PortMaster® 4

Installation Guide

Lucent Technologies
Remote Access Business Unit
4464 Willow Road
Pleasanton, CA 94588
925-737-2100
800-458-9966

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FCC Class A Notice - United States

Computing devices and peripherals manufactured by Lucent Technologies, Inc. generate, use, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions contained in this manual, may cause interference to radio communications. Such equipment has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of the FCC Rules, which are designed to provide reasonable protection against radio interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user — at his own expense — will be required to take whatever measures may be required to correct the interference.

Some components may not have been manufactured by Lucent Technologies, Inc. If not, Lucent Technologies has been advised by the manufacturer that the component has been tested and complies with the Class A computing device limits as described above.

IC-CS03 Notice - Canada

The Industry Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

European Terminal Marking

The PortMaster Communications Server carries the European Terminal Marking as follows:

CE086X

This marking is in accordance with the CE marking directive 93/68/EEC. This marking may be found on the rear of the unit.

This equipment has been tested and is compliant with the following European Directives:

- 98/13/EC (formerly 91/263/EEC) Telecommunications Terminal Equipment Directive
- 73/23/EEC Low Voltage Directive
- 89/336/EEC ElectroMagnetic Compatibility as amended by 92/31/EEC

Pan-European Approval

The notified body has issued Pan-European Approval to the PortMaster 4 in accordance with the TTE Directive 98/13/EEC (formerly 91/263/EEC). This approval is valid throughout the European Economic Market.

This approval is valid in the following European Union Countries: Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Holland, Ireland, Italy, Luxembourg, Portugal, Spain, and Sweden.

European CE approvals are automatically recognized by Iceland, Norway and Switzerland.

Contents

About This Guide

The *PortMaster 4 Installation Guide* provides installation, startup, and hardware troubleshooting instructions for the PortMaster® 4 Integrated Access Concentrator from the Remote Access Business Unit of Lucent Technologies, Inc.

This installation guide is one of three manuals that make up the comprehensive *PortMaster 4 User Manual*:

- *PortMaster 4 Installation Guide*
- *PortMaster 4 Configuration Guide*
- *PortMaster 4 Command Line Reference*

Consult the contents and indexes in each of these three manuals for detailed lists of topics and specific page references.

See the additional manuals listed under "PortMaster Documentation" for configuration, maintenance, and troubleshooting information common to all PortMaster products.

Audience

This guide is designed to be used by qualified system administrators and network managers. Knowledge of basic networking concepts is required.

PortMaster Documentation

The following manuals are available from Lucent Remote Access. They can be ordered through your PortMaster distributor or directly from Lucent.

The manuals are also provided as PDF and PostScript files on the *PortMaster Software CD* shipped with your PortMaster.

In addition, you can download PortMaster information and documentation from **http://www.livingston.com**.

- *ChoiceNet® Administrator's Guide*

  This guide provides complete installation and configuration instructions for ChoiceNet server software.

- *PortMaster Routing Guide*

  This guide describes routing protocols supported by PortMaster products, and how to use them for a wide range of routing applications.

- *PortMaster Troubleshooting Guide*

  This guide can be used to identify and solve software and hardware problems in the PortMaster family of products.

- *RADIUS for UNIX Administrator's Guide*

  This guide provides complete installation and configuration instructions for Lucent Remote Authentication Dial-In User Service (RADIUS) software for UNIX operating systems.

- *RADIUS for Windows NT Administrator's Guide*

  This guide provides complete installation and configuration instructions for Lucent RADIUS software for Microsoft Windows NT.

Additional References

To find a Request for Comments (RFC) online, visit the website of the Internet Engineering Task Force (IETF) at **http://www.ietf.org/**.

RFC 768, *User Datagram Protocol*
RFC 791, *Internet Protocol*
RFC 792, *Internet Control Message Protocol*
RFC 793, *Transmission Control Protocol*
RFC 854, *Telnet Protocol Specification*
RFC 950, *Internet Standard Subnetting Procedure*
RFC 1058, *Routing Information Protocol*
RFC 1112, *Host Extensions for IP Multicasting*
RFC 1144, *Compressing TCP/IP Headers for Low-Speed Serial Links*
RFC 1157, *A Simple Network Management Protocol (SNMP)*
RFC 1166, *Internet Numbers*
RFC 1212, *Concise MIB Definitions*
RFC 1213, *Management Information Base for Network Management of TCP/IP-based Internets: MIB-II*
RFC 1256, *ICMP Router Discovery Messages*
RFC 1321, *The MD5 Message-Digest Algorithm*
RFC 1331, *The Point-to-Point Protocol (PPP) for the Transmission of Multiprotocol Datagrams over Point-to-Point Links*
RFC 1332, *The PPP Internet Protocol Control Protocol (IPCP)*
RFC 1334, *PPP Authentication Protocols*
RFC 1349, *Type of Service in the Internet Protocol Suite*
RFC 1413, *Identification Protocol*
RFC 1490, *Multiprotocol Interconnect Over Frame Relay*
RFC 1541, *Dynamic Host Configuration Protocol*
RFC 1542, *Clarifications and Extensions for the Bootstrap Protocol*
RFC 1552, *The PPP Internet Packet Exchange Control Protocol (IPXCP)*
RFC 1587, *OSPF NSSA Options*
RFC 1597, *Address Allocations for Private Internets*
RFC 1627, *Network 10 Considered Harmful (Some Practices Shouldn't be Codified)*
RFC 1634, *Novell IPX Over Various WAN Media (IPXWAN)*
RFC 1661, *The Point-to-Point Protocol (PPP)*
RFC 1700, *Assigned Numbers*
RFC 1723, *RIP Version 2* [1994]
RFC 1771, *A Border Gateway Protocol 4 (BGP-4)*
RFC 1812, *Requirements for IP Version 4 Routers*
RFC 1814, *Unique Addresses are Good*
RFC 1818, *Best Current Practices*

RFC 1824, *Requirements for IP Version 4 Routers*
RFC 1825, *Security Architecture for the Internet Protocol*
RFC 1826, *IP Authentication Header*
RFC 1827, *IP Encapsulating Payload*
RFC 1828, *IP Authentication Using Keyed MD5*
RFC 1829, *The ESP DES-CBC Transform*
RFC 1877, *PPP Internet Protocol Control Protocol Extensions for Name Server Addresses*
RFC 1878, *Variable Length Subnet Table for IPv4*
RFC 1918, *Address Allocation for Private Internets*
RFC 1962, *The PPP Compression Control Protocol (CCP)*
RFC 1965, *Autonomous System Confederations for BGP*
RFC 1966, *BGP Route Reflection, An Alternative to Full Mesh IBGP*
RFC 1974, *PPP Stac LZS Compression Protocol*
RFC 1990, *The PPP Multilink Protocol (MP)*
RFC 1994, *PPP Challenge Handshake Authentication Protocol (CHAP)*
RFC 1997, *BGP Communities Attribute*
RFC 2003, *IP Encapsulation within IP*
RFC 2104, *HMAC: Keyed-Hashing for Message Authentication*
RFC 2125, *The PPP Bandwidth Allocation Protocol (BAP), The PPP Bandwidth Allocation Control Protocol (BACP)*
RFC 2138, *Remote Authentication Dial In User Service (RADIUS)*
RFC 2139, *RADIUS Accounting*
RFC 2153, *PPP Vendor Extensions*
RFC 2328, *OSPF Version 2*
RFC 2400, *Internet Official Protocol Standards*
RFC 2453, *RIP Version 2* [1998]

Books

Building Internet Firewalls. D. Brent Chapman and Elizabeth D. Zwicky. Sebastopol, CA: O'Reilly & Associates, Inc., 1995. (ISBN 1-56592-124-0)

DNS and BIND, 2nd ed. Paul Albitz and Cricket Liu. Sebastopol, CA: O'Reilly & Associates, Inc., 1992. (ISBN 1-56592-236-0)

Firewalls and Internet Security: Repelling the Wily Hacker. William R. Cheswick and Steven M. Bellovin. Reading, MA: Addison-Wesley Publishing Company, 1994. (ISBN 0-201-63357-4) (Japanese translation: ISBN 4-89052-672-2). Errata are available at **ftp://ftp.research.att.com/dist/internet_security/firewall.book**.

Internet Routing Architectures. Bassam Halabi. San Jose, CA: Cisco Press, 1997. (ISBN 1-56205-652-2)

Internetworking with TCP/IP, Volume 1: Principles, Protocols, and Architecture. Douglas Comer. Upper Saddle River, NJ: Prentice Hall, Inc. 1995. (ISBN 0-13-216987-8 (v.1))

Routing in the Internet. Christian Huitema. Upper Saddle River, NJ: Prentice Hall PTR, 1995. (ISBN 0-13-132192-7)

TCP/IP Illustrated, Volume 1: The Protocols. W. Richard Stevens. Reading, MA: Addison-Wesley Publishing Company. 1994. (ISBN 0-201-63346-9)

TCP/IP Network Administration. Craig Hunt. Sebastopol, CA: O'Reilly & Associates, Inc. 1994. (ISBN 0-937175-82-X)

Document Conventions

The following conventions are used in this guide:

Convention	Use	Examples
Bold font	Indicates a user entry—a command, menu option, button, or key—or the name of a file, directory, or utility, except in code samples.	• Enter **version** to display the version number. • Press **Enter**. • Open the **permit_list** file.
Italic font	Identifies a command-line placeholder. Replace with a real name or value.	• **set** *Ether0* **address** *Ipaddress* • Replace *Area* with the name of the OSPF area.
Square brackets ([ ])	Enclose optional keywords and values in command syntax.	• **set nameserver** [**2**] *Ipaddress* • **set** *S0* **destination** *Ipaddress* [*Ipmask*]
Curly braces ({ })	Enclose a required choice between keywords and/or values in command syntax.	**set syslog** *Logtype* {[**disabled**] [*Facility.Priority*]}
Vertical bar (|)	Separates two or more possible options in command syntax.	• **set** *S0*|*W1* **ospf on**|**off** • **set** *S0* **host default**|**prompt**|*Ipaddress*

Document Advisories

Note – means take note. Notes contain information of importance or special interest.

Caution – means be careful. You might do something—or fail to do something—that results in equipment failure or loss of data.

Warning – means danger. You might do something—or fail to do something—that results in personal injury or equipment damage.

Contacting Lucent Remote Access Technical Support

The PortMaster comes with a 1-year hardware warranty.

For all technical support requests, record your PortMaster ComOS version number and report it to the technical support staff or your authorized sales channel partner.

New releases and upgrades of PortMaster software are available by anonymous FTP from **ftp://ftp.livingston.com/pub/le/**.

In North America you can schedule a 1-hour software installation appointment by calling the technical support telephone number listed below. Appointments must be scheduled at least one business day in advance.

For the EMEA Region

If you are an Internet service provider (ISP) or other end user in Europe, the Middle East, Africa, India, or Pakistan, contact your local Lucent Remote Access sales channel partner. For a list of authorized sales channel partners, see the World Wide Web at **http://www.livingston.com/International/EMEA/distributors.html**.

If you are an authorized Lucent Remote Access sales channel partner in this region, contact the Lucent Remote Access EMEA Support Center Monday through Friday between the hours of 8 a.m. and 8 p.m. (GMT+1), excluding French public holidays.

- By voice, dial +33-4-92-92-48-48.
- By fax, dial +33-4-92-92-48-40.
- By electronic mail (email) send mail to **emea-support@livingston.com.**

For North America, Latin America, and the Asia Pacific Region

Contact Lucent Remote Access Monday through Friday between the hours of 7 a.m. and 5 p.m. (GMT –8).

- By voice, dial 800-458-9966 within the United States (including Alaska and Hawaii), Canada, and the Caribbean, or +1-925-737-2100 from elsewhere.
- By fax, dial +1-925-737-2110.
- By email, send mail as follows:
  - From North America and Latin America to **support@livingston.com**.
  - From the Asia Pacific Region to **asia-support@livingston.com**.
- Using the World Wide Web, see **http://www.livingston.com/**.

PortMaster Training Courses

Lucent Remote Access offers hands-on, technical training courses on PortMaster products and their applications. For course information, schedules, and pricing, visit the Lucent Remote Access website at **http://www.livingston.com/tech/training/index.html**.

Subscribing to PortMaster Mailing Lists

Lucent Remote Access maintains the following Internet mailing lists for PortMaster users:

- **portmaster-users**—a discussion of general and specific PortMaster issues, including configuration and troubleshooting suggestions. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-users** in the body of the message.

  The mailing list is also available in a daily digest format. To receive the digest, send email to **majordomo@livingston.com** with **subscribe portmaster-users-digest** in the body of the message.

- **portmaster-radius**—a discussion of general and specific RADIUS issues, including configuration and troubleshooting suggestions. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-radius** in the body of the message.

  The mailing list is also available in a daily digest format. To receive the digest, send email to **majordomo@livingston.com** with **subscribe portmaster-radius-digest** in the body of the message.

- **portmaster-announce**—announcements of new PortMaster products and software releases. To subscribe, send email to **majordomo@livingston.com** with **subscribe portmaster-announce** in the body of the message. All announcements to this list also go to the portmaster-users list. You do not need to subscribe to both lists.

PortMaster 4 Overview 1

This chapter provides the following overview of PortMaster 4 basic operation and components:

How the PortMaster 4 Works

The PortMaster 4 consists of one or more line boards and an Ethernet board, all managed by a system manager board. The Ethernet board and manager board together make up the system manager **module**. You configure and manage the lines and Ethernet interfaces via the PortMaster ComOS® operating system. Security is provided by RADIUS or PortAuthority™ RADIUS software.

The following sections describe how the components of the PortMaster 4 interact.

Slots, Boards, and Power Supplies

The front panel of the PortMaster 4 includes the following:

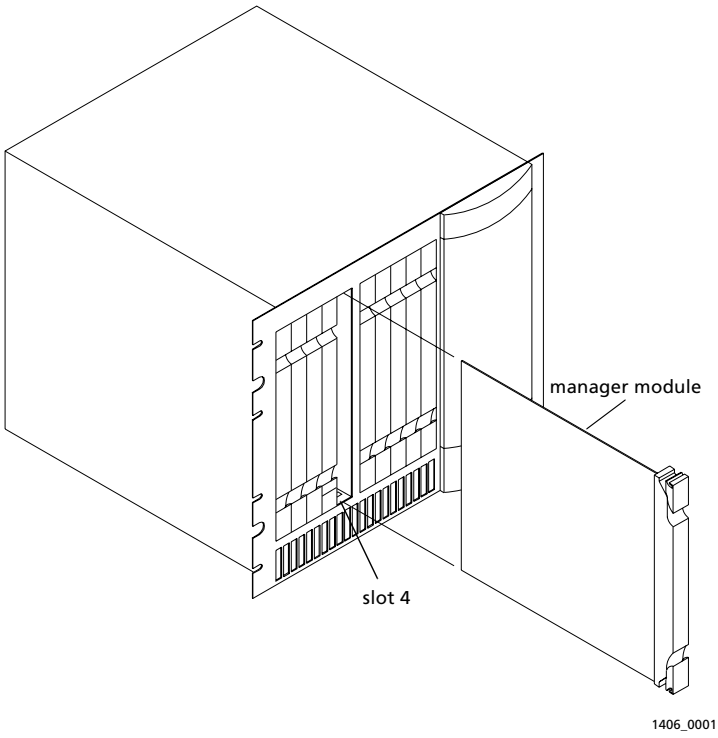
- Ten board slots. Slots are numbered 0 through 9, with slot 4 reserved for the system manager module.

Note – The slots are not physically numbered on the chassis itself.

The PortMaster 4 also provides six **virtual** slots. For example, the Ethernet board is physically located on the system manager module, but resides in a virtual slot, numbered slot 10. Later versions of the PortMaster 4 will use additional virtual slots.

Figure 1-1 shows the system manager module being inserted into slot 4.

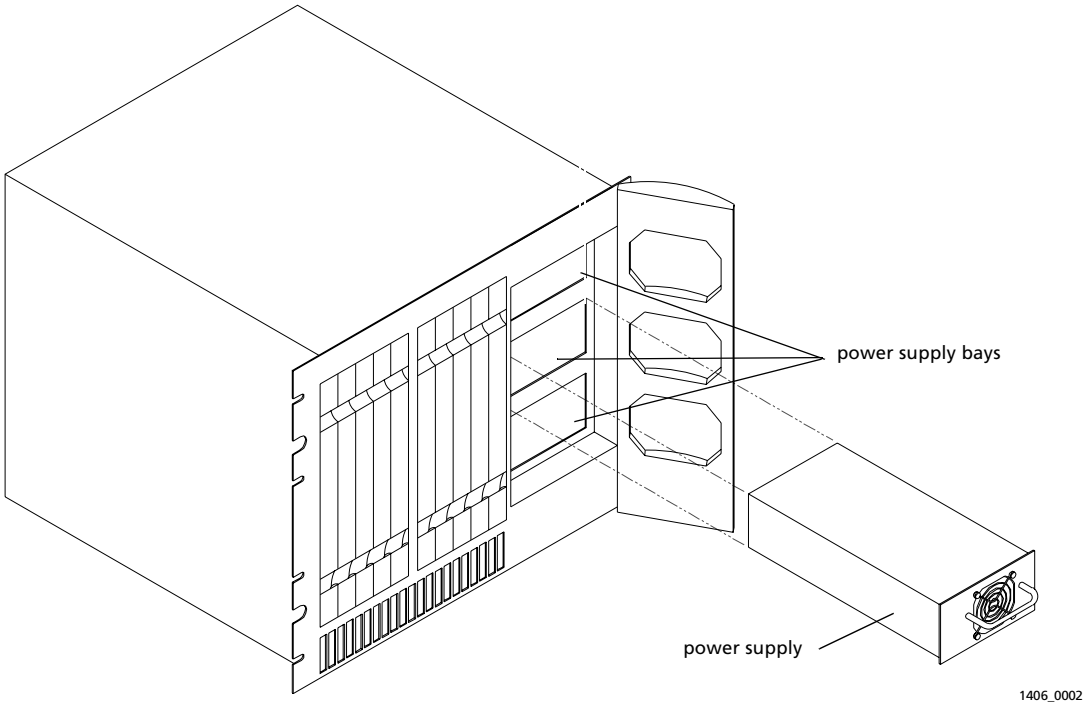
Figure 1-1 System Manager Module Installation



- Three AC power supply bays.

  AC power supplies can be inserted into any of the bays as shown in Figure 1-2 in any combination.

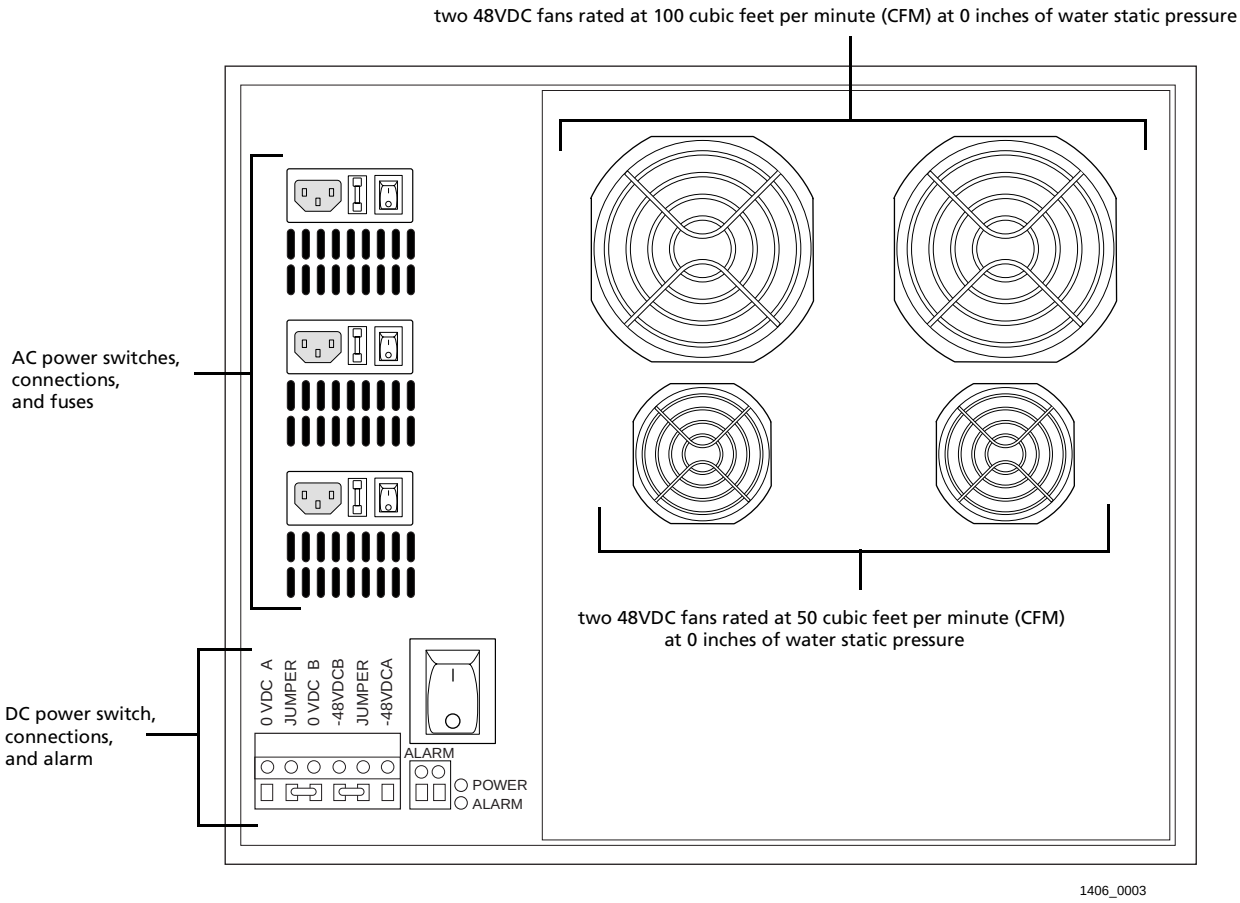
Figure 1-2 Power Supply Installation



Fans, Switches, Fuses, and Connectors

The rear panel of the PortMaster 4 includes the fans, switches, connections, and fuses shown in Figure 1-3.

Figure 1-3 Rear Panel



ComOS Software

Every PortMaster product comes with Lucent ComOS operating system software installed in nonvolatile RAM. This software is periodically updated. New releases are announced on the PortMaster mailing lists and are available by anonymous FTP from **ftp://ftp.livingston.com.** See "About This Guide" for information on mailing lists.

Each board in the PortMaster 4 has a ComOS that is specific to its operation.

Interfaces to ComOS

Use one or both of the following interfaces to ComOS to configure operational settings, collect statistics, upgrade software, busy-out modems and circuits, and monitor calls in progress from a central site:

- **Command line interface** provides commands for configuring, displaying, and debugging all PortMaster 4 operation. See the *PortMaster 4 Command Line Reference* for ComOS command syntax and descriptions.

- **PMVision™ graphical user interface (GUI**)—a Java-based configuration utility developed by Lucent Technologies to manage any PortMaster product—provides a "tree" for navigating to the following features:
  - **Monitor** dynamically monitors PortMaster operations.
  - **Graph** displays modems and sessions on a graph.
  - **Diagnose** diagnoses PortMaster problems.
  - **Maintain** backs up, restores, and upgrades PortMaster configurations.
  - **Command** sends ComOS commands to the PortMaster.
  - **Configure** adds and changes configuration settings on the PortMaster.

Note – You must use the command line interface to configure certain ComOS features.

PMVision and other Java-based configuration tools for the PortMaster are available via anonymous FTP from **ftp://ftp.livingston.com/pub/livingston/software/java**.

The instructions in this guide cover only the command line interface. Access PMVision online help for more information about using PMVision.

Management Connections

You can manage the PortMaster 4 from a PC or terminal directly connected to one of the chassis' two console ports, or via an SNMP, Telnet, or dial-up connection to one of these ports.

System Manager Module

The system manager module is made up of the manager board and an Ethernet board. The manager module is responsible for

- Storing board configurations
- Logging SNMP alarms
- Monitoring the internal temperature of the chassis
- Turning boards off and on according to ComOS commands and PortMaster 4 temperature and power requirements

The system manager board communicates with installed boards at 155Mbps using an embedded Asynchronous Transfer Mode (ATM) cell backplane. The Ethernet board attached to each manager module provides one 10/100Mbps Ethernet port and an alternative media-independent interface (MII) connection. The Ethernet board also manages the 10Mbps Ethernet management port that is physically located on the manager board. The manager board uses a 486DX5 processor, and the Ethernet board uses dual R4640 processors.

