



NI-2 Card FRU Installation and Replacement Notes

This document provides an overview of and installation and replacement procedures for the second-generation network interface (NI-2) card in the following chassis:

- Cisco 6015, commercial and outside-plant environments
- Cisco 6100
- Cisco 6130
- Cisco 6160
- Cisco 6260

The NI-2 card is a field-replaceable unit (FRU).

This document includes the following sections:

- [Introduction, page 2](#)
- [NI-2 Card Overview, page 3](#)
- [Network Clocking Overview, page 22](#)
- [Redundancy Overview, page 22](#)
- [Installation Prerequisites, page 25](#)
- [General Safety Precautions and Maintenance Guidelines, page 27](#)
- [Removing and Installing IMA NI-2 Cards, page 33](#)
- [Removing and Installing a DS3/2DS3 NI-2 Card, page 37](#)
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Introduction

The NI-2 card is a system processor module that includes the following features:

- Connects to the xTU-C line cards through point-to-point serial data buses on the backplane.
- Contains the ATM switch fabric.
- Supports subtending of as many as 12 subtended node chassis. Refer to the appropriate hardware installation guide for detailed information about subtending.
- Provides visual and audible operating status alerts.



Note Audible alerts are not supported on the DS3+T1/E1 IMA and ITEMP DS3+T1/E1 IMA NI-2 cards in the Cisco 6015 chassis.

- Provides CO facility alarm relay contact interfaces and an alarm cut-off (ACO) button.
- Is manageable through Cisco IOS software or Cisco Digital Subscriber Line Manager (CDM).
- Provides Cisco IOS-based ATM quality of service (QoS).

Table 1 shows each NI-2 card type, the physical name of the card as it appears on the NI-2 card faceplate, and the hardware configuration of each NI-2 card type.

Table 1 NI-2 Card Hardware Configuration

NI-2 Card Type	NI-2 Card Faceplate Label	Hardware Configuration	
Identified in This Document	Printed on NI-2 Card Faceplate	Trunk/Uplink (Quantity)	Subtending Interface/Downlink (Quantity)
DS3+T1/E1 IMA	DS3+T1/E1 IMA	<ul style="list-style-type: none"> • DS3 coaxial (1)¹ or • T1 link or IMA group (1) or • E1 link or IMA group (1) 	<ul style="list-style-type: none"> • T1 link (8) or IMA group (maximum of 4)¹ or • E1 link (8) or IMA group (maximum of 4)
ITEMP DS3+T1/E1 IMA	DS3+T1/E1 IMA ITEMP	<ul style="list-style-type: none"> • DS3 coaxial (1)¹ or • T1 link or IMA group (1) or • E1 link or IMA group (1) 	<ul style="list-style-type: none"> • T1 link (8) or IMA group (maximum of 4)¹ or • E1 link (8) or IMA group (maximum of 4)
DS3/2DS3	DS3/E3-DS3/E3	DS3/E3 coaxial (1) ¹	DS3/E3 coaxial (2) ¹
OC-3c/2DS3 SMF ²	OC3 SM/2XDS3	OC-3c (1)	DS3 coaxial (2) ¹
OC-3c/2DS3 MMF ³	OC3 MM/2XDS3	OC-3c (1)	DS3 coaxial (2) ¹
OC-3c/OC-3c SMF	155SM-155SM	OC-3c (1)	OC-3c (1)
OC-3c/OC-3c MMF	155MM-155MM	OC-3c (1)	OC-3c (1)

1. All network trunk and subtend connectors for this card are located on the I/O module or I/O card.
2. SMF = single-mode fiber.
3. MMF = multimode fiber.

Table 2 lists the NI-2 cards and shows which DSLAMs each card is compatible with. The table also lists the product numbers for each NI-2 card.

Table 2 NI-2 Card and Chassis Compatibility

NI-2 Card	Product Number	Cisco 6015	Cisco 6100/6130	Cisco 6160	Cisco 6260
DS3+T1/E1 IMA ¹	NI-2-DS3-T1E1=	Yes ²	No	Yes ³	Yes ⁴
ITEMP ⁵ DS3+T1/E1 IMA	NI-2-DS3-T1E1-H=	Yes ⁶	No	No	No
DS3/2DS3	NI-2-DS3-DS3=	No	Yes	Yes	Yes ^{7, 8}
OC-3c/2DS3 SMF	NI-2-155SM-DS3=	No	No	Yes	No
OC-3c/2DS3 MMF	NI-2-155MM-DS3=	No	No	Yes	No
OC-3c/OC-3c SMF	NI-2-155SM-155SM=	Yes ²	Yes	Yes	Yes ⁹
OC-3c/OC-3c MMF	NI-2-155MM-155MM=	Yes ²	Yes	Yes	Yes ⁹
OC-3c/OC-3c SMF	NI-2-155SM-155SM2=	Yes ²	Yes	Yes	Yes ⁹
OC-3c/OC-3c MMF	NI-2-155MM-155MM2=	Yes ²	Yes	Yes	Yes ⁹

1. IMA = inverse multiplexing over ATM.
2. In a Cisco 6015 system, use only in a commercial environment.
3. In a Cisco 6160 system, use only with the DS3/2DS3+8xT1 I/O card (part number 6160-1-I/O-2=).
4. In a Cisco 6260 system, use only with the E1 I/O module.
5. ITEMP = industrial temperature.
6. In a Cisco 6015 system, use only in an outside-plant environment.
7. When the DS3/2DS3 NI-2 card and the E3 I/O module are installed in the Cisco 6260 chassis, the system adopts E3 functionality.
8. In a Cisco 6260 system, use only with the E3 I/O module.
9. In a Cisco 6260 system, use only with the OC-3c I/O module.

NI-2 Card Overview

This section provides detailed information about the following NI-2 cards:

- [DS3+T1/E1 IMA and ITEMP DS3+T1/E1 IMA NI-2 Card, page 4](#)
- [DS3/2DS3 NI-2 Card, page 9](#)
- [OC-3c/2DS3 NI-2 Card, page 13](#)
- [OC-3c/OC-3c NI-2 Card, page 17](#)

DS3+T1/E1 IMA and ITEMP DS3+T1/E1 IMA NI-2 Card

This section provides the following information about the DS3+T1/E1 IMA and ITEMP DS3+T1/E1 IMA NI-2 card:

- [Features, page 4](#)
- [Faceplate Features, page 5](#)
- [Specifications, page 8](#)

Features

In addition to the features described in the “[Introduction](#)” section on page 2, the DS3+T1/E1 IMA or ITEMP DS3+T1/E1 IMA NI-2 cards

- Provide the following interfaces:
 - DS3—Cisco 6015 and Cisco 6160 only
 - T1—Cisco 6015 and Cisco 6160 only
 - E1—Cisco 6015 and Cisco 6260 only
 - T1 IMA group—Cisco 6015 and Cisco 6160 only
 - E1 IMA group—Cisco 6015 and Cisco 6260 only



Note Trunk and subtend connectors for these NI-2 cards are located on the Input/Output (I/O) module (DS3+T1 or E1) on the Cisco 6015, the I/O card (DS3/2DS3+8xT1 IMA) on the Cisco 6160, or the E1 I/O module on the Cisco 6260.

- Control timing through an internal clock or building integrated timing supply (BITS) interface, or from an ATM interface (DS3, T1, or E1).



Note The BITS interface is connected through a header located on the back of the Cisco 6015 chassis, through the I/O card located on the back of the Cisco 6160 chassis, or through the I/O module on the front of the Cisco 6260.

- Control redundancy.



Note Redundancy is not supported on the Cisco 6015 chassis.

- Support the aggregation of up to 12 subtended node chassis that are configured for T1/E1 or T1/E1 IMA group operation in a daisy-chain, tree, or star topology.



Note The ITEMP DS3+T1/E1 IMA NI-2 card motherboard and IOS daughter card are populated with industrial temperature components so that the NI-2 card can operate in an outside-plant environment.

