Upgrading DSLAMs for NI-2 Card and APS Link Redundancy

This document provides procedures for installing an additional second generation network interface (NI-2) card and upgrading NI-2 cards to support NI-2 card cold redundancy and automatic protection switching (APS) link redundancy on Cisco 6130, Cisco 6160, and Cisco 6260 digital subscriber line access multiplexers (DSLAMs).

Table 1 lists the NI-2 cards that support cold redundancy, as well as associated product numbers and chassis compatibility.

Table 1   Redundant NI-2 Cards and Chassis Compatibility

NI-2 Card	Product Number	Cisco 6130	Cisco 6160	Cisco 6260
DS3/2DS3	NI-2-DS3-DS3=	Yes	Yes	Yes[1]
OC-3c/OC-3c SMF[2, 3]	NI-2-155SM-155SM=	Yes	Yes	Yes[4]
OC-3c/OC-3c MMF[3, 5]	NI-2-155MM-155MM=	Yes	Yes	Yes
OC-3c/2DS3 SMF[6]	NI-2-155SM-DS3=	No	Yes	No
OC-3c/2DS3 MMF[6]	NI-2-155MM-DS3=	No	Yes	No
DS3+T1/E1 IMA[7]	NI-2-DS3-T1E1=	No	Yes[8]	No

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

2. SMF = single-mode fiber.

3. APS provides link redundancy on the trunk and subtended interfaces.

4. When the OC-3c/OC-3c NI-2 card and the OC-3c I/O module are installed in the Cisco 6260 chassis, the system assumes OC-3c functionality.

5. MMF = multimode fiber.

6. APS provides link redundancy only on the OC-3c trunk interface.

7. IMA = inverse multiplexing over ATM.

8. Use only with the DS3/2DS3+8T1 IMA system I/O card (part number 6160-1-I/O-2=).

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Contents

These upgrade procedures describe the following topics:

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.

- 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.

> **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. See Table 1 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.

NI-2 Card Cold Redundancy Switchover Conditions

At boot up, the standby NI-2 card begins the boot process but does not process its start-up configuration. During steady-state operations, configuration changes on the active NI-2 card are automatically synchronized to the standby NI-2 card if the cards have been configured for synchronization. This allows the standby unit to become active with the most recent configuration possible upon switchover.

An NI-2 card switchover interrupts data traffic for approximately 60 seconds.

Note Because the standby NI-2 card does not completely mirror the state of the active NI-2 card in cold redundancy, the standby NI-2 card will lose transient state information (SVC states, for example) during a switchover. In addition, the switch fabric on the standby card is not configured until the card transitions to an active state, leading to a period of data loss during the transition.

Switchover from the active NI-2 card to the standby NI-2 card occurs under the following conditions:

- A manual switch forced through a CLI command

- Removal of an active NI-2 card

- Detection of a failed active NI-2 card

When a switchover occurs, the standby NI-2 card takes over all control, management, and data plane functions from the active card. These functions include

- Processing the running configuration (when the NI-2 cards are configured for synchronization, the standby NI-2 card assumes the active role using the latest configuration from the failed NI-2 card)

- Automatically regenerating the ATM switch connections for permanent virtual connections (PVCs), switched virtual connections (SVCs), and soft permanent virtual connections (SPVCs) that terminate on the chassis

- Assuming management communication through console, auxiliary, or Ethernet connections, or through ATM in band

- Transferring data to and from the modem ports

- Establishing line card communications over the serial management bus (SMB)

- Recovering status information from line cards

- Autodiscovering line cards that have been added or removed during the switchover

A switchover from one NI-2 card to the other does not normally cause a reboot or reset of the line cards (if a line card reboot or reset occurs, refer to the troubleshooting section of the appropriate hardware installation guide).

✎ **Note** Telnet sessions open on the active network interface will be closed during a switchover.

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 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 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.

APS Link Redundancy Switchover Conditions

The active OC-3c interface is switched upon detection of Synchronous Optical Network (SONET) failure conditions. These conditions are loss of signal (LOS) and loss of frame (LOF). Signal degradation does not cause a switchover. An APS link switchover meets the Bellcore GR-253 standard of 10 ms to detect a failure condition and 50 ms to switch.

✎ **Note** The OC3 ports on the standby NI-2 card are available for APS link redundancy only if the standby NI-2 card is working and in a STANDBY-READY state.

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.

Upgrade Prerequisites

Ensure that the following product revisions are installed on your system prior to beginning these upgrade procedures:

- Cisco NI-2 card, daughterboard item number 73-3952-05 revision AO or later. Use the Cisco IOS **show hardware slot #** command to determine the currently installed NI-2 card daughterboard item number and revision.

- For the Cisco 6260 chassis, 6260 backplane item number 73-3999-05 revision AO or later. Use the Cisco IOS **show hardware chassis** command to determine the Cisco 6260 backplane item number and revision.

Required Tools and Equipment

Table 2 lists the tools and equipment that are required to install and upgrade NI-2 cards to support NI-2 card cold redundancy and APS link redundancy in Cisco 6130, Cisco 6160, and Cisco 6260 systems.

Table 2   Tool and Equipment Requirements Checklist

Check	Tools and Equipment
	Hardware Components
	Secondary NI-2 card (must be the same type as the primary NI-2 card) • DS3/2DS3 • OC-3c/OC-3c, SMF or MMF • OC-3c/2DS3, SMF or MMF • DS3+T1/E1 IMA
	Tools and Equipment
	A 3/16-inch flat-head screwdriver
	Necessary equipment for ESD protection—Required whenever you handle Cisco DSLAM equipment, which includes the chassis and cards
	Fiber cable to connect the OC-3 ports, or DS3 cables to connect the DS3 ports
	RJ-45 cable to connect the console
	RJ-45 connector, straight-through 10BaseT/100BaseTX Ethernet, half/full-duplex compliant with IEEE 802.3

General Safety Precautions and Maintenance Guidelines

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

General Safety Precautions

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

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

Caution   The procedures that are outlined in this document will force the system to stop providing DSL service for the duration of the upgrade process. Do not proceed unless this is acceptable.

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.**

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

⚠

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   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 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 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   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   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.

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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 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.

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 Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages.

Warning Class 1 laser product.

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 Because invisible laser radiation may be emitted from the aperture of the OC-3 type NI-2 optical interface port when no cable is connected, avoid exposure to laser radiation and do not stare into an open aperture.

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

Warning Before working on a chassis or working near power supplies, unplug the power cord on AC units; disconnect the power at the circuit breaker on DC units.

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.

