



Doc. No. 78-0875-04

ciscoBus Token Ring Card and Applique Installation and Upgrade Instructions

Product Numbers:

CSC-C2CTR=

APP-LTR2=

MC-C2CTR-V10.2=

This document contains instructions for installing the multiport ciscoBus Token Ring interface card (CSC-C2CTR) and Token Ring applique (APP-LTR2) in your AGS+ chassis. This document also provides instructions for upgrading the C2CTR microcode by replacing a single erasable programmable read-only memory (EPROM) component on the CSC-C2CTR card. The CSC-C2CTR provides two or four high-speed Token Ring interfaces for connection to IEEE 802.5 and IBM-compatible Token Ring media at speeds of 4 or 16 Mbps. The APP-LTR2 provides the interface between the CSC-C2CTR and your Token Ring network. Both the card and applique must be installed in an AGS+ with a CSC/3 or CSC/4 processor card and a ciscoBus II controller card (CSC-CCTL2).

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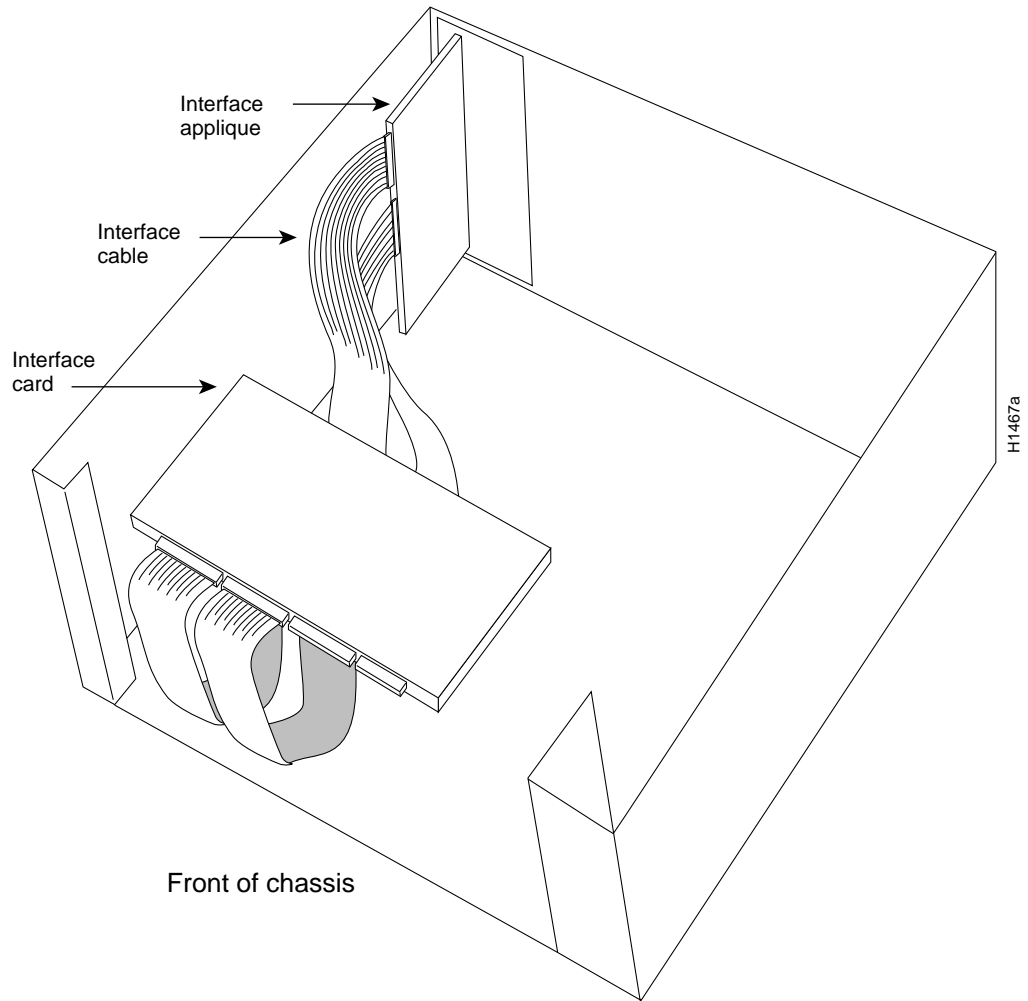
Product Descriptions

The following sections contain physical descriptions and brief functional overviews of the CSC-C2CTR card and the APP-LTR2 applique.

The CSC-C2CTR resides in the AGS+ system card cage. Each port on the CSC-C2CTR provides one Token Ring interface and connects to an APP-LTR2 applique with an internally routed ribbon cable. The APP-LTR2, which resides in an applique card cage, are installed in the two far right large plate areas in the rear of the AGS+. The appliques provide the external interface to the Token Ring network.

A typical installation, showing the interface card, the (internal) interface cable, and the interface applique, is shown in Figure 1. The system card cage and applique card cages are not included in the drawing in order to more clearly show the cable routing.

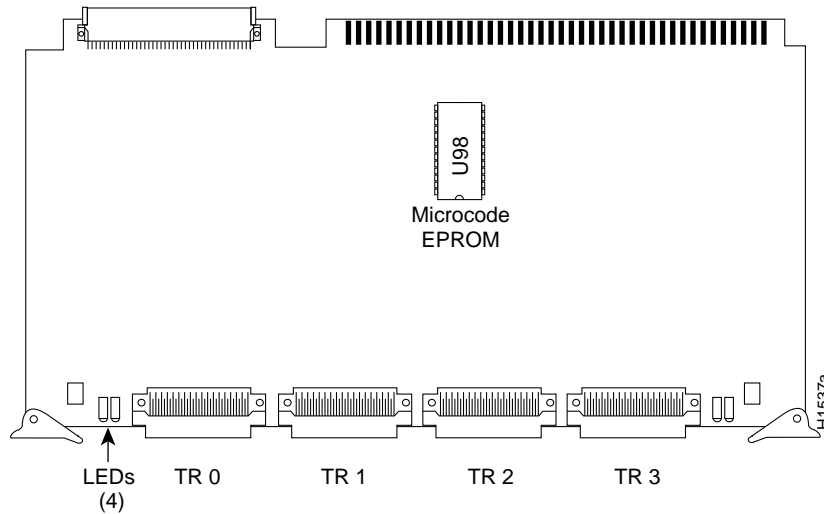
Figure 1 Typical Installation, Shown Without Card Cages



CSC-C2CTR Interface Card

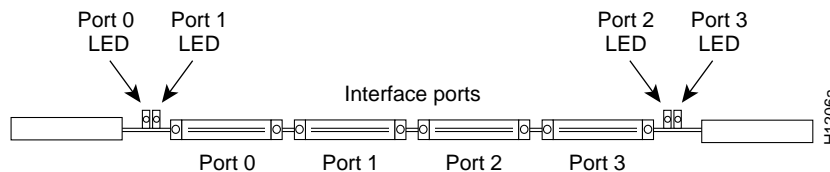
The CSC-C2CTR, shown in Figure 2, contains four ports. The card supports two interfaces when used with one APP-LTR2 and four interfaces when used with two APP-LTR2s. Each port (interface) is individually configured to operate at 4 or 16 Mbps. The C2CTR-specific microcode (firmware) resides on an EPROM in socket position U98, which may need to be replaced when the system software is upgraded or when operating enhancements are implemented. Instructions for the microcode upgrade can be found in the section “Upgrading Microcode” on page 34.

Figure 2 CSC-C2CTR ciscoBus Token Ring Card—Component-Side View



The four interface ports are numbered from left to right TR 0 through TR 3 when viewing the card as installed in the system card cage. (See Figure 3.) Each port is connected to an APP-LTR2 with an internal ribbon cable. Four green LEDs indicate the status of each port (interface). When an interface is *up*, or active in the ring, the corresponding LED is on. The LED is off when the interface is inactive, administratively down, not internally connected to the applique, or the applique is not externally connected to the ring.

Figure 3 CSC-C2CTR ciscoBus Token Ring Card—Front-Edge View

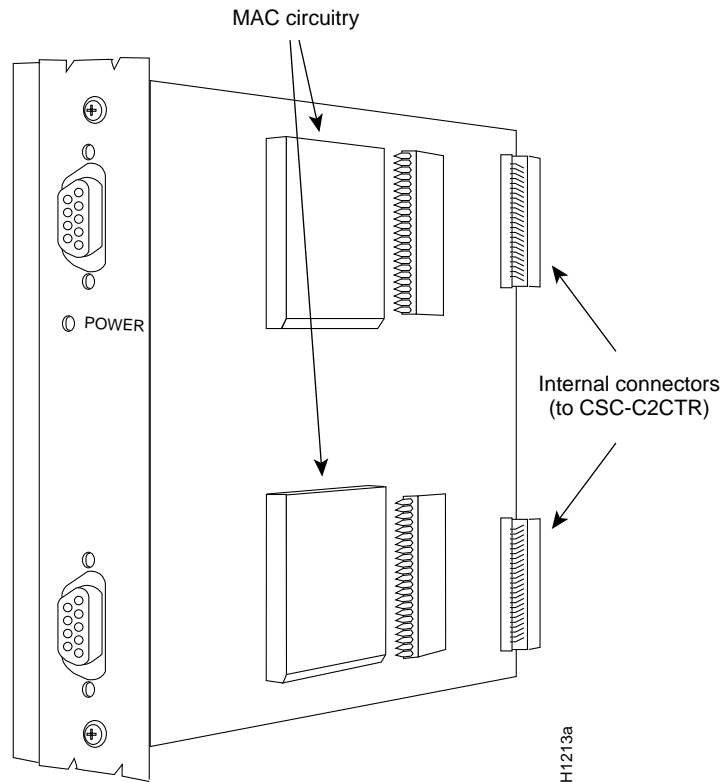


The C2 designator in the product number indicates that the CSC-C2CTR card must be installed in an AGS+ with a ciscoBus II controller card (CSC-CCTL2). The CSC-C2CTR can be installed in any available ciscoBus slot except the center slot, which contains the CSC-CCTL2. However, for optimum performance, the CSC-C2CTR should be installed in the highest-priority slot available in accordance with the slot priority scheme described on page 9. Instructions for determining your current system software version and the type of ciscoBus controller installed are provided in the section “System Compatibility Requirements” on page 6.

