PortMaster®

Office Router Hardware Installation Guide

OR-HS,OR-LS,OR-M,OR-ST,OR-ST-AP,OR-U,OR-U-AP

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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

CE188X or CE086X

Notified Body Number 188 BAPT Germany or 086 BSI United Kingdom.

This marking is in accordance with the CE Marking Directive 93/68/EEC. This marking may be found on the base of the unit.

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

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

Pan-European Approval

BTZ, the German Notified Body, has issued Pan-European Approval to the PortMaster in accordance with the TTE Directive (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, Iceland, Ireland, Italy, Luxembourg, Portugal, Spain, and Sweden.

European CE approvals are automatically recognized by Norway.

In addition to compliance with the ETSI-based European standards, I-CTR 3 (Net 3 + Bridging Measures) NET 3 and ETS 300 047, the PortMaster has been tested and complies with the following National Delta requirements:

- French delta requirements CSE P 10-21 A
- German delta requirements BAPT 223 ZV 25

Contents

About This Guide

This guide provides instructions for installing and troubleshooting the PortMaster® Office Router from Lucent Technologies, Inc. Instructions for ordering ISDN service and electrical, physical, pinout, and modem specifications are also supplied.

Audience

This guide is designed to be used by qualified system administrators and network managers. Knowledge of UNIX and basic networking concepts is required to successfully install the Office Router.

PortMaster Documentation

The following manuals are available from Lucent Remote Access. The hardware installation guides are included with most PortMaster products; other manuals 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 Command Line Reference*

  This reference provides the complete description and syntax of each command in the ComOS command set.

- *PortMaster Configuration Guide*

  This guide provides a comprehensive overview of networking and configuration for PortMaster products.

- PortMaster hardware installation guides

  These guides contain complete hardware installation instructions. An installation guide is shipped with each PortMaster.

- *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 Administrator's Guide*

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

Additional References

RFCs

Use any World Wide Web browser to find a Request for Comments (RFC) online.

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 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 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 2178, *OSPF Version 2*

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.

Convention	Use	Examples
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**, click **Services & Support**, and then click **Training & Certification**.

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 Office Router Overview 1

Intended for use in remote offices and home networks, the PortMaster Office Router series consists of high- and low-speed routers designed to operate in multiprotocol network environments. All Office Routers support the IP and IPX protocols and have packet filtering capabilities.

The Office Router series can extend networks over long distances using leased lines, Frame Relay, ISDN Basic Rate Interface (BRI), or 56Kbps switched circuits. All Office Routers support 10BaseT and 10Base5 Ethernet connections and one of the following WAN connections:

Model OR-M—up to two analog telephone lines using a PCMCIA modem and an external modem

Model OR-ST—a single ISDN BRI line (ST interface)

Model OR-U—a single ISDN BRI line with an integrated network termination (NT1) device (U interface)

Model OR-ST-AP—a single ISDN BRI line (ST interface) with an analog telephone port. This product supports the integration of traditional and digital data communications

Model OR-U-AP—a single ISDN BRI line with an integrated NT1 device (U interface) and an analog telephone port

Model OR-LS—a single synchronous leased line or Frame Relay connection up to 384Kbps

Model OR-HS—a single synchronous leased line or Frame Relay connection up to T1/E1 speeds (2.048Mbps)

Installing the PortMaster Office Router 2

Installation Checklist

- ❑ 1. Choose a Site
- ❑ 2. Prepare the Work Area
- ❑ 3. Connect a Console
- ❑ 4. Connect an Ethernet Cable
- ❑ 5. Connect a 56Kbps to T1/E1 Line (OR-HS) or Fractional T1/E1 Line (OR-LS)
- ❑ 6. Connect an ISDN BRI Line (OR-ST and OR-U)
- ❑ 7. Connect a PCMCIA Modem (OR-M)
- ❑ 8. Connect an Analog Device (OR-ST-AP and OR-U-AP)
- ❑ 9. Turn On Power
- ❑ 10. Log In
- ❑ 11. Set the Network Address
- ❑ 12. Configure the Office Router
- ❑ 13. Connect an External Modem (Optional)

1. Choose a Site

Follow these guidelines to select a site for your Office Router.

Environment

- ❑ Choose a clean and dust-free environment.
- ❑ Choose a secure, flat surface area for desktop installation.
- ❑ Choose an air conditioned area if possible.
- ❑ Choose an area without direct sunlight, close proximity to heat sources, or high levels of electromagnetic interference (EMI).

Chassis Accessibility

- ❑ Provide 3 inches (8cm) clearance at the rear of the Office Router for cabling purposes.

Air Flow and Cooling

- ❑ Provide 3 inches (8cm) around all vent openings of the Office Router for proper air flow.

Power Guidelines

- ❑ Ensure that the power source of the Office Router is properly grounded and falls within the internal power supply rating. The Office Router operates correctly at any AC voltage from 100V to 260V and frequencies from 50Hz to 60Hz.

2. Prepare the Work Area

Prepare for installation by gathering the following equipment and following all safety recommendations.

Required Equipment

- ❑ 5/32-inch flathead screwdriver

Safety Recommendations

- ❑ Keep the chassis area clean and dust free during and after installation.
- ❑ Disconnect the Office Router from the power source before working near power supplies or changing a fuse.
- ❑ 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.

Warning – Before working on equipment that is connected to power lines, remove jewelry including 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.

3. Connect a Console

Follow these instructions to connect a console.

Required Equipment

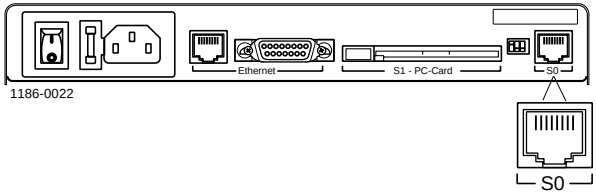
- ❑ RJ-45-to-DB-25 console cable, with a 25-to-9-pin female adapter if you are using a PC (See "Console Cable" on page D-2 for pinout information.)

  One of these cables is shipped with all Office Router models. To order additional cables from Lucent, specify product code CBL-CDB45. The adapter is available from most computer equipment suppliers.

