



Doc. No. 78-1342-02

Channel Interface Processor (CIP) Installation and Configuration

Product Numbers: CX-CIP-ECA1=, CX-CIP-ECA2=, CX-CIP-ECAP1=, CX-CIP-PCA1=, CX-CIP-PCA2=, CX-CIP-ECA1, CX-CIP-ECA2, CX-CIP-ECAP1, CX-CIP-PCA1, CX-CIP-PCA2, CAB-PCA-Y=, CAB-PCA-VA=, CAB-PCA-VB=

This document contains instructions for installing (or replacing) the Channel Interface Processor (CIP) in Cisco 7000 series and Cisco 7500 series routers. For complete and detailed descriptions of CIP-related interface commands, configuration options, and requirements, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.

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Product Descriptions

This section discusses the CIP and the Cisco 7000 series and Cisco 7500 series routers.

CIP Overview

The CIP provides up to two channel-attached interfaces for Cisco 7000 series and Cisco 7500 series routers, eliminating the need for a separate front-end processor.

The CIP interfaces are combinations of a bus and tag (also called an original equipment manufacturer's interface [OEMI] and a parallel I/O interface) adapter and an Enterprise Systems Connection (ESCON) adapter.

The bus and tag adapter is called the Parallel Channel Adapter (PCA), and the ESCON adapter is called the ESCON Channel Adapter (ECA). The PCA and ECA connect directly to the CIP, and any combination of the two adapters can be used.

Note The ECA and PCA adapters can be upgraded or replaced (in the field) by a Cisco-certified maintenance provider *only*.

Channel Attachment Overview

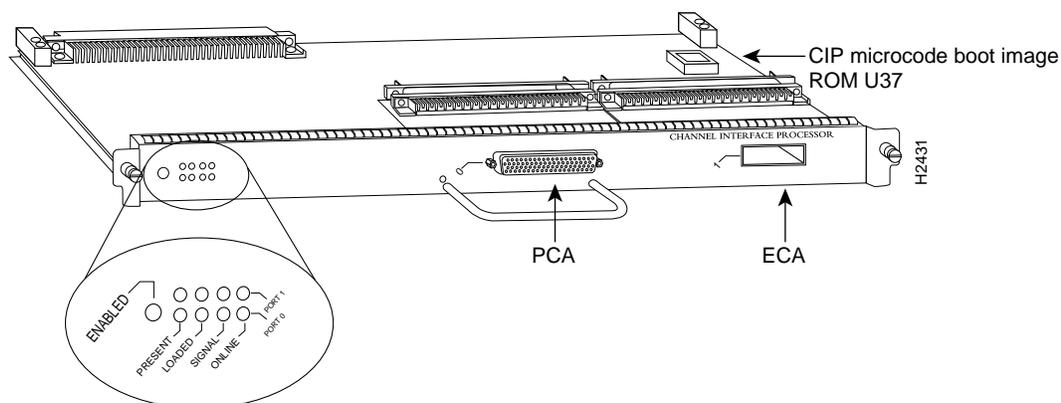
A mainframe channel (referred to as a *channel*) is an intelligent processor that manages the protocol on the communications media and controls the data transfer to and from the main central processing unit (CPU) storage. Devices called input/output processors (IOPs) communicate between the host CPU and the channel. One IOP controls multiple channels, and there is no relationship between the number of CPUs and the number of IOPs.

The channel relieves the mainframe CPU of direct communication with input/output (I/O) devices, which saves processing cycles and allows data processing and communications tasks to run concurrently. Channels use one or more channel paths as the links between mainframes and I/O devices. I/O devices are connected directly to control units, which provide the logical capabilities required to operate and control the I/O devices.

CIP Description

The CIP (see Figure 1) consists of a motherboard that is mounted on a metal carrier and one or two ECA and/or PCA interfaces. The ECA and PCA interfaces attach to the motherboard by means of a multipin connector located at the rear edge of the adapter.

Figure 1 Channel Interface Processor, Horizontal Orientation



Note The ECA and PCA adapters can be upgraded or replaced (in the field) by a Cisco-certified maintenance provider *only*.



Caution To prevent damage, and to prevent insertion problems caused by misalignment of the adapters and motherboard, do not attempt to remove the adapters or motherboard from the carrier.

Model Numbers

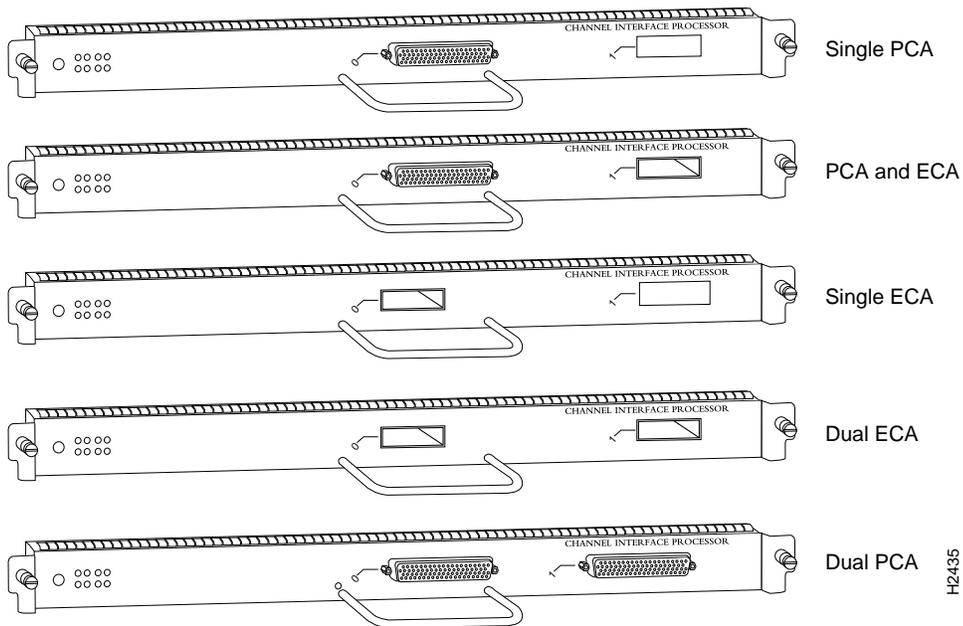
There are three CIP carrier types, which offer the following five interface adapter combinations:

- Single PCA on a PCA/ECA carrier (CX-CIP-PCA1)
- Combination PCA and ECA (CX-CIP-ECAP1)
- Single ECA on a dual ECA carrier (CX-CIP-ECA1)
- Dual ECA on a dual ECA carrier (CX-CIP-ECA2)
- Dual PCA on a dual PCA carrier (CX-CIP-PCA2)

Note Add an equal sign (=) to the product number when you order interface processors as spares.

The ECA has a female, duplex connector, and the PCA has a female, DB-78 connector. Figure 2 shows the ECA and PCA interface combinations.

Figure 2 CIP Interface Adapter Combinations



DRAM Configurations

Each CIP model is available in the following configurations of dynamic random-access memory (DRAM) single in-line memory modules (SIMMs):

- 8-MB DRAM, using two 1Mx36 SIMMs (four DRAM devices per SIMM)¹
- 32-MB DRAM, using two 4Mx36 SIMMs (four DRAM devices per SIMM)
- 64-MB DRAM, using two 8Mx36 SIMMs (four DRAM devices per SIMM)

Note CIP DRAM can *only* be upgraded in the field by Cisco-certified service personnel.

1. The 8-MB DRAM memory option is the default memory configuration for the CIP.

ESCON and Bus and Tag Specifications

Table 1 lists the specifications for the ESCON and bus and tag interfaces.

Table 1 ESCON and Bus and Tag Specifications

Characteristic	ESCON	Bus and Tag
Supported processor I/O architectures	ESA/390	System/370 370/Xa ESA/390
Bit transmission	Serial	Parallel
Maximum distance (for LED with ESCON)	1.9 miles (3.1 km) point-to-point 5.7 miles (9.2 km) with two ESCON Directors	400 ft (122 m) ¹
Channel data rate	Up to 17 MBps ²	Up to 4.5 MBps
Signaling rate ³	200 Mbps ⁴	4.5 MBps
Cable types	Fiber-optic (62.5/125 micron multimode)	Copper bus and tag
Connection types	Dynamic ⁵	Static
Number of addressable devices per channel	256 x 16 x 16 x 253 ⁶	256
Connectable control units per channel	Up to 59 (through a 9032 ESCON Director)	Up to 8
Connectable channels per adapter	Up to 59 (through a 9032 ESCON Director) Varies by control unit	1

1. The IBM 3044 C/D (host side/remote side) copper-to-fiber repeater can be used to extend this distance up to 1.2 miles (2 km).
2. MBps = megabytes per second.
3. For bus and tag, the signaling rate matches the channel data rate. For example, if you use a 3.0 MBps channel, the signaling rate is 3.0 MBps. The ESCON interface signals at a constant rate; the bus and tag interface signals at the data rate.
4. Mbps = megabits per second.
5. The CIP ESCON requires dynamic = NO with HCD.
6. Where 256 represents available unit addresses, 16 represents the number of partitions (LPARs), 16 represents the number of control unit images, and 253 represents the number of ESCON director paths. It is unlikely a system would have the resources to support the total number of available addresses.

LED Indicators and Sequences

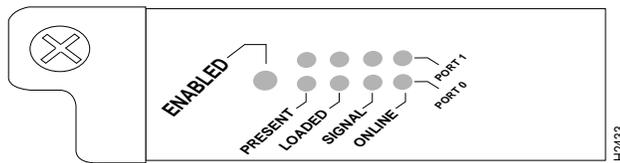
Following are the functions of the CIP LEDs. (See Figure 3.)

- Enabled—Indicates that the CIP has been enabled for operation by the system.
- Present—Indicates that the (ECA or PCA) adapter has been detected by the CIP.
- Loaded—Indicates that the (ECA or PCA) adapter firmware has been completely loaded.
- Signal—For the ECA, this LED indicates that the Sync signal has been detected.