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

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

⚠
Warning **VCCI Compliance for Class B Equipment (Japan).**

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

General Maintenance Guidelines

This section covers the following topics:

Installation and Replacement Suggestions

The following examples list recommended installation and replacement practices for 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.
*   Fully depress the locking levers to ensure that the card connector mates with the backplane correctly. Firmly seat the card in the slot.

Hot Swapping Cards

The NI-2 card can be hot swapped. Hot swapping allows you to remove and replace 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 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 chassis.

- When you install a component, use available locking 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 locking levers or captive installation screws to release the bus connectors from the backplane or midplane.

- Handle the system I/O card, I/O module, or network 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 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.

Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(1) or Earlier

The following sections describe how to install a secondary (redundant) NI-2 card, and how to upgrade NI-2 cards from Cisco IOS software release 12.1(1) (or an earlier version) to support redundancy on Cisco 6130, Cisco 6160, and Cisco 6260 systems.

✎

Note If Cisco IOS software release 12.1(2) or later is managing your system, proceed to the "Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(2) or Later" section on page 23. Use the Cisco IOS **show version** command to determine the IOS release currently managing your system.

⚠

Caution The procedures that are outlined in this section will force the system to stop providing DSL service for the duration of the upgrade process. Do not proceed unless this is acceptable.

Upgrade Checklist

When you install and upgrade NI-2 cards to support redundancy, be sure that you follow the upgrade procedures in the proper sequence. Table 3 is a checklist of the upgrade steps in the order in which they should occur. Detailed upgrade instructions are located in the sections following Table 3.

⚠
Caution   Proper ESD protection is required whenever you handle Cisco DSLAM 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   Upgrade Procedure Checklist

Check	Upgrade Step
	1. Verify the Cisco IOS release currently managing your system
	2. Backup system images and configuration files from the card in slot 10 to a network server
	3. Download Cisco IOS Release 12.1(7)DA system and boot images
	4. Upgrade the bootflash image on the NI-2 to the 12.1(5)DA dboot image
	5. Upgrade the system and boot images on the NI-2 to 12.1(7)DA
	6. Pull the NI-2 card in slot 10 away from the backplane
	7. Install a secondary NI-2 card in slot 11
	8. Upgrade system and boot images on the card in slot 11, as necessary
	9. Pull the NI-2 card in slot 11 away from the backplane
	10. Reseat the NI-2 cards in slots 10 and 11
	11. Verify the state of the standby NI-2 card
	12. Configure the NI-2 cards for file system synchronization (optional)

Upgrade Procedures

The following sections detail the procedures for installing and upgrading NI-2 cards to support NI-2 card and APS link redundancy on Cisco 6130, Cisco 6160, and Cisco 6260 systems.

Verify the Cisco IOS Software Release Managing Your System

✎
Note   The following upgrade steps are specific to systems managed by Cisco IOS Software Release 12.1(1) or earlier. If your system is managed by Cisco IOS Software Release 12.1(2) or later, proceed to the "Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(2) or Later" section on page 23.

Use the **show version** command in privileged EXEC mode to determine the Cisco IOS Software Release currently managing your system.

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Backup System Images and Configuration Files

Before you upgrade the system and boot images on the primary NI-2 card in slot 10, Cisco recommends that you copy current system and configuration images from flash memory to a TFTP server or a remote copy protocol (rcp) server. You can use these server copies as backup copies.

Note For more information about copying system images and examples of the procedure, refer to the *Configuration Guide for Cisco DSLAMs with NI-2.*

Download Cisco IOS System and Boot Images from Cisco.com

Caution The procedures that are outlined in the following steps will force the system to stop providing DSL service for the duration of the upgrade process. Do not proceed unless this is acceptable.

Cisco IOS Release 12.1(7)DA system and boot images must be installed on your system before the NI-2 cards can support redundancy. Cisco posts new versions of IOS to the Software Center on Cisco.com. You must be a registered Cisco user to log in to the Cisco Software Center. You can download Cisco IOS Release 12.1(7)DA (and the 12.1(5)DA dboot image, if necessary) from Cisco.com at the following location:

http://www.cisco.com/cgi-bin/Software/Iosplanner/Planner-tool/iosplanner.cgi?majorRel=12.1

Note For complete instructions on how to download software images via the Web or FTP, see the *CCO Software Download Guide* at http://www.cisco.com/public/sw-center/sw-dlguide.html

Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image

Note When you upgrade from Release 12.1(3)DA or earlier images on the NI-2 to Release 12.1(7)DA, you must first upgrade the bootflash image on the NI-2 to the 12.1(5)DA dboot image, then upgrade to the 12.1(7)DA image. This is a result of a problem (CSCdr89374) in old bootflash images. This defect may cause the flash application image to fail to self-decompress successfully.

To upgrade to the 12.1(5) DA dboot image in bootflash, complete the following steps:

	Command	Purpose
Step 1	DSLAM>**enable** Password: <password> DSLAM#	Enter enable mode. Enter the password. You have entered enable mode when the prompt changes to DSLAM#.
Step 2	DSLAM# **delete bootflash:**_filename_	Make room in the bootflash by deleting the name of the current boot image.
Step 3	DSLAM# **squeeze bootflash**	Recover available space in bootflash using the **squeeze bootflash** command.

Upgrade Procedures

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	Command	Purpose
Step 4	DSLAM# **copy** tftp://[server name] /[directory]/ni2-dboot-mz.121-5.da bootflash:	Copy the boot image to the bootflash.
Step 5	DSLAM# **show version**	Record the current value of the config-register that appears on the last line of the show version display.
Step 6	DSLAM# **configure terminal**	Enter global configuration mode. You have entered global configuration mode when the prompt changes to DSLAM (config)#.
Step 7	DSLAM(config)# **config-register 0**	Set the to 0x0000 so that the NI-2 will reboot in the rom monitor.
Step 8	DSLAM(config)# **exit**	Exit configure terminal mode.
Step 9	DSLAM# **copy running-config startup-config**	Save the running configuration.
Step 10	DSLAM# **reload**	Reset the system.
Step 11	rommon> **set**	If you see BOOTLDR after you enter this command, the image in bootflash is already being used as the bootstrapper; go to Step 15. Otherwise, go to Step 12 and enter the commands in Steps 12 through 14 to force the system to use ni2-dboot-mz.121-5.bin as the bootstrapper.
Step 12	rommon > **unset BOOTLDR**	Unset BOOTLDR to remove the variable.
Step 13	rommon > **sync**	Sync to save the state of rommon.
Step 14	rommon > **b**	When the NI-2 boots, it uses ni2-dboot-mz.121-5da.bin as your bootstrapper.
Step 15	DSLAM# **configure terminal**	Enter global configuration mode. You have entered global configuration mode when the prompt changes to DSLAM (config)#.
Step 16	DSLAM(config)# **config-register** *value*	Set the config-register to the value you recorded in Step 5.
Step 17	DSLAM(config)# **exit**	Return to enable mode. Proceed to the "Upgrade the System and Boot Images to 12.1(7)DA" section on page 14.