APP-LTR2 Applique

The APP-LTR2, shown in Figure 4, provides the required high-speed interfaces between the CSC-C2CTR and your Token Ring network. Each applique contains two female DB-9 Token Ring connectors and the Media Access Control (MAC) circuitry for each interface. The green power LED goes on to indicate the applique is receiving power from the CSC-C2CTR. Two ribbon cables provide the internal connection between the applique and two ports on the CSC-C2CTR.

Figure 4 APP-LTR2 Applique



The APP-LTR2 is installed in an applique card cage mounted on the rear panel of an AGS+. One or two appliques can be installed in each card cage. Because of internal space limitations, no more than two applique card cages can be installed in the AGS+ chassis; therefore, a maximum of four APP-LTR2s can be installed. A grounding strap, which is included with the applique, must also be installed to prevent noise on the interface. Detailed instructions for installing the applique and card cage are provided in the section “Installing the APP-LTR2 Applique” on page 20.

Installation Prerequisites

This section describes the minimum compatibility requirements that your system hardware and software must meet before you install a new CSC-C2CTR. It describes the various commands you can use to verify the compatibility requirements.

System Compatibility Requirements

Before installing a new CSC-C2CTR, ensure that your existing system components meet the following minimum configuration requirements for compatibility with the card:

- An AGS+ with a CSC/3 or CSC/4 processor card.
- The system is running Software Release 9.1 or later.
- A CSC-CCTL2 ciscoBus 2 controller card (Controller Type 6.0 or later) is installed.
- All ciscoBus interface cards are compatible with the CSC-CCTL2. (All must be running Microcode Version 10.0 or later.) If you are replacing a CSC-CCTL with a CSC-CCTL2, you must also upgrade all existing ciscoBus interfaces to Microcode Version 10.0 (or later) at the same time you replace the ciscoBus controller card.
- All Multibus Token Ring interface cards meet the following requirements:
 - CSC-1R and CSC-2R microcode is Version 1.2 or later.
 - CSC-R16M microcode is Version 3.2 or later.

Refer to the section “Compatibility with Other Cards” on page 15 for compatibility requirements for all ciscoBus and Multibus cards when running Software Release 9.1 (required for CSC-C2CTR and CSC-CCTL2 operation).

- An applique card cage (product number MAS-CCG) is installed in the chassis, and there is at least one empty slot available.

or

You received a new card cage in which the APP-LTR2 is already installed.

- There is a ciscoBus slot available (empty) for each CSC-C2CTR you will install.

You can display the current software version and the type of processor card installed with the **show version** command. The current system software version is displayed in the first line of the output, and the processor card information is displayed on the eighth line, followed by a list of the installed interface cards. A sample of the display follows:

```
router# show version

GS Software (GS3-BFX), Version 9.1
Copyright (c) 1986-1992 by cisco Systems, Inc.
Compiled Wed 03-Jun-92 01:24

System Bootstrap, Version 4.5(0.8)

router uptime is 11 days, 8 hours, 41 minutes
System restarted by power-on
System image file is "router-system", booted via tftp from 131.108.1.111

CSC3 (68020) processor with 4096K bytes of memory.
X.25 software.
Bridging software.
1 MCI controller (2 Ethernet, 2 Serial).
1 cBus controller.
1 MEC controller (6 Ethernet).
```

```

1 CTR controller (4 Token Ring).
Environmental Controller.
8 Ethernet/IEEE 802.3 interface.
4 Token Ring/IEEE 802.5 interface.
2 Serial network interface.
1 HSSI network interface.
1 FDDI network interface.

```

You can display a description of the current ciscoBus controller card with the **show controller cbus EXEC** command. The ciscoBus controller type is displayed, followed by a description of each ciscoBus interface card, the ciscoBus slot in which it is installed, and the microcode version of each. A sample of the display follows. For complete descriptions of all of the displayed fields, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications. In the following display, note that the microcode version on all ciscoBus interface cards is Version 10.0 or later, indicating that the ciscoBus controller is a CSC-CCTL2.

```

router# show cont cbus

ciscoBus 1, controller type 6.0, microcode version 10.0
  512 Kbytes of main memory, 128 Kbytes cache memory
  (display text omitted)
FDDI-T 0, controller type 7.1, microcode version 10.1
  Interface 0 - Fddi0, station address 0000.0c02.6aa3
  (display text omitted)
CTR 1, controller type 9.0, microcode version 10.1
  Interface 8 - TokenRing0, station address 0000.3040.e004
  13 buffer RX queue threshold, 31 buffer TX queue limit,
  (display text omitted)
  Interface 9 - TokenRing1, station address 0000.3040.e084
  (display text omitted)
  Interface 10 - TokenRing2, station address 0000.3040.e044
  (display text omitted)
  Interface 11 - TokenRing3, station address 0000.3040.e0c4
  (display text omitted)
HSCI 2, controller type 10.0, microcode version 10.0
  Interface 16 - Hssi0, electrical interface is Hssi DTE
  (display text omitted)

```

You can display a description of the current Multibus Token Ring interfaces with the **show controller token** command. There is no card name or controller type displayed with this command. Although it is not apparent, the card type is distinguishable in the first line of the **show controller token** display (CSC-1R/2Rs are displayed as TR Unit *n* on the first line of the display; CSC-R16Ms are labeled TR*n* in the first line.) The microcode version (labeled *f/w ver*) is displayed on about the twelfth line of the display.

The following example shows a CSC-1R with Microcode Version 1.2 installed:

```

router# show cont token

TR Unit 0 is board 0 - ring 0
  (11 lines of text omitted)
  f/w ver: 1.2 expr 0, chip f/w:00000.ME31100,[bridge capable]
  SMT versions: 1.01 kernel, 4.02 fastmac
  (text omitted)

```

The following example shows a CSC-R16M with Microcode Version 3.2:

```

router# show cont token

TR0: state 3, dev blk: 0x1c98A4, mailbox: 0x21000B0, sca: 0x2010000
  (11 lines of text omitted)
  f/w ver: 3.2, chip f/w: '000000.ME31100', [bridge capable]

```

For field descriptions and additional commands, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.

Note If your system software, ciscoBus controller, or other interface cards in your system do not meet the preceding compatibility requirements, contact a customer service representative.

ciscoBus Configuration

Before installing a new CSC-C2CTR, ensure that all ciscoBus interface cards are the C2 type (all have Microcode Version 10.0 or later installed), that any new ciscoBus cards you are installing will not exceed the maximum port limits for ciscoBus interfaces, and that the ciscoBus cards will be placed in the correct order of priority in the ciscoBus slots. The following sections describe how to determine all of these requirements.

ciscoBus Controller Compatibility

All ciscoBus interface cards, which are listed in Table 1, contain card-specific microcode that determines whether the card is compatible with the first- or second-generation ciscoBus controller card. Following are compatibility guidelines:

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

Table 1 CSC-CCTL2 Interface Card Compatibility Requirements

CCTL Controller Card	CCTL2 Controller Card	Description
CSC-CCTL	CSC-CCTL2	ciscoBus controller
CSC-FCI	CSC-C2FCI	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 ¹	Multiport Ethernet Controller interface

1. Only CSC-C2MEC Revision 5.1 or later is compatible with the CSC-CCTL2.

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 second-generation ciscoBus controller card, the CSC-CCTL2. With the exception of a Revision 5.0 CSC-MEC (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 revision 5.1 CSC-MEC 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 card with a CSC-CCTL2 ciscoBus controller card, you must upgrade the microcode on all ciscoBus interface cards to Microcode Version 10.0 or later.

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

You can display a description of the current ciscoBus controller and ciscoBus interface cards with the EXEC **show controller cbus** command, an example of which is shown on page 7. The name and controller type of each ciscoBus card, the ciscoBus slot in which it is installed, and the microcode version of each is displayed. (Additional statistical information is also displayed for each interface card, but is omitted from the example.)

Slot Priority

The system card cage, shown in Figure 5, 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.