- ❑ PC or terminal

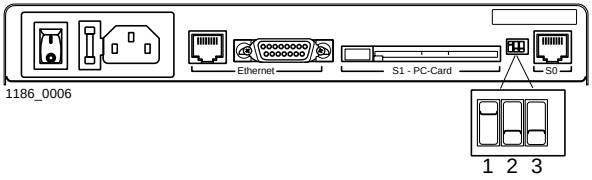
Procedure

1. **Attach the RJ-45 connector to the Office Router console port, and attach the DB-25 connector to the console port of a PC or terminal (OR-M shown).**



2. **Ensure that DIP switch 1 is up (OR-M shown).**

   When the Office Router is turned on with DIP switch 1 up, the S0 port is set to 9600bps, 8 data bits, no parity, 1 stop bit, and software flow control (XON/XOFF).



4. Connect an Ethernet Cable

The following Ethernet cables can be connected to the Office Router. (See "Ethernet Specifications" on page D-8 for more information.)

- ❑ Ethernet 10BaseT
- ❑ Ethernet 10Base5 (AUI)

Ethernet 10BaseT

Follow these instructions to connect an Ethernet cable to the Ethernet 10BaseT port.

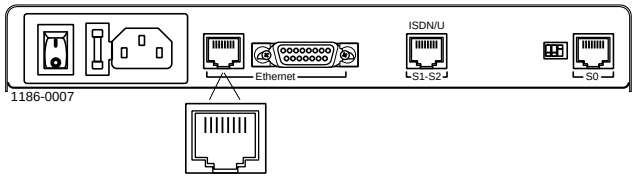
Required Equipment

- ❑ Category 5 twisted pair cable, as specified by the EIA/TIA-568-B wiring standard, with an RJ-45 connector (See "Ethernet Specifications" on page D-8 for more information.)

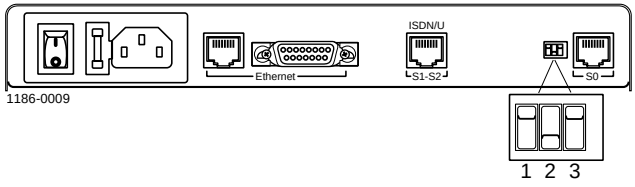
  This cable is available from most computer equipment suppliers.

Procedure

1. Connect the cable to the Ethernet 10BaseT port (OR-U shown).



2. Set DIP switch 3 up (OR-U shown).



Ethernet 10Base5 (AUI)

Follow these instructions to connect an Ethernet cable to the Ethernet 10Base5 (AUI) port.

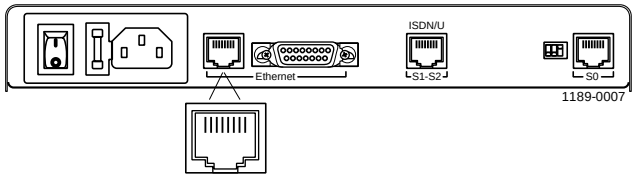
Required Equipment

❑ RG-11 50-ohm coaxial cable with a DB-15 female connector (See "Ethernet Specifications" on page D-8 for more information.)

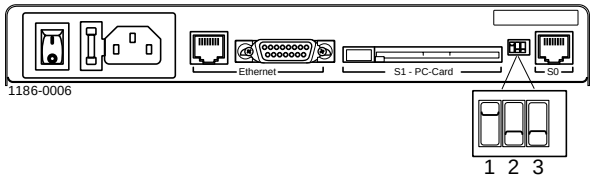
This cable is available from most computer equipment suppliers.

Procedure

1. Connect the cable to the Ethernet AUI port (OR-U shown).



2. Ensure that DIP switch 3 is down (OR-M shown).



5. *Connect a 56Kbps to T1/E1 Line (OR-HS) or Fractional T1/E1 Line (OR-LS)*

Follow these instructions to connect a T1/E1 line to the W1 port of the OR-HS or a fractional T1/E1 line to the W1 port of the OR-LS. You must have already ordered a dedicated circuit or leased line with speeds from 56Kbps up to T1/E1 from the telephone company.

Call your local telephone service provider to order T1 or E1 or fractional T1/E1 service. Typically you must pay an installation charge, a monthly flat-rate service charge, and usage charges.

Note – The W1 port requires an external clock signal that can be provided by the telephone company and a channel service unit/digital service unit (CSU/DSU).

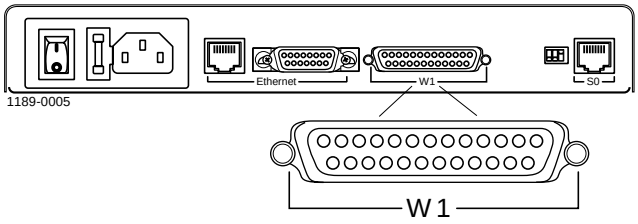
Required Equipment

- ❑ A V.35, X.21, or RS-530 cable (See "V.35 Cable" on page D-4, "X.21 Cable" on page D-5, or "RS-530 Cable" on page D-6 for pinout information.)

  These cables are available from most computer equipment suppliers.

Procedure

Connect a T1/E1 or fractional T1/E1 line to the W1 port (OR-HS shown).



6. Connect an ISDN BRI Line (OR-ST and OR-U)

Follow these instructions to connect an ISDN BRI line to the OR-ST or OR-U if you have already ordered the service from the telephone company.

Required Equipment for the OR-ST

- ❑ One 8-pin category 5 twisted pair cable with RJ-45 connectors. (See "Category 5 Twisted Pair Cable for the S/T Interface" on page D-7 for pinout information.) One of these cables is shipped with the OR-ST.
- ❑ One NT1 device for each ISDN BRI S/T interface (if not supplied by the telephone company). NT1 devices are available from most computer equipment suppliers.

