CISCO SYSTEMS

®

Text Part Number: OL-2733-01

Update to the Cisco IGX 8400 Series Installation and Configuration and Reference Guides, Release 9.2.3

Product Numbers: BC-UAI-2SMFXLR, BC-UAI-4SMFXLR Doc Number: 54512-00

This document describes the following:

- How to configure a Cisco IGX 8400 Series switch as a feeder node connected to a routing node using a universal switch module (UXM) Inverse Multiplexing over ATM (IMA) trunk

- How to configure a high-speed data module (HDM) and a low-speed data module (LDM) per-node lead to monitor lead state changes

- Specifications of the IGX UAI-2/4 OC-3c single-mode XLR back card

Note Use this document in conjunction with *Cisco IGX 8400 Series Installation and Configuration* manual, and *Cisco IGX 8400 Series Reference*. If you have questions or need help, refer to the section, Cisco Connection Online on page 31 .

This document includes the following sections:

1

Product Overview

This section describes an overview of how to set up an IGX as a feeder node that uses an UXM feeder trunk. The feeder node can be connected to an IGX or a BPX/IMATM. In addition, the UXM interface type T1/E1, T3/E3, IMA T1/E1 and OC3 single-mode and multi-mode fiber can be used to connect an IGX feeder node to the IGX/BPX routing node. This document also describes how to set up HDM/LDM Control Lead Trap on HDM/LDM modules and basic information on the UAI 2 and 4 port OC-3c SMF XLR back card module.

An IMA lets you group physical T1 or E1 lines to form a logical trunk. System software lets you specify IMA so that one or more physical lines within the logical trunk can serve as backup if a line fails.

The switch software (SWSW) and firmware for the HDM/LDM Control Lead Trap feature provides capabilities to monitor all leads on high-speed HDM and low-speed LDM data modules for lead-state change. This feature also has the ability to trigger jobs such as up and down connections on different ports.

FCC Requirements

The following tables represent the legal minimum immunity requirements for ITE products to be sold into Europe after August 2001.

Table 1   Emission Requirements: EN55022 (1998) EN55024 (1998)

Test	Applied to	Level	Immunity Criteria	Specification	Year	Comments
Radiated Emissions	Enclosure	Class A/Class B	A	EN55022	1998	Class A (other areas) Class B (Residential/Home)
Conducted Emissions	AC Line	Class A/Class B	A	EN55022	1998	Class A (other areas) Class B (Residential/Home)
Conducted Emissions	Signal Line	Class A/Class B	A	EN55022	1998	Class A (other areas) Class B (Residential/Home)
Conducted Immunity (CW)	Mains Ports	3V 1kHz 80% AM 0.15MHz-80MHz	A	EN61000-4-6	1996	Spot frequency tests at 0.2, 1.2, 7.1, 13.56, 21, 27.12, and 68MHz
Conducted Immunity (CW)	DC Ports	3V 1kHz 80% AM 0.15MHz-80MHz	A	EN61000-4-6	1996	Spot frequency tests at 0.2, 1.2, 7.1, 13.56, 21, 27.12, and 68MHz. Not applicable to equipment marketed with an external power convertor. Not applicable to DC lines within signal cables.
Conducted Immunity (CW)	Signal Lines (all)	3V 1kHz 80% AM 0.15MHz-80MHz	A	EN61000-4-6	1996	Spot frequency tests at 0.2, 1.2, 7.1, 13.56, 21, 27.12, and 68MHz. Apply to lines supporting comms on cables >3m.
Electrical Fast/Burst Transients	Mains Ports	1000V (peak) 5 kHz Rep. freq.	B	EN61000-4-4	1995	
Electrical Fast/Burst Transients	DC Ports	500V (peak) 5 kHz Rep. freq.	B	EN61000-4-4	1995	No applicale to equipment marketed with an external power converter. Not applicable to DC lines within signal cables.
Electrical Fast/Burst Transients	Signal Lines (all)	500V (peak) 5 kHz Rep. freq.	B	EN61000-4-4	1995	Apply to lines supporting comms on cables >3m.
Electro Static Discharge ESD	Enclosure	4kV contact 8kV Air	B	EN61000-4-2	1995	Based upon IEC801-2 (1991). Need to apply at least 200 discharges.
Power Frequency Magnetic Field	Enclosure	3A/m at 50Hz	A	EN61000-4-8	1994	Must contain devices susceptibility to H-fields: VDUs, Microphones. VDU interference allowed above 1 A/m.
Radiated Electric Field Immunity	Enclosure	3V 1kHz 80% AM 80MHz-1000MHz	A	EN61000-4-3	1996	Spot frequency tests at 80, 100, 120, 160, 230, 434, 460, 600, 863, 900 MHz.

Test	Applied to	Level	Immunity Criteria	Specification	Year	Comments (continued)
Surges Line to earth	Signal Lines excluding primary protection	1500V 1.2/50 (8/20)	R	CCITT K series		Apply lines which will leave buildings: ISDN, telephone lines. Apply this level if the port does not include primary protection.
Surges Line to earth	Signal Lines including primary protection	4000V 1.2/50 (8/20)	R	CCITT K series		Apply lines which will leave buildings: ISDN, telephone lines. Apply this level if the port includes primary protection.
Surges Line to earth	DC Ports	500V 1.2/50 (8/20)	B	EN61000-4-5	1995	Not applicable to equipment marketed with an external power convertor. Not applicable to DC lines within signal cables.
Surges Line to earth	Mains Ports	1000V 1.2/50 (8/20)	B	EN61000-4-5	1995	
Voltage Interruptions/ Dips	Mains Ports	30% reduction for 500ms	C	EN61000-4-11	1995	
Voltage Interruptions/ Dips	Mains Ports	95% reduction for 5000ms	C	EN61000-4-11	1995	
Voltage Interruptions/ Dips	Mains Ports	95% reduction for 10ms	B	EN61000-4-11	1995	

Safety Recommendations

Follow these guidelines to ensure general safety:

- Keep the chassis area clear and dust-free during and after installation.

- Keep tools away from walk areas where you or others could fall over them.

- Do not wear loose clothing that may get caught in the chassis. Fasten your tie or scarf and roll up your sleeves.

- Wear safety glasses when working under conditions that may be hazardous to your eyes.

- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.

Safety Warnings

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

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

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

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

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

Warnung Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen

Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.

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

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

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

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

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

Warning 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 Before working on a system that has an on/off switch, turn OFF the power and unplug the power cord.

The following warning applies to routers with a DC power supply:

Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position.

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

Caution To avoid damaging electrostatic discharge (ESD)-sensitive components, ensure that you have discharged all static electricity from your body before opening the chassis.