For the PCA, this LED indicates that the Operational Out signal has been detected. Note that even though a system reset and selective reset both cause the Operational Out signal to drop, the signal LED will still be on during those sequences.

- Online—For the ECA, this LED indicates that an establish-logical-path request has been received from the channel. For the PCA, this LED indicates that the PCA is ready to establish connection to the host channel.

Figure 3 CIP LED Indicators



Following are the sequences for the CIP LED indicators. The enabled LED is not part of the following sequences. On cold boots, the following LED sequences apply:

	Present	Loaded	Signal	Online
Port 1	On	On	Off	Off
Port 0	Off	Off	Off	Off

	Present	Loaded	Signal	Online
Port 1	On	On	On	On
Port 0	On	On	Off	Off

	Present	Loaded	Signal	Online
Port 1	On	On	On	On
Port 0	On	On	On	On

The following LED sequence indicates that the CIP is waiting for commands from the RP (or RSP).

	Present	Loaded	Signal	Online
Port 1	Off	Off	Off	Off
Port 0	Off	Off	Off	Off

On warm boots, the LEDs flash briefly. On downloads, the following three LED sequences apply; the first indicates that the system is downloading volatile programmable logic device (VPLD) code:

	Present	Loaded	Signal	Online
Port 1	On	On	On	On
Port 0	On	On	On	Off

The following sequence indicates that the CIP is downloading microcode:

	Present	Loaded	Signal	Online
Port 1	Off	Off	Off	Off
Port 0	On	On	On	On

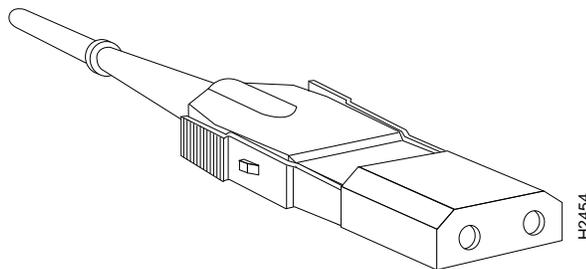
The following sequence indicates that the CIP is starting to execute the microcode:

	Present	Loaded	Signal	Online
Port 1	Off	Off	Off	Off
Port 0	Off	Off	Off	Off

ESCON Cable

The ECA interface uses 62.5/125 micrometer, multimode, fiber-optic cable with male duplex connectors at each end. (See Figure 4.) ESCON cables are not available from Cisco Systems. Refer to the ESCON specifications given in Table 1 and contact your cable supplier or the vendor of your host CPU to order the correct ESCON cable.

Figure 4 ESCON Interface Duplex Connector for the ECA



Bus and Tag Cables

Following are descriptions and illustrations of the bus and tag cables.

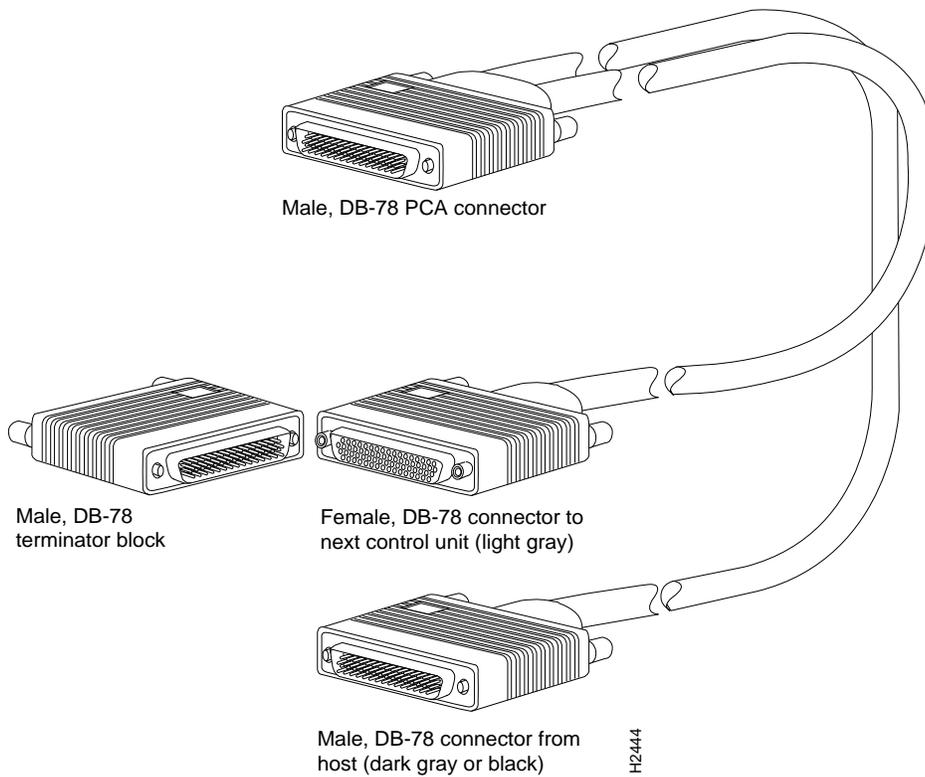
Y Cable

The bus and tag cable with three 78-pin connectors (shown in Figure 5) has a DB-78 male (PCA) connector on the CIP end, a DB-78 female connector on the next-control-unit end, and a DB-78 male connector on the from-host end. The model number is CAB-PCA-Y (referred to as the *Y cable*). The male connector might be labeled *IN* and is typically black, but can also be a dark gray. The female connector might be labeled *OUT* and is typically light gray. The female OUT cable is nearest to the select/bypass switch, which is discussed on the following page. (The IBM part number is 89F8392; however, this is subject to change.)



Caution The Y cable must be connected directly to the PCA. Do not connect any other cables directly to the PCA.

Figure 5 PCA Bus and Tag Cable, CAB-PCA-Y

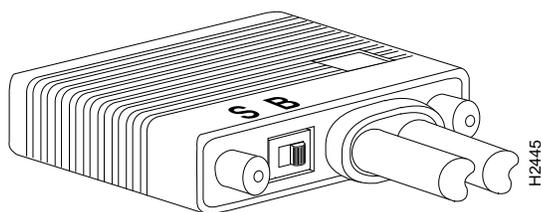


Note the switch marked *S* (for select mode) and *B* (for bypass mode). The switch is located on the rear of the PCA connector. (See Figure 6.) The select/bypass switch is required to allow the cable to be separated from the PCA without “opening” the select-out loop.



Caution To prevent halting the system or negatively affecting the mainframe operating system, verify that the select/bypass switch is in bypass mode before you remove the PCA connector from the CIP.

Figure 6 Select/Bypass Switch on the Rear of the PCA Connector, CAB-PCA-Y Bypass Shown



In select mode the PCA is operational, and the select-out signal is passed in a loop to all control lines on the channel. All control units have a relay that shorts the incoming select-out signal to the outgoing select-out signal when power is not applied to the control unit. When power is applied, the relay is opened, and the signal is passed to the PCA.

Without the select/bypass switch in bypass mode, the channel would need to be taken offline before servicing or replacing a CIP. If the selected address does not match, the select-out signal is passed to the next control unit. If the select-out signal gets all the way back to the channel, the control unit being addressed is not present. In bypass mode, the incoming select-out signal is shorted to the outgoing select-out signal, bypassing the downstream control unit, which is still active.



Caution Make sure you provide adequate strain relief for the heavy bus and tag cables that attach to the PCA, to prevent damaging the PCA connector on the CIP by unintentionally disconnecting the Y cable from the PCA connector.

VA and VB Cables

The two bus and tag cables with connector blocks have a DB-78 (male or female) connector on the CIP end and 48-pin type-A connector blocks on the bus and tag ends. (See Figure 7.)

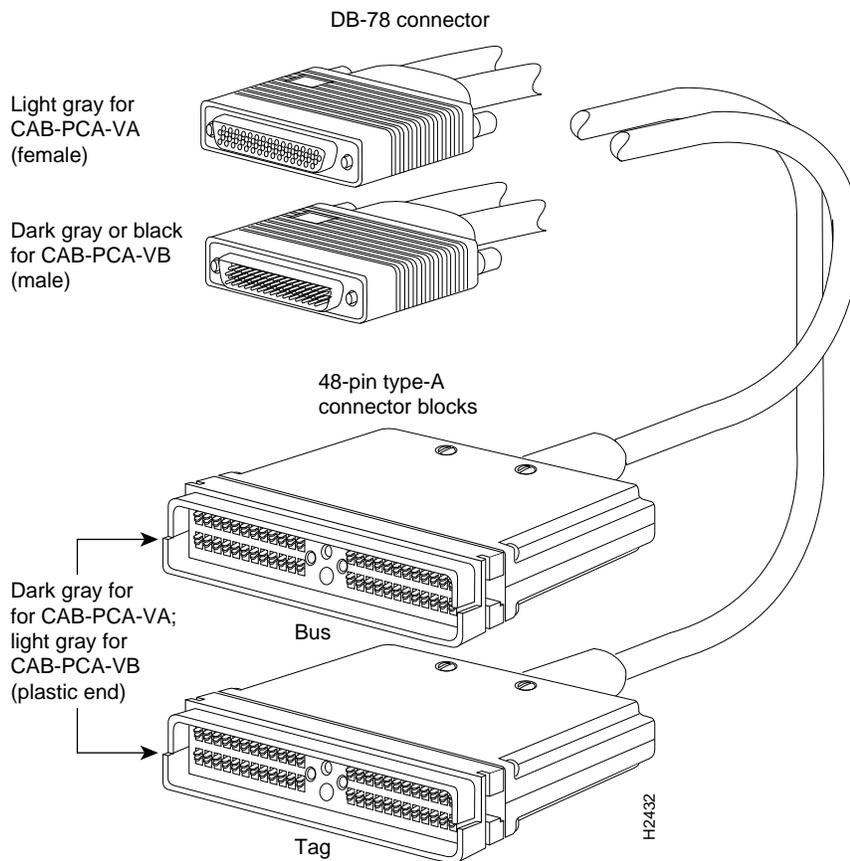
For the bus and tag cable that attaches between the host and the PCA, the model number is CAB-PCA-VA, and it is referred to as the *VA cable*. The female 78-pin connector might be labeled *IN* and is typically light gray. The cable labeled *P2* is bus, and the cable labeled *P3* is tag. Looking into the end of the female 78-pin connector (on the VA cable), with the wide part of the connector D-shell on top, the *P2* (bus) cable is on the right, and the *P3* (tag) cable is on the left. The plastic on the ends of the bus and tag connectors might be black or dark gray. The IBM part number is 12G8058; however, this is subject to change. The VA cable ships with a terminator; the Cisco model number CAB-PCA-VA includes this terminator. The terminator and VA cable together have the IBM part number 12G7988; however, this is subject to change.

