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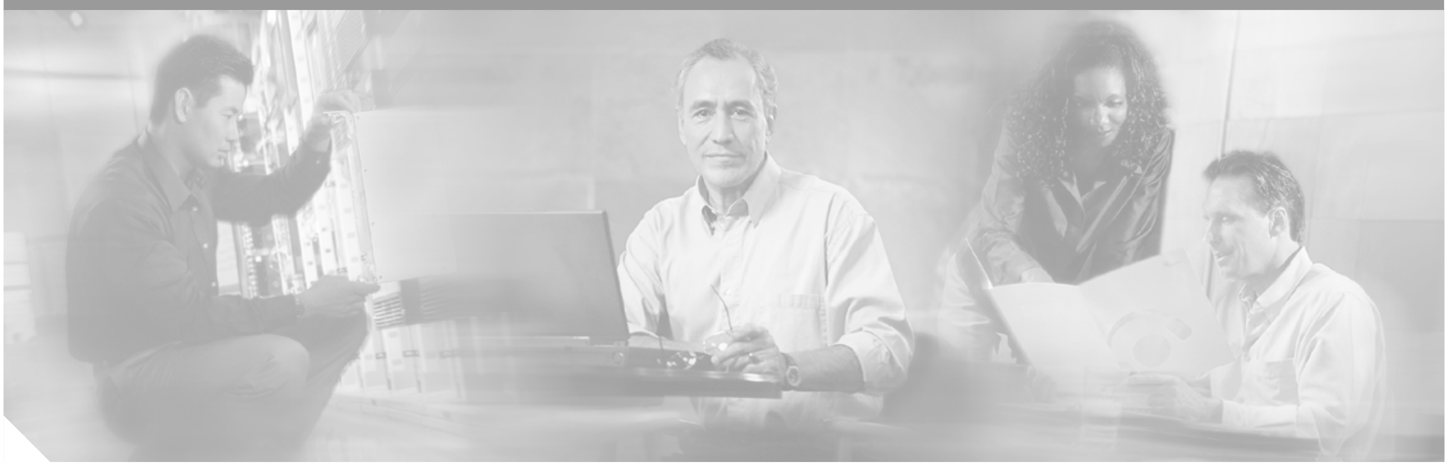

Cisco 6130 with NI-2 Hardware Installation Guide

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FIGURES

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Preface

This preface explains the audience, purpose, and organization of the *Cisco 6130 with NI-2 Hardware Installation Guide*. It also defines the conventions that are used to present instructions and information.

Audience

The *Cisco 6130 with NI-2 Hardware Installation Guide* is intended for use by central office (CO) technicians and maintenance personnel who are responsible for installing, configuring, and maintaining the Cisco 6130 with NI-2 system. A familiarity with telco products and networking systems is recommended.

Purpose

The *Cisco 6130 with NI-2 Hardware Installation Guide* describes how to set up, install, and troubleshoot the Cisco 6130 with NI-2 system. After completing the installation procedures covered in this guide, refer to the appropriate related documents to provision your Cisco 6130 with NI-2 system. For additional information on related documentation, see the "Related Documentation" section on page xix.

Organization

The *Cisco 6130 with NI-2 Hardware Installation Guide* is organized as follows:

- Chapter 1, "Product Overview," provides an overview of the Cisco 6130 with NI-2 system.
- Chapter 2, "Preparing for Installation," provides the requirements necessary to prepare for the installation of the Cisco 6130 with NI-2 system.
- Chapter 3, "Installing a Cisco 6130 with a POTS Splitter Configuration," provides installation procedures for a Cisco 6130 with a POTS splitter configuration.
- Chapter 4, "Installing a Cisco 6130 Without a POTS Splitter Configuration," provides installation procedures for a Cisco 6130 without a POTS splitter configuration.
- Chapter 5, "Troubleshooting," provides information about isolating faults in the Cisco 6130 with NI-2 system.
- Chapter 6, "Upgrading and Maintaining the Cisco 6130 System," describes upgrade and maintenance procedures for the Cisco 6130 with NI-2 system.

- Chapter 7, "Testing Configuration Connections for the Cisco 6130 with NI-2 System," provides the test procedures to ensure that your Cisco 6130 with NI-2 system is connected correctly and is properly communicating with the system management software.
- Appendix A, "Technical Specifications," provides the technical specifications for the Cisco 6130 with NI-2 system.
- Appendix B, "Cable and Port Mapping Specifications," provides cabling guidelines, cabling configuration diagrams, part numbers, and port mapping tables for the following configurations:
  - Cisco 6130 with a POTS splitter
  - Cisco 6130 without a POTS splitter
- Appendix C, "Connector and Pinout Specifications," provides information about connectors and pinouts for a Cisco 6130 with NI-2 system.
- Glossary.
- Index.

Conventions

This publication uses the document conventions listed in this section.

Table 1 Font Conventions

Convention	Definition	Sample
Times bold	Text body font used for any argument, command, keyword, or punctuation that is part of a command that the user enters in text and command environments. Also used for names of some GUI elements.	This is similar to the UNIX **route** command.
Times italic	Text body font used for publication names and for emphasis.	See the *Cisco 6100 Series User Guide* for further details.
`Courier`	Font used for screen displays, prompts, and scripts.	`Are you ready to continue?  [Y]`
`Courier bold`	Font used to indicate what the user enters in examples of command environments.	Login: **`root`** Password: **`<password>`**

Table 2 Command Syntax Conventions

Convention	Definition	Sample
Vertical bar (|)	Separates alternative, mutually exclusive elements.	**offset-list** {**in** | **out**} *offset*
Square brackets ([ ])	Indicate optional elements.	[**no**] **offset-list** {**in** | **out**} *offset*
Braces ({ })	Indicate a required choice.	**offset-list** {**in** | **out**} *offset*
Braces within square brackets ([{ }])	Indicate a required choice within an optional element.	[{*letter**number*}**Enter**]

Table 2 Command Syntax Conventions (continued)

Convention	Definition	Sample
Boldface	Indicates commands and keywords that are entered literally as shown	[**no**] **offset-list** {**in** | **out**} *offset*
Italics	Indicate arguments for which you supply values. **Note** In contexts that do not allow italics, arguments are enclosed in angle brackets (< >).	**offset-list** {**in** | **out**} *offset*

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

Tip Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information or information that might save time.

Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.

Warning **Means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, you must be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translated versions of the warning, refer to the *Regulatory Compliance and Safety* document that accompanied the device.**

Related Documentation

A complete list of all DSL product related documentation is available on the World Wide Web at http://www.cisco.com/univercd/cc/td/doc/product/dsl_prod/index.htm.

Obtaining Documentation

The following sections provide sources for obtaining documentation from Cisco Systems.

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at the following sites:

- http://www.cisco.com
- http://www-china.cisco.com

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To access Cisco.com, go to the following website:

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Technical Assistance Center

The Cisco TAC website is available to all customers who need technical assistance with a Cisco product or technology that is under warranty or covered by a maintenance contract.

Contacting TAC by Using the Cisco TAC Website

If you have a priority level 3 (P3) or priority level 4 (P4) problem, contact TAC by going to the TAC website:

http://www.cisco.com/tac

P3 and P4 level problems are defined as follows:

- P3—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- P4—You need information or assistance on Cisco product capabilities, product installation, or basic product configuration.

In each of the above cases, use the Cisco TAC website to quickly find answers to your questions.

To register for Cisco.com, go to the following website:

http://www.cisco.com/register/

If you cannot resolve your technical issue by using the TAC online resources, Cisco.com registered users can open a case online by using the TAC Case Open tool at the following website:

http://www.cisco.com/tac/caseopen

Contacting TAC by Telephone

If you have a priority level 1 (P1) or priority level 2 (P2) problem, contact TAC by telephone and immediately open a case. To obtain a directory of toll-free numbers for your country, go to the following website:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

P1 and P2 level problems are defined as follows:

- P1—Your production network is down, causing a critical impact to business operations if service is not restored quickly. No workaround is available.
- P2—Your production network is severely degraded, affecting significant aspects of your business operations. No workaround is available.

Product Overview

This chapter provides an overview of the Cisco 6130 with NI-2 system. This chapter contains the following sections:

Note If you are converting from a Cisco 6130 with NI-1 system to a Cisco 6130 with NI-2 system, refer to the conversion procedures that are available on the World Wide Web at http://www.cisco.com/univercd/cc/td/doc/product/dsl_prod/c6130ni2/upgrade/78_10709.htm

Introduction to the Cisco 6130 with NI-2 System

The Cisco 6130 with NI-2 system is part of the Cisco DSL product family that provides end-to-end service by carrying data between a subscriber's home or office, a telephone central office (CO), and various networks. The Cisco 6130 with NI-2 system sends and receives subscriber data (often Internet service) over existing copper telephone lines, concentrating all traffic onto a single high-speed trunk for transport to the Internet or a corporate intranet. Asymmetric digital subscriber line (ADSL) and symmetrical digital subscriber line (SDSL) customer premises equipment (CPE) devices, which are connected to PCs or routers at the subscriber site, modulate data so that the data can travel over telephone lines to the Cisco 6130 digital subscriber line access multiplexer (DSLAM) at the CO.

The Cisco 6130 with NI-2 system may include the following components:

- Cisco 6130 chassis.
- Cisco 6120 chassis or third-party POTS splitter—A passive plain old telephone service (POTS) splitter.
- Management software—Provisions and manages the Cisco 6130 system.
  - Cisco IOS—A command-line interface (CLI) that is available for network element provisioning.

- Cisco DSL Manager (CDM)—A graphical user interface (GUI) designed to configure and manage the 6xxx series of Cisco IOS software-based DSL access multiplexers (DSLAMs). CDM provides the following areas of network management—fault, configuration, performance, and security. CDM runs with the Cisco Element Manager Framework (EMF); both are installed on Sun workstations.

  Cisco EMF is based on an object model in which network elements or modules represent the managed entity. Each object is defined by a class and specific attributes. An object can represent a network element or a more abstract entity such as a link relationship, a network, or a container such as a site, shelf, or region.

Note See the "Hardware Specifications" section on page A-1 for minimum software and network management release requirements per Cisco 6130 chassis component.

Features

The Cisco 6130 with NI-2 system includes the following features:

- Supports both ADSL and SDSL
- Carrierless amplitude and phase modulation (CAP) rate adaptive DSL (RADSL), ANSI T1.413 Discrete Multitone (DMT), and G.lite modem support
- Small footprint that terminates up to 128 ADSL/SDSL subscriber lines
- NEBS compliant, 23-inch chassis
- Manageable through Cisco IOS or CDM
- Supports subtending of as many as twelve Cisco 6130 chassis, for a maximum of 1664 subscribers
- Supports the entire range of virtual channel identifier (VCI)/virtual path identifier (VPI) connections; none of the connections are limited by memory
- ATM Forum UNI Versions 3.1 and 4.0 compliant
- Nonblocking ATM switching architecture
- Allows up to four ATM classes of service simultaneously
- Supports NI-2 card cold redundancy and automatic protection switching (APS) link redundancy

Configurations

This guide details the installation steps for the following configurations:

- Cisco 6130 with a POTS splitter
- Cisco 6130 without a POTS splitter
- Subtended network

Cisco 6130 with a POTS Splitter Configuration

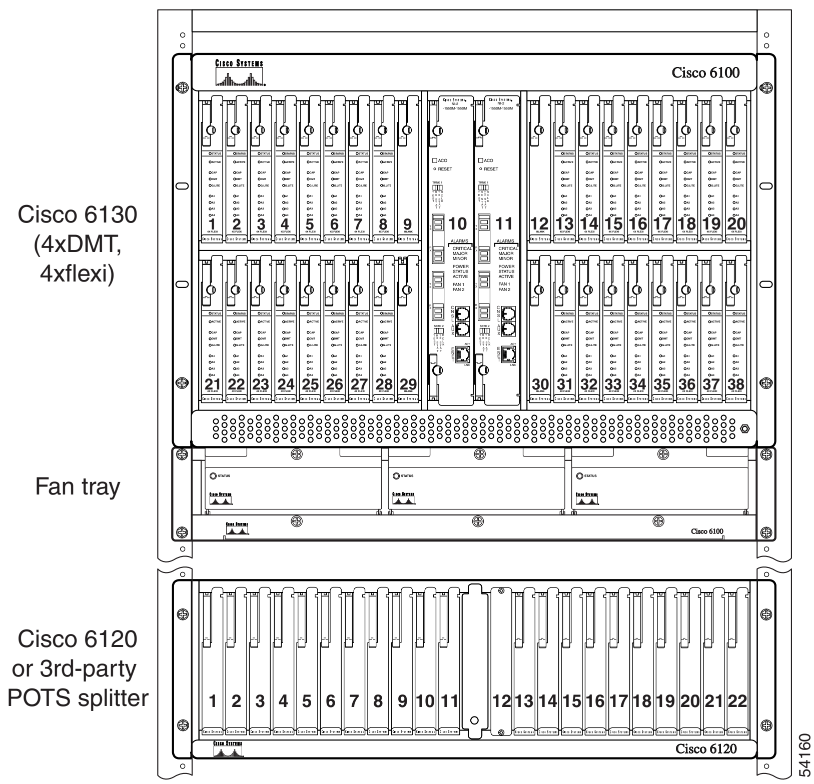
The Cisco 6130 with a POTS splitter configuration supports up to 128 subscribers through directly connected modems using ADSL technology. To increase subscribership, you can add additional chassis to your system.

This configuration includes the following hardware components:

- Cisco 6130—Maximum of two chassis are allowed per rack.
  - Quad-port DMT ATU-C line cards (4xDMTs).
  - Quad-port flexi ATU-C line cards (4xflexis)—Configure as CAP, DMT, or G.lite.
  - One or two NI-2 cards—DS3/2DS3 or OC-3c/OC-3c.
- Cisco 6120 or a third-party POTS splitter.
  - DMT POTS cards (use in either the Cisco 6120 or the third-party POTS splitter).
- Fan tray—A fan tray must be installed under each Cisco 6130 chassis.

Figure 1-1 shows the components for a Cisco 6130 chassis with a POTS splitter configuration.

Figure 1-1 Cisco 6130 with a POTS Splitter Configuration



Note Either a Cisco 6120 or a third-party POTS splitter can be used in a Cisco 6130 with a POTS splitter configuration.

A system configuration using quad-port line cards requires a POTS splitter capacity of 128 subscriber ports. Each Cisco 6120 POTS splitter supports up to 64 subscribers. Depending on the POTS splitter selected for your configuration (Cisco 6120 or third-party), the installation of an additional POTS splitter may be necessary.

Both a Cisco 6120 and a third-party POTS splitter can be used with the same Cisco 6130 chassis; however, Cisco does not supply the special cables required for this type of POTS configuration. For third-party POTS splitter port mapping and cable pinout specifications, consult the appropriate vendor documentation.

Cisco 6130 Without a POTS Splitter Configuration

The Cisco 6130 without a POTS splitter configuration supports up to 128 subscribers through directly connected modems using either ADSL or SDSL technology. To increase subscribership, you can add additional chassis to your system.

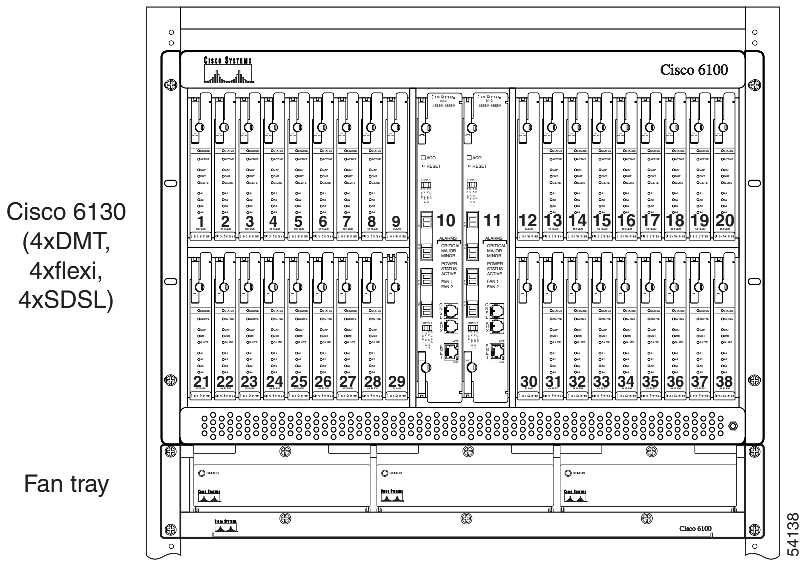
This configuration includes the following hardware components:

- Cisco 6130—Maximum of two chassis are allowed per rack.
  - 4xDMTs.
  - 4xflexis—Configure as CAP, DMT, or G.lite.
  - Quad-port STU-C line cards (4xSDSLs).
  - One or two NI-2 card(s)—DS3/2DS3 or OC-3c/OC-3c.
- Fan tray—A fan tray must be installed under each Cisco 6130 chassis.

In this configuration, the Cisco 6130 connects directly to the main distribution frame (MDF).

Figure 1-2 shows the components for a Cisco 6130 without a POTS splitter configuration.

Figure 1-2 Cisco 6130 Without a POTS Splitter Configuration



Subtended Network Configuration

A subtended network configuration

- Services and aggregates the data from one or more remotely located Cisco 6130 chassis into a subtending host chassis to take advantage of the data network interface on the subtending host chassis
- Provides additional benefits by reducing the number of ATM edge-switch ports that are required to terminate the chassis
- Supports both a Cisco 6130 with a POTS splitter and a Cisco 6130 without a POTS splitter configuration
- Supports NI-2 card cold redundancy in subtended node chassis if both the subtending host chassis and the subtended node chassis have primary and secondary NI-2 cards installed

Note An NI-2 card failure on a node in a subtend tree or daisy-chain temporarily interrupts traffic to all subtended node chassis.

- Supports APS link redundancy on subtended OC-3c interfaces if both the subtending host chassis and the subtended node chassis have primary and secondary NI-2 cards installed

Tip The term *subtending* refers to the host chassis, and *subtended* refers to the downstream chassis in a subtended network.

A subtended network configuration supports the following features:

- The capacity to run data as fast as the speed of its subtended link. Uplink speed cannot exceed the OC-3c speed.
- Four arbitration priorities, one for each quality of service (QoS) level. The supported QoS service levels are
  - Constant bit rate (CBR) for rate-limited services that require guaranteed bandwidth and bounded delay.
  - Variable bit rate real time (VBR-rt) for delay-sensitive voice and video services.
  - Variable bit rate nonreal time (VBR-nrt) for high-priority data services.
  - Unspecified bit rate (UBR) for low-priority data services.
- Explicit forward congestion indication (EFCI) marking for available bit rate (ABR) service support.
- Guaranteed frame rate (GFR).
- Tree or daisy chain configurations for DS3 subtended Cisco 6130 chassis.
- Daisy chain configurations for OC-3c subtended Cisco 6130 chassis.
- Fair access to the trunk port for each subtended chassis.
- A network trunk port that operates as fast as any subtended link.
- NI-2 card cold redundancy and APS link redundancy. See the "Redundancy Overview" section on page 1-26 for more information.

The NI-2 card provides three types of subtended network connections:

- A DS3 ATM interface
- A high-speed OC-3c optical ATM interface that supports single-mode fiber (SMF) intermediate range
- A high-speed OC-3c optical ATM interface that supports multimode fiber (MMF) short range

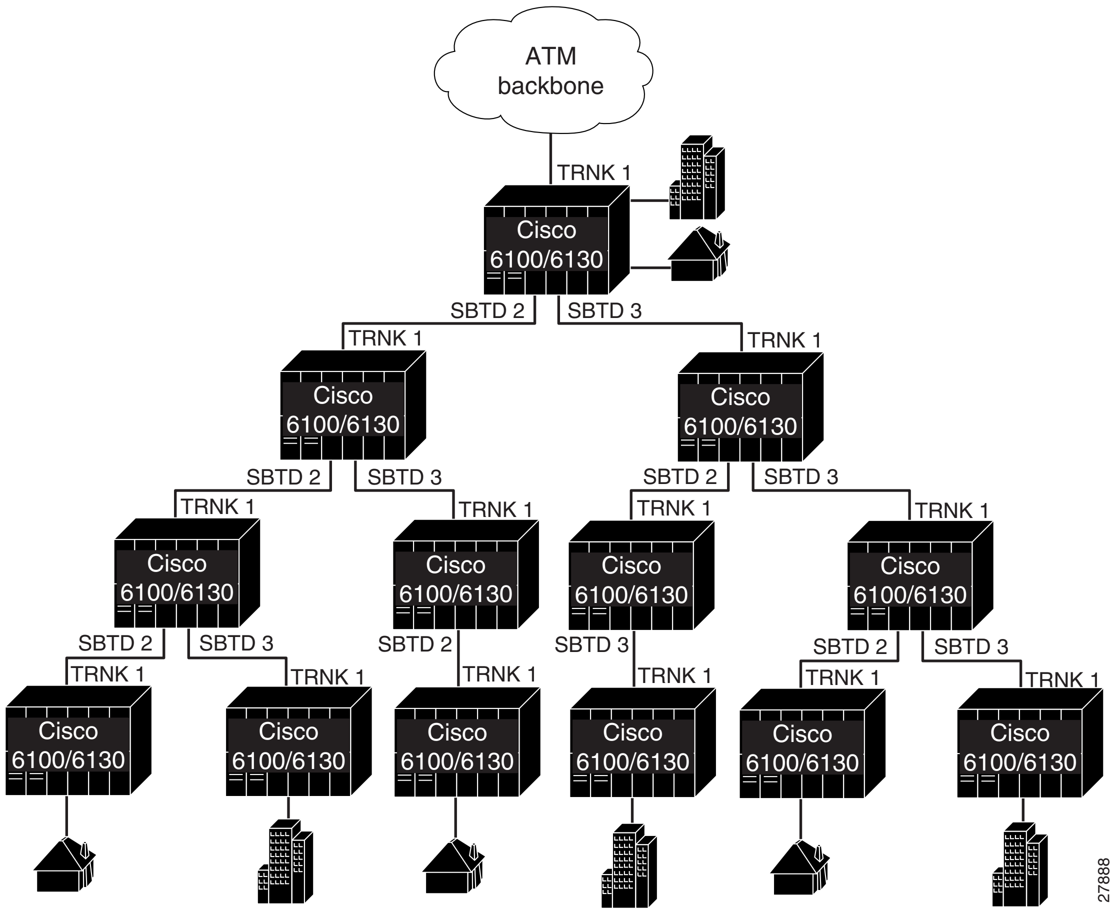
The following sections detail the three types of subtending network connections.

Subtended Network Configuration with DS3/2DS3 NI-2 Cards

In a subtended network configuration using DS3/2DS3 NI-2 cards, you can subtend a Cisco 6130 chassis to four tiers, with up to twelve chassis, all connecting through one subtending host chassis to the ATM backbone.

Figure 1-3 shows typical DS3-configured Cisco 6130 systems subtended in a combined subtending tree topology with daisy chain. The subtending host chassis at the top of the subtending tree connects directly to the ATM switch. The middle two Cisco 6130 chassis in the lowest level are daisy chained. TRNK 1 refers to the single network trunk or to the Cisco 6130 subtended network interface. SBTD 2 and SBTD 3 refer to the two Cisco 6130 chassis subtended interfaces. You make network interface connections at the system I/O card that is installed on the Cisco 6130 backplane.

Figure 1-3 Subtended Network Configuration Using DS3/2DS3 NI-2 Cards



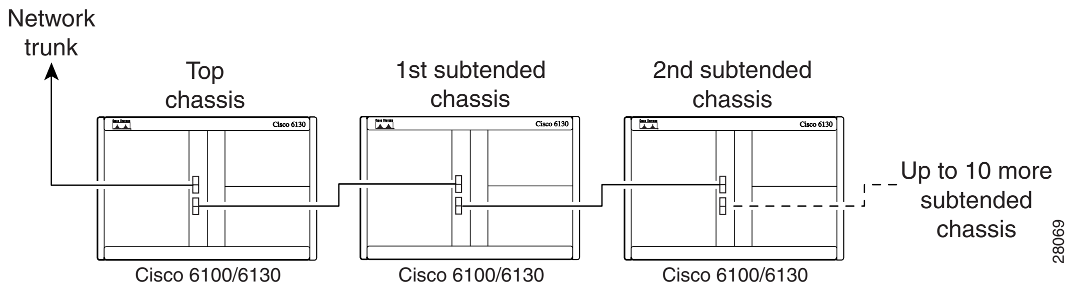
Note You can subtend Cisco 6130 chassis with DS3/2DS3 NI-2 cards in a continuous daisy chain. However, this subtending scheme is not optimal for data throughput for Cisco 6130 chassis that use DS3/2DS3 NI-2 cards.

Cisco IOS software does not manage the primary Cisco 6130 chassis and all subtended Cisco 6130 chassis as a single large Cisco 6130 with NI-2 system. Each Cisco 6130 supports an independent Cisco IOS processor and Management Information Base (MIB).

Subtended Network Configuration with OC-3c/OC-3c NI-2 Cards

In a subtended network configuration using OC-3c/OC-3c NI-2 cards (SMF or MMF), you can subtend up to twelve OC-3c configured chassis in a daisy chain, all connecting through one subtending host chassis to the ATM backbone (see Figure 1-4).

Figure 1-4 Subtended Network Configuration Using OC-3c/OC-3c NI-2 Cards



Cisco 6130 Chassis Overview

The Cisco 6130 chassis uses a 32-slot multiport line card architecture capable of supporting up to 128 ADSL/SDSL ports that are connected either directly or through a POTS splitter.

Note For hardware specifications for the Cisco 6130, see the "Cisco 6130 with NI-2 System Specifications" section on page A-2.

The following sections detail these Cisco 6130 hardware components:

- Cisco 6130 Card Compartment, page 1-9
- Cisco 6130 Backplane, page 1-10
- Cisco 6130 Cards, page 1-12
- System I/O Card, page 1-28
- Front Cover, page 1-32
- Rear Cover, page 1-32
- Fan Tray, page 1-33

Cisco 6130 Card Compartment

The card compartment holds all circuitry that relates to the Cisco 6130 with NI-2 system operation. The card compartment contains 38 slots. Table 1-1 describes each card slot assignment for the Cisco 6130.

Table 1-1 Cisco 6130 Card Slot Assignments

Card Slot	Card Assignment
1 to 8	4xDMTs, 4xflexis, or 4xSDSLs[1]
9	Blank faceplate[2]
10	NI-2 card (primary)
11	NI-2 card (secondary) or blank faceplate[2]
12	Blank faceplate[2]
13 to 20	4xDMT, 4xflexi, or 4xSDSLs[1]
21 to 28	4xDMT, 4xflexi, or 4xSDSLs[1]
29 and 30	Blank faceplates[2]
31 to 38	4xDMT, 4xflexi, or 4xSDSLs[1]

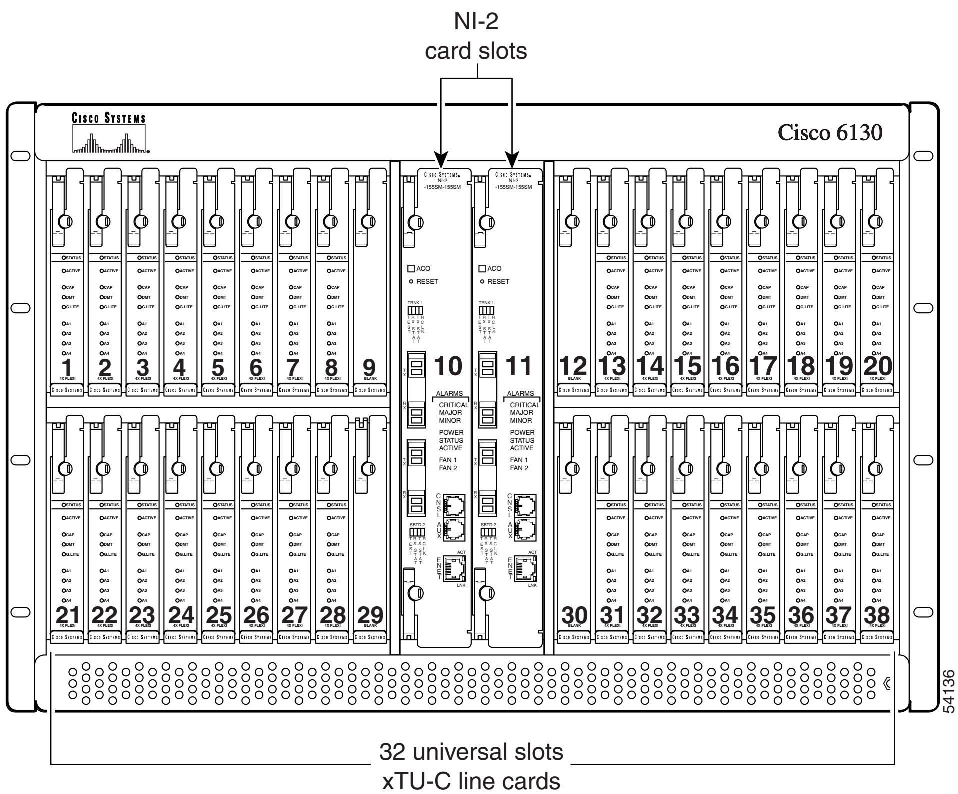
1. 4xSDSLs can only be used in a Cisco 6130 without a POTS splitter configuration.
2. Blank faceplates must be installed in all open slots of each chassis.

Note You can purchase blank faceplates for empty Cisco 6130 card slots.

Figure 1-5 identifies the Cisco 6130 card slots. Each slot on a chassis is numbered along the top of the chassis. In this guide, the slot numbers are shown on the cards for easy reference and readability. These slots are referred to in subsequent sections of this chapter and elsewhere in this guide.

Note Figure 1-5 shows the Cisco 6130 without the required front cover installed. The front cover must be installed while the Cisco 6130 with NI-2 system is in operation.

Figure 1-5 Cisco 6130 Card Slots



Cisco 6130 Backplane

Figure 1-6 shows the Cisco 6130 backplane.

Note To determine if you have a Cisco 6130, locate the Cisco 6130 label on the upper right corner of either the chassis or the front cover of the chassis. Another way to determine if you have a Cisco 6130 is to locate the J49 connector on the backplane. The Cisco 6100 backplane does not have this connector.

Figure 1-6 Cisco 6130 Backplane

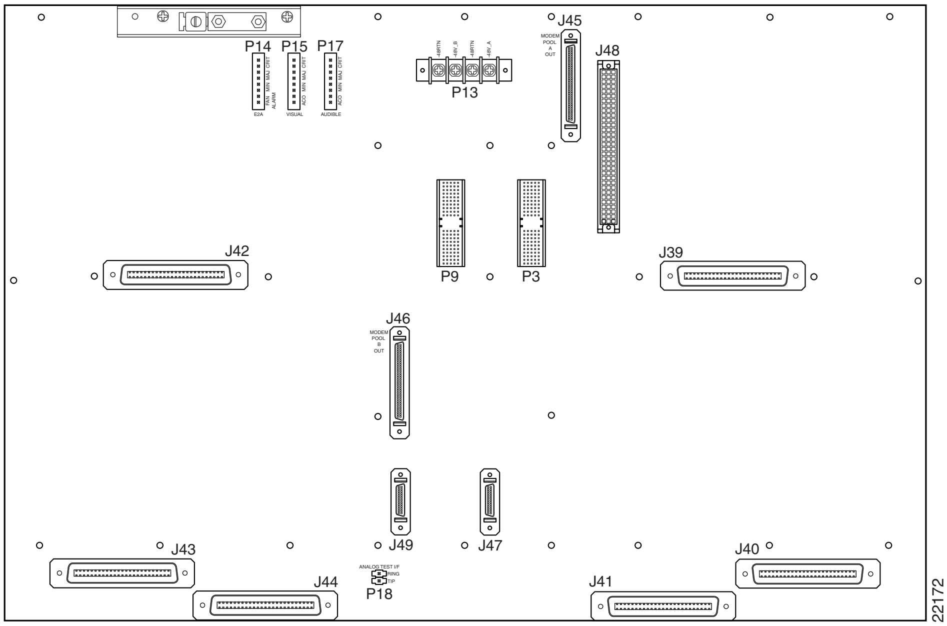


Table 1-2 describes the connectors and switches on the Cisco 6130 backplane.

Table 1-2 Cisco 6130 Backplane Connectors and Switches

Identifier	Name	Description
J45	—	Not in use.
J46	—	Not in use.
J47	—	Not in use.
J48	—	Not in use.
J49	Fan Tray Connection	26-pin SCSI connector used to connect the fan tray to the Cisco 6130 chassis.
J39, J40, J41, J42, J43, J44	Data	Six 50-pin Champ connectors used to transfer data between the Cisco 6130 chassis and the POTS splitter in a Cisco 6130 with a POTS splitter configuration. In a Cisco 6130 without a POTS splitter configuration, the connectors are used to transfer data between the Cisco 6130 chassis and the CPE equipment.
P9, P3	System I/O card	Two 2-mm HM[1] modular connectors (male on the Cisco 6130 backplane and female on the system I/O card) used to connect the system I/O card.
P13	Power	A terminal block connector with four dual-power connections (–48V_A, –48V_B, and two –48RTN[2]).

Table 1-2 Cisco 6130 Backplane Connectors and Switches (continued)

Identifier	Name	Description
P14, P15, P17	—	Not in use.
P18	Analog test input	A 2-position header for connecting external xDSL test equipment.

1. HM = hard metric
2. RTN = return (ground)

Cisco 6130 Cards

This section contains the following information about the types of Cisco 6130 cards:

- 4xDMT Overview, page 1-13
- 4xflexi Overview, page 1-15
- 4xSDSL Overview, page 1-18
- DS3/2DS3 NI-2 Card Overview, page 1-20
- OC-3c/OC-3c NI-2 Card Overview, page 1-23

Table 1-3 shows the configurations where the Cisco 6130 line cards can operate.

Table 1-3 Cisco 6130 Card and Configuration Compatibility

Line Card	Cisco 6130 with a POTS Splitter Configuration	Cisco 6130 Without a POTS Splitter Configuration
4xDMT	Yes	Yes
4xflexi[1]	Yes	Yes
4xSDSL[2, 3]	No	Yes

1. The 4xflexi feature support for the Cisco 6130 is present in Release 12.1(2)DA or later.
2. The 4xSDSL feature support for the Cisco 6130 is present in Release 12.1(2)DA or later.
3. 4xSDSL does not support POTS.

The Cisco 6130 supports restricted line card intermixing. You can intermix only the 4xflexi (CAP mode) and the 4xflexi (DMT mode) in the same chassis half. The left half of the chassis comprises slots 1 to 8 and 21 to 28; the right half comprises slots 13 to 20 and 31 to 38. The line card intermixing configurations that are supported in a Cisco 6130 chassis are

- 4xflexi (CAP mode) and 4xflexi (DMT mode)
- 4xflexi (CAP mode) and 4xSDSL (used in a Cisco 6130 without POTS splitter configuration only)
- 4xflexi (DMT mode) and 4xSDSL (used in a Cisco 6130 without POTS splitter configuration only)

Caution Other line card intermixing configurations are not currently supported. Mixing incompatible line cards can cause unpredictable system behavior.

4xDMT Overview

The 4xDMT

- Supports four ADSL modem connections.
- Converts ADSL modulation from the line into digital data streams to and from the NI-2 card.
- Negotiates the line rate with the CPE when it trains and bases the rate on line quality and distance.

Note For line card intermixing information, see the "Cisco 6130 Cards" section on page 1-12.

If provisioned, the 4xDMT rate adapts to the maximum bit rate negotiable on the line. The maximum bit rate settings are provisioned in the management software.

Note For hardware specifications for the 4xDMT, see the "4xDMT Specifications" section on page A-3.

The chassis can include up to 32 4xDMTs for a total of 128 ADSL modem connections.

Faceplate Features

The following fixtures are present on the front of the 4xDMT faceplate:

- Locking lever and locking tab
- LEDs
  - STATUS
  - ACTIVE
  - Four port (ATU-C1 through ATU-C4)
- Extraction tab

Figure 1-7 shows a close-up of the 4xDMT faceplate.

Figure 1-7 4xDMT Faceplate

Table 1-4 describes the 4xDMT LED indicator functions.

Table 1-4 4xDMT LED Indicators

LED	State	Function
STATUS	Green slow blinking	The self-test is in progress.
	Green fast blinking	The image download is in progress.
	Green solid	The status is OK.
	Red	The self-test or line card has failed.
	Off	The ATU-C line card has a power failure.
ACTIVE	Green solid	The line card is activated.
	Green blinking	A digital signal processor firmware download is in progress.
	Off	The line card is not in service.
ATU-C 1	Green solid	Modem 1 is trained.
	Green blinking	Training is in progress for modem 1.
	Off	Modem 1 is idle.
ATU-C 2	Green solid	Modem 2 is trained.
	Green blinking	Training is in progress for modem 2.
	Off	Modem 2 is idle.

Table 1-4 4xDMT LED Indicators (continued)

LED	State	Function
ATU-C 3	Green solid	Modem 3 is trained.
	Green blinking	Training is in progress for modem 3.
	Off	Modem 3 is idle.
ATU-C 4	Green solid	Modem 4 is trained.
	Green blinking	Training is in progress for modem 4.
	Off	Modem 4 is idle.

4xflexi Overview

The 4xflexi

- Supports CAP, DMT, or G.lite line encoding.
- Supports four ADSL modem connections.
- Converts ADSL modulation from the line into digital data streams to and from the NI-2 card.
- Negotiates the line rate with the CPE when it trains and bases the rate on line quality and distance.

Note For line card intermixing information, see the "Cisco 6130 Cards" section on page 1-12.

If provisioned, the 4xflexi rate adapts to the maximum bit rate negotiable on the line. The maximum bit rate settings are provisioned in the management software.

Note For hardware specifications for the 4xflexi, see the "4xflexi Specifications" section on page A-3.

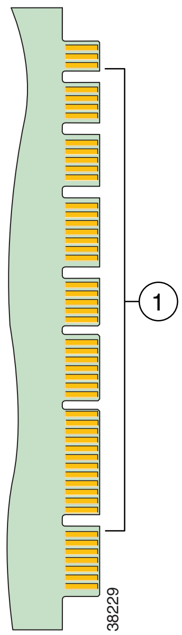
The Cisco 6130 system can include up to 32 4xflexis for a total of 128 ADSL modem connections.

Edge Connector Key

The edge connector key, located on the rear of the 4xflexi, connects the 4xflexi to the backplane of the chassis. There are two edge connector keys available for the 4xflexi: one has six notches and one has seven notches. You can use both versions in the Cisco 6130 with NI-2 system. Figure 1-8 shows the edge connector key with seven notches.

Note The 4xSDSL card also features the edge connector key.

Figure 1-8   Edge Connector Key



Faceplate Features

The following fixtures are present on the front of the 4xflexi faceplate:

- Locking lever and locking tab
- LEDs
  - STATUS
  - ACTIVE
  - CAP
  - DMT
  - G.LITE
  - Four port (A1 through A4)
- Extraction tab

Figure 1-9 shows a close-up of the 4xflexi faceplate.

Figure 1-9 4xflexi Faceplate

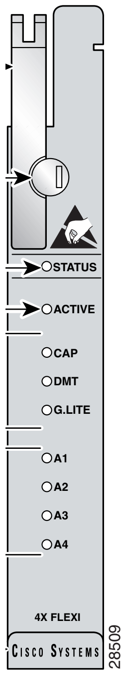


Table 1-5 describes the 4xflexi LED indicator functions.

Table 1-5 4xflexi LED Indicators

LED	State	Function
STATUS	Green slow blinking	The self-test is in progress.
	Green fast blinking	The image download is in progress.
	Green solid	The status is OK.
	Red	The self-test or line card has failed.
	Off	The ATU-C line card has a power failure.
ACTIVE	Green solid	The line card is activated.
	Off	The line card is not in service.
CAP	Green solid	The line card is in CAP mode.
	Off	The line card is not in CAP mode.
DMT	Green solid	The line card is in DMT mode.
	Off	The line card is not in DMT mode.
G.LITE	Green solid	The line card is in G.lite mode.
	Off	The line card is not in G.lite mode.
A1	Green solid	Modem 1 is trained.
	Green blinking	Training is in progress for modem 1.
	Off	Modem 1 is idle.

Table 1-5 4xflexi LED Indicators (continued)

LED	State	Function
A2	Green solid	Modem 2 is trained.
	Green blinking	Training is in progress for modem 2.
	Off	Modem 2 is idle.
A3	Green solid	Modem 3 is trained.
	Green blinking	Training is in progress for modem 3.
	Off	Modem 3 is idle.
A4	Green solid	Modem 4 is trained.
	Green blinking	Training is in progress for modem 4.
	Off	Modem 4 is idle.

4xSDSL Overview

The 4xSDSL

- Supports 2B1Q line encoding.
- Is designed for use in a Cisco 6130 without a POTS splitter configuration.
- Supports four SDSL modem connections.
- Converts SDSL modulation from the line into digital data streams to and from the NI-2 card.

Note For line card intermixing information, see the "Cisco 6130 Cards" section on page 1-12.

The negotiated bit rate is the lower of the following rates:

- The provisioned bit rate set for the 4xSDSL in the management software
- The assigned bit rate at the CPE

Note For hardware specifications for the 4xSDSL, see the "4xSDSL Specifications" section on page A-4.

The chassis can include up to 32 4xSDSLs for a total of 128 SDSL modems.

Edge Connector Key

The edge connector key, located on the rear of the 4xSDSL, connects the 4xSDSL to the backplane of the chassis. There are two edge connector keys available for the 4xSDSL: one has six notches, and the other has seven notches. You can use both versions in the Cisco 6130 with NI-2 system. Figure 1-8 shows the edge connector key with seven notches.

Faceplate Features

The following fixtures are present on the front of the 4xSDSL faceplate:

- Locking lever and locking tab
- LEDs
  - STATUS
  - ACTIVE
  - Four port (STU-C1 through STU-C4)
- Extraction tab

Figure 1-10 shows a close-up of the 4xSDSL faceplate.

Figure 1-10 4xSDSL Faceplate

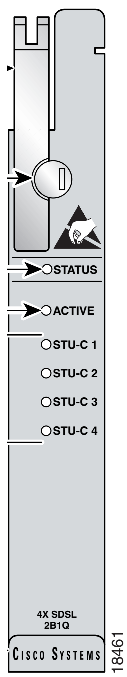


Table 1-6 describes the 4xSDSL LED indicator functions.

Table 1-6 4xSDSL LED Indicators

LED	State	Function
STATUS	Green slow blinking	The self-test is in progress.
	Green fast blinking	The image download is in progress.
	Green solid	The status is OK.
	Red	The self-test or line card has failed.
	Off	The ATU-C line card has a power failure.
ACTIVE	Green solid	The line card is activated.
	Off	The line card is not in service.

Table 1-6 4xSDSL LED Indicators (continued)

LED	State	Function
STU-C 1	Green solid	Modem 1 is trained.
	Green blinking	Training is in progress for modem 1.
	Off	Modem 1 is idle.
STU-C 2	Green solid	Modem 2 is trained.
	Green blinking	Training is in progress for modem 2.
	Off	Modem 2 is idle.
STU-C 3	Green solid	Modem 3 is trained.
	Green blinking	Training is in progress for modem 3.
	Off	Modem 3 is idle.
STU-C 4	Green solid	Modem 4 is trained.
	Green blinking	Training is in progress for modem 4.
	Off	Modem 4 is idle.

DS3/2DS3 NI-2 Card Overview

The DS3/2DS3 NI-2 card

- Connects to the *x*TU-C line cards through point-to-point serial data buses on the backplane
- Controls timing and redundancy
- Provides CO facility alarm relay contact interfaces and an alarm cut-off (ACO) button
- Provides visual and audible operating status alerts
- Contains the ATM switch fabric
- Provides the network DS3 WAN trunk interface through BNC connectors located on the system I/O card
- Provides two DS3 subtend interfaces through BNC connectors located on the system I/O card
- Supports the aggregation of up to 12 subtended node chassis that are configured for DS3 operation in a tree topology
- Supports NI-2 card cold redundancy
- Provides Cisco IOS-based ATM Quality of Service (QoS).

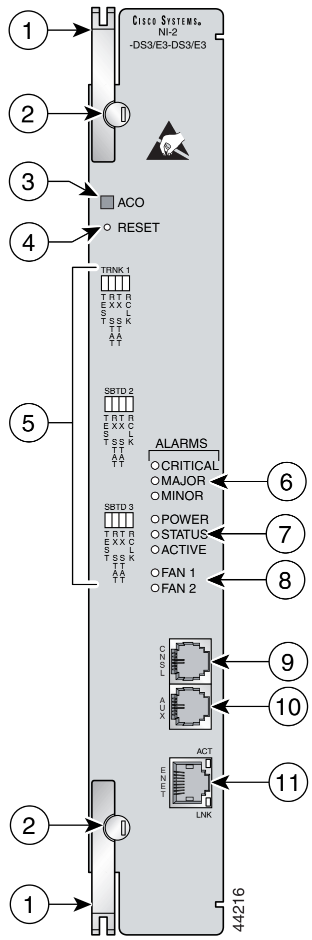
The DS3/2DS3 NI-2 card functions are managed by Cisco IOS software. The Cisco IOS software operates and integrates controller, network trunk, and subtending functions from this single card, which occupies slot 10, slot 11, or both in a Cisco 6130 chassis.

Note For DS3/2DS3 NI-2 card hardware specifications, see the "DS3/2DS3 NI-2 Card Specifications" section on page A-5.

Faceplate Features

Figure 1-11 shows a close-up of the DS3/2DS3 NI-2 card faceplate.

Figure 1-11 DS3/2DS3 NI-2 Card Faceplate



The following fixtures are present on the front of the DS3/2DS3 NI-2 card faceplate, as noted in Figure 1-11:

- Two locking levers with locking tabs.
- An ACO button and a maintenance RESET port located at the top of the faceplate.

- Three interface status LED groups, Trunk 1 (TRNK 1), Subtend 2 (SBTD 2), and Subtend 3 (SBTD 3), located on the left side of the card faceplate. These interface status LED groups monitor the trunk and subtend connections on the system I/O card or I/O module.

  Table 1-7 describes the interface status LED group indicators and their functions.

Table 1-7 Interface Status LED Group Indicators

LED	State	Function
TEST	Amber solid	Cisco IOS detects that an obtrusive test (loopback) is active on this interface.
	Off	Cisco IOS does not detect obtrusive test activity.
RX STAT	Amber solid	The receiver detects a physical layer problem.
	Off	The receiver does not detect a physical layer problem.
TX STAT	Amber solid	The transmitter detects a physical layer problem.
	Off	The transmitter does not detect a physical layer problem.
RCLK	Green solid	Hardware detects an incoming clock signal.
	Off	Hardware does not detect an incoming clock signal.

- Three alarm status LED groups located on the right side of the NI-2 card faceplate.
  - System alarm LED group
  - Card status LED group
  - Fan alarm LED group

  Table 1-8 describes the alarm status LED group indicators and their functions.

Table 1-8 Alarm Status LED Group Indicators

LED Group	LED	State	Function
System Alarm	CRITICAL	Red	When this LED is lit, a critical alarm is active.
	MAJOR	Red	When this LED is lit, a major alarm is active.
	MINOR	Amber	When this LED is lit, a minor alarm is active.
Card Status	POWER	Green	When this LED is lit, the NI-2 card has power.
	STATUS	Green	This LED indicates the operational status of the NI-2 card: • When the LED is lit, there are no internal faults or problems. • When the LED is not lit, the NI-2 card has not booted properly, or a problem is preventing normal operation.
	ACTIVE	Green	When lit, this LED indicates which NI-2 card is operating as the active network interface in the chassis.
Fan Alarm	FAN 1	—	This LED on the NI-2 card is inactive and always off. The fan status LED indicators are on the fan tray.
	FAN 2	—	This LED on the NI-2 card is inactive and always off. The fan status LED indicators are on the fan tray.

- Three operating system interface and internet ports located on the right side of the NI-2 card faceplate.
  - CNSL—An RJ-45 receptacle that provides a serial connection to a system console.
  - AUX—An RJ-45 receptacle that provides connection to an auxiliary device (such as a modem) used to remotely configure the system.
  - ENET—An RJ-45 10BaseT receptacle that complies with Ethernet standards and that provides connection to a system Ethernet. The ENET interface has two LEDs: ACT to indicate activity status and LNK to indicate link status. Table 1-9 describes the ENET interface LED indicators and their functions.

Table 1-9 ENET Interface LED Indicators

LED	State	Function
ACT	Green solid or blinking	When the LED is lit or blinking, the Ethernet interface is active.
	Off	When the LED is unlit, the Ethernet interface is inactive.
LNK	Green solid	When the LED is lit, the Ethernet link is active.

OC-3c/OC-3c NI-2 Card Overview

The OC-3c/OC-3c NI-2 card

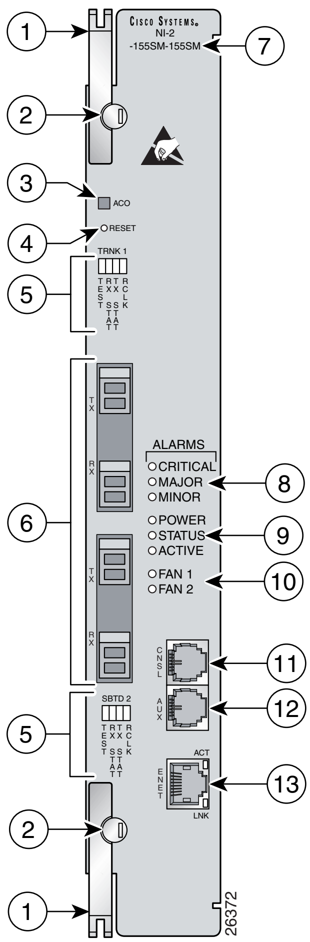
- Connects to the *x*TU-C line cards through point-to-point serial data buses on the backplane
- Controls timing and redundancy
- Provides CO facility alarm relay contact interfaces and an ACO button
- Provides visual and audible operating status alerts
- Contains the ATM switch fabric
- Provides the network OC-3c WAN trunk interface through connectors located on the NI-2 card faceplate. The following two versions of the OC-3c/OC-3c NI-2 card are available to support the WAN trunk interface:
  - SMF intermediate range
  - MMF short range
- Provides an OC-3c subtend interface through optical connectors located on the NI-2 card faceplate.
- Supports the aggregation of up to 12 subtended node chassis that are configured for OC-3c operation in a daisy-chain topology
- Supports NI-2 card cold redundancy
- Supports APS link redundancy
- Provides Cisco IOS-based ATM Quality of Service (QoS)

Note For OC-3c/OC-3c NI-2 card hardware specifications, see the "OC-3c/OC-3c NI-2 Card Specifications" section on page A-6.

Faceplate Features

Figure 1-12 shows a close-up of the OC-3c/OC-3c NI-2 card faceplate.

Figure 1-12 OC-3c/OC-3c NI-2 Card Faceplate



1	Ejector lever.	**7**	Model number
2	Locking tab.	**8**	System alarm LED group.
3	ACO button.	**9**	Card status LED group.
4	Maintenance RESET port.	**10**	Fan alarm LED group.

5	Interface status LED groups: Trunk 1 (TRNK 1) and Subtend 2 (SBTD 2). These groups show the status of the trunk and subtend connections.	11	CNSL—An RJ-45 receptacle that provides a serial connection to a system console.
6	Two optical interface connector pairs: Trunk 1 (TRNK 1) and Subtend 2 (SBTD 2) • TRNK 1—This connector pair is for network trunk interface TX and RX data optical cables. On a subtended node chassis, these network trunk interface TX and RX cables connect to SBTD 2 on the subtending host chassis. • SBTD 2—This connector pair is for subtended node chassis TX and RX data optical cables.	12	AUX—An RJ-45 receptacle that provides connection to an auxiliary device (such as a modem) used to remotely configure the system.
		13	ENET—An RJ-45 10BaseT receptacle that complies with Ethernet standards and that provides connection to a system Ethernet.

Table 1-10 describes the LED group indicators and their functions.

Table 1-10 OC-3c/OC-3c NI-2 Card LED Group Indicators

LED Group	LED	State	Function
Interface status LED (**5** in Figure 1-12)	TEST	Amber solid	Cisco IOS detects that an obtrusive test (loopback) is active on this interface.
		Off	Cisco IOS does not detect obtrusive test activity.
	RX STAT	Amber solid	The receiver detects a physical layer problem.
		Off	The receiver does not detect a physical layer problem.
	TX STAT	Amber solid	The transmitter detects a physical layer problem.
		Off	The transmitter does not detect a physical layer problem.
	RCLK	Green solid	Hardware detects an incoming clock signal.
		Off	Hardware does not detect an incoming clock signal.
System alarm (**8** in Figure 1-12)	CRITICAL	Red	A critical alarm is active.
	MAJOR	Red	A major alarm is active.
	MINOR	Amber	A minor alarm is active.
Card status (**9** in Figure 1-12)	POWER	Green	The NI-2 card has power.
	STATUS	Green	The operational status of the NI-2 card. • On—There are no internal faults or problems. • Off—The NI-2 card has not booted properly, or a problem is preventing normal operation.
	ACTIVE	Green	The NI-2 card is operating as the active NI-2 card in the chassis.

Table 1-10 OC-3c/OC-3c NI-2 Card LED Group Indicators (continued)

LED Group	LED	State	Function
Fan alarm (**10** in Figure 1-12)	FAN 1	Red	The fan module or fan tray is not operational and is in alarm mode.
	FAN 2	—	This LED on the NI-2 card is inactive and is always off.
ENET interface LED (**13** in Figure 1-12)	ACT	Green solid or blinking	The Ethernet interface is active.
		Off	The Ethernet interface is inactive.
	LNK	Green solid	The Ethernet link is connected and enabled.

Network Clocking Overview

The NI-2 card receives its network timing signal from any one of the following sources:

- A building integrated timing supply (BITS) clock. When a BITS clock serves as the network timing signal source, the Cisco 6130 chassis receives a clock signal through designated pins on the system I/O card and distributes the signal through the chassis backplane.
- An internal clock.
- A DS3 or OC-3c network trunk interface. An NI-2 card synchronizes with the network timing source and provides a clock reference signal to line cards in the chassis and to subtended node chassis.

  The active NI-2 card supplies a redundant pair of clock signals to all cards in the chassis. This same clock reference can be propagated to subtend systems via the trunk and subtended interface ports. This is done by configuring the subtending port of the root system to source the network-derived clock. The trunk port of the subtended system is configured as the network clock source for that chassis. This chain continues down the subtended tree.

Redundancy Overview

Redundancy is available for the Cisco 6130 system. The following forms of redundancy are available:

- NI-2 card cold redundancy, which allows a standby NI-2 card to take over system operations in the event of a complete failure of the active NI-2 card.
- APS link redundancy, which provides recovery from a cut fiber or the failure of an OC-3c optical transmitter or optical receiver interface on an NI-2 card. APS link redundancy is available on OC-3c/2DS3 NI-2 card trunk interfaces and OC-3c/OC-3c NI-2 card trunk and subtend interfaces.

Note Line card redundancy is not currently supported.

NI-2 Card Cold Redundancy

NI-2 card cold redundancy requires that two NI-2 cards be installed in the chassis. The primary card is installed in slot 10 of the chassis, and the secondary card is installed in slot 11. Either the primary or the secondary NI-2 card can serve as the active NI-2 card. The interface types must be the same for both the primary and secondary NI-2 cards.

In a Cisco 6130 system, NI-2 card cold redundancy is supported by DS3/2DS3, OC-3c/OC-3c SMF, and OC-3c/OC-3c MMF NI-2 cards.

During steady-state operations, one NI-2 card functions as the active unit, and the other functions as the standby unit. The active NI-2 card displays a green ACTIVE LED. In an active state, the NI-2 card

- Has full Ethernet, auxiliary port, and console access
- Communicates with line cards
- Has full access to the environmental monitoring subsystem
- Has access to the optical interfaces on the standby NI-2 card
- Allows remote access to the file system of the standby NI-2 card

The standby NI-2 card plays a minimal role during steady-state operations. In a standby state, the NI-2 card

- Receives configuration changes from the active NI-2 card (when the cards are configured for synchronization)
- Has no Ethernet, auxiliary port, or console access
- Does not communicate with line cards
- Has no access to the environmental monitoring subsystem
- Generates only APS alarms, which are reported via the active card

For management purposes, the primary and secondary NI-2 cards appear as one element. The cards share one IP address.

Note For information on NI-2 card cold redundancy switchover conditions, refer to the *Upgrading DSLAMs for NI-2 Card and APS Link Redundancy* document.

APS Link Redundancy

APS link redundancy provides recovery from a cut fiber or the failure of an OC-3c optical transmitter or receiver interface on an NI-2 card. In a Cisco 6130 system, APS link redundancy is available on OC-3c/OC-3c NI-2 card trunk and subtend interfaces.

The working link is the fiber connection between the primary NI-2 card installed in slot 10 of the chassis and the ATM switch. The protection link is the fiber connection between the secondary NI-2 card installed in slot 11 of the chassis and the ATM switch. When the fiber or optical ports on the active NI-2 card fail, that card remains active but is able to use the fiber or optical ports on the standby NI-2 card.

APS protocol information is carried over the protection link connected to the secondary NI-2 card in slot 11. The standby NI-2 card continually reports synchronous optical network (SONET) state information to the active NI-2 card.

APS link redundancy is nonrevertive. For example, after a switchover from the working to the protective link occurs, the active NI-2 card will switch back to the working fiber only if manually forced through a CLI command or if a failure condition occurs on the protection link. However, if a failure condition occurs on the protection link while the working link is still in a failed state, a switch back to the working link will not occur.

Note For information on APS link redundancy switchover conditions, refer to the *Upgrading DSLAMs for NI-2 Card and APS Link Redundancy* document.

Redundancy in Subtended Configurations

In Cisco 6130 subtending configurations, NI-2 card redundancy is supported in a DS3 subtend tree or in an OC-3c subtend daisy-chain if both the subtending host chassis and the subtended node chassis have primary and secondary NI-2 cards installed. An NI-2 card failure on a node in a subtend tree or daisy-chain temporarily interrupts traffic to all subtended node chassis.

APS link redundancy is supported on optical interfaces in Cisco 6130 subtending configurations if the subtending host chassis has a secondary (redundant) OC-3c/OC-3c NI-2 card installed.

System I/O Card

A system I/O card

- Provides transmit and receive Bayonet-Neill-Concelman (BNC) coaxial cable connections for interfacing with one DS3 network connection and up to two subtended node chassis that use DS3/2DS3 NI-2 cards.
- Provides relays and contact wire-wrap pins for dedicated CO facility operating alarms (DS3 or OC-3c systems) that are operated by Cisco IOS software
- Provides the BITS clock

The system I/O card attaches to the two 2-mm HM card connectors, P3 and P9, on the Cisco 6130 backplane.

Figure 1-13 shows the location of the system I/O card on the chassis backplane.

Figure 1-13 System I/O Card Locations

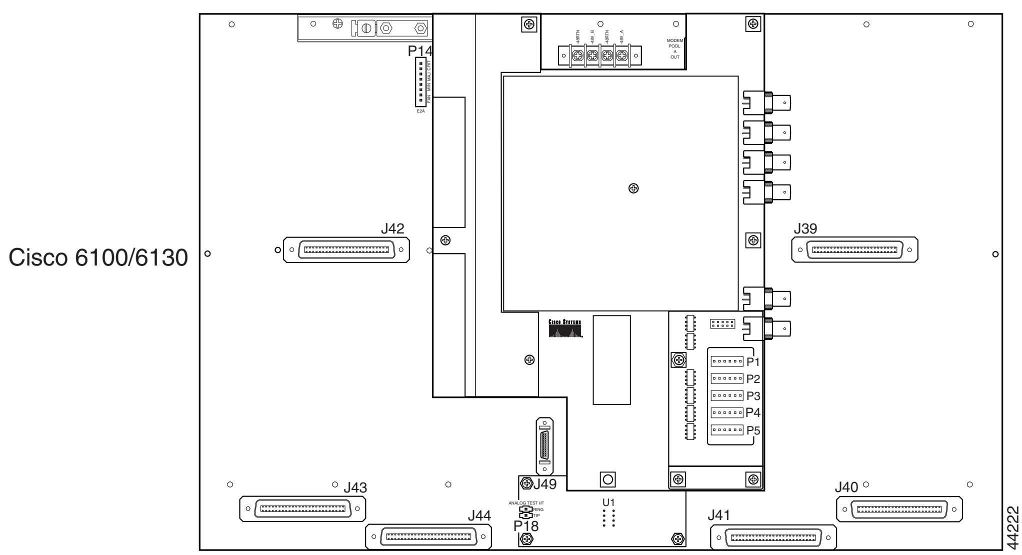


Figure 1-14 shows a close-up of the system I/O card.

Figure 1-14 System I/O Card

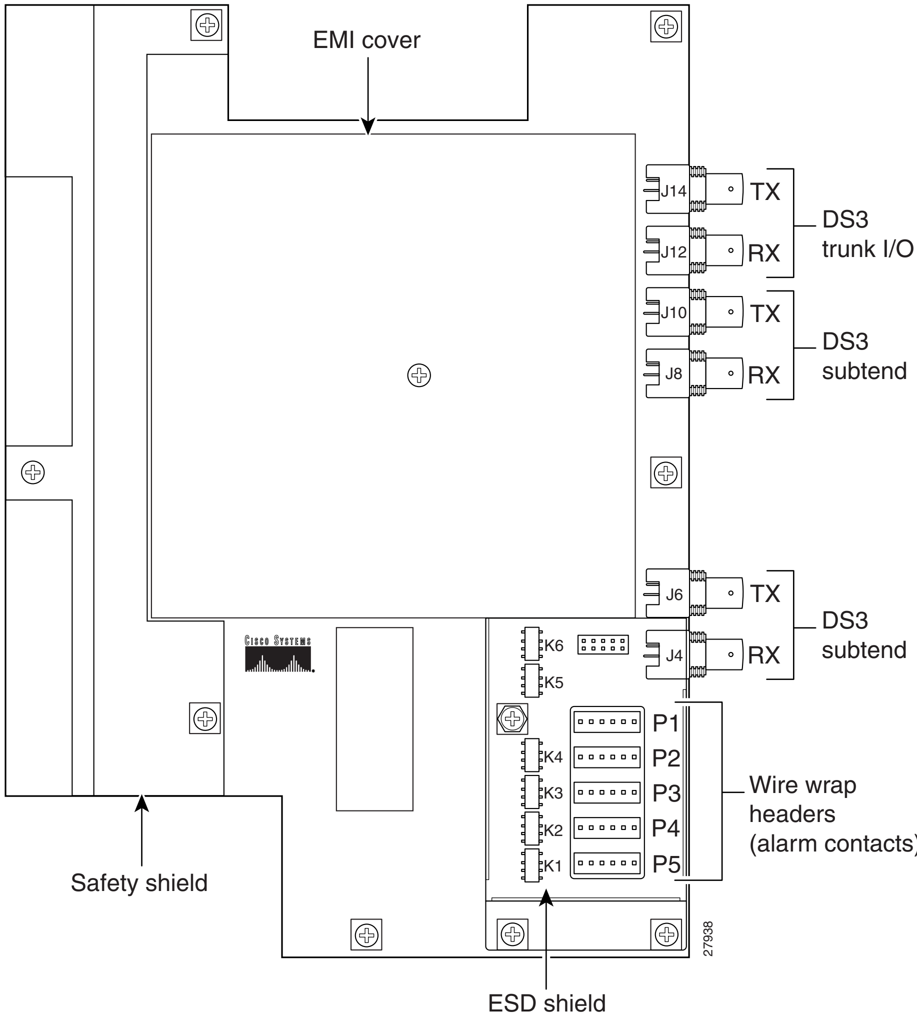


Table 1-11 describes the connectors and headers on the system I/O card.

Table 1-11 System I/O Card Connectors and Headers

Identifier	Name	Description
J4, J8	DS3 subtend (RX)	A 75-ohm BNC connector that is used to connect a subtending host chassis to a DS3-configured subtended node chassis TX connector.
J6, J10	DS3 subtend (TX)	A 75-ohm BNC connector that is used to connect a subtending host chassis to a DS3-configured subtended node chassis RX connector.

Table 1-11 System I/O Card Connectors and Headers (continued)

Identifier	Name	Description
J12	DS3 trunk I/O (RX)	A 75-ohm BNC connector that is used to connect the trunk network RX coaxial cable or used to connect a subtending host chassis to a DS3-configured subtended node chassis TX connector.
J14	DS3 trunk I/O (TX)	A 75-ohm BNC connector that is used to connect the trunk network TX coaxial cable or used to connect a subtending host chassis to a DS3-configured subtended node chassis RX connector.
P1	Alarm wire-wrap header[1]	• Pin 1 (left)—AUD[2]_CRIT[3]_CO[4] • Pin 2—AUD_CRIT_NO[5] • Pin 3—AUD_CRIT_NC[6] • Pin 4—AUD_MAJ[7]_CO • Pin 5—AUD_MAJ_NO • Pin 6 (right)—AUD_MAJ_NC
P2	Alarm wire-wrap header[1]	• Pin 1 (left)—AUD_MIN[8]_CO • Pin 2—AUD_MIN_NO • Pin 3—AUD_MIN_NC • Pin 4—VIS[9]_CRIT_CO • Pin 5—VIS_CRIT_NO • Pin 6 (right)—VIS_CRIT_NC
P3	Alarm wire-wrap header[1]	• Pin 1 (left)—VIS_MAJ_CO • Pin 2—VIS_MAJ_NO • Pin 3—VIS_MAJ_NC • Pin 4—VIS_MIN_CO • Pin 5—VIS_MIN_NO • Pin 6 (right)—VIS_MIN_NC
P4	Alarm wire-wrap header[1]	• Pin 1 (left)—DOOR ALARM • Pin 2—Reserved • Pin 3—Reserved • Pin 4—Reserved • Pin 5—ACO[10]_NO • Pin 6 (right)—ACO GND[11]

Table 1-11 System I/O Card Connectors and Headers (continued)

Identifier	Name	Description
P5	Alarm wire-wrap header[1]	• Pin 1 (left)—RX_BITS[12]_TIPA • Pin 2—RX_BITS_RINGA • Pin 3—RX_BITS_GND/GND • Pin 4—RX_BITS_TIPB • Pin 5—RX_BITS_RINGB • Pin 6 (right)—RX_BITS_GND/GND
K1, K2, K3, K4, K5, K6	Audible and visual alarm relays	Not in use.