Faceplate Features

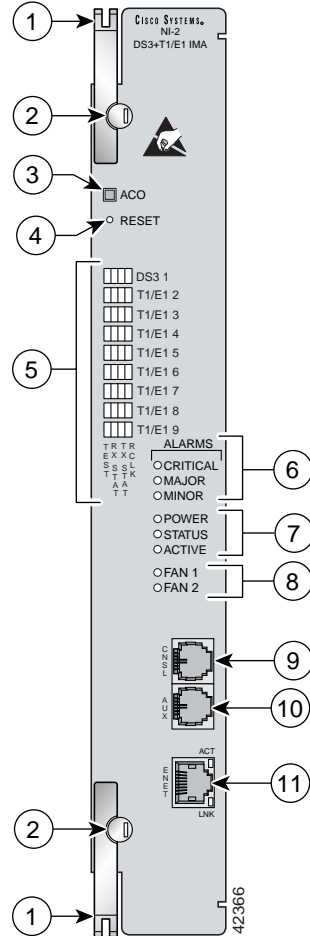
Figure 1 shows a close-up of the DS3+T1/E1 IMA NI-2 card faceplate.



Note

The only (visual) difference between the DS3+T1/E1 IMA NI-2 card and the ITEMP DS3+T1/E1 IMA NI-2 card is the word ITEMP silkscreened on the card faceplate.

Figure 1 DS3+T1/E1 IMA NI-2 Card Faceplate



1	Ejector lever.	7	Card status LED group.
2	Locking tab.	8	Fan alarm LED group.
3	ACO button.	9	CNSL—An RJ-45 receptacle that provides a serial connection to a system console.

4	Maintenance RESET port.	10	AUX—An RJ-45 receptacle that provides connection to an auxiliary device (such as a modem) used to remotely configure the system.
5	Interface status LED groups: DS3 1, T1/E1 2, T1/E1 3, T1/E1 4, T1/E1 5, T1/E1 6, T1/E1 7, T1/E1 8, and T1/E1 9. These groups show the status of the trunk and subtend connections on the I/O module or I/O card.	11	ENET—An RJ-45 10BaseT receptacle that complies with Ethernet standards and that provides connection to a system Ethernet.
6	System alarm LED group.		

Table 3 describes the LED group indicators and their functions.

Table 3 DS3+T1/E1 IMA NI-2 Card LED Group Indicators

LED Group	LED	State	Function
Interface status LED (5 in Figure 1)	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 ¹ STAT	Amber solid	The receiver detects a physical layer problem.
		Off	The receiver does not detect a physical layer problem.
	TX ² STAT	Amber solid	The transmitter detects a physical layer problem.
		Off	The transmitter does not detect a physical layer problem.
	RCLK ³	Green solid	Hardware detects an incoming clock signal.
		Off	Hardware does not detect an incoming clock signal.
System alarm (6 in Figure 1)	CRITICAL	Red	A critical alarm is active.
	MAJOR	Red	A major alarm is active.
	MINOR	Amber	A minor alarm is active.
Card status (7 in Figure 1)	POWER	Green	The NI-2 card has power.
	STATUS	Green	The operational status of the NI-2 card: <ul style="list-style-type: none"> • 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 3 DS3+T1/E1 IMA NI-2 Card LED Group Indicators (continued)

LED Group	LED	State	Function
Fan alarm (8 in Figure 1)	FAN 1	Red	The fan module or fan tray is not operational and is in alarm mode.
	FAN 2	Red	The fan module or fan tray is not operational and is in alarm mode. Note The FAN 2 LED is active only on an NI-2 card installed in a Cisco 6260. The FAN 2 LED is inactive and is always off on an NI-2 card installed in a Cisco 6015, Cisco 6100, Cisco 6130, or Cisco 6160.
ENET interface LED (11 in Figure 1)	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.

1. RX = receive
2. TX = transmit
3. RCLK = receive clock

Specifications

Table 4 lists the physical and electrical specifications of the DS3+T1/E1 IMA and ITEMP DS3+T1/E1 IMA NI-2 card.

Table 4 DS3+T1/E1 IMA and ITEMP DS3+T1/E1 IMA NI-2 Card Specifications

Specification	Description
Internal hardware	<ul style="list-style-type: none"> • 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)
External interfaces ¹	One DS3 (44.736 Mbps) coaxial port Eight T1(1.544 Mbps)/E1 (2.048 Mbps) RJ-48 ports
Connector types ²	DS3—BNC ³ E1/T1—RJ-48
Impedance	DS3—75 ohms (nominal) T1—100 ohms (nominal) E1—120 ohms (nominal)
Line encoding	DS3—B3ZS T1—AMI or B8ZS E1—AMI or HDB3
Framing	DS3—C-bit parity, optionally PLCP with M23, otherwise ADM ⁴ T1—SF or ESF E1—PCM30 or CRC4
Transmission distance	DS3—Short haul: < 225 ft (68.58 m), long haul: 225 to 450 ft (68.58 to 137.16 m) T1/E1—Short haul: 0 to 655 ft (0 to 199.64 m), long haul: > 655 ft (199.64 m) no span power
Power consumption	32.5W

1. All external interfaces for the DS3+T1/E1 IMA or ITEMP DS3+T1/E1 IMA NI-2 card are located on the I/O card or I/O module.
2. All trunk and subtend connectors for the DS3+T1/E1 IMA or ITEMP DS3+T1/E1 IMA NI-2 card are located on the I/O card or I/O module.
3. BNC = Bayonet-Neill-Concelman.
4. ADM = add/drop multiplexer.

DS3/2DS3 NI-2 Card

This section provides the following information about DS3/2DS3 NI-2 cards:

- [Features, page 9](#)
- [Faceplate Features, page 10](#)
- [Specifications, page 12](#)

Features

In addition to the features described in the [“Introduction” section on page 2](#), the DS3/2DS3 NI-2 card

- Provides the network DS3 WAN trunk interface through BNC connectors located on the I/O card (Cisco 6100, Cisco 6130, and Cisco 6160)
- Provides the network E3 WAN trunk interface through BNC connectors located on the E3 I/O module (Cisco 6260)



Note When the DS3/2DS3 NI-2 card and the E3 I/O module are installed in the Cisco 6260 chassis, the system adopts E3 functionality.

- Provides two DS3/E3 subtend interfaces through BNC connectors located on the I/O card or I/O module
- Controls timing and redundancy



Note The BITS interface is connected through the I/O card located on the back of the Cisco 6100, Cisco 6130, or Cisco 6160 chassis or through the I/O module on the front of the Cisco 6260 chassis.

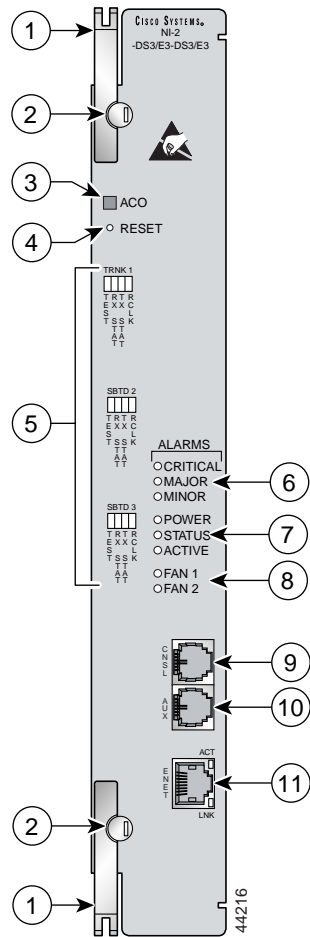
Redundancy is not supported on the Cisco 6100 chassis.

- Supports the aggregation of up to 12 subtended node chassis that are configured for DS3/E3 operation in a tree topology

Faceplate Features

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

Figure 2 DS3/2DS3 NI-2 Card Faceplate



1	Ejector lever.	7	Card status LED group.
2	Locking tab.	8	Fan alarm LED group.
3	ACO button.	9	CNSL—An RJ-45 receptacle that provides a serial connection to a system console.

