CISCO SYSTEMS

Cisco 7304 6-Port Clear Channel E3 Line Card with DSU
Installation and Configuration

Product Number: 7300-6E3
Platform Supported: Cisco 7304

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Cisco 7304 6-Port Clear Channel E3 Line Card Installation and Configuration

C O N T E N T S

Preface

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

Objectives

This document describes how to install and configure the clear channel 6-port E3 with DSU line card (7300-6E3[=]), hereafter referred to as the 6E3 line card, which is used in the Cisco 7304 router.

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

Organization

This document contains the following chapters:

Section	Title	Description
Chapter 1	Overview	Describes the 6E3 line card 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 Line Cards	Describes the procedures for installing and removing the 6E3 line card in the supported platform.
Chapter 4	Configuring the 6E3 Line Card	Provides instructions for configuring the 6E3 line card on the supported platform.

Related Documentation

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

- Cisco IOS software

    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.
    Translated documentation is available at the following URL:

    http://www.cisco.com/public/countries_languages.shtml.

- Cisco 7304 router:
    - For hardware installation and maintenance information, refer to the *Cisco 7304 Router Installation and Configuration Guide*
    - *Cisco 7304 Router Quick Start Guide*

- For international agency compliance, safety, and statutory information for WAN interfaces:
    - *Site Preparation and Safety Guide*
    - *Regulatory Compliance and Safety Information for the Cisco 7304 Internet Router*

- The *Cisco Information Packet* that shipped with your router.

Obtaining Documentation

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Cisco.com

You can access the most current Cisco documentation at this URL:

http://www.cisco.com/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

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Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

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Cisco Technical Support Website

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http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool automatically provides recommended solutions. If your issue is not resolved using the recommended resources, your service request will be assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553 2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is "down," or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

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- The Cisco *Product Catalog* describes the networking products offered by Cisco Systems, as well as ordering and customer support services. Access the Cisco Product Catalog at this URL:

  http://cisco.com/univercd/cc/td/doc/pcat/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

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- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

C H A P T E R 1

Overview

This chapter describes the 6E3 line card and contains the following sections:

Line Card Overview

The 6E3 line card provides a six port E3 single slot interface for the Cisco 7304 platform. This card provides direct customer IP access or network-to-network connections where copper E3 is the only service to a remote point of presence (POP).

The 6E3 line card:

- Provides high performance routing and connectivity with up to 34 Mbps per port
- Supports online insertion and removal (OIR)
- Provides an integrated data service unit (DSU)

Figure 1-1   *6-Port Clear Channel E3 Line Card*
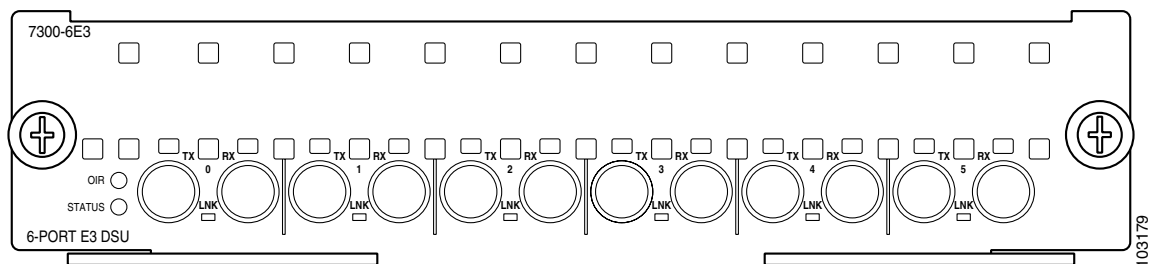
Features

The 6E3 line card provides the following features:

- Single-wide line card for the Cisco 7304 router

- Six independent E3 ports

- Serial encapsulation protocols:

  - High-Level Data Link Control (HDLC) data (default)

  - Point-to-point protocol (PPP)

  - Frame Relay

- E3 support:

  - Framing control (g751)

  - Clocking modes (local and line)

  - Local (diagnostic), DTE, network (line) and network (payload) loopback

- Integrated data service unit (DSU) functionality

- Channels are configurable to:

  - Provide payload scrambling for any two (Digital Link and Kentrox) supported third party DSU vendor modes as well as the default Cisco mode

  - Allow fractional E3 transmission (subrate) for any of two (Digital Link and Kentrox) supported third party DSU vendor modes as well as the default Cisco mode

- Support for 16- and 32-bit cyclic redundancy checks (CRCs)

- Support for DS3 MIB (RFC 1407)

- Supports receive and transmit alarm processing:

  - Remote alarm indication (RAI)

  - Framing errors, loss of frame (LOF)

  - Loss of signal (LOS)

  - Alarm indication signal (AIS)

- Performance and error counters

- TX and RX data inversion

- B3ZS line coding

- Maintenance data link (MDL) messages

- Bit error rate testing

Interoperability Guidelines for 6E3 Line Card DSUs

The 6E3 line card supports several types of integrated data service units (DSUs). Table 1-1 lists the feature compatibilities of 6E3 line card DSUs.

Table 1-1   Feature Compatibilities of 6E3 Line Card DSUs

DSU	Full Rate Support	Scrambling Support	Subrate Support	MDL[1] Support
DL3100[2]	Yes	Yes	Yes	No
Kentrox	Yes	Yes[3]	Yes[2]	No

1. MDL (maintenance data link)

2. See the "DSU Link Doesn't Work" section on page 4-20 for information about no ping response. Also see the release notes for Cisco IOS Release 12.2(20)S

3. The 6E3 line card supports scrambling and Kentrox subrate at the same time.

Maintenance Data Link Messages

E3 maintenance data link (MDL) messages are used to communicate identification information between local and remote ports. The type of information included in MDL messages includes the equipment identification code (EIC), location identification code (LIC), frame identification code (FIC), unit, Path Facility Identification (PFI), port number, and Generator Identification numbers. The values for each piece of MDL message identification can be defined only by a network administrator and are discussed in ANSI T1.107.

For information on transporting MDL messages between source and destination E3 ports on a Cisco 7304 router, refer to *T3 Maintenance Data Link Messages on the Cisco 7304 Router* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121limit/121ex/121ex13/e_t3mdl.htm

LEDs

The 6-port 6E3 line card has six LNK LEDs, one for each port, as well as one OIR LED and one STATUS LED. (See Figure 1-2.)

After system initialization, the STATUS LED goes on to indicate that power is received and that the 6E3 line card is enabled for operation.

The following conditions must all be met before the 6E3 line card is enabled:

- The 6E3 line card is correctly connected and receiving power.
- The Network Services Engine 100 (NSE-100) recognizes the 6E3 line card.
- The Cisco IOS image on the NSE-100 is running.

If any one of these conditions is not met, or if the initialization fails, the STATUS LED does not go on.

Table 1-2 on page 1-4 lists 6E3 line card LED colors and indications.

Figure 1-2   LEDs on the 6E3 Line Card
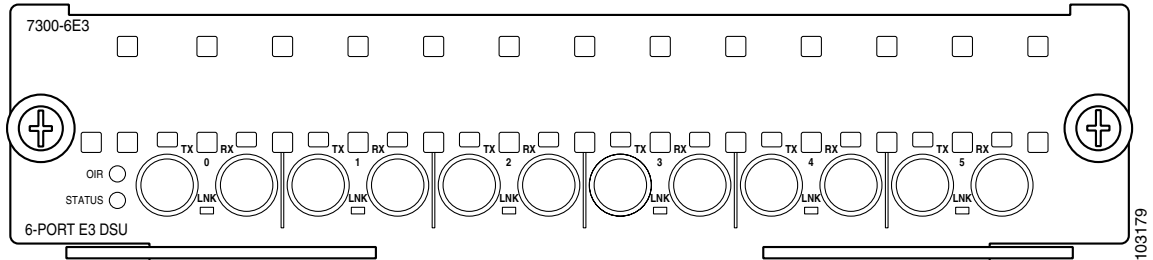
Table 1-2   6E3 Line Card LEDs

LED Label	Color	State	Meaning
OIR	Green	On	Line card is ready to be removed in CLI-controlled OIR.
		Off	Line card is online.
STATUS	Green/Yellow	Green	Line card is online.
		Yellow	Line card bootstrapping is in progress.
		Off	Line card is offline or deactivated.
LNK	Green/Yellow	Green	Line card port is enabled.
		Yellow	Line card port is in loopback mode or is receiving or transmitting alarms.
		Off	Line card port is disabled.

