NI-1 Module FRU Installation and Replacement Notes

DS3 NI-1 Module Product Number: 6100NIM-1-DS3-2=

OC-3c NI-1 Module (SMF) Product Number: 6100NIM-1-OC3-SM2=

OC-3c NI-1 Module (MMF) Product Number: 6100NIM-1-OC3-MM2=

This document provides information about installing and replacing the Cisco 6100 Series system network interface-1 (NI-1) modules (DS3 or OC-3c). The NI-1 module is a field-replaceable unit (FRU).

Note The DS3 network interface module requires that you install ferrites on the cables that connect the system I/O card to the ATM network. See the "Installing or Replacing a DS3 NI-1 Module" section on page 12 for ferrite installation procedures.

Contents

This document includes the following sections:

CISCO SYSTEMS

Corporate Headquarters: Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

78-10698-01

NI-1 Module Overview

The NI-1 module provides a high-speed connection for aggregated data traffic from the *x*TU-C modules. The NI-1 module

- Connects to the *x*TU-C modules through point-to-point serial data buses on the backplane

- Must be plugged into slot 10 for the serial connections to be made

- Provides a high-speed, internal interface to the DS3 subtend host module (STM) through the backplane

The NI-1 module provides three types of network connections:

- A DS3 ATM interface

- A high-speed OC-3c optical ATM interface supporting single-mode fiber (SMF) intermediate range

- A high-speed OC-3c optical ATM interface supporting multimode fiber (MMF) short range

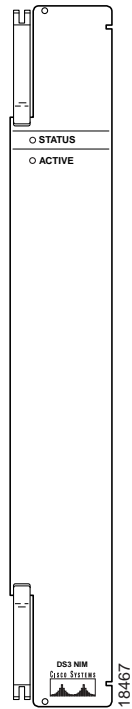The NI-1 module can be installed in chassis slot 10, as shown in Figure 1.

Figure 1   NI-1 Module Slot in the Cisco 6100/6130
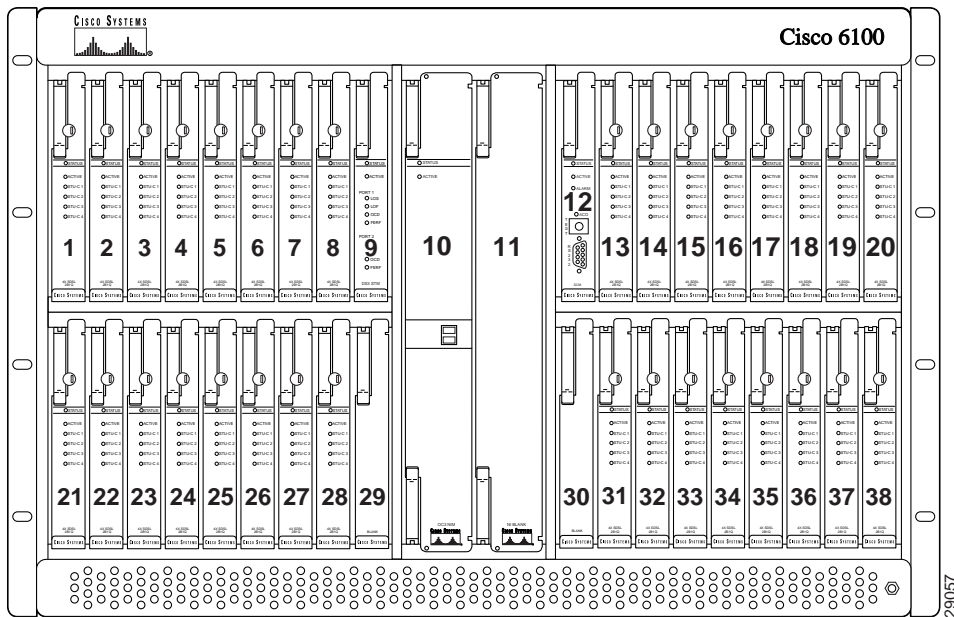
# DS3 NI-1 Module Overview

Figure 2 shows a close-up of the DS3 NI-1 module faceplate.

Figure 2   *DS3 NI-1 Module Faceplate*

The DS3 NI-1 module connections are on the system I/O card, which is located on the backplane of the Cisco 6100/6130 chassis. These connections attach to the ATM switch. Two 75-ohm DS3 Bayonet-Neill-Concelman (BNC) connectors are provided for DS3 transmit (J3) and receive (J4). See Figure 3 for the location of the DS3 BNC connectors.