Upgrade the System and Boot Images to 12.1(7)DA

Note Cisco highly recommends that you have console access to the NI-2 during the update procedure. You can use the console connection to troubleshoot any unexpected events that occur during the upgrade.

To upgrade the system and boot images on the NI-2 card, perform the following steps in privileged EXEC mode:

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	Command	Purpose
Step 1	`DSLAM#dir bootflash:`	Verify that the bootflash image is **ni2-dboot-mz.121-5.da** or **ni2-dboot-mz.121-4.da**. If it is neither, go to the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 13 and perform the instructions there, then return to this step.
Step 2	`DSLAM#dir flash:`	Display the name of the flash file that begins **ni2-** and use it as *filename* in Step 3.
Step 3	`DSLAM#delete flash:filename`	Delete the flash file name found in Step 2. Repeat Step 2 and Step 3 until all files in the flash have been deleted.
Step 4	`DSLAM#squeeze flash:`	Recover available space in Flash memory.
Step 5	`DSLAM#copy tftp://tftpserver:TFTPBOOT/ni2-dsl-mz.121-7.da flash:`	Copy the Cisco IOS image from a tftp server to Flash.

Step 6	`DSLAM#configure terminal`
	`DSLAM (config)#no boot system`
	`DSLAM (config)#boot system flash:ni2-dsl-mz.121-7.da`
	`DSLAM#end`
		Enter global configuration mode.
		
		Disable the boot from system.
		
		Specify the name of the system image to load at startup.
		
		End global configuration mode.

Step 7	`DSLAM#copy running-config startup-config`	Save your changes to the startup configuration.
Step 8	`DSLAM#reload`	Reload the system to upgrade the image.
Step 9	`DSLAM#show version`	Confirm that the running image is **ni2-dsl-mz.121-7.da**. If it is not, go to Step 5.
Step 10	`DSLAM# format bootflash:`	**Note** When you upgrade from Cisco IOS Release 12.1(5)DA or earlier images on the NI-2 to Release 12.1(7)DA, you must reformat the bootflash on the NI-2. If you are upgrading from IOS Release 12.1(6)DA or 12.1(6)DA1, you do not need to reformat the bootflash and can proceed to Step 11. Erase all information in bootflash memory. Answer **y** to all confirm questions. When the DSLAM returns you to the EXEC prompt, bootflash memory is successfully formatted and ready for use. Ensure that the bootflash is 3.8 MB total. If it is not, go to Step 5.
Step 11	`DSLAM#copy tftp://tftpserver:TFTPBOOT/ni2-dboot-mz.121-7.da bootflash:`	Copy the boot image from a tftp server to the bootflash.
Step 12	`DSLAM# reload`	Reload the system to upgrade the image.

B E T A   D r a f t   - -   C i s c o   C o n f i d e n t i a l

Pull the NI-2 Card in Slot 10 Away from the Backplane

⚠️

Caution   Proper ESD protection is required whenever you handle Cisco DSLAM 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.

Complete the following steps to pull the NI-2 card in slot 10 away from the chassis backplane connection. It is important that you accomplish each step completely 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.

✎

Note   Only the Cisco 6130 has a front cover.

Step 3   Use a flat-head screwdriver to move both locking tabs on the NI-2 card from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the NI-2 card locking levers, as shown in Figure 1.

Figure 1   Positioning the NI-2 Card Locking Tabs

Locked position   Unlocked position   27035
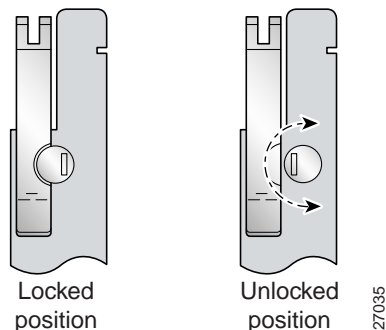
Step 4   Lift up on the locking levers of the card. This action disconnects the card from the backplane.

Step 5   Carefully slide the card toward you and away from the backplane connection. It is not necessary to completely remove the NI-2 card from slot 10.

Install a Secondary NI-2 Card in Slot 11

⚠️

Caution   Proper ESD protection is required whenever you handle Cisco DSLAM 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.

Complete the following steps to install a secondary NI-2 card in slot 11. It is important that you accomplish each step completely before moving on to the next step.

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Note The secondary NI-2 card must be the same interface type as the primary NI-2 card installed in slot 10.

Step 1 Open the front cover on the chassis, as necessary.

**Note** Only the Cisco 6130 has a front cover.

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

Step 3 Verify that slot 11 of the chassis has no bent pins.

Step 4 Vertically align the card edge with the card guides at the top and bottom of slot 11 in the chassis.

Figure 2 shows the NI-2 installation in slot 10 of a Cisco 6130 chassis. The installation procedures will be the same for other chassis and for both slots 10 and 11.

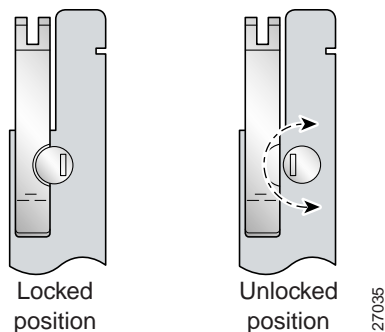*Figure 2   NI-2 Card Installation*
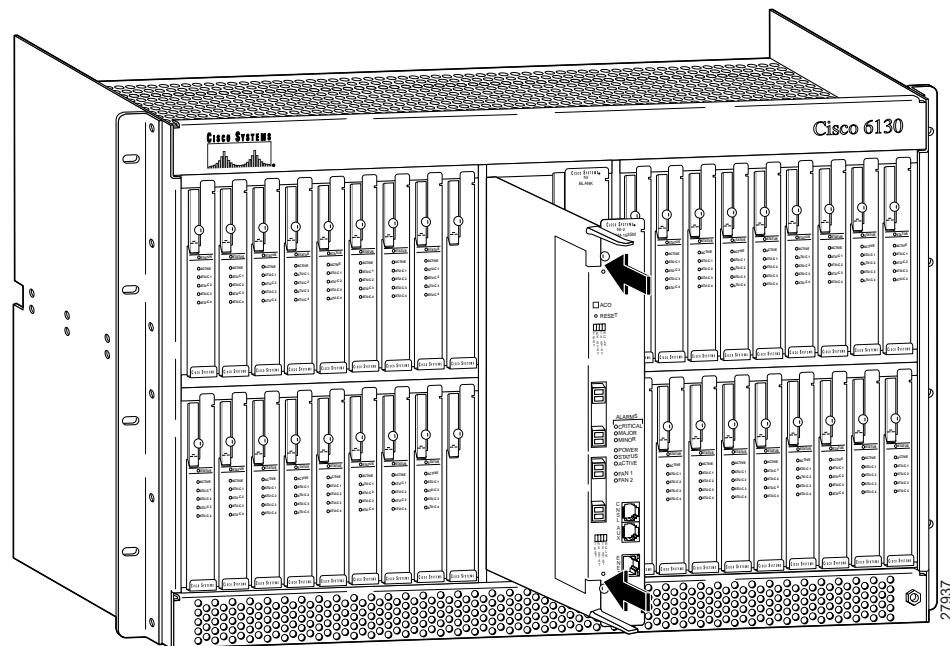
Step 5 Lift up on the locking levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

Step 6 Push on the faceplate of the card to fully seat it.

