Cisco Systems

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MultiChannel Interface Processor (MIP) Installation and Configuration

Product Numbers: CX-MIP-1CT1=, CX-MIP-2CT1=, CX-MIP-1CE1/120=, CX-MIP-2CE1/120=, CX-MIP-1CE1/75=, and CX-MIP-2CE1/75=

This document contains instructions for installing the MultiChannel Interface Processor (MIP). This document also contains basic configuration steps and examples. For complete descriptions of interface subcommands and the configuration options available for MIP interfaces, refer to the appropriate Cisco software documentation.

For a complete description of software commands, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications on UniverCD or printed copies.

Sections in this document include the following:

Caution The MIP supports online insertion and removal (OIR), which allows you to remove and replace interface processors without first shutting down the system. However, the system can indicate a hardware failure if you do not follow proper procedures. To help avoid problems with the installation, review the section Overview of Online Insertion and Removal, page 11, and follow MIP installation steps carefully.

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

What is the Cisco 7000 Series?

Figure 1 shows the interface processor end of the Cisco 7000 model, which provides access to the seven processor slots and the removable power supplies. When facing the interface processor end of the chassis, the RP and SP (or SSP) slot are on the far right. The five interface processor slots are numbered 0 to 4 from left to right and support any combination of network interface processors.

Figure 1 Cisco 7000 Chassis Rear View

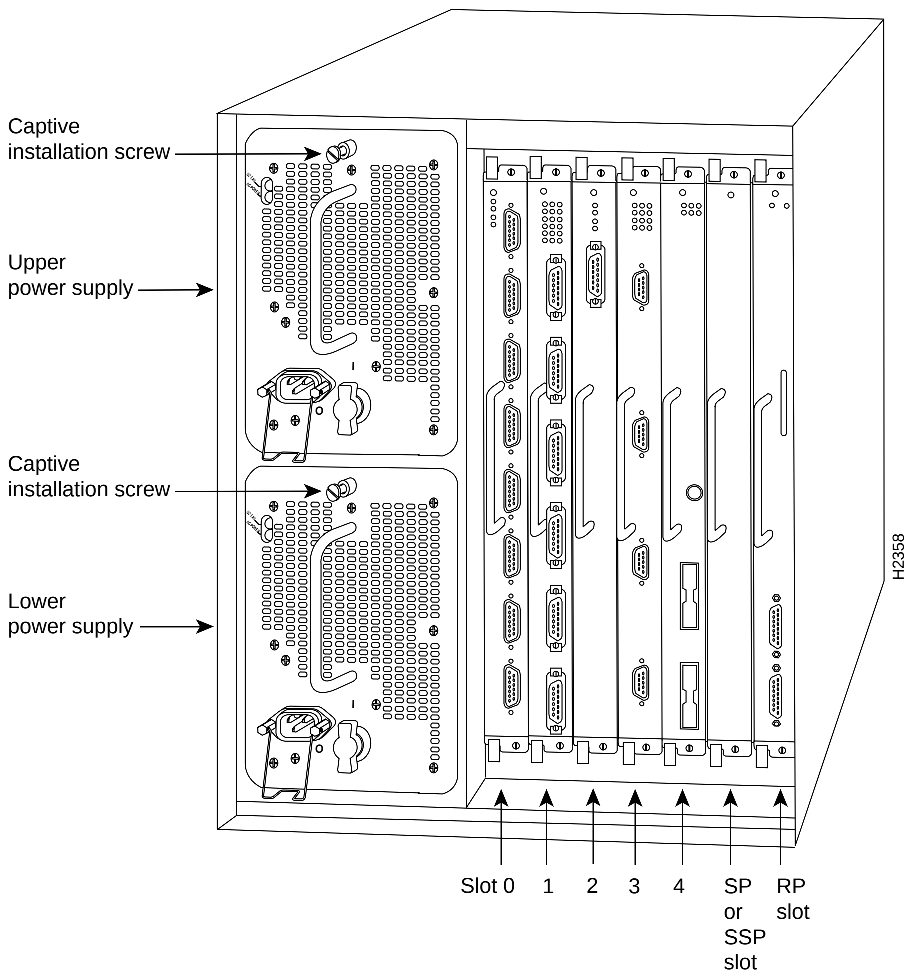
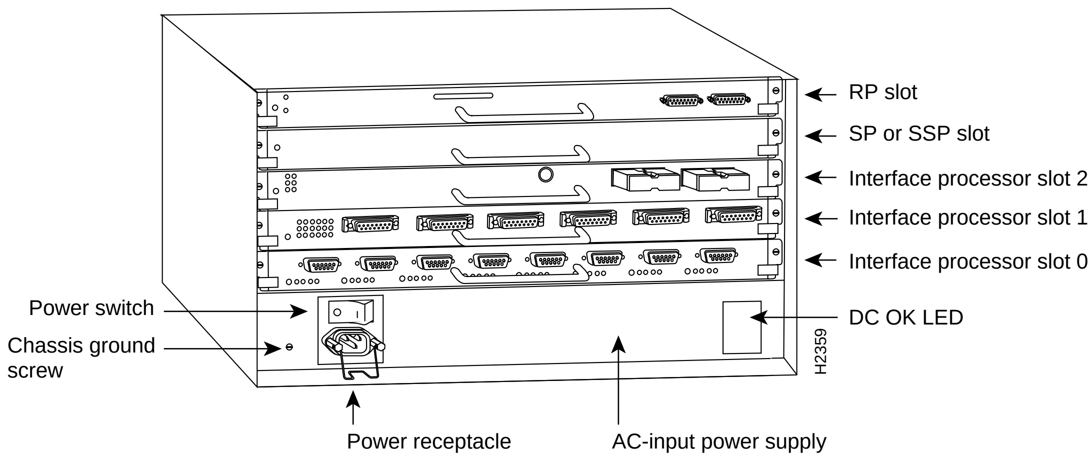


Figure 2 shows the interface processor end of the Cisco 7010 model, which provides access to the five processor slots and the removable power supplies. When facing the interface processor end of the chassis, the RP and SP (or SSP) slots are at the top. The three interface processor slots are numbered from the bottom up, beginning with slot 0 (the bottom slot) through 2 (the center slot).

Figure 2 Cisco 7010—Chassis Rear View

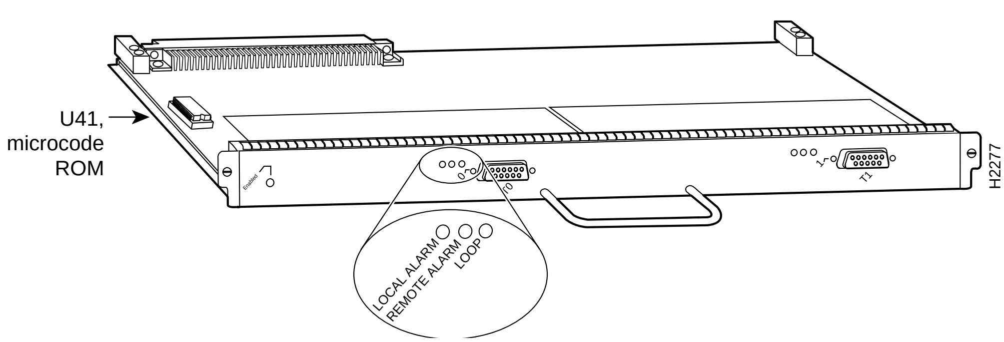


MIP Description

The MIP, shown in Figure 3, provides up to two channelized T1 or E1 connections via serial cables to a channel service unit (CSU). On the MIP, two controllers can each provide up to 24 T1 channel-groups or 30 E1 channel-groups. Each channel-group is presented to the system as a serial interface that can be configured individually.

The MIP provides one or two controllers for transmitting and receiving data bidirectionally at the T1 rate of 1.544 Mbps or one or two controllers for transmitting and receiving data bidirectionally at the E1 rate of 2.048 Mbps. For wide-area networking, the MIP can function as a concentrator for a remote site.

Figure 3 MultiChannel Interface Processor (MIP)—Dual-Port Module Shown



MIP Electrical Interface Specifications

Following are the T1 specifications:

- Transmission bit rate: 1.544 kilobits per second (kbps)   50 parts per million (ppm)
- Output pulse amplitude: 3.0 volts (V)   0.6V measured at DSX
- Output pulse width: 324 nanoseconds (ns)   54 ns
- Complies with all AT&T Accunet TR 62411 specifications.

Following are the E1 specifications:

- Transmission bit rate: 2.048 kbps   50 ppm
- Output port specifications: see G.703 / Section 6.2 (ITU-T specification)
- Input port specifications: see G.703 / Section 6.3 (ITU-T specification)
- Jitter attenuation starting at 6 hertz (Hz), which meets or exceeds G.823 for E1

Maximum Configuration

For T1 and E1, the Cisco 7000 supports a maximum of four MIP modules for a total of 8 MIP ports and up to 240 serial interfaces. The Cisco 7010 supports a maximum of three MIP modules for a total of 6 MIP ports and up to 180 serial interfaces.

Note   For both T1 and E1, there are no restrictions on slot locations or sequence; you can install the MIP in any available interface processor slot. The term *module* refers to a MIP card. A MIP module has one or two T1 or E1 adapters. Do not mix T1 and E1 port adapters on a single MIP. Do not mix 75-ohm and 120-ohm port adapters (E1 or T1) on a single MIP.

MIP LEDs

After system initialization, the enabled LED, which is present on all interface processors, turns on to indicate that the MIP is enabled for operation. The following conditions must be met before the MIP is enabled:

- The MIP contains a valid microcode version that was successfully downloaded.
- The MIP is correctly connected to the backplane and receiving power.
- The CxBus recognizes the MIP card.