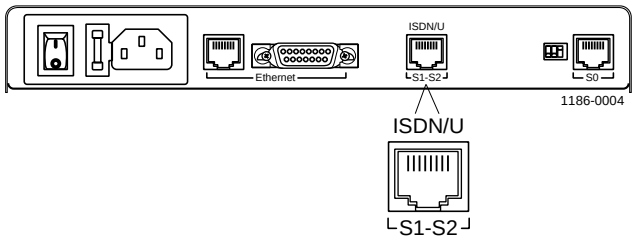
Required Equipment for the OR-U

- ❑ One category 5 twisted pair cable with RJ-45 connectors for each ISDN BRI port. (See "Category 5 Twisted Pair Cable for the U Interface" on page D-7 for pinout information.) One of these cables is shipped with the OR-U.

Procedure

Connect an ISDN BRI line to ISDN S/T or ISDN U port (OR-U shown).

If you are using an NT1 device with the S/T interface, connect the ISDN BRI line to the NT1, and connect the NT1 to the ISDN S/T interface using the cable supplied by Lucent.



7. Connect a PCMCIA Modem (OR-M)

Follow these instructions to connect a PCMCIA modem to the PCMCIA slot on the OR-M.

Required Equipment

- ❑ Type 2 PCMCIA modem card (See "PCMCIA Modems" on page E-1 for modem information.)
- ❑ Cable used to connect the modem card to a wall jack

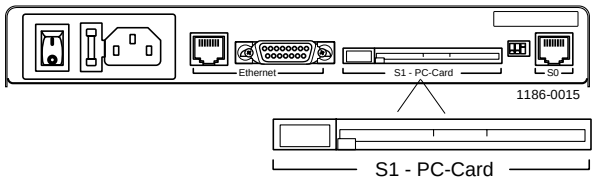
  This cable is usually supplied with the modem card.

Procedure

Note – Ensure that the PCMCIA modem is facing right side up when it is inserted. Refer to the modem manufacturer's documentation for this information.

1. **Insert the Type 2 PCMCIA modem into the PCMCIA modem slot.**

The PCMCIA modem will click into the PCMCIA slot when it is fully seated.



2. **Connect the modem cable to the PCMCIA modem and to an analog wall jack.**

8. Connect an Analog Device (OR-ST-AP and OR-U-AP)

Follow these instructions to connect an analog telephone, fax, or external modem to the analog PHONE port on the OR-ST-AP or OR-U-AP.

Required Equipment for a Telephone or Fax

- ❑ Four-pin RJ-11 cable. This cable is available from most telephone equipment suppliers.

Required Equipment for an External Modem

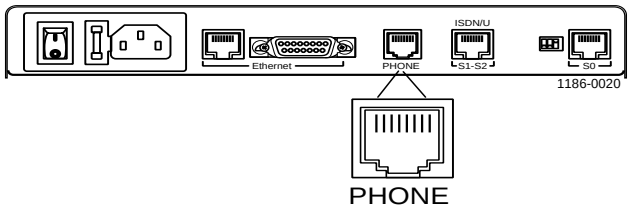
- ❑ RJ-45-to-DB-25-Male modem cable. This cable can be ordered from Lucent Technologies by specifying product code CBL-MDB45. (See "Modem Cable" on page D-3 for pinout information.)

- ❑ Four-pin RJ-11 cable. This cable is usually shipped with an external modem. Additional cables are available from most telephone equipment suppliers.

Procedure

Caution – Do not connect an analog telephone line directly to any port of the Office Router.

1. **Connect the analog device to the PHONE port on the Office Router (OR-U-AP shown).**



   If you are using an external modem, connect the RJ-45-to-DB-25-Male modem cable to the S0 port of the Office Router.

2. **Pick up the telephone receiver and ensure that a dial tone is present.**

   If no dial tone is present, verify connections. If you still do not hear a dial tone, call Lucent Remote Access Technical Support.

Notes on ISDN Service

Outgoing calls. If both ISDN B channels are being used for a Multilink PPP data connection, the Office Router OR-ST-AP and OR-U-AP temporarily drops one of the B channels connections to allow an outbound voice call.

Incoming calls. If your ISDN service is provisioned to support more than two call appearances, the Office Router temporarily drops one B channel of a Multilink PPP session to allow an inbound voice call. If your ISDN service does not support more than two call appearances, the inbound caller will hear a busy signal.

This feature is supported only on the National ISDN-1 switch type.

Data over voice (DOV) calls. To receive DOV calls, the analog PHONE port of the OR-ST-AP and OR-U-AP must be disabled.

The Office Router does not support call waiting, call hold, or caller line ID (CLID) features.

Related Commands

The following commands are available in ComOS for the OR-ST-AP and OR-U-AP.

Note – ComOS commands for the analog port use the **pots** keyword.

set pots—displays the setting (enabled/disabled) of the analog PHONE port.

set pots on—enables the analog PHONE port.

set pots off—disables the analog PHONE port.

show pots—displays the status of the analog PHONE port and the B channel associated with it.

set u-law—enables North American (T1 areas) digital signal attenuation.

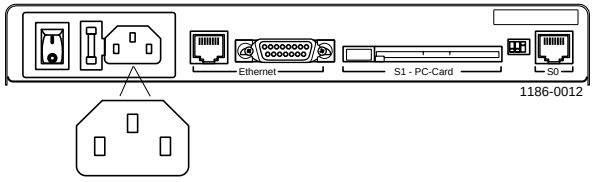
set a-law—enables International (E1 areas) digital signal attenuation.

9. Turn On Power

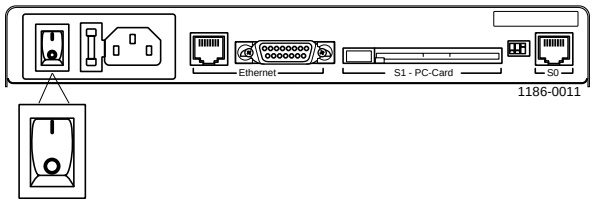
Follow these instructions to start the Office Router.

