



Doc. No. 78-0716-02

Installing the CSC-MEC and CSC-C2MEC Multiport Ethernet Controller Cards

Product Numbers: CSC-MEC2=, CSC-MEC4=, CSC-MEC6=, CSC-C2MEC2=, CSC-C2MEC4=, and CSC-C2MEC6=

This document provides the procedures for installing the ciscoBus multiport Ethernet controller cards (CSC-MEC and CSC-C2MEC) in your AGS+ router. The CSC-MEC is compatible only with the first-generation ciscoBus controller card (CSC-CCTL); the CSC-C2MEC is compatible only with the second-generation ciscoBus controller card (CSC-CCTL2). ciscoBus compatibility is described in the section, "Configuring the CSC-MEC and CSC-C2MEC Cards," on page 9.

In the following sections, the terms *CSC-MEC* or *MEC* are used to indicate both cards unless otherwise indicated. The CSC-MEC and CSC-C2MEC differ only by firmware version; the CSC-C2MEC works only with the CSC-CCTL2. There are two hardware versions of the CSC-MEC: Version 5.0 and Version 5.1. Version 5.1 CSC-MEC cards can be used as CSC-C2MEC cards (with Microcode Version 10.0 or later), but Version 5.0 CSC-MEC cards cannot be used as CSC-C2MEC cards.

The CSC-MEC card occupies a ciscoBus slot in the system card cage. Standard 15-pin or 10BaseT Ethernet appliques, which are installed on connector plates in the rear of the chassis, provide the interface between the CSC-MEC card and your 802.3/Ethernet Version 2 or Version 1 network.

The sections in this document include the following:

- Description of Parts, page 2
- Installation Prerequisites, page 7
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- Configuring the CSC-MEC and CSC-C2MEC Cards, page 9
- ciscoBus Configuration Considerations, page 10
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With the exception of compatibility requirements and the LEDs used to verify the installation, the procedures are the same for both the CSC-MEC (first-generation ciscoBus) and CSC-C2MEC (second-generation ciscoBus) cards.

Description of Parts

The CSC-MEC card resides in the router system card cage. Each port on the CSC-MEC provides one Ethernet interface and connects to an Ethernet applique in the back of the chassis with internally-routed ribbon cables. Ethernet appliques are available in standard 15-pin attachment unit interface (AUI) and RJ-45 unshielded twisted-pair (UTP) configurations. The 15-pin appliques require an external media attachment unit (MAU) or Ethernet transceiver to complete the connection between the router and your Ethernet network. The 10BaseT applique contains a built-in transceiver and connects directly to a UTP network segment.

CSC-MEC Card

The two-, four-, or six-port Multiport Ethernet Controller (CSC-MEC) card operates on the high-speed ciscoBus backplane in the router. A 16-million-instructions-per-second (mips) bit-slice processor on the card provides a high-speed data path between the CSC-MEC and other high-speed interfaces on the ciscoBus, and enables switching rates of over 20,000 packets per second for both bridging and routing. The CSC-MEC supports IEEE 802.3/Ethernet Version 2 specifications by default, and it supports Version 1 when jumpers on the card are changed as described in the section “Cables,” on page 5.

A six-port card (CSC-MEC6) is shown in Figure 1. Two-port (CSC-MEC2) and four-port (CSC-MEC4) versions are also available. The card shown in Figure 1 is an MEC controller type 5.1, card Revision E. Earlier versions of the card, MEC controller type 5.0 (card Revisions A through D) are not compatible with the second-generation ciscoBus (CSC-CCTL2). Commands for displaying the card revision (version) are described in the section “System Requirements,” on page 7.

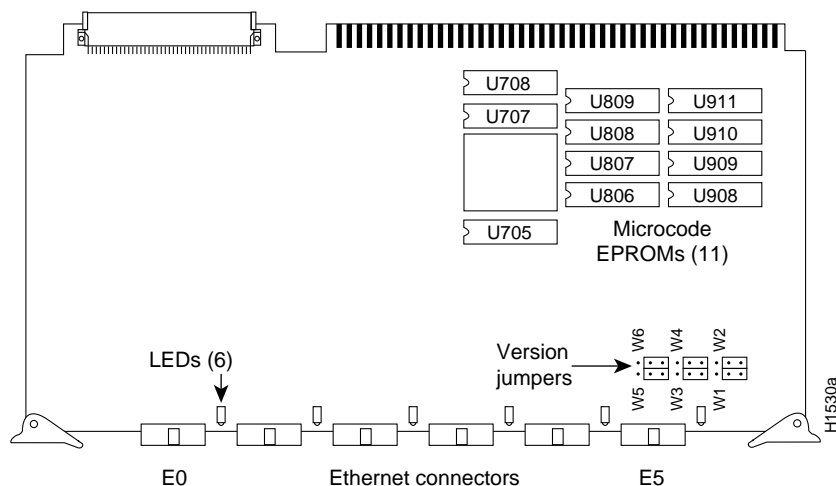


Figure 1 CSC-(C2)MEC6 Controller Type 5.1

The CSC-MEC card must be installed in a router that is running System Software Release 8.3 or later and that contains a CSC-CCTL ciscoBus controller card. The CSC-C2MEC must be installed in a router that is running System Software Release 9.1 or later and that contains a CSC-CCTL2 ciscoBus controller card. Instructions for determining your current system software release and the type of ciscoBus controller installed are provided in the section “ciscoBus Controller Compatibility,” on page 10.

Ethernet Appliques

Ethernet appliances provide the external interfaces for CSC-MEC card ports. One or more appliances are mounted on a connector plate, which is installed in the rear of the router. The 15-pin Ethernet connector appliance connects to a 10Base5 (thick -wire), 10Base2 (thin-wire), or 10BaseT (UTP) network with the appropriate MAU or Ethernet transceiver. The 10BaseT appliance connects to a 10BaseT network only and does not require an external transceiver. The following sections describe the Ethernet appliances and some of the Ethernet transceivers you may need.

Ethernet 10BaseT

The Ethernet 10BaseT appliance (see Figure 2) combines an RJ-45 connector for direct connection to an unshielded twisted-pair (UTP) network segment and a UTP transceiver. The 10BaseT appliance is compliant with IEEE 802.3. The pinout for the 10BaseT RJ-45 connector is listed in Table 1.

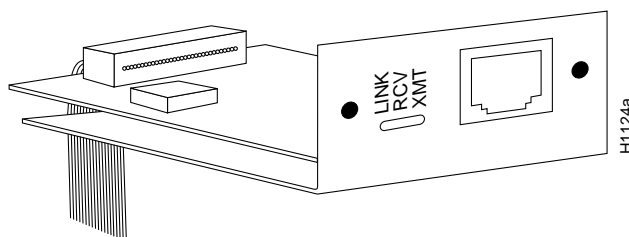


Figure 2 10BaseT Ethernet Transceiver Appliance

Table 1 10BaseT RJ-45 Connector Pinout

Pin	Signal Name
1	TD+
2	TD-
3	RD+
4	Not used
5	Not used
6	RD-
7	Not used
8	Not used

Ethernet AUI

The 15-pin Ethernet attachment unit interface (AUI) connector, shown in Figure 3, provides a standard Ethernet IEEE/802.3 connection between a CSC-MEC card port and the external Ethernet network. An Ethernet transceiver, which is required for use with this connector, provides the connection to thick-wire, thin-wire, twisted-pair, and other Ethernet media. The Ethernet transceiver either plugs directly into the 15-pin connector or is attached with an AUI interface cable. The pinouts for the AUI cable and the 15-pin connector are listed in Table 2.

Figure 3 15-Pin AUI Ethernet Connector Applique

Table 2 Ethernet (AUI) Pinout

Pin	Circuit	Description
3	DO-A	Data Out Circuit A
10	DO-B	Data Out Circuit B
11	DO-S	Data Out Circuit Shield ¹
5	DI-A	Data In Circuit A
12	DI-B	Data In Circuit B
4	DI-S	Data In Circuit Shield
7	CO-A	Control Out Circuit A ¹
15	CO-B	Control Out Circuit B ¹
8	CO-S	Control Out Circuit Shield ¹
2	CI-A	Control In Circuit A
9	CI-B	Control In Circuit B
1	CI-S	Control In Circuit Shield
6	VC	Voltage Common
13	VP	Voltage Plus
14	VS	Voltage Shield ¹
Shell	PG	Protective Ground

1. Not used.

Cables

This section describes the Ethernet interface cables you may need to install between the router and an Ethernet transceiver or MAU. It also provides cabling configurations to use with UTP networks.

AUI (Ethernet Transceiver) Cable

The standard 15-pin AUI Ethernet connectors require an external transceiver and, unless the transceiver plugs directly into the router rear panel connector, also require an Ethernet transceiver cable (or AUI cable) to connect the transceiver to the router. If you are building a transceiver cable, refer to the pinout listed in Table 2.

