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Technical Reference Guide



Workgroup LANs

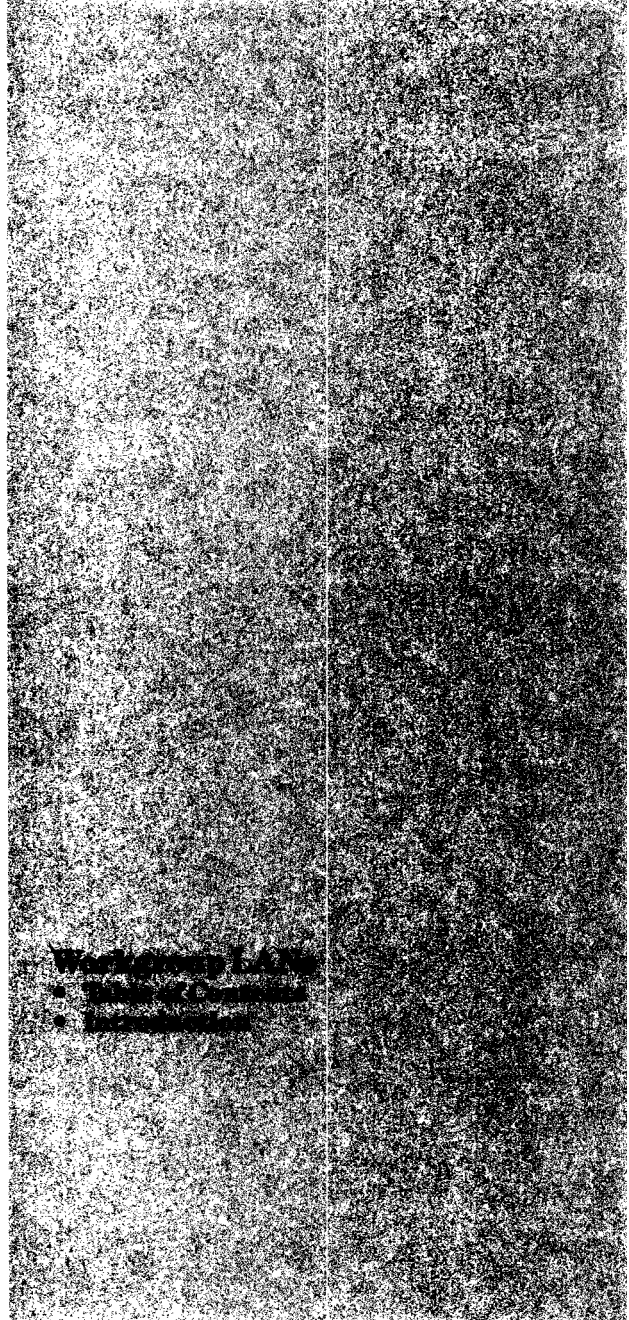
**HP EtherTwist Family
of Products**



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Technical Reference Guide





Technical Reference Guide

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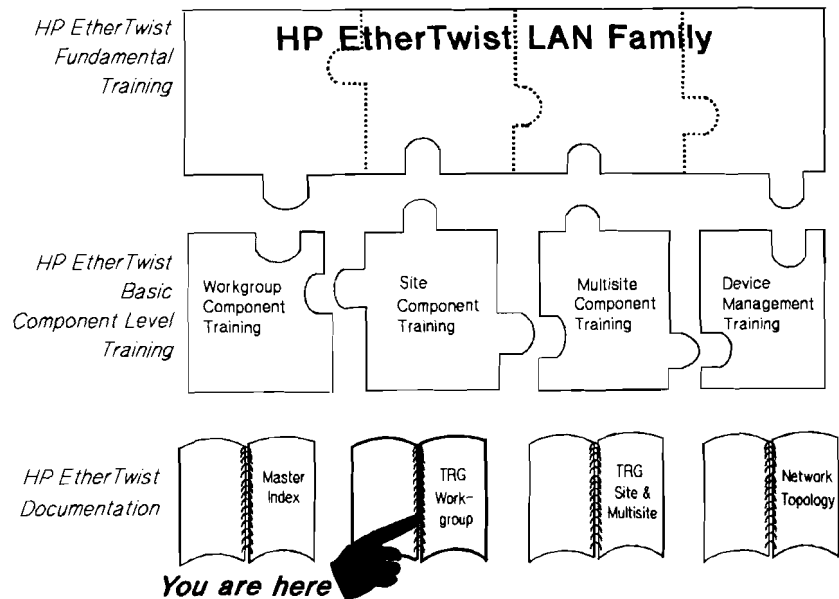
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LAN Products

