Cisco 7500 Series Routers—Example Output of the show diag Command, page 4-36](#)

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show diag Command

Following is an example of the **show diag** command from a Catalyst RSM/VIP2 with a PA-MC-T3 installed:

```
Router# show diag
Slot 1:
  Physical slot 1, ~physical slot 0xC, logical slot 1, CBus 0
  Microcode Status 0x4
  Master Enable, LED, WCS Loaded
  Board is analyzed
  Pending I/O Status: None
  EEPROM format version 1
  C5IP controller, HW rev 2.01, board revision B0
  Serial number: 06747787 Part number: 73-2167-03
  Test history: 0x00 RMA number: 00-00-00
  Flags: cisco 7000 board; 7500 compatible

  EEPROM contents (hex):
    0x20: 01 1E 02 01 00 66 F6 8B 49 08 77 03 00 00 00 00
    0x30: 58 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

  Slot database information:
  Flags: 0x4 Insertion time: 0x1B50 (19:07:47 ago)
```

Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show diag Command

Following is an example of the **show diag** command from a Catalyst 6000 family FlexWAN module with a PA-MC-T3 installed:

```
Router# show diag

(Additional displayed text omitted from this example.)

Slot 7: Logical_index 14
Board is analyzed ipc ready FlexWAN controller

Slot database information:
Flags: 0x2004Insertion time: unknown

CWAN Controller Memory Size: Unknown

PA Bay 0 Information:
  CT3 single wide PA, 1 port
  EEPROM format version 0
  HW rev 0.00, Board revision UNKNOWN
  Serial number: 00000000 Part number: 00-0000-00
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command from a Cisco 7200 series router with a PA-MC-T3 installed:

```
Router# show diag 1
Slot 1:
  CT3 single wide port adapter, 1 port
  Port adapter is analyzed
  Port adapter insertion time 00:03:24 ago
  Hardware revision 1.0          Board revision A0
  Serial number      8526482     Part number    73-3037-01
  Test history       0x0         RMA number     00-00-00
  EEPROM format version 1
  EEPROM contents (hex):
    0x20: 01 A0 01 00 00 82 1A 92 49 0B DD 01 00 00 00 00
    0x30: 05 00 00 00 98 04 27 00 00 00 00 00 00 00 00 00
```

Use additional **show** commands, which display interface and controller information, to verify the success of your PA-MC-T3 port adapter installation and configuration.

Cisco 7201 Router—Example Output of the show diag Command

Following is an example of the **show diag** command from a Cisco 7201 router:

```
Router# show diag 1
Slot 1:
Dual OC3 POS Port adapter, 2 ports
Port adapter is analyzed
Port adapter insertion time 00:02:19 ago
EEPROM contents at hardware discovery:
Hardware Revision : 1.0
PCB Serial Number : JAE07520DYL
Part Number : 73-8220-02
Board Revision : A0
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
Deviation Number : 0
Product (FRU) Number : PA-POS-20C3
Top Assy. Part Number : 800-21857-02
EEPROM format version 4
EEPROM contents (hex):
0x00: 04 FF 40 03 E3 41 01 00 C1 8B 4A 41 45 30 37 35
0x10: 32 30 44 59 4C 82 49 20 1C 02 42 41 30 03 00 81
0x20: 00 00 00 00 04 00 88 00 00 00 00 CB 94 50 41 2D
0x30: 50 4F 53 2D 32 4F 43 33 20 20 20 20 20 20 20 20
0x40: 20 C0 46 03 20 00 55 61 02 FF FF FF FF FF FF FF
0x50: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x60: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x70: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

Cisco 7401ASR Router—Example Output of the show diag Command

Following is an example of the **show diag** command from a Cisco 7401ASR router with a PA-MC-T3 installed:

```
Router# show diag 1
Slot 1:
CT3 single wide port adapter, 1 port
Port adapter is analyzed
Port adapter insertion time 00:03:24 ago
Hardware revision 1.0          Board revision A0
Serial number      8526482     Part number      73-3037-01
Test history       0x0         RMA number       00-00-00
EEPROM format version 1
EEPROM contents (hex):
0x20: 01 A0 01 00 00 82 1A 92 49 0B DD 01 00 00 00 00
0x30: 05 00 00 00 98 04 27 00 00 00 00 00 00 00 00
```

VIP in Cisco 7000 Series Routers and Cisco 7500 Series Routers—Example Output of the show diag Command