Procedure

1. **Attach the power cord to the Office Router and to a properly grounded electrical outlet (OR-M shown).**

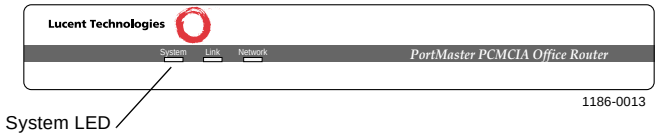


2. **Turn the power switch on (OR-M shown).**



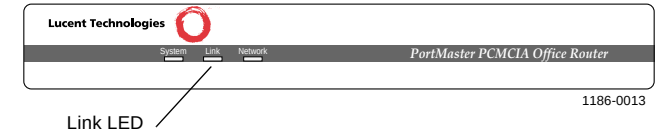
3. **Verify that the System LED is active (OR-M shown).**

While the router is booting, the System LED blinks four times in rapid succession and then twice in 1 second. During normal operation, the LED blinks once every 5 seconds. If the LED does not behave in this way, see "Observing LED Behavior" on page A-1.



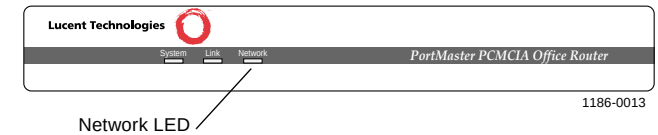
4. Verify that the Link LED is active.

The Link LED blinks on once for 10Base5 (AUI) and twice for 10BaseT. Solid on indicates that 10BaseT link integrity exists. Solid off indicates a link error for 10BaseT. After booting, the Link LED is not used for AUI cabling. If the Link LED does not behave in this way, see "Observing LED Behavior" on page A-1.



5. Verify that the Network LED is active when Ethernet traffic is present.

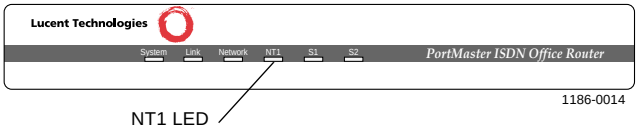
The Network LED blinks once for every packet transmitted or received. In heavy traffic situations, the LED might appear to be solidly lit. If the Network LED does not behave in this way, see "Observing LED Behavior" on page A-1.



6. Verify that the NT1 LED is active (OR-U only).

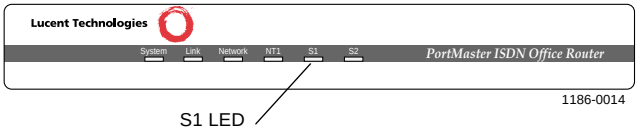
The NT1 LED blinks eight times per second for approximately 8 seconds after startup. If no service profile identifier (SPID) is set on the port and no circuit to the telephone company exists, the NT1 LED turns off after the initial 8 seconds. If a circuit to the telephone company exists and no SPID is set on the port, the NT1 LED blinks once per second.

If a SPID is set on the port and a circuit to the telephone company exists, the NT1 LED blinks once per second while synchronizing with the telephone company and then stays solidly lit. If the NT1 LED does not behave this way, contact Lucent Remote Access Technical Support.



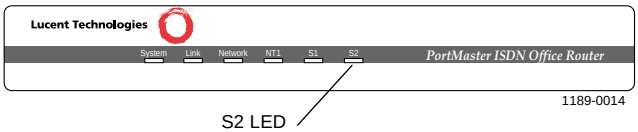
7. Verify that the S1 LED is active (OR-U and OR-ST—OR-ST shown).

The S1 LED stays solidly lit when ISDN port S1 has established a connection. If the S1 LED does not behave this way, contact Lucent Remote Access Technical Support.



8. Verify that the S2 LED is active (OR-U and OR-ST—OR-ST shown).

The S2 LED stays solidly lit when ISDN port S2 has established a connection. If the S2 LED does not behave this way, contact Lucent Remote Access Technical Support.



10. Log In

Follow these instructions to log in to the Office Router.

1. **From the login prompt, type** !root **and press the** Enter **key.**
2. **From the password prompt, press the** Enter **key—no password is needed for a first-time installation.**

```
login: !root
Password:
Command>
```

11. Set the Network Address

Set an IP address and netmask for an IP network, or an IPX network number and frame type for an IPX network.

IP Address

Follow these instructions to set an IP address and netmask for the Office Router.

From the command prompt, enter the following information, pressing the Enter **key after each line.**

Replace the *italicized* values with values appropriate for your network.

```
Command> set ether0 address 172.168.200.1
Command> set netmask 255.255.255.0
Command> save all
Command> quit
```

IPX Address

Follow these instructions to set an IPX address and frame type for the Office Router.

From the command prompt, enter the following information, pressing the Enter **key after each line.**

Replace the *italicized* values with values appropriate for your network.

```
Command> set ether0 ipxnet AFAF0808
Command> set ether0 ipxframe ethernet_802.2
Command> save all
Command> quit
```

12. Configure the Office Router

To configure the Office Router, you can use one of the following:

- **Command Line Interface.** If you are using the command line interface to configure the Office Router, refer to the *Command Line Reference* and the *PortMaster Configuration Guide* for instructions.
- **PMVision**. PMVision is a Java application used to configure, monitor, and manage any PortMaster product. PMVision has a Java tree for navigating to the various features of the application. The features in PMVision include the following:
  - **Monitor** allows you to dynamically monitor operations of the selected PortMaster product.
  - **Graph** allows you to view modems and sessions on a graph.
  - **Diagnose** diagnoses problems with selected PortMaster products.
  - **Maintain** backs up, restores, and upgrades selected PortMaster products.
  - **Command** sends ComOS commands to selected PortMaster products.
  - **Configure** adds and changes configuration settings on selected PortMaster products.
- **ORWizard.** The ORWizard is a Java software tool for initial setup of the Office Router. The ORWizard sequentially prompts you through the configuration process for an outbound dial-up network connection to an Internet service provider (ISP) or

corporate backbone network. At the end of the configuration sequence, the ORWizard displays a summary of the configuration settings. The configuration settings can be backed up to a standard ASCII text file for troubleshooting purposes.

13. Connect an External Modem (Optional)

Follow these instructions to install an external modem. (See "External Modems" on page E-2 for modem information.) Basic configuration must be completed before an external modem is connected.

Required Equipment

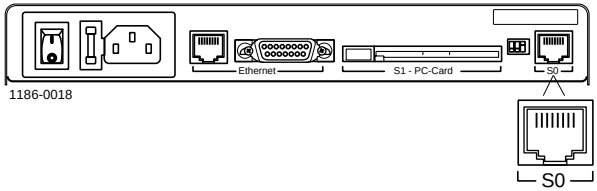
- ❑ Modem cable with RJ-45 and DB-25 connectors (See "Modem Cable" on page D-3 for pinout information.)