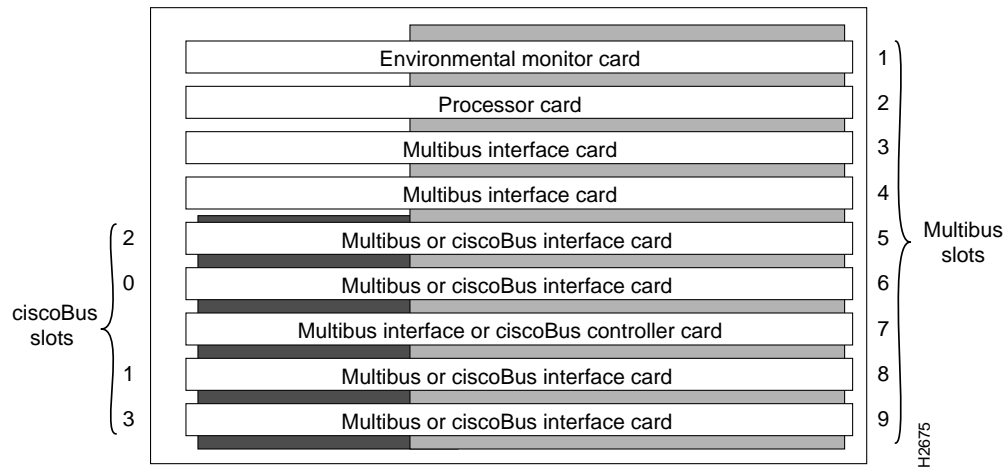
Slot priorities are set to accommodate the amount of traffic generated by each interface card and the amount of card buffering required. Each ciscoBus interface card is placed in a specific slot with regard to other ciscoBus interface cards, if any. The order of priority is the same for both first- and 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 5 AGS+ System Card Cage



ciscoBus Port Limitations

The CSC-C2CTR will interoperate with any of the C2-designated ciscoBus interface cards. The maximum number of CSC-C2CTR ports that can be used when other ciscoBus interfaces are installed are shown in Table 2.

Table 2 Maximum Port and Card Configurations for ciscoBus Interface Cards

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

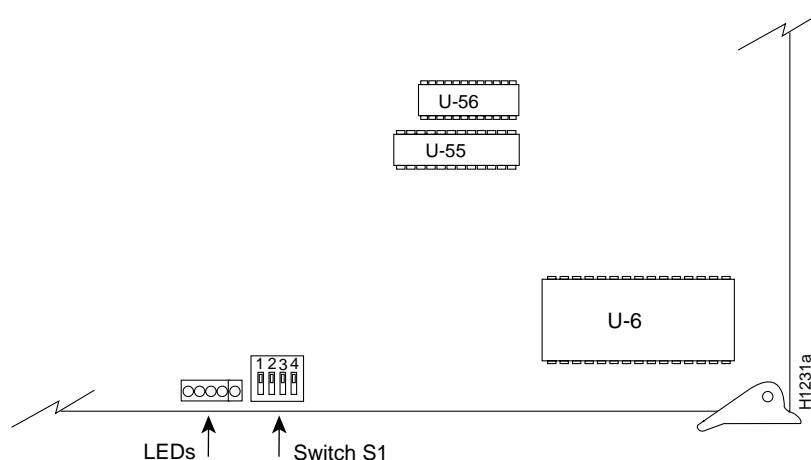
C2CTR		C2FCIT/(C2)FCI ¹		(C2)MEC		(C2)HSSI	
Ports	(Cards)	Ports	(Cards)	Ports	(Cards)	Ports	(Cards)
2	(1)	3	(3)	0	(0)	0	(0)
2	(1)	2	(2)	0	(0)	1	(1)
2	(1)	1	(1)	0	(0)	2	(2)
2	(1)	0	(0)	0	(0)	3	(3)
0	(0)	4	(4)	0	(0)	0	(0)
0	(0)	3	(3)	0	(0)	1	(1)
0	(0)	2	(2)	0	(0)	2	(2)
0	(0)	1	(1)	0	(0)	3	(3)
0	(0)	0	(0)	0	(0)	4	(4)

1. The designator C2 in parentheses indicates that the card has Microcode Version 10.0 or later installed. The designator C2 not in parentheses indicates that the card ships with Microcode Version 10.0 or later by default.

Card and Interface Numbering

The AGS+ 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 (CSC-CCTL2) has a unique card number that you set with switch S1 on each card. Figure 6 shows the location of switch S1 on the CSC-CCTL2. The system processor uses the card numbers to assign interface addresses to the ports on each card and to control traffic across the Multibus. Because the CSC-CCTL2 controls the traffic between the Multibus and all ciscoBus cards, it is the only ciscoBus card that needs a card number. The card number of the CSC-CCTL2 is always 0, which is the factory default; no Multibus cards can be set for card number 0. Figure 6 illustrates the correct switch settings for card number 0; all four pins are in the down (off) position when the CSC-CCTL2 is viewed from the front edge of the card (viewed as installed in the card cage).

Figure 6 CSC-CCTL2 Switch S1 Set for Unit 0



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 cards and continues the interface address sequence as it polls the ciscoBus cards according to the ciscoBus slot priority. (Refer to the section “Slot Priority” on page 9.)

These numbering schemes allow the system to distinguish each interface card while sequentially numbering like interfaces (such as Token Ring interfaces on CSC-2Rs and CSC-C2CTRs). Table 3 is an example of how the system assigns Token Ring interface addresses in a chassis with two CSC-2Rs (two ports each) and two CSC-C2CTRs (four ports each). The CSC-2R is a Multibus card, and the CSC-C2CTR is a ciscoBus card; therefore, the CSC-2R interface addresses are assigned first. The example in Table 3 shows the maximum number of 16 Token Ring interfaces allowable in an AGS+ without exceeding the power budget (also see the section “Compatibility with Other Cards” on page 15).

Chassis Limitations

A maximum number of two CSC-C2CTRs can be installed in an AGS+ chassis. This limit is due to the internal space available for the APP-LTR2s, which are installed in an applique card cage. Each APP-LTR2 provides two interface ports; therefore, each CSC-C2CTR requires two APP-LTR2s when all four ports are used. Since each applique card cage holds two appliques, and a maximum of two applique card cages can be installed in an AGS+, a maximum of two CSC-C2CTRs and four APP-LTR2s can be installed in an AGS+. A top-down view of the AGS+ with two card cages installed is shown in Figure 7.

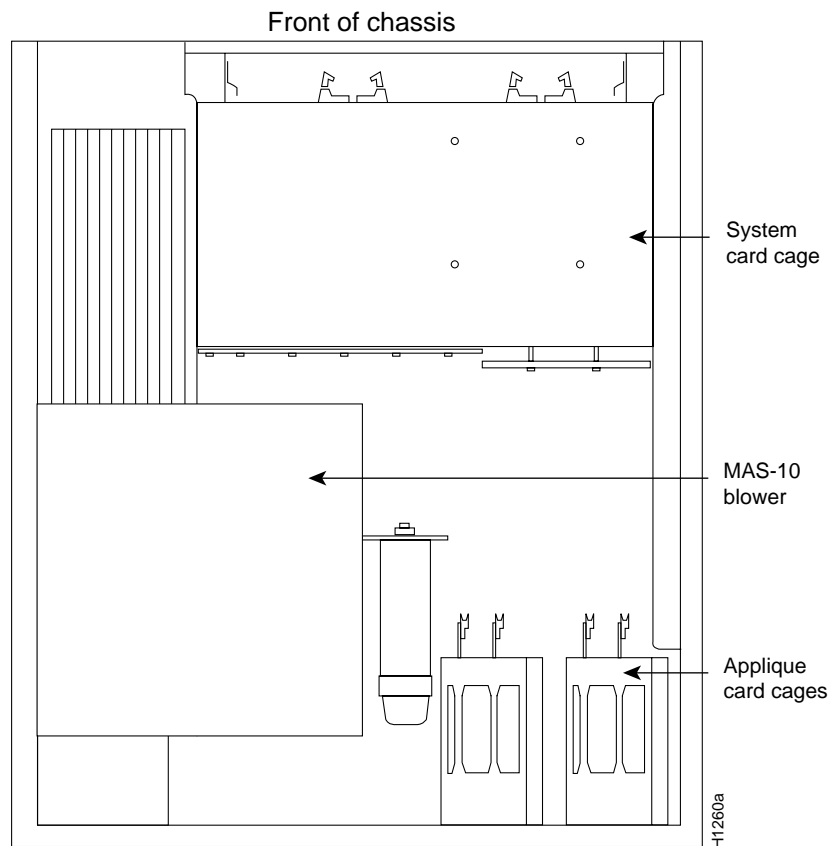
Table 3 Multibus and ciscoBus Interface Addressing Example

Card	Port on Card	Interface Address Assigned
First CSC-2R	Port 0	Token Ring 0
	Port 1	Token Ring 1
Second CSC-2R	Port 0	Token Ring 2
	Port 1	Token Ring 3
First CSC-C2CTR	Port 0	Token Ring 4
	Port 1	Token Ring 5
	Port 2	Token Ring 6
	Port 3	Token Ring 7
Second CSC-C2CTR	Port 0	Token Ring 8
	Port 1	Token Ring 9
	Port 2	Token Ring 10
	Port 3	Token Ring 11



Caution The maximum number of Token Ring interfaces in a chassis is 16, which is the result of installing 4 CSC-2Rs and 2 CSC-C2CTRs. (Two ciscoBus slots are used as Multibus slots.) The number of ciscoBus interfaces is limited by space available for applique card cages and power budget limits. Because the slower Multibus interfaces always have higher priority than ciscoBus interfaces, traffic on the Multibus may degrade performance of ciscoBus interfaces that are not autonomously switched; therefore, *we do not recommend this configuration for performance-sensitive applications.*

Figure 7 AGS+ Top View



Power Budget

In an AGS+ shipped on or after October 1, 1991, the total power drawn by all installed cards must not exceed 300W per chassis. In AGS+ chassis shipped before October 1, 1991, the total power must not exceed 260W. (The earlier chassis contained a 5A circuit breaker, rather than the 7.5A circuit used in the current chassis configuration.) Table 4 lists the power requirements for each card available for the AGS+, including the CSC-C2CTR. The values for the CSC-C2CTR were measured with four Token Ring interfaces active and include power drawn by the appliques.