Hot-Swapping Line Boards

The configuration settings for all installed line boards are stored in the nonvolatile RAM of the system manager board. Because these settings are associated with the slot in which the board resides rather than the board itself, you can remove a failed board and insert a new board in the same slot without having to reconfigure it. When the replacement board is turned on, it retrieves its configuration from the system manager board.

The system manager module is currently not hot-swappable, and its disconnection stops the PortMaster 4 from working. However, you can replace a failed manager module without shutting down power to the PortMaster 4.

Views

The PortMaster 4 is a group of different boards in one chassis that you administer both together and separately. To monitor and configure a particular board, you set the *view* to the slot number where the board resides with the **set view** command. The default view is slot 4, which is the system manager view.

The command line prompt indicates the view you are in, except in the case of the system manager board for which the prompt displays no view number.

The **save all** command saves all configurations on all boards, regardless of what view is set.

Power Management

The PortMaster 4 chassis is powered by up to three AC power units and/or a -48VDC backplane. The backplane sources -48VDC through a dual-input rear-panel connector. Each removable AC power unit supplies 400W to the PortMaster.

Each installed board requires about 80W of power. A fully loaded PortMaster 4 requires a power budget of 800W, requiring two AC power supplies or a DC power connection. You can install an optional third AC power supply as a backup.

Before turning on an installed board, the PortMaster 4 determines how much power it requires. If enough power is available in the power budget, the PortMaster 4 supplies power to that board. If not enough power is available in the power budget—if, for example, one of the power units has failed—the PortMaster 4 leaves the board turned off and generates an SNMP alarm.

If, in the course of operation, the PortMaster 4 has a drop in its power budget and cannot run all its installed boards, it turns off boards until the power budget is balanced. Boards are turned off first by type and then in order of slot number, beginning with the highest-numbered slot. Line boards are turned off first. The manager board and Ethernet board are never turned off due to a shortage of power.

You can view information about power usage of installed boards by using the **show slots** command from the system manager board view.

Temperature Management

The PortMaster 4 is air-cooled by four fans. The air in the chassis is pulled from front to back, and from bottom to top. The system manager board constantly samples the internal temperature of the chassis and issues an SNMP alarm if the temperature rises above 50ºC (122ºF). If the temperature rises above 55ºC, the system manager board begins turning boards off until the temperature goes below 50ºC (113ºF). Boards are turned off in order of slot number, with the highest-numbered slot being turned off first.

You can specify a different shutdown temperature between 30ºC and 90ºC (86ºF and 194ºF) by using the **set shutdown temp** command. For more information about this command, see the *PortMaster 4 Command Line Reference*.

If a fan fails, an SNMP alarm is generated. Fan loss does not directly cause a board to be turned off.

Line Boards

See the individual board chapters later in this guide for descriptions of the line boards currently available on the PortMaster 4.

Security Management

RADIUS Software. The Remote Authentication Dial-In User Service (RADIUS) client/server security protocol created by Lucent is shipped with the PortMaster 4. RADIUS provides a central storage and delivery mechanism for user authentication, authorization, and accounting. User information updates can be made and stored in one place, rather than throughout the network. See the *RADIUS for Windows NT Administrator's Guide* or the *RADIUS for UNIX Administrator's Guide* for details.

PortAuthority™ RADIUS Software. Lucent's PortAuthority RADIUS provides enhanced RADIUS functionality and must be purchased separately.

ChoiceNet Software. Lucent's centralized packet-filtering application can be used with either RADIUS or RADIUS ABM to control user access into and out of your network. ChoiceNet is shipped with the PortMaster 4. See the *ChoiceNet Administrator's Guide* for details.

Services Supported

ISDN Primary Rate Interface (PRI) Service.

- In North America, PRI is transmitted over 1.544Mbps T1 lines and consists of twenty-three 64Kbps bearer (B) channels for the transmission of voice and data and one 64Kbps data (D) channel for ISDN call control and signaling.

  A PortMaster 4 with PRI service can terminate calls from V.34, K56Flex, and V.90 modems, and data-over-voice calls from ISDN users.

- In Europe, PRI is transmitted over 2.048Mbps E1 lines and consists of thirty 64Kbps B channels for the transmission of voice and data, one 64Kbps D channel for ISDN call control and signaling, and one 64Kbps framing channel.

Fractional ISDN Service. You can configure the PortMaster 4 for fractional ISDN service where it is supported by the telephone company. Fractional ISDN is a partial PRI service consisting of between 1 and 22 B channels.

Channelized T1 Service. If ISDN PRI service is unavailable, or too expensive, the PortMaster 4 can connect to channelized T1 circuits for dial-up access supporting twenty-four 56Kbps data channels with robbed bit in-band signaling. When using channelized T1 lines, the PortMaster 4 can accept both modem and ISDN calls.

Channelized E1 Service. Similarly, for European users, the PortMaster 4 can connect to channelized E1 circuits for dial-up access supporting 2.048Mbps that is subdivided into thirty 64Kbps B channels with generic or multifrequency R2 (MFR2) signaling.

Full T1 or E1 Service. The full digital line capacity, minus framing, can be used for a leased line or Frame Relay connection. T1 provides 1.536Mbps, and E1 provides 1.984Mbps. When configured for a full T1 line or E1 line, ComOS creates a WAN interface that can be configured as a hardwired leased line or Frame Relay connection.

Fractional T1 or E1 Service. The PortMaster 4 operates over T1 and E1 lines in fractional data rates selectable in any multiple of 64Kbps (T1 or E1 lines) up to the line capacity. This feature is frequently used for Frame Relay or point-to-point communications.

Channelized T3 (T3 Multiplex) Service. The PortMaster 4 can be equipped to accept 28 DS-1 signals multiplexed into a T3-rate line.

Fault-Tolerance Features

The PortMaster 4 employs the following fault-tolerance features:

- Passive ATM backplane—no moving parts to break
- Automatic shut-off of power in the event of excessive power use, and for excessive heat within the PortMaster chassis
- An optional third AC power supply for backup in the event of a power supply failure
- Hot-swappable boards, AC power supplies, and fans

SNMP Monitoring

The PortMaster 4 generates SNMP alarms under the following conditions:

- Fan failure.
- Heat in excess of 50°C. (The system manager board shuts down the power to the slots when the temperature inside the chassis exceeds 50°C.)
- Heat in a line board slot is 5°C below the shutdown temperature of 50°C (122°F)—or a temperature between 30°C and 90°C (86°F and 194°F) that you set. (This is a warning only. No action is taken by the system manager board.)
- The power budget is insufficient for the installed boards. (The system manager board shuts down power to the slots when the power requirement for the installed boards exceeds the available power budget.)

- The power supply is unplugged from the power source.
- The power supply fuse is blown.
- Failure of a T1 or E1 line.
- Modem failure on a Quad T1 or Tri E1 board.
- No Internet Group Management Protocol (IGMP) multicast traffic is detected.
- System manager module reboot.

You can view SNMP alarms by using the **show alarms** command. You can clear SNMP alarms by using the **clear alarms** command. See the *PortMaster 4 Command Line Reference* for more information about using these commands.

Functional Specifications

Figure 1-1 lists the functional specifications for the PortMaster 4.

Table 1-1 Functional Specifications

Capabilities	Specifications
TCP/IP	• Internet Protocol (IP) • Transmission Control Protocol (TCP) • User Datagram Protocol (UDP) • Internet Control Message Protocol (ICMP) • Address Resolution Protocol (ARP) • Internet Packet Exchange (IPX)—ComOS 4.1 only.
Routing protocols	• Routing Information Protocol (RIP) and RIP-2 • Open Shortest Path First (OSPF) • Border Gateway Protocol version 4 (BGP-4) • Static routes
LAN connectivity	• One 10/100Mbps full-duplex Ethernet or media-independent interface (MII) • One 10Mbps full-duplex Ethernet interface

Table 1-1 Functional Specifications *(Continued)*

Capabilities	Specifications
WAN connectivity	• Synchronous and asynchronous Point-to-Point Protocol (PPP) • Dynamic IP address assignment • Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP) • Multilink PPP • Bandwidth Allocation Protocol (BACP) • Stac LZS and Microsoft MS-Stac compression
ISDN switch types	• **In North America**—Lucent 5ESS and 4ESS, Nortel DMS-100, National ISDN-1 (NI-1), and NI-2 • **In Europe**—NET3 and NET5 • **In Japan**—NTT and KDD
Signaling	• T1 robbed bit in-band • Foreign exchange station (FXS) loop start • Immediate start • E&M wink start • R2 E1 in-band
Modem protocols	• ITU-T V.90 • K56Flex • V.34 • V.32bis • V.22 Bell 212A and 103J • V.42 and Microcom Networking Protocol (MNP) 2 through MNP 4 for error control • V.42bis and MNP 5 for data compression

Table 1-1 Functional Specifications *(Continued)*

Capabilities	**Specifications**
Security and accounting	• RADIUS authentication, authorization, and accounting • Local user password • PAP and CHAP • Calling line ID • Callback • Packet filtering • ChoiceNet server support • Token cards—SecurID and ActivCard • Layer 2 Tunneling Protocol (L2TP) • IP Encapsulation within IP (IPIP)
Configuration and management	• Two asynchronous console ports • Telnet • PMVision • BOOTP • Trivial File Transfer Protocol (TFTP) network downloads • Simple Network Management Protocol (SNMP) compliance—MIB I, MIB II, and Enterprise MIB extensions
Chassis capacity	• **In North America**—864 modem connections or ISDN B channels, 36 T1 or PRI lines, or one T3 circuit • **In Europe**—810 modem connections or ISDN sessions, or 30 E1 or PRI lines

Installing Core PortMaster 4 Components 2

PortMaster 4 Installation Steps

Use the following checklist to install core PortMaster 4 components:

- ❑ Choose a Site (see page 2-1)
- ❑ Prepare the Work Area (see page 2-2)
- ❑ Unpack the PortMaster 4 (see page 2-6)
- ❑ Attach the PortMaster 4 Chassis to a Rack (see page 2-7)
- ❑ Install a Cable Guide (see page 2-8)
- ❑ (Optional) Install AC Power Supplies (see page 2-8)
- ❑ Install the Manager Module (see page 2-10)
- ❑ Connect a Console (see page 2-13)
- ❑ (Optional) Connect an External Modem (see page 2-15)
- ❑ Connect an Ethernet Cable (see page 2-16)
- ❑ Cover Empty Slots with Blank Modules (see page 2-20)

To install a line board, see the chapter on that board later in this guide.

Choose a Site

Follow these guidelines to select a site for your PortMaster 4.

Environment

- ❑ Choose a clean, dust-free environment.
- ❑ Choose an area without direct sunlight, close proximity to heat sources, or high levels of electromagnetic interference (EMI).

Chassis Accessibility

- ❑ Provide a 19-inch (49cm) rack for mounting the PortMaster 4.
- ❑ Provide 3 inches (8cm) clearance at the front of the PortMaster 4 for cabling purposes.
- ❑ Provide 18 inches (46cm) clearance at the front of the PortMaster 4 for module installation.

Air Flow and Cooling

- ❑ Provide 3 inches (8cm) around all vent openings of the PortMaster 4 for proper air flow.
- ❑ Ensure that the operating environment of the PortMaster 4 does not drop below 41°F (5°C) or exceed 113°F (45°C).

Power Guidelines

- ❑ Ensure that the power source of the PortMaster 4 is properly grounded and falls within the internal power supply rating.
  - – PortMaster 4 AC models operate correctly at any AC voltage from 100VAC to 240VAC and frequencies from 47Hz to 63Hz.
  - – PortMaster 4 DC models operate correctly at a DC voltage level of -48VDC.

    DC power must be provided through cables with ratings matching the input voltage and current requirements of the PortMaster.
- ❑ Ensure the circuit that the PortMaster will connect to can provide the proper voltage. Power draw for the PortMaster 4 is as follows:
  - – A -50VDC fully loaded chassis draws 18 amps.
  - – A 100VAC fully loaded chassis draws 9 amps.
  - – A 200VAC fully loaded chassis draws 4.5 amps.

Prepare the Work Area

Prepare for installation by gathering this equipment and following these safety recommendations.

Required Equipment

- ❑ Number 1 Phillips screwdriver
- ❑ 5/32-inch flathead screwdriver

Safety Recommendations

- ❑ Keep the chassis area clean and dust-free during and after installation.
- ❑ Disconnect the PortMaster 4 from the power source before working near power supplies, changing a fuse, or upgrading memory.
- ❑ Before applying power, look for possible hazards such as moist floors, ungrounded power extension cables or missing safety grounds, and locate the emergency power switch for the room in which you are working.
- ❑ Wear safety glasses when working under any conditions that might be hazardous to your eyes.
- ❑ Keep tools away from walk areas where you and others could fall over them.
- ❑ Do not work alone if potentially hazardous conditions exist.
- ❑ Wear a grounding strap when handling the internal components of the PortMaster 4. (See "Grounding Wrist Strap Instructions" on page 2-3.)

Warning – (DC models only) Before working on equipment that is connected to power lines, remove jewelry such as rings, necklaces, and watches. Metal objects will heat up when connected to power and ground and can cause serious burns or weld the metal object to the terminals.

If an electrical accident occurs, turn off the emergency power switch for the room in which you are working, cautiously unplug the system's power, and get medical assistance for any injured person.

Grounding Wrist Strap Instructions

When working with the internal components of the PortMaster 4, you must wear a grounding wrist strap. Grounding wrist straps can be attached either at the front of the chassis behind the power bay door, or at the back of chassis in the lower right and left corners.

Figure 2-1 shows the proper place to attach a grounding wrist strap at the front of the chassis.

Figure 2-1 Grounding Strap Attachment—Front Panel

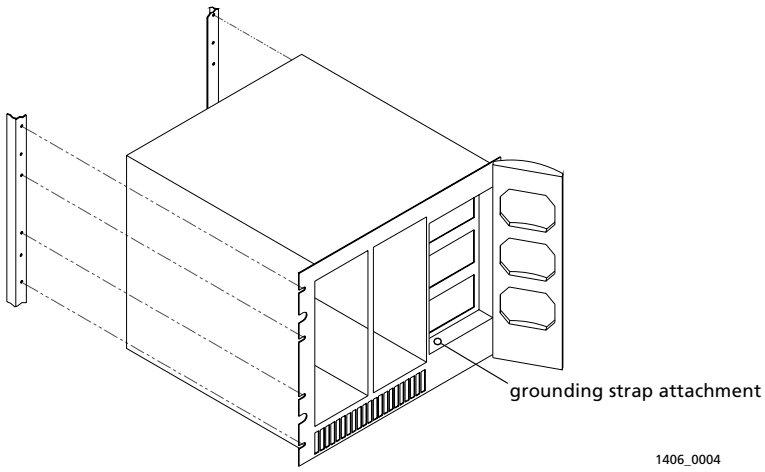
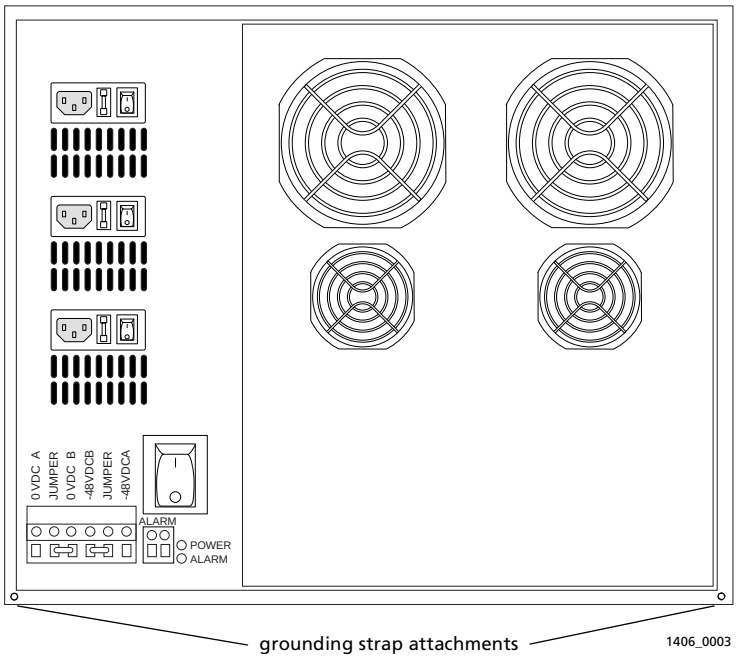


Figure 2-2 shows the proper places to attach a grounding wrist strap at the back of the chassis.

Figure 2-2 Grounding Strap Attachments—Rear Panel



Power Safety Requirements

Follow these safety requirements when installing and operating the PortMaster 4.

- **AC Mains Cords**. Be sure to use only the AC mains cord set supplied by your Lucent Remote Access authorized sales channel for the PortMaster 4. These cord sets are suitable for use in your region and comply with national and local safety requirements. Other cord sets must not be used.

  - Mains cord must comply with the safety requirements of the national and international standards to which the equipment has been approved.
  - Mains cord sets must also comply with the national and local safety requirements of any country for which the equipment is intended.

- ❑ **Disconnection Devices.** Because the AC mains cord sets are the primary devices for AC mains input connection and disconnection, ensure that all three sets are removed during PortMaster 4 disconnection to isolate mains power from the equipment.
- ❑ **Socket Outlets.** For safe connection and disconnection, ensure that three socket outlets are installed near the PortMaster 4 and are easily accessible.
- ❑ **Single-Phase Equipment.** Because the PortMaster 4 is intended for use on a single-phase supply rated at 100VAC to 240VAC, 47Hz to 63Hz, and 5/2A, ensure that all three socket outlets are provided from the same phase.
- ❑ **Outside Plant Connections.** Ensure that the PortMaster 4 is not set up for outside plant connections. The interfaces on the PortMaster 4 are not certified by the Network Equipment Building System (NEBS) for direct connection to outside plant.
- ❑ **Canada.** Ensure that bonding of the PortMaster 4 in Canada meets the requirements of Canadian standard C22.2 No. 04-M 1982, *Bonding and Grounding of Electrical Equipment (Protective Grounding)*.
- ❑ **Norway and Sweden.** For installations in Norway or Sweden:
  - Ensure that the PortMaster 4 is permanently connected to a safety earthing circuit via a suitable hardwired safety earthing conductor.
  - Ensure that this earthing connector is connected to the chassis-mounted safety earthing connection, situated at the rear of the equipment, which is marked with the primary earth symbol. (IEC 417 No. 5019.)
- ❑ **Japan DC Supply Input**. The Safety Extra Low Voltage (SELV) limit in Japan is -45VDC. Ensure that the DC input to the PortMaster 4 does not exceed this limit in Japan. The PortMaster 4 functions normally with DC inputs in the range -38VDC to -55VDC.

Interconnection of Ports

Warning – When connecting this equipment with other equipment or network interfaces, you must interconnect like ports only as designated in Table 2-1.

Table 2-1 Port Interconnection Requirements

Type of Circuit	Port Location	Port Descriptions	Network or Interconnecting Equipment Port
SELV[1]	Manager module	Two console RS-232 ports	SELV[1]
SELV[1]	Manager module	Ethernet 10BaseT port	SELV[1]

Table 2-1 Port Interconnection Requirements *(Continued)*

Type of Circuit	Port Location	Port Descriptions	Network or Interconnecting Equipment Port
SELV[1]	Manager module	Ethernet 10/100BaseT port	SELV[1]
SELV[1]	Quad T1 line board	Four T1 or ISDN Primary Rate Interface (PRI) lines	TNV-1[2] or SELV[1]
SELV[1]	Tri E1 line board	Three E1 or ISDN PRI lines	TNV-1[2] or SELV[1]
SELV[1]	T3 Mux board	Two T3 lines (one for transmitting, and one for receiving)	TNV-1[2] or SELV[1]
SELV[1]	Standalone Ethernet line board	One or two Ethernet 10/100BaseT ports	SELV[1]
SELV[1]	STS-1 Mux board	Two STS-1 lines (one for transmitting, and one for receiving)ports	TNV-1[2] or SELV[1]

1. **SELV**—Safety Extra Low Voltage. A secondary circuit that is designed and protected so that, under normal and single fault conditions, its ages do not exceed a safe value.

2. **TNV-1** —Telecommunication Network Voltage. A circuit whose normal operating voltages do not exceed the limits for an SELV circuit under normal operating conditions, on which overvoltages from telecommunication networks are possible.

Unpack the PortMaster 4

To ensure the safety of the PortMaster 4 during shipment, the chassis, power supplies, boards, and modules are individually packaged.

Procedure

1. **Turn the shipping box on its side, with the box opening perpendicular to the floor.**

   The PortMaster 4 chassis is in a cardboard tray inside the shipping box.

2. **Slide the PortMaster 4 chassis out of the box, leaving it inside the cardboard tray.**

3. **Locate the handles on the side of the cardboard tray and use the handles to lift the PortMaster chassis to a rack.**

   Follow the procedure in the following section to attach the PortMaster 4 to a rack before installing any of its components.

4. **Unpack and place the PortMaster 4 modules and boards on a flat, static-free work surface.**

5. **Ensure that you have at minimum the following equipment required for PortMaster 4 operation:**
   - One PortMaster 4 chassis.
   - One AC power supply—unless -48VDC is provided externally. Additional AC power supplies can be added as necessary.
   - One system manager module.
   - One line board.

Attach the PortMaster 4 Chassis to a Rack

Follow these instructions to attach the PortMaster 4 chassis to a rack.

Required Equipment

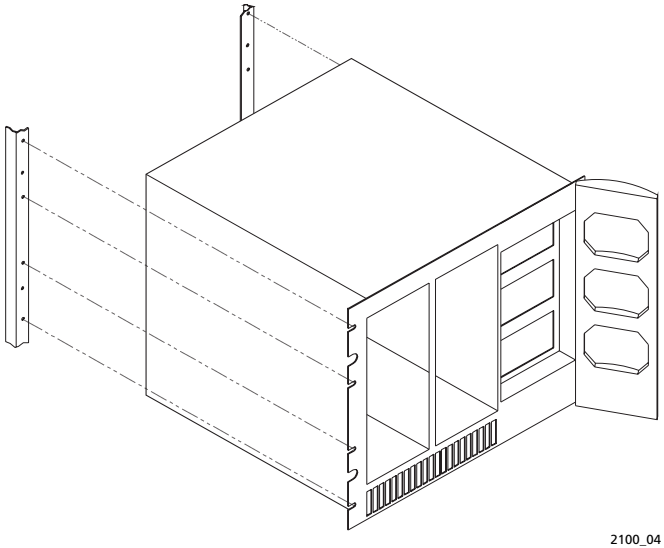
- ❑ Eight 12x24x1/2-inch Phillips pan head screws
- ❑ Phillips screwdriver
- ❑ 19-inch rack

Procedure

Caution – Lucent recommends mounting the PortMaster 4 chassis with all slots empty and using three people to complete this task.

1. **Using proper lifting procedures, position the PortMaster 4 chassis so that the front of the chassis is flush with the 19-inch rack.**
2. **Using the 8 Phillips screws, attach the PortMaster 4 chassis to the rack as shown in Figure 2-3.**

Figure 2-3 Attaching the PortMaster 4 to a Rack



Install a Cable Guide

Follow these instructions to install a cable guide.

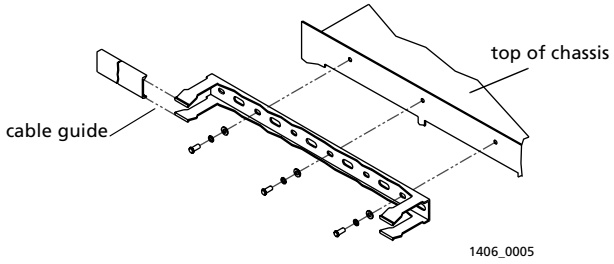
Required Equipment

- ❏ Three Phillips screws
- ❏ One Phillips screwdriver
- ❏ Three sets of washers (2 washers in each set)
- ❏ Cable guide (cable duct and cover)

Procedure

1. **Line up the holes in the duct with the holes located above the slots on the chassis as shown in Figure 2-4.**
   - The hole on the left side of the chassis lines up with the third hole on the duct.
   - The center hole in the chassis lines up with the seventh hole in the duct.
   - The hole on the right side of the chassis lines up with the 11th hole in the duct.

Figure 2-4 Installing a Cable Guide



2. **Using a Phillips screwdriver, attach the duct to the chassis as shown in Figure 2-4.**
3. **To install the cover on the cable guide, squeeze the duct fingers together with one hand while sliding the cover over the duct fingers with the other.**

(Optional) Install AC Power Supplies

The PortMaster 4 supports both AC and DC power connections and includes AC connections for three power supplies. The PortMaster 4 has three bays for two 400W switching power supplies plus a third 400W backup supply. The third power supply takes over if either of the other two power supplies fails. Each AC power supply has a fan. The DC connection has an A and B dual-feed arrangement. AC and DC connections can be used at the same time, with one as the primary power source and the other as a backup.

