HEWLETT® PACKARD

Installation and Reference Guide

HP J3188A

HP 10Base-T Hub-16M

HP 10Base-T Hub-16M (J3188A)

Installation and Reference Guide

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HP 10Base-T Hub-16M (J3188A)

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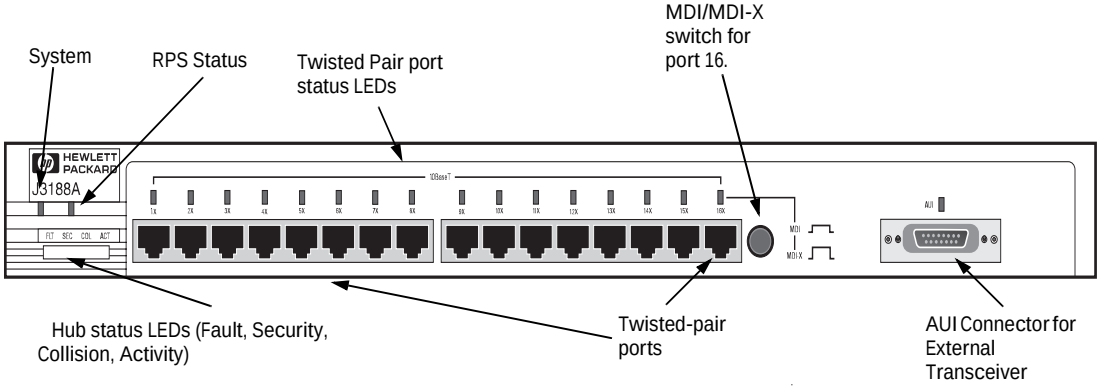
HP 10Base-T Hub-16M (J3188A)

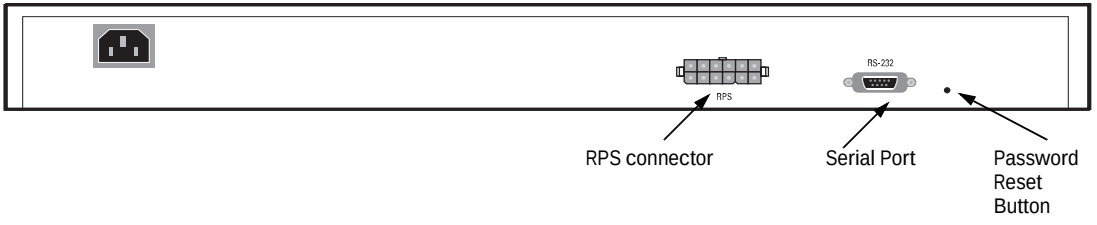
The HP 10Base-T Hub-16M (J3188A) is a multiport repeater with 16 twisted-pair ports, and one AUI port. With this hub, you can connect computers, printers, and servers together for file sharing. This hub is compliant with the IEEE 802.3 Type 10Base-T standard and supports both 802.3 and Ethernet networks. The HP Hub-16M follows these two standards by providing these features:

- lighting the hub's port LED when it detects the connected device is powered on and cable is good.
- retransmitting data that did not successfully arrive at the destination device (collision detection).
- temporarily disabling a port if a device connected to the port persistently causes problems for the network (auto-partioning).

Front of the Hub



Back of the Hub



Features

Network Connections	• **Sixteen RJ-45 (twisted-pair) ports** to connect to end nodes or other devices. • **A Media Dependent Interface (MDI)** switch for Port 16 which allows you to connect either an end node (MDI-X position) or to cascade a hub (MDI position) to the port, using a "straight-through" twisted-pair cable in both cases. Ports 1 through 15 always are MDI-X. Port 16 has a factory default of MDI-X, but can be toggled to an MDI state with the adjacent push-button. • **An AUI port** in the front of the hub for several types of external transceivers, including ThinLAN, twisted-pair, and fiber-optic. The twisted-pair transceiver adds another RJ-45 port for a total of 17 twisted-pair ports on the hub. The fiber-optic transceiver allows you to connect your hub to a fiber-optic backbone.
Easy-to-Use Design	• **Hub Status LEDs** showing power, activity, collisions, RPS status, fault, security and port status provide quick, easy-to-read hub status information and troubleshooting help. • **Metal brackets** (included with the hub) that can be easily attached to the hub for mounting the hub in a standard 19-inch telco rack.
Standards-Based Compatibility	• **IEEE 802.3 Type 10Base-T standard compatibility** to support both 802.3 and Ethernet networks. • **Advanced embedded SNMP agent code** enabling the hub to be managed remotely from a network management station that supports Simple Network Management Protocol (SNMP) over IP (using the configured IP address) or Novell NetWare (IPX). The agent code also provides HP EASE (Embedded Advanced Sampling Environment), which samples network data for enhanced diagnostics from a network management station.
Other Features	• **Extended hub management capabilities**, providing a full set of management commands that can be executed from an ASCII console session. These are described later in this document in chapter 3, "Managing the Hub." • **An RS-232** serial port that provides out-of-band management access including: – An ASCII console to configure, monitor, and troubleshoot the hub. – Variable baud rates on the hub's out-of-band management RS-232 port, and automatic sensing of the selected baud rate when connecting to a terminal device. – Full V.22bis modem line control for remote out-of-band management access to the hub. – Updatable firmware that enables enhancements to be downloaded either from a computer attached to the out-of-band management port or over the network. • **A Redundant Power Supply (RPS)** connector that enables an RPS to be connected to the hub, providing an alternative redundant power source. • **Advanced integrated design** including an Intel i960 RISC processor, 1 megabyte RAM, and 512 kilobytes of flash EEPROM for configuration and future upgrade capabilities.

Contents

1

Installing the Hub

This chapter describes how to install the hub. Topics in this chapter include

- installing and configuring the hub
- connecting devices to the hub
- connecting hubs together
- interpreting hub LEDs

Installing and Configuring Your Hub

To install and configure your hub, you must complete five basic tasks. They are:

- locating and verifying the necessary parts
- connecting an external transceiver (if necessary)
- connecting the hub to a power source
- mounting the hub
- connecting the hub to your network

1. Verify included parts

Each Hub-16M has the following components shipped with it:

- *HP 10Base-T Hub-16M (J3188A) Installation and Reference Guide*—this manual (J3188-90001)
- A U.S./Canada/Mexico (8120-1378) power cord.
- Accessory kit (5064-2053):
  - bumper feet (4)
  - hub-to-rack screws 10-32 (4)
  - bracket-to-hub screws 10-32 (4)
  - nylon finishing washer (4)
  - bracket-to-hub screws (2)
  - AUI retainer assembly

2. Connect the external transceiver

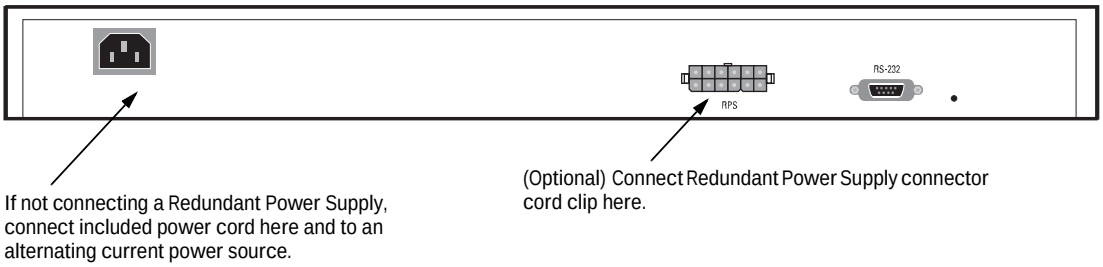
Because of the way the external transceiver protrudes out from hub once it is connected, you may want to install the external transceiver before installing the hub. Inspect your installation site and identify whether enough room will be available for the external transceiver to be connected. Then see your external transceiver guide for installation instructions.

3. Verify the hub operates correctly

Before mounting the hub, connect it to a power source and verify the hub will operate correctly.

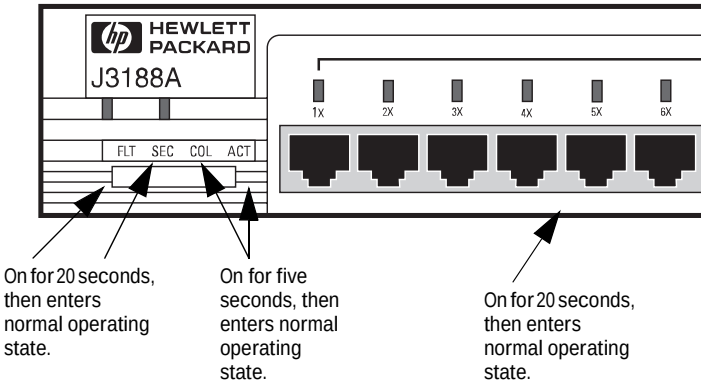
1. Plug the power cord into the hub's power cord receptacle and into an AC (alternating current) power source. If you are using an RPS as your primary power source, refer to the Cisco RPS User Guide for specific instructions.

Note If your RPS is the primary power source for the hub, disconnect the AC power cord connected directly to the hub for proper operation.



Note The hub does not have a power switch; it is powered on when the power cord is plugged in. HP recommends that you only use one power source at a given time.

2. Check the LEDs on the hub's front panel. When the hub is powered on, it performs a power-on self test. See the table below for the LED pattern that occurs during the self test.



LED	Pattern
Port LEDs, Fault, Security, AUI	ON for approximately 20 seconds, then enters normal operating state.
Activity, Collision, RPS	ON for approximately five seconds, then enters normal operating state.
System	Stays ON.

Note that once you have connected cables to the hub, a Port LED stays on if link beat has been detected at the port. A Port LED turns off if link beat is not detected. The AUI port stays on if it is enabled.

When the self test completes successfully, the LEDs go into their normal operational states. If a hub hardware fault exists, the hub will not complete self test. This will be indicated by an abnormal LED pattern.

If the self test time elapses and the Fault LED continues to stay on instead of turning off, the hub may have an error condition. If repeating the self test does not correct the problem and the Fault LED still stays continuously on, contact your reseller for replacement information. After the hub has passed its self test, you are ready to mount the hub.

4. Mount the hub

The HP Hub-16M can be mounted in two ways:

1. in a rack or cabinet
2. on a table

The hardware for mounting the hub is included in the accessory kit (5064-2053) packed with the hub. **Before mounting the hub, unplug it.** See Appendix G, "Safety and Regulatory Standards," for general mounting precautions.

Rack or Cabinet Mounting

Warning

The rack or cabinet should be adequately secured to prevent it from becoming unstable and/or falling over. Please see Appendix G, "Safety and Regulatory Standards," for precautions and warnings associated with rack mounting.

1. Using a Phillips T-10 screwdriver, attach the mounting brackets to the hub with #10-32 x 7/16" silver screws (included in the accessory kit).
2. Position the hub in the rack or cabinet and slide it up or down until the rack holes line up with the bracket holes.
3. Then attach the hub to the rack with the #10-32 x 5/8" black screws and black nylon washers included in the accessory kit with a Phillips cross-head screwdriver. (Some cabinets require number 12-24 screws instead. Make sure you have screws that fit your cabinet or rack before mounting the hub.)

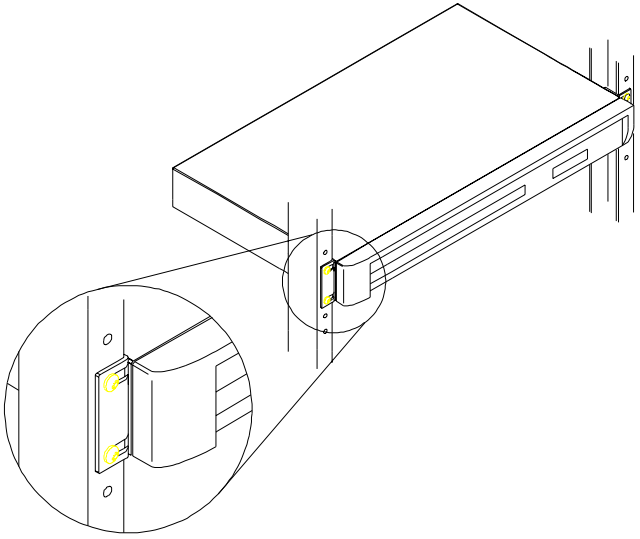


Table Mounting

To place the hub on a table or other horizontal surface, no special tools are necessary. Apply the four feet included in the accessory kit onto the bottom of the hub. Be certain to pick a sturdy table in an uncluttered area. You may want to secure the hub's cables to the leg of the table to prevent people from tripping over them.