Note In addition to the power budget, other restrictions apply when other ciscoBus interface cards or Multibus Token Ring interface cards are installed in the system. For compatibility limitations, refer to the following section, “Compatibility with Other Cards.”

Table 4 Interface Card Power Requirements

Card	Power (Watts)
CSC/3	31
CSC/4	35
CSC-ENVM	10
CSC-MC+	3
CSC-MCI	28 ¹
CSC-SCI	20
CSC-R16M	34
CSC-1R or CSC-2R	30
CSC-CCTL (cannot be used with CSC-C2CTR)	29
CSC-CCTL2	34
CSC-FCI	50
CSC-FCIT	36
CSC-MEC	22 ¹
CSC-HSCI	48
CSC-C2CTR with 1 applique (2 ports)	30
CSC-C2CTR with 2 appliques (4 ports)	42

1. Add 4W for each external Ethernet transceiver.

Before installing new cards, check the power requirements of the existing system and the new card(s) to avoid exceeding the power budget. To calculate the power requirements of an existing system, add the values for each card in the chassis; the sum is the power requirement. To determine the available power budget, subtract that sum from 300 watts (W) (260W for chassis shipped before 10/1/91); the result is the power budget available for new interface cards. For example, to determine if you can install two CSC-C2CTRs in an AGS+ that already contains two CSC-MCIs and a CSC-C2MEC, determine the power requirements of the existing system, then subtract that sum from 300. Compare the result to the total power requirement of the two new cards. If the result is greater than the power requirement for the new cards, you can install the new cards without exceeding the power budget. The following shows a sample calculation to determine whether two new CSC-CTRs can be added to an AGS+ that already contains several other interface cards. (All calculations are in watts [W].)

One CSC-ENVM card	1 x 10 = 10
One CSC/4 processor card	1 x 35 = 35
One CSC-CCTL2 card	1 x 34 = 34
One CSC-C2MEC card	1 x 22 = 22
Two CSC-MCI cards	2 x 28 = 56
Ten Ethernet transceivers	10 x 4 = 40
Power requirement of present system	197
Available power budget	300 – 197 = 103
Two CSC-C2CTRs, each with 2 appliques	2 x 42 = 84
New cards within power budget	84 < 103

Compatibility with Other Cards

The CSC-C2CTR will interoperate with any other CSC-CCTL2-compatible ciscoBus cards (within the limits specified in the section “ciscoBus Port Limitations” on page 10), 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 on interface cards may need to be upgraded in order to take advantage of the new features.

For example, the CSC-C2CTR requires a CSC-CCTL2 ciscoBus controller card and System Software Release 9.1 or later. (See the section “System Compatibility Requirements” on page 6.) If you are upgrading your system software and ciscoBus controller card 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, and you must upgrade the microcode on existing Multibus interface cards to the minimum versions required for Software Release 9.1 compatibility.

The *Microcode Release Note* publication (Part Number 78-1069-xx, where xx is the latest version) provides the latest information on both the *recommended* and *minimum required* microcode versions for using all cards with Software Releases 8.2 through 9.1. If the latest version implements features that you are not using in your system, and you already have the minimum required version installed, 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. Refer to the latest *Microcode Release Note* publication for current microcode requirements and recommendations and for a microcode revision history for each card.

Note To order upgrades or to obtain additional upgrade or compatibility information, contact a customer service representative as described in the section “Cisco Information Online” on page 35.

To display the current microcode on any interface card, use the **show controller** command with appropriate variables (*cbus*, *token*, *serial*, or *ethernet*). To display the current CSC-ENVM microcode, use the **show environment** command (available with Software Release 9.0 and later). An example of the **show controller cbus** command is shown on page 7. The following partial sample display of the **show controller mci** command shows a CSC-MCI with Microcode Version 1.10 installed.

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

The following partial sample display shows a CSC-ENVM with Microcode Version 2.2 installed.

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

With the required microcode versions installed, the CSC-C2CTR is compatible with the following three currently available Token Ring Multibus interface cards:

- CSC-2R dual-port 4/16-Mbps Token Ring card
- CSC-1R single-port 4/16-Mbps Token Ring card
- CSC-R16M single-port 4/16-Mbps Token Ring card



Caution The maximum number of Token Ring interfaces in a chassis is 16, which is the result of installing 4 CSC-2Rs and 2 CSC-C2CTRs. (Two ciscoBus slots are used as Multibus slots.) The number of ciscoBus interfaces is limited by space available for applique card cages and power budget limits. Because the slower Multibus interfaces always have higher priority than ciscoBus interface, traffic on the Multibus may degrade performance of ciscoBus interfaces that are not autonomously switched; therefore, *we do not recommend this configuration for performance-sensitive applications.*

Ring Speed

Before installing the CSC-C2CTR, determine the ring speed (4 or 16 Mbps) of each ring to be connected. There is no factory default for the interface speed; you must use the **ring-speed** command to set the speed of each interface when you bring the interface up and insert it into a ring. The CSC-C2CTR interfaces are independent, and each can be configured for either 4 Mbps or 16 Mbps.



Caution If an interface has an undefined or incorrect ring speed and is not shut down, the ring will beacon, which effectively takes the ring down and makes it inoperable.

List of Parts

Verify that you received all of the following parts. If any parts are missing, contact a customer service representative.

- ciscoBus Token Ring card: CSC-C2CTR.
- One APP-LTR2 for each two CSC-C2CTR ports (two appliques if you will use all four ports, one applique if you will use only two ports).
- Applique card cage (MAS-CCG)—one card cage is required for every two appliques. If a card cage is already installed in your chassis, and it has space available, you need not install another one.
- Ground straps—the type and number depends on the appliques in the card cage.
- 2 or 4 ribbon cables for the internal connections between the applique and CSC-C2CTR ports.
- Two interface port labels for each applique (TR 0, TR 1, and so forth)—These may already be attached to the applique when you receive it.
- One disposable grounding wrist strap. A disposable wrist strap is included with all new components and upgrade kits; use it to prevent damage to equipment from electrostatic discharge.
- If you are upgrading the microcode only, and not installing a new card or applique, you should receive one replacement EPROM component and a copy of the *Microcode Release Note* document.

Required Tools

You need some or all of the following tools to perform installation and upgrade procedures. Before you begin, read through the procedure to determine which tools you need for your chassis.

- Flat-blade screwdriver: medium-sized (if you are removing the AGS+ front access panel for the first time).
- Number 1 Phillips screwdriver (for removing the top cover of the chassis and installing the applique, applique card cage, and ground strap).
- Chip extraction/removal tool (for microcode upgrades only).
- Needlenose pliers (for microcode upgrades only).
- Antistatic mat or antistatic foam pad (only if you are replacing components).
- 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.

Safety

Follow these guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, turn off the system power and disconnect the power cord.
- Never assume that power has been disconnected from a circuit; always check.
- Do not work alone when a potentially hazardous condition exists.
- Do not perform any action that creates a potential hazard or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded wiring or power cables, and missing safety grounds.

In addition, use the guidelines that follow when working with any equipment that is connected to telephone wiring or other network cabling.

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

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) 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-preventive wrist 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 or ankle 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 or ankle strap until the installation is complete.



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

Installation

The following sections describe the procedures for installing CSC-C2CTRs and APP-LTR2s. The CSC-C2CTR is installed in the system card cage, which you access by removing the access panel on the front of the chassis. It is not necessary to disconnect cables from the rear of the chassis or to remove the top cover of the chassis to access the system card cage.

The APP-LTR2 is installed in the rear of the chassis; access to the rear of the chassis requires removing the front panel and top cover from the chassis. The appliques are installed in an applique card cage, which is then installed in one of the two far right connector areas in the rear of the chassis.

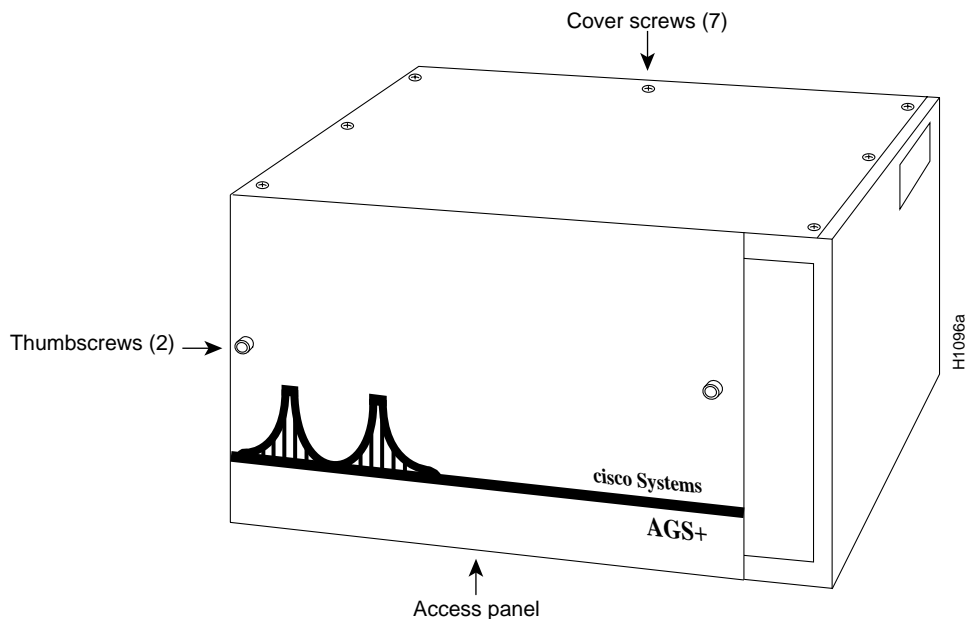
A typical installation, showing the interface card, the applique, and the internal connections, is shown in Figure 1. Before proceeding, ensure that your system and equipment meet the requirements listed in the section “Installation Prerequisites” on page 6.