If any of these conditions are not met, or if the initialization fails, the enabled LED does not turn on.

There are three LEDs associated with each MIP port that indicate alarm or loop conditions on that port. (See Figure 3.) The three LEDs above each MIP port indicate the following:

- Local alarm—Indicates a loss of signal, a loss of frame, or unavailability due to excessive errors.
- Remote alarm—Indicates a remote alarm is received from the remote end due to a local alarm at the remote end.
- Loop—Indicates controller local loopback.

Microcode

The MIP microcode is a software image that provides card-specific software instructions. Cisco 7000 series routers support downloadable microcode, which enables you to upgrade microcode versions by downloading new microcode images, storing them in Flash memory, and instructing the system to load an image from Flash instead of the default ROM image. You can store multiple images for an interface type and instruct the system to load any one of them or the default ROM image with a configuration command. All interfaces of the same type (all MIPs, all FIPs, and so on) will load the same microcode image, from either the default ROM image or from a single image stored in Flash.

Although multiple microcode versions for a specific interface type can be stored concurrently in Flash, only one image can load at startup. The **show controller cbus** command displays the currently loaded and running microcode version for the SP (or SSP) and for each interface processor. The **show configuration** command displays the current system instructions for loading microcode at startup. For a complete description of microcode and downloading procedures, refer to the section Downloading Microcode, page 27.

Cables

For T1, two standard serial cables, null-modem and straight-through, are available from Cisco Systems and other vendors for use with the MIP. The MIP, T1 interface cables are used to connect your router to external CSUs. The MIP T1 interface cables have two male 15-pin DB connectors at each end to connect the MIP with the external CSU. Figure 4 shows the MIP interface cable, connectors, and pinouts. Table 1 lists the signal pinouts for the null-modem cable and Table 2 lists the signal pinouts for the straight-through cable.

Figure 4 MIP T1 Interface Cable and Connectors

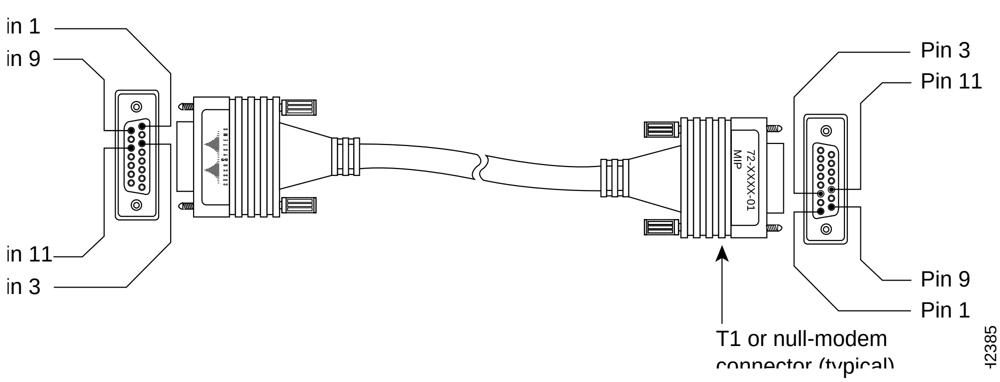


Table 1 T1 Null-Modem Cable Signals

DB-15 Connector		DB-15 Connector	
Pin	**Signal**[1]	**Pin**	**Signal**
1	Tx tip	3	Rx tip
3	Rx tip	1	Tx tip
9	Tx ring	11	Rx ring
11	Rx ring	9	Tx ring

1Tx = transmit. Rx = receive.

Table 2 T1 Straight-Through Cable Signals

DB-15 Connector		DB-15 Connector	
Pin	**Signal**[1]	**Pin**	**Signal**
1	Tx tip	1	Tx tip
3	Rx tip	3	Rx tip
9	Tx ring	9	Tx ring
11	Rx ring	11	Rx ring

1Tx = transmit. Rx = receive.

For E1, four serial cables are available from Cisco Systems for use with the MIP. All three have DB-15 connectors on the MIP end and either BNC, DB-15, Twinax, or RJ-45 connectors on the network end. Figure 5, Figure 6, Figure 7, and Figure 8 show the E1 interface cables (respectively). Table 3 lists the cable pinouts.

Figure 5 E1 Interface Cable for 75-Ohm, Unbalanced Connections (with BNC Connectors)

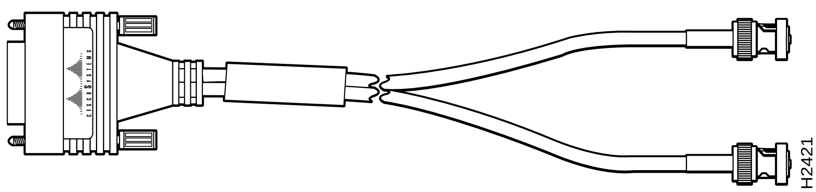


Figure 6 E1 Interface Cable for 120-Ohm, Balanced Connections (with DB-15 Connectors)

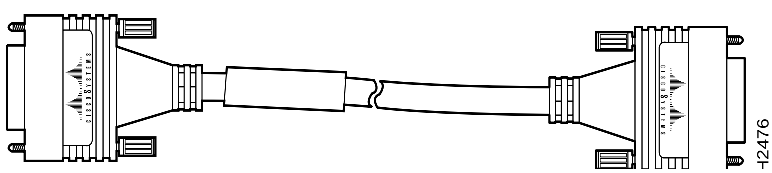


Figure 7 E1 Interface Cable for 120-Ohm, Balanced Connections (with Twinax Connectors)

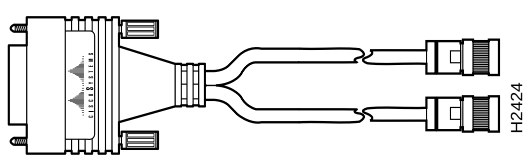


Figure 8 E1 Interface Cable for 120-Ohm, Balanced Connections (with RJ-45 Connector)

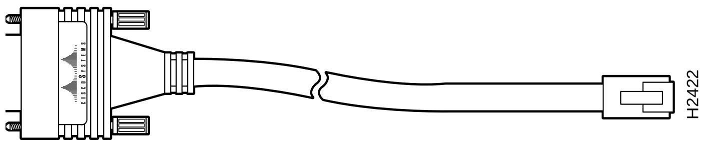


Table 3 E1 Interface Cable Pinouts

MIP End		Network End						
DB-15[1]		**BNC**	**DB-15**		**Twinax**		**RJ-45**	
Pin	**Signal[2]**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**	**Pin**	**Signal**
9	Tx tip	Tx tip	1	Tx tip	Tx-1	Tx tip	1	Tx tip
2	Tx ring	Tx shield	9	Tx ring	Tx-2	Tx ring	2	Tx ring
10	Tx shield	–	2	Tx shield	Shield	Tx shield	3	Tx shield
8	Rx tip	Rx tip	3	Rx tip	Rx-1	Rx tip	4	Rx tip
15	Rx ring	Rx shield	11	Rx ring	Rx-2	Rx ring	5	Rx ring
7	Rx shield	–	4	Rx shield	Shield	Rx shield	6	Rx shield

1Any pins not described in this table are not connected.
2Tx = transmit. Rx = receive.

Installation Prerequisites

Before you begin this installation, review the safety and ESD-prevention guidelines in this section to avoid injuring yourself or damaging the equipment. This section also provides a list of parts and tools you will need to perform the installation.

Software Requirements

The MIP is compatible with any Cisco 7000 series router that is operating with the following software and microcode:

- For T1, the current system software is Cisco Internetwork Operating System (IOS) Release 10.0 or later. The current microcode version is Release 10.0 or later.
- For E1, the current system software is Cisco IOS Release 10.3 or later. The current MIP microcode version is Release 11.0 or later.

The **show version** command displays the current hardware configuration of the router, including the system software version that is currently loaded and running. The **show controller cbus** command lists all CxBus interfaces and includes the currently loaded and running microcode version for each. Use the **show version** command to display the current system software version, and use the **show controller cbus** command to display the microcode version of the SP (or SSP) and each interface processor.

In the following example of the **show version** command, the running system software is Cisco IOS Release 10.0 (or Cisco IOS 10.3 for E1).

```
Router> show version
GS Software (GS7), IOS 10.0(5187)  (or IOS 10.3(x) for E1)
Copyright (c) 1986-1993 by cisco Systems, Inc.
Compiled Wed 02-Feb-94 15:52
ROM: System Bootstrap, Version 4.6(1) [fc2], SOFTWARE
(remainder of displayed text omitted from example)
```

In the following example of the **show controller cbus** display, the running SP (or SSP) microcode is Version 170.46 although the microcode ROM on the SP (or SSP) contains Version 1.0. (In this example, ROM Version 1.0 is assumed.)

```
Router# show controller cbus

Switch Processor 5, hardware version 11.1, microcode version 170.46
  Microcode loaded from system
  512 Kbytes of main memory, 128 Kbytes cache memory 105 1520 byte buffers,
  75 4496 byte buffers Restarts: 0 line down, 0 hung output, 0 controller error
FIP 0, hardware version 2.2, microcode version 170.12
 Microcode loaded from system
  Interface 0 - Fddi0/0, address 0000.0c03.648b (bia 0000.0c03.648b)
  15 buffer RX queue threshold, 37 buffer TX queue limit, buffer size 4496
  ift 0006, rql 13, tq 0000 01A0, tql 37

(text omitted from example)

MIP 2, hardware version 1.0, microcode version 10.0
 Microcode loaded from system
 Interface 16 - T1 2/0, electrical interface is Channelized T1
   10 buffer RX queue threshold, 14 buffer TX queue limit, buffer size 1580 ift 0001, rql
   7, tq 0000 05B0, tql 14
   Transmitter delay is 0 microseconds
Router#
```

Or, for E1, as follows:

```
MIP 2, hardware version 1.0, microcode version 11.0
 Microcode loaded from system
 Interface 16 - E1 2/0, electrical interface is Channelized E1-balance (or unbalanced)
   10 buffer RX queue threshold, 14 buffer TX queue limit, buffer size 1580 ift 0001, rql
   7, tq 0000 05B0, tql 14
   Transmitter delay is 0 microseconds
Router#
```

If the displays indicate that the running system software is earlier than Cisco IOS Release 10.0 for T1 (or Cisco IOS Release 10.3 for E1) or that the running SP (or SSP) microcode is earlier than Version 10.0, check the contents of Flash memory to determine whether the required images are available on your system. The **show flash** command displays a list of all files stored in Flash memory. The following example shows FIP Microcode Version 1.1 and SP (or SSP) Microcode Version 1.2 stored in Flash:

```
Router# show flash
4096K bytes of flash memory on embedded flash (in RP1).
file     offset     length        name
1041 0     0x80        53364       fip1-1
  1     0xD134      55410       sp1-2
  [4085336/4194304 bytes free]
```

If the preceding displays indicate that the required system software and microcode is not available, contact a customer service representative for upgrade information. (See the section Downloading Microcode, page 27 for more information.)