4	Maintenance RESET port.	10	AUX—An RJ-45 receptacle that provides connection to an auxiliary device (such as a modem) used to remotely configure the system.
5	Interface status LED groups: Trunk 1 (TRNK 1), Subtend 2 (SBTD 2), and Subtend 3 (SBTD 3). These groups show the status of the trunk and subtend connections on the I/O card or I/O module.	11	ENET—An RJ-45 10BaseT receptacle that complies with Ethernet standards and that provides connection to a system Ethernet.
6	System alarm LED group.		

Table 5 describes the LED group indicators and their functions.

Table 5 DS3/2DS3 NI-2 Card LED Group Indicators

LED Group	LED	State	Function
Interface status LED (5 in Figure 2)	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 (6 in Figure 2)	CRITICAL	Red	A critical alarm is active.
	MAJOR	Red	A major alarm is active.
	MINOR	Amber	A minor alarm is active.
Card status (7 in Figure 2)	POWER	Green	The NI-2 card has power.
	STATUS	Green	The operational status of the NI-2 card: <ul style="list-style-type: none"> 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 5 DS3/2DS3 NI-2 Card LED Group Indicators (continued)

LED Group	LED	State	Function
Fan alarm (8 in Figure 2)	FAN 1	Red	The fan module or fan tray is not operational and is in alarm mode.
	FAN 2	Red	The fan module or fan tray is not operational and is in alarm mode. Note The FAN 2 LED is active only on an NI-2 card installed in a Cisco 6260. The FAN 2 LED is inactive and is always off on an NI-2 card installed in a Cisco 6100, Cisco 6130, or Cisco 6160.
ENET interface LED (11 in Figure 2)	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.

Specifications

Table 6 lists the physical and electrical specifications of the DS3/2DS3 NI-2 card.

Table 6 DS3/2DS3 NI-2 Card Specifications

Specification	Description
Internal hardware	<ul style="list-style-type: none"> • 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)
Layer 2 protocol	ATM
External interfaces ¹	Three DS3/E3 coaxial ports
Connector type ²	BNC
Impedance	75 ohms (nominal)
Line encoding	B3ZS
Framing	C-bit parity, optionally PLCP with M23, otherwise ADM

Table 6 DS3/2DS3 NI-2 Card Specifications (continued)

Transmission distance	DS3—Short haul: < 225 ft (68.58 m), long haul: 225 to 450 ft (68.58 to 137.16 m)
Power consumption	33.5W

1. All external interfaces for the DS3/2DS3 NI-2 card are located on the I/O card or I/O module.
2. All trunk and subtend connectors for the DS3/2DS3 NI-2 card are located on the I/O card or I/O module.

OC-3c/2DS3 NI-2 Card

This section provides the following information about OC-3c/2DS3 NI-2 cards:

- [Features, page 13](#)
- [Faceplate Features, page 14](#)
- [Specifications, page 16](#)

Features

In addition to the features that are described in the “[Introduction](#)” section on page 2, the OC-3c/2DS3 NI-2 card

- 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/2DS3 NI-2 card are available to support the WAN trunk interface:
 - SMF intermediate range
 - MMF short range
- Provides two DS3 subtend interfaces through BNC connectors located on the I/O card.
- Controls timing and redundancy.



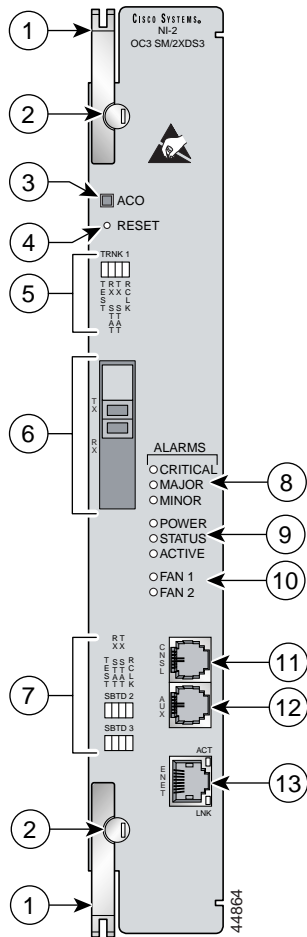
Note The BITS interface is connected through the I/O card located on the back of the Cisco 6160 chassis.

- Supports the aggregation of up to 12 subtended node chassis configured for DS3 operation in a tree configuration.

Faceplate Features

Figure 3 shows a close-up of the OC-3c/2DS3 NI-2 card faceplate.

Figure 3 OC-3c/2DS3 NI-2 Card Faceplate



1	Ejector lever.	8	System alarm LED group.
2	Locking tab.	9	Card status LED group.
3	ACO button.	10	Fan alarm LED group.
4	Maintenance RESET port.	11	CNSL—An RJ-45 receptacle that provides a serial connection to a system console.

5	Interface status LED group: Trunk 1 (TRNK 1). This group shows the status of the OC-3c network trunk connection.	12	AUX—An RJ-45 receptacle that provides connection to an auxiliary device (such as a modem) used to remotely configure the system.
6	An optical interface connector pair. This connector pair is for network trunk interface TX and RX data optical cables.	13	ENET—An RJ-45 10BaseT receptacle that complies with Ethernet standards and that provides connection to a system Ethernet.
7	Two interface status LED groups: Subtend 2 (SBTD 2) and Subtend 3 (SBTD 3). These LED groups monitor the DS3 subtend connections on the I/O card.		

Table 7 describes the LED group indicators and their functions.

Table 7 OC-3c/2DS3 NI-2 Card LED Group Indicators

LED Group	LED	State	Function
Interface status LED (5 and 7 in Figure 3)	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 3)	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 3)	POWER	Green	The NI-2 card has power.
	STATUS	Green	The operational status of the NI-2 card: <ul style="list-style-type: none"> 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
Fan alarm (10 in Figure 3)	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.

Table 7 OC-3c/2DS3 NI-2 Card LED Group Indicators (continued)

LED Group	LED	State	Function
ENET interface LED (13 in Figure 3)	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.

Specifications

Table 8 lists the physical and electrical specifications of the single-mode and multimode versions of the OC-3c/2DS3 NI-2 card.

Table 8 OC-3c/2DS3 NI-2 Card Specifications

Specification	Description
Internal hardware	<ul style="list-style-type: none"> • 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)
Power consumption	33.5W
Layer 2 protocol	ATM
DS3 Ports (Subtending)	(DS3 port specifications are the same for single-mode and multimode cards.)
External interfaces ¹	Two DS3 (44.736 Mbps) coaxial ports
Connector type ²	BNC
Impedance	75 ohms (nominal)
Line encoding	B3ZS
Framing	C-bit parity, optionally PLCP with M23, otherwise ADM

Table 8 OC-3c/2DS3 NI-2 Card Specifications (continued)

OC-3c Port (Trunk)	Single-Mode Card	Multimode Card
External interface	One OC-3c/STM-1 (155 Mbps) single-mode port	One OC-3c/STM-1 (155 Mbps) multimode port
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 DS3 subtending interfaces for the OC-3c/2DS3 NI-2 card are located on the I/O card.
2. The BNC subtend connectors for the OC-3c/2DS3 NI-2 card are located on the I/O card.

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

This section provides the following information about OC-3c/OC-3c NI-2 cards:

- [Features, page 17](#)
- [Faceplate Features, page 18](#)
- [Specifications, page 21](#)

Features

In addition to the features described in the [“Introduction” section on page 2](#), the OC-3c/OC-3c NI-2 card

- 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.
- Controls timing and redundancy.



Note The BITS interface is connected through a header located on the back of the Cisco 6015 chassis, through the I/O card located on the back of the Cisco 6100, Cisco 6130, and Cisco 6160 chassis, or through the I/O module on the front of the Cisco 6260.

Redundancy is not supported on the Cisco 6015 and Cisco 6100 chassis.

- Supports the aggregation of up to 12 subtended node chassis configured for OC-3c operation in a daisy chain configuration.

**Note**

The I/O module does not function when you use an OC-3c/OC-3c NI-2 card in the Cisco 6015; however, an I/O module must be installed in the chassis for the system to operate correctly. The OC-3c/OC-3c NI-2 card does not support the DS3, E1, or T1 interface found on the front of the Cisco 6015 I/O module. Therefore, the trunk and subtending interfaces are provided on the front of the OC-3c/OC-3c NI-2 card.

