Doc. No. 78-0872-02

Installing the 10BaseT Ethernet Transceiver Applique

Product Numbers: APP-JT1=, APP-LT=2, APP-LT4=, APP-LT6=, APP-LT8=, APP-IT1=, APP-ST2=, APP-ST4=, and APP-TT1=

This document contains instructions for installing the 10Base-T Ethernet transceiver applique in your router. The applique, shown in Figure 1, provides a direct connection between your router and an unshielded twisted-pair (UTP) Ethernet network by way of an RJ-45 connector. The applique is a system-integrated IEEE 802.3-compliant applique that eliminates the need for a separate media attachment unit (MAU) and attachment unit interface (AUI) cable.

The sections in this document include the following:

- Applique Overview, page 2
- Configuring Ethernet Interfaces, page 3
- Installation Prerequisites, page 5
- Installation, page 10

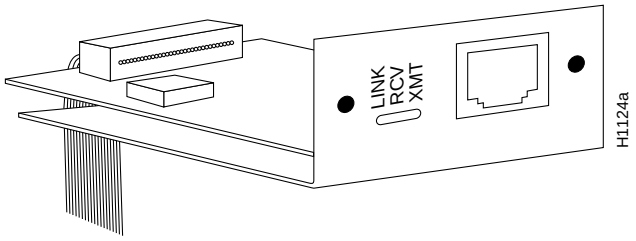

Figure 1 10Base-T Ethernet Transceiver Applique

Applique Overview

The 10BaseT applique is mounted on a connector plate, as shown in Figure 1, which is then installed in the rear of the chassis. A large and individual connector plates are shown in Figure 2. The small connector plate, which is used in the M chassis, is not shown.

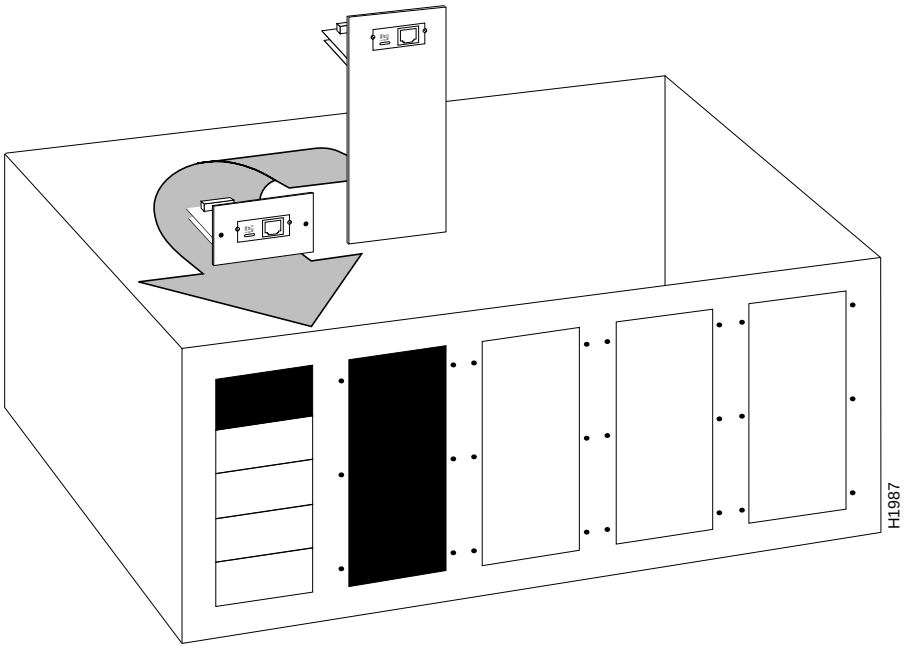

Figure 2 Connector Plates for Ethernet Connectors and Appliques

The applique, which has an RJ-45 connector for direct connection to a UTP network segment and three green status light-emitting diodes (LEDs), is installed on a connector plate on the rear of the chassis. Internally, it is connected to your Ethernet network interface card by way of a ribbon cable. The network interface card can be a CSC-MCI card (in all chassis), which provides up to two Ethernet ports, or a CSC-MEC card (AGS+ only), which provides six Ethernet ports. The CSC-MCI card is shown in Figure 3, and the CSC-MEC card is shown in Figure 4.