For the bus and tag cable that attaches between the next control unit and the PCA, the model number is CAB-PCA-VB, and it is referred to as the *VB cable*. The male 78-pin connector might be labeled *OUT* and is typically black or dark gray. The cable labeled *P2* is bus and the cables labeled *P3* is tag. Looking into the end of the male 78-pin connector (on the VB cable), with the wide part of the connector D-shell on top, the P2 (bus) cable is on the left and the P3 (tag) cable is on the right. The plastic on the ends of the bus and tag connectors might be light gray (as opposed to the black or dark gray plastic on the VA cable). The IBM part number is 12G7933; however, this is subject to change.



Caution To prevent potential system problems, do not connect the VB cable directly to the PCA. You must connect the Y cable to the PCA, then connect the VB cable to the Y cables as appropriate.

Figure 7 PCA Bus and Tag, VA and VB Cables



The Y cable always attaches to the PCA. The VA cable attaches between the male end of the Y cable and the host. The VB cable attaches between the female end of the Y cable and the next (or new) control unit. Do not connect VB cable directly to the PCA. If the PCA is the last control unit, channel termination is required at the end of the Y cable that points away from the host. (See Figure 5.) For attachment instructions refer to the section “Attaching the CIP to the Channel” on page 24.



Caution To prevent damaging the PCA connector on the CIP by unintentionally disconnecting the Y cable from the PCA connector, provide adequate strain relief for the heavy bus and tag cables that attach to the PCA.

What Are the Cisco 7000 and Cisco 7500 Series?

For the Cisco 7000 and Cisco 7500 series routers, network interfaces reside on modular interface processors, which provide a direct connection between external networks and the high-speed CxBus in the Cisco 7000 series and the high-speed CyBus in the Cisco 7500 series.

In all systems, the remaining slots support any combination of network interface types: Ethernet, Fast Ethernet, Asynchronous Transfer Mode (ATM), Token Ring, multichannel applications, Fiber Distributed Data Interface (FDDI), channel attachment, serial, or High-Speed Serial Interface (HSSI).

Figure 8 and Figure 9 show the rear of the Cisco 7000 series routers: the seven-slot Cisco 7000 and the five-slot Cisco 7010, respectively. In the Cisco 7000 series, two slots are reserved for the Route Processor (RP), which contains the system processor, and the Switch Processor (SP) (or Silicon Switch Processor [SSP]), which performs packet switching functions. The remaining slots are for interface processors: slots 0 through 4 in the Cisco 7000 and slots 0 through 2 in the Cisco 7010.

Figure 8 Cisco 7000, Interface Processor End

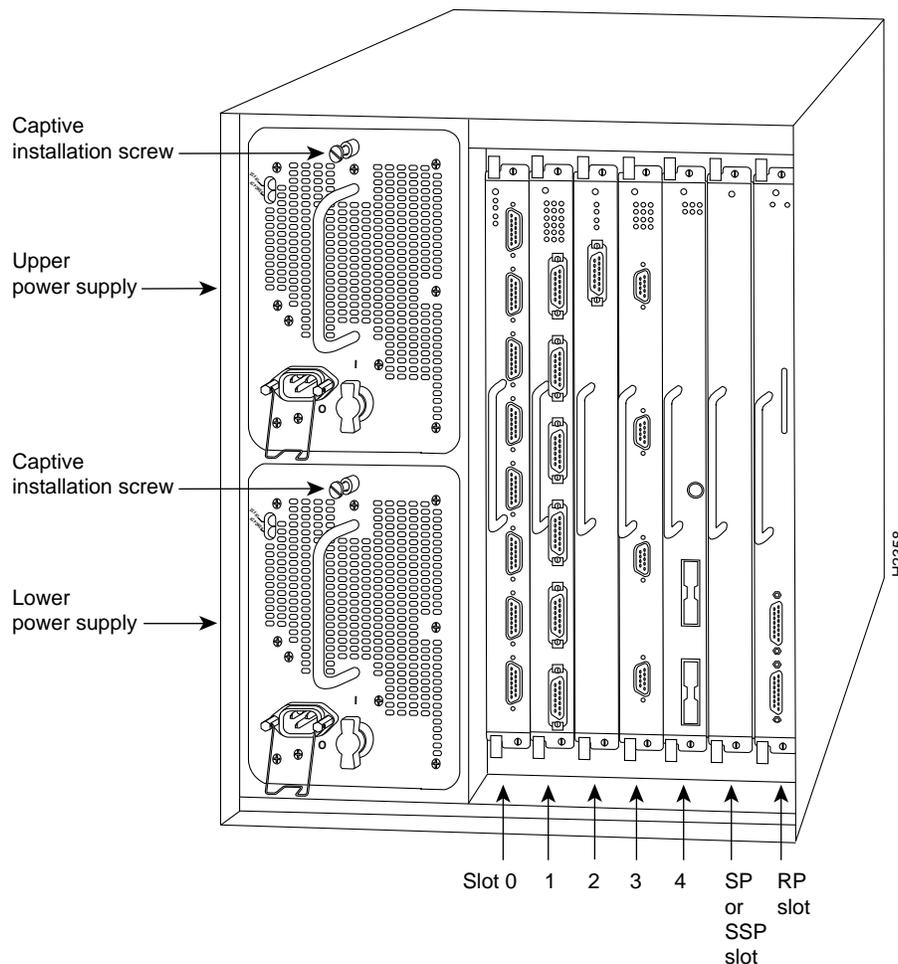


Figure 9 Cisco 7010, Interface Processor End

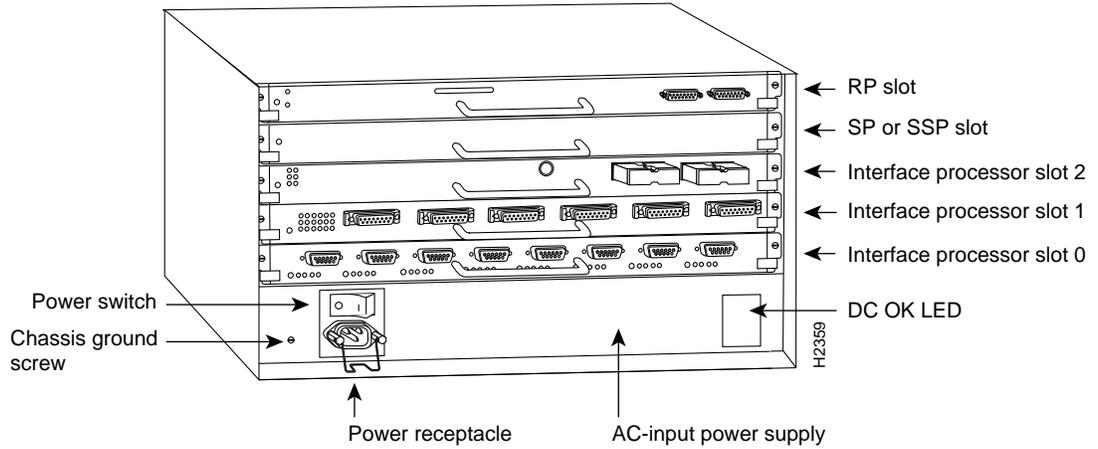


Figure 10, Figure 11, and Figure 12 show the Cisco 7500 series routers: the Cisco 7505, the Cisco 7507, and the Cisco 7513, respectively. In the Cisco 7505, one slot (4) is reserved for the Route Switch Processor (RSP1), which contains the system processor and performs packet switching functions. Slots 0 through 3 are for interface processors.

Figure 10 Cisco 7505, Interface Processor End

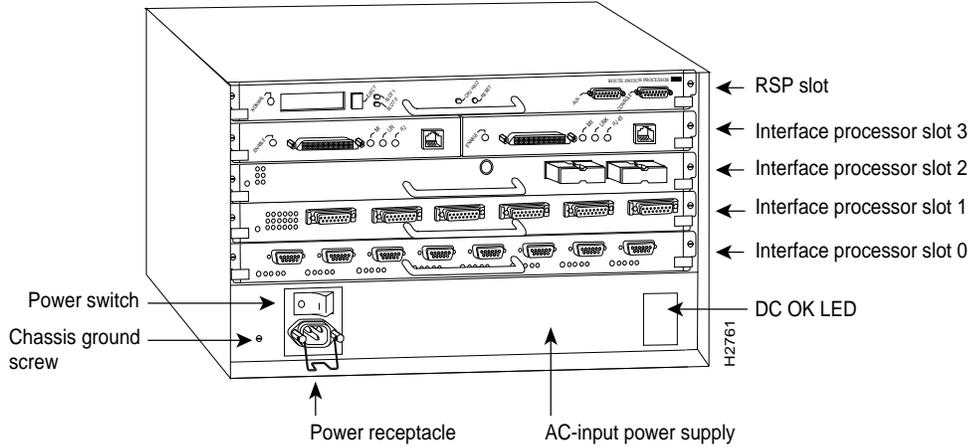


Figure 11 shows the rear of the seven-slot Cisco 7507 router. In the Cisco 7507, up to two slots (2 and 3) are reserved for the Route Switch Processor (RSP2), which contains the system processor and performs packet switching functions. Slots 0 and 1, and 4 through 6 are for interface processors.