The OC-3c/OC-3c NI-2 card can be used only in a commercial environment and does not work in an outside-plant environment. Either Cisco 6015 I/O module can be installed in conjunction with the OC-3c/OC-3c NI-2 card.

New versions of the OC-3c/OC-3c NI-2 card SMF and MMF (NI2-155SM-155SM2 and NI2-155MM-155MM2) support enhanced upstream bandwidth for use with the 8xG.SHDSL line card. For you to achieve maximum bandwidth rates for each 8xG.SHDSL, the updated boot image, ni2-dboot2-mz, must be running on the OC-3c/OC-3c NI-2 card.

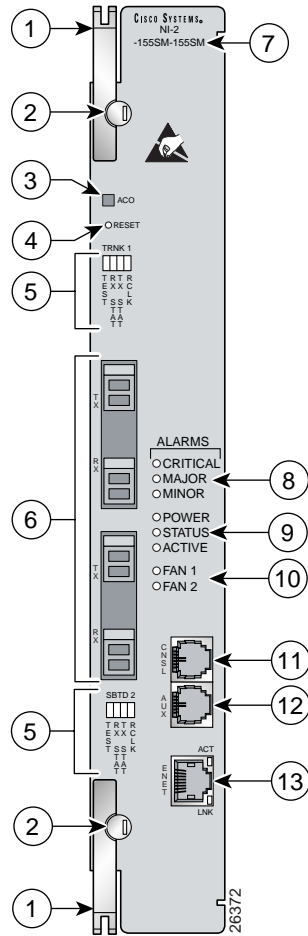
Faceplate Features

[Figure 4](#) shows a close-up of the OC-3c/OC-3c NI-2 card faceplate.

**Note**

The only (visual) difference between the commercial OC-3c/OC-3c NI-2 card (NI2-155SM-155SM and NI2-155SM-155MM) and the version of the OC-3c/OC-3c NI-2 card with enhanced upstream bandwidth features (NI2-155SM-155SM2 and NI2-155MM-155MM2) is the part number silkscreened at the top of the card faceplate.

Figure 4 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) <ul style="list-style-type: none"> • 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 9 describes the LED group indicators and their functions.

Table 9 OC-3c/OC-3c NI-2 Card LED Group Indicators

LED Group	LED	State	Function
Interface status LED (5 in Figure 4)	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 (7 in Figure 4)	CRITICAL	Red	A critical alarm is active.
	MAJOR	Red	A major alarm is active.
	MINOR	Amber	A minor alarm is active.
Card status (8 in Figure 4)	POWER	Green	The NI-2 card has power.
	STATUS	Green	The operational status of the NI-2 card: <ul style="list-style-type: none"> • 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 9 OC-3c/OC-3c NI-2 Card LED Group Indicators (continued)

LED Group	LED	State	Function
Fan alarm (9 in Figure 4)	FAN 1	Red	The fan module or fan tray is not operational and is in alarm mode.
	FAN 2	Red	The fan module or fan tray is not operational and is in alarm mode. Note The FAN 2 LED is active only on an NI-2 card installed in a Cisco 6260. The FAN 2 LED is inactive and is always off on an NI-2 card installed in a Cisco 6015, Cisco 6100, Cisco 6130, or Cisco 6160.
ENET interface LED (12 in Figure 4)	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.

Specifications

Table 10 lists the physical and electrical specifications of the single-mode and multimode versions of the OC-3c/OC-3c NI-2 card.

Table 10 OC-3c/OC-3c NI-2 Card Specifications

Specification	Description
Internal hardware	<ul style="list-style-type: none"> 150 MHz RC64475 CPU Galileo GT64120 system controller 1M x 32 bootflash¹ (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

Table 10 OC-3c/OC-3c NI-2 Card Specifications (continued)

	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).

Network Clocking Overview

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

- A BITS clock. When a BITS clock serves as the network timing signal source, the chassis receives a clock signal through designated pins on the I/O card, I/O module, or rear interface header (Cisco 6015) and distributes the signal through the chassis backplane.
- An internal clock.
- DS3, OC-3c, T1, or E1 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.



Note

For more information about network clocking with a subtended configuration or for more information about connecting the BITS clock, refer to the appropriate hardware installation guide.

Redundancy Overview

Redundancy is available for Cisco 6130, Cisco 6160, and Cisco 6260 systems. 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. See [“NI-2 Card Cold Redundancy” section on page 23](#) for additional information.
- 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 redundancy is available on OC-3c/2DS3 NI-2 card trunk interfaces and OC-3c/OC-3c NI-2 card trunk and subtend interfaces. See [“APS Link Redundancy” section on page 23](#) for additional information.



Note

Line card redundancy is not 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. See [Table 2 on page 3](#) for a list of NI-2 cards that support cold redundancy and information about NI-2 card and chassis compatibility.

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.

Due to the differences in bootflash between the commercial OC-3c/OC-3c NI-2 card (NI-2-155SM-155SM and NI-2-155SM-155MM) and the version of the OC-3c/OC-3c NI-2 card with enhanced upstream bandwidth features (NI2-155SM-155SM2 and NI2-155MM-155MM2), the NI2 redundancy feature of syncing the bootflash with the `secondary sync bootflash` command and the auto-sync configuration `bootflash` command are not supported.

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. 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.

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

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 in subtending configurations only if the subtending host chassis has a secondary (redundant) OC-3c/OC-3c or OC-3c/2DS3 NI-2 card installed.

**Note**

For more information about subtending and subtended network configurations, refer to the appropriate hardware installation guide.

Installation Prerequisites

This section provides software and network management requirements, as well as a list of parts and tools that you need to install or remove NI-2 cards.

Software and Network Management Requirements

Table 11 and Table 12 list the minimum Cisco IOS software and network management requirements for provisioning and managing the NI-2 cards.



Note

Network management through CDM is optional.

Table 11 Minimum Cisco IOS Software Requirements

NI-2 Card	Cisco 6015	Cisco 6100 ¹	Cisco 6130 ¹	Cisco 6160 ¹	Cisco 6260 ¹
DS3+T1/E1 IMA	12.1(4)DA	—	—	12.1(6)DA	12.1(7)DA
ITEMP DS3+T1/E1 IMA	12.2(5)DA	—	—	—	—
DS3/2DS3	—	12.1(2)DA	12.0(8)DA	12.1(1)DA	12.1(4)DA ²
OC-3c/2DS3	—	—	—	12.1(1)DA	—
OC-3c/OC-3c ³	12.2(5)DA	12.1(2)DA	12.0(8)DA	12.1(1)DA	12.0(5)DA
OC-3c/OC-3c ⁴	12.1(7)DA2	12.1(7)DA2	12.1(7)DA2	12.1(7)DA2	12.1(7)DA2

1. The minimum Cisco IOS software requirement for a redundant NI-2 card configuration is Release 12.1(7)DA. A redundant configuration using either NI2-155SM-155SM2 or NI2-155MM-155MM2, requires a minimum release of 12.1(7)DA2.
2. When the DS3/2DS3 NI-2 card and the E3 I/O module are installed in the Cisco 6260 chassis, the system adopts E3 functionality.
3. Denotes product numbers NI2-155SM-155SM and NI2-155MM-155MM.
4. Denotes product numbers NI2-155SM-155SM2 and NI2-155MM-155MM2.

Table 12 Minimum CDM Requirements

NI-2 Card	Cisco 6015	Cisco 6100	Cisco 6130	Cisco 6160	Cisco 6260
DS3+T1/E1 IMA	3.2	—	—	3.3(2)	3.3(3)
ITEMP DS3+T1/E1 IMA	3.4	—	—	—	—
DS3/2DS3	—	3.2	3.2	3.2	3.0(3.3) ¹
OC-3c/2DS3	—	—	—	3.2	—
OC-3c/OC-3c	3.3	3.2	3.2	3.2	3.2

1. When the DS3/2DS3 NI-2 card and the E3 I/O module are installed in the Cisco 6260 chassis, the system adopts E3 functionality.

Required Tools and Equipment

Table 13 lists the tools and equipment that you need to install and remove an NI-2 card.