Twisted-Pair Cabling

There are several types of twisted-pair cable. Unshielded twisted-pair (UTP) cable should be 26 to 22 American wire gauge (AWG)—0.4- to 0.6-millimeter (mm)—wire in a multiwire cable with 100-ohms impedance. The 802.3 specification states that the maximum length of a 10BaseT link segment is 100 meters or 328 feet of UTP wiring. *Do not exceed these limits.*

If you are *not* connected to a hub, and another 10BaseT transceiver applique is connected to the opposite end of your link, the UTP cabling must be crossed as shown in Figure 4. The RD– and RD+ signals must be swapped with the TD– and TD+ signals. When the opposite end of your link is connected to a hub, the hub performs this crossover function, so it is not necessary to cross the cables.

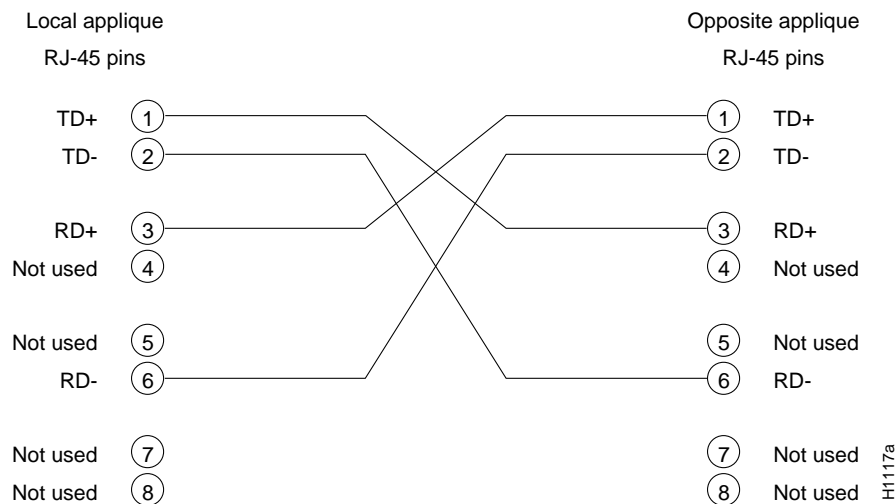


Figure 4 Applique-to-Applique UTP Cable Diagram

Ethernet Transceivers

When using a standard 15-pin AUI Ethernet connector, you need an Ethernet transceiver or media attachment unit (MAU) to connect the router to the Ethernet network. Several types of single- and multiport transceivers are available. The type you use depends on the type of cabling your Ethernet network uses: thick-wire (10Base5), thin-wire (10Base2), or unshielded twisted-pair (10BaseT). Some single-port transceivers attach directly to the 15-pin connector on the applique; others, such as multiport transceivers for connecting multiple Ethernet interfaces to a network, require interface cables. Figure 5 shows examples of different types of transceivers and installations.

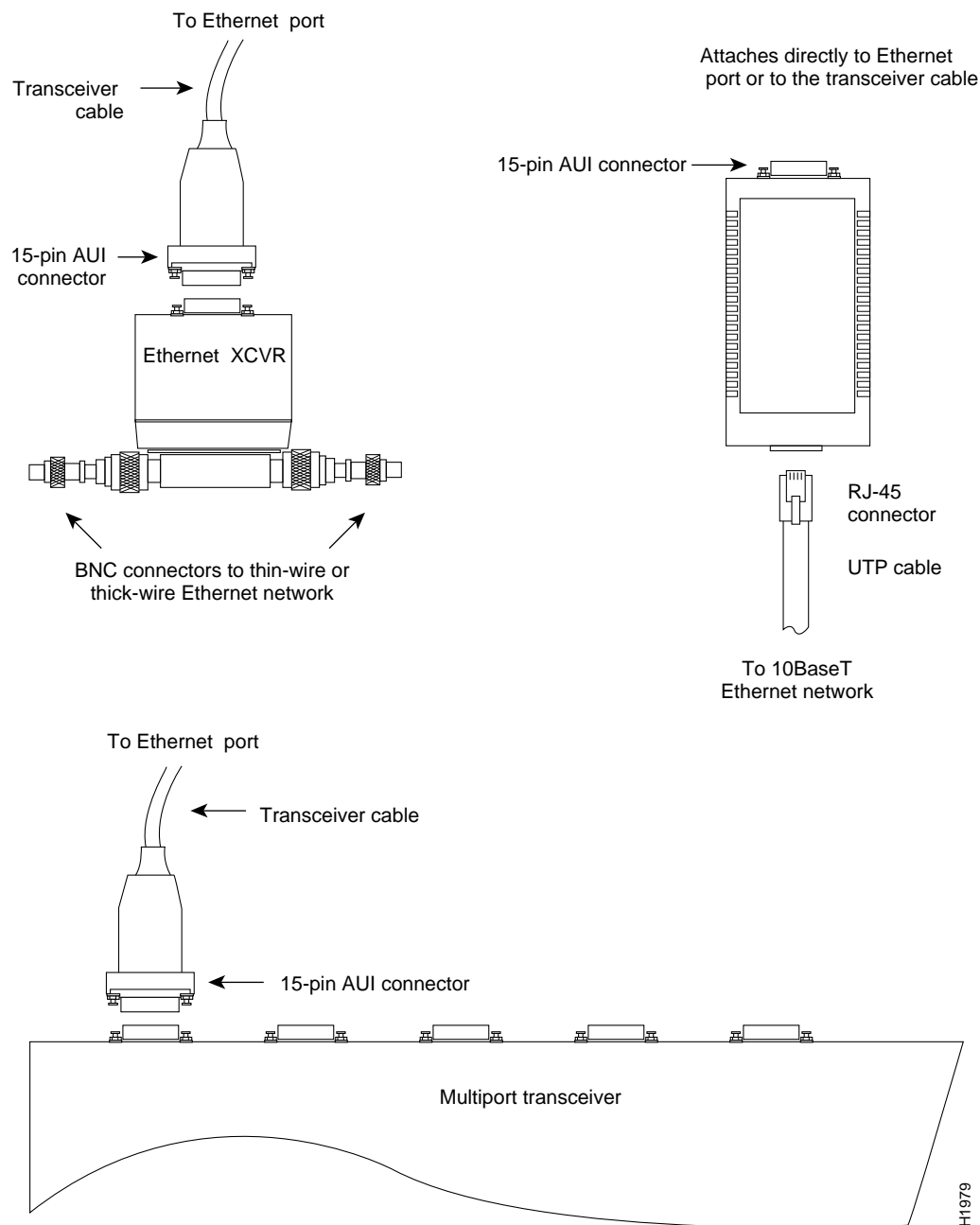


Figure 5 Ethernet Transceivers

Installation Prerequisites

Before installing the CSC-MEC card or appliques, ensure that your existing system components meet the compatibility requirements described in this section, and that you have the necessary parts and tools you will need to perform the installation without interruption.

System Requirements

The router in which you will install the components must meet the following physical requirements:

- Your router is an AGS+ model with a CSC/3 or CSC/4 processor card.
- A ciscoBus controller card (CSC-CCTL or CSC-CCTL2) is installed in the center ciscoBus slot.
- There is at least one ciscoBus slot available for each CSC-MEC card you will install.
- The total power drawn by the system will not exceed the maximum power budget after the new card is installed. (See the section “Chassis Power Budget,” on page 14.)
- Your site has an Ethernet transceiver, if required, and the appropriate network interface wiring (10Base2, 10Base5, or 10BaseT) in place and available at the rear panel of the router.
- If you are reinstalling a repaired or modified controller type 5.0 (Revision D or earlier) CSC-MEC card, the ciscoBus controller (CSC-CCTL) firmware version must be *earlier* than 10.0 (first-generation ciscoBus).
- If you are installing a 10BaseT applique, CSC-MEC jumpers (W1 through W6) for the ports to be connected to the applique are set for IEEE 802.3 Ethernet Version 2.

In addition to the physical requirements, your system must also meet the following software requirements, depending upon the type of interface card (CSC-MEC or CSC-C2MEC) you are installing:

- If you are installing a CSC-MEC (first-generation ciscoBus interface) card ensure the following:
 - The system software is Release 8.3 or later
 - The ciscoBus controller is a CSC-CCTL (controller type 3.0 or later)
 - All ciscoBus interface cards are running microcode versions *earlier than* 10.0
- If you are installing a CSC-C2MEC (second-generation ciscoBus interface) card ensure that:
 - The system software is Release 9.1 or later.
 - The ciscoBus controller is a second-generation CSC-CCTL2 (controller type 6.0).
 - All ciscoBus interface cards are running Microcode Version 10.0 or later.
- The microcode on all Multibus cards and the CSC-ENVM is compatible with the system software currently in the chassis or the version you are installing. Microcode compatibility requirements are described in “Compatibility with Other Cards,” on page 15.

You can display the type of processor card (CSC/3 or CSC/4) installed and the current software release with the EXEC command **show version**. The current system software release is displayed in the first line of the output; the processor card information is displayed on the eighth line; followed by a list of the installed interface cards.