Installing the CSC-C2CTR Interface Card

Install the CSC-C2CTR in the predetermined ciscoBus slot in the system card cage. (Refer to the section “Slot Priority” on page 9 for slot priority requirements.) The card cage in the AGS+ is accessible from the front of the chassis. To install system cards, you need to remove only the front access panel; it is not necessary to remove the top cover. All interface cards have ejector levers that lock into place when the card is seated in the card cage, which allow the card to be extracted easily from its slot. Handle cards as little as possible; try to limit contact to only the ejector levers and card edges. Install the CSC-C2CTR as follows:

- Step 1** Ensure that the chassis is firmly seated on a stable surface. The 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 (shown in Figure 8), turn the two thumbscrews counterclockwise to loosen them; do not attempt to remove them from the panel. Pull the panel off the chassis and set it aside.
- Step 3** Slip on an ESD wrist or ankle strap and connect it to the chassis as described in the previous section, “Preventing Electrostatic Discharge Damage.” Make certain that power to the chassis is OFF, but that the power cord is fully connected.

Figure 8 Chassis Front Access Panel and Cover Fasteners



Note The front panel is secured with two thumbscrews, which are tightened with 12 in/lb of torque for shipping. If you are removing the front panel for the first time, use a large flat-blade screwdriver to turn the thumbscrews counterclockwise to loosen them. When you replace the panel, turn the thumbscrews clockwise until finger-tight.

- Step 4** If necessary, disconnect the cables from other interface cards that are obstructing access to the center ciscoBus slot. Before disconnecting cables, ensure that they are properly labeled to avoid mixing up interfaces when you reconnect them.

- Step 5** If you are installing a new CSC-C2CTR, proceed to step 7, but if you are replacing an existing CSC-C2CTR, disconnect the cables from the front of the card to be removed.
- Step 6** Use your thumbs to pull the eject levers 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 pad.
- Step 7** Hold the new CSC-C2CTR by the eject levers and the card edges, component side up, with the bus edge away from you, and insert it into any empty ciscoBus slot. An AGS+ card cage is shown in Figure 5.
- Step 8** Place your thumbs on the eject levers and push the card in firmly until it snaps into place and is firmly seated in the slot.
- Step 9** If APP-LTR2s are already installed, connect the internal ribbon cables to the ports corresponding to the labels on the cables (0–3). When viewing the card in the card cage, the far left port is port 0.
- Step 10** To install the APP-LTR2(s), proceed to the next section.

or

If the appliques are already installed, proceed to the section “Installing Short Ground Straps” on page 23 or “Installing Long Ground Straps” on page 24.

Installing the APP-LTR2 Applique

The APP-LTR2 is installed in an applique card cage in the rear of the chassis; access to the rear of the chassis requires removing the front panel and top cover from the chassis. The following describes how to first install the applique in the applique card cage and then install the card cage in the chassis.



Warning Before removing any cables or fasteners from the chassis, *turn off the power and unplug the power cable from the power source*. When the cover is off the chassis, the power supply is exposed and dangerous voltages are present.

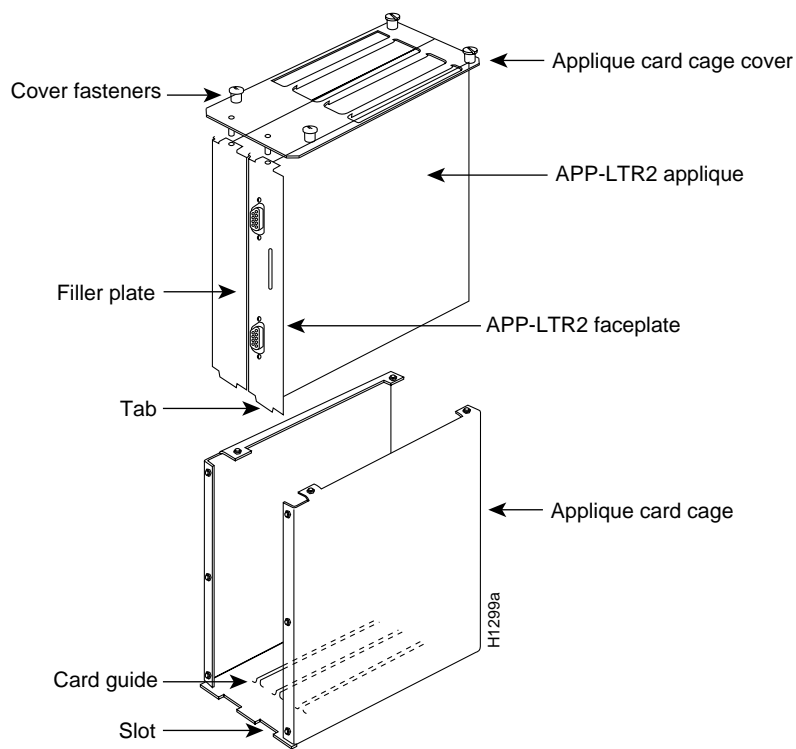
Installing the APP-LTR2 in the Applique Card Cage

The following steps describe how to install the applique in the applique card cage:

- Step 1** Remove the top cover of the chassis by loosening and removing the seven screws that secure it. (See Figure 8.)
- Step 2** Slip on an ESD-preventive wrist or ankle strap and connect it to the chassis as described in the section “Preventing Electrostatic Discharge Damage.” Make certain that power to the chassis is OFF, but that the power cord is fully connected.
- Step 3** If you have an empty card cage that is not installed in the chassis, proceed to step 5, but if the applique card cage is installed in the chassis, disconnect any external connections to the applique it contains.
- Step 4** Remove the card cage from the chassis by removing the six screws that secure it to the rear panel of the chassis. Carefully lift the card cage up and out of the chassis, using care not to strain any internal ribbon cables.

- Step 5** Remove the top cover of the applique card cage by loosening the four cover fasteners that secure it. (See Figure 9.)
- Step 6** If the card cage is empty, remove both filler plates from the rear. (See Figure 9.) If an applique is currently installed, leave the faceplate of the installed applique intact and remove only the filler plate.
- Step 7** Using the orientation shown in Figure 9, install the first APP-LTR2, with its attached faceplate, into the right side of the card cage. Position the applique so that the tab on the bottom of the applique faceplate is inserted into the slot in the bottom of the applique card cage, and the applique is seated in the card guide. (See Figure 9.)

Figure 9 Installing the APP-LTR2 in the Applique Card Cage



- Step 8** If you are installing only one applique, replace the filler plate on the left side of the card cage, sliding it down so that the edge interlocks with the faceplate of the applique on the right.

or

If you are installing a second APP-LTR2 in the card cage, install it in the left side of the card cage by sliding it down so that the faceplate interlocks with the faceplate of the applique on the right of the card cage. Insert the applique into the card cage so that the tab on the bottom of the applique card faceplate is inserted into the slot in the bottom of the applique card cage, and the applique is seated in the card guide.

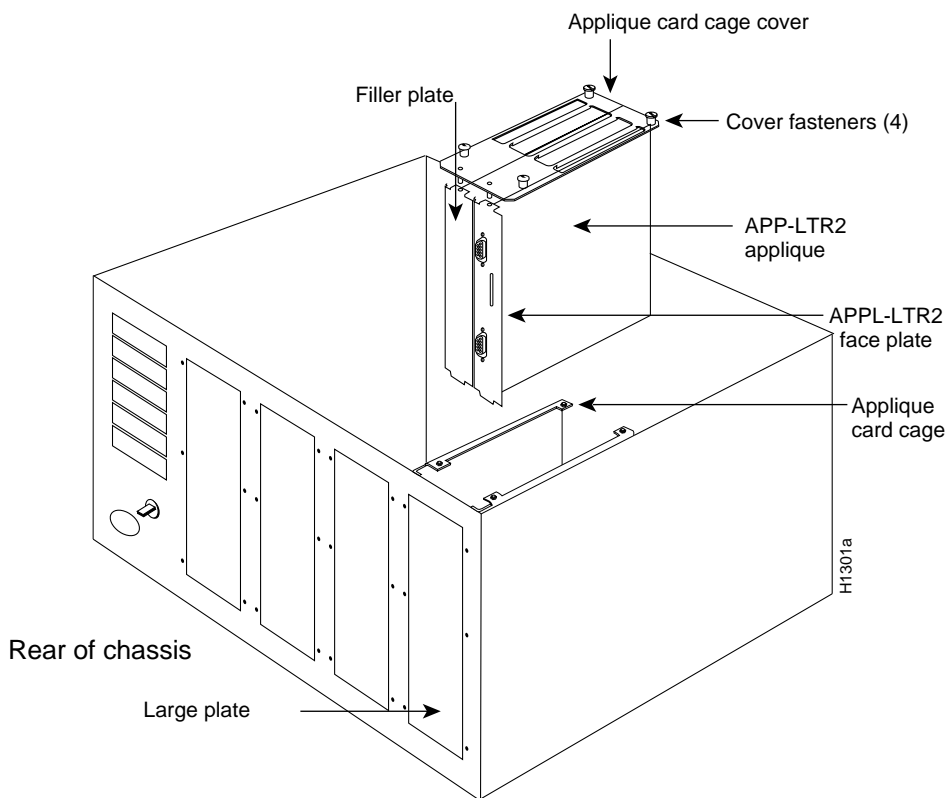
- Step 9** Replace the top cover of the applique card cage. Ensure correct alignment of the cover with the two guide pins on the bottom of the cover. The guide pins should pass through the alignment holes in the tabs on the top of each applique and faceplate assembly. (See Figure 9.)
- Step 10** Secure the top cover to the card cage with the four cover fasteners you loosened in step 5.