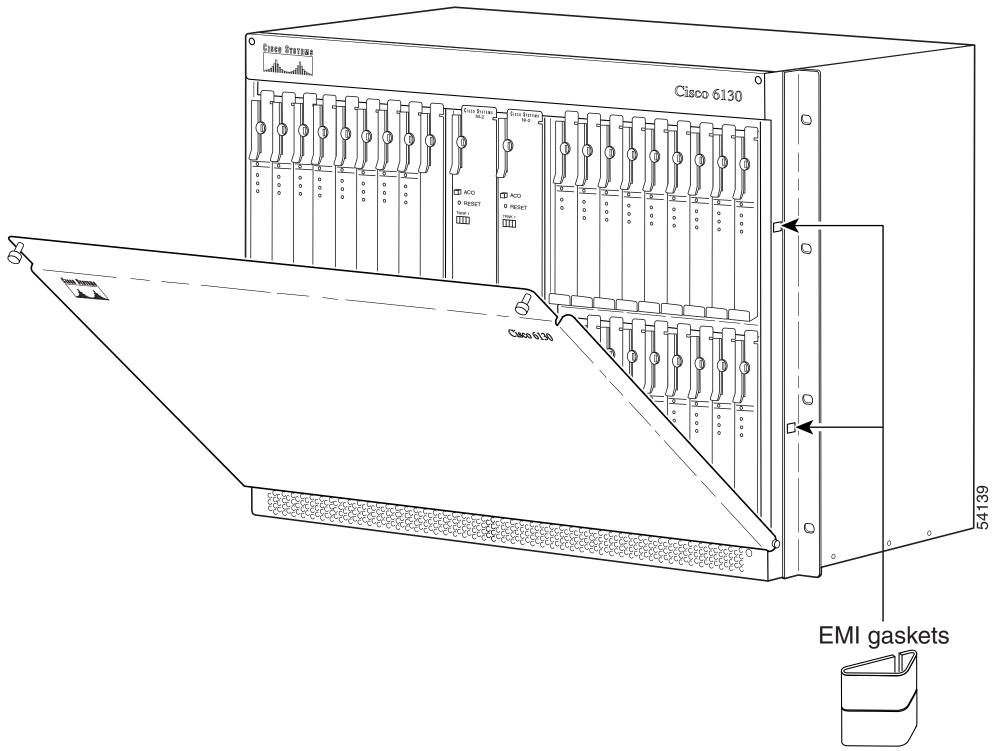
1. Each wire-wrap header is connected to a relay contact on the active NI-2 card in the Cisco 6130 chassis through the system I/O card connectors.
2. AUD = audible.
3. CRIT = critical.
4. CO = common.
5. NO = normally open.
6. NC = normally closed.
7. MAJ = major.
8. MIN = minimum.
9. VIS = visual.
10. The ACO button is located on the faceplate of the NI-2 card. This switch turns off the audible alarms that are generated by the system software.
11. GND = ground.
12. RX_BITS = receive building-integrated timing source.

An EMI shield is formed by the EMI fence, which is soldered in place on the system I/O card, and the EMI cover (see Figure 1-14). Printed circuit board fuses, relays, and surge protectors are shielded by two clear plastic covers: a safety shield and an ESD shield. The EMI cover and protective shields must be in place during Cisco 6130 with NI-2 system operation.

Front Cover

The Cisco 6130 chassis ships with a front cover that must be installed and in place while the system is in operation, as shown in Figure 1-15.

Figure 1-15 Cisco 6130 Front Cover Installation



Rear Cover

You can order and install an optional rear cover and accessory kit for the Cisco 6130 chassis. The rear cover attaches to the back of the Cisco 6130 chassis and restricts access to the backplane and cable connectors. To keep cables from interfering with the opening of the rear cover, the cables that come down from the top of the rack can be tie wrapped to the cover-mounting brackets.

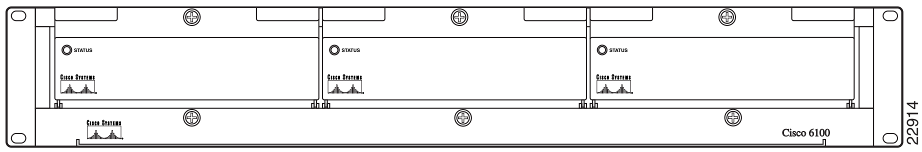
The rear cover accessory kit contains

- 1 cover-mounting bracket (detached)
- 1 cover-mounting bracket (with the rear cover attached)
- 10 tie wraps
- 6 standoff screws

Fan Tray

The system requires forced air cooling when you use a Cisco 6130 chassis. Therefore, you must install a fan tray with three fan modules below the chassis and leave 1 rack unit (RU) of space below the fan tray for intake plenum. Figure 1-16 shows the front view of the fan tray.

Figure 1-16 Fan Tray



Note The fan tray must be bolted into the rack and connected to the chassis. If you are using multiple Cisco 6130 chassis in your configuration, a fan tray must be installed under each chassis.

An LED is located on the front of each of the three fan modules. If the LED is

- Green—The fan module is operational.
- Not green—The fan module is not operational and the fan tray is in alarm mode. See Chapter 5, “Troubleshooting,” for corrective action.

Note For preventive maintenance, see Chapter 6, “Upgrading and Maintaining the Cisco 6130 System.”

Figure 1-17 shows the backplane of the fan tray.

Figure 1-17 Fan Tray Backplane

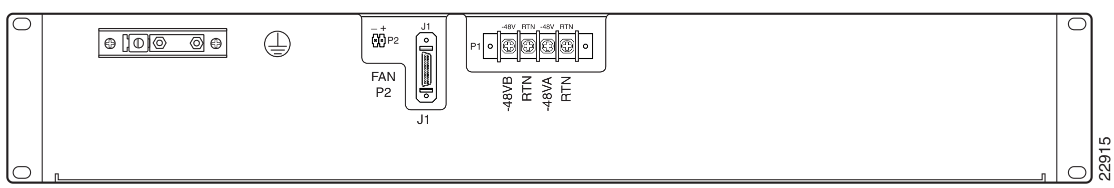


Table 1-12 describes the connectors on the backplane of the fan tray.

Table 1-12 Fan Tray Backplane Connectors

Identifier	Name	Description
P1	Power	Terminal block connector with four dual power input connections (–48VA, –48VB, and two –48VB RTN).
P2	—	A two-position header providing connections for fan tray alarm contacts. Not in use.
J1	Alarm	26-pin SCSI connector used to connect the fan tray to the Cisco 6130 chassis.

Cisco 6120 POTS Splitter Overview

The Cisco 6120 POTS splitter is a device that separates voice frequencies from DSL signals. It is used to allow POTS service to continue over communication lines accessed by DSL equipment such as the Cisco 6130 chassis. POTS frequencies are sent to the voice switch and *x*DSL frequencies are routed to the ATU-C line cards, depending on the configuration you install. The Cisco 6120 is electrically passive. Therefore, a complete loss of power to the Cisco 6130 with NI-2 system does not affect voice transport to the Public Switched Telephone Network (PSTN).

To colocate voice-switching equipment through the CO MDF, use separate 50-pin Champ connectors to cable to POTS signals. Special cables are required for this connection. Obtain these cables from Cisco, or build the cables according to a standard, accepted cable specification, for example, the Nortel NT-T100 series cable specification. For more information on the required cables, see Appendix B, "Cable and Port Mapping Specifications."

Note Refer to the appropriate vendor documentation for information on the third-party POTS splitter.

Cisco 6120 Card Compartment

The card compartment includes 22 slots. Table 1-13 describes each card slot assignment for the Cisco 6120.

Table 1-13 Cisco 6120 Card Slot Assignments

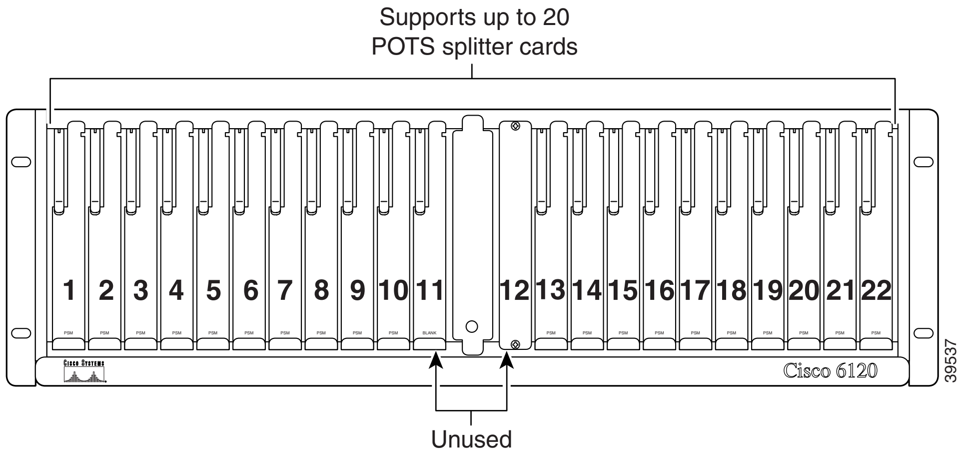
Card Slot	Card Assignment
1 to 10	DMT POTS cards only
11	Blank faceplate[1]
12	Screwed-down faceplate
13 to 22	DMT POTS cards only

1. Blank faceplates must be installed in all open slots of each chassis.

Note You can purchase blank faceplates for empty Cisco 6120 card slots.

Figure 1-18 identifies the Cisco 6120 card slots. Each slot on a chassis is numbered along the top of the chassis. In this guide, the slot numbers are shown on the cards for easy reference and readability. These slots are referred to in subsequent sections of this chapter and elsewhere in this guide.

Figure 1-18 Cisco 6120 Card Slots



Cisco 6120 Backplane

Figure 1-19 shows the backplane of the Cisco 6120.

Figure 1-19 Cisco 6120 Backplane

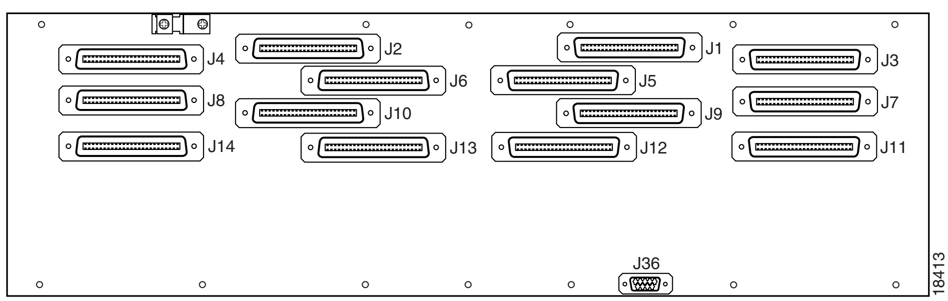


Table 1-14 describes the connectors on the backplane of the Cisco 6120.

Table 1-14 Cisco 6120 Backplane Connectors

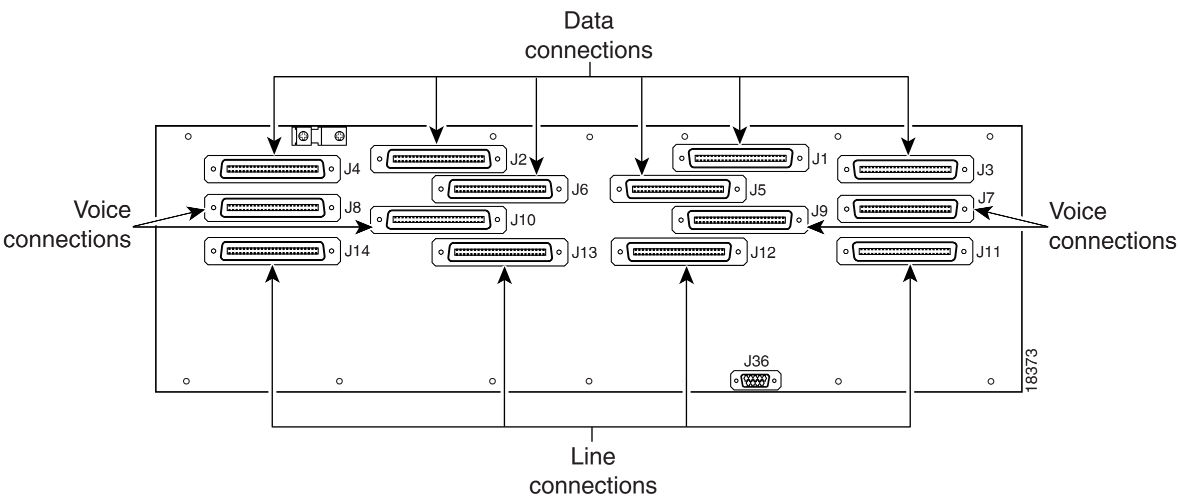
Identifier	Connector	Description
J1 through J6	—	Six 50-position Champ connectors for connection to the Cisco 6130 chassis.
J7 through J10	Voice	Four 50-position Champ connectors for connection to external voice terminating equipment.

Table 1-14 Cisco 6120 Backplane Connectors (continued)

Identifier	Connector	Description
J11 through J14	Line	Four 50-position Champ connectors for incoming *x*DSL voice/data connections.
J36	—	One 9-pin D-sub connector reserved for future use.

Figure 1-20 shows the location of the Cisco 6120 data, voice, and line connections.

Figure 1-20 Cisco 6120 Connections



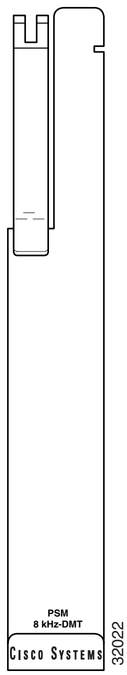
Cisco 6120 Cards

The DMT POTS card separates ADSL data from the POTS signals.

Note The Cisco 6130 with a POTS splitter configuration will support the 8 kHz DMT POTS card.

Figure 1-21 shows the DMT POTS card faceplate.

Figure 1-21 DMT POTS Card Faceplate



Management Software

You can provision and manage the Cisco 6130 with NI-2 system through the following management software:

- Cisco IOS—A CLI that is available for network element provisioning.
- CDM—A GUI designed to configure and manage the 6xxx series of Cisco IOS software-based DSLAMs. CDM provides the following areas of network management—fault, configuration, performance, and security. CDM runs with the Cisco EMF; both are installed on Sun workstations.

  Cisco EMF is based on an object model in which network elements or modules represent the managed entity. Each object is defined by a class and specific attributes. An object can represent a network element or a more abstract entity such as a link relationship, a network, or a container such as a site, shelf, or region.

Note If your network contains multiple Sun workstations, you must dedicate one workstation as the server and all additional workstations as clients. The server should be the repository and distributor of database information from which the clients request information. The client workstations allow multiple users to monitor the managed network.

Note See the "Hardware Specifications" section on page A-1 for minimum software and network management release requirements per Cisco 6130 chassis component.

The supported alarms that are generated by the management software are

- CRITICAL—A critical visual alarm condition is indicated when the CRITICAL LED in the NI-2 card faceplate lights.
  - When a critical alarm occurs, the critical visual and audible alarm relays are activated.
  - A critical alarm affects many or all subscribers that are connected to the node (for example, failure of the NI-2 card or the trunk can cause a critical alarm).
  - Critical alarms clear after you fix the condition that triggered the alarm.
  - Audible alarms are turned off when you press the ACO button on the NI-2 card faceplate.
- MAJOR—A major visual alarm condition is indicated when the MAJOR LED in the NI-2 card faceplate lights.
  - When a major alarm occurs, the major visual and audible alarm relays are also activated.
  - Several subscribers that are connected to the node are affected.
  - Major alarms clear after you fix the condition that triggered the alarm.
  - Audible alarms are turned off when you press the ACO button on the NI-2 card faceplate.
- MINOR—A minor visual alarm condition is indicated when the MINOR LED in the NI-2 card faceplate lights.
  - When a minor alarm occurs, the minor visual and audible alarm relays are also activated.
  - A small number of subscribers that are connected to the node are affected.
  - Minor alarms clear after you fix the condition that triggered the alarm.
  - Audible alarms are turned off when you press the ACO button on the NI-2 card faceplate.

Visual and audible alarm relay contacts can be wired from the Cisco 6130 chassis to CO alarm devices (remote lights or bells) located anywhere within the facility.

The visual and audible alarm relays are located on the system I/O card, but the NI-2 card hardware operates them. The visual alarms clear after you fix the problem that triggered the alarm. The audible alarms can be disabled by pressing the ACO button on the NI-2 card or clearing the alarm in the Cisco IOS software.

For more information on alarms that are generated in the management software, see Chapter 5, "Troubleshooting."

CHAPTER 2

Preparing for Installation

This chapter provides the requirements that are necessary to prepare for the installation of the Cisco 6130 with NI-2 system.

The chapter contains the following sections:

Caution Before you start the installation procedures, read the entire chapter for important information and safety warnings.

Safety Requirements

This section describes safety requirements for the Cisco 6130 with NI-2 system. Before you install the Cisco 6130 with NI-2 system, ensure that all the criteria in this section are met. The section describes the following safety requirements:

Safety Guidelines

Before working on the equipment, be aware of standard safety guidelines and the hazards involved in working with electrical circuitry to prevent accidents. Adhere to the following guidelines, cautions, and warnings and those throughout the guide for safe and hazard-free installation.

Follow these guidelines to ensure general safety:

- Keep the equipment area clear and dust-free during and after installation.
- Keep tools away from walk areas where you and others could fall over them.
- Do not wear loose clothing that could get caught in the chassis. Fasten ties or scarves and roll up shirt sleeves.
- Wear safety glasses if you are working under conditions that might be hazardous to your eyes.
- Do not perform any action that makes the equipment unsafe or creates a potential hazard to yourself or others.

Tip In the following warnings, the terms *cover panel* and *safety cover* refer to the Cisco 6130 chassis front cover.

Caution Before you start the installation procedures, read the entire chapter for important information and safety warnings.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Caution Mixing incompatible line cards can cause unpredictable system behavior. See the "Cisco 6130 Cards" section on page 1-12 for intermixing compatibility.

Caution Be careful when you remove the standoff screws and reinsert the screws into the screw holes on the backplane so that the backplane circuitry does not become damaged.

Caution Installing the cards in the chassis with the power leads reversed can damage the line cards.

Caution If fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed. Do not power up the system while you install and connect the system.

Caution If the power connections are improperly connected and power is applied while the cards are installed, the cards and chassis could be damaged.

Caution It is important that the chassis cooling fans run continuously while the system is powered.

Caution Any card that is only partially connected to the backplane can disrupt system operation.

Caution Periodically check the resistance value of the antistatic strap. Ensure that the measurement is between 1 and 10 megohms.

Caution Do not power up the Cisco 6130 chassis while locating or installing the system I/O card or line cards.

Caution Complete all installation procedures before powering up the Cisco 6130 system.

Warning **This warning symbol means *danger*. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.**

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

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

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

Warnung **Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.**

Avvertenza **Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.**

Advarsel **Dette varselsymbolet betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du vare oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.**

Aviso **Este símbolo de aviso indica perigo. Encontra-se numa situação que lhe poderá causar danos físicos. Antes de começar a trabalhar com qualquer equipamento, familiarize-se com os perigos relacionados com circuitos eléctricos, e com quaisquer práticas comuns que possam prevenir possíveis acidentes. Para ver as traduções dos avisos que constam desta publicação, consulte o documento *Regulatory Compliance and Safety Information* (Informação de Segurança e Disposições Reguladoras) que acompanha este dispositivo.**

¡Advertencia! **Este símbolo de aviso significa peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considerar los riesgos que entraña la corriente eléctrica y familiarizarse con los procedimientos estándar de prevención de accidentes. Para ver una traducción de las advertencias que aparecen en esta publicación, consultar el documento titulado *Regulatory Compliance and Safety Information* (Información sobre seguridad y conformidad con las disposiciones reglamentarias) que se acompaña con este dispositivo.**

Varning! **Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förkommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.**

Warning **The customer 48 volt power system must provide reinforced insulation between the primary AC power and the 48V DC output.**

Warning **There is the danger of explosion if the battery is replaced incorrectly. Replace the battery only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.**

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back.**

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Warning **Class 1 laser product.**

Warning **Use copper conductors only.**

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

Warning **The DS3 ports are not intended to be connected to cables that run outside the building where it is installed. For any connections outside the building, the DS3 ports must be connected to a network termination unit (NTU). NTU devices should comply with appropriate national safety standards such as UL 1950, CSA 950, EN 60950, IEC 950, and AS 3260.**

Warning **Never install telephone wiring during an electrical storm.**

Warning **Do not reach into a vacant slot or chassis while you install or remove a card or a fan module. Exposed circuitry could constitute an energy hazard.**

Warning **Ethernet cables must be shielded when used in a central office environment.**

Warning **An exposed wire lead from a DC-input power source can conduct harmful levels of electricity. Be sure that no exposed portion of the DC-input power source wire extends from the terminal block plug.**

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, and front covers are in place.**

Warning **When installing the unit, the ground connection must always be made first and disconnected last.**

Warning **This equipment is intended to be grounded. Ensure that the host is connected to earth ground during normal use.**

Warning **This equipment needs to be grounded. Use a green and yellow 12 to 14 American Wire Gauge (AWG) ground wire to connect the host to earth ground during normal use.**

Warning **Incorrect connection of this or connected equipment to a general purpose outlet could result in a hazardous situation.**

Warning **Read the installation instructions before you connect the system to its power source.**

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

Warning **The ISDN connection is regarded as a source of voltage that should be inaccessible to user contact. Do not attempt to tamper with or open any public telephone operator (PTO)-provided equipment or connection hardware. Any hardwired connection (other than by a nonremovable, connect-one-time-only plug) must be made only by PTO staff or suitably trained engineers.**

Warning **Do not stare into the beam or view it directly with optical instruments.**

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

Warning **Use caution when installing or modifying telephone lines.**

Warning **This unit has more than one power supply connection; all connections must be removed completely to completely remove power from the unit.**

Warning **To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.**

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C).**

Warning **Metal objects heat up when connected to power and ground, and can cause serious burns.**

Warning **Secure all power cabling when installing this unit to avoid disturbing field-wiring connections.**

Warning **The power supply circuitry for the equipment can constitute an energy hazard. Before you install or replace the equipment, remove all jewelry (including rings, necklaces, and watches). Metal objects can come into contact with exposed power supply wiring or circuitry inside the equipment. This could cause the metal objects to heat up and cause serious burns or weld the metal object to the equipment.**

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

Warning **This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.**

Warning **Connect the unit only to DC power source that complies with the Safety Extra-Low Voltage (SELV) requirements in IEC 60950 based safety standards.**

Warning **This product requires short-circuit (overcurrent) protection, to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.**

Warning **Care must be given to connecting units to the supply circuit so that wiring is not overloaded.**

Warning **Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.**

Warning **Do not use a telephone to report a gas leak in the vicinity of the leak.**

Warning **Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electric shock from lightning.**

Warning **Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.**

Warning **This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.**

Warning **Do not use this product near water; for example, near a bath tub, wash bowl, kitchen sink or laundry tub, in a wet basement, or near a swimming pool.**

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.**

Maintaining Safety with Electricity

Follow these guidelines when working on equipment that is powered by electricity:

- Locate the emergency power-off switch for the room in which you are working. Then, if an electrical accident occurs, you can act quickly to turn off the power.
- Disconnect all power by removing the fuses from the fuse and alarm panel before:
  - Installing or removing a chassis
  - Working near power supplies
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit; always check the circuit.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, frayed power cords, and missing safety grounds.
- If an electrical accident occurs, proceed as follows:
  - Use caution; do not become a victim yourself.
  - Turn off power to the system.
  - If possible, send another person to get medical aid. Otherwise, assess the condition of the victim and then call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions; then, take appropriate action.

Preventing Electrostatic Discharge Damage

Proper ESD protection is required whenever you handle Cisco equipment. ESD damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Use an antistatic strap during handling.

Follow these guidelines to prevent ESD damage:

- Always use an ESD ankle or wrist strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to the ESD jack on the front right side of the chassis.
- When you install a component, use 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 ensure that bus connectors are properly seated.
- When you remove a component, use available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle the system I/O card by the edges only; avoid touching the printed circuit boards or connectors.
- Avoid touching the printed circuit boards or connectors on the NI-2 cards or line cards.
- Place a removed component board-side-up on an antistatic surface or in a static-shielding container. If you plan to return the component to the factory, immediately place it in a static-shielding container.
- 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.

Caution Periodically check the resistance value of the antistatic strap. Ensure that the measurement is between 1 and 10 megohms.

General Maintenance Guidelines

This section covers the following topics:

- Hot Swapping Cards, page 2-10
- Installation and Replacement Suggestions, page 2-10

Hot Swapping Cards

Hot swapping allows you to remove and replace cards without disconnecting the system power. The Cisco 6130 chassis supports hot swapping for the following cards:

- Quad-port Discrete Multitone (DMT) ATU-C line card (4xDMT), quad-port flexi ATU-C line card (4xflexi), or quad-port STU-C line card (4xSDSL)—These line cards can be hot swapped. When the system detects that you have added or removed a line card, it automatically runs diagnostic and discovery routines and acknowledges the presence or absence of the line card. Hot swapping a line card will interrupt service for the subscribers assigned to that particular line card until the card is replaced.

  If you remove a line card and replace it with the same type of line card, the newly installed line card receives the same provisioning as the original line card. The system resumes operation without any operator intervention.

  If an unprovisioned line card is installed for the first time, the system identifies it as present but unprovisioned. Instructions for provisioning the line card are found in the appropriate software guide for your chassis.
- DS3/2DS3 or OC-3c/OC-3c NI-2 card—Hot swapping the NI-2 card will interrupt service for the entire system until the NI-2 card is replaced.

Installation and Replacement Suggestions

The following bullets list examples of recommended installation and replacement practices for the Cisco 6130 system cards.

Caution Any card that is only partially connected to the backplane can disrupt system operation.

- Do not force the card into or onto the chassis backplane connectors. This action can damage the pins on the connectors if they are not aligned properly with the card.
- Do not force the line card into its slot. This action can damage the pins on the backplane if they are not aligned properly with the line card.
- Ensure that the system I/O card is straight and parallel to the chassis backplane when you install the card onto the connectors. The pins on the connectors can be damaged if the card is not installed correctly.
- Ensure that the card is straight and not at an angle when you install the card in the slot. Installing the card at an angle can damage the card. Use the guide rails to install the card correctly.
- Fully depress the ejector tabs to ensure that the card connector mates with the backplane correctly. Firmly seat the card in the slot by locking the card.

Site Requirements

This section describes requirements for the site where the Cisco 6130 with NI-2 system will be installed. Before you install the Cisco 6130 with NI-2 system, ensure that all the criteria in this section are met. The section describes the following:

- Environmental Requirements, page 2-11
- Power, page 2-13

- Cables, page 2-14
- Rack-Mounting, page 2-14

Environmental Requirements

Proper operation of the Cisco 6130 with NI-2 system depends on a proper environment. This section describes environmental requirements for the site where you will install the Cisco 6130 with NI-2 system. The section describes the following requirements:

- Temperature, Altitude, and Humidity, page 2-11
- Ventilation, page 2-11
- Space, page 2-12

Temperature, Altitude, and Humidity

The system can tolerate a wide range of temperatures. Table 2-1 provides the Cisco recommendations for temperature, altitude, and humidity conditions in a CO environment.

Table 2-1 CO Operating Environment Requirements

Environmental Specifications	Description
Temperature	41 to 104ºF (5 to 40ºC)—Operating 23 to 131ºF (–5 to 55ºC)—Short-term operating
Altitude	–60 to 3200 meters
Humidity	5 to 90% (noncondensing)

Warning **To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 104°F (40°C).**

Ventilation

The following practices ensure proper ventilation for the Cisco 6130 with NI-2 system:

- Chassis placement—Leave 1 rack unit (RU) of space under the fan tray. The space is for the intake plenum and for the pass-through cables to the NI-2 card.
- Fan tray installation—A fan tray must be installed under each Cisco 6130 chassis.
- POTS splitter location—The POTS splitters do not dissipate heat and should be positioned at the bottom of the rack.

Space

You can install a combination of the following Cisco 6130 with NI-2 system components in a 7-foot rack:

- Cisco 6130 chassis—Maximum of two chassis are allowed per rack
- POTS splitter (Cisco 6120 or other third-party POTS splitter)—Required in a Cisco 6130 with a POTS splitter configuration only
- Fan tray—Required under each Cisco 6130 chassis

The Cisco 6130 with NI-2 system fits in a 23-inch wide rack. See Table 2-2 for individual rack space requirements.

Table 2-2 Rack Space Requirements

Component	Rack Space	Height	Depth
Cisco 6130	9 RUs[1]	15.75 in. (40.00 cm)	12 in. (30.48 cm)
Cisco 6120	4 RUs	7 in. (17.78 cm)	12 in. (30.48 cm)
Fan tray[2]	2 RUs	3.5 in. (8.89 cm)	12 in. (30.48 cm)

1. An RU is equal to 1.75 inches (4.45 cm).
2. Leave 1 RU of space under the fan tray. This space allows for the intake plenum and for cabling back to front for the NI-2 card.

Note A system configuration using quad-port line cards requires a POTS splitter that expands the system capacity to 128 subscriber ports. Depending on the POTS splitter selected for your configuration (Cisco 6120 or third-party), the installation of an additional POTS splitter may be necessary. Each Cisco 6120 POTS splitter supports up to 64 subscribers.

Depending on your configuration type, plan accordingly so that the central office (CO) rack accommodates your needs. Use Table 2-3 to calculate the rack space necessary for your Cisco 6130 with NI-2 system configuration. The total amount of rack space should not exceed 42 RUs. If your total configuration exceeds 42 RUs, either replan your configuration or use more than one rack to house the Cisco 6130 with NI-2 system components.

Table 2-3 Rack Space Calculation for the Cisco 6130 with NI-2 System Configurations

Line	Instructions	Calculation
Cisco 6130 with a POTS Splitter Configuration		
1	Total number of Cisco 6130 chassis in the rack—Maximum is two chassis per rack (include subtending host and subtended node chassis).	
2	Total number of fan trays in the rack—Must equal line 1.	
3	Total number of POTS splitters[1] in the rack	
4	Multiply 10 RUs by the total number of chassis on line 1 (with every tenth RU reserved for the intake plenum of each chassis).	
5	Multiply 2 RUs by the total number of fan trays on line 2.	
6	Multiply 4 RUs by the total number of POTS splitters on line 3.	
7	**Add lines 3 through 6 for the total number of RUs needed with your Cisco 6130 with a POTS splitter configuration.**	

Table 2-3 Rack Space Calculation for the Cisco 6130 with NI-2 System Configurations (continued)

Line	Instructions	Calculation
Cisco 6130 Without a POTS Splitter Configuration		
8	Total number of Cisco 6130 chassis in the rack—Maximum is two chassis per rack (include subtending host and subtended node chassis).	
9	Total number of fan trays in the rack—Must equal line 8.	
10	Multiply 9 RUs by the total number of chassis on line 8.	
11	Add 1 RU for the intake plenum (1 RU for each chassis on line 8).	
12	Multiply 2 RUs by the total number of fan trays on line 9.	
13	**Add lines 10 through 12 for the total number of RUs needed with your Cisco 6130 without a POTS splitter configuration.**	

1. Either a Cisco 6120 or a third-party POTS splitter can be used in a Cisco 6130 with a POTS splitter configuration.

Power

The central office (CO) power source or rectifier supplies external power to the system as –48V DC from the fuse and alarm panel. Power connections from the fuse and alarm panel are wired separately to the Cisco 6130 chassis and the fan tray. Connections for single- and dual-power feeds are provided. The power input connections are redundant, and only one is absolutely necessary for system operation. The nominal voltage is –48V DC; the minimum operating value is –36V DC; and the maximum operating value is –60V DC.

Before you connect the system to a power source, verify that the power source is properly grounded and that it falls within the internal power supply rating.

Depending on your configuration type, calculate the typical power required for each Cisco 6130 system component. After you calculate the typical power, determine the minimum fuse value for each component that is wired to the fuse and alarm panel. Use Table 2-4 to calculate the minimum fuse rating that is necessary for each of your Cisco 6130 with NI-2 system components.

Note The power rating label that is supplied on the rear of each chassis and fan tray indicates the maximum fuse value for the chassis or the fan tray.

Table 2-4 Fuse Calculation for the Cisco 6130 with NI-2 System Components

Line	Instructions	Calculation
Cisco 6130 chassis[1]		
1a	If you are using 4xDMTs, multiply 16.5W by the total number of 4xDMT line cards in the Cisco 6130.	
1b	If you are using 4xflexis (CAP or G.lite mode), multiply 13.5W by the total number of 4xflexi (CAP or G.lite mode) line cards in the Cisco 6130.	
1c	If you are using 4xflexis (DMT mode), multiply 17.5W by the total number of 4xflexi (DMT mode) line cards in the Cisco 6130.	
1d	If you are using 4xSDSLs, multiply 9W by the total number of 4xSDSL line cards in the Cisco 6130.	

Table 2-4 Fuse Calculation for the Cisco 6130 with NI-2 System Components (continued)

Line	Instructions	Calculation
2	Add the amounts for lines 1a through 1d.	
3	Enter 33.5W for each NI-2 card in the Cisco 6130.	
4	Add lines 2 and 3. This is the typical power required for the Cisco 6130.	
5	Divide line 4 by 48. This is the nominal current for the Cisco 6130.	
6	Multiply line 5 by 1.25. This is the minimum fuse rating needed to operate the Cisco 6130 in your system.	
Fan Tray		
7	A 1.25A fuse is required for each fan tray that is wired to the fuse and alarm panel. A fan tray must be installed under each Cisco 6130 chassis.	

1. Complete this section for each subtending host.

Cables

For detailed information about required cables, refer to Appendix B, "Cable and Port Mapping Specifications."

Rack-Mounting

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back.**

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

Cisco recommends that you mount the Cisco 6130 with NI-2 system in a rack. Ensure that vertical hole spacing on the rack rails meets standard EIA-310-C requirements—1 inch (2.54 cm) spacing. All portions of the rack are equal to or less than the NEBS maximum allowances of 12 inches (30.48 cm).

When you install the Cisco 6130 with NI-2 system in a rack, be sure to allow enough room to access the backplane of the unit for wiring and cabling purposes. The majority of the connectors are located on the backplane.

Required Tools and Equipment

Table 2-5 lists the tools and equipment required to install and remove the Cisco 6130 with NI-2 system components:

Table 2-5 Tool and Equipment Requirements Checklist

Check	Tools and Equipment
	Hardware Components
	Cisco 6130 chassis
	• 4xDMTs
	• 4xflexis
	• 4xSDSLs
	• NI-2 card(s): DS3/2DS3, OC-3c/OC-3c SMF[1], or OC-3c/OC-3c MMF[2]
	System I/O card for NI-2 system (if it is not already installed on the Cisco 6130 backplane)—Kit 800-07027-01 • Plastic ESD shield • Component safety shield • EMI cover and cover bracket • Screws
	Blank faceplates
	Cisco 6120 or third-party vendor POTS splitter[3]
	• DMT POTS cards
	Fan Tray
	Fan tray alarm cable (part number 72-1912-01)
	Rear cover (optional)
	Front cover
	Champ cables (see Appendix B, "Cable and Port Mapping Specifications" for cable information)
	Software Components
	• Cisco IOS • CDM[4] (optional)
	Tools
	A 3/16-inch flat-head screwdriver
	A Phillips-head screwdriver
	A one-quarter inch socket driver or wrench
	Necessary equipment for ESD protection—Required whenever you handle Cisco equipment, which includes the chassis and cards
	Mounting screws—To mount the Cisco 6130, Cisco 6120, and fan tray to the rack
	Standoff screws
	Backplane screws—Included on the backplane

Table 2-5 Tool and Equipment Requirements Checklist (continued)

Check	Tools and Equipment
	Wire-wrapping tool
	Wire stripper
	Wire for connections • 12 AWG black and red copper solid or stranded—Used for Cisco 6130 chassis power connections • 14 to 18 AWG black and red copper solid or stranded—Used for fan tray power connections • 12 AWG or thicker green or green with yellow stripes copper stranded—Used for the Cisco 6130 chassis grounding • 14 AWG or thicker green or green with yellow stripes copper stranded—Used for the fan tray and POTS splitter grounding
	Ferrites that yield an impedance of 200 ohms +/–20 percent at 100 MHz
	Tie wraps
	Coaxial cable—Used to connect the DS3/2DS3 NI-2 card • Type 734A or equivalent • Type 735A or equivalent
	Fiber cable—Used to connect the OC-3c/OC-3c NI-2 card
	Fiber cable (additional)—Used for fiber redundancy if the Cisco 6130 chassis has a secondary OC-3c/OC-3c NI-2 card
	RJ-45 serial cable to connect the console and auxiliary connectors
	RJ-45 connector, straight-through 10BaseT/100BaseTX Ethernet, half/full-duplex compliant with IEEE 802.3

1. SMF = single-mode fiber.
2. MMF = multimode fiber.
3. The Cisco 6120 or third-party vendor POTS splitter is used in a Cisco 6130 with a POTS splitter configuration only.
4. CDM = Cisco DSL Manager.

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back.**

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

Note The Cisco 6130 with NI-2 system has no internal user-serviceable parts. However, you can add or remove a line card or a fan module without removing power from the system. This action is called hot swapping. See the “Hot-Swappable FRUs” section on page 5-2 for more information.

Unpacking the Cisco 6130 System

Each Cisco 6130 with NI-2 system chassis is securely packaged in a shipping box. The Cisco 6130 with NI-2 system components ship either:

- With the line cards installed in the chassis and any additional line cards packaged separately.
- Without the line cards installed in the chassis. Each line card is individually packaged in its own antistatic carrier.

The line card antistatic carriers ship together in a box. The NI-2 card is packed in its own antistatic bag, which is housed in foam inserts and shipped in a separate box.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

To unpack the Cisco 6130 with NI-2 system, complete the following steps:

Step 1 Inspect the packing containers. If any damage or other signs of mishandling are evident, inform both the local freight carrier and Cisco before unpacking. Your freight carrier can provide you with the procedures necessary to file a claim for damages.

Step 2 Carefully open the box.

Step 3 Remove all packing material.

Step 4 Remove the chassis from the box.

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back.**

Step 5 Carefully open the additional boxes, remove the packing material, and remove the cards.

Step 6 Open the accessory kits and boxes that contain the cables, ferrites, documentation, and management software. Do not use a knife to open these boxes.

Verifying Contents

To verify that all equipment, cables, documentation, and so forth are received, compare the packing list to your shipment and to your order. If any items are missing or you need additional information, contact the Cisco Technical Assistance Center (TAC) at one of the following:

- 800 553-2447
- 408 526-7209
- tac@cisco.com

Inspecting for Damage

After you verify that all of the equipment is included, carefully examine the assemblies, cards, and cables for any damage resulting from shipping. If you suspect any damage from shipping, contact your local freight carrier for procedures on damage claims.

If you observe any physical defects in the items you ordered, obtain standard warranty service by delivering the defective part, accompanied by a copy of the dated proof-of-purchase, to the Cisco Systems Corporate Service Center or an Authorized Cisco Systems Service Center during the applicable warranty period. Contact the Cisco TAC for the location of your nearest service center.

See the back of the title page for the Cisco Systems warranty information for hardware and software products.

Installing a Cisco 6130 with a POTS Splitter Configuration

This chapter provides installation procedures for a Cisco 6130 with a POTS splitter configuration.

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

Caution Before you start the installation procedures, read the entire chapter for important information and safety warnings.

Note Before installing and cabling the equipment, be aware of standard safety practices and the hazards involved in working with electrical circuitry to prevent accidents. See the "Safety Requirements" section on page 2-1 for all cautions and warnings that are necessary to ensure a safe and hazard-free installation.

To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information for the Cisco 6100 Series System* document.

Tip See the "Cisco 6130 with a POTS Splitter Configuration" section on page 1-3 for more information about the Cisco 6130 chassis with a POTS splitter configuration components.

Installation Checklist

When you install a Cisco 6130 with a POTS splitter configuration, be sure that you follow the installation procedures in the proper sequence. Table 3-1 is a checklist of the installation steps in the order in which they should occur. Detailed installation instructions are located in the sections following Table 3-1.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Table 3-1 Installation Checklist—Cisco 6130 Chassis with a POTS Splitter Configuration

Check	Installation Step
	1. Stabilize and measure the rack space.
	2. Install the POTS splitter(s) in the rack.
	3. Install the fan tray in the rack.
	4. Install the Cisco 6130 chassis in the rack.
	5. Install the blank faceplates in the open slots.
	6. Ground the Cisco 6130, fan tray, and POTS splitter.
	7. Connect the Cisco 6130 chassis to the POTS splitter.
	8. Attach the Cisco 6130 power connections to the fuse and alarm panel.
	9. Attach the fan tray power connections to the fuse and alarm panel.
	10. Locate or install the system I/O card on the Cisco 6130 backplane.
	11. Connect the fan tray to the Cisco 6130 chassis.
	12. Connect the alarm contacts.
	13. Connect the POTS splitter to the MDF[1].
	14. Pull all of the line cards away from the backplane connection (applicable if any line cards ship in the chassis).
	15. Install the rear cover (optional).
	16. Apply power to the system.
	17. Verify that the fan tray is operational.
	18. Install the NI-2 card(s).
	19. Reseat all of the line cards (applicable if any line cards ship in the chassis).
	20. Install the cards in the Cisco 6130 and Cisco 6120 chassis, *x*TU-C[2] line cards first.
	21. Connect the NI-2 card(s) to the network.
	22. Install a subtended network (optional).
	23. Connect the Ethernet to the management network.
	24. Connect a console terminal.
	25. Connect the auxiliary port (optional).
	26. Verify that the Cisco 6130 front cover is closed.
	27. Close the optional rear cover.
	28. Complete initial configuration.

1. MDF = main distribution frame.
2. *x*TU-C is a generic term referring to a Transmission Unit—central office, which is either a quad-port DMT ATU-C line card (4xDMT) or quad-port flexi ATU-C line card (4xflexi).

Installation Procedures

The following sections detail the installation procedures for a Cisco 6130 with a POTS splitter configuration.

Stabilize and Measure Rack Space

For the rack to remain stable, you must install your Cisco 6130 with NI-2 system from the bottom to the top of the rack. Before you install any of the chassis, measure the total rack space required to install your system. The required rack space depends on the number of Cisco 6130 chassis, fan trays, and POTS splitters you plan to use. The number of chassis and required fan trays increase if you plan to install a subtended network.

You can install a combination of the Cisco 6130 system components in a 7-foot rack:

- Cisco 6130 chassis—Maximum of two chassis are allowed per rack
- POTS splitter
  - Cisco 6120 chassis
  - Third-party POTS splitter

  Note A system configuration using quad-port line cards requires a POTS splitter capacity of 128 subscriber ports. Each Cisco 6120 POTS splitter supports up to 64 subscribers. Depending on the POTS splitter selected for your configuration (Cisco 6120 or third-party), the installation of an additional POTS splitter may be necessary.

- Fan tray—Required beneath each Cisco 6130 chassis

Note See Chapter 2, “Preparing for Installation” for the calculation tables that are necessary to plan total rack space for your Cisco 6130 with NI-2 system configuration.

The Cisco 6130 with NI-2 system fits in a 23-inch wide rack. See Table 2-2 for individual rack space requirements. Allow 1 rack unit (RU) of space between the fan tray and the POTS splitter. This space allows for the intake plenum and for cabling back to front for the NI-2 card.

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

If you plan to expand your system to include more chassis in the future, allow space in the rack for additions during the initial installation, keeping in mind the weight distribution and stability of the rack.

Install the POTS Splitter

You can use the following POTS splitters in a Cisco 6130 with POTS splitter configuration:

- Cisco 6120
- Third-party POTS splitter

The following sections detail the installation procedures for each POTS splitter.

Install the Cisco 6120

Complete the following steps to install the Cisco 6120 in the rack.

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back.**

Note The Cisco 6120 chassis ships with a retaining bar in place. Verify that the retaining bar is secure before lifting the chassis. The retaining bar prevents the cards from falling out of the chassis.

Step 1 Connect a grounding strap to the ESD grounding jack. For ESD information, see the "Preventing Electrostatic Discharge Damage" section on page 2-9.

Step 2 Position one Cisco 6120, which occupies 4 RUs of space, at the bottom of the rack.

The Cisco 6120 does not dissipate heat; therefore, the bottom of the rack is the best location for the Cisco 6120.

Step 3 Use four mounting screws and a Phillips-head screwdriver to bolt the Cisco 6120 in the rack.

Step 4 Remove the two screws holding the retaining bar in place, and discard the retaining bar.

Step 5 Repeat Step 2 through Step 4 for each Cisco 6120 as necessary.

See Figure 1-1 for the correct placement of the Cisco 6120.

Install the Third-Party POTS Splitter

Refer to the appropriate vendor documentation for installation procedures for the third-party POTS splitter.

See Figure 1-1 for the correct placement of the third-party POTS splitter.

Install the Fan Tray

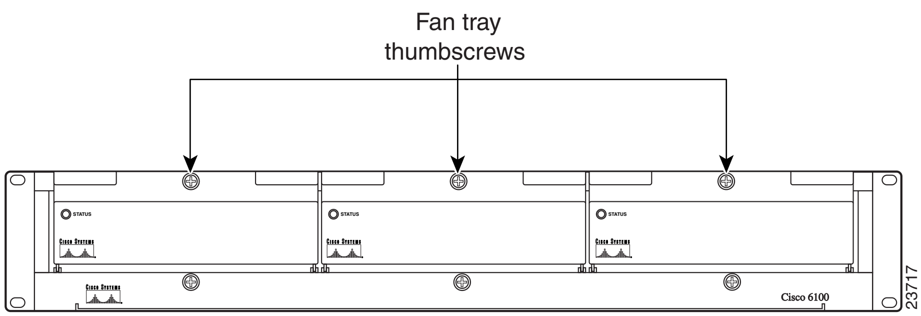
Complete the following steps to install the fan tray in the rack.

Note If you are using more than one Cisco 6130 chassis in a Cisco 6130 with a POTS splitter configuration, you must install a fan tray under each chassis.

Step 1 Place the fan tray on a flat and stable surface (for example, a table top).

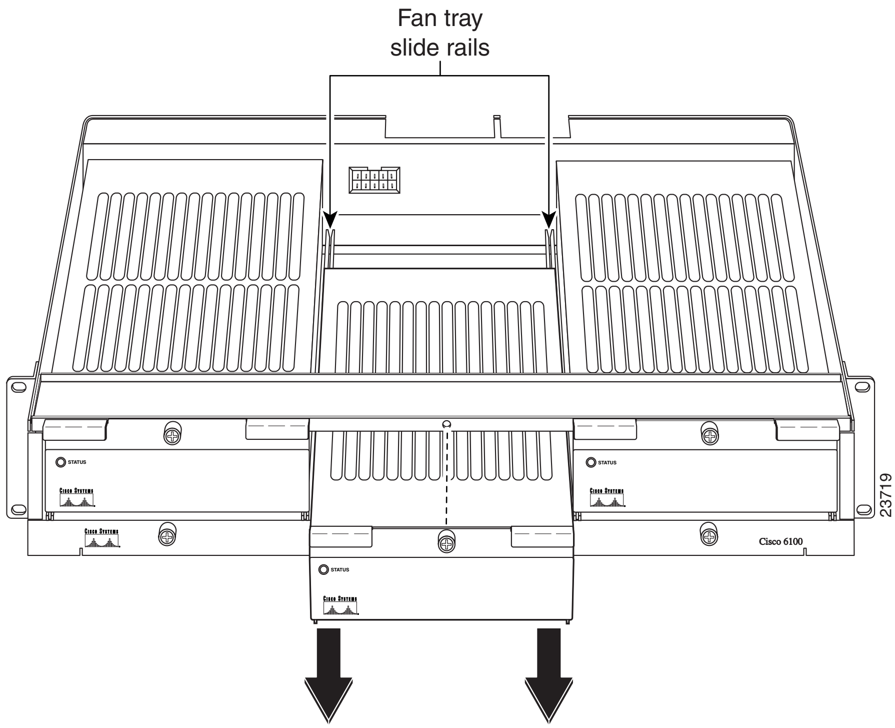
Step 2 Locate the first fan module and unscrew the thumbscrew that holds the fan module in place (the screw at the top of each fan module), as shown in Figure 3-1.

Figure 3-1 Fan Tray Thumbscrews



Step 3 Carefully remove the fan module by pulling it toward you. The fan module is located on slide rails for easy removal and installation. (See Figure 3-2.)

Figure 3-2 Removing the Fan Module from the Fan Tray



Step 4 Place the fan module on a flat and stable surface (for example, a table top) until you are ready to reinsert it into the fan tray.

Step 5 Repeat Step 2 through Step 4 for each fan module.

Step 6 Position the fan tray chassis, which occupies 2 RUs of space, above the POTS splitter.

Allow an additional 1 RU of space between the fan tray and the POTS splitter. This space allows for the intake plenum.

Step 7 Use four mounting screws and a Phillips-head screwdriver to bolt the fan tray in the rack above the POTS splitter. See Figure 1-1 for the correct placement of the fan tray.

Step 8 Align a fan module with the fan tray slide rails inside the fan tray.

Step 9 Slide the fan module into the fan tray.

Step 10 Tighten the thumbscrew above the fan module.

Step 11 Repeat Step 8 through Step 10 for each fan module.

Step 12 Repeat Step 1 through Step 11 for each fan tray.

Note For information about fan tray maintenance and air filter replacement, see Chapter 6, "Upgrading and Maintaining the Cisco 6130 System."

Install the Cisco 6130 Chassis

Complete the following steps to install the Cisco 6130 chassis.

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back.**

Note If the Cisco 6130 chassis ships with any line cards installed, verify that the chassis front cover is secure before lifting the chassis. The front cover prevents the line cards from falling out of the chassis.

Step 1 Position one Cisco 6130, which occupies 9 RUs of space, above the fan tray. The bottom of the Cisco 6130 should be flush with the top of the fan tray.

Step 2 Use four mounting screws and a Phillips-head screwdriver to bolt the Cisco 6130 chassis in the rack.

Step 3 Remove the chassis front cover.

Step 4 Repeat Step 1 through Step 3 for each Cisco 6130 chassis as necessary.

See Figure 1-1 for the correct placement of the Cisco 6130 chassis.

Install Blank Faceplates

Blank faceplates should occupy any empty slots in either the Cisco 6130 or Cisco 6120 chassis. The blank faceplate installation is similar to the line card installation.

Complete the following steps to install the blank faceplates in the Cisco 6130 or Cisco 6120:

Step 1 Vertically align the blank faceplate edge with the top and bottom guides of the chassis slot.

Step 2 Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the blank faceplate into the slot.

Step 3 Push on the faceplate to fully seat the blank faceplate.

Step 4 Press down on the locking lever to secure the faceplate.

Step 5 Repeat Step 1 through Step 4 for each Cisco 6130 or Cisco 6120 chassis.

Ground the Cisco 6130, Fan Tray, and POTS Splitter

Warning **When installing the unit, the ground connection must always be made first and disconnected last.**

Note The grounding lug is not provided by Cisco. Use either a 5/8 inch or 3/4 inch lug to ground the Cisco 6130 chassis.

Complete the following steps to connect the grounding lug on the Cisco 6130, fan tray, and POTS splitter directly to the rack:

Step 1 Verify that power in the DC circuit is off.

Step 2 Remove all paint or oxidation from the rack at the point of the grounding connection.

Step 3 Measure enough wire to connect the Cisco 6130 to the rack. Use 12 American Wire Gauge [AWG] or thicker (green or green with yellow stripes) stranded copper wire for the Cisco 6130 chassis grounding. Use 14 AWG or thicker (green or green with yellow stripes) stranded copper wire for the fan tray and POTS splitter grounding. (See Figure 3-3 for grounding wire location.)

Tip Make sure your wire is only as long as needed to make the connection.

Step 4 Use a wire stripper to remove the casing from both ends of the wires.

Step 5 Use a 3/16-inch flat-head screwdriver to loosen the screw on the rack.

Step 6 Hook one end of the copper wire around the screw on the rack.

Step 7 Tighten the rack screw over the copper wire.

Step 8 Use a flat-head screwdriver to loosen the compression screw that is provided on the grounding lug of the Cisco 6130 chassis.

The grounding lugs are located in the upper left corner of each chassis (viewed from the rear), as shown in Figure 3-3.

Step 9 Insert the other end of the copper wire under the compression screw.

Step 10 Tighten the compression screw over the copper wire.

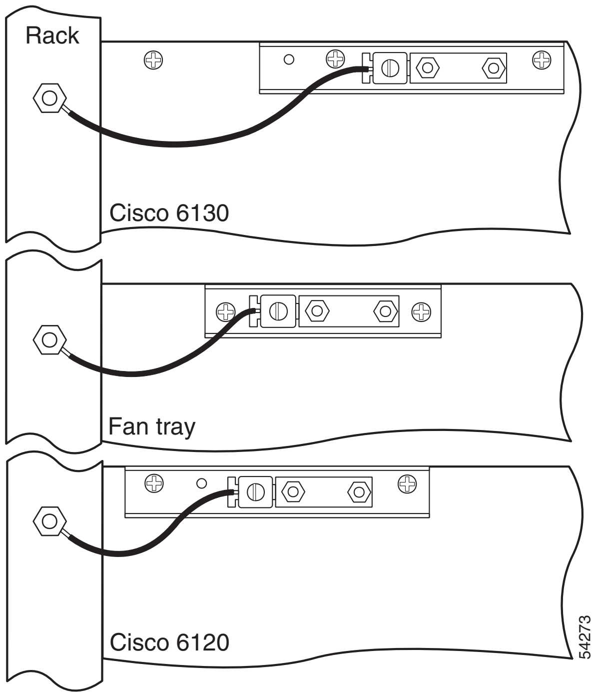
Step 11 Repeat Step 1 through Step 10 for each Cisco 6130 chassis, fan tray, Cisco 6120, and third-party POTS splitter.

Refer to the appropriate vendor documentation for grounding procedures for the third-party POTS splitter.

Note Do not ground the components in a rack by chaining them together.

The left side of Figure 3-3 shows how to ground the Cisco 6130, fan tray, and POTS splitter to the rack.

Figure 3-3 Grounding the Cisco 6130, Fan Tray, and POTS Splitter



Connect the Cisco 6130 Chassis to the POTS Splitter

You can use the following POTS splitters in a Cisco 6130 with POTS splitter configuration:

- Cisco 6120
- Third-party POTS splitter

The following sections detail the cabling procedures to connect the Cisco 6130 to each POTS splitter. These connections are for *x*DSL data flow between the Cisco 6130 and the POTS splitter.

Connect the Cisco 6130 to the Cisco 6120

Connect the one-to-two Champ cables (also called Y-cables) from each Cisco 6130 (connectors J39 through J44) to a Cisco 6120 (connectors J1 through J6). Table 3-2 shows the corresponding Cisco 6130 and Cisco 6120 connectors when two Cisco 6120 chassis are used.

Note If you are intermixing *x*TU-C line cards, see the "Intermixing Cables" section on page B-12 for cable part numbers and cabling diagrams.

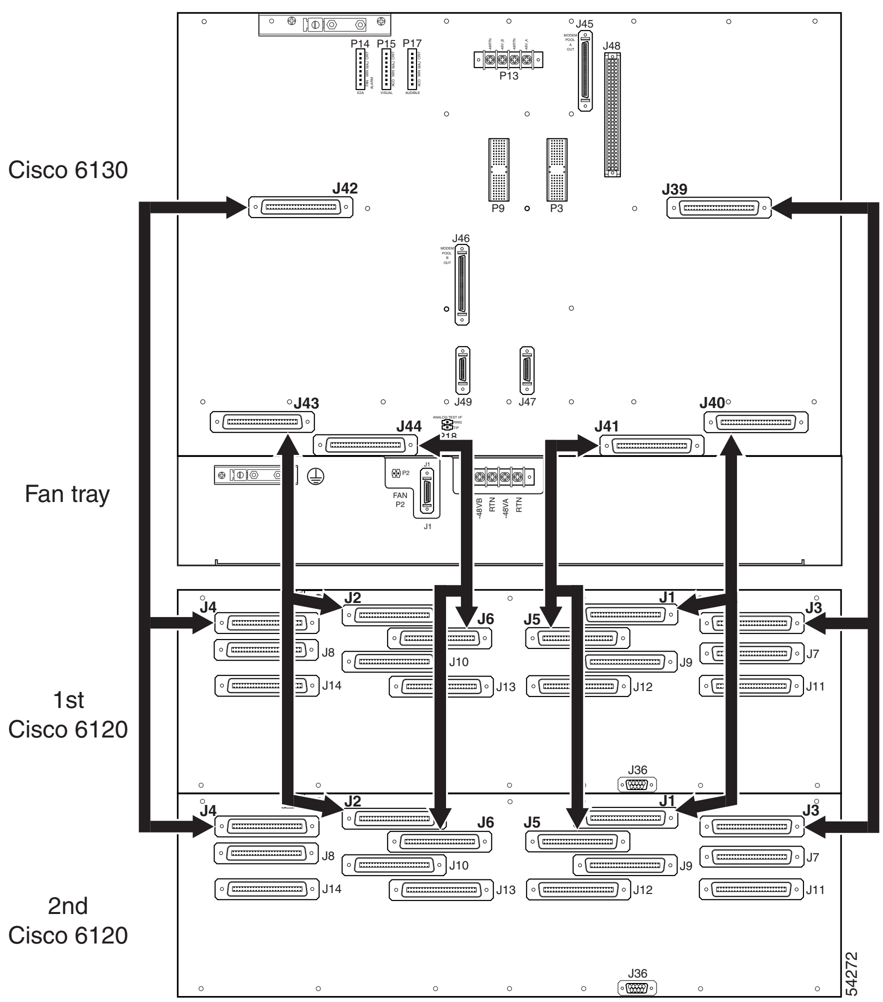
See the "Cisco 6130 to Cisco 6120 Cables" section on page B-3 for cable part numbers.

Table 3-2   Cisco 6130 and Cisco 6120 Corresponding Connectors

Cisco 6130 Connector	First Cisco 6120 Connector	Second Cisco 6120 Connector
J39	J3	J3
J40	J1	J1
J41	J5	J5
J42	J4	J4
J43	J2	J2
J44	J6	J6

Figure 3-4 shows the cabling between one Cisco 6130 and two Cisco 6120 chassis.

Figure 3-4   Cisco 6130 to Two Cisco 6120 Chassis Cabling Diagram with One-to-Two Cables



Note For additional information about the Cisco 6120 backplane connectors, see the "Cisco 6120 Backplane" section on page 1-35.

Connect the Cisco 6130 to the Third-Party POTS Splitter

Use the cables described in the "Cisco 6130 to Third-Party POTS Splitter Cables" section on page B-5 to cable each Cisco 6130 to a third-party POTS splitter. Refer to the appropriate vendor documentation for cabling procedures for the third-party POTS splitter.

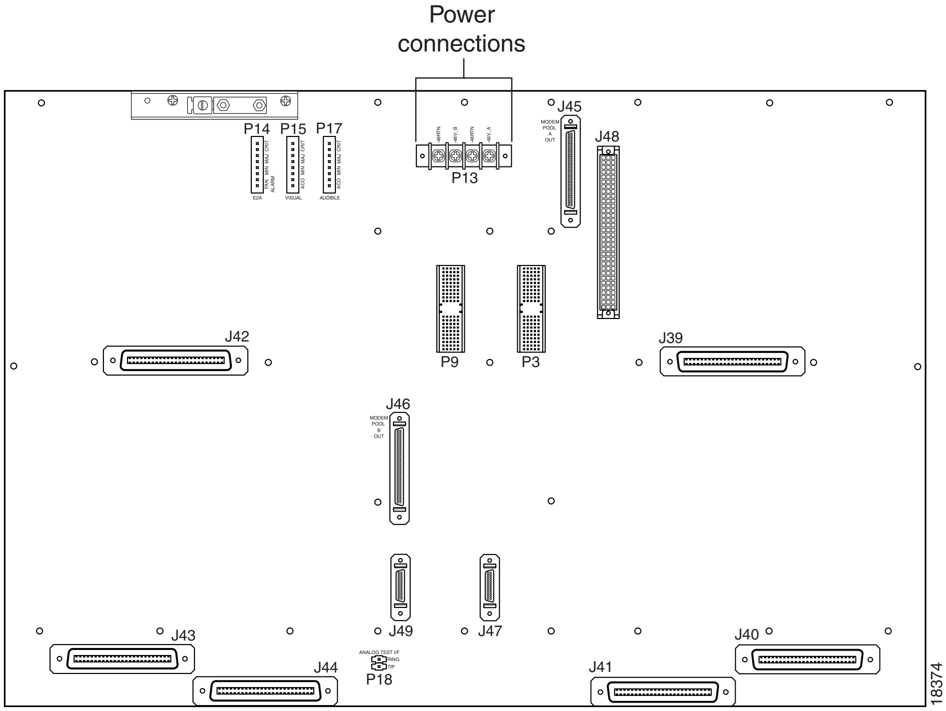
Attach Cisco 6130 Power Connections

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

External power is supplied to the system as –48V DC from the central office (CO) power source or rectifier to the fuse and alarm panel. Power is fed from the fuse and alarm panel to the Cisco 6130 chassis by a terminal block connector with four dual-power connections (P13) located at the top of the chassis backplane. Figure 3-5 shows the location of the power connection (P13) on the chassis.

Note The fuse and alarm panel and wires are not provided by Cisco.

Figure 3-5   Cisco 6130 Power Connection Locations



You can wire the power connections from the Cisco 6130 to the fuse and alarm panel for either dual- or single-power feed:

- "Attach Cisco 6130 Power Connections for a Dual-Power Feed" section on page 3-12
- "Attach Cisco 6130 Power Connections for a Single-Power Feed" section on page 3-15

Note Connect each Cisco 6130 with NI-2 system component to a separate fuse. Do not power the components in the rack by chaining them together.

See Chapter 2, "Preparing for Installation" for the calculation tables that are necessary to determine the minimum fuse rating for each component that is wired to the fuse and alarm panel. Refer to the power rating label on the back of the Cisco 6130 to determine the maximum fuse rating.

Attach Cisco 6130 Power Connections for a Dual-Power Feed

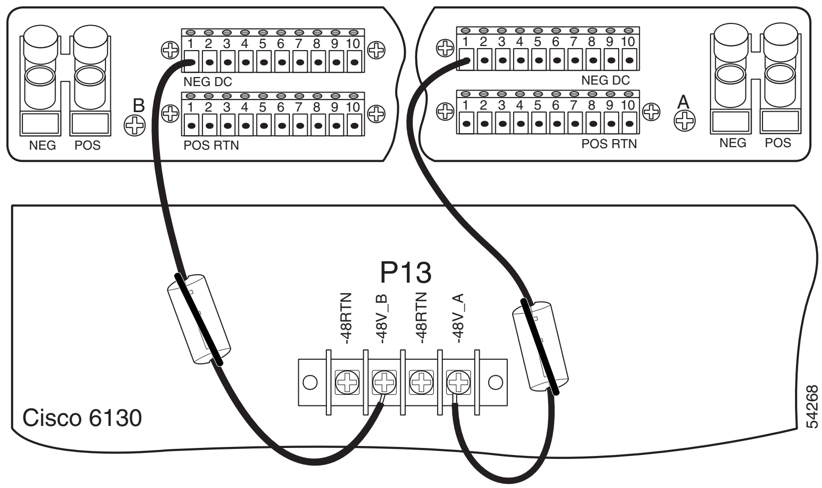
Complete the following steps to attach the Cisco 6130 power connections (P13) to the fuse and alarm panel for a dual-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the Cisco 6130 power connections.

Step 2 Measure enough wire (12 AWG black and red copper solid or stranded wire) to connect each of the Cisco 6130 power input connections to the fuse and alarm panel.

Figure 3-6 shows the Cisco 6130 power input connections wired to the fuse and alarm panel.

Figure 3-6 Power Input Connections for the Cisco 6130—Dual-Power Feed



Note Figure 3-6 shows the wires looped through a ferrite. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

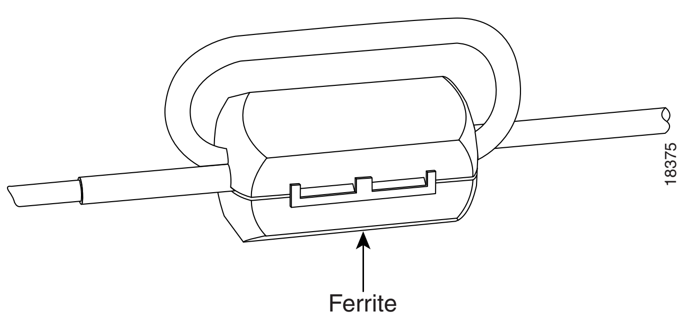
Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver to attach a wire to the –48V_A power input connection on the Cisco 6130 (P13).

Step 5 Loop the wire through the ferrite as shown in Figure 3-7. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Note Looping the wire secures the ferrite.

Figure 3-7 Wire Looped through Ferrite



Step 6 Attach the wire to a fuse and alarm panel NEG (negative) DC connector.

Step 7 Use a Phillips-head screwdriver to attach a wire to the –48V_B power input connection on the Cisco 6130 (P13).

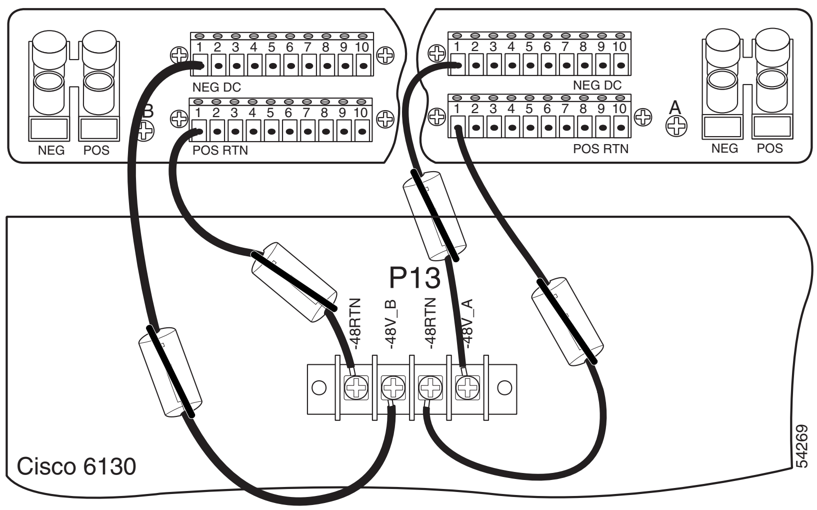
Step 8 Loop the wire through the ferrite as shown in Figure 3-7. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 9 Attach the wire to a fuse and alarm panel NEG DC connector.

Step 10 Measure enough wire (12 AWG black and red copper solid or stranded wire) to connect each of the Cisco 6130 power return connections to the fuse and alarm panel.

Figure 3-8 shows the Cisco 6130 power return connections wired to the fuse and alarm panel for a dual-power feed.

Figure 3-8 Power Return Connections for the Cisco 6130—Dual-Power Feed



Note Figure 3-8 shows the wires looped through a ferrite. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 11 Use a wire stripper to remove the casing from both ends of the wires.

Step 12 Use a Phillips-head screwdriver to attach a wire to a –48V power return connection (–48RTN) on the Cisco 6130 (P13).

Step 13 Loop the wire through the ferrite as shown in Figure 3-7. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 14 Attach the wire to a fuse and alarm panel POS (positive) RTN connector.

Step 15 Repeat Step 10 through Step 14 for the remaining –48V power return connection (–48RTN).

Step 16 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the Cisco 6130 power connections.

Step 17 Repeat Step 1 through Step 16 each Cisco 6130 chassis that is to be connected to a dual-power feed.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

Attach Cisco 6130 Power Connections for a Single-Power Feed

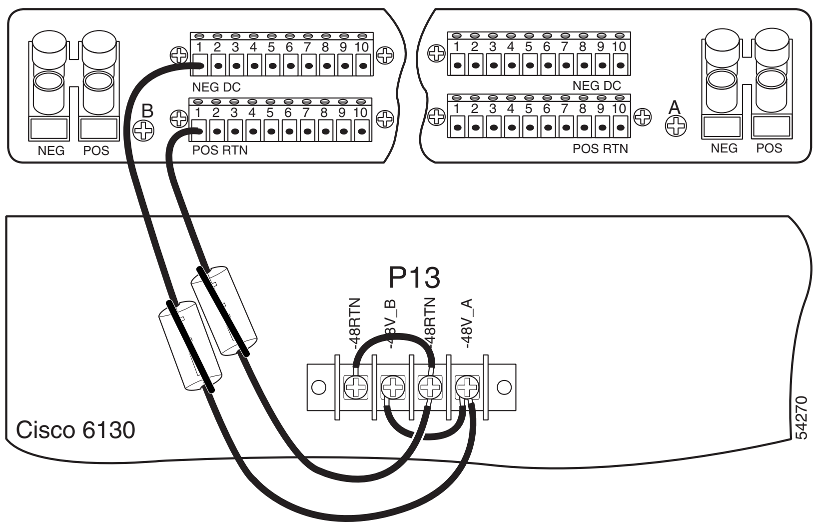
Complete the following steps to attach the Cisco 6130 power connections (P13) to the fuse and alarm panel for a single-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the Cisco 6130 power connections.

