

GIGAswitch/ATM 5-Slot System

Installation and Service

Part Number: EK-DAGWG-IN. B01

May 1997

This document explains how to install and service the GIGAswitch/ATM 5-slot system.

Revision/Update Information: This is a new manual.

Firmware Version: GIGAswitch/ATM Firmware V2.0

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This document provides instructions for installing the GIGAswitch/ATM 5-slot system. It also provides information about servicing the GIGAswitch/ATM 5-slot system.

Intended Audience

This document is intended for personnel who are experienced in installing and servicing network hardware.

Document Structure

This document is structured as follows:

These chapters contain overview and installation instructions for the system.

- Chapter 1 describes the GIGAswitch/ATM 5-slot system.
- Chapter 2 describes the procedures that you must complete before installing the system. These procedures include verifying the site preparation, unpacking the system, testing the system modules, and setting up electrostatic discharge (ESD) protection.
- Chapter 3 describes the procedures for installing the system. These procedures include installing the rackmount kit and installing the modules.

These chapters contain information for configuring and testing the system.

- Chapter 4 describes the procedures that you must complete before configuring the system.
- Chapter 5 describes the clock management module (CMM) commands.
- Chapter 6 describes the procedures for initiating the module self-tests (MSTs) and provides instructions for evaluating the results of the MSTs.
- Chapter 7 describes the procedures for upgrading the firmware.

These chapters contain information for replacing the field replaceable units (FRUs).

- Chapter 8 describes the replacement requirements for each GIGAswitch/ATM module and describes the procedures used in replacing some of the modules. These procedures include setting up electrostatic discharge (ESD) protection and removing or applying system power.
- Chapter 9 describes the procedures for replacing the cooling and power modules and the line cards. Cooling and power modules include the fan tray and power tray assemblies.
- Chapter 10 describes the procedure for removing the system from the rack.
- Chapter 11 describes the procedure for removing the backplane.

These appendixes contain reference information.

- Appendix A provides the physical, electrical, and environmental specifications for the GIGAswitch/ATM 5-slot system.
- Appendix B describes the cooling and power modules in the fan tray and power tray assemblies.
- Appendix C describes the logic modules in the line card and crossbar module families.
- Appendix D provides guidelines for installing additional logic modules.

Product Documentation

The GIGAswitch/ATM 5-slot system documentation set consists of the following documents:

- *GIGAswitch/ATM 5-Slot System Installation and Service*, EK-DAGWG-IN
- *GIGAswitch/ATM System Management*, AA-QCV8C-TE

Related Documentation

Additional information is available in the following documents:

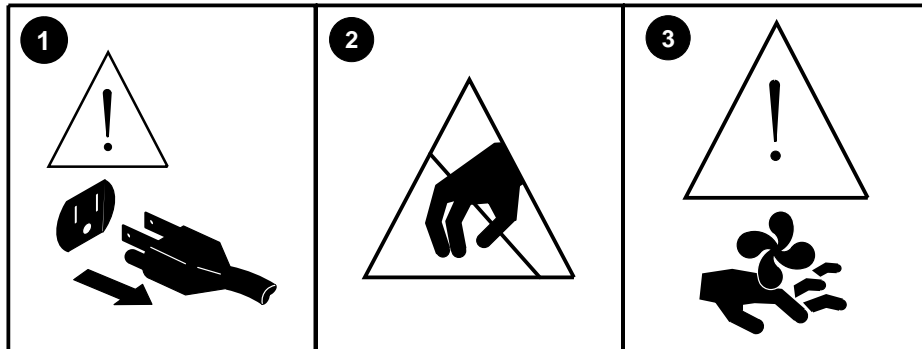
- *OPEN DEConnect Applications Guide*, EC-G2570-42
- *ATM Modular PHY Cards Installation*, EK-DAGGM-IN
- *ATM 4-Port Modular Line Card*, EK-DAGBA-IN
- *ATM 1-Port 622 Mb/s MMF Line Card*, EK-DAGCA-IN
- *ATM 1-Port 622 Mb/s SMF Line Card*, EK-DAGCB-IN

Conventions

The following conventions are used in this document:

Special typeface	Indicates system output. In text, indicates command names, keywords, node names, file names, directories, and utilities.
Bold typeface	Indicates a literal example of user input.
<i>Italic typeface</i>	Indicates a variable in examples. In text, indicates that a word or phrase is being emphasized to the reader.
<Return>	Indicates that you press the Return key on the keyboard.
<Ctrl/x>	Indicates that you must hold down the key labeled Ctrl while you press another key or a pointing device button.

Safety Symbols



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Number	Symbol	Description
❶	Caution	Remove system power before removing or installing the system module.
❷	Caution — Electrostatic sensitive device	Take precautions to protect against equipment damage due to electrostatic discharge (ESD).
❸	Caution — Rotating fans	Allow the fans to run down before removing the fan tray from the unit.

Introduction

The GIGAswitch/ATM 5-slot system is a standalone, intelligent, switching system that forwards ATM cells among a set of connected ATM links based on the VCI field within the cell header and provides 3.2 Gb/s performance. The links can be connected to end stations, bridges, and routers, another vendor's switches, and to other GIGAswitch/ATM systems.

The GIGAswitch/ATM 5-slot chassis (DAGWG-BA) contains a clock card, a fan tray, and a power tray.

The GIGAswitch/ATM 5-slot system can operate under full load conditions with one power supply. Adding a second power supply provides redundancy and each power supply would share half of the load current.

Note

Make sure that the 5 V power module option (DAGPL-AA) is installed on any line cards that you use in your system.

Failure to install the correct power module option will result in an inoperational line card.

Note that the ATM 4-port 155 Mb/s line cards (DAGGL-AA and DAGGL-AB) are not supported for use in the GIGAswitch/ATM 5-slot system.

1.1 Parts of the GIGAswitch/ATM 5-Slot System

Table 1-1 lists the GIGAswitch/ATM 5-slot system components.

Table 1–1 GIGAswitch/ATM 5-Slot System Components

Part (Order Number)	Quantity	
	DAGWG-BA	Option
4-port modular line card (DAGGL-BA) with the following orderable options: <ul style="list-style-type: none"> • Cell buffer expansion card (DAGCB-AA) • 8 MB expanded memory option (FR-PCP7M-AB) • 16 MB expanded memory option (FR-PCP7M-AC) • 5 V power module option (DAGPL-AA) • ATM modular PHY cards 	0	Up to 4 *
1-port 622 Mb/s line card (DAGGL-CA or DAGGL-CB) with the following orderable option: <ul style="list-style-type: none"> • 5 V power module option (DAGPL-AA) 	0	Up to 4 *
Clock card (F5-23289)	1	0
Chassis contains: <ul style="list-style-type: none"> • Fan tray assembly (70-33348) • Backplane assembly (70-33349) 	1	0
Power tray assembly (DAGPS-AA)	1	Up to 2 †
Power cord (non-U.S.)	0	1 country kit per power tray

* Four line cards total per chassis.

† One is required for ordinary use, two are required for redundancy.

1.1.1 Configuration Used in This Document

The configuration used in this document represents the GIGAswitch/ATM 5-slot chassis with the clock management module (CMM), fan tray assembly, and power tray.

1.1.2 Hotswap Capability

Except for the power supply, the GIGAswitch/ATM 5-slot system does not support hotswap. None of the system modules can be hotswapped. Attempts to hotswap modules will cause the system to shut down.

ATM modular PHY cards can be hotswapped on the 4-port modular line card (DAGGL-BA).

1.1.3 Power Switch

The power switch on the power tray is also a circuit breaker that provides overload and short circuit protection for the power cord and service outlet.

Preparing to Install the System

This chapter describes the following procedures that you must complete before installing the GIGAswitch/ATM 5-slot system:

1. Verifying the site preparation
2. Unpacking the system
3. Testing the system modules
4. Preparing the rack
5. Installing the mounting brackets on the system
6. Setting up electrostatic discharge (ESD) protection
7. Using ESD equipment

2.1 Verifying the Site Preparation

Verify that the following requirements are met before installing the GIGAswitch/ATM 5-slot system.

- Area
- Cable plant
- Rack space

2.1.1 Area

Appendix A provides the physical, electrical, and environmental specifications for the GIGAswitch/ATM 5-slot system.

2.1.2 Cable Plant

The *OPEN DECconnect Applications Guide* contains checklists and additional references used to verify proper cable plant installation.

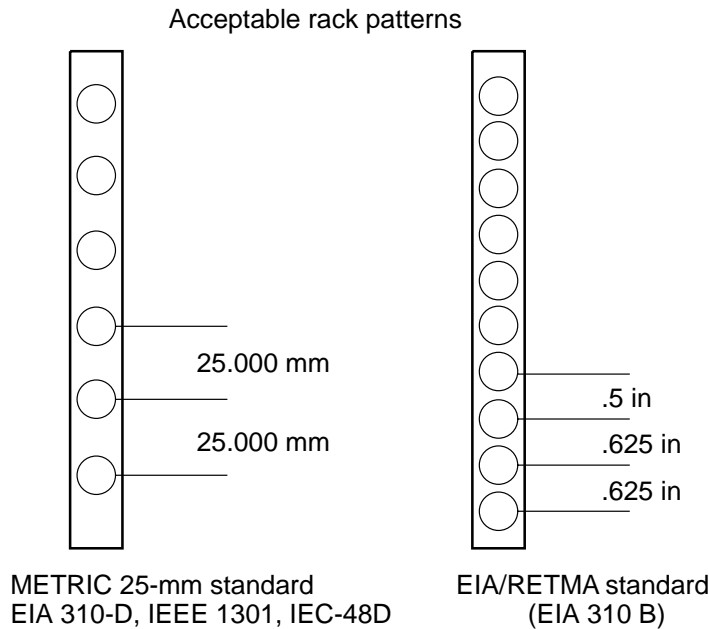
2.1.3 Rack Space

If you plan to install the GIGAswitch/ATM 5-slot system in a rack, use a grounded rack that is 48.3 cm (19 in) wide with 26.7 cm (10.5 in) contiguous vertical space.

The spacing between the holes of the rack should comply with EIA/RETMA standard EIA 310B or one of the metric 25 mm standards (EIA 310-D, IEEE 1301, or IEC-48D).

Figure 2–1 illustrates the acceptable rack patterns for both sets of standards.

Figure 2–1 Rack Patterns



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2.2 Unpacking the System

Perform the following tasks when unpacking the system:

1. Remove the packing material.
2. Identify the contents of the shipping container.

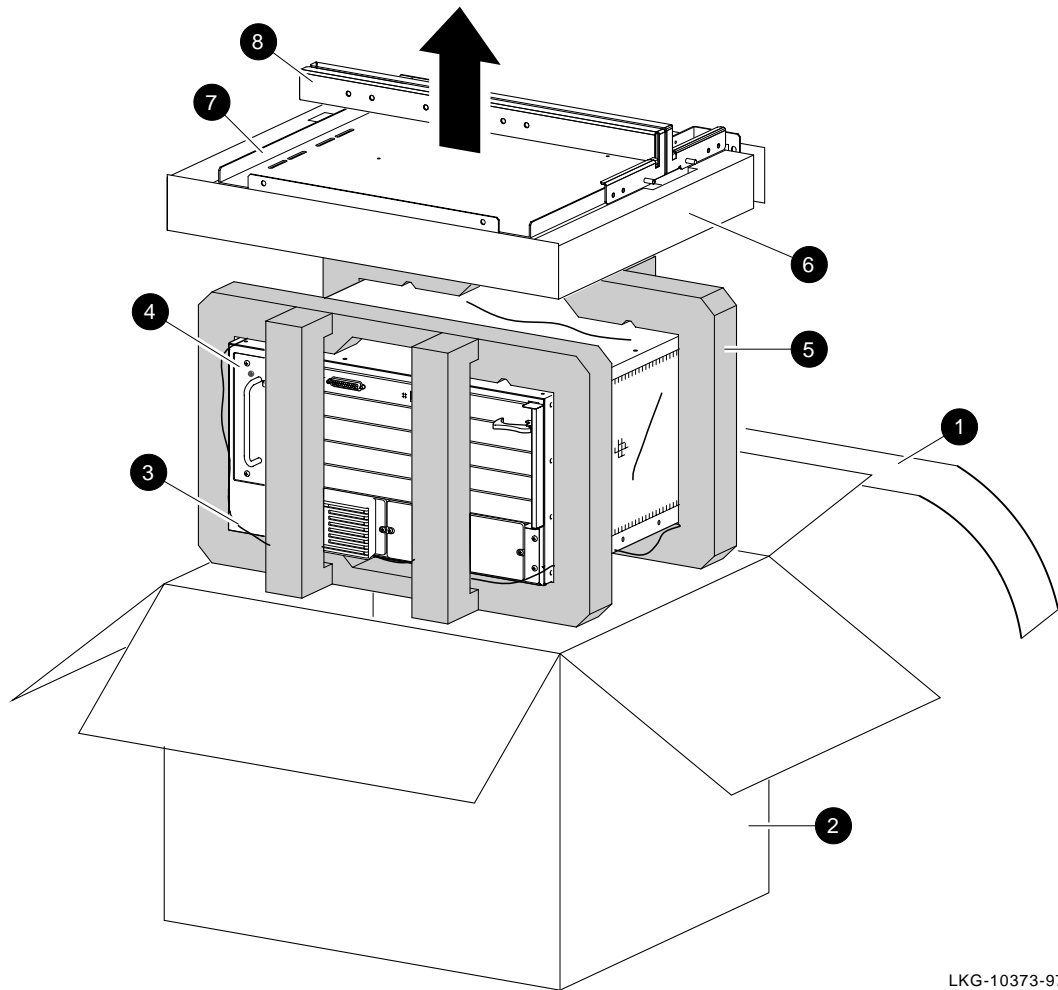
These tasks should take 15 minutes.

2.2.1 Removing the Packing Material

Refer to Figure 2–2 when performing the following tasks to remove the packing material.

1. Locate the top of the shipping container, remove the tape ❶, and open the box ❷.
2. Remove the packing material (❸, ❹, and ❺) on top of the system.
3. Lift the system out of the shipping container.
4. Remove the packing material (❸ and ❹) from around the system.
5. Remove the shipping bag ❻ from the system.

Figure 2-2 Removing the Packing Material

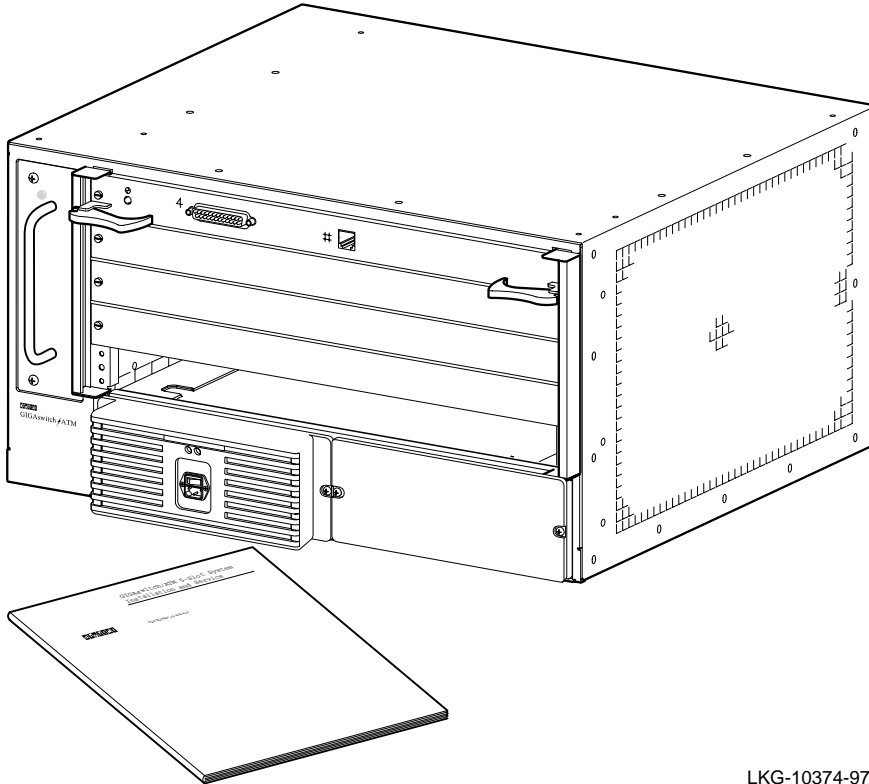


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2.2.2 Identifying the Contents of the Shipping Container

Figure 2–3 and its associated table identify the contents of the shipping container.

Figure 2–3 Contents of the Shipping Container



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Part Number	Description
DAGWG-BA	GIGAswitch/ATM 5-slot system
EK-DAGWG-IN	<i>GIGAswitch/ATM 5-Slot System Installation and Service</i>
AA-QCV8C-TE	<i>GIGAswitch/ATM System Management</i>

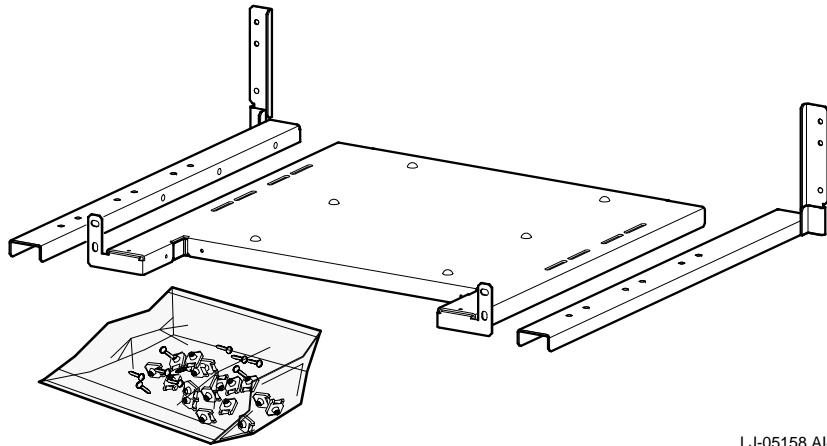
2.2.2.1 Identifying the Options

Appendix D provides a description of the options, as well as where the options should be installed in the GIGAswitch/ATM 5-slot system.

2.2.2.2 Identifying the Contents of the Rackmount Kit

Figure 2–4 and its associated table identify the contents of the rackmount kit.

Figure 2–4 Contents of the Rackmount Kit



Part Number	Name	Function
70-32910-01	Plate (with brackets)	Supports the GIGAswitch/ATM system.
N/A	Hardware packet	Contains the clip nuts and screws used to install the plate and the GIGAswitch/ATM system.
36-40161-02	Template	Used to determine the location on the rack for clip nuts.

2.3 Testing the System Modules

Perform the following tasks to test the system modules:

1. Apply power to the GIGAswitch/ATM 5-slot system.
2. Evaluate the results of the module self-test (MST).
3. Remove power from the system.

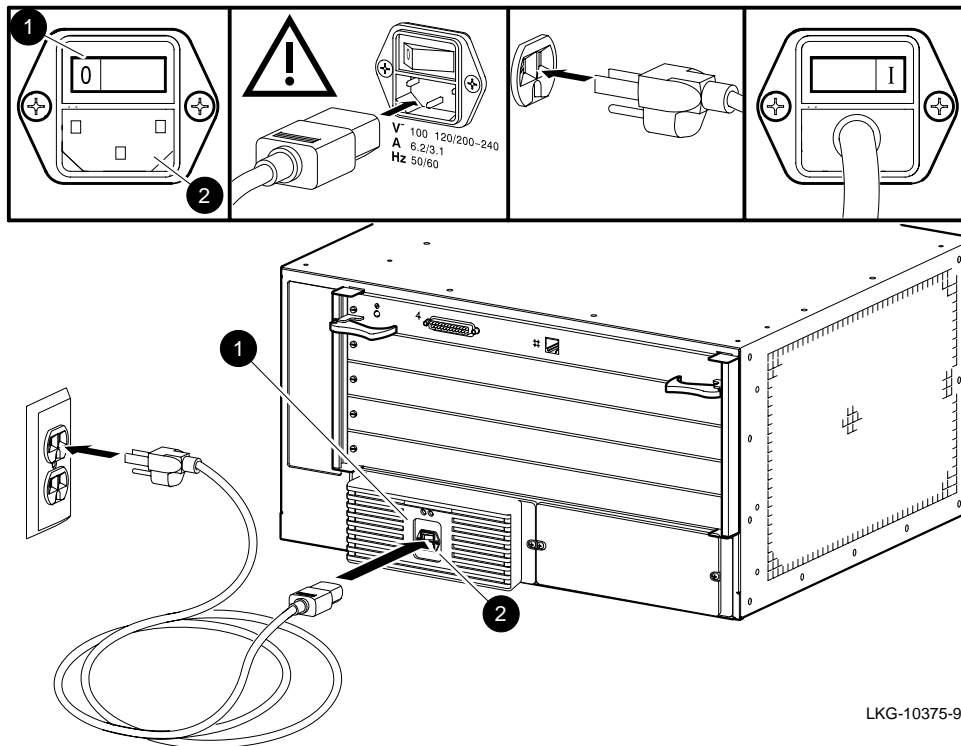
These tasks should take 5 minutes and require no tools.