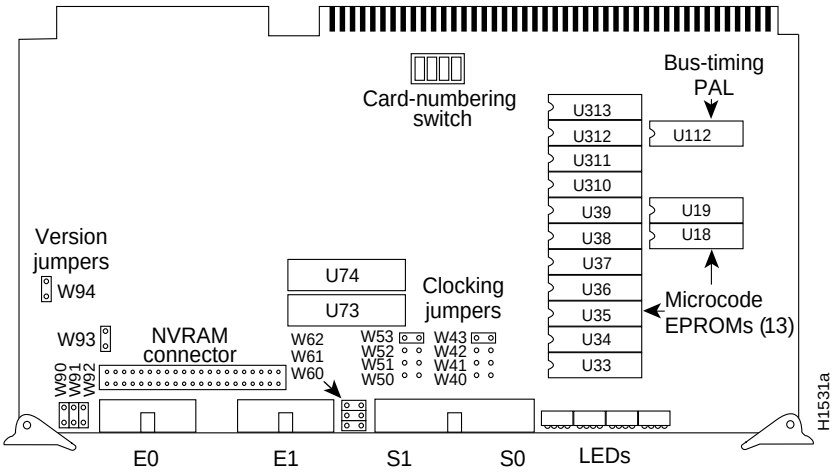

Figure 3 CSC-MCI Multiport Communications Interface Card—Component-Side View

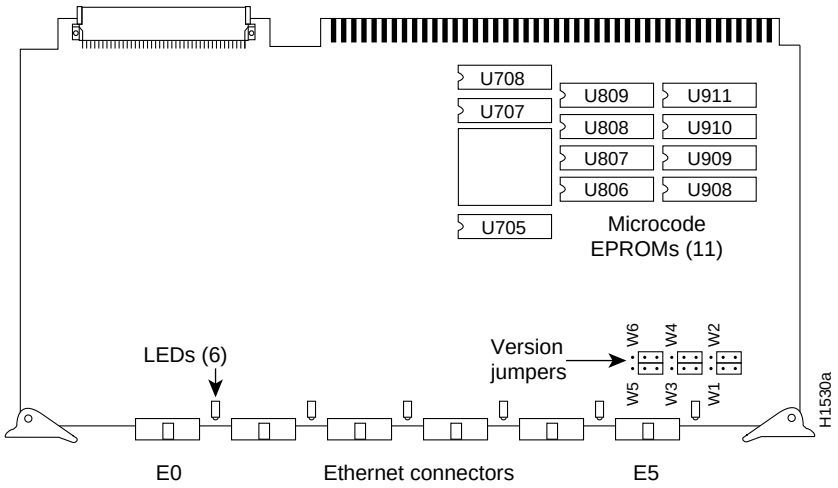

Figure 4 CSC-(C2)MEC6 Ethernet Interface Card—Component-Side View

The pinout for the RJ-45 is given in Table 1.

Table 1 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

Configuring Ethernet Interfaces

Following are the configuration considerations for the CSC-MCI and CSC-(C2) MEC interface cards.

CSC-MCI

The CSC-MCI card provides up to two Ethernet ports (the SCI card has none) and uses grounding options to accommodate the differences between the Ethernet Version 1 and IEEE 802.3 electrical specifications. Ethernet Version 1 permits certain signals to float, whereas IEEE 802.3 requires the signals to be grounded. Table 2 lists the CSC-MCI grounding options. Inserting a jumper grounds the signal and removing a jumper allows the signal to float. The factory default is to ground all signal pairs, which is compatible with both Ethernet and IEEE 802.3 requirements.

Table 2 CSC-MCI Jumper Settings for Grounding Options

Jumper Pair	Signal Description	Interface
W90	Receive Pair Shield	First Ethernet
W91	Transmit Pair Shield	First Ethernet
W92	Power Pair Shield	First Ethernet
W60	Power Pair Shield	Second Ethernet
W61	Transmit Pair Shield	Second Ethernet
W62	Receive Pair Shield	Second Ethernet

On the MCI card, jumpers W94 and W93 are 3-pin jumpers that select between Ethernet and IEEE 802.3 electrical levels. Jumper W94 controls the first Ethernet port, and jumper W93 controls the second Ethernet port. The factory default is to select IEEE 802.3 (Ethernet Version 2). Using the card orientation shown in Figure 3, place a jumper on the lower pair of pins to select Ethernet Version 1.

CSC-(C2)MEC

Figure 5 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 5 are factory defaults. Figure 6 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.

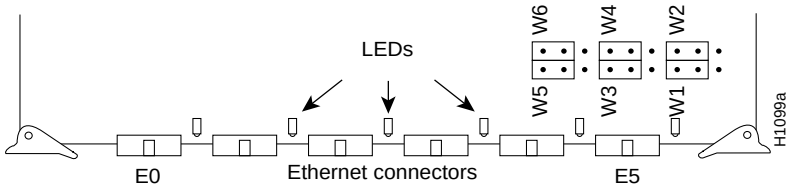

Figure 5 Jumper Settings for Ethernet Version 1

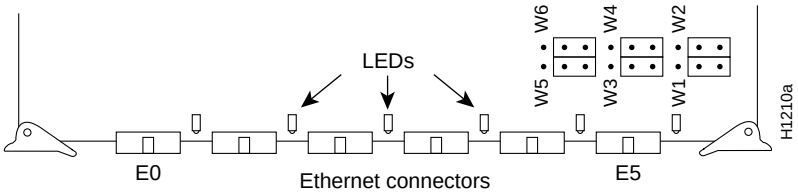

Figure 6 Jumper Settings for Ethernet Version 2 and IEEE 802.3

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 5 and Figure 6) 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 5 or Figure 6 (facing the component side of the card with the connectors at the bottom). Each connector corresponds consecutively to a pin set.