SMB Cables

The cables used to connect the 6E3 line card are presented in the following sections:

- Ordering Cables, page 1-6
- Building Your Own Cables, page 1-6

We recommend using six SMB cables. The cables are 10 feet (3.048 meters) long and have two female SMB connectors on one end, and two female or male bayonet coupling (BNC) connectors on the other end. Use the female SMB cable connectors to connect the local line card RX and TX ports. Use the BNC cable connectors to connect the line card RX and TX ports to other devices. See Figure 1-3 on page 1-5.

Note   Cisco does not automatically provide the six SMB cables recommended for your 6E3 line card.

Figure 1-3   SMB Cables (SMB Terminates into BNC)

SMB connector

Male BNC
connector

Female BNC
connector
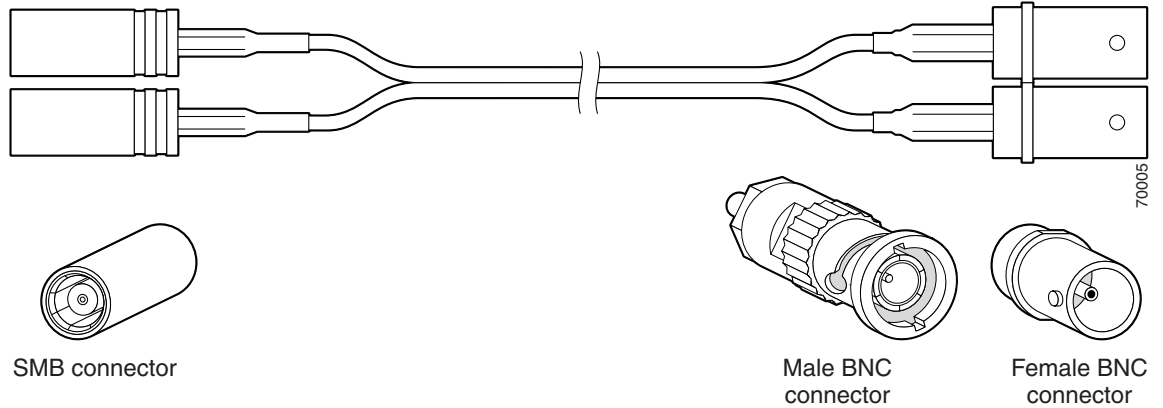
Note   Electromagnetic compliance (EMC) was verified with the 10-foot (3.048 meters) shielded cables that are orderable through Cisco. We recommend that you use only the 10-foot (3.048 meters) shielded SMB cables; otherwise, EMC is not guaranteed.

If you use cables other than those ordered from Cisco, it is your responsibility to ensure that you have a compliant system that meets local EMC requirements. To order additional cables, use the product numbers: 2CBLE-SMB-BNC-M (male) and 2CBLE-SMB-BNC-F (female).

Note   Observe the receive (RX) and transmit (TX) cabling relationship shown in Figure 1-4.

Figure 1-4   Connecting the SMB Cables

To RX

To TX
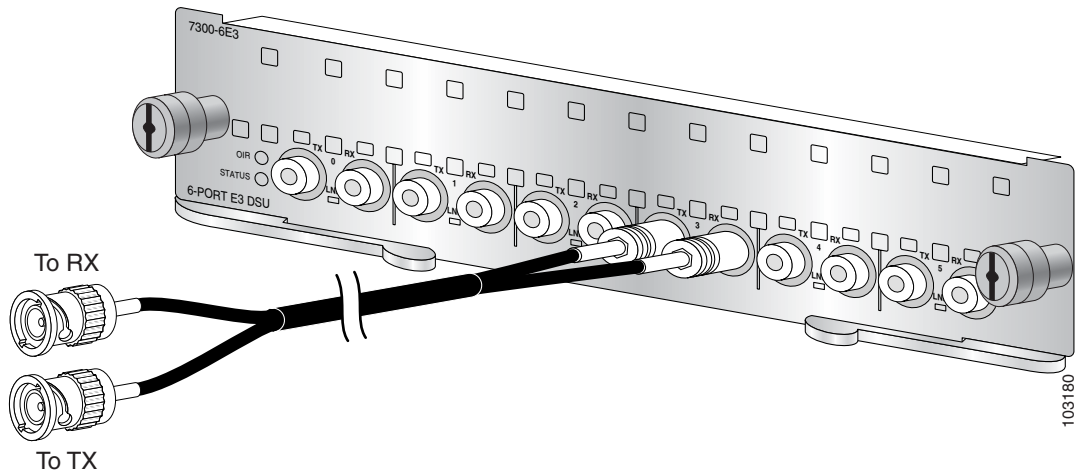
Note   After you connect the cables to a configured port on the line card, it takes up to 35 seconds to initialize the line card and light the green LNK LED.

Ordering Cables

You must order cables separately with the 6E3 line card when you order a Cisco 7304 router. Cables are *not* automatically included with the 6E3 line card. Be sure to specify the type of cable you want shipped with your card,

- 2CBLE-SMB-BNC-M [male]

- 2CBLE-SMB-BNC-F [female])

Building Your Own Cables

You can build your own cables for the 6E3 line card by using the cable components listed in Table 1-3. All three cables have an SMB connector at one end to connect to the 6E3 line card. The two SMB-to-BNC cables in Table 1-3 differ only in that one terminates in a male BNC connector, while the other terminates in a female BNC connector. You can use the back-to-back cable for directly connecting two closely-spaced 6E3 line cards back-to-back. These cables should be shielded and have SMB connectors on both ends.

Note   Back-to-back configurations, (6E3 line card serial port-to-6E3 line card serial port configurations) require a specially built SMB-to-SMB cable. Table 1-3 provides cable connector specifications. Or you can use the 2CBLE-SMB-BNC-M 10-foot (3.048 meters) shielded cable and the 2CBLE-SMB-BNC-F 10-foot (3.048 meters) shielded cable connected together.

You can order the SMB-to-BNC cables from Cisco as product numbers 2CBLE-SMB-BNC-M (male) or 2CBLE-SMB-BNC-F (female) BNC terminations, respectively. Cisco does not sell the SMB-to-SMB cable.

Table 1-3   Cable Connector Specifications

Cable Configuration	Line Card End	Remote End	RG-179 Cable
SMB-to-BNC Male	ITT-Cannon 051-124-9859-C9A	Radial R142076000 (or equivalent) Amp 41360-4 (or equivalent)	Double-shielded Harbour Ind. H6233-1 (or equivalent)
SMB-to-BNC Female	ITT-Cannon 051-124-9859-C9A	Amp 413760-8 (or equivalent)	Double-shielded Harbour Ind. H6233-1 (or equivalent)
SMB-to-SMB Back-to-Back	ITT-Cannon 051-124-9859-C9A	ITT-Cannon 051-124-9859-C9A	Double-shielded Harbour Ind. H6233-1 (or equivalent)

Caution   Cisco assumes no responsibility for system operation with other than Cisco-supplied adapter cables. The customer is responsible for ensuring that any customer-built cables meet all of the applicable compliance requirements (see the "Related Documentation" section on page viii.

E3 systems are designed for cable lengths of 450 feet (137 meters) between the transmitter and the DSX-3 demarcation point where the standard pulse mask must be met. From the DSX-3 point, another run of 450 feet (137 meters) is allowed to the receiver, making a total of 900 feet (274 meters) between transmitter and receiver. This limitation is due to signal attenuation in the cable.

Although the American National Standards Institute (ANSI) standard T1.404-1994 stipulates the Western Electric or equivalent 728A SMB cable, it has been replaced by the Lucent (formerly AT&T) 734A cable. Cisco tested more than 900 feet (274 meters) of 734A SMB cable from transmitter to receiver including the SMB-to-BNC adapter cables to verify high signal attenuation.