Figure 3   DS3 NI-1 Connection Locations
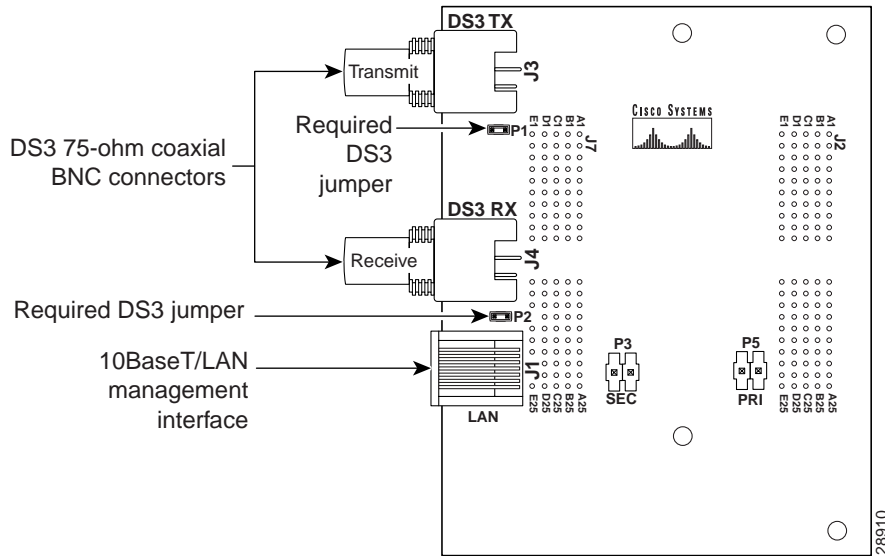
Note There are two DS3 jumpers on the system I/O card. The DS3 jumpers connect the BNC shield to the chassis ground. Both the receive DS3 jumper (P2) and the transmit DS3 jumper (P1) are installed on the system I/O card when it ships.

DS3 NI-1 Module LEDs

Table 1 describes the DS3 NI-1 module LED indicator functions.

Table 1   DS3 NI-1 Module LED Indicators

LED	State	Function
STATUS	Green slow blinking Green fast blinking Green solid Red Off	The self-test is in progress. The software is downloading. The status is OK. The self-test or module has failed. The NI-1 module has failed.
ACTIVE	Green solid Off	The module is active. The module is in standby mode.

DS3 NI-1 Module Block Diagram

Figure 4 is a block diagram of the DS3 NI-1 module.

Figure 4   DS3 NI-1 Module Block Diagram
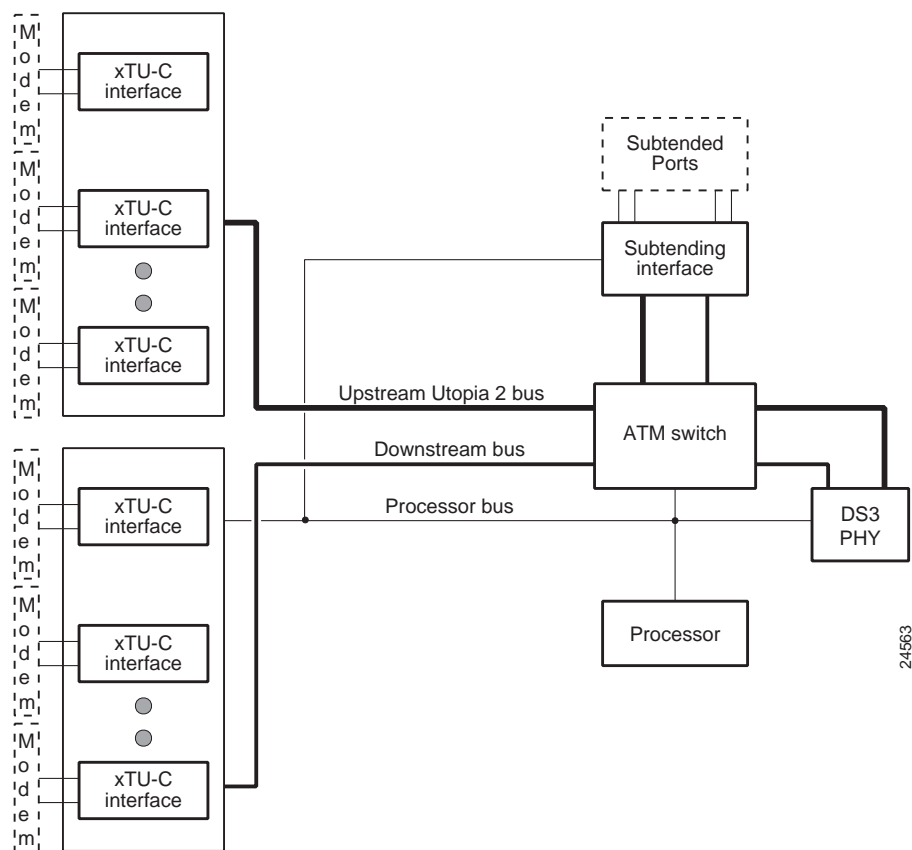
DS3 Network Connection

The DS3 NI-1 module receives its transmit timing from a local oscillator with 20 parts per million (ppm) accuracy. The line build-out defaults to 0 to 225 feet.

The default configuration for the DS3 NI-1 module is as follows:

- PLCP cell mapping enabled
- Cell payload scrambling enabled
- C-bit parity enabled
- Header error correction (HEC) disabled
- HEC calculation coset function enabled
- Cells with invalid HECs and unassigned cells are filtered from the cell stream

Table 2 shows reach comparisons for a Lucent 735A (thin coaxial cable), a Lucent 734A (thick coaxial cable), and a Belden RG-59/U (thick coaxial cable). An HP Cerjac was used to monitor the return loss. A minimum signal level of 360 millivolt (mV) was monitored at the HP Cerjac, and the cable length was then measured. The Lucent 734A thick coaxial cable performed slightly better than the Belden RG-59/U cable. The reach numbers represent the maximum distance to a DSX-3 cross connect.

