CHAPTER 2

Hardware Installation

This chapter contains installation and setup instructions for the Cisco 6732 full access device. These instructions apply to central office terminal (COT) and remote terminal (RT) installations. This chapter should be used as a reference document for customer installation and verification. Specifically, this chapter provides instructions for installing the Cisco 6732 chassis, air ramp, and fan and filter assembly (FFA).

Before You Begin

The following sections contain important safety, site planning, and power requirement information:

- Safety Recommendations
- Input Power Requirements
- Chassis Power Requirements and Power Dissipation
- Space Requirements

Safety Recommendations

When installing the Cisco 6732, observe all caution and warning statements. The following guidelines will help ensure your safety and protect the equipment. However, these guidelines may not cover all potentially hazardous situations you may encounter during system installation.

- Always disconnect all power connections before installing or removing a chassis.
- Keep the chassis area clear and free of dust during and after installation.
- Keep tools and chassis components away from walk areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the chassis. Fasten loose ties, scarves, sleeves, and other items before you start installation procedures.
- The Cisco 6732 operates safely when it is used in accordance with its marked electrical ratings and product usage instructions. The equipment grounding must meet local and national electrical codes.

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

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.**

Input Power Requirements

Use the following guidelines to determine power requirements at your installation site:

- Input power requirement: -42.5 VDC to -56 VDC
- Typical current: 15 Amps with Cisco 6732 chassis fully populated with DSX1 line interface modules
- Maximum current: 40 Amps
- Power consumption: 60 Watts for base configuration (two BPS-HP and two MCC-STR3 service modules)

If a -42.5 VDC to -56 VDC fused power source is not available at your installation site, you must use a third-party power conversion utility (such as a rectifier). Cisco Systems recommends the use of a fuse and alarm panel (FAP) in between the power source and Cisco equipment.

Chassis Power Requirements and Power Dissipation

Table 2-1 contains power requirements for each Cisco 6732 service module. Table 2-2 contains power requirements for each Cisco 6732 line interface module. You must use a -42.5 VDC to -56 VDC power source to supply power to the Cisco 6732.

Number of Cards	Service Module	Power (Watts)	Amps @ -48 VDC	Power Dissipation (Watts)	Total Amps	Total Power Dissipation (Watts)
	BPS-HP	20	0.42	20		
	MCC-STR3	20	0.42	20		
	MCC-STR4	20	0.42	20		
	AMM	6	0.13	6		
	BRG	26[1]	0.54			
	MTAC-TEI	12	0.25	12		

1. 20 REN load (BRG card)

Number of Cards	Line Interface Module	Power (Watts)	Amps @ -48 VDC	Power Dissipation (Watts)	Total Amps	Total Power Dissipation (Watts)
	DSX1/8	10	0.21	10		
	DSX3/CHNL	11	0.23	11		
	FXS/16	16	0.33	16		
	ISDN-BRI/8	12	0.25	12		

Number of Cards	Line Interface Module	Power (Watts)	Amps @ -48 VDC	Power Dissipation (Watts)	Total Amps	Total Power Dissipation (Watts)
	OC3c-UNI	12	0.31	15		
	RPOTS/16	16	0.58	16		
	RUVG/8	11	0.23	11		
	STSX1/CHNL	11	0.23	11		
	T1-2-V35	20	1.25	17		

To calculate total Cisco 6732 chassis power requirements (in watts) using the worksheet in Table 2-2, insert the quantity of modules or cards in the left column, “Number of Cards.” Calculate individual card requirements using the amp figures shown in the “Amps @ -48VDC” column. Forward amp sum totals to “Total Amps” column and total. Combine line interface modules and service module values for overall system power requirement.