Table 13 *Tool and Equipment Requirements Checklist*

Check	Tools and Equipment
	Hardware Components and Cables
	NI-2 card(s): <ul style="list-style-type: none"> • DS3+T1/E1 IMA • ITEMP DS3+T1/E1 IMA • DS3/2DS3 • OC-3c/2DS3 • OC-3c/OC-3c
	A ferrite that yields an impedance of 53 ohms at 25 MHz and 177 ohms at 100 MHz—Required only for the Ethernet connection on a DS3+T1/E1 IMA NI-2 card installed in a Cisco 6015 chassis.
	Tie wraps.
	Coaxial cable for DS3 connections—Type 734A or equivalent or Type 735A or equivalent.
	Fiber cable for OC-3c connections—SMF or MMF, as appropriate.
	Console and auxiliary cables—Unshielded RJ-45 serial cable that complies with the EIA/TIA-232 standard.
	Ethernet connection—Cat 5 UTP ¹ or Cat 5 STP ² cable with an RJ-45 connector that complies with Ethernet standards.
	Equipment necessary for ESD protection—You need this equipment whenever you handle Cisco chassis, modules, and cards.
	Tools
	No. 1 3/16-inch flat-head screwdriver.
	Software Components
	Cisco IOS or CDM.
	Note See Table 11 or Table 12 for minimum software and network management release requirements for each Cisco chassis and NI-2 card.

1. UTP = unshielded twisted pair
2. STP = shielded twisted pair

General Safety Precautions and Maintenance Guidelines

This section describes the following general safety precautions and maintenance guidelines:

- [General Safety Precautions, page 27](#)
- [General Maintenance Guidelines, page 31](#)
- [Preventing Electrostatic Discharge Damage, page 32](#)

General Safety Precautions

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



Tip

Throughout this document, the terms *cover panel* and *safety cover* refer to the Cisco 6100/6130 chassis front cover.



Caution

Before you start the installation procedures, read the entire document 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 by means of grounding straps to eliminate the risk of ESD damage to the equipment. Equipment is subject to ESD damage whenever it is removed from the chassis.



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

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



Caution

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



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 være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *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.
- Warning!** Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förekommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.
-
-  **Warning** Read the installation instructions before you connect the system to its power source.
-
-  **Warning** Use copper conductors only.
-
-  **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 module or a fan. Exposed circuitry could constitute an energy hazard.
-
-  **Warning** Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.
-
-  **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** 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

The ports labeled "Ethernet," "10BaseT," "Token Ring," "Console," and "AUX" are safety extra-low voltage (SELV) circuits. SELV circuits should only be connected to other SELV circuits. Because the BRI circuits are treated like telephone-network voltage, avoid connecting the SELV circuit to the telephone network voltage (TNV) circuits.



Warning

Class 1 laser product.



Warning

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



Warning

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



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

High-performance devices on this card can get hot during operation. To remove the card, hold it by the faceplate and bottom edge. Allow the card to cool before touching any other part of it or before placing it in an antistatic bag.



Warning

This equipment is to be installed and maintained by service personnel only as defined by AS/NZS 3260 Clause 1.2.14.3 Service Personnel.



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

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



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

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



Warning

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



Warning

Do not use this product near water; for example, near a bathtub, washbowl, 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.

General Maintenance Guidelines

This section covers the following topics:

- [Installation and Replacement Suggestions, page 31](#)
- [Hot Swapping Cards, page 31](#)

Installation and Replacement Suggestions

The following examples list recommended installation and replacement practices for the NI-2 cards.



Caution

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

- Do not force the card into its slot. This action can damage the pins on the backplane if they are not aligned properly with the card.
- 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.
- Firmly seat the card in the slot. Fully depress the ejector levers to ensure that the card connector mates with the backplane correctly.

Hot Swapping Cards

The NI-2 card can be hot swapped. Hot swapping allows you to remove and replace the cards without disconnecting the system power. When the system detects that you have added or removed a card, it automatically runs diagnostic and discovery routines and acknowledges the presence or absence of the card.

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 when you handle any card or component.

Follow these guidelines to prevent ESD damage:

- Always use an ESD ankle or wrist strap and ensure that the wrist strap makes good skin contact.
- Connect the equipment end of the strap to the ESD jack on 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 to 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 I/O card or I/O module 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 ankle or 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.

Removing and Installing IMA NI-2 Cards

The following sections describe how to remove and install a DS3+T1/E1 IMA NI-2 card or an ITEMP DS3+T1/E1 IMA NI-2 card.

Removing a DS3+T1/E1 IMA NI-2 Card

Complete the following steps to remove a DS3+T1/E1 IMA NI-2 card or an ITEMP DS3+T1/E1 IMA NI-2 card from the chassis.



Caution

This caution applies only to the Cisco 6160 and Cisco 6260 chassis. The Cisco 6015 chassis does not support redundancy.

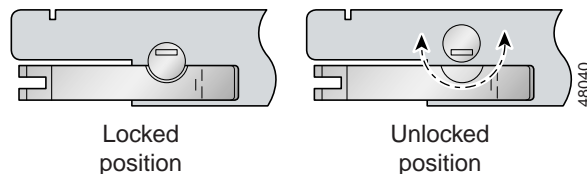
Service is interrupted to the entire system when the NI-2 card is removed unless a secondary NI-2 card is installed in the chassis. If a secondary NI-2 card is not installed, ensure that a service interruption is acceptable before proceeding.

If a secondary NI-2 card is installed in the chassis, removing the active NI-2 card causes a switchover to the standby NI-2 card, which interrupts data traffic for approximately 60 seconds.

Removing a standby NI-2 card does not interrupt service to the system.

- Step 1** Connect a grounding strap to the ESD grounding jack.
- Step 2** Disconnect the cable connected to the RJ-45 auxiliary port (AUX) on the NI-2 card, as necessary.
- Step 3** Disconnect the cable connected to the system console port (CNSL) on the NI-2 card, as necessary.
- Step 4** Disconnect the cable connected to the RJ-45 10BaseT receptacle (ENET) on the NI-2 card, as necessary.
- Step 5** Use a flat-head screwdriver to move the locking tabs on the faceplate from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the NI-2 card ejector levers, as shown in [Figure 5](#).

Figure 5 Positioning the Locking Tab for NI-2 Card Removal and Installation



- Step 6** Lift up on the ejector levers. This action disconnects the card from the backplane.
- Step 7** Carefully slide the card out of the slot.

See the [“Installing a DS3+T1/E1 IMA NI-2 Card”](#) section on page 34 for NI-2 card installation procedures.

Installing a DS3+T1/E1 IMA NI-2 Card

Complete the following steps to install a DS3+T1/E1 IMA NI-2 card or an ITEMP DS3+T1/E1 IMA NI-2 card in the chassis. This procedure shows how to install the NI-2 line card in the Cisco 6015 and the Cisco 6160 as examples, but the basic installation procedure is the same for other chassis and all NI-2 card types

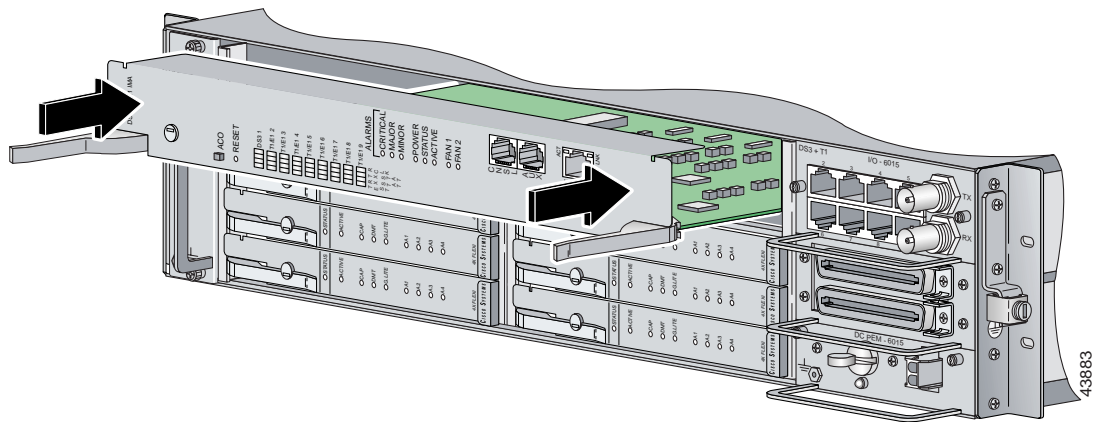


Note All cards must be fully seated in the chassis. Push on the faceplate of each card to be sure that the card is fully seated.