A sample of the **show version** command display, which shows a system running Software Release 9.1(1), follows:

```
router# show version
GS Software (GS3), Version 9.1(1)
Copyright (c) 1986-1992 by cisco Systems, Inc.
Compiled Wed 29-Jul-92 17:02

System Bootstrap, Version 4.5(0.5)

router uptime is 22 days, 12 hours, 23 minutes
System restarted by power-on
System image file is "router-system", booted via tftp from 131.108.1.111

CSC4 (68040) processor with 16384K bytes of memory.
X.25 software.
Bridging software.
1 MCI controller (2 Ethernet, 0 Serial).
1 cBus controller.
1 MEC controller (6 Ethernet).
Environmental Controller.
(text omitted)
```

You can display a description of the current ciscoBus controller and interface cards with the EXEC command **show controller cbus**. The ciscoBus controller type is displayed, followed by descriptions of each ciscoBus interface card, the slot in which it is installed, the controller type, and the microcode version. The following example display shows a first-generation ciscoBus controller (CSC-CCTL), which is a controller type 3.0. The MEC interface listed in the display is a controller type 5.1 installed in ciscoBus slot 3.

```
router# show cont cbus

cBus 1, controller type 3.0, microcode version 3.0
  128 Kbytes of main memory, 32 Kbytes cache memory
  (text omitted)
FDDI 0, controller type 4.1, microcode version 2.0
  Interface 0 - Fddi0, station address 0000.0c01.7bbd (bia 0000.0c01.7bbd)
  (text omitted)
MEC 3, controller type 5.1, microcode version 2.4
  Interface 18 - Ethernet2, station address 0000.0c02.a03c
  (text omitted)
```

The following example display shows a second-generation ciscoBus controller (CSC-CCTL2), which is a controller type 6.0. The MEC interface shown in the display is also a controller type 5.1, but the microcode version of all ciscoBus interface cards is 10.1.

```
router# show cont cbus

cBus 1, controller type 6.0, microcode version 10.0
  512 Kbytes of main memory, 128 Kbytes cache memory
  (text omitted)
FDDI-T 0, controller type 7.1, microcode version 10.1
  Interface 0 - Fddi0, station address 0000.0c02.6aa3
  (text omitted)
MEC 3, controller type 5.1, microcode version 10.1
  Interface 10 - Ethernet2, station address 0000.0c02.61b7
  (text omitted)
```

For descriptions of fields and additional commands, refer to the router products configuration publication. If your system does not meet these requirements, contact a customer service representative for upgrade information.

Configuring the CSC-MEC and CSC-C2MEC Cards

Figure 6 shows the appropriate jumper settings (jumpers W1 through W6) to use when you attach Ethernet Version 1 cables to the Ethernet connector. Jumper settings shown in Figure 6 are factory defaults. Figure 7 shows the appropriate jumper settings to use when you attach Ethernet Version 2 and IEEE 802.3 cables. The explanation for the Ethernet jumper settings follows.

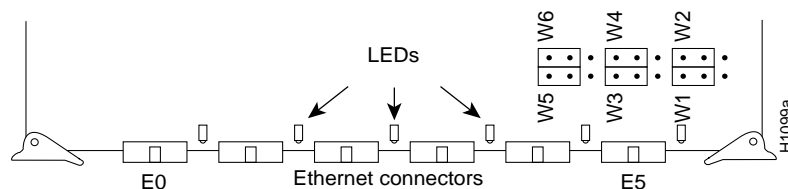


Figure 6 Jumper Settings for Ethernet Version 1

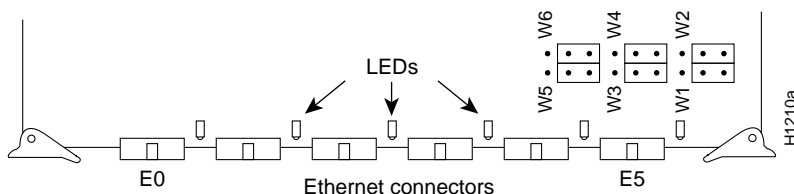


Figure 7 Jumper Settings for Ethernet Version 2 and IEEE 802.3

Jumpers on pin sets W1 through W6 set the electrical specifications for the Ethernet transceiver connection. Each jumper is moved over one pin (compare the jumpers in Figure 6 and Figure 7) to change the electrical specifications of its corresponding connector (W1 for E0, and so forth). Pin set W1 corresponds to the far left connector (E0), using the orientation in Figure 6 or Figure 7 (facing the component side of the card with the connectors at the bottom). Each connector corresponds consecutively to a pin set.

ciscoBus Configuration Considerations

Before installing the CSC-MEC in the card cage, ensure that you have the correct type of ciscoBus controller installed (CSC-CCTL or CSC-CCTL2) and that the ciscoBus interface cards will be placed in the correct slots per the slot priority requirements described in “Slot Priority,” on page 11.

ciscoBus Controller Compatibility

All ciscoBus interface cards, which are listed in Table 3, contain card-specific firmware (microcode), which determines whether the card is compatible with the first- or second-generation ciscoBus controller, as follows:

- ciscoBus cards with microcode versions earlier than 10.0 are compatible only with the first-generation ciscoBus controller (CSC-CCTL, controller type 3.0).
- ciscoBus cards with Microcode Version 10.0 or later are compatible only with the second-generation ciscoBus controller (CSC-CCTL2, controller type 6.0).
- The CSC-C2CTR and CSC-C2FCIT are compatible only with the CSC-CCTL2. The initial release of both cards contains Microcode Version 10.0.

The C2 designator added to the name of a ciscoBus interface card indicates that the card is running Microcode Version 10.0 or later and is, therefore, compatible with the CSC-CCTL2. With the exception of a revision 5.0 CSC-MEC card (see “Note” following), the first- and second-generation ciscoBus interface cards are otherwise the same. For example, you can upgrade a Revision 5.1 CSC-MEC to a CSC-C2MEC by replacing the microcode with Version 10.0 or later. When you upgrade the microcode on the CSC-MEC card to Version 10.0, the name of the card also changes from *CSC-MEC* to *CSC-C2MEC* to indicate that it is CCTL2-compatible. When you replace a CSC-CCTL ciscoBus controller with a CSC-CCTL2 ciscoBus controller, you must upgrade the microcode on all ciscoBus interface cards to Microcode Version 10.0 or later and replace the CSC-CCTL with a CSC-CCTL2.

Note Only Revision 5.1 or later CSC-MEC cards can be upgraded to a CSC-C2MEC. If you have a Revision 5.0 CSC-MEC, contact a customer service representative.

You can display a description of the current ciscoBus controller and ciscoBus interface cards with the EXEC command **show controller cbus**, an example of which is described on page 8.

Table 3 ciscoBus Interface Card Compatibility Requirements

CCTL Controller	CCTL2 Controller	Description
CSC-CCTL	CSC-CCTL2	ciscoBus controller
CSC-FCI	CSC-C2FCI ¹	Fiber Distributed Data Interface (FDDI)
–	CSC-C2FCIT	FDDI with translational bridging
CSC-HSCI	CSC-C2HSCI	High-Speed Serial Interface (HSSI)
–	CSC-C2CTR	ciscoBus Token Ring interface, 4/16Mbps
CSC-MEC	CSC-C2MEC ²	Multiport Ethernet Controller interface

1. The C2 designator indicates that these cards are compatible with the CSC-CCTL2 ciscoBus controller card. The CSC-C2CTR and CSC-C2FCIT cards are shipped (by default) with Microcode Version 10.0 or later.

Slot Priority

- Only CSC-MEC card revision 5.1 or later is compatible with the CSC-CCTL2

The system card cage, shown in Figure 8, has nine slots, five of which are designated ciscoBus slots. The center ciscoBus slot is reserved for the ciscoBus controller card, leaving four ciscoBus slots available for ciscoBus interface cards.

The system uses a slot priority scheme that assigns a priority to each ciscoBus card according to the ciscoBus slot in which the card resides. The card in ciscoBus slot 0 receives the highest ciscoBus priority, while the card in ciscoBus slot 3 receives the lowest ciscoBus priority.

Slot priorities are set to accommodate the amount of traffic generated by each interface card and the amount of card buffering required. Each ciscoBus interface card is placed in a specific slot with regard to other ciscoBus interface cards, if any. The order of priority is the same for both first- and second-generation ciscoBus controllers, except that the cards with the *C2* designation can only be used with the CSC-CCTL2.

Following is a list of ciscoBus interface cards in order of priority, from highest to lowest:

- 1 CSC-MEC and C2MEC (10 Mbps)
- 2 CSC-C2CTR (16 Mbps)
- 3 CSC-HSCI and C2HSCI with an APP-LHS applique (HSSI interface) (45 through 52 Mbps)
- 4 CSC-FCI and C2FCI (100 Mbps)
- 5 CSC-C2FCIT (100 Mbps)
- 6 CSC-HSCI and C2HSCI with an APP-ULA applique (UltraNet interface) (125 Mbps)

Install CSC-MEC or C2MEC cards in the lowest-numbered slots, beginning with slot 0 (which has the highest priority), followed by CSC-C2CTR cards. After all CSC-MEC and CSC-C2CTR cards are installed, install CSC-HSCI and C2HSCI cards with the APP-LHS applique in the lowest-numbered available slots. Follow with the CSC-FCI and C2FCI cards. Next, install CSC-C2FCIT cards. Last, install the CSC-HSCI and C2HSCI cards with the APP-ULA (UltraNet) applique. Always install cards in the lowest-numbered available slot. For example, if using only CSC-C2HSCI cards (with APP-ULA), place the first in slot 0, the second in slot 1, and so forth.