Table 1-4 lists some approximate attenuation values from the ANSI standard, and shows the RG-179 coaxial cable attenuation. RG-179coaxial cable has a much higher attenuation, so take this information into account if you plan long runs of RG-179 cable.

Table 1-4   ANSI Standard Cable-Attenuation Values

Approximate Cable Attenuation, dB[1] from ANSI Standard T1.404-1994

Frequency	100 ft (30 meters)	DSX-3 Point	Transmitter-to-receiver distance (max)	RG-179 Coaxial Cable
		450 ft (137 meters)	900 ft (274 meters)	100 ft (30 meters)
1 MHz	0.27	1.2	2.4	3.0
10 MHz	0.80	3.6	7.2	5.3
50 MHz	1.82	8.2	16.4	8.5
100 MHz	2.64	11.9	23.8	10.0

1.   dB = decibels

Management Information Base

Management Information Base (MIB) attributes are readable and writable across the Integrated Local Management Interface (ILMI) through use of the Simple Network Management Protocol (SNMP). The 6-port 6E3 line card supports the DS3 interface MIB (RFC 1407). For more MIB support information, see the *Cisco 7304 Router MIB Overview* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/core/cis7300/7304mibs/7300mib1.htm

Line Card Slot Locations on the Supported Platform

This section discusses line card slot locations on the supported platform. Figure 1-5 on page 1-8 summarizes slot location conventions on the Cisco 7304 router.

Cisco 7304 Router Slot Numbering

Figure 1-5 on page 1-8 shows a Cisco 7304 with the network services engine (NSE) installed in slots 0 and 1 and line cards installed in slots 2 through 4. In the Cisco 7304, slot 0 is in the lower left position, and slot 5 is in the upper right position.

Figure 1-5   Slots in the Cisco 7304 Router
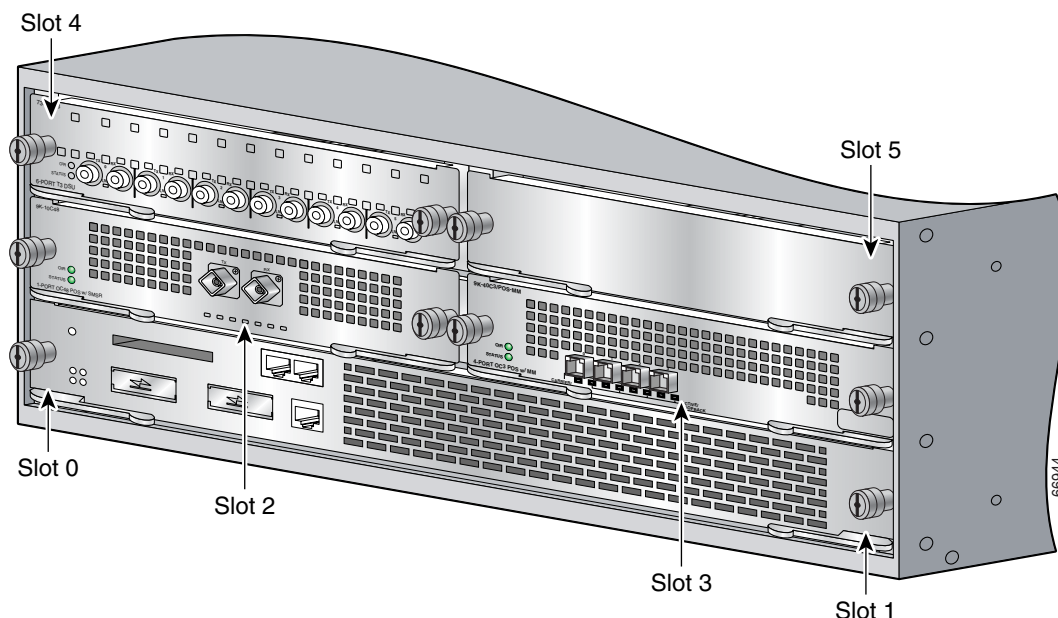
Identifying Interface Addresses

This section describes how to identify interface addresses for the 6E3 line card in the Cisco 7304 router. Interface addresses specify the actual physical location of each interface on a router or switch.

Interfaces on the 6E3 line card installed in a router maintain the same address regardless of whether other line cards are installed or removed. However, when you move a line card to a different slot, the first number in the interface address changes to reflect the new slot number.

Table 1-5 explains how to identify interface addresses.

Table 1-5   Identifying Interface Addresses

Platform	Interface Address Format	Numbers	Syntax
Cisco 7304 router	Slot-number/interface-port-number	Slot—2 through 5[1] Interface port—0 through 5	4/0

1. Slot 0 and slot 1 are reserved for the dual-width network services engine (NSE).

Cisco 7304 Router Interface Addresses

This section describes how to identify the interface addresses used for the 6E3 line card in the Cisco 7304 router. The interface address is composed of a two-part number in the format *slot-number/interface-port-number*. See Table 1-5 for the interface address format.

In the Cisco 7304 router, slots are numbered from the lower left to the upper right, beginning with slot 0 and continuing through slot 5. (Slot 0 and slot 1 are reserved for the NSE.)

The interface address of the interfaces on a 6-port 6E3 line card in slot 2 are 2/0 through 2/5 (slot 2 and interfaces 0 through 5). If the 6E3 line card was in slot 4, these same interfaces would be numbered 4/0 through 4/5 (slot 4 and interfaces 0 through 5).

Preparing for Installation

This chapter describes the general equipment, safety, and site preparation requirements for installing the 6E3 line card. This chapter contains the following sections:

- Required Tools and Equipment, page 2-1
- Software and Hardware Requirements, page 2-1
- 75-Ohm In-Line Coaxial Attenuator (Optional), page 2-2
- Safety Guidelines, page 2-2

Required Tools and Equipment

You need the following tools and parts to install a line card. If you need additional equipment, contact a service representative for ordering information.

- 6E3 line card
- SMB interface cables
- 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 6-port 6E3 line card in the 7304 router platform.

Table 2-1   6E3 Line Card Software Requirements

Router Platform	Recommended Minimum Cisco IOS Release
Cisco 7304 Router[1]	Cisco IOS Release $12.2(20)S1$ or a later release of Cisco IOS Release $12.2(20)S1$

1. The 6E3 line card requires a Network Services Engine 100 (NSE-100) to operate.

75-Ohm In-Line Coaxial Attenuator (Optional)

A 75-ohm in-line coaxial attenuator may be required to tune the signal between the 6E3 line card and the far-end equipment if the line card is experiencing line code violations (LCVs). LCVs occur when the far-end equipment transmit signal saturates the front-end receiver of the 6E3 line card.

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, go to *Installing the 75-Ohm In-line Coaxial Attenuator* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/core/7206/fru/12884att.htm

Safety Guidelines

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

⚠

Caution   The 6E3 line card is not intended for direct connection to outside telecommunication lines. If connected to an outside telecommunication line, suitable protection devices need to be provided.

Safety Warnings

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

Warning Definition

⚠

Warning   **IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Waarschuwing   **BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus   **TÄRKEITÄ TURVALLISUUSOHJEITA**

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien 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

Figyelem   FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmezeto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplo figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto 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 legemesbeskadigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.

GEM DISSE ANVISNINGER

تحذير   إرشادات الأمان الهامة

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل،
احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم
رقم البيان الموجود في أخر 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 כד לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה

Opomena   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 ОВИЕ 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

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedure 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. Line cards and processor modules consist of printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.

- Connect the equipment end of the strap to an unfinished chassis surface.

- 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 protects components from ESD voltages on the body only; ESD voltages on clothing can still cause damage.

- Never attempt to remove the printed circuit board from the metal carrier.