Parts and Tools

You need the following tools and parts to install or upgrade the MIP. If you need additional equipment, contact your service representative for ordering information.

- Flat-blade screwdriver for the captive installation screws on the MIP
- T1 and/or E1 CSU to connect the MIP with the external network
- T1 interface cables to connect the MIP and CSU:
    - Null-Modem cable—CAB-7KCT1NULL(=) or equivalent
    - Straight-through cable—CAB-7KCT1DB15(=) or equivalent
- E1 interface cables to connect the MIP and CSU:
    - BNC cable—CAB-E1-BNC(=) or equivalent
    - DB-15 cable—CAB-E1-DB15(=) or equivalent
    - Twinax cable—CAB-E1-TWINAX(=) or equivalent
    - RJ-45 cable—CAB-E1-RJ45(=) or equivalent
- ESD-preventive equipment or the disposable grounding wrist strap included with all upgrade kits
- If you are upgrading the MIP microcode ROM, you also need the following:
    - Chip extractor (IC removal tool)
    - Needlenose pliers (in case any of the ROM pins bend during installation)
    - Antistatic mat or foam pad on which to place the MIP while you replace the microcode ROM

Safety

This section lists safety guidelines you should follow when working with any equipment that connects to electrical power or telephone wiring.

Electrical Equipment

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. The MIP comprises a printed circuit board that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap whenever handling the MIP. Handle the carriers by the handles and the carrier edges only; never touch the boards or connector pins.

Following are guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to a captive installation screw on an installed power supply.
- When installing a MIP, use the ejector levers to properly seat the bus connectors in the backplane, then tighten both captive installation screws. (See Figure 9.) These screws prevent accidental removal, provide proper grounding for the system, and they help to ensure that the bus connectors are seated in the backplane.
- When removing a MIP, use the ejectors to release the bus connectors from the backplane. Use the handle to pull the MIP out slowly while keeping your other hand underneath the carrier to guide it straight out of the slot.
- Handle carriers by the handles and carrier edges only; avoid touching the board or connectors.
- Place a removed MIP board-side-up on an antistatic surface or in a static shielding bag. If the component will be returned to the factory, immediately place it in a static shielding bag.
- Avoid contact between the MIP and clothing. The wrist strap only protects the board from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the MIP printed circuit board from the metal interface processor carrier.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms.

Overview of Online Insertion and Removal

The OIR feature allows you to remove and replace CxBus interface processors while the system is operating; you do not need to notify the software or shut down the system power.

Note This section describes the mechanical functions of the system components and emphasizes the importance of following the correct procedures to avoid unnecessary board failures. This section is for background information only; specific procedures for the MIP follow in the "Installation" section.

Each RP, SP, SSP, and interface processor contains a male connector with which it connects to the system backplane. Each card (male) connector comprises a set of tiered pins, in three lengths. The pins send specific signals to the system as they make contact with the backplane. The system assesses the signals it receives and the order in which it receives them to determine what event is occurring and what task it needs to perform, such as reinitializing new interfaces or shutting down removed ones. For example, when inserting an interface processor, the longest pins make contact with the backplane first, and the shortest pins make contact last. The system recognizes the signals and the sequence in which it receives them. The system expects to receive signals from the individual pins in this logical sequence, and the ejector levers help to ensure that the pins mate in this sequence.

When you remove or insert an interface processor, the backplane pins send signals to notify the system, which then performs as follows:

1. Rapidly scans the backplane for configuration changes and does not reset any interfaces.
2. Initializes all newly inserted interface processors, noting any removed interfaces and placing them in the administratively shut down state.
3. Brings all previously configured interfaces on the interface processor back to the state they were in when they were removed. Any newly inserted interfaces are put in the administratively shut down state, as if they were present (but unconfigured) at boot time. If a similar interface processor type has been reinserted into a slot, then its ports are configured and brought on line up to the port count of the original interface processor.

The system brings on line only interfaces that match the current configuration and were previously configured as up; all others require that you configure them with the configure command.

OIR functionality enables you to add, remove, or replace interface processors with the system online, which provides a method that is seamless to end users on the network, maintains all routing information, and ensures session preservation.

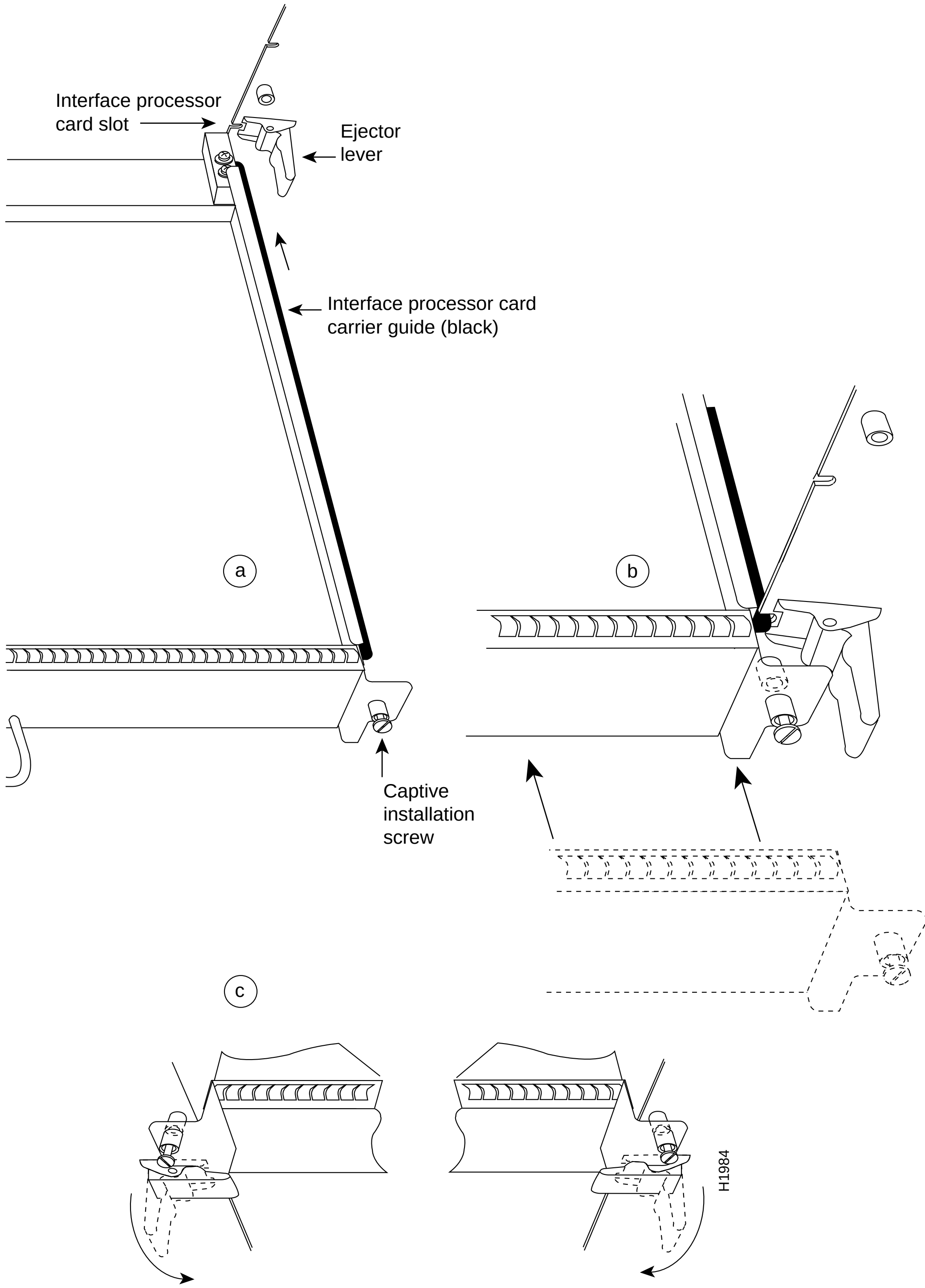
Caution When removing or replacing interface processors, you can avoid erroneous failure messages by allowing at least 15 seconds for the system to reinitialize before removing or inserting another interface processor.