Step 2 Measure enough wire (12 AWG black and red copper solid or stranded wire) to connect each of the Cisco 6130 power connections to the fuse and alarm panel.

Figure 3-9 shows the Cisco 6130 power connections wired to the fuse and alarm panel for a single-power feed.

Figure 3-9 Power Connections for the Cisco 6130—Single-Power Feed



Note Figure 3-9 shows the wires looped through a ferrite. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

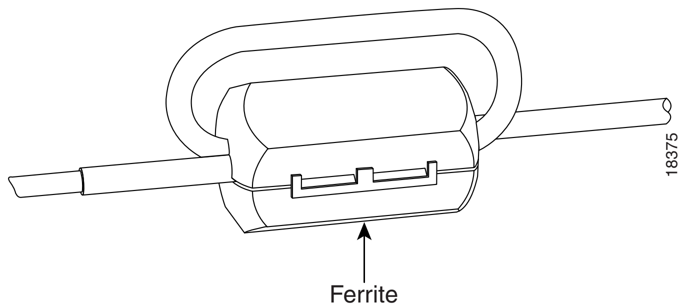
Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver, to attach a wire to the –48V_A power input connection on the Cisco 6130 (P13).

Step 5 Loop the wire through the ferrite as shown in Figure 3-10. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Note Looping the wire secures the ferrite.

Figure 3-10 Wire Looped through Ferrite



Step 6 Attach the wire to the fuse and alarm panel NEG DC connector.

Step 7 Use a Phillips-head screwdriver to attach a wire to a –48RTN power return connection on the Cisco 6130 (P13). See Figure 3-9 for correct placement.

Step 8 Loop the wire through the ferrite as shown in Figure 3-10. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 9 Attach the wire to the fuse and alarm panel POS RTN connector. See Figure 3-9 for correct placement.

Step 10 Use a Phillips-head screwdriver to attach a wire to connect the –48V_A and –48V_B power input connections to each other.

Step 11 Use a Phillips-head screwdriver to attach a wire to connect the –48RTN power return connections to each other.

Step 12 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the Cisco 6130 power connections.

Step 13 Repeat Step 1 through Step 12 for each Cisco 6130 chassis that is to be connected to a single-power feed.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

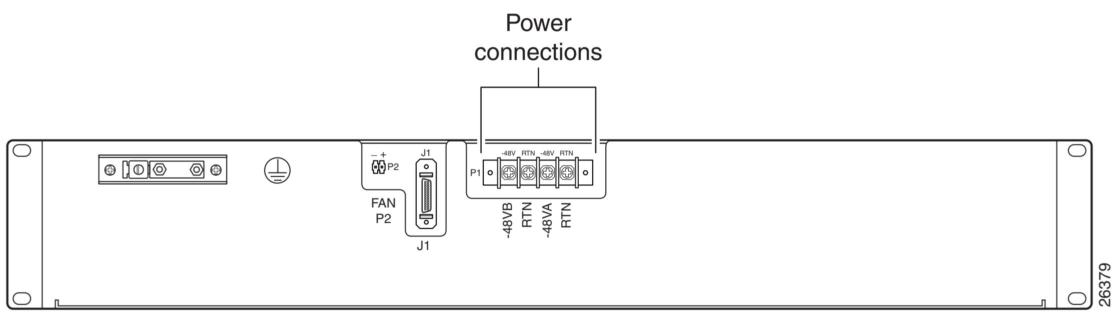
Attach Fan Tray Power Connections

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

External power is supplied to the system as –48V DC from the CO power source or rectifier to the fuse and alarm panel. Power is fed from the fuse and alarm panel to the fan tray by a terminal block connector with four dual power connections (P1) located at the top of the fan tray backplane. Figure 3-11 shows the location of the power connection (P1) on the fan tray.

Note The fuse and alarm panel and wires are not provided by Cisco.

Figure 3-11 Fan Tray Power Connection Location



Note Connect each Cisco 6130 with NI-2 system component to a separate fuse. Do not power the components in the rack by chaining them together.

See Chapter 2, "Preparing for Installation" for the calculation tables that are necessary to determine the minimum fuse rating for each component that is wired to the fuse and alarm panel. Refer to the label on the back of the fan tray to determine the maximum fuse rating.

You can wire the power connections from the fuse and alarm panel to the fan tray for either dual- or single-power feed:

- "Attach Fan Tray Power Connections for a Dual-Power Feed" section on page 3-18
- "Attach Fan Tray Power Connections for a Single-Power Feed" section on page 3-19

Attach Fan Tray Power Connections for a Dual-Power Feed

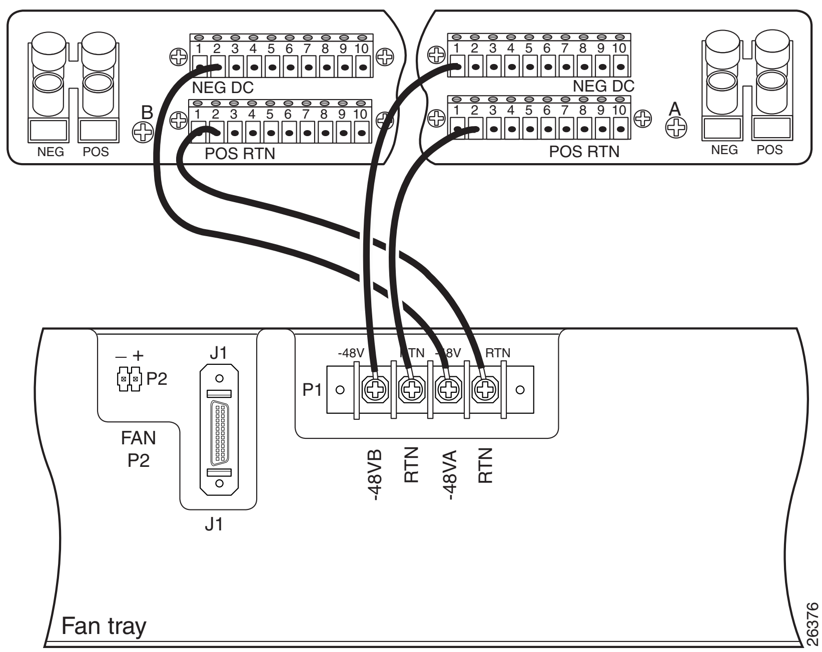
Complete the following steps to attach the fan tray power connections to the fuse and alarm panel for a dual-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the fan tray power connections.

Step 2 Measure enough wire (14 to 18 AWG copper solid or stranded wire) to connect each of the fan tray power connections to the fuse and alarm panel.

Figure 3-12 shows the power connections from the fan tray to the fuse and alarm panel for a dual-power feed.

Figure 3-12 Power Connections for the Fan Tray—Dual-Power Feed



Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver to attach a wire to the –48VA power input connection on the fan tray (P1).

Step 5 Attach the wire to the fuse and alarm panel NEG DC connector. See Figure 3-12 for correct placement.

Step 6 Use a Phillips-head screwdriver to attach a wire to the –48VB power input connection on the fan tray (P1).

Step 7 Attach the wire to the fuse and alarm panel NEG DC connector. See Figure 3-12 for correct placement.

Step 8 Use a Phillips-head screwdriver to attach a wire to an RTN power return connection on the fan tray (P1).

Step 9 Attach the wire to a fuse and alarm panel POS RTN connector.

Step 10 Repeat Step 8 and Step 9 for the remaining RTN power return connection.

Step 11 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the fan tray power connections.

Step 12 Repeat Step 1 through Step 11 for each fan tray.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

Attach Fan Tray Power Connections for a Single-Power Feed

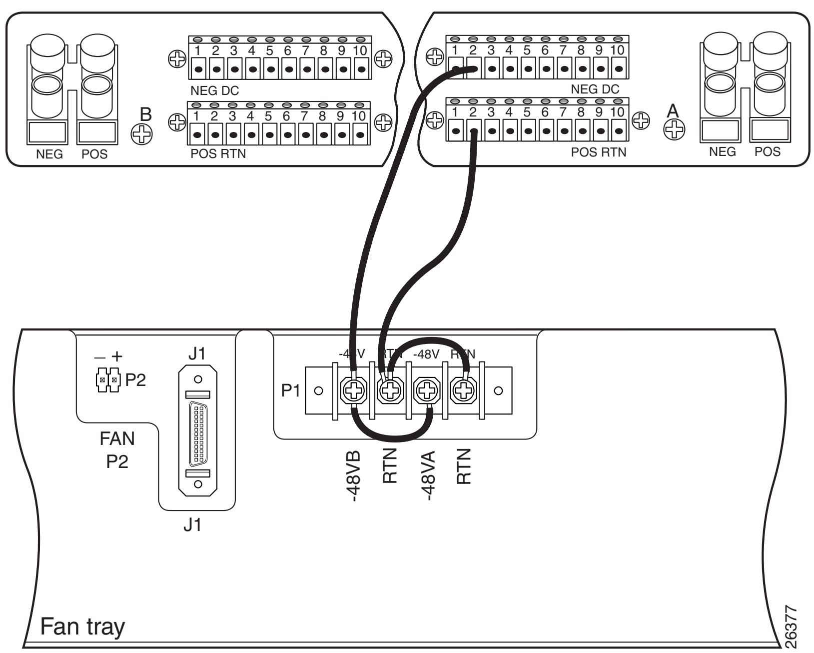
Complete the following steps to attach the fan tray power connections to the fuse and alarm panel for a single-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the fan tray power connections.

Step 2 Measure enough wire (14 to 18 AWG copper solid or stranded wire) to connect each of the fan tray power connections to the fuse and alarm panel.

Figure 3-13 shows the power connections from the fan tray to the fuse and alarm panel for a single-power feed.

Figure 3-13 Power Connections for the Fan Tray—Single-Power Feed



Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver to attach a wire to the –48VA power input connection on the fan tray (P1).

Step 5 Attach the wire to the fuse and alarm panel NEG DC connector.

Step 6 Use a Phillips-head screwdriver to attach a wire to an RTN power return connection on the fan tray (P1). See Figure 3-13 for correct placement.

Step 7 Attach the wire to the fuse and alarm panel POS RTN connector. See Figure 3-13 for correct placement.

Step 8 Use a Phillips-head screwdriver to attach a wire to connect the –48VA and –48VB power input connections to each other.

Step 9 Use a Phillips-head screwdriver to attach a wire to connect the RTN power return connections to each other.

Step 10 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the fan tray power connections.

Step 11 Repeat Step 1 through Step 10 for each fan tray.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

Locate or Install the System I/O Card

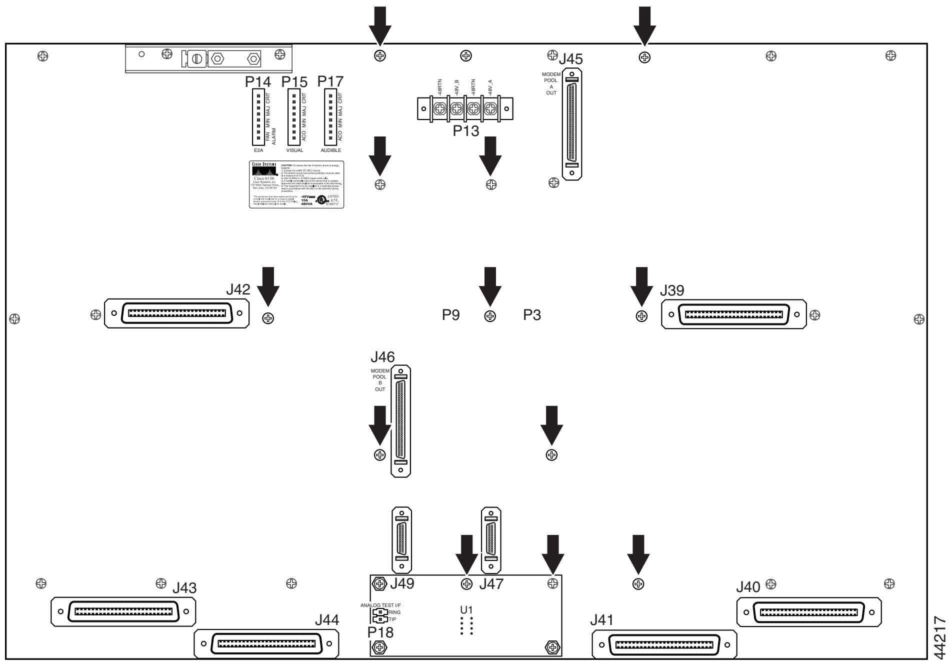
The Cisco 6130 chassis should ship with the system I/O card already installed on the chassis backplane. The system I/O card is attached to backplane connectors P3 and P9, two 2-mm hard metric (HM) module connectors.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

If the system I/O card is not installed on the Cisco 6130, complete the following steps to install it on the chassis backplane:

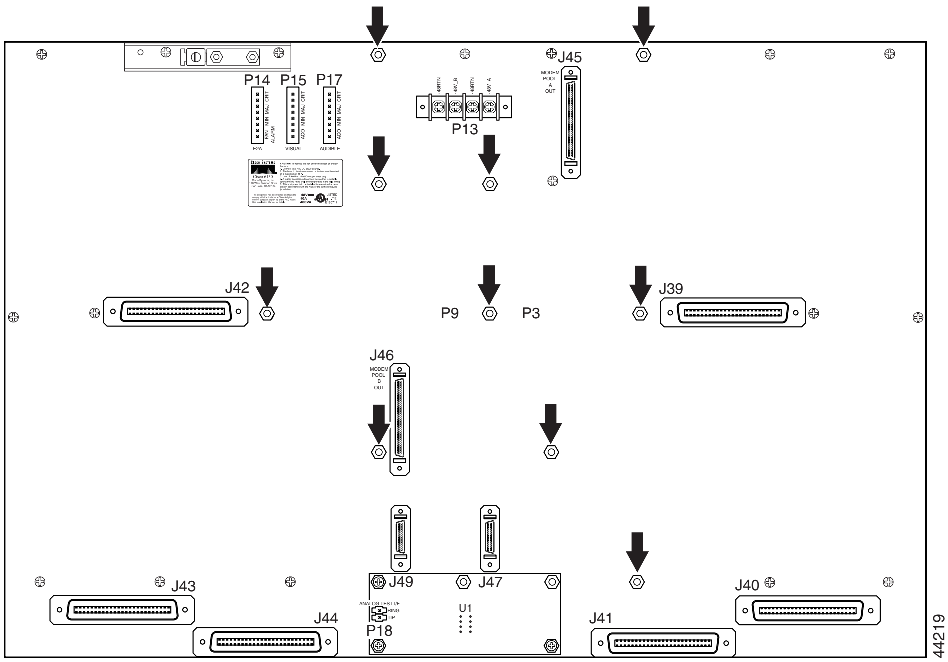
Step 1 Locate the twelve backplane screws shown in Figure 3-14. Use a Phillips-head screwdriver to remove the backplane screws. Keep these backplane screws for use when you install the system I/O card.

Figure 3-14 Backplane Screw Location for System I/O Card Installation



Step 2 Use a one-quarter inch socket driver or wrench to screw ten standoff screws into the locations formerly occupied by ten of the twelve screws that you removed in Step 1. Tighten the standoff screws using the one-quarter inch socket driver or wrench. See Figure 3-15 for standoff screw location.

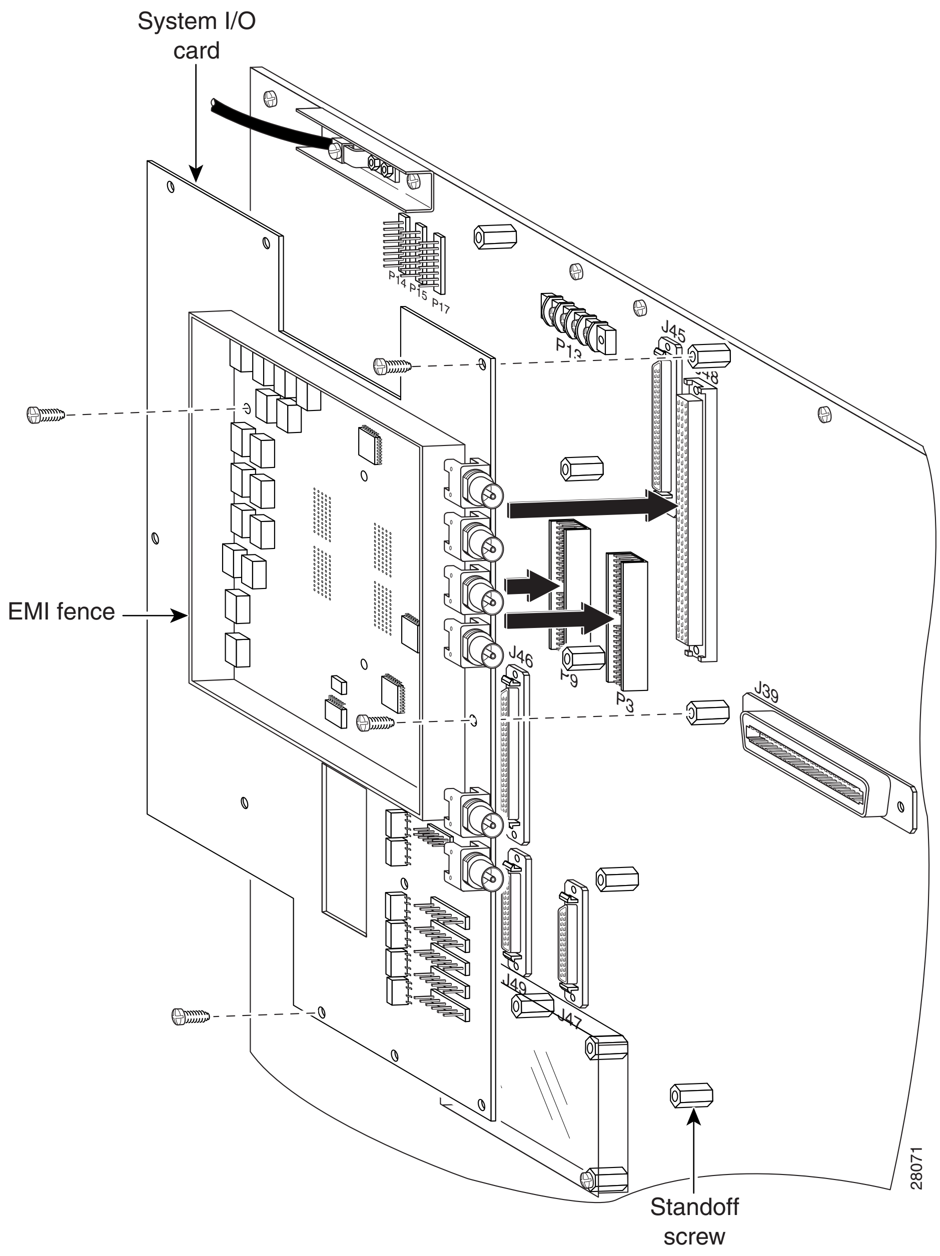
Figure 3-15 Standoff Screw Location for System I/O Card Installation



Caution Be careful when you remove the screws and reinsert the standoff screws into the screw holes on the backplane so that the backplane circuitry does not become damaged.

Step 3 Hold the system I/O card vertically and align the holes on the system I/O card over the twelve standoff screws, as shown in Figure 3-16.

Figure 3-16 System I/O Card Installation

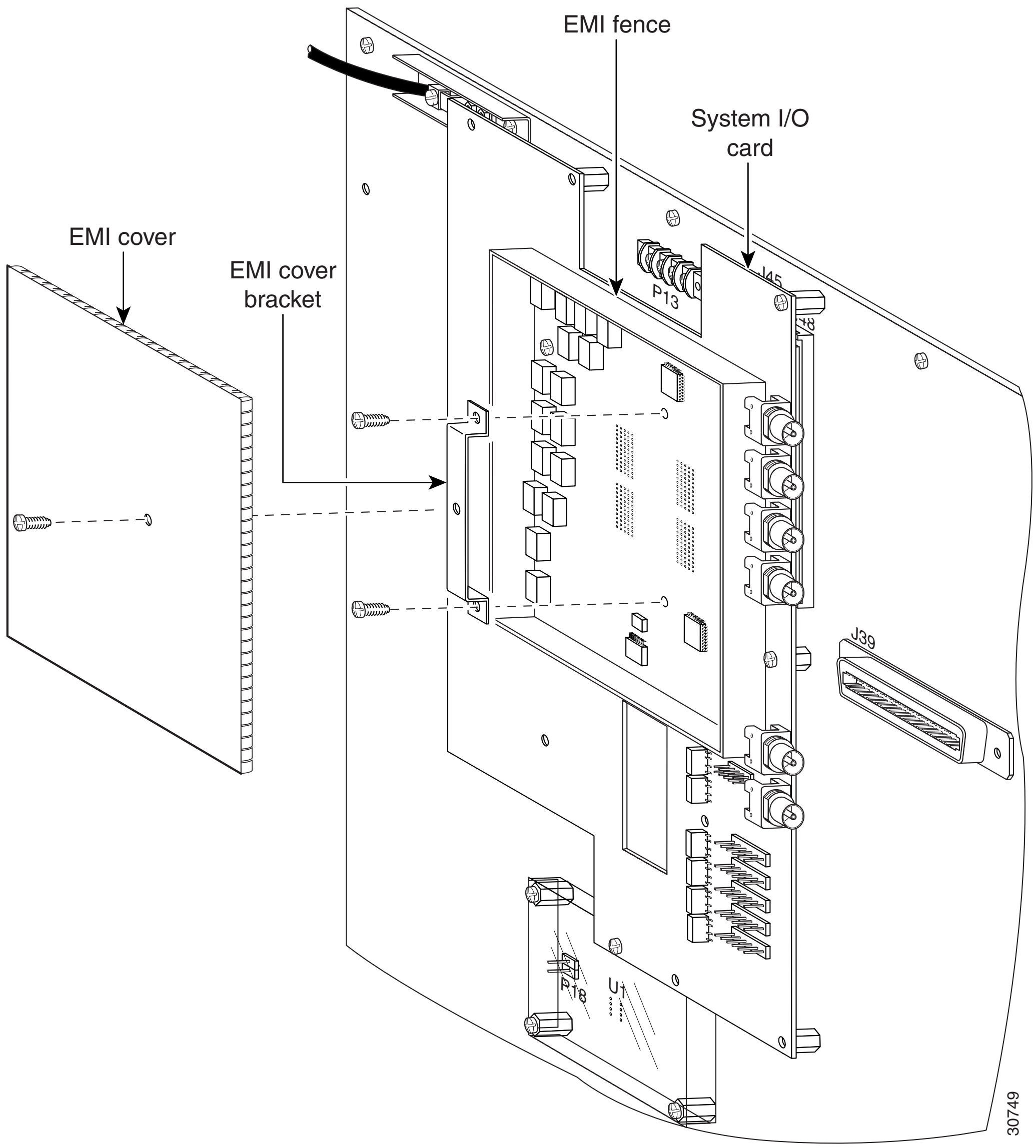


Step 4 Carefully press the system I/O card onto the Cisco 6130 connectors P3 and P9 on the chassis backplane until the system I/O card is in place and against the standoff screws.

Step 5 Use a Phillips-head screwdriver and four backplane screws to attach the system I/O card to the standoff screws, as shown in Figure 3-16.

Step 6 Use a Phillips-head screwdriver and two backplane screws to attach the EMI cover bracket, as shown in Figure 3-17.

Figure 3-17 EMI Cover Installation



Step 7 Attach the EMI cover on the EMI fence, as shown in Figure 3-17.

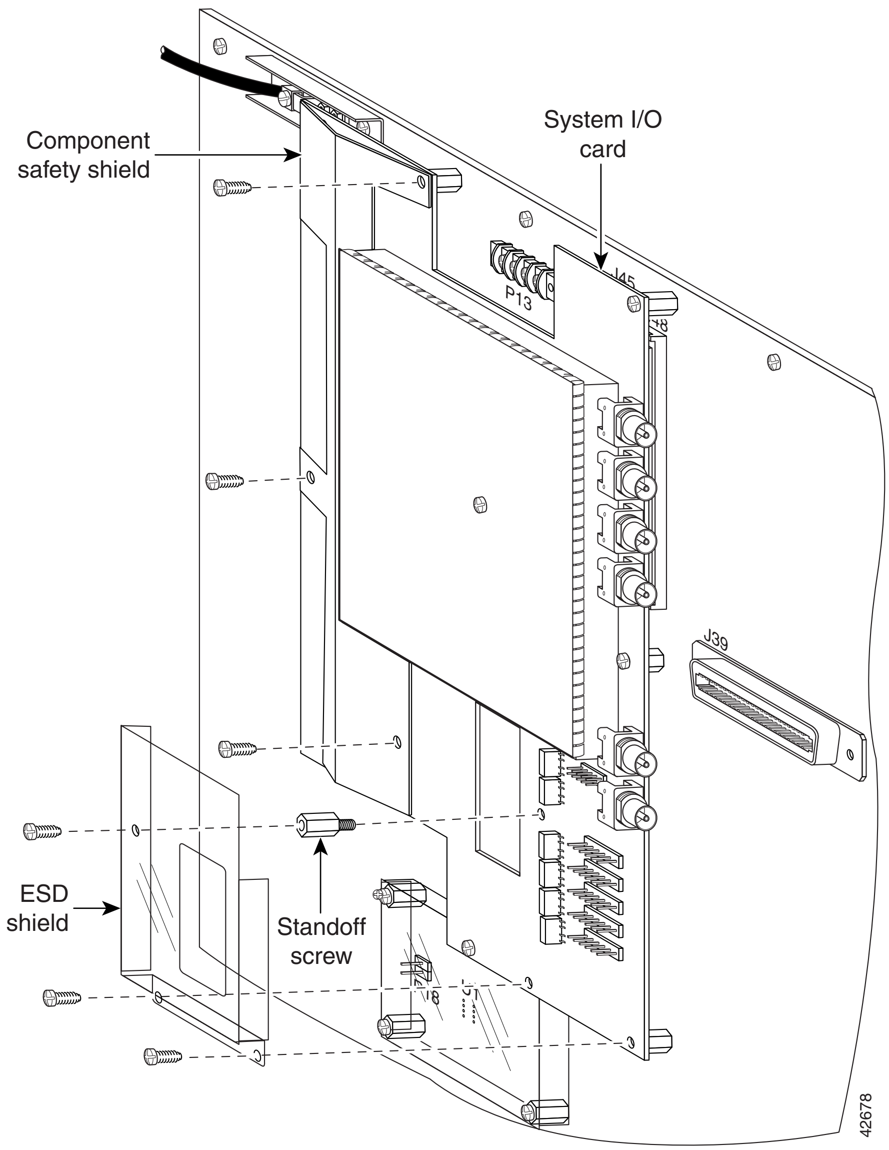
Caution Be careful not to bend the tabs on the EMI cover when you install the cover on the EMI fence.

Step 8 Verify that no EMI cover tabs are outside the EMI fence.

Step 9 Use a Phillips-head screwdriver and a screw to attach the EMI cover to the EMI cover bracket, as shown in Figure 3-17.

Step 10 Use a Phillips-head screwdriver and three backplane screws to attach the safety shield to the left side of the system I/O card, as shown in Figure 3-18. The backplane screws will screw into the existing standoff screws on the backplane.

Figure 3-18 Safety Shield and ESD Shield Installation



Step 11 Use a one-quarter inch socket driver or wrench to screw a standoff screw between relays K4 and K5, as shown in Figure 3-18. Tighten the standoff screws using the one-quarter inch socket driver or wrench.

Step 12 Position the ESD shield with the standoff screw that you installed in Step 10 so that the hole in the shield aligns with the standoff screw, as shown in Figure 3-18.

Step 13 Use a Phillips-head screwdriver and three backplane screws to attach the plastic ESD shield to the system I/O card (see Figure 3-18).

Step 14 Repeat Step 1 through Step 13 for each Cisco 6130 chassis, as necessary.

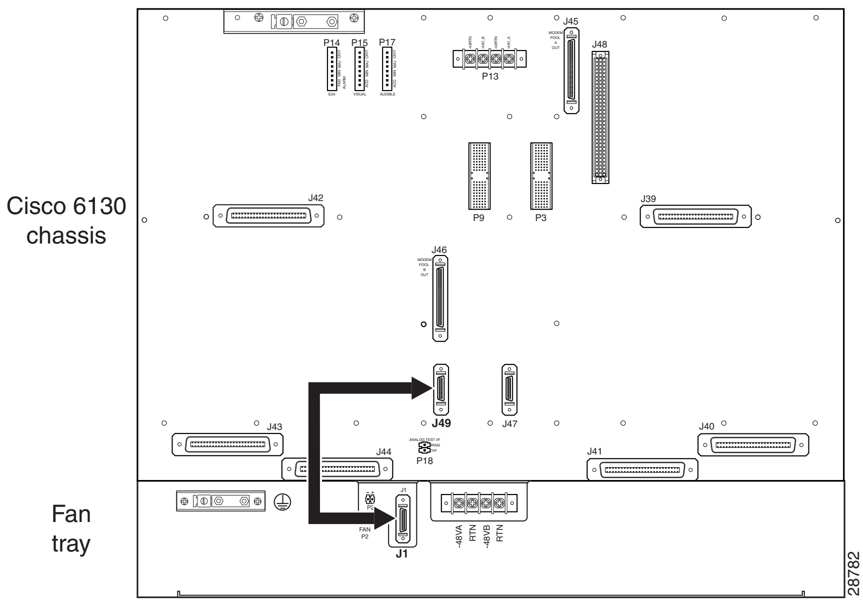
Connect the Fan Tray

Complete the following steps to connect the fan tray alarm cable between the Cisco 6130 and the fan tray:

Step 1 Attach the fan tray alarm cable (part number 72-1912-01) to connector J1 on the fan tray backplane, as shown in Figure 3-19.

Step 2 Attach the other end of the same fan tray alarm cable to connector J49 on the Cisco 6130 backplane, as shown in Figure 3-19.

Figure 3-19 Cabling the Fan Tray to the Cisco 6130 Backplane



Step 3 Repeat Step 1 and Step 2 to connect each Cisco 6130 chassis and fan tray.

Connect the Alarm Contacts

Five rows of wire-wrap pins are located on the right side of the system I/O card. These pins support the following alarms:

- Visual critical
- Visual major
- Visual minor
- Audible critical
- Audible major
- Audible minor
- Power module alarms

- Remote alarm cutoff
- Reserved (several pins that are reserved for future specification)

One NI-2 card in the Cisco 6130 chassis manages the alarms that are generated by the wire-wrap pins (P1 through P5). An alarm cutoff (ACO) switch, located on the NI-2 card faceplate, shuts off the audible alarms.

Figure 3-20 shows the location of the wire-wrap pins on the system I/O card.

Figure 3-20 System I/O Card Alarm Contacts

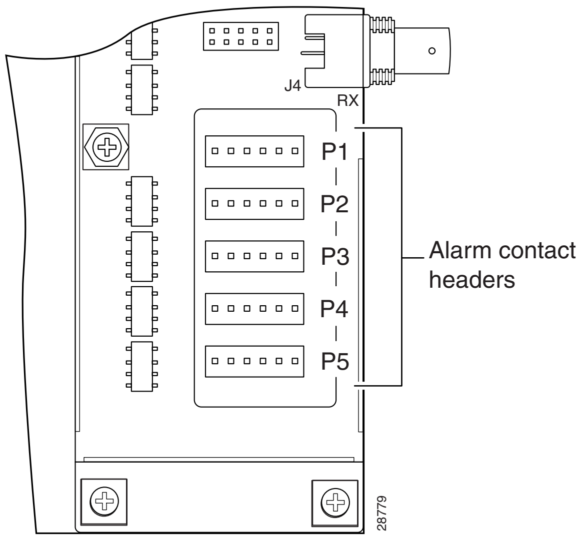


Table 3-3 maps the wire-wrap pins to the alarms that are supported by the NI-2 card through the Cisco 6130 backplane.

Table 3-3 System I/O Card Wire-Wrap Pin Mapping

PIN No.	Header P1	Header P2	Header P3	Header P4[1]	Header P5
Pin 1 (left)	AUD[2]_CRIT[3]_CO[4]	AUD_MIN[5]_CO	VIS[6]_MAJ_CO	DOOR ALARM	RX_BITS[7]_TIPA
Pin 2	AUD_CRIT_NO[8]	AUD_MIN_NO	VIS_MAJ[9]_NO	Reserved	RX_BITS_RINGA
Pin 3	AUD_CRIT_NC[10]	AUD_MIN_NC	VIS_MAJ_NC	Reserved	RX_BITS_GND/GND
Pin 4	AUD_MAJ_CO	VIS_CRIT_CO	VIS_MIN_CO	Reserved	RX_BITS_TIPB
Pin 5	AUD_MAJ_NO	VIS_CRIT_NO	VIS_MIN_NO	ACO[11]_NO	RX_BITS_RINGB
Pin 6 (right)	AUD_MAJ_NC	VIS_CRIT_NC	VIS_MIN_NC	ACO GND[12]	RX_BITS_GND/GND

1. Header P4 is used for the fan tray alarm.
2. AUD = audible.
3. CRIT = critical.
4. CO = common.
5. MIN = minimum.
6. VIS = visual.
7. RX_BITS = receive building-integrated timing source.
8. NO = normally open.
9. MAJ = major.
10. NC = normally closed.
11. The ACO switch is located on the faceplate of the NI-2 card. This switch turns off the audible alarms that are generated by the system software.
12. GND = ground.

Connect the POTS Splitter to the MDF

The following sections detail the cabling procedures to connect the POTS splitter to the MDF. You can use one of the following POTS splitters:

- Cisco 6120
- Third-party POTS splitter

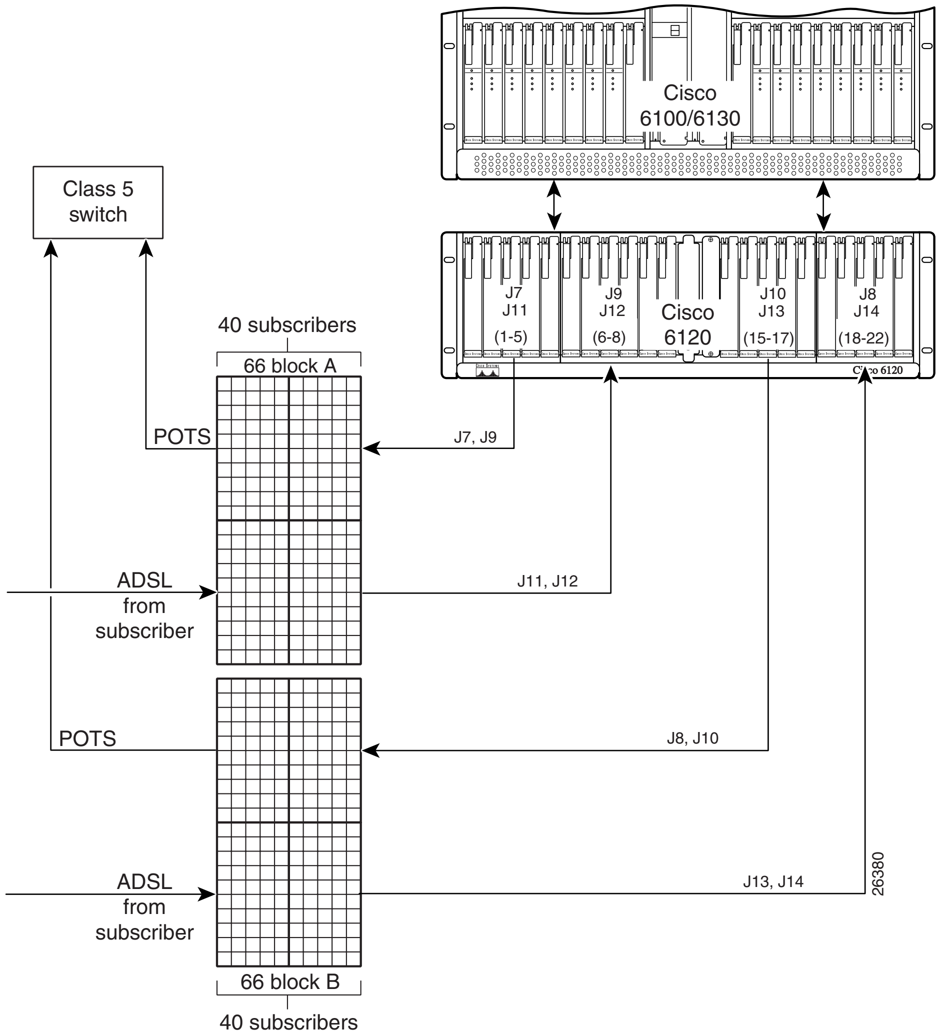
Connect the Cisco 6120 to the MDF

Complete the following steps to connect the Cisco 6120 to the MDF:

Step 1 Connect the *x*DSL subscriber line connectors (J11 to J14) to the MDF using the cables that are orderable through Cisco (see the "POTS Splitter to MDF Cables" section on page B-7) or cables that are built according to the specifications for a Nortel NT-T100 series cable.

Step 2 Connect the voice lines by connectors (J7 to J10) to the MDF for distribution to the Public Switched Telephone Network (PSTN). Figure 3-21 shows the connectors used to link the Cisco 6120 to the Class 5 switch (through the MDF).

Figure 3-21 Cisco 6120 Connection to the MDF



Step 3 Repeat Step 1 and Step 2 for each Cisco 6120.

Note See the "Cisco 6130 with a POTS Splitter Configuration Port Mapping Tables" section on page B-13 for port mapping information.

Connect the Third-Party POTS Splitter to the MDF

Use the cables that are described in the "POTS Splitter to MDF Cables" section on page B-7 to cable the third-party POTS splitter to the MDF. Refer to the appropriate vendor documentation for cabling procedures for the third-party POTS splitter.

Pull Away All Line Cards

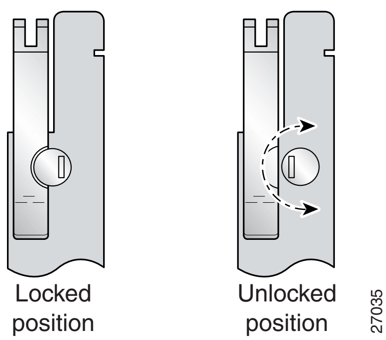
If the Cisco 6130 ships with any line cards installed, complete the following steps to pull away the line cards from the chassis backplane connection.

Caution If the power connections are improperly connected and power is applied while the line cards are installed, the line cards and chassis could be damaged.

Step 1 Unlock any *x*TU-C line cards, as necessary.

Use a flat-head screwdriver to move the locking tab from the locked to the unlocked position. Be sure to turn the locking tab so that it does not overlap the locking lever, as shown in Figure 3-22.

Figure 3-22 Unlocking the Line Card



Step 2 Lift up on the locking lever of each line card. This action disconnects the line card from the backplane.

Step 3 Carefully slide the line card toward you and away from the backplane connection.

Step 4 Repeat Step 1 through Step 3 for each *x*TU-C line card. Repeat Step 2 and Step 3 for the blank faceplates in the Cisco 6130 chassis.

Note The NI-2 card should not be installed in the chassis at this time.

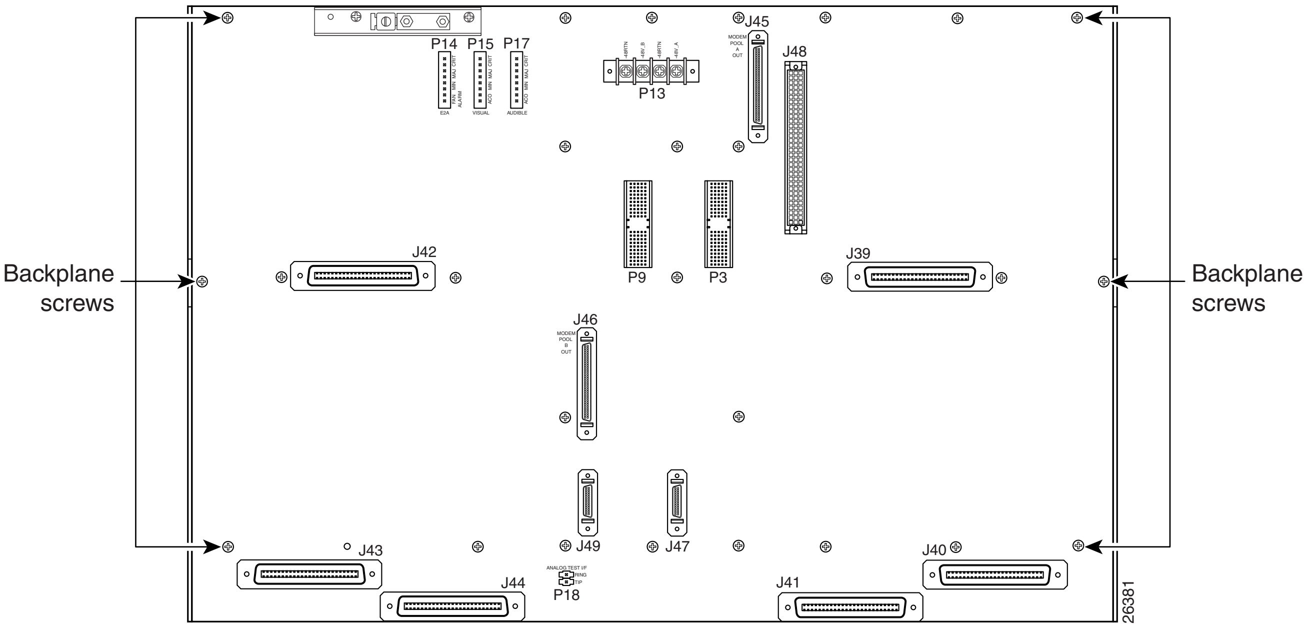
Install the Rear Cover

Complete the following steps to install the optional rear cover:

Step 1 Locate and remove six of the backplane screws that are currently used to hold the Cisco 6130 backplane to the chassis.

Three screws are located on the right of the chassis, and three are located on the left. See Figure 3-23 for the location of the screws. Keep the backplane screws. They will be used when you install the cover-mounting brackets.

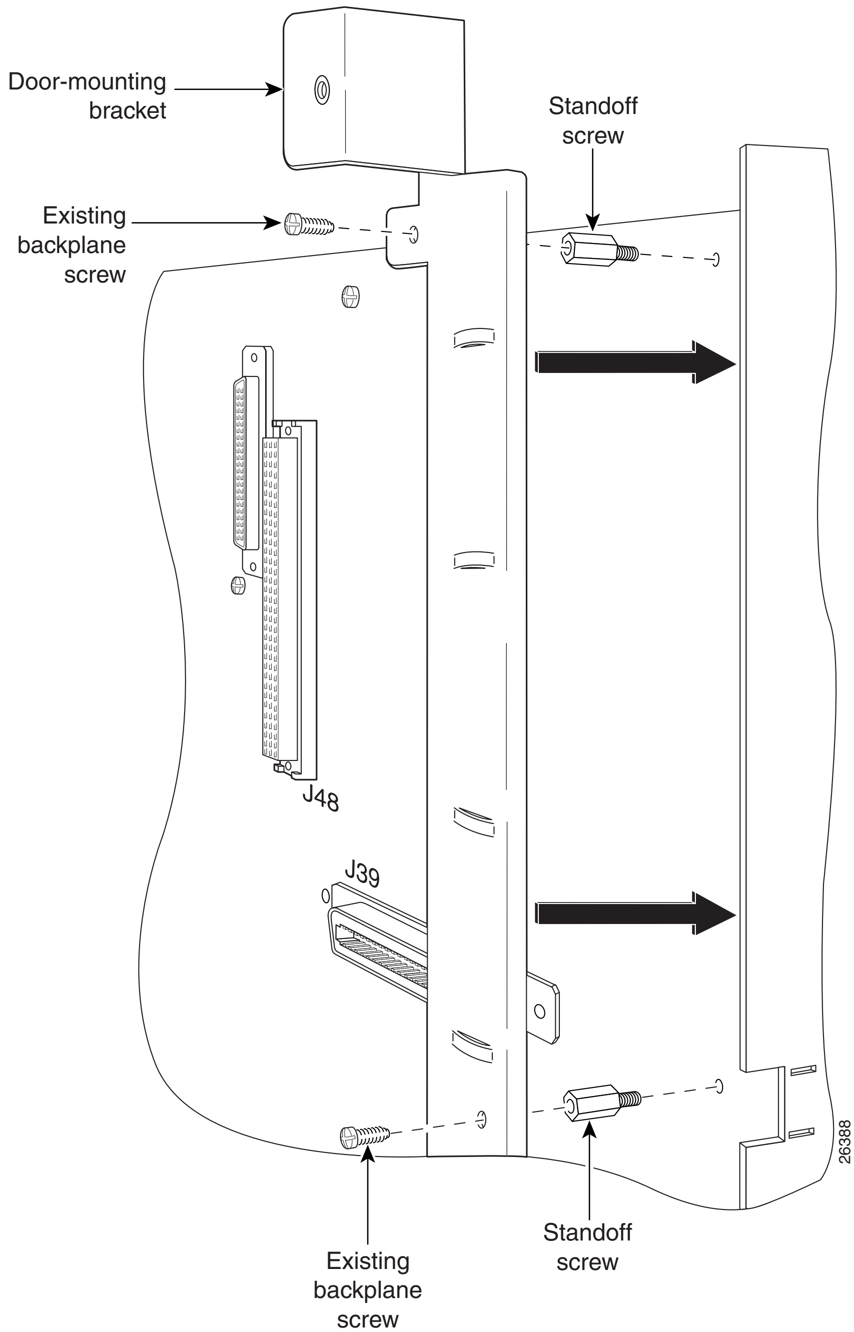
Figure 3-23 Backplane Screws for Rear Cover Installation



Step 2 Install the six standoff screws in the locations formerly occupied by the six screws that you removed in Step 1. Use a one-quarter inch socket driver or wrench to tighten the standoff screws.

Step 3 Face the rear of the chassis and install the cover-mounting bracket on the right side of the chassis. Place the bracket over the standoff screws. Use three of the screws that you removed in Step 1 to fasten the cover-mounting bracket to the chassis. (See Figure 3-24.)

Figure 3-24 Installing the Cover-Mounting Bracket



Step 4 Install the cover-mounting bracket (with the rear cover attached) on the left side of the chassis. Place the bracket (with rear cover) over the standoff screws. Use three of the screws that you removed in Step 1 to fasten the cover-mounting bracket (with rear cover) to the chassis.

Step 5 Use the tie wraps provided in the accessory kit to attach cables to the cover-mounting bracket loops, as necessary.

Step 6 Repeat Step 1 through Step 5 for each Cisco 6130 chassis rear cover.

Apply Power

Complete the following steps to apply power to the Cisco 6130 with NI-2 system:

Step 1 Verify that there are no line cards installed in the Cisco 6130 chassis or any subtended node chassis.

Step 2 Apply power to the system with one of the following methods:

- Install the fuses in the fuse and alarm panel.
- Reinsert the fuses in the fuse and alarm panel, if you removed them in the "Attach Cisco 6130 Power Connections" section on page 3-11.
- Turn on the breakers in the fuse and alarm panel.

Caution If the power connections are improperly connected and power is applied while the cards are installed, the cards and chassis could be damaged.

Step 3 Verify that the fuse calculation for the Cisco 6130 with NI-2 system is correct. See Table 2-4 for a fuse calculation table.

Step 4 Verify that the power connections from the Cisco 6130 to the fuse and alarm panel are wired as shown in Figure 3-8 or Figure 3-9.

Step 5 Verify that the power connections from the fan tray to the fuse and alarm panel are wired as shown in Figure 3-12 or Figure 3-13.

Step 6 Check the polarity of the –48V DC connections to each chassis by attaching a voltmeter with the minus lead on –48RTN and the plus lead on –48V_A or –48V_B. Ensure that the meter reads between –36V DC and –60V DC. If your voltmeter shows a positive voltage, the power inputs might be reversed. If the voltmeter shows a negative voltage that is out of the –36V DC to –60V DC range, check the power supply for failure or check for a blown fuse in the fuse and alarm panel.

Step 7 Repeat Step 1 through Step 6 for each Cisco 6130 chassis.

Verify Fan Tray Operation

Verify that the fan modules are operational by locating the LED on the front of each fan module. If the LED is

- Green—The fan module is operational.
- Not green—The fan module is not operational and the fan tray is in alarm mode. See Chapter 5, "Troubleshooting" for corrective action.

The fan modules should be operational before you install the line cards.

Caution It is important that the Cisco 6130 cooling fans run continuously.

Install the NI-2 Card(s)

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Caution Installing the cards in the chassis with the power leads reversed can damage the cards.

Warning **The power supply circuitry for the Cisco DSLAM equipment can constitute an energy hazard. Before you install or replace the equipment, remove all jewelry (including rings, necklaces, and watches). Metal objects can come into contact with exposed power supply wiring or circuitry inside the DSLAM equipment. This could cause the metal objects to heat up and cause serious burns or weld the metal object to the equipment.**

Warning **Do not reach into a vacant slot or chassis while you install or remove a card or a fan. Exposed circuitry could constitute an energy hazard.**

Note All cards must be fully seated in the chassis. A push on the faceplate of each card is required for the card to be fully seated.

Complete the following steps to install a NI-2 card in the Cisco 6130. It is important that you accomplish each step completely before moving on to the next step.

Note *Primary* and *secondary* are terms related to redundancy. The primary NI-2 card is installed in slot 10 of the Cisco 6130 chassis. If NI-2 card redundancy is desired, a secondary NI-2 card must also be installed in slot 11.

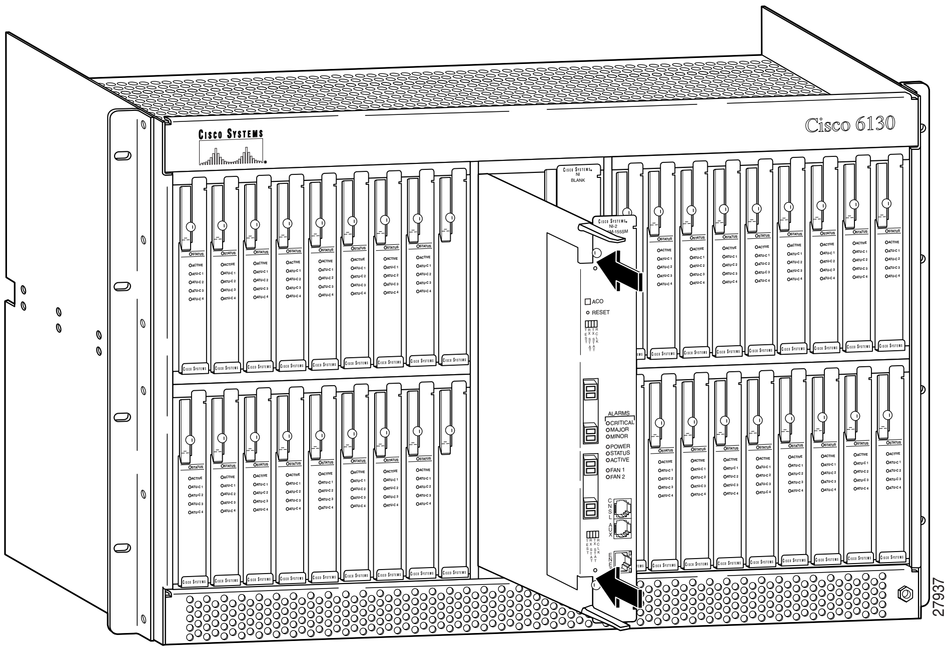
Step 1 Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.

Step 2 Verify that slot 10 or slot 11 of the Cisco 6130 chassis has no bent pins.

Step 3 Vertically align the card edge with the top and bottom guides of the chassis slot.

Figure 3-25 shows the NI-2 card installation in slot 10 of a Cisco 6130 chassis, but the installation procedure for installing an NI-2 card in slot 11 is the same.

Figure 3-25 NI-2 Card Installation



Step 4 Lift up on the locking levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

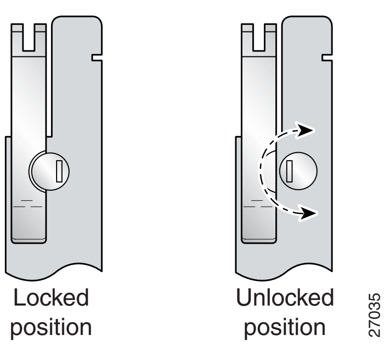
Step 5 Push on the faceplate of the card to fully seat it.

Step 6 Press down on the locking levers to secure the card and connect it to the backplane.

Step 7 Lock both NI-2 card locking tabs.

Use a flat-head screwdriver to turn the locking tabs so that they overlap the locking levers to prevent inadvertent dislodging, as shown in Figure 3-26.

Figure 3-26 Locking the NI-2 Card



Step 8 Perform a software update if the STATUS LED on the NI-2 card is flashing. Refer to the *Configuration Guide for Cisco DSLAMs with NI-2* for software upgrade procedures.

Step 9 Repeat Step 1 through Step 8 for each NI-2 card.

Reseat the Line Cards

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

If you pulled the line cards away from the Cisco 6130 chassis backplane in the "Pull Away All Line Cards" section on page 3-30, reseat the line cards to verify the power connection. If the Cisco 6130 chassis was shipped without line cards installed, proceed to the "Install the Line Cards in the Cisco 6130 and POTS Splitter" section on page 3-36.

Complete the following steps to reseat all of the line cards. It is important that you accomplish each step completely before moving on to the next step.

Note All line cards must be fully seated in the chassis. A push on the faceplate of each line card is required for the line card to be fully seated.

Step 1 Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the line card into the slot.

Step 2 Push on the faceplate of each line card to fully seat the line card.

Step 3 Press down on the locking lever to secure the line card and it to the backplane.

Step 4 Lock any *x*TU-C line cards.

Use a flat-head screwdriver to turn the locking tab so that it overlaps the *x*TU-C line card locking lever to prevent inadvertent dislodging. Figure 3-22 shows how to position the locking tab.

Step 5 Verify that the STATUS LEDs on all line cards are solid green (where applicable).

This self-test procedure takes several minutes. If the STATUS LEDs are not green after the self-test, see Chapter 5, "Troubleshooting" for troubleshooting procedures.

Step 6 Repeat Step 1 through Step 5 for each *x*TU-C line card.

Install the Line Cards in the Cisco 6130 and POTS Splitter

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

If the Cisco 6120 or Cisco 6130 chassis ships without any cards installed in the chassis, install the cards in the following order to verify the power connection:

- *x*TU-C line cards (4xDMT or 4xflexi) in the Cisco 6130 chassis
- POTS cards in the Cisco 6120 POTS splitter

Warning **The power supply circuitry for the Cisco DSLAM equipment can constitute an energy hazard. Before you install or replace the equipment, remove all jewelry (including rings, necklaces, and watches). Metal objects can come into contact with exposed power supply wiring or circuitry inside the DSLAM equipment. This could cause the metal objects to heat up and cause serious burns or weld the metal object to the equipment.**

Warning **Do not reach into a vacant slot or chassis while you install or remove a line card or a fan module. Exposed circuitry could constitute an energy hazard.**

Caution Installing the cards in the chassis with the power leads reversed can damage the cards.

Note All line cards must be fully seated in the chassis. A push on the faceplate of each line card is required for the line card to be fully seated.

To install all of the cards, complete the following steps. It is important that you accomplish each step completely before moving on to the next step.

Step 1 Install the *x*TU-C line cards in the Cisco 6130.

Note The *x*TU-C line cards are installed in slots 1 through 8, 13 through 28, and 31 through 38.

a. Hold the *x*TU-C line card vertically, with the line card faceplate toward you and the connectors facing the chassis slot.

b. Align the line card edge with the top and bottom guides of the chassis slot.

c. Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the line card into the slot.

d. Push on the faceplate of each line card to fully seat the line card.

e. Press down on the locking lever to secure the line card and connect it to the backplane.

f. Lock the line cards.

Use a flat-head screwdriver to turn the locking tab so that it overlaps the locking lever to prevent inadvertent dislodging. Figure 3-22 shows how to position the locking tab.

g. Install the remaining *x*TU-C line cards using the same procedure.

Step 2 Install the POTS splitter cards in the Cisco 6120.

Note The POTS cards are installed in slots 1 through 10 and 13 through 22 of the Cisco 6120.

a. Vertically align the card edge with the guides at the top and bottom of slot 1 on the Cisco 6120.

b. Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

c. Push on the faceplate of each card to fully seat the card.

d. Press down on the locking lever to secure the card and connect it to the backplane.

e. Install the remaining POTS cards using the same procedure.

Note Refer to the appropriate vendor documentation for POTS splitter card installation procedures for the third-party POTS splitter.

Step 3 Verify that the STATUS LEDs on all line cards are solid green (where applicable).

This self-test procedure takes several minutes. If the STATUS LEDs are not green after the self-test, see Chapter 5, "Troubleshooting" for troubleshooting procedures.

Note Blank faceplates should occupy any empty slots in the Cisco 6130. The blank faceplate installation is similar to the line card installation.

Connect the NI-2 Card to the Network

This section provides installation procedures for the DS3 and OC-3c network connections:

- "DS3 Network Connection Installation" section on page 3-38
- "OC-3c/OC-3c Network Connection Installation" section on page 3-40

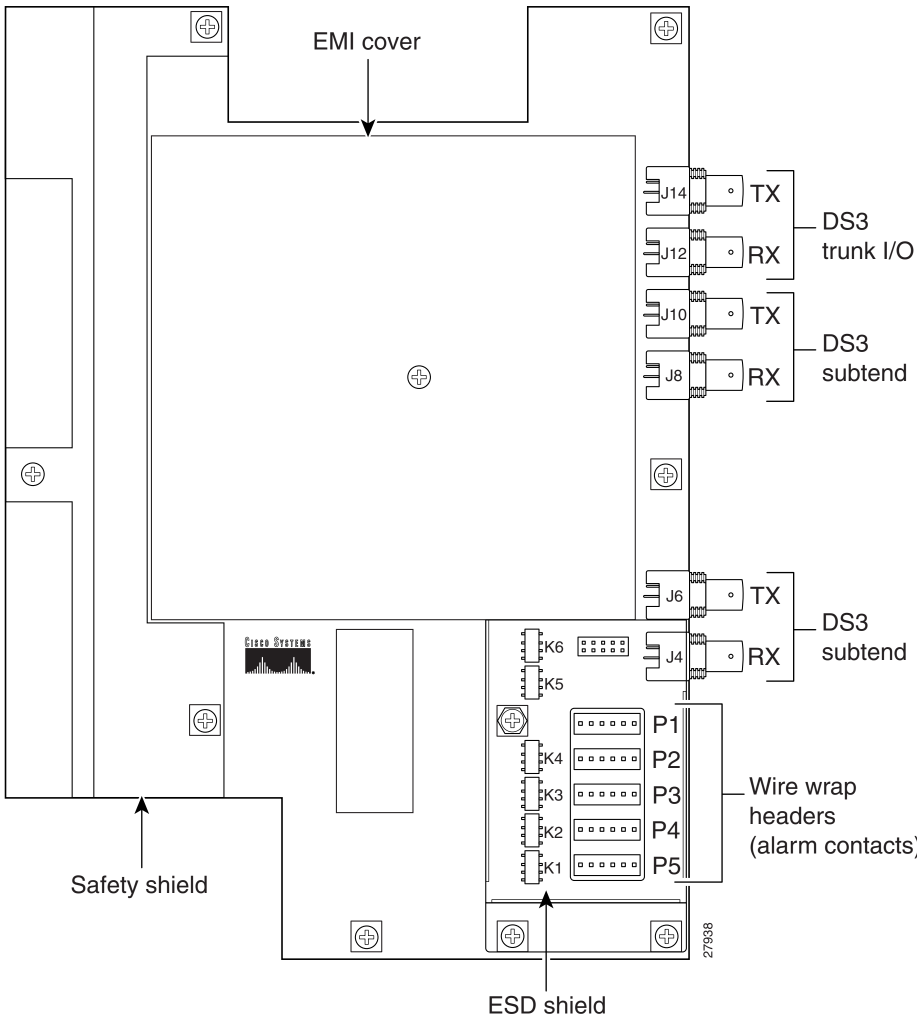
DS3 Network Connection Installation

Complete the following steps to connect the DS3/2DS3 NI-2 card to the network:

Step 1 Verify that the DS3/2DS3 NI-2 card is installed in slot 10 of the Cisco 6130 chassis to ensure that the DS3/2DS3 NI-2 card connections are active.

The DS3/2DS3 NI-2 network connections are on the system I/O card, which is located on the backplane of the Cisco 6130 chassis. These connections attach to the ATM switch. Two 75-ohm DS3 Bayonet-Neill-Concelman (BNC) connectors are provided for DS3 transmit (J14) and receive (J12). See Figure 3-27 for the location of the DS3 BNC connectors.

Figure 3-27 DS3 Network Interface Connection



Step 2 Attach one end of a coaxial cable (type 734A, type 735A, or equivalent) to the transmit DS3 BNC connector (J14) on the system I/O card on the chassis backplane.

Step 3 Attach the end of the cable that you used in Step 2, which originates at the transmit DS3 BNC connector, to the ATM switch.

Step 4 Attach one end of a coaxial cable (type 734A, type 735A, or equivalent) to the receive DS3 BNC connector (J12) on the system I/O card on the Cisco 6130 backplane.

Step 5 Attach the end of the cable that you used in Step 4, which originates at the receive DS3 BNC connector, to the ATM switch.

Step 6 If you are installing a secondary DS3/2DS3 NI-2 card (for cold redundancy) in slot 11, repeat Step 2 through Step 5 to connect the secondary NI-2 card to the network.

Note A DS3/2DS3 NI-2 card does not support APS redundancy.

OC-3c/OC-3c Network Connection Installation

Complete the following steps to connect the OC-3c/OC-3c NI-2 card to the network:

Warning **Do not stare into the beam or view it directly with optical instruments.**

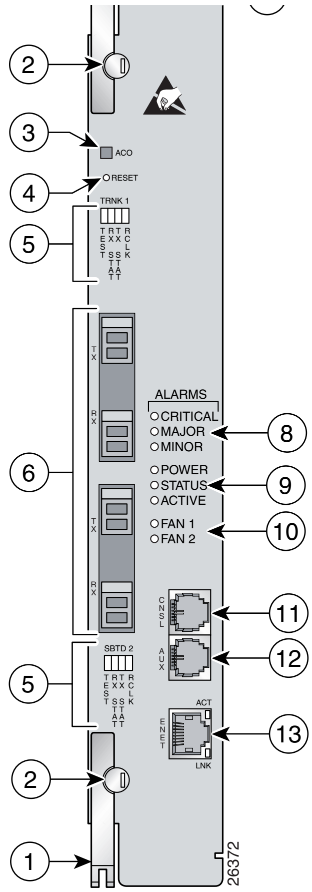
Note If the active NI-2 card fails, the standby NI-2 card is able to use the OC-3c connections to and from the failed card (not applicable to DS3/2DS3 interfaces). Cisco recommends, however, that you also cable a network connection to the ATM switch from the secondary NI-2 card in slot 11 in order to take advantage of SONET APS redundancy.

Step 1 Verify that the OC-3c/OC-3c NI-2 card is in slot 10 of the Cisco 6130 chassis.

Step 2 Pull the OC-3c/OC-3c NI-2 card transmit and receive fiber-optic cables from the ATM switch through the 1 RU of space between the fan tray and the POTS splitter.

Step 3 Attach the receive cable from the ATM switch to the transmit connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card (trunk 1 interface connector TX). See Figure 3-28 for the OC-3c network interface connection location.

Figure 3-28 OC-3c Network Interface Connection



The transmit connector is the one closest to the top of the faceplate. The receive connector is closest to the bottom of the faceplate. The connector IDs are silkscreened inside the inset.

Step 4 Attach the transmit cable from the ATM switch to the receive connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card (trunk 1 interface connector RX). See Figure 3-28 for the OC-3c network interface connection location.

Step 5 Allow enough slack in the cable so that the fan tray can be opened and the fan modules can be maintained.

Step 6 Coil the fiber loosely within the 1 RU of space to take out slack.

Step 7 If you are installing a secondary OC-3c/OC-3c NI-2 card (for redundancy) in slot 11, repeat Step 2 through Step 6 to connect the secondary card to the network.

Install a Subtended Network Configuration

If you are installing a subtended network with subtended node chassis to a subtending host chassis, complete the steps in the following sections. The following sections provide installation procedures for the DS3 and OC-3c subtended network configuration:

- "Cable the DS3 Subtending Network Configuration" section on page 3-42
- "Cable the OC-3c Subtending Network Configuration" section on page 3-44

If you are not installing a subtended network, proceed to the "Connect the Ethernet to the Management Network" section on page 3-46.

Note For information on a subtended network configuration, see the "Subtended Network Configuration" section on page 1-5.

Cable the DS3 Subtending Network Configuration

Coaxial connections for DS3 cabling are located on the system I/O card. The transmit and receive DS3 BNC connectors on the subtending host chassis system I/O card are connected to the transmit and receive DS3 BNC connectors on the subtended node chassis system I/O card.

Note The system I/O card BNC cables are not provided by Cisco.

Complete the following steps to cable the system I/O card for subtending:

Step 1 On the subtending host chassis backplane, attach one end of a BNC cable to the transmit DS3 BNC connector (J10) on the system I/O card.

Step 2 On the first subtended node chassis backplane, attach the end of the BNC cable used in Step 1 to the receive DS3 BNC connector (J12) on the system I/O card.

Step 3 On the subtending host chassis backplane, attach one end of a BNC cable to the receive DS3 BNC connector (J8) on the system I/O card.

Step 4 On the first subtended node chassis backplane, attach the end of the BNC cable used in Step 3 to the transmit DS3 BNC connector (J14) on the system I/O card.

Step 5 On the subtending host chassis backplane, attach one end of a BNC cable to the transmit DS3 BNC connector (J6) on the system I/O card.