5. Connect the hub to your network

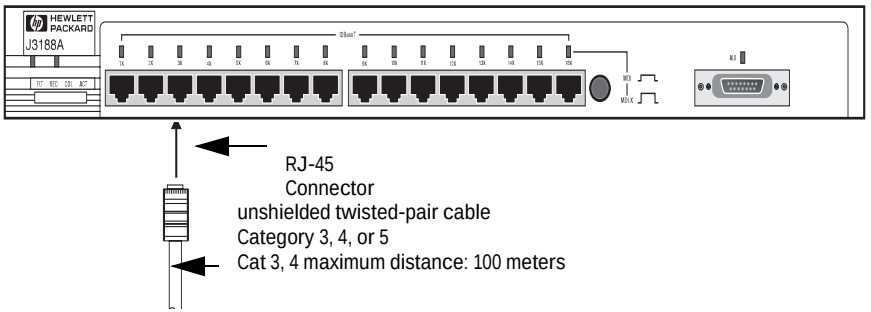
Reconnect the hub to either an AC power source or the RPS, depending on which source you are using. With the hub mounted, you are now ready to connect the hub to your network. Typical hub connections are:

- **hub-to-device connections.** Connecting to network devices such as computers, and printers.
- **hub-to-hub connections.** Connecting to another HP 10Base-T hub, or other Ethernet hub.
- **hub-to-network backbones.** Connecting to a network backbone.

This section describes the different ways you can connect your hub to your network.

Connecting Devices to the Hub

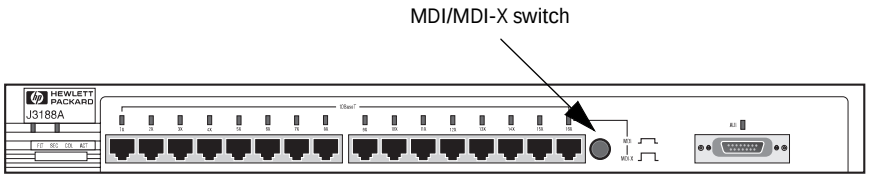
To connect a device to the hub, push the RJ-45 plug into the RJ-45 jack until the tab on the plug clicks into place.



Connecting Hubs Together

Twisted-Pair Cascade Connections

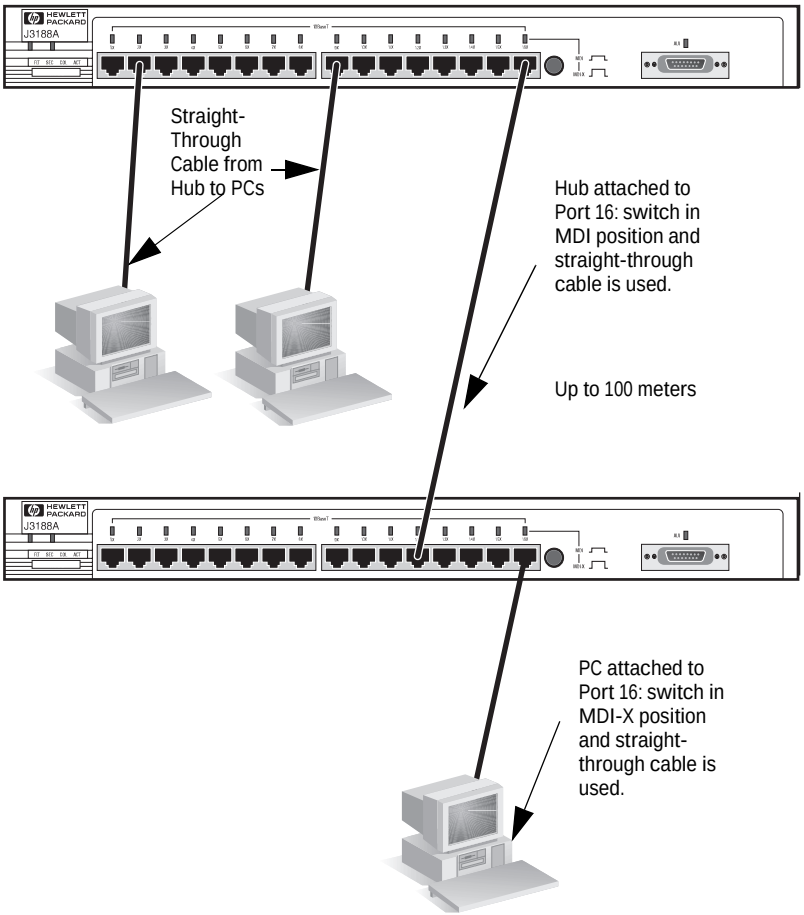
To expand your network, the hub can be connected to other hubs with straight-through cable by using the Media Dependent Interface (MDI) switch.



The MDI/MDI-X switch controls how the signals are sent through the twisted-pair cable connected to Port 16. The hub is shipped with the switch in the MDI-X position. The switch has two positions:

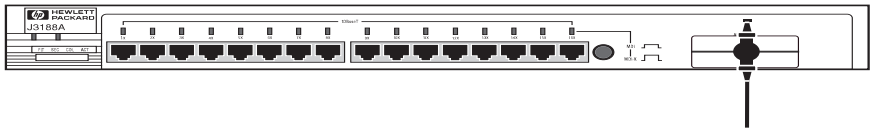
- **In the MDI position**, use Port 16 to connect your hub to another hub. In this position, the hub reverses the Tx and Rx port pairs for you. This allows you to use “straight-through” cable rather than “cross-over” cable to connect two hubs together. The cable can be up to 100 meters in length.
- **In the MDI-X position**, use Port 16 to connect your hub to a PC or similar device using “straight-through” cable.

In the following illustration, the first hub is connected to two end nodes and to a second hub. Note the second hub shows Port 16 connecting to a PC, using a straight through cable with the port in the MDI-X position.

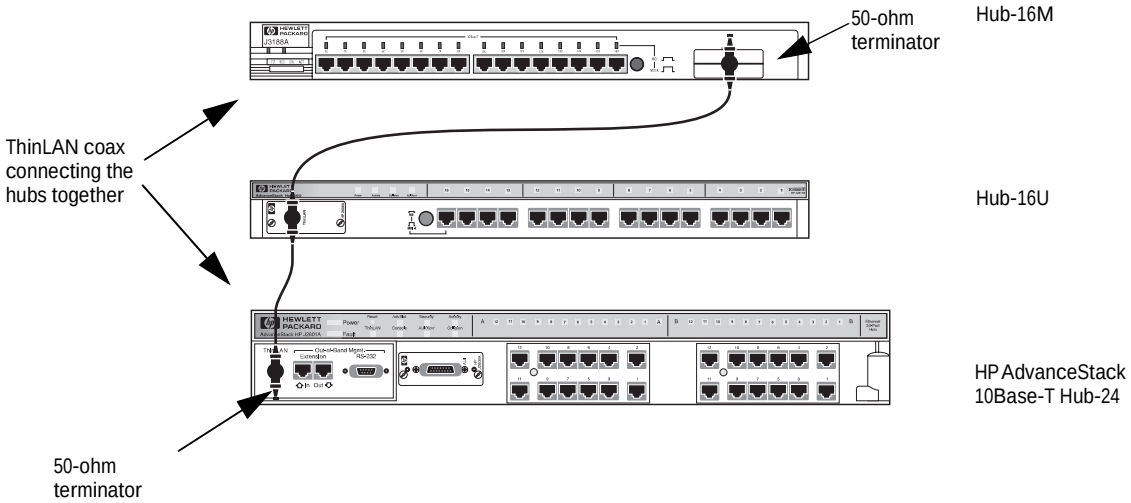


ThinLAN Connections

With an HP ThinLAN External Transceiver for 10Base2 networks, you can connect your hub or a stack of hubs to a thin LAN network. The following illustration shows a hub with an HP ThinLAN External Transceiver.



You can connect up to 30 hubs together on a common ThinLAN segment. The ThinLAN segment can include a computer attached to a hub at one end of the segment that can communicate with a computer attached to another hub at the other end of the segment. By using the BNC port on the module, the maximum repeater hop-count increment through the entire segment is only two. The following illustration shows you how to connect three hubs together from one ThinLAN port to another.

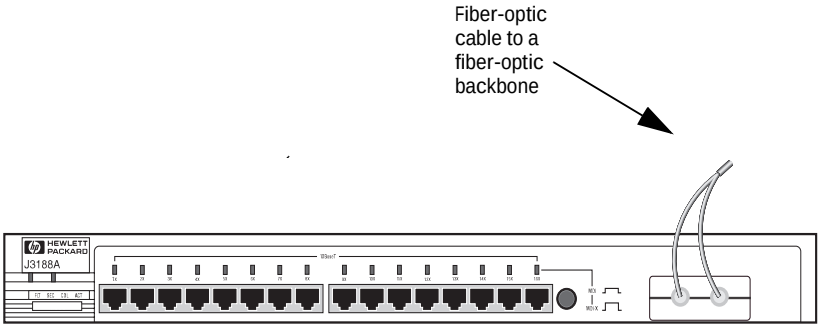


Note

Each ThinLAN cable segment must be terminated using a 50-ohm terminator at each end. In the illustration above, a 50-ohm terminator is placed at each end of the cable segment.

Connecting the Hub-16M to a Fiber-Optic Backbone

With an HP Fiber-Optic external transceiver for 10Base-FL networks, you can connect your hub to a fiber-optic backbone. The following illustration shows a hub with an HP Fiber-Optic external transceiver connected to a fiber-optic backbone:



For more information about cabling configuration, see the documentation accompanying the optional transceiver modules.

Interpreting LED Status

Two types of LEDs exist on the hub. They are:

- Hub Status LEDs. These LEDs reflect certain conditions that exist on the hub at large and are not explicitly referring to a given port.
- Port Status LEDs. These LEDs reflect basic conditions (for example, Link Beat being enabled) that exist on a specific port.

Status information for both are described in the following tables.

Interpreting Hub Status LEDs

The hub status LEDs indicate whether the hub is functioning properly. For further details on error conditions indicated by the Status LEDs, see chapter 2, "Troubleshooting".

LED	State	Meaning of LED
SYSTEM (Power) (green)	On	The hub is receiving power.
	Off	The hub is not receiving power.
ACT (Activity) (green)	Flickering	ON while a packet is being transmitted. Normally, the LED appears to flicker. In heavy traffic, it may appear on all the time.
FLT (Fault) (Orange)	On	An error has been detected on the hub.
	Off	No error has been detected on the hub.
	Flash	Flashes simultaneously with port LEDs, indicating the port is partitioned.
SEC (Security) (Orange)	On	A security violation has occurred.
	Off	Hub security has not been violated.
	Flash	Flashes simultaneously with port LEDs, indicating the port had a security violation.
RPS (RPS) (green)	On	The RPS is providing power.
	Off	The RPS is not providing power.
COL (Collision) (orange)	Flickering	This LED is on while a collision is detected. If it appears on continuously (with no flicker), it is a possible indicator of a network fault or an improperly terminated cable.

Interpreting Port Status LEDs

The following table provides LED port information.

LED	State	Meaning of LED
Twisted-pair Port (green)	On	Link beat is detected from the attached node.
	Off	The port is not receiving the link beat signal from the attached node.
	Slow Flash*	The port has been auto-partitioned. This port has been auto-partitioned (disabled) due to excessive collisions. This port will reenable when the connected device no longer causes collisions.
AUI Port (green)	On	The AUI port is enabled.
	Off	The AUI port is disabled.
	Slow Flash	The port has been auto-partitioned.
* The slow flash is approximately once every 1.5 seconds.		

Troubleshooting

This chapter describes ways to troubleshoot the hub. Topics covered are:

- troubleshooting approaches
- using a checklist to diagnose the hub
- interpreting the LED pattern during self test
- hub maintenance tasks

Troubleshooting Approaches

There are three primary ways to diagnose hub problems:

- By checking the LEDs on the front of the hub as described in the section, “Using a Checklist to Diagnose the Hub” later in this chapter.
- By using the ASCII console’s diagnostic functions as described in chapter 3, “Managing the Hub.”
- By using the CiscoView network management application as described in the CiscoView online help.

Using a Checklist to Diagnose the Hub

Use the following table to diagnose the problem with your HP Hub-16M.

Problem	Solution
How do I reset the hub?	Remove the plug on the power cord from the power source and reconnect it.
None of the LEDs are on.	Verify that the power cord is plugged into an active power source and to the hub. Make sure these connections are snug. Try power cycling the hub by unplugging and plugging the hub back in. If the Power LED is still not on, verify the AC source works by plugging another device into the outlet. Or try plugging the hub into a different outlet or try a different power cord. If this condition persists, call your HP-authorized LAN dealer or HP representative for assistance.
I lost the password.	Press the password reset button for 10 seconds. See page 2-4 for more details.
IP configuration errors have been reported.	Use the ASCII console's IP Configuration function as described in the chapter 3, "Managing the Hub."
I want to see if each cable is connected correctly.	Run TEstlink. See the command description in chapter 3, "Managing the Hub."
A user can't send data to another user.	Use the Connectivity tests in the ASCII console or in CiscoView to test the cabling. The tests are described in this chapter.
The Fault LED is on.	Remove the plug on the power cord from the power source and reconnect it. If problem persists, the device has an internal failure. Contact your HP authorized dealer or reseller.
The Security LED is flashing. How do I get it to stop?	Use the ASCII console or CiscoView to view the intruder log and clear the security violations.

Most problems with the hub can be diagnosed using the LEDs on its front panel. The following section describes the normal LED pattern during self-test, and LED patterns that indicate error conditions on the hub.

LED Operation

The tables on the following pages list the hub's LEDs, their possible states, and diagnostic tips to resolve any error conditions.