The function of the ejector levers (see Figure 9) is to align and seat the card connectors in the backplane. Failure to use the ejector levers and insert the interface processor properly can disrupt the order in which the pins make contact with the backplane. Follow the MIP installation and removal instructions carefully, and review the following examples of incorrect insertion practices and results:

- Using the handle to force the interface processor all the way into the slot can pop the ejector levers out of their springs. If you then try to use the ejector levers to seat the interface processor, the first layer of pins (which are already mated to the backplane) can disconnect and then remate with the backplane, which the system interprets as a board failure.
- Using the handle to force or slam the interface processor all the way into the slot can also damage the pins on the board connectors if they are not aligned properly with the backplane.
- When using the handle (rather than the ejector levers) to seat the interface processor in the backplane, you might need to pull the interface processor back out and push it in again to align it properly. Even if the connector pins are not damaged, the pins mating with and disconnecting from the backplane will cause the system to interpret a board failure. Using the ejector levers ensures that the board connector mates with the backplane in one continuous movement.
- Using the handle to insert or remove an interface processor, or failing to push the ejector levers to the full 90-degree position, can leave some (not all) of the connector pins mated to the backplane, a state which will hang the system. Using the ejector levers and making sure that they are pushed fully into position ensures that all three layers of pins are mated with (or free from) the backplane.

It is also important to use the ejector levers when removing an interface processor to ensure that the board connector pins disconnect from the backplane in the logical sequence expected by the system. Any RP, SP (or SSP), or interface processor that is only partially connected to the backplane can hang the bus. Detailed steps for correctly performing OIR are included with the following procedures for installing and removing the MIP.

Figure 9 Bottom Ejector Lever and Captive Installation Screw



Installation

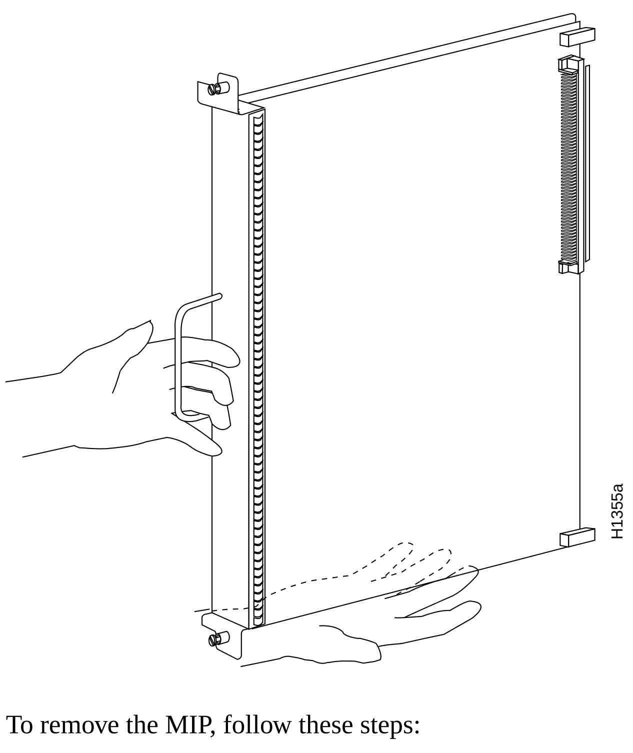
The following sections describe the procedures for removing or installing the MIP in the Cisco 7010. The OIR feature allows you to install and remove the MIP without turning off system power. Refer to the section Overview of Online Insertion and Removal, page 11 for a complete description of OIR.

Caution To avoid erroneous failure messages, remove or insert only one interface processor at a time. Also, after inserting or removing an interface processor, allow at least 15 seconds before removing or inserting another interface processor so that the system can reinitialize and note the current configuration of all interfaces.

Removing the MIP

The MIP supports OIR; therefore, you need not shut down the interface or the system power when removing the MIP. If you are replacing a failed MIP, remove the existing board first, then replace the new MIP in the same slot. Figure 10 shows proper handling of an interface processor during installation.

Figure 10 Handling Interface Processors during Installation



To remove the MIP, follow these steps:

Step 1 Disconnect the MIP interface cables from the MIP ports.

Step 2 Loosen the captive installation screws at the top and bottom of the MIP. (See Figure 9a.)

Caution Always use the ejector levers to remove or install the MIP. Failure to do so can cause erroneous system error messages, indicating a board failure.

Step 3 Place your thumbs on the upper and lower ejector levers and simultaneously push the top ejector lever up and the bottom ejector lever down (in the opposite direction from that shown in Figure 9c) to release the MIP from the backplane connector.

Step 4 Grasp the MIP handle with one hand and place your other hand under the carrier to guide the MIP out of the slot. (See Figure 10.) Avoid touching the board or any connector pins.

Step 5 Carefully pull the MIP straight out of the slot, keeping your other hand under the carrier to guide it. (See Figure 10.) Keep the MIP at a 90-degree orientation to the backplane.

Step 6 Place the removed MIP on an antistatic mat or foam pad, or place it in an antistatic bag if you will return it to the factory.

Step 7 If the interface processor slot is to remain empty, install an interface processor filler (MAS-7000BLANK=) to keep dust out of the chassis and to maintain proper airflow through the interface processor compartment.

Installing the MIP

The MIP slides into any available interface processor slot and connects directly to the backplane. The backplane slots are keyed so that the MIP can be installed only in an interface processor slot. (See Figure 1 or Figure 2.) Interface processor fillers, which are blank interface processor carriers, occupy empty slots to maintain consistent air flow through the interface processor compartment. If you are installing a new MIP, you will have to first remove the interface processor filler from the available interface processor slot. Figure 9 shows the functional details of inserting an interface processor and using the ejector levers. Figure 10 shows proper handling of an interface processor during installation.

Caution Remove or insert only one interface processor at a time. Allow at least 15 seconds for the system to complete the preceding tasks before removing or inserting another interface processor. Disrupting the sequence before the system completes its verification can cause the system to interpret hardware failures.

Follow these steps to install the MIP:

Step 1 Ensure that the console terminal is connected to the RP *Console* port and that the console is turned on.

Step 2 Choose an available interface processor slot (see Figure 1 or Figure 2) for the MIP, and ensure that the MIP interface cable is of a sufficient length to connect the MIP with the CSU.

Step 3 Interface processors and interface processor fillers are secured with two captive installation screws. (See Figure 9a.) Use a flat-blade screwdriver to loosen the captive installation screws and remove the interface processor filler (or the existing MIP) from the slot. If you remove the MIP, immediately place it into an antistatic bag to prevent damage from electrostatic discharge.

Step 4 Hold the MIP handle with one hand, and place your other hand under the carrier to support the MIP and guide it into the slot. (See Figure 10.) Avoid touching the card or any connector pins.

Caution To prevent ESD damage, handle interface processors by the handles and carrier edges only.

Step 5 Place the back of the MIP in the slot and align the notch on the bottom of the carrier with the groove in the slot. (See Figure 9a.)

Step 6 While keeping the MIP at a 90-degree orientation to the backplane, carefully slide the MIP into the slot until the back of the faceplate makes contact with the ejector levers, then *stop*. (See Figure 9b.)

Caution Always use the ejector levers when installing or removing processor modules. A module that is partially seated in the backplane will cause the system to hang and subsequently crash.

Step 7 Using the thumb and forefinger of each hand to pinch each ejector lever, simultaneously push the top ejector lever down and the bottom ejector lever up until both are at a full 90-degree orientation to the faceplate. (See Figure 9c.)

Step 8 Tighten the captive screws on the top and bottom of the interface processor faceplate to prevent the interface processor from becoming partially dislodged from the backplane and ensure proper EMI shielding. (These screws must be tightened to meet EMI specifications.)

Caution Always tighten the captive installation screws on interface processors. These screws prevent accidental removal and provide proper grounding for the system.

Step 9 Attach the MIP network interface cable between the MIP interface ports and to the DSU.

Step 10 Proceed to the following section to check the installation.

Checking the Installation

After you install the MIP, verify the installation by observing the LED states and the console display. When the system finishes reinitializing all interfaces, the enabled LED on the MIP and on all interface processors should be lit. The console screen will also display a message as the system discovers each interface during its reinitialization.

When you remove and replace CxBus interface processors, the system provides status messages on the console screen. The messages are for information only. The following sample display shows the events logged by the system as the MIP was removed from slot 4; the system then reinitialized the remaining interface processors and marked as *down* the MIP that was removed from slot 4. When the MIP was reinserted, the system marked the interfaces as *down* again because the MIP interfaces were not shut down before the MIP was removed.

```
Router#

%OIR-6-REMCARD: Card removed from slot 4, interfaces disabled
%LINK-5-CHANGED: Interfaces MIP1/0, changed to administratively down

Router#
%OIR-6-INSCARD: Card inserted in slot 4, interfaces administratively shut down
Router#
Router#
```

When a new MIP is inserted or when the MIP is moved to a new slot, the system recognizes the new MIP controllers, but leaves them in a *down* state until you configure them and change the state to *up* with the **configure** command.

The following example display shows the events logged by the system as a new MIP is inserted in slot 4:

```
Router#

OIR-6-REMCARD: Card removed from slot 4, interface disabled
Link-5-CHANGED: Interface MIPl/0, changed state to administratively down

Router#
%OIR-6-INSCARD: Card inserted in slot 4, interfaces administratively shut down
Router#
```

Verify that the MIP is installed correctly as follows:

Step 1 While the system reinitializes each controller, observe the console display messages and verify that the system discovers the MIP as follows:

- If you installed a new MIP, the system should recognize the new MIP controller but leave the controller configured as *administratively down*.
- If you replaced the MIP, the system should recognize the controller and place it in the same state (*up* or *down*) as the card removed. All interfaces on the newly inserted MIP should be in the same state as the card removed.