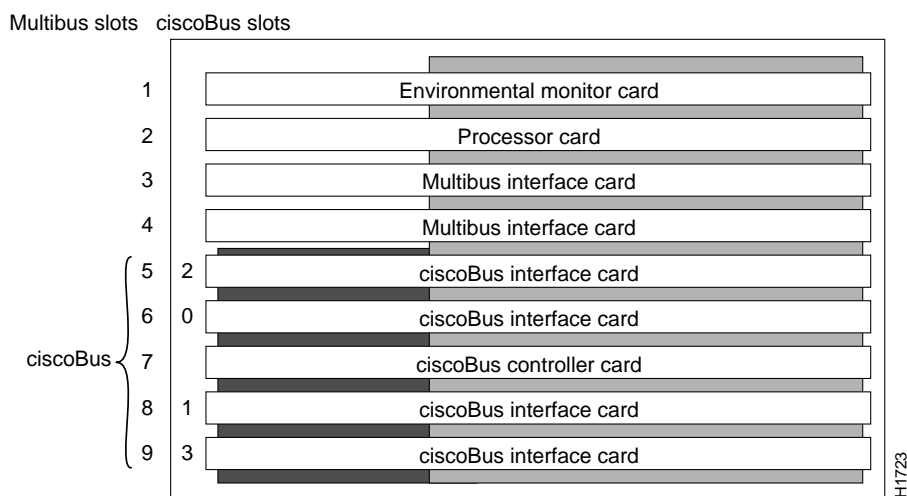


Figure 8 Router System Card Cage

ciscoBus Port Limitations

The CSC-MEC card will operate with any other ciscoBus interface cards; however, buffering and switching demands on the ciscoBus controller and processor card limit the number of interfaces that can be mixed without impeding performance of the high-speed ciscoBus interfaces.

The maximum numbers of CSC-MEC ports (interfaces) that can be combined with other ciscoBus ports are listed in Table 4. These limits are for both first- and second-generation ciscoBus systems. (For first-generation systems, disregard the C2FCIT and C2CTR ports.)

The number of cards needed for the maximum number of ports is also listed (in parentheses). Exceeding these maximum limits may impede performance on any or all installed ciscoBus interfaces.

Table 4 Maximum Port and Card Configurations for ciscoBus Interface Cards

(C2)MEC Ports (Cards)		C2FCIT/(C2)F CI Ports (Cards)		(C2)HSSI Ports (Cards)		C2CTR Ports (Cards)	
24	(4)	0	(0)	0	(0)	0	(0)
18	(3)	1	(1)	0	(0)	0	(0)
18	(3)	0	(0)	1	(1)	0	(0)
18	(3)	0	(0)	0	(0)	4	(1)
12	(2)	2	(2)	0	(0)	0	(0)
12	(2)	1	(1)	1	(1)	0	(0)
12	(2)	1	(1)	0	(0)	4	(1)
12	(2)	0	(0)	2	(2)	0	(0)
12	(2)	0	(0)	1	(1)	4	(1)
12	(2)	0	(0)	0	(0)	8	(2)
6	(1)	1	(1)	0	(0)	6	(2)
6	(1)	0	(0)	1	(1)	6	(2)
6	(1)	3	(3)	0	(0)	0	(0)
6	(1)	0	(0)	3	(3)	0	(0)
6	(1)	2	(2)	1	(1)	0	(0)
6	(1)	2	(2)	0	(0)	4	(1)
6	(1)	0	(0)	2	(2)	4	(1)
6	(1)	1	(1)	1	(1)	4	(1)
6	(1)	1	(1)	2	(2)	0	(0)
0	(0)	3	(3)	0	(0)	2	(1)
0	(0)	2	(2)	1	(1)	2	(1)
0	(0)	1	(1)	2	(2)	2	(1)
0	(0)	0	(0)	3	(3)	2	(1)
0	(0)	4	(4)	0	(0)	0	(0)
0	(0)	3	(3)	1	(1)	0	(0)
0	(0)	2	(2)	2	(2)	0	(0)
0	(0)	1	(1)	3	(3)	0	(0)
0	(0)	0	(0)	4	(4)	0	(0)

Card Numbering and Interface Addressing

The router uses a *card numbering* scheme to identify cards in the chassis, and an *interface addressing* scheme to identify the ports (interfaces) on each card. Each Multibus interface card and the ciscoBus controller card have a unique card number that you set with switch S1 on the card.

Table 5 shows the switch settings (S1) on the ciscoBus controller cards. All four pins are in the down (off) position when the ciscoBus controller is viewed from the front edge of the card (viewed as installed in the card cage). The system processor uses card numbers to assign interface addresses to the ports on each card and to control traffic across the Multibus. The ciscoBus controller card controls the traffic between the Multibus and all ciscoBus cards, so it is the only ciscoBus card that needs a card number. The card number of the ciscoBus controller is always 0, which is the factory default. No Multibus cards can be set for card number 0.

Table 5 ciscoBus Controller Switch Settings for Card Numbering

Card No.	S1-1	S1-2	S1-3	S1-4
0	off	off	off	off

At startup, the system polls each Multibus interface card, beginning with the lowest card number, and assigns a sequential interface address to each port (interface) on each card. When all Multibus interfaces are assigned, the system proceeds to the ciscoBus and continues the interface address sequence as it polls the ciscoBus cards according to the ciscoBus slot priority. (For information on slot priority, refer to the section “Slot Priority” on page 11.)

Table 6 is an example of how the system assigns Ethernet interface addresses in a chassis with one CSC-MCI 2E2T card and two CSC-MEC6 cards. The CSC-MCI is a Multibus card, and the CSC-MEC is a ciscoBus card; therefore, the CSC-MCI interface addresses are assigned first.

Table 6 Multibus and ciscoBus Interface Addressing Example

Card	Card Port No.	Interface Address Assigned
First CSC-MCI	Port 0	Ethernet 0
	Port 1	Ethernet 1
Second CSC-MCI	Port 0	Ethernet 2
	Port 1	Ethernet 3
First CSC-MEC	Port 0	Ethernet 4
	Port 1	Ethernet 5
	Port 2	Ethernet 6
	Port 3	Ethernet 7
	Port 4	Ethernet 8
	Port 5	Ethernet 9
Second CSC-MEC	Port 0	Ethernet 10
	Port 1	Ethernet 11
	Port 2	Ethernet 12
	Port 3	Ethernet 13
	Port 4	Ethernet 14
	Port 5	Ethernet 15

Chassis Power Budget

The chassis has a total power budget of 300 watts (W). The total power dissipation of the individual interface and processor cards (see Table 7) must not exceed 300W. In A-type chassis shipped before October 1, 1991, the total power cannot exceed 260W (these chassis used a 5A circuit breaker, rather than the 7.5A breaker used in the current chassis). Following is a sample calculation for adding two CSC-MEC6 cards (all values in watts).

One CSC-ENVM card	1 x 10 = 10
One CSC/4 processor card	1 x 35 = 35
One CSC-CCTL2 card	1 x 29 = 29
One CSC-FCI card	1 x 50 = 50
One CSC-MCI 2E card	2 x 28 = 28
14 Ethernet transceivers	14 x 4 = 56 (12 additional for the new MEC cards)
Power requirement of present system	208
Available power budget	300 – 208 = 98
Add two CSC-MEC cards	2 x 22 = 44
New cards within power budget	44 < 98 (New CSC-MEC cards can be installed.)

Table 7 Power Requirements for Individual Components

Card/Applique Assemblies	Power Requirement (in Watts)
CSC/4	35
CSC/3	31
CSC-ENVM	10
CSC-MC+	3
CSC-MCI ¹	28
CSC-SCI	20
CSC-R16M	34
CSC-1R and -2R	30
CSC-CCTL2	34
CSC-C2FCIT with applique	36
CSC-CSFCI with applique	50
CSC-C2MECx ²	22
CSC-CSHSCI	48
CSC-C2CTR-2 with applique	30
CSC-C2CTR-4 with appliques	42
CSC-CCTL	29
CSC-FCI with applique	50
CSC-MECx ²	22
CSC-HSCI with applique	48

1. Up to a maximum of 2 transceivers is required.
Each transceiver dissipates 4W (8W total).

2. Up to a maximum of 6 transceivers is required.
Each transceiver dissipates 4W (24W total).

Note In addition to the power budget, additional restrictions apply when other ciscoBus or Multibus interface cards are installed in the system. For compatibility limitations, refer to the section “ciscoBus Port Limitations” on page 12, and to the following section.

Compatibility with Other Cards

The CSC-MEC card will interoperate with any ciscoBus interface card that is compatible with the current ciscoBus controller (within the limits specified in the section “ciscoBus Port Limitations,” on page 12), and with any Multibus interface card that is compatible with the current system software. However, as new features are added with system software releases, the microcode (firmware) on interface cards might need to be upgraded in order to take advantage of the new features.

For example, the CSC-C2MEC requires a CSC-CCTL2 ciscoBus controller and System Software Release 9.1 or later. (See the section “System Requirements” on page 7.) If you are upgrading your system software and ciscoBus controller to a CSC-CCTL2 along with this card installation, you must upgrade the microcode on all existing ciscoBus interfaces to Version 10.0 or later and, to ensure that all the features of a software release are available, you must upgrade the microcode on existing Multibus interface and controller cards to the minimum versions required for System Software Release 9.1 compatibility.