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

3

Removing and Installing Line Cards

This chapter describes how to remove the 6E3 line card from supported platforms and also how to install a new or replacement line card. This chapter contains the following sections:

Installation Overview

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

> **Note** When a line card slot is not in use, a blank line card must fill the empty slot to allow the router to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the line cards. If you plan to install a new line card in a slot that is not in use, you must first remove the blank line card.
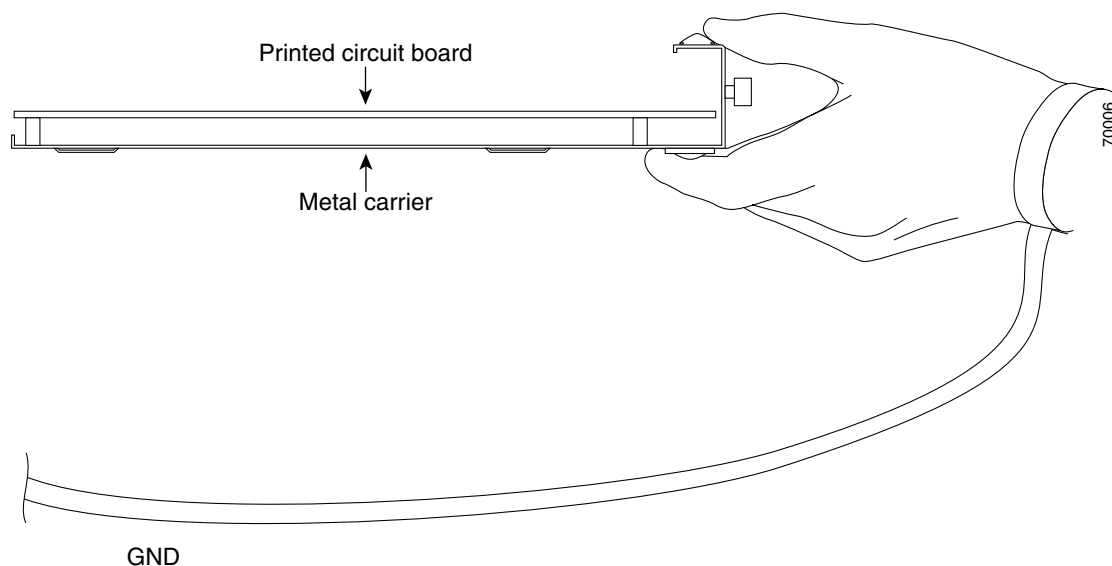
Handling Line Cards

⚠

Caution   Always handle the line card by the carrier edges and handle; never touch the line card components or connector pins. (See Figure 3-1.)

Figure 3-1   Handling a Line Card

Printed circuit board

Metal carrier

GND

Online Insertion and Removal

The Cisco 7304 router supports online insertion and removal (OIR) of line cards; therefore, you do not have to power down the router when removing and replacing a 6E3 line card on a Cisco 7304 router. The Cisco 7304 router also supports CLI-controlled OIR, which allows active data traffic to complete before the active interfaces are shut down. For more information, see the "CLI-Controlled OIR" section on page 4-18.

✎

Note   CLI-controlled OIR is the recommended way of performing OIR on this platform. As you disengage the line card from the router, online insertion and removal (OIR) administratively shuts down all active interfaces on the line card.

✎

Note   Before you begin installation, read the "Required Tools and Equipment" section on page 2-1 for a list of parts and tools required for installation.

Warnings and Cautions

Observe the following warnings and cautions when installing or removing line cards.

⚠️

Caution   Do not slide a line card 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.

⚠️

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

⚠️

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

Line Card Removal and Installation

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

- Cisco 7304—Removing and Installing a Line Card, page 3-4

🔍

Tip   If a line card lever or other retaining mechanism does not move to the locked position, the line card is not completely seated in the backplane. Carefully pull the line card halfway out of the slot, reinsert it, and move the line card levers to the locked position.

Cisco 7304—Removing and Installing a Line Card

1. To remove the line card, loosen the locking thumbscrews on both sides of the line card.
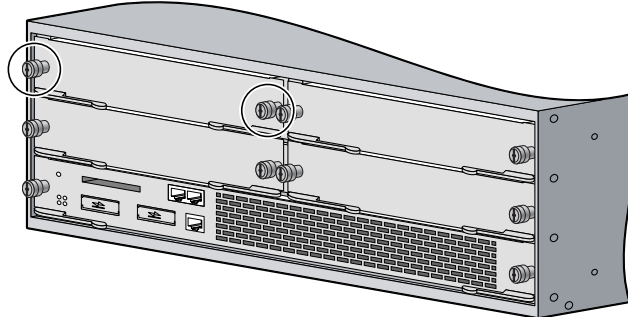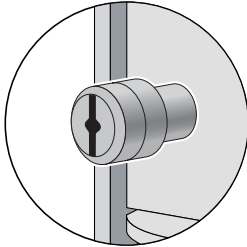
2. Pull out the line card levers and carefully slide the line card halfway out of the slot. If you are removing a blank line card, pull the blank line card completely out of the chassis slot.
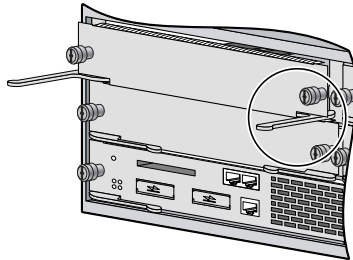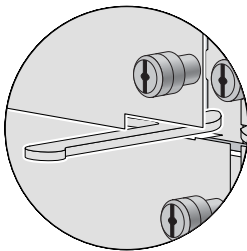
3. With the line card halfway out of the slot, disconnect all cables from the line card. After disconnecting the cables, pull the line card out of the chassis slot.

4. To insert the line card, carefully align the edges of the carrier or printed circuit board between the upper and the lower edges of the chassis slot.
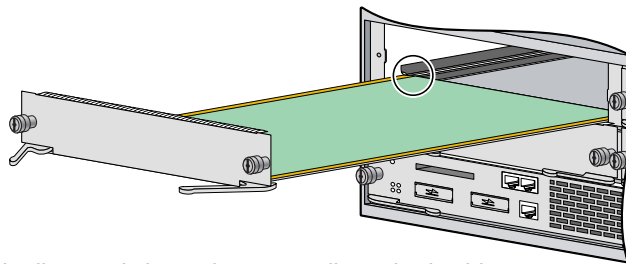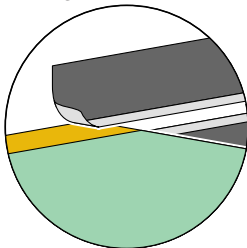
5. Carefully slide the new line card halfway into the line card slot and connect all required cables.

6. With the cables connected, carefully slide the line card into the slot until the line card makes contact with the backplane.

NOTE: The line card levers must be positioned at a 45-degree angle before the line card makes contact with the backplane.

7. Push the line card levers in until the line card is fully seated in the router backplane.

NOTE: When the chassis is fully populated, seating a new line card may be difficult. In order to properly seat the line card and avoid physical damage, loosen the thumbscrews on the neighboring line cards.

⚠ **CAUTION**: Use of excessive force to seat the line card may damage the router or line card.

8. Tighten the locking thumbscrews on both sides of the line card.

57891

Connecting a SMB Cable

On a 6E3 line card, you can use six SMB cables (one for each E3 link).

Tip If you build your own cables, we strongly recommend that you fasten together your transmit and receive cables along their entire length, as shown in Figure 3-2. Doing so reduces the effects of EMI. You can use shielded jacketing or tubing for this purpose.

Caution Each E3 link requires separate receive and transmit connections to your external E3 equipment.

Caution When you connect the 10-foot (3.048 meters) shielded SMB cables to the 6E3 line card, be careful not to bend the male cable connector pin when you connect or disconnect the cables.

Caution To prevent system problems and to maintain the proper cable connection sequences, connect the receive and transmit ports on your 6E3 line card as indicated in Step 2.

To connect the SMB cables to the 6E3 line card, follow these steps:

Step 1 Attach the SMB cables directly to the SMB ports on the 6E3 line card. Attach the SMB ends of the cable to the ports labeled TX and RX. (See Figure 3-2.)

Step 2 Attach the BNC ends of your SMB cables to your external E3 equipment as follows:

   a. Attach the cable from the 6E3 line card TX port to the RX port on your external E3 equipment.

   b. Attach the cable from the 6E3 line card RX port to the TX port on your external E3 equipment.