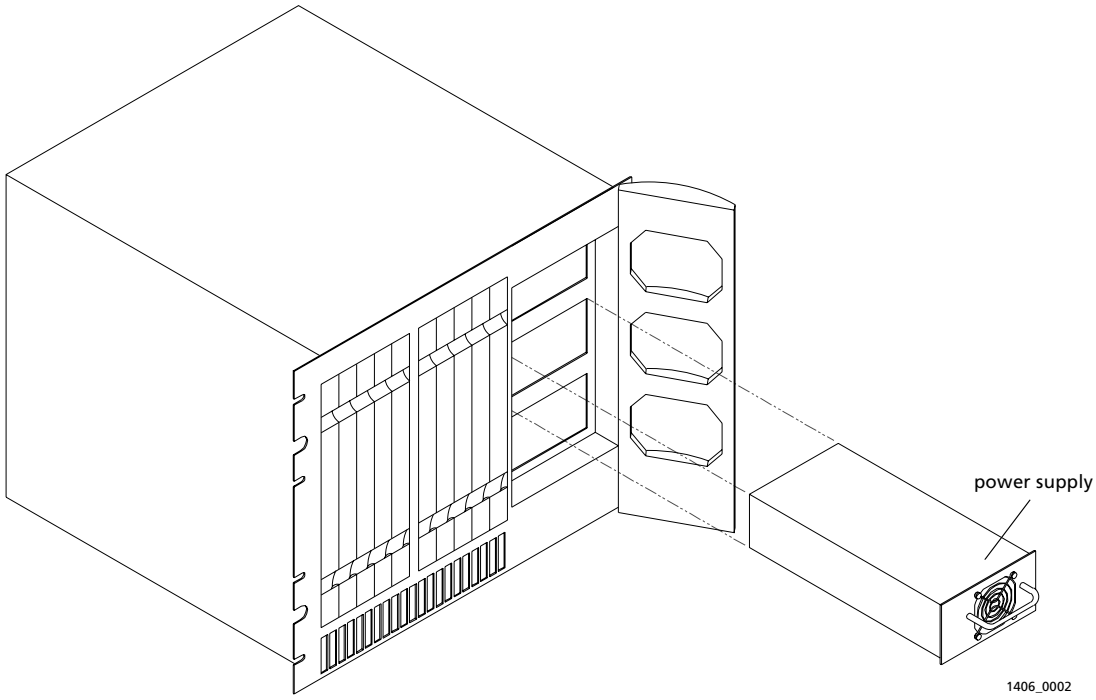
Follow these instructions to install up to three AC power supplies in the PortMaster 4 chassis.

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **On the front of the PortMaster 4 chassis, open the door to the power supply bays.**
2. **Carefully slide the AC power supply into a bay in the front of the chassis as shown in Figure 2-5.**
3. **Ensure that the connectors on the power supply and the chassis slide together smoothly without force.**

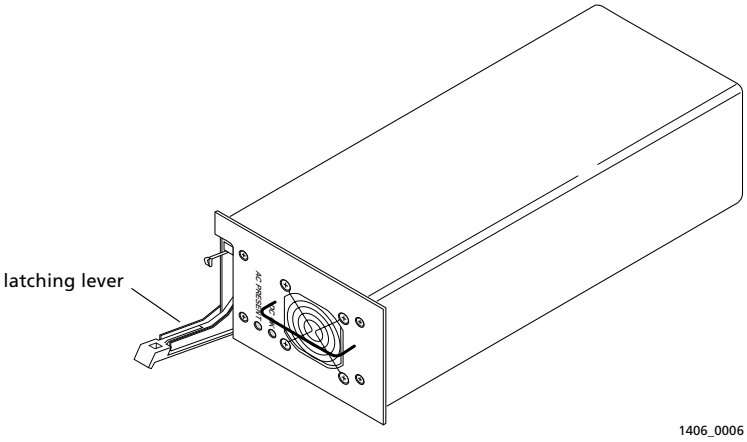
Figure 2-5 Installing a Power Supply



Caution – Forcing a power supply into the chassis can damage the connectors.

4. **Ensure that the power supply latches securely into the chassis with the latching lever (Figure 2-6).**

Figure 2-6 Latching Lever on AC Power Supply



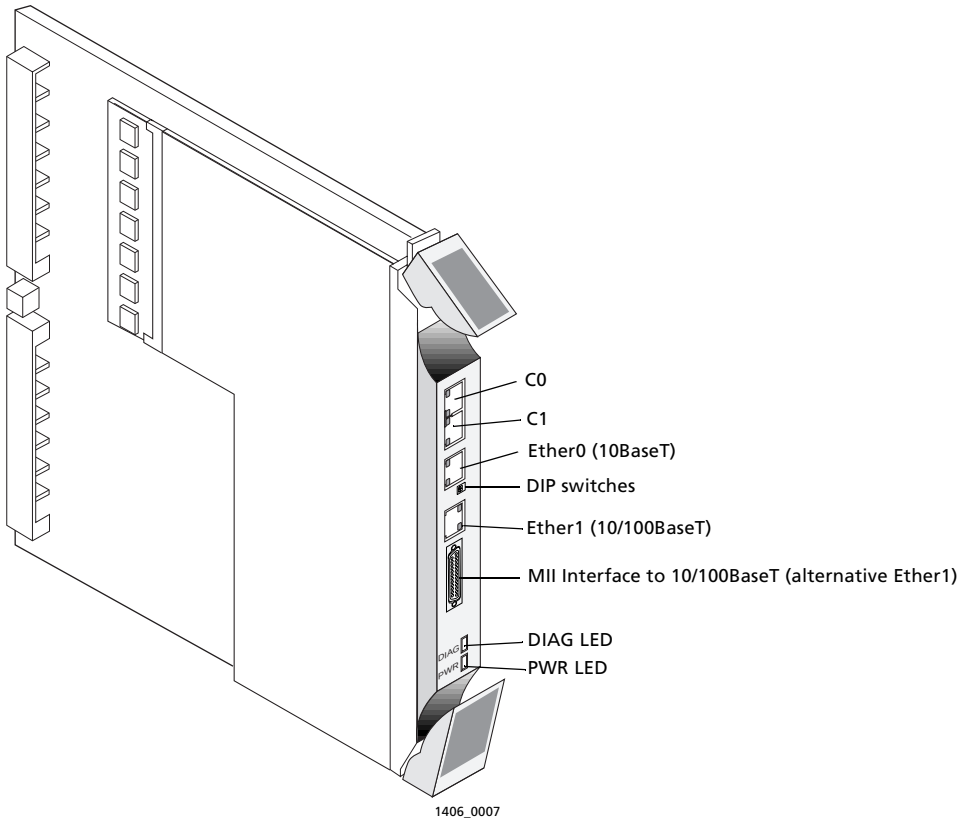
Install the Manager Module

The PortMaster 4 is shipped with a system manager module that consists of a manager board and an Ethernet 10/100Mbps board. The manager board manages and administers the installed line boards. The manager board communicates with installed line boards at 155Mbps speeds through an embedded Asynchronous Transfer Mode (ATM) cell-switching network linked to the chassis' virtual backplane.

Each manager module provides the following (see Figure 2-7):

- C0 port—for a console connection with a null modem cable or for an asynchronous connection to an external modem
- C1 port—for an asynchronous connection to an external modem
- Ether0 interface—10BaseT Ethernet interface for a private LAN connection
- DIP switch 1 (bottom) and 2 (top)—to set C0 function and the boot mode of the manager card
- Ether1 interface—10/100BaseT Ethernet interface for an upstream Ethernet connection
- Media-independent interface (MII) connection—alternative Ether1 interface that accepts optional adapters for connection to copper or optical media
- DIAG LED—lights when the module is booting and blinks off every 5 seconds during normal operation
- PWR LED—remains solidly lit when the module is receiving power during normal operation

Figure 2-7 System Manager Module



Follow these instructions to install the manager module.

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

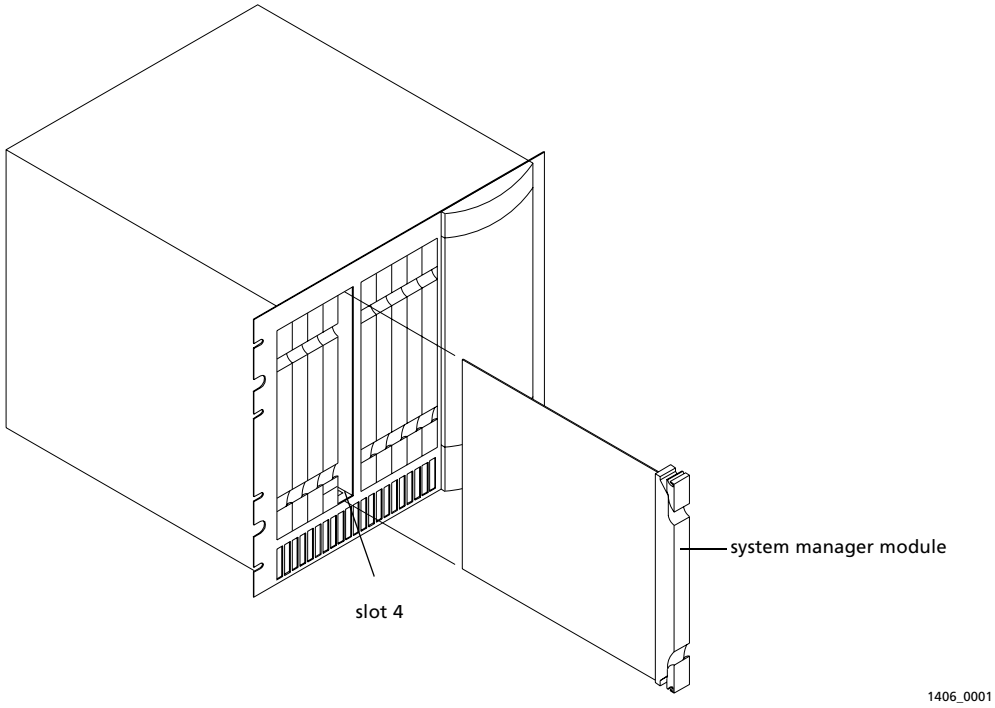
1. **Line up the edge of the module with the card guide in slot 4 (Figure 2-8).**

Note – The physical slots are numbered 0 through 9 from left to right. Although the Ethernet board in the manager module is physically installed in slot 4, it is monitored through virtual slot 10.

2. **Insert the manager module in slot 4, gently guiding the module into the slot.**

   If you have trouble sliding the module into the card guide, gently wiggle it back and forth to help it slide in.

Figure 2-8 Installing the System Manager Module



3. **When the module is completely inserted in the slot, close the top and bottom tabs so they are flush with the face of the chassis.**

   Closing the tabs causes the module to connect with the backplane.

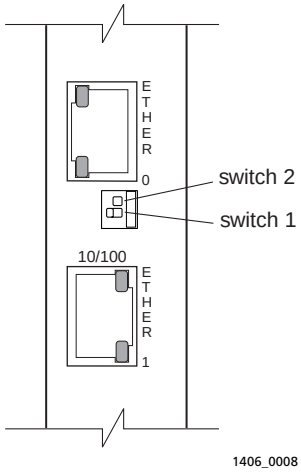
DIP Switch Settings

The DIP switches on the manager module are located between Ether0 and Ether1 (see Figure 2-9). Each switch is off when turned to the left, and on when turned to the right.

- DIP switch 1 turned to the left forces the C0 port to have a configuration of 9600 baud, 8 bits, no parity, and 1 stop bit for use as a console port. When switch 1 is turned to the right, C0 can be configured as an asynchronous port.
- DIP switch 2 turned to the left sets the PortMaster 4 for netbooting. When switch 2 is turned to the right, the PortMaster 4 can boot normally.

Figure 2-9 shows the DIP switch settings on the manager module.

Figure 2-9 DIP Switches



Connect a Console

Follow these instructions to connect a PC or terminal to the PortMaster 4 manager module for use as a console. You can use this connection to configure and manage the PortMaster 4.

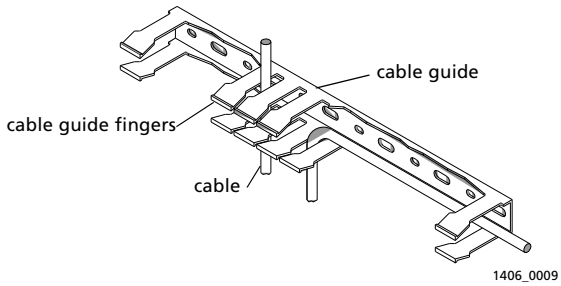
Required Equipment

- ❏ If you are using a PC, a RJ-45-to-DB-25 console cable with a 25-to-9-pin female adapter (See "Console Cable" on page A-2 for more information.)
- ❏ PC or terminal

Procedure

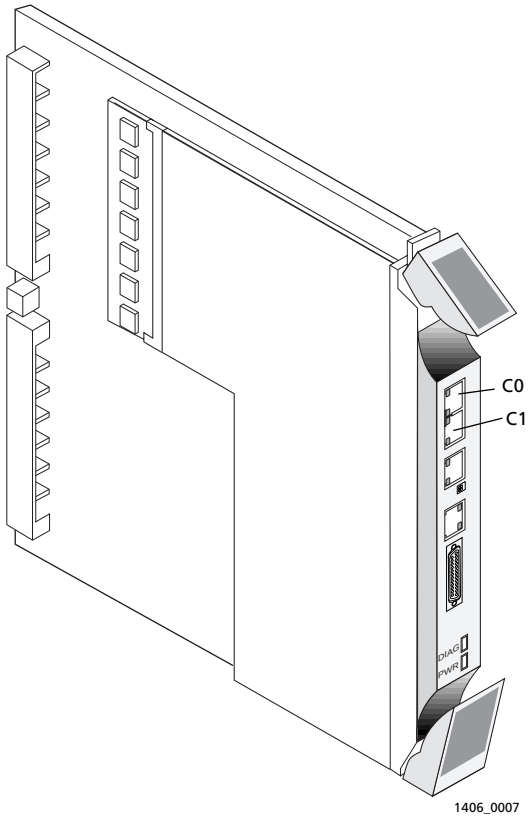
1. **Remove the cover from the cable guide if necessary.**
2. **Run the end of the cable with the RJ-45 connector through the cable guide duct until it is directly over the manager module.**
3. **Pull the end of the cable with the RJ-45 connector through the fingers of the cable guide duct as shown in Figure 2-10.**

Figure 2-10 Pulling a Cable through the Cable Guide



4. Attach the RJ-45 connector to the C0 or C1 port of the manager module (see Figure 2-11).

Figure 2-11 Asynchronous Port on the System Manager Module



5. Attach the RS-232 end of the cable to a dumb terminal or computer running terminal emulation software.

6. If you have finished inserting modules and boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.

7. Ensure that DIP switch 1 on the manager module is turned to the left.

8. Set the PC or terminal to 9600 baud, 8 data bits, 1 stop bit, a parity of none, and software flow control on (XON/XOFF).

(Optional) Connect an External Modem

Follow these instructions to connect an external modem for remote administration and troubleshooting.

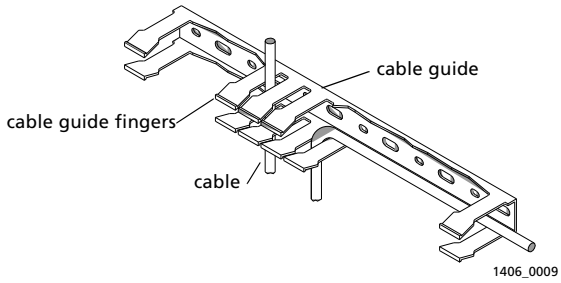
Required Equipment

- ❑ RJ-45-to-RS-232 modem cable (See "Modem Cable" on page A-1 for more information.)
- ❑ External modem

Procedure

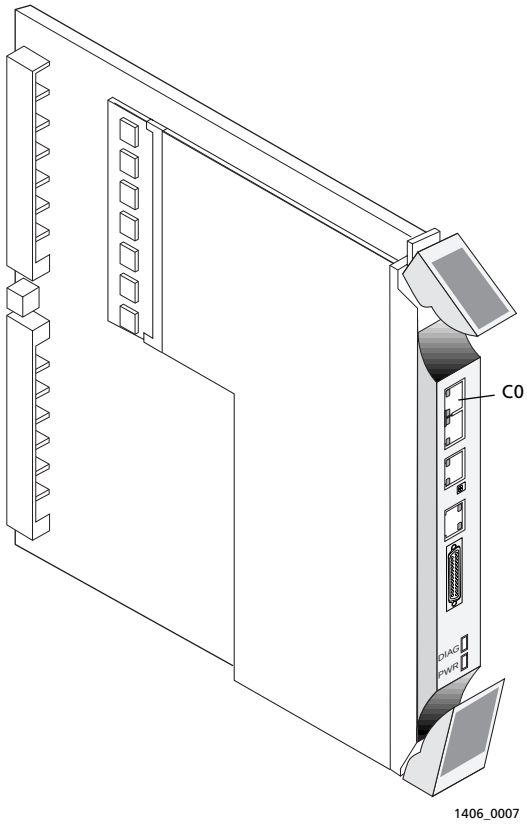
1. **Remove the cover from the cable guide, if necessary.**
2. **Run the end of the cable with RJ-45 connector the through the cable guide duct until it is directly over the manager module.**
3. **Pull the cable through the fingers of the cable guide duct as shown in Figure 2-12.**

Figure 2-12 Pulling a Cable through the Cable Guide



4. **Attach the RJ-45 end of the cable to the C0 port of the manager module (see Figure 2-13).**

Figure 2-13 Console Port on the System Manager Module



5. **If you have finished inserting modules and boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.**
6. **Ensure that DIP switch 1 is turned to the right.**
7. **Attach the RS-232 end of the cable to the external modem.**

   Refer to the documentation that came with your external modem for information on how to attach the RS-232 cable.

Connect an Ethernet Cable

The PortMaster 4 supports the following Ethernet connections:

- 10/100BaseT—used as the primary uplink. This Ether1 interface is located on the Ethernet board but powered from the manager board. It is used for **syslog**, **traceroute**, Telnet, RADIUS, ChoiceNet, the Domain Name System (DNS), and TFTP.

Note – For ComOS 4.0, Lucent recommends using Ether1 if you use only one Ethernet interface.

- 10BaseT—used for private network management. This Ether0 interface is physically located on the manager board.

- Media-independent interface (MII)—used to connect other wiring types (copper or fiber, for example) to the 10/100BaseT Ethernet. Devices attached to the MII interface must be MII-compliant.

Ethernet 10/100BaseT

If you use only one Ethernet interface, Lucent recommends using Ether1. The Ether1 interface has the following characteristics:

- Resides on the Ethernet board, which receives power from the manager board. The Ethernet board and the manager board make up the manager module.
- Communicates with the manager board over the PortMaster 4's passive ATM backplane.
- Contains a CPU for inbound data and a CPU for outbound data.
- Remains active during low power or excessive heat conditions.
- Is generally used to configure network traffic.

Follow these instructions to connect an Ethernet cable to the Ethernet 10/100BaseT interface.

Required Equipment

One of the following:

- ❑ Category 5 twisted pair cable, as specified by the EIA/TIA-568-B wiring standard, with an RJ-45 connector (See "RJ-45 Cable" on page A-2 and "Ethernet Cable Specifications" on page A-3 for more information.)
- ❑ MII cable with an MII connector

Procedure

1. **Remove the cover from the cable guide, if necessary.**
2. **Run the cable through the cable guide duct until it is directly over the manager module.**
3. **Pull the cable through the fingers of the cable guide duct as shown in Figure 2-14.**
4. **Connect the cable to the RJ-45 or MII Ethernet 10/100BaseT interface (see Figure 2-15).**

   If both interfaces are connected, the system uses the MII by default.
5. **If you have finished inserting modules and boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.**

Figure 2-14 Pulling a Cable through the Cable Guide

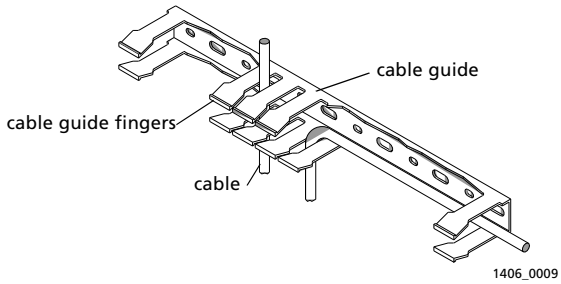
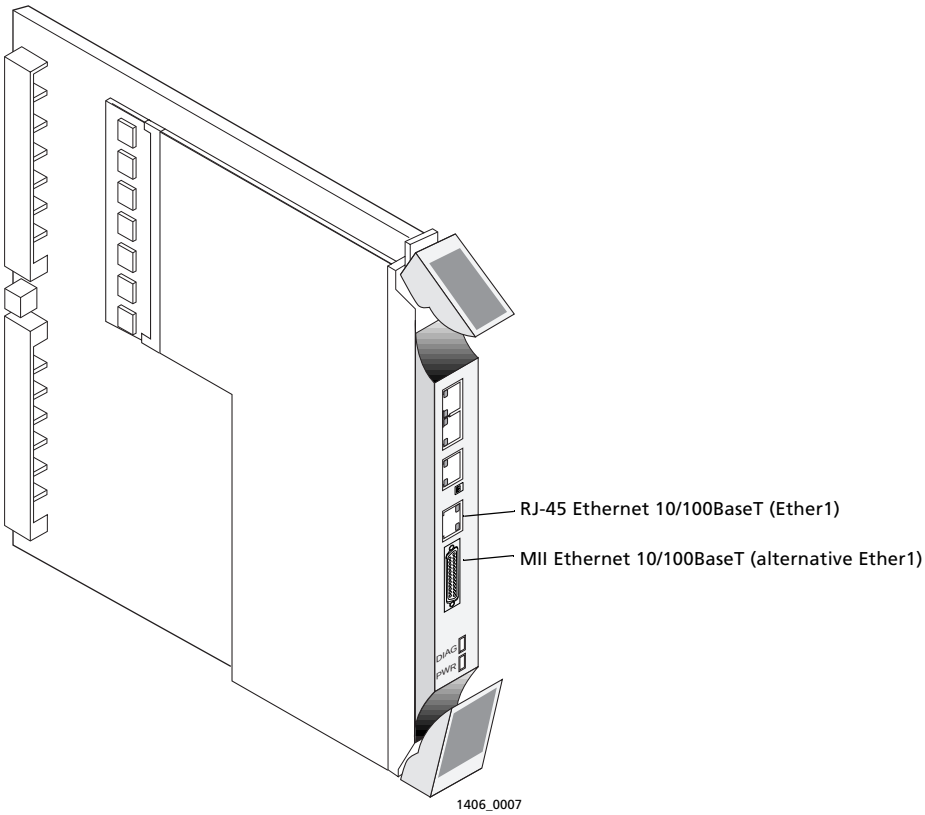


Figure 2-15 Ethernet 10/100BaseT Interfaces on the Manager Module



Ethernet 10BaseT

Follow these instructions to connect an Ethernet cable to the Ethernet 10BaseT interface of the manager module.

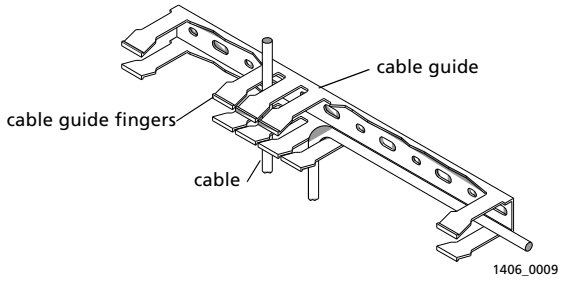
Required Equipment

- ❑ Category 5 unshielded twisted pair cable, as specified by the EIA/TIA-568-A wiring standard, with an RJ-45 connector (See "RJ-45 Cable" on page A-2 and "Ethernet Cable Specifications" on page A-3 for more information.)