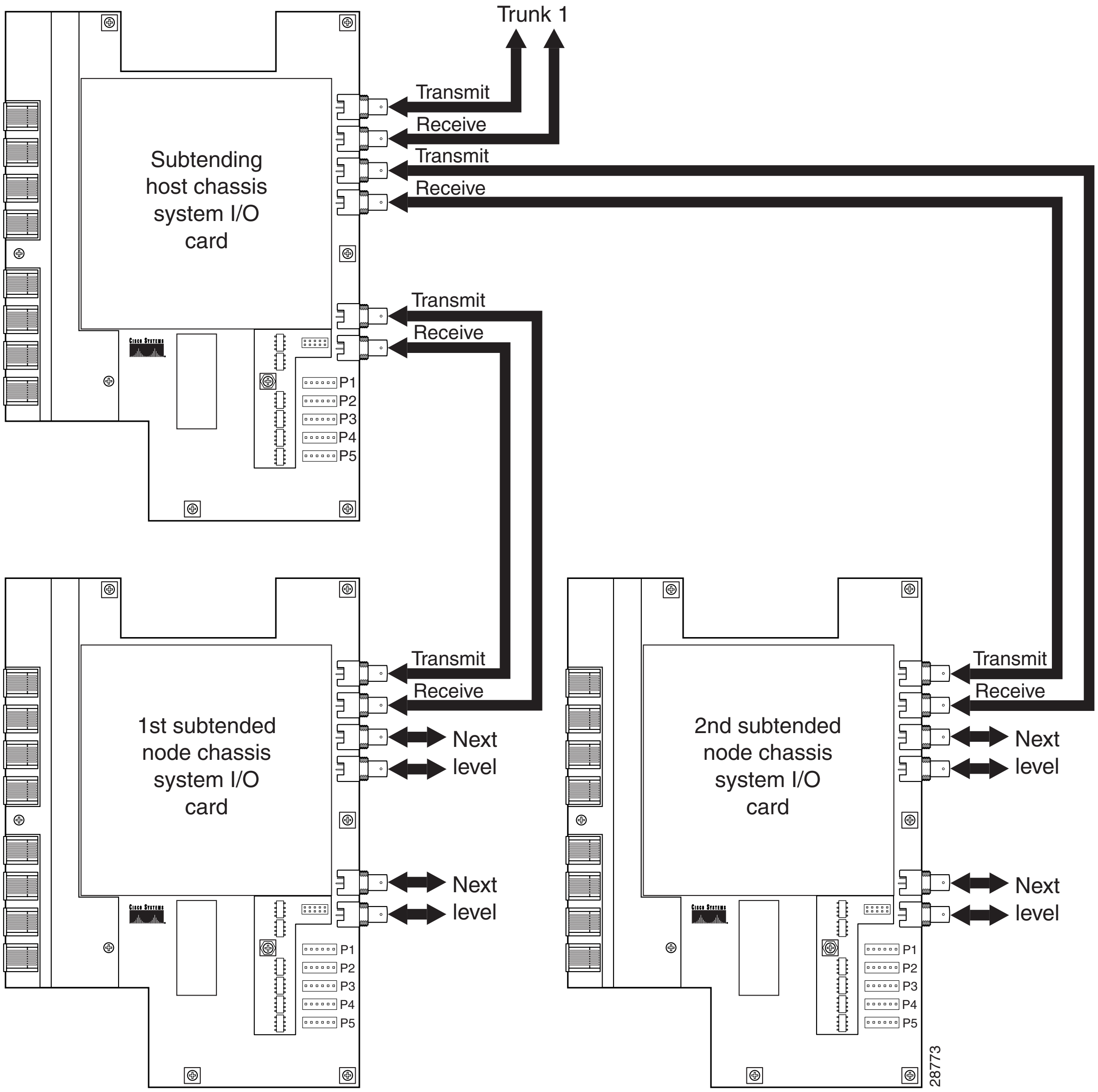
Step 6 On the second subtended node chassis backplane, attach the end of the BNC cable used in Step 5 to the receive DS3 BNC connector (J12) on the system I/O card.

Step 7 On the subtending host chassis backplane, attach one end of a BNC cable to the receive DS3 BNC connector (J4) on the system I/O card.

Step 8 On the second subtended node chassis backplane, attach the end of the BNC cable used in Step 7 to the transmit DS3 BNC connector (J14) on the system I/O card.

Figure 3-29 shows the cabling for a DS3 subtending network configuration.

Figure 3-29 Cabling for DS3 Subtending Configuration



Cable the OC-3c Subtending Network Configuration

For OC-3c subtending, the connections are made from the front of the subtending host chassis and the subtended node chassis. To cable the Cisco 6130 with NI-2 system for OC-3c subtending, complete the following steps:

Step 1 Locate the trunk 1 interface connectors (TX and RX) and the subtend 2 interface connectors (TX and RX) on the front of each OC-3c/OC-3c NI-2 card. See Figure 3-28 for connector location.

Step 2 Attach an OC-3c fiber-optic cable to the transmit (TX) subtend 2 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtending host chassis.

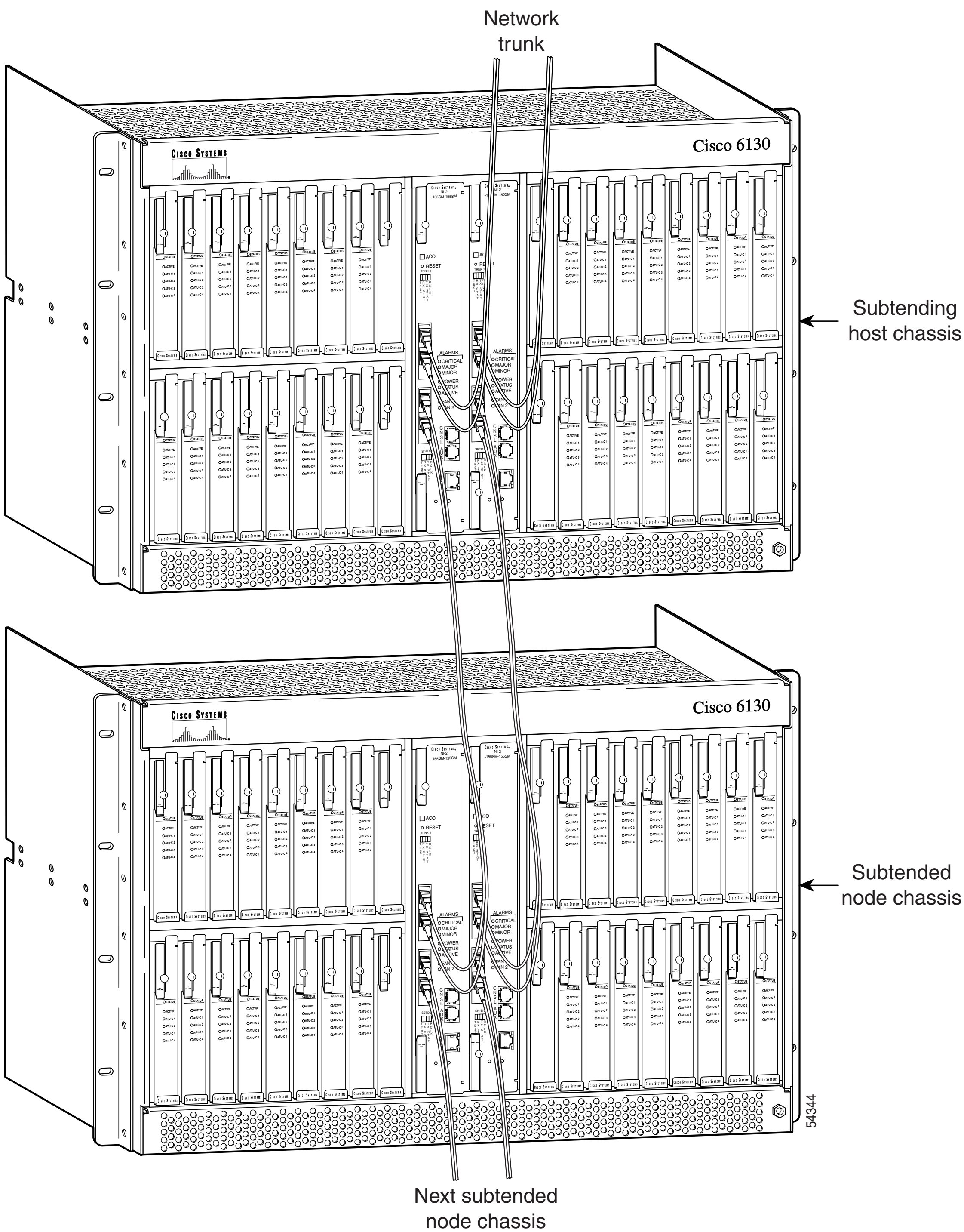
Step 3 Attach the other end of the cable that you used in Step 2 to the receive (RX) trunk 1 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtended node chassis.

Step 4 Attach an OC-3c fiber-optic cable to the receive (RX) subtend 2 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtending host chassis.

Step 5 Attach the other end of the cable that you used in Step 4 to the transmit (TX) trunk 1 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtended node chassis.

Figure 3-30 shows the network and subtending connections between two Cisco 6130 with NI-2 system chassis. The connections from slot 10 are for the primary NI-2 card.

Figure 3-30 Cabling Diagram for OC-3c Subtending



Step 6 Repeat Step 1 through Step 5 for the secondary NI-2 card.

Figure 3-30 shows the network and subtending connections between two Cisco 6130 with NI-2 system chassis. The connections from slot 11 are for the secondary NI-2 card.

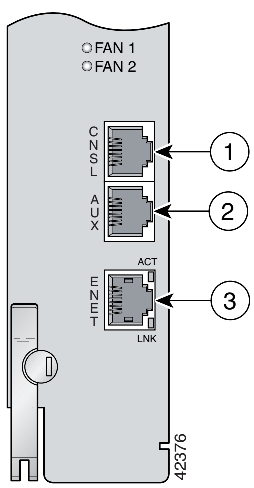
Connect the Ethernet to the Management Network

Connect the 10BaseT RJ-45 receptacle connector on the NI-2 card (ENET) to the management network (for example, LAN). Figure 3-31 shows where to connect the Ethernet cable.

Warning **The ports labeled "ENET," "CNSL," and "AUX" are safety extra-low voltage (SELV) circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the telephone network voltage (TNV) circuits.**

Tip Cisco recommends that you label each data cable at both ends to identify its destination.

Figure 3-31 ENET, CNSL, and AUX RJ-45C Receptacles on the NI-2 Card



Connect a Console Terminal

Connect a VT100-compatible terminal to the system console port on the NI-2 card (CNSL). Connect the terminal to a power source and set it up using the values that are shown in Table 3-4. Figure 3-31 shows where to connect the console cable.

Warning **The ports labeled "ENET," "CNSL," and "AUX" are SELV circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the TNV circuits.**

Table 3-4 Terminal Settings

Baud rate	9600 (transmit and receive)
Character size	8 bits
Parity	None
Stop bits	1
Flow control	None

Connect the Auxiliary Port

Note This step is optional.

Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary port on the NI-2 card (AUX). Figure 3-31 shows where to connect the auxiliary cable.

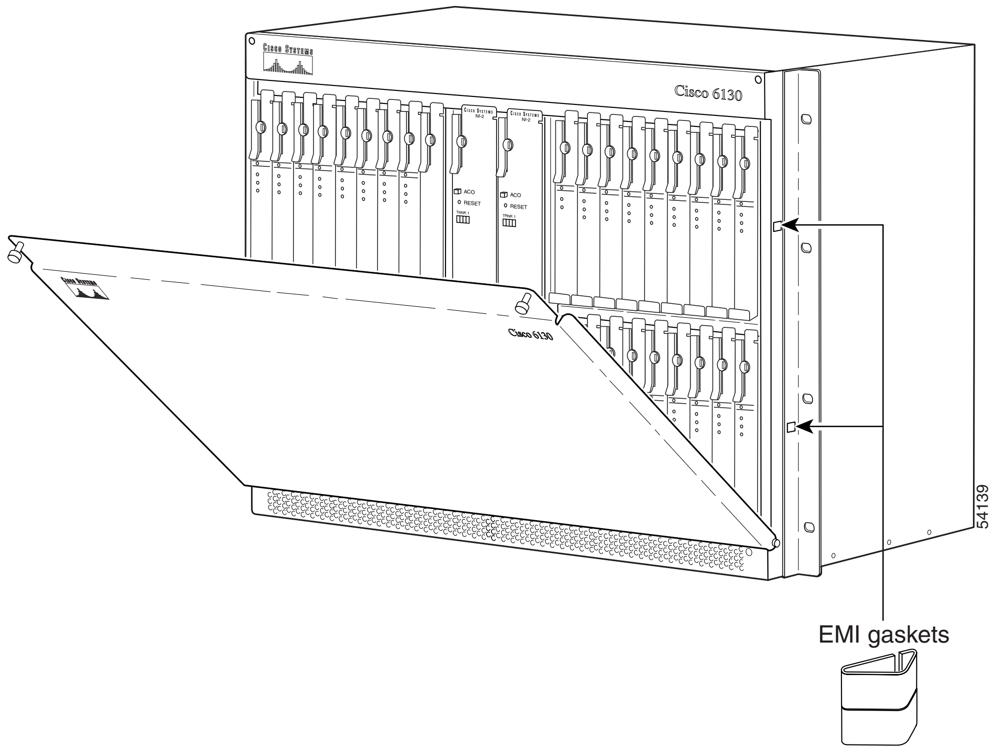
Warning **The ports labeled "ENET," "CNSL," and "AUX" are SELV circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the TNV circuits.**

Tip Cisco recommends that you label each data cable at both ends to identify its destination.

Close the Cisco 6130 Front Cover

Verify that the Cisco 6130 front cover is attached to the chassis and closed (see Figure 3-32).

Figure 3-32 Cisco 6130 Front Cover Installation

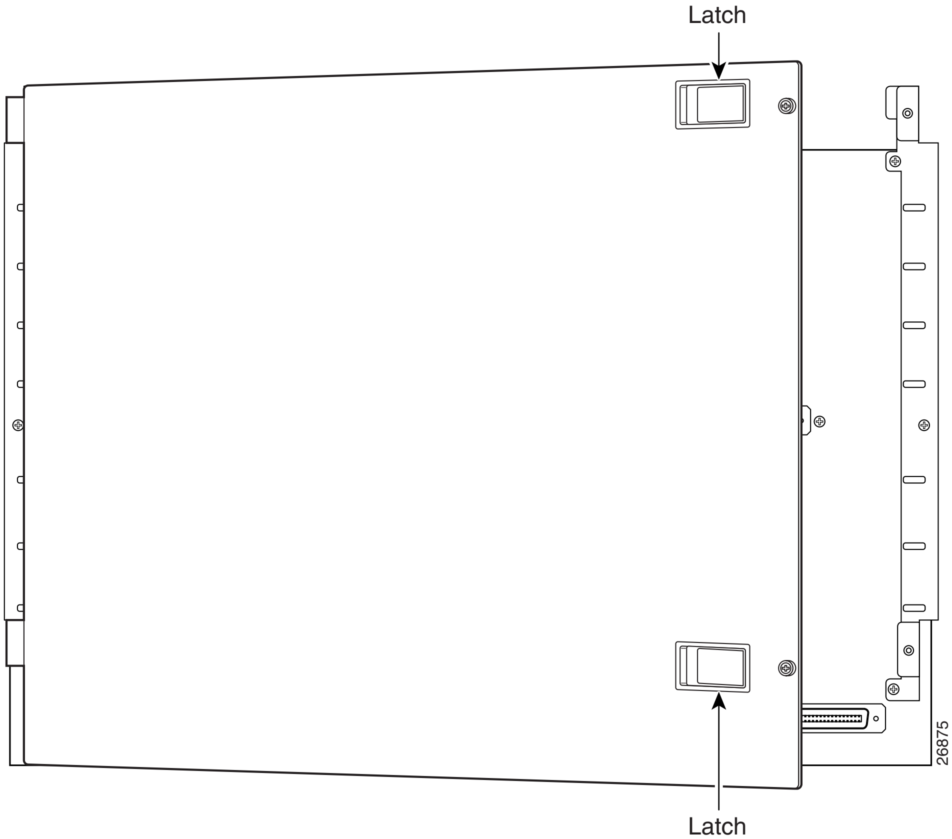


Close the Rear Cover

Complete the following steps to close the optional rear cover:

Step 1 Lift the two latches on the rear cover (as shown in Figure 3-33) as you close the rear cover. The rear cover closes left to right (seen from the rear of the chassis).

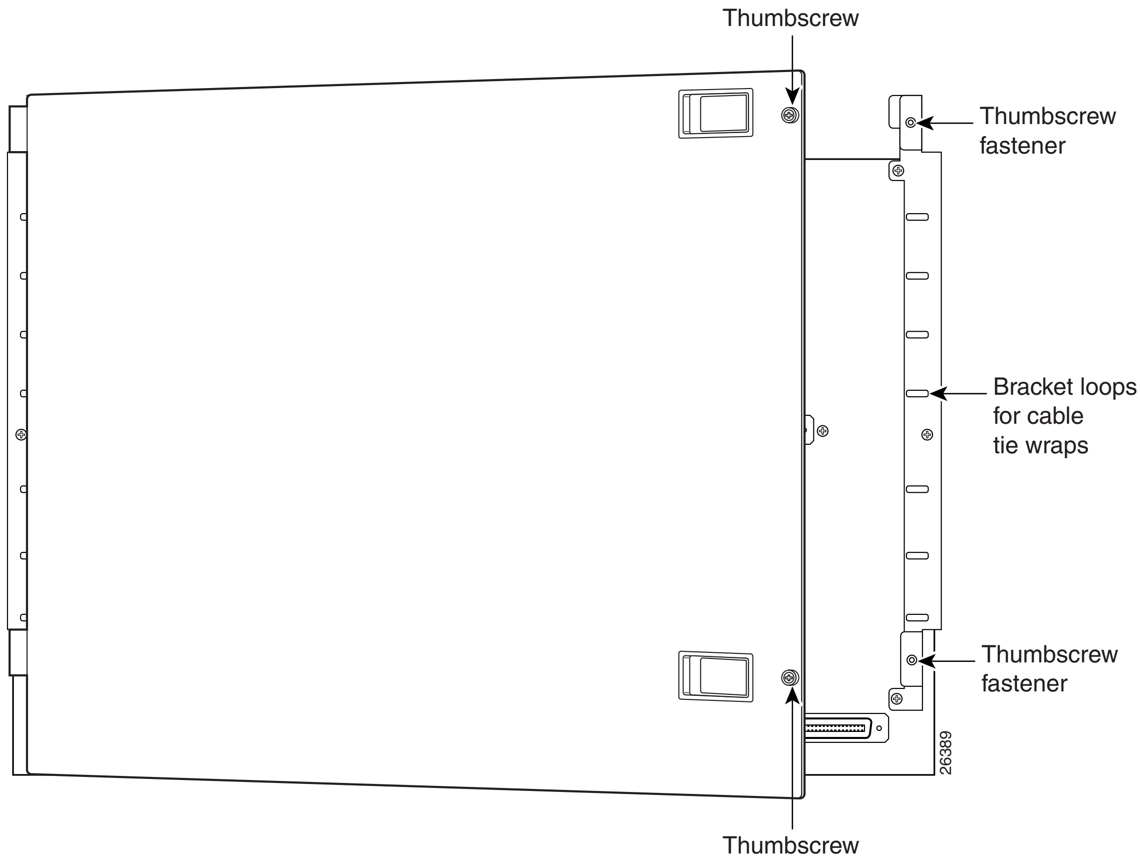
Figure 3-33 Securing the Rear Cover with the Latches



Step 2 Release the latches after the rear cover is in place.

Step 3 Align the two thumbscrews that are located on the rear cover with two thumbscrew fasteners on the bracket (see Figure 3-34). Tighten the thumbscrews to secure the rear cover.

Figure 3-34 Securing the Rear Cover with Two Thumbscrews



Step 4 Repeat Step 1 through Step 3 for additional Cisco 6130 chassis rear cover.

Complete Initial Configuration

When you turn on the Cisco 6130 system for the first time, an interactive dialog called the System Configuration Dialog appears on the console screen. The System Configuration Dialog guides you through the initial configuration process. (You can run the dialog at any time by entering the setup command in privileged EXEC mode.)

When you complete the dialog, the system displays the configuration command script that you have created. It then offers you three options:

```
[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.
```

If you enter **2**, the configuration is saved and used. If you answer **0** or **1,** the configuration you created is not saved. Enter **1** if you wish to discard the configuration and restart the System Configuration Dialog.

Before You Begin

Complete these steps before you run the System Configuration Dialog:

Step 1 Determine the IP address for the Ethernet interface.

Step 2 If you plan to configure in-band management, also determine the IP address for the ATM interface that will be used for in-band management (ATM0/0).

Step 3 Find out what the password strategy is for your environment. The System Configuration Dialog prompts you for three passwords, plus an SNMP community string. The three required password types are enable secret, enable, and virtual terminal.

Step 4 Choose a name for the Cisco 6130 system. (This step is optional.)

Using the System Configuration Dialog

When you power up a Cisco 6130 system for the first time, you are offered the option of running the System Configuration Dialog. The System Configuration Dialog offers two configuration options: basic management setup and extended setup.

- Choose basic management setup if you want to use the System Configuration Dialog to configure the passwords and the Ethernet interface only, and then use the management station or the command line interface to configure the remaining Cisco 6130 system interfaces.
- Choose extended setup if you want to use the System Configuration Dialog to configure all of the Cisco 6130 system interfaces.

An example of the use of each option follows the "Interface Numbering" section. In each example, an arrow marks the point in the dialog where basic management setup and extended setup diverge.

Interface Numbering

The System Configuration Dialog and the command line interface use the following interface numbering scheme:

- Interfaces whose names begin with "ATM0" (ATM0/1, ATM0/2, and so forth) are NI-2 card WAN interfaces. ATM0/0 is the ATM switch interface with the processor (sometimes referred to as the ASP interface, for ATM switch/processor). There is no need to configure ATM0/0 unless you plan to use in-band management. ATM0/1 is the trunk port. ATM0/2 and ATM0/3 (if present) are subtending interfaces.
- Interfaces whose names begin with "ATM1" through "ATM34" are line card interfaces. (ATM10 and ATM11, which would indicate that the NI-2 slots, are omitted.)
- Ethernet0/0 is the interface for the LAN that connects the Cisco 6130 system to its management system.

For line card interfaces, the number before the slash indicates the slot number. The number after the slash indicates the interface or port number. For example, ATM6/4 is slot 6, port 4.

Basic Management Setup Example

This is the basic management setup example:

```
         --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: y
At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.

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

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

Configuring global parameters:

  Enter host name [DSLAM]:

  The enable secret is a password used to protect access to
  privileged EXEC and configuration modes. This password, after
  entered, becomes encrypted in the configuration.
  Enter enable secret: beansoup

  The enable password is used when you do not specify an
  enable secret password, with some older software versions, and
  some boot images.
  Enter enable password: beansoup
% Please choose a password that is different from the enable secret
  Enter enable password: lab1

  The virtual terminal password is used to protect
  access to the router over a network interface.
  Enter virtual terminal password:
% No defaulting allowed
  Enter virtual terminal password: lab

  Configure SNMP Network Management? [yes]: y
    Community string [public]:

Current interface summary

Any interface listed with OK? value "NO" does not have a valid configuration

Interface              IP-Address      OK? Method Status                Protocol
ATM0/0                 unassigned      NO  unset  up                    up
Ethernet0/0            unassigned      NO  unset  up                    up
ATM0/1                 unassigned      NO  unset  down                  down
ATM0/2                 unassigned      NO  unset  down                  down

Enter interface name used to connect to the
management network from the above interface summary: Ethernet0/0

Configuring interface Ethernet0/0:
  Configure IP on this interface? [yes]: y
    IP address for this interface: 172.27.144.141
    Subnet mask for this interface [255.255.0.0] :
    Class B network is 172.27.0.0, 16 subnet bits; mask is /16

The following configuration command script was created:

hostname DSLAM
```

```
enable secret 5 $1$pR/1$0zH7ohDaUKNML3SC2.RF5.
enable password lab1
line vty 0 4
password lab
snmp-server community public
!
no ip routing

!
interface ATM0/0
no ip address
!
interface Ethernet0/0
no shutdown
ip address 172.27.144.141 255.255.0.0
!
interface ATM0/1
shutdown
no ip address
!
interface ATM0/2
shutdown
no ip address
!
end


[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]: 2
% Shutdown not allowed for ATM0/0.
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.


Press RETURN to get started!
```

Extended Setup Example

This is the extended setup example:

```
         --- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: yes

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


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

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

First, would you like to see the current interface summary? [yes]: yes

Interface              IP-Address      OK? Method Status                Protocol
ATM0/0                 70.0.0.2        YES NVRAM  up                    up
```

```
Ethernet0/0           172.27.32.156   YES NVRAM  up                    up
ATM0/1                unassigned      YES unset  down                  down
ATM0/2                unassigned      YES unset  administratively down down
ATM18/0               unassigned      YES unset  initializing          down
ATM18/1               unassigned      YES unset  initializing          down
ATM18/2               unassigned      YES unset  initializing          down
ATM18/3               unassigned      YES unset  initializing          down
ATM21/0               unassigned      YES unset  administratively down down
ATM21/1               unassigned      YES unset  administratively down down
ATM21/2               unassigned      YES unset  administratively down down
ATM21/3               unassigned      YES unset  administratively down down
ATM26/0               unassigned      YES unset  down                  down
ATM26/1               unassigned      YES unset  down                  down
ATM26/2               unassigned      YES unset  down                  down
ATM26/3               unassigned      YES unset  down                  down

Configuring global parameters:

  Enter host name [DSLAM]: sw-ni2-2

  The enable secret is a password used to protect access to
  privileged EXEC and configuration modes. This password, after
  entered, becomes encrypted in the configuration.
  Enter enable secret: lab

  The enable password is used when you do not specify an
  enable secret password, with some older software versions, and
  some boot images.
  Enter enable password [lab]: lab

  The virtual terminal password is used to protect
  access to the router over a network interface.
  Enter virtual terminal password [lab]:
  Configure SNMP Network Management? [no]:
  Configure IP? [yes]:
    Configure IGRP routing? [yes]: no

Configuring interface parameters:

Do you want to configure ATM0/0  interface? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface [70.0.0.2]:
    Subnet mask for this interface [255.0.0.0] :
    Class A network is 70.0.0.0, 8 subnet bits; mask is /8

Do you want to configure Ethernet0/0  interface? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface [172.27.32.156]:
    Subnet mask for this interface [255.255.0.0] :
    Class B network is 172.27.0.0, 16 subnet bits; mask is /16

Do you want to configure ATM0/1  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM0/2  interface? [no]:

Do you want to configure ATM18/0  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM18/1  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM18/2  interface? [yes]:
  Configure IP on this interface? [no]:
```

```
Do you want to configure ATM18/3  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM21/0  interface? [no]:

Do you want to configure ATM21/1  interface? [no]:

Do you want to configure ATM21/2  interface? [no]:

Do you want to configure ATM21/3  interface? [no]:

Do you want to configure ATM26/0  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM26/1  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM26/2  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM26/3  interface? [yes]:
  Configure IP on this interface? [no]:

The following configuration command script was created:

hostname sw-ni2-2
enable secret 5 $1$12Lo$vGKa1wlRcNyw06j1bgGQd0
enable password lab
line vty 0 4
password lab
no snmp-server
!
ip routing
!
interface ATM0/0
ip address 70.0.0.2 255.0.0.0
!
interface Ethernet0/0
ip address 172.27.32.156 255.255.0.0
!
interface ATM0/1
no ip address
!
interface ATM0/2
shutdown
no ip address
!
interface ATM18/0
no ip address
!
interface ATM18/1
no ip address
!
interface ATM18/2
no ip address
!
interface ATM18/3
no ip address
!
interface ATM21/0
shutdown
no ip address
!
```

```
interface ATM21/1
shutdown
no ip address
!
interface ATM21/2
shutdown
no ip address
!
interface ATM21/3
shutdown
no ip address
!
interface ATM26/0
no ip address
!
interface ATM26/1
no ip address
!
interface ATM26/2
no ip address
!
interface ATM26/3
no ip address
!
end


[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]:2
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.


Press RETURN to get started!
```

Note To configure your system, refer to the appropriate software or network management configuration guides.

Installing a Cisco 6130 Without a POTS Splitter Configuration

This chapter provides installation procedures for a Cisco 6130 without a POTS splitter configuration.

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

Caution Before you start the installation procedures, read the entire chapter for important information and safety warnings.

Note Before installing and cabling the equipment, be aware of standard safety practices and the hazards involved in working with electrical circuitry to prevent accidents. See the "Safety Requirements" section on page 2-1 for all cautions and warnings that are necessary to ensure a safe and hazard-free installation.

To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information for the Cisco 6100 Series System* document.

Tip See the "Cisco 6130 Without a POTS Splitter Configuration" section on page 1-4 for more information about Cisco 6130 chassis without a POTS splitter configuration components.

Installation Checklist

When you install a Cisco 6130 without a POTS splitter configuration, be sure that you follow the installation procedures in the proper sequence. Table 4-1 is a checklist of the installation steps in the order in which they should occur. Detailed installation instructions are located in the sections following Table 4-1.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Table 4-1 Installation Checklist—Cisco 6130 Chassis without a POTS Splitter Configuration

Check	Installation Step
	1. Stabilize and measure the rack space.
	2. Install the fan tray in the rack.
	3. Install the Cisco 6130 chassis in the rack.
	4. Install the blank faceplates in the open slots.
	5. Ground the Cisco 6130 and fan tray.
	6. Connect the Cisco 6130 chassis to the MDF.
	7. Attach the Cisco 6130 power connections to the fuse and alarm panel.
	8. Attach the fan tray power connections to the fuse and alarm panel.
	9. Locate or install the system I/O card on the Cisco 6130 backplane.
	10. Connect the fan tray to the Cisco 6130 chassis.
	11. Connect the alarm contacts.
	12. Pull all of the line cards away from the backplane connection (applicable if any line cards ship in the chassis).
	13. Install the rear cover (optional).
	14. Apply power to the system.
	15. Verify that the fan tray is operational.
	16. Install the NI-2 card(s).
	17. Reseat all of the line cards (applicable if any line cards ship in the chassis).
	18. Install the line cards in the Cisco 6130 chassis.
	19. Connect the NI-2 card(s) to the network.
	20. Install a subtended network (optional).
	21. Connect the Ethernet to the management network.
	22. Connect a console terminal.
	23. Connect the auxiliary port (optional).
	24. Verify that the Cisco 6130 front cover is closed.
	25. Close the optional rear cover.
	26. Complete initial configuration.

Installation Procedures

The following sections detail the installation procedures for a Cisco 6130 without a POTS splitter configuration.

Stabilize and Measure Rack Space

For the rack to remain stable, you must install your Cisco 6130 with NI-2 system from the bottom to the top of the rack. Before you install any of the chassis, measure the total rack space required to install your system. The required rack space depends on the number of Cisco 6130 chassis and fan trays you plan to use. The number of chassis and required fan trays increase if you plan to install a subtended network.

You can install a combination of the Cisco 6130 system components in a 7-foot rack:

- Cisco 6130 chassis—Maximum of two chassis are allowed per rack
- Fan tray—Required beneath each Cisco 6130 chassis

Note See Chapter 2, "Preparing for Installation," for the calculation tables that are necessary to plan total rack space for your Cisco 6130 with NI-2 system configuration.

The Cisco 6130 with NI-2 system fits in a 23-inch wide rack. See Table 2-2 for individual rack space requirements. Allow 1 rack unit (RU) of space under the fan tray. This space allows for the intake plenum and for cabling back to front for the NI-2 card.

Warning **To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:**

—This unit should be mounted at the bottom of the rack if it is the only unit in the rack.

—When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.

—If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

If you plan to expand your system to include more chassis in the future, allow space in the rack for additions during the initial installation, keeping in mind the weight distribution and stability of the rack.

Install the Fan Tray

Complete the following steps to install the fan tray in the rack.

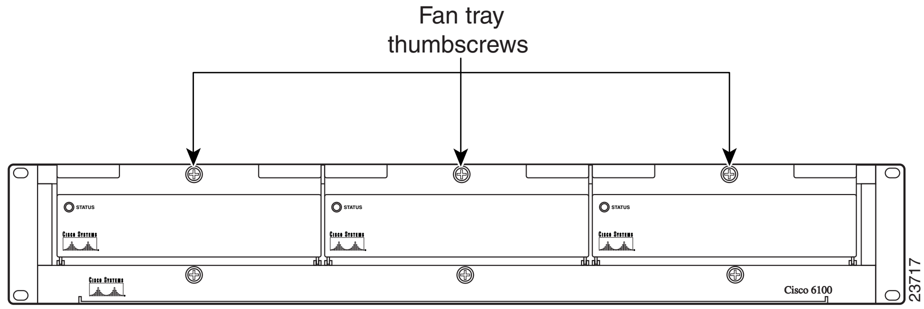
Note If you are using more than one Cisco 6130 chassis in a Cisco 6130 without a POTS splitter configuration, you must install a fan tray under each chassis.

Step 1 Connect a grounding strap to the ESD grounding jack. For ESD information, see the "Preventing Electrostatic Discharge Damage" section on page 2-9.

Step 2 Place the fan tray on a flat and stable surface (for example, a table top).

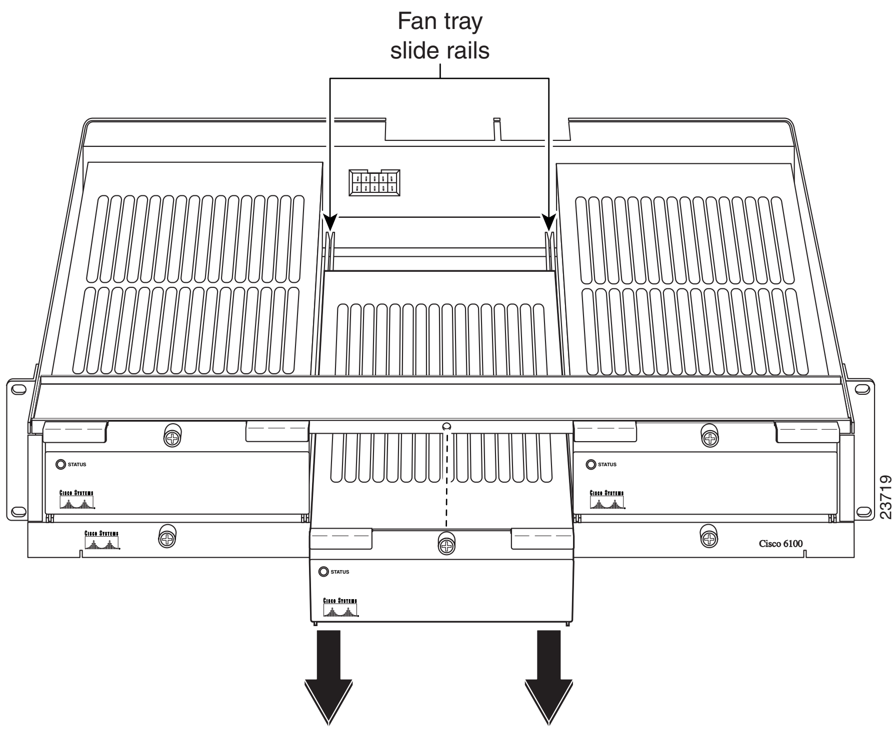
Step 3 Locate the first fan module and unscrew the thumbscrew that holds the fan module in place (the screw at the top of each fan module), as shown in Figure 4-1.

Figure 4-1 Fan Tray Thumbscrews



Step 4 Carefully remove the fan module by pulling it toward you. The fan module is located on slide rails for easy removal and installation. (See Figure 4-2.)

Figure 4-2 Removing the Fan Module from the Fan Tray



Step 5 Place the fan module on a flat and stable surface (for example, a table top) until you are ready to reinsert it into the fan tray.

Step 6 Repeat Step 3 through Step 5 for each fan module.

Step 7 Position the fan tray chassis, which occupies 2 RUs of space, at the bottom of the rack.

Allow 1 RU of space under the fan tray. This space allows for the intake plenum.

Step 8 Use four mounting screws and a Phillips-head screwdriver to bolt the fan tray in the rack. See Figure 1-2 for the correct placement of the fan tray.

Step 9 Align a fan module with the fan tray slide rails inside the fan tray.

Step 10 Slide the fan module into the fan tray.

Step 11 Tighten the thumbscrew above the fan module.

Step 12 Repeat Step 9 through Step 11 for each fan module.

Step 13 Repeat Step 2 through Step 12 for each fan tray.

Note For information about fan tray maintenance and air filter replacement, see Chapter 6, "Upgrading and Maintaining the Cisco 6130 System."

Install the Cisco 6130 Chassis

Complete the following steps to install the Cisco 6130 chassis.

Warning **Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back.**

Note If the Cisco 6130 chassis ships with any line cards installed, verify that the chassis front cover is secure before lifting the chassis. The front cover prevents the line cards from falling out of the chassis.

Step 1 Position one Cisco 6130, which occupies 9 RUs of space, above the fan tray. The bottom of the Cisco 6130 should be flush with the top of the fan tray.

Step 2 Use four mounting screws and a Phillips-head screwdriver to bolt the Cisco 6130 chassis in the rack.

Step 3 Remove the chassis front cover.

Step 4 Repeat Step 1 through Step 3 for each Cisco 6130 chassis as necessary.

See Figure 1-2 for the correct placement of the Cisco 6130 chassis.

Install Blank Faceplates

Blank faceplates should occupy any empty slots in the Cisco 6130 chassis. The blank faceplate installation is similar to the line card installation.

Complete the following steps to install the blank faceplates in the Cisco 6130 chassis:

Step 1 Vertically align the blank faceplate edge with the top and bottom guides of the slot.

Step 2 Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the blank faceplate into the slot.

Step 3 Push on the faceplate to fully seat the blank faceplate.

Step 4 Press down on the locking lever to secure the faceplate.

Step 5 Repeat Step 1 through Step 4 for each Cisco 6130 chassis.

Ground the Cisco 6130 Chassis and Fan Tray

Warning **When installing the unit, the ground connection must always be made first and disconnected last.**

Note The grounding lug is not provided by Cisco. Use either a 5/8 inch or 3/4 inch lug to ground the Cisco 6130 chassis.

Complete the following steps to connect the grounding lug on the Cisco 6130 and the fan tray directly to the rack:

Step 1 Verify that power in the DC circuit is off.

Step 2 Remove all paint or oxidation from the rack at the point of the grounding connection.

Step 3 Measure enough wire to connect the Cisco 6130 to the rack. Use 12 American Wire Gauge [AWG] or thicker green or green with yellow stripes stranded copper wire for the Cisco 6130 chassis grounding. Use 14 AWG or thicker green or green with yellow stripes stranded copper wire for the fan tray grounding. (See Figure 4-3 for grounding wire location.)

Tip Make sure your wire is only as long as needed to make the connection.

Step 4 Use a wire stripper to remove the casing from both ends of the wires.

Step 5 Use a 3/16-inch flat-head screwdriver to loosen the screw on the rack.

Step 6 Hook one end of the copper wire around the screw on the rack.

Step 7 Tighten the rack screw over the copper wire.

Step 8 Use a flat-head screwdriver to loosen the compression screw that is provided on the grounding lug of the Cisco 6130 chassis.

The grounding lugs are located in the upper left corner of the chassis (viewed from the rear), as shown in Figure 4-3.

Step 9 Insert the other end of the copper wire under the compression screw.

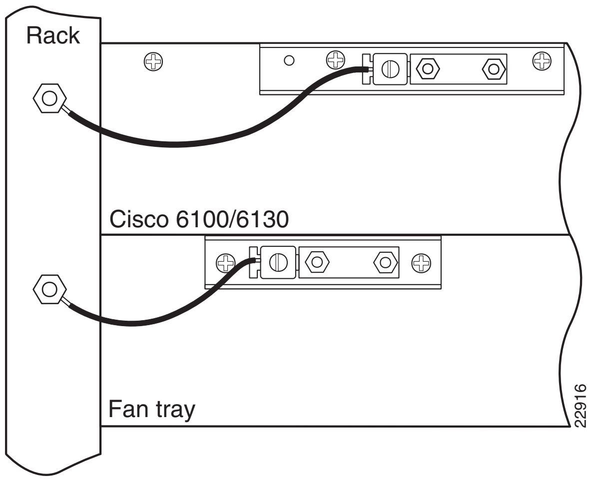
Step 10 Tighten the compression screw over the copper wire.

Step 11 Repeat Step 1 through Step 10 for each Cisco 6130 chassis and fan tray.

Note Do not ground the components in a rack by chaining them together.

The left side of Figure 4-3 shows how to ground the Cisco 6130 and fan tray to the rack.

Figure 4-3 Grounding the Cisco 6130 and Fan Tray



Connect the Cisco 6130 to the MDF

Use three-to-three cables to connect the Cisco 6130 (connectors J39 through J44) to the MDF. This connection is for *x*DSL data flow between the Cisco 6130 system and the MDF.

See the "Cisco 6130 Without a POTS Splitter Configuration Port Mapping Tables" section on page B-26 for cabling diagrams and cable part numbers. See "Cisco 6130 Without a POTS Splitter Configuration Port Mapping Tables" section on page B-26 for port mapping information.

Note If you are intermixing *x*TU-C line cards, see the "Intermixing Cables" section on page B-12 for cable part numbers and cabling diagrams.

For additional information about the Cisco 6130 backplane connectors, see the "Cisco 6130 Backplane" section on page 1-10.

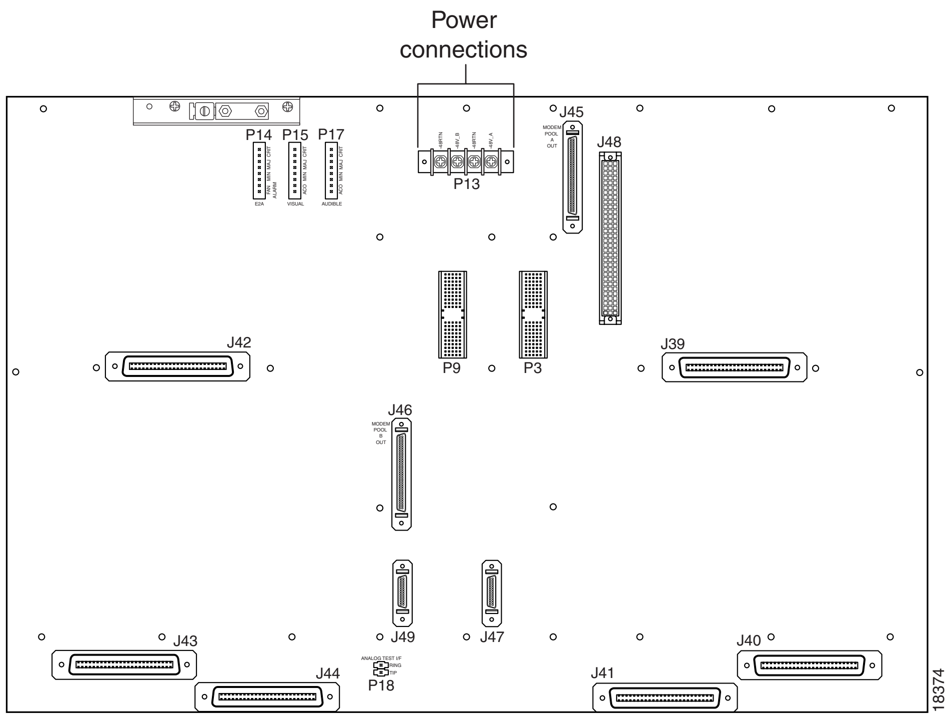
Attach Cisco 6130 Power Connections

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

External power is supplied to the system as –48V DC from the central office (CO) power source or rectifier to the fuse and alarm panel. Power is fed from the fuse and alarm panel to the Cisco 6130 chassis by a terminal block connector with four dual power connections (P13) located at the top of the chassis backplane. Figure 4-4 shows the location of the power connection (P13) on the chassis.

Note The fuse and alarm panel and wires are not provided by Cisco.

Figure 4-4 Cisco 6130 Power Connection Locations



You can wire the power connections from the Cisco 6130 to the fuse and alarm panel for either dual- or single-power feed:

- “Attach Cisco 6130 Power Connections for a Dual-Power Feed” section on page 4-9
- “Attach Cisco 6130 Power Connections for a Single-Power Feed” section on page 4-11

Note Connect each Cisco 6130 with NI-2 system component to a separate fuse. Do not power the components in the rack by chaining them together.

See Chapter 2, “Preparing for Installation,” for the calculation tables that are necessary to determine the minimum fuse rating for each component that is wired to the fuse and alarm panel. Refer to the power rating label on the back of the Cisco 6130 to determine the maximum fuse rating.

Attach Cisco 6130 Power Connections for a Dual-Power Feed

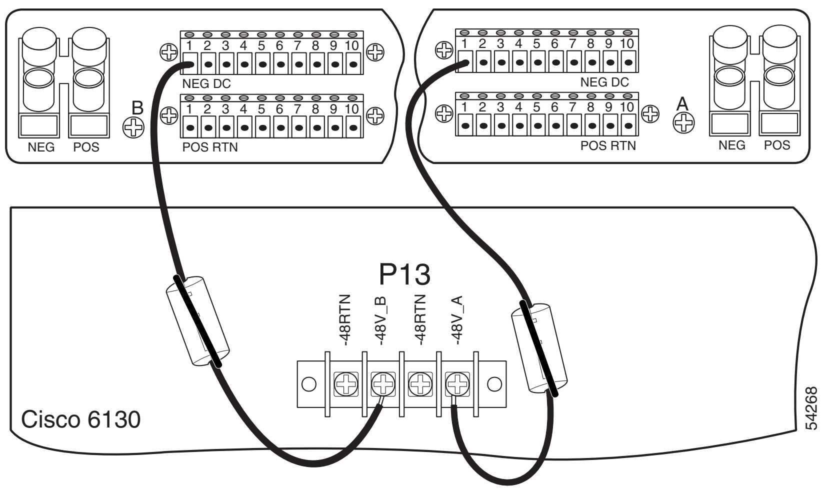
Complete the following steps to attach the Cisco 6130 power connections (P13) to the fuse and alarm panel for a dual-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the Cisco 6130 power connections.

Step 2 Measure enough wire (12 AWG black and red copper solid or stranded wire) to connect each of the Cisco 6130 power input connections to the fuse and alarm panel.

Figure 4-5 shows the Cisco 6130 power input connections wired to the fuse and alarm panel.

Figure 4-5 Power Input Connections for the Cisco 6130—Dual-Power Feed



Note Figure 4-5 shows the wires looped through a ferrite. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

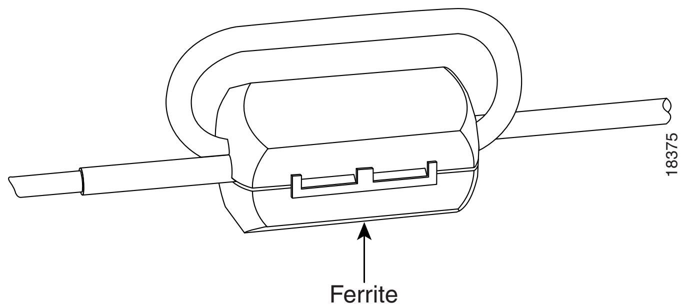
Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver to attach a wire to the –48V_A power input connection on the Cisco 6130 (P13).

Step 5 Loop the wire through the ferrite as shown in Figure 4-6. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Note Looping the wire secures the ferrite.

Figure 4-6 Wire Looped through Ferrite



Step 6 Attach the wire to a fuse and alarm panel NEG (negative) DC connector.

Step 7 Use a Phillips-head screwdriver to attach a wire to the –48V_B power input connection on the Cisco 6130 (P13).

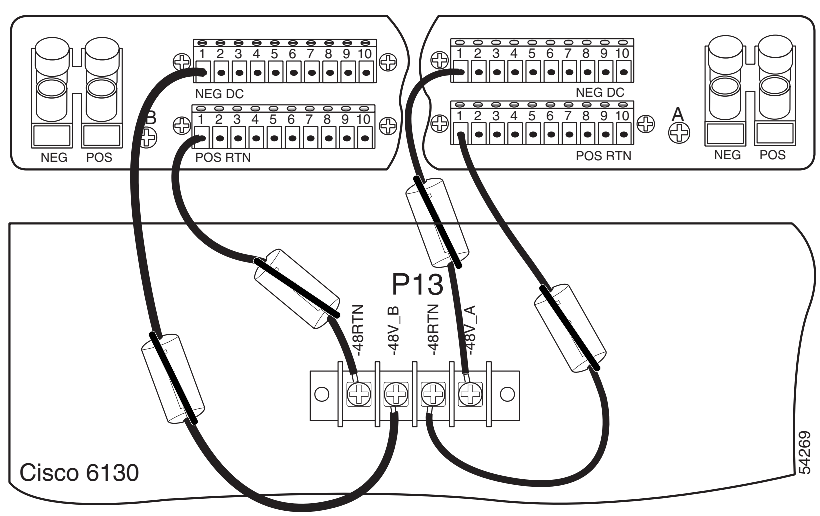
Step 8 Loop the wire through the ferrite as shown in Figure 4-6. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 9 Attach the wire to a fuse and alarm panel NEG DC connector.

Step 10 Measure enough wire (12 AWG black and red copper solid or stranded wire) to connect each of the Cisco 6130 power return connections to the fuse and alarm panel.

Figure 4-7 shows the Cisco 6130 power return connections wired to the fuse and alarm panel for a dual-power feed.

Figure 4-7 Power Return Connections for the Cisco 6130—Dual-Power Feed



Note Figure 4-7 shows the wires looped through a ferrite. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 11 Use a wire stripper to remove the casing from both ends of the wires.

Step 12 Use a Phillips-head screwdriver to attach a wire to a –48V power return connection (–48RTN) on the Cisco 6130 (P13).

Step 13 Loop the wire through the ferrite as shown in Figure 4-6. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 14 Attach the wire to a fuse and alarm panel POS (positive) RTN connector.

Step 15 Repeat Step 10 through Step 14 for the remaining –48V power return connection (–48RTN).

Step 16 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the Cisco 6130 power connections.

Step 17 Repeat Step 1 through Step 16 for each Cisco 6130 chassis that is to be connected to a dual-power feed.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

Attach Cisco 6130 Power Connections for a Single-Power Feed

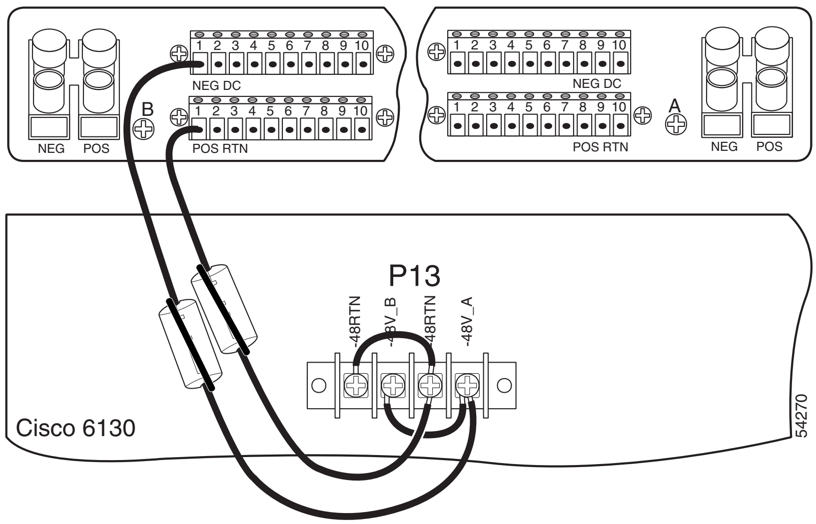
Complete the following steps to attach the Cisco 6130 power connections (P13) to the fuse and alarm panel for a single-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the Cisco 6130 power connections.

Step 2 Measure enough wire (12 AWG black and red copper solid or stranded wire) to connect each of the Cisco 6130 power connections to the fuse and alarm panel.

Figure 4-8 shows the Cisco 6130 power connections wired to the fuse and alarm panel for a single-power feed.

Figure 4-8 Power Connections for the Cisco 6130—Single-Power Feed



> **Note** Figure 4-8 shows the wires looped through a ferrite. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

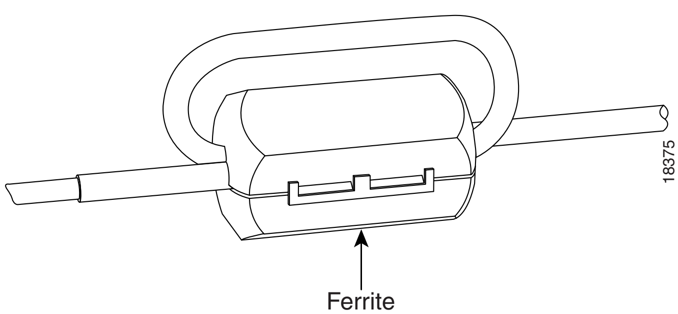
Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver, to attach a wire to the –48V_A power input connection on the Cisco 6130 (P13).

Step 5 Loop the wire through the ferrite as shown in Figure 4-9. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

> **Note** Looping the wire secures the ferrite.

Figure 4-9 Wire Looped through Ferrite



Step 6 Attach the wire to the fuse and alarm panel NEG DC connector.

Step 7 Use a Phillips-head screwdriver to attach a wire to a –48RTN power return connection on the Cisco 6130 (P13). See Figure 4-8 for correct placement.

Step 8 Loop the wire through the ferrite as shown in Figure 4-9. If you use thicker wire, it will not be necessary to loop the wire through the ferrite.

Step 9 Attach the wire to the fuse and alarm panel POS RTN connector. See Figure 4-8 for correct placement.

Step 10 Use a Phillips-head screwdriver to attach a wire to connect the –48V_A and –48V_B power input connections to each other.

Step 11 Use a Phillips-head screwdriver to attach a wire to connect the –48RTN power return connections to each other.

Step 12 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the Cisco 6130 power connections.

Step 13 Repeat Step 1 through Step 12 for each Cisco 6130 chassis that is to be connected to a single-power feed.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

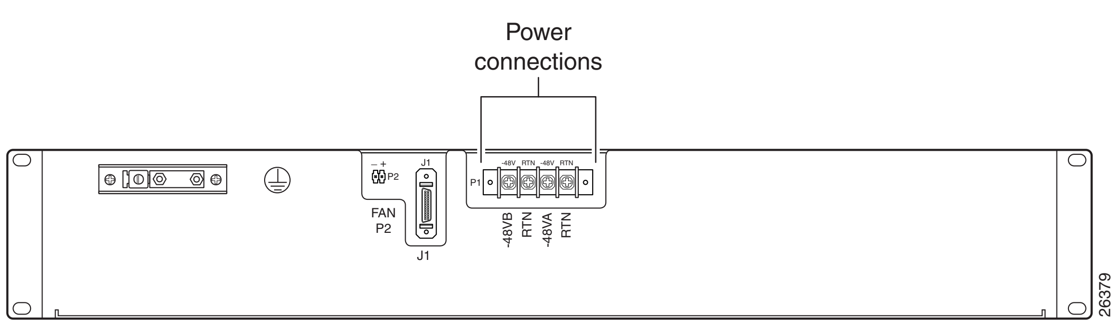
Attach Fan Tray Power Connections

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

External power is supplied to the system as –48V DC from the CO power source or rectifier to the fuse and alarm panel. Power is fed from the fuse and alarm panel to the fan tray by a terminal block connector with four dual power connections (P1) located at the top of the fan tray backplane. Figure 4-10 shows the location of the power connection (P1) on the fan tray.

Note The fuse and alarm panel and wires are not provided by Cisco.

Figure 4-10 Fan Tray Power Connection Location



Note Connect each Cisco 6130 with NI-2 system component to a separate fuse. Do not power the components in the rack by chaining them together.

See Chapter 2, "Preparing for Installation," for the calculation tables that are necessary to determine the minimum fuse rating for each component that is wired to the fuse and alarm panel. Refer to the label on the back of the fan tray to determine the maximum fuse rating.

You can wire the power connections from the fuse and alarm panel to the fan tray for either dual- or single-power feed:

- "Attach Fan Tray Power Connections for a Dual-Power Feed" section on page 4-14
- "Attach Fan Tray Power Connections for a Single-Power Feed" section on page 4-15

Attach Fan Tray Power Connections for a Dual-Power Feed

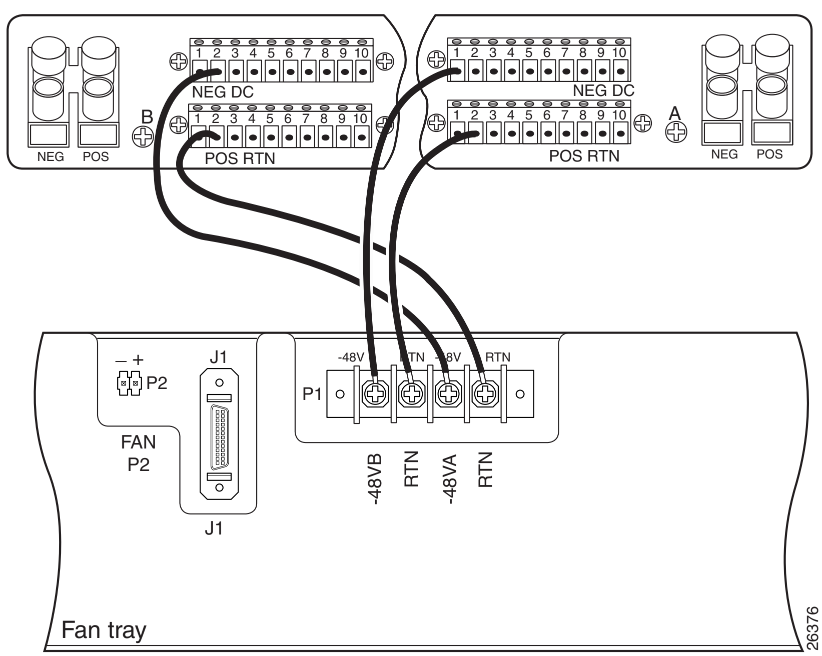
Complete the following steps to attach the fan tray power connections to the fuse and alarm panel for a dual-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the fan tray power connections.

Step 2 Measure enough wire (14 to 18 AWG copper solid or stranded wire) to connect each of the fan tray power connections to the fuse and alarm panel.

Figure 4-11 shows the power connections from the fan tray to the fuse and alarm panel for a dual-power feed.

Figure 4-11 Power Connections for the Fan Tray—Dual-Power Feed



Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver to attach a wire to the –48VA power input connection on the fan tray (P1).

Step 5 Attach the wire to the fuse and alarm panel NEG DC connector. See Figure 4-11 for correct placement.

Step 6 Use a Phillips-head screwdriver to attach a wire to the –48VB power input connection on the fan tray (P1).

Step 7 Attach the wire to the fuse and alarm panel NEG DC connector. See Figure 4-11 for correct placement.

Step 8 Use a Phillips-head screwdriver to attach a wire to an RTN power return connection on the fan tray (P1).

Step 9 Attach the wire to a fuse and alarm panel POS RTN connector.

Step 10 Repeat Step 8 and Step 9 for the remaining RTN power return connection.

Step 11 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the fan tray power connections.

Step 12 Repeat Step 1 through Step 11 for each fan tray.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

Attach Fan Tray Power Connections for a Single-Power Feed

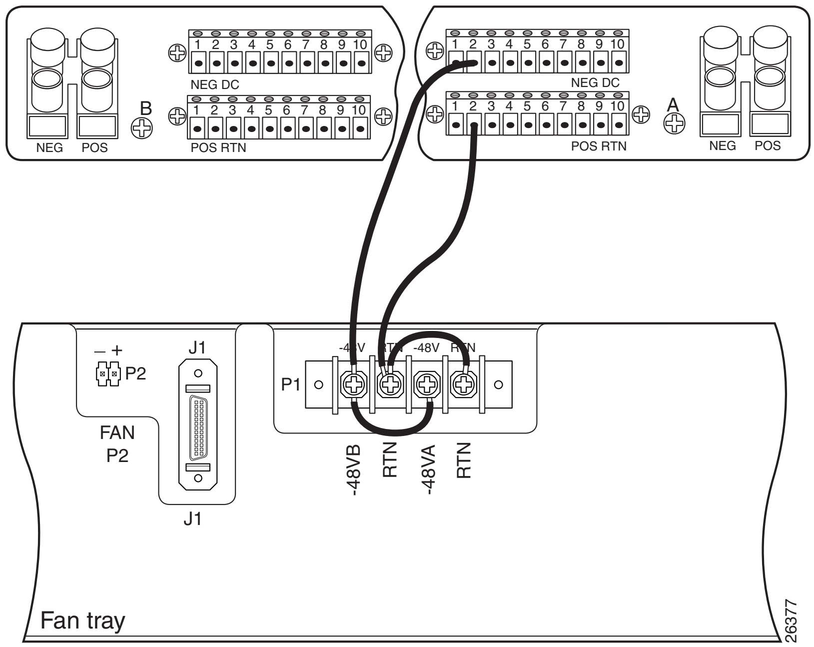
Complete the following steps to attach the fan tray power connections to the fuse and alarm panel for a single-power feed:

Step 1 Use a socket driver or a Phillips-head screwdriver to remove the clear cover over the fan tray power connections.

Step 2 Measure enough wire (14 to 18 AWG copper solid or stranded wire) to connect each of the fan tray power connections to the fuse and alarm panel.

Figure 4-12 shows the power connections from the fan tray to the fuse and alarm panel for a single-power feed.

Figure 4-12   Power Connections for the Fan Tray—Single-Power Feed



Step 3 Use a wire stripper to remove the casing from both ends of the wires.

Step 4 Use a Phillips-head screwdriver to attach a wire to the –48VA power input connection on the fan tray (P1).

Step 5 Attach the wire to the fuse and alarm panel NEG DC connector.

Step 6 Use a Phillips-head screwdriver to attach a wire to an RTN power return connection on the fan tray (P1). See Figure 4-12 for correct placement.

Step 7 Attach the wire to the fuse and alarm panel POS RTN connector. See Figure 4-12 for correct placement.

Step 8 Use a Phillips-head screwdriver to attach a wire to connect the –48VA and –48VB power input connections to each other.

Step 9 Use a Phillips-head screwdriver to attach a wire to connect the RTN power return connections to each other.

Step 10 Use a socket driver or a Phillips-head screwdriver to attach the clear cover over the fan tray power connections.

Step 11 Repeat Step 1 through Step 10 for each fan tray.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

Locate or Install the System I/O Card

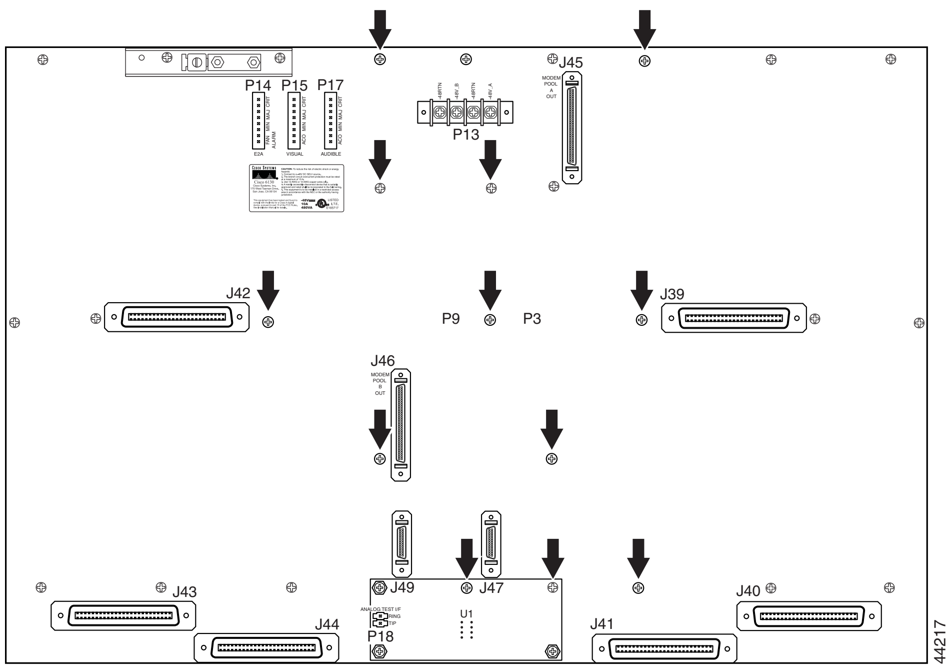
The Cisco 6130 chassis should ship with the system I/O card already installed on the chassis backplane. The system I/O card is attached to chassis connectors P3 and P9, two 2-mm hard metric (HM) module connectors.

Caution To prevent the system from powering up, do not install the fuses at this time. If the fuses are already installed in the fuse and alarm panel, remove them. You can replace the fuses after the system is installed and connected.

If the system I/O card is missing from the Cisco 6130, complete the following steps to install it on the chassis backplane:

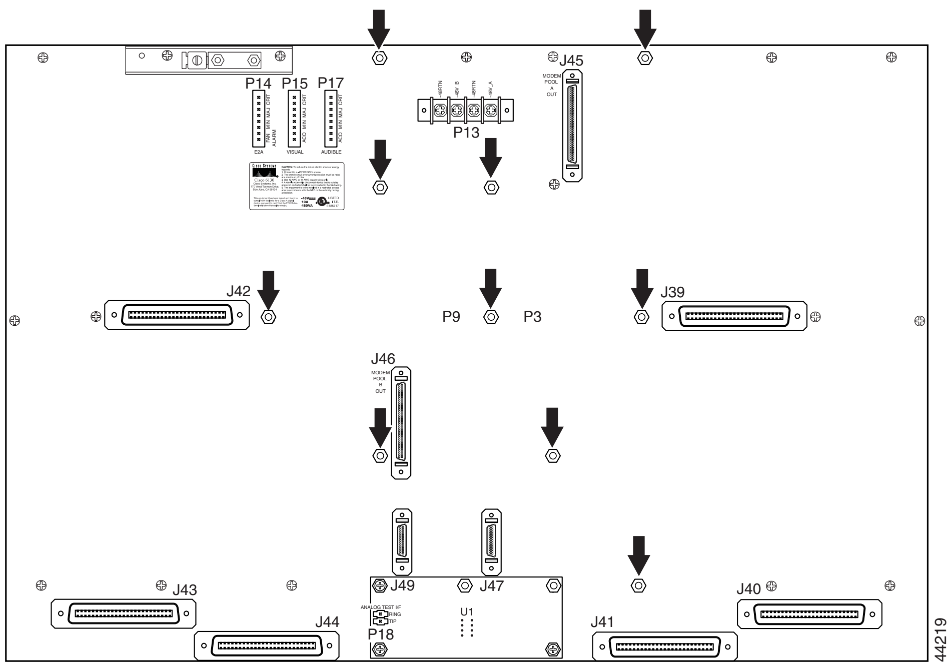
Step 1 Locate the twelve backplane screws shown in Figure 4-13. Use a Phillips-head screwdriver to remove the backplane screws. Keep these backplane screws for use when you install the system I/O card.

Figure 4-13 Backplane Screw Location for System I/O Card Installation



Step 2 Use a one-quarter inch socket driver or wrench to screw ten standoff screws into the locations formerly occupied by ten of the twelve screws that you removed in Step 1. Tighten the standoff screws using the one-quarter inch socket driver or wrench. See Figure 4-14 for standoff screw location.