Following is an example of the **show diag** command from a VIP2 with a PA-MC-T3 installed:

```
Router# show diag 3
Slot 3:
Physical slot 3, ~physical slot 0xC, logical slot 3, CBus 0
Microcode Status 0x4
Master Enable, LED, WCS Loaded
Board is analyzed
Pending I/O Status: None
EEPROM format version 1
```

```

VIP2 R5K controller, HW rev 2.01, board revision B0
Serial number: 06747787 Part number: 73-2167-03
Test history: 0x00 RMA number: 00-00-00
Flags: cisco 7000 board; 7500 compatible

EEPROM contents (hex):
  0x20: 01 1E 02 01 00 66 F6 8B 49 08 77 03 00 00 00 00
  0x30: 58 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

Slot database information:
Flags: 0x4 Insertion time: 0x1B50 (19:07:47 ago)

Controller Memory Size: 64 MBytes DRAM, 8192 KBytes SRAM

PA Bay 0 Information:
  CT3 single wide PA, 1 port
  EEPROM format version 1
  HW rev 1.00, Board revision UNKNOWN
  Serial number: 07503345 Part number: 73-3037-01

PA Bay 1 Information:
  CT3 single wide PA, 1 port
  EEPROM format version 1
  HW rev 1.00, Board revision UNKNOWN
  Serial number: 07503343 Part number: 73-3037-01

```

Following is an example of the **show diag** command from a VIP4 with a PA-MC-T3 installed:

```

Router# show diag 8
Slot 8:
Physical slot 8, ~physical slot 0x7, logical slot 8, CBus 0
Microcode Status 0x4
Master Enable, LED, WCS Loaded
Board is analyzed
Pending I/O Status:None
EEPROM format version 2
VIP4 RM7000 controller, HW rev 2.01, board revision UNKNOWN
Serial number:11500489 Part number:211-18700-71
Test history:0x02 RMA number:00-00-00
Flags: unknown flags 0x7F; 7500 compatible

EEPROM contents (hex):
  0x20:02 22 02 01 00 AF 7B C9 D3 49 0C 47 02 00 00 00
  0x30:02 3A 0C FF FF FF FF FF FF FF FF FF FF FF FF FF

Slot database information:
Flags:0x4 Insertion time:0x3E6C96C (00:01:19 ago)

Controller Memory Size:64 MBytes DRAM, 65536 KBytes SRAM

PA Bay 0 Information:
  CT3 single wide PA, 1 port
  EEPROM format version 1
  HW rev 1.00, Board revision A0
  Serial number:13345087 Part number:73-3037-01

PA Bay 1 Information:
  T3+ Serial PA, 1 ports
  EEPROM format version 1
  HW rev 1.00, Board revision B0
  Serial number:12374558 Part number:

```

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 individual platforms, refer to the publications listed in the “[Related Documentation](#)” section on [page viii](#).



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 sections provide platform-specific output examples using the **show interfaces** command:

- [Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show interfaces Command, page 4-38](#)
- [Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show interfaces Command, page 4-39](#)
- [Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show interfaces Command, page 4-39](#)
- [Cisco 7201 Router—Example Output of the show interfaces Command, page 4-40](#)
- [Cisco 7401ASR Router—Example Output of the show interfaces Command, page 4-40](#)
- [VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show interfaces Command, page 4-41](#)

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show interfaces Command

Following is an example of the **show interfaces serial** command from a Catalyst RSM/VIP2 with a PA-MC-T3 in port adapter slot 1:

```
Router# show interfaces serial 1/0/1:0
Serial1/0/1:0 is up, line protocol is up
  Hardware is cyBus T3
  Internet address is 1.1.1.1/24
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 19:04:01, output 12:49:52, output hang never
  Last clearing of "show interface" counters 13:09:09
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    18722 packets input, 2134308 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    82 input errors, 0 CRC, 0 frame, 82 overrun, 0 ignored, 0 abort
    18722 packets output, 2134308 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffers copied, 0 interrupts, 0 failures
    8 carrier transitions no alarm present
  Timeslot(s) Used: 1-24, Transmitter delay is 0 flags, transmit queue length 5
  non-inverted data
```


Catalyst 6000 Family FlexWAN Module in Catalyst 6000 Family Switches—Example Output of the show interfaces Command