Introduction

Workgroup LANs

HP Family of Network Products Training Map



Refer to the *Master Index* (part number 5091-0917E) for a comprehensive list of all the documentation and training available for the HP EtherTwist family of network products.

This technical reference guide focuses on the HP EtherTwist family of network products that are typically used in workgroup LANs:

- HP EtherTwist Hubs
- HP EtherTwist Adapter Cards
- HP Transceiver Family
- HP OpenView Hub Manager
- Workgroup LAN product cabling

For more information on the HP EtherTwist family of products used in site and multisite LANs, please refer to the *Technical Reference Guide for Site LANs and Multisite LANs*, part number 5091-0666E.

Local Area Networking Environments

The Hewlett-Packard EtherTwist family of network products offers a simple way to build complex networks. From a small departmental LAN to networked sites around the world, HP EtherTwist family of network products offers a full range of easy-to-install connectivity components for any local area network environment.

Because networking sizes and requirements vary greatly from customer-to-customer, HP EtherTwist networking solutions are categorized into four environments: workgroup LANs, site LANs, multisite LANs, and network management.

A workgroup LAN is a family of users who have common projects and share similar objectives. They usually use common software, and have identical, localized security needs. They interact with each other daily and share peripherals such as a printer or plotter.

A site LAN is a collection of several different workgroups. The workgroup LANs that are joined in a site LAN are usually in the same geographical location (same building or campus, for example). Within a site LAN, members of different workgroups can communicate with each other. The workgroup LANs in a site LAN are joined by a backbone. The backbone can be housed within a single building or between several closely located buildings on a campus.

A multisite LAN connects the site LANs. A multisite LAN does not have geographical limitations. It could connect many site LANs located in different cities or states.

The network management environment allows management and control of the workgroup, site, and multisite LANs easily and reliably from a centralized or distributed locations on the LAN.

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HP EtherTwist Hub, Hub Plus, and Hub Plus/48

Technical Data

**Product Numbers
HP 28684A, HP 28688B,
and HP 28699A**

The HP EtherTwist hubs are Type 10BASE-T multiport repeaters for use in twisted-pair LANs. These hubs deliver industry-leading price/performance in both large and small networks. They offer network management, and they support growing topologies with flexible backbone connections.

The HP EtherTwist Hub Plus and Hub Plus/48 are designed for networks that require LAN-based network management. They provide 12 and 48 twisted-pair ports, respectively. The HP EtherTwist Hub is a low-cost, unmanaged, 12-port hub for use in smaller networks.

The EtherTwist hubs are part of the HP EtherTwist family of network components. These LAN components—hubs, bridges, adapter cards, and transceivers—provide your network with high performance in a low-cost hardware solution. Easily racked together and connected with a thin coaxial cable between their integrated BNC ports, the hubs merge with one another along a virtual extended backplane. This gives you full cardcage-like functionality without the expense and limitations of a

cardcage design. Using only a few different hardware components, each designed for optimum price/performance, you can build a network that ranges from a few nodes to thousands.