Figure 3-2   Attaching SMB Cables to a 6E3 Line Card
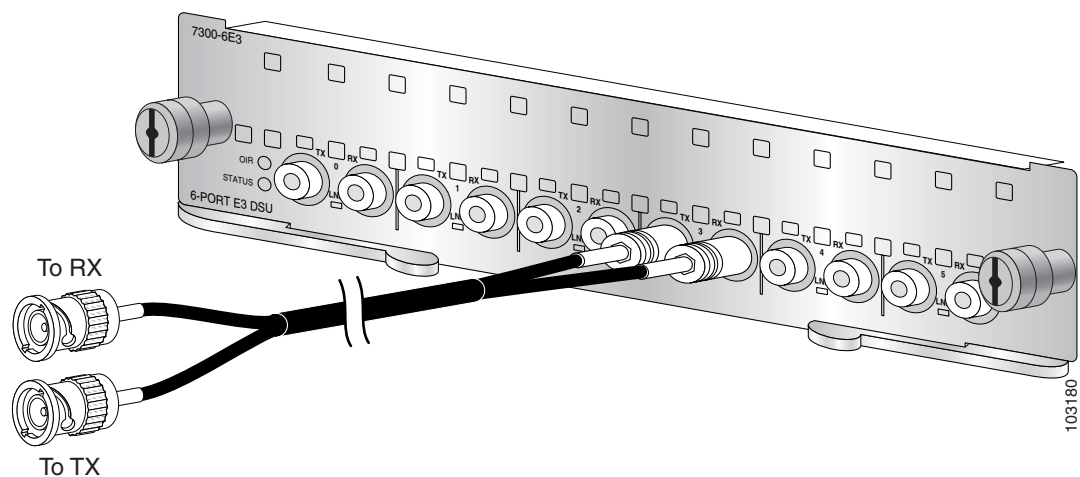
C H A P T E R 4

Configuring the 6E3 Line Card

To continue your 6E3 line card installation, you must configure the serial interfaces.

This chapter contains the following sections:

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 6E3 line card is installed correctly (the STATUS LED turns green), use the privileged-level **configure** command to configure the new interfaces. Have the following information available:

- E3 information such as clock source and framing type
- 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
- Timing source for each new interface

If you installed a new 6E3 line card or if you want to change the configuration of an existing interface, you must enter configuration mode to configure the new interfaces. If you replaced a 6E3 line card that was previously configured, the system recognizes the new interfaces and brings each of them up in their existing configuration.

For a summary of the configuration options available and instructions for configuring interfaces on a 6E3 line card, refer to the appropriate configuration publications listed in the "Related Documentation" section on page viii.

You execute configuration commands from the privileged level of the EXEC command interpreter, which usually requires password access. 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:

- Shutting Down an Interface, page 4-2
- Performing a Basic Configuration, page 4-4
- Customizing the 6E3 Line Card Configuration, page 4-5

Shutting Down an Interface

Before you remove an interface that you will not replace, or replace line cards, use the **shutdown** command to shut down (disable) the interfaces to prevent anomalies when you reinstall the new 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 the "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 **interface serial** subcommand (followed by the interface address of the interface), and then enter the **shutdown** command. Table 4-1 on page 4-3 shows the command syntax.

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.

Table 4-1   Syntax of the shutdown Command

Platform	Command	Example

Cisco 7304 routers	**interface**, followed by the *type* (**serial**) and *slot/port* (slot-number/ interface-port-number)	The example is for interface 0 and interface 1 on a 6E3 line card in slot 2.
		
		 ```Router(config-if)# interface serial 2/0```
		```Router(config-if)# shutdown```
		```Router(config-if)# interface serial 2/1```
		```Router(config-if)# shutdown```
		```Ctrl-Z```
		```Router#```

✎

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

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 4-2 provides examples.

Table 4-2   Examples of the show interfaces serial Command

Platform	Command	Example

Cisco 7304 router	**show interfaces serial**, followed by *slot/port* (slot-number/ interface-port-number)	The example is for interface 0 on a 6E3 line card in slot 2.
		
		 ```Router# show interfaces serial 2/0```
		
		```Serial 2/0 is administratively down, line protocol is down```

Step 6   Reenable interfaces by doing the following:

a.   Repeat Step 3 to reenable an interface. Substitute the **no shutdown** command for the **shutdown** command.

b.   Repeat Step 4 to write the new configuration to memory. Use the **copy running-config startup-config** command.

c.   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 Configuration

Following are instructions for a basic configuration: enabling an interface and specifying IP routing. 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 4-3 provides an example.

Table 4-3   Examples of the interface serial Subcommand

Platform	Command	Example

Cisco 7304 router	**interface serial**, followed by *slot/port* (slot-number/ interface-port-number)	The example is for the first interface of a 6E3 line card in slot 4.
		
		`Router(config)# interface serial 4/0`
		`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   Reenable the interfaces using the **no shutdown** command. (See the "Shutting Down an Interface" section on page 4-2.)

Step 6   Configure all additional line card 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 interpreter prompt.

Step 8   Write the new configuration to NVRAM as follows

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

This completes the procedure for creating a basic configuration.

Table 4-4 shows the default values for the 6E3 line card serial interfaces.

Table 4-4   6E3 Line Card Serial Interface Default Values

Parameter	Configuration Command	Default Value
Clock source	clock source [internal	line]	line
Cyclic redundancy check	crc [16	32]	16
DSU mode	[no] dsu mode [cisco	digital-link	kentrox]	cisco
DSU subrate bandwidth	[no] dsu bandwidth *kbps*	34010
Encapsulation	encapsulation [frame-relay	hdlc	ppp]	hdlc
Idle character mode	[no] idle-character [flags	marks]	flags
Invert data	[no] invert data	no invert data
Keepalive	[no] keepalive [seconds]	keepalive 10
Loopback mode	[no] loopback [local	network line	network payload	dte]	no loopback
Maximum transmission unit	[no] mtu *bytes*	4470 bytes
National bit	[no] national bit [0	1]	0
Payload scrambling	[no] scramble	no scramble
Transmitter delay	[no] transmitter-delay # *of idle characters*	0–255

Customizing the 6E3 Line Card Configuration

There are two sides to the network, a local network side and a remote customer side, or near and far ends. The 6E3 line card supports third-party data service units (DSUs), Internet Service Provider (ISP)-provided E3 lines, and so on. The configuration parameter default values in the 6E3 line card port interfaces must match the remote DSUs on your network. Table 4-5 shows the configuration parameters.

Table 4-5   6E3 Line Card Serial Interface DSU Modes

Parameter	Configuration Command	Default Value	Command
DSU mode	[no] dsu mode [cisco	digital-link	kentrox]	cisco	Router(config-if)# **dsu mode cisco**
DSU subrate bandwidth	[no] dsu bandwidth *kbps*	34010	Router(config-if)# **dsu bandwidth 34010**
Payload scrambling	[no] scramble	no scramble	Router(config-if)# **scramble**
Cyclic redundancy check	crc [16	32]	16	Router(config-if)# **crc 16**

Note   The local port and the remote port must have matching configurations.

Verifying Local and Remote E3 Port Settings

You can use **telnet** to determine the DSU mode settings on the remote E3 port. Once you verify the remote E3 port settings, you can negotiate changing configuration parameters so that DSU mode settings are the same on both the local and remote E3 ports.

Selecting a DSU Mode

The DSU mode supports two third-party DSU vendors—Digital Link and Kentrox—and the default DSU mode, Cisco. If you use a DSU to make the connection between the Cisco 7304 router and another device, the local E3 port configuration must match the remote E3 port configuration. Therefore, if the remote E3 port uses the Kentrox vendor, a request is sent to the local E3 port to change the DSU mode to Kentrox, either by manually entering the **dsu mode** configuration command and specifying the Kentrox DSU or by using the Cisco Remote Connection Management (CRCM) feature to remotely configure the remote E3 port. If you make a direct connection between a Cisco 7304 router and another device, you can use the Cisco DSU mode.

Configuring the DSU Bandwidth Range

The DSU bandwidth range is from 0 to 34010 kbps. The local port and the remote port must have matching configurations. Therefore, if you reduce the effective bandwidth to 3000 on the local port, you must do the same on the remote port by entering the **dsu bandwidth** interface configuration command.

In interface configuration mode, reduce effective bandwidth (range of 0 to 34010 kbps) by entering the **dsu bandwidth** configuration subcommand, as in the following example:

```
Router(config-if)# dsu bandwidth 3000
```

Use the **no** form of this command to return to the default, 34010.