Step 7 Press down on the locking levers to secure the card and connect it to the backplane.

Step 8 Lock both NI-2 card locking tabs. Use a flat-head screwdriver to turn the locking tabs so that they overlap the NI-2 card locking levers to prevent inadvertent dislodging, as shown in Figure 3.

Figure 3   Positioning the NI-2 Card Locking Tabs

Locked   Unlocked
position   position

Step 9   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 "Troubleshooting" section on page 32.

Step 10   For DS3/2DS3 NI-2 cards, refer to the *NI-2 FRU Installation and Replacement Notes* or to the appropriate hardware installation guide for information on trunk and subtending connections, which are made from the system I/O card or I/O module.

> **Note**   Steps 11 and 12 are optional but recommended for APS link redundancy on secondary OC-3c/OC-3c or OC-3c/2DS3 NI-2 cards.
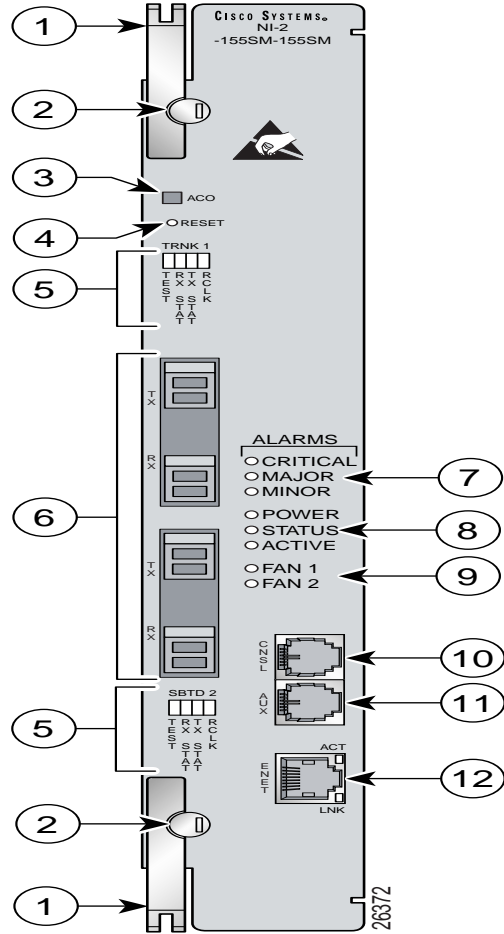
Step 11   Attach the receive fiber from the ATM switch to the transmit connector in the inset on the faceplate of the NI-2 card in slot 11 (trunk 1 interface connector TX). See Figure 4 for the network interface connection location.

> **Note**   Figure 4 shows an OC-3c/OC-3c NI-2 card; the trunk receive and transmit connections will be the same for OC-3c/2DS3 NI-2 cards.

Figure 4   Network Interface Connection

The transmit connector is the one closest to the top of the faceplate. The receive connector is closer to the bottom of the faceplate. The connector IDs are silkscreened on the NI-2 card faceplate.

Step 12   Attach the transmit fiber from the ATM switch to the receive connector in the inset on the faceplate of the NI-2 card (trunk 1 interface connector RX). See Figure 4 for the network interface connection location.

Figure 5   CNSL, AUX , and ENET RJ-45 Receptacles on the NI-2 Card
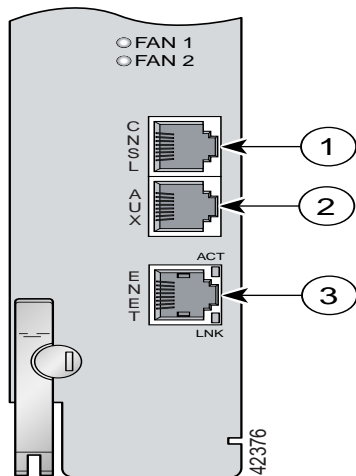
Step 13   Connect a VT100-compatible terminal to the system console port (CNSL) on the NI-2 card. Figure 5 shows where to connect the console cable. Connect the terminal to a power source and set it up using the values that are shown in Table 4.

Table 4   Terminal Settings

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

Step 14   Close the front cover on the chassis, as necessary.

Note   For information on redundant APS subtending connections from the OC-3c/OC-3c NI-2 card, see the appropriate hardware installation guide.

Upgrade System and Boot Images on the NI-2 Card in Slot 11

Cisco IOS Release 12.1(7)DA system and boot images must be installed on both NI-2 cards before they can support redundancy. To upgrade the system and boot images to Cisco IOS Release 12.1(7)DA on the NI-2 card in slot 11, follow the same procedures used to upgrade system and boot images on the NI-2 card in slot 10. These procedures can be found in the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 13 and the "Upgrade the System and Boot Images to 12.1(7)DA" section on page 14.

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Pull the NI-2 Card in Slot 11 Away from the Backplane

⚠️

Caution   Proper ESD protection is required whenever you handle Cisco DSLAM 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.

Complete the following steps to pull the NI-2 card in slot 11 away from the chassis backplane connection. It is important that you accomplish each step completely 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.

✎

Note   Only the Cisco 6130 has a front cover.

Step 3   Use a flat-head screwdriver to move both locking tabs on the NI-2 card from the locked to the unlocked position. Be sure to turn the locking tabs so that they do not overlap the NI-2 card locking levers, as shown in Figure 6.

Step 4   Lift up on the card locking levers. This action disconnects the card from the backplane.

Step 5   Carefully slide the card toward you and away from the backplane connection. It is not necessary to completely remove the NI-2 card from slot 11.