Figure 11 Cisco 7507, Interface Processor End

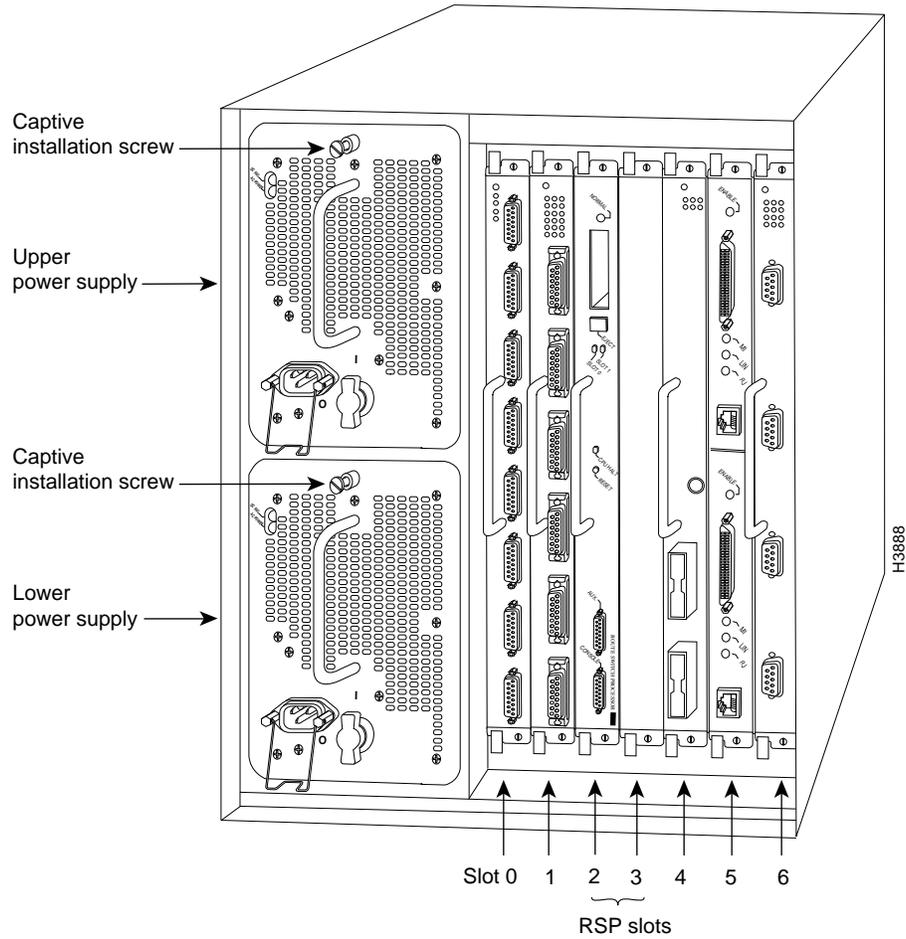
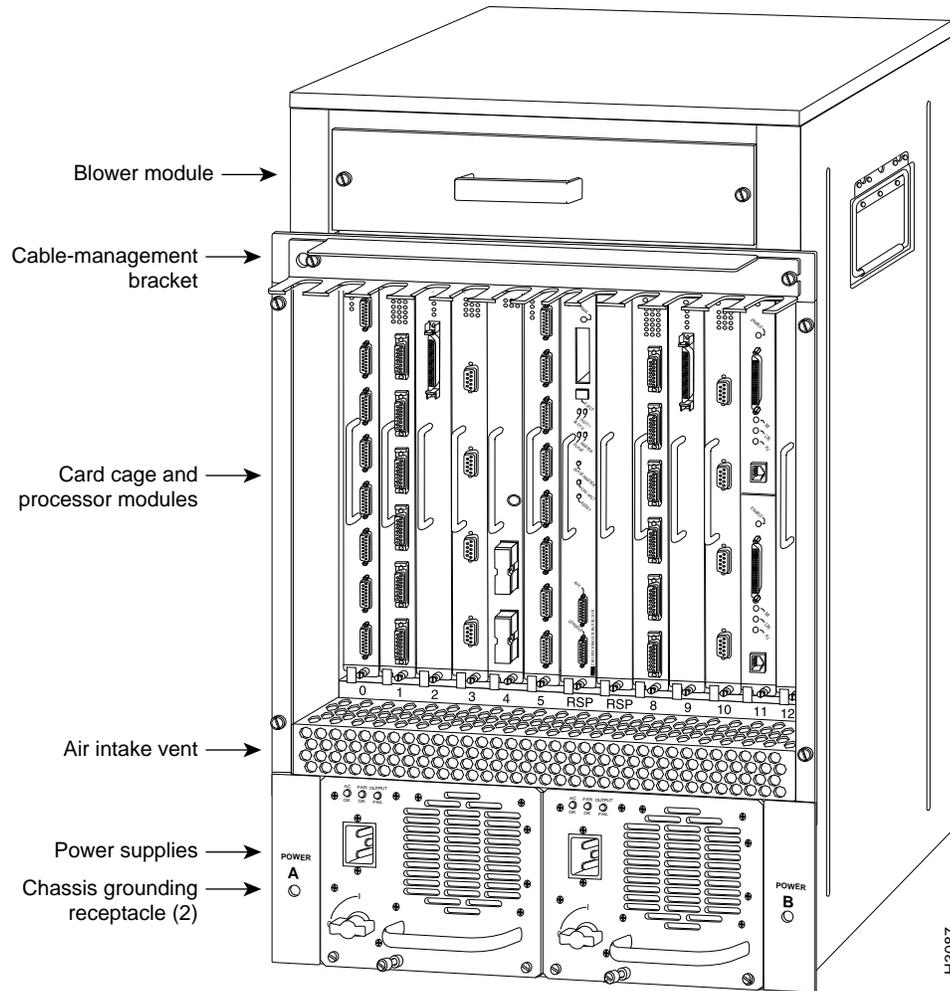


Figure 12 shows the rear of the Cisco 7513, with two AC-input power supplies installed. Two slots (6 and 7) are reserved for the second generation Route Switch Processor (RSP2), which contains the system processor and performs packet-switching functions. Slots 0 through 5, and 8 through 12 are for interface processors.

Figure 12 Cisco 7513, Interface Processor End



Note Support for the CIP is not available with the initial release of the Cisco 7505 and RSP1, or the Cisco 7507 and Cisco 7513 and the RSP2.

The CIP supports online insertion and removal (OIR), which allows you to install or remove a CIP while the system is operating, without shutting down system power.

Installation Prerequisites

Before you install the CIP, review the safety and electrostatic discharge (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, and lists the software and microcode requirements.

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 when potentially hazardous conditions exist.
- Never assume that power has been 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

ESD damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Each processor module contains a printed circuit card 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 an ESD-preventive wrist or ankle strap whenever you handle any electronic system component.

Following are guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact.
- When you work at the interface processor end of the chassis, connect the equipment end of the strap to a captive installation screw on an installed interface processor, or to any unpainted chassis surface.
- When you install a processor module, use the ejector levers to properly seat the bus connectors in the backplane, then tighten both captive installation screws. These screws prevent accidental removal, provide proper grounding for the system, and help to ensure that the bus connectors are seated in the backplane.
- Handle processor modules by the carrier handles and carrier edges only; never touch the board or any connector pins.
- When you remove a processor module, place it card side up on an antistatic surface or in a static shielding bag. Immediately place the module in a static shielding bag if you need to return it to the factory.
- Avoid contact between electronic equipment and clothing. Antistatic straps only protect the equipment from ESD voltages on the body; ESD voltages on clothing can still cause damage.



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

Online Insertion and Removal—An Overview

The OIR feature allows you to remove and replace 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 CIP are contained in the following sections.

Each 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.

Required Tools and Parts

You need the following tools and parts to install or replace a CIP. If you need additional equipment, contact a customer service representative for ordering information.

- Number 2 Phillips or one-quarter-inch flat-blade screwdriver for the captive installation screws on the CIP. (Although most interface processors use slotted screws, some interface processor carriers use Phillips screws.)
- A new CIP if you are replacing an existing CIP or installing a new one.
- The appropriate cable for your CIP type: bus and tag for a PCA (with terminal blocks or 78-pin connectors) and/or ESCON fiber with duplex connectors for an ECA.
- ESD-preventive wrist strap or other device for preventing ESD damage.
- Interface processor filler (MAS7K-BLANK) if you are removing a CIP and not installing a new CIP or other interface processor in the empty slot.

Software Prerequisites

The CIP is compatible in the Cisco 7000 series routers with Cisco Internetworking Operating System (Cisco IOS) Release 10.2(6) or later.

The CIP is compatible in the Cisco 7500 series routers with Cisco IOS Release 10.3(7), or later, and Cisco IOS Release 11.0(3) or later.

The **show version** and **show hardware** commands display the current hardware configuration of the router, including the system software version that is currently loaded and running. The **show microcode** command lists the bundled microcode (target hardware) version for each processor type. The **show controller cxbus** or **show controller cbus** commands show the microcode version you are running. (For complete descriptions of **show** commands, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.)

You can determine the current version of software or microcode stored in read-only memory (ROM) either by removing the processor module and checking the ROM labels or by configuring the system to boot the system software or microcode from ROM, reloading the system, and using **show** commands to check the version that is loaded and running. Refer to the section “Configuring Microcode” on page 30 for basic configuration information, and to the appropriate software documentation for complete configuration instructions and examples.