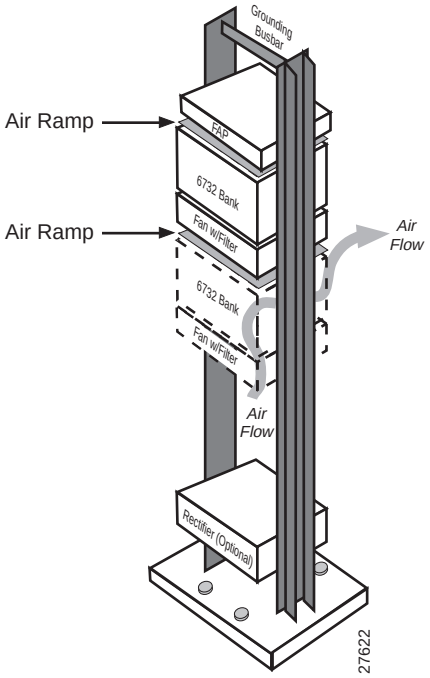
To calculate total Cisco 6732 chassis power dissipation using the worksheet in Table 2-2, insert the quantity of modules or cards in the left column, “Number of Cards.” Calculate individual line card power dissipation using the amp watts values shown in the “Power Dissipation” column. Forward watt sum totals to the last column on the right and total. Combine service modules and line interface modules for overall system power dissipation.

Space Requirements

Figure 2-1 represents a typical Cisco 6732 rack configuration. The fuse and alarm panel (FAP) is placed at the top of the rack. At least 1-3/4 inches of clearance should be provided between the FAP and the Cisco 6732 bank. The fan and filter assembly (FFA) should be installed directly below the Cisco 6732. An air ramp should be installed directly above the Cisco 6732. The FFA is designed to force air up through the Cisco 6732 chassis, and the air ramp forces heated air to the rear of the rack.

Determine rack spacing requirements for mounting the Cisco 6732 with the FFA touching the under side of the Cisco 6732 and the air ramp touching the top of the Cisco 6732.

Figure 2-1 Cisco 6732 Rack Configuration



- Two persons should hold the Cisco 6732 chassis in place and fasten the Cisco 6732 to the rack. The Cisco 6732 chassis weighs 41 pounds.
- The Cisco 6732 requires front and rear access. When mounting the rack, provide at least 3 feet of clearance from the rack and any walls or other equipment to ensure complete access to all cabling and connections.
- If you plan to install four Cisco 6732 chassis in a standard 7-foot rack, you will not be able to install an FFA and air ramp for each Cisco 6732. To meet the thermal requirements, alternate cooling equipment should be used.

Unpacking the Equipment

Unpack the air ramp, FFA, and Cisco 6732 full access device. Inspect these items for damage and make sure you have the required components.

Air Ramp

The air ramp kit should contain the following:

- Air ramp
- Four 12-24 x 3/4-inch set screws with slotted head (stainless steel)

Fan and Filter Assembly

The fan and filter assembly (FFA) kit should contain the following:

- Fan assembly
- Air filter
- Four 12-24 x 3/4-inch set screws with slotted head (stainless steel)

Cisco 6732 Chassis

The Cisco 6732 chassis kit should contain the following:

- Eight 12-24 x 3/8-inch hex washer slotted head rack screws
- Two 12-24 x 3/4-inch set screws with slotted head
- ESD wrist strap

Put any service modules, line interface modules, or software kits in a convenient place. These will be used later in the installation procedure.