Step 2 When the reinitialization is complete, verify that the enabled LED on the MIP turns on and remains on. If it does, proceed to step 5. If it does not, proceed to the next step.

Step 3 If the enabled LED on the MIP fails to go on, suspect that the MIP board connector is not fully seated in the backplane. Loosen the captive installation screws, then firmly push the top ejector lever down while pushing the bottom ejector lever up until both are at a 90-degree orientation to the MIP faceplate. Tighten the captive installation screws. After the system reinitializes, the enabled LED on the MIP should go on. If it does, proceed to step 5. If it does not, proceed to the next step.

Step 4 If the enabled LED still fails to go on, remove the MIP and try installing it in another available interface processor slot.

- If the enabled LED turns on when the MIP is installed in the new slot, suspect a failed backplane port in the original interface processor slot.
- If the enabled LED still fails to turn on, but other LEDs on the MIP go on to indicate activity, proceed to step 5 to resume the installation checkout and suspect that the enabled LED on the MIP has failed.
- If no LEDs on the MIP are on, suspect that the MIP is faulty.
- If the enabled LED still does not turn on, do not proceed with the installation. Contact a customer service representative to report the faulty equipment and obtain further instructions.

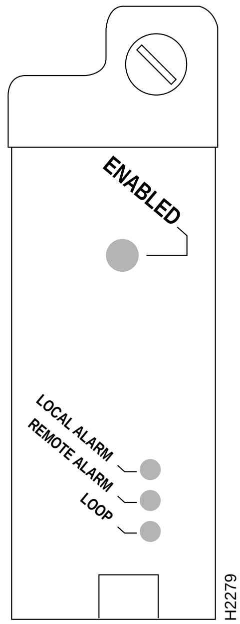
Step 5 If the MIP controller is new, proceed to the section Configuring the Interfaces, page 18 to configure the new controller. (This does not have to be done immediately, but the controller will not be available until you configure it.)

Step 6 If this installation was a replacement MIP, use the **show interfaces** or **show controllers cbus** command to verify the status of the MIP controller.

Step 7 When the MIP controller is up, check the activity of the controller with the MIP LEDs, which are shown in Figure 11.

The LED states are described in the section “MIP LEDs” on page 4.

Figure 11 MIP LEDs



If an error message displays on the console terminal, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publication for error message definitions. If you experience other problems that you are unable to solve, contact a customer service representative for assistance.

This completes the MIP installation. If you installed a new MIP, you must now configure the new MIP controller, as described in the following section.

Configuring the Interfaces

If you installed a new MIP or if you want to change the configuration of an existing controller, you must enter the configuration mode. If you replaced the MIP that was previously configured, the system will recognize the new MIP and bring it up in the existing configuration.

After you verify that the new MIP is installed correctly (the enabled LED is on), use the privileged-level **configure** command to configure the new MIP controller. Be prepared with the information you will need, such as the following:

- T1 and/or E1 information, for example clock source (for T1), line code, and framing type
- Channel-group information and timeslot mapping
- Protocols and encapsulations you plan to use on the new interfaces
- Internet protocol (IP) addresses if you will configure the interfaces for IP routing
- Whether the new interface will use bridging

Refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications for a summary of the configuration options available and instructions for configuring the MIP controller.

Configuring Jumper J6 on the E1 Port Adapter

By default, channelized E1 port adapters are set with capacitive coupling between the receive (Rx) shield and chassis ground. This provides direct current (DC) isolation between the chassis and external devices, as stated in the G.703 specification. Jumper J6 controls this function. To make changes, remove the E1 port adapter from the mother board, place one of the spare jumpers on J6 pins one and two *or* pins two and three (refer to Table 4), and replace the port adapter on the mother board. Pin 1 of J6 is designated with a square. (See Figure 12.)

Figure 12 Location of Jumper J6 on the E1 Port Adapter—Partial View

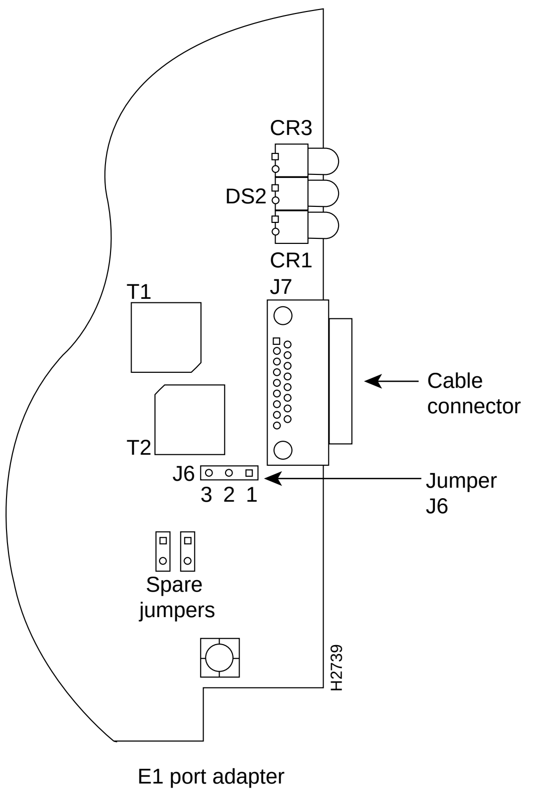


Table 4 Jumper Settings and Functions

Jumper	Pins and Impedance	Function
J6	1 and 2 for 120 ohm 2 and 3 for 75 ohm	Controls capacitive coupling for either 120-ohm or 75-ohm operation. An installed jumper directly connects the Rx shield to chassis ground.

Warning To prevent problems with the E1 interface and to reduce the potential for injury, jumper J6 should be installed by trained service personnel *only*. For either impedance option, a jumper installed at J6 bypasses the AC-decoupling capacitor to ground, thereby coupling the interface directly to AC. This is a setting that could pose a risk of severe injury. By default and for safety, J6 has no jumper installed.

After you set jumper J6, proceed to the section "Installing Port Adapters" on page 31.

Using the EXEC Command Interpreter

Before you use the **configure** command, you must enter the privileged level of the EXEC command interpreter with the **enable** command. The system will prompt you for a password if one has been set.

The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>). At the console terminal, enter the privileged level as follows:

Step 1 At the user-level EXEC prompt, enter the **enable** command. The EXEC prompts you for a privileged-level password, as follows:

```
Router> enable

Password:
```

Step 2 Enter the password (the password is case sensitive). For security purposes, the password is not displayed.

Step 3 When you enter the correct password, the system displays the privileged-mode system prompt (#) as follows:

```
Router#
```

Step 4 Proceed to the following section to configure the MIP controller.

Using the Configure Commands

Following are instructions for a configuration: enabling a controller and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface.

The channel-groups must be mapped before the MIP controller can be configured.

For complete descriptions of configuration subcommands and the configuration options available, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publication.

Following are commands used to map the channel-group, with he default variable is listed first:

Commands for T1:	Commands for E1:
controller t1 *slot/applique*	**controller e1** *slot/applique*
clock source [*line* | *internal*]	Not required for E1
linecode [*ami* | *b8zs*]	**linecode** [*hdb3* | *ami*]
framing [*sf* | *esf*]	**framing** [*crc4* | *no-crc4*]
loopback [*local* | *remote*]	**loopback**
shutdown	**shutdown**
channel-group *number* **timeslots** *list* [speed {56 | 48 | 64}] For speed, 56 is the default.	**channel-group** *number* **timeslots** *list* [speed {56 | 48 |64}] For speed, 64 is the default.

Number is the channel-group 0 to 23 for T1 and 0 to 29 for E1.

Timeslots list is a number between 1 to 24 for T1 and 1 to 31 for E1. It conforms to D3/D4 numbering for T1. Timeslots may be entered individually and separated by commas or as a range that is separated by a hyphen (for example, 1-3, 8, 9-18). For E1 and T1, 0 is illegal.

Speed specifies the DSO speed of the channel-group: T1 default is 56 kbps and E1 default is 64 kbps.

Note   Cisco 7000 series routers identify channel-groups as serial interfaces by slot number (interface processor slots 0 to 4), applique (0 or 1), and channel-group number (0 to 23 for T1 and 0 to 29 for E1) in the format, *slot/port:channel-group*. For example, the address of the MIP installed in interface processor slot 4, with applique 1 and channel-group 5, would be serial *4/1:5*.

T1 Configuration

The following steps describe a basic T1 configuration. Press the Return key after each configuration step.

Step 1   At the privileged-mode prompt, enter the configuration mode and specify that the console terminal will be the source of the configuration subcommands as follows:

```
Router# conf t
Enter configuration commands, one per line. End with CNTL/Z. Router(config)#
```

Step 2   At the prompt, specify the controller to configure by entering the subcommand **cont**, followed by **t1**, *and slot/applique* (interface processor slot number/applique). The example that follows is for the MIP in interface processor slot 4, applique 1:

```
Router(config)# cont t1 4/1
```

Step 3   At the prompt, specify the clock source for the controller. The **clock source** command will determine which end of the circuit provides the clocking.

```
Router(config-controller)# clock source line
```

Note   The clock source should only be set to use the internal clocking for testing the network or if the full T1 line is used as the channel-group. Only one end of the T1 line should be set to internal.