Following is an example of the **show interfaces serial** command with a Catalyst 6000 family FlexWAN module in slot 5, and a PA-MC-T3 port adapter in port adapter slot 0:

```
Router# show interfaces serial 5/0/0/1:0
Serial5/0/0/1:0 is down, line protocol is down
Hardware is T3
MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec,
  reliability 255/255, txload 1/255, rxload 1/255
Encapsulation HDLC, crc 16, loopback not set
Keepalive not set
Last input never, output never, output hang never
Last clearing of "show interface" counters never
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  0 packets input, 0 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
  0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
  0 packets output, 0 bytes, 0 underruns
  0 output errors, 0 collisions, 2 interface resets
  0 output buffer failures, 0 output buffers swapped out
  0 carrier transitions alarm present
Timeslot(s) Used: 1-24, Transmitter delay is 0 flags, transmit queue length 999
non-inverted data
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show interfaces Command

Following is an example of the **show interfaces serial** command from a Cisco 7200 series router with a PA-MC-T3 in slot 1:

```
Router# show interfaces serial 1/0/1:0
Serial1/0/1:0 is up, line protocol is up
Hardware is cyBus T3
Internet address is 1.1.1.1/24
MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 1/255
Encapsulation HDLC, loopback not set, keepalive not set
Last input 19:04:01, output 12:49:52, output hang never
Last clearing of "show interface" counters 13:09:09
Queueing strategy: fifo
Output queue 0/40, 0 drops; input queue 0/75, 0 drops
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
  18722 packets input, 2134308 bytes, 0 no buffer
  Received 0 broadcasts, 0 runts, 0 giants
  82 input errors, 0 CRC, 0 frame, 82 overrun, 0 ignored, 0 abort
  18722 packets output, 2134308 bytes, 0 underruns
  0 output errors, 0 collisions, 0 interface resets
  0 output buffers copied, 0 interrupts, 0 failures
  8 carrier transitions no alarm present
Timeslot(s) Used: 1-24, Transmitter delay is 0 flags, transmit queue length 5
non-inverted data
```

Cisco 7201 Router—Example Output of the show interfaces Command

Following is an example of the **show interfaces** command from a Cisco 7201 router:

```
Router# show interfaces
GigabitEthernet0/0 is up, line protocol is up
  Hardware is MV64460 Internal MAC, address is 0019.56c5.2adb (bia
0019.56c5.2adb)
  Internet address is 209.165.200.225
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
    reliability 255/255, txload 1/255, rxload 45/255
  Encapsulation ARPA, loopback not set
  Keepalive set (10 sec)
  Full-duplex, 1000Mb/s, media type is RJ45
  output flow-control is XON, input flow-control is XON
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:07:03, output 00:00:07, output hang never
  Last clearing of "show interface" counters 00:00:04
  Input queue: 0/75/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 180240000 bits/sec, 430965 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    2222975 packets input, 133378500 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
    0 watchdog, 0 multicast, 0 pause input
    0 input packets with dribble condition detected
    0 packets output, 0 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 babbles, 0 late collision, 0 deferred
    0 lost carrier, 0 no carrier, 0 pause output
    0 output buffer failures, 0 output buffers swapped out
```

Cisco 7401ASR Router—Example Output of the show interfaces Command

Following is an example of the **show interfaces serial** command from a Cisco 7401ASR router with a PA-MC-T3 in slot 1:

```
Router# show interfaces serial 1/0/1:0
Serial1/0/1:0 is up, line protocol is up
  Hardware is cyBus T3
  Internet address is 1.1.1.1/24
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 19:04:01, output 12:49:52, output hang never
  Last clearing of "show interface" counters 13:09:09
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    18722 packets input, 2134308 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    82 input errors, 0 CRC, 0 frame, 82 overrun, 0 ignored, 0 abort
    18722 packets output, 2134308 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffers copied, 0 interrupts, 0 failures
    8 carrier transitions no alarm present
  Timeslot(s) Used: 1-24, Transmitter delay is 0 flags, transmit queue length 5
  non-inverted data
```

VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show interfaces Command

Following is an example of the **show interfaces serial** command with a VIP2 in interface processor slot 1, and a PA-MC-T3 in port adapter slot 0:

```
Router# show interfaces serial 1/0/0/1:0
Serial1/0/0/1:0 is up, line protocol is up
  Hardware is cyBus T3
  Internet address is 1.1.1.1/24
  MTU 1500 bytes, BW 1536 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 19:04:01, output 12:49:52, output hang never
  Last clearing of "show interface" counters 13:09:09
  Queueing strategy: fifo
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    18722 packets input, 2134308 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants
    82 input errors, 0 CRC, 0 frame, 82 overrun, 0 ignored, 0 abort
    18722 packets output, 2134308 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffers copied, 0 interrupts, 0 failures
    8 carrier transitions no alarm present
  Timeslot(s) Used: 1-24, Transmitter delay is 0 flags, transmit queue length 5
  non-inverted data
```

Enabling Performance Reports

To enable and disable 1-second transmissions of performance reports through the facility data link (per ANSI T1.403 specification), you must use the following command on both ends of the connection:

```
t1 t1-line-number fdl ansi
```

where: *t1-line-number* is 1 to 28.



Note

You can use this command *only* when the T1 framing is ESF. Use the **no** form of the command to disable remote performance reports.

Displaying Remote Performance Reports

To display remote (far-end) performance data, use the following command:

```
show controllers t3 1/0/0/1 remote performance.
```

The following sections provide platform-specific output examples using the **show controllers t3 remote performance** command:

- [Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show controller t3 remote performance Command, page 4-42](#)
- [Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show controller t3 remote performance Command, page 4-42](#)
- [VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show controller t3 remote performance Command, page 4-43](#)

Catalyst RSM/VIP2 in Catalyst 5000 Family Switches—Example Output of the show controller t3 remote performance Command

Following is an example of the **show controllers t3 remote performance** command from a Catalyst RSM/VIP2 with a port adapter in slot 1:

```
Router# show controllers t3 1/0/1 remote performance
T3 1/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.0, CT3 ROM Version: 1.1, CT3 F/W Version: 0.23.0
FREEDM version: 1

T1 1 - Remote Performance Data
Data in current interval (356 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
Data in Interval 1:
  1 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  2 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
Data in Interval 2:
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
Total Data (last 2 15 minute intervals):
  1 Path Code Violations
  1 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
  2 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
T1 2 - Remote Performance Data
.
.
.
(additional displayed text not shown)
```



Note

If you do not first enable remote performance data with the **t1 t1-line-number fdl ansi** command, the following is displayed:

```
T1 1 - Remote Performance Data (Not available)
```

Cisco 7200 Series Routers, Cisco 7200 VXR Routers, and Cisco uBR7200 Series Routers—Example Output of the show controller t3 remote performance Command

Following is an example of the **show controllers t3 remote performance** command from a Cisco 7200 series router with a port adapter in slot 1:

```
Router# show controllers t3 1/0 remote performance
T3 1/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version :1.0.1, CT3 ROM Version :1.1, CT3 F/W Version :2.0.1
FREEDM version:1, reset 0

T1 1 - Remote Performance Data
Data in current interval (640 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs

T1 2 - Remote Performance Data
```

```

Data in current interval (640 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
T1 3 - Remote Performance Data
Data in current interval (7 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs

T1 4 - Remote Performance Data (Not available)

T1 5 - Remote Performance Data (Not available)

T1 6 - Remote Performance Data (Not available)
.
.
.
(additional displayed text not shown)

```

**Note**

If you do not first enable remote performance data with the **t1 t1-line-number fdl ansi** command, the following is displayed:

```
T1 1 - Remote Performance Data (Not available)
```

VIP in Cisco 7000 Series Routers or Cisco 7500 Series Routers—Example Output of the show controller t3 remote performance Command

Following is an example of the **show controllers t3 remote performance** command from a Cisco 7500 series router with a VIP2 in interface processor slot 1 and a port adapter in port adapter slot 0:

```

Router# show controllers t3 1/0/0/1 remote performance
T3 1/0/0 is up. Hardware is CT3 single wide port adapter
CT3 H/W Version : 1.0.0, CT3 ROM Version: 1.1, CT3 F/W Version: 0.23.0
FREEDM version: 1

T1 1 - Remote Performance Data
Data in current interval (356 seconds elapsed):
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
Data in Interval 1:
  1 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  2 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
Data in Interval 2:
  0 Line Code Violations, 0 Path Code Violations
  0 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins
  0 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
Total Data (last 2 15 minute intervals):
  1 Path Code Violations
  1 Slip Secs, 0 Fr Loss Secs, 0 Line Err Secs, 0 Degraded Mins,
  2 Errored Secs, 0 Bursty Err Secs, 0 Severely Err Secs
  0 Unavail Secs
T1 2 - Remote Performance Data
.

```

```
.
.
(additional displayed text not shown)
```



Note

If you do not first enable remote performance data with the **t1 t1-line-number fdl ansi** command, the following is displayed:

```
T1 1 - Remote Performance Data (Not available)
```

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 viii](#) for detailed command descriptions and examples.

The **ping** command sends echo requests 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 that a bad connection.

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

```
Router# ping 10.0.0.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, 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 next section, [“Using loopback Commands \(t1\)”](#), to finish checking network connectivity.