Preassembled Components

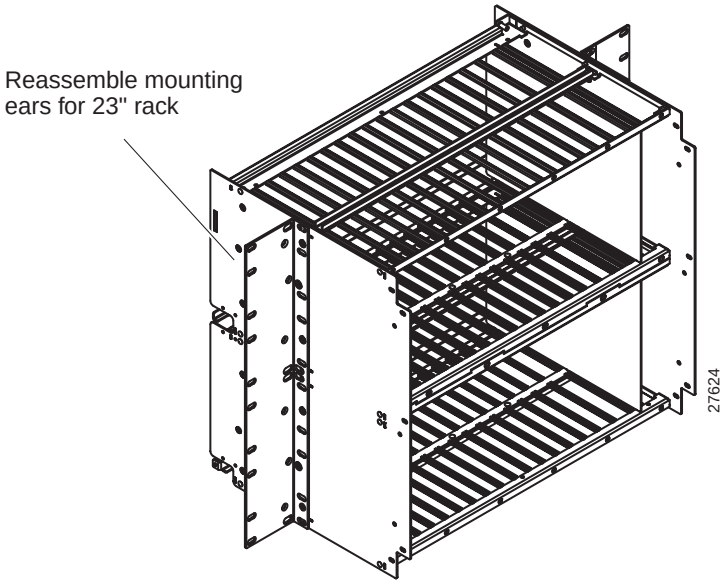
- Power cables are delivered attached to the power source “A” and “B” side power inputs of the Cisco 6732.
- Frame ground (earth) cable (green/yellow) is delivered attached to the frame ground terminal on the Cisco 6732 backplane (8 AWG minimum).
- Transient Ground cable (green/yellow) is delivered jumpered from the transient ground connector on the Cisco 6732 backplane (12 AWG minimum) to the frame ground connector.
- Subscriber cables (labeled P1-P22) terminated with 50-pin connectors are attached to the backplane.
- Alarm input and output cables are attached to the backplane.
- For systems using the MTAC-TEI module, three MTAC cables are attached to the backplane.

For more information about cables on the Cisco 6732 chassis, see Chapter , “Cabling and Wiring.” Cisco Systems can provide additional materials upon request (for example, tie wraps and/or velcro straps and Category-5 UTP patch cables.)

Preparing the Cisco 6732 for Mounting in a 23-inch Rack

The Cisco 6732 chassis is shipped ready for mounting in a 19-inch rack. If you are using a 23-inch rack, unfasten the Cisco 6732 mounting ears and reassemble them as shown in Figure 2-2. Reassemble the left ear on the left side and the right ear on the right side.

Figure 2-2 Cisco 6732 with Mounting Ears for 23-Inch Rack



Installing the Cisco 6732 Chassis

This section describes the installation of a Cisco 6732 in a COT or RT location. Cisco Systems recommends that the unit be connected to a fused power source.

Note Two persons may be required to hold the Cisco 6732 chassis in place and fasten the Cisco 6732 to the rack. The Cisco 6732 chassis weighs 41 pounds.

Step 1 Place the provided (12-24 x 3/4-inch) set screws in the desired holes on the rack. The set screws hold the Cisco 6732 in place while the rack screws are being inserted.

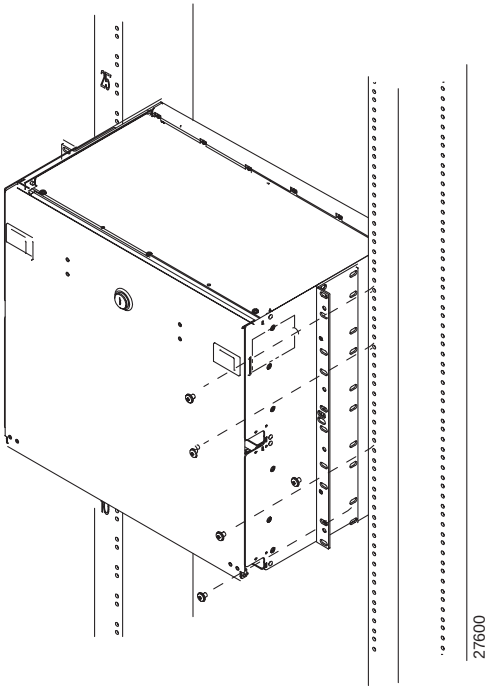
Step 2 Place the Cisco 6732 on the set screws.

Step 3 Secure the Cisco 6732 to the rack with the 8 provided rack screws (12-24 x 3/8-inch).

Step 4 Connect the green/yellow earth ground wire from the Cisco 6732 to the rack, the grounding busbar, or any appropriate earth ground.

Step 5 To test the ground wiring, use a digital multimeter to test the Cisco 6732 chassis against the equipment rack. Resistance should be less than 1 ohm.