Table 2   Reach Comparisons for 734A, 735A, and RG-59/U Cables

Cable Type	Line Build Out	Haul Length	Reach
735A	1	Short haul	175 feet
734A	1	Short haul	325 feet
RG-59/U	1	Short haul	250 feet

OC-3c NI-1 Module Overview

Figure 5 shows a close-up of the OC-3c NI-1 module faceplates. The faceplates are labeled differently for OC-3c SMF and OC-3c MMF.

Figure 5   OC-3c NI-1 Module Faceplates
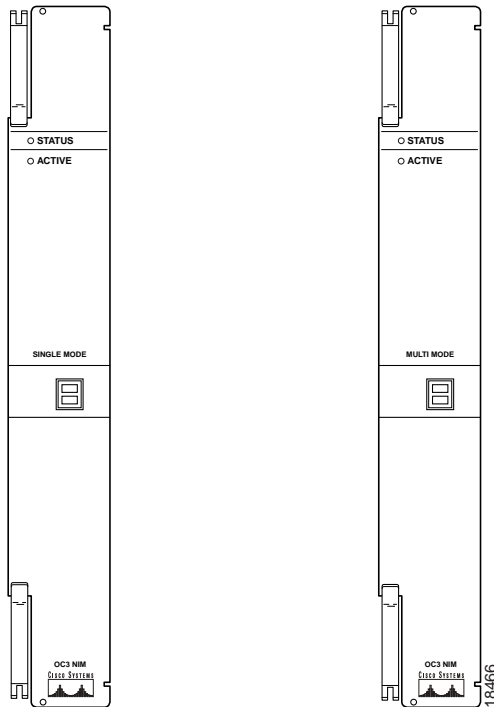
OC-3c NI-1 Module LEDs

Table 3 describe the OC-3c NI-1 module LED indicator functions.

Table 3   OC-3c NI-1 Module LED Indicators

LED	State	Function
STATUS	Green slow blinking Green fast blinking Green solid Red Off	The self-test is in progress. The software is downloading. The status is OK. The self-test or module has failed. The NI-1 module has failed.
ACTIVE	Green solid Off	The module is active. The module is in standby mode.

OC-3c NI-1 Module Block Diagram

Figure 6 is a block diagram of the OC-3c NI-1 module.

Figure 6   OC-3c NI-1 Module Block Diagram
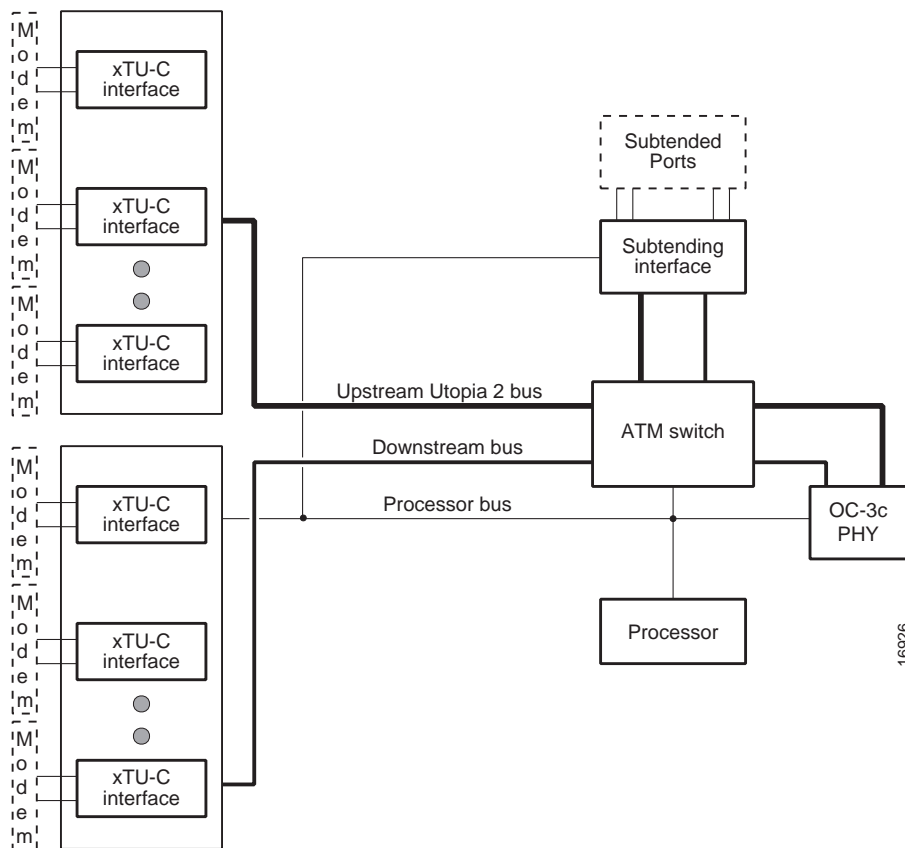
OC-3c Network Connection

The reach for the SMF interface is specified as 35 km if you use Siecor 0.20 dB per kilometer, 9 micrometers optical cable. Table 4 shows the electro-optical characteristics of the single-mode 155 MB ATM transceiver.

Table 4   Single-Mode OC-3c Transceiver Electro-Optical Characteristics

Transmitter	Units	Minimum	Typical	Maximum
Output power (average)	dBm	–15.0	–11.0	–8.0
Center wave length	nm	1260	—	1360

For single-mode ATM/SONET/SDH transceivers, the receiver minimum optical input power is –31 dBm (average), and the receiver maximum optical input power is –8 dBm (average).