Step 4   At the prompt, specify the **framing** type.

```
Router(config-controller)# framing esf
```

Step 5   At the prompt, specify the **linecode** format.

```
Router(config-controller)# linecode b8zs
Router(config-controller)#
%CONTROLLER-3-UPDOWN: Controller T1 4/1, changed state to up
Router(config-controller)#
```

Step 6 At the prompt, specify the **channel-group** modification command, channel-group and timeslots to be mapped. The example shows channel-group 0 and timeslots 1, 3 through 5, and 7 selected for mapping.

```
Router(config-controller)# channel-group 0 timeslots 1,3-5,7
Router(config-controller)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial4/1:0, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial4/1:0, changed state to up
Router(config-controller)#
Router(config-controller)#
```

Step 7 At the prompt, specify the interface, serial, slot, applique, and channel-group to modify.

```
Router(config-controller)# int serial 4/1:0
```

Step 8 At the prompt, assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand as in the following example:

```
Router(config-if)# ip address 1.1.15.1 255.255.255.0
Router(config-if)#
```

Step 9 Add any additional configuration subcommands required to enable routing protocols and adjust the interface characteristics.

Step 10 After including all of the configuration subcommands, to complete the configuration, enter **^z** (hold down the Control key while you press Z) to exit the configuration mode.

Step 11 Write the new configuration to memory as follows:

```
Router# write memory
```

The system will display an OK message when the configuration is stored.

Step 12 Exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

Step 13 Proceed to the following section to check the interface configuration with **show** commands.

E1 Configuration

The following steps describe a basic E1 configuration. Press the Return key after each step.

Step 1 At the privileged-mode prompt, enter the configuration mode and specify that the console terminal will be the source of the configuration subcommands as follows:

```
Router# conf t
Enter configuration commands, one per line. End with CNTL/Z. Router(config)#
```

Step 2 At the prompt, specify the controller to configure by entering the subcommand **cont**, followed by **e1**, *and slot/applique* (interface processor slot number/applique). The example that follows is for the MIP in interface processor slot 4, applique 1:

```
Router(config)# cont e1 4/1
```

Step 3 At the prompt, specify the **framing** type.

```
Router(config-controller)# framing crc4
```

Step 4 At the prompt, specify the **linecode** format.

```
Router(config-controller)# linecode hdb3
Router(config-controller)#
%CONTROLLER-3-UPDOWN: Controller E1 4/1, changed state to up
Router(config-controller)#
```

Step 5 At the prompt, specify the **channel-group** modification command, channel-group and timeslots to be mapped. The example shows channel-group 0 and timeslots 1, 3 through 5, and 7 selected for mapping.

```
Router(config-controller)# channel-group 0 timeslots 1,3-5,7
Router(config-controller)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial4/1:0, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial4/1:0, changed state to up
Router(config-controller)#
Router(config-controller)#
```

Step 6 At the prompt, specify the interface, serial, slot, applique, and channel-group to modify.

```
Router(config-controller)# int serial 4/1:0
```

Step 7 At the prompt, assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand as in the following example:

```
Router(config-if)# ip address 1.1.15.1 255.255.255.0
Router(config-if)#
```

Step 8 Add any additional configuration subcommands required to enable routing protocols and adjust the interface characteristics.

Step 9 After including all of the configuration subcommands, to complete the configuration, enter **Ctrl-Z** (hold down the Control key while you press Z) to exit the configuration mode.

Step 10 Write the new configuration to memory as follows:

```
Router# write memory
```

The system will display an OK message when the configuration is stored.

Step 11 Exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable
Router>
```

Step 12 Proceed to the following section to check the interface configuration with **show** commands.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces.

Command Descriptions and Examples

Following are descriptions and examples of the show commands. Descriptions are limited to fields that are relevant for verifying the configuration.

- The **show version** command displays the configuration of the system hardware (the number of each interface processor type installed), the software version, the names and sources of configuration files, and the boot images.

```
Router> show version

GS Software (GS7), Version 10.0(5187) (for E1, 10.3[x])
Copyright (c) 1986-1994 by cisco Systems, Inc.
Compiled Wed 02-Feb-94 15:52

ROM: System Bootstrap, Version 4.6(1) [fc2], SOFTWARE

Router uptime is 42 minutes
System restarted by reload
System image file is “wmay/gs7-k”, booted via tftp from 131.108.13.111

RP (68040) processor with 16384K bytes of memory. X.25 software, Version 2.0, NET2, BFE
and GOSIP compliant. Bridging software.
1 Switch Processor.
1 EIP controller (6 Ethernet).
1 TRIP controller (4 Token Ring).
1 FSIP controller (4 Serial).
1 MIP controller (1 T1). (or 1 E1, and so forth)
6 Ethernet/IEEE 802.3 interfaces.
4 Token Ring/IEEE 802.5 interfaces.
6 Serial network interfaces.
1 FDDI network interface.
128K bytes of non-volatile configuration memory.
4096K bytes of flash memory sized on embedded flash.
Configuration register is 0x100
```

- The **show controllers cbus** command displays the internal status of the SP (or SSP) and each CxBus interface processor, including the interface processor slot location, the card hardware version, and the currently running microcode version. It also lists each interface (port) on each interface processor including the logical interface number, interface type, physical (slot/port) address, and hardware (station address) of each interface. The following example shows the MIP installed in interface processor slot 1:`

```
Router# show controller cbus

Switch Processor 5, hardware version 11.1, microcode version 170.46
  Microcode loaded from system
  512 Kbytes of main memory, 128 Kbytes cache memory 105 1520 byte buffers,
  75 4496 byte buffers Restarts: 0 line down, 0 hung output, 0 controller error
FIP 0, hardware version 2.2, microcode version 170.12
 Microcode loaded from system
  Interface 0 - Fddi0/0, address 0000.0c03.648b (bia 0000.0c03.648b)
  15 buffer RX queue threshold, 37 buffer TX queue limit, buffer size 4496
  ift 0006, rql 13, tq 0000 01A0, tql 37

(text omitted from example)
```

```
MIP 2, hardware version 1.0, microcode version 10.0
 Microcode loaded from system
 Interface 16 - T1 2/0, electrical interface is Channelized T1
   10 buffer RX queue threshold, 14 buffer TX queue limit, buffer size 1580 ift 0001, rql
   7, tq 0000 05B0, tql 14
   Transmitter delay is 0 microseconds
Router#
```

- The **show controller t1** command displays the status of the default T1 (which is specified in RFC 1406). The command, **show controller t1** *slot/applique* command displays the verbose information for a particular T1.

```
Router# show cont t1
T1 4/1 is up.
  No alarms detected.
  Framing is ESF, Line Code is AMI, Clock Source is line
  Data in current interval (0 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations 0 Slip Secs, 0 Fr Loss Secs,
     0 Line Err Secs, 0 Degraded Mins 0 Errored Secs, 0 Bursty Err Secs,
     0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 79 15 minute intervals):
     0 Line Code Violations, 0 Path Code Violations, 0 Slip Secs, 0 Fr Loss Secs,
     0 Line Err Secs, 0 Degraded Mins, 0 Errored Secs, 0 Bursty Err Secs,
     0 Severely Err Secs, 0 Unavail Secs
Router#
```

- The **show controller e1** command displays the status of the default E1 (which is specified in RFC 1406). The command, **show controller e1** *slot/applique* displays the verbose information for a particular E1.

```
Router# show cont e1
E1 4/1 is up.
  No alarms detected.
  Framing is E1-crc, Line Code is hdb3
  Data in current interval (0 seconds elapsed):
     0 Line Code Violations, 0 Path Code Violations 0 Slip Secs, 0 Fr Loss Secs,
     0 Line Err Secs, 0 Degraded Mins 0 Errored Secs, 0 Bursty Err Secs,
     0 Severely Err Secs, 0 Unavail Secs
  Total Data (last 79 15 minute intervals):
     0 Line Code Violations, 0 Path Code Violations, 0 Slip Secs, 0 Fr Loss Secs,
     0 Line Err Secs, 0 Degraded Mins, 0 Errored Secs, 0 Bursty Err Secs,
     0 Severely Err Secs, 0 Unavail Secs
Router#
```

- The **show configuration** command displays the contents of the system configuration file stored in NVRAM. This file should reflect all new configuration changes you made and wrote to memory with the **write memory** command.

```
Router# show config

Using 1708 out of 130048 bytes
!
version 10.0 (or 10.3 for E1)
!
hostname Router
!
enable password *****
!
clns routing
!
```

```
controller T1 4/1 (for E1, E1 4/1, and so forth)
framing esf (for E1, crc4, and so forth)
linecode b8zs (for E1, hdb3, and so forth)
channel-group 0 1,3,5,7
channel-group 1 2,4,6,8-10
!
interface Ethernet 1/0
ip address 131.108.43.220 255.255.255.0
no mop enabled
!
interface Ethernet1/1
no ip address
shutdown
!
interface Ethernet1/2
no ip address
shutdown
!
interface Ethernet1/3

   (display text omitted)
```

- The **show protocols** command displays the global (system-wide) and interface-specific status of any configured Level 3 protocol.