Figure 2-3 Cisco 6732 Mounting in a 19-Inch Rack

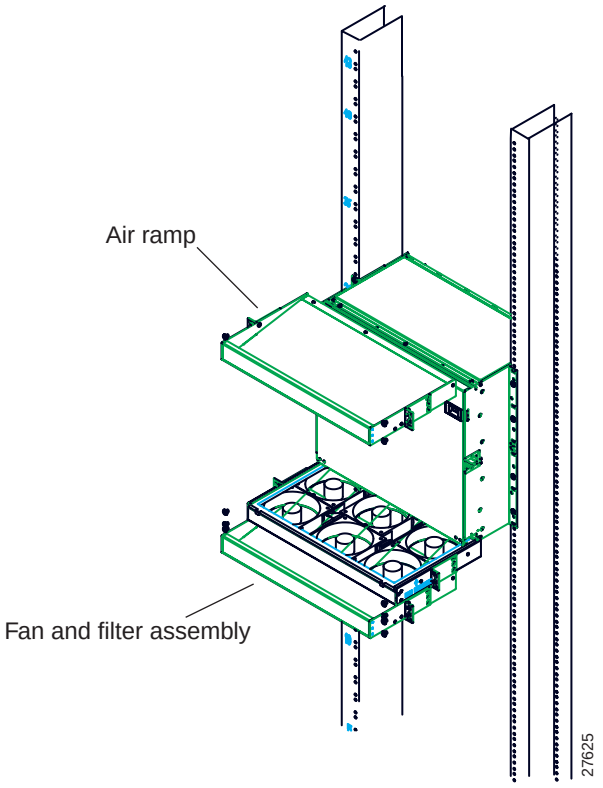


Installing the Fan and Filter Assembly (FFA) and Air Ramp

Figure 2-4 shows the proper positioning for the fan and filter assembly (FFA) and air ramp. The fan is designed to force air up though the system. The air ramp is designed to direct air exhaust to the back side of the ramp. Install the fan tray using hardware provided. (See Figure 2-4.)

- Mount the air ramp on top of the Cisco 6732 chassis with the provided screws.
- Mount the FFA below the Cisco 6732 chassis with the provided screws.

Figure 2-4 Cisco 6732 Fan and Filter Assembly (FFA) with Air Ramp



Connecting System DC Power

Cisco Systems recommends that the Cisco 6732 chassis be connected to a fused power source. Verify the circuit breaker on the power source is in the off position. If your power source uses fuses instead of circuit breakers, remove the fuses from the power source.

Note Bonding and grounding shall meet the general bonding and grounding requirements as specified in GR-1089-CORE. Wiring shall be suitable for class C installations. Refer to UL1950.

Step 1 Connect the red cable from the Cisco 6732 -48VDC BAT_IN_A terminal to the power source A1 terminal.

Step 2 Connect the black cable from the Cisco 6732 RTN BAT_IN_RTN terminal to the power source RTN terminal.

Step 3 For redundant power (optional), connect the red cable from the Cisco 6732 -48 VDC BAT_IN_B terminal to the power source B1 terminal.

Step 4 Measure the resistance between the Cisco 6732 and the rack. Resistance should be less than 1 ohm.

Step 5 Connect the red cable from the FFA -48 VDC terminal to the power source F1 RTN terminal.