The *Microcode Release Note* publication (Document Number 78-1069-*nn*) provides the latest information on both the *recommended* and *minimum required* microcode versions for using all cards with System Software Releases 8.2 through 9.1. If the latest release implements features that you are not using in your system and you already have the minimum required version installed, then there is no requirement to update the microcode. However, new microcode versions occasionally fix bugs and provide performance enhancements in addition to implementing new features. You will obtain maximum performance and reliability by upgrading to the recommended version. For current microcode requirements and recommendations, and for a microcode revision history for each card, refer to the latest *Microcode Release Note* publication (Document Number 78-1069-*nn*).

Note To order upgrades or to obtain additional upgrade or compatibility information, contact a customer service representative at the number on the front page of this document.

Use the **show controller** [*type*] command with appropriate variables [*cBus*, *token*, *serial*, or *ethernet*] to display the current microcode on any interface card, and use the **show environment** command (available with System Software Release 9.0 and later) to display the current CSC-ENVM microcode. An example of the **show controller cbus** command is shown on page 8. The following partial sample display of the **show controller mci** command shows a CSC-MCI with Microcode Version 1.9 installed.

```
router# show cont mci
MCI 1, controller type 1.1, microcode version 1.10
(display text omitted from example)
```

The following partial, sample display of the **show environment** command shows a CSC-ENVM with Microcode Version 2.2 installed.

```
router# show env
Environmental controller firmware version 2.2
(display text omitted from example)
```

Note With the required microcode versions installed, the CSC-MEC is compatible with the CSC-MCI Multibus communications interface card. The maximum number of Ethernet interface ports that can be installed without exceeding the power budget is 26, the result of installing four CSC-MEC6 cards and one CSC-MCI card with two Ethernet interface ports. This configuration is possible; however, because the slower Multibus interfaces always have higher priority than ciscoBus interfaces, traffic on the Multibus may degrade performance of the ciscoBus interfaces. Therefore, this configuration is not recommended for performance-sensitive applications.

Setup Command Facility

When new hardware components are installed, the system automatically invokes the **setup** command facility the first time the system is started. You have the option of using **setup** to configure new interfaces, or of exiting **setup** and configuring new interfaces with the **configure EXEC** command. If you are adding new interfaces at the same time you are installing the CSC-CCTL2, be prepared with the information you will need to configure each new interface, such as the protocols you plan to route, IP addresses and subnet masks, and whether or not you will use bridging. For step-by-step instructions for using the **setup** command facility and configuring the interfaces, refer to the *Router Products Getting Started Guide*.

Required Parts

Verify that you have all of the following parts and optional equipment you will need to install the new Ethernet interfaces. If you need additional equipment, contact your customer service representative for ordering information.

- One ciscoBus CSC-MEC card.
- One Ethernet connector or applique for each Ethernet port on the CSC-MEC card.
- One attachment unit for each Ethernet port you will attach to a thin-wire or thick-wire network (not required for use with 10BaseT appliques):
 - A media attachment unit (MAU) and an attachment unit interface (AUI) cable
 - or*
 - An Ethernet transceiver and, if required, a transceiver cable.

Both MAUs and Ethernet transceivers are available in multiport configurations; be sure you have an available port for each new Ethernet interface.

- One interface port label for each Ethernet connector or applique (E0, E1, and so on); these may be attached to the connector plate and cables when you receive them
- One ESD-preventive wrist strap

Required Tools

The following tools are required for installing the CSC-MEC card:

- Large, flat-blade screwdriver if you have never removed the router front access panel.
- Phillips screwdriver, No. 1 size, if you are also installing connectors or appliques.
- ESD-prevention wrist strap or other grounding device. A disposable wrist strap is included with the card; use it to prevent damage to equipment from electrostatic discharge.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) is a discharge of stored static electricity that can damage equipment and impair electrical circuitry. It occurs when electronic components are improperly handled and can result in complete or intermittent failures.

Following are guidelines for preventing ESD damage:

- Before you open a chassis, ensure that power to the unit is turned off, but that the power cord is connected to the wall receptacle. Having the power cord connected will ensure a ground path for any ESD voltages.
- Always use an ESD wrist strap or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unpainted surface of the chassis frame or another proper grounding point or surface. We recommend that you attach it to the inside bottom of the chassis, or to the rear panel (inside or outside), without making contact with any connectors or appliques.
- Avoid contact between equipment and clothing. The wrist strap only protects the equipment from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Handle printed circuit cards and appliques by the edges only; avoid touching the components, traces, or any connector pins.
- Place a removed card component-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.
- Do not remove the wrist strap until the installation is complete.



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

Installation

The following sections describe the procedures for installing a CSC-MEC card and Ethernet appliques. The CSC-MEC card is installed in the system card cage, which you access by removing the access panel on the front of the chassis. To access the system card cage, it is not necessary to disconnect cables from the rear of the chassis, or to remove the top cover of the chassis. Ethernet appliques are installed on connector plates in the rear of the chassis; access to the rear of the chassis requires removing the front panel and top cover from the chassis.

Before proceeding, ensure that your system and equipment meet the requirements listed in the section “Installation Prerequisites,” on page 7.

Installing the CSC-MEC Card

Install the CSC-MEC card in the predetermined ciscoBus slot in the system card cage. (For slot priority requirements, refer to the section “Slot Priority,” on page 11.) All network interface cards have ejectors that lock into place when the card is seated in the card cage and allow the card to be extracted easily from its slot. Handle the card as little as possible; try to limit contact to only the ejector tabs and card edges. Install the CSC-MEC card as follows.



Caution To prevent ESD damage, be sure to follow the ESD-prevention procedures described in the previous section. Failure to do so may cause intermittent or immediate equipment failure.

- Step 1** Ensure that the chassis is firmly seated on a stable surface. In the router, the high-performance cards that connect to the ciscoBus require substantial force to slide them into the card cage and seat them properly.
- Step 2** On the front access panel (see Figure 9), turn the two thumb screws counterclockwise to loosen them; do not attempt to remove them from the panel. Pull the panel off the chassis and set it aside.

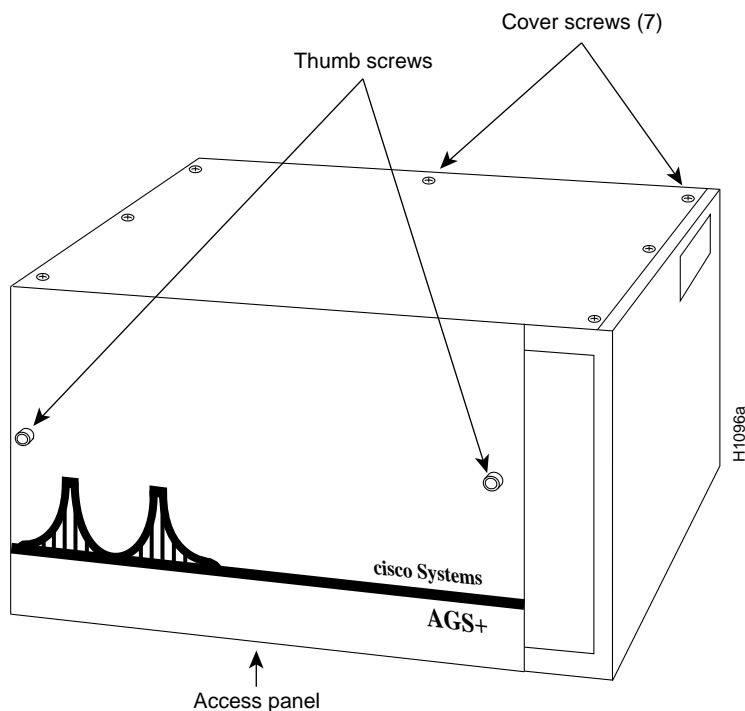


Figure 9 Front Access Panel and Cover Fasteners

- Step 3** Slip on an ESD wrist strap and connect it to the chassis as described in “Preventing Electrostatic Discharge Damage,” on page 17.

Note If you are installing a new CSC-MEC card, disregard steps 4 through 6; skip to step 7.

- Step 4** If you are replacing an existing CSC-MEC card, disconnect the cables from the front of the card to be removed.
- Step 5** If necessary, disconnect the cables from other interface cards so you can remove the CSC-MEC from the card cage. Before disconnecting cables, ensure that they are properly labeled to avoid mixing up interfaces when you reconnect them.
- Step 6** Use your thumbs to pull the ejector tabs out and away from the card edge to loosen it, and pull the card out of its slot. Place the removed card on an antistatic mat or antistatic foam.
- Step 7** Ensure that the jumper for each Ethernet port is set for the correct electrical specification: Ethernet Version 2 (default) or Version 1. (Refer to the section “Configuring the CSC-MEC and CSC-C2MEC Cards,” on page 9.)
- Step 8** Hold the new CSC-MEC card by the ejector tabs and the card edges, component-side up, with the bus edge away from you, and insert it into ciscoBus slot 0 or the lowest-numbered available (empty) ciscoBus slot. (Refer to the section “Slot Priority” on page 11.)
- Step 9** Place your thumbs on the ejector tabs and push the card in firmly until it is firmly seated in the slot. The ejectors close automatically when the card is seated properly.
- Step 10** Place any additional CSC-MEC cards sequentially into slot 1, then 2, then 3.
- Step 11** If Ethernet appliques for all the CSC-MEC ports are already installed, connect the internal ribbon cables from each applique to the CSC-MEC ports. Refer to the labels on the cables, if any, and to the labels on the applique ports to ensure you connect the correct applique to each port.
- Step 12** Proceed to the next section to install the applique(s). If the appliques are already installed, skip to the section “Checking the Installation” on page 21.