Warning The Ethernet 10BaseT, serial, console, and auxiliary ports contain safety extra-low voltage (SELV) circuits. BRI circuits are treated like telephone-network voltage (TNV) circuits. Avoid connecting SELV circuits to TNV circuits.

Safety with Electricity

Warning Before working on equipment that is connected to power lines, remove jewelry (including rings, necklaces, and watches). Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.

Follow these guidelines when working on equipment powered by electricity:

- Locate the room's emergency power-OFF switch. Then, if an electrical accident occurs, you can quickly shut the power OFF.
- Before working on the system, turn OFF the power and unplug the power cord.
- Disconnect all power before doing the following:
  - Working on or near power supplies
  - Installing or removing a router chassis or network processor module
  - Performing a hardware upgrade
- Do not work alone if potentially hazardous conditions exist.
- Look carefully for possible hazards in your work area, such as moist floors, ungrounded power extension cables, and missing safety grounds.
- Never assume that power is disconnected from a circuit. Always check.
- If an electrical accident occurs, proceed as follows:
  - Use caution, and do not become a victim yourself.
  - Turn OFF power to the system.
  - If possible, send another person to get medical aid. Otherwise, determine the condition of the victim and call for help.
  - Determine if the person needs rescue breathing or external cardiac compressions; then take appropriate action.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures. Always follow ESD prevention procedures when removing and replacing cards. Ensure that the router chassis is electrically connected to earth ground. Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground. To properly guard against ESD damage and shocks, the wrist strap and cord must be used correctly. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

Caution   For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms (Mohm).

Caution   Before opening the chassis, be sure that you have discharged all static electricity from your body and the power is OFF.

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.

Configuring a UXM Feeder Node

This section describes how to configure an IGX as a feeder node that uses an UXM feeder trunk. The feeder node can be connected to an IGX or a BPX/IMATM. In addition, the UXM interface type T1/E1, T3/E3, IMA T1/E1 and OC3 single-mode and multi-mode fiber can be used to connect an IGX feeder node to the IGX/BPX routing node. For detailed information regarding the UXM, refer to the *Cisco IGX 8400 Series Reference*.

Inverse Multiplexing over ATM

An IMA lets you group physical T1 or E1 lines to form a logical trunk. A logical trunk consisting of more than one T1 or E1 line supports connections with data rates that are much higher than the T1 or E1 rate. System software lets you specify IMA so that one or more physical lines within the logical trunk can serve as backup if a line fails. IMA characteristics are as follows:

- All physical ports of an IMA trunk use the same line configuration.

- The node maintains a set of *retained links* for the IMA trunk to keep it active. The IMA trunk does not fail unless the number of active trunks is less than the user-specified number of retained links.

- The IMA trunk can provide a clock source or clock path (see **cnftrk** command). The first (the lowest numbered) available physical line is used. If this line fails, the next available line within the IMA provides the clock source or clock path.

- Full support for individual physical line alarms and statistics.

To specify the range of ports for an IMA trunk, you can use either Cisco WAN Manager or the command-line interface (CLI). To define an IMA trunk on the CLI, use the **uptrk** command:

uptrk *slot.start_port-end_port*

For example, you could enter **uptrk** 8.1–4. Subsequently, you would refer to this logical trunk by using only the slot number and first port number—8.1 in this example—when you use other commands, such as **addtrk**, **deltrk**, **cnftrk**, and so on. Commands for viewing IMA information also include **dspportstats**, **dspphyslns**, **dsptrkcnf**, **dspfdr**, **dspnode**, and **dspphyslnstathist**.

Supported Card Types on the IGX Feeder Node

The following card types are supported on the IGX feeder node feature:

- CVM
- FRM
- HDM
- LDM
- UFM
- UXM
- UXM-E
- UVM

Adding an IGX Feeder

The IMA feeder node feature provides redundancy in case one of the physical lines on an IMA trunk fails. This reduces the chance of a single point of failure when a single feeder trunk is out of service. In addition, this feature allows you to configure the services on a feeder node instead of a routing node.

Figure 1 shows an example of an IGX feeder topology.

Figure 1   Sample IGX Feeder Topology
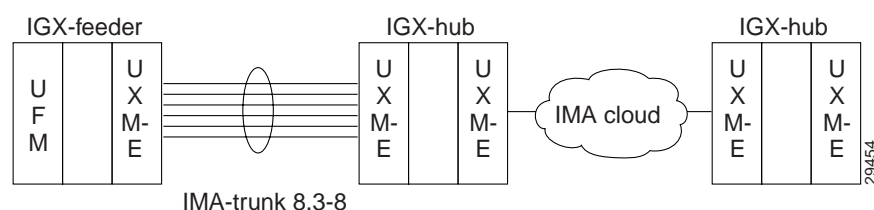
Currently supported on the IGX, a Service Expansion Shelf (SES) can function as a feeder node connected to an IGX routing node using a UXM OC-3 interface. The UXM feeder node feature adds the capability to support the UXM interface and the IGX as a feeder node. The routing node can be an IGX or a BPX/BXM-T3, BPX/BXM-E3, or BNI. The UXM interface type T1/E1, nxT1/E1, T3/E3, and OC-3, SMF/MMF Extra Long Reach can be used to connect an IGX feeder node to the IGX/BPX routing node.

To add the UXM feeder trunk, you can use either Cisco WAN Manager or the CLI. To define an IMA trunk on the CLI:

Step 1   Activate the trunk between the interface shelf and routing hub by specifying the primary link and the IMA group members of a UXM feeder trunk on an IGX routing node or an IGX feeder node. Enter:

uptrk *slot.group-member(s)*

Step 2   Use the **cnftrk** command to configure the activated UXM feeder trunk:

cnftrk *slot.primary link*

Step 3   Use the **addshelf** command to add the feeder trunk to an IGX routing node:

addshelf *slot.primary link shelf type*

**Note**   The routing node can be one of the following: IGX, BPX, or BPX-BXM/IMATM.

For a summary of commands you use to bring up an IGX node, refer to the section "IGX Configuration Summary" in *Cisco IGX 8400 Series Installation and Configuration*.

Adding and Removing IMA Group Links

When you configure an IMA trunk through Cisco WAN Manager or the **cnftrk** command, you enter the number of retained links. This represents the number of ports that must remain active for the IMA trunk itself to remain active. If a physical line goes out of service, but the number of active lines is at least as great as the retained links value, the IMA trunk remains active even though the node goes into major alarm. Also, the available load bandwidth is adjusted according to physical line status, so the switch does not reroute connections after a line failure unless the *used* bandwidth becomes greater than the *available* bandwidth.