LED patterns indicating problems						Diagnostic Tips
Power	**Coll**	**Port LED**	**Sec**	**Fault**	**RPS**	
OFF	*	*	*	*	*	Verify that the power cord is plugged into an active power source and to the hub. Make sure these connections are snug. Try power cycling the hub by unplugging and plugging the hub back in. If the Power LED is still not on, verify the AC source works by plugging another device into the outlet. Or try plugging the hub into a different outlet or try a different power cord. If this condition persists, call your HP-authorized LAN dealer or HP representative for assistance.
ON	*	**OFF**	*	*	*	Check cabling on the indicated port all the way out to the device attached to that port. Faulty wiring or a bad connection could exist somewhere in that connection. The end node or hub attached to the port is off. The port may be disabled. Use the ASCII console or management application to enable the port. If Port 16, check the position of the MDI/MDI-X switch. See the figure in chapter 1 that details the MDI/MDI-X switch.
ON	**ON**	*	*	*	*	Very frequent collisions are occurring, which could indicate a network fault or improperly terminated cable.
***This LED is not important for the diagnosis.**						

LED patterns indicating problems						Diagnostic Tips
Power	**Coll**	**Port LED**	**Sec**	**Fault**	**RPS**	
ON	*	**Fast Flash**	**Fast Flash**	*	*	A security violation has occurred on the port that is flashing. See SEcure command for definition and details in Chapter 3.
ON	*	**Slow Flash**	*	**Slow Flash**	*	The port has been auto-partitioned because of an excessive collision condition. Check cable connections and status of attached network devices for causes of the excess collisions. The hub will automatically recover after certain IEEE 802.3 criteria are successfully met.
ON	*	*	**Fast Flash**	*	*	Network management security violation occurred. See SEcure command for details.
ON	*	*	*	**ON**	*	The hub has failed its self-test. Power-cycle the hub. If this condition persists, call your HP-authorized LAN dealer or HP representative for assistance.
ON	*	*	*	*	**OFF**	The internal power supply is operating properly and the RPS is not being used.
ON	*	*	*	*	**ON**	The internal power supply has failed or has been unplugged and the RPS has been activated as the current operating power supply.
***This LED is not important for the diagnosis.**						

Hub Maintenance Tasks

There are several hub maintenance tasks you can perform. They include:

- testing the hub only
- clearing a password from the ASCII console
- running connectivity tests

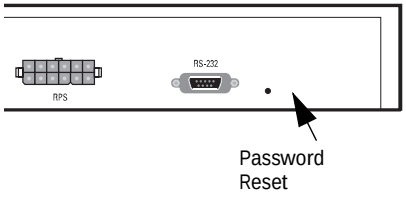
Each of these tasks is described in the following sections.

Testing the Hub Only

If you believe that the hub is not operating correctly, remove and reinsert the power cord for that hub. This procedure will cause the hub to complete its power-on self-test. If any error conditions exist in the hub, the LEDs should display the condition.

Clearing a Password for the ASCII Console

You can use the Password Reset button to clear a forgotten console password that was previously configured on the hub. The password is configured from the ASCII console.

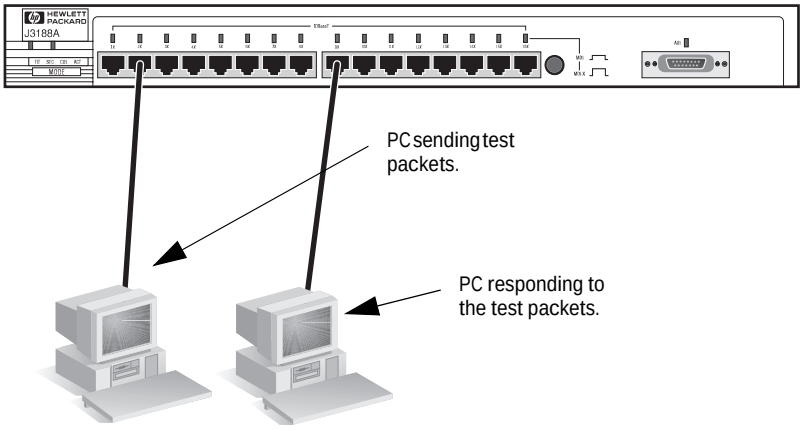


To clear the password, follow these steps:

1. Verify the hub has powered-up, passed power-on test, and that the System LED is lit.
2. Press the Password Reset button on the back of the hub for 10 seconds.

Running Connectivity Tests

Both the hub and cabling can be tested by running an end-to-end communications test -- a test that sends known data from one network device to another through the hub -- such that you can verify that the data was correctly transmitted between the devices.



See your LAN adapter's manual for information on running an end-to-end communication test.

Obtaining Firmware Enhancements

In the future, Hewlett-Packard may provide improvements to this product through firmware upgrades. The upgrade code can be downloaded from a PC attached to the hub's RS-232 port or over the network. The update procedures are described in documents that come with the firmware enhancements.

You can determine the current firmware version on the hub from the ASCII console. Look for the SNMP Agent EEPROM version number to determine the revision. When you access the console, the version number appears.

Managing the Hub

This chapter describes the features available from an ASCII console. Topics include:

- setting up the ASCII Console
- console command reference

The HP Hub-16M has SNMP that allows you to manage the hub using one of the following utilities:

- an ASCII console
- CiscoWorks
- any SNMP-compliant network management product except HP AdvanceStack Assistant.

Setting up the ASCII Console

You can begin a console session in the hub in the following ways:

- directly, using a serial cable and a terminal (or a PC using a terminal emulator)
- remotely, using Telnet
- remotely, using a modem and a terminal

The HP Hub-16M supports a single console session only. If a console session is already running, a second console session can override the current console session.

Directly, Using A Serial Cable and a Terminal

To directly connect a terminal to a hub, follow these steps:

1. Connect an ASCII terminal, or a PC emulating an ASCII terminal, to the RS-232 port using an RS-232-C "null modem" cable. (For pin-outs and recommended cables see Appendix A, "Cables and Connectors".)
2. Switch on the terminal's power (or switch on the PC's power and start the terminal emulation program). Configure the terminal for 8 bits per character, 1 stop bit, no parity, Xon/Xoff handshaking, and a baud rate of 38400, 19200, 9600, 4800, 2400, or 1200.
3. Press Enter several times for the => or Password prompt. The baud rate for communication between the hub and the terminal is set automatically when you press Enter.

Remotely, Using Telnet

The HP Hub-16M supports a Telnet console session. Your Telnet syntax depends on your TCP/IP software or your terminal server. By default, Telnet is enabled. You can disable Telnet by using the IPconfig console command described on page 3-7.

To establish a Telnet session, follow these steps:

1. Verify that the hub has been configured with an IP address, and that it is accessible via IP from your PC or workstation.
2. Enter the command **telnet** followed by the IP address or system name of the hub, for example:

   ```
   telnet 192.1.1.10
   or
   telnet your_hub
   ```

   (Your Telnet syntax depends on your TCP/IP software or your terminal server. You can use a system name if you have name resolution such as DNS.)

To end the Telnet session, type DI (the DIsconnect command) to terminate the console session. Or use your Telnet application's command to close or quit the Telnet session.

Remotely, Using a Modem and a Terminal

1. Use a full-duplex, asynchronous (character-mode) modem only.
2. Connect the modem to the hub's RS-232 port using an RS-232-C modem cable. (For pin-outs and recommended cables see Appendix A, "Cables and Connectors".)
3. Configure the modem as described in the Appendix C, "Modem Configuration."
4. At the remote site, connect the terminal (or PC emulating a terminal) to the remote modem. Make sure the terminal and modems are functioning properly, then establish the link between the terminal's modem and the hub's modem according to the modem instructions.
5. Press Enter several times for the => or Password prompt. The baud rate for communication between the hub and the modem is set automatically when you press Enter.

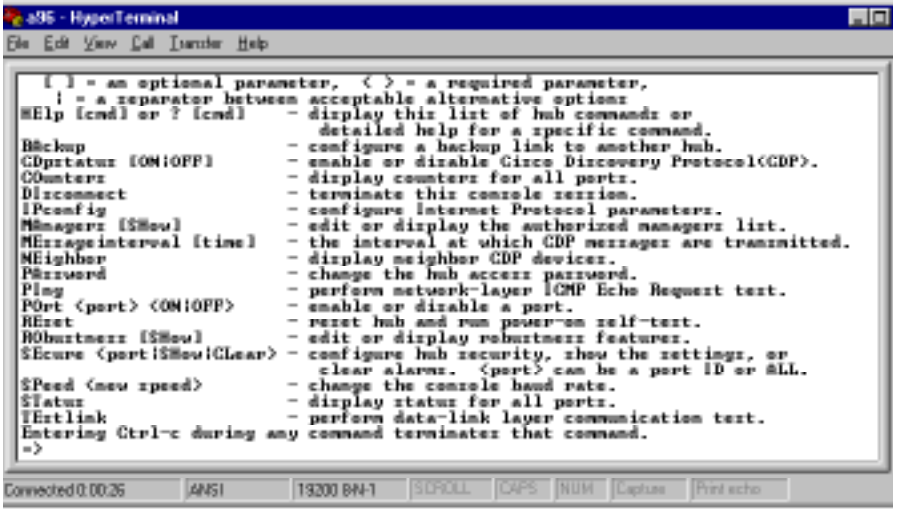
Starting the Console

The console session starts with a display similar to the following (the actual version numbers may be different):

```
HP J3188A Hub-16M
ROM A.01.00
EEPROM A.01.00
HW A.01.00
Use console commands for hub configuration.

Enter password:

    If a password has not been assigned with the PAssword command, then you
    are not prompted for your password here.

    If a console session is currently active, then you are prompted to break the
    current active console session.
A console session is currently active.

Do you want to break in? (Y/[N]) Y

Connecting…

Enter a console command, or HE or? for help.
=>
```

Console Command Reference

Enter at least the first two letters of a command to execute it, such as HE for the Help command. The Help command displays a screen like the following, listing all commands.



Syntax Conventions on Help Screen:

< >	–	Indicates a required parameter.
[ ]	–	Indicates an optional parameter.
|	–	Used as a separator between acceptable variable values.
For example, SE <port|SHow|CLear> indicates that either a port ID, or the characters SH or CL, must be entered after the SE command.		

The commands are described in the rest of the chapter.

HElp [cmd] or? [cmd]

To see the help screen shown above or, if you include a specific command, the syntax and description of that specific console command. For the [cmd] parameter, use the first two letters of the command you wish to see.

Example: HE ST (This displays help for the Status command.)

BAckup

To configure one of the hub's ports for dedicated use in a backup (redundant) link to another hub.

An HP Hub-16M allows you to use any two of its network ports for a redundant link to another hub in your network. The backup link normally carries no traffic, but it is automatically activated if the primary link fails. *Note that any of the ports can be the backup port to any other port.*

When you enter the Backup command, you are prompted for these values:

	Default	Description
Backup Port	Disabled	The port used for the backup link. Enter the port ID. Or, enter DI (for disable) if you wish to remove an existing backup link configuration.
Primary Port	None	The port used for the primary link. Enter the port ID.
Remote MAC address	000000-000000	The 12-digit hexadecimal MAC address of the hub at the remote end of the critical link.
Seconds Between Test Packets	1 second	How often you want the hub to send an IEEE 802.2 Test packet to the remote hub over the primary link.
Consecutive Failures	2 failures	The number of consecutive Test packet response failures that will trigger activation of the backup link. For example, enter 5 to activate the backup link on the fifth failure.

The hub monitors the primary link by sending IEEE 802.2 Test packets at the specified frequency to the specified remote hub. If "n" consecutive Response packets are not returned from the remote hub, the primary port is disabled and the backup port is enabled.

When the primary link is repaired, you must re-enable the primary port by using the Port command. It is not automatically re-enabled. When the primary port is re-enabled, the backup port is disabled automatically and returned to backup mode. See the appendix on Backup Links. This appendix also covers more information on backup links, including requirements, limitations, and sample topologies.

CDpstatus

To enable or disable the Cisco Discovery Protocol (CDP). The command takes either an ON or an OFF argument. The initial setting is ON. ON enables the protocol. OFF disables it. If no option is chosen, the current status is shown.

COunters

To display network activity counters for each network port, the hub's SNMP agent, and the global count for all ports.

The port counters are from the IEEE 802.3 Repeater Management Specification. They are described below:

Counter Name	Definition	Valid Range	Corrective Action if over Valid Range
Good Packets	Number of error-free packets received.	Less than 4000 packets per second.*	Decrease the traffic level by using a switch to segment the network.
Collisions	Number of times the port was involved in a collision. A single collision will be counted by all ports involved, so the total collision counters may be less than the sum of the port counts.	Less than 2 times the number of good packets.	Decrease the traffic level by using a switch to segment the network Replace bad cables and/or transceivers if problems persist. Rarely, you may have a defective LAN adapter.
Late Collisions	Number of collisions which went undetected by the sending end node.	Less than.1% of good packets.	Too many repeaters between end nodes, or cables which are too long, or bad cable.
CRC/Alignment Errors	Number of packets transmitted incorrectly and number of incorrectly aligned packets.	Less than.1% of good packets.	This counter indicates faulty cabling.
Giant Packets	Number of packets larger than 1518 bytes.	Less than.1% of good packets.	Update the LAN adapter drivers on all nodes connected to the port.
Broadcast Packets	Number of packets addressed to everyone in the network. These packets consume CPU resources from each node on the network.	Less than 200 packets per second.*	Decrease the number of nodes in an IP subnet or IPX network by using more routers. Consult Novell Netware documentation on how to reduce broadcasts in an IPX network.
*The port counters in the ASCII console show totals, not number of packets per second. For the Good Packets and Broadcast packets, display counters twice over a period of one section to see if the value falls in the valid range.			