Using loopback Commands (t1)

With the loopback test, you can detect and isolate equipment malfunctions by testing the connection between the PA-MC-T3 interface and a remote device such as a modem or a CSU/DSU. 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 or compact serial cable. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device or compact serial cable in the path of the loopback test.



Note

You must configure a clock rate on the port *before* performing a loopback test. However, if no cable is attached to the port, the port is administratively up, and the port is in loopback mode; you do not have to configure a clock rate on the port *before* performing a loopback test.

Specify loopback for a T1 line using the following command:

```
t1 t1-line-number loopback [local | network {line | payload} | remote {line {fdl {ansi | bellcore} | inband} | payload [fdl] [ansi]}]
```

where: *t1-line-number* is 1 to 28.



Note

This command requires that you are in T3 controller mode.

Explanations of specific loopback modes are as follows:

| | |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| local | (Optional.) Loops the router output data back toward the router at the T1 framer and sends an AIS signal out toward the network. |
| network { line payload } | (Optional.) Loops the data back toward the network before the T1 framer and automatically sets a local loopback at the HDLC controllers (line) or loops the payload data back toward the network at the T1 framer and automatically sets a local loopback at the HDLC controllers (payload). |
| remote line fdl { ansi bellcore } | (Optional.) Sends a repeating, 16-bit ESF data link code word (00001110 11111111 for ANSI; 00010010 11111111 for Bellcore) to the remote end, requesting that it enter into a network line loopback. Specify the ansi keyword to enable the remote line facility data link (FDL) ANSI bit loopback on the T1 channel, per the ANSI T1.403 specification. Specify the bellcore keyword to enable the remote SmartJack loopback on the T1 channel, per the TR-TSY-000312 specification. |
| remote line inband | (Optional.) Sends a repeating, 5-bit inband pattern (00001) to the remote end, requesting that it enter into a network line loopback. |
| remote payload [fdl] [ansi] | (Optional.) Sends a repeating, 16-bit ESF data link code word (00010100 11111111) to the remote end, requesting that it enter into a network payload loopback. Enables the remote payload Facility Data Link (FDL) ANSI bit loopback on the T1 channel. You can optionally specify fdl and ansi , but it is not necessary. |

Table 4-14 provides examples of **t1 loopback local** commands for the supported platforms.

Table 4-14 Examples of t1 loopback local Commands for the Supported Platforms

| Platform | Command | Purpose | Example |
|------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | loopback local | Sets the first T1 line into local loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback local |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | loopback local | Sets the first T1 line into local loopback | Port adapter in a FlexWAN module in interface processor slot 5: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 5/0/0 Router(config-controller)# t1 1 loopback local |
| Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 series routers | loopback local | Sets the first T1 line into local loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback local |
| Cisco7201 router, Cisco 7301 router, and Cisco 7401ASR router | loopback local | Sets the first T1 line into local loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback local |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | loopback local | Sets the first T1 line into local loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 3/0 Router(config-controller)# t1 1 loopback local |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | loopback local ¹ | Sets the first T1 line into local loopback | Port adapter on a VIP in interface processor slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0/0 Router(config-controller)# t1 1 loopback local |

1. Local loopback loops the router output data back toward the router at the T1 framer and send an AIS out toward the network.

Table 4-15 provides examples of **t1 loopback network line** commands for the supported platforms.