2.3.1 Applying Power to the System

Refer to Figure 2–5 when completing the following steps to apply power to the system:

1. Locate the power switch ❶, the power cord, and the power connector ❷. (Note that non-U.S. power cords are shipped separately in country kits.)
2. Place the power switch ❶ in the 0 (OFF) position. Note that you should press the side marked 1 so that the side marked 0 becomes visible.
3. Plug the power cord into the power connector ❷ and then into the connector for the primary power source.
4. Place the power switch ❶ in the 1 (ON) position. Note that you should press the side marked 0 so that the side marked 1 becomes visible.

Figure 2–5 Applying Power



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2.3.2 Evaluating the Results of the MST

Observe the operational status of the GIGAswitch/ATM 5-slot system after the power-on MST is complete. If one or more of the following conditions exist, see Chapter 6. If none of the following conditions exist, see Section 2.3.3.

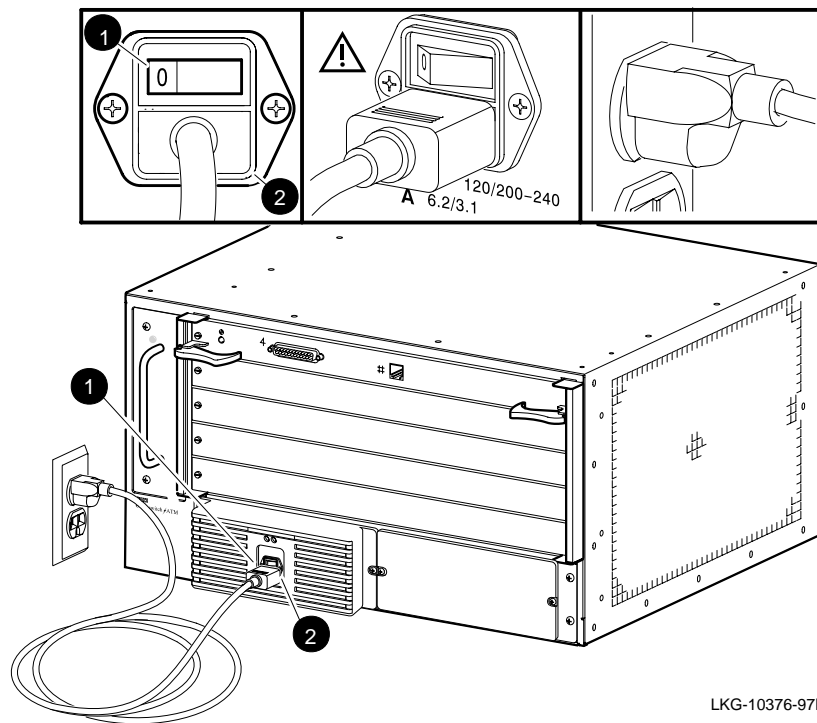
- One or more of the LEDs on the GIGAswitch/ATM 5-slot system remains solid amber or solid green.
- None of the LEDs light.
- The fan tray LED is off and the power supply LEDs remain solid green.

2.3.3 Removing Power from the System

Refer to Figure 2–6 when completing the following steps to remove the power from the GIGAswitch/ATM 5-slot system:

1. Locate the power switch ❶ and the power connector ❷.
2. Place the power switch ❶ in the 0 (OFF) position. Note that you should press the side marked 1 so that the side marked 0 becomes visible.
3. Do not remove the power cord from the power connector ❷. The power cord provides the ground for ESD protection.

Figure 2–6 Removing Power



2.4 Preparing the Rack

If you plan to install the system in a rack, perform the following tasks to prepare the rack:

1. Install the clip nuts.
2. Install the plate.

These tasks should take 30 minutes and require a number 2 cross-point screwdriver, a pencil, and a tape measure.

2.4.1 Installing the Clip Nuts

Perform the following tasks when installing the clip nuts:

1. Mark the position for the clip nuts.
2. Attach the clip nuts.

2.4.1.1 Marking the Position for the Clip Nuts

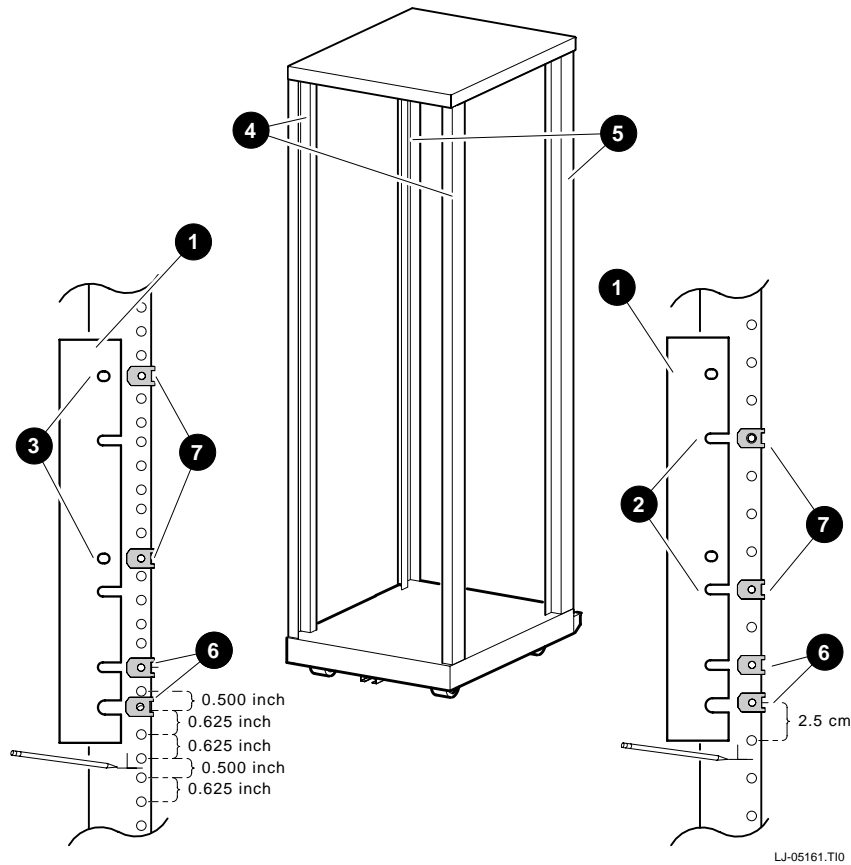
Refer to Figure 2–7 when completing the following steps to mark the position for the clip nuts:

1. Locate the template ❶ and distinguish between the metric markings ❷ and the RETMA (Radio Electronics Television Manufacturer's Association) markings ❸.
2. Locate the front rails ❹ and the rear rails ❺.
3. Identify the area in the rack designated for the GIGAswitch/ATM system.
4. Position the template ❶ beside one of the front rails ❹. Match the markings on the template to the holes in the rail using one of the following:
 - Metric markings ❷ (open slot) for metric racks
 - RETMA markings ❸ (closed slot) for RETMA racks

If the whole pattern does not fit in the space reserved, move equipment (as necessary) to reserve the additional space.

5. Mark the position on the front rail ❹ for the clip nuts associated with the system.
6. Repeat steps 4 and 5 for the other front rail.
7. Repeat step 4 for a rear rail ❺.
8. Mark the position on the inside of the rear rail ❺ for the clip nut associated with the bracket.
9. Repeat steps 7 and 8 for the other rear rail.

Figure 2–7 Marking Positions for Clip Nuts

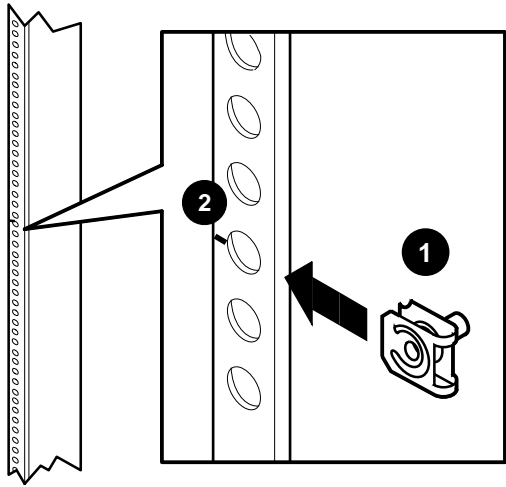


2.4.1.2 Attaching the Clip Nuts

Refer to Figure 2–8 when completing the following steps to attach the clip nuts to the front rails of the rack:

1. Locate the clip nuts ❶ and the marked holes ❷ on the rack.
2. Place the clip nuts over the marked holes on the right front rail of the rack. Orient each clip nut ❶ so the screw can be installed from the front of the rack and press each clip nut onto the marked hole ❷.
3. Repeat step 2 for the left front rail.
4. Place the clip nuts over the marked holes on the right rear rail of the rack. Orient each clip nut ❶ so the screw can be installed from the front of the rack and press each clip nut onto the marked hole ❷.
5. Repeat step 4 for the left rear rail.

Figure 2–8 Attaching the Clip Nuts



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2.4.2 Installing the Plate

Perform the following tasks when installing the plate:

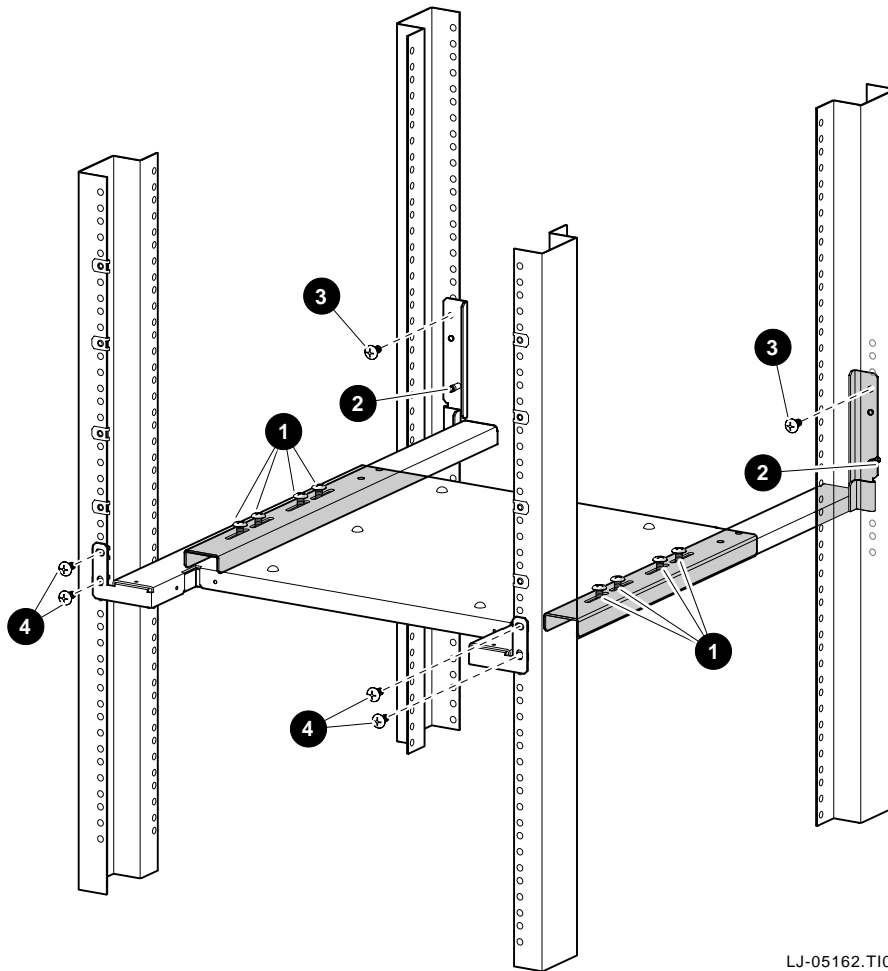
1. Attach the brackets to the plate.
2. Attach the plate assembly to the rack.
3. Tighten the plate assembly.

2.4.2.1 Attaching the Brackets to the Plate

Refer to Figure 2–9 (which shows the plate assembly being attached to the rack) when completing the following steps to attach the the brackets to the plate:

1. Locate the plate, the right and left brackets, and the four screws **1** used to connect the right and left brackets to the plate.
2. Attach the plate to the right bracket. Loosely install the two screws using a number 2 cross-point screwdriver. Do not tighten the screws.
3. Repeat step 2 for the left bracket.

Figure 2–9 Attaching the Plate Assembly



LJ-05162.T10

2.4.2.2 Attaching the Plate and Brackets to the Rack

Refer to Figure 2–9 when completing the following steps to attach the plate and brackets to the rack:

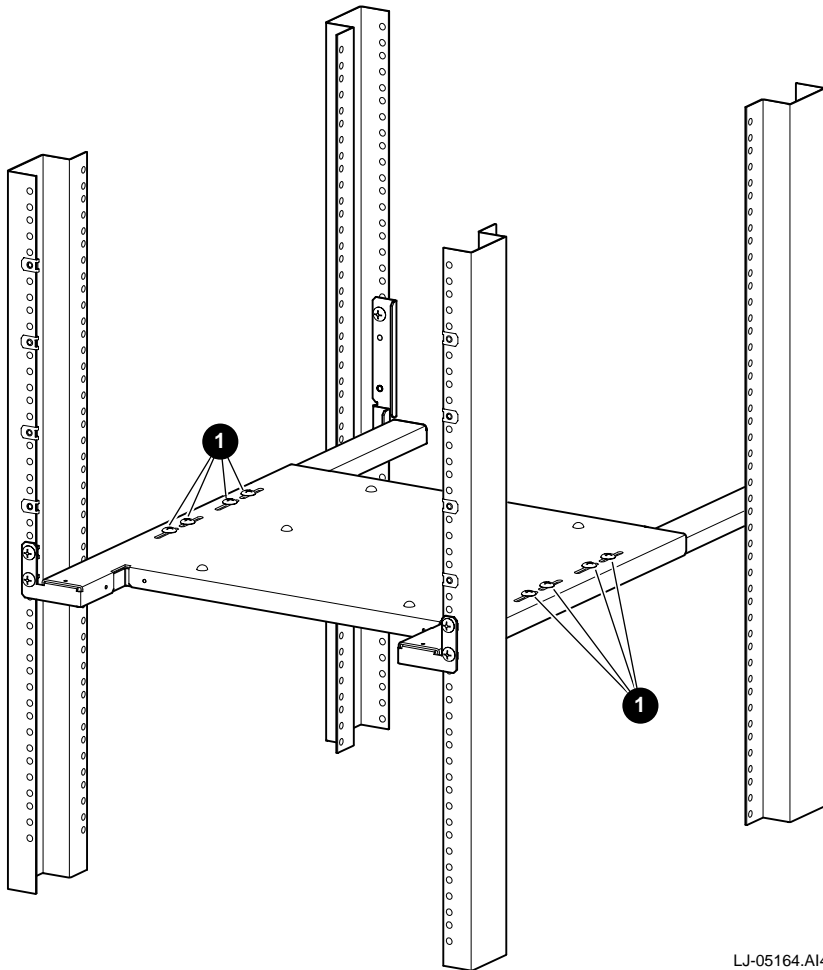
1. Locate the plate, the six clip nuts and associated screws, and the right and left brackets.
2. Position the right and left brackets on the rear rails so that they rest in the pins ②.
3. Align the holes in the brackets on the plate with the clip nuts on the front rails of the rack designated for the plate.
4. Attach the plate to the front rails of the rack. Install the four screws ④ using a number 2 cross-point screwdriver.
5. Attach the right bracket to the rear rail by installing the screw ③ using a number 2 cross-point screwdriver.
6. Repeat step 5 for the left bracket.

2.4.2.3 Tightening the Plate Assembly

Refer to Figure 2–10 when completing the following steps to attach the bracket to the plate:

1. Locate the screws **1** that loosely attach the plate and brackets together.
2. Tighten each screw using a number 2 cross-point screwdriver until all the screws secure the plate and brackets together.

Figure 2–10 Tightening the Plate Assembly



LJ-05164.A14

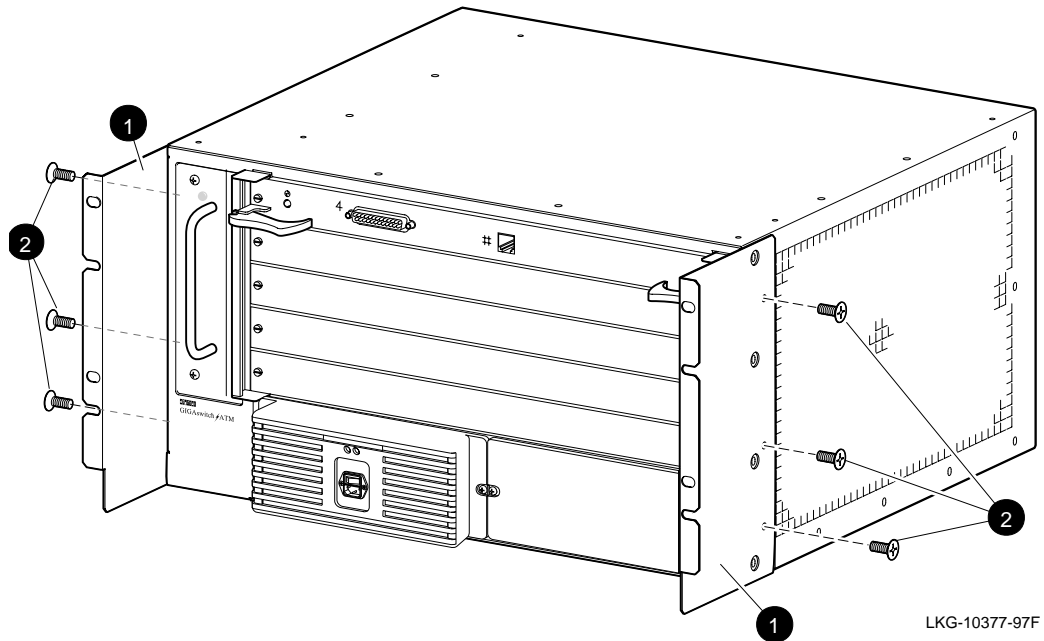
2.5 Installing the Mounting Brackets on the System

If you plan to install the system in a rack, refer to Figure 2–11 when completing the following steps to attach the mounting brackets to the system:

1. Locate the GIGAswitch/ATM 5-slot system, the right and left mounting brackets **1**, and the six screws **2** used to connect the mounting brackets to the system.
2. Align the holes of the right mounting bracket with the corresponding holes on the system.
3. Attach the right mounting bracket to the system by installing the three screws using a number 2 cross-point screwdriver.

4. Repeat steps 2 and 3 for the left mounting bracket.

Figure 2–11 Installing Mounting Brackets on the System



2.6 Setting Up ESD Protection

Protect the logic modules (clock card or line cards) against damage from electrostatic discharge (ESD) by using:

- Static-free containers for long-term storage
- Grounded ESD wrist strap while installing and removing modules
- Grounded ESD mat for temporary storage

2.7 Using ESD Equipment

The Portable Static-Dissipative Field Service Kit (DIGITAL Part Number 29-26246) is used to protect ESD-sensitive modules against damage. Complete the following steps to set up and maintain a static-free area:

1. Ground the unit. The unit is grounded through the power cord when it is connected between the unit and the primary power source.
2. Lay out the static-dissipative work surface (ESD mat) on a flat surface.
3. Connect the ground cord assembly to the ESD mat and to an unpainted surface on the unit.
4. Wear the ESD wrist strap and attach it to the ground cord assembly.

Installing the System

Note

Complete the procedures in Chapter 2 before proceeding with this chapter.