In Figure 2, the number of retained links is set to 3. If line 1 fails for example, trunk 8.1-4 will continue functioning, however, the node will show major alarm due to the physical line failure.

Figure 2   Line Redundancy
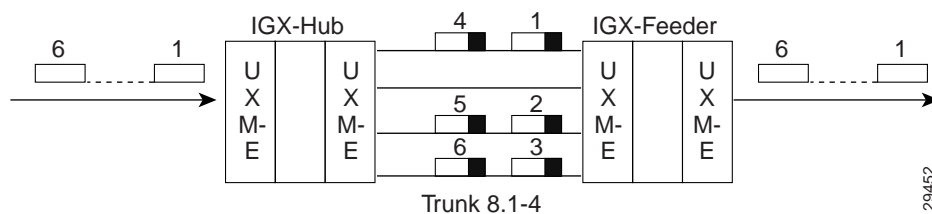
The transmit and receive rate of an IMA trunk is the sum of all physical lines minus the IMA protocol overhead. The overhead for up to four lines is one DS0. Using the previous IMA trunk example, the maximum rates are as follows:

for trunk 8.1-4 (with T1 lines),

TX rate = Rx rate = 24 * 4 DS0s – 1 DS0 = 95 DS0s

You could configure the line receive rate to be the maximum bandwidth allowed on this trunk:

total bandwidth = RX rate = 95 DS0s

You could configure the line transmit rate to be the maximum bandwidth allowed on this trunk:

total bandwidth = RX rate = 95 DS0s

However, if a physical line fails (and the number of retained links are still active), the switch adjusts the total bandwidth. Using the example IMA trunk consisting of four physical T1 lines:

total bandwidth is 95 DS0s – 24 DS0s = 71 DS0s

Figure 3 shows an example of IMA protocol overhead. In the example, DS0 1 is reserved for an IMA group with 1 to 4 physical lines and DS0 2 is reserved for an IMA group with 5 to 8 physical lines.

Figure 3   IMA Protocol
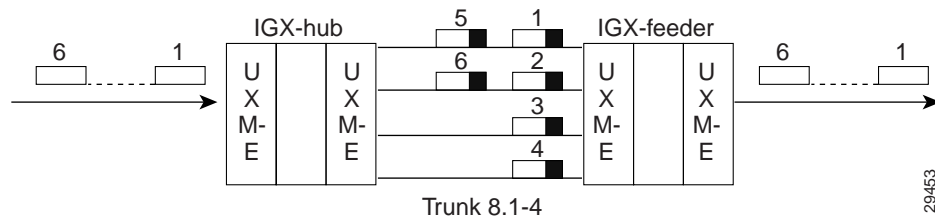
To add links to an IMA group, you can use either Cisco WAN Manager or the CLI. To add a link to an IMA on the CLI:

Step 1   Find the nodes configured as trunks connected to the IMA feeder. Enter:

dsptrks

Step 2   Increase the IMA group members on both trunk and feeder nodes by manually entering the number of group members. Enter:

cnftrk *slot.primary link*

Step 3   Increase the receive rate using the DS0 calculation example in Figure 2 on both trunk and feeder nodes.

Step 4   Increase the number of retained links on both trunk and feeder nodes.

To remove links from an IMA group, you can use either Cisco WAN Manager or the CLI. To remove a link from an IMA group on the CLI:

Step 1   Find the nodes configured as trunks connected to the IMA feeder by using the **dsptrks** command.

Step 2   Reduce the number of retained links on the IMA feeder node.

Step 3   Reduce the receive rate using the DS-0 calculation example in Figure 2 on the IMA feeder node.

Step 4   Repeat steps 2 and 3 on the IMA trunk.

Step 5   Reduce the number of IMA group members on both trunk and feeder nodes by manually entering the number of group members. Enter:

cnftrk *slot.primary link*

Note   The primary link cannot be removed from an IMA group.

Supported Segment Connections on the IGX Feeder Node

Figure 4 shows an example of configuring a two-segment connection for IGX feeder node functionality.
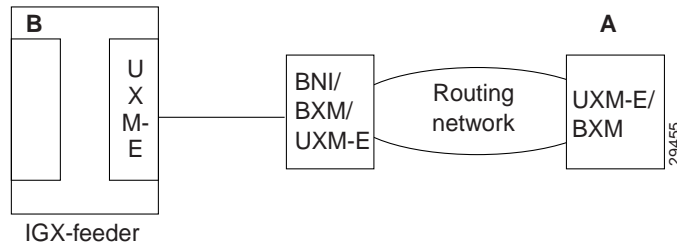
Figure 4 **Sample Two-Segment Connections**

Table 2 lists the corresponding routing and feeder endpoints with applicable gateway and load types and also connection types.

Table 2 **Two-Segment Connections**

Routing Endpoint A	Feeder Endpoint B	Connection Type	VCC or VPC	Gateway Type	Cell Routing	Load Type
UXM	UXM	CBR	Both	GW_TYPE_NONE	True	CBR_LOAD
BXM		RT-VBR		GW_TYPE_NONE	True	CBR_LOAD
		NRT-VBR		GW_TYPE_NONE	True	VBR_LOAD
		ABR.STD		GW_TYPE_NONE	True	ABR_LOAD
		ABRFST		GW_TYPE_NONE	True	ABR_LOAD
		UBR		GW_TYPE_NONE	True	UBR_LOAD
UXM	UXM	ATFR	N/A	GW_TYPE_NWI	N/A	BDATA_LOAD
BXM		ATFST		GW_TYPE_NWI	N/A	BDATB_LOAD
UXM	UFM	ATFR	N/A	GW_TYPE_NWI	N/A	BDATA_LOAD
	FRM	ATFST	N/A	GW_TYPE_NWI	N/A	BDATB_LOAD
UFM	UFM	ATFR	N/A	GW_TYPE_NWI	N/A	BDATA_LOAD
		ATFST	N/A	GW_TYPE_NWI	N/A	BDATB_LOAD
		ATFX	N/A	GW_TYPE_SIWX	N/A	BDATA_LOAD
		ATFXFST	N/A	GW_TYPE_SIWX	N/A	BDATB_LOAD
		ATFT	N/A	GW_TYPE_SIWT	N/A	BDATA_LOAD
		ATFTFST	N/A	GW_TYPE_SIWT	N/A	BDATB_LOAD
FRM	FRM	ATFR	N/A	GW_TYPE_NWI	N/A	BDATA_LOAD

Note Two-segment voice and data connections are not supported.

Figure 5 shows an example of configuring a three-segment connection for IGX feeder node functionality.