Figure 6   Positioning the NI-2 Card Locking Tabs

Locked position   Unlocked position   27035
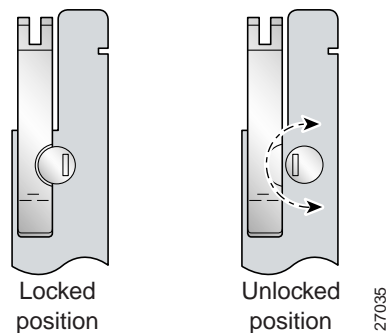
Reseat the NI-2 Card in Slots 10 and 11

Complete the following steps to reseat the NI-2 card in slot 10. It is important that you complete each step before moving on to the next step.

Step 1   Lift up on the NI-2 card locking levers and gently apply pressure to the bottom of the faceplate while pushing the NI-2 card into the slot.

Step 2   Push on the faceplate of the NI-2 card to fully seat the card.

Step 3   Press down on the locking levers to secure the NI-2 card and connect it to the backplane.

Step 4 Use a flat-head screwdriver to turn the locking tabs so that they overlap the NI-2 card locking levers to prevent inadvertent dislodging, as shown in Figure 6.

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, refer to the "Troubleshooting" section on page 32.

Step 5 Repeat Step 1 through Step 4 to reseat the NI-2 card in slot 11.

Verify the State of the Standby NI-2 Card

Once both NI-2 cards have been installed, configured, and reseated according to the procedures above, use the **show redundancy states** command in privileged EXEC mode on the active NI-2 card to verify that the peer state of the standby card has reached STANDBY-READY. This process may take several minutes as the peer state progresses through STANDBY COLD-CONFIG, STANDBY COLD-FILESYS, AND STANDBY COLD-BULK to STANDBY-READY.

Configure the NI-2 Cards for File System Synchronization

NI-2 redundancy supports autosynchronization of the primary and secondary NI-2 card file systems, but the flash and bootflash must first be manually synchronized between the two cards before autosynchronization can be enabled. To synchronize the flash and bootflash on the NI-2 cards, complete the following steps in privileged EXEC mode:

	Command	Purpose
Step 1	DSLAM#**secondary sync flash**	Manually synchronize the secondary NI-2 flash to the primary NI-2 flash.
Step 2	DSLAM#**secondary sync bootflash**	Manually synchronize the secondary NI-2 bootflash to the primary NI-2 bootflash.
Step 3	DSLAM#**configure terminal** DSLAM (config)#**auto-sync flash** DSLAM (config)#**auto-sync bootflash** DSLAM(config)#**exit**	Enter global configuration mode. Enable autosynchronization of the secondary NI-2 flash to the primary NI-2 flash. Enable autosynchronization of the secondary NI-2 bootflash to the primary NI-2 flash. Exit configure terminal mode.
Step 4	DSLAM#**copy running-config startup-config**	Save your changes to the startup configuration. ⚠ **Caution** Executing this command will write configuration changes to the NVRAM of both the active and the standby NI-2 cards, and any previous configuration information will be lost.

> **Note** For more information on configuring NI-2 cards, refer to the *Configuration Guide for Cisco DSLAMs with NI-2*.

Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(2) or Later

The following sections describe how to install a secondary (redundant) NI-2 card, and how to upgrade NI-2 cards from Cisco IOS software release 12.1(2) or later to support redundancy on Cisco 6130, Cisco 6160, and Cisco 6260 systems.

> **Note** If Cisco IOS software release 12.1(1) or earlier is managing your system, follow the upgrade procedures in the "Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(1) or Earlier" section on page 11. Use the **show version** command to determine the Cisco IOS release currently managing your system.

> **Caution** The procedures that are outlined in this section will force the system to stop providing DSL service for the duration of the upgrade process. Do not proceed unless this is acceptable.

Upgrade Checklist

When you install and upgrade NI-2 cards to support redundancy, be sure that you follow the upgrade procedures in the proper sequence. Table 5 is a checklist of the upgrade steps in the order in which they should occur. Detailed upgrade instructions are located in the sections following Table 5.

Table 5   Upgrade Procedure Checklist

Check	Upgrade Step
	1. Verify the Cisco IOS release currently managing your system
	2. Backup system images and configuration files from the card in slot 10 to a network server
	3. Download Cisco IOS Release 12.1(7)DA system and boot images
	4. Upgrade the bootflash image on the NI-2 to the 12.1(5)DA dboot image, as necessary
	5. Upgrade the system and boot images on the NI-2 to 12.1(7)DA
	6. Install a secondary NI-2 card in slot 11, as necessary
	7. Upgrade system and boot images on the card in slot 11, as necessary
	8. Verify the state of the standby NI-2 card
	9. Configure the NI-2 cards for file system synchronization (optional)

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Upgrade Procedures

The following sections detail the procedures for installing and upgrading NI-2 cards to support NI-2 card and APS link redundancy on the Cisco 6130, Cisco 6160, and Cisco 6260 systems.

Verify the Cisco IOS Software Release Managing Your System

> **Note** The following upgrade steps are specific to systems managed by Cisco IOS Software Release 12.1(2) or later. If your system is managed by Cisco IOS Software Release 12.1(1) or earlier, follow the upgrade procedures in the "Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(1) or Earlier" section on page 11.

Use the **show version** command in privileged EXEC mode to determine the Cisco IOS Software Release currently managing your system.

Backup System Images and Configuration Files

Before you upgrade the system and boot images on the NI-2 card in slot 10, Cisco recommends that you copy current system and configuration images from flash memory to a TFTP server or a remote copy protocol (rcp) server. You can use these server copies as backup copies.

> **Note** For more information about copying system images and examples of the procedure, refer to the *Configuration Guide for Cisco DSLAMs with NI-2.*

Download Cisco IOS System and Boot Images from Cisco.com

> **Caution** The procedures that are outlined in the following steps will force the system to stop providing DSL service for the duration of the upgrade process. Do not proceed unless this is acceptable.

Cisco IOS Release 12.1(7)DA system and boot images must be installed on your system before the NI-2 cards can support redundancy. Cisco posts new versions of IOS to the Software Center on Cisco.com. You must be a registered Cisco user to log in to the Cisco Software Center. You can download Cisco IOS Release 12.1(7)DA (and the 12.1(5)DA dboot image, if necessary) from Cisco.com at the following location:

http://www.cisco.com/cgi-bin/Software/Iosplanner/Planner-tool/iosplanner.cgi?majorRel=12.1

> **Note** For complete instructions on how to download software images via the Web or FTP, see the *CCO Software Download Guide* at http://www.cisco.com/public/sw-center/sw-dlguide.html

Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image

> **Note**   If you are upgrading from Release 12.1(3)DA or earlier images on the NI-2 to Release 12.1(7)DA, you must first upgrade the bootflash image on the NI-2 to the 12.1(5)DA dboot image, then upgrade to the 12.1(7)DA image. This is a result of a problem (CSCdr89374) in old bootflash images. This defect may cause the flash application image to fail to self-decompress successfully.
>
> If you are upgrading from Release 12.1(5)DA or later, skip this section and proceed to the "Upgrade the System and Boot Images on the NI-2 to 12.1(7)DA" section on page 26.