DIsconnect

To terminate the console session and reset the console port baud rate to be automatically sensed. The command also disconnects the phone link if you accessed the console using modems.

IPconfig

To set IP (Internet Protocol) configuration parameters on the hub. By default, the hub is configured to use BOOTP (Internet Boot Protocol) to automatically retrieve the IP parameters from a BOOTP server, and to enable Telnet access to the hub's console interface. Use this command if you want to manually configure the IP address or disable Telnet.

The IP configuration must be carefully controlled. If each device's IP address is not unique on the network, severe network performance problems will occur. A network administrator should maintain responsibility for the IP settings. See Appendix D, "Network Addressing," for information on setting the IP configuration.

Note

At the end of the process of changing the IP configuration, the hub will be reset. This terminates the console session (and disconnects the phone line if using a modem) and resets the console port baud rate to be automatically sensed. To restart a console session, when the reset process completes, press Enter several times for the prompt.

When to Use IPconfig

If any of the following is true, the hub's IP parameters must be configured, either on a BOOTP server or on the hub through the console interface:

- The hub will be managed remotely with a network management product, such as CiscoWorks over an IP network (a network that uses IP communications, for example TCP/IP).
- The network cable segments attached to the hub will be tested using the IP "Ping" test.
- Telnet access to the hub is desired.

Configuring for Network Management

If the hub is to be managed from a network management station, it must use the same networking protocol as the network management station. You have these choices:

- Novell NetWare IPX
- IP

Using Novell NetWare IPX

The HP Hub-16M is designed to automatically use Novell NetWare's IPX protocol. If you are using the hub on a Novell NetWare network, no configuration of the hub is required for it to communicate with a network management station that is also using the IPX protocol.

The hub determines its IPX address automatically from information received from a router or file server that is running IPX on the network, and from its own MAC address, physical address, or Ethernet address). See your Novell documentation for more information on IPX communications and addressing.

Using IP

You can use IP by using one of the following methods:

- using BOOTP by adding an entry for the hub in the BOOTP table on your BOOTP server, and enabling BOOTP through the hub's console interface (this is the default setting)
- using the console interface to configure the IP parameters

BOOTP is covered in Appendix D, "Network Addressing."

To use the console interface to configure the IP parameters, enter IP and the following text appears:

```
=>IP
Active IP parameters:
BOOTP protocol enabled:  YES
Telnet access enabled:  YES
IP address:  0.0.0.0
Subnet mask:  0.0.0.0
Default router:  0.0.0.0
Time to live:  64
Change IP configuration?  (Y/[N]):
```

The following table explains the IP parameters.

Parameter	Default Value	Definition
BOOTP protocol enabled	YES	Keep or set this value to YES if you are using a BOOTP server to provide the IP configuration to the hub. By default, the hub is configured to automatically seek an IP address from a BOOTP server on the network. This is done when the hub is powered on. If an IP address is not found, the HP Hub-16M will seek an IP address every ten minutes until it finds an IP address. Set this value to NO to disable this BOOTP process. If you are not using BOOTP to provide the hub's IP configuration, you should set this parameter to NO.
Telnet access enabled	YES	Determine whether users are allowed to use Telnet to access the hub's console interface.
IP address	0.0.0.0	The IP address of the hub (written in the format X.X.X.X). Each X is a decimal number between 0 and 255 separated by a decimal point. This address will be used unless the BOOTP protocol is enabled. The default value (0.0.0.0) disables IP communications on the hub when BOOTP is also disabled.
Subnet mask	Must be supplied and depends on the class of IP address that has been entered.	The bit mask defining which portion of the IP address is the subnet address, written in the format X.X.X.X. All the devices on your network should use the same subnet mask. See your network administrator for the correct value.
Default router	0.0.0.0	The IP address of the nearest IP router in your network. If no IP routers are in your network, enter the device's own IP address.
Time to live	64	The number of IP routers a packet is allowed to cross before the packet is discarded. Increase this value if the hub will be sending IP packets to a destination that is more than 64 routers away. The maximum is 255.

MAnagers [SHow]

To configure the list of network management stations that are authorized to access and manage this hub, and to specify which of those stations should receive alarms. Use the SHow option to display the current list of authorized management stations without being prompted to edit the list.

The list consists of the IP or IPX address of the network management station and an indication of whether each management station should receive alarms (indications of specific network events that are configured for the hub from

network management— also called SNMP event alarms). The start of the table is shown below. Up to ten network management stations can be entered into the table. Entry 0 (zero) is used for the "all managers allowed" entry.

ID	Manager Address (IP or IPX)	Receive Alarms?
0	All managers allowed	NA
1		
2		

The hub is initially shipped with *all* network management stations allowed to manage the hub, but the "all managers" entry does not identify where alarms are to be sent. Specific addresses must be entered into the table to identify where the alarms should be sent.

Note

If you want to restrict which management stations are allowed to manage the hub, delete entry 0. Then add the allowed management stations with the A command.

At the interface prompt, enter MA; the current authorized managers list is displayed and you are prompted to add or delete an entry in the list, or to enter E to end your editing.

To add an entry, enter A at the prompt. Enter the IP or IPX address of the network management station, or enter A to allow all managers to manage the hub, then indicate at the next prompt whether this management station should receive alarms generated by the hub. A new entry is added to the list.

Example: To add the network management station with IP address 190.40.101.10 to the list and to send alarms to that station, the process would appear as follows:

Add entry (A), Delete entry (D), or End changes (E): **A**
Enter Manager Address, or (A) to allow all managers access: **190.40.101.10**
Should this manager receive alarms: (Y/[N]):**Y**

Add entry (A), Delete entry (D), or End changes (E): **E**
Current authorized manager list:

ID	Manager Address (IP or IPX)	Receive Alarms?
0	All managers allowed	NA
1	190.40.101.10	YES
2		

To delete an entry, specify the ID number in the list corresponding to the network management station to be deleted.

Example: To delete the entry made in the example above, the steps would be:

Add entry (A), Delete entry(D), or End changes (E): **D**
Enter ID of entry to delete: **1**

Add entry (A), Delete entry (D), or End changes (E): **E**

The table entry with ID 1 would now be a blank line.

MEssageinterval

To enter a new value that will indicate how much time, in seconds, should lapse between transmissions of CDP messages. Displays the current interval if no time is specified. Acceptable values are decimal numbers from 5 to 900 (seconds). The default value is 60 seconds.

NEighbor

Displays the other devices that are using CDP protocol.

PAssword

To set or change the password on the hub. The Password is used to prevent unauthorized access to the hub from network management stations, and through the console interface. The hub is initially shipped without a password. Follow the prompts to enter a new password or to change the existing password. If you assign a password, it is also used as the SNMP community name.

If you decide to delete the password, enter the Password command, then press Enter without entering any characters at the password prompt.

Press and hold the Password Reset button for approximately 10 seconds to clear a password.

Note

After the password has been cleared, access to the hub from the ASCII console and from SNMP management stations will no longer be password protected. A new password can be assigned from the ASCII console or CiscoWorks.

PIng

To test the path between the hub and another device that responds to IP packets. The hub sends Internet Control Message Protocol (ICMP) Echo Request (Ping) packets to another node with the specified IP address and waits for Echo Response packets in return.

When you run the Ping command, you will be prompted for:

- the IP address of the destination device (in the format X.X.X.X)
- the number of packets to send
- the timeout value (the number of seconds to wait for a response)

If any errors are reported during this test, there may be a fault in the path used during the test or in the destination device. For more information about testing network links, see chapter 2, “Troubleshooting”.

POrt <port> <ON/OFF>

To enable (set to ON) or disable (set to OFF) a hub port. The initial setting for all ports is enabled (ON). You can use the Status command to check the current status of all the ports. The <port> parameter can be:

- twisted-pair port number
- XCVR or XC for the AUI port
- ALL or AL for all ports

Example 1: P0 7 OFF (Disables port 7)

Example 2: P0 AL ON (Enables all ports)

REset

To reset the hub and run a hub self-test. This command also resets all the network statistic counters, and the time since the last reset. The current configuration is unchanged. The hub is not accessible from network management software while it is being tested, but it continues to repeat data. If the hub is faulty, at the end of the reset process, the Fault LED will stay on.

This command also terminates the console session (and disconnects the phone line if you are using a modem to access the console) and resets the console port baud rate to be automatically sensed. To restart the console session, first re-establish the phone link (if used), then press Enter several times for the prompt.

RObustness

Allows you to invoke options to improve the hub's ability to tolerate network problems resulting from excessive collisions. The configurable options are:

- Intelligent Partition Recovery
- Late Collision Monitoring

By default, the robustness features are off. The Intelligent Partition Recovery option makes it difficult for a problem port to automatically re-enable itself to send traffic on the network.

The Late Collision Monitoring option monitors ports for excessive late collisions. If monitored ports experience excessive late collisions, these ports are disabled.

See the section on Auto-Partitioning in the chapter that provides the Product Description.

SEcure <port|SHow|CLear>

To control or display the hub's security configuration, and to clear security violation indicators. The <port> parameter can be:

- a twisted-pair port number only.
- XCVR or XC for the AUI port.
- ALL or AL for all ports

Security Configuration Parameter Definitions

The following security parameters are configurable on each of the hub's network ports. These parameters are defined on the next two pages:

- Address selection method, or authorized MAC address
- Send alarm when intruder detected
- Eavesdrop prevention

An additional parameter, "Disable port when intruder detected", is set automatically by your selection of the address selection method. See "Auto Port Disable" in Appendix F, "Security Information," on this parameter.

Address selection method, or authorized MAC address. This is the method by which the hub automatically learns the address of the device that is authorized to use the port, or you can enter a specific address. The following methods are configurable:

- **Learn Continuously**—*provides minimum port security (default security state)*. The hub learns the address of the first device attached to the port and makes it the authorized MAC address. If a different device is later attached to the port, the new address is learned and becomes the authorized address. Each new device attached becomes the authorized device. You can be informed of any such changes by setting the Send Alarm parameter to YES. In that case, when a new address is detected, the

Security and port LEDs flash, the intruder's MAC address is displayed on the console Status command screen, and an alarm is sent to the authorized network management station(s).

- **Use the First Address Heard**—*provides medium port security*. The hub learns the address of the first device attached to the port and makes it the authorized MAC address. If you have any security configured for the port (Send Alarm and/or Eavesdrop Prevention parameters are set to YES), when a different device is later attached to the port, the new address is registered as an "intruder address"; a security violation has occurred. In that case, the port is automatically disabled, and the Security and affected port LEDs flash. An alarm is also sent to the authorized network management station(s) if the Send Alarm parameter is set to YES.
- **Assign an Address**—*provides the highest security*. You enter the address of the device that is authorized to be attached to the port. If you have any security configured for the port (Send Alarm and/or Eavesdrop Prevention parameters are set to YES), when a different device is later attached to the port, the new address is registered as an "intruder address"; a security violation has occurred. In that case, the port is automatically disabled, and the Security and affected port LEDs flash. An alarm is also sent to the authorized network management station(s) if the Send Alarm parameter is set to YES.
- **Port Security Off**—*disables port security*. This is a convenient way to remove the port security. It automatically sets the Send Alarm and Eavesdrop Prevention parameters to OFF (and therefore, the Disable Port parameter will also be OFF).

Send Alarm when intruder detected. Configures the hub to send an alarm (SNMP trap) to a network management station whenever an unauthorized address (an intruder) is detected on the port. *Note that for the alarm to actually be sent, you must have first used the Managers command to configure one or more network managers to receive alarms.* See the Managers command description earlier in this chapter.

Eavesdrop prevention. Configures the hub to prevent the port from hearing data that is intended for another port. Only the data packets that have a destination address that matches the port's authorized address are sent to the port. If Eavesdrop Prevention is not enabled on all ports, the hub functions like a repeater and every packet seen by the hub is forwarded to the non-Eavesdrop Prevention ports. See Appendix F, "Security Information," for a detailed description of this feature.

Configuring Security on a Single Port

To set or change the security configuration for a single port on the hub (twisted-pair or AUI), enter SE and the port's ID; for example, SE 4. The port's current security configuration is displayed, followed by a prompt to change the configuration or not.

If you choose to change the configuration, you are then prompted for the following parameters (defined on the previous page):

- Address selection method, or authorized MAC address
- You are first prompted if you want to change the address selection method or the authorized address. Press Enter or enter N to retain the current value. Enter Y to change the value and you are prompted to select one of the following methods:
  - learn address Continuously (enter C)
  - use First address heard (enter F)
  - Assign an address (enter A)
  - port security Off (enter O)
- Send alarm when intruder detected
- Eavesdrop prevention

Note

To enable security on a port, at least one of the parameters, Send Alarm or Eavesdrop Prevention, must be set to ON.