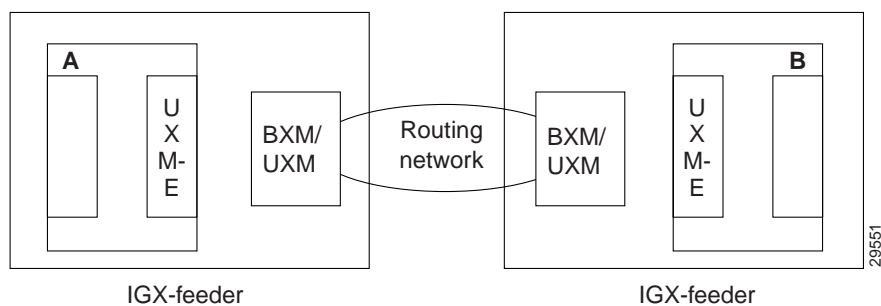**Figure 5   Sample Three-Segment Connections**

Table 3 lists the corresponding feeder endpoints with applicable gateway and load types and connection types.

Table 3   Three-Segment Connections

Feeder Endpoint A	Feeder Endpoint B	Connection Type	VCC or VPC	Gateway Type	Cell Routing	Load Type
UXM	UXM	CBR	Both	GW_TYPE_NONE	True	CBR_LOAD
		RT-VBR		GW_TYPE_NONE	True	CBR_LOAD
		NRT-VBR		GW_TYPE_NONE	True	VBR_LOAD
		ABR.FST		GW_TYPE_NONE	True	ABR_LOAD
		ABR.STD		GW_TYPE_NONE	True	ABR_LOAD
		UBR		GW_TYPE_NONE	True	UBR_LOAD
UXM	UXM	ATFR	Both	GW_TYPE_NWI	N/A	BDATA_LOAD
UFM	UFM	ATFST		GW_TYPE_NWI	N/A	BDATB_LOAD
		ATFX		GW_TYPE_SIWX	N/A	BDATA_LOAD
		ATFXST		GW_TYPE_SIWX	N/A	BDATB_LOAD
		ATFT		GW_TYPE_SIWT	N/A	BDATA_LOAD
		ATFTST		GW_TYPE_SIWT	N/A	BDATB_LOAD
UXM	UXM	ATFR	N/A	GW_TYPE_NWI	N/A	BDATA_LOAD
FRM	FRM	ATFST	N/A	GW_TYPE_NWI	N/A	BDATB_LOAD
UVM	UVM	CBR	N/A	GW_TYPE_NONE	N/A	CBR_LOAD
CVM	CVM					
HDM	HDM					
LDM	LDM					

Table 4 lists the corresponding functions of gateway types.

Table 4   Gateway Types

Gateway Type	Function
GW_TYPE_SGW	Simple gateway
GW_TYPE_NWI	FR Frame <-> AAL-5 Frame Interworking
GW_TYPE_CELL	Cell <--> FastPacket Interworking
GW_TYPE_SIWX	Service Interworking (Translational)
GW_TYPE_SIWT	Service Interworking (Transparent)
GW_TYPE_CELL_VPC	Cell GW path connections
GW_TYPE_NONE	Used for TRUE ATM to ATM connections

Troubleshooting IGX Feeder Configuration

This section describes elementary troubleshooting procedures and briefly describes the commands used when troubleshooting an IGX feeder node.The IGX operating system software does most of the IGX monitoring and maintenance. (Complete troubleshooting techniques for the Cisco IGX 8400 switches are described in detail in the *Cisco IGX 8400 Series Installation and Configuration Guide*.) This set of procedures is not exhaustive and does not take into account any of the diagnostic or network tools available to troubleshoot the IGX node.

> **Caution**   Do not perform any disruptive tests or repairs to the IGX node without first calling the Technical Assistance Center (TAC) through Cisco Customer Engineering. Cisco personnel can help isolate the fault and provide repair information. Within the United States, call 1-800-553-6387, 6:00 AM to 6:00 PM, Pacific Time, Monday through Friday. Outside the U.S., call 1-(408)-526-4000.

The IGX node regularly runs self-tests to ensure proper function. When the node finds an error condition that affects operation, it deactivates the affected card or line then selects a standby card or redundant line if one is available.

> **Caution**   If a FAIL LED on a card lights up, it indicates that an error occurred. Try resetting the light with the **resetcd f** command. If the FAIL LED lights up again, call the Cisco TAC to obtain information on isolating the problem and possibly replacing a component.

Table 5   Troubleshooting for Adding a Feeder

Procedure	Purpose	Conditions
Use the **dspphyslns** command.	View the status of all physical links configured for an IMA group.	Status cannot be in LOS.
Use the **lmtrace** command.	Activates the lmi trace.	Be aware of the 7A (node status) message sent from the IGX/BPX to the feeder and expect a 7A message ACK. The 7A (node status) message is sent to the feeder to initiate the add feeder.
Use the **nwtrace** command.	Activates the nw trace to monitor blind messages and used to initiate the addshelf.	The network management message is 0xEC.

> **Note**   Make sure the trunk is cleared to avoid physical trunk failures.

Table 6   Troubleshooting for the Feeder Comm Break

Procedure	Purpose	Conditions
Use the **dsplmistats** command.	Verify receive and transmit counts are approximately matching and incrementing in sync.	The network management message is 0xEC.
Use the **dsptrkstats** command.	Verify receive and transmit counts are approximately matching and incrementing in sync.	The network management message is 0xEC.
Use the **nwstats** command.	Shows if there are checksum errors.	Make sure transmit and receive count of the network message function code of 0xEC match.
Use the **lmtrace** command.	Activates the lmi trace.	The 7A (node status) message is sent to the feeder for keepalive messages. The IGX sends 7A messages to the feeder at 10-second intervals.
Use the **dspalms** command.	Displays state of the feeder node.	The feeder node should be in comm break with the SHELF.

Note   Be sure to check physical connections.

Table 7   Troubleshooting for Telnet to Feeder Through IP Relay

Procedure	Purpose	Conditions
Use the **nwtrace** command.	Activates the nw trace.	Monitors the management message 0xE3
Use the **lmtrace** command.	Activates the lmi trace.	Monitors type0 and reply 7B messages.

Note   CWM can telnet to the feeder via the IP relay.

HDM/LDM Control Lead Trap

This section provides descriptions of the HDM/LDM modules and how to configure a particular lead per node on a serial port of IGX HDM/LDM nodes, which can then be monitored for lead-state change and used as a failover mechanism.

High-Speed Data Module

The high-speed data module (HDM) front card in an IGX node is a programmable communications processor that can support four high-speed, synchronous data channels. It operates at speeds from 1.2 kbps up to 1344 kbps on all four ports while performing link error monitoring.