```
Router> show protocols

Global values:
   Internet Protocol routing is enabled
CLNS routing is enabled (address 41.0000.0000.0000.0001.0000.0000.00) Fddi0/0 is down,
line protocol is down
Internet address is 1.1.20.1, subnet mask is 255.255.255.0
CLNS enabled
Ethernet1/0 is up, line protocol is up
Internet address is 131.108.43.220, subnet mask is 255.255.255.0


(display text omitted)
```

Using Show Commands to Verify the MIP Status

The following procedure describes how to use the **show** commands to verify that the new MIP interface is configured correctly:

Step 1 Use the **show version** command to display the system hardware configuration. Ensure that the list includes the new MIP network interface.

Step 2 Display all of the current CxBus interface processors and their interfaces with the **show controllers cbus** command. Verify that the new MIP appears in the correct slot.

Step 3 Display the T1 and/or E1 alarm condition with the **show controller T1** and/or **show controller E1** command.

Step 4 Specify the new interface with the **show interfaces serial** *slot/port:channel-group* command and verify that the first line of the display specifies the serial interface with the correct slot, port and channel-group number. Also verify that the interface and line protocol are in the correct state: up or down.

Step 5 Display the protocols configured for the entire system and specific interfaces with the command **show protocols**. If necessary, return to the configuration mode to add or remove protocol routing on the system or specific interfaces.

Step 6 Display the entire system configuration file with the **show configuration** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, contact a customer service representative for assistance.

This completes the configuration procedure for the new MIP interface.

Downloading Microcode

Cisco 7000 series routers support downloadable microcode, which enables you to upgrade microcode versions without having to physically replace the ROMs on the boards. You can download new microcode versions and store multiple versions in Flash memory, and you can boot from them just as you can with the system software images. System software upgrades might also contain upgraded microcode images, which will load automatically when the new software image is loaded.

You can download microcode to Flash memory by copying the TFTP image of a microcode version to Flash memory. When the microcode image is stored in Flash memory you can use the **microcode reload** command to manually load the new microcode file, and the **configure** command to instruct the system to load the new image automatically at each system boot.

Caution Before you copy a file to Flash, be sure there is ample space available in Flash memory. Compare the size of the file you wish to copy to the amount of available Flash memory shown. If the space available is less than the space required by the file you wish to copy, the copy process will continue, but the entire file will not be copied into Flash.

In order to compare the size of the microcode image and the amount of Flash memory available, you must know the size of the new microcode image. The image size is specified in the README file that is included on the floppy disk with the new image, and in the *Upgrading System Software and Microcode in the Cisco 7000* publication that is shipped with all Cisco 7000 microcode upgrades. Note the size of the new image before proceeding to ensure that you have sufficient available Flash memory for the new image.

Follow these steps to copy a microcode version from the TFTP server to Flash memory.

Step 1 To display the total amount of Flash memory present, its location, any files that currently exist in Flash memory and their size, and the amount of Flash memory remaining, use the **show flash** command. Following is an example of the output that is displayed:

```
Router# show flash

4096K bytes of flash memory on embedded flash (in RP1).

file    offset      length        name
  0     0xD134      55410         sp1-2
  [4085336/4194304 bytes free]
```

Step 2 Compare the amount of available Flash memory (last line in the preceding example) to the size of the new microcode image on the floppy disk to ensure that there is sufficient space available. If you attempt to copy in a new image, and the size of the new image exceeds the available space in Flash, only part of the new image will be copied and the following error message will be displayed:

```
buffer overflow - xxxx/xxxx
```

where xxxx/xxxx is the number of bytes read in/number of bytes available.

Step 3 After you verify that there is sufficient space available in Flash memory for the new image, enter the following command at the privileged-level prompt:

```
Router# copy tftp flash
```

Step 4 Enter the IP address of the remote host:

```
IP address or name of remote host [255.255.255.255]? 131.108.12.106
```

Step 5 Enter the name of the file you wish to copy to Flash (*MIP1-1* in the following example):

```
Name of file to copy ? MIP1-1
```

Step 6 To confirm that you want the file copied into Flash, press Return.

```
Copy MIP1-1 from 131.108.12.106 into flash memory? [confirm]
```

If the correct file is not shown, enter **no** at the prompt to return to the system prompt and enter the correct file name.

Step 7 If you do not want Flash erased, enter **no** at the next prompt. If you accept the default to erase by pressing Return without first typing **no**, the new image will write over the entire contents of Flash memory and you will lose all other microcode and system software images stored in Flash.

```
Erase flash before writing? [confirm] no
```

While the file is copied to Flash, output similar to the following is displayed:

```
Loading from 131.108.12.106: !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
 [OK - 108966/4194304 bytes]
Verifying via checksum...
Flash verification successful. Length = 53364, checksum = 0x0000
```

Step 8 Use the **show flash** command to verify that the microcode has been copied to Flash. The output should display the file name of the image you copied to Flash (*MIP1-1* in the following example):

```
Router# show flash
4096K bytes of flash memory on embedded flash (in RP1).

file   offset    length      name
 0     0x40      55410       sp1-2
 1     0xD0D4    53364       MIP1-1
  [4085336/4194304 bytes free]
```

Step 9 To ensure that the new microcode is used when you reboot the system, add the appropriate commands to the configuration file. To modify the configuration file, enter the following command:

```
Router# configure terminal
```

Step 10 Specify that you are changing the microcode for the MIP (*microcode MIP*), and that it will load from Flash memory *(flash)*. Then add the file name of the new microcode image to be loaded from Flash:

```
microcode MIP flash MIP1-1
```

Step 11 To save the configuration file, enter **Ctrl-Z**.

Step 12 Copy the new configuration to NVRAM:

```
Router# write memory
```

The **microcode reload** command is automatically added to your running configuration. The new MIP microcode image will load automatically the next time the system boots or reinitializes.

Step 13 To load the new microcode immediately, you can instruct the system to load the new microcode by issuing the **microcode reload** configuration command (you must be in configuration mode to enter this command):

```
Router# configure
```

```
microcode reload
```

Immediately after you enter the **microcode reload** command and press Return, the system reloads all microcode. Configuration mode remains enabled; after the reload is complete, enter **Ctrl-Z** to exit from configuration mode and return to the system prompt.

Step 14 To verify that the MIP is using the correct microcode, issue the **show configuration** or **show controller cbus** command. The **show controller cbus** display indicates the currently loaded and running microcode version for each interface processor and the SP (or SSP).