Features

All HP EtherTwist Hubs

- Provide 12 twisted-pair ports (Hub and Hub Plus) or 48 ports (Hub Plus/48).
- Comply with IEEE 802.3 Type 10BASE-T standard.
- Support 100 meters of cable to each PC adapter card or twisted-pair transceiver. Greater distances are possible with low-loss cable.
- Allow choice of 50-pin or 8-pin connections. You can connect a 25-pair bundle (50-pin Telco connector) or individual 4-pair cables with modular RJ-45 plugs (using an optional 12-port modular adapter, product number HP 28638A).
- Include BNC and AUI ports for simultaneous connection to both thin coaxial cable and (via transceiver) thick coaxial, fiber-optic, or twisted-pair cable.
- Support both IEEE 802.3 and Ethernet 1.0 and 2.0 standards.

- Isolate network faults by automatically segmenting ports disturbing the network.
- Include LEDs for a quick visual check of individual link status, port segmentation, collisions, activity, and power.
- Provide console (RS-232) port, which allows users to read network statistics and configure ports in the hub. This port connects to a terminal or terminal emulator either directly or via modem.
- Are transparent to network operating system software.
- Fully support existing HP StarLAN 10 networks.
- Mount on wall (flat or on end) or mount in racks with cables facing front or back.

Additional Features of the HP EtherTwist Hub Plus and Hub Plus/48

- In addition to the above features, the Plus versions:
- Support SNMP/IP-based network management.
 - Include link test diagnostics to perform loopback test on any path through the network.

Flexible Cabling

The EtherTwist hubs provide flexible connections for both subnets and backbones. The twisted-pair ports let you take advantage of twisted-pair LAN cabling, with its ease of installation and administration. Twisted-pair connections are made through a 50-pin Telco connector on the back of the hub (4 connectors on the Hub Plus/48). This allows you to make a single connection using a 25-pair bundle (typically running to a cross-connect block). Alternatively, you can attach a 12-port modular adapter (HP 28638A), which breaks out the 50-pin connector to 12 modular (RJ-45) jacks; these provide the connections for 4-pair cables that serve individual stations on the network.

You can make backbone connections to the hub using the integrated ThinLAN (BNC) port for thin coax, and the AUI port for thick coax or optical fiber. Both the ThinLAN and AUI ports can be connected at the same time. You can connect multiple hubs to a thin coaxial "backplane", which in turn can be connected to another backbone via the AUI port.

In addition, you can cascade hubs with twisted-pair cabling, using either a direct connection between twisted-pair ports on each hub, or using a twisted-pair to AUI connection through a twisted-pair transceiver (HP 28685A).

Compatibility to Meet Your Changing Needs

HP's EtherTwist hubs are fully compliant with the 10BASE-T standard. HP has done extensive compatibility testing with other 10BASE-T equipment on the market today, giving you the confidence you need to build a multivendor network that best fits your business requirements. In addition, the HP EtherTwist hubs are completely backward-compatible with HP StarLAN 10 adapter cards, transceivers, and hubs through configuration of the link integrity signal (link beat).

Maximum Reliability Through Fault Isolation

An HP EtherTwist hub automatically identifies any segment disturbing the network and disconnects it from the rest of the network (autosegmentation), ensuring network integrity. Once the problem is corrected, the hub automatically reconnects the segment.

Control of Your Network with Hub Management

The HP EtherTwist Hub Plus and Hub Plus/48 support SNMP/IP and can communicate over the LAN with HP OpenView Hub Manager for DOS (product number HP 28686C) and HP OpenView Interconnect Manager for HP-UX (product number HP 27360A for HP 9000 Series 300 and 400, product number HP 27361A for HP 9000 Series 600 and 800).

From a single network management station, a network administrator can monitor and control any Hub Plus on the network. Hub Manager continuously updates OpenView Windows' graphical network map to display the current state of the network, and notifies the network administrator of network events. Configuring, monitoring, and controlling the network is made easy with the HP OpenView device managers and the HP EtherTwist Hub Pluses.