Note All jumper settings for the CSC-MEC also apply to the CSC-C2MEC. 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: Revision 5.0 and Revision 5.1. Revision 5.1 CSC-MEC cards can be used as CSC-C2MEC cards (with the appropriate microcode), but Revision 5.0 CSC-MEC cards cannot.

Installation Prerequisites

Before installing the applique, ensure that your system meets the following prerequisites:

- Your system contains an MCI card (any modular chassis unit), or an MEC card (AGS+ only), and the card has at least one available Ethernet port for each applique you will install.
- Your CSC-MCI or CSC-MEC card has the jumpers set for Ethernet Version 2 (802.3). On the CSC-MCI card, Ethernet Version 2 is selected with jumpers W93 and W94, the correct settings of which are shown in Figure 5. On the CSC-MEC card, this is selected with jumpers W1 through W6, the correct settings of which are shown in Figure 6.
- You have an existing UTP Ethernet network segment to which your chassis will be connected.
- Your UTP cabling meets the requirements in the following section “Twisted-Pair Cabling.”

Twisted-Pair Cabling

There are several types of twisted-pair cable. UTP cable should be 26 to 22 AWG (0.4 to 0.6 mm) wire in a multiwire cable with 100 ohms impedance. The 802.3 specification states that the maximum length of a 10Base-T 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 10Base-T transceiver applique is connected to the opposite end of your link, the UTP cabling must be crossed as shown in Figure 7. 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, and it is not necessary to cross the cables.

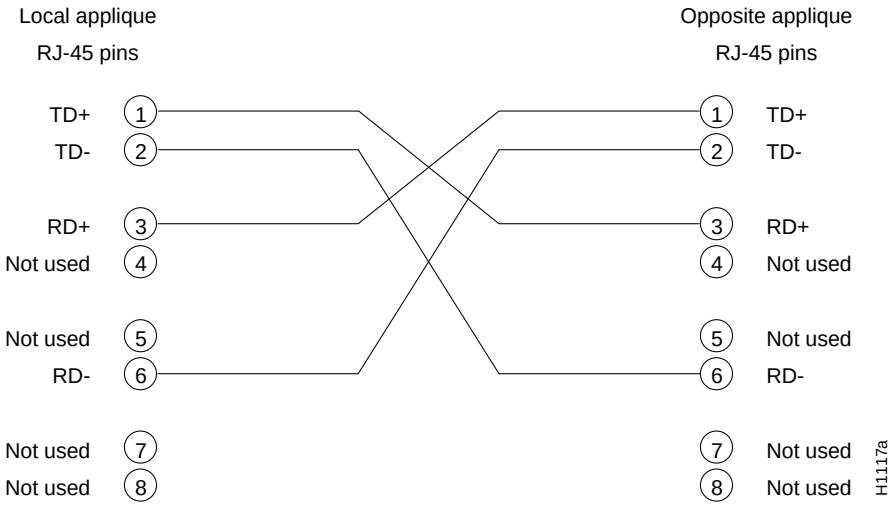

Figure 7 Applique-to-Applique UTP Cable Diagram

List of Parts

Verify that you received all of the parts for the interface(s) you will install. If any parts are missing, contact a customer service representative.

- 10Base-T applique(s) mounted on a connector plate
- One plastic ribbon clip
- One port label for each applique (10BaseT 0, 10BaseT 1, and so forth)

The Ethernet transceiver applique is a self-contained unit. The internal ribbon cable, which connects the applique to the internal network interface control card, is permanently attached to the 16-pin connector on the applique.

Required Tools

The following tools are required to install the applique:

- Screwdrivers: No. 1 and No 2 Phillips, medium-sized flat-blade
- ESD-preventive wrist strap
- Wrench: 3/16-inch hex or needlenose pliers

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.

Chassis Access Procedure

Choose the following procedure that describes your chassis type.

A-Type Chassis

Following is the procedure for accessing the A-type chassis interior. You will need a medium-sized flat-blade screwdriver.

Warning Before accessing the chassis interior, turn OFF power to the chassis and unplug the power cord because hazardous voltages may exist in or near the power supply. Use extreme caution when working near the power supply.

Step 1 Turn OFF power to the chassis and unplug it from AC power.

Step 2 If the chassis is rack mounted, disconnect all external cables from the chassis rear panel. Note where these cables were connected, for reinstallation.

Step 3 Remove the chassis from the rack and transfer it to a desktop or work table.

Step 4 If you will need to handle any electronic components (cards and so forth), attach appropriate ESD protection and attach the AC power cord, but to prevent a shock hazard, make certain the chassis power is OFF.