If the displays indicate that the required system software and microcode is not available in your system, contact a customer service representative for upgrade information. (Refer to the section “Cisco Information Online” on page 35.)

Microcode Prerequisites

In the Cisco 7000 series, the CIP is compatible with SP Microcode Version 10.4 or later and SSP Microcode Version 10.4 or later. In the Cisco 7500 series, the SP and SSP are not used so there is no similar requirement.

Microcode, also known as firmware, is a set of processor-specific software instructions that enables and manages the features and functions of a specific processor type. At system startup or reload, the system loads the microcode for each processor type present in the system. The latest available microcode image for each processor type is bundled and distributed with the system software image. The CIP microcode boot image resides in ROM socket U37. (See Figure 1 on page 3.) The entire CIP microcode image is located in the software/microcode bundle.

New microcode is released to enable new features, improve performance, or fix bugs in earlier versions. The Cisco 7000 series and Cisco 7500 series routers feature downloadable software and microcode for most upgrades. These features enable you to download new (upgraded) images remotely, store the images in router memory, and load the new images at system startup without having to physically access the router. You can store multiple versions for a specific processor type in Flash memory, and use configuration commands to specify which version the system should load at startup. All interfaces of the same type (for example, all CIPs) use the same microcode image. Although most upgrades can be downloaded, some exceptions require ROM replacement to ensure proper startup and operation.

Microcode images that are bundled with the system image load automatically along with the new software image. Refer to the section “Configuring Microcode” on page 30 for instructions.

Note As of Cisco IOS Release 10.0 and later, the software and interface processor microcode images are carefully optimized and bundled to work together. Overriding the bundle can result in incompatibility between the various interface processors in the system.



Caution To ensure proper operation of the CIP and to preclude system problems, you must use *only* the CIP microcode image that is bundled.

Installation

The following sections provide a functional overview of online insertion and removal (OIR), and describe the procedures for installing or replacing CxBus interface processors in Cisco 7000 series routers. Before installing any new interfaces, ensure that your system meets the minimum software and microcode requirements described in the sections “Software Prerequisites” and “Microcode Prerequisites” on page 18.

The OIR feature allows you to remove and install a CIP without turning off system power. However, you must follow the insertion instructions carefully; for example, failure to use the ejector levers or insert the CIP properly can cause system error messages indicating a card failure.

Each unused interface processor slot contains an interface processor filler (which is an interface processor carrier without an interface card) to keep dust out of the chassis and to maintain proper airflow through the interface processor compartment. If you install a new CIP, select an empty interface processor slot and remove the interface processor filler. If you replace a CIP, *you can retain the existing interface configuration by removing the existing interface processor and installing the new one in the same slot*; however, the new CIP must be the same hardware type as the CIP you replaced.



Caution To avoid unnecessary errors, read the following OIR overview before removing or replacing a CIP.

Following the OIR overview, proceed to the section “Removing a CIP or an Interface Processor Filler” on page 20 for instructions on making an interface processor slot available for the new CIP, then to the section “Installing a CIP” on page 23 for the installation instructions. After the new CIP is secure, follow the procedures in the section “Checking the Installation” on page 28 to verify that it is installed and functioning properly.

Removing a CIP or an Interface Processor Filler

The CIP supports OIR, so you do not need to shut down the interface or the system power when you remove a CIP; however, to prevent a possible interface control check on the mainframe, consult with your system administrator to take appropriate precautions. If you are installing a new CIP, select an available slot and remove the interface processor filler. If you are replacing a CIP, first remove the existing CIP and immediately place it component side up on an antistatic surface, then insert the new CIP in the same slot to retain the previous configuration for the new channel interface.

Figure 13 shows proper handling of an interface processor for installation in the Cisco 7010 or Cisco 7505 models. The processor slots are oriented horizontally in the Cisco 7010 and Cisco 7505, and vertically in the Cisco 7000, Cisco 7507, and Cisco 7513. When installing interface processors in these latter chassis, handle the interface processor in the same manner, but rotated 90 degrees clockwise.

Figure 13 Handling Interface Processors during Installation

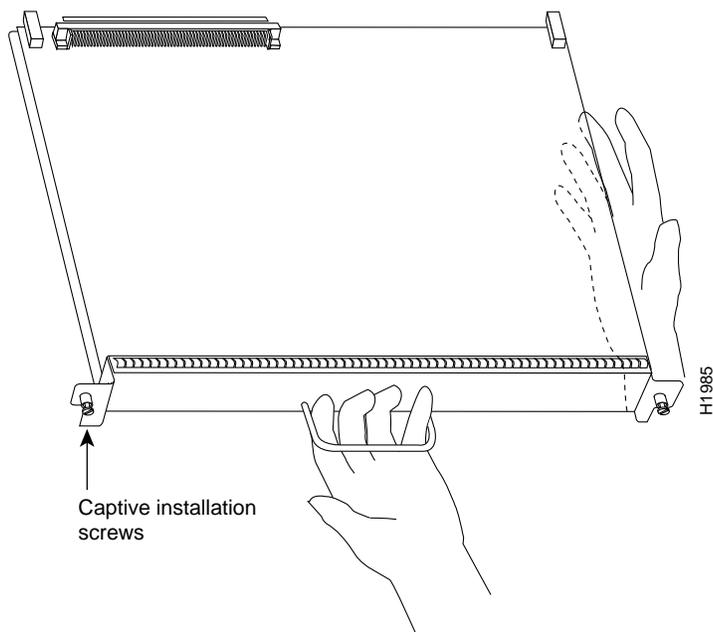
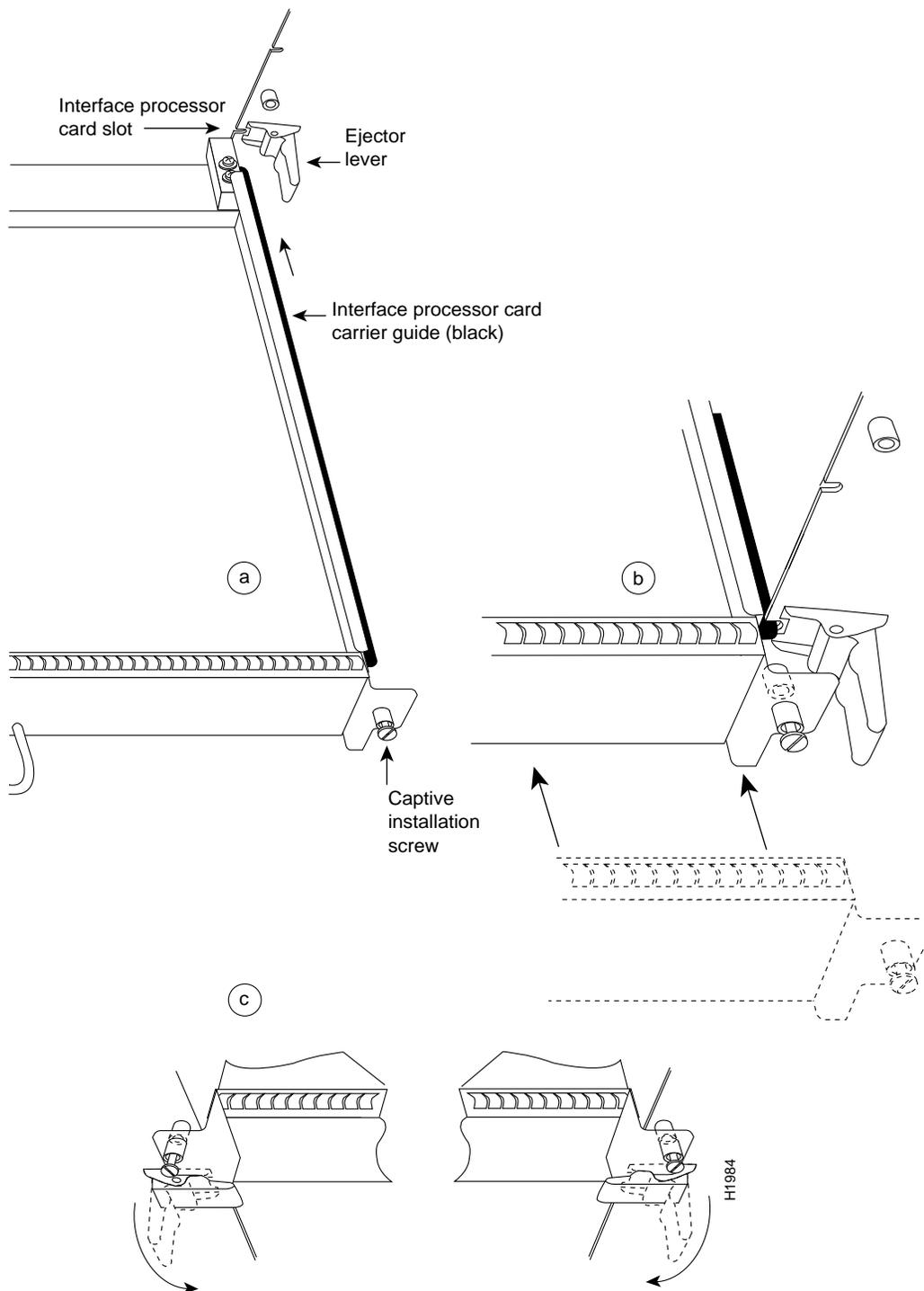


Figure 14 shows the functions of the ejector levers in the correct orientation for the horizontal processor slots in a Cisco 7010 and Cisco 7505 chassis. In a Cisco 7000, Cisco 7507, and Cisco 7513 chassis, the function of the ejector levers is the same, but the orientation is rotated 90 degrees clockwise for the vertical processor slots.

Figure 14 Function of the Ejector Levers



The function of the ejector levers (see Figure 14) 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.