Table 4-15 Examples of t1 loopback network line Commands for the Supported Platforms

| Platform | Command | Purpose | Example |
|------------------------------------------------------------------------------------|------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | loopback network line¹ | Sets the first T1 line into network line loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback network line |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | loopback network line | Sets the first T1 line into network line loopback | Port adapter in a FlexWAN module in interface processor slot 5: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 5/0/0 Router(config-controller)# t1 1 loopback network line |
| Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 series routers | loopback network line² | Sets the first T1 line into network line loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback network line |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | loopback network line³ | Sets the first T1 line into network line loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback network line |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | loopback network line⁴ | Sets the first T1 line into network line loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 3/0 Router(config-controller)# t1 1 loopback network line |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | loopback network line | Sets the first T1 line into network line loopback | Port adapter on a VIP in interface processor slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0/0 Router(config-controller)# t1 1 loopback network line |

1. Network line loopback loops the data back toward the network (before the T1 framer).

2. Network line loopback loops the data back toward the network (before the T1 framer).
3. Network line loopback loops the data back toward the network (before the T1 framer).
4. Network line loopback loops the data back toward the network (before the T1 framer).

Table 4-16 provides examples of **t1 loopback network payload** commands for the supported platforms.

Table 4-16 Examples of t1 loopback network payload Commands for the Supported Platforms

| Platform | Command | Purpose | Example |
|------------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | loopback network payload¹ | Sets the first T1 line into network payload loopback | Port adapter in slot 1: <pre>Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback network payload</pre> |
| Catalyst 6000 family FlexWAN module with Catalyst 6000 family switches | loopback network payload | Sets the first T1 line into network payload loopback | Port adapter on a FlexWAN module in interface processor slot 5: <pre>Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 5/0/0 Router(config-controller)# t1 1 loopback network payload</pre> |
| Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 series routers | loopback network payload² | Sets the first T1 line into network payload loopback | Port adapter in slot 1: <pre>Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback network payload</pre> |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | loopback network payload³ | Sets the first T1 line into network payload loopback | Port adapter in slot 1: <pre>Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback network payload</pre> |

Table 4-16 Examples of t1 loopback network payload Commands for the Supported Platforms (continued)

| Platform | Command | Purpose | Example |
|-----------------------------------------------------------------|----------------------------------------------|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | loopback network payload ⁴ | Sets the first T1 line into network payload loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 3/0 Router(config-controller)# t1 1 loopback network payload |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | loopback network payload | Sets the first T1 line into network payload loopback | Port adapter on a VIP in interface processor slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0/0 Router(config-controller)# t1 1 loopback network payload |

1. Network payload loopback loops just the payload data back toward the network at the T1 framer.
2. Network payload loopback loops just the payload data back toward the network at the T1 framer.
3. Network payload loopback loops just the payload data back toward the network at the T1 framer.
4. Network payload loopback loops just the payload data back toward the network at the T1 framer.

Table 4-17 provides examples of **t1 loopback remote line inband** commands for the supported platforms.

Table 4-17 Examples of t1 loopback remote line inband Commands for the Supported Platforms

| Platform | Command | Purpose | Example |
|----------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | loopback remote line inband ¹ | Sets the first T1 line into remote line inband loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote line inband |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | loopback remote line inband | Sets the first T1 line into remote line inband loopback | Port adapter on a FlexWAN module in interface processor slot 5: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 5/0/0 Router(config-controller)# t1 1 loopback remote line inband |

Table 4-17 Examples of t1 loopback remote line inband Commands for the Supported Platforms (continued)

| Platform | Command | Purpose | Example |
|------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 series routers | loopback remote line inband² | Sets the first T1 line into remote line inband loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote line inband |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | loopback remote line inband³ | Sets the first T1 line into remote line inband loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote line inband |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | loopback remote line inband⁴ | Sets the first T1 line into remote line inband loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 3/0 Router(config-controller)# t1 1 loopback remote line inband |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | loopback remote line inband | Sets the first T1 line into remote line inband loopback | Port adapter on a VIP in interface processor slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0/0 Router(config-controller)# t1 1 loopback remote line inband |

1. Remote line inband loopback sends a repeating 5-bit inband pattern (of 00001) to the remote end, requesting that it enter into a network line loopback.
2. Remote line inband loopback sends a repeating 5-bit inband pattern (of 00001) to the remote end, requesting that it enter into a network line loopback.
3. Remote line inband loopback sends a repeating 5-bit inband pattern (of 00001) to the remote end, requesting that it enter into a network line loopback.
4. Remote line inband loopback sends a repeating 5-bit inband pattern (of 00001) to the remote end, requesting that it enter into a network line loopback.

Table 4-18 provides examples of **t1 loopback remote line fdl ansi** commands for the supported platforms.