HP WireTest and Cabling

HP EtherTwist local area networks use twisted-pair cabling (ordinary telephone wire). Two pairs of 22, 24, or 26 AWG unshielded twisted-pair wire are required for each connection. Shielded twisted-pair wire can also be used.

The HP WireTest Service is available to qualify your existing telephone cabling for use in a Type 10BASE-T network. Contact your local HP Sales and Support Office or your HP Authorized LAN Dealer for information and availability of this service. If you have a large network and wish to do your own testing, you can purchase the HP 28687A Wire Test Instrument.

Specifications

Environmental Characteristics

Operating Temperature:
0°C to 55°C (32°F to 131°F)

Relative Humidity:
5% to 95% @ 40°C (104°F)
noncondensing

Physical and Electrical Characteristics

HP EtherTwist Hub and Hub Plus

Dimensions:
42.55 cm x 23.50 cm x 4.37 cm
(16.75 in. x 9.25 in. x 1.72 in.)

Weight:
2.72 kg (6.0 lb)

Power Consumption:

| | | |
|--------------------|-----------|------------|
| ac Voltage: | 100-120 V | 200-240 V |
| Current: | 0.5 A max | 0.25 A max |
| Frequency: | 50/60 Hz | 50/60 Hz |

Physical and Electrical Characteristics

HP EtherTwist Hub Plus/48

Dimensions:
42.55 cm x 23.50 cm x 8.87 cm
(16.75 in. x 9.25 in. x 3.49 in.)

Weight:
3.77 kg (8.3 lb)

Power Consumption:

| | | |
|--------------------|-----------|-----------|
| ac Voltage: | 100-120 V | 200-240 V |
| Current: | 0.5 A max | 0.5 A max |
| Frequency: | 50/60 Hz | 50/60 Hz |

Standards

Emissions:
VDE 0871 Level A
VCCI Class 1
FCC Part 15 Class A
CISPR-22 Class A

Safety:
UL 1950
IEC 950/EN60950
CSA 220
CSA 950

Radiated Emission Immunity:
IEC 801-2
IEC 801-3

Warranty

The HP 28684A, HP 28688B, and HP 28699A EtherTwist Hubs are warranted for one year against defects. Check with your local Hewlett-Packard Sales and Support Office or your HP Authorized LAN Dealer for more information.

Ordering Information

| | |
|------------------|------------------------|
| HP 28684A | EtherTwist Hub |
| HP 28688B | EtherTwist Hub Plus |
| HP 28699A | EtherTwist Hub Plus/48 |
| HP 28638A | Modular Adapter |
| HP 28689B | Troubleshooting Kit |

HP OpenView Network Management

Technical Data

Product Numbers HP 28653C Bridge Manager and HP 28686C Hub Manager

HP OpenView network device managers (Hub Manager and Bridge Manager) use the SNMP (simple network management protocol) over IP (internet protocol) to manage HP hubs and bridges throughout the network from a single, centralized network management station. The device managers can manage networks of various sizes, ranging from a work-group LAN in a local environment to a global network comprising thousands of nodes. The device managers are windows-based, and include an extensive online help facility.

HP's exclusive autodiscovery software allows the HP OpenView device managers to discover and map any active device (that supports SNMP/IP) on the network. This includes discovering network devices from HP or any other vendor.

The HP 28686C OpenView Hub Manager manages:

- HP 28688A EtherTwist Hub Plus
- HP 28688B EtherTwist Hub Plus
- HP 28699A EtherTwist Hub Plus/48
- HP 28682A Fiber-Optic Hub Plus

The HP 28653C OpenView Bridge Manager manages:

- HP 28673A 10:10 LAN Bridge
- HP 28674A Remote Bridge

Features

- **Adherence to standards.**

By using the de facto simple network management protocol (SNMP) standard over internet protocol (IP), the HP OpenView device managers can discover and manage network devices made by both HP and other vendors who also support the SNMP over IP standard in their network products. HP OpenView network management is so well respected that a number of vendors use it as the basis of their network management products.