To upgrade the dboot image in bootflash, complete the following steps:

	Command	Purpose

Step 1	`DSLAM>`**`enable`**
	`Password: <password>`
	`DSLAM#`
		Enter enable mode.
		Enter the password.
		You have entered enable mode when the prompt changes to DSLAM#.

Step 2	`DSLAM# `**`delete bootflash:`**`filename`	Make room in the bootflash by deleting the name of the current boot image.
Step 3	`DSLAM# `**`squeeze bootflash`**	Recover available space in bootflash using the **squeeze bootflash** command.
Step 4	`DSLAM# `**`copy`** `tftp://[server name]`**`/[directory]/ni2-dboot-mz.121-5.da bootflash:`**	Copy the boot image to the bootflash.
Step 5	`DSLAM# `**`show version`**	Record the current value of the config-register that appears on the last line of the show version display.
Step 6	`DSLAM# `**`configure terminal`**	Enter global configuration mode. You have entered global configuration mode when the prompt changes to `DSLAM (config)#`.
Step 7	`DSLAM(config)# `**`config-register 0`**	Set the to 0x0000 so that the NI-2 will reboot in the rom monitor.
Step 8	`DSLAM(config)# `**`exit`**	Exit configure terminal mode.
Step 9	`DSLAM# `**`copy running-config startup-config`**	Save the running configuration.
Step 10	`DSLAM# `**`reload`**	Reset the system.
Step 11	`rommon> `**`set`**	If you see BOOTLDR after you enter this command, the image in bootflash is already being used as the bootstrapper; go to Step 15. Otherwise, go to Step 12 and enter the commands in Steps 12 through 14 to force the system to use ni2-dboot-mz.121-5.bin as the bootstrapper.
Step 12	`rommon > `**`unset BOOTLDR`**	Unset BOOTLDR to remove the variable.
Step 13	`rommon > `**`sync`**	Sync to save the state of rommon.
Step 14	`rommon > `**`b`**	When the NI-2 boots, it uses ni2-dboot-mz.121-5da.bin as your bootstrapper.

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	Command	Purpose
Step 15	DSLAM# **configure terminal**	Enter global configuration mode. You have entered global configuration mode when the prompt changes to `DSLAM (config)#`.
Step 16	DSLAM(config)# **config-register** *value*	Set the config-register to the value you recorded in Step 5.
Step 17	DSLAM(config)# **exit**	Return to enable mode. Proceed to the "Upgrade the System and Boot Images on the NI-2 to 12.1(7)DA" section on page 26.

Upgrade the System and Boot Images on the NI-2 to 12.1(7)DA

Note   Cisco highly recommends that you have console access to the NI-2 during the update procedure. You can use the console connection to troubleshoot any unexpected events that occur during the upgrade.

To upgrade the system and boot images to 12.1(7)DA, perform the following steps in privileged EXEC mode:

	Command	Purpose
Step 1	DSLAM#**dir bootflash:**	Verify that the bootflash image is **ni2-dboot-mz.121-5.da** or **ni2-dboot-mz.121-4.da**. If it is neither, go to the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 25 and perform the instructions there, then return to this step.
Step 2	DSLAM#**dir flash:**	Display the name of the flash file that begins **ni2-** and use it as *filename* in Step 3.
Step 3	DSLAM#**delete flash:***filename*	Delete the flash file name found in Step 2. Repeat Step 2 and Step 3 until all files in the flash have been deleted.
Step 4	DSLAM#**squeeze flash:**	Recover available space in Flash memory.
Step 5	DSLAM#**copy tftp://***tftpserver***:TFTPBOOT/ni2-dsl-mz.121-7.da flash:**	Copy the Cisco IOS image from a tftp server to Flash.
Step 6	DSLAM#**configure terminal** DSLAM (config)#**no boot system** DSLAM (config)#**boot system flash:ni2-dsl-mz.121-7.da** DSLAM#**end**	Enter global configuration mode. Disable the boot from system. Specify the name of the system image to load at startup. End global configuration mode.
Step 7	DSLAM#**copy running-config startup-config**	Save your changes to the startup configuration.
Step 8	DSLAM#**reload**	Reload the system to upgrade the image.

	Command	Purpose
Step 9	`DSLAM#show version`	Confirm that the running image is **ni2-dsl-mz.121-7.da**. If it is not, go to Step 5.
Step 10	`DSLAM# format bootflash:`	**Note** When you upgrade from Cisco IOS Release 12.1(5)DA or earlier images on the NI-2 to Release 12.1(7)DA, you must reformat the bootflash on the NI-2. If you are upgrading from IOS Release 12.1(6)DA or 12.1(6)DA1, you do not need to reformat the bootflash and can proceed to Step 11. Erase all information in bootflash memory. Answer **y** to all confirm questions. When the DSLAM returns you to the EXEC prompt, bootflash memory is successfully formatted and ready for use. Ensure that the bootflash is 3.8 MB total. If it is not, go to Step 5.

Step 11	`DSLAM#copy`
	`tftp://`*tftpserver*`:TFTPBOOT/ni2-dboot-mz`
	`.121-7.da bootflash:`
		Copy the boot image from a tftp server to the bootflash.

Step 12	`DSLAM# reload`	Reload the system to upgrade the image.

Install a Secondary NI-2 Card in Slot 11

⚠ **Caution**   Proper ESD protection is required whenever you handle Cisco DSLAM 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.

Complete the following steps to install a secondary NI-2 card in slot 11. It is important that you accomplish each step completely before moving on to the next step.

✎ **Note**   The secondary NI-2 card must be the same interface type as the primary NI-2 card installed in slot 10.

Step 1   Open the front cover on the chassis, as necessary.

✎ **Note**   Only the Cisco 6130 has a front cover.

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

Step 3   Verify that slot 11 of the chassis has no bent pins.

Step 4   Vertically align the card edge with the card guides at the top and bottom of slot 11 in the chassis.
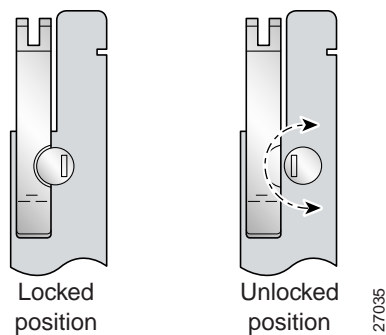
Figure 7 shows the NI-2 installation in slot 10 for a Cisco 6130 chassis. The installation procedures will be the same for the other chassis and for both slots 10 and 11.