Step 5 To access cards in the card cage, loosen the two thumbscrews and remove the front panel from the chassis. (See Figure 8.) If you wish to access cards in the card cage only, skip the next step.

Step 6 To access other system components, locate and remove the seven No. 1 Phillips screws securing the top cover. (See Figure 8.) Set the top cover and screws aside.

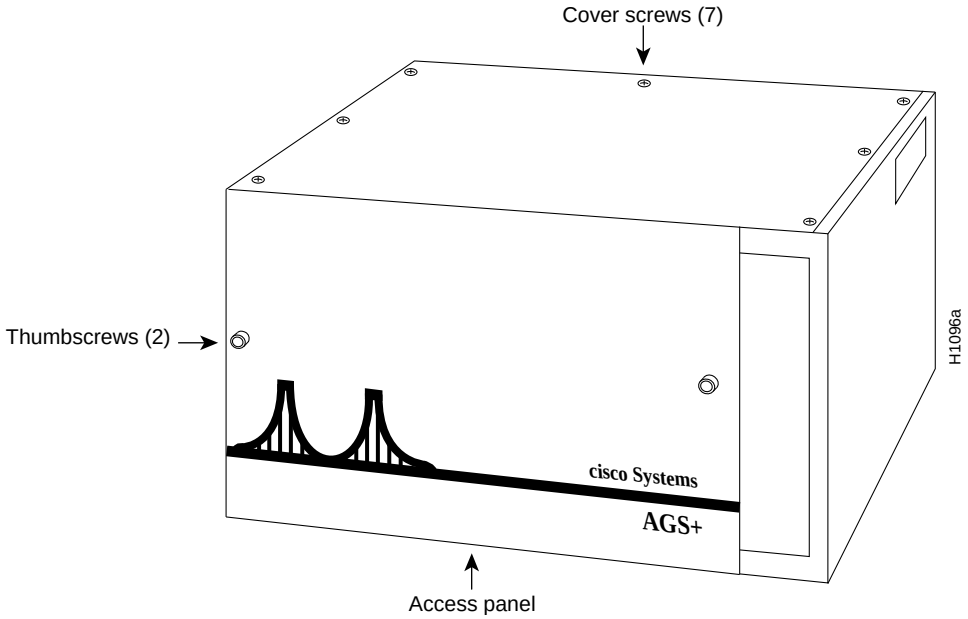

Figure 8 Chassis Front and Top Panels

To reassemble the chassis, reverse all steps.

MGS Chassis

Following is the procedure for accessing the MGS chassis interior. You will need a medium-sized flat-blade screwdriver and a No. 1 Phillips screwdriver.

Warning Before accessing the chassis interior, turn OFF power to the chassis and unplug the power cord because hazardous voltages may exist in or near the power supply. Use extreme caution when working near the power supply.

Step 1 Turn OFF power to the chassis and unplug it from AC power.

Step 2 If the chassis is rack mounted, disconnect all external cables from the chassis rear panel. Note where these cables were connected, for reinstallation.

Step 3 Remove the chassis from the rack and transfer it to a desktop or work table.

Step 4 If you need to handle any electronic components (cards, and so forth) attach appropriate ESD protection and attach the AC power cord, but to prevent a shock hazard, make certain the chassis power is OFF.

Step 5 To access the cards in the card cage, locate the three flat-blade screws that secure the card cage access panel. (See Figure 9.) These screws are located on the top of the MGS chassis access panel.

Step 6 Using the flat-blade screwdriver, turn each of these screws 1/4 to 1/2 turn counterclockwise until the screw pops up.

Step 7 Using the No. 2 Phillips screwdriver, loosen the three screws at the bottom edge of the card cage cover. (Do not remove these screws completely.) Carefully remove the card cage cover and set it aside.

Step 8 To access the other chassis components, use the No. 1 Phillips screwdriver to remove the 14 screws that secure the top cover of the MGS chassis. (See Figure 9.) Set the top cover aside.