Procedure

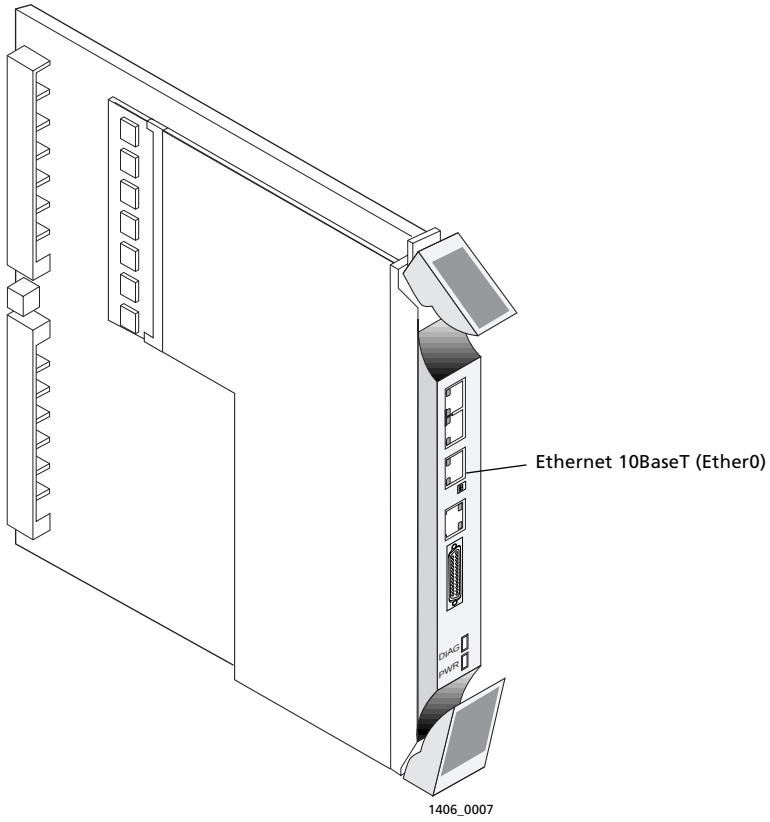
1. **Remove the cover from the cable guide, if necessary.**
2. **Run the cable through the cable guide duct until it is directly over the manager module.**
3. **Pull the cable through the fingers of the cable guide duct as shown in Figure 2-16.**

Figure 2-16 Pulling a Cable through the Cable Guide



4. **Connect the cable to the Ethernet 10BaseT interface (see Figure 2-17).**

Figure 2-17 Ethernet 10BaseT Interface on the Manager Module



5. **If you have finished inserting modules and boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.**

Cover Empty Slots with Blank Modules

When you have finished installing modules into the PortMaster 4, you must cover any empty slots with blank modules to promote air circulation and heat dissipation. A blank module has a blank faceplate and a short, blank board attached. If you order the PortMaster 4 with fewer than nine line boards, blank modules are included in the shipment.

For example, if your PortMaster 4 chassis contains an STS-1 board in slot 0, a manager module in slot 4, and seven Quad T1 boards in slots 1 through 3 and 6 through 9, you must insert blank modules in slots 5 and 10.

Required Equipment

- ❑ Blank modules

Procedure

1. **Line up the edge of the blank module with the card guide in an empty slot.**
2. **Gently guide the blank module into the slot.**

   If you have trouble sliding the module into the card guide, gently wiggle it back and forth to help it slide in.
3. **When the module is completely inserted in the slot, close the top and bottom tabs so they are flush with the face of the chassis.**

   Closing the tabs secures the module in the chassis.
4. **Repeat the procedure until all empty slots are covered.**

Getting the PortMaster 4 Up and Running 3

Basic PortMaster 4 Configuration

Use the following checklist to start up and configure your PortMaster 4 for the first time.

- ❑ Turn On Power (see page 3-2)
- ❑ Log In (see page 3-6)
- ❑ Set the System Name (see page 3-6)
- ❑ Set the Administrative Password (see page 3-6)
- ❑ Set the Default Route Gateway (see page 3-7)
- ❑ Set the Network Address and Broadcast Address (see page 3-7)
- ❑ Test the Basic Setup (see page 3-9)

For additional configuration instructions, see the *PortMaster 4 Configuration Guide*.

Overview of PortMaster 4 Operation

The manager board in the PortMaster 4 manager module has an expanded nonvolatile file system with one shared directory and individual directories for each slot in the PortMaster 4. The shared directory contains default ComOS versions and configurations for specific board types.

Each board's configuration is associated with a slot and stored in an individual directory, identified by slot number. The configuration is stored in the manager board's nonvolatile RAM. When the PortMaster 4 is turned on, each installed board retrieves its configuration from the manager board and stores it in dynamic RAM. Because each configuration is associated with a slot rather than a board, you can replace defective boards without having to reconfigure them.

Refer to the *PortMaster 4 Command Line Reference* for command descriptions.

Turn On Power

Follow these instructions to start the PortMaster 4:

1. **Ensure that DIP switch 1 is turned to the left and DIP switch 2 is turned to the right.**
2. **Ensure that the power switches for the AC and DC versions of the PortMaster 4 are turned off (Figure 3-1 and Figure 3-2).**

Figure 3-1 AC Power Switches

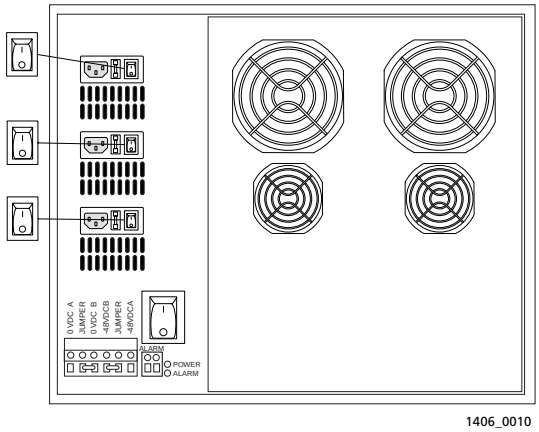
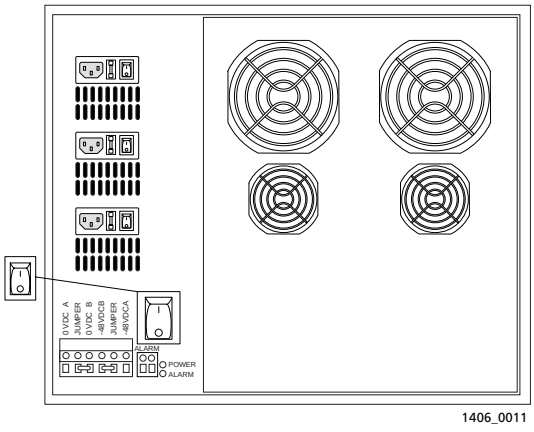


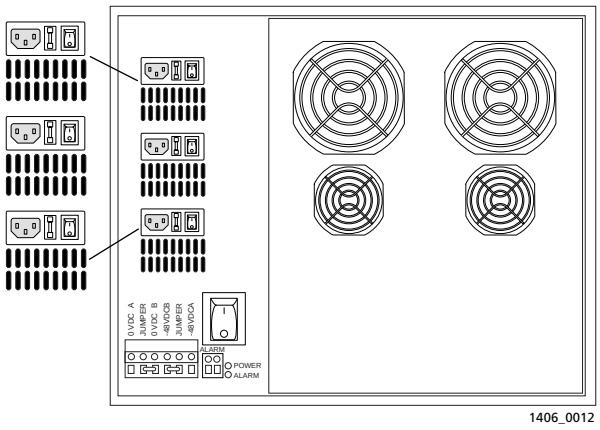
Figure 3-2 DC Power Switch



3. **If you are using AC power on the PortMaster 4, connect an active power source to each installed power supply unit.**

   For each power supply, connect a power cord to the appropriate power receptacle (Figure 3-3) and to a properly grounded electrical outlet.

Figure 3-3 Three AC Power Receptacles



The AC power sources supply approximately 80W to each slot in the PortMaster 4.

4. If you are using the single-feed DC version of the PortMaster 4, connect an active power source as follows (see Figure 3-4):

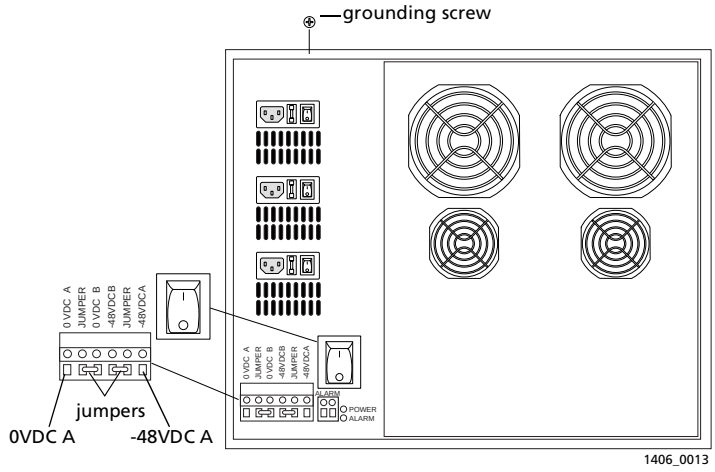
a. Connect a -48VDC A line to the -48VDC A rightmost terminal block.

b. Connect a 0VDC A line to the 0VDC A leftmost terminal block.

c. Connect the two -48VDC B and 0VDC B inputs together using the provided jumpers.

d. Connect a ground line to the grounding screw.

Figure 3-4 DC Power Receptacles with Jumpers for Single Power Feed



The DC power sources supply approximately 80W to each slot in the PortMaster 4.

5. If you are using the double-feed DC version of the PortMaster 4, connect an active power source as follows (see Figure 3-5):

a. Connect a -48VDC A line to the -48VDC A (rightmost) terminal block.

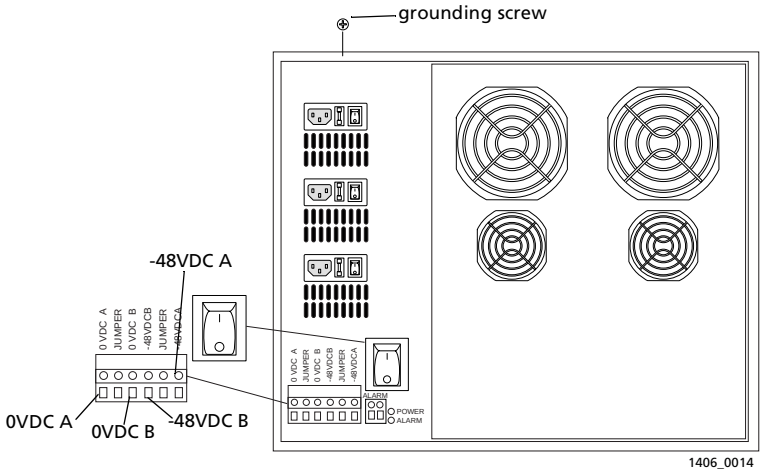
b. Connect a 0VDC A line to the 0VDC A (leftmost) terminal block.

c. Connect a -48VDC B line to the -48VDC B (center right) terminal block.

d. Connect a 0VDC B line to the 0VDC B (center left) terminal block.

e. Connect a ground line to the grounding screw.

Figure 3-5 DC Power Receptors for DC Double Power Feed



The DC power sources supply approximately 80W to each slot in the PortMaster 4.

6. Turn the power on (Figure 3-6 and Figure 3-7).

Figure 3-6 AC Power Switches

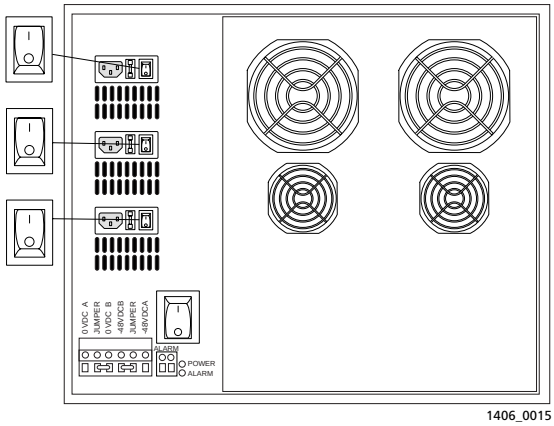
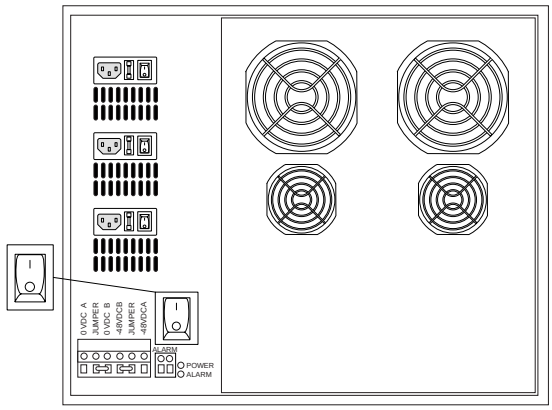


Figure 3-7 DC Power Switch



The startup sequence on a PortMaster 4 proceeds as follows. (See "Observing Boot Messages" on page 4-3 for a description of startup messages that appear on the console):

a. The manager module starts up.

b. The PortMaster 4 performs a file system check of the directories in the nonvolatile RAM of the manager module.

c. The manager board creates permanent virtual circuits (PVCs) across the ATM network to the other installed boards and starts them up. If insufficient power is available to start up all installed boards, the manager module turns on only as many boards as the power budget can handle, beginning with the lowest-numbered slots.

d. The installed boards load any configuration files that are in their respective directories in the manager board's nonvolatile RAM. If no configuration is found, the boards download default configurations from the manager board.

7. Verify that the green POWER LED on the rear panel of the PortMaster 4 is solidly lit.

Note – When a power malfunction occurs in the PortMaster 4, the amber ALARM LED on the rear panel is solidly lit.

8. On the front of the PortMaster 4, verify that the amber LED and green LED are lit on each installed AC power supply.

The amber LED lights when AC power is applied to the unit, and the green LED lights when the unit detects proper -48VDC power on the output of the supply.

9. On the front of the PortMaster 4, verify that the PWR LED is lit on the manager module and all installed line boards.

The PWR LED is located at the bottom of an installed module or board.

10. Verify the following on the manager module:

a. The DIAG LED blinks three times per second during the startup sequence and then stays solidly lit with a 1-second interruption every 5 seconds.

DIAG LED behavior might vary, depending on the version of ComOS.

b. The green link LEDs are solidly lit for each Ethernet connection.

   Locate the link LEDs next to the RJ-45 10BaseT and 10/100BaseT Ethernet ports.

c. The amber network LED for each Ethernet connection blinks when Ethernet traffic is present.

   Locate the network LEDs next to each RJ-45 Ethernet port.

Note – Heavy traffic can cause the network LED to blink so rapidly that it appears to be solidly lit.

See "Troubleshooting LED Behavior on the Manager Module" on page 4-1 if any LED fails to light properly.

Log In

Follow these instructions to log in to the PortMaster 4:

1. **At the login prompt, type** !root **and press** Enter**.**
2. **At the password prompt, press** Enter**—no password is needed when the PortMaster is running with the factory defaults.**

```
login: !root

Password:

Command>
```

Set the System Name

The system name identifies the PortMaster 4 for SNMP queries and CHAP authentication.

Use this command, replacing *String* with the appropriate value, to set the system name for the PortMaster 4.

```
Command> set sysname String
```

The system name can have up to 16 characters. When the system name is set, it replaces the word **Command** in the prompt.

Set the Administrative Password

Follow these instructions, replacing *Password* with the appropriate value, to set the administrative password:

1. **At the** Password **prompt, press** Enter**.**
2. **Set the administrative password.**

The password is an ASCII-printable string of up to 16 characters used to access the PortMaster 4 administrative features. Only a person with administrative access can change this password.

```
Command> set password [Password]
```

After using the **set password** command to reset the administrative password, log in as **!root** to gain administrative access.

Password Override

If you forget your password, follow this procedure to reset it:

1. **Attach a console to the C0 port of the manager module.**
2. **Set DIP switch 1 to the left, and turn the power on.**
3. **At the** login: **prompt, enter** !root**.**
4. **At the** Password **prompt, enter** override**.**
5. **Write down the 16-character encrypted challenge.**
6. **Leave the system unchanged, and call Lucent Remote Access technical support for the override password.**

   Do not attempt another login as **!root**. Doing so will cause the challenge to change.

Set the Default Route Gateway

The PortMaster 4 sends packets to the default route gateway router when it has no other routing information. The default gateway address is also the destination address the PortMaster 4 selects when it cannot locate the destination of a packet on the local Ethernet segment.

Use this command, replacing all italicized values with the appropriate values, to set the default route gateway.

```
Command> set gateway Ipaddress [Metric]
```

The optional metric value can be between 1 and 15 for the IP gateway. The default is 1.

Set the Network Address and Broadcast Address

Ether1 and Ether0 are both fully routable Ethernet interfaces, each with its own media access control (MAC)—or **machine**—address.

Note – For ComOS 4.0, Lucent recommends that you configure Ether1 if you are configuring only one Ethernet interface. If you configure both, Lucent recommends that they be connected to separate Ethernet segments.

Use the commands in the following sections, replacing all italicized values with the appropriate values, to set the following values and to enable Routing Information Protocol (RIP) routing for one or both interfaces:

- IP address and netmask.
- Broadcast address—The standard for hosts is to broadcast **high**, but some UNIX hosts still broadcast **low** (the PortMaster 4 default). Set this value to match the value set for the other hosts on the Ethernet segment.

Because both Ethernet interfaces are located in the manager module, you configure them from the default (manager) view.

Ether1

The 10/100Mbps Ether1 does not shut down due to overheating or low power and maintains its own forwarding table learned from the manager board. RADIUS packets leaving the PortMaster have a source IP address of Ether1, even if the packet exits through Ether0. Ether1 is used for **syslog**, **traceroute**, Telnet, DNS, RADIUS, ChoiceNet, and TFTP.

Although you configure Ether1 from the manager view, you must use the **reset slot10** command—which reboots the Ethernet board connected to the manager board in slot 4—to activate any change in Ether1 configuration.

ComOS recognizes both the Ether1 interface and the MII as Ether1, but uses the MII interface if both are connected.

```
Command> set ether1 address Ipaddress

Command> set ether1 netmask Netmask

Command> set ether1 broadcast high|low

Command> set ether1 rip on

Command> save all

Command> reset slot10
```

Ether0

The 10Mbps Ether0 interface can be used for netbooting.

```
Command> set ether0 address Ipaddress

Command> set ether0 netmask Netmask

Command> set ether0 broadcast high|low

Command> set ether0 rip on

Command> save all

Command> reboot
```

Test the Basic Setup

Use the **ping** command to verify that you have network connectivity:

```
Command> ping Ipaddress
Ipaddress is alive - round trip=15 ms
```

For additional configuration information, see the *PortMaster 4 Configuration Guide*.

Core Troubleshooting and Maintenance 4

This chapter gives the following troubleshooting and maintenance instructions for core PortMaster 4 hardware:

Troubleshooting LED Behavior on the Manager Module

Figure 4-1 identifies the manager module's LED problem-indicating behavior, possible causes of the behavior, and potential solutions.

Table 4-1 Hardware Problems and Solutions on the Manager Module

LED Behavior	Possible Cause	Possible Solution
All LEDs fail to light.	Power is not present.	Check the power switch, power cable, outlet, and fuse. For instructions on checking and changing the fuse in the AC version, see "Replacing a Fuse" on page 4-10. Contact Lucent Remote Access Technical Support if power is not present on the DC version.
Amber DIAG LED on the manager module does not light.	Board malfunction.	Contact Lucent Remote Access Technical Support.
During startup, the DIAG LED on the manager module fails to light, stays lit, or blinks three times per second continuously.	A hardware problem has occurred.	Contact Lucent Remote Access Technical Support.

Table 4-1 Hardware Problems and Solutions on the Manager Module *(Continued)*

LED Behavior	Possible Cause	Possible Solution
During startup, the DIAG LED on the manager module blinks once per second for more than a minute.	• DIP switch 2 is turned to the left and no boot server is present. • Nonvolatile RAM contents are corrupt.	• If no boot server is available, verify that DIP switch 2 is turned to the right and reboot; otherwise, see the network booting procedure in the *PortMaster Troubleshooting Guide*. • If nonvolatile RAM contents are corrupt, follow the *PortMaster Troubleshooting Guide* procedure for network booting and rewriting the contents of nonvolatile RAM.
Immediately after booting, the DIAG LED on the manager module stays solidly lit or does not light. This behavior does not refer to the boot sequence, during which the DIAG LED is not lit for between 5 and 7 seconds.	A component might have loosened during shipping.	Remove the manager module from the PortMaster 4 chassis and verify the following: • The SIMM is firmly seated. • The nonvolatile RAM is firmly in place. If all items have been verified and the problem is not fixed, refer to "Observing Boot Messages" on page 4-3, and boot in console mode. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.
During operation, the DIAG LED on the manager module stays solidly lit or does not light.	A hardware problem might have been caused by an external device.	If the LED stays solidly lit or does not light after you have removed all external devices, contact Lucent Remote Access Technical Support.
No console login prompt is displayed.	Terminal settings are incorrect or a connection or cable is inoperable.	• Verify terminal settings of 9600 baud, 8 data bits, 1 stop bit, a parity of none, and software control on (XON/XOFF). • Verify that DIP switch 1 is turned to the left. • Verify that you have a working console (null modem) cable and that it is properly connected at both ends. For cable information see "Console Cable" on page A-2.

Table 4-1 Hardware Problems and Solutions on the Manager Module *(Continued)*

LED Behavior	Possible Cause	Possible Solution
Link (green) LED on an Ethernet interface is not lit when connected to an Ethernet hub.	There is no link integrity.	Check the connection to the hub.
Network (amber) LED on an Ethernet interface is solidly lit.	Heavy traffic can cause the network LED to blink so rapidly that it appears to be solidly lit. However; If packets cannot be passed, you might have an incorrectly cabled network.	Verify that the network cabling is correct.
Network (amber) LED on an Ethernet interface is not lit.	If the PortMaster 4 is not receiving or sending traffic, the network LED is not lit.	Verify that the network cabling is correct.
An undefined problem occurred at startup, but the cause cannot be determined from LED behavior.	Refer to the solution column.	Try booting in console mode, and observe the boot messages. See "Observing Boot Messages" on page 4-3. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.

Observing Boot Messages

If you are having difficulty booting the PortMaster 4 and are unable to isolate the problem by observing LED behavior, boot the PortMaster 4 in console mode and check the boot messages.

Follow these instructions to check boot messages:

1. **Set up a console connection to the manager module (see "Connect a Console" on page 2-13).**
2. **Turn on power (see "Turn On Power" on page 3-2).**
3. **Observe the boot messages displayed on the console screen.**

Note – Boot messages vary slightly, depending on the version of the nonvolatile RAM and ComOS and whether line boards are installed.

The following listing displays a normal boot process for a PortMaster 4:

```
PM4 manager prom 1.4

Testing System Clock....
Sizing System Memory... 16MB
CPU Type.... 486DX5-133
Starting FLASH Boot.....
Flash Memory ...  Am29F016 8192K
16384  flash copy complete
Verifying Loader Module Checksum...
Starting Loader ...
Loading kernel... 1184788 bytes
Testing High Memory ... . 16384K
Found Slot ID 5
Setting up ACC 2188 PCI Controller
Found 1024K PCI Memory at 0x20000000
Testing PCI Memory block 0x20000000-0x200fffff ...Passed
Total of 1024K PCI Memory Ready
block_alloc: cpu<0> control 002e3f70 free_count<460>
Setting up ATM SAR Chip (TC35856-BF),  Reverse_Utopia
Testing SAR SRAM Memory ...128K
Scheduler Process: 133250
Flash Memory ...  Am29F016 8192K
Flash type Am29F016 with 8192K of memory in 128 cells and 8064 nodes
Found 12 ports....
board: init Slot4 12 0 0 0 0 0 0 1
e_loopback_test: packet buffer at 200d0080
ether0 active ... PCI-Master
Resetting Switch Matrix
Setting up MMC ATM Switch Matrix
Switch fabric Management connections ...  Ready
Switch fabric Socket connections ...  Ready
Switch fabric Data connections ...  Ready
MMC ATM Switch is ready
Running ComOS...

PortMaster Console login: board: init Slot10 0 0 0 0 0 0 0 1
board
```

Note – ComOS 4.1 enables you to display a history of reboots on the manager module and line boards. From the console, type in the command **show bootlog**. If a crash occurs, the stack trace is saved. The boot log is stored in the nonvolatile RAM file system (Flash memory) as a 64KB file. This file can be erased with the **erase file bootlog** command. For more information, see the *PortMaster 4 Configuration Guide* and *PortMaster 4 Command Line Reference*.

Use Figure 4-2 to interpret possible diagnostic boot messages.

Table 4-2 Interpreting Diagnostic Boot Messages

Field	**Possible Message**	**Explanation**
PM4 manager prom	*N*	Version number of the installed boot PROM.
Testing System Clock	ERROR	This error indicates a boot failure. Record all information to this point and contact Lucent Remote Access Technical Support.
Sizing System Memory	ERROR at *failed memory address.*	This error indicates a boot failure. Record all information to this point and contact Lucent Remote Access Technical Support.
CPU Type	486DX5-133	The type of CPU installed.
Starting FLASH Boot	N/A	N/A
Flash Memory	Am29F016 8192K	Nonvolatile RAM brand name and size in kilobytes.
flash copy complete	16384	Counter for nonvolatile RAM bytes transferred to dynamic RAM. If the counter freezes, record all information to this point and contact Lucent Remote Access Technical Support.
Verifying Load Module Checksum	Invalid Length for Flash at *RAM address.*	This error indicates a boot failure. Record all information to this point and contact Lucent Remote Access Technical Support.
Starting Loader	N/A	N/A
Loading kernel	1184788	Size of kernel image in bytes.