Figure 7   NI-2 Card Installation
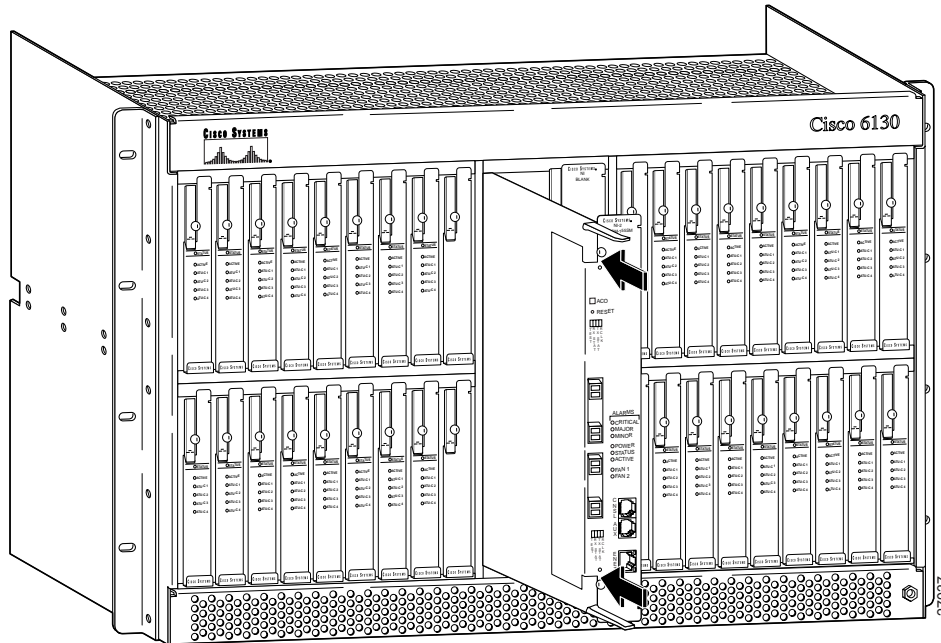
Step 5   Lift up on the locking levers and gently apply pressure to the bottom of the faceplate while pushing the card into the slot.

Step 6   Push on the faceplate of each card to fully seat the card.

Step 7   Press down on the locking levers to secure the card and connect it to the backplane.

Step 8   Lock both NI-2 card locking tabs. Use a flat-head screwdriver to turn the locking tabs so that they overlap the NI-2 card locking levers to prevent inadvertent dislodging, as shown in Figure 8.

Figure 8   Positioning the NI-2 Card Locking Tabs

Locked position

Unlocked position

Step 9   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 "Troubleshooting" section on page 32.

Step 10   For DS3/2DS3 NI-2 cards, refer to the *NI-2 FRU Installation and Replacement Notes* or to the appropriate hardware installation guide for information on trunk and subtending connections, which are made from the system I/O card or I/O module.

Note   Steps 11 and 12 are optional but recommended for APS link redundancy on secondary OC-3c/OC-3c or OC-3c/2DS3 NI-2 cards.

Step 11   Attach the receive fiber from the ATM switch to the transmit connector in the inset on the faceplate of the NI-2 card in slot 11 (trunk 1 interface connector TX). See Figure 9 for the network interface connection location.

Note   Figure 9 shows an OC-3c/OC-3c NI-2 card; the trunk receive and transmit connections will be the same for OC-3c/2DS3 NI-2 cards.

Figure 9   Network Interface Connection
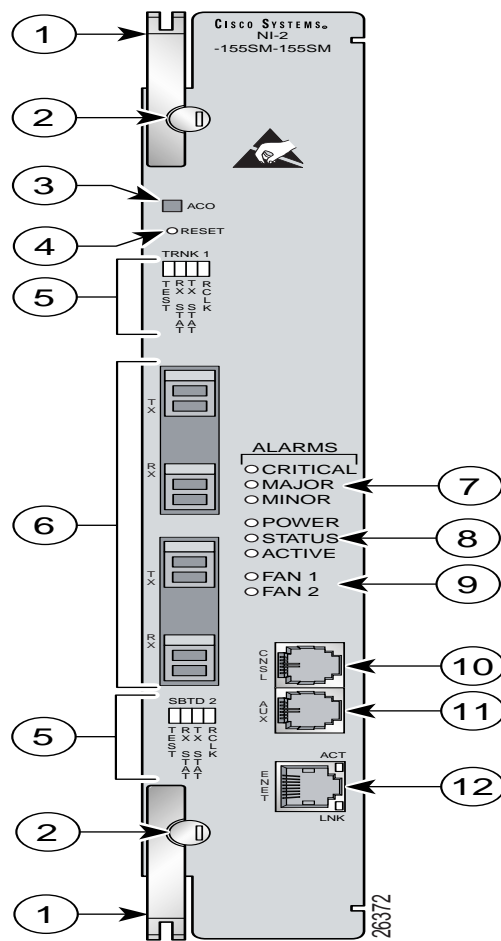
The transmit connector is the one closest to the top of the faceplate. The receive connector is closer to the bottom of the faceplate. The connector IDs are silkscreened on the NI-2 card faceplate.

Step 12   Attach the transmit fiber from the ATM switch to the receive connector in the inset on the faceplate of the NI-2 card (trunk 1 interface connector RX). See Figure 9 for the network interface connection location.

Figure 10   CNSL, AUX, and ENET RJ-45 Receptacles on the NI-2 Card
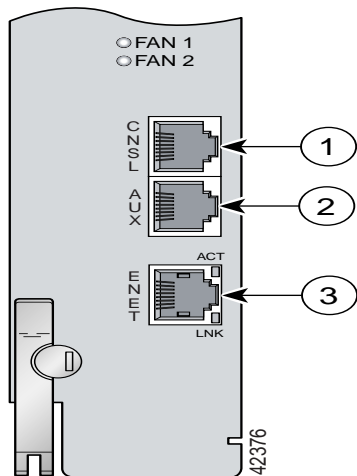
Step 13   Connect a VT100-compatible terminal to the system console port (CNSL) on the NI-2 card. Figure 10 shows where to connect the console cable. Connect the terminal to a power source and set it up using the values that are shown in Table 6.

Table 6   Terminal Settings

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

Step 14   Close the front cover on the chassis, as necessary.

> ✎
> **Note**   For information on redundant APS subtending connections from the OC-3c/OC-3c NI-2 card, see the appropriate hardware installation guide.