Note The local port configuration must match the remote port configuration.

Enabling Payload Scrambling

Payload (data) scrambling converts the data received by the local or remote E3 ports from the Digital Link and Kentrox third-party DSU vendor modes as well as the default, Cisco mode. To enable payload scrambling on the local and remote E3 ports, you must enter the **scramble** interface configuration command. If you do not enter the **scramble** command, payload scrambling remains disabled by default on the local and remote E3 ports.

Configuring Cyclic Redundancy Checks

Table 4-6 summarizes cyclic redundancy check (CRC) commands. For more information, see the remainder of this section.

Table 4-6   CRC Commands

Purpose	Command	Example

Enable 32-bit CRC	**crc** *size*	The example enables 32-bit CRC on a serial interface:
		
		`Router(config)# interface serial 3/0`
		`Router(config-if)# crc 32`

Return to default 16-bit CRC	**no crc** *size*	The example disables 32-bit CRC on a serial interface and returns to the default 16-bit CRC:
		
		`Router(config)# interface serial 3/0`
		`Router(config-if)# no crc 32`

CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. All interfaces use a 16-bit CRC by default but also support a 32-bit CRC. The sender of a data frame calculates the frame check sequence (FCS). Before it sends a frame, the sender appends the FCS value to the message. The receiver recalculates the FCS and compares its calculation to the FCS from the sender. When the CRC on a received frame is not correct, the frame is dropped. The card does not send a request to the remote end to transmit the frame. (A higher layer protocol is required to implement the retransmission.)

Enable 32-bit CRC using the **crc 32** command. Before you can enable 32-bit CRC, you must use the **interface serial** command (followed by the interface address of the interface) to select the interface on which you want to enable 32-bit CRC. This command functions in the same way on all supported platforms.

In the example that follows, 32-bit CRC is specified:

```
Router(config-if)# crc 32
```

The preceding command example applies to all systems in which the 6E3 line card is supported. Use the **no crc 32** command to disable the 32-bit CRC setting and return the interface to the default 16-bit CRC setting.

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 prompt. Then write the new configuration to NVRAM using the **copy running-config startup-config** command.

Note   When enabling a 16-bit or 32-bit CRC on a local interface, ensure that the remote device is also configured for a 16-bit or 32-bit CRC.

For command descriptions, refer to the *Configuration Fundamentals Configuration Guide* publication. For more information, see the "Obtaining Additional Publications and Information" section on page xi and the "Obtaining Additional Publications and Information" section on page xi.

Configuring the Clock Source

The only exception for matching local and remote E3 port configurations is that the clock sources must be set opposite each other. Therefore, if you enter the **clock source internal** command for the local E3 port, you must enter **clock source line** for the remote E3 port.

Defining the DSU Mode

In interface configuration mode, define the DSU interoperability mode by entering the
dsu mode [**cisco** | **digital-link** | **kentrox**] configuration subcommand, as in the following example:

```
Router(config-if)# dsu mode cisco
```

Use the **no** form of this command to return to the default, cisco.

✎

Note The local port configuration must match the remote port configuration. For example, if you define the DSU interoperability mode as **cisco** on the local port, you must do the same on the remote port. You need to know what type of DSU is at the remote port to find out if it interoperates with the 6E3 line card. For E3 serial interfaces, specify **cisco** for connection from a 6E3 line card to another 6E3 line card. Specify **digital-link** for connection to a Digital Link DSU (DL3100). Specify **kentrox** for connection from a 6E3 line card to a Kentrox DSU.

Also see the "Interoperability Guidelines for 6E3 Line Card DSUs" section on page 1-3 for information regarding DSU feature compatibilities.

Enabling E3 Scrambling

In interface configuration mode, enable E3 scrambling by entering the **scramble** configuration subcommand, as in the following example:

```
Router(config-if)# scramble
```

Use the **no** form of this command to restore the default value, scramble.

✎

Note The local port configuration must match the remote port configuration. For example, if you enable scrambling on the local port, you must do the same on the remote port.

Also see the "Interoperability Guidelines for 6E3 Line Card DSUs" section on page 1-3 for information regarding DSU feature compatibilities.

Checking the Configuration

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

- Using show Commands to Verify the New Interface Status, page 4-9
- E3 Alarm and Event Detection, page 4-14
- Using the ping Command to Verify Network Connectivity, page 4-15
- Using loopback Commands, page 4-16
- Bit Error Rate Testing, page 4-17

Using show Commands to Verify the New Interface Status

Table 4-7 on page 4-9 demonstrates how you can use the **show** commands to verify that new interfaces are configured and operating correctly and that the 6E3 line card 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.

> **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.

Table 4-7   Using show Commands

Command	Function	Example
show version	Displays system Cisco IOS software version, names and sources of configuration files, and boot images	Router# **show version**
show controllers	Displays all the current E3 interfaces	Router# **show controllers**
show diag *slot*	Displays types of line cards installed in your system and information about a specific chassis slot	Router# **show diag 2**
show interfaces *type slot-number/ interface-port-number*	Displays status information about a specific type of interface (for example, serial) in a Cisco 7304 router	Router# **show interfaces serial 2/0**
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 shut down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the interface is properly connected and terminated. If you still have problems bringing up the interface, contact a service representative for assistance. This section includes the following subsections:

- Using the show version Command, page 4-10
- Using the show diag (slot) Command, page 4-12
- Using the show interfaces Command, page 4-13

Choose the subsection appropriate for your system. Proceed to the "Using the ping Command to Verify Network Connectivity" section on page 4-15 when you have finished using the **show** commands.

Using the show version Command

Display the configuration of the hardware, the Cisco IOS software version, the names and sources of configuration files, and the boot images by using the **show version** 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.

Cisco 7304 Routers

Following is an example of the **show version** command from a Cisco 7304 router with the 6E3 line card:

```
WS_2_DS3_1600 #show version

Cisco Internetwork Operating System Software
IOS (tm) 7300 Software (C7300-JS-M), Version 12.2(20S)
Copyright (c) 1986-2001 by cisco Systems, Inc.
Compiled Thu 20-Dec-03 03:25 by cva
Image text-base:0x4000878, data-base:0x42794000

ROM:System Bootstrap, Version 12.1(12r)EX1,RELEASE SOFTWARE (fc1)
Currently running ROMMON from ROM 0

WS_@_DS3_1600 uptime is 3 hours, 50 minutes
System returned to ROM by reload
System image file is "disk0:c7300-js-mz

cisco 7300 (NSE100) processor (revision E) with 114688K/16384K bytes of memory.
Processor board ID SCA0702004V
R7000 CPU at 350Mhz, Implementation 39, Rev 3.2, 256KB L2, 1024KB L3 Cache
4 slot midplane, Version 67.49

Last reset from software reset or reload
Bridging software.
X.25 software, Version 3.0.0.
SuperLAT software (copyright 1990 by Meridian Technology Corp).
TN3270 Emulation software.
PXF processor tmc0 running 'system:pxf/ucode1' v1.4 is active
PXF processor tmc1 running 'system:pxf/ucode1' v1.4 is active
1 FastEthernet/IEEE 802.3 interface(s)
2 Gigabit Ethernet/IEEE 802.3 interface(s)
12 Serial network interface(s)
1 Packet over Sonet network interface(s)
509K bytes of non-volatile configuration memory.

16064K bytes of ATA compact flash in bootdisk (Sector size 512 bytes).
31360K bytes of ATA compact flash in disk0 (Sector size 512 bytes).
Configuration register is 0x0
```

Using the show diag (slot) Command

Display the types of line cards installed in your system (and specific information about each) using the **show diag** *slot* 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.