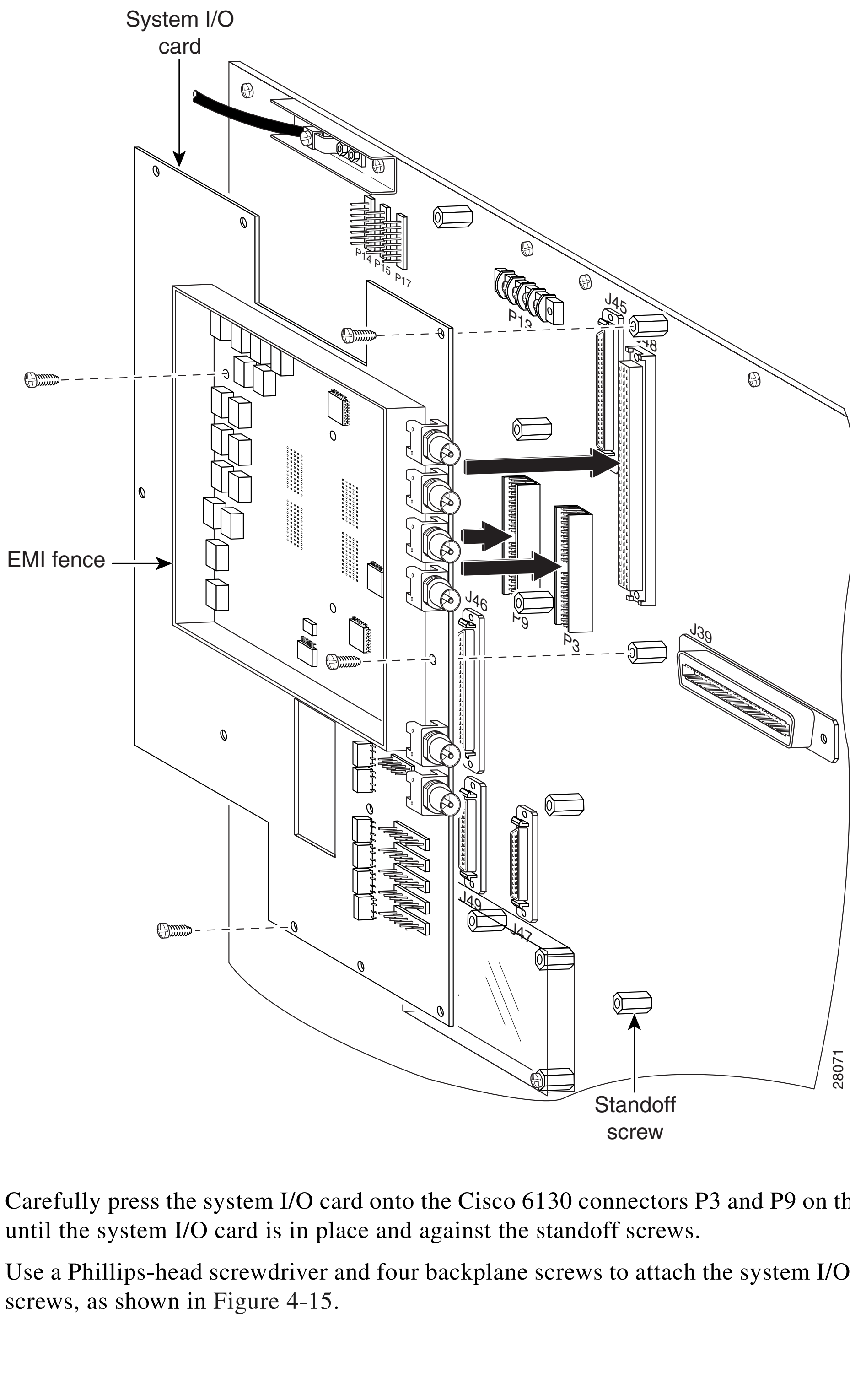
Figure 4-14 Standoff Screw Location for System I/O Card Installation



Caution Be careful when you remove the screws and reinsert the standoff screws into the screw holes on the backplane so that the backplane circuitry does not become damaged.

Step 3 Hold the system I/O card vertically and align the holes on the system I/O card over the twelve standoff screws, as shown in Figure 4-15.

Figure 4-15 System I/O Card Installation

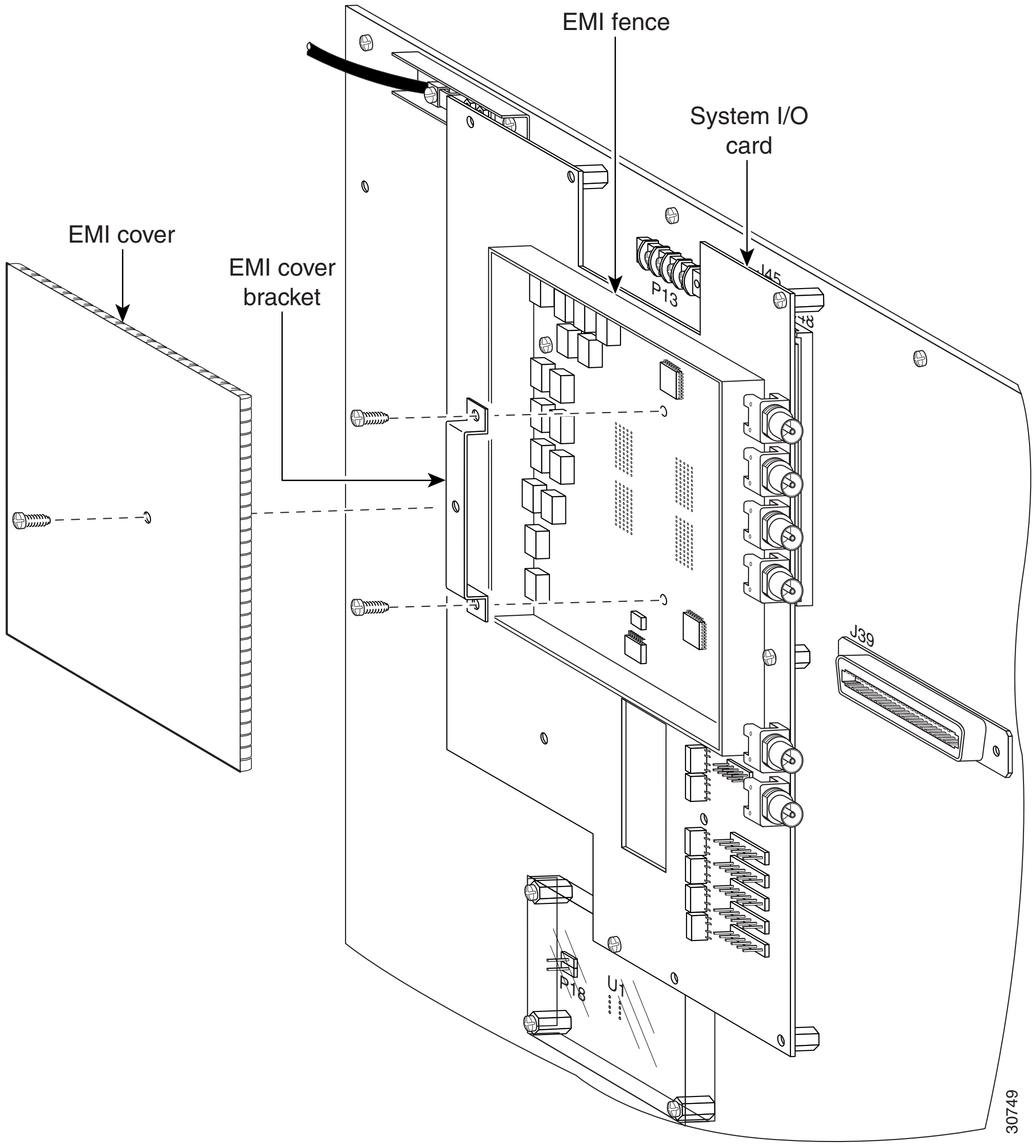


Step 4 Carefully press the system I/O card onto the Cisco 6130 connectors P3 and P9 on the chassis backplane until the system I/O card is in place and against the standoff screws.

Step 5 Use a Phillips-head screwdriver and four backplane screws to attach the system I/O card to the standoff screws, as shown in Figure 4-15.

Step 6 Use a Phillips-head screwdriver and two backplane screws to attach the EMI cover bracket, as shown in Figure 4-16.

Figure 4-16 EMI Cover Installation



Step 7 Attach the EMI cover on the EMI fence, as shown in Figure 4-16.

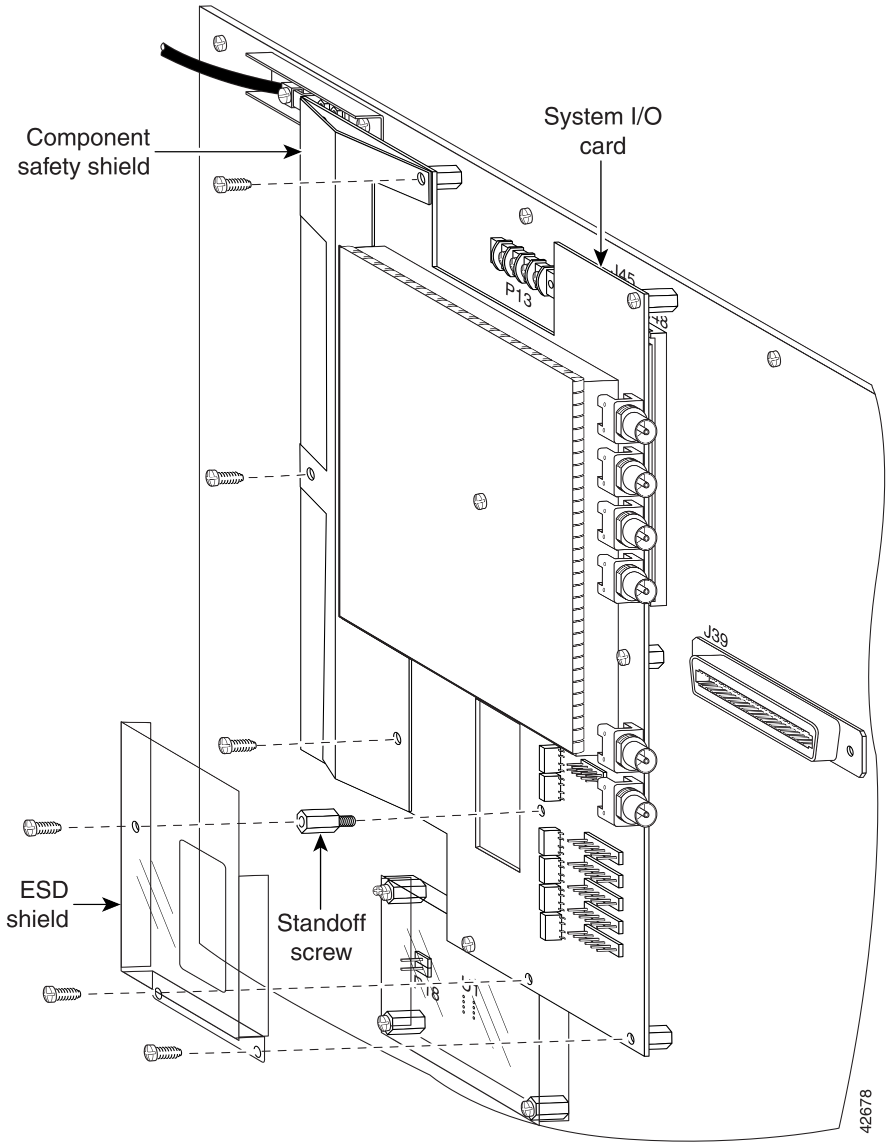
Caution Be careful not to bend the tabs on the EMI cover when you install the cover on the EMI fence.

Step 8 Verify that no EMI cover tabs are outside the EMI fence.

Step 9 Use a Phillips-head screwdriver and a screw to attach the EMI cover to the EMI cover bracket, as shown in Figure 4-16.

Step 10 Use a Phillips-head screwdriver and three backplane screws to attach the safety shield to the left side of the system I/O card, as shown in Figure 4-17. The backplane screws will screw into the existing standoff screws on the backplane.

Figure 4-17 Safety Shield and ESD Shield Installation



Step 11 Use a one-quarter inch socket driver or wrench to screw a standoff screw between relays K4 and K5, as shown in Figure 4-17. Tighten the standoff screws using the one-quarter inch socket driver or wrench.

Step 12 Position the ESD shield with the standoff screw that you installed in Step 10 so that the hole in the shield aligns with the standoff screw, as shown in Figure 4-17.

Step 13 Use a Phillips-head screwdriver and three backplane screws to attach the plastic ESD shield to the system I/O card (see Figure 4-17).

Step 14 Repeat Step 1 through Step 13 for each Cisco 6130 chassis, as necessary.

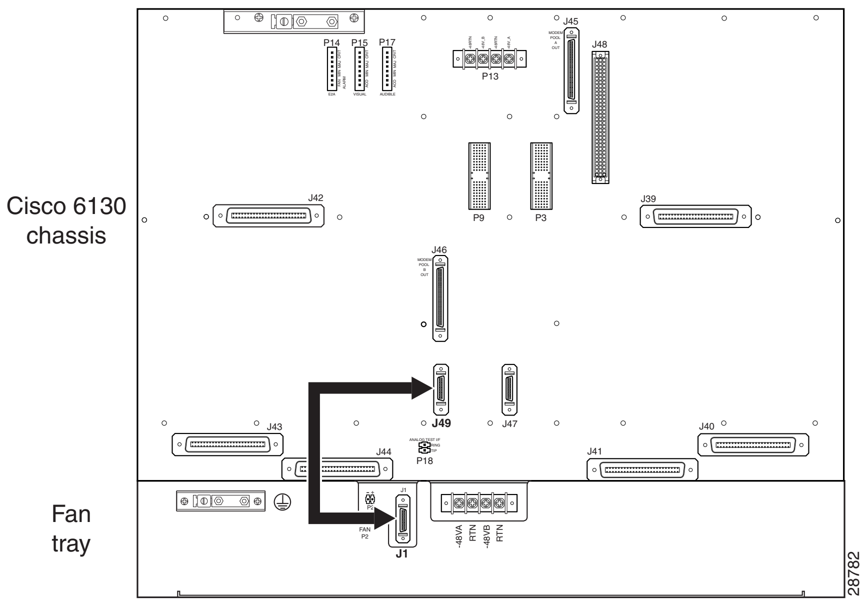
Connect the Fan Tray

Complete the following steps to connect the fan tray alarm cable between the Cisco 6130 and the fan tray:

Step 1 Attach the fan tray alarm cable (part number 72-1912-01) to connector J1 on the fan tray backplane, as shown in Figure 4-18.

Step 2 Attach the other end of the same fan tray alarm cable to connector J49 on the Cisco 6130 backplane, as shown in Figure 4-18.

Figure 4-18 Cabling the Fan Tray to the Cisco 6130 Backplane



Step 3 Repeat Step 1 and Step 2 to connect each Cisco 6130 chassis and fan tray.

Connect the Alarm Contacts

Five rows of wire-wrap pins are located on the right side of the system I/O card. These pins support the following alarms:

- Visual critical
- Visual major
- Visual minor
- Audible critical
- Audible major
- Audible minor
- Power module alarms

- Remote alarm cutoff
- Reserved (several pins that are reserved for future specification)

One NI-2 card in the Cisco 6130 chassis manages the alarms that are generated by the wire-wrap pins (P1 through P5). An alarm cutoff (ACO) switch, located on the NI-2 card faceplate, shuts off the audible alarms.

Figure 4-19 shows the location of the wire-wrap pins on the system I/O card.

Figure 4-19 System I/O Card Alarm Contacts

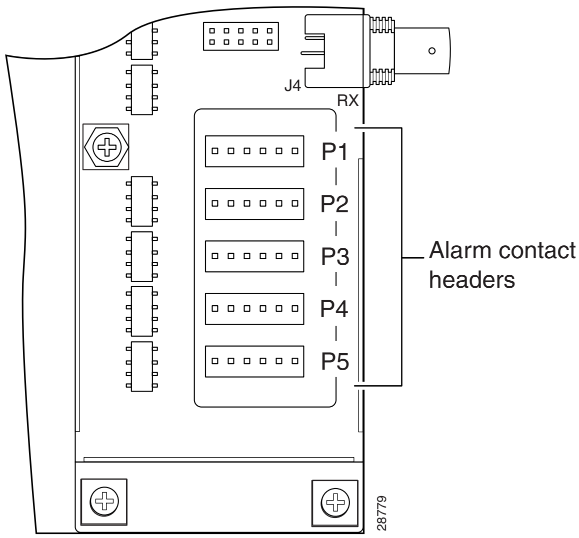


Table 4-2 maps the wire-wrap pins to the alarms that are supported by the NI-2 card through the Cisco 6130 backplane.

Table 4-2 System I/O Card Wire-Wrap Pin Mapping

PIN No.	Header P1	Header P2	Header P3	Header P4[1]	Header P5
Pin 1 (left)	AUD[2]_CRIT[3]_CO[4]	AUD_MIN[5]_CO	VIS[6]_MAJ_CO	DOOR ALARM	RX_BITS[7]_TIPA
Pin 2	AUD_CRIT_NO[8]	AUD_MIN_NO	VIS_MAJ[9]_NO	Reserved	RX_BITS_RINGA
Pin 3	AUD_CRIT_NC[10]	AUD_MIN_NC	VIS_MAJ_NC	Reserved	RX_BITS_GND/GND
Pin 4	AUD_MAJ_CO	VIS_CRIT_CO	VIS_MIN_CO	Reserved	RX_BITS_TIPB
Pin 5	AUD_MAJ_NO	VIS_CRIT_NO	VIS_MIN_NO	ACO[11]_NO	RX_BITS_RINGB
Pin 6 (right)	AUD_MAJ_NC	VIS_CRIT_NC	VIS_MIN_NC	ACO GND[12]	RX_BITS_GND/GND

1. Header P4 is used for the fan tray alarm.
2. AUD = audible.
3. CRIT = critical.
4. CO = common.
5. MIN = minimum.
6. VIS = visual.
7. RX_BITS = receive building-integrated timing source.
8. NO = normally open.
9. MAJ = major.
10. NC = normally closed.
11. The ACO switch is located on the faceplate of the NI-2 card. This switch turns off the audible alarms that are generated by the system software.
12. GND = ground.

Pull Away All Line Cards

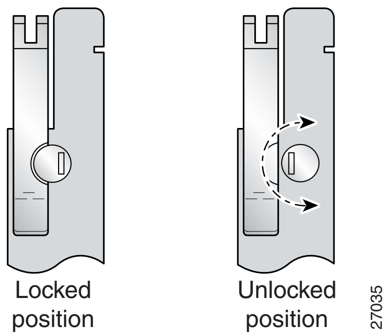
If the Cisco 6130 ships with any line cards installed, complete the following steps to pull away the line cards from the chassis backplane connection:

Caution If the power connections are improperly connected and power is applied while the line cards are installed, the line cards and chassis could be damaged.

Step 1 Unlock any *x*TU-C line cards, as necessary.

Use a flat-head screwdriver to move the locking tab from the locked to the unlocked position. Be sure to turn the locking tab so that it does not overlap the locking lever, as shown in Figure 4-20.

Figure 4-20 Unlocking the Line Card



Step 2 Lift up on the locking lever of each line card. This action disconnects the line card from the backplane.

Step 3 Carefully slide the line card toward you and away from the backplane connection.

Step 4 Repeat Step 1 through Step 3 for each *x*TU-C line card. Repeat Step 2 and Step 3 for the blank faceplates in the Cisco 6130 chassis.

Note The NI-2 card should not be installed in the chassis at this time.

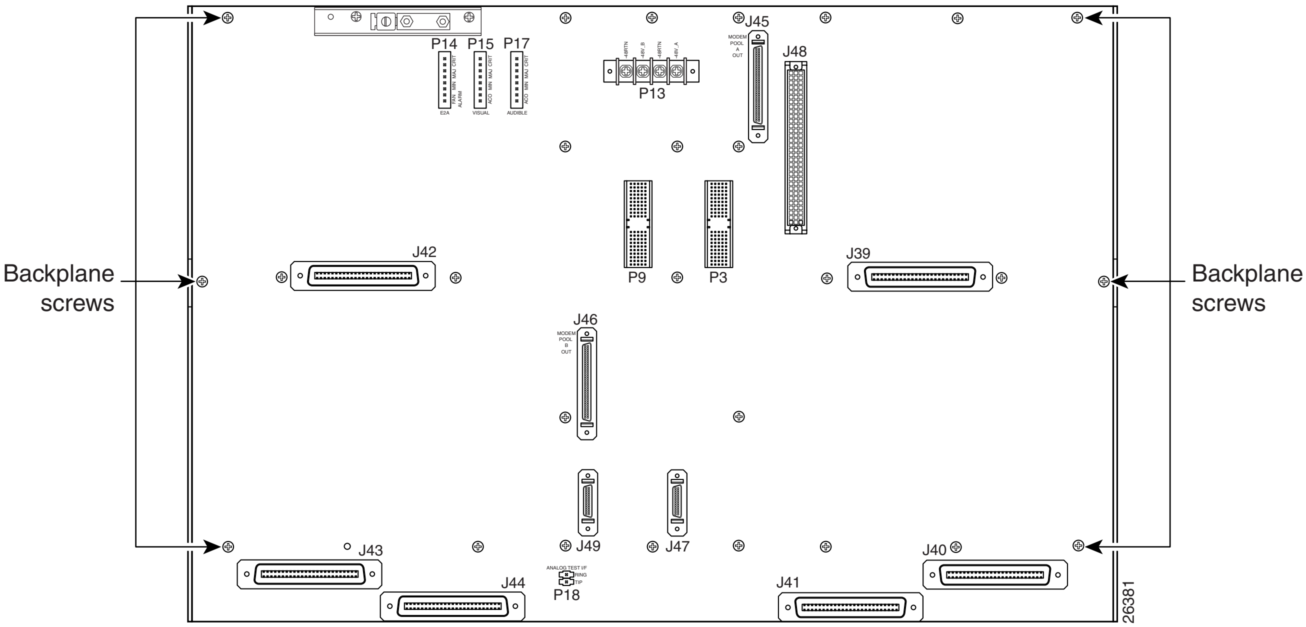
Install the Rear Cover

Complete the following steps to install the optional rear cover:

Step 1 Locate and remove six of the backplane screws that are currently used to hold the Cisco 6130 backplane to the chassis.

Three screws are located on the right of the chassis, and three are located on the left. See Figure 4-21 for the location of the screws. Keep the backplane screws. They will be used when you install the cover-mounting brackets.

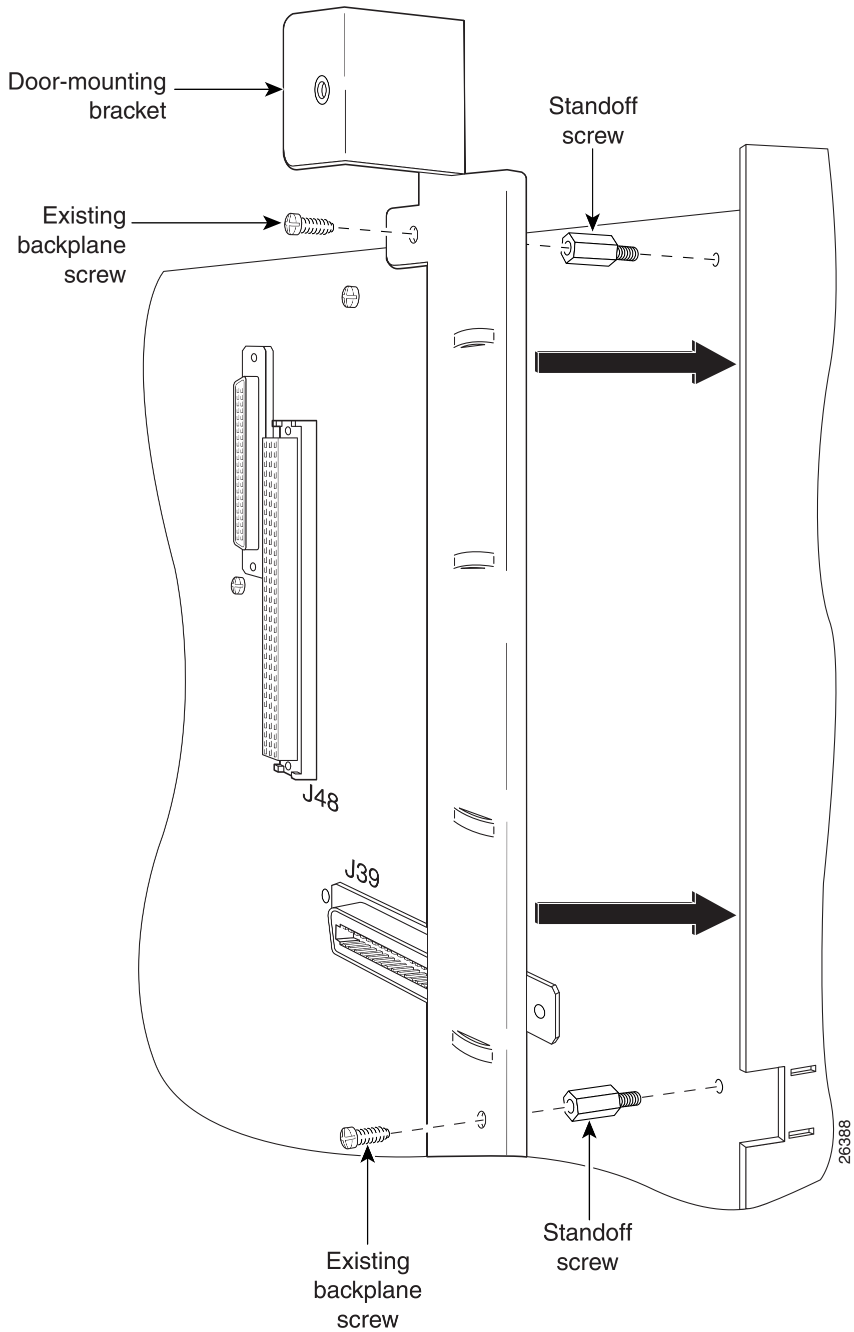
Figure 4-21 Backplane Screws for Rear Cover Installation



Step 2 Install the six standoff screws in the locations formerly occupied by the six screws that you removed in Step 1. Use a one-quarter inch socket driver or wrench to tighten the standoff screws.

Step 3 Face the rear of the chassis and install the cover-mounting bracket on the right side of the chassis. Place the bracket over the standoff screws. Use three of the screws that you removed in Step 1 to fasten the cover-mounting bracket to the chassis. (See Figure 4-22.)

Figure 4-22 Installing the Cover-Mounting Bracket



Step 4 Install the cover-mounting bracket (with the rear cover attached) on the left side of the chassis. Place the bracket (with rear cover) over the standoff screws. Use three of the screws that you removed in Step 1 to fasten the cover-mounting bracket (with rear cover) to the chassis.

Step 5 Use the tie wraps provided in the accessory kit to attach cables to the cover-mounting bracket loops, as necessary.

Step 6 Repeat Step 1 through Step 5 for each Cisco 6130 chassis rear cover.

Apply Power

Complete the following steps to apply power to the Cisco 6130 with NI-2 system:

Step 1 Verify that there are no line cards installed in the Cisco 6130 chassis or any subtended node chassis.

Step 2 Apply power to the system with one of the following methods:

- Install the fuses in the fuse and alarm panel.
- Reinsert the fuses in the fuse and alarm panel, if you removed them in the "Attach Cisco 6130 Power Connections" section on page 4-7.
- Turn on the breakers in the fuse and alarm panel.

Caution If the power connections are improperly connected and power is applied while the cards are installed, the cards and chassis could be damaged.

Step 3 Verify that the fuse calculation for the Cisco 6130 with NI-2 system is correct. See Table 2-4 for a fuse calculation table.

Step 4 Verify that the power connections from the Cisco 6130 backplane to the fuse and alarm panel are wired as shown in Figure 4-7 or Figure 4-8.

Step 5 Verify that the power connections from the fan tray to the fuse and alarm panel are wired as shown in Figure 4-11 or Figure 4-12.

Step 6 Check the polarity of the –48V DC connections to each chassis by attaching a voltmeter with the minus lead on –48RTN and the plus lead on –48V_A or –48V_B. Ensure that the meter reads between –36V DC and –60V DC. If your voltmeter shows a positive voltage, the power inputs might be reversed. If the voltmeter shows a negative voltage that is out of the –36V DC to –60V DC range, check the power supply for failure or check for a blown fuse in the fuse and alarm panel.

Step 7 Repeat Step 1 through Step 6 for each Cisco 6130 chassis.

Verify Fan Tray Operation

Verify that the fan modules are operational by locating the LED on the front of each fan module. If the LED is

- Green—The fan module is operational.
- Not green—The fan module is not operational and the fan tray is in alarm mode. See Chapter 5, "Troubleshooting" for corrective action.

The fan modules should be operational before you install the line cards.

Caution It is important that the Cisco 6130 chassis cooling fans run continuously.

Install the NI-2 Card(s)

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Caution Installing the cards in the chassis with the power leads reversed can damage the cards.

Warning **The power supply circuitry for the Cisco DSLAM equipment can constitute an energy hazard. Before you install or replace the equipment, remove all jewelry (including rings, necklaces, and watches). Metal objects can come into contact with exposed power supply wiring or circuitry inside the DSLAM equipment. This could cause the metal objects to heat up and cause serious burns or weld the metal object to the equipment.**

Warning **Do not reach into a vacant slot or chassis while you install or remove a card or a fan. Exposed circuitry could constitute an energy hazard.**

Note All cards must be fully seated in the chassis. A push on the faceplate of each card is required for the card to be fully seated.

Complete the following steps to install a NI-2 card in the Cisco 6130. It is important that you accomplish each step completely before moving on to the next step.

Note *Primary* and *secondary* are terms related to redundancy. The primary NI-2 card is installed in slot 10 of the Cisco 6130 chassis. If NI-2 card redundancy is desired, a secondary NI-2 card must also be installed in slot 11.

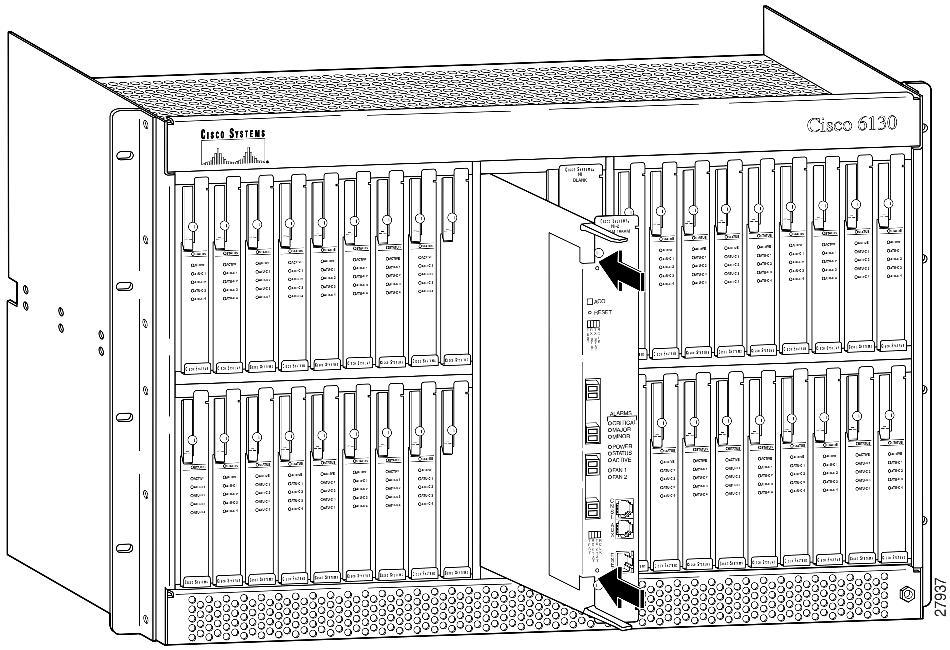
Step 1 Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.

Step 2 Verify that slot 10 or slot 11 of the Cisco 6130 chassis has no bent pins.

Step 3 Vertically align the card edge with the top and bottom guides of the chassis slot.

Figure 4-23 shows the NI-2 card installation in slot 10 of the Cisco 6130 chassis, but the installation procedure for installing an NI-2 card in slot 11 is the same.

Figure 4-23 NI-2 Card Installation



Step 4 Lift up on the locking levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

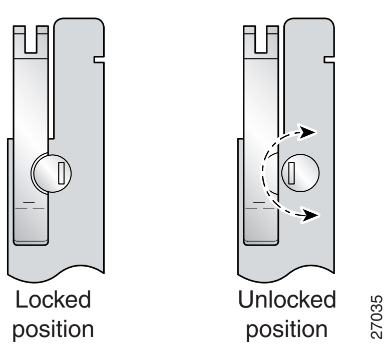
Step 5 Push on the faceplate of each card to fully seat it.

Step 6 Press down on the locking levers to secure the card and connect it to the backplane.

Step 7 Lock both NI-2 card locking tabs.

Use a flat-head screwdriver to turn the locking tabs so that they overlap the locking levers to prevent inadvertent dislodging, as shown in Figure 4-24.

Figure 4-24 Locking the NI-2 Card



Step 8 Perform a software update if the STATUS LED on the NI-2 card is flashing. Refer to the *Configuration Guide for Cisco DSLAMs with NI-2* for software upgrade procedures.

Step 9 Repeat Step 1 through Step 8 for each NI-2 card.

Reseat the Line Cards

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

If you pulled the line cards away from the Cisco 6130 chassis backplane in the "Pull Away All Line Cards" section on page 4-24, reseat the line cards to verify the power connection. If the Cisco 6130 chassis was shipped without line cards installed, proceed to the "Install the Line Cards in the Cisco 6130" section on page 4-31.

Complete the following steps to reseat all of the line cards. It is important that you accomplish each step completely before moving on to the next step.

Note All line cards must be fully seated in the chassis. A push on the faceplate of each line card is required for the line card to be fully seated.

Step 1 Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the line card into the slot.

Step 2 Push on the faceplate of each line card to fully seat the line card.

Step 3 Press down on the locking lever to secure the line card and connect it to the backplane.

Step 4 Lock any *x*TU-C line cards.

Use a flat-head screwdriver to turn the locking tab so that it overlaps the *x*TU-C line card locking lever to prevent inadvertent dislodging. Figure 4-20 shows how to position the locking tab.

Step 5 Verify that the STATUS LEDs on all line cards are solid green (where applicable).

This self-test procedure takes several minutes. If the STATUS LEDs are not green after the self-test, see Chapter 5, "Troubleshooting," for troubleshooting procedures.

Step 6 Repeat Step 1 through Step 5 for each *x*TU-C line card.

Install the Line Cards in the Cisco 6130

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

If the Cisco 6130 chassis ships without any line cards installed, install the *x*TU-C line cards (quad-port DMT ATU-C line card [4xDMT], quad-port flexi ATU-C line card [4xflexi], or quad-port STU-C line card [4xSDSL]) to verify the power connection.

Warning **The power supply circuitry for the Cisco DSLAM equipment can constitute an energy hazard. Before you install or replace the equipment, remove all jewelry (including rings, necklaces, and watches). Metal objects can come into contact with exposed power supply wiring or circuitry inside the DSLAM equipment. This could cause the metal objects to heat up and cause serious burns or weld the metal object to the equipment.**

Warning **Do not reach into a vacant slot or chassis while you install or remove a line card or a fan module. Exposed circuitry could constitute an energy hazard.**

Caution Installing the cards in the chassis with the power leads reversed can damage the cards.

Note All line cards must be fully seated in the chassis. A push on the faceplate of each line card is required for the line card to be fully seated.

To install all of the cards, complete the following steps. It is important that you accomplish each step completely before moving on to the next step.

Step 1 Install the *x*TU-C line cards in the Cisco 6130.

Note The *x*TU-C line cards are installed in slots 1 through 8, 13 through 28, and 31 through 38.

a. Hold the *x*TU-C line card vertically, with the line card faceplate toward you and the connectors facing the chassis slot.

b. Align the line card edge with the top and bottom guides of the chassis slot.

c. Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the line card into the slot.

d. Push on the faceplate of each line card to fully seat the line card.

e. Press down on the locking lever to secure the line card and connect it to the backplane.

f. Lock the line cards.

Use a flat-head screwdriver to turn the locking tab so that it overlaps the line card to prevent inadvertent dislodging. Figure 4-20 shows how to position the locking tab.

g. Install the remaining *x*TU-C line cards using the same procedure.

Step 2 Verify that the STATUS LEDs on all line cards are solid green (where applicable).

This self-test procedure takes several minutes. If the STATUS LEDs are not green after the self-test, see Chapter 5, "Troubleshooting" for troubleshooting procedures.

Note Blank faceplates should occupy any empty slots in the Cisco 6130. The blank faceplate installation is similar to the line card installation.

Connect the NI-2 Card to the Network

This section provides installation procedures for the DS3 and OC-3c network connections:

- "DS3 Network Connection Installation" section on page 4-33
- "OC-3c Network Connection Installation" section on page 4-35

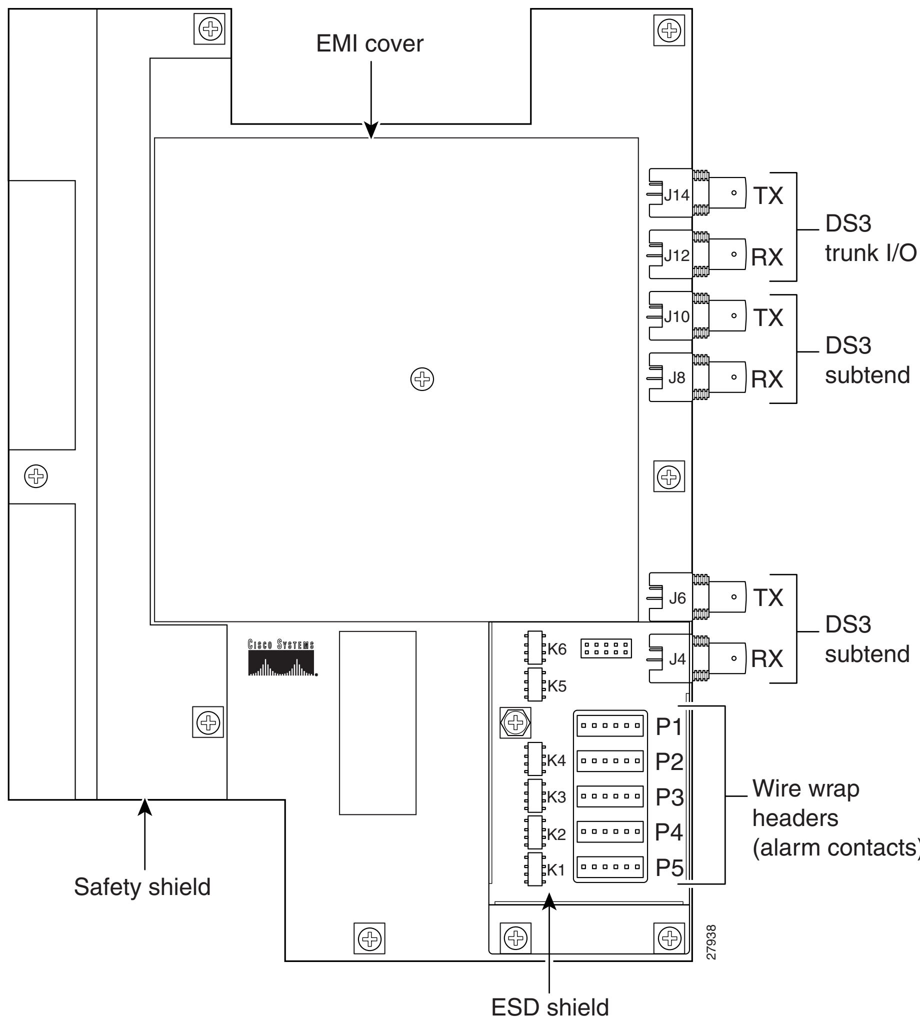
DS3 Network Connection Installation

Complete the following steps to connect the DS3/2DS3 NI-2 card to the network:

Step 1 Verify that the DS3/2DS3 NI-2 card is installed in slot 10 of the Cisco 6130 chassis to ensure that the DS3/2DS3 NI-2 card connections are active.

The DS3/2DS3 NI-2 card connections are on the system I/O card, which is located on the backplane of the Cisco 6130 chassis. These connections attach to the ATM switch. Two 75-ohm DS3 Bayonet-Neill-Concelman (BNC) connectors are provided for DS3 transmit (J14) and receive (J12). See Figure 4-25 for the location of the DS3 BNC connectors.

Figure 4-25 DS3 Network Interface Connection



Step 2 Attach one end of a coaxial cable (type 734A, type 735A, or equivalent) to the transmit DS3 BNC connector (J14) on the system I/O card on the chassis backplane.

Step 3 Attach the end of the cable that you used in Step 2, which originates at the transmit DS3 BNC connector, to the ATM switch.

Step 4 Attach one end of a coaxial cable (type 734A, type 735A, or equivalent) to the receive DS3 BNC connector (J12) on the system I/O card on the Cisco 6130 backplane.

Step 5 Attach the end of the cable that you used in Step 4, which originates at the receive DS3 BNC connector, to the ATM switch.

Step 6 If you are installing a secondary DS3/2DS3 NI-2 card (for cold redundancy) in slot 11, repeat Step 2 through Step 5 to connect the secondary NI-2 card to the network.

Note A DS3/2DS3 NI-2 card does not support APS redundancy.

OC-3c Network Connection Installation

Complete the following steps to connect the OC-3c/OC-3c NI-2 card to the network:

Warning **Do not stare into the beam or view it directly with optical instruments.**

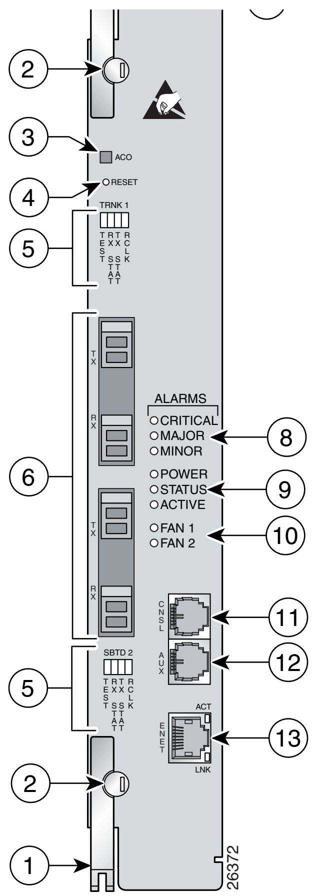
Note If the active NI-2 card fails, the standby NI-2 card is able to use the OC-3c connections to and from the failed card (not applicable to DS3/2DS3 interfaces). Cisco recommends, however, that you also cable a network connection to the ATM switch from the standby NI-2 card in slot 11 in order to take advantage of SONET APS redundancy.

Step 1 Verify that the OC-3c/OC-3c NI-2 card is in slot 10 of the Cisco 6130 chassis.

Step 2 Pull the OC-3c/OC-3c NI-2 card transmit and receive fiber-optic cables from the ATM switch through the 1 RU of space under the fan tray.

Step 3 Attach the receive cable from the ATM switch to the transmit connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card (trunk 1 interface connector TX). See Figure 4-26 for the OC-3c network interface connection location.

Figure 4-26 OC-3c Network Interface Connection



The transmit connector is the one closest to the top of the faceplate. The receive connector is closest to the bottom of the faceplate. The connector IDs are silkscreened inside the inset.

Step 4 Attach the transmit cable from the ATM switch to the receive connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card (trunk 1 interface connector RX). See Figure 4-26 for the OC-3c network interface connection location.

Step 5 Allow enough slack in the cable so that the fan tray can be opened and the fan modules can be maintained.

Step 6 Coil the fiber loosely within the 1 RU of space to take out slack.

Step 7 If you are installing a secondary OC-3c/OC-3c NI-2 card (for redundancy) in slot 11, repeat Step 2 through Step 6 to connect the secondary card to the network.

Install a Subtended Network Configuration

If you are installing a subtended network with subtended node chassis to a subtending host chassis, complete the steps in the following sections. The following sections provide installation procedures for the DS3 and OC-3c subtended network configuration:

- "Cable the DS3 Subtending Network Configuration" section on page 4-37
- "Cable the OC-3c Subtending Network Configuration" section on page 4-39

If you are not installing a subtended network, go to the "Connect the Ethernet to the Management Network" section on page 4-41.

Note For information on a subtended network configuration, see the "Subtended Network Configuration" section on page 1-5.

Cable the DS3 Subtending Network Configuration

Coaxial connections for DS3 cabling are located on the system I/O card. The transmit and receive DS3 BNC connectors on the subtending host chassis system I/O card are connected to the transmit and receive DS3 BNC connectors on the subtended node chassis system I/O card.

Note The system I/O card BNC cables are not provided by Cisco.

Complete the following steps to cable the system I/O card for subtending:

Step 1 On the subtending host chassis backplane, attach one end of a BNC cable to the transmit DS3 BNC connector (J10) on the system I/O card.

Step 2 On the first subtended node chassis backplane, attach the end of the BNC cable used in Step 1 to the receive DS3 BNC connector (J12) on the system I/O card.

Step 3 On the subtending host chassis backplane, attach one end of a BNC cable to the receive DS3 BNC connector (J8) on the system I/O card.

Step 4 On the first subtended node chassis backplane, attach the end of the BNC cable used in Step 3 to the transmit DS3 BNC connector (J14) on the system I/O card.

Step 5 On the subtending host chassis backplane, attach one end of a BNC cable to the transmit DS3 BNC connector (J6) on the system I/O card.

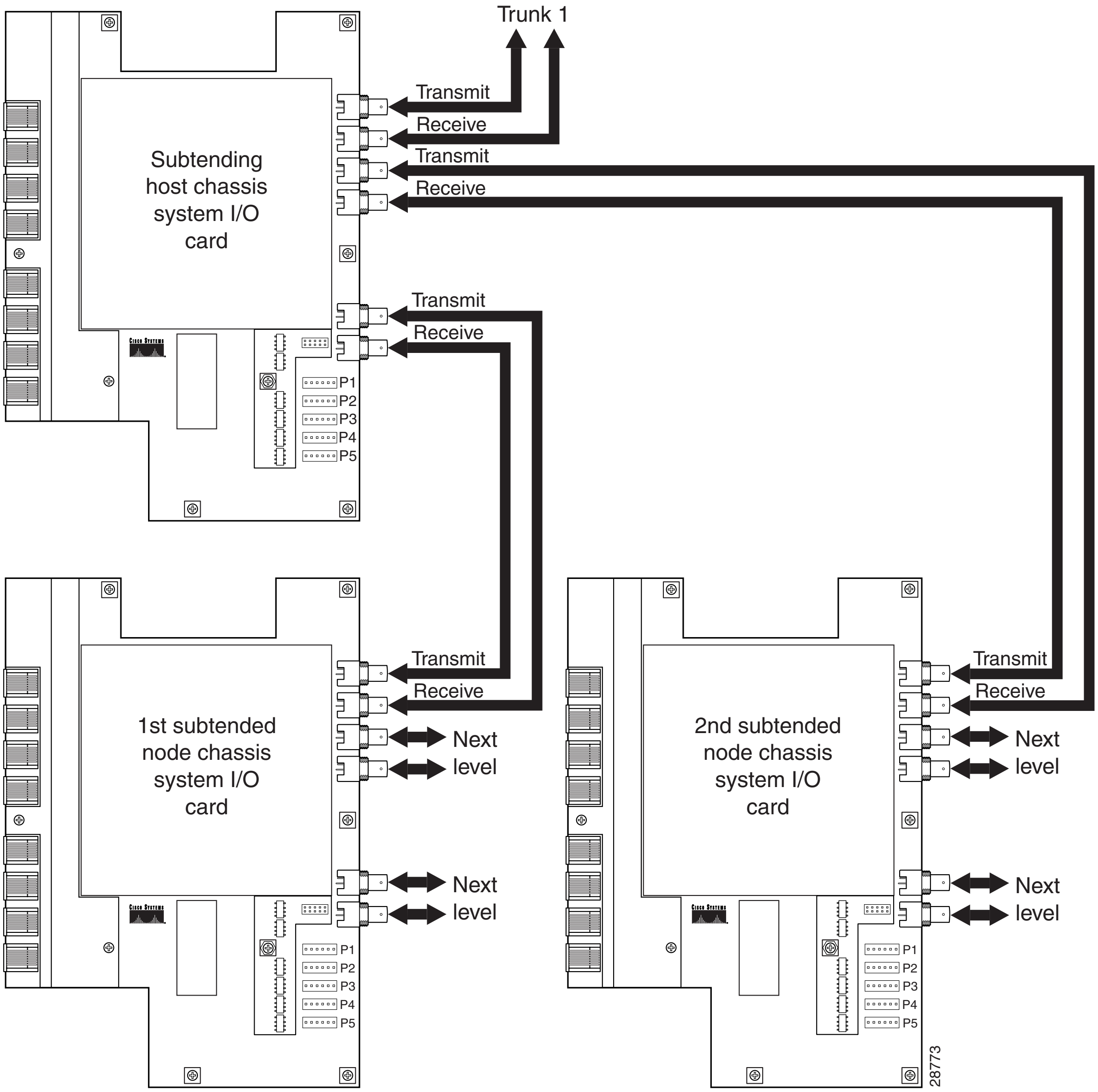
Step 6 On the second subtended node chassis backplane, attach the end of the BNC cable used in Step 5 to the receive DS3 BNC connector (J12) on the system I/O card.

Step 7 On the subtending host chassis backplane, attach one end of a BNC cable to the receive DS3 BNC connector (J4) on the system I/O card.

Step 8 On the second subtended node chassis backplane, attach the end of the BNC cable used in Step 7 to the transmit DS3 BNC connector (J14) on the system I/O card.

Figure 4-27 shows the cabling for a DS3 subtending network configuration.

Figure 4-27 Cabling for DS3 Subtending Configuration



Cable the OC-3c Subtending Network Configuration

For OC-3c subtending, the connections are made from the front of the subtending host chassis and the subtended node chassis. To cable the Cisco 6130 with NI-2 system for OC-3c subtending, complete the following steps:

Step 1 Locate the trunk 1 interface connectors (TX and RX) and the subtend 2 interface connectors (TX and RX) on the front of each OC-3c/OC-3c NI-2 card. See Figure 4-26 for connector location.

Step 2 Attach an OC-3c fiber-optic cable to the transmit (TX) subtend 2 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtending host chassis.

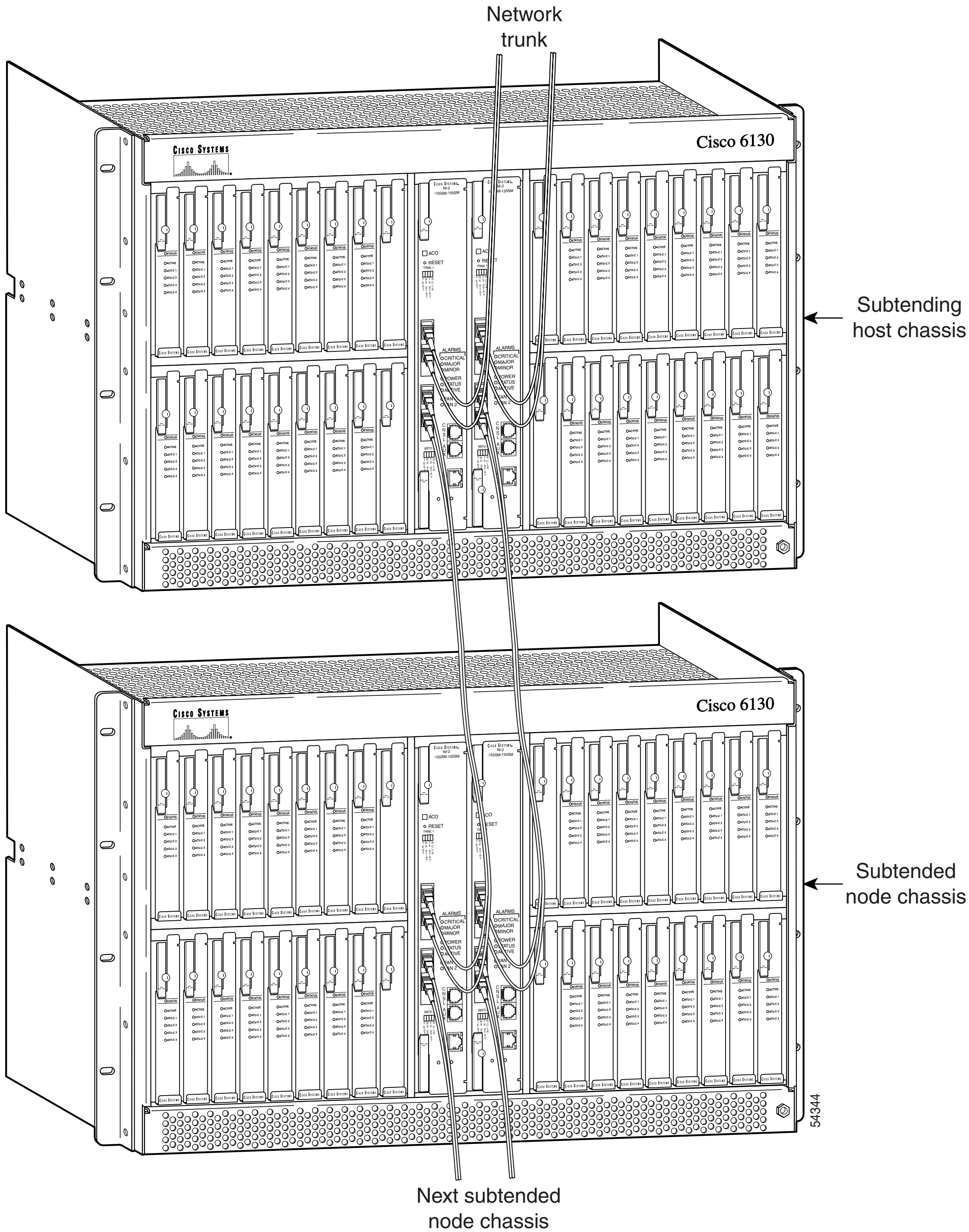
Step 3 Attach the other end of the cable that you used in Step 2 to the receive (RX) trunk 1 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtended node chassis.

Step 4 Attach an OC-3c fiber-optic cable to the receive (RX) subtend 2 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtending host chassis.

Step 5 Attach the other end of the cable that you used in Step 4 to the transmit (TX) trunk 1 interface connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card in the subtended node chassis.

Figure 4-28 shows the network and subtending connections between two Cisco 6130 with NI-2 system chassis. The connections from slot 10 are for the primary NI-2 card.

Figure 4-28 Cabling Diagram for OC-3c Subtending



Step 6 Repeat Step 1 through Step 5 for the secondary NI-2 card.

Figure 4-28 shows the network and subtending connections between two Cisco 6130 with NI-2 system chassis. The connections from slot 11 are for the secondary NI-2 card.

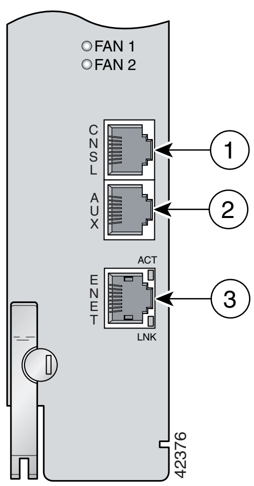
Connect the Ethernet to the Management Network

Connect the 10BaseT RJ-45 receptacle connector on the NI-2 card (ENET) to the management network (for example, LAN). Figure 4-29 shows where to connect the Ethernet cable.

Warning **The ports labeled "ENET," "CNSL," and "AUX" are safety extra-low voltage (SELV) circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the telephone network voltage (TNV) circuits.**

Tip Cisco recommends that you label each data cable at both ends to identify its destination.

Figure 4-29 ENET, CNSL, and AUX RJ-45C Receptacles on the NI-2 Card



Connect a Console Terminal

Connect a VT100-compatible terminal to the system console port on the NI-2 card (CNSL). Connect the terminal to a power source and set it up using the values that are shown in Table 4-3. Figure 4-29 shows where to connect the console cable.

Warning **The ports labeled "ENET," "CNSL," and "AUX" are SELV circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the TNV circuits.**

Table 4-3 Terminal Settings

Baud rate	9600 (transmit and receive)
Character size	8 bits
Parity	None
Stop bits	1
Flow control	None

Connect the Auxiliary Port

Note This step is optional.

Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary port on the NI-2 card (AUX). Figure 4-29 shows where to connect the auxiliary cable.

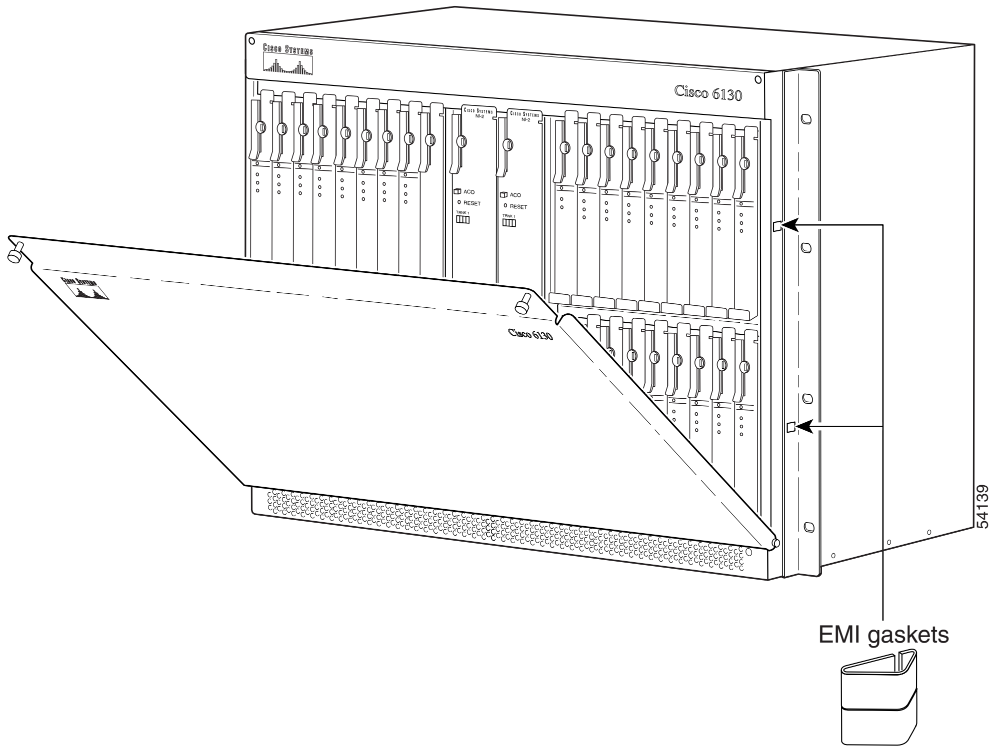
Warning **The ports labeled "ENET," "CNSL," and "AUX" are SELV circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the TNV circuits.**

Tip Cisco recommends that you label each data cable at both ends to identify its destination.

Close the Cisco 6130 Front Cover

Verify that the Cisco 6130 front cover is attached to the chassis and closed (see Figure 4-30).

Figure 4-30 Cisco 6130 Front Cover Installation

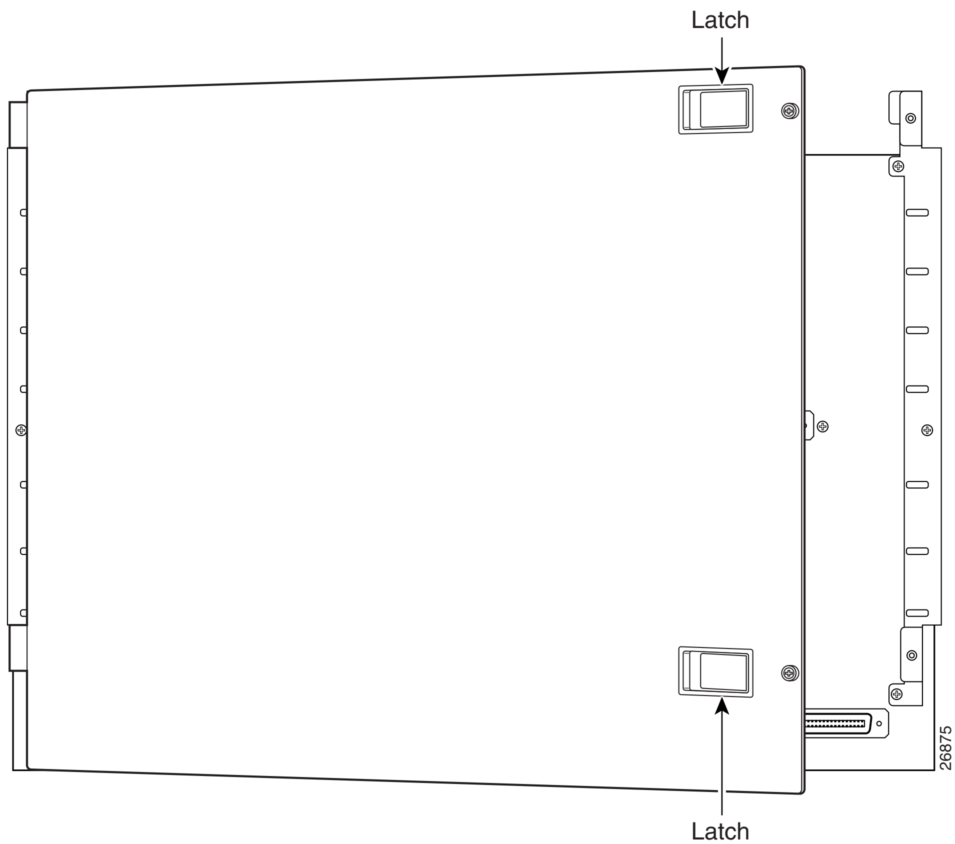


Close the Rear Cover

Complete the following steps to close the optional rear cover:

Step 1 Lift the two latches on the rear cover (as shown in Figure 4-31) as you close the rear cover. The rear cover closes left to right (seen from the rear of the chassis).

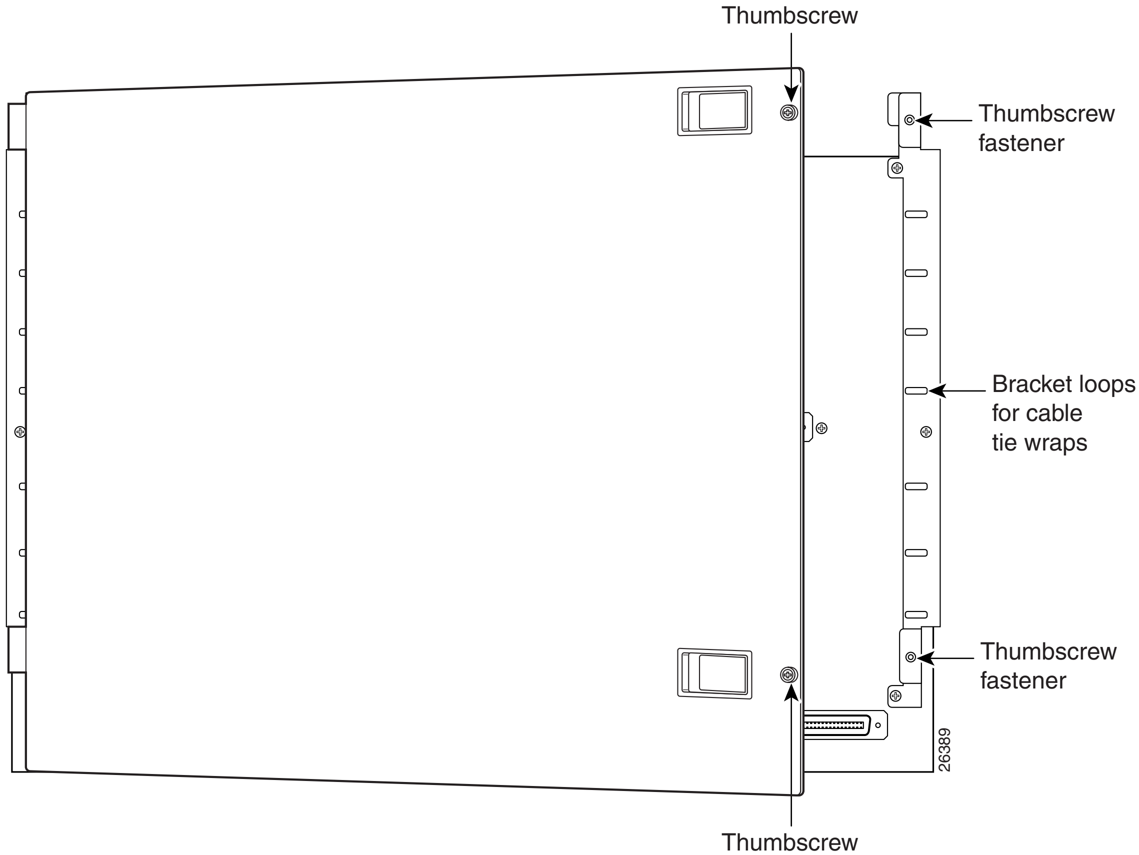
Figure 4-31 Securing the Rear Cover with the Latches



Step 2 Release the latches after the rear cover is in place.

Step 3 Align the two thumbscrews that are located on the rear cover with two thumbscrew fasteners on the bracket (see Figure 4-32). Tighten the thumbscrews to secure the rear cover.

Figure 4-32 Securing the Rear Cover with Two Thumbscrews



Step 4 Repeat Step 1 through Step 3 for additional Cisco 6130 chassis rear cover.

Complete Initial Configuration

When you turn on the Cisco 6130 system for the first time, an interactive dialog called the System Configuration Dialog appears on the console screen. The System Configuration Dialog guides you through the initial configuration process. (You can run the dialog at any time by entering the setup command in privileged EXEC mode.)

When you complete the dialog, the system displays the configuration command script that you have created. It then offers you three options:

```
[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.
```

If you enter **2**, the configuration is saved and used. If you answer **0** or **1,** the configuration you created is not saved. Enter **1** if you wish to discard the configuration and restart the System Configuration Dialog.

Before You Begin

Complete these steps before you run the System Configuration Dialog:

Step 1 Determine the IP address for the Ethernet interface.

Step 2 If you plan to configure in-band management, also determine the IP address for the ATM interface that will be used for in-band management (ATM0/0).

Step 3 Find out what the password strategy is for your environment. The System Configuration Dialog prompts you for three passwords, plus an SNMP community string. The three required password types are enable secret, enable, and virtual terminal.

Step 4 Choose a name for the Cisco 6130 system. (This step is optional.)

Using the System Configuration Dialog

When you power up a Cisco 6130 system for the first time, you are offered the option of running the System Configuration Dialog. The System Configuration Dialog offers two configuration options: basic management setup and extended setup.

- Choose basic management setup if you want to use the System Configuration Dialog to configure the passwords and the Ethernet interface only, and then use the management station or the command line interface to configure the remaining Cisco 6130 system interfaces.
- Choose extended setup if you want to use the System Configuration Dialog to configure all of the Cisco 6130 system interfaces.

An example of the use of each option follows the "Interface Numbering" section. In each example, an arrow marks the point in the dialog where basic management setup and extended setup diverge.

Interface Numbering

The System Configuration Dialog and the command line interface use the following interface numbering scheme:

- Interfaces whose names begin with "ATM0" (ATM0/0, ATM0/1, and so forth) are NI-2 card WAN interfaces. ATM0/0 is the ATM switch interface with the processor (sometimes referred to as the ASP interface, for ATM switch/processor). There is no need to configure ATM0/0 unless you plan to use in-band management. ATM0/1 is the trunk port. ATM0/2 and ATM0/3 (if present) are subtending interfaces.
- Interfaces whose names begin with "ATM1" through "ATM34" are line card interfaces. (ATM10 and ATM11, which would indicate the NI-2 slots, are omitted.)
- Ethernet0/0 is the interface for the LAN that connects the Cisco 6130 system to its management system.

For line card interfaces, the number before the slash indicates the slot number. The number after the slash indicates the interface or port number. For example, ATM6/4 is slot 6, port 4.