Following are examples of *incorrect* insertion practices and their 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 card failure.
- Using the handle to force or slam the interface processor all the way into the slot can also damage the pins on the card 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 may 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 card failure. Using the ejector levers ensures that the card connector mates with the backplane in one continuous movement.
- Using only the handle to seat or remove an interface processor, or failing to push the ejector levers flat against the CIP faceplate, can leave some (not all) of the connector pins mated to the backplane, a state that will halt 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 you remove an interface processor to ensure that the card connector pins disconnect from the backplane in the logical sequence expected by the system. Any processor module that is only partially connected to the backplane can halt the bus. Detailed steps for correctly performing OIR are included with the following removal and installation procedures.

Refer to Figure 14 while performing the following steps to remove a CIP or interface processor filler. If you are removing an interface processor filler, proceed to step 5. If you are replacing an existing CIP, begin at step 1. In the following procedures, two channel-related terms are used: *vary offline* refers to disabling an interface; *vary online* refers to enabling an interface. For instructions on how to vary the host channel or addresses online or offline, refer to the documentation for your operating system.

- Step 1** Vary offline the addresses assigned to the PCA or ECS. For instructions on how to vary offline, refer to the documentation for your operating system.
- Step 2** Use the **shutdown** interface command to shut down the router interface.
- Step 3** On the PCA connector, place the select/bypass switch in bypass mode. (See Figure 6 on page 9.)
- Step 4** Disconnect the interface cables from the CIP interface ports.
- Step 5** Use a screwdriver to loosen both the captive installation screws on the CIP or interface processor filler. (See Figure 14a.)
- Step 6** Place your thumbs on the ends of each of the ejector levers and simultaneously pull them both outward, away from the interface port (in the opposite direction from that shown in Figure 14c) to release the carrier from the slot. If you are removing a CIP, this also releases the CIP bus connector from the backplane.
- Step 7** Grasp the handle with one hand and pull the CIP or interface processor filler straight out of the slot, keeping your other hand under the carrier to guide it. (See Figure 13.) Keep the carrier parallel to the backplane. Avoid touching the card or any connector pins.

- Step 8** Place the removed CIP on an antistatic mat or foam pad, or place it in an antistatic bag if you need to return it to the factory. If you removed an interface processor filler, store the filler in case you need it later to fill an empty slot.
- Step 9** If the interface processor slot is to remain empty, install an interface processor filler to keep dust out of the chassis and to maintain proper airflow through the interface processor compartment.

This completes the removal procedure. Proceed to the next section to install a new CIP.

Installing a CIP

The CIP slides into any available interface processor slot and connects directly to the backplane of the Cisco 7000 series or Cisco 7500 series router. The backplane slots are keyed so that the CIP can be installed only in an interface processor slot. (Refer to Figure 8, Figure 9, Figure 10, Figure 11, or Figure 12, depending on your chassis type.) Figure 14 shows the functional details of inserting an interface processor and using the ejector levers. Figure 13 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 has completed its verification can cause the system to assume that there has been a hardware failure.

Follow these steps to install a CIP:

- Step 1** Ensure that a console terminal is connected to the RP (or RSP) console port and that the console power switch is turned ON.
- Step 2** Choose an available interface processor slot for the CIP and ensure that the interface cables are of sufficient length to connect the CIP to the channel.
- Step 3** Hold the CIP handle with one hand, and place your other hand under the carrier to support the CIP (see Figure 13), and guide it into the slot. Avoid touching the card or any connector pins.
- Step 4** Place the back of the CIP in the slot and align the notches along the edge of the carrier with the grooves in the slot. (See Figure 14a on page 21.)
- Step 5** Keeping the carrier parallel to the backplane, carefully slide the CIP into the slot until the back of the faceplate makes contact with the ejector levers, then *stop*. (See Figure 14b on page 21.)



Caution Always use the ejector levers when installing or removing interface processor modules. A module that is partially seated in the backplane will cause the system to halt and subsequently crash, and shoving or slamming the interface processor into the slot can damage the backplane and connector pins.

- Step 6** Using the thumb and forefinger of each hand to pinch each ejector lever, simultaneously push both ejector levers inward (toward the interface ports) until they snap into place and are parallel to the faceplate. (See Figure 14c on page 21.)

Step 7 Use a screwdriver to tighten the two captive screws on the interface processor faceplate. This prevents the interface processor from becoming partially dislodged from the backplane and ensures proper EMI shielding. (These screws must be tightened to meet EMI specifications.)

Proceed to the next section to attach the bus and tag and/or ESCON cables between the CIP interface ports and your channel.

Attaching the CIP to the Channel

The CIP can be connected to the channel using the bus and tag cables (for the PCA) and/or using a fiber-optic ESCON cable with duplex connectors (for the ECA). Bus and tag and ESCON connections each have their own special requirements. The following sections discuss bus and tag and ESCON connections.

Attaching the Bus and Tag Cables

The PCA is connected using the bus and tag cable with 78-pin connectors (the Y cable) and the bus and tag cables with 48-pin, type A connector blocks (the VA and VB cables). In general, a Y cable attaches to the PCA on the CIP and the VA and VB cables attach to the remaining ends of the Y cable.

Attaching the PCA to the Host Channel

Attach the PCA to the host as follows.



Caution To reduce the potential for problems, you should have an authorized service representative or other qualified service person perform the following procedure. To prevent hardware problems with your host processor, all the channel connections must be tight. A loose connection can cause the host processor or its channel to *halt*. All connections must be screwed together.

Step 1 Vary offline the host channel to which the PCA will be attached.

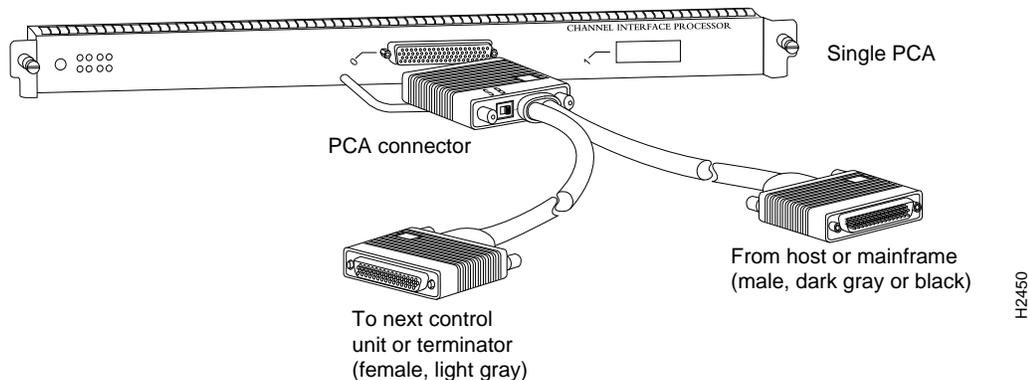
For instructions on how to vary the host channel offline, refer to the documentation for your operating system.



Caution If the select/bypass switch is in the select position when the PCA connector is detached, other devices on the channel and the mainframe operating system can be negatively affected.

Step 2 Attach the PCA connector of the Y cable to the PCA. (See Figure 15.)

Figure 15 Connecting or Removing the Y Cable



Step 3 Attach the female (light-gray) end of the Y cable (see Figure 16a) to the male (dark gray or black) end of the VB cable (that goes to the next control unit).

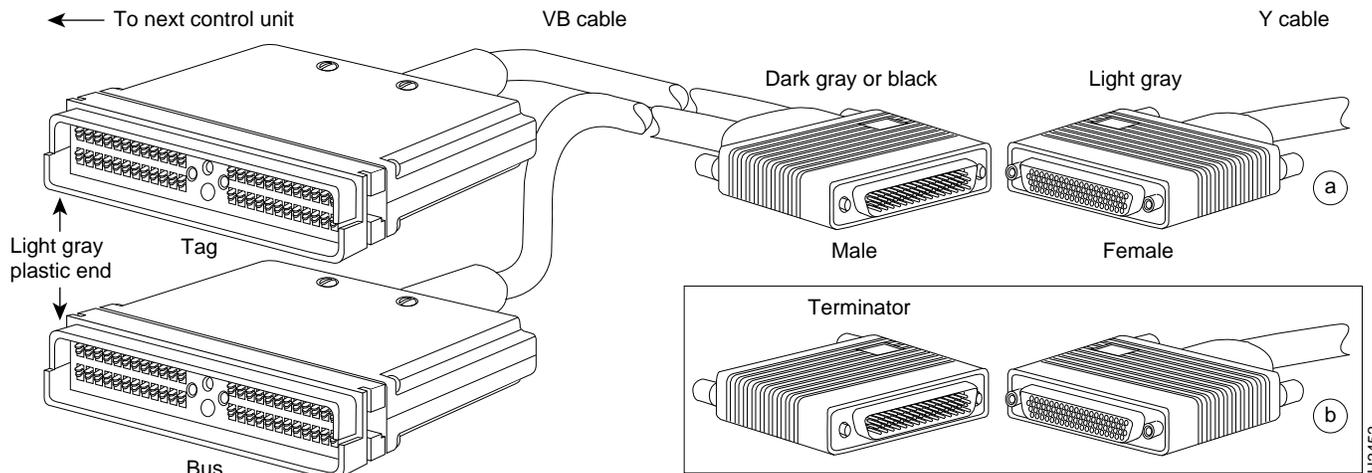
If the PCA is the *last* control unit on the channel, attach a terminator to the female end of the Y cable. (See Figure 16b.) *Do not attach a VB cable.*

Note If the PCA is the *last* control unit, channel termination is absolutely required to loop signals back to the host.



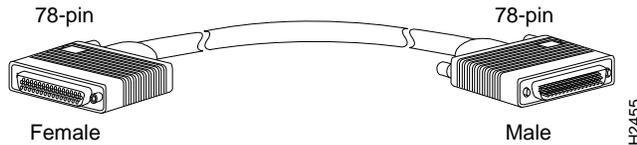
Caution To prevent potential system problems, do not connect the VB cable directly to the PCA. You must connect the Y cable to the PCA, then connect the VB cable to the Y cables as appropriate.