Cisco 7304 Routers

Following is an example of the **show diag** *slot* command that shows the 6E3 line card in slot 2 of a Cisco 7304 router:

```
Router# show diag 2

Slot 2:
        E3 Line Card, 6 ports
        Line Card state:Active
        Insertion time:23:39:27 ago
        Bandwidth points:204060
        EEPROM contents at hardware discovery:
        Hardware Revision       :3.0
        Unknown Field (type 0046):00 00
        PCB Serial Number       :CAB0548LLN5
        Part Number             :73-5938-04
        Board Revision          :A0
        Fab Version             :02
        RMA Test History        :00
        RMA Number              :0-0-0-0
        RMA History             :00
        Deviation Number        :0-0
        Product Number          :7300-6E3
        Top Assy. Part Number   :68-0000-00
        Manufacturing Test Data :00 00 00 00 00 00 00 00
        Field Diagnostics Data  :00 00 00 00 00 00 00 00
        Calibration Data        :Minimum:0 dBmV, Maximum:0 dBmV
              Calibration values :
        EEPROM format version 4
        EEPROM contents (hex):
          0x00:04 FF 40 03 E2 41 03 00 46 00 00 C1 8B 43 41 42
          0x10:30 35 34 38 4C 4C 4E 35 82 49 17 32 04 42 41 30
          0x20:02 02 03 00 81 00 00 00 00 04 00 80 00 00 00 00
          0x30:CB 94 37 33 30 30 2D 36 45 33 20 20 20 20 20 20
          0x40:20 20 20 20 20 20 87 44 00 00 00 C4 08 00 00 00
          0x50:00 00 00 00 00 C5 08 00 00 00 00 00 00 00 00 C8
          0x60:09 00 00 00 00 00 00 00 00 00 C7 7C F6 49 44 35
          0x70:00 00 00 00 00 00 00 00 00 00 00 00 07 08 64 32
          0x80:28 37 26 09 C4 64 32 28 32 DD 0C E4 64 32 28 43
          0x90:24 2E E0 AA 82 64 F4 24 00 00 00 00 00 00 00 00
          0xA0:00 00 00 00 00 00 F4 B9 FF FF FF FF FF FF FF FF
          0xB0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0xC0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0xD0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0xE0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0xF0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x100:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x110:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x120:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x130:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
          0x140:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

```
                  0x150:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x160:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x170:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x180:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x190:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x1A0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x1B0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x1C0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x1D0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x1E0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
                  0x1F0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
            FPGA information:
              Current FPGA version     :00.16
              IOS bundled FPGA version :00.16
            CPLD version     :01.02
            LC recoveries happened so far:1
            LC Crash History:
            LC 2, LC Santa Ana, channel A, error counters:
                                SL0   SL1   SL2   SL3
            Reframe:            [   0     0     0     0 ]
            Overrun:            [   0     0     0     0 ]
            Underrun:           [   0     0     0     0 ]
            OOB:                [   0     0     0     0 ]
            Disparity:          [   0     0     0     0 ]
            Missing_Ctrl_Code: [    0     0     0     0 ]
            Chip access errors:[    0     0     0     0 ]
            LC 2, NSE Santa Ana 0, channel A, error counters:
                                SL0   SL1   SL2   SL3
            Reframe:            [   0     0     0     0 ]
            Overrun:            [   0     0     0     0 ]
            Underrun:           [   0     0     0     0 ]
            OOB:                [   0     0     0     0 ]
            Disparity:          [   0     0     0     0 ]
            Missing_Ctrl_Code: [    0     0     0     0 ]
            Chip access errors:[    0     0     0     0 ]

            Linecard interrupt counters:
              Egress droped packet = 11 (23:41:58 ago)
              Alarms  = 30 (23:56:13 ago)
              Egress hw error = 10 (23:41:58 ago)
            Linecard egress hardware error counters:
              Pkt buffer invalid i/p hdr = 10 (23:41:58 ago)
              No sop flag at the packet hdr = 4 (23:44:24 ago)
              Port id error = 10 (23:41:58 ago)

      Router#
```

Using the show interfaces Command

The **show interfaces** command displays status information (including the physical slot and interface address) for the interfaces you specify. The example that follows specifies serial interfaces.

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.

Cisco 7304 Routers

Following is an example of the **show interfaces** command for Cisco 7304 routers. In this example, the serial interfaces (0 to 5) are on a 6E3 line card in slot 1, also, the status information for interfaces 1 through 5 is omitted. (Interfaces are administratively shut down until you enable them.)

```
Router #sho interfaces serial 2/1
Serial2/1 is up, line protocol is up
  Hardware is Packet over E3
  Internet address is 150.2.2.1/24
  MTU 4470 bytes, BW 34009 Kbit, DLY 200 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation HDLC, crc 16, loopback set
  Keepalive not set
  Last input 21:04:19, output 21:04:19, output hang never
  Last clearing of "show interface" counters 16:31:30
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:15263
  Queueing strategy:fifo
  Output queue:0/40 (size/max)
  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 IP multicast)
     0 runts, 0 giants, 0* throttles
              0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun,, 0 abort
     505603671 packets output, 48537952992 bytes, 0 underruns
     0 output errors, 0 applique, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
(Additional display test omitted from this example.)
```

E3 Alarm and Event Detection

This section assumes that you are familiar with E3 alarms and line states. The 6E3 line card does not have an LED for alarm and event detection. However, you can enter the **show controllers serial** *slot/port* EXEC command to verify whether the alarm and event detection messages are active or inactive. Most alarm and event detection messages are short-lived, because if problems occur, the line card clears the error condition, but records the event to verify line card operation status.

The output from the **show controllers serial** *slot/port* EXEC command sends messages about the following types of alarms and events:

- AIS (Alarm Indication Signal)
- LOF (Loss of Frame)
- LOS (Loss of Signal)
- RAI (Remote Alarm Indication)
- OOF (Out of Frame)

Cisco 7304 Routers

The output also indicates whether the alarm or event originates from the local-end connector or the remote-end connector, as shown in the following example:

```
WS_2_DS3_1600 #show controllers serial 2/0
Interface Serial2/0 (E3 port 0)
Line state is up
  rxLOS inactive, rxLOF inactive, rxAIS inactive
  txAIS inactive, rxRAI inactive, txRAI inactive
Current configurable parameter settings:
  Loopback is none,
  Clock source is internal
  DSU mode is cisco, DSU bandwidth limit is 34010
  National bit is 0
  Payload scrambling is disabled, CRC is 32
  Bert pattern is disabled, Bert interval is 0 minutes
  Transmitter delay is 0, Encapsulation is HDLC
  Idle character is flags, Invert data is disabled
 MTU is 9216
MIB information:
  Data in current interval (477 seconds elapsed):
   0 Line Code Violations
   0 P-bit Err Secs, 0 P-bit Sev Err Secs
   0 Sev Err Framing Secs, 0 Unavailable Secs
   0 Line Errored Secs
  No alarms detected.
Interface 2/0 counters:
  Total input packets  = 804690023, bytes = 77792437916, drops = 0
  Total output packets = 816580774, bytes = 78921469092, drops = 0
  PXF i/f number = 0x10
  PXF Hdr lo = 0x3000012, PXF Hdr hi = 0x1000000
```

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

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

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

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

Proceed to the next section, "Using loopback Commands," to finish checking network connectivity.

Using loopback Commands

With the loopback test, you can detect and isolate equipment malfunctions by testing the connection between the 6E3 line card interface and a remote device such as a modem or a CSU/DSU. The **loopback** command 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.

Table 4-8 provides examples of the **loopback** {**dte** | **local** | **network** {**line** | **payload**} command. The examples given are for interface 0 of a 6E3 line card in slot 2 of a Cisco 7304 router:

Table 4-8   Using loopback Commands

Command	Function	Example
loopback local	Sets the interface into local loopback mode. Local loopback loops the router output data back toward the router at the framer.	Router(config)# **interface serial 2/0** Router(config-if)# **loopback local**
loopback network line	Sets the interface into network line loopback mode. Network line loopback loops the data back toward the network (before the framer).	Router(config)# **interface serial 2/0** Router(config-if)# **loopback network line**
loopback network payload	Sets the interface into network payload loopback mode. Network payload loopback loops just the payload data back toward the network at the E3 framer.	Router(config)# **interface serial 2/0** Router(config-if)# **loopback network payload**
loopback dte	Sets the interface into loopback data terminal equipment (DTE) mode. Loopback DTE loops the router output data back toward the router (after the LIU).	Router(config)# **interface serial 2/0** Router(config-if)# **loopback dte**

Figure 4-1 on page 4-17 shows the data flow for three loopback configuration paths, including no loopback.

Figure 4-1   E3 Loopback Paths
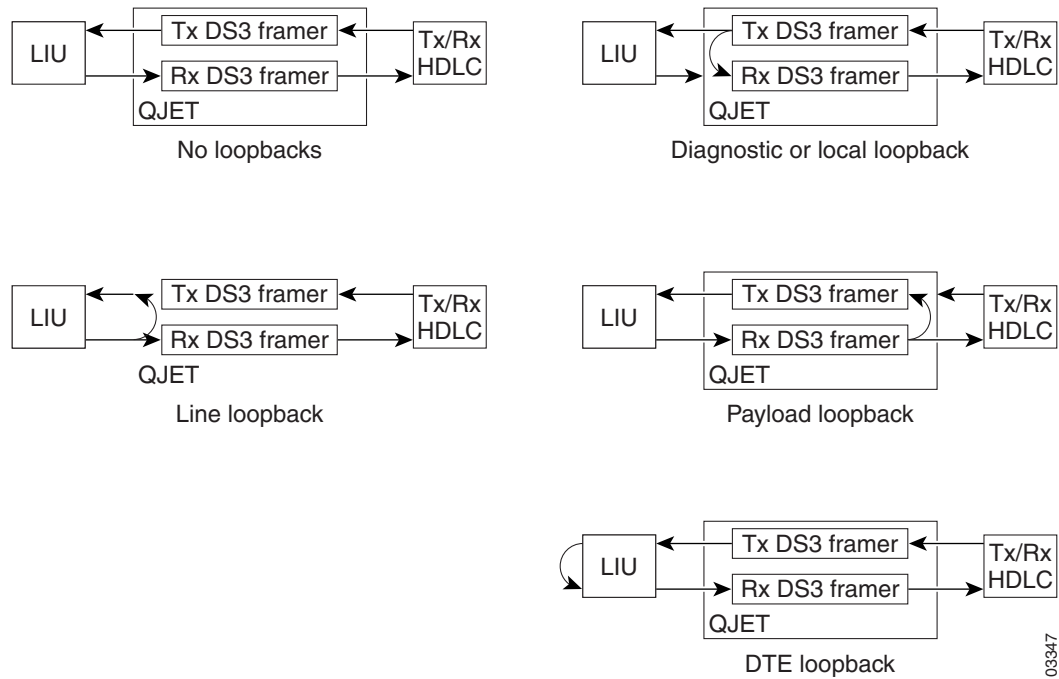
Bit Error Rate Testing

The ratio of received bits on an interface that contain errors is called the bit error rate (BER). A bit error rate test (BERT) is used to check the BER. E3 bit error rate testing is used on the Cisco 7304 router to check communication between local and remote E3 ports. If traffic is not being transmitted or received on an E3 port, or if the quality of the line simply needs to be tested, E3 bit error rate testing can be used to test the port.

For information on performing bit error rate testing, refer to the *Configuration Tasks* section of the *T3 Maintenance Data Link Messages* on the Cisco 7304 Router documenat the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/software/ios121/121newft/121limit/121ex/121ex12c/e_t3bert.htm#1023406

CLI-Controlled OIR

Line cards can be removed from the Cisco 7304 router without disrupting data flow by using the **hw-module slot** *slot #* **stop/start** command in EXEC mode. The **hw-module slot** *slot #* **stop** command will stop traffic, shut down all line card interfaces, and deactivate the line card. The **hw-module slot** *slot # **start** command resets the line card, puts the line card back online and turns off the OIR LED.

Note   Upon insertion of a line card, the system will automatically activate the card. The **hw-module slot** *slot # **start** command is only necessary when reactivating an installed line card that has been deactivated with the **hw-module slot** *slot # **stop** command.

To remove and install an active line card in slot 2 proceed as follows:

Step 1   Enter the following:

```
Router# hw-module slot 2 stop
```

Step 2   When the OIR LED turns green, remove the line cards from slot 2.

When the OIR LED turns green, the line card in slot 2 has been deactivated and can be physically removed and replaced with a new line card (see the "Line Card Removal and Installation" section on page 3-3).

Step 3   Insert the new line card in slot 2. It is automatically reset, put online, and the OIR LED is turned off.

Line Card Crash Recovery

The 6E3 line card automatically recovers from the following catastrophic errors:

- Fatal serial link errors
- Line card local processor firmware crash
- Loss of keepalive packets from line card local processor
- Hardware errors reported by line card devices
- Too many line card error interrupts (more than 60 interrupts within 10 processor ticks)

If the 6E3 line card encounters more than five fatal errors within one hour, recovery will not be attempted and the line card will be deactivated. To reactivate the line card use the **hw-module slot** *slot # **start** command, or physically remove and replace the line card.

The 6E3 line card crash history may be viewed by using the **show diag** *slot* command. The crash history is saved as long as the line card is physically present in the chassis. Physically removing the 6E3 line card from the chassis or performing a CLI-controlled OIR will clear the crash history.

The following messages are associated with line card recovery:

Error Message 00:00:06:% LC-3-RECOVERY: Line card (slot <x>) recovery in progress

Error Message 00:00:06:% LC-3-EXCESSERRORS: Errors seen on the line card (slot %d) exceeds the error threshold

When the 6E3 line card encounters any of the nonrecoverable errors listed below, the line card is deactivated and must be restarted by performing a CLI-controlled OIR or physically removing and installing the line card.

- Line card hardware failures
- Line card local processor boot code/firmware initialization failure (failure to boot or boot code exceptions, firmware download failure)
- Environmental critical conditions (voltage and temperature)
- Insufficient system memory to allocate critical line card driver data structures during line card initialization

The following examples show nonrecoverable fatal error messages:

Error Message 00:00:06% SERIAL-0-DLL_OUTOFLOCK: E3 HW DLLS failed to lock in line card at slot <x>

Error Message 00:00:06% SERIAL-0-860_BOOT_NOTOK: E3 Line card local processor at slot <x> failed to boot

Error Message 00:00:06% SERIAL-3-FW_CHECKSUM_FAILED: E3 line card in slot <x>, firmware integrity check failed (section <x>, expected checksum: <x>, calculated checksum: <x>)

Error Message 00:00:06% ENVM-0-SHUTDOWN: Environmental Monitor initiated shutdown due to <voltage/temperature/power supply> in slot <x>

Error Message 00:00:06% SERIAL-1-ALLOCFAIL: E3 (slot <x>) line card plugin structure allocation failure

DSU Link Doesn't Work

Symptom

The link between the 6E3 line card and digitial link DSU (DL3100E) doesn't work when subrates have been configured. Pings don't go through.

> **Note**   This is an intermittent problem that occurs with the DL3100E DSU. Other supported external CSU and DSU products are not affected.

Conditions

This symptom is observed after you have reloaded a Cisco 7304, (when a 6-port E3 line card is connected to an external digital link DSU) and when the interface has the **dsu bandwidth** command enabled.

Workaround

Enter the **shutdown** command followed by the **no shutdown** command on the affected interface.

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int ser 5/0
Router(config-if)#shut
Router(config-if)#no shut

*Oct 20 21:39:34.331: %LINK-5-CHANGED: Interface Serial5/0, changed state to
administratively down
Router(config-if)#
*Oct 20 21:39:34.331: %WS_ALARM-6-INFO: ASSERT INFO Se5/0 Physical Port Administrative
State Down
*Oct 20 21:39:35.331: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial5/0, changed
state to down
*Oct 20 21:39:37.263: %LINK-3-UPDOWN: Interface Serial5/0, changed state to down
*Oct 20 21:39:37.263: %WS_ALARM-6-INFO: CLEAR INFO Se5/0 Physical Port Administrative
State Down
*Oct 20 21:39:37.263: %WS_ALARM-6-INFO: ASSERT MAJOR Se5/0 Physical Port Link Down
Router(config-if)#
Router(config-if)#
*Oct 20 21:39:41.895: %LINK-3-UPDOWN: Interface Serial5/0, changed state to up
*Oct 20 21:39:41.895: %WS_ALARM-6-INFO: CLEAR MAJOR Se5/0 Physical Port Link Down
*Oct 20 21:39:42.895: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial5/0, changed
state to up
Router(config-if)#end
Router#
```