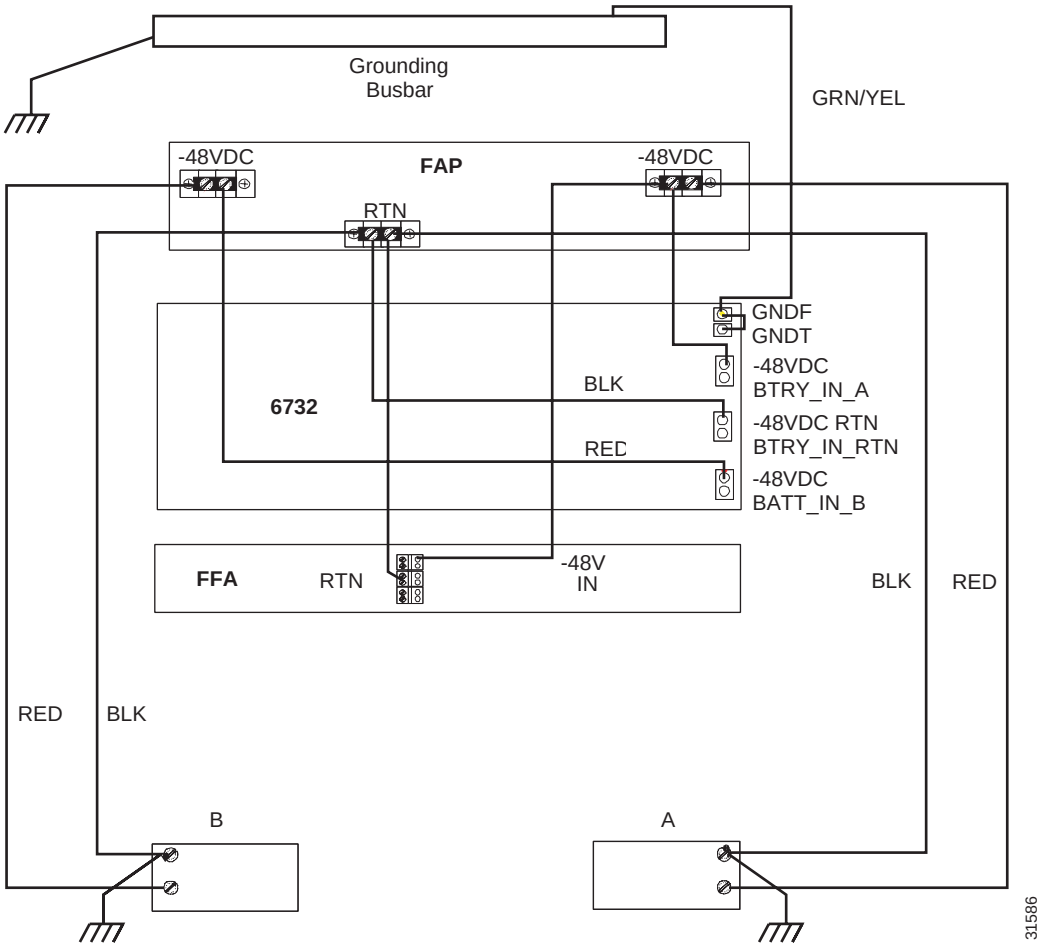
Caution The FFA uses +48 VDC. If the power is connected improperly the fans will not work.

Step 6 Connect the black cable from the FFA -48 VDC RTN terminal to the power source F1 -48 VDC A positive terminal.

Step 7 Power on the Cisco 6732 chassis and FFA by switching the power source circuit breaker to the on position.

Figure 2-5 shows a typical power and ground wiring configuration, using a fuse and alarm panel (FAP), grounding busbar, and dual (redundant) power sources.

Figure 2-5 Cisco 6732 Chassis and FFA Power and Ground Wiring



Inserting Service Modules and Line Interface Modules

Caution To prevent electrostatic discharge damage to the Cisco 6732 chassis and components, you must wear an ESD-preventative strap when inserting or removing modules. Place the strap on your wrist, and connect the wire an appropriate ground, such as an equipment. The Cisco 6732 chassis provides a strap insert connection located directly above the BPS-A card slot, at the upper left corner of the chassis.

To insert a service module or line interface module:

Step 1 Identify an open slot in the chassis that supports the service module or line interface module. See Chapter , “Hardware Description,” for service module and line interface module requirements.

Step 2 Attach an ESD-preventive strap between you and the chassis surface.

Step 3 Hold the service module vertically, with the faceplate toward you and the backplane connectors away from you. Ensure that the module is right side up by noting the lettering on the faceplate.

Step 4 Carefully align the upper and lower edges of the module with the upper and lower guides in the chassis.

Step 5 Gently slide the module into the slot until the lever (at the upper left of the module faceplate) touches the chassis.

Step 6 Lift the lever up and slide the module into the slot until it makes contact with the backplane.

Step 7 Secure the module by pressing the lever down.

Step 8 Connect any cables to cable interfaces on the faceplate.

Removing a Service Module or Line Interface Module

Use the following procedure to remove a service module or line interface module:

Step 1 Attach an ESD-preventive strap between you and the chassis surface.