- **Network monitoring.**

Bridge Manager and Hub Manager continuously monitor and display the status of HP bridges, hubs and nodes connected to the hubs. Each device manager understands the nature of the various devices on the network. Each provides a unique set of counters for those devices and displays appropriate status information on the network map.

- **Automatic device discovery.**

With a click of a mouse, the HP OpenView device managers use an intelligent algorithm to discover active devices on the network and draw the network map automatically.

- **Network statistics.**

Bridge Manager and Hub Manager let you collect a variety of statistics related to the operation of your network devices. Using the graphing facility, you can easily graph the level of network traffic, number of collisions, number of packets forwarded and filtered, and many other network statistics. You can export the same statistics to Excel or Lotus 1-2-3 for data presentation and graphing.

- **Event notification.**

Depending on your network size and use, Bridge Manager and Hub Manager let you set up thresholds for network traffic levels and specific device events. Certain traffic levels and events can be flagged as alarms that show up (real time) on your network management station and are logged into event log files.



- **Network performance.**
With continuous network monitoring and graphic display of network health, you can see problems coming before they arrive. You can set event thresholds to activate alarms when network statistics approach problem levels. This allows you to improve the overall network performance and minimizes problem calls from network users.
- **Network diagnostics.**
The automatically generated alarm conditions (that you set) allow you to collect performance and fault data on any HP bridge and hub. The fault data coupled with the facility to perform communication tests between nodes can help you isolate faults on the network.
- **Network reliability.**
With Bridge Manager and Hub Manager, you can easily monitor your network's health and prevent any problems from occurring. In addition, HP's bridges use the IEEE 802.1 spanning tree protocol for support of redundant network paths. With spanning tree protocol, redundant paths are automatically activated if an active path fails.
- **Network security.**
Security features vary from simple password security or disabling a port on a hub to setting an alarm for security violation. For example, you can use the alarm notification facility to notify you of any unauthorized attempts to use a port on your network.

Network Management Station Requirements

The HP OpenView network management station requires the following hardware and software.

Hardware

A personal computer with the following equipment:

- 80286, 80386, or 80486 processor
- 640 Kbytes system memory
- 10-Mbytes available disk space
- 1.2-Mbyte floppy disk drive (5.25") or 1.44-Mbyte floppy disk drive (3.5")
- 2 Mbytes of extended (not expanded) memory (4 Mbytes is recommended if you are installing both the Hub and Bridge Managers)
- EGA or VGA monitor (VGA recommended)
- Microsoft Windows 3.0 compatible mouse

Any one of the following network adapter cards:

- HP EtherTwist Adapter Card/8 (HP 27245A)
- HP EtherTwist Adapter Card/8 Six Pack (HP 27267A)
- HP EtherTwist Micro Channel Adapter/16 (HP 27246A)
- HP EtherTwist Adapter Card/16 (HP 27247A)
- HP EtherTwist Adapter Card/16 Six Pack (HP 27269A)
- HP ThinLAN PC Adapter Card (HP 27250A)
- 3Com EtherLink II (3C503TP)
- 3Com EtherLink/MC (3C523) PS/2 10BaseT Card
- 3Com EtherLink (3C503)
- Western Digital EtherCard PLUS 10T
- Western Digital EtherCard PLUS 10T/A PS/2 10BaseT Card
- Western Digital ThinLAN Interface WD8003E

The following personal computers have been tested and approved for use with HP OpenView Bridge Manager and Hub Manager:

- HP Vectra 286/12
- HP Vectra QS/16, QS/20, RS/16, RS/20, and RS/25C
- IBM PC/AT and PS/2 Models 50, 55, 60, 70, 80
- Compaq DeskPro 286 and 386

Software

- MS-DOS, version 3.2, 3.3 or 4.01
- Microsoft Windows, version 3.00a or later

Installation Policy

HP OpenView Bridge Manager and Hub Manager are designed to be customer installable. Customers who would like assistance with the installation must contract this installation service from their local HP Sales and Support Office or HP Authorized LAN Dealer.