This chapter describes the following procedures for installing the GIGAswitch/ATM system:

- Installing the system in the rack
- Installing the logic modules

3.1 Installing the GIGAswitch/ATM System in the Rack

Perform the following tasks when installing the system in the rack:

1. Place the system on the plate.
2. Attach the system to the rack.

These tasks should take 45 minutes and require the following tools:

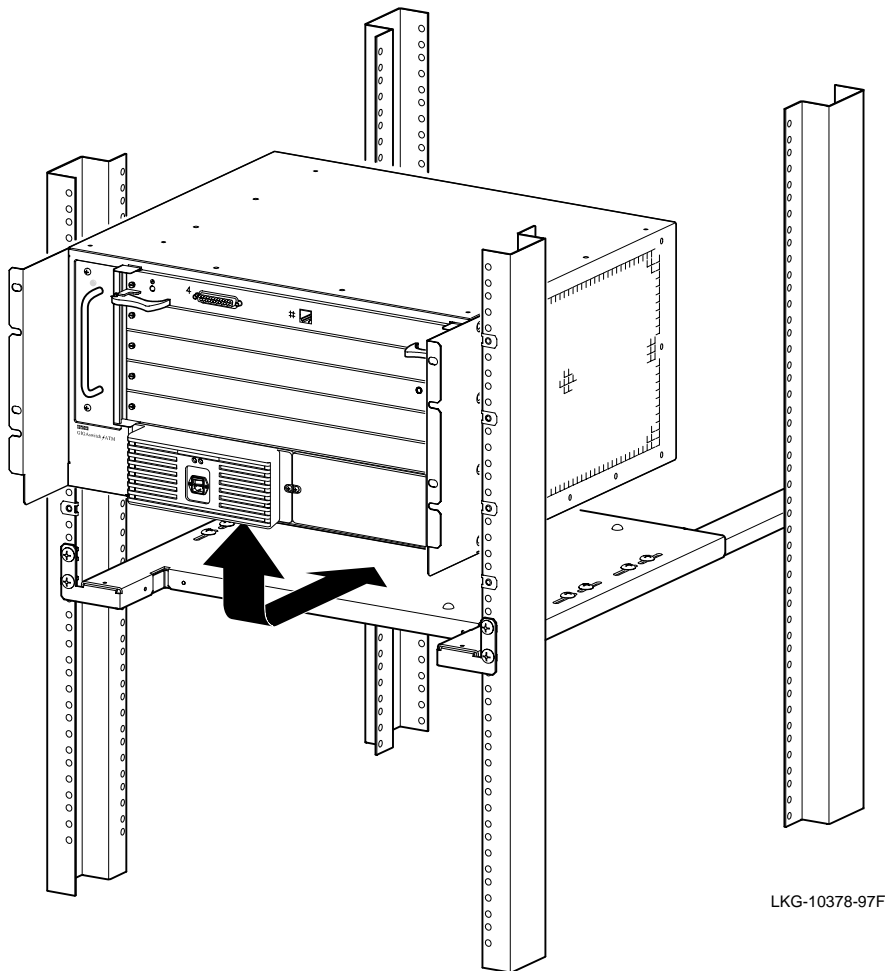
- Adjustable wrench
- Number 2 cross-point screwdriver
- ESD equipment

3.1.1 Placing the GIGAswitch/ATM System on the Plate

Refer to Figure 3–1 when performing the following steps to place the system on the plate:

1. Lift the system to the height of the plate in the rack.
2. While supporting the system from the bottom, slide the empty system into the rack, placing it onto the plate.

Figure 3–1 Placing the System on the Plate



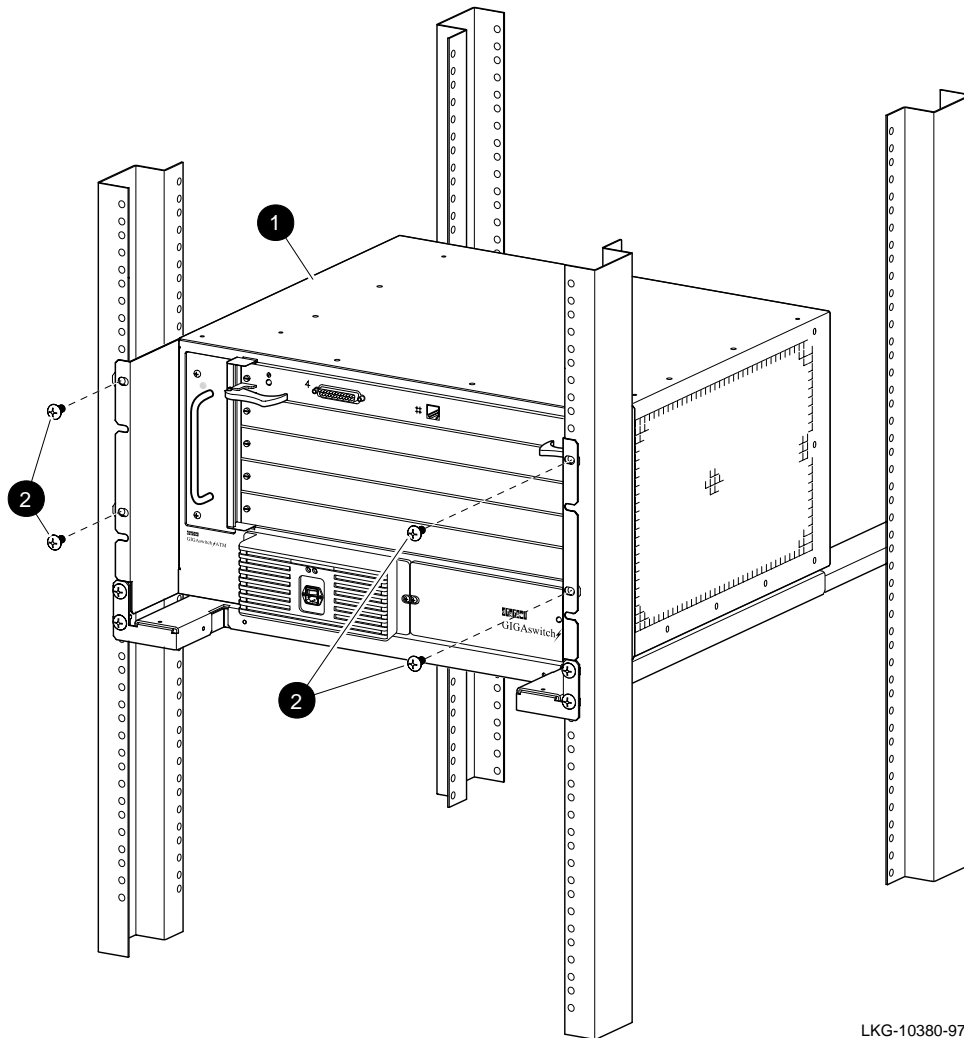
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3.1.2 Attaching the GIGAswitch/ATM System to the Rack

Refer to Figure 3–2 when performing the following tasks to attach the system to the rack:

1. Locate the GIGAswitch/ATM system ❶, the four clip nuts (not shown) designated for the GIGAswitch/ATM system, and the four screws ❷.
2. Align the holes in the system with the corresponding clip nuts on the rack.
3. Partially tighten the screws ❷ using a number 2 cross-point screwdriver.
4. Finish tightening the screws ❷ using a number 2 cross-point screwdriver.

Figure 3–2 Attaching the System to the Rack



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3.2 Installing the Line Card

Caution

Make sure a power tray is installed (see Section 9.4.2) before installing any line cards. The power cord provides the ground required for ESD protection.

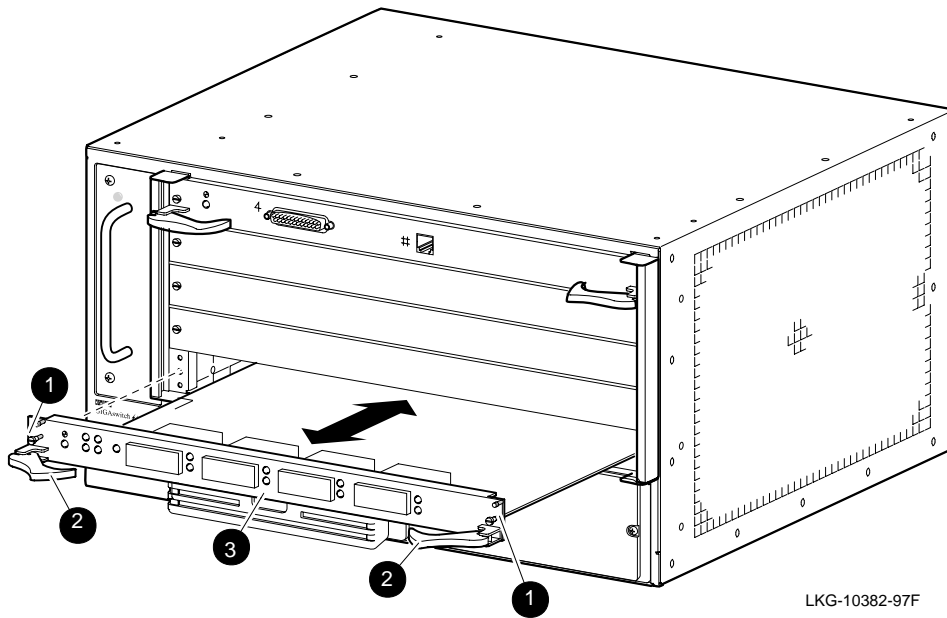
Note

Line cards can be placed in slots 1 through 4, but the first line card should be placed in slot 1. All additional cards should be placed above it.

Refer to Figure 3–3 when completing the following steps to install the line card.

1. Locate the screws **1** that fasten the selected module **3** to the system and the ejectors **2** used to seat the module.
2. Set up the ESD equipment (see Section 2.6).
3. Wear the ESD wrist band.
4. If necessary, remove the blank handle (see Section 9.2.1).
5. Align the module (LEDs toward the left) with the guides, and GENTLY slide the module into the unit.
6. Move the ejectors **2** inward to seat the module **3** in the unit.
7. Tighten the screws **1** using a number 2 cross-point screwdriver.

Figure 3–3 Installing a Line Card



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Preparing to Configure the System

This chapter describes the procedures that you should complete before configuring the GIGAswitch/ATM system:

1. Setting up the hardware
2. Setting up the BootP and TFTP servers
3. Setting up the SLIP interface
4. Setting up the OBM session

The GIGAswitch/ATM system uses a Telnet/TCP/IP/Ethernet port or a console port for out-of-band management (OBM) that permits access to the switch configuration parameters and allows the setup and teardown of permanent virtual circuits (PVCs).

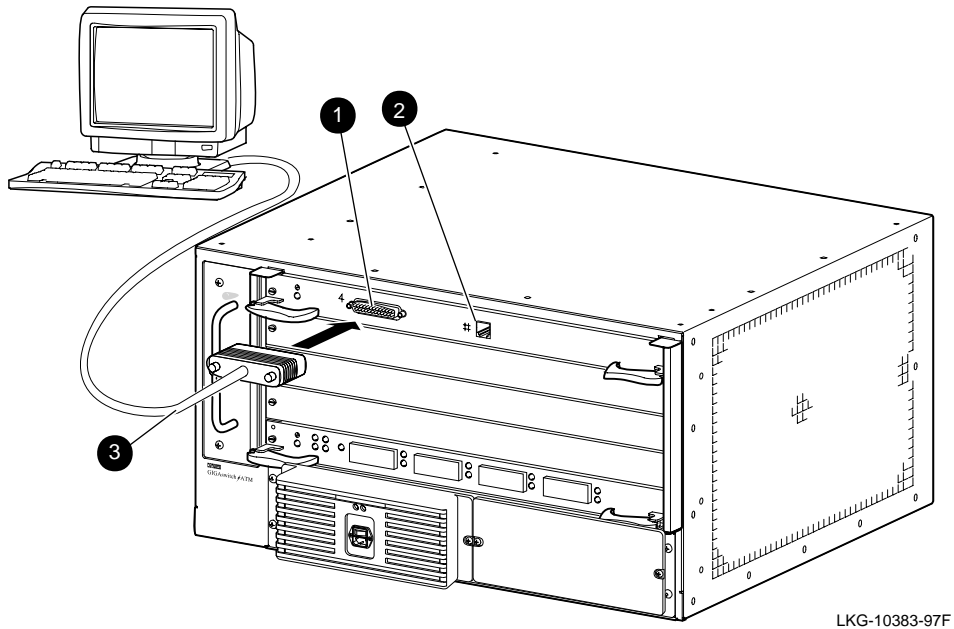
If you do not need to upgrade the software, you can use the OBM interface from the console port located on the clock card (also referred to as the clock management module or CMM) by performing the tasks described in Section 4.1.1. If you have a console attached to the switch, the status of the system load is displayed on the screen when you first power up the system.

If you have the latest firmware (V2.0 or later) installed, you do not have to set up the BootP server; you can use the `set_download_info` command at the console prompt and enter the switch IP address, switch net mask, TFTP server IP address, and control file name. If you do not change your configuration, the BootP server is bypassed the next time that you start up the system.

4.1 Setting Up the Hardware

Refer to Chapter 3 for information about installing the GIGAswitch/ATM system. Refer to Figure 4–1 when completing the steps described in this section to set up the hardware for asynchronous, Ethernet, or SLIP access.

Figure 4–1 Hardware Setup



4.1.1 Setting Up the Hardware for Asynchronous Access

To set up the hardware for asynchronous access, refer to Figure 4–1 when completing the following steps:

1. Locate the console port **1** on the clock card.
2. Connect a terminal to the console port using a shielded null modem cable **3**. Refer to Section 4.1.4 for more information about the use of the shielded null modem cable.
3. Press the <Ctrl/O> key sequence at the prompt so that you can connect to the master line card and use the console commands (described in *GIGAswitch/ATM System Management*).
4. Type `obm` at the console prompt (`GIGAswitch/ATM->`). OBM displays the announcement message.

4.1.2 Setting Up the Hardware for Ethernet Access

To set up the hardware for Ethernet access, refer to Figure 4–1 when completing the following steps:

1. Locate the Ethernet connector **2** on the CMM. It is to the right of the console port **1**.
2. Connect a twisted-pair Ethernet cable and Ethernet repeater between the Ethernet port on the CMM and your Ethernet network.
3. Determine the box Ethernet address for the GIGAswitch/ATM system; the box Ethernet address is marked on the CMM in the following format:
08-00-2b-xx-xx-xx (6 bytes)
or
00-00-F8-xx-xx-xx (6 bytes)

4. The GIGAswitch/ATM system requires a single IP address for remote OBM access, firmware updates, and access to diagnostic services in both the master and slave line cards. The IP address becomes the master line card's IP address.
5. Set up the Ethernet and IP addresses with or without the BootP server.

If you have a BootP server, set up the BootP server with the Ethernet address and assigned IP address from steps 3 and 4. During initialization, the CMM elects the master line card. The master line card gets its IP address from the BootP server. Section 4.2.2 describes how to set up the BootP server.

If you do not have a BootP server, you can set up the IP address using the OBM interface from the console. Follow the steps described in Section 4.1.1 and set the IP address from step 4 using OBM. Once the IP address is set, you have remote OBM access and you can use the `ping` command.

If you have a BootP server configured to respond to BootP requests from the GIGAswitch/ATM system, the values assigned by the BootP server override the IP address set using OBM.

6. Type `telnet ip-address 5000` at the operating system prompt, where *ip-address* is the IP address from step 4.

or

Type `telnet ip-address` at the operating system prompt, where *ip-address* is the IP address from step 4. Type `obm` at the console prompt (GIGAswitch/ATM->). OBM displays the announcement message.

4.1.3 Setting Up the Hardware for SLIP Access

To set up the hardware for serial line IP (SLIP) access, refer to Figure 4-1 when completing the following steps:

1. Assign two IP addresses, one to the switch and another to the host system that connects to the switch. The assigned SLIP IP addresses must be different from the existing Ethernet/IP addresses.
2. Connect a terminal to the console port ❶ on the CMM using a shielded null modem cable ❷. Refer to Section 4.1.4 for more information about the use of the shielded null modem cable.
3. The CMM responds with the `CLK>` prompt. Enter console forwarding mode by pressing the `<Ctrl/O>` key sequence.
4. Invoke the OBM utility on the GIGAswitch/ATM system and select the Management Parameter Selection Menu.
5. Select the `Set Box SLIP IP address and Host IP address` option and enter the two assigned IP addresses. Enter `y` when the switch asks, `Commit IP address to non-volatile storage, y or n? (n):`.
6. Configure the SLIP interface on the host system. Consult the host system documentation for information about configuring the SLIP interface. (Refer to Section 4.3 for an example of the setup on a DIGITAL UNIX system.)
7. Enable security on the switch. Remote access through SLIP is available only if the switch has security enabled.
8. Press the Break key on the terminal. CMM enters local mode.

9. Enter `SL` at the `CLK>` prompt. The SLIP mode is stored in nonvolatile RAM and enters SLIP mode automatically on powerup.
 (NOTE: CMM enters SLIP mode only if the IP addresses for SLIP are configured according to the above steps. If the SLIP command is entered at the `CLK>` prompt and the SLIP IP addresses are not set up, the CMM stays in local mode and displays the `CLK>` prompt.)
10. Disconnect the terminal from the CMM console port and connect it to the serial communication port on the host system.
11. Verify the SLIP access by using the `ping` command on the host system. (Specify the SLIP IP address of the GIGAswitch/ATM system in the `ping` command.)
12. You can access the switch (Telnet or SNMP) using the SLIP IP address. However, you can access only the master line card using SLIP. Telnet access to the slave line cards is not supported through the SLIP interface. All the switch management operations do not require accessing the slave line cards. Telnet access to the slave line cards through Ethernet is provided only for debugging or servicing (such as reading error logs from the slave line cards).

4.1.4 Using Shielded Cables for the Console Port Connection

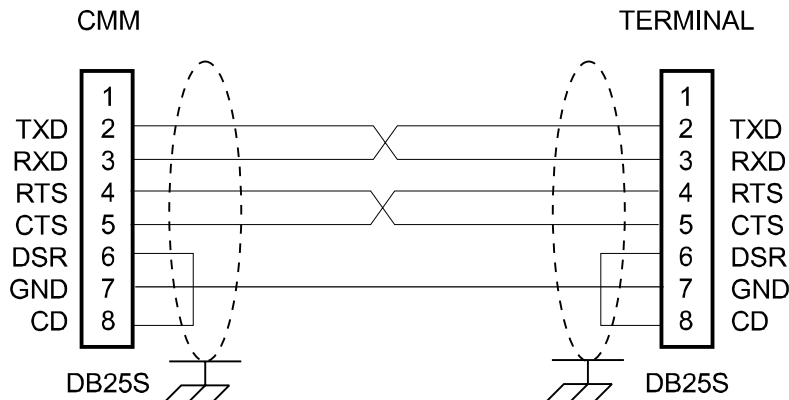
When you are connecting the console port to a terminal console, you must use a shielded null modem cable for this connection that allows the following configuration for the clock card:

- The connector on the clock card is a male DB25 25-pin connector.
- The cable that is used must allow the clock card to be configured to operate as a null modem interface with a standard RS-232 signal interface that utilizes the four modem handshake signals (RTS, CTS, DSR, and CD).

Note that the cable scheme must provide a jumper between pins 6 and 8 (DSR/CD) so that the necessary modem handshake is present for operating the data line interface.

- The proper connector for your terminal console.

The following figure shows an example of the end-to-end signal interface between the clock card and a standard DIGITAL VT terminal.



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4.2 Setting Up the Servers

The BootP and TFTP servers are used to upgrade software and to assign an IP address to the GIGAswitch/ATM system. The BootP server must be set up to respond to BootP requests from the GIGAswitch/ATM system. Refer to your operating system documentation for the specific commands that you need to set up and start a server.

4.2.1 Setting Up the TFTP Server

This section describes the procedure for setting up TFTP locally on your DIGITAL UNIX system.