Table 4-18 Examples of **t1 loopback remote line fd1 ansi** Commands for the Supported Platforms

| Platform | Command | Purpose | Example |
|------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | loop remote line fdl ansi¹ | Sets the first T1 line into remote line FDL ANSI bit loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote line fdl ansi |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | loop remote line fdl ansi | Sets the first T1 line into remote line FDL ANSI bit loopback | Port adapter in a FlexWAN module in interface processor slot 5: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 5/0/0 Router(config-controller)# t1 1 loopback remote line fdl ansi |
| Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 series routers | loop remote line fdl ansi² | Sets the first T1 line into remote line FDL ANSI bit loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote line fdl ansi |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | loop remote line fdl ansi³ | Sets the first T1 line into remote line FDL ANSI bit loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote line fdl ansi |
| Cisco 7304 PCI port adapter carrier card in a Cisco 7304 router | loop remote line fdl ansi⁴ | Sets the first T1 line into remote line FDL ANSI bit loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 3/0 Router(config-controller)# t1 1 loopback remote line fdl ansi |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | loop remote line fdl ansi | Sets the first T1 line into remote line FDL ANSI bit loopback | Port adapter on a VIP in interface processor slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0/0 Router(config-controller)# t1 1 loopback remote line fdl ansi |

1. Remote line FDL ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0000111011111111) to the remote end, requesting that it enter into a network line loopback.
2. Remote line FDL ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0000111011111111) to the remote end, requesting that it enter into a network line loopback.
3. Remote line FDL ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0000111011111111) to the remote end, requesting that it enter into a network line loopback.
4. Remote line FDL ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0000111011111111) to the remote end, requesting that it enter into a network line loopback.

Table 4-19 provides examples of **t1 loopback remote payload fdl ansi** commands for the supported platforms.

Table 4-19 Examples of t1 loopback remote payload fdl ansi Commands for the Supported Platforms

| Platform | Command | Purpose | Example |
|------------------------------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Catalyst RSM/VIP2 in Catalyst 5000 family switches | loopback remote payload fdl ansi¹ | Sets the first T1 line into remote payload FDL ANSI bit loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote payload fdl ansi |
| Catalyst 6000 family FlexWAN module in Catalyst 6000 family switches | loopback remote payload fdl ansi | Sets the first T1 line into remote payload FDL ANSI bit loopback | Port adapter on a FlexWAN module in interface processor slot 5: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 5/0/0 Router(config-controller)# t1 1 loopback remote payload fdl ansi |
| Cisco 7200 series routers, Cisco 7200 VXR routers, or Cisco uBR7200 series routers | loopback remote payload fdl ansi² | Sets the first T1 line into remote payload FDL ANSI bit loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote payload fdl ansi |
| Cisco 7201 router, Cisco 7301 router, and Cisco 7401ASR router | loopback remote payload fdl ansi³ | Sets the first T1 line into remote payload FDL ANSI bit loopback | Port adapter in slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0 Router(config-controller)# t1 1 loopback remote payload fdl ansi |

Table 4-19 Examples of t1 loopback remote payload fdl ansi Commands for the Supported Platforms (continued)

| Platform | Command | Purpose | Example |
|-----------------------------------------------------------------|-----------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cisco 7304 PCI Port Adapter Carrier Card in a Cisco 7304 router | loopback remote payload fdl ansi⁴ | Sets the first T1 line into remote payload FDL ANSI bit loopback | Port adapter in a Cisco 7304 PCI port adapter carrier card in slot 3 of the Cisco 7304 router: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 3/0 Router(config-controller)# t1 1 loopback remote payload fdl ans |
| VIP in Cisco 7000 series routers or Cisco 7500 series routers | loopback remote payload fdl ansi | Sets the first T1 line into remote payload FDL ANSI bit loopback | Port adapter on a VIP in interface processor slot 1: Router# configure terminal Enter configuration commands, one per line. End with CNTL/Z. Router(config)# controller t3 1/0/0 Router(config-controller)# t1 1 loopback remote payload fdl ansi |

1. Remote payload ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0001010011111111) to the remote end, requesting that it enter into a network payload loopback.
2. Remote payload ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0001010011111111) to the remote end, requesting that it enter into a network payload loopback.
3. Remote payload ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0001010011111111) to the remote end, requesting that it enter into a network payload loopback.
4. Remote payload ANSI bit loopback sends a repeating 16-bit ESF data link code word (of 0001010011111111) to the remote end, requesting that it enter into a network payload loopback.