The HDM front data card:

- Performs cell adaptation

- Supports normal, looped, and split clocking

- Provides isochronous clocking circuitry

- Packetizes and depacketizes EIA lead sampling information

- Provides loopback capabilities, testing, and diagnostics

An internal baud rate generator provides transmit and receive data clocks to the SDI card at the selected rate. The HDM can accept data from an external data device with a non-network synchronized clock (isochronous clock) up to 112 kbps. With isochronous clocking, the HDM sends a clock control signal to the other end of the circuit to synchronize the far end HDM receive clock to the isochronous clock received at the near end.

Unless specified, a packet of data for EIA control lead information is built only at a very low rate or when a change of state is detected on one or more of the control leads. The data rate is specified as either "fast" or "not fast" (the default) by the **addcon** command for data connections. A fast EIA lead transmission can be specified in the software to send EIA control lead information in every Fast Packet (interleaved EIA mode). This tightly couples the EIA lead states with the transmitted data but reduces the bandwidth efficiency.

The HDM card is installed in a front slot. An SDI back card plugs directly into the P2 connector of the front card. The SDI back card provides the proper data channel interface.

The faceplate of the HDM has message lights and buttons for loopback control and signal monitoring. The buttons relate to loopback testing or scrolling through the Fast Packet data ports for a snapshot of selected data port conditions (indicated by Port, Port Under Test, loopback, and communication line state lights).

Low-Speed Data Module

The low-speed data module (LDM) front card supports up to eight synchronous or asynchronous data ports. Each port can be independently configured for DTE or DCE mode, baud rate, and so on. The LDM card is a low-speed data module for use on EIA/TIA-232C ports with data rates up to 19.2 kbps, where the higher speed capabilities of an HDM are unnecessary to use.

The LDM can process either synchronous or non-synchronous input data. With non-synchronous inputs, the data is over-sampled at a rate determined by how much jitter your equipment can tolerate. Using an external device is also possible for synchronizing the asynchronous data before the data enters the IGX node.

The LDM front data card:

- Performs cell adaptation of customer data and EIA control leads

- Supports normal and looped clocking

- Provides loopback capabilities, testing and diagnostics

Additional features, such as embedded (fast) EIA, sixth EIA lead support, and pleisochronous clocking, are also supported. The fast EIA control lead lets the user include the RTS/CTS EIA control leads in the same Fast Packet as customer data. The EIA control lead status is encoded as the eighth data bit in each data byte. This provides a quick EIA response without significantly affecting bandwidth requirements. It is limited to data rates of 19.2 kbps and below.

The LDM can reside in any empty front slot and requires an LDI back card. The LDI card plugs directly into the P2 connector of the LDM card.

The faceplate of the LDM has message lights and buttons for loopback control and signal monitoring. The buttons are for loopback testing and scrolling through the Fast Packet data ports to obtain a snapshot of selected port conditions (indicated by Port, Port Under Test, loopback, and communication line status lights).

Monitoring HDM/LDM Control Lead Trap

IGX software currently supports the ability to monitor Request to Send (RTS) lead-state transitions for an HDM/LDM port, and trigger jobs, such as up and down connections on different ports. The switch software and firmware for this feature provides capabilities to monitor all leads on low-speed LDM or high-speed HDM.

Figure 6 shows a system-level block diagram of an NMS attached to an IGX using Simple Network Management Protocol (SNMP) to monitor port leads.

Figure 6   Monitored Port-Lead Transitions through NMS
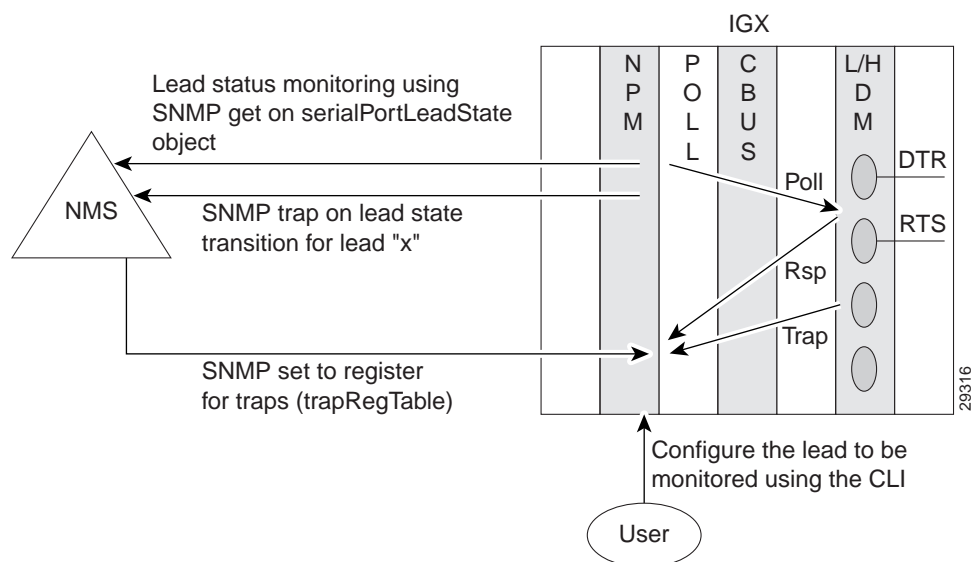
In Figure 6, you configure the type of lead to be monitored on a node through the IGX switch software using the CLI command **cnfleadmon**. The HDM/LDM card firmware reports lead-state changes (transition triggered events) monitored on the node to the SWSW at intervals of 5 to 55 seconds. The firmware reports lead-state changes at an interval based on the timer value specified in the **cnfleadmon** command. If the lead state has not changed, no event will be sent to the SWSW. This feature improves performance because the firmware on the HDM/LDM cards will report any lead changes instead of the SWSW polling for them.

Note For the firmware to report lead-state changes when polled, it must be done by disabling the lead monitoring on the node. If the user specifies the timer value as "0" in the **cnfleadmon** command, the lead-state change feature is disabled on the node and allows the firmware to monitor state transitions when polled by the SWSW.

The state of the lead(s) on any particular HDM/LDM lead port can be read by doing an SNMP get on the serialPortIfLeadState object defined MIB in the serialPort table. The HDM/LDM firmware will still respond to a lead-state request from the SWSW.

Note Only one type of lead per node can be monitored at a time.

Port Lead Types Supported

Table 8 lists the port leads that can be monitored on HDM/LDM.