1. Log in as root or superuser. Go to the root directory using the `cd /` command and create the `tftpboot` directory using the `mkdir` command.
2. Copy the image files to the `/tftpboot` directory on your server using the `cp` command. (These are the same files created by the `tar` command described in Section 7.1.) Make sure that these files have the correct permission (world has read access) using the `ls -l` command. If you need to change the permission, use the `chmod` command.
3. In the same directory, there should be a control file named `AN3_VERxx`, where `xx` is the version number for your firmware (for example, V2.0 would be 20). The control file might contain the following lines:

```
000000000/tftpboot/LC15V20.BIN
LC15V20.ROM
QLC15      LC15V20.ROM      LC15V20.BIN
QLCV2      LC20V20.ROM      LC20V20.BIN
LC622      L622V20.ROM      L622V20.BIN
```

where the following table identifies the location of the fields in the control file:

Line	Field
1	Application Firmware Image information used to correctly load the 4-port 155 Mb/s line card.
2	Kernel Image Filespec for 4-port 155 Mb/s line card.
3- <i>n</i>	Three fields on each line separated by spaces indicate the hardware type, the ROM file name, and the application file name.

Comment lines start with a number sign (#). Blank lines are also considered comment lines.

The first two lines are ignored. (They were used to upgrade previous firmware releases.)

The third line and any subsequent lines should contain three fields separated by spaces to indicate the hardware type, the kernel image file name, and the application image file name. The following table indicates the entries that you might see for different hardware types:

```
QLC15      LC15V20.ROM      LC15V20.BIN
QLCV2      LC20V20.ROM      LC20V20.BIN
LC622      L622V20.ROM      L622V20.BIN
```

where `QLC15` is the 4-port 155 Mb/s line card, `QLCV2` is the 4-port modular line card (DAGGL-BA), and `LC622` is the 1-port 622 Mb/s line card (DAGGL-CA for MMF or DAGGL-CB for SMF).

4.2.2 Setting Up the BootP Server

This section describes the procedure for setting up a DIGITAL UNIX system as the BootP server.

1. Log in as root or superuser.
2. Verify that the following lines are in the `/etc/inetd.conf` file using the more command:

```
bootps dgram  udp    wait   root   /usr/sbin/bootpd    bootpd  -d
tftp   dgram  udp    wait   root   /usr/sbin/tftpd     tftpd  -r /tftpboot
```

If these lines do not exist or are commented out (preceded by a number sign), edit the file and include these lines or remove the number sign. After editing the file, you must stop and restart the `inetd` process by:

- a. Determining the process ID (PID) of the `inetd` process using the `ps -aux | grep inetd` command
 - b. Stopping the `inetd` process using the `kill -9 pid` command, where *pid* is the PID from the preceding command
 - c. Restarting the `inetd` process using the `/usr/sbin/inetd &` command
3. On the server system, the `bootp/tftp` load control file controls the downline load of both the kernel image and the application image. The entry in the BootP server's `/etc/bootptab` file that corresponds to the switch's Ethernet address contains the name of the load control file. (The switch's Ethernet address is printed on the handle of the CMM or can be determined using the A CMM command.) Note that the downline load occurs over the Ethernet, not over the ATM links.

Check the firmware upgrade documentation for the name and location of the firmware image and any release information used for setting up this file. Set up the `/etc/bootptab` file to include the information for the GIGAswitch/ATM system in the following format:

```
node:ht=hw-type:ha=hw-addr:ip=ip-addr:sm=subnet-mask:gw=gw-addr:hd=home-dir:bf=boot-file
where
```

<i>node</i>	Is the unique node name of the GIGAswitch/ATM system.
<i>hw-type</i>	Is the hardware type. For Ethernet, the value is 1.
<i>hw-addr</i>	Is the hardware address (MAC or Ethernet address) for the switch.
<i>ip-addr</i>	Is the IP address for the switch.
<i>subnet-mask</i>	Is the subnet mask if subnets are configured. This field is optional and must be specified if the assigned IP address is a Class C address. The specified value must be compatible with your BootP or TFTP server. If the subnet mask is not specified, the GIGAswitch/ATM system uses 255.255.0.0 as the default value.
<i>gw-addr</i>	Is the default gateway address. This optional field is used as the inet address of the default router if specified.
<i>home-dir</i>	Is the home directory of the boot file.
<i>boot-file</i>	Is the name of the boot file that points to the binary image of the firmware.

Make sure the home directory reflects the TFTP path and directory specified in the `/etc/inetd.conf` file. The home directory is found on the local host. For example, a switch node named `an23` with Ethernet address `08-00-2B-12-34-56` and IP address `16.20.111.222` would have the following entry in the `/etc/bootptab` file:

```
an23:ht=1:ha=08002B123456:ip=16.20.111.222:hd=/tftpboot:bf=AN3_VER20
```

The control file is located in the `/tftpboot` directory by default and contains pointers to the image files. You must modify the control file if you change the file names or the directory. Uppercase file names are used for compatibility with DOS. You can rename the files with lowercase file names if your BootP server supports lowercase file names.

4. See if the `/tftpboot` directory exists. If it does not exist, follow the instructions in Section 4.2.1 for setting up the TFTP server. Verify that the directory specified by the boot file is `/tftpboot` and that the specified control file exists in this directory.
5. Modify the local `/etc/hosts` file to include the workstation and GIGAswitch/ATM system information for the switch. For example, the `/etc/hosts` file might list the GIGAswitch/ATM system as follows:

Inet Address	Host Name	Full inet name	Comments
16.17.18.19	an29	an21c10.nac.lkg.dec.com	# GIGAswitch/ATM system

6. Apply power to the GIGAswitch/ATM system to verify that the BootP server can respond to downline load requests. Determine the directory with the latest time-stamp from the directory listing of `/usr/adm/syslog.dated` using the `ls` command. Determine if there is a `daemon.log` file in the directory with the latest time-stamp using the `ls /usr/adm/syslog.dated/latest-date` command, where *latest-date* is the directory with the latest time-stamp from the preceding command. If there is a `daemon.log` file, then you can verify that the BootP requests are coming from the target GIGAswitch/ATM system by using the `tail -f /usr/adm/syslog.dated/latest-date/daemon.log` command.
7. Confirm that the host address in the `/etc/hosts` file is correct and that the GIGAswitch/ATM system can receive the correct IP address through the BootP server by executing one of the following commands:

```
#ping ip-addr
#ping node-name
```

where *ip-addr* is the IP address of the GIGAswitch/ATM system and *node-name* is the node name of the GIGAswitch/ATM system. Use the `<Ctrl/C>` key sequence to end the display.

8. Create a remote connection to the console for the GIGAswitch/ATM system using the following command:

```
#telnet node-name
```

where *node-name* is the node name for the GIGAswitch/ATM system. Your host must be on the network. The `help` command displays information about available console commands. Use the `logout` command to end the remote connection. Display network information, such as IP addresses, by executing the `ifShow` command. To identify the host that serviced the last request, execute the `hostShow` command. Refer to *GIGAswitch/ATM System Management* for more information about some useful console commands.

You can now set up the OBM session using the OBM interface.

4.3 Setting Up the SLIP Interface

You can set up the SLIP interface for the GIGAswitch/ATM system using the OBM menus. The following example describes the setup procedure for Alpha systems running the DIGITAL UNIX operating system.

This procedure assumes that you have already configured the GIGAswitch/ATM console port to run in SLIP mode and have connected a suitable null modem cable between the Alpha and GIGAswitch/ATM systems as described in Section 4.1.3.

1. The serial line (sl) device must be listed in the `/sys/conf/HOSTNAME` configuration file. The following example configures two sl devices:

```
pseudo-device    sl        2
```

2. Enter the host information into the `/etc/hosts` file for both the local and remote nodes of the SLIP connection to facilitate subsequent setup procedures. The following example shows the format of the entries. The `_sl` piece is optional, but it helps differentiate this interface as a SLIP port.

```
16.24.96.100     localhost_sl
16.24.96.101     remotehost_sl
```

Be sure that there is not an IP address or subnet conflict with existing interfaces on the system (ln0, fta0, and so forth).

3. Configure the SLIP interface using the `ifconfig` command as follows:

```
ifconfig sl0 localhost_sl remotehost_sl netmask 255.255.255.0 up
```

Substitute the dot notation IP address if you did not add this information to the `hosts` file.

4. Assign a serial line to the network interface:

```
slattach tty00
```

The `tty` line is attached to the first available network interface that has already been configured with the local and remote addresses of each end of the SLIP connection using the `ifconfig` command. In this case, `sl0` will be chosen.

You can omit the full path because the command defaults to `/dev` for the `tty`.

You can use the third parameter to specify the baud rate. The default is 9600.

5. Accessing the remote system over the SLIP connection is the same as connecting to a system over the network. In this case, you would enter one of the following:

```
# telnet remotehost_sl
# telnet 16.24.96.101
```


4.4 Setting Up the OBM Session

This section describes how to set up the OBM session. *GIGAswitch/ATM System Management* describes the management commands in more detail.

To connect to the OBM agent in the GIGAswitch/ATM system, use one of the following commands on the remote management station:

```
> telnet ip-address 5000  
> telnet node-name 5000
```

where *ip-address* is the IP address of the GIGAswitch/ATM system and *node-name* is the node name of the GIGAswitch/ATM system.

To use the OBM menu interface from the console, follow the steps described in Section 4.1.1.

4.5 Gathering Information for Configuration

Before you configure your system, make sure the information about your configuration is available. Before you can have ATM connections between the hosts and the switch, you must set up permanent virtual circuits (PVCs) on your hosts. The following worksheet can help you gather information about your hosts for setting up PVCs. You also might want to include information about bandwidth and flow control. You do not need this information for setting up switched virtual circuits (SVCs).

5

Using CMM Commands

This chapter describes the clock management module (CMM) local mode commands, such as SL, A, CO, B, E, CL, T, DO, DE, SD, H, and <Ctrl/O>. Press the Return key after each command. Use these commands by connecting a terminal to the CMM. When you first power on the GIGAswitch/ATM system, you are in local mode on the CMM. The Help Screen appears with the following prompt:

```
CLK>
```

5.1 Obtaining Information About CMM Commands

The H command displays the Clock Management Module Console Port Help Screen.

```
CLK>H
```

```
*** GIGAswitch/ATM Clock Management Module Console Port ***  
Copyright (c) 1994 Digital Equipment Corporation
```

```
Clock Management Module Console Port Help Screen
```

```
^O  Enter LC Forwarding Mode  
SL  Enter SLIP Mode  
A   Show Ethernet Addresses  
CO  Show Slot Configuration  
B   Show Box Configuration (Fans, Power, etc.)  
E   Retrieve Error Log  
CL  Clear Error Log  
T   Show/Modify Real Time Clock Contents  
DO  DOWnload Code Image  
DE  Set Default Soft Switch Settings  
SD  Show Default Soft Switch Settings  
H   Show Help Screen
```

```
CLK>
```

5.2 Changing to Line Card Forwarding Mode

To transfer control to the master line card, press the <Ctrl/O> key sequence. After entering line card forwarding mode, you can use the console commands described in *GIGAswitch/ATM System Management*. To switch back to local mode on the CMM, press the Break key.

5.3 Using SLIP Mode

This section explains how to enter and leave SLIP mode if your hardware has been set up for SLIP access. Refer to Section 4.1.3 for more information about setting up SLIP support.

5.3.1 Entering SLIP Mode

The `SL` command causes the CMM console mode, which is stored in nonvolatile RAM, to be set to SLIP. Thus, SLIP mode is entered automatically when the system is powered up.

```
CLK>SL
```

If the IP addresses for SLIP have not been configured as described in Section 4.1.3, the CMM stays in local mode and displays the `CLK>` prompt.

5.3.2 Leaving SLIP Mode

To leave SLIP mode, perform the following steps:

1. Connect a terminal to the CMM console port.
2. Press the Break key (F4 key on VT300 terminals).
3. The CMM enters local mode and displays the `CLK>` prompt.
4. At the `CLK>` prompt, you can execute any of the local mode commands.

5.4 Displaying Ethernet Addresses

The `A` command displays the Ethernet address for the GIGAswitch/ATM system as shown in the following example:

```
CLK>A
```

```
GIGAswitch/ATM Ethernet Address Assignments
```

```
Switch Address: 08-00-2B-A5-AC-80
```

5.5 Displaying Slot Configuration

The CO command displays the slot configuration for the GIGAswitch/ATM system as shown in the following example of a single mode setting:

```
CLK>CO
```

```
GIGAswitch/ATM Slot Configuration
```

```
Slot      Card Type
1*      Quad Line Card (V 2.0)
2        -
3        -
4        -
5      Clock Card
```

```
CLK>
```

The asterisk (*) indicates the current master line card.

5.6 Displaying Box Configuration

The B command displays the box configuration for the GIGAswitch/ATM system as shown in the following example:

```
CLK>B
```

```
GIGAswitch/ATM Box Configuration
```

```
Clock Card:
  FW Revision: 2.5
  HW Revision: B.3
```

```
Cabinet temperature: normal
Fan status: normal
```

```
CLK>
```

5.7 Retrieving Error Logs

The E command retrieves the CMM error log (a circular list of 12 entries) and displays the twelfth entry. The error logs are stored in Flash memory on the CMM and are preserved over power cycles of the switch. After each error log entry is displayed, the user is prompted to continue or abort the display. Answering Y or pressing the Return key causes the next entry to be displayed. The following example shows a typical error log entry:

```
Entry #      = 3
              Logged by Diagnostic Firmware, Revision 1.70
              THU 02/15/96 10:04:00

Entry status = 0000 [0=valid, 1=wrt_err, 2=invalid, 3=empty, 4=crc_err]
Entry CRC    = FABE3788
Write Count  = 1
FRU Mask     = GIGAswitch/ATM CMM
Error ID     = Ethernet Address ROM Test
```

```
Test Data:
Subtest: Start Address Test
Returned Status      = Block A <> Block B
Expected Value       = 00CB
Actual Value         = 00CF
Power Enable Register = 0080
```

```
Display next entry? (Y to continue)>
```

The information displayed varies depending upon whether the log entry was generated by the diagnostic or the operational firmware and the nature of the error.

5.8 Clearing Error Logs

The CL command clears CMM error logs. When you enter this command, you are asked to verify your decision to clear error logs as indicated by this display:

```
CLK>CL
Clear Error Log: Are You Sure? [N]
```

If you respond with Y, the error log entries are deleted and you are notified that the log is cleared.

5.9 Displaying Time

The T command displays the time.

```
CLK>T
```

```
Current = WED 02/14/96 16:40:17. Change to >
```

```
CLK>
```

The new date and time must match the displayed format (DDD mm/dd/yy HH:MM:SS) or you will receive an error message about illegal input of the date and time.

5.10 Loading Code Images

The DO command is used to downline load code images. Chapter 7 contains more information about this command and its use when upgrading firmware.

5.11 Modifying Switch Settings

The DE command is used to modify the switch settings. You can set the line card startup mode, console output mode, console baud rate, and UID mode. These settings are preserved over power cycles of the switch. To modify the setting, you would use the DE command and the appropriate option to make that change. After you use this command, the settings are displayed to show your changes.

5.11.1 Modifying the Line Card Startup Mode

To modify the line card startup mode, use the DE/SM0, DE/SMF, DE/SML, or DE/SMN commands. The /SM0 option is for normal startup mode with self-test, the /SMF option is for fast load startup mode without self-test, and the /SML and /SMN options are for diagnostics.

5.11.2 Modifying the Console Output Mode

To modify the console output mode, use the DE/OMQ (quiet mode) or DE/OMV (verbose mode) commands.

5.11.3 Modifying the Console Baud Rate

To modify the console baud rate, use the DE/BR=*n* command, where *n* specifies your baud rate. The baud rate can be 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, or 115200.

5.11.4 Modifying the UID Mode

To modify the UID mode, use the /UIDS (single) or /UIDM (multiple) options. Single mode is the default option and should not be changed.

5.11.5 Displaying Switch Settings

The SD command allows you to display the switch settings. You can display the power option, line card startup mode, console output mode, console baud rate, and UID mode. The output of this command resembles the following display:

```
CLK>SD
```

```
GIGAswitch/ATM Soft Switch Settings
```

```
Line Card Startup Mode = 0           [/SM0, /SMA, /SMD, /SMF, /SML, /SMN]
Line Card Output MOde  = Verbose     [/OMQ, /OMV]
Console Baud Rate      = 9600        [/BR=nnnn]
Switch-wide Resets     = Disabled
```

```
UID Mode                = Single     [/UIDS, /UIDM]
Local Diagnostics       = Disabled
Line Card Mfg Mode      = Disabled
```

```
CLK>
```

Testing the System

This chapter describes the various screens associated with the following procedures:

- Initiating the module self-test (MST)
- Evaluating the results of the MST

Before you initiate the MST, read Chapter 4 for information about connecting the out-of-band management (OBM) terminal to the OBM port. The OBM terminal and the associated cables are supplied by the user.

6.1 Initiating the MST

The following methods are used to initiate the MST.

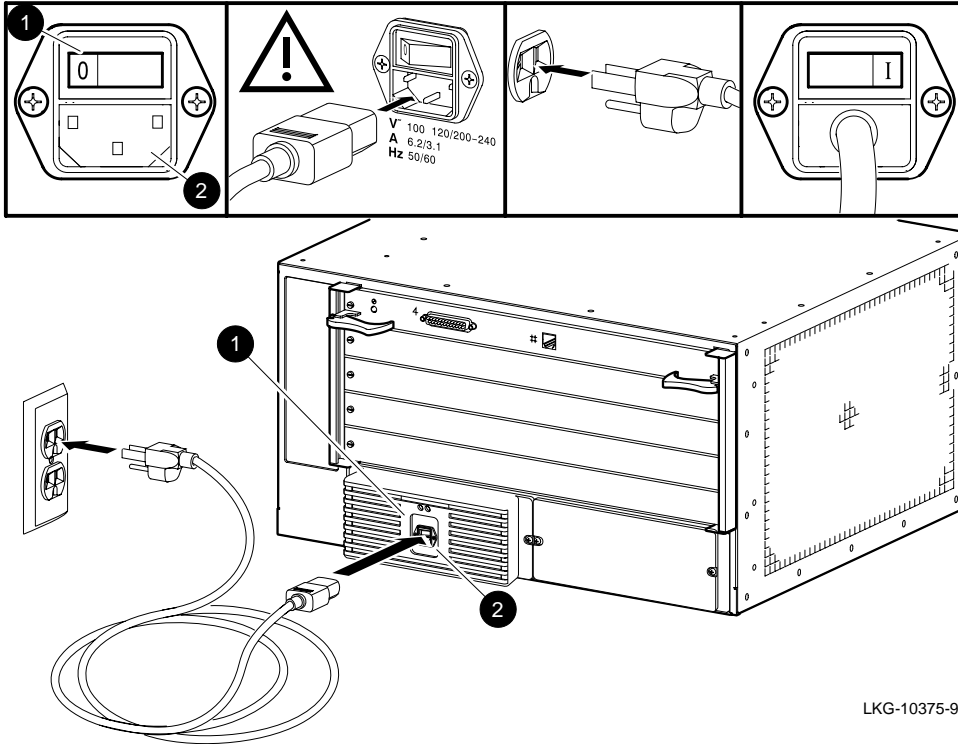
- Applying power to the system
- Rebooting the system

6.1.1 Applying Power to the GIGAswitch/ATM System

Refer to Figure 6–1 when completing these steps to apply power to the system:

1. Locate the power switch ❶, the power cord, and the power connector ❷.
Note that some power cords are shipped separately in country kits.
2. Place the power switch ❶ in the 0 (OFF) position. Note that you should press the side marked 1 so that the side marked 0 becomes visible.
3. Plug the power cord into the power connector ❷ and then into the connector for the primary power source.
4. Place the power switch ❶ in the 1 (ON) position. Note that you should press the side marked 0 so that the side marked 1 becomes visible.

Figure 6–1 Applying Power to the System



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6.1.2 Rebooting the GIGAswitch/ATM System

This section contains the displays and selections required to reboot the GIGAswitch/ATM system from the OBM terminal. To initiate a remote OBM session, use the following Telnet command to connect to the OBM daemon.

```
telnet ip-address 5000
```

where *ip-address* is the switch's IP address or its logical equivalent.

From the OBM session, you can reboot the GIGAswitch/ATM system using the OBM menu interface.

1. Select option 3 (Switch Configuration Menu) from the Main Menu.
2. Select option 7 (Reboot Switch Software) from the Switch Configuration Menu.
3. Respond with *y* to confirm that you want to reboot the switch. This action disconnects the OBM session and reboots the switch.