Installing Appliques

Following is the procedure for installing either the standard 15-pin Ethernet connector appliques or the 10BaseT appliques; both are mounted on the same type of connector plate and are installed in the same connector area of the chassis. Before proceeding, ensure that your system and equipment meet the requirements described in the section “Installation Prerequisites” on page 7.

The router has four large connector plates and one large individual connection area with space for six individual connector plates. The rear panel of a router, and a 10BaseT connector plate are shown in Figure 10. You must remove the top panel to gain access to the back panel connector plates and make internal cable connections. You also need to remove the front access panel to connect the internal ribbon cables to the CSC-MEC card ports.

Figure 10 Rear Panel Connector Plates and 10BaseT Applique

Note If you are replacing any 15-pin Ethernet connectors with 10BaseT appliques, you can leave unused connectors installed on a connector plate; however, you must disconnect all internal cables. Otherwise, they could propagate noise on other connections.



Warning Before removing any cables or fasteners from the chassis, be sure to turn off the power and unplug the power cable from the power source.

- Step 1** Ensure power to the chassis is turned OFF, and the power cord is unplugged from the power source.
- Step 1** If the chassis front access panel is still in place, remove it according to step 2 in the section “Installing the CSC-MEC Card” on page 18.
- Step 2** Remove the top cover of the router by removing the seven screws that secure it. (See Figure 9.)
- Step 3** On the rear of the router, remove a blank connector plate from the connector area that is the same size as the connector plate you are installing. Individual plates are secured with two screws, large plates with six.



Caution If you are installing a 10BaseT applique, ensure that the CSC-MEC card jumpers are set for Ethernet Type 2 (IEEE 802.3). (Refer to the section “Cables” on page 5.)

- Step 4** Place the new connector plate on the inside of the chassis, against the opening, with the Ethernet connector facing out, and the component side of the applique facing up. See Figure 10.) Secure the applique with the screws you removed in step 3.
- Step 5** Internally, route the internal ribbon cable under the system card cage and up to a port on the CSC-MEC card. Be careful not to tug on or kink the cable.
- Step 6** Affix the appropriate label (Ethernet0, Ethernet1, and so forth) below the applique connector before connecting the next port.
- Step 7** Repeat steps 3 through 6 for any additional appliques.
- Step 8** On the rear of the chassis, connect one of the following to each Ethernet applique connector:
- For 10BaseT appliques, attach a UTP network segment cable directly to the RJ-45 port on the applique.
 - For 15-pin Ethernet connector appliques, attach an Ethernet transceiver cable from the applique connector to a transceiver or MAU; *or*, if you are using a transceiver that does not require a cable, connect the transceiver directly to the applique connector.
 - Make sure the connecting cable, if any, is an IEEE 802.3 cable if connecting to an IEEE 802.3 transceiver, or an Ethernet-compatible cable if connecting to an Ethernet Version 1 or 2 transceiver.
- Step 9** If necessary, reconnect other cables on the back of the chassis.
- Step 10** Replace the top cover on the chassis, but do not secure it with the cover screws until the installation has checked out successfully.
- Step 11** Proceed to the following section “Checking the Installation,” on page 21.

Checking the Installation

After you have installed a new interface, verify the installation before you replace the front panel by observing the LEDs on the CSC-MEC card, the ciscoBus controller card, the system processor card, and on any 10BaseT appliques. When the LEDs indicate that the cards and appliques are installed correctly, you will configure the new interfaces and check the configuration with the EXEC **show** commands.

Checking LEDs

The LEDs on the CSC/3 and CSC/4 processor cards indicate the status of the system software. The ciscoBus controller LEDs indicate the presence (correct installation) of ciscoBus cards in the ciscoBus. The LEDs on the CSC-MEC card are on when the corresponding port (immediately to the right of each LED on the card) is connected to an external interface. If any 10BaseT appliques are installed, the LEDs on the applique indicate the state of that interface. There are no LEDs on the 15-pin Ethernet applique connectors. You will have to be able to access the rear panel of the chassis to observe the LEDs on 10BaseT appliques.

Processor Card LEDs

To the right of the configuration register, on the front edge of the processor card, are three LEDs. On the CSC/3, the left and center LEDs are red (see Figure 11), while on the CSC/4, they are yellow (see Figure 12). The third LED (far right) on each card is green. The LED on the left is a software-programmable status light; it is on (momentarily) during initialization, flashes to indicate an error, and remains off under normal operation. The middle LED is the processor halt light; it is

on when the processor halts for any reason. This LED can flash at power-up, but should not remain on; a problem is indicated when it does. The green LED on the right is a software-programmable run light that is on when the system is running properly.

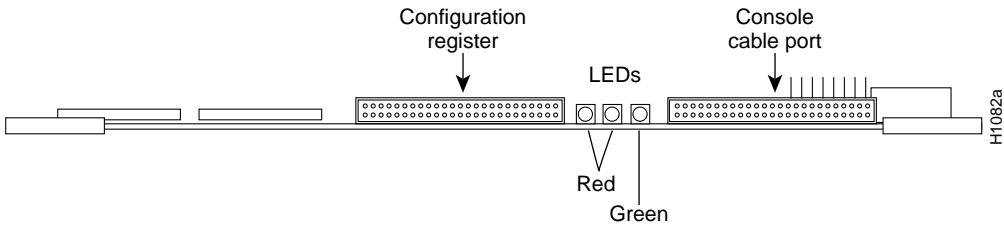


Figure 11 CSC/3 Processor Card LEDs

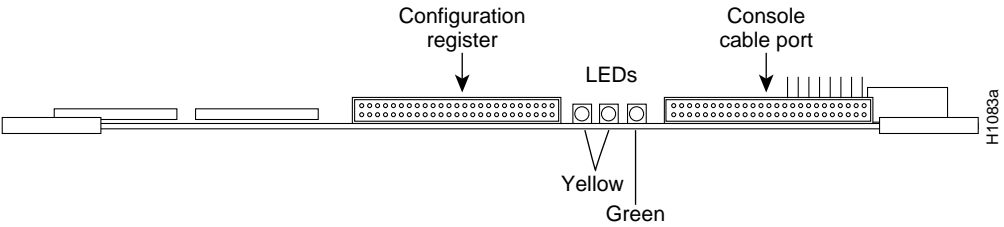


Figure 12 CSC/4 Processor Card LEDs

ciscoBus Controller Card LEDs

Depending upon whether you installed a CSC-MEC or a CSC-C2MEC, you will check the following ciscoBus controller card:

- If you installed a CSC-MEC (first-generation ciscoBus interface card), check the LEDs on the CSC-CCTL ciscoBus controller card.
- If you installed a CSC-C2MEC (second-generation ciscoBus interface card), check the LEDs on the CSC-CCTL2 ciscoBus controller card.

The ciscoBus controller card (CSC-CCTL or CSC-CCTL2) is always installed in the center ciscoBus slot (Multibus slot number 7) as shown in Figure 8.

Following are LED descriptions for both ciscoBus controller cards.

Figure 13 illustrates the LEDs that are on when a card is present in a corresponding ciscoBus slot. (The orientation of Figure 13 is looking at the front edge of the card installed in the card cage.) The numbers above the LEDs indicate the ciscoBus slot numbers. Depending upon the slot in which the ciscoBus card is installed (slot 0 through 3), the corresponding LED will be on to indicate a card in that slot. Some ciscoBus cards have appliques that require power from the card to which they attach. If these appliques are not connected correctly, the corresponding LED on the CSC-CCTL will not be on. All other LEDs are on momentarily at power on, but are not currently used.

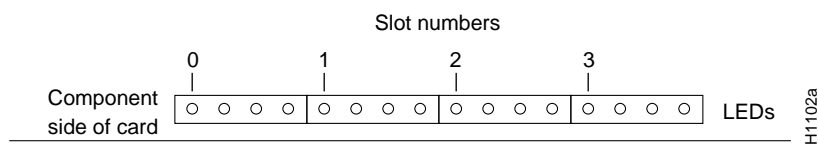


Figure 13 CSC-CCTL Card LEDs—Front-Edge View

The LEDs on the CCTL2 card indicate when an interface is present in a ciscoBus slot. The front edge of the CCTL2 card contains a bank of five LEDs as shown in Figure 14. (The orientation of Figure 14 is looking at the front edge of the card installed in the card cage.) There is one red LED for each interface slot in the ciscoBus, and a green LED to indicate a successful boot procedure. One red LED will be on for each correctly connected ciscoBus card using the correct version of microcode. It will not be on if the card is incorrectly connected or if the microcode on that ciscoBus card is the wrong version. The numbers above the LEDs (0 through 3 from right to left) indicate the ciscoBus slot numbers.