Basic Management Setup Example

This is the basic management setup example:

```
         --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: y
At any point you may enter a question mark '?' for help.
Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.

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

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

Configuring global parameters:

  Enter host name [DSLAM]:

  The enable secret is a password used to protect access to
  privileged EXEC and configuration modes. This password, after
  entered, becomes encrypted in the configuration.
  Enter enable secret: beansoup

  The enable password is used when you do not specify an
  enable secret password, with some older software versions, and
  some boot images.
  Enter enable password: beansoup
% Please choose a password that is different from the enable secret
  Enter enable password: lab1

  The virtual terminal password is used to protect
  access to the router over a network interface.
  Enter virtual terminal password:
% No defaulting allowed
  Enter virtual terminal password: lab

  Configure SNMP Network Management? [yes]: y
    Community string [public]:

Current interface summary

Any interface listed with OK? value "NO" does not have a valid configuration

Interface              IP-Address      OK? Method Status                Protocol
ATM0/0                 unassigned      NO  unset  up                    up
Ethernet0/0            unassigned      NO  unset  up                    up
ATM0/1                 unassigned      NO  unset  down                  down
ATM0/2                 unassigned      NO  unset  down                  down

Enter interface name used to connect to the
management network from the above interface summary: Ethernet0/0

Configuring interface Ethernet0/0:
  Configure IP on this interface? [yes]: y
    IP address for this interface: 172.27.144.141
    Subnet mask for this interface [255.255.0.0] :
    Class B network is 172.27.0.0, 16 subnet bits; mask is /16

The following configuration command script was created:

hostname DSLAM
```

```
enable secret 5 $1$pR/1$0zH7ohDaUKNML3SC2.RF5.
enable password lab1
line vty 0 4
password lab
snmp-server community public
!
no ip routing

!
interface ATM0/0
no ip address
!
interface Ethernet0/0
no shutdown
ip address 172.27.144.141 255.255.0.0
!
interface ATM0/1
shutdown
no ip address
!
interface ATM0/2
shutdown
no ip address
!
end


[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]: 2
% Shutdown not allowed for ATM0/0.
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.


Press RETURN to get started!
```

Extended Setup Example

This is the extended setup example:

```
         --- System Configuration Dialog ---

Continue with configuration dialog? [yes/no]: yes

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


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

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

First, would you like to see the current interface summary? [yes]: yes

Interface              IP-Address      OK? Method Status                Protocol
ATM0/0                 70.0.0.2        YES NVRAM  up                    up
```

```
Ethernet0/0            172.27.32.156   YES NVRAM  up                     up
ATM0/1                 unassigned      YES unset  down                   down
ATM0/2                 unassigned      YES unset  administratively down down
ATM18/0                unassigned      YES unset  initializing           down
ATM18/1                unassigned      YES unset  initializing           down
ATM18/2                unassigned      YES unset  initializing           down
ATM18/3                unassigned      YES unset  initializing           down
ATM21/0                unassigned      YES unset  administratively down down
ATM21/1                unassigned      YES unset  administratively down down
ATM21/2                unassigned      YES unset  administratively down down
ATM21/3                unassigned      YES unset  administratively down down
ATM26/0                unassigned      YES unset  down                   down
ATM26/1                unassigned      YES unset  down                   down
ATM26/2                unassigned      YES unset  down                   down
ATM26/3                unassigned      YES unset  down                   down

Configuring global parameters:

  Enter host name [DSLAM]: sw-ni2-2

  The enable secret is a password used to protect access to
  privileged EXEC and configuration modes. This password, after
  entered, becomes encrypted in the configuration.
  Enter enable secret: lab

  The enable password is used when you do not specify an
  enable secret password, with some older software versions, and
  some boot images.
  Enter enable password [lab]: lab

  The virtual terminal password is used to protect
  access to the router over a network interface.
  Enter virtual terminal password [lab]:
  Configure SNMP Network Management? [no]:
  Configure IP? [yes]:
    Configure IGRP routing? [yes]: no

Configuring interface parameters:

Do you want to configure ATM0/0  interface? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface [70.0.0.2]:
    Subnet mask for this interface [255.0.0.0] :
    Class A network is 70.0.0.0, 8 subnet bits; mask is /8

Do you want to configure Ethernet0/0  interface? [yes]:
  Configure IP on this interface? [yes]:
    IP address for this interface [172.27.32.156]:
    Subnet mask for this interface [255.255.0.0] :
    Class B network is 172.27.0.0, 16 subnet bits; mask is /16

Do you want to configure ATM0/1  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM0/2  interface? [no]:

Do you want to configure ATM18/0  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM18/1  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM18/2  interface? [yes]:
  Configure IP on this interface? [no]:
```

```
Do you want to configure ATM18/3  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM21/0  interface? [no]:

Do you want to configure ATM21/1  interface? [no]:

Do you want to configure ATM21/2  interface? [no]:

Do you want to configure ATM21/3  interface? [no]:

Do you want to configure ATM26/0  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM26/1  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM26/2  interface? [yes]:
  Configure IP on this interface? [no]:

Do you want to configure ATM26/3  interface? [yes]:
  Configure IP on this interface? [no]:

The following configuration command script was created:

hostname sw-ni2-2
enable secret 5 $1$12Lo$vGKa1wlRcNyw06j1bgGQd0
enable password lab
line vty 0 4
password lab
no snmp-server
!
ip routing
!
interface ATM0/0
ip address 70.0.0.2 255.0.0.0
!
interface Ethernet0/0
ip address 172.27.32.156 255.255.0.0
!
interface ATM0/1
no ip address
!
interface ATM0/2
shutdown
no ip address
!
interface ATM18/0
no ip address
!
interface ATM18/1
no ip address
!
interface ATM18/2
no ip address
!
interface ATM18/3
no ip address
!
interface ATM21/0
shutdown
no ip address
!
```

```
interface ATM21/1
shutdown
no ip address
!
interface ATM21/2
shutdown
no ip address
!
interface ATM21/3
shutdown
no ip address
!
interface ATM26/0
no ip address
!
interface ATM26/1
no ip address
!
interface ATM26/2
no ip address
!
interface ATM26/3
no ip address
!
end


[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]:2
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.


Press RETURN to get started!
```

Note To configure your system, refer to the appropriate software or network management configuration guides.

CHAPTER 5

Troubleshooting

This chapter provides information about isolating faults in the Cisco 6130 with NI-2 system. Most problems in a Cisco 6130 with NI-2 system can be traced to one of the system's field-replaceable units (FRUs), which include the following hardware components:

- Primary or secondary NI-2 card
- Line cards
  - Quad-port Discrete Multitone (DMT) ATU-C line card (4xDMT)
  - Quad-port flexi ATU-C line card (4xflexi)
  - Quad-port STU-C line card (4xSDSL)
- System I/O card
- Fan tray
- Air filter

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

This chapter consists of three major sections:

- System-Wide Problems, page 5-3: Troubleshooting faults that affect the entire system
- Cisco 6130 Component-Specific Problems, page 5-6: Troubleshooting faults that affect subsystems
- Alarms, page 5-13: Descriptions of alarms that can signal problems or help with troubleshooting

Hot-Swappable FRUs

All Cisco 6130 FRUs are hot swappable, except the system I/O card. However, hot swapping some FRUs causes an interruption in service. See Table 5-1 for more detailed information.

Table 5-1 Service Interruptions Caused by the Replacing of FRUs

FRU	Does Hot Swap Interrupt Service?	Notes
NI-2 card	Yes	If a secondary NI-2 card is installed (redundancy), it will automatically take over service and become the active NI-2 card. Otherwise, service is interrupted until the NI-2 card is replaced.
Line card	Yes	Service is interrupted only for subscribers served by that line card.
System I/O card	Yes	You must turn off system power to replace the system I/O card. Note that the MAC address is stored on the system I/O card.
Fan tray	No	—
Air filter	No	—

Basic Checks

Before using the troubleshooting tables in this chapter, make the following basic checks:

- Are the ports properly configured? Refer to these sources for configuration instructions:
  - *Configuration Guide for Cisco DSLAMs with NI-2*
  - *Command Reference for Cisco DSLAMs with NI-2*
  - Cisco IOS Release 12.1 information on the Word Wide Web—http://www.cisco.com/univercd/cc/td/doc/product/dsl_prod/ios_dsl/rel121/index.htm
  - *ATM Switch Router Software Configuration Guide*
  - *ATM Switch Router Command Reference Guide*
- Are power leads and data cables firmly connected at both ends?
- Are all cards firmly seated and locked (as necessary) in the chassis?
- Is the system I/O card securely screwed to the chassis backplane?
- Are the Cisco IOS images up-to-date? Refer to these sources for update instructions:
  - *Configuration Guide for Cisco DSLAMs with NI-2*
  - *Command Reference for Cisco DSLAMs with NI-2*

Contacting the Cisco TAC for Help

In certain situations, the troubleshooting tables in this chapter direct you to contact the Cisco Technical Assistance Center (TAC) for help. If you have a maintenance contract or if your hardware is under warranty, call the TAC at 1 800 553 2447 (North America only), 1 408 526 7209, or visit this URL for a worldwide list of TAC regional telephone numbers:

http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml

System-Wide Problems

Use the following table to diagnose and troubleshoot any problems that affect the entire Cisco 6130 system.

Symptoms	Steps to Take
System fails to come up.	**1.** Check the POWER LED on the NI-2 card and the STATUS LEDs on the line cards. If all LEDs are off, troubleshoot the power source. **2.** If any green LEDs are on, the system has power. Check the STATUS LED on the NI-2 card. If the STATUS LED is off, refer to the "NI-2 Card Problems" section on page 5-6. **3.** If the Cisco 6130 is set to boot from a remote device over the network, make sure the remote device is up, that its network connection is solid, and that it contains the boot file. (The Cisco 6130 tries to boot over the network for a configured period, usually 5 to 15 minutes. If it is unable to boot over the network, it will eventually boot from bootflash.) **4.** Try to establish a console connection to the Cisco 6130. If you cannot connect, see the steps for the symptom "You cannot establish a console or Telnet connection to the system." **5.** If you achieve a console connection: – Examine the command prompt. If the prompt says `rommon 1>`, the problem could be in flash memory, in bootflash, in an incorrectly set boot configuration register, or in an incorrect file name in a **boot system** command in the startup-config file. Refer to the *Configuration Guide for Cisco DSLAMs with NI-2* for information on setting and interpreting configuration registers, configuring flash memory, and editing the startup-config file. To select an image to boot the system from flash, enter **dir flash:**. In the resulting display, find the name of the software image. Then enter **boot flash:***imagename*, replacing *imagename* with the name of the software image. The system boots from flash. – If you see a normal Cisco IOS prompt, which usually contains the name of the system (default is `DSLAM>`), enter **show oir status**. If the results indicate that the card is loading software, wait a few minutes for the port to come back up.

Symptoms	Steps to Take
You cannot establish a console or Telnet connection to the system.	**1.** For a console problem, check the terminal settings against the list of settings in the "Connect a Console Terminal" section on page 3-47 or the "Connect a Console Terminal" section on page 4-42. **2.** For a Telnet problem: – If you are connecting to the Cisco 6130 through the Ethernet interface, check the configuration of your LAN for both the Cisco 6130 and the Telnet source. – If you are connecting to the Cisco 6130 through an ATM interface, make sure that PVCs are set up between the two devices and that the map-list is correctly configured. Enter the command **show running-config** to display this information. – If the Telnet source and the Cisco 6130 are on different networks, make sure static routes are configured at both ends so that the two devices can communicate. To check, use the **ping** command to ping each device from the other (that is, ping the Cisco 6130 from the Telnet source, and ping the Telnet source from the Cisco 6130). Alternatively, ping your default gateways from each end of the connection. **3.** For both console and Telnet problems: – Check the cabling and connectors between the terminal or Telnet source and the Cisco 6130. See Appendix C, "Connector and Pinout Specifications" to check pinouts. – Press the **Reset** button on the NI-2 card faceplate to reset the card. – If the problem persists, replace the NI-2 card.
System experiences a critical, major, or minor alarm.	**1.** Enter the command **show facility-alarm status**. Note the affected slot and port, if any, and the description of the problem. **2.** If no slot number is indicated, enter **show environment all** and examine the results for an indication of which FRU is at fault. Refer to the "Cisco 6130 Component-Specific Problems" section on page 5-6 for instructions on troubleshooting that FRU. **3.** If ATM0/0, ATM0/1, ATM0/2, or ATM0/3 is indicated: – Enter a **show int** command for the interface (for example, **show int atm0/1**). Results may indicate a SONET problem (Loss of Signal, for example). Refer to the "NI-2 Card Problems" section on page 5-6 for instructions on troubleshooting the NI-2 card. – Enter **show controllers** commands for all trunk and subtending ports. (The ports are atm0/1, atm0/2, and, in a DS3 system, atm0/3.) For example, **show controllers atm0/1**. In the resulting display, check that the framing mode is set to the same value on this interface as at the other end of the connection. Also check that cell payload scrambling is on (on DS3 interfaces only). **4.** If a line card slot is indicated, consult the "Line Card Problems" section on page 5-8.

<table>
<tr><th>Symptoms</th><th>Steps to Take</th></tr>
<tr><td>A trunk or subtending port fails to come up. (OC-3c or DS3.)</td><td>
1. Check the cable connections at both ends. Refer to Appendix C, “Connector and Pinout Specifications,” to check pinouts.
2. To check the interface status and configuration, enter show interface atm slot#/port#. Check the following in the resulting display:
– If the port Admin Status is down, enter the commands below to correct the problem, replacing slot/port ID atm 0/1 with your slot/port ID:
<pre>DSLAM> configure terminal
Enter configuration commands, one per line.
End with CNTL/Z.
DSLAM(config-if)# int atm 0/1
DSLAM(config-if)# no shutdown
DSLAM(config-if)#</pre>
– If the port IF Status is down, check for disconnected or faulty cables. (Optical cables connect to the NI-2 card; DS3 coaxial cables connect to the system I/O card on the back of the chassis.)
– If the Line Protocol is down, the line protocol software processes might have determined that the line is unusable; try swapping the cable. Another possibility is that clocking might be misconfigured, or the clocking source might have failed.
– Check the CRC field. The presence of many CRC errors but not many collisions is an indication of excessive noise. If the number is too high (greater than 0.5 to 2 percent of total traffic on the interface), check the cables to determine if any are damaged.
If you need more information on interface configuration, refer to the Configuration Guide for Cisco DSLAMs with NI-2 and the ATM Switch Router Software Configuration Guide.
3. For a DS3 interface: enter show controllers atmslot#/port#. Check the following in the resulting display:
– Framing mode must be the same at both ends of the connection.
– Cell payload scrambling must be On at both ends of the connection.
4. Check the status and configuration of the interface at the far end.
5. If you need to run a loopback test, do the following:
– In interface configuration mode, enter loopback diagnostic or loopback line.
– Set the external test equipment to loop data through the Cisco 6130 port.
– Obtain loopback results from your external test equipment.
– Enter no loopback diagnostic to take the port out of loopback mode.
6. In interface configuration mode, reset the trunk port by executing the shutdown command followed by the no shutdown command.
7. Replace the NI-2 card.
8. If the problem with a DS3 interface persists, troubleshoot the system I/O card. See the “System I/O Card Problems” section on page 5-11.
</td></tr>
<tr><td>System overheats.</td><td>Troubleshoot the fan tray. See the “Fan Tray Problems” section on page 5-13.</td></tr>
<tr><td>System experiences a clocking problem.</td><td>Troubleshoot the NI-2 card. See the “NI-2 Card Problems” section on page 5-6.</td></tr>
<tr><td>System experiences a power problem.</td><td>Troubleshoot the fuse and alarm panel.</td></tr>
</table>

Cisco 6130 Component-Specific Problems

The following sections describe symptoms that might occur and the steps that you need to take if you experience problems with any of the following Cisco 6130 components:

- NI-2 Card Problems, page 5-6
- NI-2 Card Cold Redundancy Problems, page 5-7
- Line Card Problems, page 5-8
- System I/O Card Problems, page 5-11
- Fan Tray Problems, page 5-13

NI-2 Card Problems

Use the following table to diagnose and troubleshoot any problems with the NI-2 cards.

Note If you need to remove or replace an NI-2 card, complete the steps in the "DS3/2DS3 NI-2 Card Installation and Removal" section on page 6-9 or "OC-3c/OC-3c NI-2 Card Installation and Removal" section on page 6-13.

Symptom	Steps to Take
POWER LED is off.	1. Check the STATUS LEDs on the line cards. If all LEDs are off, troubleshoot the power source. 2. If the line card STATUS LEDs are lit, remove the NI-2 card from its slot and check for bent or broken pins on both the card and the backplane. If you find damaged pins on the card, replace it. If you find damaged pins on the backplane, contact the Cisco TAC.
STATUS LED is off, indicating that the NI-2 card failed to boot or failed its power-on self test.	Press the **Reset** button on the NI-2 card. If the problem persists, replace the card.
CRITICAL LED, MAJOR LED, or MINOR LED is on.	See the "System-Wide Problems" section on page 5-3.
A trunk or subtending port fails to come up.	See the "System-Wide Problems" section on page 5-3.
NI-2 card cannot be fully inserted into its slot.	Inspect connectors on both the card and the backplane, looking for obstructions, bent pins, or other damage. If you find damage to a line card connector, replace the line card. If you find damage to a backplane connector, contact the Cisco TAC.

NI-2 Card Cold Redundancy Problems

Use the following table to diagnose and troubleshoot any problems with an NI-2 cold redundancy configuration.

Note If you need to remove or replace an NI-2 card, complete the steps in the "DS3/2DS3 NI-2 Card Installation and Removal" section on page 6-9 or "OC-3c/OC-3c NI-2 Card Installation and Removal" section on page 6-13.

Symptom	Steps to Take
Both NI-2 cards go active	Ensure that both NI-2 cards are revision AO or later.
DS3 traffic interrupted when a second NI-2 card is inserted	1. Ensure that both NI-2 cards are revision AO or later. 2. Ensure that the correct boot image is installed on the NI-2 cards. See the "System-Wide Problems" section on page 5-3 for instructions.
Line card communication is interrupted	1. Ensure that both NI-2 cards are revision AO or later. 2. Ensure that the correct boot image is installed on the NI-2 cards. See the "Line Card Problems" section on page 5-8 for instructions.
Transient environmental alarms occur	Ensure that the correct boot image is installed on the NI-2 cards. See the "System-Wide Problems" section on page 5-3 for instructions.
TFTP boot fails	The NI-2 card is not configured to boot from Flash. See the "System-Wide Problems" section on page 5-3 for instructions.
Line cards reboot or reset upon switch over	The software version on the primary and secondary NI-2 cards may be mismatched. Use the Cisco IOS command **show version** to determine the Cisco IOS release currently installed on each of the NI-2 cards. See the "System-Wide Problems" section on page 5-3 for more information on upgrading software images.

Line Card Problems

Use the following table to diagnose and troubleshoot any problems with the line cards (4xDMT, 4xflexi, or 4xSDSL).

Note If you need to remove or replace a line card, complete the steps in the "xTU-C Line Card Installation and Removal" section on page 6-6.

Symptom	Steps to Take
All LEDs are off.	**1.** Check the POWER LED on the NI-2 card. If all LEDs are off, troubleshoot the power source. **2.** If the NI-2 card POWER LED is off, remove the card from its slot and check for bent or broken pins on both the card and the backplane. If you find damaged pins on the card, replace it. If you find damaged pins on the backplane, contact the Cisco TAC.
All ports on a card fail to come up (modems do not train). STATUS LED might be red, indicating that the line card failed to boot or failed its power-on self test.	**1.** Enter the **show ipc nodes** command to find out whether there is a communication problem between the line card and the NI-2 card. There should be an entry in the resulting display for each line card ("SMB IP Slot *n*") and for the NI-2 card ("IPC Master"). If there is an entry for each card, go to Step 4. **2.** If one or more cards are not listed, enter **show oir status**. If the resulting display indicates that the card in question is loading new code, wait a few minutes and reenter the command. (Usually, 2 to 3 minutes is long enough to wait.) The card's status should change to `running`. **3.** Enter the command **show dsl int atm** *slot#/port#*. If the status says `Microcode downloading`, wait 10 minutes. When the download is complete, the card will reboot and come up normally. **4.** Check the ALARM LEDs on the NI-2 card or enter **show facility-alarm status** to determine the alarm status of the system. If any alarms are indicated, see the "Alarms" section on page 5-13 for instructions on how to troubleshoot alarms. **5.** Enter the command **show dsl status** and examine the results to ensure that the card is configured to be in its current slot. (In the Names column, the slot number appears as part of the port ID. For example, in ATM19/2, the slot number is 19. Nothing is displayed for slots that are not configured.) If necessary, use the **slot** command to update the configuration, or move the card to the correct slot. If the line card is a 4xflexi, it will not function unless you use the **slot** command to configure either CAP or DMT operation. **6.** Reset the line card by disconnecting it from the backplane and reseating it in its slot. **7.** Install the card in another slot. **8.** If the problem persists, replace the line card.

Symptom	Steps to Take
Port fails to come up (modems do not train), or port LED flashes continuously.	1. Enter the command **show dsl int atm** *slot#/port#* to display the port configuration. Check the display to ensure that the port is properly provisioned. Make sure the port is configured to be running (“no shutdown” or IOS admin state = up). Also check the line status; if this reads “No CPE detected,” troubleshoot the CPE device and the loop as described below under the symptom “You suspect a problem with the CPE or the subscriber loop.” 2. In interface configuration mode, reset the port by executing the **shutdown** command followed by the **no shutdown** command. 3. Connect the subscriber to another port on the Cisco 6130. If the modems do not train, troubleshoot the CPE device and the loop as described below under the symptom “You suspect a problem with the CPE or the subscriber loop.” If the modems train, go to the next step to troubleshoot the port that failed. 4. To test the modem on the line card, enter **dsl test atm***slot#/port#* **self**. Results are displayed automatically after a few seconds. If the modem fails the test, replace the line card.
You suspect a problem with the CPE or the subscriber loop.	1. Disconnect the local loop and replace it with a test setup that consists of a modem or CPE that is known to work and a few thousand feet of wire. If the modems train over the shorter distance, the problem lies in the local loop or in the CPE—see the steps that follow. If the modems do not train, the port is probably at fault. Replace the line card. 2. Make sure that the CPE at the subscriber site is powered up. 3. Make sure that the CPE is compatible with the Cisco 6130, and that the software version running on the CPE is compatible with the software version running on the Cisco 6130. 4. Power cycle the CPE. When you turn the power on, the WAN Link LED on the CPE should blink. If the LED does not blink, check the CPE’s configuration—if the interface is shut down, bring it up. 5. Perform a continuity check to find out if the cabling to the CPE is connected and intact. For example, if there is a phone on the line, check for a dial tone. 6. If there is no POTS, check DC resistance by shorting tip and ring at the remote end. 7. Make sure there are no load coils on the local loop. 8. Is the local loop too long? The maximum length range is 15,000 to 25,000 feet (4572 to 7620 meters). Within that range, wire gauge, crosstalk, and multiple bridge taps reduce the distance over which the modems can train. 9. Is the local loop too short? DMT modems train best over loops of several thousand feet. In a test situation with a loop just a few feet in length, the modems may fail to train. Add wire to the loop. 10. Replace the CPE.

<table>
<tr><th>Symptom</th><th>Steps to Take</th></tr>
<tr><td>Modems train at a low bit rate, or modems retrain continuously, or the line experiences too many errors.</td><td>

Enter the command show dsl int atmslot#/port# to display the port configuration. Check the display to ensure that the port is properly provisioned. Look in particular for these statistics:

Attenuation: typically this is 20 to 50 dB. If the attenuation value is higher than 50 dB, it might be depressing the bit rate. Repair or replace the cables and connectors in the loop.
SNR margin: 3 to 6 dB is optimum. Use the dmt margin command to adjust SNR margin.
Correction ratio: under DSL Statistics, look at the Received Superframes and Corrected Superframes values. A ratio of more than 1 corrected superframe for every 10 superframes received is too high. One or more of these adjustments might correct the problem: increase the SNR margin using the dmt margin command; increase error correction using the dmt check-bytes command; or increase interleaving using the dmt interleaving-delay command.
Errored seconds: a rate of 10 to 20 errored seconds per minute or more is likely to cause retraining. (1 or 2 errored seconds every 15 minutes is a good rate.) See the steps that follow on crosstalk and impulse noise for suggestions on how to compensate.
CRC errors: normal rates vary system by system. If the CRC error rate is higher than usual, it might cause excessive retraining. See the steps that follow on crosstalk and impulse noise for suggestions on how to compensate.

Crosstalk is caused by interference between services in adjacent cables. It affects random bits rather than chunks of data; upstream and downstream traffic can be affected differently. If crosstalk is increasing the bit error rate (BER), you can compensate in several ways:

Reduce the bit rate using the dmt bitrate command. (See the Command Reference for Cisco DSLAMs with NI-2 for information on the dmt bitrate command.)
Increase the SNR margin using the dmt margin command. (See the Command Reference for Cisco DSLAMs with NI-2 for information on the dmt margin command.)
Turn on or increase error correction. Use the dmt check-bytes command. If the codeword size is not set to auto, you might need to use the dmt codeword-size command to adjust the codeword setting. (See the Command Reference for Cisco DSLAMs with NI-2 for information on these commands.)

If you experience impulse noise or clipping, both of which affect chunks of data rather than random bits, you can compensate by turning on or increasing interleaving and error correction. (However, note that this approach adds delay.) Use the dmt interleaving-delay command for interleaving. Use the dmt encoding-trellis command or the dmt check-bytes command for error correction. If you use dmt check-bytes and if the codeword size is not set to auto, you might need to use the dmt codeword-size command to adjust the codeword setting.

</td></tr>
</table>

Symptom	Steps to Take
	4. If errors or retraining occur while the line is ringing, use the **dmt interleaving-delay** command to turn on interleaving. 5. In interface configuration mode, reset the port by executing the **shutdown** command followed by the **no shutdown** command. 6. Connect the customer to a different port on the Cisco 6130. If the modems train, replace the line card with the faulty port. 7. Troubleshoot the CPE device and the loop as described above under the symptom “You suspect a problem with the CPE or the subscriber loop.“ 8. Replace the line card.
Card cannot be fully inserted into its slot.	1. Remove the card and reinsert it, pushing firmly on both the top and the bottom of the faceplate. (The card might jam in the slot if you apply pressure to the top only.) If the chassis is full, you might need to push sideways to insert the card. 2. Inspect connectors on both the card and the backplane, looking for obstructions, bent pins, or other damage. If you find damage to a line card connector, replace the line card. If you find damage to a backplane connector, contact the Cisco TAC.
Card experiences problems in one slot but operates normally in another.	There may be a fault in your backplane. Contact the Cisco TAC.

System I/O Card Problems

Use the following table to diagnose and troubleshoot any problems with the system I/O card.

Note If you need to remove or replace a system I/O card, complete the steps in the “System I/O Card Installation and Removal” section on page 6-17.

Symptom	Steps to Take
A trunk port fails to come up.	See the "System-Wide Problems" section on page 5-3.
A subtending port fails to come up.	See the "System-Wide Problems" section on page 5-3.
An alarm relay or BITS circuit fails.	1. Check the connection at the wire-wrap connector on the system I/O card. See Table 1-11 on page 1-29 for the pin assignments of the wire wrap connector. 2. Check the connection at the other end of the circuit. 3. For a BITS problem, troubleshoot the T1 line at the other end of the circuit. 4. Replace the system I/O card (except in the case of a circuit breaker alarm problem; the system I/O card does not provide the circuit breaker trip alarm).
This message appears on the console or in the system log file: `00:00:28:%C6100-4-COOKIE: Corrupt or missing MAC address cookie using random base 007e.eb7d.e700`	1. Make sure the software release running on your system is compatible with the hardware. 2. Enter the command **show hardware chassis**. In the resulting display, look for data from the system I/O card EEPROM. If the system can read the contents of the EEPROM, the system I/O card is likely to be healthy. 3. If the system I/O card is missing, install it. 4. If the system I/O card is present, reseat it. First, turn off system power. Use a screwdriver to unfasten the screws that secure the system I/O card cover, and pull the card off the connectors. Push it firmly back into place and tighten the screws. 5. If the problem persists, replace the system I/O card.

Fan Tray Problems

Use the following table to diagnose and troubleshoot any problems with the fan tray.

Note If you need to remove or replace the fan tray or fan module, complete the steps in the "Replacing Fans in the Fan Tray" section on page 6-4.

Symptom	Steps to Take
Fan modules do not run.	**1.** Make sure the fan module is fully inserted into the fan tray and screwed in place. **2.** Replace the fan module.
Fan modules run but the system overheats.	**1.** Make sure that the air intake vents at the bottom front of the chassis and the exhaust vents on the top of the chassis are free of blockages. **2.** Make sure that the ambient temperature and other environmental factors affecting the system are within the ranges specified in the "Environmental Requirements" section on page 2-11. **3.** Make sure that all cards, blank faceplates, and covers are in place. The cooling system cannot operate effectively unless the chassis is fully enclosed. **4.** Check the LED on the fan module. If the LED is not green, the fan module has failed. Replace the fan module. **5.** Check the air filter at the bottom of the fan tray, and if necessary clean or replace it. See the "Replacing the Air Filter in the Fan Tray" section on page 6-2 for instructions on cleaning or replacing the air filter. **6.** Reduce the ambient temperature.
Fan module status LED is not green.	The fan module has failed or is not receiving power. If other components in the system are receiving power (look for green LEDs), replace the fan module.
Air filter is damaged, dirty, or clogged.	See the "Replacing the Air Filter in the Fan Tray" section on page 6-2 for instructions on cleaning or replacing the air filter.

Alarms

Tables 5-2 through 5-8 describe alarms for the Cisco 6130. In each table, the text in the Alarm column is the text that appears in the description field of the alarm message. Alarm messages appear on the console screen as the alarms occur; to see a list of current alarms, enter **show facility-alarm status**.

Refer to the problem tables in this chapter for more detailed troubleshooting instructions.

Table 5-2 Chassis Alarm

Alarm	Keyword	Severity	Description
Chassis temperature too high	OVER_TEMP	Major	An overtemperature condition has been detected. (Temperature is measured on the NI-2 card.)

Table 5-3 Line Card Slot Alarms

Alarm	Keyword	Severity	Description
Provisioned slot is empty	MODULE_MISMATCH	Major	The line card in this slot does not match the type configured for this slot.
Line card not equal to provisioning	MODULE_MISSING	Minor	This slot is configured for a line card, but no line card is present.
Invalid line card for this slot	MODULE_INVALID	Minor	The line card detected in this slot cannot operate in this slot or is incompatible with the system configuration.
Flexi line card not provisioned	FLEX_MODULE_NOT_PROVISIONED	Info	You must use the **slot** command to configure a 4xflexi as either CAP or DMT.

Table 5-4 NI-2 Redundancy Alarms

Alarm	Keyword	Severity	Description
Active/Standby NI2 type mismatch	C6100_CONTROLLER_SLOT_MISMATCH_ALARM	Major	The NI-2 cards installed in slot 10 and slot 11 are different types; for example, one is an OC-3c/OC-3c NI-2 card and the other is an OC-3c/2xDS3 NI-2 card.
Standby NI2 missing	C6100_CONTROLLER_SLOT_MISSING_ALARM	Major	The secondary NI-2 card slot has been provisioned for a standby NI-2 card, but the card is not installed in the chassis.
Redundancy process failed	NI2_RF_PROCESS_FAILED	Major	An internal redundancy software process has failed and redundancy may not be available.
Peer APS mode mismatch	APS_MODE_MISMATCH_ALARM	Minor	The OC3 trunk is connected to a device not configured for nonrevertive, unidirectional APS.

Table 5-5 IOS Controller Alarms

Alarm	Keyword	Severity	Description
Loss of active clock sync	LOSS_OF_SYNC	Major	Loss of timing reference. The configured clock source is not available, so the system is using its internal clock.
BITS clock failure	BITS_FAILED	Major	BITS clock failure (LOS or AIS). The configured clock source is not available, so the system is using its internal clock.

The source of the OC-3c alarms in Table 5-6 is one of the following interfaces: ATM0/1 (the trunk) or ATM0/2 (the subtending interface).

Table 5-6 OC-3c/STM-1 Network Interface Alarms

Alarm	Keyword	Severity	Description
Loss of Cell Delineation	SONET_LOCD	Critical	Loss of cell delineation on a SONET line.
Path RDI Received	SONET_PRDI	Critical	Path Remote Defect Indication was received on a SONET line. This is equivalent to Path Far End Receive Failure (FERF).
Path AIS Received	SONET_PAIS	Critical	Path Alarm Indication Signal was received on a SONET line.
Loss of Pointer	SONET_LOP	Critical	Loss of pointer condition on a SONET line.
Line RDI	SONET_LRDI	Critical	Line Remote Defect Indication received on a SONET line. This is equivalent to line Far End Receive Failure (FERF).
Line AIS Received	SONET_LAIS	Critical	Line Alarm Indication Signal received on a SONET line.
Loss of Frame	SONET_LOF	Critical	LOF[1] condition on a SONET line.
Loss of Signal	SONET_LOS	Critical	LOS[2] detected on the SONET line.
Signal Label Mismatch	SONET_SIGNAL_ LABEL	Minor	Incorrect payload type signal label mismatch on a SONET line.

1. LOF = Loss Of Frame
2. LOS = Loss Of Signal

The source of the DS3 alarms in Table 5-7 is one of the following interfaces: ATM0/1 (the trunk), ATM0/2 (subtending interface), or ATM0/2 (subtending interface).

Table 5-7 DS3/E3 Network Interface Alarms

Alarm	Keyword	Severity	Description
Loss of Cell Delineation	DS3/E3_LOCD	Critical	The DS3 line is experiencing a loss of cell delineation.
RAI Received	DS3/E3_RAI	Critical	The DS3 line is receiving a remote alarm indication.
Yellow Alarm Received	DS3/E3_YELLOW	Critical	The DS3 line is receiving a yellow alarm, indicating that another device has detected a failure that might be in this device.
AIS Received	DS3/E3_AIS	Critical	The DS3 line is receiving an Alarm Indication Signal.
OOF Received	DS3/E3_OOF	Critical	The DS3 line has detected an Out of Frame condition.
LOS Detected	DS3/E3_LOS	Critical	The DS3 line has detected Loss of Signal at the framer.
PLCP LOF Detected	DS3_PLCP_LOF	Critical	The DS3 line has detected a Physical Layer Convergence Procedure Loss of Frame error.

Table 5-8 Fan Tray Alarms

Alarm	Keyword	Severity	Description
Not detected or missing	FAN_TRAY_REMOVED	Major	The fan tray has been disconnected from the chassis or is missing.
Multiple fan failures	FAN_FAIL_MULTI	Major	Two or more fan modules (out of three) in the fan tray have failed. When fan modules fail, the remaining fan modules run at full speed until the fault is corrected.
Single fan failure	FAN_FAIL_SING	Minor	A single fan module (one of three) in the fan module has failed. When fan modules fail, the remaining fan modules run at full speed until the fault is corrected.

Upgrading and Maintaining the Cisco 6130 System

This chapter describes upgrade and maintenance procedures for the Cisco 6130 with NI-2 system, which includes

Backing Up Software

Cisco recommends that you maintain, on a TFTP server, current copies of three files for each Cisco 6130 with NI-2 system:

- The Cisco IOS software image
- The Cisco IOS boot image
- The configuration file (running-config)

If you keep copies of these files on a TFTP server, you can easily recover from a fault in an NI-2 card: simply replace the NI-2 card, and download the software image and configuration file from the TFTP server. Remember to update your backup files whenever you change your configuration or upgrade your Cisco IOS software.

Complete the following steps to copy the Cisco IOS software images and configuration file to a TFTP server:

Step 1 Log in to the Cisco 6130 node whose software you wish to back up.

Step 2 Enter the **dir** command to display the names of the files:

```
6130# dir
```

Step 3 Enter a copy command to copy the Cisco IOS software file to the node TFTP server:

```
6130# copy flash:<image-name> tftp
```

Step 4 Enter a second copy command to copy the Cisco IOS boot image file to the node TFTP server:

```
6130# copy bootflash:<image-name> tftp
```

Step 5 Enter a third copy command to copy the configuration file to the node TFTP server:

```
6130# copy running-config tftp
```

Fan Tray Maintenance

The following sections describe the preventive maintenance procedures for the fan tray:

- Replacing the Air Filter in the Fan Tray
- Replacing Fans in the Fan Tray

Replacing the Air Filter in the Fan Tray

The air filter is located directly below the three fan modules in the fan tray. Replace the air filter every 60 days. If you notice a significant accumulation of dust in the filter prior to 60 days, replace the filter at that time. Record the date each time you replace the filter.

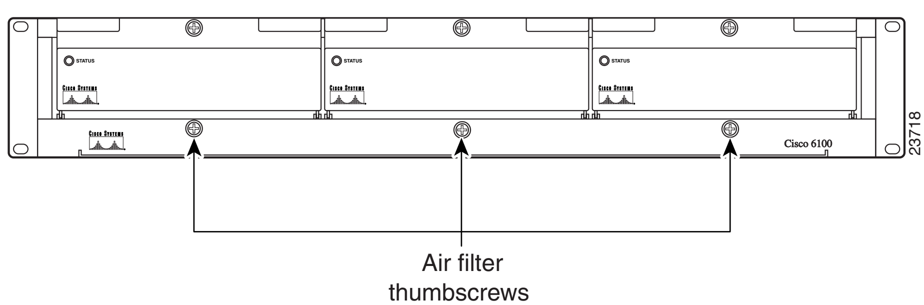
You can order a replacement air filter (part number 6100-AF-01=) through Cisco.

To replace the air filter, complete the following steps:

Step 1 Using the slack in the cables in front of the fan tray, move the cables to the side of the fan tray so that the air filter door can be removed and the air filter can be replaced.

Step 2 Locate and unscrew the three thumbscrews shown in Figure 6-1.

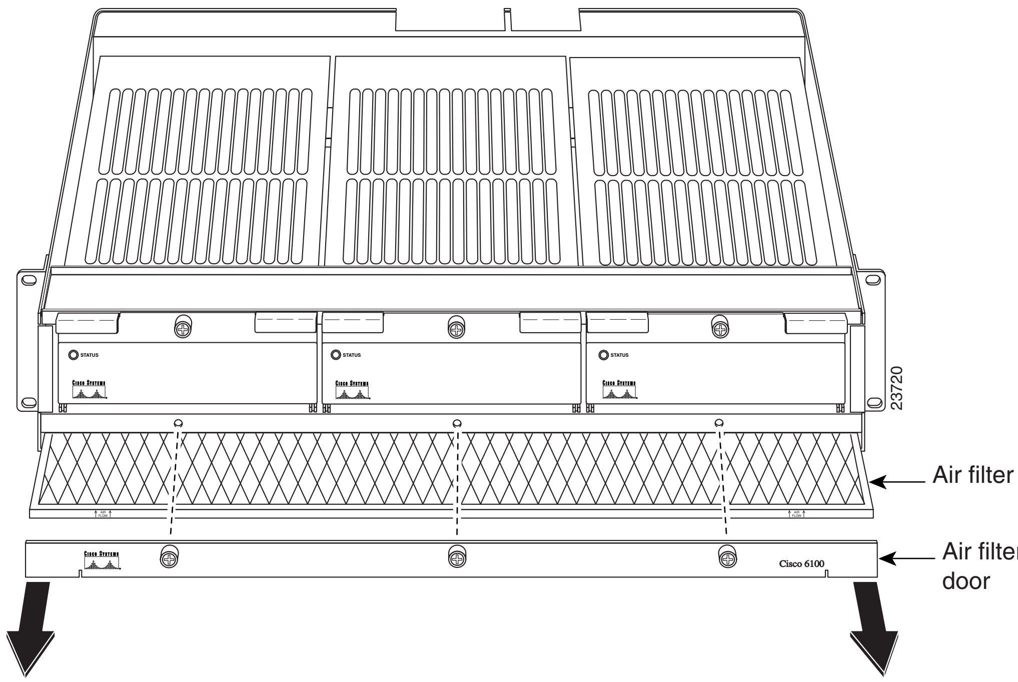
Figure 6-1 Location of Air Filter Thumbscrews



Step 3 Carefully remove the air filter door.

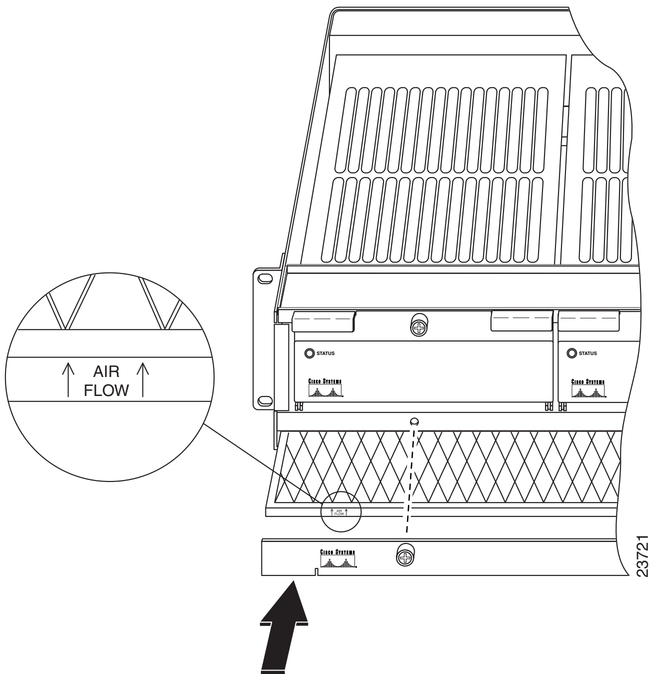
Step 4 Slide the air filter out from the bottom of the fan tray. Gently pull the used air filter toward you to remove it from the fan tray (see Figure 6-2). The fan tray remains operational while you replace the air filter.

Figure 6-2 Removing Air Filter Door and Dirty Air Filter



Step 5 Hold the replacement air filter so that the air flow arrows on the end of the air filter face upward, as shown in Figure 6-3.

Figure 6-3 Installing the Replacement Air Filter



Step 6 Slide the filter into its slot at the bottom of the fan tray. (See Figure 6-3.)

Step 7 Place the air filter door back on the fan tray and tighten the three thumbscrews. (See Figure 6-3.)

Step 8 Discard the used air filter.

Replacing Fans in the Fan Tray

If a fan module is running too slowly or is no longer operational, an alarm is generated in the system management software. You will need to replace the nonoperational fan module. While you are replacing the nonoperational fan module, the operational fan modules continue to run. You can order a replacement fan module (part number 6100-FU-01=) through Cisco.

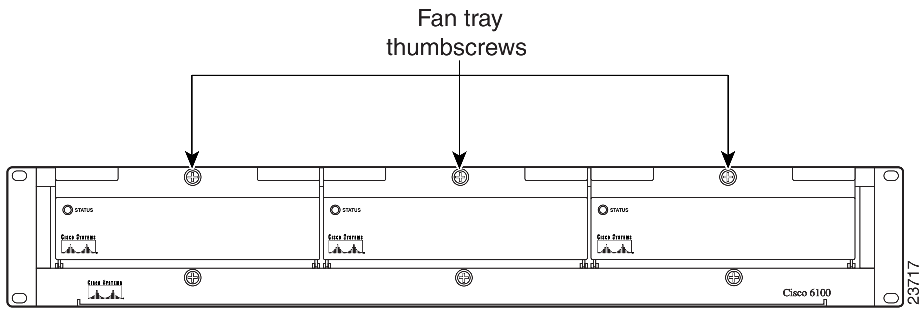
Warning **If you do not have a replacement fan available, pull all of the line cards away from the backplane connection and power off the system until a replacement fan module is available.**

To replace a fan module in the fan tray, complete the following steps:

Step 1 Using the slack in the cables in front of the fan tray, move the cables to the side of the fan tray so that the fan module can be removed and replaced.

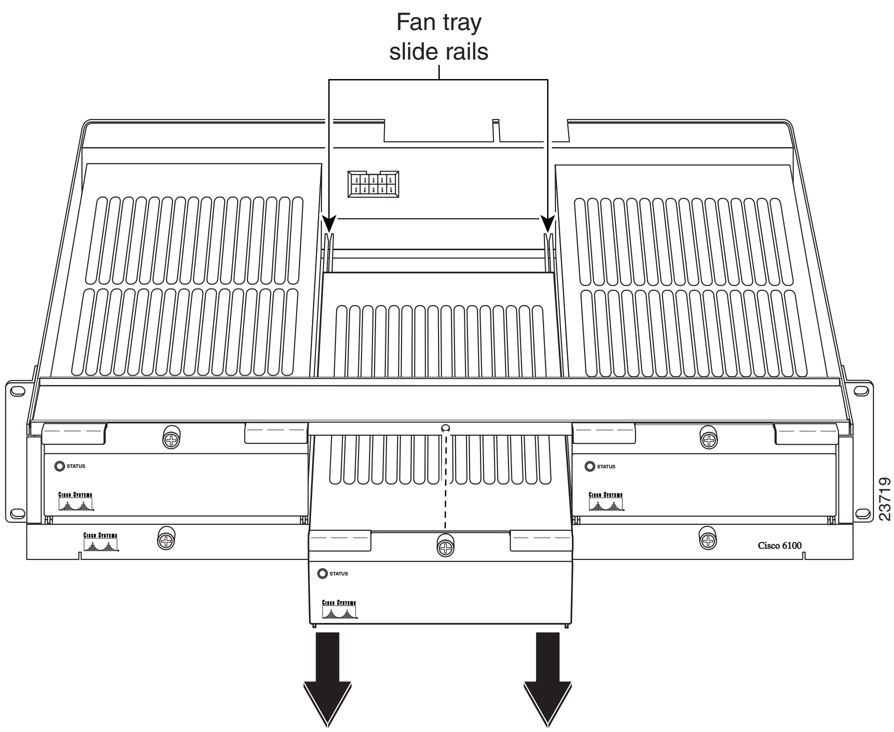
Step 2 Locate the fan module and unscrew the thumbscrew (the screw at the top of the fan module) that holds the fan module in place. (See Figure 6-4.)

Figure 6-4 Location of Fan Tray Thumbscrews



Step 3 Carefully remove the fan module by pulling it toward you. The fan module is located on slide rails for easy removal and installation. (See Figure 6-5.)

Figure 6-5 Removing the Fan Module from the Fan Tray



Caution It is important that the chassis cooling fans run continuously while the system is powered.

Step 4 Align the new fan module with the fan tray slide rails inside the fan tray.

Step 5 Slide the replacement fan module into the fan tray.

Step 6 Tighten the thumbscrew above the replacement fan module.

Step 7 Discard the used fan module.

Installing and Replacing Hardware

This section details the installation and removal procedures for the following field replaceable unit (FRU) hardware components:

- *x*TU-C line card
- Blank faceplate
- DS3/DS3 NI-2 card
- OC-3c/OC-3c NI-2 card
- System I/O card

Note See the "General Maintenance Guidelines" section on page 2-9 for installation and replacement practices for the Cisco 6130 with NI-2 system cards.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

See the "Preventing Electrostatic Discharge Damage" section on page 2-9 for ESD grounding jack location and procedures for the Cisco 6130 with NI-2 system.

xTU-C Line Card Installation and Removal

The following sections detail the installation and removal procedures for the *x*TU-C line card.

Installing an *x*TU-C Line Card

Complete the following steps to install the *x*TU-C line card in the chassis.

Note It is important that you complete each step before moving on to the next step.

Step 1 Connect a grounding strap to an ESD grounding jack.

Step 2 Open the front cover on the chassis, as necessary.

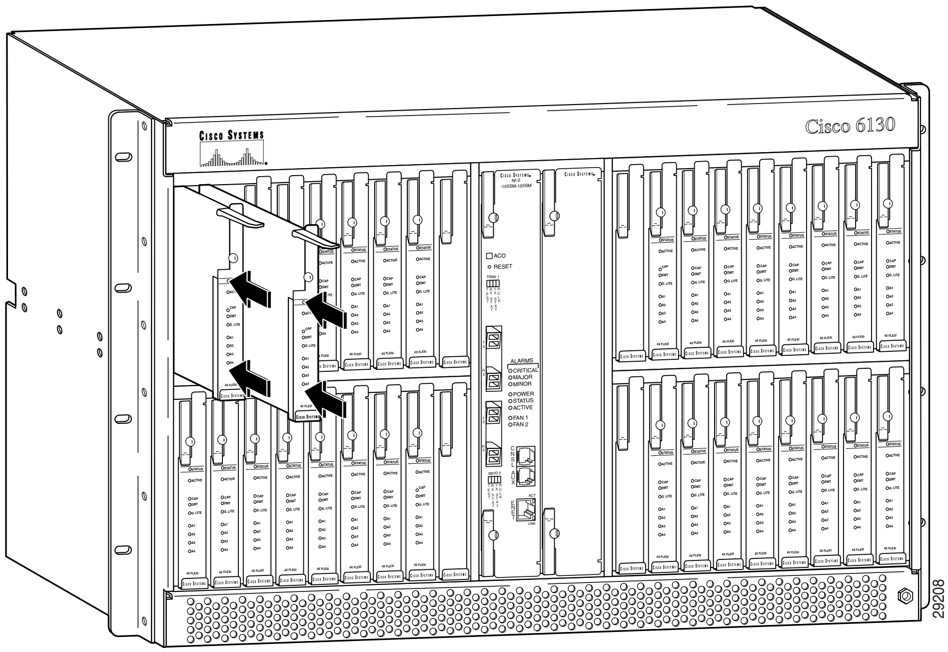
Step 3 Hold the *x*TU-C line card vertically, with the line card faceplate toward you and the connectors facing the chassis slot.

Step 4 Align the line card edges with the top and bottom guides of the chassis slot.

Step 5 Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the line card into the slot.

Figure 6-6 shows the line card installation for a Cisco 6130 chassis.

Figure 6-6 xTU-C Line Card Installation



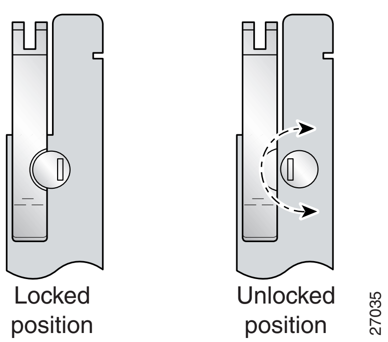
Step 6 Push on the faceplate of each line card to fully seat the line card.

Step 7 Press down on the locking lever to secure the line card and connect it to the backplane.

Step 8 Lock the line cards.

Use a flat-head screwdriver to turn the locking tab so that it overlaps the locking lever to prevent inadvertent dislodging. Figure 6-7 shows how to position the locking tab.

Figure 6-7 Positioning the Locking Tab for the xTU-C Line Card Installation and Removal



Step 9 Verify that the STATUS LED is solid green after the brief self-test. If the STATUS LED is not green after the self-test, see Chapter 5, "Troubleshooting" for troubleshooting procedures.

Note If you are installing the line card for the first time, refer to the provisioning procedures in the appropriate software guide for your chassis.

Removing an *x*TU-C Line Card

Complete the following steps to remove a *x*TU-C line card from the chassis:

Step 1 Connect a grounding strap to a ESD grounding jack.

Step 2 Open the front cover on the chassis, as necessary.

Step 3 Use a flat-head screwdriver to move the locking tab from the locked to the unlocked position. Be sure to turn the locking tab so that it does not overlap the locking lever, as shown in Figure 6-7.

Step 4 Lift up on the locking lever. This action disconnects the line card from the backplane.

Step 5 Carefully slide the line card out of the slot.

Either replace the line card that you remove, or insert a blank faceplate in the empty slot. See the "Installing an xTU-C Line Card" section on page 6-6 for 4xflexi installation instructions. For blank faceplate installation instructions, see the "Installing a Blank Faceplate" section on page 6-8.

Note Blank faceplates should occupy any empty slots in the chassis.

Blank Faceplate Installation and Removal

Blank faceplates should occupy any empty line card slots in the Cisco 6130 chassis. Blank faceplate installation is similar to line card installation.

The following sections detail the installation and removal procedures for a blank faceplate.

Installing a Blank Faceplate

Complete the following steps to install a blank faceplate in the Cisco 6130 chassis:

Step 1 Connect a grounding strap to a ESD grounding jack.

Step 2 Open the front cover on the chassis, as necessary.

Step 3 Vertically align the blank faceplate edge with the top and bottom guides of the chassis slot.

Step 4 Lift up on the locking lever and gently apply pressure to the bottom of the faceplate while pushing the blank faceplate into the slot.

Step 5 Push on the faceplate to fully seat the blank faceplate.

Step 6 Press down on the locking lever to secure the faceplate.

Removing a Blank Faceplate

Complete the following steps to remove a blank faceplate from the Cisco 6130 chassis:

Step 1 Connect a grounding strap to a ESD grounding jack.

Step 2 Open the front cover on the chassis, as necessary.

Step 3 Lift up on the locking lever. This action disconnects the line card from the backplane.

Step 4 Carefully slide the line card out of the slot.

Either replace the blank faceplate that you remove, or insert a line card in the empty slot. See the “Installing a Blank Faceplate” section on page 6-8 for blank faceplate installation procedures. For line card installation procedures, see the “Installing an xTU-C Line Card” section on page 6-6.

DS3/2DS3 NI-2 Card Installation and Removal

The following sections detail the installation and removal procedures for the DS3/2DS3 NI-2 card.

Warning **The ports labeled "ENET," "CNSL," and "AUX" are SELV circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the TNV circuits.**

Tip Cisco recommends that you label each data cable at both ends to identify its destination.

Caution Service is interrupted for the entire system when the NI-2 card is removed.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Caution Installing the cards in the chassis with the power leads reversed can damage the cards.

Warning **The power supply circuitry for the Cisco DSLAM equipment can constitute an energy hazard. Before you install or replace the equipment, remove all jewelry (including rings, necklaces, and watches). Metal objects can come into contact with exposed power supply wiring or circuitry inside the DSLAM equipment. This could cause the metal objects to heat up and cause serious burns or weld the metal object to the equipment.**

Warning **Do not reach into a vacant slot or chassis while you install or remove a line card or a fan. Exposed circuitry could constitute an energy hazard.**

Note All cards must be fully seated in the chassis. A push on the faceplate of each card is required for the card to be fully seated.

Installing a DS3/2DS3 NI-2 Card

Complete the following steps to install a DS3/2DS3 NI-2 card in the chassis. It is important that you accomplish each step completely before moving on to the next step.

Step 1 Connect a grounding strap to a ESD grounding jack.

Step 2 Open the front cover on the chassis, as necessary.

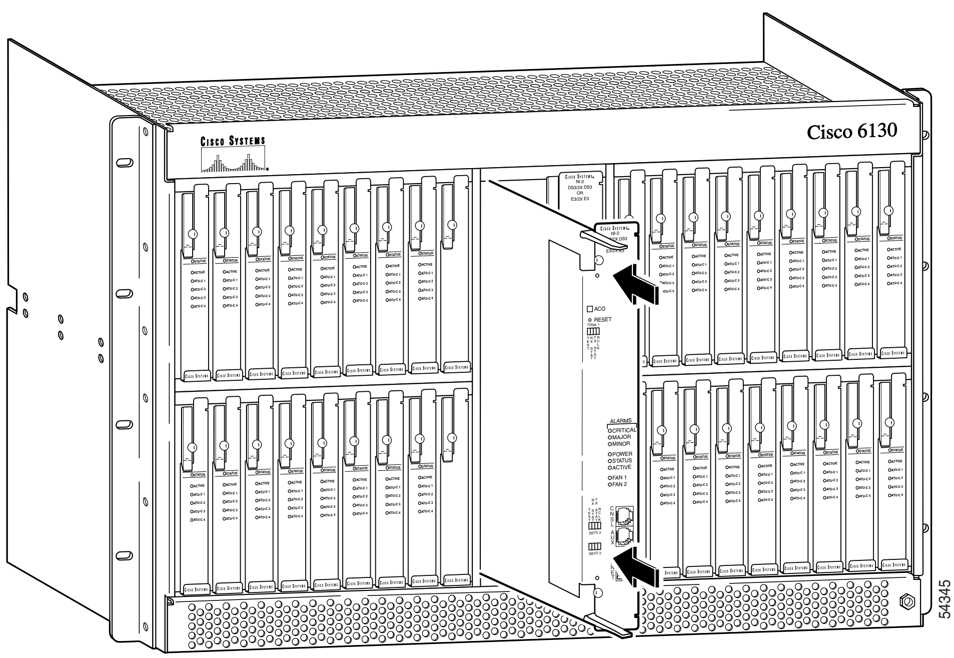
Step 3 Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.

Step 4 Verify that slot 10 or slot 11 of the chassis has no bent pins.

Step 5 Vertically align the card edge with the top and bottom guides of the chassis slot.

Figure 6-8 shows the NI-2 card installation in slot 10 of a Cisco 6130 chassis, but the installation procedure for installing an NI-2 card in slot 11 is the same.

Figure 6-8 NI-2 Card Installation



Step 6 Lift up on the locking levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

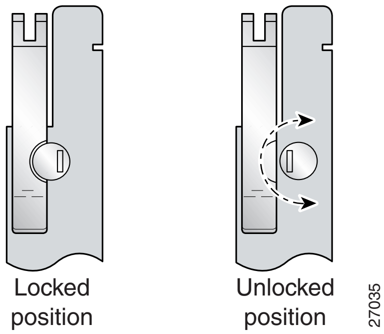
Step 7 Push on the faceplate of the card to fully seat it.

Step 8 Press down on the locking levers to secure the card and connect it to the backplane.

Step 9 Lock both NI-2 card locking tabs.

Use a flat-head screwdriver to turn the locking tabs so that they overlap the locking levers to prevent inadvertent dislodging, as shown in Figure 6-9.

Figure 6-9 Locking the NI-2 Card



Step 10 Verify that the STATUS LED on the NI-2 card is solid green (where applicable).

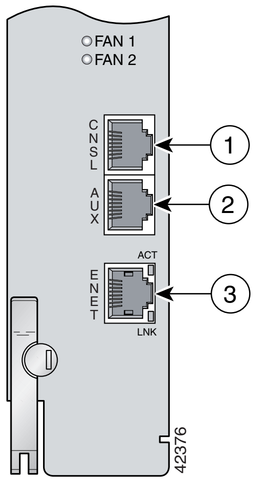
The power-on self-test procedure may take several minutes. If the STATUS LED is not green after the self-test, see the "NI-2 Card Problems" section on page 5-6.

Perform a software update if the STATUS LED on the NI-2 card is flashing. Refer to the *Configuration Guide for Cisco DSLAMs with NI-2* for software upgrade procedures.

Note The network connection to the ATM switch and the subtending connections are done from the system I/O card or I/O module. For more information on these connection procedures, see one of the following sections: the "Locate or Install the System I/O Card" section on page 3-20 for a Cisco 6130 chassis with POTS splitter, or the "Locate or Install the System I/O Card" section on page 4-17 for a Cisco 6130 chassis without a POTS splitter.

Step 11 Connect the 10BaseT RJ-45 receptacle connector on the NI-2 card (ENET) and the management network (for example, LAN). Figure 6-10 shows where to connect the Ethernet cable.

Figure 6-10 ENET, CNSL, and AUX RJ-45C Receptacles on the NI-2 Card



Step 12 Connect a VT100-compatible terminal to the system console port on the NI-2 card (CNSL). Connect the terminal to a power source and set it up using the values that are shown in Table 6-1. Figure 6-10 shows where to connect the console cable.

Table 6-1 Terminal Settings

Baud rate	9600 (transmit and receive)
Character size	8 bits
Parity	None
Stop bits	1
Flow control	None

Step 13 Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary port on the NI-2 card (AUX). Figure 6-10 shows where to connect the auxiliary cable.

Note This step is optional.

Step 14 Close the front cover on the chassis, as necessary.

Removing a DS3/2DS3 NI-2 Card

Complete the following steps to remove a DS3/2DS3 NI-2 card from the chassis:

Step 1 Connect a grounding strap to a ESD grounding jack.

Step 2 Open the front cover on the chassis as necessary.

Step 3 Disconnect the RJ-45 auxiliary port on the NI-2 card (AUX).

Step 4 Disconnect the VT100-compatible terminal from the system console port on the NI-2 card (CNSL).

Step 5 Disconnect the 10BaseT RJ-45 receptacle connector on the NI-2 card (ENET).

Step 6 Use a flat-head screwdriver to move the locking tabs from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the locking levers, as shown in Figure 6-9.

Step 7 Lift up on the locking levers. This action disconnects the card from the backplane.

Step 8 Carefully slide the card out of the slot.

See the "Installing a DS3/2DS3 NI-2 Card" section on page 6-10 for NI-2 card installation procedures.

Note The network connection to the ATM switch and the subtending connections are done from the system I/O card. For more information on these connection procedures, see the appropriate installation chapter.

OC-3c/OC-3c NI-2 Card Installation and Removal

The following sections detail the installation and removal procedures for the OC-3c/OC-3c NI-2 card.

Warning **The ports labeled "ENET," "CNSL," and "AUX" are SELV circuits. SELV circuits should be connected only to other SELV circuits. Because the DSL circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the TNV circuits.**

Tip Cisco recommends that you label each data cable at both ends to identify its destination.

Caution Service is interrupted for the entire system when the NI-2 card is removed.

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Caution Installing the cards in the chassis with the power leads reversed can damage the cards.

Warning **The power supply circuitry for the Cisco DSLAM equipment can constitute an energy hazard. Before you install or replace the equipment, remove all jewelry (including rings, necklaces, and watches). Metal objects can come into contact with exposed power supply wiring or circuitry inside the DSLAM equipment. This could cause the metal objects to heat up and cause serious burns or weld the metal object to the equipment.**

Warning **Do not reach into a vacant slot or chassis while you install or remove a line card or a fan. Exposed circuitry could constitute an energy hazard.**

Warning **Do not stare into the beam or view it directly with optical instruments.**

Note All cards must be fully seated in the chassis. A push on the faceplate of each card is required for the card to be fully seated.

Installing an OC-3c/OC-3c NI-2 Card

Complete the following steps to install an OC-3c/OC-3c NI-2 card in the chassis. It is important that you complete each step before moving on to the next step.

Step 1 Connect a grounding strap to an ESD grounding jack.

Step 2 Open the front cover on the chassis, as necessary.

Step 3 Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.

Step 4 Verify that slot 10 or slot 11 of the chassis has no bent pins.

Step 5 Vertically align the card edge with the top and bottom guides of the chassis slot.

Figure 6-8 shows the NI-2 card installation in slot 10 of a Cisco 6130 chassis, but the installation procedure for installing an NI-2 card in slot 11 is the same.

Step 6 Lift up on the locking levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

Step 7 Push on the faceplate of each card to fully seat the card.

Step 8 Press down on the locking levers to secure the card and connect it to the backplane.

Step 9 Lock both NI-2 card locking tabs.

Use a flat-head screwdriver to turn the locking tabs so that they overlap the locking levers to prevent inadvertent dislodging, as shown in Figure 6-9.

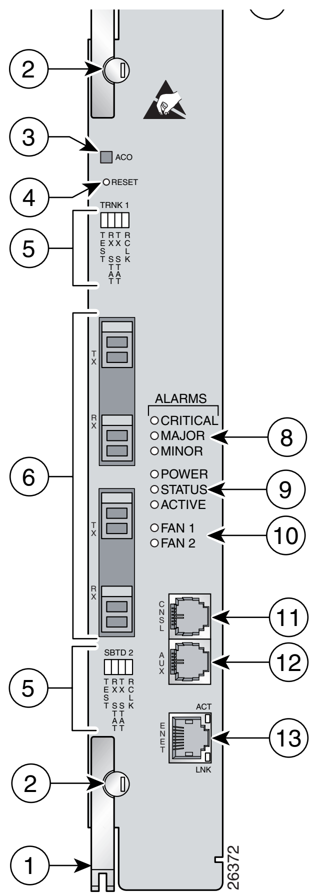
Step 10 Verify that the STATUS LEDs on all cards are solid green (where applicable).

This self-test procedure takes several minutes. If the STATUS LEDs are not green after the self-test, see Chapter 5, "Troubleshooting" for troubleshooting procedures.

Step 11 Pull the OC-3c/OC-3c NI-2 card transmit and receive fiber-optic cables from the ATM switch through the 1 RU of space under the fan tray.

Step 12 Attach the receive cable from the ATM switch to the transmit connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card (trunk 1 interface connector TX). See Figure 6-11 for the OC-3c network interface connection location.

Figure 6-11 OC-3c Network Interface Connection



The transmit connector is the one closest to the top of the faceplate. The receive connector is closest to the bottom of the faceplate. The connector IDs are silkscreened inside the inset.

Step 13 Attach the transmit cable from the ATM switch to the receive connector in the inset on the faceplate of the OC-3c/OC-3c NI-2 card (trunk 1 interface connector RX). See Figure 6-11 for the OC-3c network interface connection location.

Step 14 Allow enough slack in the cable so that the fan tray can be opened and the fan modules can be maintained.

Step 15 Coil the fiber loosely within the 1 RU of space to take out slack.

Note To cable the chassis for OC-3c subtending, see one of the following sections: the “Cable the OC-3c Subtending Network Configuration” section on page 3-44 for a Cisco 6130 chassis with a POTS splitter, or the “Cable the OC-3c Subtending Network Configuration” section on page 4-39 for a Cisco 6130 chassis without a POTS splitter.

Step 16 Connect the 10BaseT RJ-45 receptacle connector on the NI-2 card (ENET) to the management network (for example, LAN). Figure 6-10 shows where to connect the Ethernet cable.

Step 17 Connect a VT100-compatible terminal to the system console (CNSL) port on the NI-2 card. Connect the terminal to a power source and set it up using the values that are shown in Table 6-1. Figure 6-10 shows where to connect the console cable.

Step 18 Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary (AUX) port on the NI-2 card. Figure 6-10 shows where to connect the auxiliary cable.

Note This step is optional.

Step 19 Close the front cover on the chassis, as necessary.

Removing an OC-3c/OC-3c NI-2 Card

Complete the following steps to remove an OC-3c/OC-3c NI-2 card from the chassis:

Step 1 Connect a grounding strap to a ESD grounding jack.

Step 2 Open the front cover on the chassis as necessary.

Step 3 Disconnect the RJ-45 auxiliary port on the NI-2 card (AUX).

Step 4 Disconnect the VT100-compatible terminal from the system console port on the NI-2 card (CNSL).

Step 5 Disconnect the 10BaseT RJ-45 receptacle connector on the NI-2 card (ENET).

Step 6 Disconnect the receive cable from the transmit connector in the inset on the faceplate of the NI-2 card (trunk 1 interface connector TX).

Step 7 Disconnect the transmit cable from the receive connector in the inset on the faceplate of the NI-2 card (trunk 1 interface connector RX).

Step 8 Disconnect the RX subtend 2 interface connector in the inset on the faceplate of the NI-2 card, as necessary.

Step 9 Disconnect the TX subtend 2 interface connector in the inset on the faceplate of the NI-2 card, as necessary.

Step 10 Use a flat-head screwdriver to move the locking tabs from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the locking levers, as shown in Figure 6-9.

Step 11 Lift up on the locking levers. This action disconnects the card from the backplane.

Step 12 Carefully slide the card out of the slot.

See the "Installing an OC-3c/OC-3c NI-2 Card" section on page 6-14 for NI-2 card installation procedures.

System I/O Card Installation and Removal

The following sections detail the installation and removal procedures for the system I/O card.

Installing a System I/O Card

Complete the following steps to install the system I/O card in the chassis backplane.

Note It is important that you complete each step before moving on to the next step.

Caution Static voltages as low as 30 volts can cause latent damage to circuitry on the system I/O card. Be sure to observe all standard antistatic procedures (for example, wear a grounding strap).

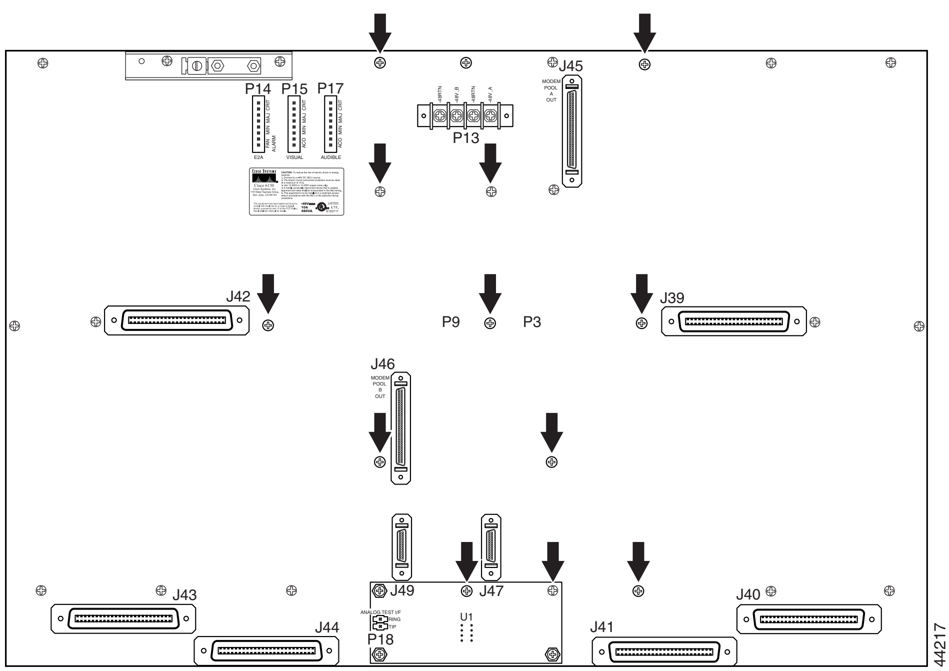
Step 1 Connect a grounding strap to an ESD grounding jack.