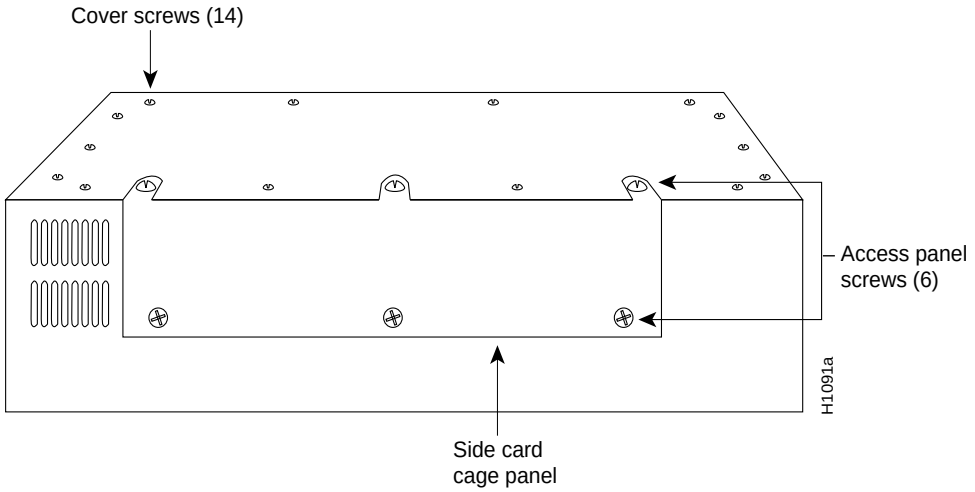

Figure 9 Screw Locations on the MGS Chassis Exterior—Side View

To reassemble the chassis, reverse all steps.

C Chassis

Following is the procedure for accessing the C chassis interior. You will need a medium-sized flat-blade screwdriver and No. 1 and No. 2 Phillips screwdrivers.

Warning Before accessing the chassis interior, turn OFF power to the chassis and unplug the power cord because hazardous voltages may exist in or near the power supply. Use extreme caution when working near the power supply.

Step 1 Turn OFF power to the chassis and unplug it from AC power.

Step 2 If you need to handle any electronic components (cards, and so forth) attach appropriate ESD protection and attach the AC power cord, but to prevent a shock hazard, make certain the chassis power is OFF.

Step 3 Use the No. 2 Phillips screwdriver to remove the ten screws that secure the cover of the C chassis. There are two screws on each side and six screws on the bottom of the chassis. (See Figure 10.)

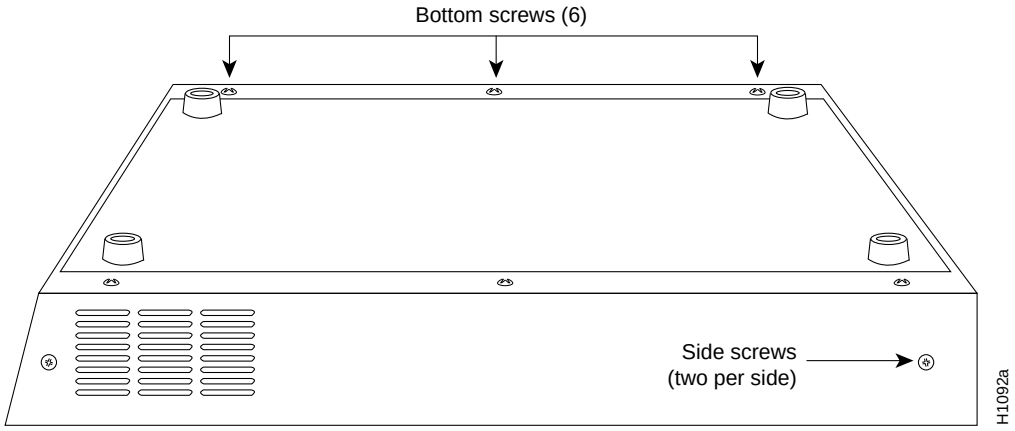

Figure 10 Screw Locations on the C Chassis Exterior—Side View

Step 4 Position the chassis so that the back (the side with the ports) is on your left; the front of the chassis (with the LED) is on your right; and the chassis top is facing up. (This is completely opposite of the chassis position shown in Figure 10.)

Step 5 Pull the front of the cover to the right (while securing the back of the chassis with your left hand) until the power supply and card cage are completely exposed. Because the fit is snug, pull slowly and carefully, and do not remove the cover.

Caution Several cables are located close to the interior of the C chassis cover. Avoid damage to these cables by ensuring that they do not impede the cover as you remove it.

To reassemble the chassis, reverse all steps.

Installation

The procedures in this section describe how to install the applique in the rear of the chassis, connect the applique ribbon cable to an Ethernet port on a network interface card (CSC-MCI or CSC-MEC), and anchor the ribbon cable to the bottom of the chassis with the clip provided.

If you are installing the applique in an M or C chassis, you *must* use applique assembly Part Number 73-0981, which is specifically for the M and C chassis. It contains a shorter cable than the one used in the A-type chassis. (The longer cable can propagate noise.) Before proceeding, ensure that your system and equipment meet the requirements listed in the section “Installation Prerequisites” on page 5.

Installing the Applique

The applique is already mounted on a connector plate. If there is an unused (blank) connector plate of the same size in the chassis, you need only install the new plate as described in the procedure “Installing the Connector Plate.” If you are replacing one or more connectors, you also need to perform the steps in the following procedure “Replacing an Existing Connector Plate.”

When installing more than one applique, install and connect each applique before installing the next; this will help avoid crossing the internal cables and mixing up your designated Ethernet interfaces.

If you have more than one Ethernet connector on a large plate, and are not replacing all of them with UTP appliques, you can do either of the following:

- Remove the connector plate that contains the old connectors and replace it with a connector plate that contains the new 10Base-T appliques

  or

- Leave the existing Ethernet connector installed as is, and install the new 10Base-T applique in an unused connector plate slot.