```
Router# show configuration
```

This completes the procedure for downloading microcode to Flash memory.

Removing and Replacing Port Adapters

Port adapters provide the ports for the E1 and T1 interfaces. Each port adapter provides one port. Each MIP is shipped from the factory with one or two port adapters installed. *You cannot add ports to an MIP by installing an additional port adapter. Port adapters are not field-replaceable units (FRUs)*; however, you need to remove an existing E1 port adapter in order to access jumper J6.

Before proceeding, refer to the section Removing the MIP, page 14.

Caution To prevent damaging the MIP and port adapters, remove and install port adapters only when it is necessary. Do not attempt to isolate faults or to troubleshoot MIPs or interfaces by swapping port adapters. The surface-mount circuitry on the port adapters will not tolerate excessive handling. *Do not mix T1 and E1 port adapters on the same mother board.*

Tools Required

You need the following tools to complete this procedure:

- Number 1 Phillips screwdriver
- 3/16-inch nut driver
- An ESD-preventive wrist strap or other grounding device to prevent ESD damage

Removing a Port Adapter

Port adapters are installed on each MIP at the factory. Each port adapter is anchored to the MIP with one plastic double-row vertical board-to-board (BTB) connector and four Phillips screws that extend through standoffs, into the mother board. (See Figure 13.) The port adapter is also anchored to the carrier faceplate with two jackscrews and two lock washers.

Caution The surface-mounted components on the port adapters are extremely susceptible to ESD damage. Keep each port adapter in a separate antistatic bag until you are ready to install it. Always wear an ESD-preventive ground strap and handle boards as little as possible. When you must handle the board, limit contact to the board edges only, avoiding contact between the board and clothing.

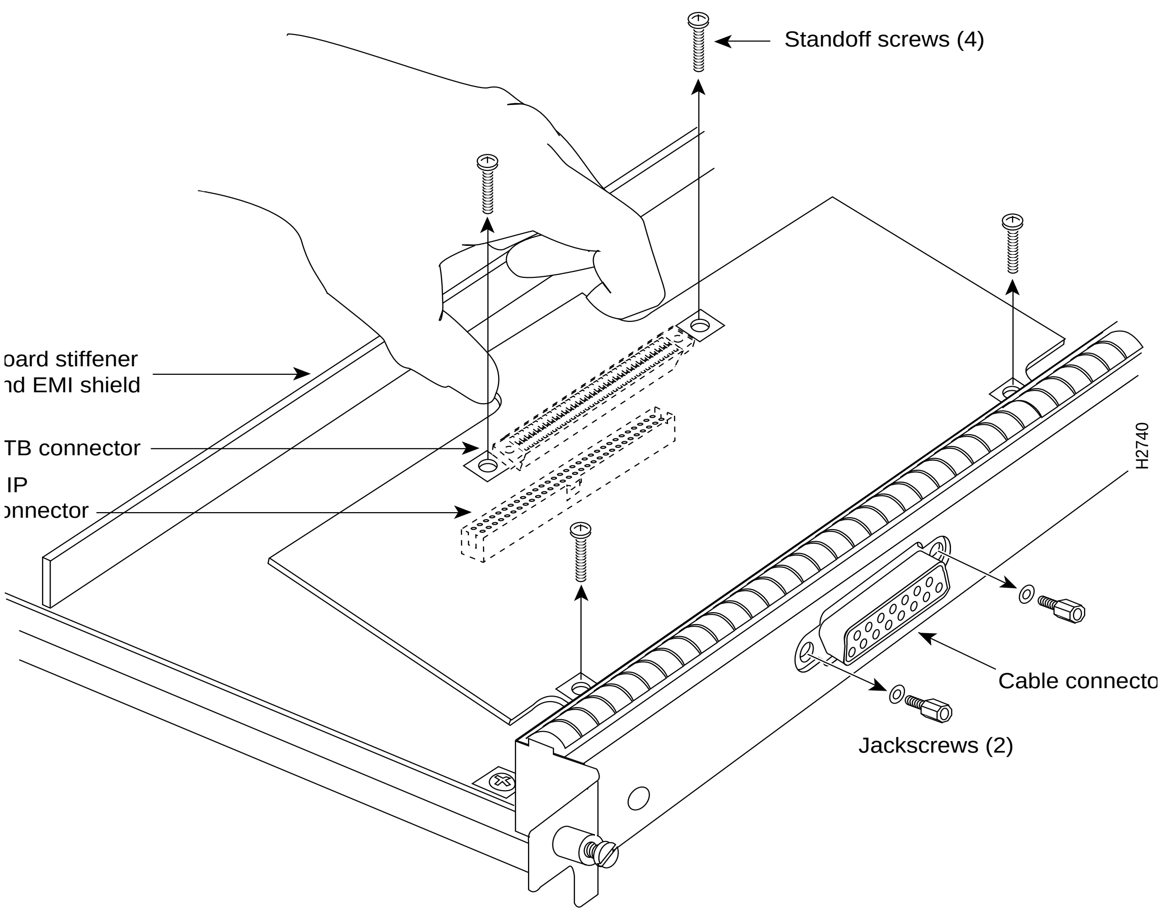
To remove an E1 port adapter from the MIP, refer to Figure 13 and perform the following steps:

Step 1 Ensure that the MIP is resting on an antistatic mat or on antistatic foam. You should still be wearing an ESD-preventive strap.

Step 2 Position the MIP so that it is in the same orientation shown in Figure 13.

Step 3 Locate the E1 port adapter to be removed and use a 3/16-inch nut driver to loosen the two jackscrews, one on either side of the cable connector. (See Figure 13.)

Figure 13 Removing an E1 Port Adapter



Step 4 Remove the jackscrews and washers and put them aside.

Step 5 Use a number 1 Phillips screwdriver to loosen and remove the four standoff screws. (See Figure 13.) The port adapter is now held in place only by the plastic BTB connector.

Step 6 While avoiding contact with any traces or components on the board, insert your thumb and forefinger under the extension behind the BTB connector and gently lift the adapter upward to dislodge it from the MIP connector. If the port adapter resists, rock it very slightly from side to side until it pulls free of the MIP connector.

Caution To prevent damage to the MIP, do not pry the port adapter out with a screwdriver or any other tool. In particular, do not use the board stiffener for leverage.

Step 7 When the port adapter is completely disconnected from the MIP connector, tilt the back of the port adapter up at about a 70-degree angle from vertical and slowly pull it up and out (using the orientation shown in Figure 13) and away from the faceplate. The MIP cable connector will pull out of the cutout in the faceplate.

Step 8 To reconfigure jumpers on the E1 port adapter, refer to the section Configuring Jumper J6 on the E1 Port Adapter, page 19. After you have set the jumpers, proceed to the section "Installing Port Adapters."

Caution To prevent overheating chassis components, do not reinstall the MIP in the chassis unless all port adapters are in place. The empty port will allow cooling air to escape freely through the cutouts in the faceplate, which could misdirect the airflow inside the chassis and allow components on other boards to overheat.

Replacing a Port Adapter

If necessary, refer to the previous section to remove an E1 port adapter from the MIP. Refer to Figure 14 while you perform the following steps:

Step 1 Ensure that the MIP is resting on an antistatic mat or on antistatic foam and position it with the same orientation as that shown in Figure 14. You should still be wearing an ESD-preventive ground strap.

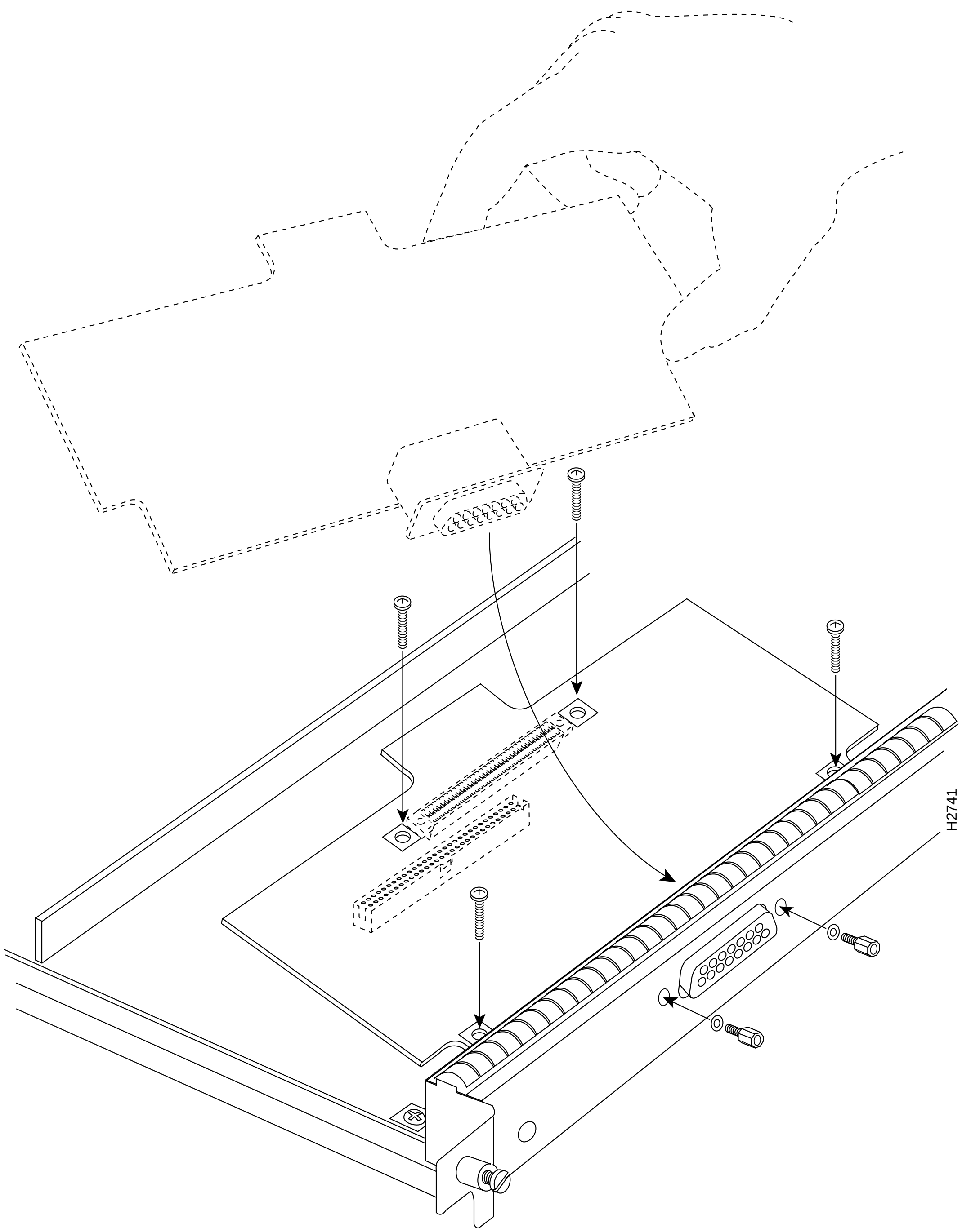
Step 2 Handle the port adapter by the board edges only.

Step 3 Position the port adapter so that it is in the orientation shown in Figure 14: at about a 70-degree angle from vertical, component-side down, standoffs on the underside, and the external interface cable connector facing the inside of the carrier faceplate.

Step 4 As shown in Figure 14, *partially* insert the cable connector through the back of the cutout in the carrier faceplate. Do not force the cable connector through the cutout until the standoffs and BTB connector is aligned.

Step 5 With the cable connector partially inserted into the faceplate cutout, slowly lower the back (opposite) side of the port adapter. Continue to ease the cable connector through the cutout until the BTB connector and the MIP and port adapter meet and the standoffs on the MIP are aligned with the standoff holes in port adapter. Shift the port adapter until the cable connector is fully inserted through the cutouts and the standoffs are aligned with the standoff holes. (See Figure 14.)

Figure 14 Installing an E1 Port Adapter



Step 6 Place your fingers over the BTB connector and firmly (but gently) press down until the BTB connector mates with the MIP connector. If the connector resists, do not force it. Shift the port adapter around until the connectors mate properly.

Step 7 Insert the four long Phillips screws through the four port adapter holes and finger-tighten them. These screws extend through the standoffs and the MIP board and thread into the metal carrier.

Step 8 Install a lockwasher on each of the two jackscrews.

Step 9 Insert the two jackscrews through the front of the carrier faceplate and into the holes on either side of the cable connector.

Step 10 When all screws and connectors are aligned properly, use a Phillips screwdriver to tighten the four standoff screws and a 3/16-inch nut driver to tighten the two jackscrews. *Do not overtighten any of these screws.*

Step 11 Follow the steps in the section Installing the MIP, page 15 to reinstall the MIP in the chassis.

Step 12 Reconnect the network interface cables or other connection equipment to the MIP interface ports.

Caution To prevent potential EMI and overheating problems, do not replace the MIP in the chassis unless all port adapters are installed. An empty port violates the EMI integrity of the system, and also allows cooling air to escape freely through the cutouts in the carrier faceplate, which could misdirect the airflow inside the chassis and allow components on other boards to overheat.

When you insert the new MIP, the console terminal will display several lines of status information about OIR as it reinitializes the interfaces. Change the state of the interfaces to up and verify that the configuration matches that of the interfaces you replaced.

Use the **configure** command or the **setup** command facility to configure the new interfaces. You do not have to do this immediately, but the interfaces will not be available until you configure them and bring them up.

After you configure the interfaces, use the **show controller cbus**, **show controller T1**, **show controller E1** commands to display the status of the new interface. For brief descriptions of commands refer to Using Show Commands to Verify the MIP Status, page 26.

For complete command descriptions and instructions refer to the appropriate software publications.

This completes the port adapter replacement procedure.

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