Configuring Security on All Twisted-Pair Ports

To set or change the security configuration for all the twisted-pair ports together, enter SE ALL. This method is most useful when you are using the same security configuration for all the twisted-pair ports, either at initial setup or when you want to change the configuration for all the ports. You are prompted whether to continue this process or not. If you choose to continue, you are then prompted for:

- Address selection method:

  If you select First heard for all ports (F), learn continuously for all ports (C), or security Off for all ports (O), the setting you select will be applied to all the twisted-pair ports. If you enter F, the authorized address for each of the twisted-pair ports will be the source address in the first packet received from the attached device. If you enter C, each of the twisted-pair ports will continuously update the authorized address when the attached devices change. If you enter O, the security will be turned off for all the twisted-

pair ports; that is, the security parameters will all be set to NO (configured address selection methods, and learned or assigned addresses are not changed).

If you select assign Each port (E), a table like the following is displayed:

Port	ADDRESS SELECTION METHOD	AUTHORIZED ADDRESS	F, C, or a MAC address
1	CONTINUOUS	NONE	
2	CONTINUOUS	NONE	
3	CONTINUOUS	NONE	

For each port, enter an address selection method (F, or C), or a specific MAC address, or press Enter to retain the current value. Continue this process until all of the ports are displayed. If you do not want to configure all twisted-pair ports, note that you can terminate the address selection method by pressing Enter once. In either case, you are then prompted for the settings for the Send Alarm and Eavesdrop Prevention parameters, as described on the next page.

- Send Alarm when intruder detected? and Eavesdrop prevention?:

  These parameters are defined earlier in the chapter under "Security Configuration Parameter Definitions".

  The values you select for these parameters will be applied to all the twisted-pair ports for which you have selected (or retained) the address selection method.

Showing the Security Configuration

Enter the command SE SH to display the security configuration for all of the hubs ports. A table like the following is presented:

Port	ADDRESS SELECTION METHOD	AUTHORIZED ADDRESS	EAVESDROP PREVENTION	SEND ALARM	DISABLE PORT *
1	CONTINUOUS	123456-890123	YES	NO	NO
2	CONTINUOUS	NONE	NO	NO	NO
3	FIRST HEARD	123456-789012	YES	YES	YES

The vertical bar between Send Alarm and Disable Port indicates that the value for the Disable Port parameter is not directly configurable. This parameter is automatically set by the Address Selection Method. If the method is either First Heard or Assigned, and if at least one of the other security parameters is set to YES, the Disable Port parameter will be YES. If the method is Continuous, the Disable Port parameter is always automatically set to NO.

Clearing Security Violation Indicators

Enter the command SE CL to clear any security violation indicators and to "rearm" the indicators to be ready for the next intrusion. The indications are slightly different between port security violations and network management security violations, as described next.

For Port Security. The security violations are indicated by the Security LED and the LED for the affected port blinking simultaneously, and the intruder's MAC address being added to the Status command screen for the affected port. Security violations occur when a non-authorized address is detected on a port and at least one of the intruder prevention parameters (Send Alarm or Disable Port) is set to YES.

For Network Management Security. The security violations are indicated by the Security LED flashing and the violating network management station's address being displayed on the Status command screen.

A network management security violation occurs when a network management station that is not on the authorized management station list attempts to issue SNMP "set" commands to the hub, or when a network management station uses an invalid password (SNMP community name) to access the hub.

See the Managers command description, earlier in this chapter, for information on the authorized management station list. By default, all network management stations are allowed to manage the hub. Under this configuration, network management security violations will not occur.

Notes

If the port was disabled because of a security violation (Disable Port = YES), to re-enable the port you must enter the port ON command for that port.

The Security Clear command does not remove the cause of the security violation, for example the wrong device being attached to a port. Until the cause is removed, the violation can reoccur immediately after issuing the SE CL command. It may appear as if the violation indication was never cleared.

SPeed <new speed>

Change the console port baud rate. Normally, the baud rate is automatically sensed. Use this command if you want to set the baud rate explicitly to 1200, 2400, 4800, 9600, 19200, or 38400. You will be prompted to set the terminal's baud rate to the same speed and to press Enter for the prompt. Example SP 9600. (Sets the baud rate to 9600.)

STatus

To display status information for the hub. The status information includes:

- the time elapsed since the last reset (see the Reset command),
- the hub's MAC address,
- if a network management security violation has occurred, the MAC address of the violating network management station,

- Redundant Power Supply status:
  - NOT CONNECTED means the RPS is not attached to the device.
  - CONNECTED/FAULT means the RPS is attached but is reporting an error.
  - CONNECTED/GOOD means the RPS is attached with no errors, but has not been enabled.
  - CONNECTED/GOOD/ACTIVE means the RPS is attached with no errors, and is active (the primary power supply is not operating and the RPS has been initiated as a backup system).
- a table with the port information described as follows:

Status Information	**What It Means**
Port	The port ID. (Additionally, **bkup** indicates that the port is configured as the backup link, **pri** indicates that the port is the primary link—see the Backup command).
Port Status	The status of each port: **ON** means the port is enabled and is not auto-segmented. **OFF** means that the port has been disabled by the Port command or because of a security violation. **PARTITIONED** means the port has been auto-partitioned. (See "Auto-Partitioning" in the *chapter that provides information on the Product Description*.) **ON/REVERSED** means that reversed wiring polarity on the receive pair has been detected on a twisted-pair cable and the hub has compensated.
Link Beat	Informs the hub of the presence of a device connected to it over twisted-pair cable.
MAC address	The unique 12-digit link-layer address for the hub. (Also called Ethernet address or physical address.)
INTRUDER ADDRESS	The address of a device not authorized to access the hub.

TEstlink

To run a test of the link between the hub and another IEEE 802.3 device.

Note

The destination device must be able to send an IEEE 802.2 Test Response packet upon receipt of an IEEE 802.2 Test command packet. The HP Hub-16M will respond with the correct packet.

You will be prompted for the 12-digit hexadecimal MAC address of the destination device. You will then be prompted for the number of test packets to send.

If any errors are reported during this test, there may be a fault on the link being tested or on the destination device. For more information about testing network links, see the chapter 2, “Troubleshooting”.

Cables and Connectors

This appendix lists cables that have been tested and verified for use with the HP Hub-16M. The following topics are covered:

- recommended Cables
- twisted Pair Cable/Connector Pinouts
- RS-232 Connector and Cable Pinouts

It also includes minimum pin-out information so, if you wish to use an unlisted cable, you can verify that the cables used in your installation are correctly wired. Note that each pin-out does not necessarily match the pin-out for the corresponding HP cable, but cables manufactured to follow the minimum pin-out will function correctly.

Recommended Cables

The following table shows PC connections to the RS-232 port.

Console PC connection to the RS-232 port:			
Purpose	**Cable**	**Description**	**Part No.**
Connecting the PC directly to the module's RS-232 port	9-pin male	RS-232 9-pin female to 9-pin female null modem or "cross-over" cable	F1047-80002 or F1047-60901 or 5182-4794
	25-pin male 25-pin female	RS-232C 9-pin female to 25-pin male null modem or "cross-over" cable RS-232C 9-pin female to 25-pin-female null modem or "crossover" cable	24542G (3 meters) 25442H (3 meter)
Connecting a modem to the hub's RS-232 port	25-pin female	RS-232C 9-pin female to 25-pin male standard modem or "straight-through" cable	HP 24542M

The following table shows network connections to the hub.

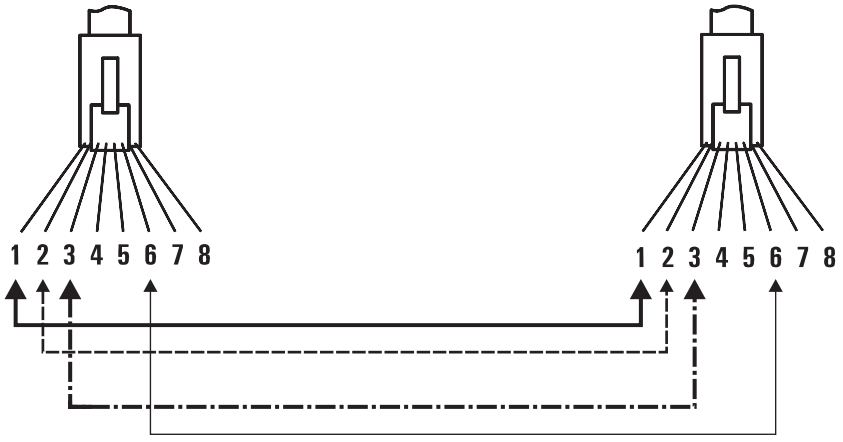
Cable Function	Cable Type	HP Product Number
Network connections to the hub:		
Hub to end node connection or hub to hub connection using the MDI/MDI-X switch	Twisted-pair "straight-through" cable	92268A (4 pair, 4 meters) 92268B (4 pair, 8 meters) 92268C (4 pair, 16 meters) 92268D (4 pair, 32 meters) 92268N (4 pair, 300 meters)*
* The maximum total length of any twisted-pair segment is 100 meters.		

You can contact your HP authorized dealer or call HP at 1-800-538-8787 to order these parts.

Twisted-Pair Cable/Connector Pin-Outs

Twisted-Pair Cable for Hub-to-Computer Network Connection

To connect PCs or other network devices to the hub, use a "straight-through" 10Base-T cable. The twisted-pair wires must be twisted through the entire length of the cable. The wiring sequence must conform to AT&T 258A (not USOC). See "Twisted-Pair Cable Pin Assignments" at the end of this chapter for a listing of the signals used on each pin.



Note

Pins 1 and 2 *must* be a twisted pair.
Pins 3 and 6 *must* be a twisted pair.

Pins 4, 5, 7, and 8 are not used in this application, although they may be wired in the cable.

RS-232 Connector and Cable Pin-Outs

The Management Module's RS-232 port connector is wired as depicted in the following table.

PIN	US	CCITT	DIN
1	DCD	109	M5
2	Rx	104	D2
3	Tx	103	D1
4	DTR	108	S1
5	GND	102	-
6	DSR	107	M1
7	RTS	105	S2
8	CTS	106	M2
9	RI	125	M3

Use the RS-232 port to connect a PC to be used as the console. To make this connection, you must use a null modem cable or you can use the minimum cable pin-out described below.

This appendix lists cables that have been tested and verified for use with the HP Hub-16M. It also includes minimum pin-out information so, if you wish to use an unlisted cable, you can verify that the cables used in your installation are correctly wired. Note that each pin-out does not necessarily match the pin-out for the corresponding HP cable, but cables manufactured to follow the minimum pin-out will function correctly.

Note

Incorrectly wired cabling is the most common cause of problems for LAN communications. HP recommends that you work with a qualified LAN cable installer for assistance with your cabling requirements.

Minimum Cable Pinout for ASCII Console Connection

PC end 9-pin male		Hub end 9-pin male	
2		2	Rx
3		3	Tx
5		5	GND

RS-232 Modem Cable

Modem end 25-pin male		Hub end 9-pin male	Signal
2	←	3	Tx
3	→	2	Rx
4	←	7	RTS
5	→	8	CTS
6	→	6	DSR
7	—	5	GND
8	→	1	CD OR DCD
20	←	4	DTR
22	→	9	RI
23	←		DRS–typically on V.24 (European) modems (not connected)

Twisted-Pair Cable Pin Assignments

Twisted-Pair Straight-Through Cable

Hub End (MDI-X)			Computer or Transceiver End (MDI)	
Signal	**Pins**		**Pins**	**Signal**
(receive +)	1	←	1	(transmit +)
(receive –)	2	←	2	(transmit –)
(transmit +)	3	→	3	(receive +)
(transmit –)	6	→	6	(receive –)

Specifications

Physical

Width:	42.5 cm (16.8 in)
Depth:	23.8 cm (9.4 in)
Height:	4.36 cm (1.7 in)
Weight :	8 lbs and 7 oz. (8.7 lbs)

Electrical

The hub automatically adjusts to any voltage between 100-127 and 200-240 volts and either 50 or 60 Hz.

ac voltage:	100–127 volts	200–240 volts
Maximum current:	0.3A max	0.2A max
Frequency range:	50/60 Hz	50/60 Hz

The maximum current ratings represent the current that could be drawn with an external transceiver attached to the hub.

Environmental

	Operating	**Non-Operating**
Temperature:	-5°C to 45°C (23°F to 113°F)	-40°C to 70°C (-40°F to 158°F)
Relative humidity: (non-condensing)	10% to 95% at 40°C (104°F)	10% to 90% at 65°C (149°F)
Maximum altitude:	3,000 m (9,843 ft)	3,000 m (9,843 ft)

Connectors

The RJ-45 twisted-pair ports are compatible with the IEEE 802.3 Type 10Base-T standard.

Electromagnetic

Emissions: FCC part 15 Class A
EN 55022 Class A / CISPR-22 Class A
VCCI Level I
Complies with Canadian EMC Class A requirements.

Complies with Australia/New Zealand EMC Class A requirements.

Immunity: See the Declaration of Conformity for details at the end of Appendix G, "Safety and Regulatory Statements" in this guide.