Table 4-2 Interpreting Diagnostic Boot Messages *(Continued)*

Field	Possible Message	Explanation
Testing High Memory	ERROR *at failed memory address*	This error indicates a boot failure. Record all information to this point and contact Lucent Remote Access Technical Support.
Found Slot ID 5		
Setting up ACC 2188 PCI Controller Found 1024K PCI Memory at 0x20000000 Testing PCI Memory block 0x20000000-0x200fffff ...Passed Total of 1024K PCI Memory Ready block_alloc: cpu<0> control 002e3f70 free_count<460>		PCI memory has been correctly set up.
Setting up ATM SAR Chip (TC35856-BF), Reverse_Utopia Testing SAR SRAM Memory ...128K		Segmentation and reassembly (SAR) chip is running. The SAR controls the ATM backplane.
Scheduler Process: 133250		For Lucent Remote Access engineering use only.
Found *x* ports	Integer between 2 and 864	Number of ports found, including C0 and C1. The total number of ports found depends on the number of installed boards.
board: init Slot4 12 0 0 0 0 0 0 1		
ether0 active	PCI-Master	Ethernet interface found.
Resetting Switch Matrix Setting up MMC ATM Switch Matrix Switch fabric Management connections ... Ready Switch fabric Socket connections ... Ready Switch fabric Data connections ... Ready MMC ATM Switch is ready		ATM matrix has been reset.

Table 4-2 Interpreting Diagnostic Boot Messages *(Continued)*

Field	Possible Message	Explanation
Running ComOS	N/A	If the system becomes suspended at this point and does not print the next message, the configuration nonvolatile RAM (NVRAM) has been corrupted. Refer to the *PortMaster Troubleshooting Guide* for instructions on nonvolatile RAM recovery.
PortMaster Console login:	N/A	System is up and running.
board: init	Slot10...	Installed boards are identified and initialized.

Replacing a Failed Module or Line Board

Follow these steps to replace a failed manager module, Ethernet module, or line board.

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

Caution – The system manager module is currently **not** hot-swappable, and its disconnection stops the PortMaster 4 from working. However, you can replace a failed manager module without shutting down power to the PortMaster 4.

1. **Do one of the following:**
   - If you are replacing the manager module that is still running, log out from the PortMaster 4.
   - If you are replacing an Ethernet module or line board, enter the following command to turn off power to the board:

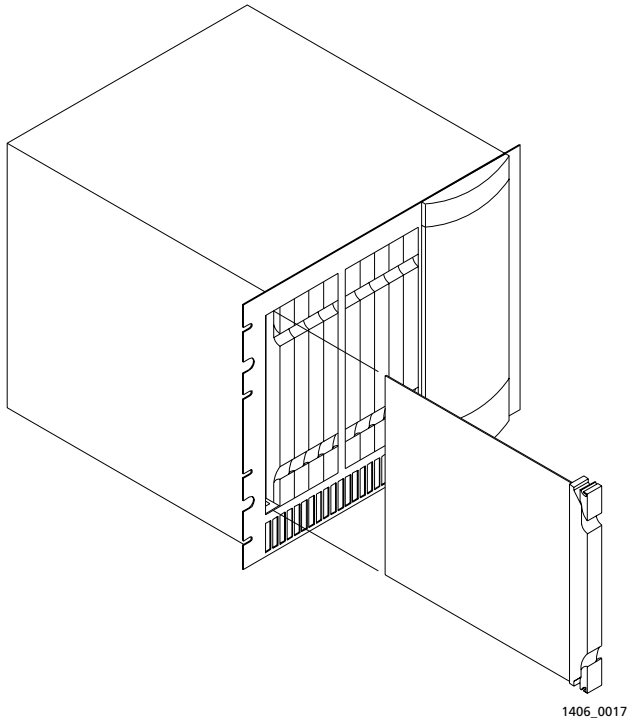
     ```
     Command> set Slot0 off
     ```

     Replace *Slot0* with the number of the slot in which the board is installed.
2. **Disconnect any cables from the failed module or board.**
3. **Open the top and bottom tabs on the failed module or board, and remove it from the slot in the PortMaster 4 chassis.**
4. **Line up the edge of the new module or board with the card guide in the same slot (see Figure 4-1).**

   The manager module must be inserted into slot 4.
5. **Gently guide the new module or board into the slot.**

If you have trouble sliding the module or board into the card guide, gently wiggle it back and forth to help it slide in.

Figure 4-1 Installing a New Module or Board



6. **When the module or board is completely inserted into the slot, close the top and bottom tabs so they are flush with the face of the chassis.**

   Closing the tabs connects the module or board to the backplane.

7. **Reconnect any cables you disconnected in Step 2.**

8. **Do one of the following:**

   – If you are replacing a failed Ethernet module or line board, enter the following command to turn on power to the board:

   ```
   Command> set Slot0 on
   ```

   Replace *Slot0* with the number of the slot in which the board is installed.

9. **If you are replacing a manager module, log back into the PortMaster 4.**

Replacing a Failed AC Power Supply

In the event of a power supply failure, the PortMaster 4 manager module shuts down boards if the power requirement begins to exceed the available power. Boards are shut down in numeric order, with the highest-numbered slots being shut down first.

Follow these steps to replace a failed AC power supply.

Required Equipment

- ❑ Replacement power supply

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Turn off the switch and unplug the power cord at the failed AC power supply.**
2. **On the front of the PortMaster 4 chassis, open the door to the power supply bays.**
3. **Pull down the latching lever on the failed AC power supply (Figure 4-2), and carefully slide the failed power supply out of the PortMaster 4 chassis (Figure 4-3).**

Figure 4-2 Latching Lever on AC Power Supply

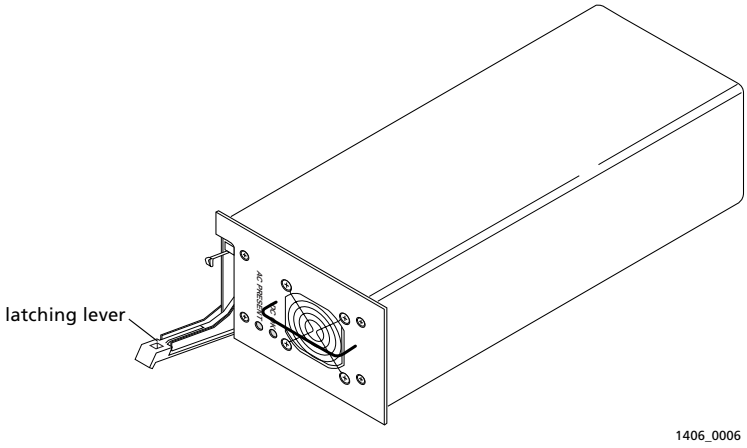
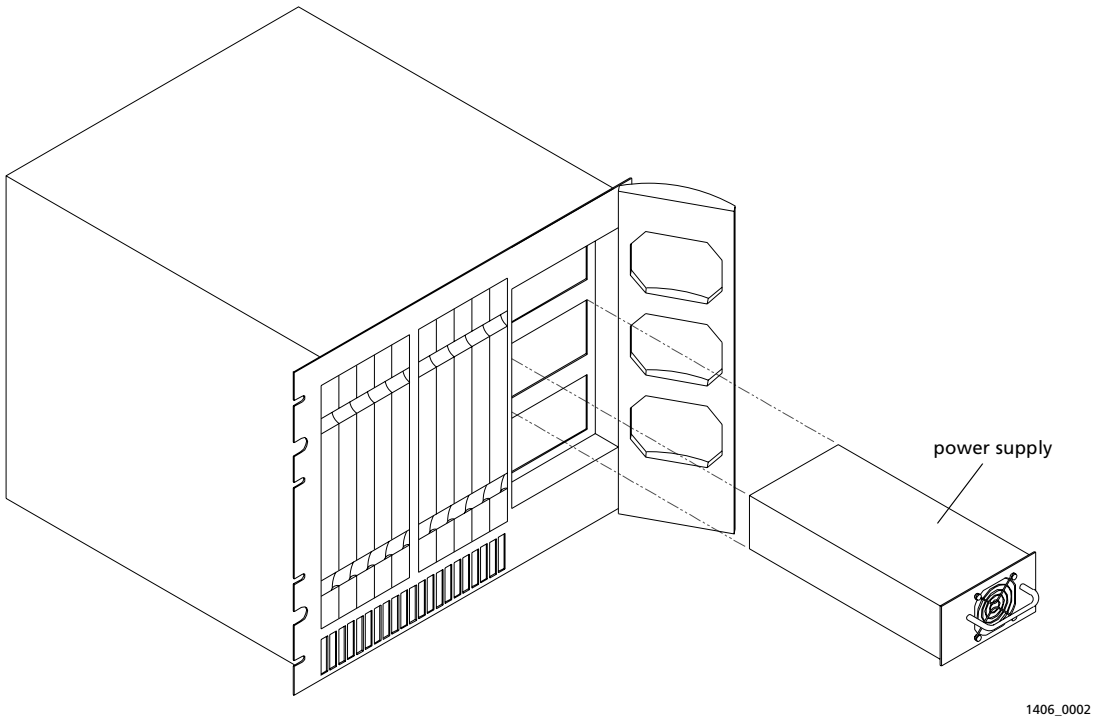


Figure 4-3 Installing a Power Supply



Caution – Forcing a power supply into the chassis can damage the connectors.

4. **Carefully slide the new AC power supply into a bay in the front of the chassis as shown in Figure 4-3.**
5. **Ensure that the connectors on the power supply and the chassis slide together smoothly without force.**
6. **Ensure that the power supply latches securely into the chassis with the latching lever (Figure 4-2).**
7. **Reattach the power cord to the power supply and turn the power on.**

   If necessary, the PortMaster 4 automatically turns boards on as power becomes available.

Replacing a Fuse

If your PortMaster 4 loses power while connected to an active power source, check the fuse.

Follow these instructions to check and replace the fuse in the PortMaster 4.

Required Equipment

- ❏ 5/32-inch flathead screwdriver
- ❏ 250V, 2A fuse (AC version)

Procedure

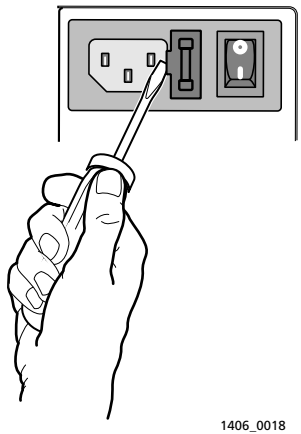
1. **Turn the power switch(es) off and disconnect the PortMaster 4 from all power sources.**

   If you are using more than one power supply, you must disconnect all power supplies before replacing the fuse.

2. **Detach the power cord(s) from the PortMaster 4.**

3. **Insert a 5/32-inch flathead screwdriver between the fuse door and the chassis, and gently pull the fuse door open (Figure 4-4).**

Figure 4-4 Opening the Fuse Door



4. **If the white outer coating of the fuse is discolored (burned), replace the fuse.**

   The fuse can be inserted from either end.

5. **Press the fuse door shut until it clicks.**

6. **Reconnect the power cord(s) to the PortMaster 4.**

7. **Turn the power switch(es) on.**

Replacing a Failed Fan

The PortMaster 4 has two 48VDC fans rated at 100CFM at 0 inches of water static pressure and two 48VDC fans rated at 50CFM at 0 inches of water static pressure.

In the event that a fan fails, the PortMaster 4 manager module shuts down operations as the temperature in the unit exceeds safe limits.

Follow these steps to replace a failed fan.

Required Equipment

- ❑ Phillips screwdriver
- ❑ Replacement fan

Caution – Wear a grounding strap when handling the internal components of the PortMaster 4.

1. **Remove the four screws that secure the back panel of the PortMaster 4 chassis (Figure 4-5).**

   When the screws are removed, the back panel swings out from the chassis to reveal the fan assembly (Figure 4-6).

Figure 4-5 Screws Securing Back Panel

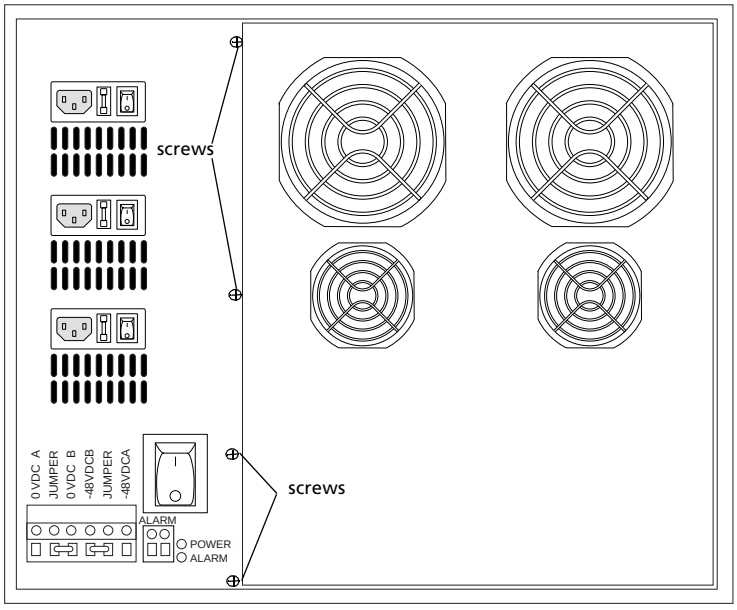
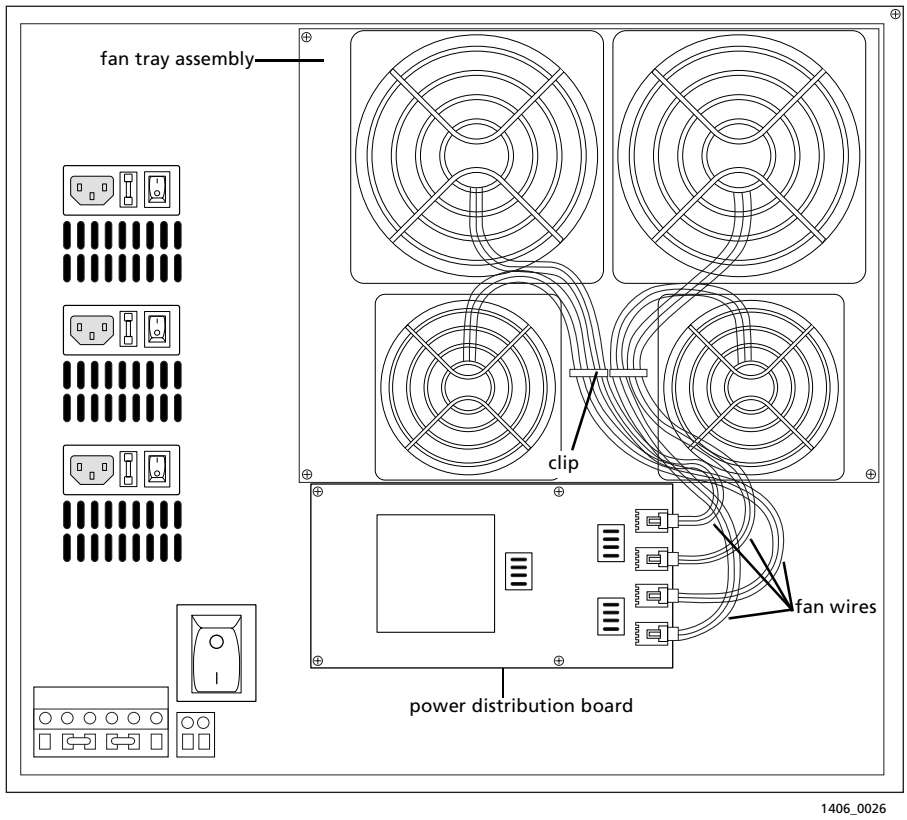


Figure 4-6 Fan Assembly



2. **Unscrew the four screws located on the corners of the failed fan.**
3. **Remove the wires of the failed fan from the clip.**
4. **Remove the fan wires from the power distribution board.**
5. **Remove the failed fan from the fan assembly tray.**
6. **Using the four fan screws, secure the replacement fan to the fan tray.**
7. **Reconnect the fan wires into the appropriate receptacle on the power distribution board.**

   Fan wires are labeled **1** through **4**. The receptacles are labeled **J1** through **J4**. Connect wires labeled **1** into the receptacle labeled **J1**, connect wires labeled **2** into the receptacle labeled **J2**, and so on.
8. **Fit the back panel under the groove on the right side of the chassis.**
9. **Secure the left side of the panel with the four back panel screws.**

Replacing the Fan Power Distribution Board

The fans in a PortMaster 4 are connected to a fan power distribution board located below the fans. A fan power distribution board might need to be replaced if

- All four fans stop working
- A new replacement fan does not work after installation

Note – The fan power distribution board is **not** hot-swappable.

Required Equipment

- ❑ Fan power distribution board
- ❑ Phillips screwdriver

Procedure

Follow these steps to replace the fan power distribution board.

Warning – You must wear a grounding strap when working with the electronic components of the PortMaster 4. Failure to do so could result in damage to the electronic components.

1. **Turn all power switches off, and disconnect the PortMaster 4 from the power source.**
2. **Unscrew the four screws that secure the rear panel of the PortMaster 4 chassis.**

   When the screws are removed, the back cover swings out from the chassis.
3. **Disconnect the fan wires from the power distribution board (Figure 4-6).**
4. **Unscrew the four screws on the corners of the power distribution board.**
5. **Disconnect the power distribution board and remove it from the rear of the chassis.**

   If the power distribution board is not easy to remove at this point, ensure that Steps 2 through 4 were performed correctly.
6. **Plug the new power distribution board into the base.**
7. **Using the four screws, attach the power distribution board to the rear of the PortMaster 4 chassis.**
8. **Connect the fan wires into the power distribution board.**

   Connect wires labeled **1** into the receptacle labeled **J1**, connect wires labeled **2** into the receptacle labeled **J2**, and so on.
9. **Fit the rear panel under the groove on the right side of the chassis.**

10. **Secure the left side of the panel with the four back panel screws.**
11. **Reconnect the power source(s) and turn on power to the PortMaster 4.**

Installing Memory on the Manager Module

Follow these instructions to do the following:

- Upgrade or replace a single inline memory module (SIMM) of dynamic RAM (DRAM)
- Replace the nonvolatile RAM—also known as a dual inline memory module (DIMM)

Upgrading or Replacing SIMMs

The manager module ships with one 16MB socketed single inline memory module (SIMM) of dynamic RAM, upgradable to 32MB.

Note – The PortMaster 4 does not support extended data output (EDO) dynamic RAM.

Required Equipment

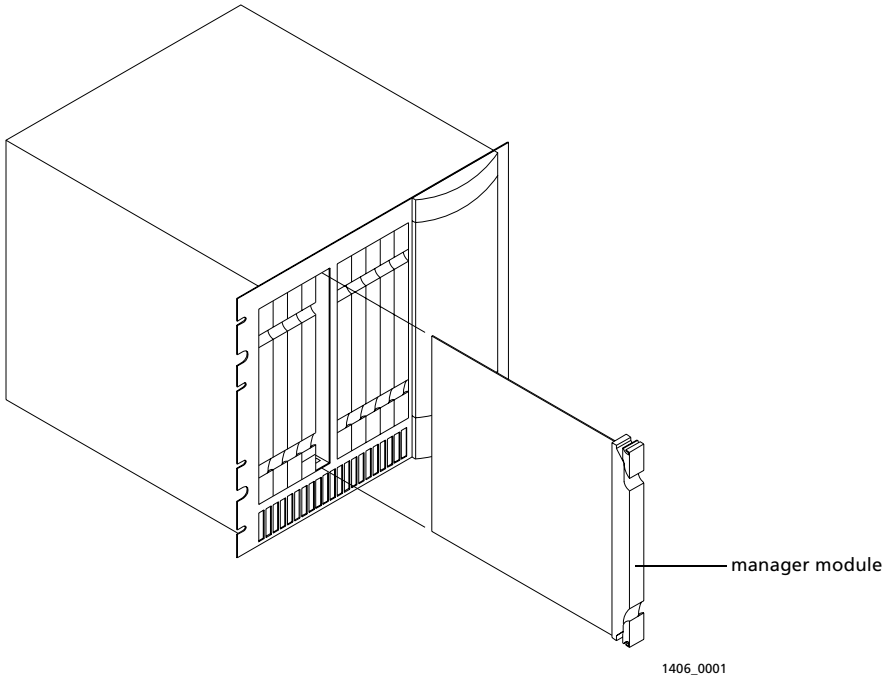
❑ One socketed SIMM with 72 pins, 60-nanosecond-or-better speeds, and no parity

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Ensure that all power switches are turned off and that the PortMaster 4 is disconnected from all power sources.**
2. **Disconnect all connectors from the manager module.**
3. **Open the top and bottom tabs on the module, and remove it from the slot in the PortMaster 4 chassis (Figure 4-7).**

Figure 4-7 Removing a Manager Module



4. **Locate the SIMM socket.**

   When the front of the manager module is facing you, the SIMM socket is in the back right quadrant of the module, located next to the socketed nonvolatile RAM. The SIMM socket is about 1 inch wide and 4 inches long.

5. **Pull the levers on either side of the SIMM socket away from the SIMM.**

   If the SIMM does not pop up on its own, gently pull it up to about a 45-degree angle.

6. **Pull the old SIMM out of its socket and put it in a static-free bag.**

7. **Insert the new SIMM into the SIMM socket.**

   The SIMM has pin 1 on the left side. Generally, 72-pin SIMMs have a notch that allows them to be inserted only one way. Make sure that the SIMM is completely pushed into the socket.

8. **With even pressure, push down on the SIMM until the side levers engage.**

   The holes on either side of the SIMM must line up with holes in the SIMM socket.

9. **Carefully reinstall the module into the PortMaster 4, being careful to close the top and bottom tabs and reconnect all connectors.**

   See "Install the Manager Module" on page 2-10 for detailed instructions if necessary.

10. **Reconnect power sources, turn on the power, and log back in to the PortMaster 4.**

Replacing the Nonvolatile RAM (DIMM)

Use the following procedure to replace the nonvolatile RAM installed on the manager module of the PortMaster 4.

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

Required Equipment

- ❑ One socketed 8MB nonvolatile RAM card, also known as a DIMM

Procedure

1. **Ensure that all power switches are turned off and that the PortMaster 4 is disconnected from all power sources.**
2. **Disconnect all connectors from the manager module you are upgrading.**
3. **Open the top and bottom tabs on the manager module, and remove it from the slot in the PortMaster 4 chassis.**
4. **Locate the DIMM on the manager module.**

   When the back of the manager module is facing you, the DIMM is located towards the back left quadrant of the module. The DIMM is about 2-1/2 inches long and 1 inch wide.
5. **If the DIMM is partially covered by the SIMM, remove the SIMM.**

   See "Upgrading or Replacing SIMMs" on page 4-15 for instructions.
6. **Locate the small plastic levers on either side of the DIMM socket, and gently pull them away from the DIMM.**

   Use care because these levers are fragile and break easily. If the DIMM does not pop up on its own, pull it up to about a 45-degree angle.
7. **Remove the old DIMM from its socket.**
8. **Slide the new DIMM into the socket, gold fingers toward the socket, at a 45-degree angle.**

   The DIMM fits into the socket only one way. The DIMM is completely inserted when the gold fingers are no longer showing.
9. **Push the DIMM down until the side levers lock it in place.**
10. **Reinstall the SIMM, if necessary.**

    See "Upgrading or Replacing SIMMs" on page 4-15 for instructions.
11. **Carefully reinstall the manager module into the PortMaster 4, being careful to close the top and bottom tabs and reconnect all connectors.**

See "Install the Manager Module" on page 2-10 for detailed instructions if necessary.

12. **Reconnect power sources, turn on the power, and log back in to the PortMaster 4.**

Quad T1 and Tri E1 Boards 5

This chapter provides installation, troubleshooting, and maintenance information as follows for the Quad T1 and Tri E1 boards:

Quad T1 Board Description

The Quad T1/PRI board can accept four DS-1 lines on four RJ-45 connectors. The board also has its own microprocessor, 8MB of dynamic RAM, which holds ComOS and the operational settings for the board. A Quad T1 board includes a built-in packet forwarding engine that enables V.90 modem and ISDN calls to be terminated on the board. A single board can be configured to handle PRI, channelized T1, full T1, and fractional T1 services.