Ordering Information

HP 28686C OpenView Hub Manager

HP 28653C OpenView Bridge Manager

Each product includes the following:

- HP OpenView Hub Manager or Bridge Manager Software
- HP OpenView Windows software
- HP IP (internet protocol) software: ARPA Services 2.1
- HP OpenView Bridge Manager and Hub Manager computer-based training disks
- HP OpenView Bridge Manager and Hub Manager Installation and Startup Guide
- HP OpenView Windows User's Guide

HP EtherTwist Hubs

3rd Party Compatibility List

Type 10-BASE-T Network Devices

HP designs EtherTwist hubs (HP 28684A, 28688A, 28688B, 28699A) to operate with industry-standard hardware and software products. Based on limited testing, HP believes the following products achieve compatibility with HP's EtherTwist hubs.

HP relies in part upon information from the suppliers of the products and makes no warranty, expressed or implied, with respect to the following products' operation or compliance with worldwide regulatory requirements. HP advises customers to conduct independent examination to determine suitable levels of compatibility for the customer's individual needs.

| HP Product | 3rd Party Product | Configuration |
|------------------------|---|---|
| 28684A and 28688A hubs | Synoptics 3030 concentrator with 10BASE-T module | cascading up to 4 units |
| 28684A and 28688A hubs | 3Com's multiconnect with 10BASE-T module | cascading up to 4 units |
| 28684A and 28688A hubs | Cabletron MMAC-3 with MR-9000PT concentrator module | cascading up to 4 units |
| 28684A and 28688A hubs | Synoptics 502A transceiver | connect non-10BASE-T LAN card to HP hub using transceiver |
| 28684A and 28688A hubs | Cabletron TPT-S transceiver | connect non-10BASE-T LAN card to HP hub using transceiver |

HP EtherTwist Hubs

Product Note

Firmware Updates

The HP EtherTwist Hub Pluses (HP 28688A, HP 28688B, and HP 28699A) contain firmware that can be updated without physically replacing the ROM. Using HP's firmware update utility and a personal computer, a hub plus can be updated through its console (RS-232) interface.

The firmware update utility is shipped with the HP OpenView Hub Manager product. The update utility and the latest hub firmware revision are also available via HPNN and CompuServe (GO HP, under the new updates library or the Vectra library).

The files included with the firmware update utility include:

- \README.TXT, contains instructions for using the utility
- \RELEASE.TXT, contains firmware revision history
- \UPDATE.EXE, contains firmware update utility
- \HPxxxxxx\UPDATE.BIN, contains hub firmware, version X.xx.xx

The "HPxxxxxx" will vary depending upon which product is being updated. If the HP 28688A EtherTwist Hub Plus is to be updated, the binary file containing the new hub firmware code would be under the \HP28688A subdirectory.

When to update hub plus firmware:

There are two situations where you would want to update hub firmware:

- The current hub firmware has known bugs.
- HP OpenView Hub Manager software enhancements require it.

Uploading the hub's configuration:

1. Whenever you perform a firmware update, you should first save your current hub configuration (that is stored in firmware) by using the Hub Manager Upload command. This command will save all the configuration parameters you have defined on the hub (except the hub password, IP configuration parameters, and Hub Manger system strings).

Starting the update utility:

2. Using the correct RS-232 cable, connect the serial (RS-232) port of the PC or HP Portable Plus to the console (RS-232) port of the Hub Plus. (See the “Cabling” section in this guide for details on RS-232 cables.)

The connection between PC and hub console port can be made directly by using a cable or remotely by using a modem. For information on cable pin-outs refer to the “Cabling” section in this technical reference guide.