Safety: IEC950/EN60950
CSA950
NOM-019-SCFI-1993
UL1950

Modem Configuration

Before installing the modems (one attached to the hub and one attached to the terminal/PC), configure them by either issuing the appropriate AT command or by setting the modem's switches, as described in the tables in the rest of this appendix.

Hayes Smartmodem Optima 28.8 (V.34)
Hayes ACCURA 288 V.34 + FAX
Hayes V-Series ULTRA Smartmodem 14400

At the hub end:	Issue the following AT command: **A0101:** AT&FQ2&C2&D3S0=1&W0 (if &C2 gives error, use &C0) **Next Rev:** AT&FQ2&C1&D3S0=1&W0
At the user end:	Issue the following AT command: AT&FW1&C1&W

US Robotics Courier V.FC/V.34

At the hub end:	Issue the following AT command: **A0101:** AT&F&C0S0=1&W0 **Next Rev:** AT&F&C1S0=1&W0
At the user end:	Issue the following AT command: AT&F&W

Megahertz XJ2288 PCMCIA card modem

At the user end:	Issue the following AT command: AT&F\N0&W

Practical Peripherals PM288MT II V.34

At the hub end:	Issue the following AT command: **A0101:** AT&F0&C2S0=1Q2&D3&W0 **Next Rev:** AT&F0&C1S0=1Q2&D3&W0
At the user end:	Issue the following AT command: AT&F0&W0

Intel 14.4EX

At the hub end:	Set the A/B switch to A Issue the following AT command: AT&F0&R1&W0
At the user end:	Set the A/B switch to A Issue the following AT command: AT&F0&W0

Supra FAX 288

At the hub end:	Issue the following AT command: **A0101:** AT&F0&C0S0=1Q2&D3&K3&W0 **Next Rev:** AT&F0&C1S0=1Q2&D3&K3&W0
At the user end:	Issue the following AT command: AT&F0&W0

Network Addressing

This appendix describes how network address information is obtained and used. Topics covered are:

- Communications Between Hub and Network Management Station
- IPX Addressing for Novell NetWare
- IP Addresses for IP and non-IP Networks
- Using BOOTP

Communication Between the Hub and Network Management Station

The HP Hub-16M can be managed over the network by CiscoWorks network management software. These hubs can also be managed by any other network management products that comply with the Simple Network Management Protocol (SNMP) standard and have standard SNMP MIB-browser functionality.

The communication between the SNMP network management station and the hub takes place using the network layer protocols, IPX for Novell networks, or IP for TCP/IP networks.

Which protocol you use depends on the protocol being used by the network management station. Additionally, if the network management station is on the other side of a router from your hub, the protocol you run on both the hub and the network management station depends on which protocol the router can handle.

The network layer communications require that the hub have a network layer address. This appendix provides some background information on IPX and IP addressing.

IPX Addressing for Novell NetWare

The Novell NetWare network operating system uses a proprietary protocol called Internetwork Packet Exchange (IPX). The IPX protocol firmware is always available on an HP Hub-16M; it becomes active when the hub gets an IPX address. The IPX address consists of a network number and a device identification. The address is automatically assigned to the hub as follows (no IPX configuration of the hub is necessary):

- The network number is automatically assigned by a router or file server on the network that is running the IPX protocol.
- The device identification is the hub's MAC address (also known as the Ethernet address or physical address). This address is a unique 12-digit hexadecimal number assigned to the hub at the factory.

IPX Addressing Notes:

Because the IPX address is assigned automatically, no IPX configuration is necessary; therefore no IPX configuration is provided on the hub console interface. By default, the hub is ready to be managed by an SNMP network management station that is configured for IPX communications.

IP Addresses for IP and Non-IP Networks

If you have chosen to manage your hub with an SNMP/IP network manager, your hub must be configured with an IP address. If your network will be connected with other networks that use IP addresses, you must use *assigned* IP addresses. Otherwise, you can build your own IP addressing scheme.

Globally Assigned IP Network Addresses

If you intend to connect your network to other networks that use globally administered IP addresses, Hewlett-Packard strongly recommends that you use IP addresses that have a network address assigned to you. There is a formal process for assigning unique IP addresses to networks worldwide. Contact one of the following companies:

Country	Phone Number/E-Mail/URL	Company Name/Address
United States/Countries not in Europe or Asia/Pacific	1-703-742-4777 questions@internic.net http://rs.internic.net	Network Solutions, Inc. Attn: InterNIC Registration Service 505 Huntmar Park Drive Herndon, VA 22070
Europe	+31 20 592 5065 ncc@ripe.net http://www.ripe.net	RIPE NCC Kruislaan 409NL-1098 SJ Amsterdam, The Netherlands
Asia/Pacific	domreg@apnic.net http://www.apnic.net	Attention: IN-ADDR.ARPA Registration Asia Pacific Network Information Center c/o Internet Initiative Japan, Inc. Sanbancho Annex Bldg. 1-4 Sanban-cho Chiyoda-ku Tokyo 102, Japan

For more information, refer to *Internetworking with TCP/IP: Principles, Protocols and Architecture* by Douglas E. Comer (Prentice-Hall, Inc., publisher).

Device IP Configuration

List all the manageable devices on your network and their IP configuration. Make sure that every device has a unique IP address. Make sure that all devices on the network have the same subnet mask.

The IP configuration parameters are as follows:

IP Address: The IP address of the hub is written in the format X.X.X.X, where each X is a decimal number between 1 and 254. Every IP address on a network must be unique.

The default value, 0.0.0.0, disables IP communications.

Subnet Mask: The bit mask defines which portion of the IP address is the subnet address and is written in the format X.X.X.X. The default value is automatically generated and depends on the class of IP address that you entered. See your network administrator for the subnet mask address. All devices on your IP network must use the same subnet mask address.

Default Router: The routing IP address of the nearest router in your network. The default is 0.0.0.0. If no routers are in your network, enter the IP address of this device.

Time To Live: The number of IP routers a packet is allowed to cross before the packet is discarded. The default value is 32. Increase this value if the hub is managed from a network management station that is more than 32 routers away. The maximum allowable value is 255.

Use the IP Configuration command in the ASCII console or CiscoView to specify IP addresses.

Using BOOTP

BOOTP (Bootstrap Protocol) is used to download network configuration data from a server (the BOOTP server) to the hub. The configuration data the hub retrieves from the BOOTP server is:

- the IP address for the hub
- the subnet mask for the subnet on which the hub is installed
- the default router

If you have configured the hub's IP parameters on a BOOTP server, you do not need to use the IPConfig command in the ASCII console. As shipped from the factory, the hub is configured to use BOOTP to retrieve the IP configuration information.

The BOOTP Process

When the hub is powered on, it broadcasts BOOTP requests that contain the hub's MAC address. The BOOTP server receives the request and searches its BOOTP table file for an entry that matches the hub's MAC address. If a match is found, the configuration data in the associated file entry is returned to the hub as a BOOTP reply. For most UNIX systems, the BOOTP table is contained in the /etc/bootptab file. The example below applies to the BOOTP table for UNIX systems.

BOOTP Table File Entries

An entry in the BOOTP table file /etc/bootptab for an HP Hub-16M would be similar to the following:

```
hphub16M:\
  ht=ether:\
  ha=080009123456:\
  ip=190.40.101.22:\
  sm=255.255.255.0:\
  gw=190.40.101.1:\
  vm=rfc1048
```

Definitions of the table entry fields:

hphub16M	is a user-defined symbolic name to help you find the correct section of the bootptab file. If you have multiple hubs that will be using BOOTP to get their IP configuration, you should use a unique symbolic name for each hub.
ht	is the "hardware type" tag. For the HP 10Base-T hubs, set this to **ether** (for Ethernet). *This tag must precede the* ha *tag.*
ha	is the "hardware address" tag. Use the hub's 12-digit MAC address.
ip	is the IP address to be assigned to the hub. Enter the address in the dotted-decimal format as shown in the example on the previous page.
sm	is the subnet mask of the subnet in which the hub is installed.
gw	is the IP address of the default router (or gateway) that allows the hub to communicate with systems that are not on the local network segment. If there is no default router, do no include this tag.
vm	is a required entry that specifies the BOOTP report format. *For the HP 10Base-T hubs, you must set this parameter to* **rfc1048**.

Notes for the bootptab file:

- Blank lines and lines beginning with the pound sign (#) are ignored.
- Make sure you include a colon (:) and a backslash (\) as a continuation indication at the end of each line except the last one. Each record is a single line. The colon (:) separates fields in the record. The backslash (\) indicates the current record continues on the next line as if there were no carriage return and linefeed characters.
- Spaces are not allowed between the characters on a line.
- Names, such as hphub16M must begin with a letter and can only contain letters, numbers, periods, or hyphens.

Backup Links

This chapter describes how to use Backup Links on the hub. Topics described include:

- how backup links work
- examples of backup links
- configuring a backup link
- identifying a backup link
- indications of backup link activation
- reactivating the primary link

How Backup Links Work

In some network configurations a critical link exists, for example between two workgroups that regularly share or exchange data over the network. To maintain the integrity of such a critical link, the HP Hub-16M offer a backup link feature. A backup link is a separate cable run between two hubs that is automatically enabled if the connection designated as the primary link fails.

The hub on which the redundant link is configured (hub A in the illustration—the “Monitoring Hub”), is responsible for monitoring the link. It sends IEEE 802.2 Test packets to the hub at the other end of the link (hub B in the illustration—the “Remote Hub”) and looks for response packets from that hub. If the response packets fail to come back, the primary link is considered as having failed and the backup link, which had not been carrying any traffic, is enabled automatically. If the primary link does fail, it is automatically disabled until it can be repaired and re-enabled.

When the primary link is repaired, you must re-enable the primary port. It is not re-enabled automatically. When the primary port is enabled, the backup port is automatically disabled and returned to backup mode. See “Reactivating the Primary Link” later in this appendix.

Limitations

- Each hub can monitor a single backup link (only one backup link can be configured on each hub). But, the hub may be at the remote end of one backup link and at the monitoring end of a backup link to a different hub.
- A given hub should be connected to the remote end of no more than two backup links. If it is functioning as the remote hub in more than two backup links, it may not be able to respond to the test packets fast enough when there is a high level of data traffic on the network.

  This ability to respond may be improved by increasing the time between test packet transmissions on the monitoring hubs. For *all* the backup links in which the remote hub is involved, the time configured on the monitoring hubs for those links should be increased by one second for each additional backup link beyond two links. Add one to this count if the remote hub is also functioning as a primary (monitoring) hub in a different link.

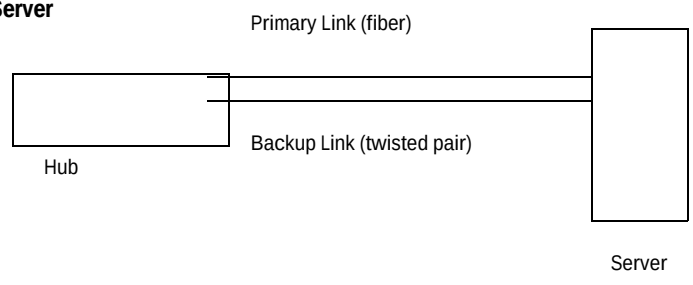
Additional Notes

- Any port on the hub can be used for either the primary link or the backup link.
- Any combination of media types can be used as a backup link by using the AUI port. This accepts fiber, thin coax, and twisted pair external transceivers.
- The primary link and the backup link cabling should be run over different paths (through different conduits, for example) to reduce the possibility that damage will occur to both cables simultaneously.

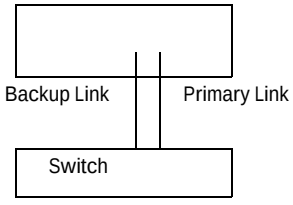
Examples of Backup Links

The Backup Link function allows you to specify a backup link between two devices in case the primary link fails. An example of a backup link is shown below.

Hub to a Server



Hub to a Switch



A backup link is a separate path connected between the hub and a device. The port through which the cable is connected between the two devices is automatically enabled if the connection designated as the primary link fails.

How the Backup Function Works

The hub on which the redundant link is configured is responsible for monitoring the link. It sends packets to the station at the other end of the link and looks for response packets from that station. If the response packets fail to come back, the primary link is considered as having failed and the backup link, which had not been carrying any traffic, is enabled automatically. If the primary link does fail, it is automatically disabled until it can be repaired and re-enabled.

When the primary link is repaired, you must re-enable the primary port. It is not re-enabled automatically. When the primary port is enabled, the backup port is automatically disabled and returned to backup mode. See "Reactivating the Primary Link" later in this appendix.

Note

- Any combination of media types can be used as a backup link by attaching an external transceiver to the AUI port. This port accepts fiber, thin coax, twisted-pair external transceivers. For example, a thin coax link from the ThinLAN port can act as a backup link to a twisted-pair link.
- The hub can monitor only one link.
- The remote device should have no more than 2 backup links connected to it from a monitoring hub. If the remote device has more than 2 backup links functioning, it may not be able to respond to the test packets fast enough when there is a high level of data traffic on the network segments.
- This ability to respond may be improved by increasing the time between test packet transmissions on the monitoring hubs. For *all* the backup links in which the remote device is involved, the time configured on the monitoring hubs for those links should be increased by one second for each additional backup link beyond two links. Add one to this count if the remote device is also functioning as a primary (monitoring) hub for a different link.