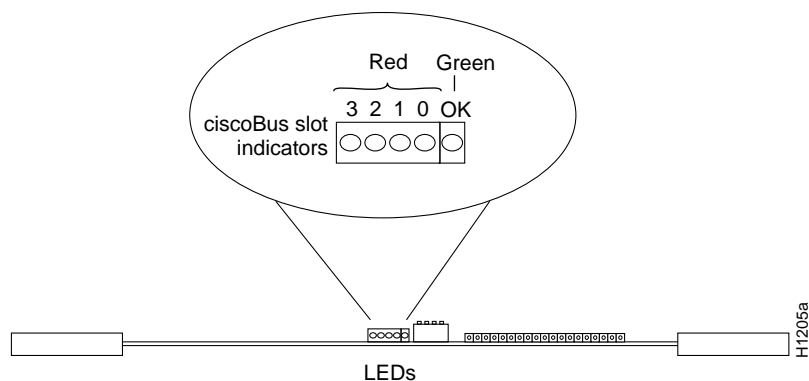


Figure 14 CSC-CCTL2 Card LEDs—Front-Edge View

CSC-MEC Card LEDs

On the CSC-MEC, an LED is located to the right of each port. (See Figure 15.) After the system has booted, the LED for each connected port should be on.

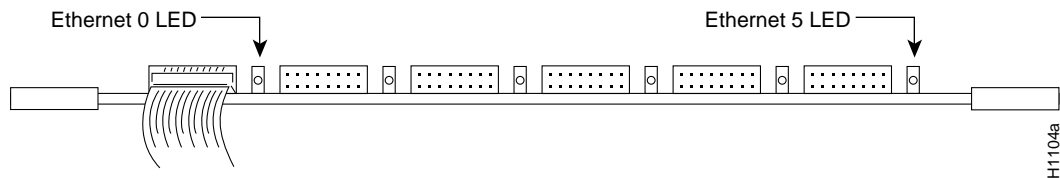


Figure 15 CSC-MEC Card—Front-Edge View

Applique LEDs

The three green LEDs on the 10BaseT applique, shown in Figure 16, indicate the following:

- LINK—ON when a good link on the receive data (RD) pair has been established.
- RCV—ON to indicate that a packet has been received from the network.
- XMT—ON to indicate that a packet has been sent from the router.

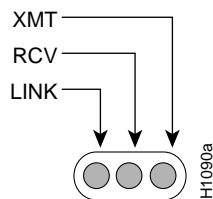


Figure 16 10BaseT Applique Status Indicator LEDs

At power up, the LINK LED is on and remains on if it is connected to a 10BaseT link that is powered up. This LED indicates that a good link has been established. If it does not come on, check the opposite end of the link to ensure that it is powered up and that the cable is securely installed. If the LED still is not on, switch the transmit and receive pair at one end of the link and restart the system. When a good link is established, the RCV LED will flash or remain on to indicate packet traffic on the link. The XMT LED will be on when the unit transmits data over the link.

If the opposite end of the link is connected to a hub, the hub will perform a *crossover* function, which means that the transmitter from the unit goes to the receiver of the hub, and the transmitter from the hub goes to the receiver of the unit. This configuration is correct; however, if the unit connects to an external media attachment unit (MAU), the crossover function must be performed in the attaching wires. Otherwise, the two transmit wires are connected to each other, as are the two receive wires.

Note The Ethernet AUI appliques have no LEDs.

Restarting the System

To check the installation, first verify the ciscoBus controller card LEDs, then the CSC-MEC LEDs, then any applique LEDs with the following steps. Before turning on the system power, ensure that you are able to access the rear of the chassis to observe the LEDs on the applique.



Caution To prevent chassis overheating, replace the chassis cover before restarting the system. Operating the system with the cover removed misdirects the flow of cooling air and can cause the chassis to overheat and force the environmental monitor to shut down the system.

Step 1 Plug in the power cord and turn power ON to the system.

Step 2 Verify that the LEDs on the ciscoBus controller card (CSC-CCTL or CSC-CCTL2) light according to the previous descriptions. If they are off, do the following:

- Check the LEDs on the processor card. If no LEDs on the system processor card are on, check the system power. If the system is receiving power, you will hear the internal blower operating.
- Ensure the ciscoBus controller card is installed in the center ciscoBus slot (Multibus slot 7) as shown in Figure 8.
- If only the LEDs on the ciscoBus controller card fail to light, turn OFF the system power and remove the ciscoBus controller card to check the setting of switch S1. Ensure that S1 is set for unit 0, which is the factory default. (See the section “Card Numbering and Interface Addressing” on page 13.)
- If the system does not boot, turn OFF the system power and check switch S1 on each Multibus interface card that was removed from the chassis. Ensure that none were inadvertently set to card number 0; the only card that can be set for card number 0 is the ciscoBus controller card.

Step 3 When the system has booted, check the LEDs on the CSC/3 or CSC/4 system processor card. The far right green LED should be on; the other two LEDs should be off. If the far right LED is off, or if either of the other two LEDs is on or flashing, do the following:

- Turn OFF the system power, remove and reseal the processor card, and restart the system.
- If you installed new components on the processor card, turn OFF system power, remove the card, and check the new components for bent pins. If any are bent, carefully remove the component, straighten the pin with needlenose pliers, replace the card, and restart the system. If a component pin is broken off, contact a customer service representative for a replacement component.

Step 4 CSC-CCTL2 only—When the system is operational, verify that the far right, green OK LED is on and remains on. If it does not, proceed with the installation to determine whether the LED is faulty.

Step 5 Check the four red LEDs on the ciscoBus controller card. Ensure that the LED is on for each ciscoBus slot occupied by a ciscoBus card; the ciscoBus controller LEDs are off for ciscoBus slots that contain Multibus cards. (See the section “Checking LEDs” on page 21.) If any LEDs are not on (that should be), do the following:

- If an LED for a slot with a new card fails to come on, ensure the card is firmly seated in the ciscoBus slot. Turn OFF the system power, reseal the card, and turn ON the system power again.

- Ensure that the interface card in question is installed in one of the four ciscoBus interface slots. (See Figure 8.)
- If the ciscoBus controller card LEDs (for other occupied slots) are on, turn OFF system power, remove the interface card in question, install it in a different ciscoBus slot, and reboot the system.
- If the LED for this card still fails to come on, refer to the section “System Requirements” on page 7, and ensure that the card controller type and microcode are compatible with your system.

Step 6 Check the LEDs on the CSC-MEC card. The ports activate from left to right when viewing the card in the card cage. The LEDs are on to indicate the interface is functional, *even when the interface is not attached to a transceiver*. The LED to the right of each connected port should be on. (See Figure 15.) If any LEDs for a connected port are not on, do the following:

- If no LEDs on the CSC-MEC are on, turn OFF power to the system, remove and reseal the CSC-MEC, and reboot the system.
- If other LEDs on the card are on, remove the cable from the port in question and connect it to another port on the same card. If the LED is on when the cable is connected to a different port, use the **show** commands (described in the next section) to check the interface. If the interface is up but the LED is not on, the LED is bad; return the card for service.

Step 7 Check the LINK LEDs on any installed 10BaseT appliques. Ensure that each LINK led is on. (See Figure 16.) If it is off, check the following:

- Check the connection at both ends of the internal ribbon cable between the applique and the CSC-MEC card. The applique draws power directly from the card.
- Swap the cable in question with a spare cable, if available, or with the cable from a functional 10BaseT applique.
- Check the connections at both ends of the link (the applique RJ-45 connector and the Ethernet network connection or hub) and ensure that the cables are securely seated in the connectors at each end.
- At the network end (opposite the router end), ensure that the 10BaseT link has power.
- If the LED is still off, switch the transmit and receive pair at one end of the link and reboot.

Step 8 Check the system console terminal and ensure that the system banner is displayed, followed by a list of the installed hardware. (See page 8 for an example of this display, which is the same as the output for the **show version** command.) The number of MEC interfaces displayed should include the new CSC-MEC cards you just installed.

Note If the LEDs fail to come on correctly or the startup screen does not appear after a second installation attempt, contact a service representative for assistance.

Step 9 When the installation checks out successfully replace and tighten any remaining cover screws.

Step 10 Replace and secure the front access panel.

Step 11 To configure the new interfaces, proceed to the following section, “Configuring the Interfaces.” Do not affix the interface labels (E0, E1, and so on) until all interfaces are configured.

When new hardware is installed, the system automatically defaults to the **setup** command facility. You can either remain in **setup** and answer each prompt, or exit from **setup** and configure any new interfaces with **configure** command. If you have no new interfaces to configure (you replaced a card), exit from **setup** by answering **no** to the following prompt:

```
Continue with configuration dialog [yes]? no
```

When the system is configured and running, use the **show controller cBus** command to display the name, controller type, microcode version, and interfaces on each card in the ciscoBus. For descriptions of other **show** commands, refer to the router products configuration publication.