Upgrade System and Boot Images on the NI-2 Card in Slot 11

Cisco IOS Release 12.1(7)DA must be installed on both NI-2 cards before they can support redundancy. If Cisco IOS Release 12.1(7)DA is not currently installed on the secondary NI-2 card, follow the same procedures used to upgrade system and boot images on the NI-2 card in slot 10. These procedures can be found in the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 25 and the "Upgrade the System and Boot Images on the NI-2 to 12.1(7)DA" section on page 26.

Verify the State of the Standby NI-2 Card

Once both NI-2 cards have been installed, configured, and reseated according to the procedures above, use the **show redundancy states** command in privileged EXEC mode on the active NI-2 card to verify that the peer state of the standby card has reached STANDBY-READY. This process may take several minutes as the peer state progresses through STANDBY COLD-CONFIG, STANDBY COLD-FILESYS, AND STANDBY COLD-BULK to STANDBY-READY.

Configure the NI-2 Cards for File System Synchronization

NI-2 redundancy supports autosynchronization of the primary and secondary NI-2 card file systems, but the flash and bootflash must first be manually synchronized between the two cards before autosynchronization can be enabled. To synchronize the flash and bootflash on the NI-2 cards, complete the following steps in privileged EXEC mode:

	Command	Purpose
Step 1	DSLAM#**secondary sync flash**	Manually synchronize the secondary NI-2 flash to the primary NI-2 flash.
Step 2	DSLAM#**secondary sync bootflash**	Manually synchronize the secondary NI-2 bootflash to the primary NI-2 bootflash.
Step 3	DSLAM#**configure terminal** DSLAM (config)#**auto-sync flash** DSLAM (config)#**auto-sync bootflash** DSLAM(config)#**exit**	Enter global configuration mode. Enable autosynchronization of the secondary NI-2 flash to the primary NI-2 flash. Enable autosynchronization of the secondary NI-2 bootflash to the primary NI-2 flash. Exit configure terminal mode.
Step 4	DSLAM#**copy running-config startup-config**	Save your changes to the startup configuration. ⚠ **Caution** Executing this command will write configuration changes to the NVRAM of both the active and the standby NI-2 cards, and any previous configuration information will be lost.

✎

Note For more information on configuring NI-2 cards, refer to the *Configuration Guide for Cisco DSLAMs with NI-2*.

Troubleshooting

This section provides information on isolating faults in the NI-2 card and APS link redundancy. This section covers the following topics:

- Basic Checks, page 32
- NI-2 Card Problems, page 32
- Alarms, page 34

Basic Checks

Before using the troubleshooting table in this section, check the following:

- Are power leads and data cables firmly connected at both ends?
- Are the NI-2 cards correctly installed and firmly seated in the chassis? Refer to the "Install a Secondary NI-2 Card in Slot 11" section on page 16 for instructions, or refer to the appropriate hardware installation guide.
- Are the system and boot images updated? Refer to the "Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(1) or Earlier" section on page 11 or the "Upgrading NI-2 Cards from Cisco IOS Software Release 12.1(2) or Later" section on page 23 for instructions, or refer to these sources for additional configuration information:
  - *Configuration Guide for Cisco DSLAMs with NI-2*
  - *Command Reference for Cisco DSLAMs with NI-2*

NI-2 Card Problems

Table 7 provides information about symptoms and corrective actions related to redundancy problems. For more information on troubleshooting, refer to the appropriate hardware installation guide or to the *NI-2 Card FRU Installation and Replacement Notes*.

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Table 7 — Troubleshooting Redundancy Problems

Symptom	Steps to Take
Power LED is off.	1. Check the Status LEDs on the line cards and the Input OK LED on each power entry module (PEM). If all LEDs are off, or if the red Out Fail LED on either PEM is on, troubleshoot the PEMs—see the appropriate hardware installation guide. ✎ **Note** The Cisco 6130 does not have a PEM. 2. If the line card Status LEDs and the PEM Input OK 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 failed to boot or failed its power-on self test.	Press the **Reset** button on the NI-2. If the problem persists, replace the card.
A trunk or subtending port fails to come up.	See the appropriate hardware installation guide.
NI-2 cannot be fully inserted into its slot.	Inspect connectors on both the NI-2 card and the backplane, looking for obstructions, bent pins, or other damage. If you find damage to an NI-2 card connector, replace the NI-2 card. If you find damage to a backplane connector, contact the Cisco TAC.
Both NI-2 cards go active	Ensure that the NI-2 card is revision AO or later
DS3 traffic interrupted.	1. Ensure that the NI-2 card is revision AO or later. 2. Ensure that the correct boot image is installed on the NI-2 card(s). See the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 13 for instructions.
Line card communication is interrupted.	1. Ensure that the NI-2 card is revision AO or later. 2. Ensure that the correct boot image is installed on the NI-2 card(s). See the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 13 for instructions.
Standby state never gets beyond STANDBY-COLD.	For a Cisco 6260 system, ensure that the Cisco 6260 backplane has been upgraded to part number 73-3999-05 rev. AO or later.
Transient environmental alarms occur.	Ensure that the correct boot image is installed on the NI-2 card(s). See the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 13 for instructions.
No access to secondary file systems.	For a Cisco 6260 system, ensure that the Cisco 6260 backplane has been upgraded to part number 73-3999-05 rev. AO or later.
TFTP boot fails.	The NI-2 card is not configured to boot from flash. See the "Upgrade the System and Boot Images to 12.1(7)DA" section on page 14 for instructions.
Line cards reboot or reset upon switchover.	The software version on the primary and secondary NI-2 cards may be mismatched. Use the Cisco IOS **show version** command to determine the IOS release currently installed on each of the NI-2 cards. See the "Upgrade the Bootflash Image on the NI-2 to the 12.1(5)DA dboot Image" section on page 13 for more information on upgrading software images.

Alarms

Table 8 describes redundancy alarms. 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**.

See Table 7 on page 33 for more detailed troubleshooting instructions.

✎
Note For more information on NI-2 Alarms, refer to the *NI-2 Card FRU Installation and Replacement Notes* document that ships with new or replacement NI-2 cards. For information on chassis or line card alarms, refer to the appropriate hardware installation guide.

Table 8   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/2DS3 NI-2 card.
Standby NI2 missing	C6100_CONTROLLER _SLOT_MISSING_AL ARM	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_F AILED	Major	An internal redundancy software process has failed and redundancy may not be available.
Peer APS mode mismatch	APS_MODE_MISMAT CH_ALARM	Minor	The OC3 trunk is connected to a device not configured for nonrevertive, unidirectional APS.
Both units ACTIVE	NI2_RF_ACTIVE_CL ASH	Info	Both the primary and the secondary NI-2 cards have come up in an active state.

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

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Obtaining Technical Assistance

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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

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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.

This document is to be used in conjunction with the documents listed in the "Related Documentation" section.

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