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.

Caution Before proceeding, ensure that the CSC-MCI or CSC-MEC card jumpers are set for Ethernet Type 2 (802.3). On the CSC-MCI card, the correct settings for jumpers W93 and W94 are shown in Figure 5. On the CSC-MEC card, the correct settings for jumpers W1 through W6 are shown in Figure 6.

Replacing an Existing Connector Plate

Following is the procedure for removing or disconnecting the appliques on an existing connector plate. If you are not replacing an existing connection, skip this section and proceed to the following section “Installing the Connector Plate.”

Step 1 Ensure power to the chassis is turned OFF, but that the power cord is still connected to the wall receptacle, to channel ESD voltages to ground.

Step 1 Disconnect all external interface cables from the connector plate you are replacing.

Step 2 Trace the internal ribbon cable to the port on the CSC-MCI or CSC-MEC card. Tag the port if necessary to avoid confusing it later.

Step 3 Unplug the ribbon cable from the card, and route it under the card cage.

Step 4 If you are going to leave the existing connector installed, roll up the cable and secure it with a tie wrap or rubber band, then lay it down out of the way of other cables. Skip the next two steps.

Step 5 On the rear of the chassis, loosen and remove the screws that secure the connector plate to the chassis. Individual plates are secured with two screws, small plates with four screws, large plates with six screws.

Step 6 Carefully lift the plate up and out of the chassis, without straining any internal ribbon cables.

Step 7 To complete the installation, proceed to the following section, “Installing the Connector Plate.”

Installing the Connector Plate

Following is the procedure for installing the connector plate on which the applique is mounted. If you are replacing an existing Ethernet connection, first perform the steps in the previous section.

Step 1 Ensure power to the chassis is turned OFF, but that the power cord is still connected to the wall receptacle, to channel ESD voltages to ground.

Step 2 On the rear of the chassis, remove a blank connector plate from the connector area. Individual plates are secured with two screws, small plates with four, large plates with six.

Step 3 Place the new connector plate on the inside of the chassis, against the opening, with the RJ-45 connector facing out, and the component side of the applique facing up. (See Figure 2.) Secure the applique with the screws you removed in step 2.

Step 4 Internally, connect the ribbon cable to an available Ethernet port on the CSC-MEC or CSC-MCI card in the system card cage. Route the cable under the system card cage and up to the connector in the front of the chassis. Be careful not to strain or crimp the cable.

Step 5 M and C chassis only—Ensure that you are installing the applique that includes a 26-inch cable. To keep the internal ribbon cable away from the card cage, anchor it to the bottom of the chassis with the clip provided.

Slide one or more cables into a clip, remove the paper backing, and press the adhesive side of the clip onto the chassis bottom to secure it. See Figure 11 for suggested placement.

Step 6 Attach the external network interface cable to the connector on the applique and the other end to your network segment.

Step 7 Turn ON power to the system to check the installation as described in the following section.