Configuring the Interfaces

The system automatically invokes the **setup** command facility whenever new hardware components are installed. This facility determines which interfaces are installed and prompts you for configuration information for each one. When you complete each interface, the facility automatically starts over for the next, continuing until each interface has been configured. When you add new interfaces, the configuration information for the system and all existing interfaces is retained and displayed as the default (in brackets []) in the prompts. Use the Return key to accept the defaults (existing configuration information) at each prompt. At this point you have two options: continuing in **setup** to configure the new interfaces, or exiting **setup** and configuring the new interfaces with the **configure EXEC** command.

Before beginning this configuration procedure, be prepared with the information you will need such as the protocols you plan to route on each interface, IP addresses if you will configure the interfaces for IP, and which interfaces, if any, will use bridging.

The system banner and a list of all installed interfaces, including those you just installed, should be displayed on the screen. (See page 8 for an example of this display, which is the same as the output from the **show version** command.) If this information is not displayed, return to the section “Restarting the System,” on page 25.

The System Configuration Dialog text is displayed below the list of installed hardware, with the following message at the end of the display:

```
Default settings are in square brackets '[ ]'. Continue with
configuration dialog [yes]?
```

To continue with the **setup** facility, answer **yes** at the prompt and proceed to the following section, “Using Setup.” To exit from **setup** and use the configure EXEC command to configure the new interfaces, answer **no** at the prompt and proceed to the section “Using the Configure EXEC Command” on page 29.

Using Setup

After you choose to continue with the **setup** command (by answering **yes** to the system configuration dialog prompt), the remainder of the script is the actual configuration process. The dialog prompts you first for global system parameters, then for configuration information for each interface. The existing configuration is displayed as the default, in brackets ([]), at the end of each prompt. Press the Return key to accept the default settings.

Note After you start the setup facility, the system runs through the entire configuration process; you cannot quit out of it. If you want to make a change or correct a mistake, press the Return key at each prompt, answer **no** when asked if you want to save the configuration, and restart the setup facility.

Step 1 The following script is displayed on the screen, with the name of your router as the default in the brackets:

```
Configuring global parameters:
```

```
Enter host name [router]:
```

Step 2 Press Return to accept the default and keep the router name. (If you *do* want to change the name of the router, enter the new name before pressing Return.)

Step 3 Proceed through the remainder of the global parameter prompts; use the Return key to accept the defaults.

Step 4 After the global parameters are configured, the system prompts you for interface configuration information, one interface at a time. The following is a partial display of the script for a previously-configured interface:

```
Configuring interface parameters:
```

```
Configuring interface Ethernet0:
```

```
Is this interface in use [yes]:
```

```
Configure IP on this interface? [yes]:
```

```
IP address for this interface: 131.108.6.67
```

```
(remainder of display text omitted)
```

Step 5 Press the Return key to accept the default at each prompt and retain the existing configuration information. When you reach the scripts for configuring new interfaces, enter the new configuration information at each prompt.

When all interfaces are configured, the system displays the entire configuration script followed by the following prompt for which there is no default (you must enter **yes** or **no**):

```
Use this configuration [yes/no]:
```

Step 6 Enter **yes** at the prompt (unless you want to discard the configuration file and start over). The following message is displayed:

```
Press RETURN to get started!
```

The configuration process is complete.

For descriptions of **show** commands you can use to display and verify the configuration information, proceed to the section “Checking the Configuration” on page 31.

Using the Configure EXEC Command

You must enter the privileged level of the EXEC in order to use the **configure** command. After specifying an interface, you will enter the configuration information with interface subcommands. Before beginning this procedure, use the **show interfaces** command to determine interface numbers you need to configure.

The EXEC command **show configuration** displays the configuration information stored in nonvolatile memory. Before entering any new interface information, you may want to use this command to review the current configuration. The following example shows a partial display of the **show configuration** command output:

```
router# show config

Using 533 out of 32768 bytes
!
no service config
!
Interface Ethernet 0
ip address 4.0.0 1 255.0.0.0.

Interface Serial 0
ip address 5.0.0.1 255.0.0.0

Interface Ethernet 1
ip address 9.9.9.9 255.0.0.0.

Interface Serial 1
ip address 7.7.7.67 255.0.0.0
```

In the configuration mode, you identify the specific interface to be configured with the **interface** configuration command, which begins the configuration subcommand collection mode for the specified interface. The syntax is **interface type unit**, where *type* identifies the type of interface (such as Ethernet), and *unit* identifies the interface unit address. You then must enter the configuration subcommands that define the configuration specifics for the interface. For example, new interfaces are shut down by default; you must enable each one with the **no shutdown** interface subcommand. You need other interface subcommands to assign a descriptive name to an interface, specify encapsulation methods, and define routing protocols. Refer to the router products configuration publication for complete descriptions of the configuration subcommands.

In the following sample configuration, two new Ethernet interfaces are enabled and assigned IP addresses, then the configuration is written to memory.

```
router> ena
Password:

router# config term
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U; end with CTRL/Z

interface ethernet 2
ip address 145.22.4.67 255.255.255.0
no shut
interface ethernet 3
ip address 145.22.4.68 255.255.255.0
no shut
^z
router# write memory
[ok]
router#
```

The following steps provide instructions for a basic configuration: enabling an interface and specifying IP routing. You may also need to enter other configuration subcommands, depending upon the requirements for your system configuration. (Configuration subcommands are described in the router products configuration publication). Refer to the previous example as necessary.

Step 1 At the system prompt, enter **enable** and the appropriate password to enter the EXEC command level.

Step 2 Enter the configuration mode by entering the following:

```
configure terminal <Return>
```

Step 3 At the prompt, specify the first interface to configure by entering the subcommand **interface** *type unit* as shown in the following example:

```
interface ethernet 2 <Return>
```

Step 4 If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand as follows:

```
ip address 145.22.4.67 255.255.255.0 <Return>
```

Step 5 Change the default shutdown state and enable the interface by entering the **no shut** configuration subcommand as follows:

```
no shut <Return>
```

Step 6 Enter any additional configuration subcommands required.

Step 7 Repeat steps 3 through 6 for each new interface.

Step 8 When all new interfaces are configured, enter **Ctrl-Z**. (Hold the Control key down and press Z.)

Step 9 Write the new configuration to memory by entering the following:

```
write memory <Return>
```

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

Step 10 Enter **quit** to exit the configuration mode.

Step 11 Check the configuration as described in the following section.

Checking the Configuration

After you configure the new interface(s), observe the LEDs on any 10BaseT appliques installed, and use the EXEC **show** commands to display status information as follows:

- Step 1** If the LINK LED is on, but the XMT and RCV LEDs are off, no data is getting through. Check the XMT and RCV LEDs on any installed 10BaseT appliques.
- Turn OFF the system power and check the jumper settings of W1 through W6 on the CSC-MEC card and ensure that the jumper for each port connected to a 10BaseT applique is set for Ethernet Version 2. (Refer to the section “Configuring the CSC-MEC and CSC-C2MEC Cards,” on page 9.)
- Step 2** Use the **show config** command to display the current system configuration file. Each interface is listed along with its assigned IP address. Verify that each new Ethernet interface appears. A partial, sample display is shown on page 29.
- Step 3** To obtain detailed status information about a specific Ethernet interface (for example, Ethernet 1), specify the interface with the command **show interface ethernet 1**. The first line of the display names the interface and its unit address (1) and indicates whether the interface and the line protocol are up or down. If the line protocol is down (and you did not administratively shut the interface down), the hardware is not functioning properly; ensure that the network interface is properly connected and terminated. For explanations of the displayed information, refer to the router products configuration publication.

Following is a partial sample display of the **show interface** command for Ethernet interface 1:

```
router# show int ether 1

Ethernet 1 is up, line protocol is up
  Hardware is cBus Ethernet, address is 0000.0c02.a03d
  Internet address is 131.108.42.9, subnet mask is 255.255.255.0
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  ARP type: ARPA, ARP Timeout 4:00:00
  Last input 0:00:01, output 0:00:00, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 63 drops; input queue 0/75, 0 drops
  Five minute input rate 4000 bits/sec, 6 packets/sec
  Five minute output rate 29000 bits/sec, 24 packets/sec
    6655552 packets input, 613757001 bytes, 0 no buffer
    Received 423040 broadcasts, 4 runts, 0 giants
    5 input errors, 1 CRC, 0 frame, 0 overrun, 45 ignored, 0 abort
    14231290 packets output, 1923109363 bytes, 0 underruns
    0 output errors, 25588 collisions, 3 interface resets, 0 restarts
```

You can also use the command **show interface** (without variables) to display all network interfaces: serial, Ethernet, FDDI, and Token Ring. Each new MEC interface should be appended to the list of existing interfaces, with the next sequential number assigned to it.

Use the command **show controller cBus** to display the current internal status of the CSC-MEC card(s), including the interfaces and how the system has identified them. The display lists the interfaces connected to each CSC-MEC cards and indicates that the system has identified your new interface, but it does not indicate the state of the line or protocol.

For descriptions of additional commands, refer to the router products configuration publication.

This completes the installation and configuration procedure for the CSC-MEC card and associated equipment.

Note For technical assistance, contact a service representative or the Cisco Technical Assistance Center (TAC) at 800 553-2447, 415 903-7209, or tac@cisco.com. For upgrade or product information, contact the Customer Response Center at 800 553-6387, 415 903-7208, or cs-rep@cisco.com.

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