Table 8   **HDM/LDM Monitored Port Leads**

Card Type	Monitored Leads
HDM	CTS, DSR, RI, SB, SCTS, DCD, TM, SRxD
	QM, SQ, SI, SDCD, RTS, DTR, LL, SRTS
	DM, CS, RR, SS, SF, TST, SI, IS, TR, RS, IC
	NS, RL, STxD
LDM	RTS, DSR, DCD, CTS, DTR

Note HDM/LDM Control Lead Trap is not supported on HDM/LDM cards prior to model C.

Configuring HDM/LDM Control Lead Trap

Use the **dspcd** command to view a detailed display of the HDM/LDM cards. Following is an example display from the **dspcd** command:

```
p7c TN Cisco IGX 8420 9.2.30 Nov. 23 1999 15:40 PDT

Detailed Card Display for LDM in slot 9

Status: Active  (Front Card Supports Lead State Trap)
Revision: CK08
Serial Number: 586964
Fab Number: 20-7252-04
Backplane Installed
Backcard Installed
```

```
      Type: 232-8
      Revision: AL
      Serial Number: 358942
      Chan 1: DCE Chan 5: DCE
      Chan 2: DCE Chan 6: DCE
      Chan 3: DCE Chan 7: DCE
      Chan 4: DCE Chan 8: DCE

  Last Command: dspcd 9

  Next Command:
```

In the example, *Chan <n>*, each port on back cards with EIA style interfaces (V.35 and RS-232) can be configured either as Data Terminal Equipment (DTE) or Data Communication Equipment (DCE). This is done by the insertion of a daughter board for each port on the back card for the Serial Data Interface (SDI) back cards.

Following is an example display from the **dsplogcd** command:

```
  p7c TN Cisco IGX 8420 9.2.30 Nov. 23 1999 15:40 PDT

  Logical Data Base for LDM card 9 at address 584KIT2V

  Logical Data Base for LDM card 9 at address 313CAB4C

    Service            1
    Slot Number        9                Y Cable slot        8
    Need Card Flag     0                Y Cable status     Primary
    Need bkcd Flag     0                Chan   LUs      Status      Lead State Bmp
    Need Switch Flag   0                0      165      ACTIVE      00008000
    Cd LCCB Ptr        30D3451C         1      78       ACTIVE      00008000
    Ch Cnfg Ptr        30D8A51C         2      0        INACTIVE    00008000
    LC Card Type       LDM              3      0        INACTIVE    00008000
    Logep Tree Ptr     31993B0C         4      129      ACTIVE      00008000
                                        5      165      ACTIVE      00008000
                                        6      57       ACTIVE      00008000
                                        7      165      ACTIVE      00008000


    This Command: dsplogcd 10 9
```

In the example, *Lead State Bitmap*, a hexidecimal that designates the port lead state configured on a node.

To configure the type of lead to be monitored on a node, use the **cnfleadmon** command. Following is an example display from the **cnfleadmon** command.

```
  p2b           TN   Cisco       IGX 8420  9.2.3C   Oct. 6 1999  15:27 PDT


         |      LDM    |  HDM/SDI-RS232 |   HDM/SDI-RS449   |  HDM/SDI-V35  |
  index  | DCE  :  DTE |  DCE  :  DTE   |  DCE   :  DTE     | DCE  :  DTE   |
     1           :                 :TST/25   IS/28  :SB/36           :
     2           :        LL/18    :RI/22    LL/10  :IC/15           :RI/J
===>  3  DTR/20  :DSR/6   DTR/20   :DSR/6    TR/12&30 :DM/11&29  DTR/H :DSR/E
     4  RTS/4   :CTS/5    RTS/4    :CTS/5    RS/7&25  :CS/9&27   RTS/C :CTS/D
     5           :        STxD/14  :SRxD/16           :              :
     6           :        RL/21    :         RL/14    :TM/18          :TM/K
     7           :DCD/8            :DCD/8    NS/34    :RR/13&31       :DCD/F
     8           :        SRTS/19  :SCTS/13           :              :
     9           :                 :SDCD/12           :              :
    10           :        SF/23    :SI/23    SF/16    :SI/2          :
    11           :                 :                  :SQ/33         :
    12           :        ***/11   :QM/11    SS/32    :              :
  Sampling interval for HDM or LDM control lead shown above ......   5 seconds
```

```
This Command: cnfleadmon


Enter lead type index (1-12):
```

In the example *index*, designates the lead number of HDM/LDM cards. The configured interface is shown in the HDM/LDM cards column.

In the example *Sampling interval for HDM or LDM control lead shown above*, designates the configurable interval set to send reports of lead-state changes (transition triggered events) monitored on the node to the SWSW.

Note   Only one type of lead per node can be configured at a time.

UAI-2/4 OC-3c SMF XLR Back Card Module

This section provides a general description of the UAI 2 and 4 port OC-3c SMF XLR back card module, illustrations of the architecture and back-card faceplate, and a table describing the connectors and status LEDs.

A hardware change to the OC-3 SMF Rev. A0 is the *ATM-XCVR*. This new transceiver supports a range greater than 100 Kilometers and has a minimum sensitivity of -32.5 dBm, allowing for increased link budgets.

Block Specifications for the UXM OC-3c XLR Module

Figure 7 displays the back-card block diagram for the UXM OC-3c XLR. The following circuits are necessary to implement backcard functions:

- Management address decoder–The front card drives Local bus management addresses (16:1) to the back card. The back card uses these addresses, unbuffered, to decode the card functions.

- Management control–The local bus management control signals (Wr*, Rd*, Sel*, and Rst*) are driven from the front card, through buffers that are next to the associated connector pins. The local bus management control signals (Rdy* and Int*) are received by the front card through buffers on the back card that are next to the associated connector pins.

- Management data–The local bus management data (7:0) are bidirectional signals driven and received through buffers that are next to the associated connector pins on the front card. The back card contains no bidirectional buffer to the local bus.

Configuration NOVRAM describes the backcard support functions. NOVRAM accesses are performed by the management interface. A serial NOVRAM (256 bits) contains all of the UAI-2/4 SMF XLR back card's configuration parameters, such as serial number, hardware revision, and type of back card installed. Production diagnostics are intended to program the NOVRAM.