Two models of the Quad T1 board are available. Both models can terminate DS-1 lines via RJ-45 connectors, or internally demultiplexed from a T3 board, and support hardware-based Stac compression that is integral to the PortMaster 4.

- PM4-4T1-98M—Each Quad T1 98-modem board provides connections for four DS-1 lines and is equipped with 98 True Digital modems. This configuration provides two hot spare modems if all lines are channelized T1.
- PM4-4T1-0M—Each Quad T1 board terminates four DS-1 lines without modems. This board can be used for T1 WAN or ISDN connections.

Tri E1 Board Description

The Tri E1/PRI board can accept three E1 lines on three RJ-45 connectors. The board also has its own microprocessor, 8MB of DRAM, which holds ComOS and the operational settings for the board. Each Tri E1 board includes a built-in packet forwarding engine that enables V.90 modem and ISDN calls to be terminated on the board. A single board can be configured to handle ISDN PRI, fractional PRI, R2 signaling (channelized E1), full E1, and fractional E1 services.

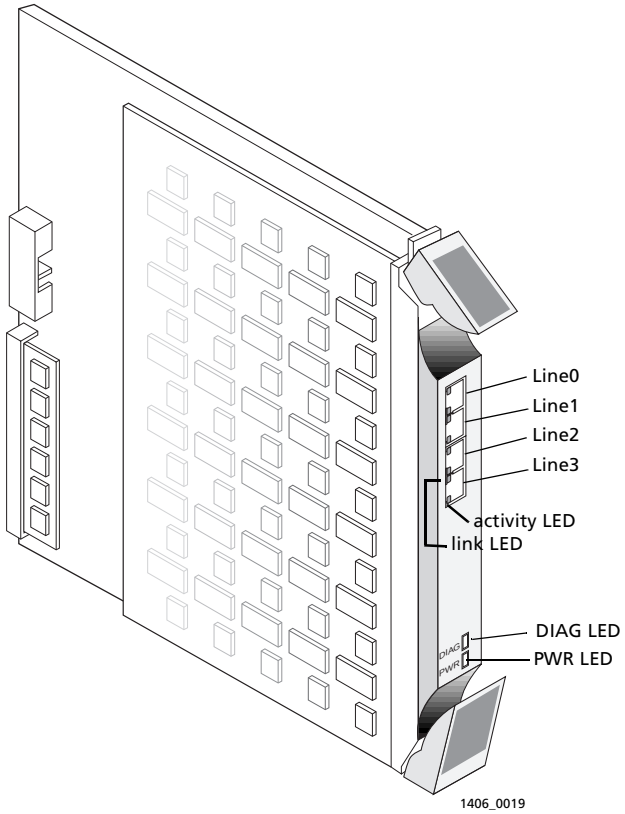
Two models of the Tri E1 board are available. Both models can terminate E1 lines via RJ-45 connectors and support hardware-based Stac compression that is integral to the PortMaster 4.

- PM4-3E1-98M—Each Tri E1 98-modem board provides connections for three E1 lines and is equipped with 98 True Digital modems. This configuration provides eight hot spare modems if all lines are being used for modem connections.
- PM4-3E1-0M—Each Tri E1 board terminates three E1 lines without modems. This board can be used for E1 WAN or ISDN connections.

Installing a Quad T1 or Tri E1 Board

Follow these instructions to install a Quad T1 or Tri E1 board. Figure 5-1 shows a Quad T1 board with modems.

Figure 5-1 Quad T1 Board with Modems



Note – Because the T1 and E1 boards are hot-swappable, you can install a T1 or E1 board while the PortMaster 4 is turned on and running.

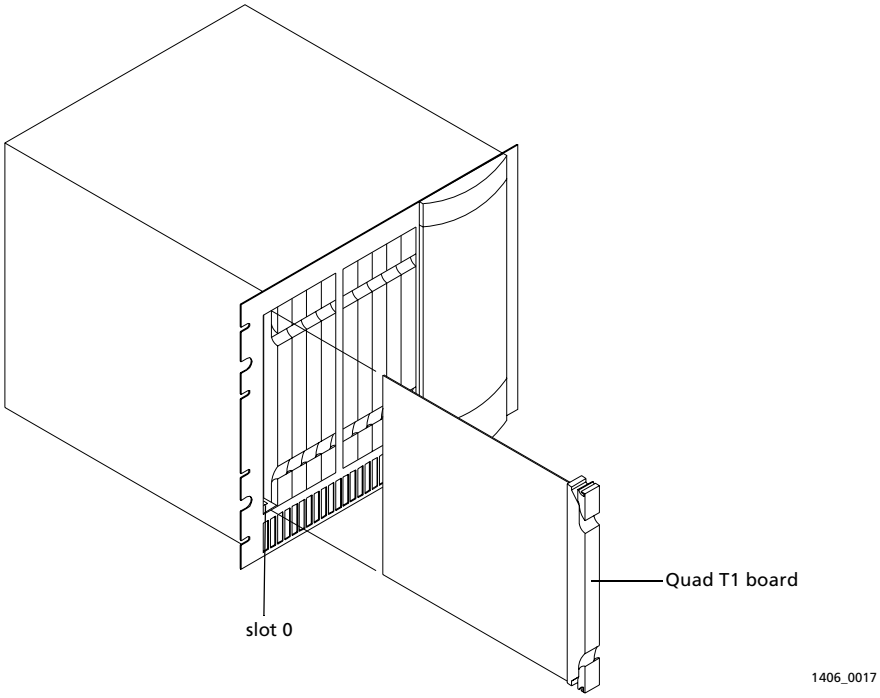
Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Line up the edge of the board with the card guide in any slot except slot 4 (Figure 5-2).**

   Slots are numbered 0 through 9 from left to right. Slot 4 is reserved for the manager module.

Figure 5-2 Installing a Quad T1 or Tri E1 Board



2. **Insert the board in the slot and gently guide it into the slot.**

   If you have trouble sliding the board into the card guide, gently wiggle it back and forth to help it slide in.

3. **When the board is completely inserted in the slot, close the top and bottom tabs so they are flush with the face of the chassis.**

   Closing the tabs causes the board to connect with the backplane.

4. **After you finish installing boards or modules in the PortMaster 4, ensure that every slot contains either a working board or blank board.**

   See "Cover Empty Slots with Blank Modules" on page 2-20.

Connecting a T1, E1, or ISDN PRI Line

Follow these procedures to connect the following types of lines to a T1 or E1 board if you have already ordered the service from the telephone company:

- For the Quad T1 board:
  - Full T1
  - Fractional T1
  - Channelized T1
  - ISDN PRI
- For the Tri E1 board:
  - Full E1
  - Fractional E1
  - R2 signaling for channelized E1
  - ISDN PRI
  - Fractional PRI

If you have not already done so, call your local telephone service provider to order the line and to find out about service availability, pricing, features, and wait time. Typically, you must pay an installation charge, a monthly flat-rate service charge, and usage charges. See Appendix C, "Provisioning Information," for information you must supply to your telephone service provider when you order service.

Required Equipment

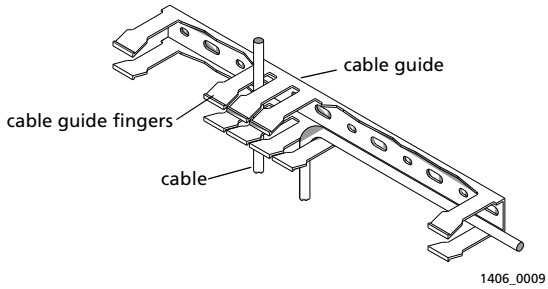
❑ Category 5 twisted pair cables, as specified by the EIA/TIA-568-B wiring standard, with an RJ-45 connector (See "RJ-45 Cable" on page A-2 for more information.)

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Remove the cover from the cable guide, if necessary.**
2. **Run the cable through the cable guide duct until it is directly over the Quad T1 or Tri E1 board.**
3. **Pull the cable through the fingers of the cable guide duct as shown in Figure 5-3.**

Figure 5-3 Pulling a Cable through the Cable Guide



4. Determine whether the line you are connecting has telephone company clocking.

Each Quad T1/PRI board and Tri E1/PRI board has an integrated channel service unit/digital service unit (CSU/DSU). However, the other end of a T1 or E1 connection might require an external clock signal provided by the telephone company or a CSU/DSU.

Lines from the telephone company have telephone company clocking with a stable frequency. However, lines from nontelephone company sources can sometimes shift the frequency of the clock signal they generate and can disrupt the operation of analog modems so that they do not answer calls.

Because each T1 or E1 board uses the clock signal of the first connected port, starting with Line0, for its transmit clock signal that is shared among all its line ports, the device that Line0 is connected to must provide a stable clocking frequency.

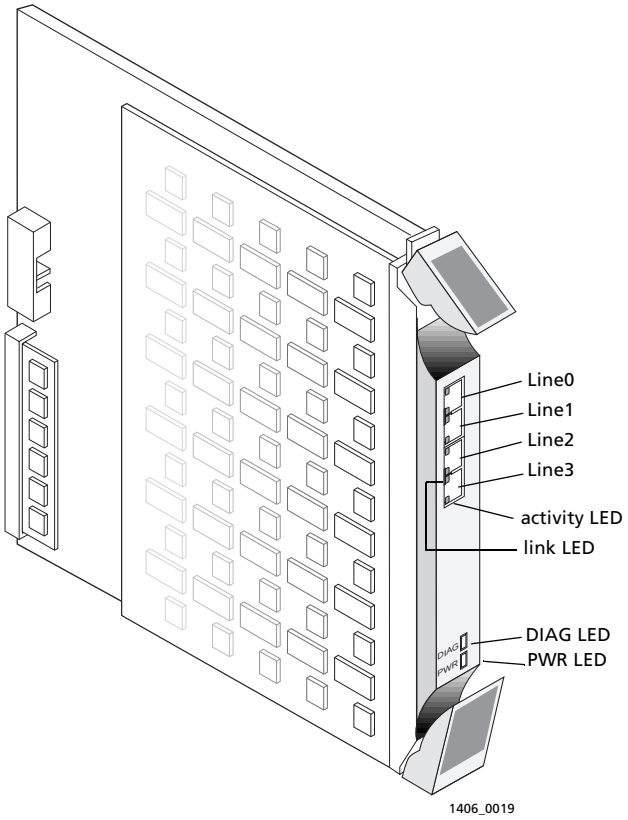
If you also have a T3 board installed, you can configure it to provide clocking to the backplane using the **set mux backplane-clock enable** command. To configure the T1 board to use clocking from the backplace, use the **set** *Line0* **clock backplane** command. For more information about these commands, see the *PortMaster 4 Command Line Reference*.

ISDN and hardwired connections are mostly immune to shifts in clocking frequency.

5. Connect lines to the RJ-45 ports of the T1 or E1 board (T1 with modems shown in Figure 5-4).

Ports are labeled Line0 through Line3 on a T1 board and Line0 through Line2 on an E1 board.

Figure 5-4 Quad T1 Board with Modems



6. Verify the following LED behavior:

a. The PWR LED at the bottom of the board is solidly lit.

b. The amber DIAG LED at the bottom of the board blinks three times per second during startup and then stays solidly lit with a 1-second interruption every 5 seconds.

DIAG LED behavior might vary according to the version of ComOS you are running.

c. The green link LED next to the RJ-45 port for each T1 or E1 connection is **on** when a carrier is present and **off** when no carrier is present.

d. The amber activity LED next to the RJ-45 port for each T1 or E1 connection is **off** when a carrier is present and **on** when no carrier is present.

See "Troubleshooting LED Behavior on a Quad T1 or Tri E1 Board" on page 5-7 if any LED fails to behave properly.

7. If you have finished inserting boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.

Troubleshooting LED Behavior on a Quad T1 or Tri E1 Board

Figure 5-1 identifies problem-indicating LED behavior on a T1 or E1 board, possible causes of the behavior, and possible solutions.

Table 5-1 Hardware Problems and Solutions on a T1 or E1 Board

Problem	Possible Cause	Possible Solution
A T1, E1, or ISDN PRI line is connected to a T1 or E1 port and the amber activity T1 or E1 LED stays lit.	The PortMaster 4 does not recognize service from the telephone company.	Contact the telephone company.
Green link LED and amber activity LED are both lit	• On a PRI line, the D channel might be having problems, or a frame error might have occurred.	• Call Lucent Remote Access Technical Support.
	• On a channelized T1 or E1 line, a frame error might have occurred.	• Use the **show** *W1* command to check for frame errors and correct the clock signal if necessary.
All LEDs fail to light.	Power is not present.	Check the power switch, power cable, outlet, and fuse. For instructions on checking and changing the fuse in the AC version, see "Replacing a Fuse" on page 4-10. Contact Lucent Remote Access Technical Support if power is not present on the DC version.
Amber DIAG LED on a T1 or E1 board does not light.	Board malfunction.	Contact Lucent Remote Access Technical Support.
During startup, the DIAG LED on a T1 or E1 board fails to light, stays lit, or blinks three times per second continuously.	A hardware problem has occurred.	Contact Lucent Remote Access Technical Support.
Immediately after booting, the DIAG LED on a T1 or E1 board stays solidly lit or does not light. This behavior does not refer to the boot sequence, during which the DIAG LED on a T1 or E1 board is not lit for between 5 and 7 seconds.	A component might have loosened during shipping.	Remove the T1 or E1 board from the PortMaster 4 chassis and verify that the SIMM is firmly seated. If the SIMM is seated properly but the problem is not fixed, refer to "Observing Boot Messages" on page 4-3, and boot in console mode. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.

Table 5-1 Hardware Problems and Solutions on a T1 or E1 Board *(Continued)*

Problem	Possible Cause	Possible Solution
During operation, the DIAG LED on a T1 or E1 board stays solidly lit or does not light.	A hardware problem might have been caused by an external device.	If the LED stays solidly lit or does not light after you have removed all external devices, contact Lucent Remote Access Technical Support.
An undefined problem occurred at startup, but the cause cannot be determined from LED behavior.	Refer to the solution column.	Try booting in console mode, and observe the boot messages. See "Observing Boot Messages" on page 4-3. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.

Replacing a Failed Board

In the event of a board failure, you can replace a failed board with a functional one without having to reconfigure the new board. The configuration is attached to the slot in which the board resides. See "Replacing a Failed Module or Line Board" on page 4-7 for instructions. The configuration settings reside in the system manager board. Nonvolatile RAM is loaded when you insert the board and turn it on with the **set** *Slot0* **on** command.

Installing Memory on a Quad T1 or Tri E1 Board

Follow these instructions to upgrade or replace a single inline memory module (SIMM).

Each T1 or E1 board ships with one 4MB socketed single inline memory module (SIMM) of dynamic RAM.

Note – The PortMaster 4 does not support extended data output (EDO) dynamic RAM.

Required Equipment

- ❑ One socketed SIMM with 72 pins, 70-nanosecond-or-better speeds, and no parity

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

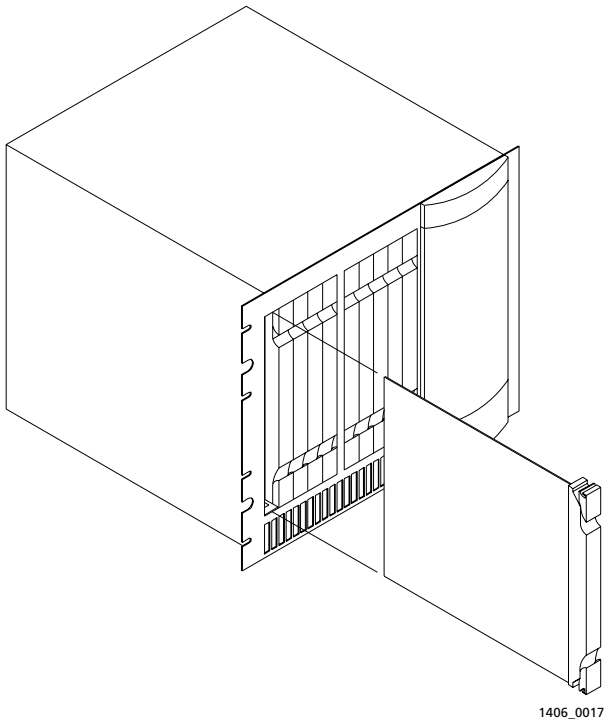
1. **Enter the following command to turn off power to the T1 or E1 board you are upgrading:**

   ```
   Command> set Slot0 off
   ```

   Replace *Slot0* with the number of the slot in which the board is installed.

2. **Disconnect all connectors from the board.**
3. **Open the top and bottom tabs on the board, and remove it from the slot in the PortMaster 4 chassis (Figure 5-5).**

Figure 5-5 Removing a T1 or E1 Board



4. **Locate the SIMM socket.**

   On the T1 and E1 boards, the socket is located in the rear left quadrant of the board.

5. **Pull the levers on either side of the SIMM socket away from the SIMM.**

   If the SIMM does not pop up on its own, gently pull it up to about a 45-degree angle.

6. **Pull the old SIMM out of its socket and put it in a static-free bag.**
7. **Insert the new SIMM into the SIMM socket.**

   The SIMM has pin 1 on the left side. Generally, 72-pin SIMMs have a notch that allows them to be inserted only one way. Make sure that the SIMM is completely pushed into the socket.

8. **With even pressure, push down on the SIMM until the side levers engage.**

   The holes on either side of the SIMM must line up with holes in the SIMM socket.

9. **Carefully reinstall the board into the PortMaster 4, being careful to close the top and bottom tabs and reconnect all connectors.**

   See "Installing a Quad T1 or Tri E1 Board" on page 5-2 for detailed instructions if necessary.

10. Enter the following command to turn on power to the board:

```
Command> set Slot0 on
```

Replace *Slot0* with the number of the slot in which the board is installed.

Quad T1 and Tri E1 Board Physical Specifications

Table 5-2 and Table 5-3 identify the physical specifications that apply to the Quad T1 and Tri E1 boards. For physical specifications for core PortMaster 4 components, see Appendix B, "Physical Specifications for Core Components."

Table 5-2 Interface Specifications

Interface	Specification
T1/PRI	RJ-45
E1/PRI	RJ-45

Table 5-3 Electrical Specifications

Parameter	Specification
Memory	4MB RAM

T3 Multiplexer (Mux) Boards 6

This chapter provides installation, troubleshooting, and maintenance information as follows for the channelized T3 Mux boards.

T3 Mux Board Description

Each channelized T3 Mux board contains an integral CSU and accepts a single DS-3 interface through the use of a pair of BNC connectors. This board provides a similar function to an M13 multiplexer by demultiplexing the channelized T3 line into 28 individual T1 lines that are terminated on installed Quad T1 boards. The T3 Mux board supports M13 framing format and converts bipolar 3-zero substitution (B3ZS) line encoding to nonreturn to zero (NRZ) digital DS-3 signaling.

The board can demultiplex any individual T1 stream over the virtual backplane to any installed Quad T1 board. To fully demultiplex a T3 line, you must have seven Quad T1 boards installed.

The T3 Mux board can provide internal clocking or receive clocking externally at the DS-1 clocking rate of 1.544Mbps.

Installing a T3 Mux Board

Follow these instructions to install a channelized T3 Mux board.

Note – Because the T3 Mux board is hot-swappable, you can install it while the PortMaster 4 is turned on and running.

Caution – Do not remove the T3 Mux board while it is turned on. Doing so can cause the system manager module's ATM matrix to suspend operation, requiring you to reboot the PortMaster 4 to restore operation. Before removing the T3 Mux board from the PortMaster 4 chassis, use the **set** *Slot0* **off** command to turn off power to the board. Replace *Slot0* with the number of the slot in which the board is installed.

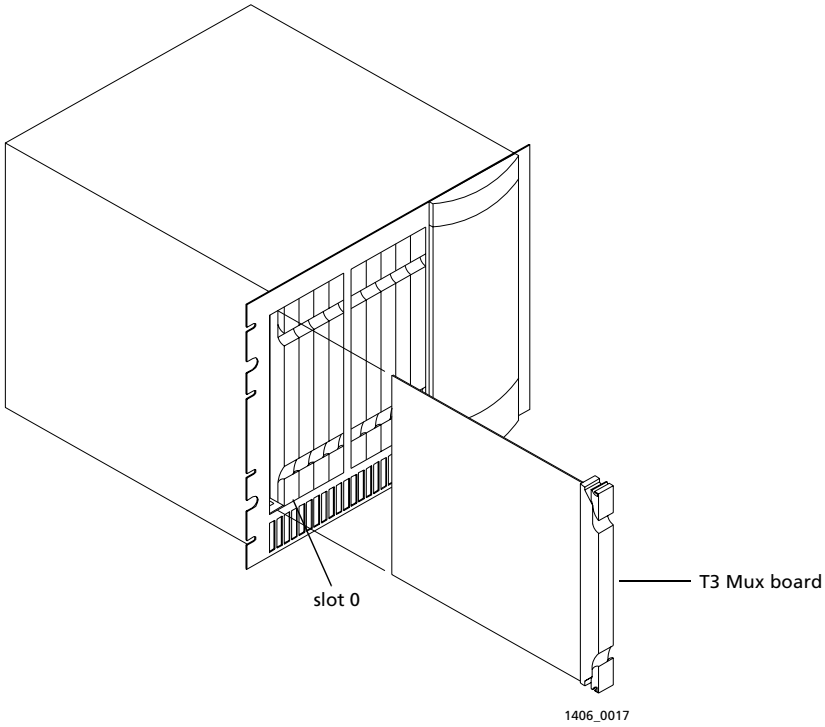
Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Line up the edge of the board with the card guide in any slot except slot 4 (Figure 6-1).**

   Slots are numbered 0 through 9 from left to right. Slot 4 is reserved for the manager module.

Figure 6-1 Installing a T3 Mux Board



2. **Insert the board in the slot and gently guide it into the slot.**

   If you have trouble sliding the board into the card guide, gently wiggle it back and forth to help it slide in.

3. **When the board is completely inserted in the slot, close the top and bottom tabs so they are flush with the face of the chassis.**

   Closing the tabs causes the board to connect with the backplane.

4. **After you finish installing boards or modules in the PortMaster 4, ensure that every slot contains either a working board or blank board.**

   See "Cover Empty Slots with Blank Modules" on page 2-20.

Connecting a T3 Line

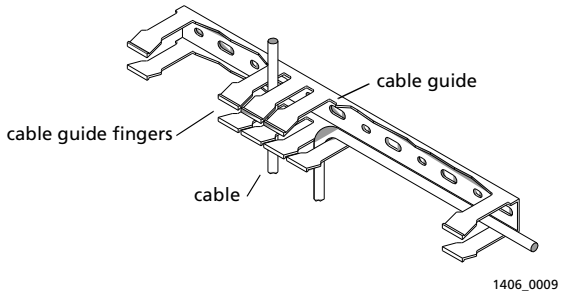
Required Equipment

- ❑ Shielded coaxial cables with 75-ohm impedance and BNC connectors (See "T3 Mux Board Physical Specifications" on page 6-6 for more information.)

Procedure

1. **Remove the cover from the cable guide, if necessary.**
2. **Run the cable through the cable guide duct until it is directly over the channelized T3 Mux board.**
3. **Pull the cable through the fingers of the cable guide duct as shown in Figure 6-2.**

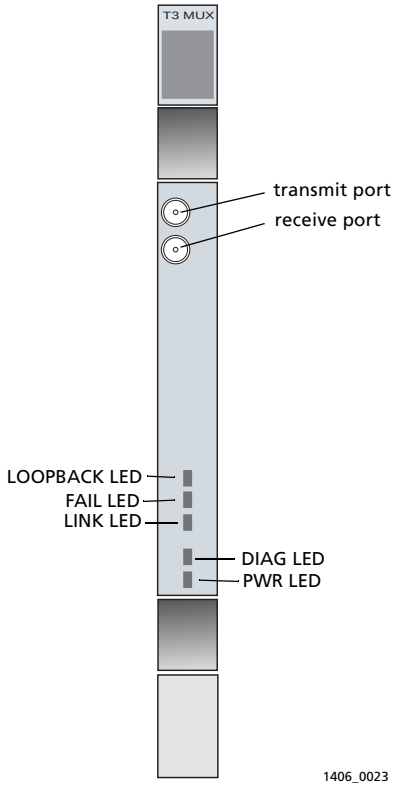
Figure 6-2 Pulling a Cable through the Cable Guide



4. **Connect lines to the BNC connectors of the T3 Mux board.**

   Each T3 connection consists of one transmit line and one receive line. See Figure 6-3 for connector locations.

Figure 6-3 T3 Mux Board



5. Verify the following LED behavior:

a. The PWR LED at the bottom of the board is solidly lit.

b. The amber DIAG LED at the bottom of the board blinks three times per second during startup and then stays solidly lit with a 1-second interruption every 5 seconds.

DIAG LED behavior might vary according to the version of ComOS you are running.

c. The green FAIL LED is not lit.

d. The amber LINK LED is lit.