Step 2 Open the rear cover on the chassis, as necessary.

Step 3 Remove the fuses from the fuse and alarm panel. By removing the fuses, the system is not powered while you install and connect the system I/O card.

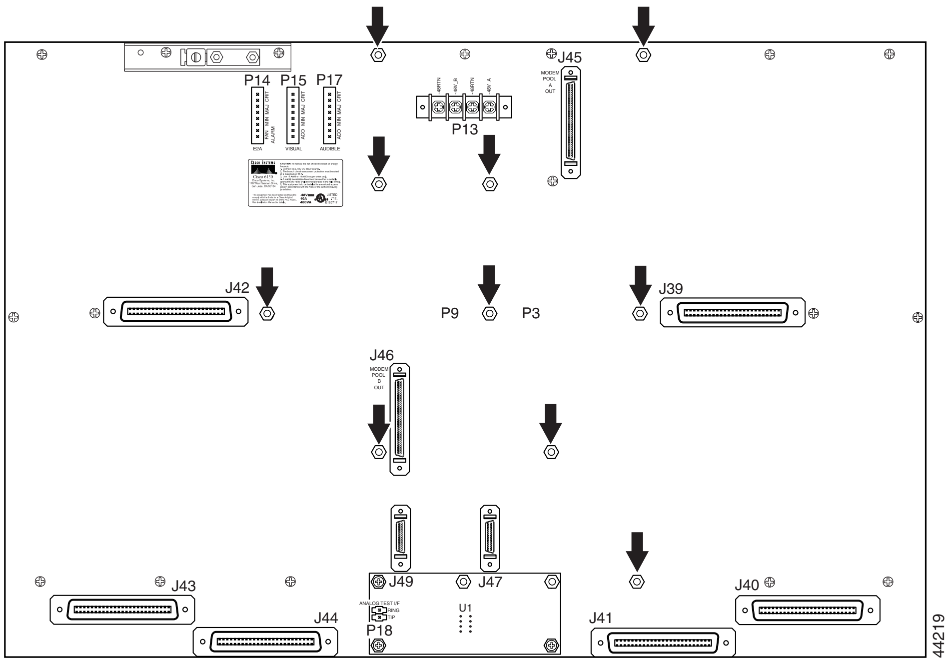
Step 4 Locate the twelve backplane screws shown in Figure 6-12. Use a Phillips-head screwdriver to remove the backplane screws. Keep these backplane screws for use when you install the system I/O card.

Figure 6-12 Backplane Screw Location for System I/O Card Installation



Step 5 Use a 1/4 inch socket driver or wrench to screw ten standoff screws into the locations formerly occupied by ten of the twelve screws that you removed in Step 4. Tighten the standoff screws using the 1/4 inch socket driver or wrench. See Figure 6-13 for standoff screw location.

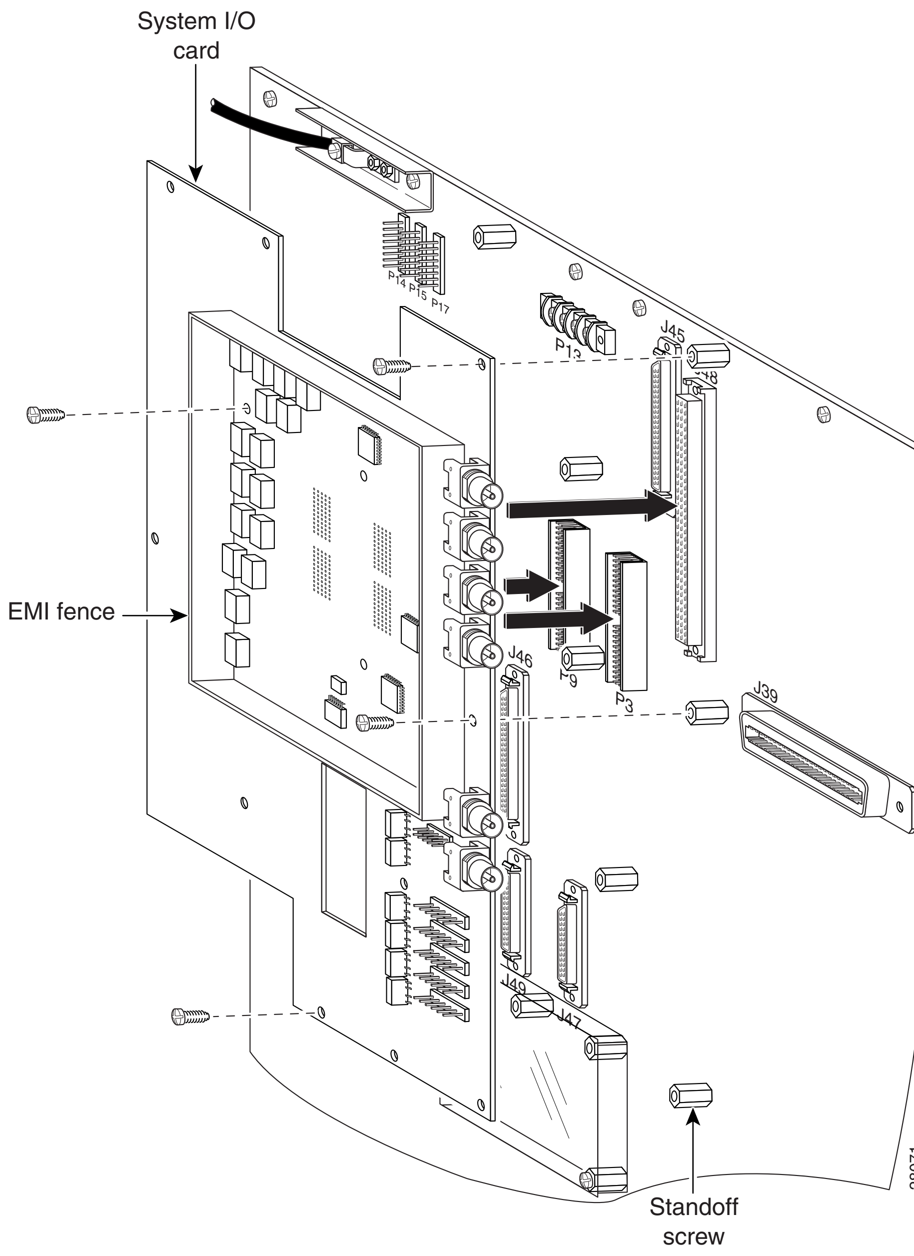
Figure 6-13 Standoff Screw Location for System I/O Card Installation



Caution Be careful not to damage backplane circuitry when you remove and reinsert the standoff screws on the backplane.

Step 6 Hold the system I/O card vertically and align the holes on the system I/O card over the twelve standoff screws, as shown in Figure 6-14.

Figure 6-14 System I/O Card Installation

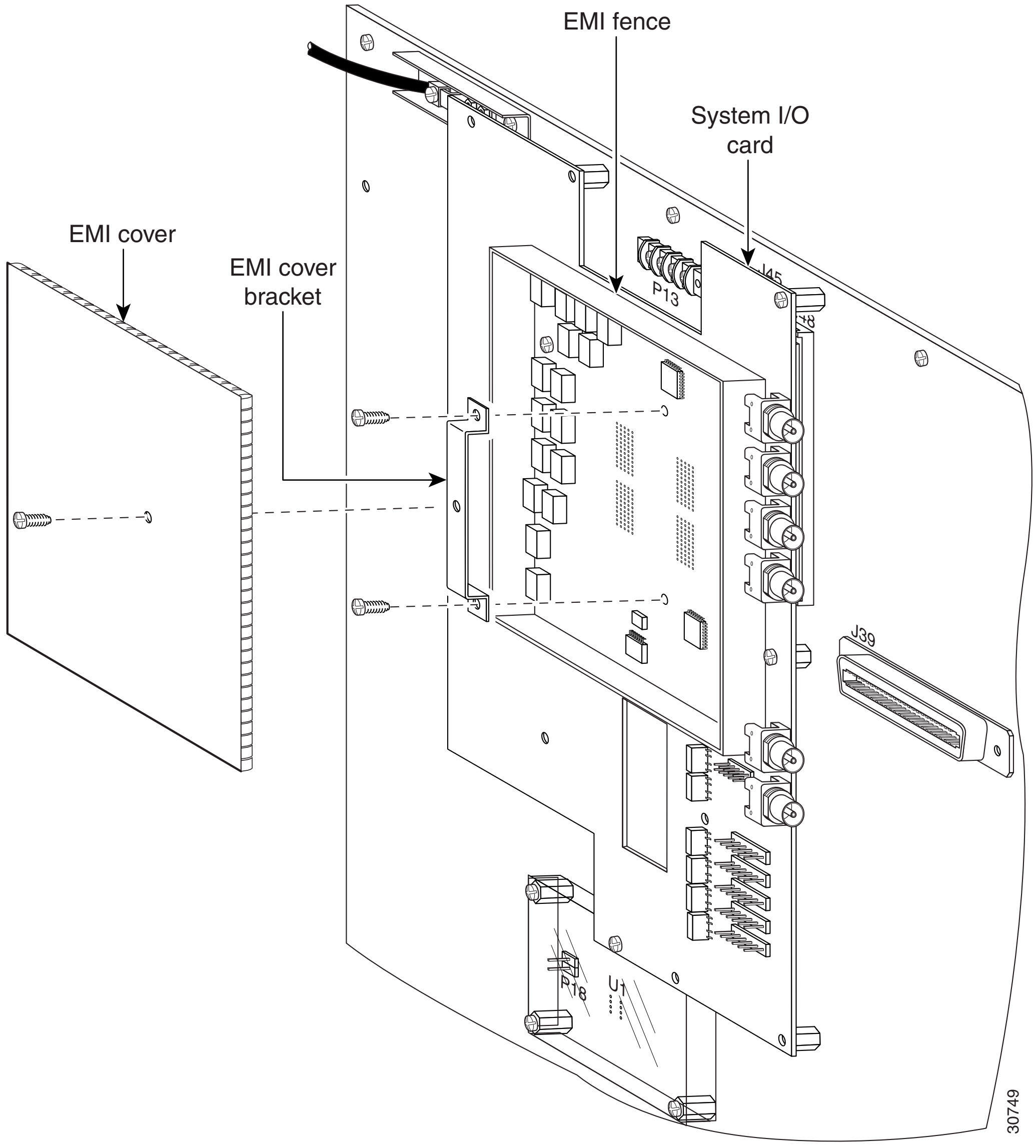


Step 7 Carefully press the system I/O card onto the Cisco 6130 with NI-2 connectors P3 and P9 on the chassis backplane until the system I/O card is in place and against the standoff screws.

Step 8 Use a Phillips-head screwdriver and four backplane screws to attach the system I/O card to the standoff screws, as shown in Figure 6-14.

Step 9 Use a Phillips-head screwdriver and two backplane screws to attach the EMI cover bracket, as shown in Figure 6-15.

Figure 6-15 EMI Cover Installation



Step 10 Attach the EMI cover on the EMI fence, as shown in Figure 6-15.

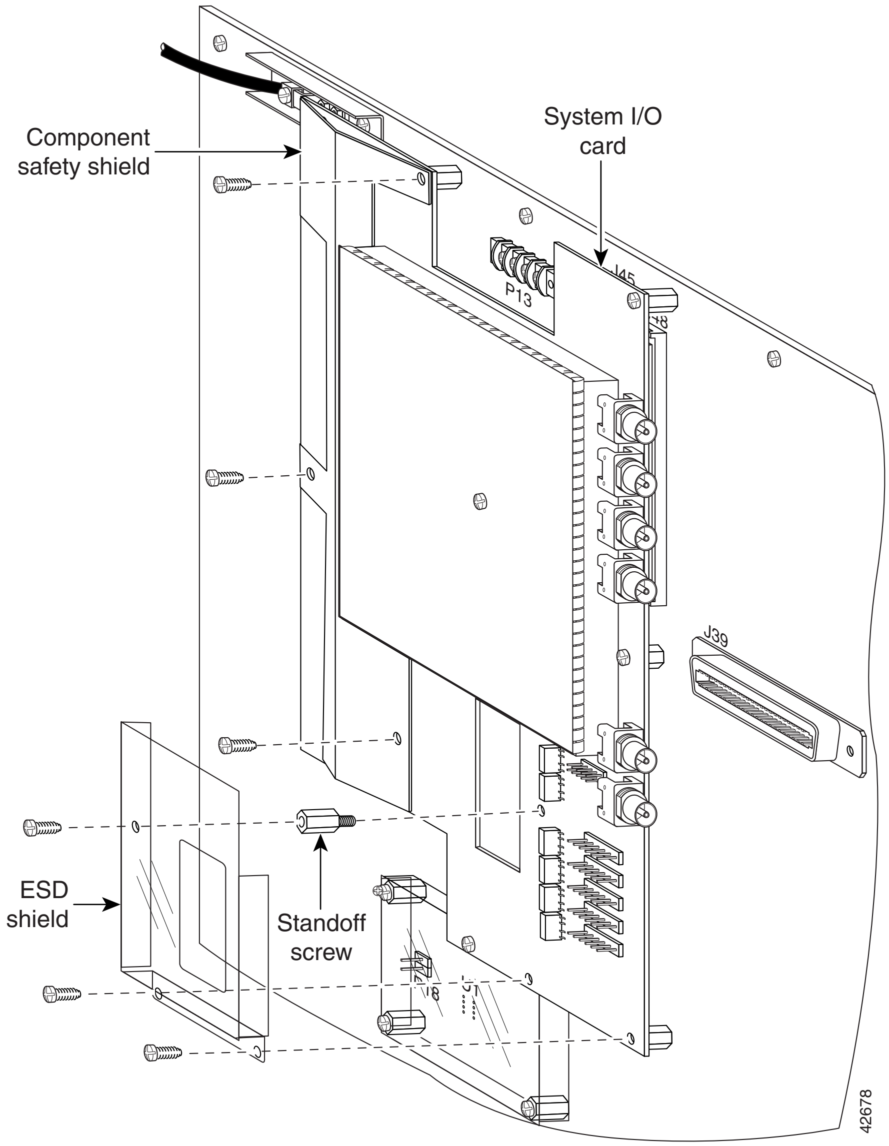
Caution Be careful not to bend the tabs on the EMI cover when you install the cover on the EMI fence.

Step 11 Verify that no EMI cover tabs are outside the EMI fence.

Step 12 Use a Phillip-head screwdriver and a screw to attach the EMI cover to the EMI cover bracket, as shown in Figure 6-15.

Step 13 Use a Phillips-head screwdriver and three backplane screws to attach the safety shield to the left side of the system I/O card, as shown in Figure 6-16. The backplane screws will screw into the existing standoff screws on the backplane.

Figure 6-16 Safety Shield and ESD Shield Installation



Step 14 Use a 1/4 inch socket driver or wrench to screw a standoff screw between relays K4 and K5, as shown in Figure 6-16. Tighten the standoff screws using the 1/4 inch socket driver or wrench.

Step 15 Place the ESD shield above the standoff screw that you installed in Step 14 so that the hole in the shield aligns with the standoff screw, as shown in Figure 6-16.

Step 16 Use a Phillips-head screwdriver and three backplane screws to attach the plastic ESD shield to the system I/O card (see Figure 6-16).

Step 17 If you are not cabling the system I/O card for DS3 subtending, reinstall the fuse and alarm panel fuses and close the optional rear cover, as necessary.

Step 18 If you are cabling the system I/O card for DS3 subtending, complete the following steps:

Note The system I/O card BNC cables are not provided by Cisco.

a. On the subtending host chassis backplane, attach one end of a BNC cable to the transmit DS3 BNC connector (J10) on the system I/O card.

b. On the first subtended node chassis backplane, attach the end of the BNC cable used in a. to the receive DS3 BNC connector (J12) on the system I/O card.

c. On the subtending host chassis backplane, attach one end of a BNC cable to the receive DS3 BNC connector (J8) on the system I/O card.

d. On the first subtended node chassis backplane, attach the end of the BNC cable used in c. to the transmit DS3 BNC connector (J14) on the system I/O card.

e. On the subtending host chassis backplane, attach one end of a BNC cable to the transmit DS3 BNC connector (J6) on the system I/O card.

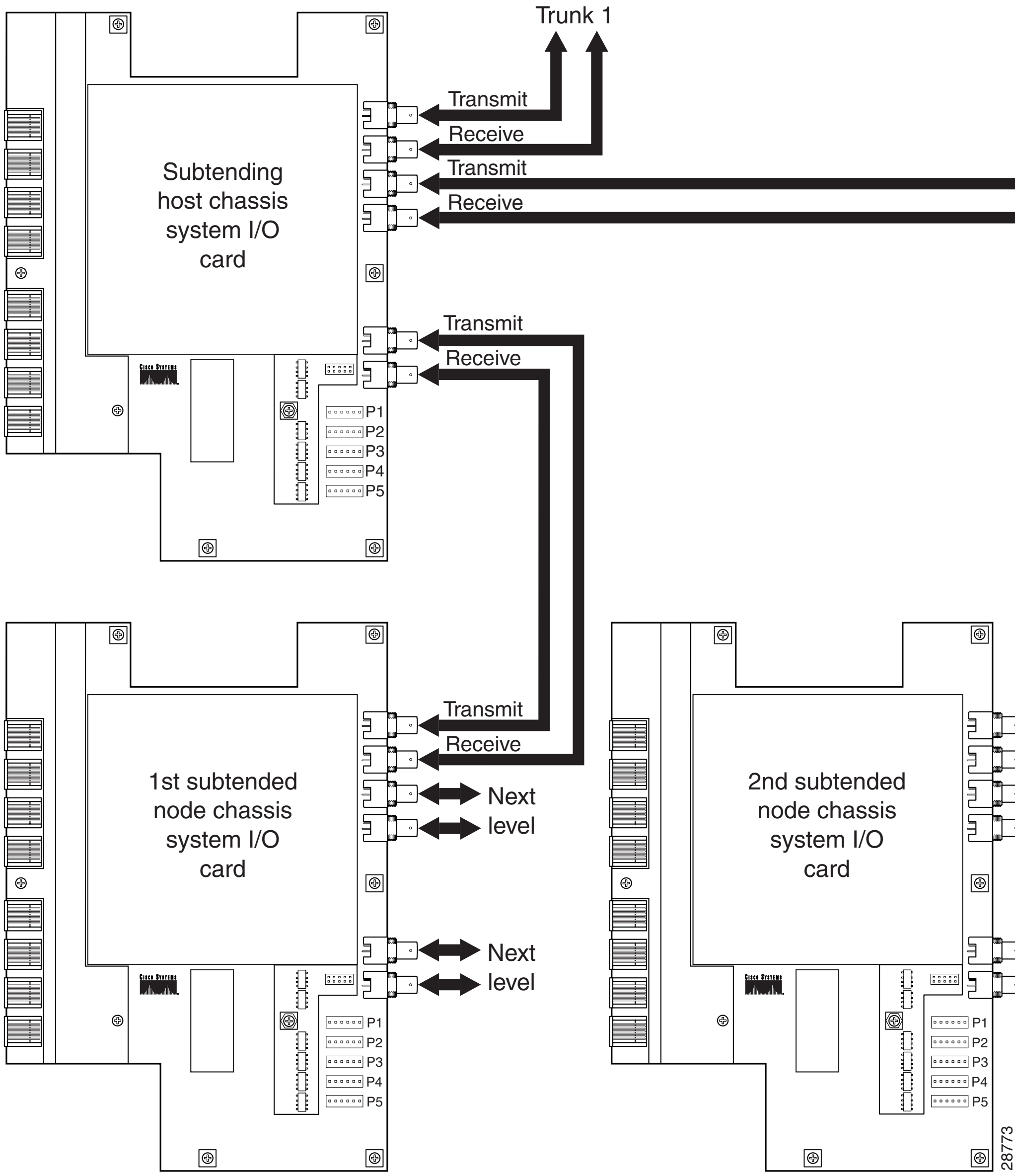
f. On the second subtended node chassis backplane, attach the end of the BNC cable used in e. to the receive DS3 BNC connector (J12) on the system I/O card.

g. On the subtending host chassis backplane, attach one end of a BNC cable to the receive DS3 BNC connector (J4) on the system I/O card.

h. On the second subtended node chassis backplane, attach the end of the BNC cable used in g. to the transmit DS3 BNC connector (J14) on the system I/O card.

Figure 6-17 shows the cabling for a DS3 subtending network configuration.

Figure 6-17 Cabling for DS3 Subtending Configuration



i. Close the optional rear cover, as necessary.

j. Reinstall the fuse and alarm panel fuses.

Removing a System I/O Card

Complete the following steps to remove the system I/O card from the chassis backplane:

Caution Static voltages as low as 30 volts can cause latent damage to circuitry on the system I/O card. Be sure to observe all standard antistatic procedures (for example, wear a grounding strap).

Step 1 Connect a grounding strap to an ESD grounding jack.

Step 2 Open the rear cover on the chassis, as necessary.

Step 3 Remove the fuses from the fuse and alarm panel. By removing the fuses, the system is not powered while you install and connect the system I/O card.

Step 4 If they are present, mark and disconnect all BNC coaxial cables at system I/O card receptacles J4, J6, J8, J10, J12, and J14.

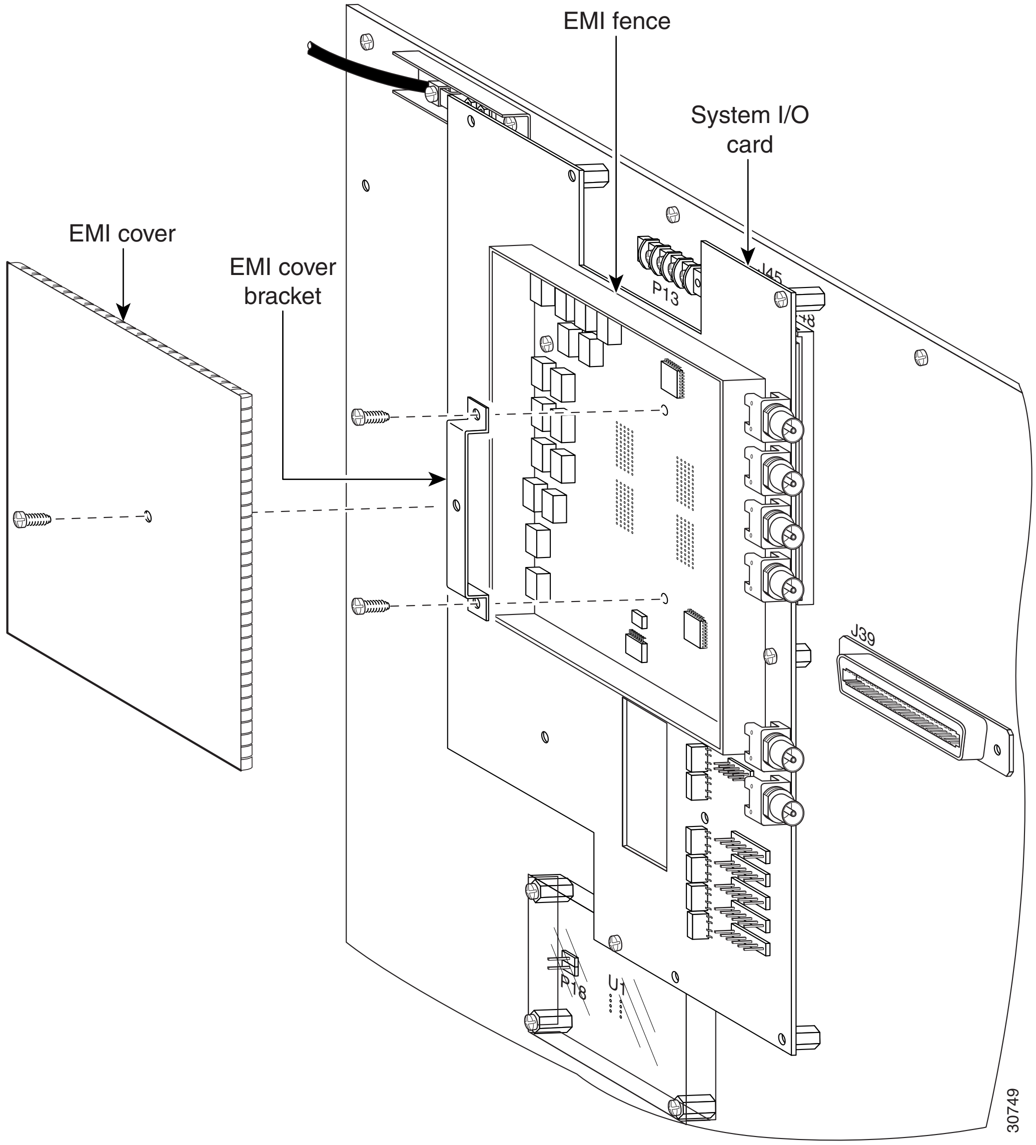
Step 5 If they are present, mark and disconnect all wires at the system I/O card wire-wrap header pins.

Step 6 Remove the screw at the center of the EMI cover.

Step 7 Remove the EMI cover.

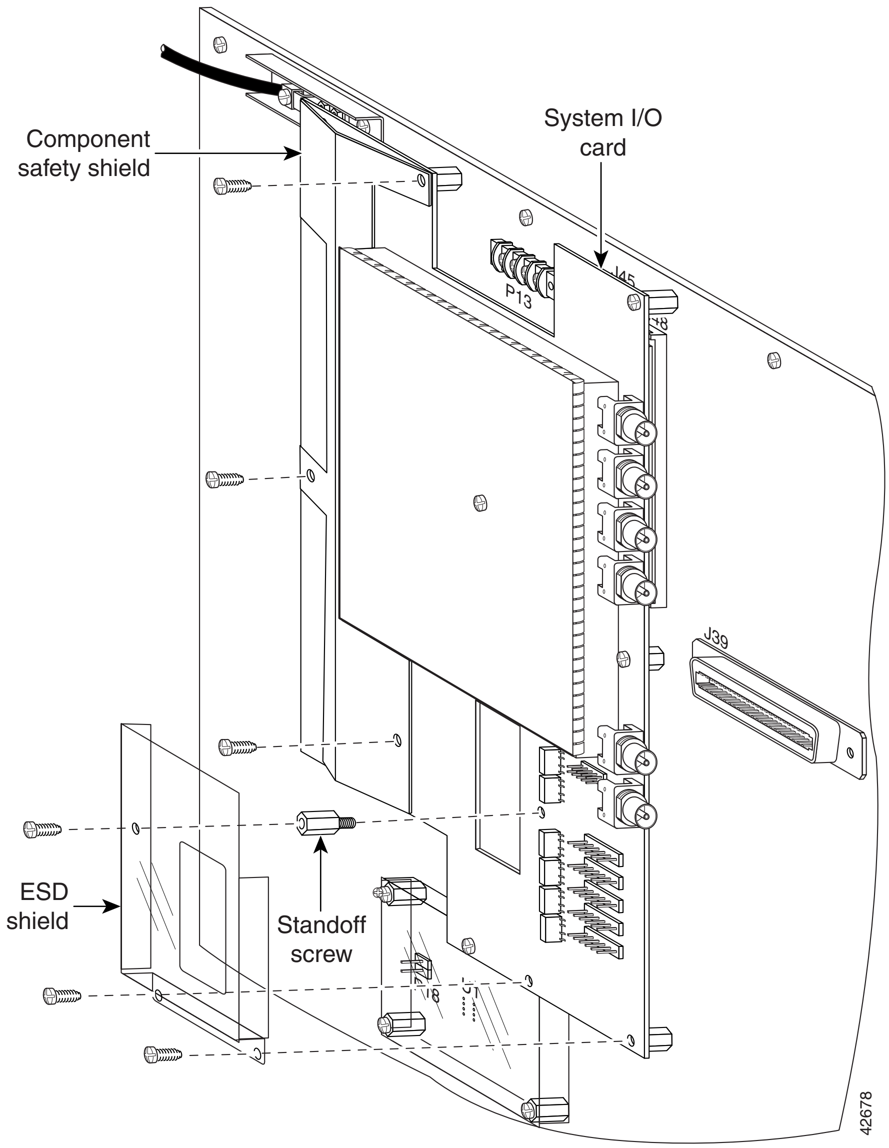
Step 8 Remove the two EMI cover bracket screws and the EMI cover bracket. (See Figure 6-18.)

Figure 6-18 EMI Cover Removal



Step 9 Remove the six screws at the center of the system I/O card ESD shield, and also remove the component safety shield and the ESD shield. (See Figure 6-19.)

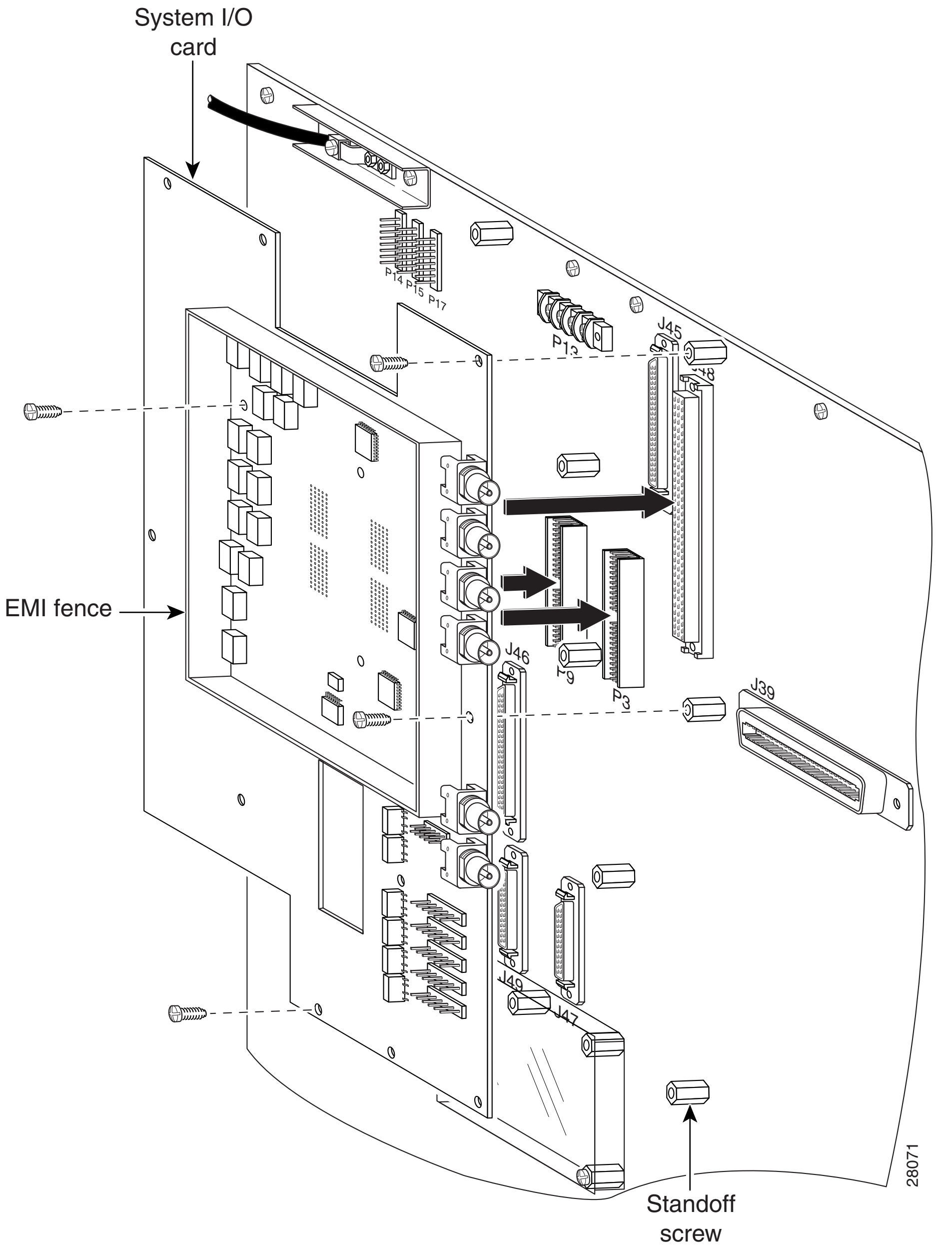
Figure 6-19 Safety Shield and ESD Shield Removal



Step 10 Remove the standoff screw from which the ESD shield screw was removed.

Step 11 Use a Phillips-head screwdriver to remove the four screws shown in Figure 6-20.

Figure 6-20 System I/O Card Removal



Step 12 Carefully pull the system I/O card away from connectors P3 and P9.

Step 13 Place the system I/O card in an antistatic bag or in a box lined with antistatic material.

Step 14 Store removed screws, covers, and shields in a safe place for reinstallation. For installation procedures, see the “Installing a System I/O Card” section on page 6-17.

CHAPTER 7

Testing Configuration Connections for the Cisco 6130 with NI-2 System

This chapter provides the test procedures to ensure that your Cisco 6130 with NI-2 system is connected correctly and is properly communicating with the system management software.

In this chapter, you will test the system connections by completing the following procedures:

- Testing System Connectivity, page 7-2
- Testing PPP Connectivity, page 7-3

Caution Proper ESD protection is required whenever you handle Cisco equipment. Installation and maintenance personnel should be properly grounded using ground straps to eliminate the risk of ESD damage to the equipment. Cards are subject to ESD damage whenever they are removed from the chassis.

Required Equipment

To run the tests described in this chapter, you need the following tools and equipment:

- Crossover Ethernet cable
- Terminal emulator (for example, ProComm Plus or HyperTerminal)
- Appropriate customer premises equipment (CPE) device (optional)
  - Cisco 675 for quad-port flexi ATU-C line cards (4xflexis) configured as CAP
  - Cisco 677 for 4xflexis configured as DMT
  - Cisco 678 for 4xflexis configured as CAP or DMT
- Cable (optional—see Appendix B, “Cable and Port Mapping Specifications” for cable information)
- Punch-down tool (optional)
- 66 block to RJ-11 jumper (optional)
- Necessary equipment for ESD protection—Required whenever you handle Cisco DSLAM equipment, which includes the chassis, modules, and cards

Testing System Connectivity

This system connectivity test is a method for testing connectivity between the Cisco 6130 with NI-2 system and the MDF for all *x*TU-C ports in the system. This test is also known as a Zing Test.

Note The system connectivity test is optional. The Cisco 675 and Cisco 678 are the only CPE devices that can perform bit error rate (BER) testing.

Complete the following steps to test system connectivity:

Step 1 Attach the CPE device to the first wire pair on the subscriber side of the MDF.

If you use 66-type punchdown blocks, you can make the connection by using a cable with alligator clips on one end and an RJ-11 connector on the other. Depending on the type of MDF that you are using, a different cabling configuration can be required.

Step 2 Loop back the network interface port.

For a DS3/2DS3 NI-2 card, attach a short coaxial cable between the DS3 transmit and receive connectors to loop back the interface. For an OC-3c/OC-3c NI-2 card, use a short multimode or single-mode fiber to loop back the interface.

Step 3 Train the CPE device to the first modem port on the Cisco 6130 chassis.

Step 4 To perform a BER test on the line, complete these steps:

a. Log in to the CPE device using an Ethernet or serial port.

b. Enter **enable debug commands**.

c. Enter **int wan0 stay**.

Note This command prevents the CPE device from trying to retrain, although the command does not recognize far-end terminating equipment.

d. Enter **debug bert on**.

This command initiates the Bit Error Rate (BER) test.

e. Enter **debug bert header 00100011**.

This command sets the header bits of the outgoing cells and qualifies the incoming cells. See Table 7-1 for a description of the bit fields.

Table 7-1 Bit Field Description

7	6	5	4	3	2	1	0
GFC				VPI			
VPI				VCI			
VCI				VCI			
VCI				PTI			CLP
Example: VPI=1, VCI=1 (GFC=0, PTI=0, CLP=0) across the ADSL loop: NSOS>debug bert header 00100010 <Enter>							

f. Enter **debug bert count**.

This step displays a count of the BER test errors and cell loss since the previous query. The first number reported is the number of cells with sequence errors. The second number is the number of cells with bit errors.

Note The meaning for each of the top two LEDS on the CPE device changes during the BER test. The BERT SYNC LED (WAN LNK) is illuminated once the CPE device detects a valid BER test pattern. The BERT ERROR LED (WAN ACT) is toggled whenever the CPE device detects a BER test error. During a successful BER test, the WAN LNK LED is illuminated. The WAN ACT LED is solid (either off or on, but not blinking).

g. Repeat Step 3 through Step 4g for the remaining 15 lines.

h. Repeat the entire Zing test (Step 1 through Step 4g) for the Champ connectors labeled for lines 16 through 32, 33 through 48, and 49 through 64.

Note In Step 4g and Step 4h, "lines" refers to the incoming wire pairs used for CPE connections.

Testing PPP Connectivity

This section provides instructions for testing point-to-point protocol (PPP) connectivity.

Note Testing PPP connectivity is optional. The Cisco 633 does not have PPP connectivity capabilities.

Step 1 Attach the CPE device to the first wire pair on the subscriber side of the MDF.

If you use 66-type punchdown blocks, you can make the connection by using a cable with alligator clips on one end and an RJ-11 connector on the other. A different cabling configuration may be required depending on the MDF type.

Step 2 Power on the CPE device.

Step 3 Verify that the PPP LCP and NCP states are open after the train. For all Cisco 6xx Series CPE equipment, the command for verification is **show ppp**. The exception is the Cisco 633, which has no PPP connectivity capabilities. For third-party CPE equipment, consult the documentation that came with the equipment.

Step 4 Move the RJ-11 jumper to the next punched line and repeat the procedure until you verify all punched lines.

APPENDIX A

Technical Specifications

This appendix provides the technical specifications for the Cisco 6130 with NI-2 system. The appendix contains the following sections:

- Hardware Specifications, page A-1
- Software Specifications, page A-7

Note For information on site and safety requirements, see Chapter 2, “Preparing for Installation.”

Hardware Specifications

This section details the specifications for the following hardware components:

- Cisco 6130 with NI-2 system
- Quad-port DMT ATU-C line card (4xDMT)
- Quad-port flexi ATU-C line card (4xflexi)
- Quad-port STU-C line card (4xSDSL)
- DS3/2DS3 NI-2 card
- OC-3c/OC-3c NI-2 card

Cisco 6130 with NI-2 System Specifications

Table A-1 lists the hardware specifications of the Cisco 6130 with NI-2 system.

Table A-1 Hardware Specifications

Specification		Description
Dimensions	Cisco 6130 Cisco 6120 Fan tray	9 RUs[1]—23 in. x 15.75 in. x 12 in. (58.42 cm x 40.005 cm x 30.48 cm) 4 RUs—23 in. x 7 in. x 12 in. (58.42 cm x 17.78 cm x 30.48 cm) 2 RUs—23 in. x 3.5 in. x 12 in. (58.42 cm x 8.89 cm x 30.48 cm)
Weight	Cisco 6130 Cisco 6120 Fan tray	Empty—approximately 31 lb (14.06 kg) Loaded—approximately 62 lb (28.12 kg) Empty—approximately 16 lb (7.26 kg) Loaded—approximately 34 lb (15.42 kg) Loaded—approximately 18.45 lb (8.37 kg)
Network interface		ATM OC-3c (single- or multimode fiber), ATM DS3
ADSL interface		CAP—Up to 7.168 Mbps downstream/1.088 Mbps upstream DMT—Up to 8.032 Mbps downstream/1024 kbps upstream G.lite—Up to 1.536 Mbps downstream/512 kbps upstream
SDSL interface		2B1Q encoding; up to 1168 kbps upstream and downstream
Craft interface		Console terminal connection on the NI-2 card
Management access		• RJ-45 interface for craft alarm discovery • RJ-45 Ethernet • ATM in-band management
External alarm contacts		Single dry contact alarm input (NO)
Power requirements		–48V DC **Note** See Chapter 2, "Preparing for Installation" for detailed power requirements.
CO operating requirements	Temperature Altitude Humidity	41 to 104ºF (5 to 40ºC)—Operating 23 to 163ºF (–5 to 50ºC)—Short term operating –60 meters to 3200 meters 5 to 90% (noncondensing)
Subtending		NI-2 card
Redundancy		NI-2 card and APS[2]

1. RU = rack unit. An RU is equal to 1.75 inches (4.45 cm).
2. APS = automatic protection switching.

4xDMT Specifications

Table A-3 lists the specifications for the 4xDMT.

Table A-2 4xDMT Specifications

Specification	Description
Standards supported	ITU G.dmt ITU G.lite ANSI T1.413 Issue 2
External interfaces	4 (no connectors on card)
Data rates (per port)	Upstream: Up to 864 kbps Downstream: Up to 8.032 Mbps
Internal hardware	• 18 MHz AM186ESLV.2 CPU • AD20msp918 DMT modem chipset • 128 KB SRAM • 256K x 16 boot flash • 2 kb serial EEPROM
Dimensions	Height: 6.07 in. (15.42 cm) Depth: 8.50 in. (21.59 cm) Width: 0.88 in. (2.24 cm)
Weight	0.875 lb (0.4 kg)
Power consumption	16.5W
Minimum software requirements	Cisco IOS Release 12.0(5)DA CDM[1]—Release 3.2 (optional)

1. CDM = Cisco DSL Manager

4xflexi Specifications

Table A-3 lists the specifications for the 4xflexi.

Table A-3 4xflexi Specifications

Specification	DMT Mode	CAP Mode	G.lite Mode
Standards supported	ITU G.dmt (G.992.1) ANSI T1.413 Issue 2	RADSL[1]	ITU G.lite (G.992.2)
Power consumption	17.5W	13.5W	13.5W
Maximum data rates (per port)			
Downstream	8.032 Mbps	7.168 Mbps	1.536 Mbps
Upstream	864 kbps	1.088 Mbps	512 kbps
External interfaces	4 (no connectors on card)		

Table A-3 4xflexi Specifications (continued)

Specification	DMT Mode	CAP Mode	G.lite Mode
Internal hardware	AMD 186-based 3.3V 18-MHz CPU 128 KB SRAM 512K flash		
Dimensions	Height: 6.07 in. (15.42 cm) Depth: 8.50 in. (21.59 cm) Width: 0.88 in. (2.24 cm)		
Weight	0.875 lb (0.4 kg)		
Minimum software requirements	Cisco IOS Release 12.1(2)DA CDM—Release 3.2 (optional)		

1. Rate-adaptive digital subscriber line.

4xSDSL Specifications

Table A-4 lists the specifications for the 4xSDSL.

Table A-4 4xSDSL Specifications

Specification	Description
Standards supported	ITU G.991.1
External interfaces	4 (no connectors on card)
Maximum data rates (per port) Downstream Upstream	 1168 kbps 1168 kbps
Line encoding	2B1Q
Internal hardware	AMD 186-based 3.3V 18-MHz CPU 128 KB SRAM 512K flash
Dimensions	Height: 6.07 in. (15.42 cm) Depth: 8.50 in. (21.59 cm) Width: 0.88 in. (2.24 cm)
Weight	0.875 lb (0.4 kg)
Power consumption	9W
Minimum software requirements	Cisco IOS Release 12.1(2)DA CDM—Release 3.2 (optional)

DS3/2DS3 NI-2 Card Specifications

Table A-5 lists the specifications for the DS3/2DS3 NI-2 card.

Table A-5 DS3/2DS3 NI-2 Card Specifications

Specification	Description
Internal hardware	150 MHz RC64475 CPU Galileo GT64120 system controller 1M x 32 bootflash 4M x 32 Flash 512 KB boot EPROM
Dimensions	Height: 12.38 in. (31.45 cm) Depth: 8.50 in. (21.59 cm) Width: 1.80 in. (4.57 cm)
Weight	3.0 lb (1.36 kg)
Level 2 protocol	ATM
External interfaces	Three DS3 (44.736-Mbps) coaxial ports
Connector type	BNC[1]
Impedance	75 ohms (nominal)
Line encoding	B3ZS
Framing	C-bit parity, optionally PLCP with M23, otherwise Add Drop Multiplexer (ADM)
Power consumption	33.5W
Redundancy	NI-2 card redundancy only (with a second NI-2 card installed). No link redundancy.
Minimum software requirements	Cisco IOS Release 12.1(4)DA CDM 3.2 (optional)

1. The Bayonet-Neill-Concelman (BNC) connectors are located on the system I/O card which is installed on the backplane of the chassis.

OC-3c/OC-3c NI-2 Card Specifications

Table A-6 lists the specifications of the single-mode and multimode versions of the OC-3c/OC-3c NI-2 card.

Table A-6 OC-3c/OC-3c NI-2 Card Specifications

Specification	Description	
Internal hardware	• 150 MHz RC64475 CPU • Galileo GT64120 system controller • 1M x 32 boot flash[1] (4 MB) • 4M x 32 Flash (16 MB) • 512 KB boot EPROM	
Dimensions	Height: 12.38 in. (31.45 cm) Depth: 8.50 in. (21.59 cm) Width: 1.80 in. (4.57 cm)	
Weight	3.0 lb (1.36 kg)	
Layer 2 protocol	ATM	
Power consumption	33.5W	
Minimum software and network management requirement	Cisco IOS • Non-redundant NI-2 card configurations—Release 12.1(1)DA • Redundant NI-2 card configurations—Release 12.1(7)DA CDM—Release 3.0/3.2 (optional)	
	Single-Mode Card	**Multimode Card**
External interfaces	Two OC-3c/STM-1 (155 Mbps) single-mode ports	Two OC-3c/STM-1 (155 Mbps) multimode ports
Connector type	SC-PC	SC-PC
Fiber type	Intermediate reach single mode	Multimode
Average transmitted power	–15 to –8 dBm	–20 to –14 dBm
Average received power	–8 dBm	–11 dBm
Transmission distance	Up to 12 miles (19.3 km)	Up to 1.2 miles (1.93 km)
Wavelength	1310 nm	1300 nm

1. The version of the OC-3c/OC-3c NI-2 card with enhanced upstream bandwidth features (NI2-155SM-155SM2 and NI2-155MM-155MM2) has a 2M x 32 bootflash (8 MB).

Software Specifications

Table A-7 lists Cisco 6130 with NI-2 system software specifications.

Table A-7 Software Specifications

Specification	Description
Management protocols	Cisco IOS software support for SNMP to CEMF[1]
Management applications	• Cisco IOS • CDM (optional)
Management interfaces	In band—ATM VC Out of band—10BaseT Ethernet, console, auxiliary

1. CEMF = Cisco Element Management Framework

APPENDIX **B**

Cable and Port Mapping Specifications

This appendix provides cabling guidelines, cabling configuration diagrams, part numbers, and port mapping tables for the following configurations:

- Cisco 6130 with a POTS splitter configuration
- Cisco 6130 without a POTS splitter configuration

Cisco used a standard telco color chart when designing the cables for the Cisco 6130 with NI-2 system connections. This appendix includes a standard telco color chart.

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

Note For port mapping tables to build your own Cisco 6130 cables, see Table B-12 on page B-31.

Table B-1 shows an overview of the cables used for each Cisco 6130 with NI-2 system configuration.

Table B-1 Cisco 6130 with NI-2 System Configuration and Cable Overview

			Ports			Reference	
Configuration	**Connection**	**Cable Type**	**Cisco 6130**	**POTS Splitter**	**Line Coding Technology**	**Table**	**Figure**
Cisco 6130 with a POTS splitter	Cisco 6130 to two Cisco 6120 chassis	One-to-two	128	64 each POTS splitter	CAP (ADSL) or DMT-2 (ADSL)	Table B-2	Figure B-2 and Figure B-3
	Third-party POTS splitter to Cisco 6130	One-to-one	128	128	DMT-2 (ADSL)	Table B-3	Figure B-4
	POTS splitter to MDF[1]	One-to-one	—	80	CAP (ADSL) or DMT-2 (ADSL)	Table B-4	Figure B-5, Figure B-6, and Figure B-7
		Two-to-two	—	80	CAP (ADSL) or DMT-2 (ADSL)	Table B-5	Figure B-8, Figure B-9, and Figure B-10

Table B-1 Cisco 6130 with NI-2 System Configuration and Cable Overview (continued)

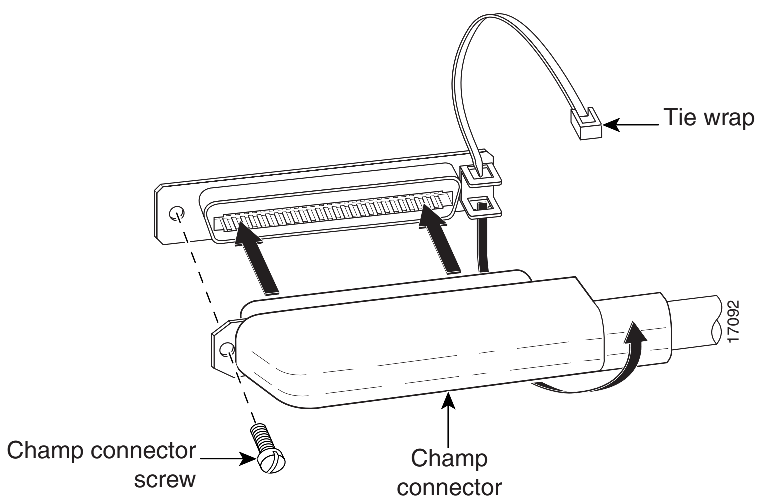
Configuration	Connection	Cable Type	Ports: Cisco 6130	Ports: POTS Splitter	Line Coding Technology	Reference: Table	Reference: Figure
Cisco 6130 without a POTS splitter	Cisco 6130 to MDF	Three-to-three	128	—	DMT-2 (ADSL) 2B1Q (SDSL[2])	Table B-6	Figure B-11 and Figure B-12
Intermixing	• Cisco 6130 to third-party POTS splitter • Cisco 6130 to MDF	One-to-one	96	128	CAP (ADSL) or DMT-2 (ADSL) 2B1Q (SDSL)	Table B-7	—

1. MDF = main distribution frame
2. SDSL = symmetrical digital subscriber line

Cabling Guidelines

You need to ensure that all cables are screwed in to the backplane and that the Champ connectors are tie wrapped. (See Figure B-1.)

Figure B-1 Cabling Guidelines



Cisco 6130 with a POTS Splitter Configuration Cables

In a Cisco 6130 with a POTS splitter configuration, use only designated cables to connect the Cisco 6130, the POTS splitter, and the MDF. This section provides tables and illustrations for the following cables:

- Cisco 6130 to Cisco 6120 Cables
- Cisco 6130 to Third-Party POTS Splitter Cables
- POTS Splitter to MDF Cables

Note Some chassis connectors in the cabling diagrams are not used because they are specific to one of the other configurations of the Cisco 6130 with NI-2 system or because they are reserved for future use.

Cisco 6130 to Cisco 6120 Cables

You can use one-to-two cables to connect one Cisco 6130 to two Cisco 6120 chassis for systems using quad-port *x*TU-C line cards.

Table B-2 lists the backplane connectors and the part numbers for the one-to-two cables. In this configuration, 64 POTS splitter ports are used in each Cisco 6120, for a total of 128 ports.

Table B-2 Connectors and Part Numbers for One-to-Two Cables—Cisco 6130 to Two Cisco 6120 Chassis Connection

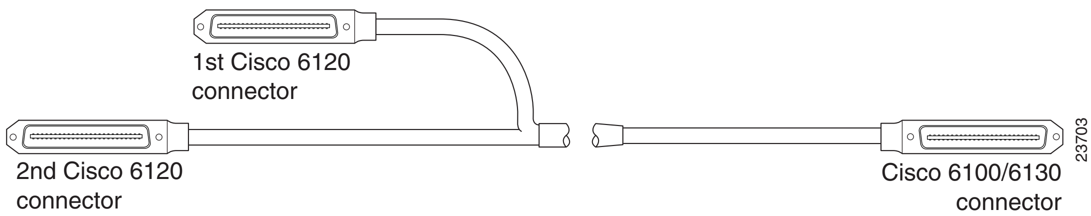
Backplane Connector					Cisco Part Number	
	First Cisco 6120 Connector		Second Cisco 6120 Connector		Kit	Subassembly
Cisco 6130	Backplane	Cable	Backplane	Cable		
J39	J3	P3A	J3	P3B	CAB-MC128-PSC80	72-1767-01[1]
J40	J1	P1A	J1	P1B	CAB-MC128-PSC80	72-1767-01
J41	J5	P5A	J5	P5B	CAB-MC128-PSC80	72-1767-01
J42	J4	P4A	J4	P4B	CAB-MC128-PSC80	72-1768-01[2]
J43	J2	P2A	J2	P2B	CAB-MC128-PSC80	72-1769-01[3]
J44	J6	P6A	J6	P6B	CAB-MC128-PSC80	72-1770-01[4]

1. This cable can be used for Cisco 6130 connectors J39, J40, and J41.
2. This cable is specifically for Cisco 6130 connector J42.
3. This cable is specifically for Cisco 6130 connector J43.
4. This cable is specifically for Cisco 6130 connector J44.

Note When you use the one-to-two cable, see Table B-8 on page B-14 for port mapping information.

Figure B-2 shows the one-to-two cable.

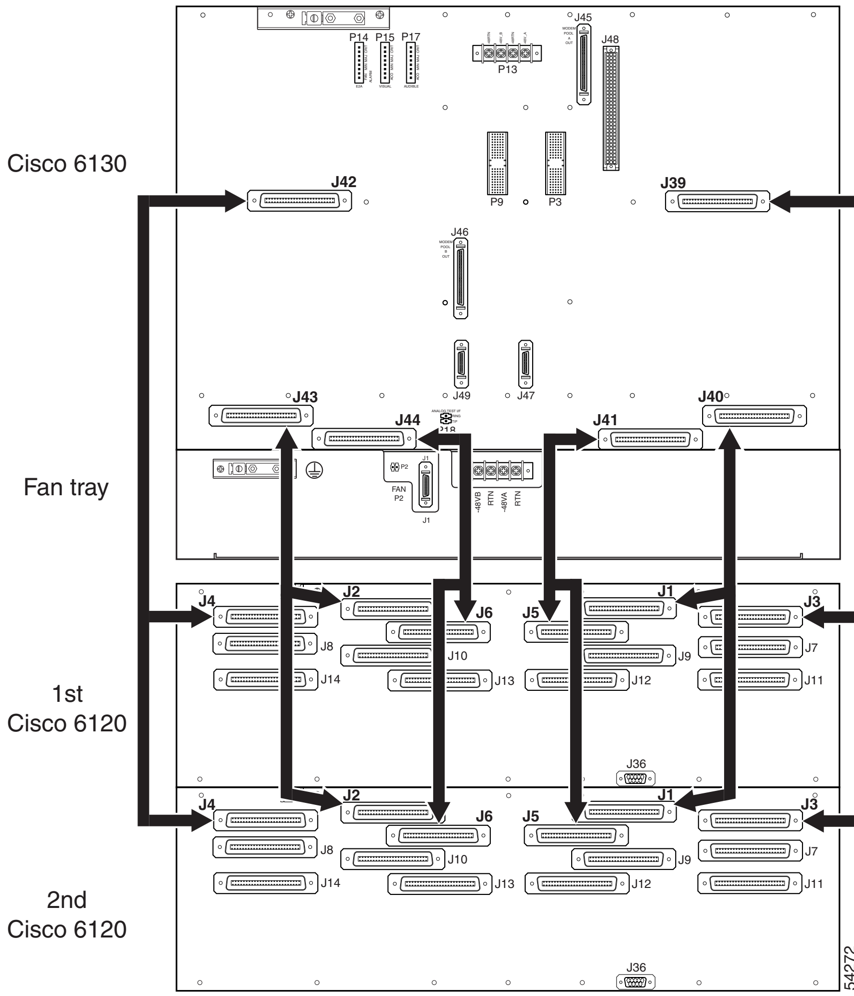
Figure B-2 One-to-Two Cable



Tip If you use 64 POTS splitter ports, tie wrap the second Cisco 6120 connector to the rack. When you expand your system to 128 POTS splitter ports, the second Cisco 6120 connector will attach to a second Cisco 6120.

Figure B-3 shows the cabling between one Cisco 6130 and two Cisco 6120 chassis in which the cables listed in Table B-2 are used.

Figure B-3 Cisco 6130 to Two Cisco 6120 Chassis Cabling Diagram with One-to-Two Cables



Cisco 6130 to Third-Party POTS Splitter Cables

A third-party POTS splitter is compatible with the Cisco 6130. If you use a third-party POTS splitter, you need six one-to-one cables to connect the POTS splitter to the Cisco 6130 connectors J39 through J44. This one-to-one cable is not the same as the one-to-one cables used in previous configurations.

Use the one-to-one cable when you are connecting the Cisco 6130 to the third-party POTS splitter. Table B-3 lists the cable and associated part numbers.

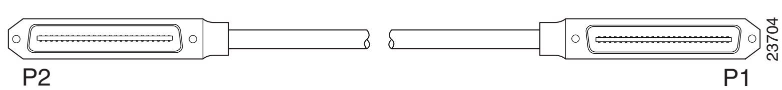
Table B-3 Connectors and Part Numbers for One-to-One Cables for the Third-Party POTS Splitter

Backplane Connector		Cisco Part Number	
Cisco 6130	**Third-Party POTS Splitter**	**Kit**	**Subassembly**
J39	*x*DSL 9-32	CAB-6121-1	72-1766-01
J40	*x*DSL 1-8 65-72	CAB-6121-1	72-1766-01
J41	*x*DSL 73-96	CAB-6121-1	72-1766-01
J42	*x*DSL 33-56	CAB-6121-1	72-1766-01
J43	*x*DSL 57-64 121-128	CAB-6121-1	72-1766-01
J44	*x*DSL 97-120	CAB-6121-1	72-1766-01

Note When you use the one-to-one cable, see Table B-9 on page B-18 for port mapping information.

Figure B-4 shows the one-to-one special cable.

Figure B-4 One-to-One Special Cable



Note If you are installing a Cisco 6130 with a POTS splitter configuration using the third-party POTS splitter, install the Cisco components (excluding the POTS splitter) according to Chapter 4, "Installing a Cisco 6130 Without a POTS Splitter Configuration." Refer to the appropriate vendor documentation for installation procedures for the third-party POTS splitter.

POTS Splitter to MDF Cables

You can use the following cables to connect the POTS splitter (Cisco 6120 or third-party POTS splitter) to the MDF in a Cisco 6130 with a POTS splitter configuration:

- One-to-one cables—Used to connect the POTS splitter (Cisco 6120 or third-party POTS splitter) to the MDF.

Note Refer to the appropriate vendor documentation for cabling connectors and procedures for the third-party POTS splitter.

- Two-to-two cables—Used to clearly associate the mapping between the wire pairs and the Cisco 6130 or Cisco 6120 ports. These cables attach to the Cisco 6120 MDF connections (J11 to J14) and the Cisco 6120 POTS connections (J7 to J10).

One-to-One Cables

You can use one-to-one cables to connect the Cisco 6120 to the MDF or POTS service connectors. Table B-4 lists the backplane connectors, the available cable lengths, and the part numbers for the one-to-one cables. Each cable has the same pinouts. The only difference between the four cables is the length. Use the length that works best for your configuration.

Table B-4 Connectors, Lengths, and Part Numbers for One-to-One Cables—Cisco 6120 to MDF or POTS Connections

Backplane Connector		Cisco Part Number	
Cisco 6120	**MDF Modem**	**Kit**	**Subassembly**
MDF Connectors			
J11, J12, J13, J14	P1 (modems 1 to 16), P3 (modems 33 to 48), P2 (modems 17 to 32), or P4 (modems 49 to 64)	CAB-61-015 50-ft cable	72-1599-01
		CAB-61-016 150-ft cable	72-1598-01
		CAB-61-017 75-ft cable	72-1597-01
		CAB-61-018 175-ft cable	72-1596-01
POTS Connectors			
J7, J8, J9, J10	P1 (modems 1 to 16), P3 (modems 33 to 48), P2 (modems 17 to 32), or P4 (modems 49 to 64)	CAB-61-015 50-ft cable	72-1599-01
		CAB-61-016 150-ft cable	72-1598-01
		CAB-61-017 75-ft cable	72-1597-01
		CAB-61-018 175-ft cable	72-1596-01

Figure B-5 shows the one-to-one cable.

Figure B-5 One-to-One Cable

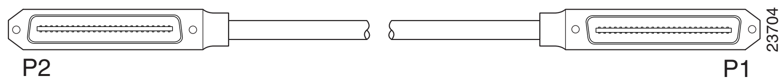


Figure B-6 shows the cabling between the Cisco 6120 to the MDF in which the cables listed in Table B-4 are used.

Figure B-6 Cisco 6120 to MDF Cabling Diagram with One-to-One Cables

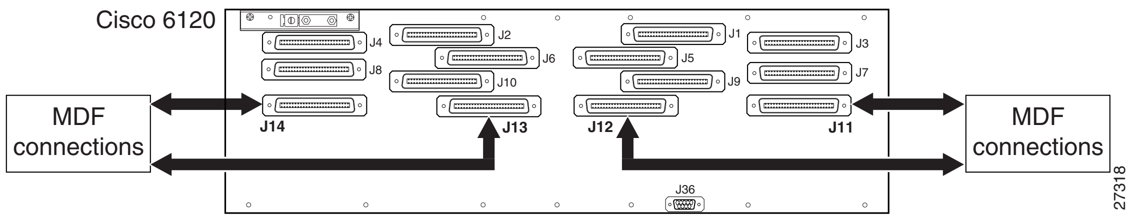
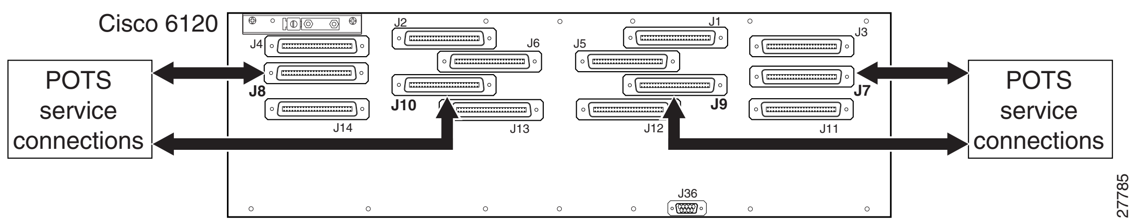


Figure B-7 shows the cabling between the Cisco 6120 to the POTS service connections in which the cables listed in Table B-4 are used.

Figure B-7 Cisco 6120 to POTS Service Cabling Diagram with One-to-One Cables



Note Refer to the appropriate vendor documentation for cabling connectors and procedures for the third-party POTS splitter.

Two-to-Two Cables

To associate the Cisco 6120 MDF or POTS wire pairs and the Cisco 6130 modem ports, the two-to-two cable remaps the wire pairs from the Cisco 6120 MDF or POTS connectors to the Cisco 6120 connectors. You can use the two-to-two cable to

- Connect the *x*DSL subscriber line connections on the Cisco 6120 (J11 to J14) to the MDF
- Connect the voice lines on the Cisco 6120 (J7 to J10) to the voice-switching equipment that provides local POTS service

Table B-5 lists the backplane connectors and the part numbers for the two-to-two cables connecting the Cisco 6120 to the MDF in a Cisco 6130 with a POTS splitter configuration.

Table B-5 Connectors and Part Numbers for Two-to-Two Cables—Cisco 6120 to MDF Connections

Backplane Connector		Cisco Part Number	
Cisco 6120	**MDF Modem**	**Kit**	**Subassembly**
***x*DSL Subscriber Line Connectors**			
J11, J12	P1 (modems 1 to 16) or P3 (modems 33 to 48)	CAB-PSC-80-REPIN	72-1716-01 (right cable)
J13, J14	P2 (modems 17 to 32) or P4 (modems 49 to 64)	CAB-PSC-80-REPIN	72-1772-01 (left cable)
Voice Line Connectors			
J7, J9	P1 (modems 1 to 16) or P3 (modems 33 to 48)	CAB-PSC-80-REPIN	72-1716-01 (right cable)
J8, J10	P2 (modems 17 to 32) or P4 (modems 49 to 64)	CAB-PSC-80-REPIN	72-1772-01 (left cable)

Note When you use the two-to-two cable, see Table B-10 on page B-23 for port mapping information.

Figure B-8 shows the two-to-two cable.

Figure B-8 Two-to-Two Cable

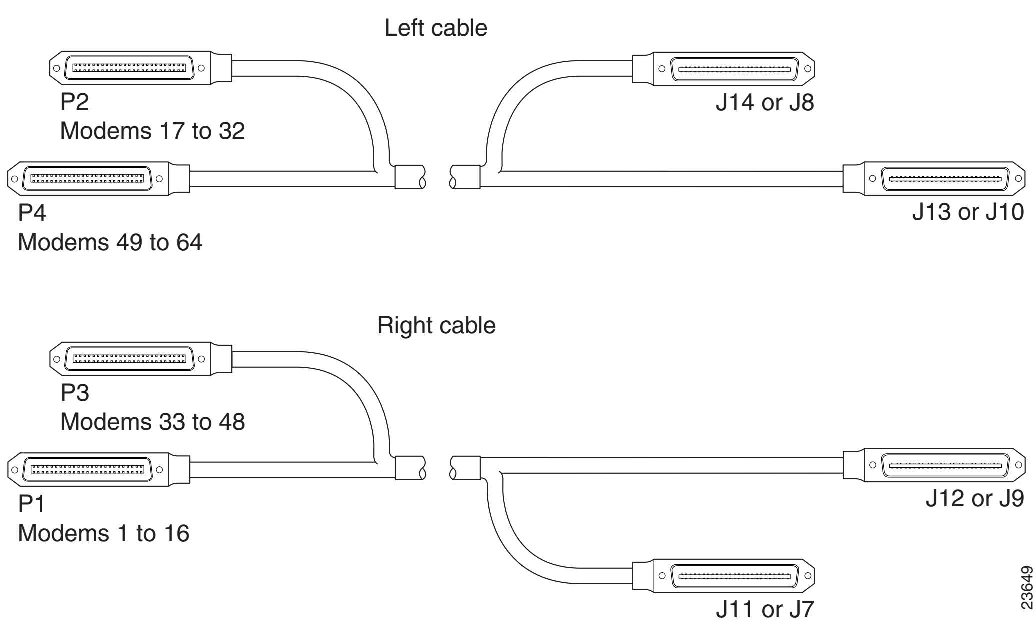


Figure B-9 shows the cabling between the *x*DSL subscriber line connectors on the Cisco 6120 and the MDF in which the cables listed in Table B-5 are used.