When the switch reboots, the following menu appears:

```
*** GIGAswitch/ATM Clock Management Module Console Port ***
Copyright (c) 1994 Digital Equipment Corporation
```

```
Clock Management Module Console Port Help Screen
```

```
^O   Enter LC Forwarding Mode
SL   Enter SLIP Mode
A    Show Ethernet Addresses
CO   Show Slot Configuration
B    Show Box Configuration (Fans, Power, etc.)
E    Retrieve Error Log
CL   Clear Error Log
T    Show/Modify Real Time Clock Contents
DO   DOWnload Code Image
DE   Set Default Soft Switch Settings
SD   Show Default Soft Switch Settings
H    Show Help Screen
```

```
CLK>
```

6.2 Evaluating the Results of the MST

This section helps you evaluate the results of the MST by identifying each light-emitting diode (LED) and describing its purpose on the following components:

- Line card
- Clock card
- Cooling and power modules

6.2.1 4-Port Modular Line Card LEDs

Each line card contains two sets of LEDs. The LED at the top of the module is called the Module LED, the four LEDs below the Module LED (labeled 1 through 4) are called Link LEDs, and the two LEDs below each port are called Physical layer (PHY) LEDs.

The PHY LEDs display Physical layer information. Refer to *ATM Modular PHY Cards Installation* for information about the PHY LEDs.

The Module LED (topmost LED) displays the mode for the Link LEDs. When the Module LED is green, the four Link LEDs display the status of the lines and the type of end node (an ATM end node [UNI] or an ATM switch [NNI]) connected at the remote end. The end node information (switch versus end node) is intended to help the system manager connect cables. When the Module LED is amber, the four Link LEDs display information about self-test failures that occur when booting the line cards.

During switch initialization, the Module and Link LEDs indicate the progress of the loading procedure for the Flash and RAM with the following sequence:

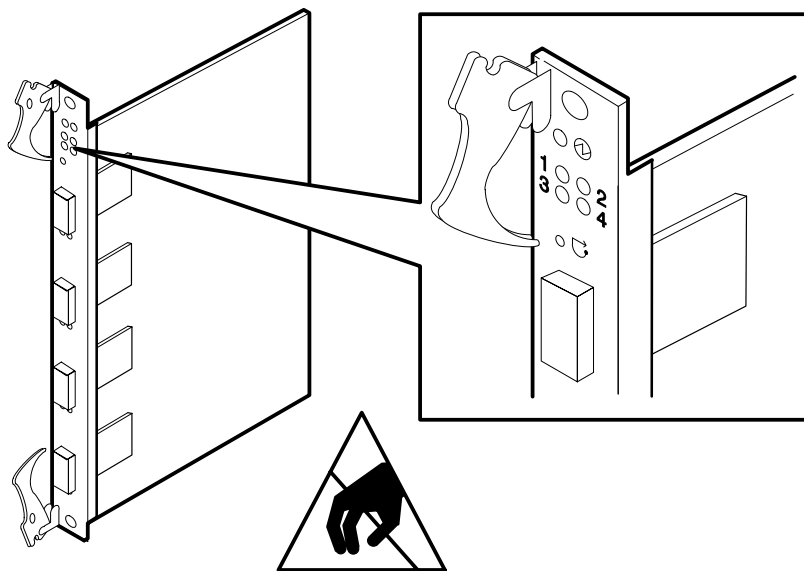
1. The Module LED turns amber when power is applied to the module.
2. The Module LED flashes green to indicate that the firmware is loading.
3. The Module LED flashes amber to indicate that the diagnostics are running.

4. The Module LED turns solid green to indicate that the firmware is executing or solid amber to indicate that diagnostics have failed.

The transmit line uses the upper receptacle and the receive line uses the lower receptacle of each port.

Figure 6–2 shows the LEDs and Table 6–1 describes the meaning of each LED condition for the 4-port modular line card.

Figure 6–2 LEDs for the 4-Port Modular Line Card



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Table 6–1 LED Conditions for 4-Port Modular Line Cards

LED Condition	Meaning
The topmost or Module LED displays the mode for the four Link LEDs as follows:	
Off	Module is powered down.
Flashing green	System initialization is in progress. The four Link LEDs display the progress of the firmware load as described in Section 6.2.1.1.
Flashing amber	Self-test is in progress.
Green	Self-test completed successfully. The four Link LEDs display the type of line, one for each port (as described in Table 6–3).
Amber	Self-test has completed and an error was detected. The four Link LEDs display diagnostic codes as described in Section 6.2.1.2.

6.2.1.1 Determining Firmware Load Progress on 4-Port Line Cards

When the Module LED flashes green, it indicates that the line card is loading firmware. The four Link LEDs indicate the load progress as described in Table 6–2.

Table 6–2 LED Indications of Firmware Load Progress

LED 1	LED 2	LED 3	LED 4	Condition
Amber	Off	Off	Off	Bootp request timed out and response was not received.
Green	Off	Off	Off	Bootp successful and response was received.
Green	Amber	Off	Off	Kernel image download was attempted and failed.
Green	Green	Off	Off	Kernel image download succeeded.
Green	Green	Amber	Off	Application image download was attempted and failed.
Green	Green	Green	Off	Application image download succeeded.
Green	Green	Green	Amber	Decompression of application image to RAM failed; application image version does not match kernel version.
Green	Green	Green	Green	Application image has loaded from Flash to RAM.

After all the Link LEDs turn green to indicate that the application image has loaded from the Flash to the RAM, application initialization starts. The Module LED turns green and the remaining four LEDs turn off. After the application initialization is complete, the Module LED stays green and the Link LEDs indicate the link status described in Table 6–3.

Table 6–3 LED Indications for Link Status on 4-Port Line Cards

LED Condition	Meaning
If the Module LED is green, the Link LEDs display the following information for each line:	
Flashing green	Testing is in progress; Receive signal is present.
Solid green	Testing has completed; Receive and Transmit signals are synchronized. Line error rate is less than the threshold.
Flashing amber	Suspected remote end node is a DIGITAL switch; testing is in progress to confirm. If a loopback cable is connected between two ports on the same switch, the LEDs stay flashing amber.
Solid amber	Established that remote end is a DIGITAL switch (other than itself).

6.2.1.2 Using the Diagnostic LEDs on 4-Port Line Cards

When the Module LED is amber, the four Link LEDs are used to report self-test failures when booting the line cards. The Link LEDs indicate the failures listed in Table 6–4.

Table 6–4 LED Indications for Diagnostics on 4-Port Line Cards

LED 1	LED 2	LED 3	LED 4	Condition
Off	Off	Amber	Off	Boot ROM corrupted
Off	Amber	Off	Amber	Problem with Line 1
Off	Amber	Off	Green	Problem with Line 2
Off	Amber	Amber	Off	Problem with Line 3
Off	Amber	Amber	Amber	Problem with Line 4
Off	Off	Off	Amber	CPU fail 1
Off	Off	Off	Green	CPU fail 2

LED 1	LED 2	LED 3	LED 4	Condition
Off	Off	Amber	Amber	RAM fail
Off	Off	Green	Off	Bad UART 1
Off	Off	Green	Amber	Bad UART 2
Off	Off	Green	Green	Ethernet problem
Amber	Off	Amber	Amber	Xilinx load failed
Amber	Amber	Off	Off	Queue RAM failed
Amber	Amber	Off	Amber	Queue RAM failed
Amber	Amber	Off	Green	Cell RAM failed
Amber	Green	Off	Off	Credit RAM fail 1
Green	Off	Off	Amber	Credit RAM fail 2
Green	Off	Off	Green	Front unit load failed

6.2.2 1-Port 622 Mb/s Line Card LEDs

Each line card contains two sets of LEDs. The LED at the top of the module is called the Module LED, the LED below the Module LED (labeled 1) is called the Link LED, the set of three LEDs below the Link LED (labeled i) are called Information LEDs, and the two LEDs above the port are called Physical layer (PHY) LEDs.

The PHY LEDs display Physical layer information. The two PHY LEDs are the Port Status LED (left LED above the port) and the FRU (field-replaceable unit) LED (right LED above the port).

The Module LED (topmost LED) displays the mode for the line card. When the Module LED is green, the line card is operational and the Link LED displays the status of the line and the type of end node (an ATM end node [UNI] or an ATM switch [NNI]) connected at the remote end. The end node information (switch versus end node) is intended to help the system manager connect cables. When the Module LED is amber, the Link LED and Information LEDs display information about self-test failures that occur when booting the line cards.

During switch initialization, the LEDs indicate the progress of the loading procedure for the Flash and RAM with the following sequence:

1. The Module LED turns amber when power is applied to the module.
2. The Module LED flashes green to indicate that the firmware is loading.
3. The Module LED flashes amber to indicate that the diagnostics are running.
4. The Module LED turns solid green to indicate that the firmware is executing or solid amber to indicate that diagnostics have failed.

The transmit line uses the lower fiber receptacle and the receive line uses the upper fiber receptacle of the port.

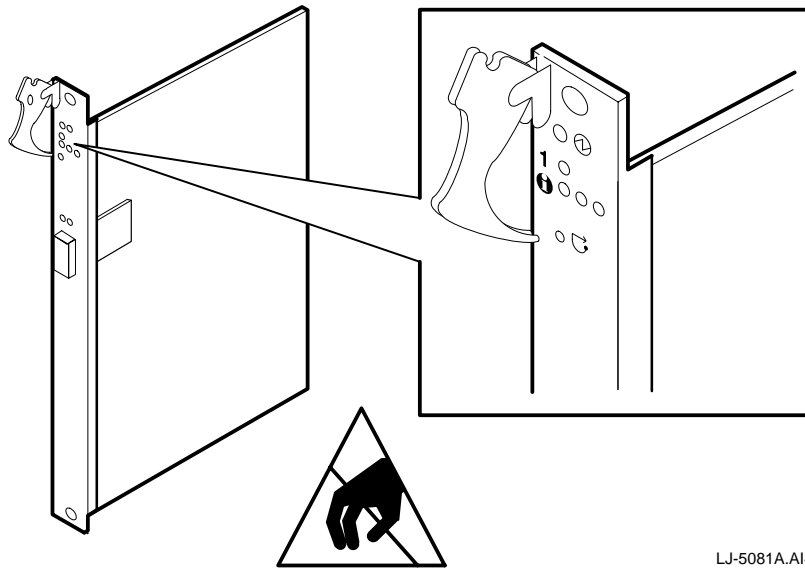
You can perform a simple loopback test for the port on a line card by connecting a fiber-optic loopback connector between the transmit and receive lines when the Module LED is solid green to see whether the Link LED lights up. When you make the connection, the Link LED should turn flashing green briefly. It should then turn solid green briefly before flashing amber.

If you have more than one 1-port 622 Mb/s line card in your switch, you can perform a simple loopback test for the ports on two line cards by connecting a fiber-optic cable between the transmit line (the lower line of the port) of port 1 to the receive line (the upper line of the port)

of port 2 to see whether the Port Status LED and the Link LED light up. When you make this connection, the Port Status LED for port 1 should turn solid green. The Link LED should briefly turn flashing green and then briefly turn solid green before turning flashing amber. When you connect the receive line of port 1 to the transmit line of port 2, the LEDs for port 2 should also display the same sequence of LED indications.

Figure 6–3 shows the LEDs and Table 6–5 describes the meaning of each LED condition for the single-port 622 Mb/s line card.

Figure 6–3 LEDs for the 1-Port 622 Mb/s Line Card



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Table 6–5 LED Conditions for 1-Port 622 Mb/s Line Cards

LED Condition	Meaning
The topmost or Module LED displays the mode for the four LEDs below it as follows:	
Off	Module is powered down.
Flashing green	System initialization is in progress. The Link LED and Information LEDs display the progress of the firmware load as described in Section 6.2.2.1.
Flashing amber	Self-test is in progress.
Green	Self-test completed successfully. The line card is in an operational state. The Link LED displays the link status for the port as described in Table 6–7.
Amber	Self-test has completed and an error was detected. The Link LED and Information LEDs display diagnostic codes as described in Section 6.2.2.2.

The left or Port Status LED above the link displays the following information:

Off	Port is waiting for a connection.
Green	Port is active (connected, with link established).
Flashing green	Port is disabled by management.
Amber	Port is receiving photons, but the line is not up.

LED Condition	Meaning
The right or FRU LED above the link displays the following information:	
Amber	PHY card has a hardware fault.
Off	Normal state.

6.2.2.1 Determining Firmware Load Progress on 622 Mb/s Line Cards

When the Module LED flashes green, it indicates that the line card is loading firmware. The LEDs indicate the load progress as described in Table 6–6. (The Link LED is LED 1 and the three Information LEDs are LED 2 through LED 4 from left to right.)

Table 6–6 LED Indications of Firmware Load Progress on 622 Mb/s Line Cards

LED 1	LED 2	LED 3	LED 4	Condition
Amber	Off	Off	Off	Bootp request timed out and response was not received.
Green	Off	Off	Off	Bootp successful and response was received.
Green	Amber	Off	Off	Kernel image download was attempted and failed.
Green	Green	Off	Off	Kernel image download succeeded.
Green	Green	Amber	Off	Application image download was attempted and failed.
Green	Green	Green	Off	Application image download succeeded.
Green	Green	Green	Amber	Decompression of application image to RAM failed; application image version does not match kernel version.
Green	Green	Green	Green	Application image has loaded from Flash to RAM.

After all the LEDs turn green to indicate that the application image has loaded from the Flash to the RAM, application initialization starts. The Module LED turns green and the remaining four LEDs turn off. After the application initialization is complete, the Module LED stays green and the Link LED indicates the link status described in Table 6–7.

Table 6–7 LED Indications for Link Status on 622 Mb/s Line Cards

LED Condition	Meaning
Flashing green	Testing is in progress; Receive signal is present.
Solid green	Testing has completed; Receive and Transmit signals are synchronized. Line error rate is less than the threshold.
Flashing amber	Remote end node is a DIGITAL switch. If a loopback cable is connected between two ports on the same switch, the LEDs stay flashing amber.
Solid amber	Established that remote end is a DIGITAL switch (other than itself).

6.2.2.2 Using the Diagnostic LEDs on 1-Port 622 Mb/s Line Cards

When the Module LED is amber, the four LEDs below it are used to report self-test failures when booting the line cards. These LEDs indicate the failures listed in Table 6–8. (The Link LED is LED 1 and the three Information LEDs are LED 2 through LED 4 from left to right.)

Table 6–8 LED Indications for Diagnostics on 622 Mb/s Line Cards

LED 1	LED 2	LED 3	LED 4	Condition
Off	Off	Amber	Off	Boot ROM corrupted
Off	Off	Off	Amber	CPU fail 1
Off	Off	Off	Green	CPU fail 2
Off	Off	Amber	Amber	RAM fail
Off	Off	Green	Off	Bad UART 1
Off	Off	Green	Amber	Bad UART 2
Off	Off	Green	Green	Ethernet problem
Amber	Off	Amber	Amber	Xilinx load failed
Amber	Amber	Off	Off	Queue RAM failed
Amber	Amber	Off	Amber	Queue RAM failed
Amber	Amber	Off	Green	Cell RAM failed
Amber	Green	Off	Off	Credit RAM fail 1
Green	Off	Off	Amber	Credit RAM fail 2

6.2.3 Using the Diagnostic Services

The GIGAswitch/ATM system provides various error logging and diagnostic capabilities. These diagnostic services are not required for configuring the GIGAswitch/ATM system.

6.2.3.1 Using the Network Port for Diagnostic Services

The GIGAswitch/ATM system has a network diagnostic port that provides remote access to the shell (command interface) in the control processor of the line cards using Telnet and TCP/IP over Ethernet. The network diagnostic port can be used to access both the master line card and all slave line cards. Once you are logged in to the shell, you can perform line card diagnostic operations.

Any host system with Telnet capability that can connect to the same Ethernet network as the GIGAswitch/ATM system can be used to access the diagnostic port. To access the diagnostic port for a particular line card, use this command at the prompt on the selected workstation:

```
telnet ip-address port-number
```

where *ip-address* is the IP address defined for the GIGAswitch/ATM system in dotted decimal notation and *port-number* is the Telnet port number for a slave line card in a particular slot (see Table 6–9). Do not supply a port number when you are connecting to the master line card.

Table 6–9 Telnet Port Numbers for Line Cards

Slot Number	Telnet Port Number
1	8215
2	8471
3	8727
4	8983
5	Clock management module is not accessible.

The following command returns a message indicating the name and address of the line card that is providing the shell and a prompt:

```
% telnet 16.17.18.19

Trying 16.17.18.19...
Connected to an22.nac.lkg.dec.com.
Escape character is '^]'.

->
```

In this example, 16.17.18.19 is the IP address of the GIGAswitch/ATM system in the `/etc/bootptab` file and `an22.nac.lkg.dec.com` is the domain name selected in the `/etc/hosts` table. The `->` prompt indicates that the shell on the line card is now ready to accept commands. The shell command, `help`, displays information on the commands available from the shell.

6.2.3.2 Producing Line Card Error Logs

You can display or create a file of log and status information contained in the internal line card logs. The error log is a nonvolatile log that is retained through power cycles and keeps only those entries that result from the detection of errors. The status log is factory configured to collect certain routine status information on the operation of the switch. It is in volatile memory and contains information since the last power-up only. Each log is a ring buffer that contains the most recent entries.

To print the contents of the error log, type this line at the shell prompt:

```
-> alog_printError(mode, num-entries)
```

where *mode* is 1, 2, 3, or 4 and *num-entries* is the number of log entries that you want to display. The four modes correspond to FIRST, NEXT, ALL, and LAST. FIRST mode gets the oldest messages (for the number of specified entries), NEXT mode gets the entries starting from the current pointer and increments by the specified number of entries, ALL mode gets the complete log that fits within the buffer, and LAST mode gets the latest messages (for the number of specified entries).

For example, the following command requests FIRST mode for three entries and it is followed by a sample display:

```
-> alog_printError(1, 3)
LOGERR in alog.c at 370.  Module: 20 Code: 1
  TimeStamp Master StartNum: 2 Time-seconds: 42 Time-nsec: 230000000
  ErrMsg: Powerup log entry. Master UID: 8: 0:2b:22:3b:70 Master StartNum: 2
LOGERR in alog.c at 370.  Module: 20 Code: 1
  TimeStamp Master StartNum: 2 Time-seconds: 42 Time-nsec: 830000000
  ErrMsg: Powerup log entry. Master UID: 8: 0:2b:22:3b:70 Master StartNum: 2
LOGERR in alog.c at 385.  Module: 20 Code: 1
  TimeStamp Master StartNum: 3 Time-seconds: 31 Time-nsec: 700000000
  ErrMsg: Master UID: 8: 0:2b:22:3b:70 Master StartNum: 3
value = 3 = 0x3
```

To display the status log, type this command at the prompt:

```
-> alog_printStatus(mode, num-entries)
```

where *mode* is 1, 2, or 3 and *num-entries* is the number of log entries that you want to display. The three modes correspond to FIRST, NEXT, and ALL. FIRST mode gets the oldest messages for the specified number of entries, NEXT mode gets the entries starting from the current pointer and incrementing by the specified number of entries, and ALL mode gets the complete log that fits within the buffer. The log printed to the screen is similar to the example for the error log.

A file of the log contents can also be made using the shell scripting capability on the client workstation. Before establishing the Telnet connection to the line card, type the following command in the client shell:

```
% script atmErrorLog.txt
```

This command causes the commands printed to the screen by the line card to also be printed into the `atmErrorLog.txt` file. The procedure can be used for both error and status logs. Turn off the scripting by typing `exit` in the client shell after logging out of the Telnet session to the line card.