- Step 1** Connect a grounding strap to the ESD grounding jack.
- Step 2** Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.
- Step 3** Verify that the NI-2 card slot in the chassis has no bent pins.
- Step 4** Hold the NI-2 card with the faceplate toward you and the connectors facing the chassis slot.
- Step 5** Align the card edges with the slot guides in the chassis.
- Step 6** Lift up on the ejector levers and gently apply pressure to the faceplate while pushing the card into the slot.

Figure 6 shows an example of how to install an NI-2 card in a Cisco 6015 chassis.

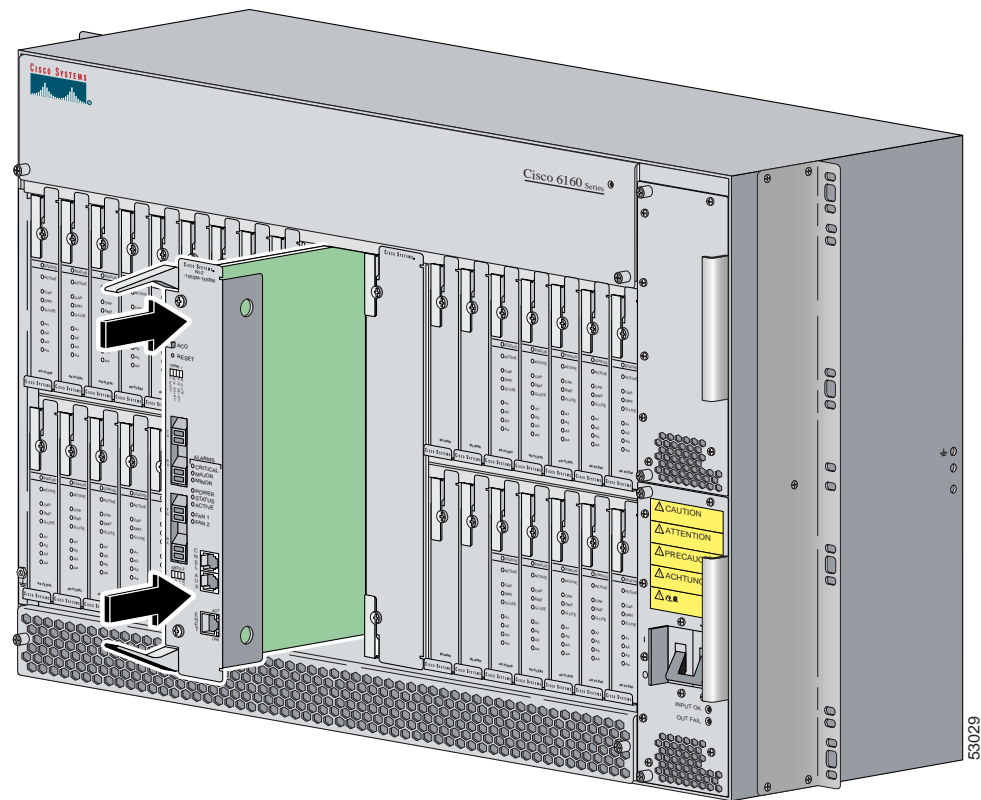
Figure 6 NI-2 Card Installation in the Cisco 6015



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Figure 7 shows an example of how to install an NI-2 card in a Cisco 6160 chassis.

Figure 7 NI-2 Card Installation in the Cisco 6160



- Step 7** Push on the faceplate of the card to fully seat the card.
- Step 8** Press down on the ejector levers to secure the card and connect it to the backplane.
- Step 9** Use a flat-head screwdriver to turn the locking tabs on the faceplate so that they overlap the NI-2 card ejector levers to prevent inadvertent dislodging. [Figure 5 on page 33](#) shows how to position the locking tabs.
- Step 10** Verify that the STATUS, ACTIVE, and POWER LEDs on the NI-2 card are solid green after the self-test is complete. The self-test procedure takes several minutes. If the LEDs are not green after the self-test, refer to the appropriate hardware installation guide for troubleshooting procedures.



Note If you are installing the card for the first time, refer to the provisioning procedures in the *Configuration Guide for Cisco DSLAMs with NI-2*.

- Step 11** Perform a software update if the STATUS LED on the NI-2 card is blinking. 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 made from the I/O card or I/O module. For more information on these connection procedures, refer to the appropriate hardware installation guide.

Step 12 Connect the Ethernet to the management network.

- a. Connect an Ethernet cable to the RJ-45 10BaseT receptacle (ENET) on the DS3+T1/E1 IMA NI-2 card faceplate.



Note See the [“Required Tools and Equipment”](#) section on page 26 for cable and ferrite requirements.

An Ethernet cable connected to a DS3+T1/E1 IMA NI-2 card that is installed in a Cisco 6015 chassis must have a ferrite attached. If you are connecting an Ethernet cable to a DS3+T1/E1 IMA NI-2 card installed in a Cisco 6160 chassis, skip Step b and proceed to Step c.

- b. Run the Ethernet cable through the ferrite one time and clamp the ferrite shut.
- c. Connect the other end of the Ethernet cable to the management network (for example, a LAN).

Step 13 Connect a VT100-compatible terminal to the system console port (CNSL) on the NI-2 card faceplate. Connect the terminal to a power source and set it up using the values shown in [Table 14](#).

Table 14 *Terminal Settings*

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

Step 14 Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary port (AUX) on the NI-2 card faceplate. This step is optional.

Removing and Installing a DS3/2DS3 NI-2 Card

The following sections describe how to remove and install a DS3/2DS3 NI-2 card.

Removing a DS3/2DS3 NI-2 Card

Complete the following steps to remove a DS3/2DS3 NI-2 card from the chassis.



Caution

Service is interrupted to the entire system when the NI-2 card is removed unless a secondary NI-2 card is installed in the chassis. If a secondary NI-2 card is not installed, ensure that a service interruption is acceptable before proceeding.

If a secondary NI-2 card is installed in the chassis, removing the active NI-2 card causes a switchover to the standby NI-2 card, which interrupts data traffic for approximately 60 seconds.

Removing a standby NI-2 card does not interrupt service to the system.

Step 1 Connect a grounding strap to an ESD grounding jack.

Step 2 Open the chassis front cover, as necessary.



Note Only the Cisco 6100 and Cisco 6130 have front covers.

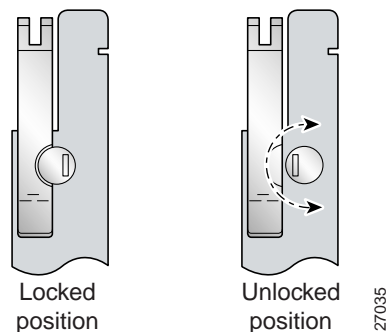
Step 3 Disconnect the cable connected to the RJ-45 auxiliary port (AUX) on the NI-2 card, as necessary.

Step 4 Disconnect the cable connected to the system console port (CNSL) on the NI-2 card, as necessary.

Step 5 Disconnect the cable connected to the RJ-45 10BaseT receptacle (ENET) on the NI-2 card, as necessary.

Step 6 Use a flat-head screwdriver to move the locking tabs on the faceplate from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the ejector levers on the NI-2 card, as shown in [Figure 8](#).

Figure 8 Positioning the Locking Tab for NI-2 Card Removal and Installation



Step 7 Lift up on the ejector 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 38 for NI-2 card installation procedures.

Installing a DS3/2DS3 NI-2 Card

Complete the following steps to install a DS3/2DS3 NI-2 card in the chassis.



Note All cards must be fully seated in the chassis. Push on the faceplate of each card to be sure that the card is fully seated.