Figure 16 Connecting the VB Cable Between the Y Cable and the Next Control Unit



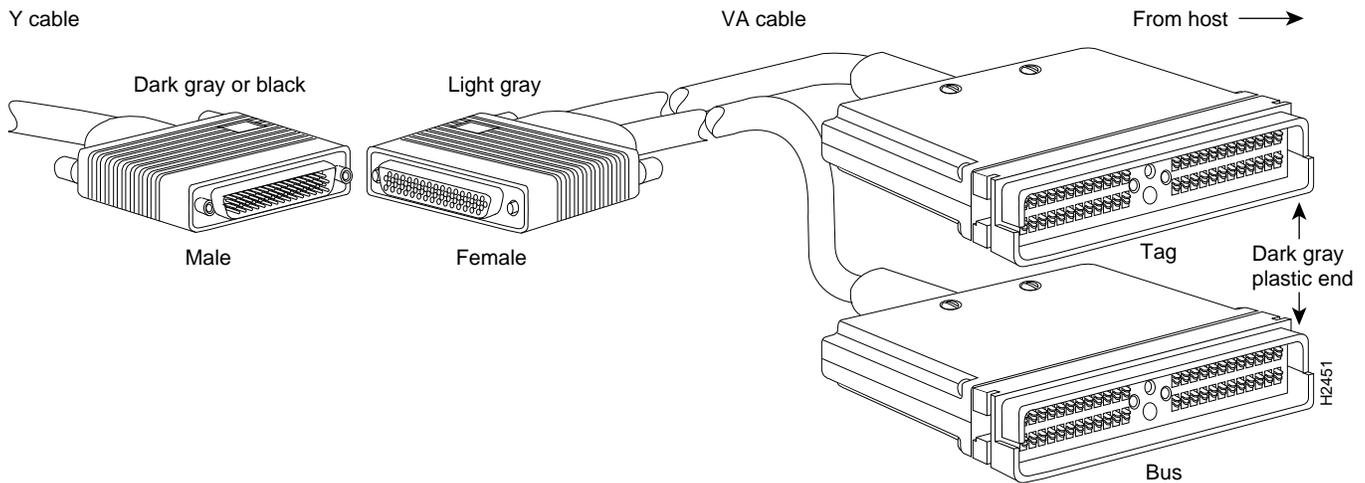
Step 4 If required, extend the length of the Y cable connections (between the VA and VB cables) with a straight-through cable (shown in Figure 17) that is available from IBM. This cable is not available from Cisco Systems.

Figure 17 Straight-Through Cable



Step 5 Attach the male (dark gray or black) end of the Y cable to the female (light gray) end of the VA cable that comes from the host. (See Figure 18.)

Figure 18 Connecting the VA Cable Between the Y Cable and the Host



Step 6 Leave the select/bypass switch (see Figure 6 on page 9) in bypass mode until the PCA connector is attached to the PCA.

Step 7 Connect the Y cable to the PCA.

Step 8 Place the select/bypass switch in select mode.

Step 9 Boot up the router.

Step 10 Configure the interface on the router.

Step 11 Vary the host channel online.

For instructions on how to vary the host channel online, refer to the documentation for your operating system.



Caution Make sure you provide adequate strain relief for the heavy bus and tag cables that attach to the PCA, to prevent damaging the PCA connector on the CIP by unintentionally disconnecting the Y cable from the PCA connector.

Detaching the Y Cable from the PCA

To properly detach a Y cable from the PCA, use the following procedure.



Caution To reduce the potential for problems, you should have an authorized service representative or other qualified service person perform the following procedure. To prevent hardware problems with your host processor, all the channel connections must be tight. A loose connection can cause the host processor or its channel to halt. Every cable must be tightly seated in its mating connector.

Step 1 Have the system operator vary offline all addresses assigned to the PCA. For instructions on how to vary addresses offline, refer to the documentation for your operating system.

Step 2 Place the select/bypass switch on the PCA connector in bypass mode. (See Figure 6 on page 9.)

To allow the propagation of channel signals to downstream control units while the PCA cable is disconnected, leave this switch in bypass mode.



Caution If the select/bypass switch is in select mode when the PCA connector is removed, other devices on the channel and the mainframe operating system might not operate properly.

Step 3 Remove the PCA cable connector (on the Y cable) from the PCA. (See Figure 15.)

Step 4 When you are finished with the task that required you to detach the PCA from the host channel, reattach the PCA connector (on the Y cable) to the PCA.

Step 5 Place the select/bypass switch on the PCA connector in select mode. (See Figure 6 on page 9.)

Step 6 Vary online all addresses assigned to the PCA. For instructions on how to vary addresses online, refer to the documentation for your operating system.



Caution To prevent damaging the PCA connector on the CIP by unintentionally disconnecting the Y cable from the PCA connector, provide adequate strain relief for the heavy bus and tag cables that attach to the PCA.

Attaching the ESCON Cable

Following is the procedure for attaching the ESCON cable between the ECA and the host channel.

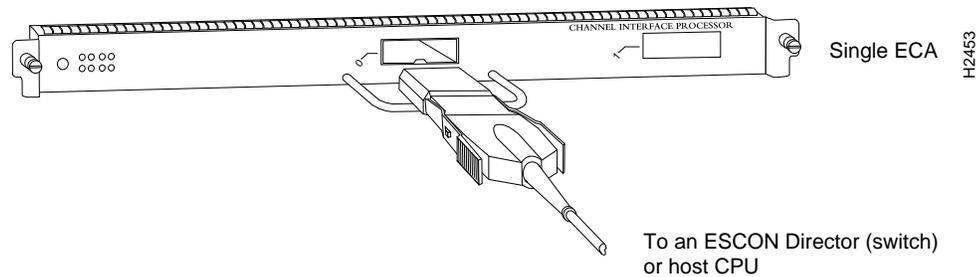


Caution To reduce the potential for problems, you should have an authorized service representative or other qualified service person perform the following procedure. To prevent hardware problems with your host processor, all the channel connections must be tight. A loose connection can cause the host processor or its channel to halt. Every cable must be tightly seated in its mating connector.

Step 1 Make certain the ECA interface is shut down to prevent excessive error messages from being sent to the router log output. It is recommended, but not necessary, to vary offline the host channel to which the ECA will be attached. For instructions on how to vary the host channel offline, refer to the documentation for your operating system.

- Step 2** Attach an ESCON cable between the ECA and the host channel. (See Figure 19.) Make certain the ESCON cable plug “clicks” into place in the receptacle on the ECA. If not, the connection will be incomplete and connection problems could result. It is best to visually inspect the connection after you make it, rather than relying on an audible cue in a noisy lab environment.

Figure 19 Connecting an ESCON Cable to the ECA



- Step 3** Vary the host channel online. For instructions on how to vary the host channel online, refer to the documentation for your operating system.

Checking the Installation

After you install the CIP and cables, verify the installation by observing the LED states and the console display. When the system has reinitialized all interfaces, the enabled LED on the CIP (and on all interface processors) should go on. The console screen will also display a message as the system discovers each interface during its reinitialization.

If you need to verify the operation of the interfaces, refer to the section “Diagnostic Tests” on page 33.

When you remove and replace interface processors, the system provides status messages on the console screen. These messages are for information only. The following sample display shows the events logged by the system as a CIP was removed from slot 1; the system then reinitialized the remaining interface processors and marked as *down* the CIP that was removed from slot 1. When the CIP was reinserted, the system marked the interface as *up* again because the interface was not shut down before the CIP was removed.

The sample display follows:

```
Router#
%OIR-6-REMCARD: Card removed from slot 1, interfaces disabled
%LINK-5-CHANGED: Interface CIP1/0, changed state to administratively down

Router#
%OIR-6-INSCARD: Card inserted in slot 1, interfaces administratively shut down
%LINK-5-CHANGED: Interface CIP1/0, changed state to up
```

When a new CIP is inserted or when a CIP is moved to a new slot, the system recognizes the new interface, but leaves it in a down state until you configure it and change the state to up with the **no shutdown** command.

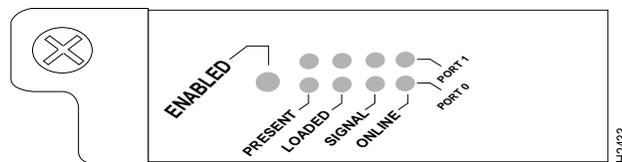
The following sample display shows the events logged by the system as a new single-PCA CIP is inserted in slot 3:

```
Router#
%OIR-6-INSCARD: Card inserted in slot 3, interfaces administratively shut down
```

Verify that the CIP is installed correctly, as follows:

- Step 1** While the system reinitializes each interface, observe the messages on the console display and verify that the system discovers the CIP, as follows:
- If you installed a new CIP, the system should recognize the new interface, but leave it configured as down.
 - If you replaced a CIP, the system should recognize the interface and place it in the same state (up or down) it was in before you removed the first CIP.
 - If the router fails to boot, displays an error message, or fails to recognize the CIP, remove the CIP and reboot. If the router boots successfully, verify that the currently running system software and microcode meet the minimum requirements for CIP operation. (See the sections “Software Prerequisites” and “Microcode Prerequisites” on page 18.)
- Step 2** When the ECA or PCA interface is up, check the activity of the interface with the CIP LEDs. Refer to the state descriptions in the section “LED Indicators and Sequences” and Figure 3 on page 6. If no LEDs remain on, the CIP has not been successfully configured by the system and will not function, or the CIP is not inserted properly.
- Step 3** When the reinitialization is complete, verify that the enabled LED on the CIP goes on and remains on. (See Figure 20.) If it does, proceed to step 7. If it does not, proceed to the following step.