Suggestion

The primary link and the backup link cabling should be run over different paths (through different conduits, for example) to reduce the possibility that damage will occur to both cables simultaneously.

Configuring a Backup Link

Configure the Monitoring Hub Only. All configuration of the backup links feature is performed from CiscoView or the ASCII console. On the "remote" device, you only need to make sure the ports used for the primary and backup links are both enabled.

Use the Backup Function. To configure this link, you use the Backup function in the ASCII console. You provide the following information:

- the device and port to be used for the backup link
- the device and port to be used for the primary link
- the MAC address of the device at the remote end of the link
- how frequently (in seconds) test packets (used to check the status of the primary link) should be sent to the remote device
- how many consecutive response failures will trigger activation of the backup link

Configuration/Installation Sequence

If a hub is installed in a network that includes two connections to another hub, and the backup link has not yet been configured, a loop in the network now exists that will cause some network performance degradation. For this reason, it is better to configure the backup link on the hub before the hub is installed in the network. It is best to follow these steps:

1. Attach a PC running an ASCII terminal emulator to the hub and start the ASCII terminal emulator.
2. Use the Backup function to configure the backup link.
3. Complete the network cable connections between the monitoring hub and the remote device. For cabling instructions, see Appendix A, "Cables and Connectors," in this manual.
4. On the remote device, make sure that the ports connected to both the primary and backup links are enabled. On the monitoring hub, the status of the primary and backup ports is controlled by the hub's firmware; you do not need to explicitly enable the monitoring hub's ports.

5. Enable the primary port in software. This step is necessary because until you have completed step 3 (connecting the cables), the test packets cannot be successfully sent through the primary port. The primary port will therefore be disabled and the backup port will be activated. Once you enable the primary port, it assumes the active role.

Identifying the Backup Link

The ports designated as the primary and backup ports are identified in:

- the CiscoView Backup function window.
- ASCII console interface by using the Backup command

The primary port is identified by (pri), the backup port by (bkup).

Indications of Backup Link Activation

When the primary link fails (“n” consecutive test packet responses were not received on the primary port from the other device), the backup link is automatically enabled. The effect of this change is displayed on the monitoring hub's LEDs and management interface. Activation of the backup link does not change the status of any of the ports on the remote device.

On the monitoring hub's LEDs, the primary port LED goes off, and the backup port LED goes on.

In the ASCII console or CiscoView, the status of the primary port changes from “active” to “not active”, and the backup port changes from not active to active. See the ASCII console help or CiscoView online help for more information.

Reactivating the Primary Link

When the primary link is repaired, you can use any of the following methods to re-enable the primary port:

- From the ASCII console, select “Port/Segment Configuration”, then “Disable and enable ports option”, then enable ports.
- From CiscoView, re-enable the primary port. See the network management product documentation for details on how to enable a port.
- Power-cycle the hub.

When the primary port is re-enabled, the backup port is automatically disabled and returned to backup mode.

Security Information

This section describes how to set security for your product. It covers the following topics:

- how intruder prevention works
- how eavesdrop prevention works
- setting inbound security with intruder prevention
- setting outbound security with eavesdrop prevention

Understanding Network Security

In addition to password protection and network access protection, the HP Hub-16M provides two major types of per-port security:

- *Intruder Prevention* for inbound data (from the end user to the hub).
- *Eavesdrop Prevention* for outbound data (from the hub to the end user).

Both of these types of security can be configured on each port individually (all twisted-pair ports and the AUI port through the SEcure command on the ASCII console interface. These per-port security features are enabled by comparing the source and destination address of each packet received or transmitted by the hub to each port's *Authorized MAC address*—the MAC address of the device that is authorized to communicate through that hub port. These features can be seen through the CiscoView network management application.

How Intruder Prevention Works

Intruder Prevention stops an unauthorized computer (or other device) from actively gaining access to the network. When a port is configured for Intruder Prevention, the hub examines the source address of each packet coming in through that port and compares it with the authorized MAC address. If the addresses are not the same, the hub concludes that an intruder is attempting to gain access to the network and takes the appropriate action (as configured): either disabling the port, sending an alarm to the network management station, or both. See "Setting Inbound Security with Intruder Prevention" later in this appendix.

How Eavesdrop Prevention Works

Eavesdrop Prevention stops a computer (or other device) from seeing network traffic that is not intended for that port. When Eavesdrop Prevention is configured on a port, the hub compares the port's authorized MAC address with the destination address of any outbound packet. If the addresses match, the hub concludes that the packet is destined for the computer attached to the port, and it sends the packet out through the port unaltered. However, if the addresses do not match, the hub prevents the computer from seeing the packet's contents by substituting a meaningless string of 1's and 0's. *Note that broadcast and multicast packets are repeated to all the ports, even when Eavesdrop Prevention is activated.* See "Setting Outbound Security with Eavesdrop Prevention" later in this appendix.

Authorized MAC address

To provide data security on a hub port, a single, unique MAC address must be configured as the authorized MAC address for each port. You can configure the authorized MAC address either by assigning it or by designating the port to learn it automatically. This configuration is performed with the Secure command from the hub's console. See the Secure command description in the chapter on Managing the Hub.

Assigning the Authorized MAC address

You can assign an authorized MAC address by entering it manually at the hub console interface or at the network management station. Assigning a specific address provides the maximum control of the port's authorized MAC address. The Intruder Prevention and Eavesdrop Prevention security that you have configured for that port is implemented as soon as the address is assigned.Learning the Authorized MAC address

You can set the hub to learn a port's authorized MAC address automatically by using either a "first heard" or a "learn continuous" method. The method used to learn the authorized MAC address should be chosen based on the level of data security required on a port. In each case, the security configuration for that port is implemented when the port receives a packet from the attached device. It learns the device's address from the source address field in the packet.

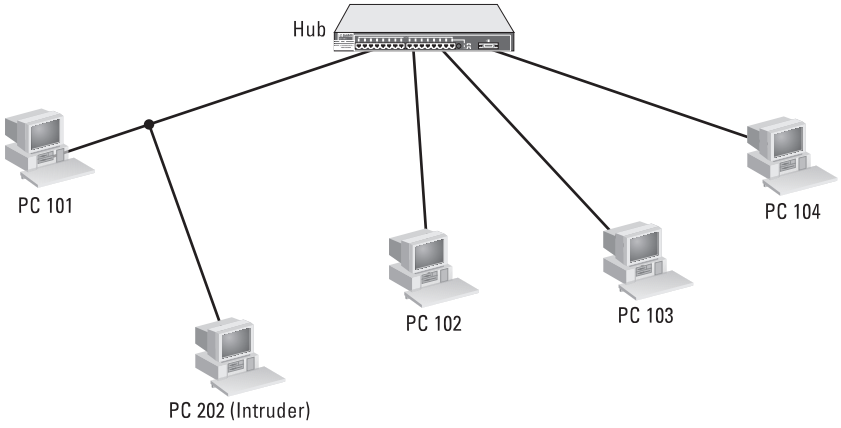
First-Heard Method. The "first heard" method automatically assigns the first address detected on the port as the authorized MAC address. This method is useful to quickly identify and authorize end users whose ports may require both Eavesdrop Prevention and Intruder Prevention. Under this method, the port will be disabled automatically if an intruder is detected on the port.

Learn-Continuous Method. The "learn continuous" method allows the hub to continuously update the authorized MAC address configured for a port. Each new device connected to the port becomes the new authorized device. This security method is useful for dynamic workgroups that experience frequent changes to end-user configuration and but require minimal data security protection. In the "learn continuous" mode, the port may be configured to provide the Eavesdrop Prevention data security and the send-alarm security violation notification. Under this method, the port will not be disabled if an intruder is detected.

Setting Inbound Security with Intruder Prevention

The picture below illustrates the use of inbound security using Intruder Prevention. This type of data security allows only one authorized user per port to access the network. The authorized user is identified by the authorized MAC address of the end node attached to the port.

Intruder prevention includes an “auto port disable” data security feature and a “send alarm” security violation notification feature. These features are described on the next page.



In the above illustration, the authorized end user is represented by PC 101, and the intruder is represented by PC 202 (Intruder). (For illustration purposes, the numbers 101, and 202 are used to represent 12-digit hexadecimal MAC addresses.) The HP hub compares the authorized MAC address, 101, to the source address of the packet received from the Intruder, 202. The hub detects the unauthorized MAC address and automatically disables the port, and sends an alarm (a security violation trap notification) to the authorized network management station.

Auto Port Disable

Any port may be configured to be disabled automatically when an intruder's MAC address is detected. *This feature is automatically controlled* by your selection of the Authorized Address Selection Method for the port: If the address used is the "first heard" or an "assigned" address, the port will be disabled automatically when an intruder is detected. If the address is "learned continuously", the port will not be automatically disabled.

Note

Auto port disable may not be used on cascaded ports, ports connected to a network with multiple end users, or ports configured to learn the authorized MAC address continuously.

The auto port disable feature compares the authorized MAC address of the port to the source address of the packet inbound to the hub at that port. If the authorized address and the source address do not match, the HP hub will automatically disable the port.

Once a port is disabled because of a security violation, to resume operation, the port must be re-enabled either by using the hub console interface's Port command, or from the network management station.

A bit error in the source address field of the packet will not cause the port to be disabled. In this case, the hub detects a CRC error for the packet and does not consider it as a security violation.

Send Alarm

Any port may be configured to send an alarm (trap notification) to the network management station when an unauthorized MAC address or a new MAC address is detected on a secure port.

To use the "send alarm" feature, you must authorize at least one network management station to receive the trap notifications by entering the IP or IPX address of the network management station in the authorized managers list. Use the Managers command from the hub's console to configure these addresses. See chapter 3, "Managing the Hub" for more information on this command.

Setting Outbound Security with Eavesdrop Prevention

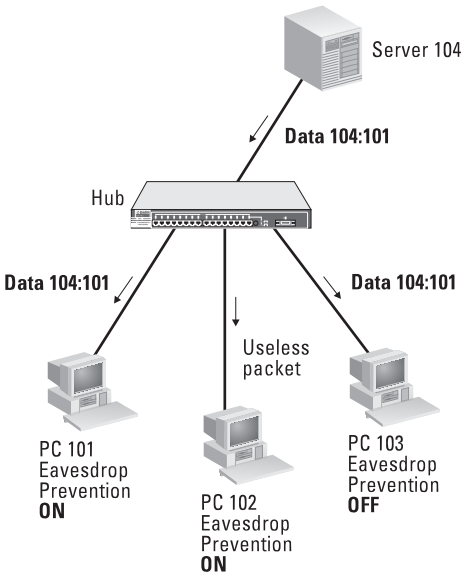
Eavesdrop Prevention allows a port to receive a packet transmitted on the network as valid data only if the port's MAC address matches the packet's destination address. If the port's MAC address does not match the packet destination address, the port will receive a packet containing a meaningless data field of alternating 1's and 0's. Multicast and broadcast packets are transmitted to all ports unmodified.

Note that sending a packet containing alternating 1's and 0's will continue to allow the port to detect the traffic on the network, so that the CSMA/CD network requirements are met. However, the port will correctly record the invalid data packet received as a CRC error. An end-user attached to an HP hub implementing Eavesdrop Prevention data security will normally record a high number of CRC errors on the computer card statistics.

The illustration on the next page shows the use of outbound data security using Eavesdrop Prevention. This type of data security should be enabled on any port that is to receive data on a "need to know" basis. The port must have an authorized MAC address configured and must be connected to only one end-user.

Eavesdrop Prevention may not be used on cascaded ports, or ports connected to a network with multiple end users.

In the illustration below, Server 104 is transmitting a packet destined for PC 101. (For illustration purposes, the numbers 101, 102, 103, and 104 are used to represent 12-digit hexadecimal MAC addresses.) The ports for PC 101 and PC 102 have Eavesdrop Prevention enabled or configured ON. Because PC 101's MAC address matches the packet destination address, it receives the packet unaltered. However, PC 102's MAC address does not match the packet destination address and therefore it receives a useless packet (the packet data field contains a meaningless pattern of alternating 1's and 0's.) The port for PC 103 does not have Eavesdrop Prevention enabled and therefore PC 103 receives the packet unaltered from Server 104.


Server 104
Data 104:101
Hub
Data 104:101
Data 104:101
Useless
packet
PC 101
Eavesdrop
Prevention
ON
PC 102
Eavesdrop
Prevention
ON
PC 103
Eavesdrop
Prevention
OFF

Safety and Regulatory Statements

This chapter covers the following topics:

- mounting precautions
- power precautions
- safety and regulatory statements
- Declaration of Conformity

Mounting Precautions

When you put a hub into a rack, follow these mounting precautions:

- The rack or cabinet should be adequately secured to prevent it from becoming unstable and/or falling over. The hub should be mounted in a position toward the bottom of the rack for stability and to make it easier to stack the other hubs on top.
- Before mounting a hub, plan its location and orientation relative to other devices and equipment. Also consider the cabling that will be attached to the hub and the ports that will be used. Verify that there is room for the grouped cables to trail out from the side of the hub. Allow at least 2.54 cm (1 inch) in the front of the hub. In the back of the hub, allow at least 3.8 cm (1 1/2 inches) of space for the power cord. If you are using a Redundant Power Supply, allow the appropriate amount of space for the RPS connector.
- Ensure that the HP Hub-16M does not overload the power circuits, wiring, and over-current protection. To determine the possibility of overloading the supply circuits, add together the amperage ratings from the name-plates of all your hubs (and other equipment) installed on the same circuits and compare the total with the rating limits for the supply circuits.
- Make sure that the power source circuits are properly grounded, then use the supplied power cord to connect the HP Hub-16M to the circuit. *See the Safety Statements in this chapter.*
- Do not block airflow around the side and the back of the unit.