Step 2 Remove any connections to the module. Be sure to cover any fiber optic connections to prevent contamination from moisture or dirt.

Step 3 Lift the lever up to unseat the module.

Step 4 Grasp the module faceplate, and carefully slide the module out of the slot. Avoid damaging the connectors on the rear of the module.

Step 5 Place the module on an anti-static surface.

Module Insertion Order

Service modules and line interface modules must be inserted into the chassis in the following order:

1. Bank Power Supply (BPS-HP) module in slot BPS-A
2. Bank Power Supply (BPS-HP) module in slot BPS-B
3. Alarm Maintenance and Monitoring (AMM) module in slot AMM-1
4. Main Control Card (MCC) module in slot MCC-A
5. Main Control Card (MCC) module in slot MCC-B

6. DSX3/CHNL, STSX1/CHNL, and OC3c-UNI (broadband) modules in slots 17-20.
7. Remaining service modules and line interface modules in available general-purpose slots.

Inserting the Active BPS-HP Module

When you insert a BPS-HP module in slot BPS-A, the green PWR LED will light immediately. This indicates that the module is above the minimum -42.5 VDC input voltage threshold.

Any further LED activity indicates module or system status. See Chapter , “Hardware Description,” for LED information for the BPS-HP module.

Note Additional LED activity will occur on the BPS-HP module when an MCC module is inserted in the same shelf (top or bottom).

Inserting the Standby BPS-HP Module

When you insert a second (standby) BPS-HP module in slot BPS-B, the green PWR LED will light immediately. This indicates that the module is above the minimum -42.5 VDC input voltage threshold.

Any further LED activity indicates module or system status. See Chapter , “Hardware Description,” for LED information for the BPS-HP module.

Inserting the AMM Module

When you insert an AMM module in slot AMM-1, the FAIL LED lights for several seconds and then turns off.

Any further LED activity indicates module or system status. See Chapter , “Hardware Description,” for LED information for the AMM module.

Troubleshooting

If the PWR LED does not light, the BPS-HP is not receiving a minimum of -42.5VDC. Measure the input power terminals on the backplane to determine if the Cisco 6732 is receiving a minimum input of -42.5 VDC.

The FUSE LED illuminates if one of the three card fuses is blown.

Note These fuses are not field replaceable.

If a BPS-HP card senses an output short or overvoltage, the module shuts down (providing no voltage to power the LEDs).

If the module fails, remove the module and then reseat it in the bank. If the failure persists, replace the BPS-HP and contact the Cisco Systems technical assistance center (TAC).

Inserting the Active MCC Module

When you insert an MCC module (either MCC-STR3 or MCC-STR4) in slot MCC-A, the following initialization sequence occurs:

1. The red FAIL LED will light immediately.
2. All LEDs on the MCC module then light up simultaneously and turn off.
3. The LEDs will perform a “walk-up” sequence, beginning from the bottom LED (SYNC) to the top LED (FAIL).
4. After the walk-up sequence is completed, the red FAIL LED and the green ACTV LED will remain on while the MCC module boots up and achieves active status. The boot up process may take 20 to 30 seconds to complete.
5. When boot up is complete, the green ACTV LED will light and remain on.
6. After the active MCC module boots up, the green BUSY LED on the BPS-HP module in slot BPS-A should light. The BUSY LED indicates that the BPS-HP module is supplying power to the MCC module.

Any further LED activity indicates module or system status. See Chapter , “Hardware Description,” for LED information for the MCC module.

Inserting the Standby MCC Module

When you insert a second (standby) MCC module (either MCC-STR3 or MCC-STR4) in slot MCC-B, the following initialization sequence occurs:

1. The red FAIL LED lights immediately.
2. All LEDs on the MCC module light simultaneously and turn off.
3. The LEDs perform a “walk-up” sequence, beginning from the bottom LED (SYNC) to the top LED (FAIL).
4. After the walk-up sequence is completed, the red FAIL LED lights continuously while the amber STBY LED blinks slowly. The slow blinking amber STBY LED indicates that the module is establishing communications with the active MCC module.
5. After communication between the active MCC and standby MCC is established, the amber STBY LED blinks rapidly. The rapid blinking amber STBY LED indicates that the module is downloading the database from the active MCC. The download process takes 20 to 30 seconds to complete.
6. When the database transfer is complete, the amber STBY LED stops blinking rapidly and remains on. The red FAIL LED turns off.
7. The red BKUP LED on the active MCC blinks rapidly after the embedded software database is synchronized.