3. Execute the UPDATE command from the same drive and directory that contains UPDATE.EXE. For example, if UPDATE.EXE were on a floppy disk in drive A, the following command would be executed from the A prompt:

A: \update

4. Follow the instructions given in the update utility.
5. If you are using HP 28686C Hub Manager, you must first configure your hub IP configuration parameters. Use the hub console interface’s IPconfig command (IP) to set the parameters.

Downloading the hub’s configuration:

6. To restore the hub’s configuration, use Hub Manager’s Download command. Remember to define the hub’s password, and Hub Manager system strings.

Note: A hub’s firmware version cannot be updated over the LAN using HP OpenView Hub Manager. It can only be done through the hub’s console interface.

HP OpenView Network Management

Product Note

Tips for Using Network Device Managers

Following are a few helpful tips and reminders to consider when using HP OpenView Hub Manager and Bridge Manager.

1. Exit network software before running HP OpenView network device managers.

If you are running other network operating system software on your network management station, such as Novell NetWare or 3Com 3+Open, you must exit your current network software before running Hub Manager or Bridge Manager. That is, no other network software should be running concurrently with Hub Manager or Bridge Manager on the network management station.

2. Discover all hubs and bridges.

In OVDRAW, execute Autodiscovery to discover all manageable hubs and bridges in the network. Then use Autodiscovery's layout command to lay out the network map for use with OVRUN.

3. A "red" device on the network map.

If a device appears on the network map as critical (red), perform the following checks:

- Check Show Alarms and Event Log for a brief description of the event(s).
- Make sure that the device is defined properly on the network map. (Check for correct IP address.)
- Check that the device is not powered off.
- If no other devices on the map are critical, execute Poll Devices to verify the map.
- For nodes connected to hubs, check to see that they can transmit data. Use the tests provided under the Diagnose menu to verify the communication between the hub and its end nodes. You can also send a ping packet if the end node supports IP packets.

4. Quick network status.

To get a quick status of the network, use Poll Devices to query all hubs and/or bridges. To query a single device use Set Parameters. You don't have to log on to any devices to do this.

5. Multiple network management stations.

While one network management station can manage large LANs at multiple sites, there can be more than one OpenView network management station in the network. The management stations can access all hubs and bridges on the network. To control all hubs and bridges, each management station must log on to each device. To provide security, a unique password can be assigned to each hub and bridge. Also, one network management station can access multiple hubs and bridges.

Be aware that other network management stations can override your session. That is, if you log on to a hub and some time later someone else (at another management station) logs on to the same hub, your session will be terminated. Only one station can be logged on to one hub at a time. Be careful with your hub and bridge passwords.

6. Quick identification of hubs and bridges.

The Identify command will retrieve a hub's or bridge's model number, IP address, station address, and current firmware code.

7. Multiple network topologies.

If the network topology is changed by the customer on a regular basis, then maps should be discovered and saved for each topology. This way, you can change maps online without having to re-discover the network map for each change.

8. Testing the communication path between an end node and the hub.

If a user cannot access the network, use the tests under the Diagnose menu to send a "test" packet (from the hub) to the user station. These tests do not work on network operating systems that do not support 802.2 test packets, and "ping" IP packets, such as Novell NetWare networks.

9. Online help screens for error messages.

Use the help menus to decode and decide on an appropriate action for any "Error HMxxx", "Error BMxxx", "Error ADxxx", and "OVxxx" error codes.

10. Print a hardcopy of the online help information.

If a printer is configured, use the help menu entry "How to use the help menus" to print a hardcopy of online help. This is useful if the management station exhibits a problem and the online help menus are inaccessible.

You can also print the network map and its subnet pictures by using the print screen facility of Microsoft Windows (see the Window's User's Guide for information on the print screen function).