  This cable is not included with the Office Router but is available from Lucent. Specify product code CBL-MDB45.

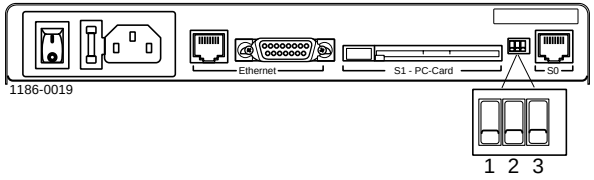
- ❑ External modem

Procedure

1. **Attach the RJ-45 connector to the S0 port and the DB-25 connector to an external modem.**



2. **Set DIP switch 1 down.**



For modem configuration information, refer to the *PortMaster Configuration Guide*.

Troubleshooting A

This appendix provides the following troubleshooting information for the PortMaster Office Router:

- Observing LED behavior
- Observing the console display (OR-M)
- Observing boot messages
- Replacing a fuse

Observing LED Behavior

Table A-1 identifies LED behavior, likely causes of the behavior, and potential solutions.

Table A-1 Hardware Problems and Solutions

LED Indication	Likely Cause	Solution
System LED does not light.	Power is not present.	Check the power switch, power cable, outlet, and fuse. For instructions on checking and changing the fuse, see "Replacing a Fuse" on page A-8.
During startup, the System LED fails to light, becomes solidly lit, or blinks three times per second continuously.	There is a hardware problem.	Contact Lucent Remote Access Technical Support.

Table A-1 Hardware Problems and Solutions *(Continued)*

LED Indication	Likely Cause	Solution
During startup, the System LED continues blinking once per second for more than a minute.	• DIP switch 2 is up and no boot server is present.	• If no boot server is present, verify that DIP switch 2 is down; otherwise, see the network booting procedure in the *PortMaster Configuration Guide*.
	• Nonvolatile RAM contents are corrupt.	• If nonvolatile RAM contents are corrupt, follow the *PortMaster Configuration Guide* procedure for network booting and rewriting the contents of nonvolatile RAM.
Immediately after startup, the System LED stays solidly lit or does not light.	A nonvolatile RAM problem has occurred.	Contact Lucent Remote Access Technical Support.
During operation, the System LED stays solidly lit or does not light.	A hardware failure has occurred, possibly 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 A-1 Hardware Problems and Solutions *(Continued)*

LED Indication	Likely Cause	Solution
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 (XON/XOFF). • Verify that DIP switch 1 is up. • Verify that you have a working console cable and that it is properly connected at both ends. For cable information, see "Console Cable" on page D-2.
Link LED is solid off.	If you are connected to an 10Base5 (AUI) Ethernet transceiver, the Link LED blinks only once at startup.	
Link LED is not lit when connected to a 10BaseT Ethernet hub.	There is no link integrity.	Verify that DIP switch 3 is up and that you have a working 10BaseT cable properly connected to the Office Router and to the hub. Turn the power off and on to activate the DIP switch setting.
Network LED 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 LED is not lit.	If the Office Router is not receiving, or sending traffic, the network LED is not lit.	Verify that the network cabling is correct.

Table A-1 Hardware Problems and Solutions *(Continued)*

LED Indication	Likely Cause	Solution
An undefined difficulty occurred at startup, but the cause cannot be determined from LED behavior.	See the solution column.	Try starting in console mode, and observe the boot messages. See "Observing Boot Messages" on page A-5. If the boot messages do not suggest a solution, record the information and contact Lucent Remote Access Technical Support.

Observing the Console Display (OR-M)

Follow these instructions if port S1 does not appear on the console display during configuration of the Office Router:

1. **Turn the power switch off.**
2. **Reinsert the PCMCIA modem card.**

   Consult the manufacturer's documentation to ensure that the modem card is inserted with the correct side up. (See "Connect a PCMCIA Modem (OR-M)" on page 2-9.)

3. **Turn on power (see "Turn On Power" on page 2-12).**

Observing Boot Messages

If you are having difficulty starting the Office Router and are unable to isolate the problem by observing LED behavior, start the Office Router in console mode and check the boot messages.

Follow these instructions to check boot messages:

1. **Attach a console (see "Connect a Console" on page 2-4).**
2. **Turn on power (see "Turn On Power" on page 2-12).**
3. **Observe the boot messages displayed on the console screen.**

Note – Boot messages vary slightly, depending on the version of the programmable ROM (PROM) and ComOS.

The following example of boot messages is from an OR-M:

```
Livingston Enterprises, Inc. Boot Prom Rev K

Testing Low Memory ....
Testing System Clock ....
Testing System Memory .... A000
Checking Boot Rom ....
Starting FLASH Boot .....
Booting From Flash Type Am29F040
Loading Image at 0fff0000
320112 flash copy complete
Verifying Load Module Checksum ...
Starting Load Module ...
Testing High Memory ... . 1024K
PCMCIA slot .... PCMCIA card type
Found 2 ports....
Running ComOS...
PortMaster Console login:
```

Use Table A-2 to interpret possible diagnostic boot messages.

Table A-2 Interpreting the Diagnostic Boot Messages

Field	Possible Message	Explanation
Boot Prom Rev	K	Version number of the installed boot PROM.
Testing Low Memory	ERROR	This error indicates a startup failure. Record all information to this point and contact contact Lucent Remote Access Technical Support.
Testing System Clock	ERROR	This error indicates a startup failure. Record all information to this point and contact Lucent Remote Access Technical Support.
Testing System Memory	ERROR at *failed memory address*	This error indicates a startup failure. Record all information to this point and contact contact Lucent Remote Access Technical Support.
Checking Boot Rom	ERROR	This error indicates a boot failure. Record all information to this point and contact contact Lucent Remote Access Technical Support.
Starting FLASH Boot	N/A	N/A
Booting From Flash Type	Am29F040	Nonvolatile RAM brand name.
Loading Image at	0fff0000	RAM address.
Flash copy complete	320112	Counter for nonvolatile RAM bytes transferred to RAM. If the counter freezes, record all information to this point and contact contact Lucent Remote Access Technical Support.
Verifying Load Module Checksum	Invalid Length for Flash at *RAM address*	This error indicates a startup failure. Record all information to this point and contact contact Lucent Remote Access Technical Support.
Starting Load Module	N/A	N/A
Loading kernel (OR-ST, OR-U, OR-LS, OR-HS only)	506088 bytes	Counter for nonvolatile RAM bytes transferred to DRAM. If the counter freezes, record all information to this point and contact Lucent Remote Access Technical Support.