6.2.3.3 Producing CMM Error Logs

The CMM error log is a circular list of 12 error log entries. The error logs are stored in Flash memory on the CMM and are preserved over power cycles of the switch. The `E` command entered at the `CLK>` prompt displays the twelfth entry. After the error log is displayed, a prompt asks whether you want to continue. Answering `y` or pressing the Return key causes the next entry to be displayed. The following example shows a typical error log entry.

```
Entry #          = 3
                  Logged by Diagnostic Firmware, Revision 1.70
                  THU 01/18/96 10:04:00

Entry status    = 0000
Entry CRC       = C7CEF802
Write Count     = 1
FRU Mask        = GIGAswitch/ATM CMM
Error ID        = Ethernet Address ROM Test
Test Data:
                  Subtest: Start Address Test
                  Returned Status      = Block A <> Block B
                  Expected Value       = 00CB
                  Actual Value         = 00CF
                  Power Enable Register = 0080
```

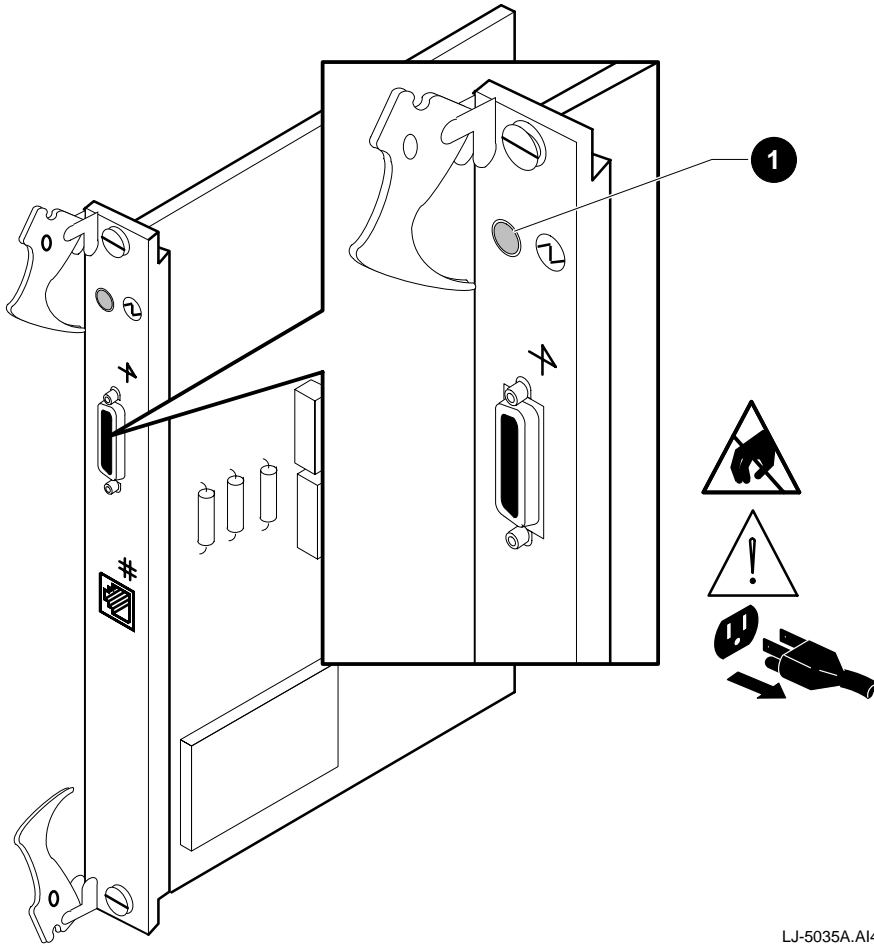
The information displayed varies depending upon whether it was generated by the diagnostic or the operational firmware.

6.2.4 Clock Card LED

During power-up diagnostics, the clock card LED is amber. If the CMM boot diagnostics fail, the LED changes to flashing amber. If the CMM boot diagnostics complete successfully, the LED changes to solid green. If a higher level failure occurs (such as master election error or buffer exhaustion), the LED changes from green to amber and the GIGAswitch/ATM system reboots. Check the CMM error log for more information about the failure.

Figure 6–4 shows the LED for the clock card.

Figure 6–4 Clock Card LED



LJ-5035A.A14

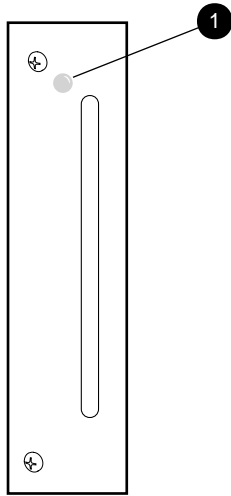
The following table describes the meaning of each LED condition for the clock card LED:

Event Number	Event	LED Condition	Meaning
1	Clock card startup	Solid amber	MST in progress
2	Clock card MST	Flashing amber	MST failed
		Solid green	MST passed

6.2.5 Cooling and Power Modules LED Summary

Figure 6–5 and Figure 6–6 show the LEDs for the cooling and power modules.

Figure 6–5 Cooling Module LED

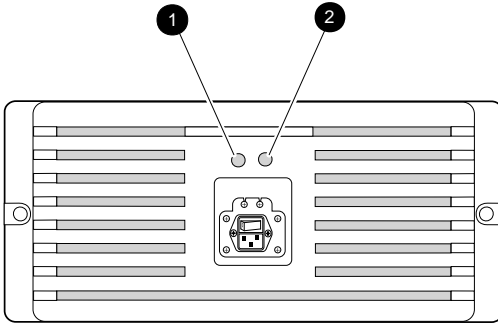


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The following table describes the meaning of each LED condition for the LED shown in Figure 6–5:

LED Condition	Meaning
Solid amber	MST failure
Off	MST passed

Figure 6–6 Power Module LED



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The following table describes the meaning of each LED condition for the LED shown in Figure 6–6:

Number/Name	LED Condition	Meaning
❶/AC OK	Solid green	AC power available and above the minimum acceptable threshold.
	Off	No available AC power.
❷/DC OK	Solid green	+5 Vdc and +15 Vdc normal and power supply fan is operational.
	Off	Fault with either the +5 Vdc, +15 Vdc, or power supply fan.

Upgrading the Firmware

This chapter describes the procedures for upgrading the firmware for single or multiple line cards. Consult the release notes and `READ_ME.TXT` files for the firmware release to determine the correct versions.

Note that line card images must be upgraded before CMM images.

7.1 Copying the Firmware

The GIGAswitch/ATM firmware image is located in the release area of the DIGITAL FTP site (`ftp.digital.com`). The name of the firmware image is in the `READ_ME.TXT` file found in the `/pub/DEC/GIGAswitchATM` directory. Copy the image to your system using these commands:

```
# ftp ftp.digital.com

username: anonymous
password: your_internet_address

ftp> cd /pub/DEC/GIGAswitchATM
ftp> bin
ftp> get image_name.tar image_name.tar
ftp> bye
```

To unpack the new image:

```
# tar -xvf image_name.tar
```

This command creates a subdirectory (named after the image) within your current working directory and unpacks files into this subdirectory.

7.2 Loading the Firmware for the Line Card

The firmware for the line card is divided into two components, the kernel and the application, which are loaded separately. The kernel consists of the operating system, protocol stack, and basic control routines. The application contains the diagnostics and higher level functions such as management, signaling, and routing. Some firmware releases require only an upgrade to the application image. Other releases require updating both kernel and application images. Updating the kernel image is a two-step loading procedure.

Note

The BootP (if used) and TFTP servers must be set up correctly to upgrade the line card firmware. Refer to Section 4.2 for more information about setting up your servers.

7.2.1 Upgrading the Kernel and Application Images

To downline load both the kernel and application images when upgrading firmware, use the control file (see Section 4.2.1). The lines in the control file are used by the appropriate modules to download the proper images for that module. For example, the QLCV2 line directs the downloading of the correct images for the 4-port modular line card (DAGGL-BA).

Note that downline loading a new kernel image requires downline loading a new application image. However, downline loading a new application does not necessarily require a new kernel.

After setting up the control file, reboot the switch. If the kernel version displayed by the master line card is not V2.0 or later, reboot the switch again. If the kernel version is still incorrect, make sure your control file is set up properly and try rebooting again.

Upgrading the firmware for the master line card is controlled by using the `force_image_reload` console command or the `DE/SML CMM` command. Once the master line card has upgraded firmware, the master line card checks the application image on the slave line cards for mismatched versions. If there is a mismatch, the master line card triggers a download of the image identified in the control file to the affected line cards from the nearest source (another slot in the system or an external host system).

7.2.2 Loading the Firmware to Multiple Line Cards

If you are trying to download to multiple line cards, use the procedure described in Section 7.2.1. Use the `DE/SML CMM` command to cause the new firmware to be loaded automatically to all the line cards. After the download completes, use the `DE/SM0 CMM` command to resume normal loading.

7.2.3 Line Card LED Indications During Switch Initialization

During initialization, the Module and Link LEDs are used to indicate progress in the loading of Flash and RAM. The Module LED turns amber when power is applied to the module. Once loading of firmware starts, the LED flashes green. When diagnostics start, the LED flashes amber. Once the switch firmware starts executing, the LED becomes solid green.

The Link LEDs indicate load progress. LED 1 turning green indicates that the BootP response was received, and amber indicates that the BootP request timed out without a response. If the control file requests that new versions of the kernel or application be loaded into Flash, LEDs 2 and 3 indicate the success or failure of those loads, respectively. Green means success, amber means failure. Similarly, LED 4 indicates that RAM has been loaded with the decompressed kernel and application images.

7.3 Loading the Firmware for the CMM

Before upgrading the clock management module (CMM) firmware, verify that the current revision level is the one listed in the latest firmware release notes. The current revision level can be determined by using the `B` command on the CMM's local console. If the CMM firmware is not at the revision level stated in the release notes, you must upgrade to that revision before proceeding further. Also, remember that you must upgrade the line card firmware before upgrading the CMM firmware.

The CMM firmware is downline loaded over the serial line console connection of the CMM. To load a new firmware version from a UNIX system, change directory to the location of the new firmware. Invoke the `tip` utility, specifying the serial line connection to the CMM. The serial line must be configured in the `/etc/remote` file, for example:

```
lport0:dv=/dev/tty01:br#9600:pa=none:
```

The cable connected to this `tty01` is now defined as `lport0`. You can choose any name.

If it does not exist, create the `/var/spool/locks` directory. To connect to the CMM attached to `lport0`, use the command:

```
tip lport0
```

Once the `tip` session is started, the clock responds with a command menu and a `CLK>` prompt. Note that only a single `tip` or Telnet user can be active at one time. If the CMM is already running, you must press the Return key to display the `CLK>` prompt. If the `/etc/remote` file is incorrect, `tip` responds with this message:

```
tip: unknown host lport0
```

Correct the `/etc/remote` file and/or the `/var/spool/locks` directory before proceeding.

1. Enter the Download Code Image command:

```
CLK>DO
Transmit S-Records at SDLL> prompt:
SDLL>
The CMM is now waiting for an S-Record file.
```

2. Return to the host system by entering a tilde followed by a right angle bracket (`~>`).

```
SDLL>~>
```

3. The host system prompts you for the file name of the firmware you wish to load (for example, `CMM1-80.X`).

```
Local File Name? :
```

Note

If your system does not support this method of loading the CMM with the `tip` utility, refer to Section 7.3.1 for an alternate procedure.

The downline load of the CMM firmware takes about three minutes. During that time, the current record number of the firmware image file being loaded is displayed, so you see an integer value increasing from 1 to several thousand. When the load is completed, the following messages are displayed:

```
Termination Record Received. Count=00000xxx  
RAM download complete  
Flash programming complete
```

where *xxx* is the number of S-Records in hexadecimal format. There are delays between each line in the above display. It takes about 30 seconds to complete the Flash programming after the RAM is loaded. After the Flash is programmed, the switch is automatically rebooted to run the new firmware. At the `CLK>` prompt, enter the `B` command to display the switch configuration information, including the CMM Firmware Version number. Verify that the version number loaded is correct by using the `B CMM` command.

7.3.1 Alternate Downline Load Procedure

This procedure requires a serial port from the Alpha system connected to the serial port on the GIGAswitch/ATM CMM via the `tip` utility. In this instance, `tty01` (DEC423 connector) is used, but any serial port on the Alpha system (such as `tty00`, a 25-pin RS-232) could be used just as easily.

1. Configure a serial port on the Alpha system to allow a `tip` session:
 - a. Add the following line to `/etc/remote`:

```
tipcsl:dv=/dev/tty01:br#9600:pa=none:
```
 - b. If it does not exist, create the `/var/spool/locks` directory.
2. Connect the `tty01` port (DEC423 connector) to the serial port on the CMM.
3. Power on the GIGAswitch/ATM system.
4. Initiate a `tip` session to the switch using the following command:

```
# tip tipcsl  
CLK>
```
5. Enter the Download Code Image command:

```
CLK>DO  
Transmit S-Records at SDLL> prompt:  
SDLL>  
The CMM is now waiting for an S-Record file.
```
6. Exit the `tip` session by entering a tilde followed by a period (`~.`).

```
SDLL>~.  
#
```
7. Download the S-Record CMM file as follows:

```
# cat CMMn-nn.X > /dev/tty01
```

where *n-*nn** is the version number of the CMM firmware.

8. When the system prompt (#) returns, connect to the GIGAswitch/ATM system using `tip` and press the Return key to terminate the load process:

```
# tip tipcsl  
<Return>
```

The CMM responds with the following text and then reboots the switch:

```
Termination Record Received. Count = 00000E65  
RAM download complete  
Flash programming complete
```

9. Verify that the new version is correct, using the `B` command.

7.3.2 CMM LED Indications During Switch Initialization

During power-up diagnostics, the CMM LED is amber. If the CMM boot diagnostics fail, the LED remains flashing amber. The LED turns green after the CMM diagnostics complete successfully, usually 10 seconds after power-up. In the event of a higher level failure (such as master election error or buffer exhaustion), the LED turns from green to amber and the switch reboots. Check the CMM error log for information about the failure.

Preparing to Replace Modules

This chapter lists the prerequisites for replacing the GIGAswitch/ATM modules and describes the following procedures:

- Setting up ESD protection
- Using ESD equipment
- Removing power from the system

GIGAswitch/ATM modules include the following:

- Logic modules
- Cooling and power modules

The following table summarizes the prerequisites for removing logic modules. They identify slot limitations, which modules must be removed before performing the replacement procedure for the desired module, and whether power must be removed or ESD equipment used.

Module	ESD Required?	Power Removed?	Slot Limitations?	Other Modules Removed?
Line card	Yes	Yes	1 through 4	No
Clock card	Yes	Yes	5	No
Backplane assembly	Yes	Yes	N/A	All system modules*

* The GIGAswitch/ATM system also needs to be removed from the rack before backplane assembly replacement if the rear of the rack is not accessible.

8.1 Setting Up ESD Protection

Protect the logic module against damage from electrostatic discharge (ESD) by using:

- Static-free containers for long-term storage
- Grounded ESD wrist strap while installing and removing modules
- Grounded ESD mat for temporary storage

8.2 Using ESD Equipment

The Portable Static-Dissipative Field Service Kit (DIGITAL Part Number 29-26246) is used to protect ESD-sensitive modules against damage. Complete the following steps to set up and maintain a static-free area:

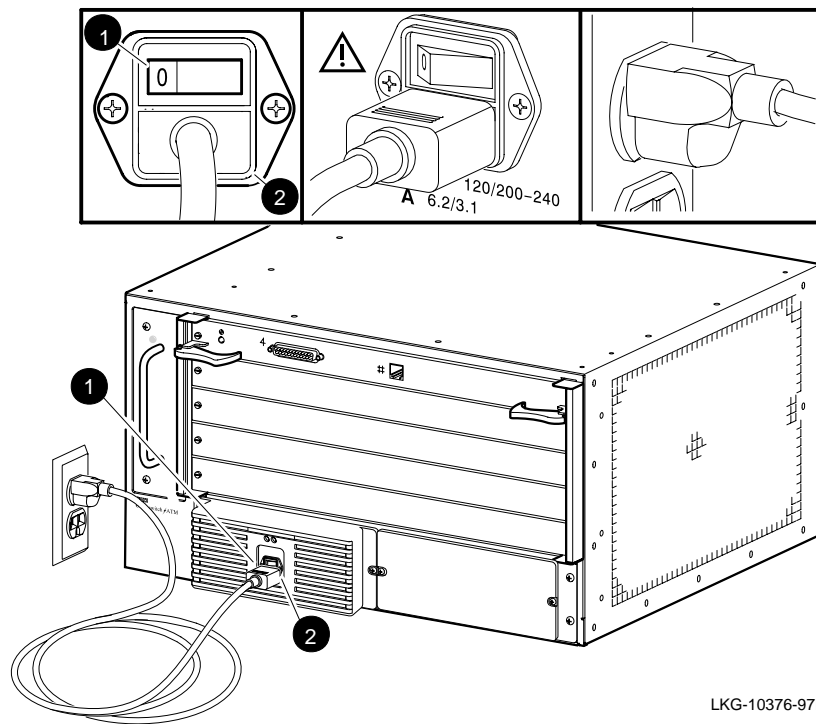
1. Ground the unit. The unit is grounded through the power cord when it is connected between the unit and the primary power source.
2. Lay out the static-dissipative work surface (ESD mat) on a flat surface.
3. Connect the ground cord assembly to the ESD mat and to an unpainted surface on the unit.
4. Wear the ESD wrist strap and attach it to the ground cord assembly.

8.3 Removing Power

Refer to Figure 8–1 when completing these steps to remove the power from the system:

1. Locate the power switch ❶ and the power connector ❷.
2. Place the power switch ❶ in the 0 (OFF) position. Note that you should press the side marked 1 so that the side marked 0 becomes visible.
3. Do not remove the power cord from the power connector ❷. The power cord provides the ground for ESD protection.

Figure 8–1 Removing Power from the System



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Replacing Modules

Caution

Read Chapter 8 before attempting to replace any module in the GIGAswitch/ATM 5-slot system.

This chapter describes the following procedures for replacing the GIGAswitch/ATM system modules:

- Replacing a logic module
- Replacing a blank handle
- Replacing a fan tray assembly
- Replacing a power tray

9.1 Replacing a Logic Module

Note

Appendix D contains the recommended locations for the modules.

Complete the following steps to replace a logic module:

1. Set up the ESD equipment. See Chapter 8.
2. Wear the grounded ESD wrist band.
3. Unpack the replacement module. Leave the module in the ESD bag.
4. Place the ESD bagged replacement module on a flat surface.
5. Place the empty container on the ESD mat.
6. Remove the module to be replaced from the chassis. See the procedure in Section 9.1.1.
7. Place the module to be replaced in the empty container.
8. Remove the replacement module from the ESD bag.

9. Install the replacement module in the chassis. See the procedure in Section 9.1.2.
10. Remove the module to be replaced from the container and place it in the ESD bag.
11. Place the ESD bagged module in the container.
12. Remove the ESD wrist band.

9.1.1 Removing the Logic Module

Refer to Figure 9–1 when completing the following steps to remove the logic modules from the GIGAswitch/ATM system. A line card module is shown in the illustration, but the same procedure is used for removing a clock card module.

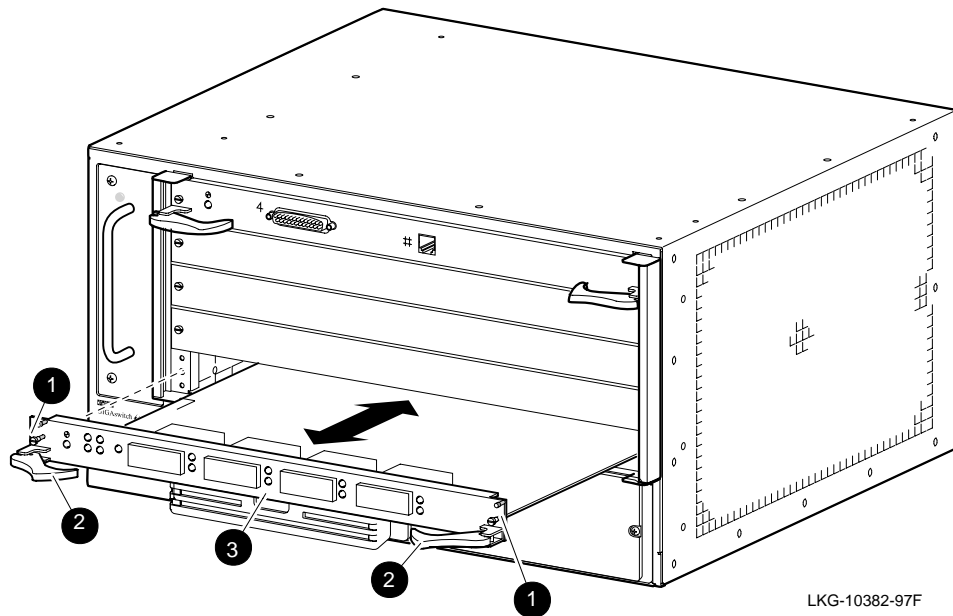
1. Locate the two screws ❶ that fasten the selected module ❸ to the GIGAswitch/ATM system and the ejectors ❷ used to seat the module.
2. Set up the ESD equipment.
3. Slip on the ESD wrist band.
4. Loosen the screws ❶.
5. Move the ejectors ❷ outward to unseat the module ❸ from the unit.
6. GENTLY slide the module ❸ out of the unit.
7. Place the module in a static proof bag.