Table 5 shows the electro-optical characteristics of the multimode OC-3c transceiver.

Table 5   Multimode OC-3c Transceiver Electro-Optical Characteristics

Transmitter	Units	Minimum	Typical	Maximum
Output power (average)	dBm	–17.0	–15.0	–12.0
Center wave length	nm	800	—	900

Part and Tool Requirements

To install or replace the NI-1 module, you need the following parts and tools:

- NI-1 module (DS3 or OC-3c).

- Ferrites that yield an impedance of 200 ohms +/– 20 percent at 100 MHz.

- Tie wraps.

- Coaxial cable.

  - Type 734A or equivalent.

  - Type 735A or equivalent.

- Necessary equipment for ESD protection—Required whenever you handle Cisco digital subscriber line access multiplexer (DSLAM) equipment, which includes the chassis, modules, and cards.

Note   The Cisco 6100 Series system has no internal user-serviceable parts. However, you can add or remove an NI-1 module without removing power from the system (hot swapping).

General Safety Precautions and Maintenance Guidelines

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

- General Safety Precautions, page 9
- Hot-Swapping Modules, page 11
- Module Installation and Replacement Suggestions, page 11

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.

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

Tips In the following warnings, the terms *cover panel* and *safety cover* refer to the Cisco 6100/6130 chassis front cover.

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. Modules are subject to ESD damage whenever they are removed from the chassis.

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

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

Warning **Use copper conductors only.**

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

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

Warning   Blank faceplates and cover panels serve three important functions: they prevent exposure to hazardous voltages and currents inside the chassis; they contain electromagnetic interference (EMI) that might disrupt other equipment; and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, and front covers are in place.

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

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

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

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   The safety cover is an integral part of the product. Do not operate the unit without the safety cover installed. Operating the unit without the cover in place will invalidate the safety approvals and pose a risk of fire and electrical hazards.

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

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

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

Hot-Swapping Modules

The NI-1 module supports hot swapping. Hot swapping allows you to remove and replace the modules without disconnecting the system power. When the system detects that a module is added or removed, it automatically runs diagnostic and discovery routines, and acknowledges the presence or absence of the module.

Module Installation and Replacement Suggestions

The following examples list recommended module installation and replacement practices:

- Do not force the module into its slot. This action can damage the pins on the backplane if they are not aligned properly with the module.
- Ensure that the module is straight and not at an angle when you install the module in the slot. Installing the module at an angle can damage the module.
- Fully depress the ejector tabs to ensure that the module connector mates with the backplane correctly. Firmly seat the module in the slot.

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

Removing and Installing a DS3 NI-1 Module

The following sections describe how to remove and replace or install a DS3 NI-1 module.

Removing a DS3 NI-1 Module

⚠

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. Modules are subject to ESD damage whenever they are removed from the chassis.

Use the following steps to remove a DS3 NI-1 module from the Cisco 6100/6130:

Step 1   Open the front cover on the Cisco 6100/6130 chassis.

Step 2   Lift up the ejector tabs of the DS3 NI-1 module. This action disconnects the module from the backplane.

Step 3   Carefully slide the module out of the slot.

Step 4   Replace the DS3 NI-1 module by completing the steps in the "Installing or Replacing a DS3 NI-1 Module" section on page 12.

Installing or Replacing a DS3 NI-1 Module

⚠

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. Modules are subject to ESD damage whenever they are removed from the chassis.

Complete the following steps to install the DS3 NI-1 module in the Cisco 6100/6130 chassis:

✎

Note   It is important that you accomplish each step completely before moving on to the next step.

Step 1   Open the front cover on the chassis.

Step 2   Inspect the NI-1 module. Verify that the two daughterboards are fully seated on the main board.

Step 3   Verify that slot 10 of the Cisco 6100/6130 chassis has no bent pins.

Step 4   Vertically align the module edge with the module guides at the top and bottom of slot 10 on the Cisco 6100/6130.

Step 5 Lift up on the ejector tabs and gently apply pressure to the bottom of the faceplate while pushing the module into the slot (see Figure 7).

Figure 7   DS3 NI-1 Module Installation
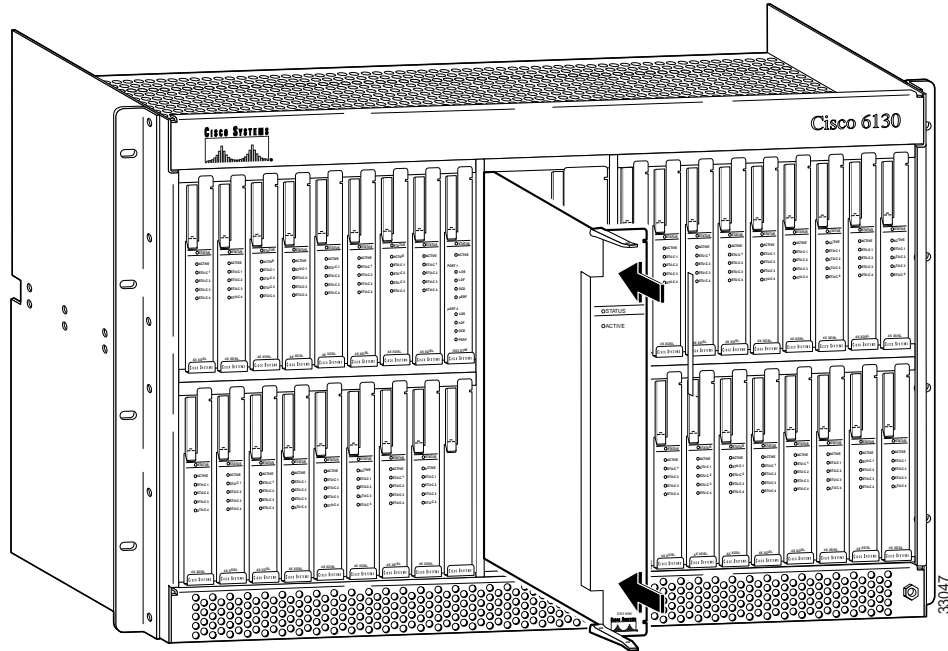
Step 6 Push on the faceplate of each module to fully seat the module.