Step 1 Connect a grounding strap to an ESD grounding jack.

Step 2 Open the chassis front cover, as necessary.



Note Only the Cisco 6100 and Cisco 6130 have front covers.

Step 3 Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.

Step 4 Verify that the NI-2 card slot in the chassis has no bent pins.

Step 5 Hold the NI-2 card with the module faceplate toward you and the connectors facing the chassis slot.

Step 6 Vertically align the card edges with the guides at the top and bottom of slot 10 or slot 11 in the chassis.

[Figure 7](#) shows an example of how to install an NI-2 card in a Cisco 6160 chassis. The installation procedures are the same for the other chassis and for all NI-2 card types.

Step 7 Lift up on the ejector levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

Step 8 Push on the faceplate of each card to fully seat the card.

Step 9 Press down on the ejector levers to secure the card and connect it to the backplane.

Step 10 Use a flat-head screwdriver to turn the locking tabs on the faceplate so that they overlap the NI-2 card ejector levers. This prevents inadvertent dislodging, as shown in [Figure 8 on page 37](#).

Step 11 Verify that the STATUS, ACTIVE, and POWER LEDs on the NI-2 card are solid green after the self-test is complete. This self-test procedure takes several minutes. If the LEDs are not green after the self-test, refer to the appropriate hardware installation guide for troubleshooting procedures.



Note If you are installing the card for the first time, refer to the provisioning procedures in the *Configuration Guide for Cisco DSLAMs with NI-2*.

Step 12 Perform a software update if the STATUS LED on the NI-2 card is blinking.

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 made from the I/O card or I/O module. For more information on connection procedures, refer to the appropriate hardware installation guide.

- Step 13** Connect the Ethernet to the management network.
- a. Connect an Ethernet cable to the RJ-45 10BaseT receptacle (ENET) on the NI-2 card faceplate.



Note See the “[Required Tools and Equipment](#)” section on page 26 for cable requirements.

- b. Connect the other end of the Ethernet cable to the management network (for example, a LAN).

- Step 14** Connect a VT100-compatible terminal to the system console port (CNSL) on the NI-2 card faceplate. Connect the terminal to a power source and set it up using the values that are shown in [Table 15](#).

Table 15 *Terminal Settings*

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

- Step 15** Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary port (AUX) on the NI-2 card faceplate. This step is optional.
- Step 16** Close the chassis front cover, as necessary.

Removing and Installing an OC-3c/2DS3 NI-2 Card

The following sections describe how to remove and install an OC-3c/2DS3 NI-2 card.

Removing an OC-3c/2DS3 NI-2 Card

Complete the following steps to remove an OC-3c/2DS3 NI-2 card from the chassis.



Caution

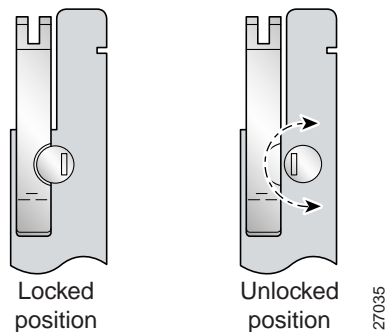
Service is interrupted to the entire system when the NI-2 card is removed unless a secondary NI-2 card is installed in the chassis. If a secondary NI-2 card is not installed, ensure that a service interruption is acceptable before proceeding.

If a secondary NI-2 card is installed in the chassis, removing the active NI-2 card causes a switchover to the standby NI-2 card, which interrupts data traffic for approximately 60 seconds.

Removing a standby NI-2 card does not interrupt service to the system.

- Step 1** Connect a grounding strap to an ESD grounding jack.
- Step 2** Disconnect the cable connected to the RJ-45 auxiliary port (AUX) on the NI-2 card, as necessary.
- Step 3** Disconnect the cable connected to the system console port (CNSL) on the NI-2 card, as necessary.
- Step 4** Disconnect the cable connected to the RJ-45 10BaseT receptacle (ENET) on the NI-2 card, as necessary.
- Step 5** Disconnect the ATM switch receive cable from the TRNK 1 TX optical interface connector on the NI-2 card.
- Step 6** Disconnect the ATM switch transmit cable from the TRNK 1 RX optical interface connector on the NI-2 card.
- Step 7** Use a flat-head screwdriver to move the locking tabs on the faceplate from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the NI-2 card ejector levers, as shown in [Figure 9](#).

Figure 9 Positioning the Locking Tab for NI-2 Card Removal and Installation



- Step 8** Lift up on the ejector levers. This action disconnects the card from the backplane.
- Step 9** Carefully slide the card out of the slot.
- See the “[Installing an OC-3c/2DS3 NI-2 Card](#)” section on page 41 for NI-2 card installation procedures.

Installing an OC-3c/2DS3 NI-2 Card

Complete the following steps to install an OC-3c/2DS3 NI-2 card in the chassis.



Note All cards must be fully seated in the chassis. Push on the faceplate of each card to be sure that the card is fully seated.

- Step 1** Connect a grounding strap to an ESD grounding jack.
- Step 2** Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.
- Step 3** Verify that the NI-2 card slot in the chassis has no bent pins.
- Step 4** Hold the NI-2 card with the faceplate toward you and the connectors facing the chassis slot.
- Step 5** Vertically align the card edges with the guides at the top and bottom of slot 10 or slot 11 in the chassis. [Figure 7 on page 35](#) shows an example of how to install an NI-2 card in a Cisco 6160 chassis.
- Step 6** Lift up on the ejector 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 ejector levers to secure the card and connect it to the backplane.
- Step 9** Use a flat-head screwdriver to turn the locking tabs on the faceplate so that they overlap the NI-2 card ejector levers. This prevents inadvertent dislodging, as shown in [Figure 9 on page 40](#).
- Step 10** Verify that the STATUS, ACTIVE, and POWER LEDs on the NI-2 card are solid green after the self-test is complete. This self-test procedure takes several minutes. If the LEDs are not green after the self-test, refer to the appropriate hardware installation guide for troubleshooting procedures.



Note If you are installing the card for the first time, refer to the provisioning procedures in the *Configuration Guide for Cisco DSLAMs with NI-2*.

- Step 11** Perform a software update if the STATUS LED on the NI-2 card is blinking.
Refer to the *Configuration Guide for Cisco DSLAMs with NI-2* for software upgrade procedures.
- Step 12** Attach the receive cable from the ATM switch to the TRNK 1 TX optical interface connector on the OC-3c/2DS3 NI-2 card. See [Figure 3](#) for the OC-3c network trunk interface connection location.
The TRNK 1 TX connector is the one closest to the top of the faceplate. The TRNK 1 RX connector is closer to the bottom of the faceplate. The connector IDs are silkscreened inside the faceplate inset.
- Step 13** Attach the transmit cable from the ATM switch to the TRNK 1 RX optical interface connector on the OC-3c/2DS3 NI-2 card. See [Figure 3](#) for the OC-3c network trunk interface connection location.



Note DS3 subtending connections are done from the I/O card. For more information on these connection procedures, refer to the appropriate hardware installation guide.

Step 14 Connect the Ethernet to the management network.

- a. Connect an Ethernet cable to the RJ-45 10BaseT receptacle (ENET) on the NI-2 card faceplate.



Note See the [“Required Tools and Equipment”](#) section on page 26 for cable requirements.

- b. Connect the other end of the cable to the management network (for example, a LAN).

Step 15 Connect a VT100-compatible terminal to the system console port (CNSL) on the NI-2 card faceplate. Connect the terminal to a power source and set it up using the values that are shown in [Table 16](#).

Table 16 *Terminal Settings*

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

Step 16 Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary port (AUX) on the NI-2 card faceplate. This step is optional.

Removing and Installing an OC-3c/OC-3c NI-2 Card

The following sections describe how to remove and install an OC-3c/OC-3c NI-2 card.

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.



Caution

This caution applies only to the Cisco 6130, Cisco 6160, and Cisco 6260 chassis. The Cisco 6015 chassis does not support redundancy.