When replacing a 4-port modular line card (DAGGL-BA) or a 1-port 622 Mb/s line card (DAGGL-CA or DAGGL-CB), note that any installed options must be removed (refer to Section 9.1.1.1). For example, the 5 V power module option (DAGPL-AA) is a common option that must be removed using the procedure described in Section 9.1.1.2.

8. Place the bagged module on a flat surface or on another bagged module. The modules can be stacked four modules high.
9. Repeat steps 4 through 8 to remove the rest of the line card modules.

See Section 9.1 for the complete replacement procedure.

Figure 9–1 Removing and Installing the Logic Module



9.1.1.1 Removing Line Card Options

The procedures for installing and removing the options for the line cards are provided with the document that is shipped with the line card. Refer to that document for the proper instructions.

9.1.1.2 Removing the 5 V Power Module Option

Follow these steps to remove the 5 V power module option (DAGPL-AA):

1. Carefully grasp the edges of the power module.
2. GENTLY pull the power module off the line card.

9.1.2 Installing the Logic Module

Refer to Figure 9–1 when completing the following steps to install the logic module. A line card module is shown in the illustration, but the same procedure is used for installing a clock card module.

1. Locate the screws **1** that fasten the selected module **3** to the GIGAswitch/ATM system and the ejectors **2** used to seat the module.
2. Set up the ESD equipment (see Chapter 8).
3. Wear the ESD wrist band.
4. Align the module (LEDs on the left) with the guides, and GENTLY slide the module into the unit.
5. Move the ejectors **2** inward to seat the module **3** in the unit.
6. Tighten the screws **1** using a number 2 cross-point screwdriver.

See Section 9.1 for the complete replacement procedure.

9.2 Replacing a Blank Handle

9.2.1 Removing a Blank Handle

Refer to Figure 9–2 when completing the following steps to remove a blank handle from the GIGAswitch/ATM system:

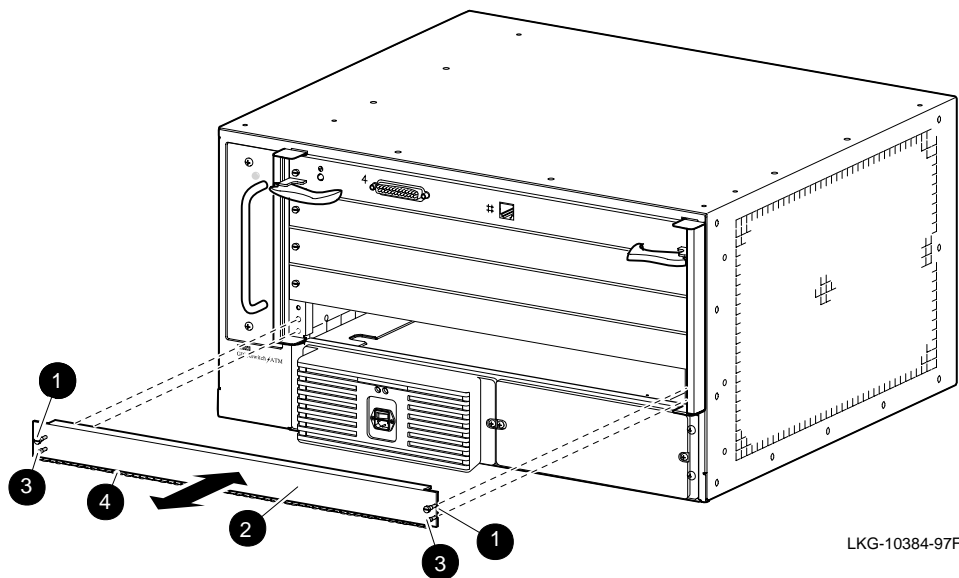
1. Locate the screws ❶ that fasten the selected blank handle ❷ to the GIGAswitch/ATM system, the guide pins ❸, and the EMI shield ❹.

Caution

Be careful not to damage the EMI shield.

2. Loosen the screws that fasten the selected blank handle to the system using a number 2 cross-point screwdriver.
3. Lift the blank handle ❷ away from the GIGAswitch/ATM system.

Figure 9–2 Removing and Installing Blank Handles



9.2.2 Installing a Blank Handle

Refer to Figure 9–2 when completing the following steps to install a blank handle:

1. Locate the screws ❶ that fasten the selected blank handle ❷ to the GIGAswitch/ATM system, the guide pins ❸, and the EMI shield ❹.

Caution

Be careful not to damage the EMI shield.

2. Align the guide pins ③ on the blank handle (EMI shield ④ facing down) with the associated holes in the card cage.
3. Tighten the screws ① using a number 2 cross-point screwdriver.

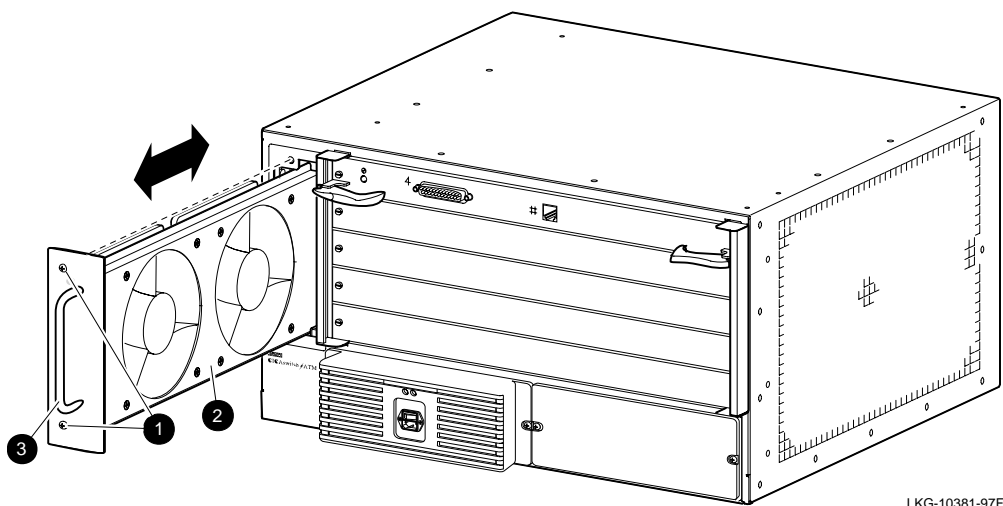
9.3 Replacing a Fan Tray Assembly

9.3.1 Removing the Fan Tray Assembly

Refer to Figure 9–3 when completing the following steps to remove the fan tray assembly from the system.

1. Locate the two fasteners ① that attach the fan tray assembly ② to the GIGAswitch/ATM system and the handle ③.
2. Release the two fasteners ① that attach the fan tray assembly to the system.
3. Grasp the handle ③ and slide the fan tray assembly ② out of the unit enough to see if the fans are rotating.
4. Wait for the fans to stop rotating.
5. Slide the fan tray assembly out of the unit. Grasp the handle ③ with one hand and support the bottom of the fan tray assembly with your other hand.

Figure 9–3 Removing and Installing the Fan Tray Assembly



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9.3.2 Installing the Fan Tray Assembly

Refer to Figure 9–3 when completing the following steps to install the fan tray assembly:

1. Locate the two fasteners ① that attach the fan tray assembly ② to the system, and the handle ③ of the fan tray assembly.
2. Align the fan tray assembly ② with the module guides of the slot designated for the fan tray assembly.
3. Slide the fan tray assembly ② into the GIGAswitch/ATM system.
4. Tighten the two fasteners ①.

9.4 Replacing the Power Tray Assembly

9.4.1 Removing the Power Tray Assembly

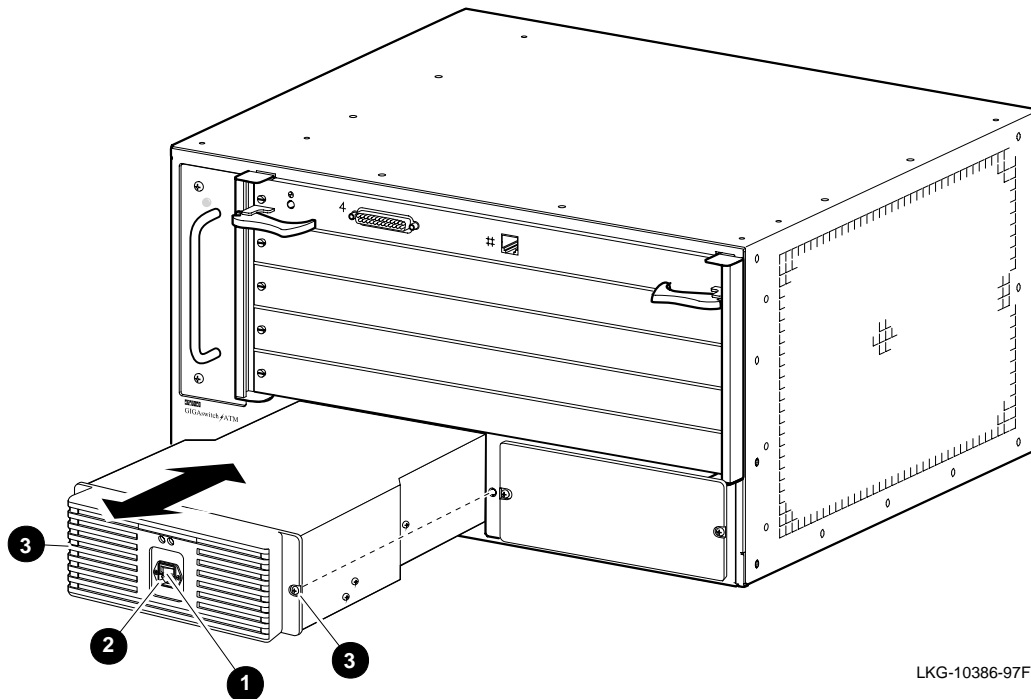
Caution

Remove the power tray assembly after removing all logic modules. The power cord provides the ground required for ESD protection.

Refer to Figure 9–4 when completing these steps to remove the power tray assembly:

1. Locate the power switch **1**, the power cord (not shown), the two screws **3** that fasten the power tray assembly to the system, and the handle of the power tray (located beneath the power connector **2**).
2. Place the power switch **1** in the 0 (OFF) position and remove the power cord from the primary power outlet and the power connector **2**. Note that you should press the side marked 1 so that the side marked 0 becomes visible.
3. Remove the two screws **3** on the module using a number 2 cross-point screwdriver.
4. Slide the module out of the unit. Grasp the handle with one hand and support the bottom of the module with your other hand.

Figure 9–4 Removing and Installing the Power Tray Assembly



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9.4.2 Installing the Power Tray Assembly

Refer to Figure 9–4 when completing these steps to install the power tray assembly:

1. Locate the power switch ❶, the power cord (not shown), the two screws ❸ that fasten the power tray assembly to the system, and the handle of the power tray (located beneath the power connector ❷).
2. Align the power tray with the module guides of the slot designated for the module.
3. Grasp the handle and slide the module into the unit.
4. Tighten the two screws ❸ using a number 2 cross-point screwdriver.
5. Place the power switch ❶ in the 0 (OFF) position. Note that you should press the side marked 1 so that the side marked 0 becomes visible.
6. Plug the power cord into the power connector ❷ and then into the connector for the primary power source.

10

Removing the System from the Rack

This chapter describes how to detach and lower the GIGAswitch/ATM system from the rack.

These procedures should take 45 minutes and require the following tools:

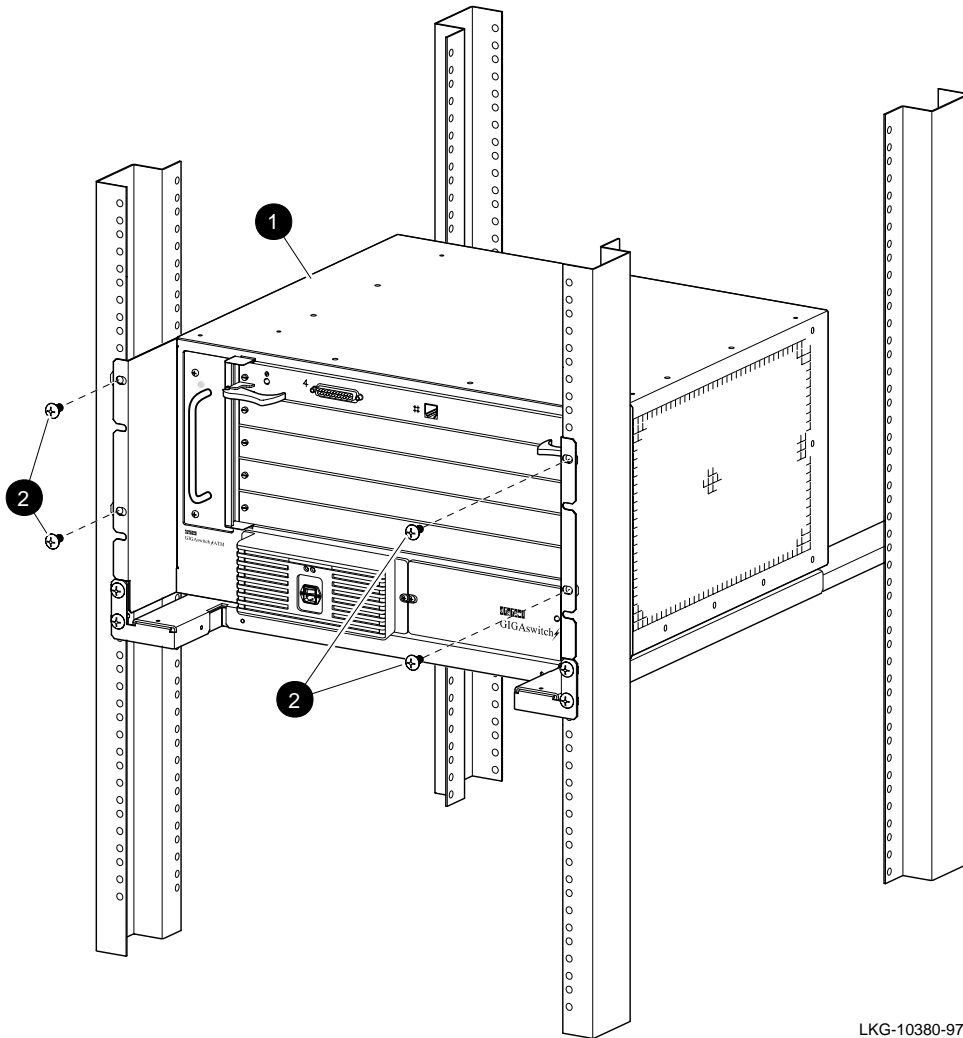
- Number 2 cross-point screwdriver
- ESD equipment
- Static-proof containers for modules

10.1 Detaching the System from the Rack

Refer to Figure 10–1 when completing the following steps to detach the GIGAswitch/ATM system from the rack:

1. Locate the GIGAswitch/ATM system ❶ and the four screws ❷.
2. Remove the four screws ❷ using a number 2 cross-point screwdriver.

Figure 10–1 Detaching the System from the Rack



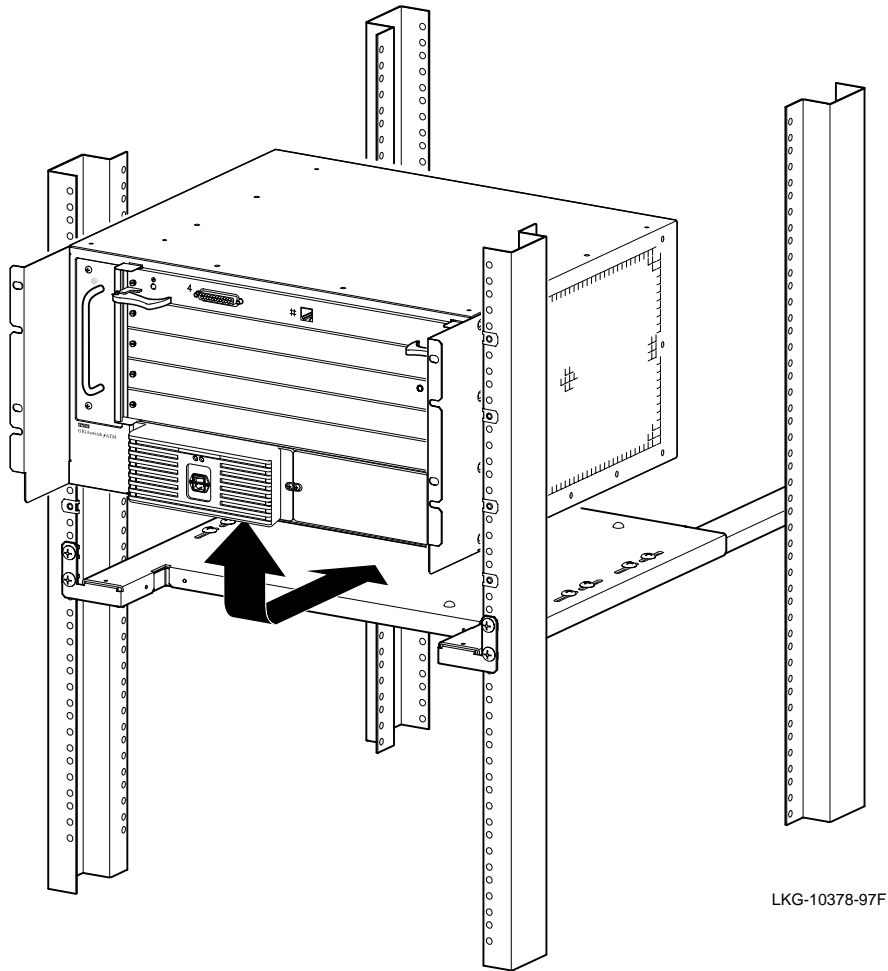
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10.2 Removing the GIGAswitch/ATM System

Refer to Figure 10–2 when completing the following procedure to remove the system:

1. Pull the GIGAswitch/ATM system away from the rack.
2. Lower the GIGAswitch/ATM system and place it on a flat surface.

Figure 10–2 Removing the System



Replacing the Backplane

Because of the complexity involved in backplane removal, make sure that you eliminate all other possible causes for your equipment failure before performing this procedure.

Caution

Read Chapter 8 before attempting to replace a backplane assembly.

Note

The system modules should already be removed. (See Chapter 9 for information about removing the modules.)

This chapter describes the following procedures for replacing the backplane assembly:

- Replacing the backplane assembly
- Restoring the system

These procedures should take 60 minutes and require the following tools:

- Number 2 cross-point screwdriver
- Thin flat-blade (4.41 mm [3/16 in]) screwdriver

11.1 Replacing the Backplane Assembly

Make sure that you have access to the back of the system. Refer to Chapter 10 if you have installed the system in a rack. To replace the backplane, perform the following procedures:

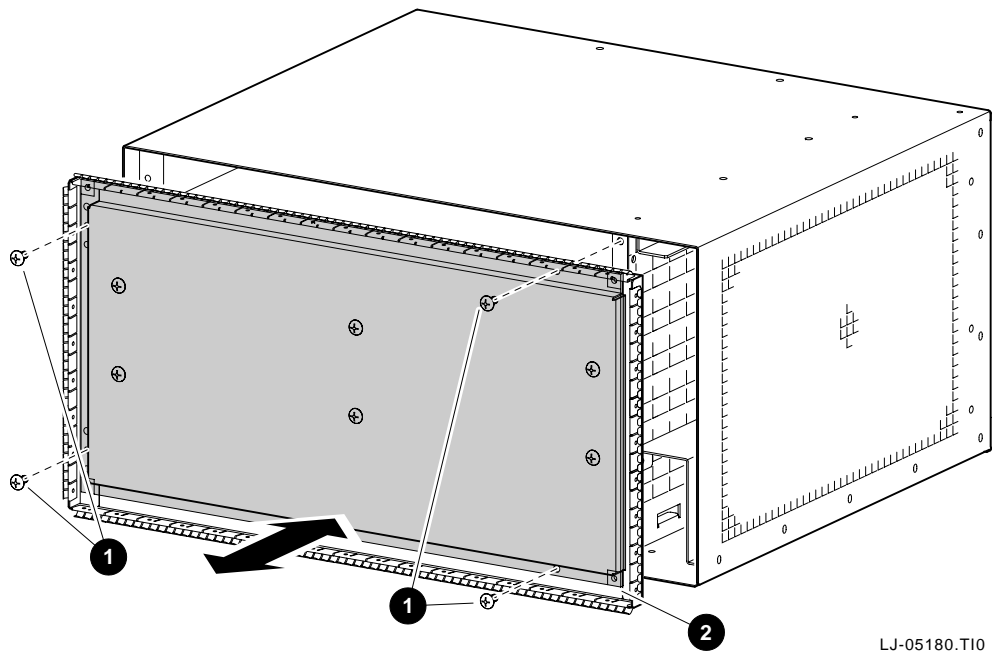
1. Remove the rear cover (backplane assembly).
2. Install the backplane assembly.