Figure 7   UXM OC-3c XLR Back Card Block Diagram
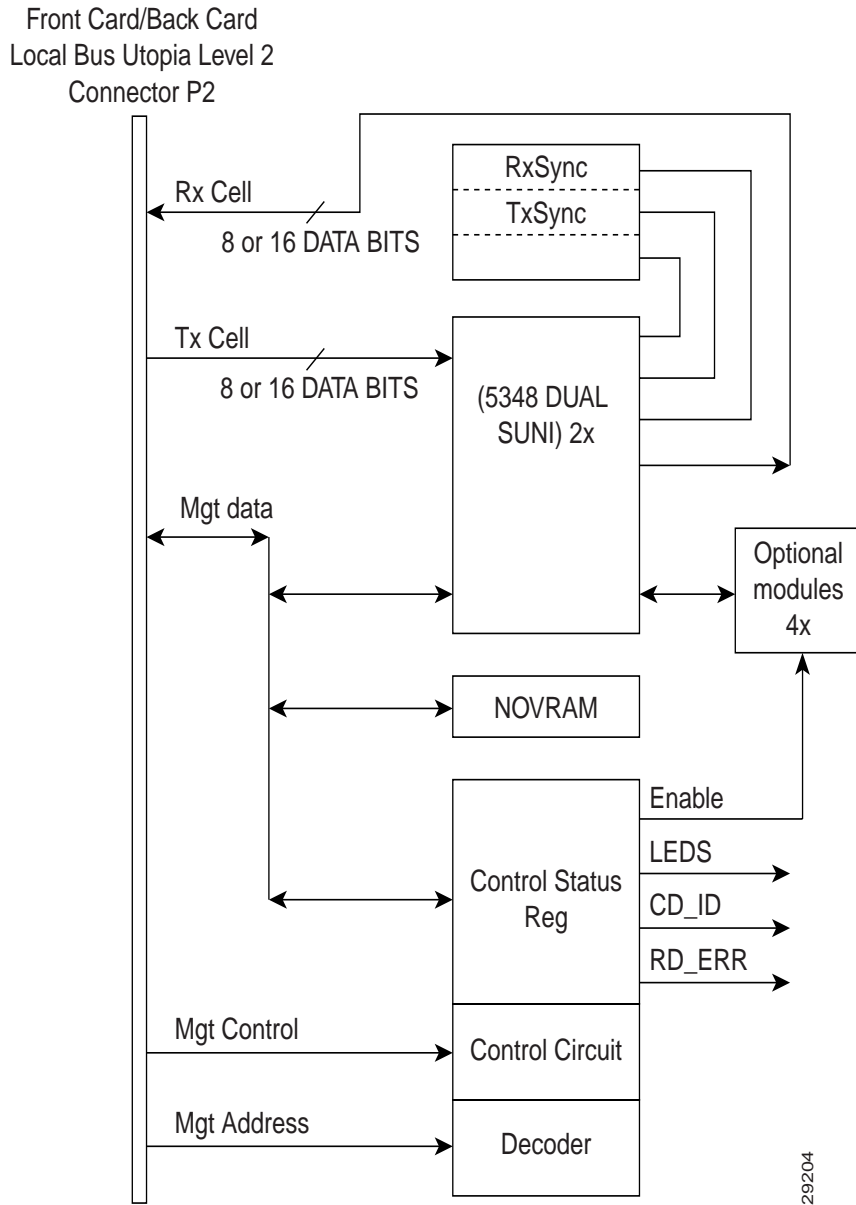
The UAI 2/4 port OC-3c SMF XLR back-card module has SMF connection. As indicated by the "2" and "4" in the model number, these cards have two or four transmit and receive connectors. Each line has a tricolor LED whose color indicates its status. Each card also has a red FAIL LED and a green Active LED to indicate the status of the card.

Table 9 lists the connectors and LEDs.

Table 9   Connectors and LEDs for the UAI 2/4 Port OC-3c SMF XLR Back Card

Connector/Indicator	Function
Transmit and Receive	SC connector for SMF
Red (on the tricolor LED)	On indicates line is active but a local alarm was detected.
Yellow (on the tricolor LED	On indicates line is active but a remote alarm was detected.
Green (on the tricolor LED)	On indicates line is active.
Fail light (red)	An error was detected. Reset the card with **resetcd f** to clear it. If Fail comes on again, call the TAC through Cisco Customer Engineering.
Active light (green)	The card is active and in service.

Y-Cabled UXM Redundancy

The UXM features *hot standby* as a part of its Y-cable redundancy capability. With hot standby, the redundant card receives the configuration information as soon as you finish specifying redundancy. The standby card also receives updates to its configuration as the active card configuration changes. Hot standby lets the backup card go into operation as soon as necessary rather than waiting for the NPM to download the configuration. To view Y-cable redundancy illustration examples, refer to the *Cisco IGX 8400 Series Installation and Configuration* manual.

Y-cable redundancy requires that both cards are active and available before you set up redundancy. Use Cisco WAN Manager or the CLI commands **uptrk**, **addtrk**, then **addyred**. (See also descriptions of **addyred**, **delyred**, **dspyred**, and **ptyred** in the *Cisco WAN Switching Command Reference* publication).

Switchover to a Redundant UXM

If the card fails, a switchover occurs to a Y-cabled, redundant UXM card set if available. If the switchover occurs, the primary UXM acquires failed status, and the FAIL LED turns on.

Faceplate of the UXM OC-3c XLR Module

Figure 8and Figure 9 show the faceplates of the UAI-2/4 OC-3c SMF XLR back-card modules.

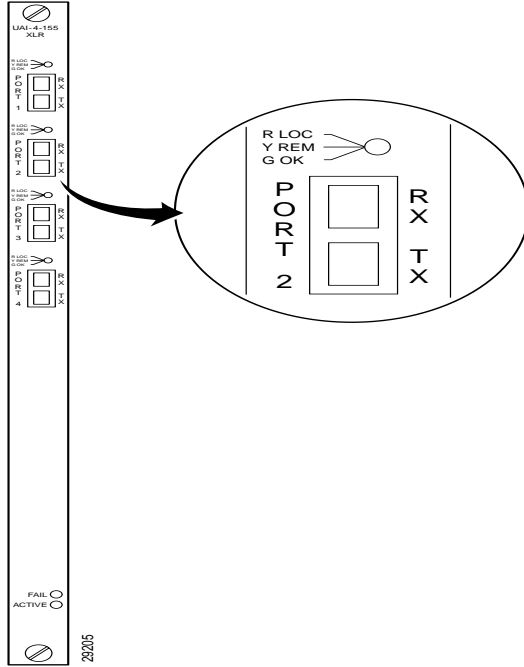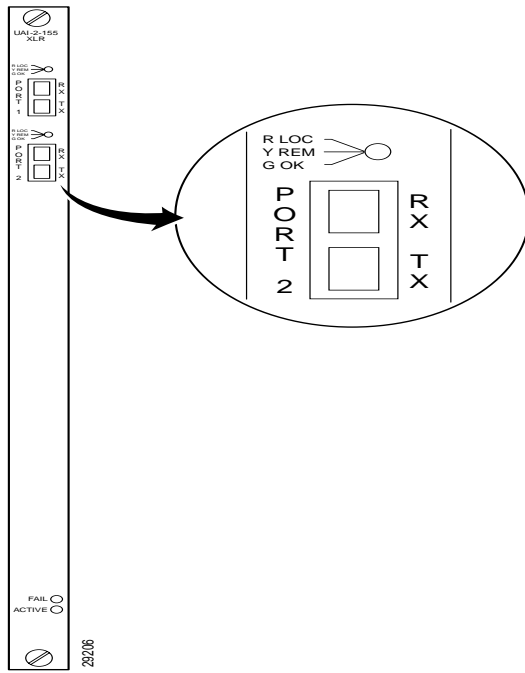**Figure 8**   **UAI-4-OC3c-XLR Faceplate**

Figure 9   **UAI-2-OC3c-XLR Faceplate**

Documentation Changes Since Last Release

This section consists of documentation changes that have occurred since IGX switch software 9.2.0.