Step 7 Press down on the ejector tabs to secure the module and connect it to the backplane.

Step 8 Attach one end of a coaxial cable (type 734A, type 735A, or equivalent) to the transmit DS3 BNC connector (J3) for the system I/O card on the chassis backplane. See Figure 3 for DS3 BNC connector location.

Step 9 Add ferrites to the coaxial cables that you use to cable the system I/O card to the ATM switch. If you are using

- Thick type 734A coaxial cable or equivalent, run the cable through a ferrite and clamp the ferrite shut, as shown in Figure 8. Attach the ferrite as close as possible to the transmit DS3 BNC connector (J3) on the system I/O card. Tie wrap the cable directly behind the ferrite.

*Figure 8   Thick Coaxial Cable Through Ferrite*
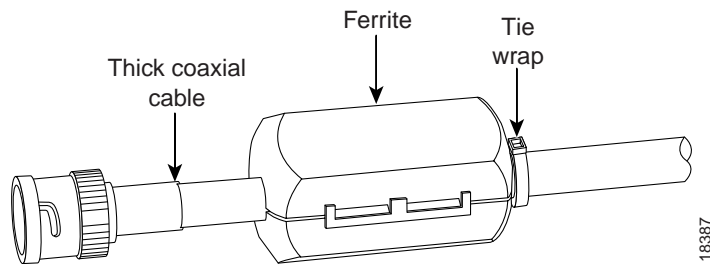
- Thin type 735A coaxial cable or equivalent, run the cable through one time, loop the cable back through a ferrite, and clamp the ferrite shut, as shown in Figure 9. Attach the ferrite as close as possible to the transmit DS3 BNC connector (J3) on the DS3 system I/O card.

✎

Note The minimum bend radius for thin type 735A coaxial cable or equivalent is one-quarter of an inch. If the minimum bend radius exceeds one-quarter of an inch, the cable might not work properly.

Looping the wire secures the ferrite.

Figure 9   Thin Coaxial Cable Through Ferrite
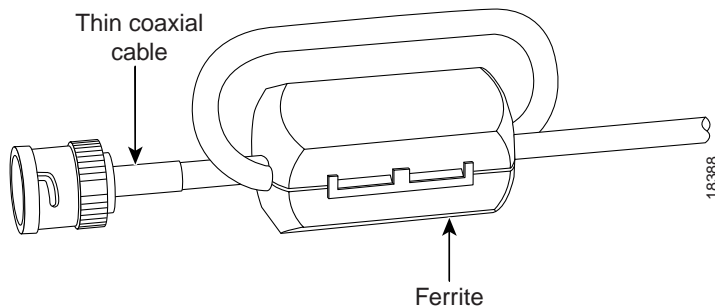
Step 10 Attach the end of the cable that is used in Step 3, which originates at the transmit DS3 BNC connector, to the ATM switch.

Step 11 Attach one end of a coaxial cable (type 734A, type 735A, or equivalent) to the receive DS3 BNC connector (J4) for the system I/O card on the Cisco 6100/6130 backplane.

Step 12 Attach the ferrite as close as possible to the receive DS3 BNC connector on the system I/O card (see Figure 8 or Figure 9 for ferrite installation). Tie wrap the cable directly behind the ferrite, as necessary.

Step 13 Attach the end of the cable that is used in Step 11, which originates at the receive DS3 BNC connector, to the ATM switch.

Step 14 Tie wrap the transmit and receive cables that are coming from the system I/O card where the cables meet after coming from the ferrites and every 1 foot thereafter for a total of 15 feet, as shown in Figure 10.