Installing the Applique Card Cage in the Chassis

The following steps describe how to install the applique card cage in the chassis. The applique card cage can only be installed in one of the two far right large plate areas. (See Figure 10.) If you removed the card cage to install the applique, proceed to step 2. (The large plate area will already be open.)

- Step 1** Remove a blank large plate from one of the two far right large plate areas (shown in Figure 10) by removing the six screws that secure it.

Figure 10 Installing the Applique Card Cage in the Chassis



- Step 2** Label each internal ribbon cable with a Token Ring interface number so that you can connect the applique interfaces to the correct ports on the CSC-C2CTR.
- Step 3** Place a corresponding external interface label on the face of each applique connector below each Token Ring connector (Token0 on the top and Token1 on the bottom). Be sure to match the interface numbers with the labels on the internal cables.
- Step 4** Connect the appropriate internal Token Ring ribbon cable to the connectors on each applique (Token0 to the top connector and Token1 to the bottom connector).

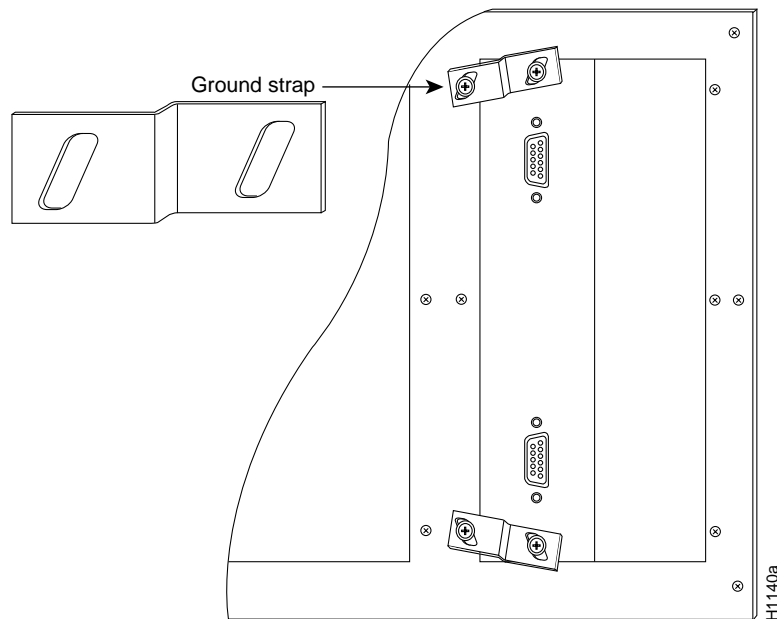
- Step 5** Slide the applique card cage down into the rear of the chassis, and align the six holes in the rear panel of the chassis with those in the applique card cage. (See Figure 10.)
- Step 6** Secure the card cage with the connector plate screws you removed in step 1, leaving appropriate holes empty for the ground straps. See Figure 11 and Figure 12 for ground strap configurations.
- Step 7** Route each internal ribbon cable under the system card cage then up to the corresponding connector on the CSC-C2CTR. Be sure to connect each cable to the correct port on the CSC-C2CTR; card ports are numbered 0 to 3 (from left to right when viewed from the front of the chassis).
- Step 8** Decide if your installation requires short or long ground straps. Use a short ground strap when you install the applique next to a blank connector plate (see Figure 11) or next to an applique that does not contain a hole for the long ground strap screw. Use a long ground strap when you install the applique next to an applique that contains a hole for the long ground strap, for example, another APP-LTR2 (see Figure 12).

Note Some installations require a long ground strap across the top of two appliques and a short ground strap on the bottom of one applique.

Installing Short Ground Straps

Ground straps, which are included with all appliques, ground the applique to the chassis to prevent EMI noise on your network interface. The applique card cage containing the APP-LTR2(s) should already be installed in the chassis and secured with at least three screws. Refer to Figure 11 while you install the short ground straps.

Figure 11 Short Ground Strap Installation

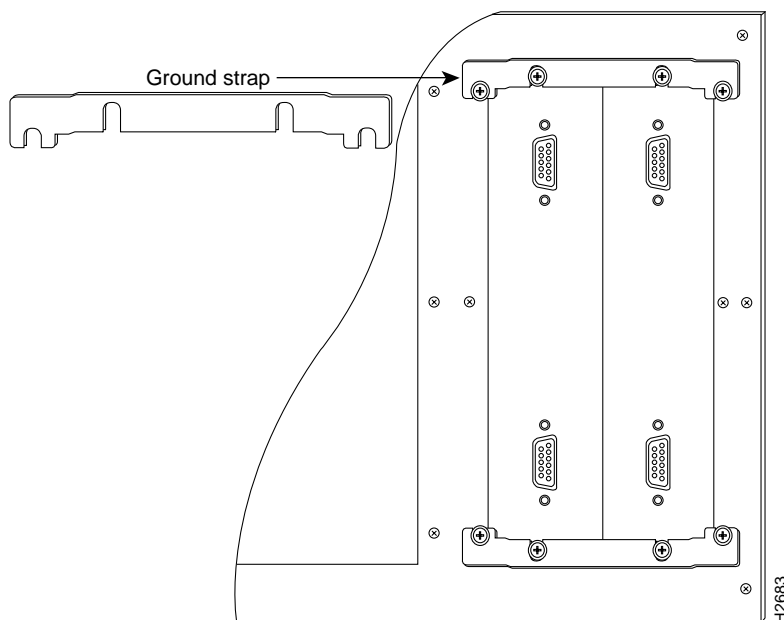


- Step 1** Remove the Phillips screw from the top center of the applique.
- Step 2** Position the ground strap so that it straddles the applique and the rear panel of the chassis. Align the holes in the ground strap with those on the rear panel and the applique.
- Step 3** Secure the ground strap with the two Phillips screws.
- Step 4** Repeat the same process for the bottom ground strap.
- Step 5** Connect ground straps to other appliques as necessary, and proceed to the section “Finishing the Installation” on page 25.

Installing Long Ground Straps

Ground straps, which are included with all appliques, ground the applique to the chassis to prevent EMI noise on your network interface. The applique card cage containing the APP-LTR2(s) should already be installed in the chassis and secured with at least two screws. Refer to Figure 12 while you install the long ground straps.

Figure 12 APP-LTR2 Long Ground Strap Installation



- Step 1** Remove the Phillips screw from the top center of each applique.
- Step 2** Position the ground strap so that it straddles both appliques and the rear panel of the chassis. Align the holes in the ground strap with those on the rear panel and the appliques.
- Step 3** Secure the ground strap with the four Phillips screws.
- Step 4** Repeat the same process for the bottom ground strap.
- Step 5** Connect ground straps to other appliques as necessary, and proceed to the next section, “Finishing the Installation.”

Finishing the Installation

The following steps describe the final installation procedure:

- Step 1** Connect the external cables from your Token Ring network to the Token Ring connectors on the appliques.
- Step 2** If necessary, reconnect other cables on the rear of the chassis.
- Step 3** Replace the chassis cover, but do not secure it with the cover screws until you have verified successful installation.



Caution You *must* replace the chassis cover before powering up the system for an installation check. However, you do not need to tighten the screws.

- Step 4** Proceed to the next section to check the installation before configuring the interface.

Checking the Installation

After you have installed a CSC-C2CTR and/or APP-LTR2, verify the installation before you replace the front panel by observing the LEDs on the system processor card, the CSC-CCTL2 ciscoBus controller card, the CSC-C2CTR card, and the APP-LTR2 in the rear of the chassis. The LEDs on the CSC-C2CTR will not light until the new interfaces are configured and brought up. After you configure the interfaces (as described in the section “Configuring the Interfaces” on page 29), you will check the CSC-C2CTR LEDs and use the **show EXEC** commands to verify the interfaces.



Warning Never power up the system when the top cover is removed because the power supply and dangerous voltages are exposed. Also, the internal airflow is misdirected when the cover is off, which can cause the system to overheat and subsequently shut down.

LED Functions

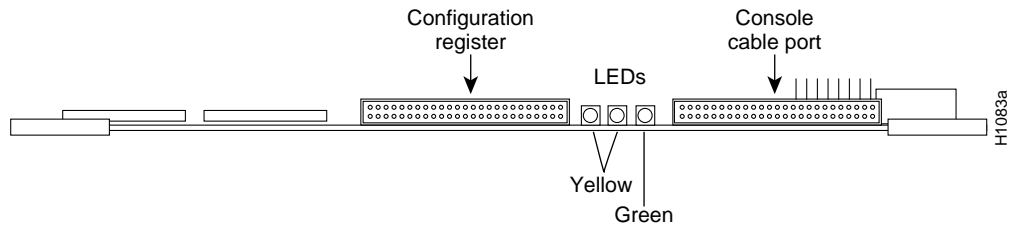
The LEDs on the CSC/3 and CSC/4 processor cards indicate the status of the system software. If the system detects a problem at startup, the system error LED on the processor card will be on or will flash. The CSC-CCTL2 LEDs verify the presence (correct installation) of all cards installed in the ciscoBus. Also, on the APP-LTR2 (see Figure 4), a single, green, power LED goes on to indicate that the applique is receiving power from the CSC-C2CTR. After the interfaces are configured and brought up, the LEDs on the CSC-C2CTR go on for each active port. (See the section “CSC-C2CTR Interface Card” on page 4.)