Replacing the SCM

Below is the correct procedure for replacing an System Clock Module (SCM).

Note Note that no connections are to be deleted prior to replacing an SCM.

Step 1 Visually inspect the replacement SCM to verify it is in good working order.

Note If the replacement IGX SCM has any defects, contact the Cisco TAC and do not proceed with replacement.

Step 2 Verify there are no alarms on the IGX LEDs by using the **dspalms** command. Clear all alarms on target node if possible.

Step 3 Reset the Standby NPM if the target IGX has CC redundancy. Allow the module to come back to standby mode.

Note Resetting the Standby NPM may take 30 minutes or longer depending on the size and complexity of the network. This activity may be completed during a maintenance window 12 hours in advance of the SCM replacement as long as there are no provisioning or changes to the target IGX during those 12 hours.

Step 4 Use the **switchcc** command to verify that both NPMs can control IGX functionality.

Step 5 Wait for the standby NPM to come back in standby mode.

Step 6 Power the IGX node down.

Step 7 Disconnect all cables to the SCM. Identify and mark any cable locations before removing them.

Step 8 Loosen the captive mounting screws on the top and bottom of the IGX SCM faceplate.

Step 9 Operate the extractor levers and slide the SCM out of the cabinet.

Step 10 Inspect the backplane (upper portion of the IGX chassis) and the Utility Bus (lower portion of the IGX chassis) to verify there are no bent pins or other defects.

Note If there are any bent pins or defects, contact the Cisco TAC before proceeding.

Step 11 Insert the replacement IGX SCM into the empty slot.

Step 12 Tighten captive mounting screws on the top and bottom of the IGX SCM faceplate.

Step 13 Operate the extractor levers and slide the SCM into the cabinet. Verify that extractor levers do not get wedged behind the SCM faceplate upon insertion.

Step 14 Reattach all cables to IGX SCM.

Step 15 Power the IGX on.

Note Verify that the IGX displays no new alarms after start-up. It may take 10 to 15 minutes for all the cards in the IGX to clear alarm status. Do not power the node off and on to clear alarms. If alarms do not clear, contact the Cisco TAC. If the IGX clears alarm state, but does not recognize the correct number of cards in the chassis, a jumper may need to be changed on the SCM. If this happens, contact the Cisco TAC to obtain the correct jumper position.

Note SCM jumpers W5 and W6 determine the total number of cards the switch software will sense (W5 in and W6 out = IGX-8; W5 out and W6 in = IGX-16; W5 and W6 in = IGX-32).

UFI Maximum Port Speeds

The note associated with the Maximum Port Speed Modes on the UFI Back Cards table in Table 4-36 in the *Cisco IGX 8400 Series Reference* stated the following:

Note As you use Table 4-36, keep in mind that the maximum, continuous throughput is 16 Mbps. When planning or adding connections, you must be sure that the total bandwidth of the connections across all ports for the mode of the UFM-U does not exceed 16 Mbps.

The correct note should read:

Note As you use Table 4-36, keep in mind that the maximum, continuous throughput is 16 Mbps. When planning or adding connections, you must be sure that the total bandwidth of the connections across all ports for the mode of the UFM-U does not exceed 16 Mbps. You cannot add the maximum rates on each port for a given mode and take that to be the maximum throughput for the card. If two or more ports are active per port group, the total group bandwidth for that port group cannot exceed 8 Mbps.

BC-UAI-3-T3 Connections and Indicators

The BC-UAI-3-T3 Connections and Indicators table in Table 3-33 in the *Cisco IGX 8400 Series Reference* incorrectly stated that the BC-UAI-3-T3 module had BNC transmit and receive jack connectors. Instead, the BC-UAI-3-T3 module has SMB transmit and receive jack connectors. Refer to Table 10 in this document for the correct information.

Table 10   BC-UAI-1E3 Connections and Indicators

Connector/Indicator	Function
Transmit Jack	SMB connector for transmit data.
Receive Jack	SMB connector for receive data.
LOS light (red)	Loss of signal at the local end.
Red alarm light (red)	Loss of local T3 or E3 frame alignment or loss of cell alignment.
Yellow alarm light (yellow)	Loss of frame alignment at remote end or loss of cell alignment.
AIS light (green)	All ones on the line.

Connector/Indicator	Function
Fail light (red)	An error was detected. (Reset the card with **resetcd f**. If the LED comes on again, contact the TAC through Cisco Customer Engineering.)
Active: light (green)	The card is in service and has active circuits.

Cisco Connection Online

Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

Available 24 hours a day, 7 days a week, CCO provides a wealth of standard and value-added services to Cisco's customers and business partners. CCO services include product information, product documentation, software updates, release notes, technical tips, the Bug Navigator, configuration notes, brochures, descriptions of service offerings, and download access to public and authorized files.

CCO serves a wide variety of users through two interfaces that are updated and enhanced simultaneously: a character-based version and a multimedia version that resides on the World Wide Web (WWW). The character-based CCO supports Zmodem, Kermit, Xmodem, FTP, and Internet e-mail, and it is excellent for quick access to information over lower bandwidths. The WWW version of CCO provides richly formatted documents with photographs, figures, graphics, and video, as well as hyperlinks to related information.

You can access CCO in the following ways:

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

- WWW: http://www-europe.cisco.com

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

- Telnet: cco.cisco.com

- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

Note If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@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, a member of the Cisco Connection Family, is updated monthly. Therefore, it might be more current than printed documentation. To order additional copies of the Documentation CD-ROM, contact your local sales representative or call customer service. The CD-ROM package is available as a single package or as an annual subscription. You can also access Cisco documentation on the World Wide Web at http://www.cisco.com, http://www-china.cisco.com, or http://www-europe.cisco.com.

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