Figure B-9 Cisco 6120 to MDF Cabling Diagram with Two-to-Two Cables—xDSL Subscriber Line Connectors

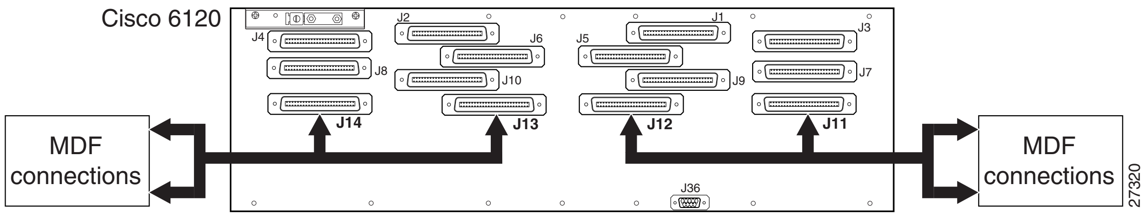
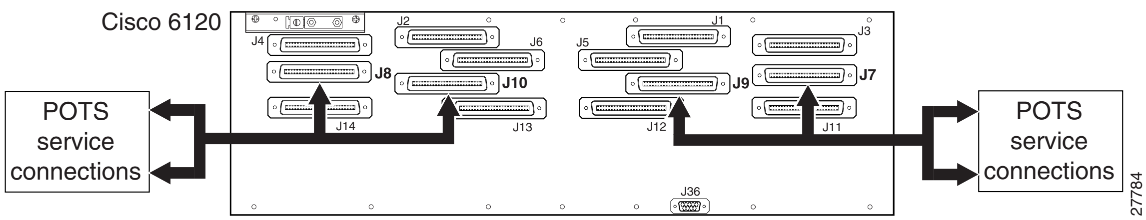


Figure B-10 shows the cabling between the voice lines on the Cisco 6120 and the voice-switching equipment that provides local POTS service. The cables listed in Table B-5 are used for the connection.

Figure B-10 Cisco 6120 to MDF Cabling Diagram with Two-to-Two Cables—Voice Line Connectors



Cisco 6130 Without a POTS Splitter Configuration Cables

In a Cisco 6130 without a POTS splitter configuration, use only designated cables to connect the Cisco 6130 and the MDF.

Note Some chassis connectors in the cabling diagrams are not used because they are specific to one of the other configurations of the Cisco 6130 with NI-2 system or because they are reserved for future use.

To associate the MDF wire pairs and the Cisco 6130 modem ports, the three-to-three cable remaps the wire pairs from the Cisco 6130 connectors to the MDF connectors. Use the cable in systems with quad-port *x*TU-C modules installed in the chassis. Table B-6 lists the backplane connectors and the part numbers for the three-to-three cables connecting the Cisco 6130 to the MDF in a Cisco 6130 without a POTS splitter configuration.

Table B-6 Connectors and Part Numbers for Three-to-Three Cables—Cisco 6130 to MDF Connections

Backplane Connector		Cisco Part Number	
Cisco 6130	**MDF**	**Kit**	**Subassembly**
J39, J40, J41	P4 (slots 1 to 6), P5 (slots 7, 8, and 21 to 24), or P6 (slots 25 to 28)	CAB-MC128-MDF	72-1765-01 (right cable)
J42, J43, J44	P1 (slots 13 to 18), P2 (slots 19, 20, and 31 to 34), or P3 (slots 35 to 38)	CAB-MC128-MDF	72-1720-01 (left cable)

Note When you use the three-to-three cable, see Table B-11 on page B-26 for port mapping information.

Figure B-11 shows the three-to-three cable.

Figure B-11 Three-to-Three Cable

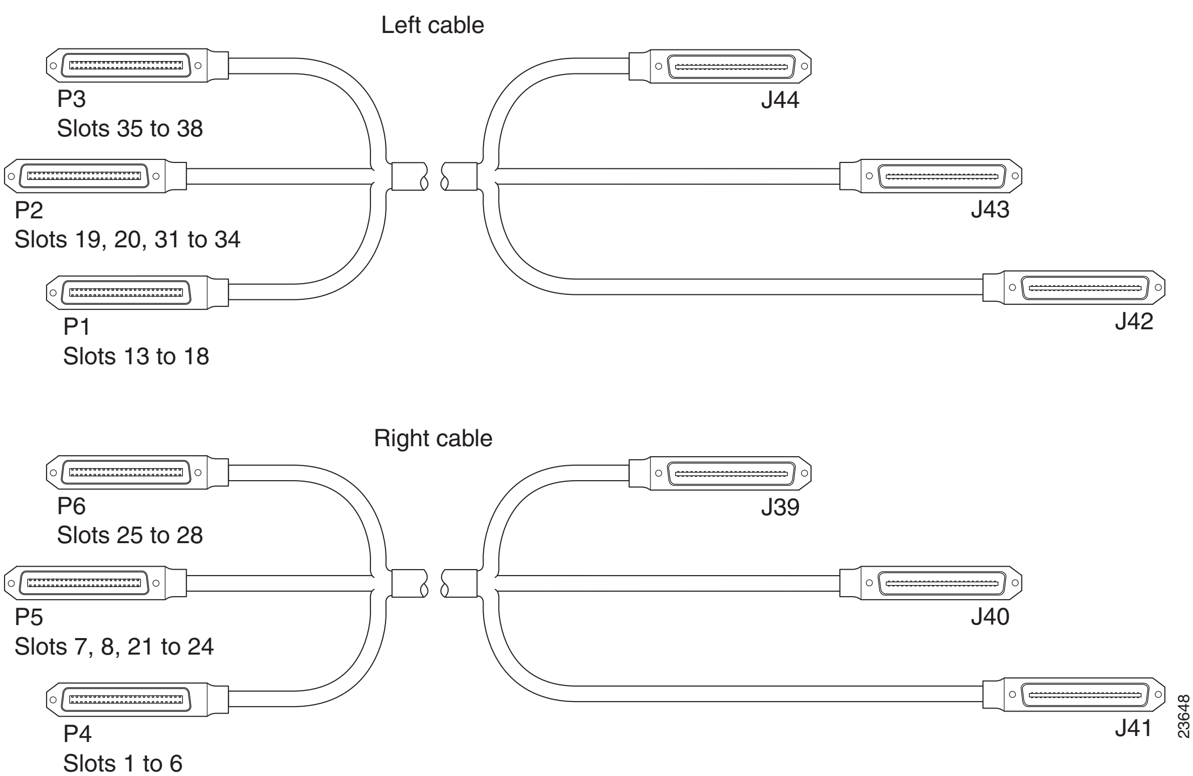
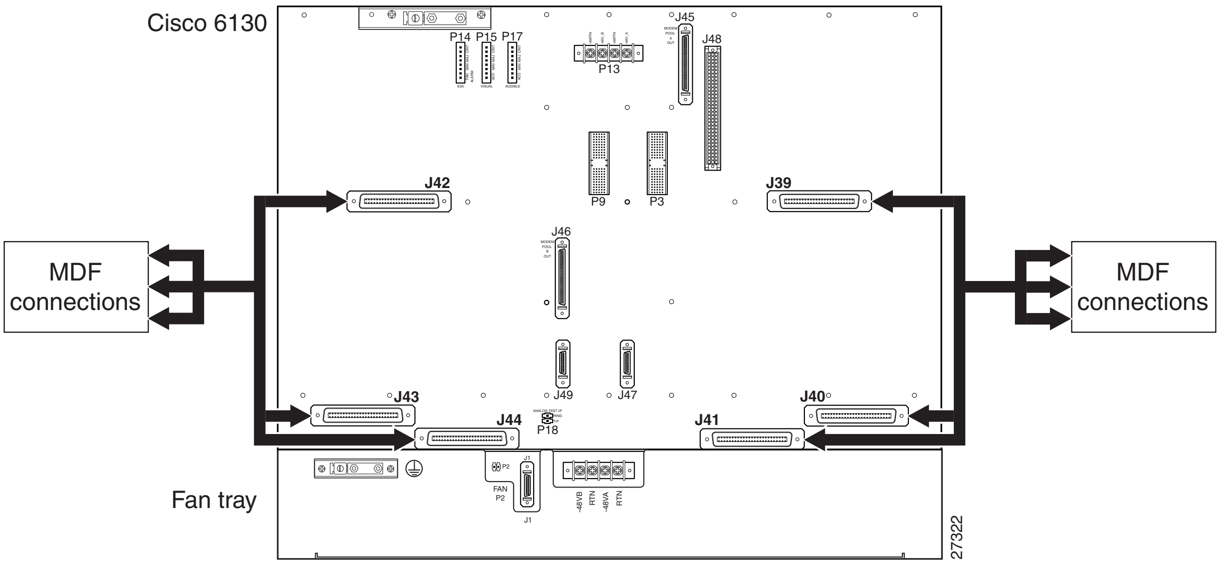


Figure B-12 shows the cabling between the Cisco 6130 and the MDF in which the cables listed in Table B-6 are used.

Figure B-12 Cisco 6130 to MDF Cabling Diagram with Three-to-Three Cables



Intermixing Cables

Use intermixing cables when you want to configure half of the Cisco 6130 chassis with ADSL (Cisco 6130 with a POTS splitter configuration) and the other half of the chassis with SDSL (Cisco 6130 without a POTS splitter configuration).

Use CAB-128-mix cable set when you install quad-port flexi ATU-C line cards (4xflexis) in slots 1 through 8 and slots 21 through 28 and quad-port STU-C line cards (4xSDSLs) in slots 13 through 20 and slots 31 through 38. Table B-7 lists the backplane connectors and the part numbers for the CAB-128-mix cable set.

Table B-7 Connectors and Part Numbers for CAB-128-Mix Cable Set

Backplane Connector			**Cisco Part Number**	
Cisco 6130	**Third-Party POTS Splitter**	**MDF**	**Kit**	**Subassembly**
J39	*x*DSL 9-32	—	CAB-128-mix	72-1766-01
J40	*x*DSL 1-8 65-72	—	CAB-128-mix	72-1766-01

Table B-7 Connectors and Part Numbers for CAB-128-Mix Cable Set (continued)

Backplane Connector			Cisco Part Number	
Cisco 6130	**Third-Party POTS Splitter**	**MDF**	**Kit**	**Subassembly**
J41	*x*DSL 73-96	—	CAB-128-mix	72-1766-01
J42, J43, J44	—	P1 (slots 13 to 18), P2 (slots 19, 20, and 31 to 34), or P3 (slots 35 to 38)	CAB-128-mix	72-1720-01 (left cable)

Note See the left side of Figure B-12 for the Cisco 6130 cable connections for the J42, J43, and J44 connectors. Refer to the appropriate vendor documentation for cabling connectors and procedures for the third-party POTS splitter.

Port Mapping Tables

This section provides port mapping tables which show the wire pair and chassis port assignments for the following configurations and cables:

- Cisco 6130 with a POTS splitter configuration
- Cisco 6130 without a POTS splitter configuration
- Building your own Cisco 6130 cables

Cisco 6130 with a POTS Splitter Configuration Port Mapping Tables

Table B-8 maps the Cisco 6130 ports, the Cisco 6120 ports for two Cisco 6120 chassis, and the wire pairs when using the one-to-two cables (see Table B-2 on page B-3) for a Cisco 6130 with a POTS splitter configuration. The corresponding cable kit number is CAB-MC128-PSC80. You can use the one-to-two cables to connect one Cisco 6130 to two Cisco 6120 chassis for systems using quad-port ATU-C line cards.

Table B-8 Port Mapping for One-to-Two Cables in a Cisco 6130 with a POTS Splitter Configuration

Cisco 6130 Slot/Line	Cisco 6120 Slot/Line		Champ Pins		Cisco 6120 MDF/ POTS Connection
	Cisco 6120 Chassis 1	Cisco 6120 Chassis 2	Tip	Ring	
1/1	1/1	—	9	34	J11/J7
1/2	1/2	—	10	35	
1/3	—	1/1	9	34	
1/4	—	1/2	10	35	
2/1	1/3	—	11	36	
2/2	1/4	—	12	37	
2/3	—	1/3	11	36	
2/4	—	1/4	12	37	
3/1	2/1	—	5	30	
3/2	2/2	—	6	31	
3/3	—	2/1	5	30	
3/4	—	2/2	6	31	
4/1	2/3	—	7	32	
4/2	2/4	—	8	33	
4/3	—	2/3	7	32	
4/4	—	2/4	8	33	
5/1	3/1	—	1	26	
5/2	3/2	—	2	27	
5/3	—	3/1	1	26	
5/4	—	3/2	2	27	
6/1	3/3	—	3	28	
6/2	3/4	—	4	29	
6/3	—	3/3	3	28	
6/4	—	3/4	4	29	
7/1	4/1	—	18	43	
7/2	4/2	—	19	44	
7/3	—	4/1	18	43	
7/4	—	4/2	19	44	
8/1	4/3	—	20	45	
8/2	4/4	—	21	46	
8/3	—	4/3	20	45	
8/4	—	4/4	21	46	

Table B-8 Port Mapping for One-to-Two Cables in a Cisco 6130 with a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Cisco 6120 Slot/Line		Champ Pins		Cisco 6120 MDF/ POTS Connection
	Cisco 6120 Chassis 1	Cisco 6120 Chassis 2	Tip	Ring	
13/1	19/1	—	18	43	J14/J8
13/2	19/2	—	19	44	
13/3	—	19/1	18	43	
13/4	—	19/2	19	44	
14/1	19/3	—	20	45	
14/2	19/4	—	21	46	
14/3	—	19/3	20	45	
14/4	—	19/4	21	46	
15/1	20/1	—	1	26	
15/2	20/2	—	2	27	
15/3	—	20/1	1	26	
15/4	—	20/2	2	27	
16/1	20/3	—	3	28	
16/2	20/4	—	4	29	
16/3	—	20/3	3	28	
16/4	—	20/4	4	29	
17/1	21/1	—	5	30	
17/2	21/2	—	6	31	
17/3	—	21/1	5	30	
17/4	—	21/2	6	31	
18/1	21/3	—	7	32	
18/2	21/4	—	8	33	
18/3	—	21/3	7	32	
18/4	—	21/4	8	33	
19/1	22/1	—	9	34	
19/2	22/2	—	10	35	
19/3	—	22/1	9	34	
19/4	—	22/2	10	35	
20/1	22/3	—	11	36	
20/2	22/4	—	12	37	
20/3	—	22/3	11	36	
20/4	—	22/4	12	37	

Table B-8 Port Mapping for One-to-Two Cables in a Cisco 6130 with a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Cisco 6120 Slot/Line		Champ Pins		Cisco 6120 MDF/ POTS Connection
	Cisco 6120 Chassis 1	Cisco 6120 Chassis 2	Tip	Ring	
21/1	5/1	—	22	47	J11/J7
21/2	5/2	—	23	48	
21/3	—	5/1	22	47	
21/4	—	5/2	23	48	
22/1	5/3	—	24	49	
22/2	5/4	—	25	50	
22/3	—	5/3	24	49	
22/4	—	5/4	25	50	
23/1	6/1	—	6	31	J12/J9
23/2	6/2	—	7	32	
23/3	—	6/1	6	31	
23/4	—	6/2	7	32	
24/1	6/3	—	8	33	
24/2	6/4	—	9	34	
24/3	—	6/3	8	33	
24/4	—	6/4	9	34	
25/1	7/1	—	2	27	
25/2	7/2	—	3	28	
25/3	—	7/1	2	27	
25/4	—	7/2	3	28	
26/1	7/3	—	4	29	
26/2	7/4	—	5	30	
26/3	—	7/3	4	29	
26/4	—	7/4	5	30	
27/1	8/1	—	1	26	
27/2	8/2	—	10	35	
27/3	—	8/1	1	26	
27/4	—	8/2	10	35	
28/1	8/3	—	11	36	
28/2	8/4	—	12	37	
28/3	—	8/3	11	36	
28/4	—	8/4	12	37	

Table B-8 Port Mapping for One-to-Two Cables in a Cisco 6130 with a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Cisco 6120 Slot/Line		Champ Pins		Cisco 6120 MDF/ POTS Connection
	Cisco 6120 Chassis 1	Cisco 6120 Chassis 2	Tip	Ring	
31/1	15/1	—	1	26	J13/J10
31/2	15/2	—	10	35	
31/3	—	15/1	1	26	
31/4	—	15/2	10	35	
32/1	15/3	—	11	36	
32/2	15/4	—	12	37	
32/3	—	15/3	11	36	
32/4	—	15/4	12	37	
33/1	16/1	—	2	27	
33/2	16/2	—	3	28	
33/3	—	16/1	2	27	
33/4	—	16/2	3	28	
34/1	16/3	—	4	29	
34/2	16/4	—	5	30	
34/3	—	16/3	4	29	
34/4	—	16/4	5	30	
35/1	17/1	—	6	31	
35/2	17/2	—	7	32	
35/3	—	17/1	6	31	
35/4	—	17/2	7	32	
36/1	17/3	—	8	33	
36/2	17/4	—	9	34	
36/3	—	17/3	8	33	
36/4	—	17/4	9	34	
37/1	18/1	—	22	47	J14/J8
37/2	18/2	—	23	48	
37/3	—	18/1	22	47	
37/4	—	18/2	23	48	
38/1	18/3	—	24	49	
38/2	18/4	—	25	50	
38/3	—	18/3	24	49	
38/4	—	18/4	25	50	

Table B-9 maps the Cisco 6130 ports, the POTS splitter ports, and the wire pairs when using the one-to-one cables (see Table B-3 on page B-6) when a third-party POTS splitter is installed in your configuration. The corresponding cable kit number is CAB-6121-1.

Table B-9 Port Mapping for One-to-One Cables with a Third-Party POTS Splitter

Cisco 6130 Slot/Line	POTS Splitter Slot/Line	Champ Pins		POTS Splitter Connection
		Tip	Ring	
1/1	1/1	26	1	Line 1 to 24 or POTS 1 to 24
1/2	1/2	27	2	
1/3	1/3	28	3	
1/4	1/4	29	4	
2/1	1/5	30	5	
2/2	1/6	31	6	
2/3	1/7	32	7	
2/4	1/8	33	8	
3/1	2/1	34	9	
3/2	2/2	35	10	
3/3	2/3	36	11	
3/4	2/4	37	12	
4/1	2/5	38	13	
4/2	2/6	39	14	
4/3	2/7	40	15	
4/4	2/8	41	16	
5/1	3/1	42	17	
5/2	3/2	43	18	
5/3	3/3	44	19	
5/4	3/4	45	20	
6/1	3/5	46	21	
6/2	3/6	47	22	
6/3	3/7	48	23	
6/4	3/8	49	24	

Table B-9 Port Mapping for One-to-One Cables with a Third-Party POTS Splitter (continued)

Cisco 6130 Slot/Line	POTS Splitter Slot/Line	Champ Pins		POTS Splitter Connection
		Tip	Ring	
7/1	4/1	26	1	Line 25 to 48 or POTS 25 to 48
7/2	4/2	27	2	
7/3	4/3	28	3	
7/4	4/4	29	4	
8/1	4/5	30	5	
8/2	4/6	31	6	
8/3	4/7	32	7	
8/4	4/8	33	8	
13/1	5/1	34	9	
13/2	5/2	35	10	
13/3	5/3	36	11	
13/4	5/4	37	12	
14/1	5/5	38	13	
14/2	5/6	39	14	
14/3	5/7	40	15	
14/4	5/8	41	16	
15/1	6/1	42	17	
15/2	6/2	43	18	
15/3	6/3	44	19	
15/4	6/4	45	20	
16/1	6/5	46	21	
16/2	6/6	47	22	
16/3	6/7	48	23	
16/4	6/8	49	24	

Table B-9 Port Mapping for One-to-One Cables with a Third-Party POTS Splitter (continued)

Cisco 6130 Slot/Line	POTS Splitter Slot/Line	Champ Pins		POTS Splitter Connection
		Tip	Ring	
17/1	7/1	26	1	Line 49 to 72 or POTS 49 to 72
17/2	7/2	27	2	
17/3	7/3	28	3	
17/4	7/4	29	4	
18/1	7/5	30	5	
18/2	7/6	31	6	
18/3	7/7	32	7	
18/4	7/8	33	8	
19/1	8/1	34	9	
19/2	8/2	35	10	
19/3	8/3	36	11	
19/4	8/4	37	12	
20/1	8/5	38	13	
20/2	8/6	39	14	
20/3	8/7	40	15	
20/4	8/8	41	16	
21/1	9/1	42	17	
21/2	9/2	43	18	
21/3	9/3	44	19	
21/4	9/4	45	20	
22/1	9/5	46	21	
22/2	9/6	47	22	
22/3	9/7	48	23	
22/4	9/8	49	24	

Table B-9 Port Mapping for One-to-One Cables with a Third-Party POTS Splitter (continued)

Cisco 6130 Slot/Line	POTS Splitter Slot/Line	Champ Pins		POTS Splitter Connection
		Tip	Ring	
23/1	10/1	26	1	Line 73 to 96 or POTS 73 to 96
23/2	10/2	27	2	
23/3	10/3	28	3	
23/4	10/4	29	4	
24/1	10/5	30	5	
24/2	10/6	31	6	
24/3	10/7	32	7	
24/4	10/8	33	8	
25/1	11/1	34	9	
25/2	11/2	35	10	
25/3	11/3	36	11	
25/4	11/4	37	12	
26/1	11/5	38	13	
26/2	11/6	39	14	
26/3	11/7	40	15	
26/4	11/8	41	16	
27/1	12/1	42	17	
27/2	12/2	43	18	
27/3	12/3	44	19	
27/4	12/4	45	20	
28/1	12/5	46	21	
28/2	12/6	47	22	
28/3	12/7	48	23	
28/4	12/8	49	24	

Table B-9 Port Mapping for One-to-One Cables with a Third-Party POTS Splitter (continued)

Cisco 6130 Slot/Line	POTS Splitter Slot/Line	Champ Pins		POTS Splitter Connection
		Tip	Ring	
31/1	13/1	26	1	Line 97 to 120 or POTS 97 to 120
31/2	13/2	27	2	
31/3	13/3	28	3	
31/4	13/4	29	4	
32/1	13/5	30	5	
32/2	13/6	31	6	
32/3	13/7	32	7	
32/4	13/8	33	8	
33/1	14/1	34	9	
33/2	14/2	35	10	
33/3	14/3	36	11	
33/4	14/4	37	12	
34/1	14/5	38	13	
34/2	14/6	39	14	
34/3	14/7	40	15	
34/4	14/8	41	16	
35/1	15/1	42	17	
35/2	15/2	43	18	
35/3	15/3	44	19	
35/4	15/4	45	20	
36/1	15/5	46	21	
36/2	15/6	47	22	
36/3	15/7	48	23	
36/4	15/8	49	24	
37/1	16/1	26	1	Line 121 to 128 or POTS 121 to 128
37/2	16/2	27	2	
37/3	16/3	28	3	
37/4	16/4	29	4	
38/1	16/5	30	5	
38/2	16/6	31	6	
38/3	16/7	32	7	
38/4	16/8	33	8	

Table B-10 maps the Cisco 6130 ports, the Cisco 6120 ports, and the wire pairs when using the two-to-two cables (see Table B-5 on page B-9) for a Cisco 6130 with a POTS splitter configuration. The corresponding cable kit number is CAB-PSC-80-REPIN.

You can use the two-to-two cables to clearly associate the mapping between the wire pairs and the Cisco 6130 and Cisco 6120 ports. These cables attach to the Cisco 6120 MDF connections (J11 to J14) and the Cisco 6120 POTS connections (J7 to J10) for systems using dual-port *x*TU-C line cards.

Table B-10 Port Mapping for Two-to-Two Cables in a Cisco 6130 with a POTS Splitter Configuration

Cisco 6130 Slot/Line	Cisco 6120 Slot/Line	Champ Pins		Cable Connector
		Tip	Ring	
1/1	1/1	1	26	P1
1/2	1/2	2	27	
2/1	1/3	3	28	
2/2	1/4	4	29	
3/1	2/1	5	30	
3/2	2/2	6	31	
4/1	2/3	7	32	
4/2	2/4	8	33	
5/1	3/1	9	34	
5/2	3/2	10	35	
6/1	3/3	11	36	
6/2	3/4	12	37	
7/1	4/1	13	38	
7/2	4/2	14	39	
8/1	4/3	15	40	
8/2	4/4	16	41	

Table B-10 Port Mapping for Two-to-Two Cables in a Cisco 6130 with a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Cisco 6120 Slot/Line	Champ Pins		Cable Connector
		Tip	Ring	
13/1	19/1	1	26	P2
13/2	19/2	2	27	
14/1	19/3	3	28	
14/2	19/4	4	29	
15/1	20/1	5	30	
15/2	20/2	6	31	
16/1	20/3	7	32	
16/2	20/4	8	33	
17/1	21/1	9	34	
17/2	21/2	10	35	
18/1	21/3	11	36	
18/2	21/4	12	37	
19/1	22/1	13	38	
19/2	22/2	14	39	
20/1	22/3	15	40	
20/2	22/4	16	41	
21/1	5/1	1	26	P3
21/2	5/2	2	27	
22/1	5/3	3	28	
22/2	5/4	4	29	
23/1	6/1	5	30	
23/2	6/2	6	31	
24/1	6/3	7	32	
24/2	6/4	8	33	
25/1	7/1	9	34	
25/2	7/2	10	35	
26/1	7/3	11	36	
26/2	7/4	12	37	
27/1	8/1	13	38	
27/2	8/2	14	39	
28/1	8/3	15	40	
28/2	8/4	16	41	

Table B-10 Port Mapping for Two-to-Two Cables in a Cisco 6130 with a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Cisco 6120 Slot/Line	Champ Pins		Cable Connector
		Tip	Ring	
31/1	15/1	1	26	P4
31/2	15/2	2	27	
32/1	15/3	3	28	
32/2	15/4	4	29	
33/1	16/1	5	30	
33/2	16/2	6	31	
34/1	16/3	7	32	
34/2	16/4	8	33	
35/1	17/1	9	34	
35/2	17/2	10	35	
36/1	17/3	11	36	
36/2	17/4	12	37	
37/1	18/1	13	38	
37/2	18/2	14	39	
38/1	18/3	15	40	
38/2	18/4	16	41	

Cisco 6130 Without a POTS Splitter Configuration Port Mapping Tables

Table B-11 maps the Cisco 6130 ports and the wire pairs when using the three-to-three cables (see Table B-6 on page B-11) for a Cisco 6130 without a POTS splitter configuration. The corresponding cable kit number is CAB-MC128-MDF. You can use the three-to-three cables to connect the Cisco 6130 to the MDF for systems using dual-port DMT-2 ATU-C or quad-port *x*TU-C line cards.

Table B-11 Port Mapping for Three-to-Three Cables in a Cisco 6130 Without a POTS Splitter Configuration

Cisco 6130 Slot/Line	Champ Pins		Cable Connector/ Cable Part Number
	Tip	Ring	
1/1	1	26	Connector P4/ Cable 72-1765-01
1/2	2	27	
1/3	3	28	
1/4	4	29	
2/1	5	30	
2/2	6	31	
2/3	7	32	
2/4	8	33	
3/1	9	34	
3/2	10	35	
3/3	11	36	
3/4	12	37	
4/1	13	38	
4/2	14	39	
4/3	15	40	
4/4	16	41	
5/1	17	42	
5/2	18	43	
5/3	19	44	
5/4	20	45	
6/1	21	46	
6/2	22	47	
6/3	23	48	
6/4	24	49	

Table B-11 Port Mapping for Three-to-Three Cables in a Cisco 6130 Without a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Champ Pins		Cable Connector/ Cable Part Number
	Tip	Ring	
7/1	1	26	Connector P5/ Cable 72-1765-01
7/2	2	27	
7/3	3	28	
7/4	4	29	
8/1	5	30	
8/2	6	31	
8/3	7	32	
8/4	8	33	
13/1	1	26	Connector P1/ Cable 72-1720-01
13/2	2	27	
13/3	3	28	
13/4	4	29	
14/1	5	30	
14/2	6	31	
14/3	7	32	
14/4	8	33	
15/1	9	34	
15/2	10	35	
15/3	11	36	
15/4	12	37	
16/1	13	38	
16/2	14	39	
16/3	15	40	
16/4	16	41	
17/1	17	42	
17/2	18	43	
17/3	19	44	
17/4	20	45	
18/1	21	46	
18/2	22	47	
18/3	23	48	
18/4	24	49	

Table B-11 Port Mapping for Three-to-Three Cables in a Cisco 6130 Without a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Champ Pins		Cable Connector/ Cable Part Number
	Tip	Ring	
19/1	1	26	Connector P2/ Cable 72-1720-01
19/2	2	27	
19/3	3	28	
19/4	4	29	
20/1	5	30	
20/2	6	31	
20/3	7	32	
20/4	8	33	
21/1	9	34	Connector P5/ Cable 72-1765-01
21/2	10	35	
21/3	11	36	
21/4	12	37	
22/1	13	38	
22/2	14	39	
22/3	15	40	
22/4	16	41	
23/1	17	42	
23/2	18	43	
23/3	19	44	
23/4	20	45	
24/1	21	46	
24/2	22	47	
24/3	23	48	
24/4	24	49	

Table B-11 Port Mapping for Three-to-Three Cables in a Cisco 6130 Without a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Champ Pins		Cable Connector/ Cable Part Number
	Tip	Ring	
25/1	1	26	Connector P6/ Cable 72-1765-01
25/2	2	27	
25/3	3	28	
25/4	4	29	
26/1	5	30	
26/2	6	31	
26/3	7	32	
26/4	8	33	
27/1	9	34	
27/2	10	35	
27/3	11	36	
27/4	12	37	
28/1	13	38	
28/2	14	39	
28/3	15	40	
28/4	16	41	
31/1	9	34	Connector P2/ Cable 72-1720-01
31/2	10	35	
31/3	11	36	
31/4	12	37	
32/1	13	38	
32/2	14	39	
32/3	15	40	
32/4	16	41	
33/1	17	42	
33/2	18	43	
33/3	19	44	
33/4	20	45	
34/1	21	46	
34/2	22	47	
34/3	23	48	
34/4	24	49	

Table B-11 Port Mapping for Three-to-Three Cables in a Cisco 6130 Without a POTS Splitter Configuration (continued)

Cisco 6130 Slot/Line	Champ Pins		Cable Connector/ Cable Part Number
	Tip	Ring	
35/1	1	26	Connector P3/ Cable 72-1720-01
35/2	2	27	
35/3	3	28	
35/4	4	29	
36/1	5	30	
36/2	6	31	
36/3	7	32	
36/4	8	33	
37/1	9	34	
37/2	10	35	
37/3	11	36	
37/4	12	37	
38/1	13	38	
38/2	14	39	
38/3	15	40	
38/4	16	41	

Port Mapping Table for Building Cisco 6130 Cables

Table B-12 provides the Champ pins and Cisco 6130 port mapping information needed to build your own chassis cables.

Table B-12 Port Mapping for Building Cisco 6130 Cables

Connector	Champ Pins		Cisco 6130 Slot/Line
	Tip	Ring	
J39 *x*DSL Slots 3 through 8 (pins 25 and 50 are not used)	1	2	6/1
	3	4	6/2
	5	6	6/3
	7	8	6/4
	9	10	7/1
	11	12	7/2
	13	14	7/3
	15	16	7/4
	17	18	8/1
	19	20	8/2
	21	22	8/3
	23	24	8/4
	26	27	5/1
	28	29	5/2
	30	31	5/3
	32	33	5/4
	34	35	4/1
	36	37	4/2
	38	39	4/3
	40	41	4/4
	42	43	3/1
	44	45	3/2
	46	47	3/3
	48	49	3/4

Table B-12 Port Mapping for Building Cisco 6130 Cables (continued)

Connector	Champ Pins		Cisco 6130 Slot/Line
	Tip	Ring	
J40 *x*DSL Slots 1, 2, 21, and 22 (pins 9 through 25 are not used)	1	2	22/1
	3	4	22/2
	5	6	22/3
	7	8	22/4
	26	27	21/1
	28	29	21/2
	30	31	21/3
	32	33	21/4
	34	35	2/1
	36	37	2/2
	38	39	2/3
	40	41	2/4
	42	43	1/1
	44	45	1/2
	46	47	1/3
	48	49	1/4

Table B-12 Port Mapping for Building Cisco 6130 Cables (continued)

Connector	Champ Pins		Cisco 6130 Slot/Line
	Tip	Ring	
J41	1	2	26/1
*x*DSL	3	4	26/2
Slots 23 through 23	5	6	26/3
(pins 25 and 50 are not used)	7	8	26/4
	9	10	27/1
	11	12	27/2
	13	14	27/3
	15	16	27/4
	17	18	28/1
	19	20	28/2
	21	22	28/3
	23	24	28/4
	26	27	25/1
	28	29	25/2
	30	31	25/3
	32	33	25/4
	34	35	24/1
	36	37	24/2
	38	39	24/3
	40	41	24/4
	42	43	23/1
	44	45	23/2
	46	47	23/3
	48	49	23/4

Table B-12 Port Mapping for Building Cisco 6130 Cables (continued)

Connector	Champ Pins		Cisco 6130 Slot/Line
	Tip	Ring	
J42	1	2	17/1
*x*DSL	3	4	17/2
Slots 13 through 18	5	6	17/3
(pins 25 and 50 are not used)	7	8	17/4
	9	10	18/1
	11	12	18/2
	13	14	18/3
	15	16	18/4
	17	18	13/1
	19	20	13/2
	21	22	13/3
	23	24	13/4
	26	27	16/1
	28	29	16/2
	30	31	16/3
	32	33	16/4
	34	35	15/1
	36	37	15/2
	38	39	15/3
	40	41	15/4
	42	43	14/1
	44	45	14/2
	46	47	14/3
	48	49	14/4

Table B-12 Port Mapping for Building Cisco 6130 Cables (continued)

Connector	Champ Pins		Cisco 6130 Slot/Line
	Tip	Ring	
J43 *x*DSL Slots 19, 20, 37, and 38 (pins 9 through 25 and 50 are not used)	1	2	20/1
	3	4	20/2
	5	6	20/3
	7	8	20/4
	26	27	19/1
	28	29	19/2
	30	31	19/3
	32	33	19/4
	34	35	38/1
	36	37	38/2
	38	39	38/3
	40	41	38/4
	42	43	37/1
	44	45	37/2
	46	47	37/3
	48	49	37/4

Table B-12 Port Mapping for Building Cisco 6130 Cables (continued)

Connector	Champ Pins		Cisco 6130 Slot/Line
	Tip	Ring	
J44 *x*DSL Slots 31 through 36 (pins 25 and 50 are not used)	1	2	35/1
	3	4	35/2
	5	6	35/3
	7	8	35/4
	9	10	36/1
	11	12	36/2
	13	14	36/3
	15	16	36/4
	17	18	31/1
	19	20	31/2
	21	22	31/3
	23	24	31/4
	26	27	34/1
	28	29	34/2
	30	31	34/3
	32	33	34/4
	34	35	33/1
	36	37	33/2
	38	39	33/3
	40	41	33/4
	42	43	32/1
	44	45	32/2
	46	47	32/3
	48	49	32/4

Standard Telco Color Chart

In designing the cables for the Cisco 6130 with NI-2 system connections, Cisco used a standard telco color chart. Table B-13 lists the colors used for the Cisco 6130 with NI-2 system cables.

Table B-13 Standard Telco Color Chart

Wire Color	P1	Wire Color	P2		Wire Color	P1	Wire Color	P2
Wht/blu	1	Wht/blu	1		Grn/blk	38	Grn/blk	38
Blu/wht	26	Blu/wht	26		Blk/brn	14	Blk/brn	14
Wht/org	2	Wht/org	2		Brn/blk	39	Brn/blk	39
Org/wht	27	Org/wht	27		Blk/gry	15	Blk/gry	15
Wht/grn	3	Wht/grn	3		Gry/blk	40	Gry/blk	40
Grn/wht	28	Grn/wht	28		Yel/blu	16	Yel/blu	16
Wht/brn	4	Wht/brn	4		Blu/yel	41	Blu/yel	41
Brn/wht	29	Brn/wht	29		Yel/org	17	Yel/org	17
Wht/gry	5	Wht/gry	5		Org/yel	42	Org/yel	42
Gry/wht	30	Gry/wht	30		Yel/grn	18	Yel/grn	18
Red/blu	6	Red/blu	6		Grn/yel	43	Grn/yel	43
Blu/red	31	Blu/red	31		Yel/brn	19	Yel/brn	19
Red/org	7	Red/org	7		Brn/yel	44	Brn/yel	44
Org/red	32	Org/red	32		Yel/gry	20	Yel/gry	20
Red/grn	8	Red/grn	8		Gry/yel	45	Gry/yel	45
Grn/red	33	Grn/red	33		Vio/blu	21	Vio/blu	21
Red/brn	9	Red/brn	9		Blu/vio	46	Blu/vio	46
Brn/red	34	Brn/red	34		Vio/org	22	Vio/org	22
Red/gry	10	Red/gry	10		Org/vio	47	Org/vio	47
Gry/red	35	Gry/red	35		Vio/grn	23	Vio/grn	23
Blk/blu	11	Blk/blu	11		Grn/vio	48	Grn/vio	48
Blu/blk	36	Blu/blk	36		Vio/brn	24	Vio/brn	24
Blk/org	12	Blk/org	12		Brn/vio	49	Brn/vio	49
Org/blk	37	Org/blk	37		Vio/gry	25	Vio/gry	25
Blk/grn	13	Blk/grn	13		Gry/vio	50	Gry/vio	50

APPENDIX C

Connector and Pinout Specifications

This appendix provides information about connectors and pinouts for the Cisco 6130 with NI-2 system.

Cisco 6130 Chassis Connectors

This section describes the Cisco 6130 chassis connectors and pinouts for the following:

- xDSL Connectors, page C-1
- Cisco 6130 Terminal Block Connector, page C-2

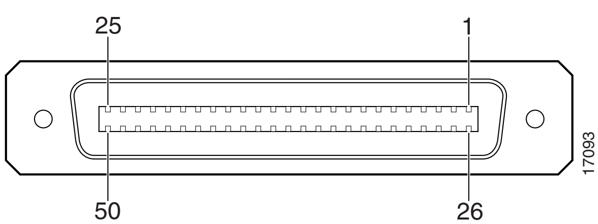
*x*DSL Connectors

The backplane of the chassis contains six Champ connectors which connect to the *x*TU-C twisted-pair subscriber data interface. This connection can be made by either of the following:

- Through a POTS splitter for voice and data applications (Cisco 6130 with a POTS splitter configuration)
- Directly for data-only applications (Cisco 6130 without a POTS splitter configuration)

Figure C-1 shows connector pin locations for the *x*DSL Champ connectors. Pin locations are the same for all Champ connectors.

Figure C-1 xDSL Connector Pin Locations



Note You must screw all cables into the backplane and tie wrap Champ connectors (see "Cabling Guidelines" section on page B-2).

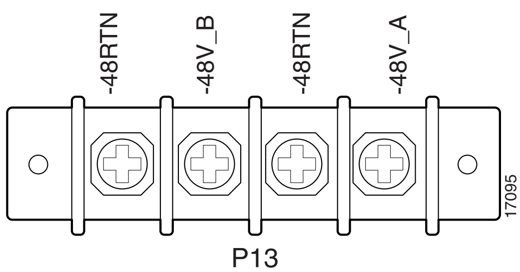
Cisco 6130 Terminal Block Connector

Use the terminal block connector to wire the Cisco 6130 to the power source on the fuse and alarm panel. For more information on power connections, see one of the following sections:

- The “Attach Cisco 6130 Power Connections” section on page 3-11 for a Cisco 6130 with a POTS splitter configuration
- The “Attach Cisco 6130 Power Connections” section on page 4-7 for a Cisco 6130 without a POTS splitter configuration

The terminal block connectors will accept 12 to 18 American Wire Gauge (AWG) copper solid or stranded wire. Figure C-2 shows the Cisco 6130 with NI-2 system power terminal block.

Figure C-2 Cisco 6130 Power Terminal Block



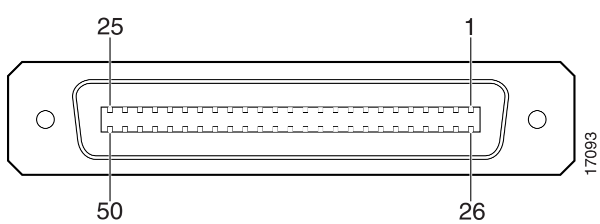
Cisco 6120 Chassis Connectors

The backplane of the Cisco 6120 provides three sets of connectors:

- Four Champ connectors for connection to subscriber pairs
- Four Champ connectors for connections to the PSTN for voice service

Pin locations are the same for all Champ connectors on the Cisco 6120 (see Figure C-3).

Figure C-3 Connector Pin Locations for All Champ Connectors



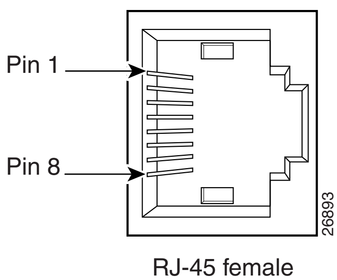
Console and Auxiliary Ports

The console and auxiliary ports, which are two identical serial EIA/TIA-232 ports, use receptacle connectors on the NI-2 card faceplate. Table C-1 shows the pin assignments, and Figure C-4 shows an RJ-45 receptacle.

Table C-1 Pin Assignments for the NI-2 Card Console and Auxiliary Receptacles

Pin Number	Signal
1	RTS
2	DTR
3	TXD
4	GND
5	GND
6	RXD
7	DSR
8	CTS

Figure C-4 NI-2 Card Console and Auxiliary Receptacle



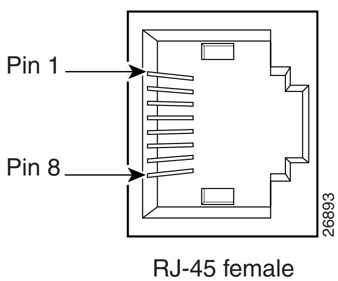
Ethernet Port

The Ethernet port, a 10BaseT interface with a receptacle connector, is on the NI-2 card faceplate. It is used to connect the Cisco 6130 to the management station, a Sun SPARCstation running Cisco DSL Manager (CDM) software. Table C-2 shows the pin assignments, and Figure C-5 shows an NI-2 card Ethernet connector.

Table C-2 Pin Assignments for the NI-2 Card Management Ethernet Receptacle

Pin Number	Signal
1	TX+
2	TX–
3	RX+
4	Unused
5	Unused
6	RX–
7	Unused
8	Unused

Figure C-5 NI-2 Card Management Ethernet Receptacle



GLOSSARY

A

AAL5 — ATM adaptation layer 5. This layer maps higher layer user data into ATM cells, making the data suitable for transport through the ATM network.

access identifier — See *AID*.

address mask — A bit mask used to select bits from an Internet address for subnet addressing. The mask is 32 bits long and selects the network portion of the Internet address and one or more bits of the local portion. Sometimes called subnet mask.

ADSL — asymmetric digital subscriber line. A digital subscriber line (DSL) technology in which the transmission of data from server to client is much faster than the transmission from the client to the server.

ADSL Transmission Unit—central office — See *ATU-C*.

ADSL Transmission Unit—remote — See *ATU-R*.

AID — access identifier.

AIS — alarm indication signal.

American National Standards Institute — See *ANSI*.

American Wire Gauge — See *AWG*.

ANSI — American National Standards Institute. An organization that develops standards for many things, only some having to do with computers. ANSI is a member of the International Standards Organization (ISO). See *ISO*.

asymmetric digital subscriber line — See *ADSL*.

asynchronous communications — A method of transmitting data in which each transmitted character is sent separately. The character has integral start and stop bits so that the character can be sent at an arbitrary time, and separate from any other character.

Asynchronous Transfer Mode — See *ATM*.

ATM Asynchronous Transfer Mode. A cell-based data transfer technique in which channel demand determines packet allocation. ATM offers fast packet technology, real time, demand led switching for efficient use of network resources.

ATM adaptation layer 5 See *AAL5*.

ATU-C ADSL Transmission Unit—central office.

ATU-R ADSL Transmission Unit—remote.

authentication A security feature that allows access to information to be granted on an individual basis.

autonegotiation Procedure for adjusting line speeds and other communication parameters automatically between two computers during data transfer.

AWG American Wire Gauge. The measurement of thickness of a wire.

B

bandwidth The range of frequencies a transmission line or channel can carry: the greater the bandwidth, the greater the information-carrying capacity of a channel. For a digital channel this is defined in bits. For an analog channel, it is dependent on the type and method of modulation used to encode the data.

bandwidth on demand The ability of a user to dynamically set upstream and downstream line speeds to a particular rate of speed.

BOOTP A TCP/IP network protocol that lets network nodes request configuration information from a BOOTP "server" node.

bps bits per second. A standard measurement of digital transmission speeds.

bits per second See *bps*.

bridge A device that connects two or more physical networks and forwards packets between them. Bridges can usually be made to filter packets, that is, to forward only certain traffic. Related devices are: repeaters which simply forward electrical signals from one cable to the other, and full-fledged routers which make routing decisions based on several criteria. See repeater and router.

broadband Characteristic of any network that multiplexes independent network carriers onto a single cable. This is usually done using frequency division multiplexing (FDM). Broadband technology allows several networks to coexist on one single cable; traffic from one network does not interfere with traffic from another since the "conversations" happen on different frequencies in the "ether" rather like the commercial radio system.

broadband remote access server Device that terminates remote users at the corporate network or Internet users at the ISP network that provides firewall, authentication, and routing services for remote users.

broadcast A packet delivery system where a copy of a given packet is given to all hosts attached to the network. Example: Ethernet.

C

CAP Carrierless Amplitude and Phase Modulation. A modulation technology for ADSL.

Carrierless Amplitude and Phase Modulation See *CAP*.

CBOS Cisco Broadband Operating System. Operating System that users access to configure and operate the Cisco products.

CCO Cisco Connection Online.

cell relay Generic term for a protocol based on small fixed packet sizes capable of supporting voice, video, and data at very high speeds.

central office See *CO*.

Channel Service Unit/Data Service Unit (CSU/DSU) A digital interface unit that connects end user equipment to the local digital telephone loop.

chassis The card cage (housing) where modules are placed.

Cisco Broadband Operating System See *CBOS*.

Cisco Connection Online See *CCO*.

CLEI Common Language Equipment Identifier.

client-server model A common way to describe network services and the user processes (programs) of those services. Examples include the name-server/name-resolver paradigm of the DNS and file-serve/file-client relationships such as NFS and diskless hosts.

CLI command line interface.

CLLI Common Language Location Identifier.

CO central office. Local telephone office through which all local loops in a given area connect and switch subscriber lines.

Common Language Equipment Identifier See *CLEI*.

Common Language Location Identifier See *CLLI*.

connectionless network The transport of a single datagram or packet of information from one network node to a destination node or multiple nodes without establishing a network connection.

connection-oriented network The transport of packets of information from one network node to a destination node following an established network connection.

CPE	customer premises equipment. Terminating equipment, such as terminals, telephones, and modems, supplied by the telephone company. The equipment is installed at customer sites and connected to the telephone company network.
CTC	common transmit clock.
customer premises equipment	See *CPE*.

D

daemon	A program that is not invoked explicitly but lies dormant waiting for some condition(s) to occur.
DDTS	Cisco Distributed Defect Tracking System.
dial-up network	Enables computer users to dial up a service provider's computer using a modem.
digital signal level 3	See *DS3*.
Discrete Multitone	See *DMT*.
Distributed Defect Tracking System	See *DDTS*.
distributed processing	An approach that allows one application program to execute on multiple computers linked together by a network. The networked computers share the work between them.
DMT	Discrete Multitone.
dotted decimal notation	The syntactic representation for a 32-bit integer that consists of four 8-bit numbers written in base 10 with periods (dots) separating them. Used to represent IP addresses in the Internet as in: 221.34.64.32.
downstream rate	The line rate for return messages or data transfers from the network machine to the user's CPE.
DRAM	dynamic random-access memory. A type of semiconductor memory in which the information is stored in capacitors on a metal oxide semiconductor integrated circuit.
DS1	digital signal level 1. A 1.544 Mbps digital signal that is carried on a T1 line.
DS3	digital signal level 3. Framing specification used for transmitting digital signals at 44.736 Mbps on a T3 facility.
DSLAM	digital subscriber line access multiplexer. Concentrates and multiplexes digital subscriber line signals at the telephone service provider location to the broadband wide area network. Replaces ADSLAM.
DSL Forum	An organization of competing companies that sponsors an Internet Web site (http://www.adsl.com) containing information about the applications, technology, systems, market, trials, and tariffs related to DSL technology.
dynamic random-access memory	See *DRAM*.

E

E1
A digital carrier that is used to transmit a formatted signal at 2.048 Mbps.

EIA
Electronic Industries Association. A standards organization made up of electronics industry organizations. EIA is responsible for The RS-232C and RS-422 standards.

Electronic Industries Association
See *EIA*.

encapsulation
The technique used by layered protocols in which a layer adds header information to the protocol data unit (PDU) from the layer above. As an example, in Internet terminology, a packet would contain a header from the physical layer, followed by a header from the network layer (IP), followed by a header from the transport layer (TCP), followed by the application protocol data.

entity
A physical or logical system component which is represented in the 6100 SNMP Agent.

EPROM
Erasable programmable read-only memory.

erasable programmable read-only memory
See *EPROM*.

error detection
A process used during file transfer to discover discrepancies between transmitted and received data. Some file transfer programs only detect errors; others detect errors and attempt to fix them (called error correction).

ESF
Extended Superframe. A framing type that is used on T1 circuits that consists of 24 frames of 192 bits each, with the 193rd bit providing timing and other functions.

Ethernet
One of the most common local area network (LAN) wiring schemes, Ethernet has a transmission rate of 10 Mbps; a newer standard called Fast Ethernet carries 100 Mbps.

ETSI
A European standards body established in 1988 by a decision of the European Conference of Postal and Telecommunications Administrations (CEPT). It has taken over the work of the CEPT the area of developing the *Net-Normes Europeene de Telecommunication*, Net standards.

F

FCC
Federal Communications Commission. A U.S. government agency that regulates interstate and foreign communications. The FCC sets rates for communication services, determines standards for equipment, and controls broadcast licensing.

Federal Communications Commission
See *FCC*.

File Transfer Protocol
See *FTP*.

finger daemon
A software tool that allows a client to query a server for information on users.

firewall A method for protecting Internet-connected enterprise networks from break-ins by unauthorized persons outside the network.

frame A packet as it is transmitted over a serial line. The term derives from character oriented protocols where special start-of-frame and end-of-frame characters were added when transmitting packets.

FTP File Transfer Protocol. The Internet protocol (and program) used to transfer files between hosts.

G

G.804 ITU-T framing standard that defines the mapping of ATM cells into the physical medium.

gateway A system which does translation from some native format to another. Examples include X.400 to/from RFC 822 electronic mail gateways. See router.

H

handshake Part of the procedure to set up a data communications link. The handshake can be part of the protocol itself or an introductory process. The computers wishing to talk to each other set out the conditions they can operate under. Sometimes, the handshake is just a warning that a communication is imminent.

HDLC High-Level Data Link Control. A bit-oriented, synchronous, link layer, data-framing, flow control, and error detection and correction protocol. Available subsets include: 802.2 (logical link control for FDDI, Token Ring, and some Ethernet LANs, LAP (link access procedure balanced for X.25), LAPD (link access procedure for the ISDN D channel and frame relay), and LAPM (link access procedure for error-correcting modems specified as part of V.42).

High-Level Data Link Control See *HDLC*.

hop count A measure of distance between two points on the Internet. It is equivalent to the number of gateways that separate the source and destination.

HTML Hypertext Markup Language. The page-coding language for the World Wide Web.

HTML browser A browser used to traverse the Internet, such as Netscape or Microsoft Internet Explorer.

HTTP Hypertext Transfer Protocol. The protocol used to carry world wide web (WWW) traffic between a WWW browser computer and the WWW server being accessed.

Hypertext Markup Language See *HTML*.

Hypertext Transfer Protocol See *HTTP*.

I

ICMP Internet Control Message Protocol. The protocol used to handle errors and control messages at the IP layer.

ICP IMA control protocol.

IDCR IMA data cell rate.

IEEE Institute of Electrical and Electronics Engineers. A U.S. publishing and standards organization responsible for many LAN standards.

IMA inverse multiplexing over ATM. Standard protocol defined by the ATM Forum in 1997.

Industry-Standard Architecture See *ISA*.

Institute of Electrical and Electronics Engineers See *IEEE*.

International Organization for Standardization See *ISO*.

International Telecommunication Union Telecommunication Standardization Sector See *ITU-T*.

Internet A collection of networks interconnected by a set of routers, which allows them to function as a single, large virtual network. When written in upper case, Internet refers specifically to the DARPA (Defense Advanced Research Projects Agency) Internet and the TCP/IP protocols it uses.

Internet address An IP address assigned in blocks of numbers to user organizations accessing the Internet. The United States Department of Defense's Network Information Center establishes these addresses. Duplicate addresses can cause major problems on the network, but the NIC trusts organizations to use individual addresses responsibly. Each address is a 32-bit address in the form of x.x.x.x where *x* is an eight- bit number from 0 to 255. There are three classes: A, B, and C, depending on how many computers on the site are likely to be connected.

Internet Control Message Protocol See *ICMP*.

Internet Protocol See *IP*.

Internet service provider See *ISP*.

Internetwork Packet Exchange See *IPX*.

Internetwork Packet Exchange Control Protocol	See *IPXCP*.
inverse multiplexing	Allows individually dialed channels across the network to be combined into a single, higher-speed data streams. Using this service, a user can dial multiple calls and combine them together into a single high-speed data stream.
IP	Internet Protocol. The network layer protocol for the Internet Protocol suite.
IP address	The 32-bit address assigned to hosts that want to participate in a TCP/IP Internet.
IP datagram	The fundamental unit of information passed across the Internet. It contains source and destination addresses along with data and a number of fields that define such things as the length of the datagram, the header checksum, and flags to say whether the datagram can be or has been fragmented.
IPX	Internetwork Packet Exchange. The network layer (OSI Layer 3) datagram-based protocol usually used by Novell's NetWare network operating system. Supports any window size and packet sizes up to 64 KB.
IPXCP	Internetwork Packet Exchange Control Protocol. A protocol defined in RFC 1552.
ISA	Industry-Standard Architecture. The bus used in standard IBM-compatible PCs to provide power to add-in boards and to the motherboard (into which the boards plug). Typical maximum transfer speed of 1 to 2.5 Mbps (variables include other devices, memory, and buffering) but designed for up to 16 Mbps.
ISO	International Organization for Standardization. A voluntary, nontreaty organization founded in 1946, responsible for creating international standards in many areas, including computers and communications.
ISP	Internet service provider. A company that allows home and corporate users to connect to the Internet.
ITC	independent transmit clock.
ITU-T	International Telecommunication Union Telecommunication Standardization Sector. ITU-T is the telecommunication standardization sector of ITU and is responsible for making technical recommendations about telephone and data (including fax) communications systems for service providers and suppliers.

L

LAN	local-area network. A limited distance (typically under a few kilometers or a couple of miles) high-speed network (typically 4 to 100 Mbps) that supports many computers (typically two to thousands).
LCD	loss of cell delineation.
LCP	link control protocol.
LED	light emitting diode. The lights indicating status or activity on electronic equipment.
LIF	loss of IMA frame.

light emitting diode See *LED*.

line concentration Functionality performed by a type of multiplexer that combines multiple channels onto a single transmission medium in such a way that all the individual channels can be simultaneously active. For example, ISPs use concentrators to combine their dial-up modem connections onto faster T1 lines that connect to the Internet.

line rate The speed by which data is transferred over a particular line type, express in bits per second (bps).

local-area network See *LAN*.

LODS loss of delay synchronization.

LOF loss of frame.

logical pool A logical grouping of ATU-C ports and LIM ports that comprise a particular DOH oversubscription ratio.

logical port A logical entry to a server machine. These ports are mostly invisible to the user, though you may occasionally see a URL with a port number included in it. These ports do not refer to physical locations; they are set up by server administrators for network trafficking.

loopback A diagnostic test that returns the transmitted signal back to the sending device after it has passed through a network or across a particular link. The returned signal can then be compared to the transmitted one. The discrepancies between the two help to trace the fault. When trying to locate a faulty piece of equipment, loopbacks will be repeated, eliminating satisfactory machines until the problem is found.

LOS loss of signal.

M

MAC Media Access Control. A sublayer of the Data Link Layer (Level Two) of the ISO OSI Model responsible for media control.

Management Information Base See *MIB*.

MD5 protocol Authentication and encryption protocol.

MDI Multidocument Interface.

Media Access Control See *MAC*.

MIB Management Information Base. A collection of objects that can be accessed via a network management protocol, such as SNMP and CMIP (Common Management Information Protocol).

MMF multimode fiber.

modem redundancy When backup modems are immediately available should a modem facilitating communication fail.

module A printed circuit board that occupies a slot in a chassis.

Multidocument Interface See *MDI*.

multimode fiber See *MMF*.

multicast A special form of broadcast where copies of the packet are delivered to only a subset of all possible destinations. See also *broadcast*.

multiplexer A device that can send several signals over a single line. They are then separated by a similar device at the other end of the link. This can be done in a variety of ways: time division multiplexing, frequency division multiplexing, and statistical multiplexing. Multiplexers are also becoming increasingly efficient in terms of data compression, error correction, transmission speed, and multidrop capabilities.

N

NAT Network Address Translation.

Network Address Translation See *NAT*.

network interface Boundary between a carrier network and a privately-owned installation.

network layer The OSI layer that is responsible for routing, switching, and subnetwork access across the entire OSI environment.

Network Virtual Terminal See *NVT*.

NI-2 A second generation network interface card.

node A general term used to refer to a computer or related device; often used to refer to a networked computer or device.

Node System Save file See *NSS*.

noise margin The amount of noise tolerated by the ATU-C and ATU-R while training.

NSS Node System Save file. The file that is saved during a Save Configuration or during a Software download. This file is required for Restore Configurations.

NVT Network Virtual Terminal.

O

OC-3 optical carrier level 3. Physical protocol, defined for SONET optical signal transmissions.

octet A networking term that identifies eight bits. In TCP/IP, it is used instead of *byte,* because some systems have bytes that are not eight bits.

OOF	out of frame.
Open System Interconnection	See *OSI*.
Optical Carrier Level 3	See *OC-3*.
OSI	Open System Interconnection. An international standardization program to facilitate communications among computers from different manufacturers. See ISO.
OSR	oversubscription ratio. The number of LIM ports divided by the number of ATU-C ports within a given logical pool.
oversubscription ratio	See *OSR*.

P

packet	The unit of data sent across a packet switching network.
PAP	Password Authentication Protocol.
Password Authentication Protocol	See *PAP*.
PCI	Peripheral Component Interconnect. An industry local bus standard. Supports up to 16 physical slots but is electrically limited to typically three or four plug-in PCI cards in a PC. Has a typical sustained burst transfer rate of 80 Mb—enough to handle 24-bit color at 30 frames per second (full-color, full-motion video).
PEM	power entry module.
Peripheral Component Interconnect	See *PCI*.
permanent virtual circuit	See *PVC*.
physical layer	Handles transmission of raw bits over a communication channel. The physical layer deals with mechanical, electrical, and procedural interfaces.
physical pool	A physical grouping of chassis slots within the Cisco 6100/6130 or Cisco 6110.
physical port	A physical connection to a computer through which data flows. An “Ethernet port,” for example, is where Ethernet network cabling plugs into a computer.
plain old telephone service	See *POTS*.

Point-to-Point Protocol See *PPP*.

port The abstraction used by Internet transport protocols to distinguish among multiple simultaneous connections to a single destination host. A single termination point on one of the multiport modules (POTS, LIM, or ATU-C).

POTS plain old telephone service.

PPP Point-to-Point Protocol. The successor to SLIP, PPP provides router-to-router and host-to-network connections over both synchronous and asynchronous circuits. See SLIP.

protocol A formal description of messages to be exchanged and rules to be followed for two or more systems to exchange information.

PVC permanent virtual circuit. A fixed virtual circuit between two users: the public data network equivalent of a leased line. No call setup or clearing procedures are needed.

Q

QoS quality of service. A characteristic of data transmission that measures how accurately and how quickly a message or data is transferred from a source computer to a destination computer over a network.

quality of service See *QoS*.

R

RADIUS Remote Authentication Dial-In User Service. A client/server security protocol created by Livingston Enterprises. Security information is stored in a central location, known as the RADIUS server.

RADIUS Accounting Client Permits system administrators to track dial-in use.

RADIUS Security Client Controls access to specific services on the network.

RADSL rate adaptive digital subscriber line. A technique for keeping the quality of transmissions within specified parameters.

Rate Adaptive Digital Subscriber Line See *RADSL*.

remote address The IP address of a remote server.

Remote Authentication Dial-In User Service See *RADIUS*.

remote server A network computer that allows a user to log onto the network from a distant location.

Request for Comments See *RFC*.

RFC Request for Comments. The document series, begun in 1969, which describes the Internet suite of protocols and related experiments. Not all RFCs describe Internet standards, but all Internet standards are written up as RFCs.

route The path that network traffic takes from its source to its destination. The route a datagram may follow can include many gateways and many physical networks. In the Internet, each datagram is routed separately.

router A system responsible for making decisions about which of several paths network (or Internet) traffic will follow. To do this, it uses a routing protocol to gain information about the network and algorithms to choose the best route based on several criteria known as “routing metrics.” See also *bridge*.

routing table Information stored within a router that contains network path and status information. It is used to select the most appropriate route to forward information along.

RS-232 An EIA standard that is the most common way of linking data devices together.

S

SAP Service Advertisement Protocol.

SDSL symmetrical digital subscriber line.

secret It is the encryption key used by RADIUS to send authentication information over a network.

serial line A serial line is used to refer to data transmission over a telephone line via a modem or when data goes from a computer to a printer or other device.

Service Advertisement Protocol See *SAP*.

shared secret RADIUS uses the shared secret to encrypt the passwords in the authentication packets, so outside parties do not have access to the passwords on your network.

signal-to-noise ratio See *SNR*.

SIMM Single In-line Memory Module. A small circuit board or substrate, typically about 10cm x 2cm, with RAM integrated circuits or die on one or both sides and a single row of pins along one long edge.

Simple Network Management Protocol See *SNMP*.

Single In-line Memory Module See *SIMM*.

single-mode fiber See *SMF*.

slot A numbered location within a chassis capable of housing a module.

SMF	single-mode fiber.
SNMP	Simple Network Management Protocol. The network management protocol of choice for TCP/IP-based internets.
SNR	signal-to-noise ratio. Usable signal being transmitted divided by the noise or undesired signal.
socket	(1) The Berkeley Unix mechanism for creating a virtual connection between processes. (2) IBM term for software interfaces that allow two Unix application programs to talk via TCP/IP protocols.
Spanning-Tree Protocol	See *STP*.
spoofing	A method of fooling network end stations into believing that keep-alive signals have come from and return to the host. Polls are received and returned locally at either end of the network and are transmitted only over the open network if there is a condition change.
STP	Spanning-Tree Protocol. Part of an IEEE standard. A bridge protocol for detecting and preventing loops from occurring in a multibridged environment. When bridges connect three or more LAN segments, a loop can occur. Because a bridge forwards all packets which are not recognized as being local, some packets can circulate for long periods of time, eventually degrading system performance. This algorithm ensures only one path connects any pair of stations, selecting one bridge as the 'root' bridge, with the highest priority one as identifier, from which all paths should radiate.
STU-C	SDSL Transmission Unit—central office.
subnet	For routing purposes, IP networks can be divided into logical sub nets by using a subnet mask. Values below those of the mask are valid addresses on the subnet.
subnet mask	See *address mask*.
subordinate entity	An entity which has a superior entity.
subscriber	A logical entity with attributes identifying the customer that is receiving service on a particular LIM port.
superior entity	An entity which has subordinate entities.
SVC	switched virtual circuit. A temporary virtual circuit between two users.
switch	Equipment used to connect and distribute communications between a trunk line or backbone and individual nodes.
switched virtual circuit	See *SVC*.
symmetrical digital subscriber line	See *SDSL*.
synchronous connection	During synchronous communications, data is not sent in individual bytes, but as frames of large data blocks.
SYSLOG	SYSLOG allows you to log significant system information to a remote server.

T

T1	A digital carrier that is used to transmit a DS1 formatted digital signal at 1.544 Mbps.
T3	A digital carrier that is used to transmit a DS3 formatted digital signal at 45 Mbps.
TCP	Transmission Control Protocol. The major transport protocol in the Internet suite of protocols providing reliable, connection-oriented full-duplex streams.
Telnet	The virtual terminal protocol in the Internet suite of protocols. Allows users of one host to log into a remote host and act as normal terminal users of that host.
TFTP	Trivial File Transfer Protocol. A simple file transfer protocol (a simplified version of FTP) that is often used to boot diskless workstations and other network devices such as routers over a network (typically a LAN). Has no password security.
training	The procedure used by the ATU-C and ATU-R to establish an end-to-end ADSL connection.
training mode	Characteristic of a router that allows it to use RADSL technology to adjust its line speed according to noise conditions on the transmission line.
Transmission Control Protocol	See *TCP*.
transparent bridging	So named because the intelligence necessary to make relaying decisions exists in the bridge itself and is thus transparent to the communicating workstations. It involves frame forwarding, learning workstation addresses and ensuring no topology loops exist (in conjunction with the Spanning-Tree algorithm).
Trivial File Transfer Protocol	See *TFTP*.
twisted pair	Two insulated copper wires twisted together with the twists or lays varied in length to reduce potential signal interference between the pairs.

U

UDP	User Datagram Protocol. A connectionless transport protocol that runs on top of the TCP/IP IP. UDP, like TCP, uses IP for delivery; however, unlike TCP, UDP provides for exchange of datagrams without acknowledgments or guaranteed delivery. Best suited for small, independent requests, such as requesting a MIB value from an SNMP agent, in which first setting up a connection would take more time than sending the data.
UL	Underwriters Laboratories. A private organization that tests and certifies electrical components and devices against rigorous safety standards. A UL Listing Mark on a product means that representative samples of the product have been tested and evaluated to nationally recognized safety standards with regard to fire, electric shock, and other related safety hazards.
Underwriters Laboratories	See *UL*.
UNI	User-Network Interface.

UNI signaling User-Network Interface signaling for ATM communications.

upstream rate The line rate for message or data transfer from the source machine to a destination machine on the network. Also see downstream rate.

User Datagram Protocol See *UDP*.

V

VC virtual circuit. A logical circuit created to ensure reliable communication between two network devices. A virtual circuit is defined by a VPI/VCI pair, and can be either permanent (PVC) or switched (SVC). In ATM, a virtual circuit is called a virtual channel. Sometimes abbreviated VC. See also *PVC, SVC, VCI,* and *VPI*.

VCC virtual channel connection. Logical circuit, made up of links, that carries data between two end points in an ATM network. Sometimes called a virtual channel connection. See also *VCI* and *VPI*.

VCI virtual channel identifier. 16-bit field in the header of an ATM cell. The VCI, together with the VPI, is used to identify the next destination of a cell as it passes through to the ATM switch. Sometimes called virtual channel connection. See also *VPI*.

virtual channel See *VC*.

virtual circuit See *VC*.

virtual channel connection See *VCC*.

virtual channel identifier See *VCI*.

virtual connection In ATM, a connection between end users that has a defined route and endpoints. See also *PVC* and *SVC*.

virtual path A logical grouping of virtual circuits that connect two sites. See also *virtual circuit*.

virtual path identifier See *VPI*.

virtual path identifier/virtual circuit identifier See *VPI* and *VCI*.

VP virtual path. One of two types of ATM circuits identified by a VPI. A virtual path is a bundle of virtual circuits, all of which are switched across a network based on a common VPI. See also *VPI*.

VPI virtual path identifier. An 8-bit field in the header of an ATM cell. The VPI, together with the VCI, is used to identify the next destination of a cell as it passes through the network. See also *VCI*.

W

WAN wide-area network. A data communications network that spans any distance and is usually provided by a public carrier (such as a telephone company or service provider).

wide-area network See *WAN*.

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