See "Troubleshooting LED Behavior on a T3 Mux Board" on page 6-5 if any LED fails to behave properly.

6. If you have finished inserting boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.

For information on demultiplexing the T3 line to the installed Quad T1 boards, see the *PortMaster 4 Configuration Guide*.

Troubleshooting LED Behavior on a T3 Mux Board

Table 6-1 identifies problem-indicating LED behavior on a channelized T3 Mux board, possible causes of the behavior, and possible solutions. For LED locations, see Figure 6-3.

Table 6-1 Hardware Problems and Solutions on a T3 Mux Board

Problem	Possible Cause	Possible Solution
All LEDs fail to light.	Power is not present.	Check the power switch, power cable, outlet, and fuse. For instructions on checking and changing the fuse in the AC version, see "Replacing a Fuse" on page 4-10. Contact Lucent Remote Access Technical Support if power is not present on the DC version.
Amber DIAG LED on a T3 Mux board does not light.	Board malfunction.	Contact Lucent Remote Access Technical Support.
During startup, the DIAG LED on a T3 Mux board fails to light, stays lit, or blinks three times per second continuously.	A hardware problem has occurred.	Contact Lucent Remote Access Technical Support.
During operation, the DIAG LED on a T3 Mux board stays solidly lit or does not light.	A hardware problem might have been caused by an external device.	If the LED stays solidly lit or does not light after you have removed all external devices, contact Lucent Remote Access Technical Support.
The amber LOOPBACK LED is lit.	The T3 line is in loopback.	If the loopback setting is in error, use the **set mux line-loop off** command to clear the loopback. See the *PortMaster 4 Command Line Reference* for more information.
The green FAIL LED is lit.	No line is connected.	Check that the cables are securely fastened to the ports.
The amber LINK LED is not lit.	There is no DS-3 link.	Verify that all cables are securely fastened. This behavior might indicate a nonfunctioning line. Contact the telephone company.
An undefined problem occurred at startup, but the cause cannot be determined from LED behavior.	Refer to the solution column.	Try booting in console mode, and observe the boot messages. See "Observing Boot Messages" on page 4-3. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.

Replacing a Failed Board

In the event of a board failure, you can replace a failed board with a functional one without having to reconfigure the new board. The configuration is attached to the slot in which the board resides. See "Replacing a Failed Module or Line Board" on page 4-7 for instructions. The configuration settings reside in the system manager board. Nonvolatile RAM is loaded when you insert the board and turn it on with the **set** *Slot0* **on** command.

T3 Mux Board Physical Specifications

Table 6-2 and Table 6-3 identify physical specifications for transmitter and receiver connections to the channelized T3 Mux boards. For physical specifications for core PortMaster 4 components, see Appendix B, "Physical Specifications for Core Components."

Table 6-2 Receiver Specifications

Parameter	Specification
Interface cable	AT&T 728A or 734A coaxial
Connector	External BNC
DS-3 clocking rates	44.736Mbps +/- 20 parts (errors) per million clock cycles (ppm)
Input signal amplitude	100 millivolts peak to peak (mVp) minimum to 950mVp maximum AC (differential input)
Input return loss	Greater than 26dB at 22.368MHz with an external 75-ohm resistor.
Input resistance	Greater than 5000 ohms
Cable length	0 to 900 feet (0 to 274 meters), adaptive equalization

Table 6-3 Transmitter Specifications

Parameter	Specification
Interface cable	AT&T 728A or 734A coaxial
Connector	External BNC
Cable length	50 to 450 feet (15 to 137 meters)

Standalone Ethernet Boards 7

This chapter provides installation, troubleshooting, and maintenance information as follows for a standalone Ethernet module and board:

Standalone Ethernet Board Description

The PortMaster 4 supports two standalone Ethernet boards: a single-interface board and a dual-interface module. The single-interface board can be inserted into any slot—except slot 4, which is reserved for the manager module. The dual-interface standalone Ethernet module, which consists of two boards, must be inserted into slot 3 because slot 3 has more backplane width. A single PortMaster 4 can have only one dual-interface Ethernet module.

Numbering of Standalone Ethernet Interfaces

The interfaces on a standalone Ethernet board or module have two-digit numbers that correspond to the slot in which they are installed:

- On a dual-interface Ethernet module, the interfaces are always numbered *Ether30* and *Ether31* because the module must be installed in slot 3.

  Although physically installed in slot 3, the Ether31 interface is monitored and reset thorough virtual slot 11.

- On a single-interface Ethernet board, the interface can be have any of the following numbers because this board can be installed in any slot except slot 4: *Ether00, Ether10, Ether20, Ether30, Ether50, Ether60, Ether70, Ether80*, or *Ether90*.

Standalone Ethernet Characteristics

The standalone Ethernet interfaces have the following characteristics:

- Communicate with the manager board over the passive ATM backplane
- Supported by a CPU for inbound data and a CPU for outbound data
- Are generally used to configure network traffic

Installing a Standalone Ethernet Board

Follow these instructions to install a standalone Ethernet board.

Note – Because the Ethernet board is hot-swappable, you can install it while the PortMaster 4 is turned on and running.

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

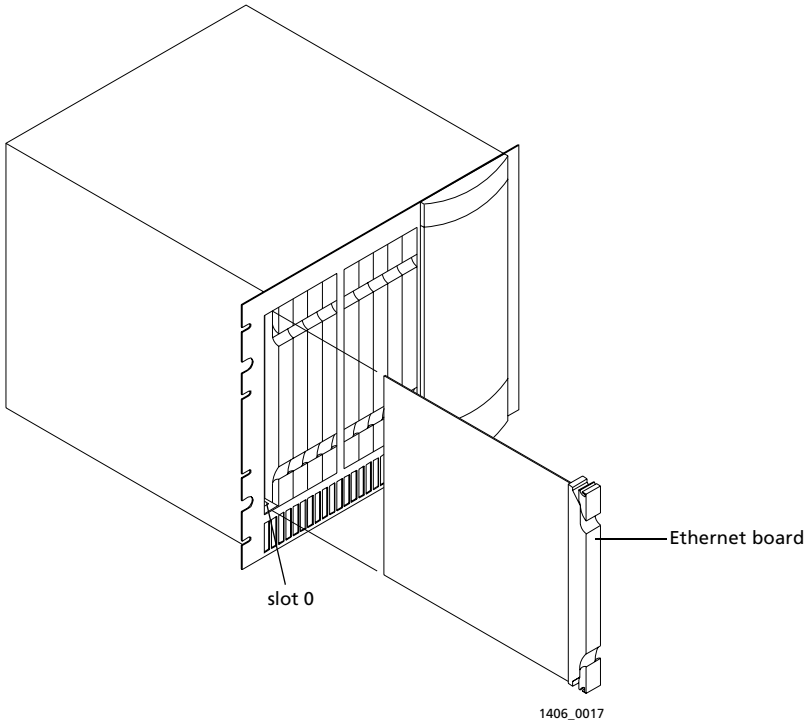
1. **Line up the edge of the board with the card guide in the appropriate slot.**

   – If you are installing a single-interface Ethernet board, you can use any slot except slot 4 (Figure 7-1).

   – If you are installing a dual-interface Ethernet module, you must install it in slot 3.

   Slots are numbered 0 through 9 from left to right. Slot 4 is reserved for the manager module.

Figure 7-1 Installing a Standalone Ethernet Board



2. **Insert the board in the slot and gently guide it into the slot.**

   If you have trouble sliding the board into the card guide, gently wiggle it back and forth to help it slide in.

3. **When the board is completely inserted in the slot, close the top and bottom tabs so they are flush with the face of the chassis.**

   Closing the tabs causes the board to connect with the backplane.

4. **After you finish installing boards or modules in the PortMaster 4, ensure that every slot contains either a working board or blank board.**

   See "Cover Empty Slots with Blank Modules" on page 2-20.

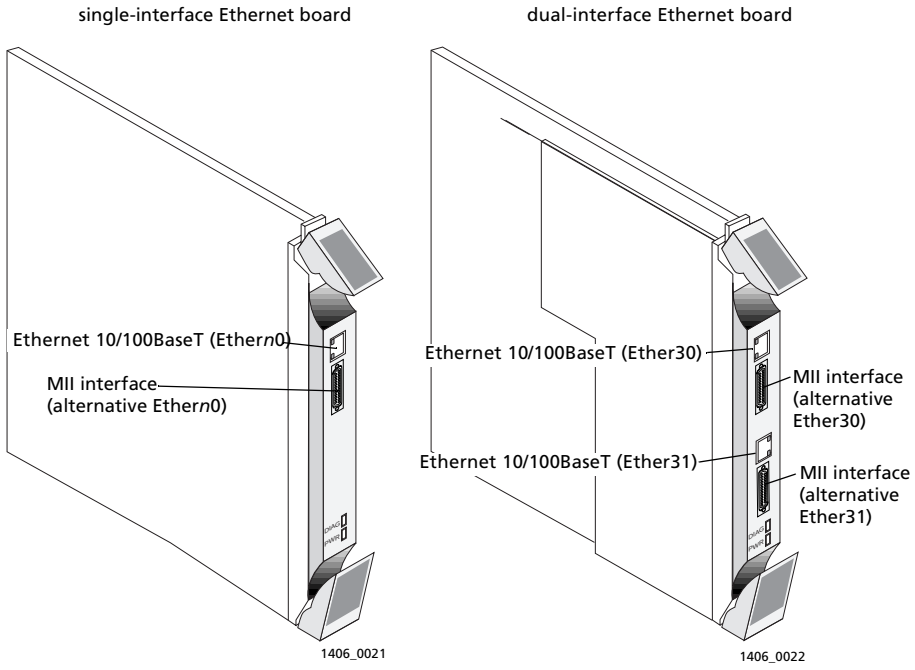
Connecting an 10/100BaseT Ethernet Cable

A standalone Ethernet board has the following Ethernet connections:

- 10/100BaseT—The single Ethernet board has one RJ-45 interface (labeled Ether*n0* in Figure 7-2), and the dual Ethernet module has two (labeled Ether30 and Ether31).
- Media-independent interface (MII)—This interface is used to connect other wiring types (copper or fiber, for example) to the 10/100BaseT Ethernet. Devices attached to the MII interface must be MII-compliant. The single Ethernet board has one MII, and the dual Ethernet module has two (labeled alternative Ether30 and alternative Ether31).

If both the RJ-45 interface and MII are connected, the PortMaster 4 uses the MII.

Figure 7-2 Single-Interface and Dual-Interface Ethernet Boards



Follow these instructions to connect an Ethernet cable to the Ethernet 10/100BaseT interface.

Required Equipment

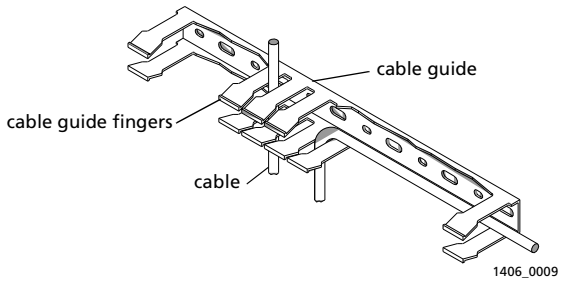
One of the following:

- ❑ Category 5 twisted pair cable, as specified by the EIA/TIA-568-B wiring standard, with an RJ-45 connector (See "RJ-45 Cable" on page A-2 and "Ethernet Cable Specifications" on page A-3 for more information.)
- ❑ MII cable with an MII connector

Procedure

1. **Remove the cover from the cable guide, if necessary.**
2. **Run the cable through the cable guide duct until it is directly over the standalone Ethernet board or module.**
3. **Pull the cable through the fingers of the cable guide duct as shown in Figure 7-3.**

Figure 7-3 Pulling a Cable through the Cable Guide



4. **Connect the cable to the Ethernet RJ-45 connector or MII connector (see Figure 7-2).**
5. **Verify the following LED behavior:**
   a. The PWR LED at the bottom of the board or module is solidly lit.
   b. The amber DIAG LED at the bottom of the board blinks three times per second during startup and then stays solidly lit with a 1-second interruption every 5 seconds.

      DIAG LED behavior might vary according to the version of ComOS you are running.

   c. The green link LED next to the RJ-45 interface is solidly lit for each Ethernet connection.
   d. The amber network LED next to the RJ-45 interface blinks when Ethernet traffic is present.

See "Troubleshooting LEDs on a Standalone Ethernet Board" on page 7-5 if any LED fails to behave properly.

6. **If you have finished inserting modules and boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.**

Troubleshooting LEDs on a Standalone Ethernet Board

Figure 7-1 identifies problem-indicating LED behavior on a standalone single-interface Ethernet board or dual-interface Ethernet module, possible causes of the behavior, and possible solutions.

Table 7-1 Standalone Ethernet Hardware Problems and Solutions

Problem	Possible Cause	Possible Solution
All LEDs fail to light.	Power is not present.	Check the power switch, power cable, outlet, and fuse. For instructions on checking and changing the fuse in the AC version, see "Replacing a Fuse" on page 4-10. Contact Lucent Remote Access Technical Support if power is not present on the DC version.
Amber DIAG LED on a standalone Ethernet board does not light.	Board malfunction.	Contact Lucent Remote Access Technical Support.
During startup, the DIAG LED on a standalone Ethernet board fails to light, stays lit, or blinks three times per second continuously.	A hardware problem has occurred.	Contact Lucent Remote Access Technical Support.
During operation, the DIAG LED on a standalone Ethernet board stays solidly lit or does not light.	A hardware problem might have been caused by an external device.	If the LED stays solidly lit or does not light after you have removed all external devices, contact Lucent Remote Access Technical Support.

Table 7-1 Standalone Ethernet Hardware Problems and Solutions *(Continued)*

Problem	Possible Cause	Possible Solution
Link LED on a standalone Ethernet board is not lit when connected to a 10/100BaseT Ethernet hub.	There is no link integrity.	Check the connection to the hub.
Network (amber) LED on a standalone Ethernet board is solidly lit.	Heavy traffic can cause the network LED to blink so rapidly that it appears to be solidly lit. However, if packets cannot be passed, you might have an incorrectly cabled network.	Verify that the network cabling is correct.
Network (amber) LED on a standalone Ethernet board is not lit.	If the PortMaster 4 is not receiving, or sending traffic, the network LED is not lit.	Verify that the network cabling is correct.
An undefined problem occurred at startup, but the cause cannot be determined from LED behavior.	Refer to the solution column.	Try booting in console mode, and observe the boot messages. See "Observing Boot Messages" on page 4-3. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.

Replacing a Failed Board

In the event of a board failure, you can replace a failed board with a functional one without having to reconfigure the new board. The configuration is attached to the slot in which the board resides. See "Replacing a Failed Module or Line Board" on page 4-7 for instructions. The configuration settings reside in the system manager board. Nonvolatile RAM is loaded when you insert the board and turn it on with the **set** *Slot0* **on** command.

LNS Boards 8

This chapter provides installation, troubleshooting, and maintenance information as follows for the Layer 2 Tunneling Protocol (L2TP) network server (LNS) boards:

LNS Board Description

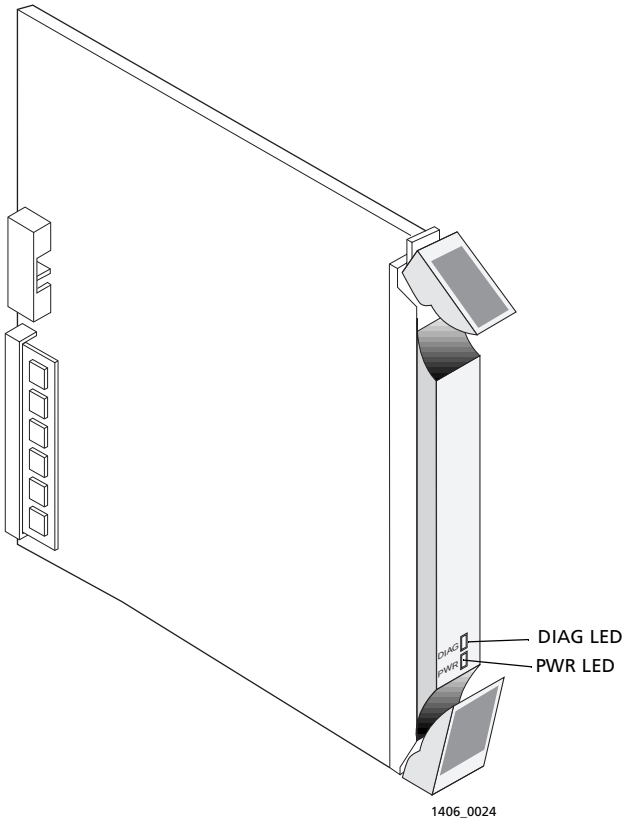
The Layer 2 Tunneling Protocol (L2TP) allows PPP frames to be tunneled across an IP network from one PortMaster that answers the call—the L2TP access concentrator (LAC)—to another PortMaster that processes the PPP frames—the L2TP network server (LNS).

The LNS board has its own microprocessor, with 32MB of dynamic RAM, which holds ComOS and the operational settings for the board.

Installing an LNS Board

Follow these instructions to install an LNS board (Figure 8-1).

Figure 8-1 LNS Board



Note – Because LNS boards are hot-swappable, you can install an LNS board while the PortMaster 4 is turned on and running.

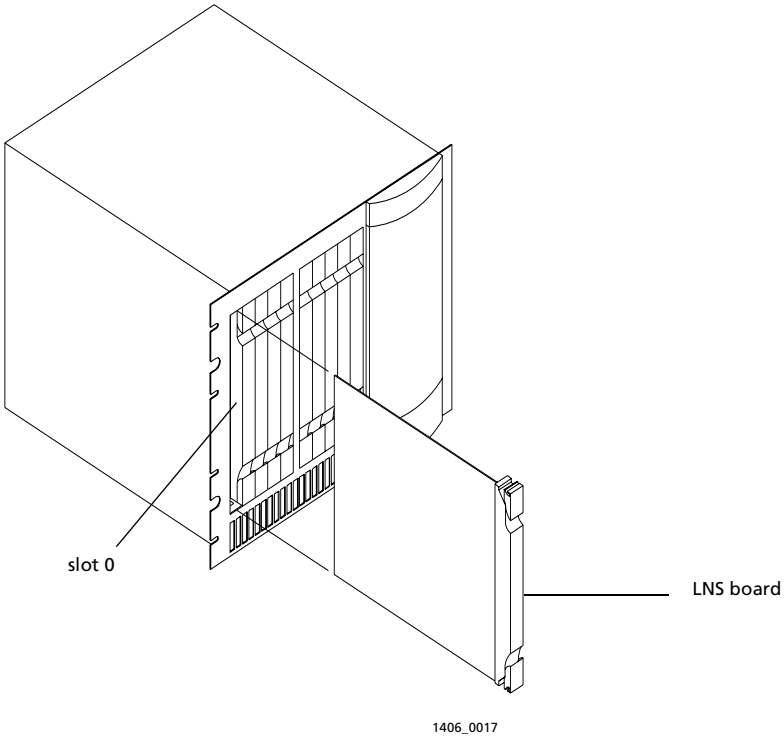
Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Line up the edge of the board with the card guide in any slot except slot 4 (Figure 8-2).**

   Slots are numbered 0 through 9 from left to right. Slot 4 is reserved for the manager module.

Figure 8-2 Installing an LNS Board



2. **Insert the board in the slot and gently guide it into the slot.**

   If you have trouble sliding the board into the card guide, gently wiggle it back and forth to help it slide in.

3. **When the board is completely inserted in the slot, close the top and bottom tabs so they are flush with the face of the chassis.**

   Closing the tabs causes the board to connect with the backplane.

4. **After you finish installing boards or modules in the PortMaster 4, ensure that every slot contains either a working board or blank board.**

   See "Cover Empty Slots with Blank Modules" on page 2-20.

Troubleshooting LED Behavior on an LNS Board

Figure 8-1 identifies problem-solving LED behavior on an LNS board, possible causes of the behavior, and possible solutions.

Table 8-1 Hardware Problems and Solutions on an LNS Board

Problem	Possible Cause	Possible Solution
DIAG and POWER LEDs fail to light.	Power is not present.	Check the power switch, power cable, outlet, and fuse. For instructions on checking and changing the fuse in the AC version, see "Replacing a Fuse" on page 4-10. Contact Lucent Remote Access Technical Support if power is not present on the DC version.
Amber DIAG LED on an LNS board does not light.	Board malfunction.	Contact Lucent Remote Access Technical Support.
During startup, the DIAG LED on an LNS board fails to light, stays lit, or blinks three times per second continuously.	A hardware problem has occurred.	Contact Lucent Remote Access Technical Support.
Immediately after booting, the DIAG LED on an LNS board stays solidly lit or does not light. This behavior does not refer to the boot sequence, during which the DIAG LED on an LNS board is not lit for between 5 and 7 seconds.	A component might have loosened during shipping.	Remove the LNS board from the PortMaster 4 chassis and verify that the SIMM is firmly seated. If the SIMM is seated properly and the problem is not fixed, refer to "Observing Boot Messages" on page 4-3, and boot in console mode. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.
During operation, the DIAG LED on an LNS board stays solidly lit or does not light.	A hardware problem might have been caused by an external device.	If the LED stays solidly lit or does not light after you have removed all external devices, contact Lucent Remote Access Technical Support.
An undefined problem occurred at startup, but the cause cannot be determined from LED behavior.	Refer to the solution column.	Try booting in console mode, and observe the boot messages. See "Observing Boot Messages" on page 4-3. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.

Replacing a Failed Board

In the event of a board failure, you can replace a failed board with a functional one without having to reconfigure the new board. The configuration is attached to the slot in which the board resides. See "Replacing a Failed Module or Line Board" on page 4-7 for instructions. The configuration settings reside in the system manager board. Nonvolatile RAM is loaded when you insert the board and turn it on with the **set** *Slot0* **on** command.

Installing Memory on an LNS Board

Follow these instructions to upgrade or replace a single inline memory module (SIMM).

Each LNS board ships with one 8MB socketed single inline memory module (SIMM) of dynamic RAM.

Required Equipment

- ❑ One socketed SIMM with 72 pins, 70-nanosecond-or-better speeds, and no parity

Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Enter the following command to turn off power to the LNS board you are upgrading:**

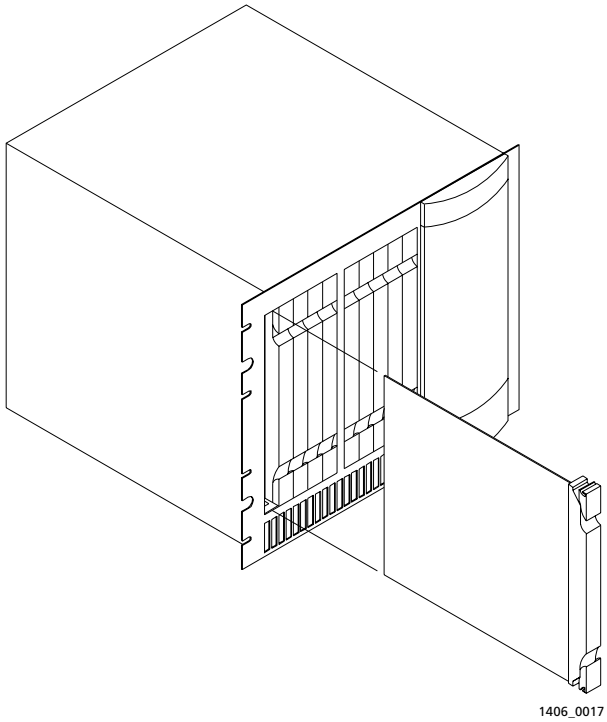
   ```
   Command> set Slot0 off
   ```

   Replace *Slot0* with the number of the slot in which the board is installed.

2. **Disconnect all connectors from the board you are upgrading.**

3. **Open the top and bottom tabs on the module or board, and remove it from the slot in the PortMaster 4 chassis (Figure 8-3).**

Figure 8-3 Removing an LNS Board



4. **Locate the SIMM socket.**

   On the LNS board, the socket is located in the rear left quadrant of the board.

5. **Pull the levers on either side of the SIMM socket away from the SIMM.**

   If the SIMM does not pop up on its own, gently pull it up to about a 45-degree angle.

6. **Pull the old SIMM out of its socket and put it in a static-free bag.**

7. **Insert the new SIMM into the SIMM socket.**

   The SIMM has pin 1 on the left side. Generally, 72-pin SIMMs have a notch that allows them to be inserted only one way. Make sure that the SIMM is completely pushed into the socket.

8. **With even pressure, push down on the SIMM until the side levers engage.**

   The holes on either side of the SIMM must line up with holes in the SIMM socket.