Figure 10   Ferrites Close to DS3 BNC Connectors on a System I/O Card
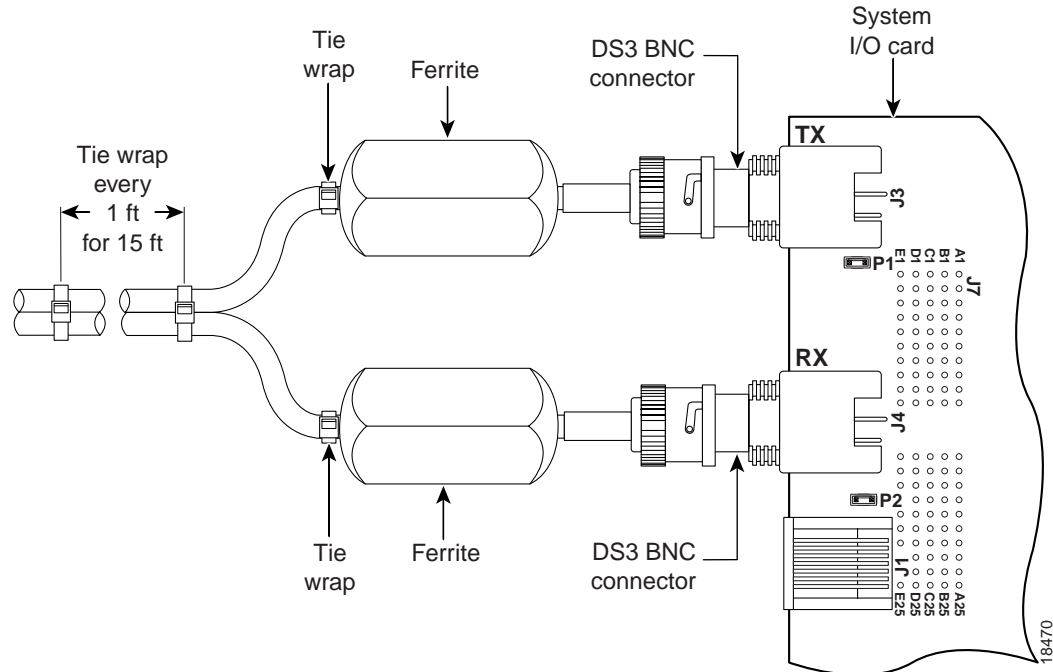
Step 15 Verify that the STATUS LED on the module is blinking green as the software is downloading from the system controller module. The software download will take several minutes.

Step 16 Verify that the STATUS LED on the module is solid green after the software download. If the STATUS LED is not green, refer to the *Cisco 6130 with NI-1 Direct Connect Installation Guide*, the *Cisco 6100 with NI-1 Direct Connect Installation Guide*, or the *Cisco 6100 with NI-1 Digital Off-Hook Installation Guide* for troubleshooting procedures.

Step 17 Verify that there are no alarms on the system controller module (ALARM LED off).

Removing and Installing an OC-3c NI-1 Module

The following sections describe how to remove and replace or install an OC-3c NI-1 module.

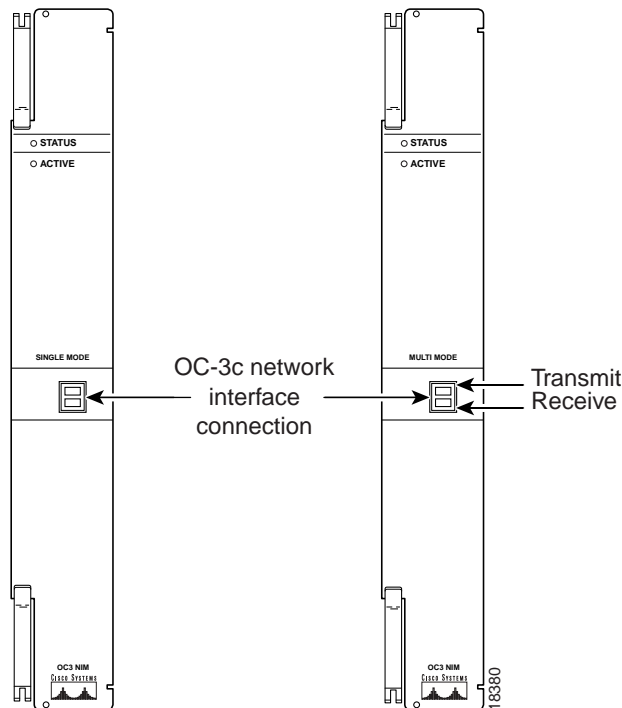## Removing an OC-3c NI-1 Module

⚠️

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. Modules are subject to ESD damage whenever they are removed from the chassis.

Use the following steps to remove an OC-3c NI-1 module from the Cisco 6100/6130:

Step 1   Open the front cover on the Cisco 6100/6130 chassis.

Step 2   Disconnect the optical fiber that is going to the transmit and receive connectors in the inset on the front panel of the OC-3c network interface module. See Figure 11 for the OC-3c NI-1 connection location.

Figure 11   OC-3c NI-1 Connection

Step 3   Pull the fiber through to the front of the chassis.

Step 4   Lift up the ejector tabs of the OC-3c NI-1 module. This action disconnects the module from the backplane.

Step 5   Carefully slide the module out of the slot.

Step 6   Replace the OC-3c NI-1 module by completing the steps in the "Installing or Replacing an OC-3c NI-1 Module" section on page 17.

Installing or Replacing an OC-3c NI-1 Module

⚠

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. Modules are subject to ESD damage whenever they are removed from the chassis.

To install the OC-3c NI-1 module in the Cisco 6100/6130 chassis, complete the following steps:

✎

Note   It is important that you accomplish each step completely before moving on to the next step.

Step 1   Open the front cover on the chassis.

Step 2   Inspect the NI-1 module. Verify that the two daughterboards are fully seated on the main board.

Step 3   Verify that slot 10 of the Cisco 6100/6130 chassis has no bent pins.

Step 4   Vertically align the module edge with the module guides at the top and bottom of slot 10 on the Cisco 6100/6130.