Note

If your installation requires a different power cord than the one supplied with the hub, be sure to use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the hub.

- Do not install the hub in an environment where the operating ambient temperature might exceed 45°C (113°F).
- Make sure the air flow around the sides of the hub is not restricted.

Power Precautions

Follow these precautions when unplugging and plugging in power to the hub as well as adding or removing modules.

Note

The hub does not have a power switch; it is powered on when the power cord is plugged in. The hub's power supply automatically adjusts to any AC power source between 100-127 volts and 200-240 volts. There are no voltage range settings to configure.

When installing the hub, note that the AC outlet must be installed near the equipment and should be easily accessible.

Safety Information

Documentation reference symbol. If the product is marked with this symbol, refer to the product documentation to get more information about the product.

WARNING	A WARNING in the manual denotes a hazard that can cause injury or death.
CAUTION	A CAUTION in the manual denotes a hazard that can damage equipment.
	Do not proceed beyond a WARNING or CAUTION notice until you have understood the hazardous conditions and have taken appropriate steps.

Grounding

These are safety class I products and have protective earthing terminals. There must be an uninterruptible safety earth ground from the main power source to the product's input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, disconnect the power cord until the ground has been restored.

For LAN cable grounding:

- If your LAN covers an area served by more than one power distribution system, be sure their safety grounds are securely interconnected.
- LAN cables may occasionally be subject to hazardous transient voltages (such as lightning or disturbances in the electrical utilities power grid). Handle exposed metal components of the network with caution.

Servicing

There are no user-serviceable parts inside these products. Any servicing, adjustment, maintenance, or repair must be performed only by service-trained personnel.

These products do not have a power switch; they are powered on when the power cord is plugged in.

Informations concernant la sécurité

Symbole de référence à la documentation. Si le produit est marqué de ce symbole, reportez-vous à la documentation du produit afin d'obtenir des informations plus détaillées.

WARNING	Dans la documentation, un WARNING indique un danger susceptible d'entraîner des dommages corporels ou la mort.
CAUTION	Un texte de mise en garde intitulé CAUTION indique un danger susceptible de causer des dommages à l'équipement.
	Ne continuez pas au-delà d'une rubrique WARNING ou CAUTION avant d'avoir bien compris les conditions présentant un danger et pris les mesures appropriées.

Cet appareil est un produit de classe I et possède une borne de mise à la terre. La source d'alimentation principale doit être munie d'une prise de terre de sécurité installée aux bornes du câblage d'entrée, sur le cordon d'alimentation ou le cordon de raccordement fourni avec le produit. Lorsque cette protection semble avoir été endommagée, débrancher le cordon d'alimentation jusqu'à ce que la mise à la terre ait été réparée.

Mise à la terre du câble de réseau local:

- si votre réseau local s'étend sur une zone desservie par plus d'un système de distribution de puissance, assurez-vous que les prises de terre de sécurité soient convenablement interconnectées.
- Les câbles de réseaux locaux peuvent occasionnellement être soumis à des surtensions transitoires dangereuses (telles que la foudre ou des perturbations dans le réseau d'alimentation public). Manipulez les composants métalliques du réseau avec précautions.

Aucune pièce contenue à l'intérieur de ce produit ne peut être réparée par l'utilisateur. Tout dépannage, réglage, entretien ou réparation devra être confié exclusivement à un personnel qualifié.

Cet appareil ne comporte pas de commutateur principal ; la mise sous tension est effectuée par branchement du cordon d'alimentation.

Hinweise zur Sicherheit

Symbol für Dokumentationsverweis. Wenn das Produkt mit diesem Symbol markiert ist, schlagen Sie bitte in der Produktdokumentation nach, um mehr Informationen über das Produkt zu erhalten.

WARNING	Symbol für Dokumentationsverweis. Wenn das Produkt mit diesem Symbol markiert ist, schlagen Sie bitte in der Produktdokumentation nach, um mehr Informationen über das Produkt zu erhalten.
CAUTION	Symbol für Dokumentationsverweis. Wenn das Produkt mit diesem Symbol markiert ist, schlagen Sie bitte in der Produktdokumentation nach, um mehr Informationen über das Produkt zu erhalten. Fahren Sie nach dem Hinweis WARNING oder CAUTION erst fort, nachdem Sie den Gefahrenzustand verstanden und die entsprechenden Maßnahmen ergriffen haben.

Dies ist ein Gerät der Sicherheitsklasse I und verfügt über einen schützenden Erdungsterminal. Der Betrieb des Geräts erfordert eine ununterbrochene Sicherheitserdung von der Hauptstromquelle zu den Geräteingabeterminals, den Netzkabeln oder dem mit Strom belieferten Netzkabelsatz voraus. Sobald Grund zur Annahme besteht, daß der Schutz beeinträchtigt worden ist, das Netzkabel aus der Wandsteckdose herausziehen, bis die Erdung wiederhergestellt ist.

Für LAN-Kabelerdung:

- Wenn Ihr LAN ein Gebiet umfaßt, das von mehr als einem Stromverteilungssystem beliefert wird, müssen Sie sich vergewissern, daß die Sicherheitserdungen fest untereinander verbunden sind.
- LAN-Kabel können gelegentlich gefährlichen Übergangsspannungen ausgesetzt werden (beispielsweise durch Blitz oder Störungen in dem Starkstromnetz des Elektrizitätswerks). Bei der Handhabung exponierter Metallbestandteile des Netzwerkes Vorsicht walten lassen.

Dieses Gerät enthält innen keine durch den Benutzer zu wartenden Teile. Wartungs-, Anpassungs-, Instandhaltungs- oder Reparaturarbeiten dürfen nur von geschultem Bedienungspersonal durchgeführt werden.

Dieses Gerät hat keinen Netzschalter; es wird beim Anschließen des Netzkabels eingeschaltet.

Considerazioni sulla sicurezza

Simbolo di riferimento alla documentazione. Se il prodotto è contrassegnato da questo simbolo, fare riferimento alla documentazione sul prodotto per ulteriori informazioni su di esso.

WARNING	La dicitura WARNINGdenota un pericolo che può causare lesioni o morte.
CAUTION	La dicituraCAUTION denota un pericolo che può danneggiare le attrezzature.
	Non procedere oltre un avviso di WARNING o di CAUTIONprima di aver compreso le condizioni di rischio e aver provveduto alle misure del caso.

Questo prodotto è omologato nella classe di sicurezza I ed ha un terminale protettivo di collegamento a terra. Dev'essere installato un collegamento a terra di sicurezza, non interrompibile che vada dalla fonte d'alimentazione principale ai terminali d'entrata, al cavo d'alimentazione oppure al set cavo d'alimentazione fornito con il prodotto. Ogniqualvolta vi sia probabilità di danneggiamento della protezione, disinserite il cavo d'alimentazione fino a quando il collegaento a terra non sia stato ripristinato.

Per la messa a terra dei cavi LAN:

- se la vostra LAN copre un'area servita da più di un sistema di distribuzione elettrica, accertatevi che i collegamenti a terra di sicurezza siano ben collegati fra loro;
- i cavi LAN possono occasionalmente andare soggetti a pericolose tensioni transitorie (ad esempio, provocate da lampi o disturbi nella griglia d'alimentazione della società elettrica); siate cauti nel toccare parti esposte in metallo della rete.

Nessun componente di questo prodotto può essere riparato dall'utente. Qualsiasi lavoro di riparazione, messa a punto, manutenzione o assistenza va effettuato esclusivamente da personale specializzato.

Questo apparato non possiede un commutatore principale; si mette scotto tensione all'inserirsi il cavo d'alimentazione.

Consideraciones sobre seguridad

Símbolo de referencia a la documentación. Si el producto va marcado con este símbolo, consultar la documentación del producto a fin de obtener mayor información sobre el producto.

WARNING	Una WARNING en la documentación señala un riesgo que podría resultar en lesiones o la muerte.
CAUTION	Una CAUTION en la documentación señala un riesgo que podría resultar en averías al equipo.
	No proseguir después de un símbolo de WARNING o CAUTION hasta no haber entendido las condiciones peligrosas y haber tomado las medidas apropiadas.

Este aparato se enmarca dentro de la clase I de seguridad y se encuentra protegido por una borna de puesta a tierra. Es preciso que exista una puesta a tierra continua desde la toma de alimentación eléctrica hasta las bornas de los cables de entrada del aparato, el cable de alimentación o el juego de cable de alimentación suministrado. Si existe la probabilidad de que la protección a tierra haya sufrido desperfectos, desenchufar el cable de alimentación hasta haberse subsanado el problema.

Puesta a tierra del cable de la red local (LAN):

- Si la LAN abarca un área cuyo suministro eléctrico proviene de más de una red de distribución de electricidad, cerciorarse de que las puestas a tierra estén conectadas entre sí de modo seguro.
- Es posible que los cables de la LAN se vean sometidos de vez en cuando a voltajes momentáneos que entrañen peligro (rayos o alteraciones en la red de energía eléctrica). Manejar con precaución los componentes de metal de la LAN que estén al descubierto.

Este aparato no contiene pieza alguna susceptible de reparación por parte del usuario. Todas las reparaciones, ajustes o servicio de mantenimiento debe realizarlos solamente el técnico.

Este producto no tiene interruptor de potencia; se activa cuando se enchufa el cable de alimentación.

Safety Information (Japanese)

安全性の考慮

安全記号

マニュアル参照記号。製品にこの記号がついている場合はマニュアルを参照し、注意事項等をご確認ください。

WARNING　マニュアル中の「WARNING」は人身事故の原因となる危険を示します。

CAUTION　マニュアル中の「CAUTION」は装置破損の原因となる危険を示します。

「WARNING」や「CAUTION」の項は飛ばさないで必ずお読みください。危険性に関する記載事項をよく読み、正しい手順に従った上で次の事項に進んでください。

これは安全性クラスIの製品で保護用接地端子を備えています。主電源から製品の入力配線端子、電源コード、または添付の電源コード・セットまでの間、切れ目のない安全接地が存在することが必要です。もしこの保護回路が損なわれたことが推測されるときは、接地が修復されるまで電源コードを外しておいてください。

LAN ケーブルの接地に関して:

- もし貴社の LAN が複数の配電システムにより電力を受けている領域をカバーしている場合には、それらのシステムの安全接地が確実に相互に結合されていることを確認してください。
- LAN ケーブルは時として危険な過度電圧（例えば雷や、配電設備の電力網での障害）にさらされることがあります。露出した金属部分の取扱いには十分な注意をはらってください。

本製品の内部にはユーザーが修理できる部品はありません。サービス、調整、保守および修理はサービス訓練を受けた専門家におまかせください。

本製品には電源スイッチがありません。電源コードを接続したとき電源入となります。

Regulatory Statements

FCC Class A Statement (for U.S.A. Only)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference in which case the user will be required to correct the interference at his own expense.

VCCI Class 1 (For Japan Only)

注意

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づく第一種情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

European Community

This equipment complies with ISO/IEC Guide 22 and EN55022 Class A with unshielded cables and EN55022 Note

With unshielded cables this is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Canada

This product complies with Class A Canadian EMC requirement.

Declaration of Conformity

The following Declaration of Conformity for the HP J3188A Hub-16M complies with ISO/IEC Guide 22 and EN 45014. The declaration identifies the product, the manufacturer's name and address, and the specifications that are recognized in the European community

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN45014

Manufacturer's Name: Hewlett-Packard Company

Manufacturer's Address: 8000 Foothills Blvd.
Roseville, CA 95747-5502
U.S.A.

declares that the product:

Product Name: HP 10Base-T Hub-16M

Model Number: HP J3188A

conforms to the following Product Specifications:

Safety: EN60950 (1992)+A1,A2 / IEC 950:1991+A1,A2

EMC: EN 55022 (1994) / CISPR-22 (1993) class A
EN50082-1 (1992)
prEN 55024-2 (1992) / IEC 801-2 (1991) 4 kV CD, 8 kV AD
prEN 55024-3 (1991) / IEC 801-3 (1984), 3 V/m
prEN 55024-4 (1992) / IEC 801-4 (1988): 1 kV-(power line)
0.5 kV-(signal line)

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly. LEDs in this product(s) are Class-1 in accordance with EN60825-1:1994.

Tested with Hewlett-Packard Co. products only.

Roseville, May 30, 1997

Mike Avery
Regulatory Engineering Manager

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department TRE, Herrenberger Strasse 130, D-71034 Böblingen (FAX:+49-7031-14-3143).

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Technical information in this document is subject to change without notice.

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