9. **Carefully reinstall the module into the PortMaster 4, being careful to close the top and bottom tabs and reconnect all connectors.**

   See "Installing an LNS Board" on page 8-1 for detailed instructions if necessary.

10. **Enter the following command to turn on power to the board:**

    ```
    Command> set Slot0 on
    ```

    Replace *Slot0* with the number of the slot in which the board is installed.

LNS Board Physical Specifications

Table 8-2 identifies the physical specifications that apply to the LNS board. For physical specifications for core PortMaster 4 components, see Appendix B, "Physical Specifications for Core Components."

Table 8-2 Electrical Specifications

Parameter	Specification
Memory	32MB RAM

STS-1 Multiplexer (Mux) Boards 9

This chapter provides installation, configuration, troubleshooting, and maintenance information for the STS-1 Mux boards.

STS-1 Mux Board Description

The Synchronous Transport Signal level 1 (STS-1) Mux board is designed to integrate a PortMaster 4 into a switching installation of a telecommunications service provider. STS-1 is the basic signal for the Synchronous Optical Network (SONET), defined by the Bellcore standard GR-253-CORE.

The STS-1 signal uses synchronous byte-interleaved multiplexing to transfer its payload. The payload is the portion of the SONET signal that is available to carry DS-1 signals. The payload contents of the STS-1 circuit consists of the STS path overhead (POH) and a synchronous payload envelope (SPE) from a virtual tributary (VT). The STS POH is used to communicate the location where the payload is mapped to, and the STS-1 SPE is used to deliver the payload. STS-1 circuits operate at 51.840Mbps, carrying 28 DS-1 signals in the form of 28-byte mapped VTs. The interleaved VTs travel at 1.728Mbps.

Each DS-1 is demultiplexed within the STS-1 board at the VT-1.5 rate of 1.728Mbps, using information from the SPE to map each DS-1 signal onto the PortMaster 4 ATM backplane. Four DS-1 channels are mapped to each Quad T1 board. To demultiplex all 28 DS-1 signals, a PortMaster 4 must have seven Quad T1 boards installed.

The physical interface on the STS-1 board consists of two 75-ohm coaxial BNC connectors that provide one line for transmitting and one for receiving.

Note – Lucent recommends that you use the STS-1 Mux board with external clocking. Because the STS-1 signal is synchronous, all clocks in the system have the same constant frequency. The STS-1 rate remains at 51.84Mbps, allowing many synchronous STS-1 signals to be stacked together when multiplexed.

Installing an STS-1 Mux Board

Follow these instructions to install an STS-1 Mux board.

Note – Because the STS-1 Mux board is hot-swappable you can install an STS-1 Mux board while the PortMaster 4 is turned on and running.

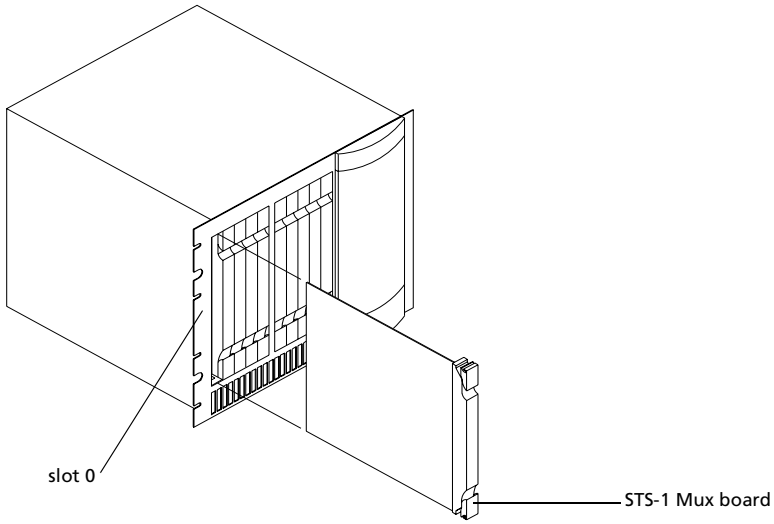
Procedure

Warning – To avoid damaging the internal components of the PortMaster 4, follow antistatic precautions by wearing a grounding wrist strap. See "Grounding Wrist Strap Instructions" on page 2-3.

1. **Line up the edge of the STS-1 Mux board with the card guide in slot 0. (Figure 9-1).**

   Slots are numbered 0 through 9 from left to right. Slot 0 is reserved for the STS-1 Mux board, and slot 4 is reserved for the system manager module.

Figure 9-1 Installing an STS-1 Mux Board



2. **Insert the STS-1 Mux board in slot 0 and gently guide it into the slot.**

   If you have trouble sliding the board into the card guide, gently move it back and forth to help it slide in.

3. **When the board is completely inserted in slot 0, close the top and bottom brackets so they are flush with the face of the chassis.**

   Closing the tabs causes the board to connect with the backplane.

4. **After you finish installing boards or modules in the PortMaster 4, ensure that every slot contains either a working board or blank board.**

   See "Cover Empty Slots with Blank Modules" on page 2-20.

Connecting an STS-1 Line

Follow these instructions to connect an STS-1 line.

Note – This procedure does not cover instructions for provisioning the switch or the data networks to support the PortMaster 4. For more specific information on how to provision your data network or switch, contact your telecommunications service provider.

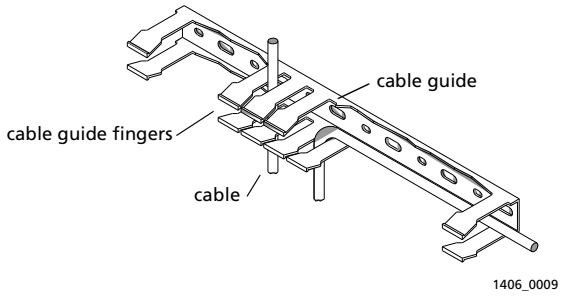
Required Equipment

- ❑ Two BNC shielded coaxial cable connectors with 74-ohm impedance and BNC-to-BNC connections on each end. (See "STS-1 Mux Board Physical Specifications" on page 9-8 for more information.)

Procedure

1. **Remove the cover from the cable guide, if necessary.**
2. **Run the cable through the cable guide duct until it is directly over the STS-1 Mux board.**
3. **Pull the cable through the fingers of the cable guide duct as shown in Figure 9-2.**

Figure 9-2 Pulling a Cable through the Cable Guide



4. **Connect the coaxial cables to the BNC connectors of the STS-1 Mux board.**

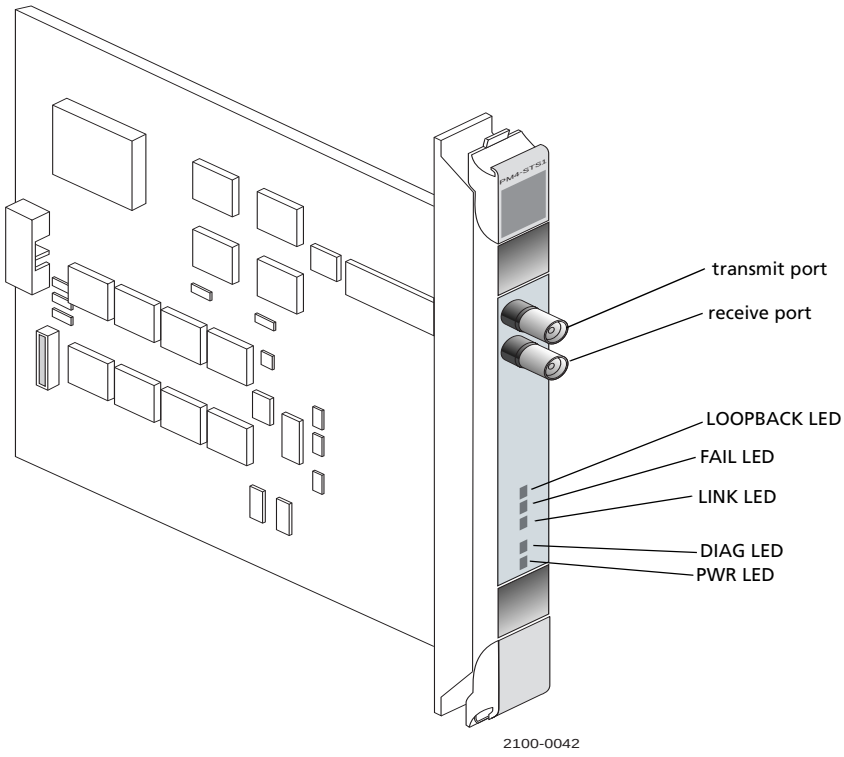
5. **Connect the other end of the BNC connectors to the STS-1 BNC connections on the STS-1 circuit source equipment.**

   Each STS-1 cable connection consists of one transmit line and one receive line. See Figure 9-3 for connector locations, LED status indicators, and a view of the motherboard.

   The term *circuit source equipment* refers to a Digital Network Unit SONET (DNU-S) or a digital cross-connect for DS-1 signals (DSX-1).

   Most installations of the STS-1 board require that the cable lines connect the transmit port of the STS-1 Mux board to the receive port of the circuit source equipment, and the receive port of the STS-1 Mux board to the transmit port of the circuit source equipment.

Figure 9-3 STS-1 Mux Board



6. **Verify the following LED behavior:**

   a. The PWR LED at the bottom of the board is solidly lit.

   b. The amber DIAG LED at the bottom of the board blinks three times per second during startup and then stays solidly lit with a 1-second interruption every 5 seconds.

      DIAG LED behavior might vary according to the version of ComOS you are running.

   c. The green FAIL LED is not lit.

d. The amber LINK LED is lit.

See "Troubleshooting LED Behavior on an STS-1 Mux Board" on page 9-7 if any LED fails to behave properly.

7. **If you have finished inserting boards and connecting lines, replace the cable guide cover by squeezing the duct fingers together with one hand, and sliding the cover over the duct fingers with the other.**

Configuring an STS-1 Mux Board

Use the commands in Table 9-1 to configure the STS-1 board and the Quad T1 boards to enable the transport of DS-1 T1 circuits over the PortMaster 4 ATM backplane. To fully demultiplex an STS-1 circuit you must have seven Quad T1 boards installed.

For more information about configuration settings, refer to the *PortMaster 4 Configuration Guide* and *PortMaster 4 Command Line Reference.*

Note – To activate the STS-1 Mux board, you must first configure Ether0 or Ether1 with an IP address.

Table 9-1 shows the STS-1 configuration commands.

Table 9-1 STS-1 Mux Board Configuration Commands

Action	Command Syntax	Event
Determine slot numbers.	• Command> **show slots**	This command identifies all boards loaded in the PortMaster 4, and determines each of their slot locations.
Configure the STS-1 clock source.	• Command> **set view 0**	To configure a specific board, you must enter the specific slot number in the **set view** command.
	• Command 0> **set mux line-clock external**	Set the STS-1 clock source to **external**—the default setting.
Configure each Quad T1 board.	• Command 0> **set view 1**	For each Quad T1 board, set the slot where it is installed—for example, slot 1.
	• Command 1> **set line0 clock backplane** • Command 1> **set line0 source 0:1**	Then assign a clock source to Quad T1 lines 0, 1, 2, and 3 on the Quad T1 boards from the ATM backplane of the PortMaster 4. Finally, map each T1 line for multiplexing to a DS-1 channel between 1 and 28 on the STS-1 Mux board. Each Quad T1 line is assigned a DS-1 T1 circuit from the STS-1 Mux board in slot 0.

Table 9-1 STS-1 Mux Board Configuration Commands *(Continued)*

Action	Command Syntax	Event
	• Command 1> **set line1 clock backplane**	
	• Command 1> **set line1 source 0:2**	
	• Command 1> **set line2 clock backplane**	
	• Command 1> **set line2 source 0:3**	
	• Command 1> **set line3 clock backplane**	
	• Command 1> **set line3 source 0:4**	
Save settings and reboot.	• Command 1> **set view 0**	You can save configuration settings and reboot the PortMaster 4 from any slot.
	• Command 1> **save all**	This command saves **all** configuration settings into nonvolatile RAM on the system manager module.
	• Command 1> **reboot**	To make all configurations active, a reboot is required.
Perform loopback testing.	• Command 1> **set view 0**	Set the view to the STS-1 board.
	• Command 0> **set mux line-loop auto|on|off**	This command initiates a loopback from the STS-1 board to the STS-1 circuit source to help determine the state of the STS-1 circuit.
	• Command 0> **set mux channel-loop** *Channel* **auto|on|off**	This command initiates a loopback from the STS-1 board for a specific DS-1 circuit back to the STS-1 circuit source. Replace *Channel* with the number of the DS-1 channel—between 1 and 28.
Debug the configuration.	• Command 0> **set debug mux**	This command activates the output of the STS-1 debug information.
	• Command 0> **set console**	This command directs all debug output to the command line screen of your session.
	• Command 0> **set debug off**	This command turns debug mode off.
	• Command 0> **reset console**	This command redirects all debug output to null.

Troubleshooting LED Behavior on an STS-1 Mux Board

Table 9-2 identifies problems-indicating LED behavior on an STS-1 Mux board, possible causes of the behavior, and possible solutions.

Table 9-2 Hardware Problems and Solutions on an STS-1 Mux Board

Problem	Possible Cause	Possible Solution
The green LINK LED is lit with no line connection.	Possible hardware failure.	Contact Lucent Technical Support.
All LEDs fail to light.	Power is not present.	Check to make sure the power switch is turned on, the power cable is connected, the boards are properly seated, and the fuse functions. For instructions on checking and changing the fuse, see "Replacing a Fuse" on page 4-10. If unable to diagnose contact Lucent Technical Support.
Amber DIAG LED on a STS-1 Mux board does not light.	STS-1 Mux board malfunction.	Contact Lucent Technical Support.
During startup, the DIAG LED on an STS-1 Mux board fails to light, stays lit, or blinks three times per second continuously.	A hardware problem has occurred.	Contact Lucent Technical Support.
During operation, the DIAG LED on an STS-1 Mux board stays solidly lit or does not light.	A hardware problem might have been caused by an external device.	If the LED stays solidly lit or does not light after you have removed all external devices, contact Lucent Technical Support.
The amber LOOPBACK LED is lit.	The STS-1 line is in loopback.	If the loopback setting is in error, use the **set mux line-loop off** command to clear the loopback. See the *PortMaster 4 Command Line Reference* for more information.
The green FAIL LED is lit.	No line is connected.	Check that the cables are securely fastened to the ports.
The amber LINK LED is not lit.	There is no STS-1 link.	Verify all switch connections and provisioning. This behavior might indicate a non functioning line. Contact the telephone company.

Table 9-2 Hardware Problems and Solutions on an STS-1 Mux Board *(Continued)*

Problem	Possible Cause	Possible Solution
An undefined problem occurred at startup, but the cause cannot be determined from LED behavior.	Refer to the solution column.	Try booting in console mode, and observe the boot messages. See "Observing Boot Messages" on page 4-3. If the boot messages do not suggest a solution, record the information and contact Lucent Technical Support.

Replacing a Failed Board

In the event of a board failure, you can replace a failed board with a functional one without having to reconfigure the new board. See "Replacing a Failed Module or Line Board" on page 4-7 for instructions. The configuration settings reside in the system manager board. Nonvolatile RAM is loaded when you insert the board and turn it on with the **set** *Slot0* **on** command.

STS-1 Mux Board Physical Specifications

Table 9-3 and Table 9-4 identify physical specifications for the transmitter and receiver connections on the STS-1 Mux boards. For physical specifications of the core PortMaster 4 components see Appendix B, "Physical Specifications for Core Components."

Table 9-3 Receiver Specifications

Parameter	Specification
Interface cable	AT&T 728A or 734A coaxial
Connector	External BNC, 75 ohms
VT1.5 clocking rates	51.840MHz +/- 20 parts (errors) per million clock cycles (ppm)
Input signal amplitude	100 millivolts peak to peak (mVp) minimum to 950mVp maximum AC (differential input)
Input return loss	Greater than 26dB at 22.369MHz with an external 74-ohm resistor.
Input resistance	Greater than 5000 ohms
Cable length (buildout)	0 to 900 feet (0 to 274 meters)

Table 9-4 Transmitter Specifications

Parameter	Specification
Connector	External BNC, 75 ohms
Cable length (buildout)	0 to 900 feet (0 to 274 meters)

Cable Specifications A

This appendix provides pinout and length information for the following cables used on the PortMaster 4 and specifications for cables used on PortMaster 4 Ethernet interfaces.

- **Modem Cable.** This cable is used to connect a data communication equipment (DCE) device (modem) to the C0 or C1 port. See page A-1.

  This cable is available from most computer equipment suppliers.

- **Console Cable.** Also known as a null-modem cable, this cable is used to connect a data terminal equipment (DTE) device (terminal) to the C0 port. See page A-2.

  This cable is available from most computer equipment suppliers.

- **RJ-45 Cable.** This cable is used to connect an Ethernet 10BaseT or 10/100BaseT line to an Ethernet port, or to connect a T1, channelized T1, E1, channelized E1 or ISDN PRI line to a T1 or E1 port. See page A-2.

Modem Cable

Table A-1 gives pinout specifications for an RS-232 modem cable with RJ-45 and DB-25 connectors.

Table A-1 Modem Cable Pinouts

PortMaster 4 Serial Port (C0, C1)				**PC or Terminal Serial Port**	
RJ-45	**Name**	**Definition**	**Direction**	**DB-25 (DTE)**	**Signal**
1	RTS	Request to Send	Output	5	CTS
2	DTR	Data Terminal Ready	Output	8[1]	DCD
3	TXD	Transmit Data	Output	3	RXD
4	GND	Signal Ground		NC[2]	
5	GND	Signal Ground		7	GND
6	RXD	Receive Data	Input	2	TXD
7	DCD	Data Carrier Detect	Input	20	DTR
8	CTS	Clear to Send	Input	4	RTS
NC[2]		Data Set Ready		6[1]	DSR

1. Pins 8 and 6 in the DB-25 connectors are connected internally.

2. Not connected.

Lucent recommends that the length of an RS-232 null-modem cable does not exceed 50 feet (15 meters).

Console Cable

Table A-2 gives pinout information for an RS-232 console (null modem) cable with RJ-45 and DB-25 connectors.

Table A-2 Console Cable Pinouts

PortMaster 4 Serial Port (C0, C1)				**External Modem**
RJ-45	**Name**	**Definition**	**Direction**	**DB-25 (DCE)**
1	RTS	Request to Send	Output	4
2	DTR	Data Terminal Ready	Output	20
3	TXD	Transmit Data	Output	2
4	GND	Signal Ground		NC[1]
5	GND	Signal Ground		7
6	RXD	Receive Data	Input	3
7	DCD	Data Carrier Detect	Input	8
8	CTS	Clear to Send	Input	5

1. Not connected.

Lucent recommends that the length of an RS-232 straight-through console cable does not exceed 50 feet (15 meters).

RJ-45 Cable

Table A-3 shows the pinout specifications for a Category 5 twisted pair cable, as specified by the ANSI/EIA-568-A wiring standard, with an RJ-45 connector—also known as a RJ-48C connector.

Table A-3 RJ-45 Cable Pinouts

PortMaster 4 Ethernet, T1, and E1 RJ-45 Ports			
RJ-45	**Signal**	**Definition**	**Direction to or from the PortMaster 4**
1	RXD (Ring)	Receive Data	Input
2	RXD (Tip)		
4	TXD (Ring)	Transmit Data	Output
5	TXD (Tip)		

See "Ethernet Cable Specifications" on page A-3 for more information.

Ethernet Cable Specifications

Table A-4 provides cable specifications for the PortMaster 4 Ethernet interface.

Table A-4 Ethernet Cable Specifications

Ethernet Type	**Connector Type**	**Cable Type**	**Transmission Distance**
RJ-45	RJ-45 for 10BaseT	Category 5 unshielded twisted pair[1]	A Category 5 distributed cable that meets the ANSI/EIA-568-A standard has a maximum length of 328 feet (100 meters), divided as follows: • 20 feet (6 meters) between the hub and the patch panel (if used) • 295 feet (90 meters) from the wiring closet to the wall outlet • 10 feet (3 meters) from the wall outlet to the desktop device • A maximum of four repeaters Ethernet cable must be grounded at both ends.
RJ-45	RJ-45 for 100BaseT	Category 5 unshielded twisted pair[1]	

1. For NEBS-compliant installations, Category 5 **shielded** twisted pair cable must be used.

Physical Specifications for Core Components B

This appendix describes the following specifications for PortMaster 4 core components:

- Interface
- Size and weight
- Environmental
- Electrical

Interface Specifications

Table B-1 Interface Specifications

Interface	Specification
Ethernet	10BaseT (RJ-45), 10/100BaseT (RJ-45 and MII)
Asynchronous serial	RJ-45, with data rates up to 115,200bps

Size and Weight Specifications

Table B-2 Size and Weight Specifications

Parameter	Metric	U.S. Equivalent
Dimensions (HxWxD)	482.6mm wide x 400mm high x 450.9mm deep	19 inches wide x 15.75 inches high x 18 inches deep
Chassis weight (empty)	26.33 kilograms	58 pounds
Power supply	2.72 kilograms	6 pounds
Manager modules and line boards	1.22 to 1.59 kilograms	2.7 to 3.5 pounds

Environmental Specifications

Table B-3 Environmental Specifications

Parameter	Metric	U.S. Equivalent
Operating temperature	5 to 45°C	41 to 113°F
Storage temperature	-40 to 85°C	-40 to 185°F
Operating humidity	20 to 80 percent, noncondensing	20 to 80 percent, noncondensing

Electrical Specifications

Table B-4 Electrical Specifications

Parameter	Specification
Input voltage	AC models: Two power units each providing 400W switching with a third providing backup. DC models: -48VDC.
Power dissipation	80W per slot. Total power dissipation for a fully loaded PortMaster 4 is 800W[1].
Power draw	-50VDC fully loaded chassis draws 18 amps. 100VAC fully loaded chassis draws 9 amps. 200VAC fully loaded chassis draws 4.5 amps.
Memory, manager module	8MB nonvolatile RAM. 16MB dynamic RAM (upgradable to 32MB).
AC fuses	250V, 2 amps.
DC fuses	External to the PortMaster 4.
Cooling, pulling air from front to back	Two 48VDC fans rated at 100CFM at 0 inches of water static pressure. Two 48VDC fans rated at 50CFM at 0 inches of water static pressure.

1. The PortMaster 4 power dissipation exceeds NEBS limits of 27.9W per square foot per foot. Special equipment room cooling might be required.

Provisioning Information C

Table C-1 through Table C-5 contain information that you must supply to your telephone service provider when you are ordering ISDN PRI, T1, E1, or T3 service. See Figure 1-1 on page 1-9 for a list of supported ISDN switch types.

For information on how to configure the PortMaster 4 for ISDN PRI, T1, E1, or T3 service, see the *PortMaster 4 Configuration Guide*.

Table C-1 Provisioning Information for ISDN PRI

Option	Suggested	Comments
One-way or two-way service	One-way	One-way service is for inbound calling. Two-way service is for both inbound and outbound calling.
Alternating circuit-switched voice and data, or circuit-switched data only	Alternating circuit-switched voice and data	Alternating circuit-switched voice and data permits ISDN and modem calls. Circuit-switched data permits only ISDN calls.
Directory numbers	One, with all channels hunting	Normally a T1 line has a single telephone number. However, when the line is set up for ISDN B channels, multiple directory numbers are supported.
Line framing	Extended super frame (ESF)	ESF and D4 are supported.
Line encoding	Bipolar 8-zero substitution (B8Zs)	Alternate mark inversion (AMI) or B8ZS are supported.
Non-facility associated signaling (NFAS)		NFAS is an optional feature.
Optional Services		
Directory Number Identification Service (DNIS)	Yes	One through 10 digits.

Table C-2 Provisioning Information for Channelized T1

Option	Suggested	Comment
Two-state dual-tone multifrequency (DTMF)	Required	
Signaling method	E&M wink	E&M wink and foreign exchange station (FXS) loop start are supported.
One-way or two-way service	One-way	Two-way service will be supported in a future ComOS release.
Directory Number Identification Service (DNIS)	One digit	

Table C-3 Provisioning Information for T1

Option	Suggested	Comment
Line framing	ESF	ESF and D4 are supported.
Line encoding	B8ZS	B8ZS and AMI are supported.
Signalling method	E&M wink	E&M wink and foreign exchange station (FXS) loop start are supported.

Table C-4 Provisioning Information for E1

Option	Suggested	Comment
Line framing	CRC4	CRC4 and FAS are supported.
Line encoding	HDB3	High-density bipolar 3

Table C-5 Provisioning Information for T3

Option	Suggested	Comment
Line framing	M13	
Line encoding	B3ZS	The T3 Mux board converts bipolar 3-zero substitution (B3ZS) line encoding to nonreturn to zero (NRZ) DS-3 signaling.

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