11.1.1 Removing the Backplane Assembly

Refer to Figure 11–1 when completing the following steps to remove the backplane assembly from the GIGAswitch/ATM system:

1. Remove all system modules (see Chapter 9).
2. Locate the four screws ❶ that fasten the rear cover ❷ to the GIGAswitch/ATM system.
3. Loosen each screw until it is disengaged from the chassis.
4. Lift the backplane assembly away from the system. If you cannot pull the backplane assembly away from the outside, push it gently from the inside while supporting it from the outside.

Figure 11–1 Removing and Installing the Backplane Assembly



11.1.2 Installing the Backplane Assembly

Refer to Figure 11–1 when completing the following steps to install the backplane assembly on the system:

1. Locate the four screws ❶ that fasten the rear cover ❷ to the GIGAswitch/ATM system.
2. Place the backplane assembly onto the system by aligning the pins on the system with the four holes on the backplane assembly.
3. Thread each of the four screws until you feel resistance. Using a screwdriver, tighten each screw until the rear cover is secured to the chassis. Torque to 16 in-lb (1.8 N-m).

11.2 Restoring the System

To restore the system, install the system modules (see Chapter 9).

GIGAswitch/ATM System Specifications

This appendix provides the specifications for the GIGAswitch/ATM 5-slot system. These specifications include:

- Physical specifications
- Electrical specifications
- Environmental specifications

A.1 Physical Dimensions

Table A–1 shows the physical specifications for the GIGAswitch/ATM 5-slot system. Allow 26.7 cm (10.5 in) of contiguous vertical space for the installation of the system.

Table A–1 Physical Specifications

Parameter	Min.	Typ.	Max.	Units	Symbol
Mounting type		Desktop			
Height	-	239	-	millimeters	mm
	-	9.4	-	inches	in
Width	-	447	-	millimeters	mm
	-	17.6	-	inches	in
Depth	-	406	-	millimeters	mm
	-	16.0	-	inches	in
Mounting type		Rack mounted			
Height	-	267	-	millimeters	mm
	-	10.5	-	inches	in
Width	-	483	-	millimeters	mm
	-	19.0	-	inches	in
Depth	-	406	-	millimeters	mm
	-	16.0	-	inches	in
Weight	-	16.36	-	kilograms	kg
	-	36.0	-	pounds	lb

(continued on next page)

Parameter	Min.	Typ.	Max.	Units	Symbol
Operation clearance (front)	51	-	-	millimeters	mm
	2.0	-	-	inches	in
Operation clearance (rear)	76	-	-	millimeters	mm
	3.0	-	-	inches	in
Operation clearance (side)	50	-	-	millimeters	mm
	1.95	-	-	inches	in
Service clearance (front)	914	-	-	millimeters	mm
	36.0	-	-	inches	in
Service clearance (rear)	914	-	-	millimeters	mm
	36.0	-	-	inches	in
Service clearance (side)	0	-	-	millimeters	mm
	0	-	-	inches	in
Service clearance (top)	0	-	-	millimeters	mm
	0	-	-	inches	in
Shipping height *	-	422	-	millimeters	mm
	-	16.63	-	inches	in
Shipping width *	-	559	-	millimeters	mm
	-	22.0	-	inches	in
Shipping depth *	-	480	-	millimeters	mm
	-	18.88	-	inches	in
Shipping weight *	-	24.32	-	kilograms	kg
	-	54.05	-	pounds	lb

* Shipping specifications for standard shipping container.

A.2 Electrical Information

A.2.1 AC Input Power Requirements

Table A-2 shows the ac input power requirements for a single power supply when used with the GIGAswitch/ATM 5-slot system.

Table A–2 AC Power Requirements

Parameter	Min.	Typ.	Max.	Units	Symbol
Nominal voltage	-	120	-	volts	V
Operational voltage range	93	-	264	volts	V
Nominal frequency	-	50/60	-	hertz	Hz
Frequency range	47	-	63	hertz	Hz
Number of phases	-	1	-	none	N/A
120 V single phase input current (steady state)	-	5.0	6.2	amperes	A
120 V single phase input current (ground G)	-	-	1.0	milliamperes	mA
240 V single phase input current (steady state)	-	3.0	3.1	amperes	A
240 V single phase input current (ground G)	-	-	1.0	milliamperes	mA
Ride-through time	-	-	30	milliseconds	ms
Inrush current cold start at 25°C	-	-	60	amperes peak	A
Power consumption	-	-	571	watts	W
Apparent power	-	-	601	volt amperes	VA
Power factor	-	.95	-	none	PF
Crest factor	-	1.37	-	none	CF
Efficiency factor	-	.75	-	none	

A.2.2 DC Power Requirements

Table A–3 shows the dc output power capacity for a single power supply. If a redundant power supply is used, each supply shares half of the current load.

Table A–3 DC Power Capacity for the Power Supply

Parameter	Min	Typ	Max	Units	Symbol
Current at 5.15 Vdc	-	-	70	amperes	A
Current at 15 Vdc	-	2.0	4.0	amperes	A
DC voltage range (5.15 Vdc)	5.09	-	5.20	volts	Vdc
DC voltage range	14.85	-	15.15	volts	Vdc
Output watts available	-	-	400	watts	W

A.3 Environmental Information

Table A–4 shows environmental information for the GIGAswitch/ATM 5-slot system.

Table A-4 Environmental Information

Parameter	Min	Typ	Max	Units	Symbol
Temperature (operating)	10	-	35	degrees Celsius	°C
	50	-	95	degrees Fahrenheit	°F
Altitude	-	1.8	-	degrees Celsius per kilometer	°C/km
	-	1.0	-	degrees Fahrenheit per 1000 feet	°F/1000 ft
Temperature (nonoperating)	-40	-	66	degrees Celsius	°C
	-40	-	151	degrees Fahrenheit	°F
Temperature (storage)	-40	-	66	degrees Celsius	°C
	-40	-	151	degrees Fahrenheit	°F
Relative humidity (operating)	10	-	90	percent relative humidity (noncondensing)	%RH
Relative humidity (nonoperating)	<50	-	95	percent relative humidity (noncondensing)	%RH
Relative humidity (storage)	<50	-	95	percent relative humidity (noncondensing)	%RH
Maximum wet bulb temperature (operating)	-	-	28	degrees Celsius	°C
	-	-	82	degrees Fahrenheit	°F
Maximum wet bulb temperature (storage)	-	-	46	degrees Celsius	°C
	-	-	115	degrees Fahrenheit	°F
Minimum dew point temperature (operating)	2	-	-	degrees Celsius	°C
	36	-	-	degrees Fahrenheit	°F
Heat dissipation	-	-	571	watts	W
	-	-	1948	Btu/hr	Btu/hr
Altitude (operating)	-	-	3000	meters above sea level	m
	-	-	10000	feet above sea level	ft
Altitude (nonoperating)	-	-	12000	meters above sea level	m
	-	-	40000	feet above sea level	ft
Mechanical shock (operating)		Duration Time	10+/-3	milliseconds	ms
Vibration frequency range (operating)			10g	gravities	G
			500	hertz	Hz
Vibration level (operating)	.010- in DA	.25g	peak		
Mechanical shock (nonoperating)		Duration Level	25.0	milliseconds	ms
			30.0	gravities	G
Vibration frequency range (nonoperating)			300	hertz	Hz
Vibration level (nonoperating)	1.03 g rms	-	.015 g2/hz		
Airflow Intake Location		Right			
Airflow Exhaust Location		Left			

A.3.1 Acoustical Specifications

Table A–5 lists the acoustical specifications for the GIGAswitch/ATM 5-slot system (DAGWG-BA) and the power tray assembly (DAGPS-AA).

Table A–5 Acoustical Specifications

Declared Values per ISO 9296 and ISO 7779*

Product	Sound Power Level $L_{WA,d}$, B	Sound Pressure Level L_{pAm} , dBA (bystander positions)
	Idle/Operate	Idle/Operate
DAGWG-BA	6.0	45
DAGPS-AA	5.3	40

* Current values for specific configurations are available from DIGITAL representatives. 1 B = 10 dBA.

The German version of the acoustical specifications from Table A–5 are provided here to meet the German Noise Declaration Decree.

Schallemissionswerte - Werteangaben nach ISO 9296 und ISO 7779/DIN EN27779*

Produkt	Schalleistungspegel $L_{WA,d}$, B	Schalldruckpegel L_{pAm} , dBA (Zuschauerpositionen)
	Leerlauf/Betrieb	Leerlauf/Betrieb
DAGWG-BA	6,0	45
DAGPS-AA	5,3	40

* Aktuelle Werte für spezielle Ausrüstungsstufen sind über die Digital Equipment Vertretungen erhältlich.
1 B = 10 dBA.

A.3.2 Ventilation

The GIGAswitch/ATM cooling system is designed to be tolerant of various installation configurations. However, to provide adequate ventilation, do not allow the cooling air entering the GIGAswitch/ATM 5-slot system to rise above 35°C (95°F).

Allow a minimum of 5 cm (1.95 in) clearance on both sides of the system to allow proper air flow through the inlet and exhaust grilles.

A.3.3 EMC Compliance

The GIGAswitch/ATM 5-slot system meets or exceeds worldwide emissions (radiated and conducted) requirements (class A limits) and CE immunity requirements for class 1 products.

Cooling and Power Modules

This appendix provides a description of the cooling and power modules belonging to the following families:

- Fan tray assembly
- Power tray assembly

B.1 Fan Tray Assembly

The fan tray assembly (70-33348) is a member of the fan tray assembly family of cooling modules. The fan tray assembly contains two 120 mm fans used to provide convective cooling to the GIGAswitch/ATM 5-slot system. These variable-speed fans are controlled by the system based on ambient temperature measured by sensors. A safety feature increases the fan speed of all other fans in case of a single fan failure in either the power tray or the fan tray.

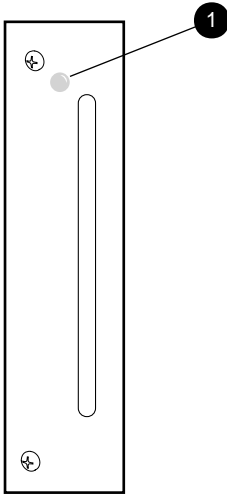
B.1.1 Air Flow

The cooling air flow for the GIGAswitch/ATM 5-slot system is drawn from the right side of the system, directed across the modules inside the system, and exhausted from the left side of the system.

B.1.2 LED Meaning

The fan tray assembly LED is used to indicate temperature conditions of the system logic modules. It also indicates the status of the fan tray assembly. Figure B-1 and its associated table identify the fan tray assembly LED and its meaning for each condition.

Figure B-1 Fan Tray Assembly LED



LKG-10388-97F

LED Condition	Meaning
Solid amber	MST failure
Off	MST passed

B.2 Power Tray Assembly

Each power tray assembly (DAGPS-AA) contains the power supply. It also contains two 60 mm fans to control power supply cooling.

Dual redundancy is provided by autodetection circuitry that maintains system power in a failover mode in the event of a single supply failure. The front panel monitoring LEDs provide operational status indications of the fan tray and the operational condition of each power supply.

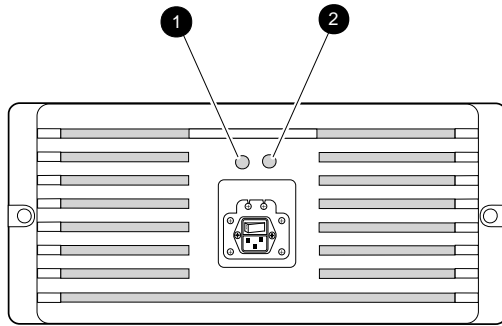
B.2.1 Function

The power supply converts primary ac power to 5 Vdc logic power and 15 Vdc fan power. The 15 Vdc are used by the system to generate a variable dc voltage that powers the fans relative to ambient temperature.

B.2.2 LEDs

Figure B-2 and its associated table identify the power tray assembly LEDs and their meaning for each condition.

Figure B-2 Power Tray Assembly LED



LKG-10387-97F

Number/Name	LED Condition	Meaning
❶/AC OK	Solid green	AC power available and above the minimum acceptable threshold.
	Off	No available AC power.
❷/DC OK	Solid green	+5 Vdc and +15 Vdc normal and power supply fan is operational.
	Off	Fault with either the +5 Vdc, +15 Vdc, or power supply fan.

Logic Modules

This appendix describes the logic modules belonging to the following families:

- Line card
- Clock card
- Crossbar

C.1 4-Port Modular Line Card

The 4-port modular line card (DAGGL-BA) is a member of the line card family of logic modules. It performs ATM cell forwarding functions among a set of connected ATM links. The line card implements four ports and connects these ports to the crossbar module. This line card supports the use of ATM modular PHY (modPHY) cards. Thus, these ports can use the supported media types implemented by the ATM modPHY cards. Refer to *ATM Modular PHY Cards Installation* for more information about the installation and use of ATM modPHY cards.

C.2 1-Port 622 Mb/s Line Card

The 1-port 622 Mb/s MMF line card (DAGGL-CA) and the 1-port 622 Mb/s SMF line card (DAGGL-CB) are members of the line card family of logic modules. This type of line card performs ATM cell forwarding functions among a set of connected ATM links. It implements one port using an OC-12 (622 Mb/s) link and connects this port to the crossbar module.

C.3 Clock Card

The clock card (F5-23289) is a member of the clock card family of logic modules. The clock card must be included in any GIGAswitch/ATM 5-slot system configuration.

C.3.1 Application

The clock card performs the following functions:

- Clock generation and distribution
- Terminal or modem interface
- Twisted-pair Ethernet connection

C.3.1.1 Clock Generation and Distribution

The clock card generates master system clocks and distributes them through the backplane to each of the line cards. This allows resources associated with the backplane to be used in a synchronous and efficient manner.

C.3.1.2 Terminal or Modem Interface

The clock card provides the GIGAswitch/ATM system user with a standard terminal or modem interface conforming to RS-232 specifications, and compatible with RS423. The interface can be used to connect a terminal to the GIGAswitch/ATM system for local management and diagnostic purposes. Full modem support is also provided for remote maintenance and diagnostic support.

User-specific parameters, such as baud rates, stop bits, parity, data length, and so forth are stored locally on the clock card in nonvolatile (Flash) memory.

C.3.1.3 Twisted-Pair Ethernet Connection

The clock card provides a twisted-pair Ethernet connection to allow for quick and efficient updating of line card software. The clock card bridges traffic between the line cards and the network to filter out unnecessary packets.

C.3.2 Environmental Status

The clock card polls the environmental status of the system regularly. This status includes:

- The state of the fans
- Cabinet temperature thresholds

C.3.3 Line Card Monitoring and Power Control

The clock card monitors line cards to determine the type of card present during power initialization.

C.4 Crossbar

The crossbar function in a GIGAswitch/ATM 5-slot system is accomplished by the motherboard embedded in the backplane that implements a 32-bit, 4-port crossbar switch.

The function of the crossbar is to perform cell switching that allows multiple connections. Each connection is capable of transferring an ATM cell every 520 nanoseconds at a throughput of 800 Mbits per second for each port. Any input port may be connected to any single output or group of outputs. Each connection must be specified individually.

The motherboard also contains the power system controller (PSC) functions. It controls and monitors the power supply and the fan tray assembly. It also reports the operational status of the monitored units. It performs the following functions:

- MST diagnostics, and fan tests at start-up
- Temperature and fan speed monitoring
- Fan speed control to minimize audible noise and to ensure sufficient cooling
- Power and cooling system status, configuration and fault reporting by way of the serial bus

- Power and cooling system LED on/off control
- Power supply shutdown if line cards are hotswapped

The crossbar has an aggregate maximum bandwidth of 3.2 gigabits/second. Connections are made through the crossbar every 520 nanoseconds. The crossbar supports concurrent full-duplex communication across all ports.

D

Guidelines for Installing Additional Modules

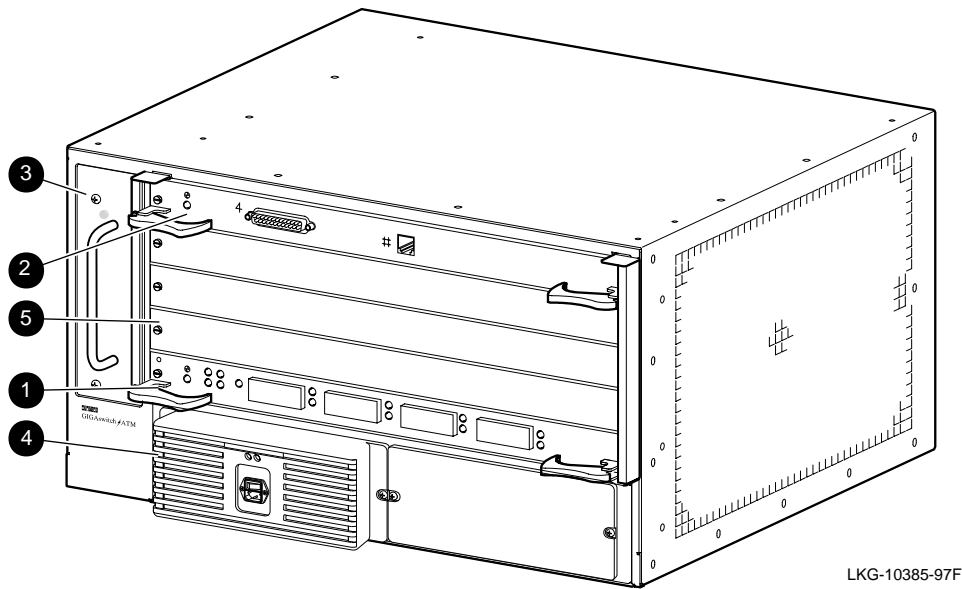
This appendix provides guidance for installing additional logic modules.

D.1 Identifying the Contents of the GIGAswitch/ATM System

The contents of the GIGAswitch/ATM 5-slot system depend on the options ordered with the system.

Refer to Figure D-1 and its associated table to identify the contents of a sample configuration.

Figure D-1 GIGAswitch/ATM Configuration



LKG-10385-97F

Number	Order Number	Description
1	DAGGL-BA	4-port modular line card. Additional line cards can be ordered separately by the customer.
2	F5-23289	A clock card is included in all versions of the product.
3	70-33348	A fan tray assembly is included in all versions of the product.
4	DAGPS-AA	A power tray assembly is included in all versions of the product. One additional power tray can be ordered as a redundant power supply.
5	70-30587-05	All empty logic slots are covered by blank handles.

D.2 Recommended Location for Logic Modules

Although line cards can be placed in slots 1 through 4, the master line card should be placed in slot 1. All additional line cards must be placed above the master line card. DIGITAL recommends the positions shown in Figure D-2 for minimal future upgrade impact.

Figure D–2 Logic Module Locations

CLK	5
LC	4
	3
	2
MC	1

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Abbreviation	Order Number	Description
MC	DAGGL- <i>xx</i>	The line card inserted in slot 1 is used as the master line card. The 4-port modular line card (DAGGL-BA) should be used as the master line card.
LC	DAGGL- <i>xx</i>	Additional line cards can be ordered separately by the customer.
CLK	F5-23289	The clock card is used to perform management functions. It must be in slot 5. An Ethernet port connection is provided on this card for OBM access.

The *xx* variables in the above table specify particular line cards. DAGGL-BA is the 4-port modular line card, DAGGL-CA is the 1-port 622 Mb/s MMF line card, and DAGGL-CB is the 1-port 622 Mb/s SMF line card.

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