Table A-2 Interpreting the Diagnostic Boot Messages *(Continued)*

Field	Possible Message	Explanation
Testing High Memory	ERROR at *failed memory address*	This error indicates a startup failure. Record all information to this point and contact Lucent Remote Access Technical Support.
PCMCIA slot (OR-M only)	*PCMCIA card type*	PCMCIA card type.
ISDN Found in Slot 0 - Testing memory (OR-ST, OR-U only)	512K	ISDN interface found. Test of ISDN memory in progress.
Found *x* Ports	1, 2, 3	Number of ports detected. Note that S0 is one port and PCMCIA is another. The ISDN BRI counts as two ports.
Ether0 active	16K burst - IO	Ethernet interface found; 16Kbps is detected as the maximum amount of data that can be input or output at any given time on the Ethernet interface.
Running ComOS	N/A	If the system becomes suspended at this point and does not print the next message, the configuration of nonvolatile RAM has been corrupted. Refer to the troubleshooting chapter of the *PortMaster Configuration Guide* for instructions on nonvolatile RAM recovery.
PortMaster Console login:	N/A	System is up and running.

Replacing a Fuse

If the Office Router loses power while connected to an active power source, check the fuse.

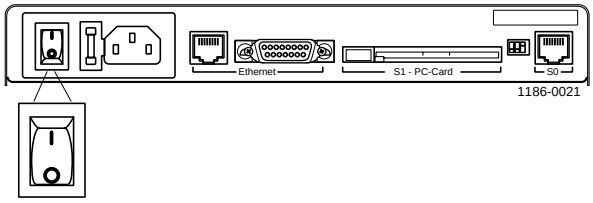
Follow these instructions to check and replace the fuse in the Office Router.

Required Equipment

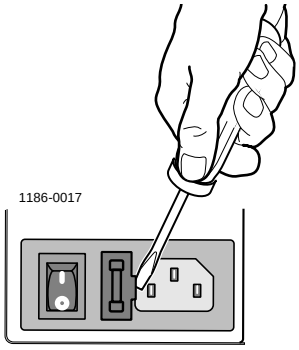
- 5/32-inch flathead screwdriver
- 250V, 2A fuse

Procedure

1. **Turn the power switch off and disconnect the Office Router from the power source.**



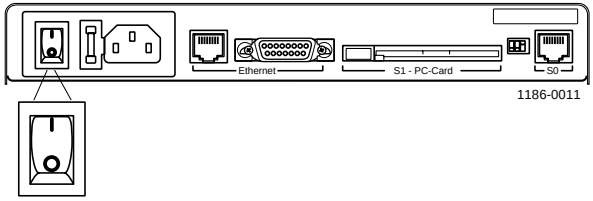
2. **Detach the power cord from the Office Router.**
3. **Insert a 5/32-inch flathead screwdriver between the fuse door and the chassis, and gently pull the fuse door open.**



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

   The 250V, 2A fuse can be inserted from either end.

5. **Press the fuse door shut until it clicks.**
6. **Reconnect the power cord to the Office Router.**
7. **Turn the power switch on.**



Ordering ISDN Service B

This appendix provides information on ordering ISDN service for PortMaster Office Router users installing the OR-U, OR-U-AP, OR-ST, and OR-ST-AP in the United States and Canada.

Ordering Instructions

Complete the following steps to order ISDN basic rate interface (BRI) service from your telephone service provider:

1. **Call your local service provider to find out about ISDN BRI service availability, pricing, and features.**

   Typically you are charged an ISDN installation cost, a monthly flat rate for service, and usage costs.

2. **When ordering channel provisioning, compare the costs of circuit-switched voice/circuit-switched data (CSV/CSD) service and CSD-only service, and select the less expensive service.**

   Although Office Router ISDN models can be used for data transmission only, many ISDN providers offer data and voice service at a lower rate than data-only service. Because the Office Router transmits data over B channels configured for both voice and data as well as for data only, you can choose the less costly alternative.

3. **Determine the ISDN switch type.**

   Ask your provider what type of ISDN switch you will be connected to.

4. **Check the switch type and refer to one of the tables in this appendix for switch type translations.**

   Fax or read the appropriate table to the sales representative.

- **National ISDN-1 or NI-1 Compliant,** see Table B-1 on page B-3
- **AT&T 5ESS Custom Multi-Point,** see Table B-2 on page B-4
- **AT&T 5ESS Custom Point-to-Point,** see Table B-3 on page B-5
- **Northern Telecom DMS-100 or DMS-100 Custom,** see Table B-4 on page B-6

After you have completed Step 4, proceed to Step 5 on page B-7.

National ISDN-1 or NI-1 Compliant

Table B-1 gives National ISDN-1 or NI-1–compliant switch translation information.

Table B-1 National ISDN-1 or NT-1 Compliant

Attribute	**Setting**
Line	2B+D
Line code	2B1Q
Terminal type (TERMTYP)	A
Maximum number of channels (MAXB)	2
B1	CSD (or CSVD)
B2	CSD (or CSVD)
D	Signaling
Number of channels simultaneously connected (CSD)	2
Channel to be used for data calls (CSD CHL)	Any
Number of data calls that can be made simultaneously (CSD LIMIT)	2
ACT USR	Yes
Dynamic terminal endpoint identifier (TEI)	Yes
Electronic key telephone service (EKTS)	No
Maximum number of terminals active on the BRI line (MTERM)	1
CA PREF	1
Call appearances	Idle
Protocol version control	2
Release key	No
Ringing indicator	No

AT&T 5ESS Custom Multi-Point

Table B-2 gives AT&T 5ESS Custom Multi-Point switch translation information.