Processor Card LEDs

Either a CSC/3 or a CSC/4 can be installed in your system. Both have three LEDs with similar functions. When viewing either card when it is installed in the system card cage, the right LED is the system OK light, which goes on to indicate that the system is operating correctly. The far left LED on both is a system error LED, which goes on or flashes if the system detects an error during startup or is unable to start up the operating system.

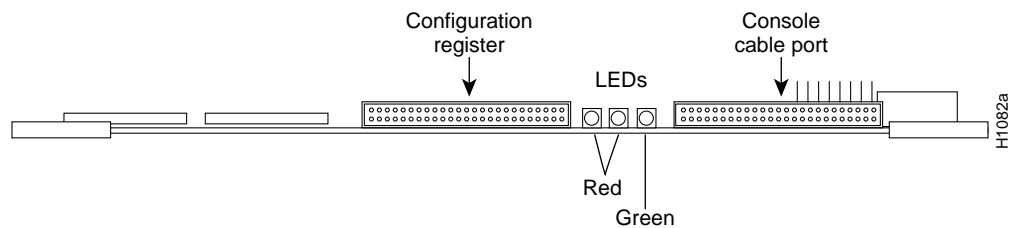
The three CSC/4 LEDs are shown in Figure 13. The left yellow status LED goes on momentarily during initialization, flashes if there is an error, and is off under normal conditions. The middle, yellow LED is not used. The right, green, OK LED goes on at startup and remains on to indicate that the system software has booted and is operational.

Figure 13 CSC/4 Processor Card LED Indicators—Front-Edge View



The three CSC/3 LEDs are shown in Figure 14. The far left, red, status LED goes on momentarily during initialization, flashes if there is an error, and is off under normal conditions. The middle, red, halt LED goes on only when the processor is in a halt state (which indicates an error). The far right green OK LED lights at startup and remains on to indicate that the system software has booted and is operational.

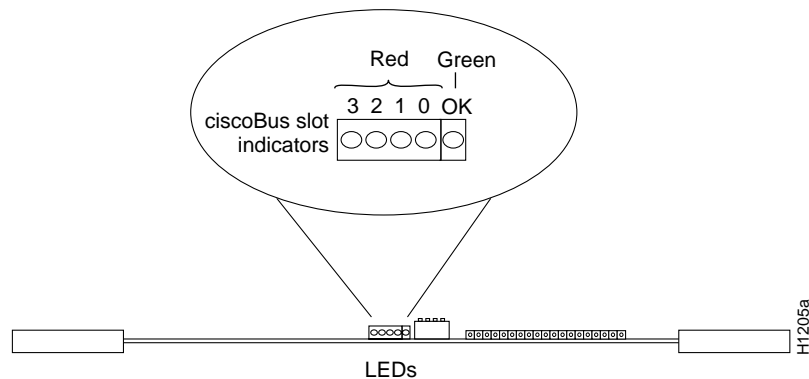
Figure 14 CSC/3 Processor Card LED Indicators—Front-Edge View



ciscoBus Controller Card LEDs

The CSC-CCTL2 contains a bank of five LEDs, one red LED for each ciscoBus slot and one green OK LED. Figure 15 shows the LEDs as viewed with the card installed in the card cage. The numbers above each LED indicate the corresponding ciscoBus slot number. (Slot numbers and locations are shown in Figure 5.)

Figure 15 CSC-CCTL2 ciscoBus Controller Card—Front-Edge View



On power up, all the LEDs go on indicating that the CSC-CCTL2 is active. When the system boot is completed, only those LEDs that indicate the presence of a card in the corresponding ciscoBus slot should remain on; the LEDs for empty ciscoBus slots should go off. Before you power up the system, make a note of the ciscoBus slot(s) that contain a new CSC-C2CTR so that you can verify that the corresponding CSC-CCTL LED lights. All ciscoBus slot numbers are shown in Figure 5.

Note The four LEDs on the CSC-C2CTR will not go on until the ring speed is configured.

Checking LEDs

Take the following steps to verify correct installation:

- Step 1** Plug in the power cord and turn ON the system power.
- Step 2** Verify that all five LEDs on the ciscoBus controller card (CSC-CCTL2) goes on while the system boots. If they do not go on, do the following:
- Check the LEDs on the processor card. If no LEDs are 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 CSC-CCTL2 is installed in the center ciscoBus slot (Multibus slot 7) as shown in Figure 5.
 - If only the LEDs on the ciscoBus controller card fail to go on, turn OFF the system power and remove the CSC-CCTL2 to check the setting of Switch S1. Ensure that S1 is set for card number 0, which is the factory default. (See the section “Card and Interface Numbering” on page 11.)
 - If Switch S1 on the CSC-CCTL is set to card number 0 and the LEDs still fail to light, turn the system power OFF 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 right, green OK LED should be lit; the other two LEDs should be off. (See Figure 13 and Figure 14.) If the right, green LED is not on, 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 reseating the card does not solve the problem, and 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 pins are bent, carefully remove the component, straighten the pin with needlenose pliers, replace the card, and restart the system.
- Step 4** When the system has completed its boot cycle (indicated by a beep), verify that the right, green OK LED on the CSC-CCTL2 goes on and remains on. (See Figure 15.) If it does not, proceed with the installation to determine whether the LED is faulty.

- Step 5** Verify that the power LED on the APP-LTR2 is lit. (See Figure 4.) If it is not on, do the following:
- Check the connection at both ends of the internal ribbon cable between the applique and the CSC-C2CTR. The applique draws power directly from the card.
 - Swap the cable in question with the cable from a functional APP-LTR2 or with a spare cable, if either are available.
- Step 6** Check the four red LEDs on the CSC-CCTL2. (See Figure 15.) Ensure that each LED goes on for each ciscoBus slot occupied by a ciscoBus card; the ciscoBus controller LEDs do not light for ciscoBus slots that contain Multibus cards. (See the section “Checking LEDs” on page 27 for LED descriptions.) If any do not go on, do the following:
- If an LED for a ciscoBus slot with a new card fails to light, ensure that 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 5.)
 - If the CSC-CCTL2 LEDs for other occupied slots are lit, turn OFF system power, remove the interface card in question, install it in a different ciscoBus slot, and restart the system.
 - If the ciscoBus card still fails to turn on the LED on the CSC-CCTL2, refer to the section “System Compatibility Requirements” on page 6, and ensure that the card type and microcode are compatible with your system.
- Step 7** Check the system console terminal and ensure that the system banner is displayed, followed by a list of the installed hardware. (See page 6 for an example of this display, which is the same as the output for the **show version** command.) CSC-C2CTRs are displayed as CTR interfaces, and the number of interfaces displayed should include the new interfaces you just installed.

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

Closing the Chassis

When the installation check is successful, proceed as follows:

- Step 1** Turn OFF the system power.
- Step 2** Replace and tighten any remaining cover screws.
- Step 3** Replace and secure the front access panel.
- Step 4** Turn ON the system power to configure your network interface.

You must configure new interfaces and bring them up before you can verify them with screen displays. Proceed to the following section to configure each new interface.

Configuring the Interfaces

If you installed a new CSC-C2CTR or if you want to change the configuration of an existing interface, you must enter configuration mode. After you verify that the new equipment is installed correctly, use the privileged-level **configure** command to configure each new Token Ring interface. Be prepared with the information you will need, which includes the following:

- Protocols you plan to route on the new interface
- Internet Protocol (IP) addresses if you will configure the interface for IP routing
- Whether or not the new interface will use bridging

Refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications for a complete summary of the configuration options available and instructions for configuring a Token Ring interface.

Note The **configure** command requires privileged-level access to the EXEC command interpreter, which usually requires a password. Refer to the description that follows and contact your system administrator if necessary to obtain privileged-level access.

Privileged Access to the EXEC Command Interpreter

Before you use the **configure** command, you must enter the privileged level of the EXEC command interpreter with the **enable** command. The system will prompt you for a password if one has been set. The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>). At the console terminal, enable the privileged level as follows:

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

```
Router> enable
```

```
Password:
```

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

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

```
Router#
```

Proceed to the next section to configure the interface.

Using the Configure Command

Following are instructions for a basic configuration: enabling an interface and specifying IP routing. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. For complete descriptions of configuration subcommands and the configuration options available for Token Ring, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.

The system banner and a list of all installed interfaces, including those you just installed, should be displayed. (See page 6 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 “Installing Long Ground Straps” on page 24 and perform the steps to isolate the problem.

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 which interfaces you need to configure.

The **show configuration** EXEC command 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 2648 out of 65536 bytes
version 9.1
!
hostname router
!
enable-password secretword
!
(display text omitted)
!
interface TokenRing 0
ip address 131.108.8.35 255.255.255.0
ip helper-address 131.108.7.255
ip helper-address 131.108.9.255
ring-speed 4
appletalk cable-range 4035-4035 4035.8
appletalk zone Engineering
!
interface TokenRing 1
no ip address
shutdown
!
(remainder of display text omitted)
```

In 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 Token Ring), and *unit* identifies the interface unit address. Then you enter the configuration subcommands that define the specific configuration 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 the ring speed (4 or 16 Mbps) to each interface, specify encapsulation methods, and define routing protocols. The speed of each Token Ring interface must be configured before you bring the interface up and insert it into the ring. The interfaces are independent and can be configured for different speeds. There is no factory default

speed; you *must* configure each interface for either 4 or 16 Mbps. For complete descriptions of the configuration subcommands, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.

In the following sample configuration, two new Token Ring interfaces are enabled and assigned ring speeds and IP addresses using the **configure** command from the terminal (the **config term** command); then the configuration is written to memory (using the **write memory** command).