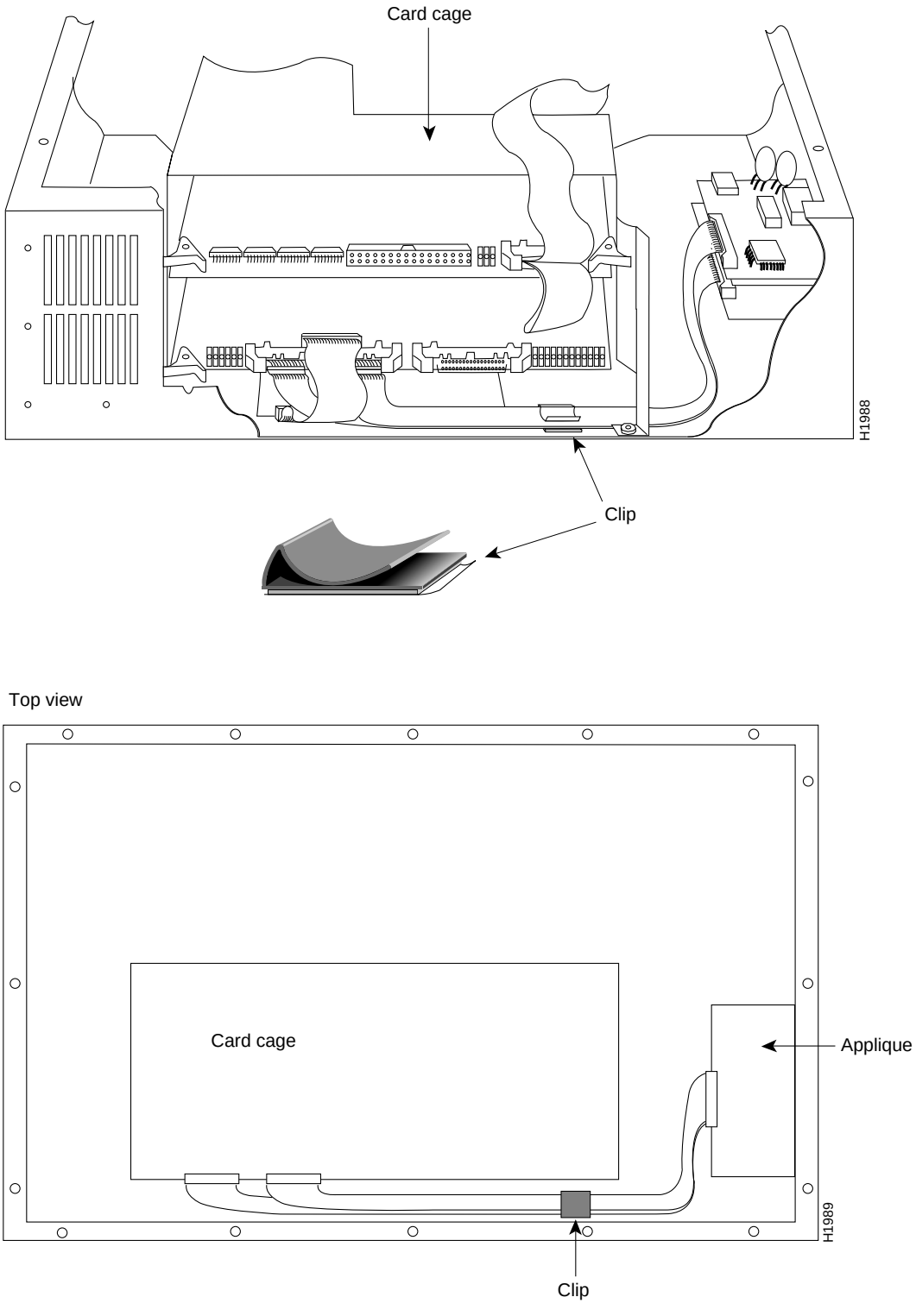

Figure 11 Placement of Anchoring Clips in the M and C Chassis

Verifying the Installation

After you install your applique, verify that it is installed correctly before you replace the cover. Turn on the system power and observe the status indicators on the applique and the interface card, then use EXEC **show** commands to verify that your interfaces are recognized by the system and have been assigned port addresses.

Reading LED Indicators

Power up the system and observe the status indicators on the applique, which are shown in Figure 12. Verify that the indicators come on as follows:

- At power up, the LINK indicator comes on and remains on if it is connected to a 10Base-T link that is powered up. This indicates that a good link has been established. If it does not come on, check the opposite end of the link and ensure it is powered up and the cable is securely installed. If it still does not come on, switch the transmit and receive pair at one end of the link and restart the system.

Note 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 MAU; then 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.

- When a good link is established, the RCV indicator will flash or remain on to indicate packet traffic on the link.
- The XMT indicator will come on when the unit transmits data (a packet) over the link.

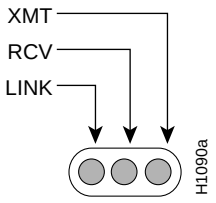

Figure 12 10Base-T Applique Status Indicator LEDs

If the LINK indicator comes on, but no data is getting through, or if the bit error rate increases, check the MCI or MEC card to ensure the jumpers are properly set for Ethernet Version 2. The correct jumper settings are described in the section “Installation Prerequisites” on page 5.

Also, verify that the appropriate LEDs on the CSC-MCI or CSC-MEC card come on, indicating that the new interface is recognized. The following two illustrations show the indicators at the front edge of the MEC card (shown in Figure 13) and the MCI card (shown in Figure 14) as viewed when the cards are installed in the card cage.

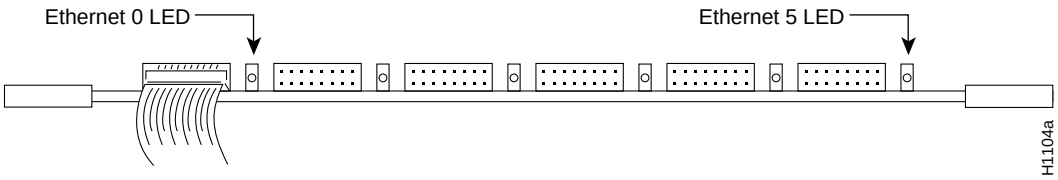

Figure 13 CSC(C2)MEC Card LED Indicators—Front-Edge View

The MEC card indicators are located to the right of each connector port. The indicator for each connected port should come on and remain on after initialization.