Table B-2 AT&T 5ESS Custom Multi-Point

Attribute	Setting
Line	2B+D
Line code	2B1Q
Terminal type (TERMTYP)	A
Maximum number of channels (MAXB)	2
B1	CSD (or CSVD)
B2	CSD (or CSVD)
D	Signaling
Number of channels simultaneously connected (CSD)	2
Channel to be used for data calls (CSD CHL)	Any
ACT USR	Yes
Dynamic terminal endpoint identifier (TEI)	Yes
EKTS	No
Maximum number of terminals active on the BRI line (MTERM)	1
CA PREF	1
Autohold	No
OneTouch	No
Display	No
Call appearances	Idle

AT&T 5ESS Custom Point-to-Point

Table B-3 gives AT&T 5ESS Custom Point-to-Point switch translation information.

Table B-3 AT&T 5ESS Custom Point-to-Point

Attribute	**Setting**
Terminal type (TERMTYP)	A
Call appearances	1
Display	No
Channels for circuit-switched voice (CSV) per dial number (DN)	1
Channels for circuit-switched data (CSD) per DN	1

Northern Telecom DMS-100 or DMS-100 Custom

Table B-4 gives Northern Telcom DMS-100 or DMS-100 Custom switch translation information.

Table B-4 Northern Telcom DMS-100 or Custom DMS-100

Attribute	Setting
Line	2B+D
Line code	2B1Q
Terminal type (TERMTYP)	A
Maximum number of B channels (MAXB CHL)	2
Circuit-switched service	Yes
CSD/CSV channel	Any
Signaling	Functional
Dynamic TEI	Yes
EKTS	No
Protocol version control	1
Maximum number of programmable keys	3
Release key	No
Ringing indicator	No

5. Choose a service provider for long-distance ISDN service.

Staying with the telephone company that provides your existing analog long-distance service might be easier than choosing another carrier, although this is not a requirement.

6. Configure your site wiring to support ISDN service.

Ask your provider what additional wiring is necessary to support ISDN on your premises. Depending on your existing wiring, you might need to have an extra pair of copper wires brought to your premises or additional inside wiring installed.

If your ISDN wall jack is an RJ-11 jack (four pins, like a standard telephone jack), use an RJ-11-to-RJ-45 cable. If it is an RJ-45 jack (eight pins), use an RJ-45-to-RJ-45 cable.

7. Get your service profile identifiers (SPIDs) and directory numbers.

You need this information to configure the OR-U and OR-ST.

The SPID identifies your equipment to the ISDN switch. Directory numbers are the telephone numbers assigned to your ISDN B channels by the telephone company.

To configure the ISDN switch type, SPID, and/or port directory numbers on the PortMaster, see the chapter on ISDN connections in the *PortMaster Configuration Guide*.

Physical Specifications C

This appendix includes size, weight, and interface specifications and electrical and environmental specifications for the PortMaster Office Router.

Size, Weight, and Interface Specifications

Table C-1 provides size, weight, and interface specifications for the PortMaster Office Router.

Table C-1 Size, Weight, and Interface Specifications

Description	Design Specifications
Dimensions (HxWxD)	1.75 inches x 10.5 inches x 8.75 inches (4.3cm x 26.2cm x 22cm)
Weight	3.9lb (1.8kg)
Ethernet interface	10BaseT (RJ-45) or 10Base5 (DB-15)
Asynchronous serial interface	EIA/TIA-232/423 (RJ-45) (data rates up to 115,200bps)
PCMCIA Interface (OR-M only)	Type 2 (data rates up to 115,200bps)
ISDN interface (OR-ST only)	RJ-45 BRI (ST interface), providing two 64Kbps B channels.
ISDN interface (OR-U only)	RJ-45 BRI with integrated NT1 (U interface), providing two 64Kbps B channels.
Synchronous serial interface (OR-LS only)	1—capable of transmission rates up to 384Kbps
Synchronous serial interface (OR-HS only)	1—capable of transmission rates up to T1/E1 (1.544/2.048Mbps)
RJ-11 interface (OR-ST-AP and OR-U-AP)	1—RJ-11

Electrical Specifications

Table C-2 provides electrical specifications for the PortMaster Office Router.

Table C-2 Electrical Specifications

Description	Design Specifications
Input voltage	110VAC +/-10 percent, 47Hz to 63Hz, 1.0A
	220VAC +/-10 percent, 47Hz to 63Hz, 0.6A
Fuse	One 250V, 2A
Power dissipation	10W
Memory	1MB RAM, 512KB nonvolatile RAM

Environmental Specifications

Table C-3 provides environmental specifications for the PortMaster Office Router.

Table C-3 Environmental Specifications

Description	Design Specifications
Operating temperature	32° to 104°F (0° to 40°C)
Storage temperature	-40° to 185°F (-40° to 85°C)
Operating humidity	10 to 90 percent, noncondensing

Cable and Ethernet Specifications D

This appendix gives specifications for the following:

- **Console cable**—connects a data terminal equipment (DTE) device (terminal or PC) to the S0 port (See page D-2.)
- **Modem cable**—connects a data communications equipment (DCE) device (modem) to the S0 port (See page D-3.)
- **V.35 cable**—connects a T1/E1 line to the to the W1 port. (See page D-4.)
- **X.21 cable**—connects a T1/E1 line to the to the W1 port. (See page D-5.)
- **RS-530 cable**—connects a T1/E1 line to the to the W1 port. (See page D-6.)
- **Category 5 twisted pair cable for the S/T interface**—connects an ISDN BRI line to the S/T interface (See page D-7.)
- **Category 5 twisted pair cable for the U interface**—connects an ISDN BRI line to the U interface (See page D-7.)
- **Ethernet interface specifications** (See page D-8.)

Console Cable

Table D-1 gives pinout information for a console cable with RJ-45 and DB-25 connectors.

Table D-1 Console Cable

PortMaster Office Router Serial Port (S0)				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.

Modem Cable

Table D-2 gives pinout information for a modem cable with RJ-45 and DB-25 connectors.