```
router# enable

Password:

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

interface token ring 0
ring-speed 16
ip address 145.22.4.67 255.255.255.0
no shut

interface token ring 1
ring-speed 4
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, setting the ring speed, and specifying IP routing. You may also need to enter other configuration subcommands, depending on the requirements for your system configuration. (Configuration subcommands are described in the *Router Products Configuration Guide* and *Router Products Command Reference* publications.) Refer to the previous example as necessary.



Caution By default, all interfaces are configured as shut down until you enter **no shut**. After you enter **no shut** (or if the interface is already configured as *up*), the interface is inserted into the ring as soon as you press **Return**. *Failure to match the interface speed to the ring speed will bring down the ring.* The speed of each interface on the CSC-C2CTR must be configured to match the speed of the ring to which the interface is connected; only values of 4 or 16 will be accepted by the system. Each interface on the CSC-C2CTR can be configured for either 4 or 16 Mbps (for instance, Token Ring interface 0 can be set for 4 Mbps and Token Ring interface 1 set for 16 Mbps).

The following steps provide line-by-line instructions for configuring the interfaces. Refer to the previous examples as necessary.

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

Step 2 Enter configuration mode by entering the following:

```
configure terminal <Return>
```

Step 3 At the prompt, specify the first Token Ring interface to configure by entering the following:

```
interface token ring 0 <Return>
```

Step 4 Specify the ring speed for Token Ring 0, either 4 or 16 (Mbps), by entering the following (where *n* is either 4 or 16):

```
ring-speed n <Return>
```

Step 5 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 111.111.111.111 255.255.255.0 <Return>  
(where 111.111.111.111 represents whatever address you assign to this interface)
```

Step 6 Change the default shutdown state and bring the interface up by entering the following:

```
no shut <Return>
```

Step 7 Specify the next Token Ring interface to configure by entering the following:

```
interface token ring 1 <Return>
```

Step 8 Repeat steps 3 through 6 for each new Token Ring interface.

Step 9 When all new interfaces are configured, enter **Ctrl - Z** (hold the Control key down and press z).

Step 10 Write the new configuration to memory by entering the following:

```
write memory <Return>
```

The system will display an OK message to indicate that the configuration has been stored.

Step 11 To exit configuration mode, enter **quit**.

Step 12 Check the configuration as described in the following section.

Checking the Configuration

After you have configured the ring speed of each interface, check the LEDs on the CSC-C2CTR and use EXEC command displays to verify the new Token Ring interfaces. When the system is started, the interface cards query the appliques for interface information. If an applique is not connected to its interface card when the system initializes, it will not be recognized until it is properly connected to the card, and the system is restarted.

To check the configuration, proceed as follows:

Step 1 Turn the system power OFF, wait approximately five seconds, then turn the power ON again to reboot the system. (The system will beep when it has booted.)

Step 2 Open the front access panel and check the LEDs on the CSC-C2CTR. Two LEDs are located on each side of the card, numbered 0 through 3 from left to right as shown in Figure 3. Each LED goes on to indicate that the corresponding interface is active. The LED for each active interface should be on.

Step 3 If any of the LEDs indicate that an interface is not active (but should be), return to the configuration mode as described in steps 1 through 3 on page 31. Enter the interface unit address, then enter **no shut** as shown in the following example:

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



```

interface token ring 1
no shut
^z
router# write memory
[ok]
router#

```

Step 4 When the LEDs indicate that all interfaces are configured correctly, replace and secure the front access panel.

Step 5 You can now enter the commands described in the following paragraphs to verify the configuration.

The **show controller cbus EXEC** command (described in “System Compatibility Requirements” on page 6) displays the current internal status of the CSC-C2CTR(s), including the interfaces and how the CSC-C2CTR has identified them. The display lists the interfaces connected to each CSC-C2CTR and indicates that the system has identified new interfaces, but it does not indicate the state of the line or protocol.

The **show controller token EXEC** command displays the current internal status of Multibus Token Ring interface cards (CSC-1R, CSC-2R, and CSC-R16M). Following is a sample display:

```

TR0: state 3
current address: 0000.3080.2d6f, burned in address: 0000.3080.2d6f
Last Ring Status: none
      (displayed text omitted)
TR1: state 3
current address: 0000.3080.2def, burned in address: 0000.3080.2def
Last Ring Status: none

```

To obtain more extensive information about the interfaces, such as the state of the lines and protocol types, use the **show interface tokenring EXEC** command [*unit number*] to display statistics about a specific Token Ring interface. The first line of the **show interfaces** display names the interface and its interface address (TR 0) and indicates whether the hardware and line protocol are up or down. If the line protocol is down (and you did not administratively shut it down), the hardware is not functioning properly; ensure that the network interface is properly connected and terminated. Following is a partial sample display:

```

router# show interface tokenring 0
TokenRing 0 is up, line protocol is up
Hardware is ciscoBus Token Ring, address is 0000.3040.e004
Internet address is 131.108.35.6, subnet mask is 255.255.255.0
MTU 4464 bytes, BW 4000 Kbit, DLY 2500 usec, rely 255/255
Encapsulation SNAP, loopback not set, keepalive set (10 sec)
ARP type: SNAP, ARP Timeout 4:00:00
Ring speed: 4 Mbps
Single ring node, Source Route Transparent Bridge capable

```

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

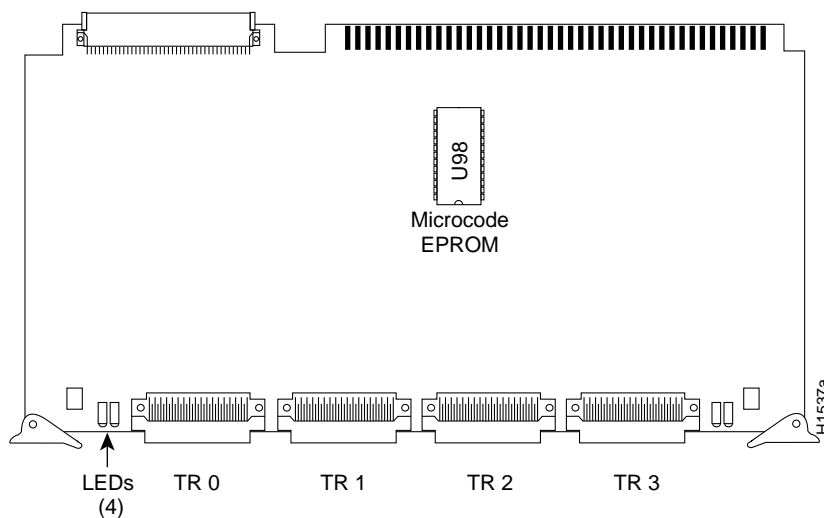
For descriptions of additional commands and examples, refer to the *Router Products Configuration Guide* and *Router Products Command Reference* publications.

Upgrading Microcode

Network interface cards contain microcode, which is interface-specific software that interoperates with the system software. The CSC-C2CTR microcode is contained on a single erasable programmable read-only memory (EPROM) component, which is located in socket U98. You may need to replace the CSC-C2CTR EPROM when upgrading your system software or to add new functionality to the card when it becomes available. Use the **show controller cbus** command (described in the section “System Compatibility Requirements” on page 6) to display the current microcode version installed on the CSC-C2CTR and all ciscoBus interface cards. Refer to Figure 16 for component locations while performing the following steps.

- Step 1** Turn OFF the chassis power, open the front access panel, and remove the CSC-C2CTR as described in steps 1 through 7 of “Installing the CSC-C2CTR Interface Card” on page 19.
- Step 2** Slip on an ESD-preventive wrist strap and connect it to the chassis as described in the section “Preventing Electrostatic Discharge Damage.” Make certain that power to the chassis is OFF, but that the power cord is fully connected.
- Step 3** Referring to Figure 16, locate the EPROM in socket U98. Note the orientation of the notch; the new EPROM must be inserted with the same orientation.

Figure 16 Microcode EPROM Location



- Step 4** Use a chip extractor to remove the EPROM from its socket. If you do not have a chip extractor available, use the tip of the screwdriver blade to gently pry the EPROM out of its socket.
- Step 5** Install the new EPROM in socket U98. Make sure that the notched end has the same orientation as the EPROM you removed. Do not use the orientation of the label to align the new EPROM.



Caution If the microcode EPROM is installed backwards when the power is turned on, it will be damaged and will have to be replaced.

- Step 6** Replace the card in the card cage. Place your thumbs on the ejector levers, and push the card in firmly until it snaps into place and is firmly seated in the slot.

- Step 7** Reconnect the internal ribbon cables to the connectors on the front of the card. Be sure to match the interface numbers labeled on the cables with the interface ports on the CSC-C2CTR. Interface ports on the card are numbered 0 to 3, from left to right as shown in Figure 16.
- Step 8** Turn on the system for an installation check, which is described in the section “Installing Long Ground Straps” on page 24.

Note If the microcode component is not installed correctly, or if any of the pins are bent during installation, the ciscoBus controller card will not recognize that a card exists in that ciscoBus slot, and the corresponding LED on the ciscoBus Controller card will not go on. If this happens, remove the component, straighten any bent pins, then reinsert it and try again. If a pin breaks off, the component will have to be replaced.

For descriptions of additional commands and examples, refer to the Router *Products Configuration Guide* and *Router Products Command Reference* publications.

This completes the CSC-C2CTR and APP-LTR2 installation, replacement, and microcode upgrade procedures.

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