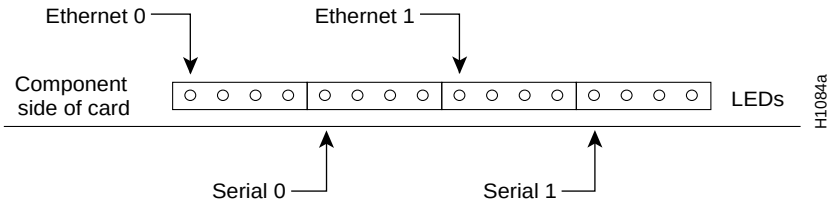

Figure 14 CSC-MCI Card LED Indicators—Partial Font-Edge View

The MCI card contains 16 indicators, four banks of four LEDs. Each bank represents an Ethernet or serial port. As shown in Figure 14, the far-left indicator (LED 0) represents Ethernet 0, and the eighth (LED 8) represents Ethernet 1. If only one Ethernet interface is connected to the MCI card, only the far-left indicator (LED 0) should come on. If two Ethernet interfaces are connected to the card, both Ethernet indicators (LED 0 and LED 8) should come on.

An error condition exists if one of the following occurs:

- No indicators come on at power-up or after initialization
- The green LINK indicator on the applique fails to come on after initialization
- An indicator for a connected port on the MEC or MCI card fails to come on

If any of these happen, ensure that all cards are firmly seated and all cables are securely installed. If a second power-up attempt also fails, contact a service representative.

Using Show Commands

When the status indicators show that the applique is installed correctly, use EXEC command displays to verify that the new Ethernet interface is properly recognized by the system. 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 be not be recognized until it is properly connected to the card and the system is restarted.

Use the EXEC command **show config** to obtain the current system configuration information. Each interface is listed along with its assigned ip address. Verify that the new Ethernet interface appears. Following is a sample display:

```
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

name-server 255.255.255.255
```

The EXEC command **show version** displays the system hardware configuration. The output includes a summary of hardware features, software version strings, and the names and sources of configuration files and/or boot images. The total number of each type of interface is listed; verify that the total number of Ethernet 802.3 interfaces is correct. Following is a partial, sample display:

```
GS Software, Version 8.3
Copyright (c) 1986-1991 by cisco Systems, Inc.
Compiled Sat 14-Sep-91 04:05 by satz

System Bootstrap, Version 4.3

dross uptime is 1 week, 23 hours, 28 minutes
System restarted by reload
System image file is unknown, booted via tftp from 131.108.1.111
Host configuration file is “dross-config”, booted via tftp from 131.108.1.111

CSC3 (68020) processor with 4096K bytes of memory.
X.25 software.
5 MCI controller
8 Ethernet/IEEE 802.3 interface
12 Serial network interface
32K bytes of non-volatile configuration memory.
```

The EXEC command **show controller mci** displays the current internal status of the MCI and SCI cards, including the interfaces and how the card has identified them. Although the command specifies the MCI card, it also provides the same information for SCI cards: controller types 1.0 and 1.1 are MCI cards; controller type 2.0 is an SCI card.

The display lists all interfaces connected to the MCI and SCI cards, including Ethernet interfaces on the MCI cards. The display indicates that the system has identified your new interface, but it does not indicate the state of the line or protocol. Use the EXEC command **show controller cbus** to display the same information for the MEC card.

Following is a sample displays:

```
router# show controller mci

MCI 0, controller type 1.1, microcode version 1.10
  128 Kbytes of main memory, 4 Kbytes cache memory
22 system TX buffers, largest buffer size 1520
  Restarts: 0 line down, 0 hung output, 0 controller error
  Interface 0 is Ethernet0, station address aa00.0400.0134
15 total RX buffers, 11 buffer TX queue limit, buffer size 1520
    Transmitter delay is 0 microseconds
 Interface 1 is Serial0, electrical interface is V.35 DTE
    15 total RX buffers, 11 buffer TX queue limit, buffer size 1520
    Transmitter delay is 0 microseconds
    High speed synchronous serial interface
```

To obtain more extensive information about the interfaces, such as the state of the lines and protocol types, use the EXEC command **show interface ethernet** to display statistics about each of the Ethernet interfaces in the server. The first line of the show interface display names the interface and its unit number (Ethernet 0), indicates whether the hardware and the line protocol are up or down. If the line protocol is 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 ethernet

Ethernet 0 is up, line protocol is up
Hardware is MCI Ethernet, address is aa00.0400.0134 (bia 0000.0c00.4369)
Internet address is 131.108.1.1, subnet mask is 255.255.255.0
```

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

Restarting the System

When the installation check is successful:

Step 1 Turn OFF power to the system.

Step 2 Replace and secure the chassis cover.

Step 3 Affix the new labels (10Base-T 0, 10Base-T 1, and so forth) below the connector on the applique.

Step 4 Turn ON power to the system to configure your network interface.

The router products configuration publication contains additional information for configuring the new interface and managing the system.

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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This document can be used in conjunction with the *AGS+ Hardware Installation and Maintenance*, *ASM-CS Hardware Installation and Maintenance*, and *M and C Chassis Hardware Installation and Maintenance* publications.