Step 5   Lift up on the ejector tabs and gently apply pressure to the bottom of the faceplate while pushing the module into the slot (see Figure 12).

Figure 12   OC-3c NI-1 Module Installation
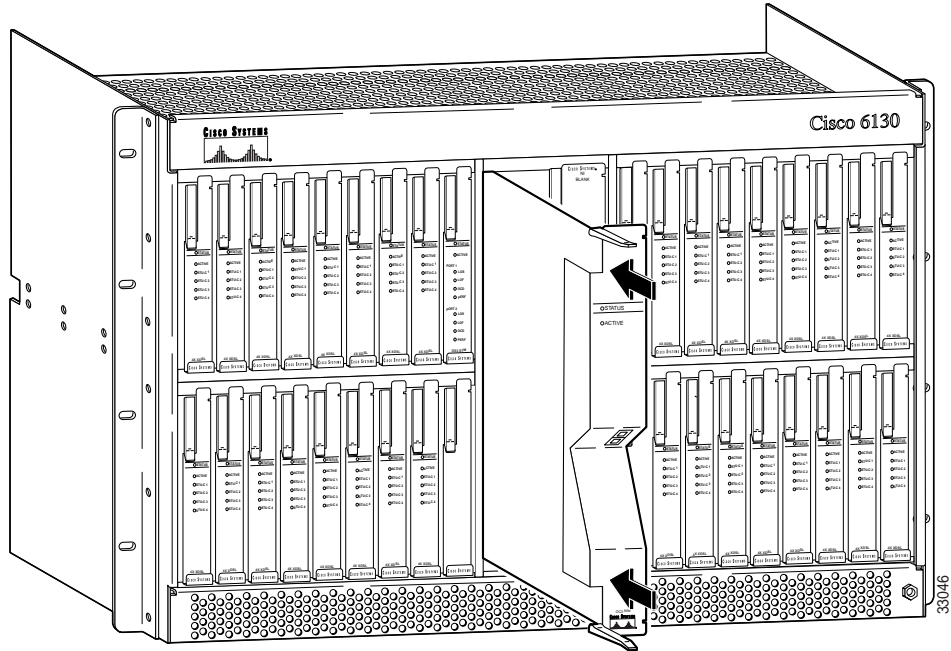

Step 6   Push on the faceplate of each module to fully seat the module.

Step 7   Press down on the ejector tabs to secure the module and connect it to the backplane.

Step 8   Pull the OC-3c NI-1 module transmit and receive cables from the ATM switch through the 1 RU of space either under the fan tray or the Cisco 6100/6130 chassis, depending on your configuration.

Step 9 Attach the transmit optical fiber to the receive connector in the inset on the faceplate of the OC-3c NI-1 module. See Figure 13 for the OC-3c NI-1 connection location.

Figure 13   OC-3c NI-1 Connection
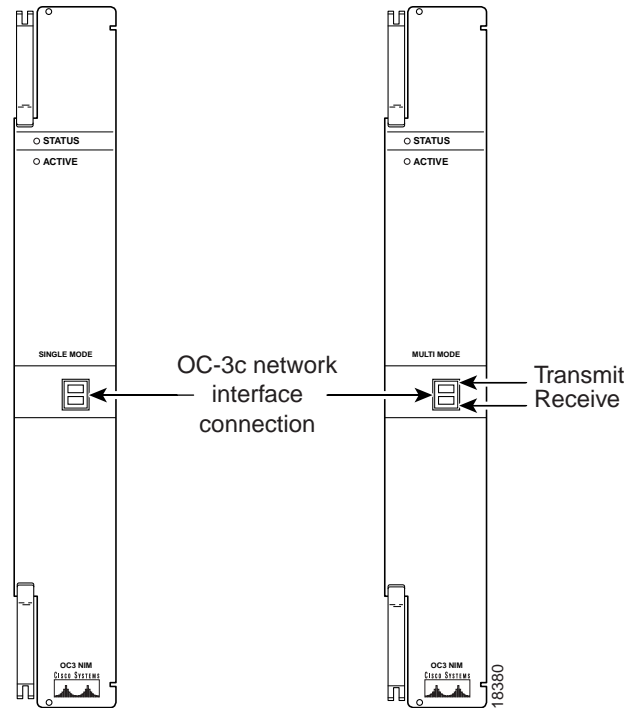
The transmit connector is the one closest to the top of the faceplate. The receive connector is closest to the bottom of the faceplate. The connector IDs are silkscreened inside the inset.

Step 10 Attach the receive optical fiber to the transmit connector in the inset on the faceplate of the OC-3c NI-1 module. See Figure 13 for the OC-3c NI-1 connection location.

Step 11 Allow enough slack in the cable so that the fan tray can be opened and the fans can be maintained.

Step 12 Coil the fiber loosely within the 1 RU of space to take out slack.

Step 13 Verify that the STATUS LED on the module is blinking green as the software is downloading from the system controller module. The software download will take several minutes.

Step 14 Verify that the STATUS LED on the module is solid green after the software download. If the STATUS LED is not green, refer to the *Cisco 6130 with NI-1 Direct Connect Installation Guide*, the *Cisco 6100 with NI-1 Direct Connect Installation Guide*, or the *Cisco 6100 with NI-1 Digital Off-Hook Installation Guide* for troubleshooting procedures.