Figure 20 CIP LED Indicators



- Step 4** If the enabled LED on the CIP fails to go on, the CIP card connector might not be fully seated in the backplane. Proceed as follows:
- Loosen the captive installation screws, then firmly push the ejector levers inward (toward the interface port) until both are parallel to the CIP faceplate.
 - Tighten the captive installation screws.
 - After the system reinitializes the interfaces, the enabled LED on the CIP should go on. If it does, proceed to step 7. If it does not, proceed to step 5.
- Step 5** If the enabled LED still fails to go on, remove the CIP and try installing it in another available interface processor slot.
- If the enabled LED goes on when the CIP is installed in the new slot, there could be a failed backplane port in the original interface processor slot.
 - If the enabled LED still fails to go on, but other LEDs on the CIP are on and indicate activity, the enabled LED on the CIP has probably failed. Proceed to step 7 to resume the installation check.
 - If the enabled LED still does not go on, *do not proceed with the installation*. Contact a service representative to report the faulty equipment and obtain further instructions. (Instructions for obtaining technical assistance are provided at the end of this document.)

Step 6 If the present LED fails to go on, the connection between the ECA or PCA and the motherboard might be faulty; however, *do not* attempt to disassemble the CIP in order to check this connection. Instead, contact a service representative.

Step 7 If the interface is new, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications to configure the new interface. (This does not have to be done immediately, but an interface will not be available until you configure it.)

If this installation was a replacement CIP, use the **show interfaces** or **show controllers cxbus EXEC** commands to verify the status of the interface. (For complete descriptions of the **show** commands, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.)

If an error message is displayed on the console terminal, refer to the *System Error Messages* publication for error message definitions. If you experience other problems that you are unable to solve, contact a service representative for assistance.

This completes the CIP hardware installation.

Configuring Microcode

At system startup or reload, the system loads a microcode image for each processor type. The default is to bypass the ROM microcode and load the microcode images bundled with the system software.

All processors of the same type use the same microcode image; only one image for each type can load at startup. This section describes how to modify the startup configuration to load different microcode images at startup, or to change existing configuration instructions and reenoble the system default.

Note This section describes how to configure the system to load specific microcode images that are already stored in the router's memory; it does *not* provide instructions for downloading new images from floppy disk or a remote server, or for replacing microcode ROMs. For those upgrade instructions, refer to *Upgrading System Software and Microcode in Cisco 7000 Series Routers* (Document Number 78-1144-xx, where xx is the latest version of the document).

The CIP ROM provides a CIP microcode boot image. The entire CIP microcode image is located in the bundle.

Note As of Cisco IOS Release 10.0 and later, the software and interface processor microcode images are carefully optimized and bundled to work together. Overriding the bundle can result in incompatibility between the various interface processors in the system.



Caution To ensure proper operation of the CIP and to preclude system problems, you must use *only* the CIP microcode image that is bundled.

Whenever you upgrade software or microcode by downloading new images into Flash memory, you must configure the system to load the new image at startup. Otherwise, the system will continue to load the default image from the system, or attempt to load the previous image (if any) if it is still specified in the configuration file.

Also, if you are upgrading to a release that uses bundled images, you must also remove any previous instructions from the configuration file that would prevent any new images from loading. For example, if the configuration file contains instructions to load the CIP microcode from a file named `cip1-1` in Flash memory, the system will continue to follow those instructions at startup and prevent the newer CIP microcode image, which is bundled with the system image, from loading.

To instruct the system to boot a CIP microcode image other than the default at startup, use the **microcode** *interface-type* [**system** | **flash**] **filename** configuration command to add the instructions to the configuration file. The **system** option tells the system to load from the system bundle. All processors of the same type (for example, all CIPs) will load the same microcode image, either from the default source or from the source you specify.

Follow these steps to configure the microcode for a specific processor:

Step 1 If you plan to load a microcode image from an individual file or a bundled system image stored in Flash memory, enter the **show flash EXEC** command to display the contents and verify the exact name of the file:

```
Route> show flash
4096K bytes of flash memory on embedded flash (in RP1).

file   offset   length   name
  0     0x40    462500   cip1-1
      [3678246/3787214 bytes free]
```

Step 2 Enter the privileged EXEC mode command interpreter, as follows:

```
Router> enable
Password:
Router#
```

Note For complete information on the command interpreter and software functions, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.

Step 3 In privileged command mode, enter router configuration mode and specify that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
```

To load the microcode from an individual microcode image that is stored as a file in Flash memory, enter the **microcode** command, the processor type, the keyword **flash**, and the exact argument for *filename* (the filename in the following examples is `cip1-1`):

```
microcode cip flash cip1-1
```

The **no microcode** command cancels any existing instructions to load an image from Flash memory:

```
no microcode cip flash cip1-1
```

- Step 4** To save the configuration file, press **Ctrl-Z**, then copy the new configuration to nonvolatile random-access memory (NVRAM) as follows:

```
Router# copy running-config startup-config
```

When you press **Ctrl-Z** to exit from configuration mode and return to the system prompt, the system will automatically reload the microcode and execute the new instructions. The **microcode reload** command is automatically invoked whenever you modify the system default for loading microcode images.

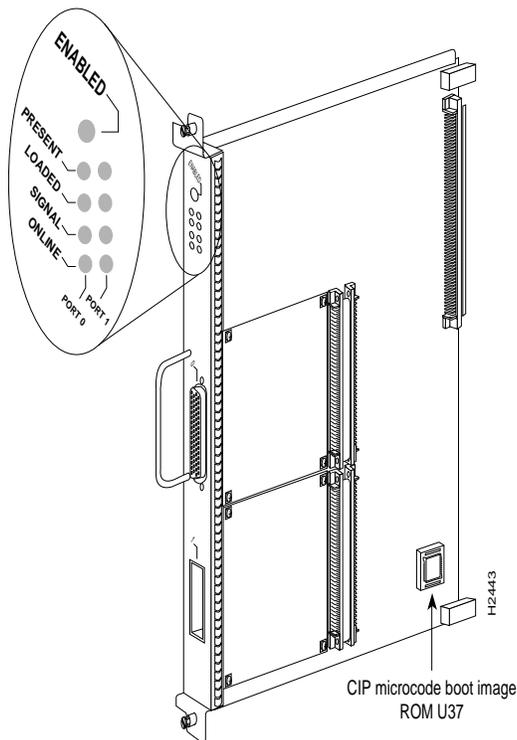
- Step 5** To verify that the correct microcode is loaded according to the new instructions, enter the **show controller cxbus EXEC** command. The resulting display indicates the currently loaded and running microcode version for each interface processor and the SP (or SSP).

- Step 6** To verify the contents of the configuration file, enter the **show configuration EXEC** command. You can also verify that the correct system image is configured to load at system restart or reload.

This completes the procedure for configuring microcode. For complete descriptions of the **show** commands, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.

The microcode boot image ROM device on the CIP is located at socket location U37. (See Figure 21.) Typically, it is not necessary to replace this ROM; however, should it become necessary, instructions are located in the publication *Upgrading System Software and Microcode in Cisco 7000 Series Routers* (Document Number 78-1144-xx), which is shipped with each new microcode (and software) bundle.

Figure 21 CIP Microcode ROM Location, Vertical Orientation



Reference Information

This reference section provides a summary of the diagnostic test routines that you can use to verify the current system status, a list of related documentation, and includes phone numbers for obtaining technical assistance.

Diagnostic Tests

There are six PCA and ECA diagnostic test routines.

The six diagnostic tests are as follows:

- Processor test 1
- Processor test 2
- I/O device tests
- Serial link controller (SLC) device tests
- Internal electrical wrap
- External optical wrap (ECA only) or external electrical wrap (PCA only)

The external wrap routine will run in two modes: optical and electrical.

Note All diagnostic tests are run every time the adapter is started. They cannot be run independently. The wrap tests require special wrap plugs for the PCA and ECA; contact a service representative.

The interface has to pass the first five tests. The sixth test (which is the same as the fifth, but with a different mode for the optical wrap plug for the ECA, instead of electrically wrapping the interface) will fail if no wrap plug is installed or if the interface is connected to the channel. This type of failure will not affect the channel.

If a wrap plug is inserted, following is how the wrap diagnostics will be repeated:

- Until a failure occurs
- Until the wrap plug is removed (which may be reported as a failure depending on when you pull the wrap plug)
- Until you enable the second adapter (as in a dual channel-attached CIP)

If you suspect that an adapter might be the cause of a problem you are seeing, you can run a single pass of the diagnostic tests on an installed PCA or ECA interface by entering configuration mode and specifying that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
```

Next, specify the slot/port number (interface processor slot number/port number) of the interface for which you want the diagnostic tests to run, by entering the **interface channel** command, followed by the slot/port of the interface.

The example that follows is for a CIP interface in interface processor slot 1:

```
interface channel 1/0
```

To run the diagnostic tests once, enter the **shutdown** command and then the **no shutdown** command, as follows:

```
shutdown
no shutdown
```

The **no shutdown** command causes the diagnostic tests to run on the PCA or ECA interface you selected. If no failures occur, you can rule out that adapter as the source of your problem.

Related Documents

Following are the related (and orderable) publications referenced in this document:

- *Router Products Command Summary* (for the Cisco IOS software release running on your system)
- *Router Products Configuration Guide* (for the Cisco IOS software release running on your system)
- *Router Products Command Reference* (for the Cisco IOS software release running on your system)
- *Router Products Command Reference Addendum* (for the Cisco IOS software release running on your system)
- *Router Products Release Notes* (for the Cisco IOS maintenance release running on your system)
- *Upgrading System Software and Microcode in Cisco 7000 Series Routers*
- *Cisco 7000 Hardware Installation and Maintenance*
- *Cisco 7010 Hardware Installation and Maintenance*
- *Cisco 7505 Hardware Installation and Maintenance*
- *Cisco 7507 Hardware Installation and Maintenance*
- *Cisco 7513 Hardware Installation and Maintenance*

All documents listed above are available on UniverCD or in print.

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