Note After the standby MCC module completes the database transfer from the active MCC module, no additional LED activity will occur on the standby BPS-HP module.

Any further LED activity indicates module or system status. See Chapter , “Hardware Description,” for LED information for the MCC module.

Inserting a Line Interface Module

When you insert a line interface module in an available general-purpose slot, the following initialization sequence occurs:

1. The red FAIL LED and the green BUSY LED light and remains on while the module downloads the internal software from the active MCC module.
2. After download, all of the LEDs will flash in sequence from top to bottom.

Any LEDs that remain lit after initialization indicate module or line status. See Chapter , “Hardware Description,” for LED information for each line interface module.

Broadband Module Restrictions

Internal cross-connects created on broadband modules DSX3/CHNL, STSX1/CHNL, and OC3c-UNI can prohibit the use of certain general-purpose slots. If you plan to create internal cross-connects between broadband modules, see Table 2-1 for a list of slots that will be disabled.

Table 2-1 Slots Disabled by Internal Broadband Cross-Connects

Broadband Cross-connect Slot	Disabled Slots
17	9, 10
18	11, 12
19	13, 14
20	15, 16

Troubleshooting

If the green ACTV LED does not light, the active MCC-STR3 card has not booted up properly.

If the yellow STBY LED does not light, the standby MCC-STR3 card has not completed the database transfer from the active MCC-STR3 card properly.

If an active or standby MCC-STR3 card fails, remove the card and reseat it in the chassis. If the failure persists, replace the MCC-STR3 card and contact the Cisco Systems technical assistance center (TAC).

BRG LED Indicators

The red FAIL LED and the green BUSY LED will light and remain on until the module downloads its code (usually completed in less than 1 second).

After downloading, only the red FAIL LED will be lit while the module initializes (usually completed in less than 1 second).

When initialization is complete, the red FAIL LED will flash, then the green BUSY LED will flash in sequence. This completes the download and initialization process. Any LED status demonstrated after this point will reflect module status.

Troubleshooting

When the red FAIL LED is on, a module-level failure has occurred.

When the red FAIL LED and green BUSY LED flash alternately, the BRG module has been inserted into a slot that is provisioned for another type of module.

When the green BUSY LED is on, the proper ring voltage is applied. The module must be provisioned in service (using the Element Management System) to display this status.

3. If the line interface module and its lines have already been provisioned in service, the LEDs for the provisioned in service lines (LINE1 - LINE8) will be on. Please note the following LED conditions:
   - When the red FAIL LED and green BUSY LED flash alternately, it indicates that the line interface module has been inserted into a slot that has been provisioned for another type of module (provisioning error).
   - When a LINE# LED is red, LOS or LOF has occurred at the far end.
   - When a LINE# LED is yellow, the line has received a near-end alarm.
   - When a LINE# LED is green, the facility is framed on the incoming signal.

If the line interface module has not been provisioned for in service (as may be the case in an initial installation), none of the LEDs will be on after boot up and initialization. The LEDs will light after the module and line(s) have been provisioned in service using the Element Management System (EMS).

Troubleshooting

When the red FAIL LED is on, a module-level failure has occurred.

When the red FAIL LED and green BUSY LED flash alternately, it indicates that the module has been inserted into a slot that has been provisioned for another type of module (provisioning error).

When the green BUSY LED is on, it indicates that the proper ring voltage is applied. The module must be provisioned in service (via Element Management System) to display this status.

If the red FAIL LED does not turn off, the module has not booted up properly.

If a line interface modulefails, remove the card and then reseat it in the bank. If the failure persists, replace the module and contact the Cisco Systems technical assistance center (TAC).