Table D-2 Modem Cable

PortMaster Office Router S0 (Serial) Port				**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
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

V.35 Cable

Table D-3 gives pinout information for a V.35 cable with DB-25 and V.35 connectors. Pins not listed have no connection.

Table D-3 Synchronous V.35 Cable

DB-25 Pin	Name	V.35 Pin	Definition	Direction
2	TXD	P	Transmit Data	Output
14	TXD-	S		
3	RXD	R	Receive Data	Input
16	RXD-	T		
4	RTS	C	Request to Send	Output
5	CTS	D	Clear to Send	Input
6	DSR	E	Data Set Ready	Input
7	SGND	B	Signal Ground	
8	DCD	F	Data Carrier Detect	Input
15	ST	Y	Send Timing	Input
13	ST-	AA		
17	RT	V	Receive Timing	Input
19	RT-	X		
20	DTR	H	Data Terminal Ready	Output

X.21 Cable

Table D-4 gives pinout information for an X.21 cable with DB-25 and DB-15 connectors. Pins not listed have no connection.

Table D-4 Synchronous X.21 Cable

PortMaster Port W1	V.35 DB-25 Pin	Name	Definition	Direction	X.21 DB-15 Pin	Name
7	B	SGND	Signal Ground		8	SGND
					10	Control B
4	C	RTS	Request to Send	Output	3	Control A
5	D	CTS	Clear to Send	Input		
8	F	CD	Carrier Detect	Input	5	Indicate A
3	R	RXA	Receive Data	Input	4	RXA
16	T	RXB	Receive Data	Input	11	RXB
17	V	RX CLKA	Receive Timing	Input	6	CLKA
15	Y	TX CLKA	Send Timing	Input		
19	X	RX CLKB	Receive Timing	Input	13	CLKB
13	AA	TX CLKB	Send Timing	Input		
2	P	TXD A	Transmit Data	Output	2	TXA
14	S	TXD B	Transmit Data	Output	9	TXA

RS-530 Cable

Table D-5 gives pinout information for a synchronous RS-530 cable with DB-25 connectors. Pins not listed have no connection.

Table D-5 Synchronous RS-530 Cable

PortMaster Port W1	RS-530 CSU/DSU Pin	Name	Definition	Direction
2	2	TXD	Transmit Data	Output
14	14	TXD-		
3	3	RXD	Receive Data	Input
16	16	RXD-		
4	4	RTS	Request to Send	Output
5	5	CTS	Clear to Send	Input
6	6	DSR	Data Set Ready	Input
7	7	SGND	Signal Ground	
8	8	DCD	Data Carrier Detect	Input
15	15	ST	Send Timing	Input
13	12	ST-		
17	17	RT	Receive Timing	Input
19	9	RT-		
20	20	DTR	Data Terminal Ready	Output

Category 5 Twisted Pair Cable for the S/T Interface

Table D-6 gives pinout information for an 8-pin, category 5 twisted pair cable with RJ-45 connectors for the S/T interface. Pins not listed have no connection.

Table D-6 Category 5 Cable for the S/T Interface

RJ-45 Pin	Name	Definition	Direction
3	TXD	Transmit Data	Output
6	TXD-		
4	RXD	Receive Data	Input
5	RXD-		

Category 5 Twisted Pair Cable for the U Interface

Table D-7 gives pinout information for an 8-pin, category 5 twisted pair cable with RJ-45 connectors for the U interface. Pins not listed have no connection.

Table D-7 Category 5 Cable for the U Interface

ISDN/U Port	Direction
4	Input/Output
5	Input/Output

Ethernet Specifications

Table D-8 gives specifications for the 10Mbps baseband IEEE 802.3-compatible Ethernet interface.

Table D-8 Ethernet Cables

Ethernet Type	Connector Type	Cable Type	Transmission Distance
10Base5 (AUI)	15-pin Dec-Intel-Xerox (DIX) for connection to external transceiver	RG-11 50-ohm coaxial	Trunk segment—1,640 feet (500m) maximum Transceiver cable—164 feet (50m) maximum Network trunk—8,200 feet (2,500m) maximum
10BaseT (RJ-45)	RJ-45 for 10BaseT	Unshielded twisted pair	Hub distance—328 feet (100m) maximum Repeaters—four maximum

Modem Specifications E

This appendix gives information on PCMCIA modems, external modems, and modem configuration tips.

PCMCIA Modems

Table E-1 gives an alphabetical listing of PCMCIA modems in that have been verified for use with the PortMaster Office Router.

Table E-1 PCMCIA Modems

Manufacturer	Model	Speed
AT&T	KeepInTouch	14.4/V.32bis
Cardinal	MVP288CC	28.8/V.34
DSI	Scout 144DF	14.4/V.32bis
Eiger Labs	Eiger 14.4	14.4/V.32bis
	Eiger 28.8	28.8/V.34
Hayes	Optima 14.4	14.4/V.32bis
Intel	Satisfaction	14.4/V.32bis
Megahertz	MHZ	14.4/V.32bis
	MHZ XJ2288	28.8/V.34
Motorola	Power Class	14.4/V.32bis
	Lifestyle	14.4/V.32bis
Multitech	2834LT	28.8/V.34
Newcom	14,400pcm	14.4/V.32bis
Practical	PC288T2-EZ	28.8/V.34bis
Premax	PCMCIA 14.4	14.4/V.32bis

Table E-1 PCMCIA Modems *(Continued)*

Manufacturer	Model	Speed
TDK	DF1414	14.4/V.32bis
	DF2814	28.8/V.FC
U.S. Robotics	Sportster	14.4/V.32bis
	Sportster	28.8/V.34
	Courier	28.8/V.34
ZOOM	ZPCMCIA 14.4C	14.4/V.32bis

External Modems

Most external modems operate with the PortMaster Office Router.

Modem Tips

Lucent recommends any reputable vendor of V.32bis or V.34 modems. For best results, configure the modem to do the following:

- Lock the data terminal equipment (DTE) rate at 115.2Kbps or as high as the modem can operate reliably
- Raise DCD when a call comes in
- Reset itself when DTR is dropped
- Use hardware flow control (RTS/CTS)
- Answer the telephone on the first ring for dial-in use

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