Step 15 Verify that there are no alarms on the system controller module (ALARM LED off).

Standards and Certifications

Table 6 lists NI-1 module standards and certifications.

Table 6   *Standards and Certifications*

Category	Description
NEBS Level 3	Bellcore GR-63-CORE, GR-1089-CORE
EMI	FCC Part 15, Class A
Safety	UL 1950, 3rd Edition

Related Documentation

The following sections list the central office (CO) and customer premises equipment (CPE) publications that relate to the Cisco DSL product family.

CO Publications

A complete list of all released Cisco 6100 Series system with NI-1 related documentation is available on the World Wide Web at
http://www.cisco.com/univercd/cc/td/doc/product/dsl_prod/c6100/index.htm.

The following ViewRunner management software is used to provision and manage the Cisco 6100 Series system with NI-1. A complete list of all released ViewRunner documentation is available on the Word Wide Web.

- ViewRunner for Windows
  http://www.cisco.com/univercd/cc/td/doc/product/dsl_prod/vrmgtsw/vr4w/index.htm
- ViewRunner for HP OpenView
  http://www.cisco.com/univercd/cc/td/doc/product/dsl_prod/vrmgtsw/vr4ov/index.htm

CPE Publications

The Cisco CPE, also known as the Cisco 600 Series, is part of the Cisco end-to-end DSL product family. CPE comprises modems and routers at the customer site primarily used by home office and corporate LAN personnel. Most CPE uses the Cisco Broadband Operating System (CBOS) as its operating system. CBOS provides a comprehensive command set and web interface that allow you to configure your Cisco CPE modem or router.

A complete list of all released Cisco 600 Series documentation is available on the World Wide Web at http://www.cisco.com/univercd/cc/td/doc/product/dsl_prod/c600s/index.htm.

Obtaining Documentation

World Wide Web

You can access the most current Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

Documentation CD-ROM

Cisco documentation and additional literature are available in a CD-ROM package, which ships with your product. The Documentation CD-ROM is updated monthly. Therefore, it is probably more current than printed documentation. The CD-ROM package is available as a single unit or as an annual subscription.

Ordering Documentation

Registered CCO users can order the Documentation CD-ROM and other Cisco Product documentation through our online Subscription Services at http://www.cisco.com/cgi-bin/subcat/kaojump.cgi.

Nonregistered CCO users can order documentation through a local account representative by calling Cisco's corporate headquarters (California, USA) at 408 526-4000 or, in North America, call 800 553-NETS (6387).

Obtaining Technical Assistance

Cisco provides Cisco Connection Online (CCO) as a starting point for all technical assistance. Warranty or maintenance contract customers can use the Technical Assistance Center. All customers can submit technical feedback on Cisco documentation using the web, e-mail, a self-addressed stamped response card included in many printed docs, or by sending mail to Cisco.

Cisco Connection Online

Cisco continues to revolutionize how business is done on the Internet. Cisco Connection Online is the foundation of a suite of interactive, networked services that provides immediate, open access to Cisco information and resources at anytime, from anywhere in the world. This highly integrated Internet application is a powerful, easy-to-use tool for doing business with Cisco.

CCO's broad range of features and services helps customers and partners to streamline business processes and improve productivity. Through CCO, you will find information about Cisco and our networking solutions, services, and programs. In addition, you can resolve technical issues with online support services, download and test software packages, and order Cisco learning materials and merchandise. Valuable online skill assessment, training, and certification programs are also available.

Customers and partners can self-register on CCO to obtain additional personalized information and services. Registered users may order products, check on the status of an order and view benefits specific to their relationships with Cisco.

You can access CCO in the following ways:

- WWW: www.cisco.com

- Telnet: cco.cisco.com

- Modem using standard connection rates and the following terminal settings: VT100 emulation; 8 data bits; no parity; and 1 stop bit.

    – From North America, call 408 526-8070

    – From Europe, call 33 1 64 46 40 82

You can e-mail questions about using CCO to cco-team@cisco.com.

Technical Assistance Center

The Cisco Technical Assistance Center (TAC) is available to warranty or maintenance contract customers who need technical assistance with a Cisco product that is under warranty or covered by a maintenance contract.

To display the TAC web site that includes links to technical support information and software upgrades and for requesting TAC support, use www.cisco.com/techsupport.

To contact by e-mail, use one of the following:

Language	E-mail Address
English	tac@cisco.com
Hanzi (Chinese)	chinese-tac@cisco.com
Kanji (Japanese)	japan-tac@cisco.com
Hangul (Korean)	korea-tac@cisco.com
Spanish	tac@cisco.com
Thai	thai-tac@cisco.com

In North America, TAC can be reached at 800 553-2447 or 408 526-7209. For other telephone numbers and TAC e-mail addresses worldwide, consult the following web site: http://www.cisco.com/warp/public/687/Directory/DirTAC.shtml.

Documentation Feedback

If you are reading Cisco product documentation on the World Wide Web, you can submit technical comments electronically. Click **Feedback** in the toolbar and select **Documentation**. After you complete the form, click **Submit** to send it to Cisco.

You can e-mail your comments to bug-doc@cisco.com.

To submit your comments by mail, for your convenience many documents contain a response card behind the front cover. Otherwise, you can mail your comments to the following address:

Cisco Systems, Inc.
Document Resource Connection
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate and value your comments.

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

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