Service is interrupted to the entire system when the NI-2 card is removed unless a secondary NI-2 card is installed in the chassis. If a secondary NI-2 card is not installed, ensure that a service interruption is acceptable before proceeding.

If a secondary NI-2 card is installed in the chassis, removing the active NI-2 card causes a switchover to the standby NI-2 card, which interrupts data traffic for approximately 60 seconds.

Removing a standby NI-2 card does not interrupt service to the system.

Step 1 Connect a grounding strap to an ESD grounding jack.

Step 2 Open the chassis front cover, as necessary.



Note Only the Cisco 6100 and Cisco 6130 have front covers.

Step 3 Disconnect the cable connected to the RJ-45 auxiliary port (AUX) on the NI-2 card, as necessary.

Step 4 Disconnect the cable connected to the system console port (CNSL) on the NI-2 card, as necessary.

Step 5 Disconnect the cable connected to the RJ-45 10BaseT receptacle (ENET) on the NI-2 card, as necessary.

Step 6 Disconnect the ATM switch receive cable from the TRNK 1 TX optical interface connector on the NI-2 card.

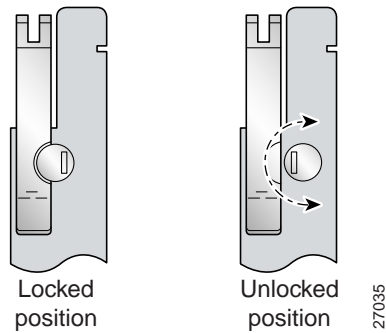
Step 7 Disconnect the ATM switch transmit cable from the TRNK 1 RX optical interface connector on the NI-2 card.

Step 8 Disconnect the SBTD 2 RX optical interface connector on the NI-2 card, as necessary.

Step 9 Disconnect the SBTD 2 TX optical interface connector on the NI-2 card, as necessary.

- Step 10** Use a flat-head screwdriver to move the locking tabs on the faceplate from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the NI-2 card ejector levers, as shown in [Figure 10](#).

Figure 10 Positioning the Locking Tab for NI-2 Card Removal and Installation



- Step 11** Lift up on the ejector 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 44](#) for NI-2 card installation procedures.

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.



Note All cards must be fully seated in the chassis. Push on the faceplate of each card to be sure that the card is fully seated.

- Step 1** Connect a grounding strap to an ESD grounding jack.
- Step 2** Open the chassis front cover, as necessary.



Note Only the Cisco 6100 and Cisco 6130 have front covers.

- Step 3** Inspect the NI-2 card. Verify that the daughterboard is fully seated on the main board.
- Step 4** Verify that the NI-2 card slot in the chassis has no bent pins.
- Step 5** Hold the NI-2 card with the faceplate toward you and the connectors facing the chassis slot.
- Step 6** Align the card edges with the slot guides in the chassis.
- [Figure 6 on page 34](#) shows an example of how to install an NI-2 card in a Cisco 6015 chassis.
- [Figure 7 on page 35](#) shows an example of how to install an NI-2 card in a Cisco 6160 chassis. The basic installation procedures are the same for the other chassis and for all NI-2 card types.
- Step 7** Lift up on the ejector levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.
- Step 8** Push on the faceplate of each card to fully seat the card.

- Step 9** Press down on the ejector levers to secure the card and connect it to the backplane.
- Step 10** Use a flat-head screwdriver to turn the locking tabs on the faceplate so that they overlap the NI-2 card ejector levers. This prevents inadvertent dislodging, as shown in [Figure 10](#).
- Step 11** Verify that the STATUS, ACTIVE, and POWER LEDs on the NI-2 card are solid green after the self-test is complete. This self-test procedure takes several minutes. If the STATUS LEDs are not green after the self-test, refer to the appropriate hardware installation guide for troubleshooting procedures.
- Step 12** Perform a software update if the STATUS LED on the NI-2 card is blinking.



Note Refer to the *Configuration Guide for Cisco DSLAMs with NI-2* for software upgrade procedures.

- Step 13** Attach the receive cable from the ATM switch to the TRNK 1 TX optical interface connector on the OC-3c/2DS3 NI-2 card. See [Figure 4](#) for the OC-3c network trunk interface connection location.
- The TRNK 1 TX connector is the one closest to the top of the faceplate. The TRNK 1 RX connector is closer to the bottom of the faceplate. The connector IDs are silkscreened inside the faceplate inset.
- Step 14** Attach the transmit cable from the ATM switch to the TRNK 1 RX optical interface connector on the OC-3c/2DS3 NI-2 card. See [Figure 4](#) for the OC-3c network trunk interface connection location.



Note To cable the chassis for OC-3c subtending, refer to the appropriate hardware installation guide.

- Step 15** Connect the Ethernet to the management network.
- Connect an Ethernet cable to the RJ-45 10BaseT receptacle (ENET) on the OC-3c/OC-3c NI-2 card faceplate.



Note See [Table 13](#) for cable requirements.

- Connect the other end of the cable to the management network (for example, a LAN).

Connect a VT100-compatible terminal to the system console port (CNSL) on the NI-2 card faceplate. Connect the terminal to a power source and set it up using the values that are shown in [Table 17](#).

Table 17 Terminal Settings

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

- Step 16** Connect a terminal, a modem, or another serial device to the RJ-45 auxiliary port (AUX) on the NI-2 card faceplate. This step is optional.
- Step 17** Close the chassis front cover, as necessary.
-

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 explain how to obtain documentation from Cisco Systems.

World Wide Web

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

<http://www.cisco.com>

Translated documentation is available at the following URL:

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

Documentation CD-ROM

Cisco documentation and additional literature are available in a Cisco Documentation CD-ROM package, which is shipped with your product. The Documentation CD-ROM is updated monthly and may be more current than printed documentation. The CD-ROM package is available as a single unit or through an annual subscription. Registered Cisco.com users can order the Documentation CD-ROM through the online Subscription Store:

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The Cisco TAC is available to all customers who need technical assistance with a Cisco product, technology, or solution. Two types of support are available through the Cisco TAC: the Cisco TAC Web Site and the Cisco TAC Escalation Center.

Inquiries to Cisco TAC are categorized according to the urgency of the issue:

- Priority level 4 (P4)—You need information or assistance concerning Cisco product capabilities, product installation, or basic product configuration.
- Priority level 3 (P3)—Your network performance is degraded. Network functionality is noticeably impaired, but most business operations continue.
- Priority level 2 (P2)—Your production network is severely degraded, affecting significant aspects of business operations. No workaround is available.
- Priority level 1 (P1)—Your production network is down, and a critical impact to business operations will occur if service is not restored quickly. No workaround is available.

Which Cisco TAC resource you choose is based on the priority of the problem and the conditions of service contracts, when applicable.

Cisco TAC Web Site

The Cisco TAC Web Site allows you to resolve P3 and P4 issues yourself, saving both cost and time. The site provides around-the-clock access to online tools, knowledge bases, and software. To access the Cisco TAC Web Site, go to the following URL:

<http://www.cisco.com/tac>

All customers, partners, and resellers who have a valid Cisco services contract have complete access to the technical support resources on the Cisco TAC Web Site. The Cisco TAC Web Site requires a Cisco.com login ID and password. If you have a valid service contract but do not have a login ID or password, go to the following URL to register:

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

If you cannot resolve your technical issues by using the Cisco TAC Web Site, and you are a Cisco.com registered user, you can open a case online by using the TAC Case Open tool at the following URL:

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

If you have Internet access, it is recommended that you open P3 and P4 cases through the Cisco TAC Web Site.

Cisco TAC Escalation Center

The Cisco TAC Escalation Center addresses issues that are classified as priority level 1 or priority level 2; these classifications are assigned when severe network degradation significantly impacts business operations. When you contact the TAC Escalation Center with a P1 or P2 problem, a Cisco TAC engineer will automatically open a case.

To obtain a directory of toll-free Cisco TAC telephone numbers for your country, go to the following URL:

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

Before calling, please check with your network operations center to determine the level of Cisco support services to which your company is entitled; for example, SMARTnet, SMARTnet Onsite, or Network Supported Accounts (NSA). In addition, please have available your service agreement number and your product serial number.

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