11. Hub Manager and Bridge Manager software compatibility.

The following chart summarizes the compatibility of software versions associated with Hub Manager and Bridge Manager products. A check-mark indicates the version(s) of software that operate with the device manager products (shown at the top of the chart).

| | HP Bridge Manager | | | HP Hub Manager | | |
|---|-------------------|--------|--------|----------------|--------|--------|
| | 28653A | 28653B | 28653C | 28686A | 28686B | 28686C |
| OpenView | | | | | | |
| A.01.02 | ✓ | | | | | |
| A.03.00 | ✓ | | | ✓ | | |
| A.04.00 | | ✓ | ✓ | | ✓ | ✓ |
| Bridge Manager | | | | | | |
| HP 28653A | | | | | | |
| HP 28653B | | | | | ✓ | |
| HP 28653C | | | | | | ✓ |
| Hub Manager | | | | | | |
| HP 28686A | | | | | | |
| HP 28686B | | ✓ | | | | |
| HP 28686C | | | ✓ | | | |
| Windows | | | | | | |
| 2.11 | ✓ | | | ✓ | | |
| 3.00a | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| OfficeShare | | | | | | |
| B.00.02 | ✓ | ✓ | | ✓ | ✓ | |
| ARPA 2.1* | | | ✓ | | | ✓ |
| DOS | | | | | | |
| 3.2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3.3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4.01 | | ✓ | ✓ | | ✓ | ✓ |
| *Note: Only the ARPA 2.1 IP transport is used by Hub Manager and Bridge Manager. | | | | | | |

12. Use Hub Manager/Bridge Manager's Upload command to save your hub/bridge configurations.

Hub Manager/Bridge Manager's Upload command will save all the configuration parameters you have made on your hub/bridge except your hub/bridge password, the IPconfig parameters, and the Hub Manager/Bridge Manager system strings. (Hub Manager/Bridge Manager system strings are parameters specified by the user, via Hub Manager/Bridge Manager, to provide identification information on the hub/bridge. The three 80-character strings are: system contact, system name, and system location.)

Every time you perform a firmware update, it is a good idea to use Hub Manager/Bridge Manager's Upload command to save a copy of your hub/bridge's current configurations.

13. Hub Manager and hub firmware revisions.

This chart provides the firmware revisions required for HP hubs (HP 28682A, HP 28688A, HP 28688B, and HP 28699A) to communicate with the Hub Manager products (shown at the top of the chart).

| | HP Hub Manager | | |
|---|----------------------------|----------------------------|---------------------------|
| | HP 28686A | HP 28686B | HP 28686C |
| HP 28682A Fiber-Optic Hub Plus firmware | Not Compatible | Not Compatible | C.01.xx (SNMP over IP) |
| HP 28688A EtherTwist Hub Plus firmware | A.01.xx (SNMP over LLC) | B.01.xx (SNMP over LLC) | C.01.xx (SNMP over IP) |
| HP 28688B EtherTwist Hub Plus firmware | Not Compatible | Not Compatible | C.01.xx (SNMP over IP) |
| HP 28699A EtherTwist Hub Plus/48 firmware | Not Compatible | Not Compatible | C.01.xx (SNMP over IP) |

The firmware revisions are given as: A.01.xx, B.01.xx, and C.01.xx. You only need to check the first three digits of your revision number.

“SNMP over IP” means that the firmware version associated with the hub manager product allows the simple network management protocol to communicate over internet protocol.

“SNMP over LLC” means that the firmware version associated with the hub manager product allows the simple network management protocol to communicate over logical link control. LLC is a low-level access method for IEEE 802.3 and Ethernet devices. It operates at the data link layer (layer 2) of the OSI model.



14. Bridge Manager and bridge firmware revisions.

This chart lists the firmware revisions required for HP bridges (HP 28673A and HP 28674A) to communicate with the Bridge Manager products (shown at the top of the chart).

| | HP Bridge Manager | | |
|-------------------------------------|-------------------|----------------------------|---------------------------|
| | HP 28653A | HP 28653B | HP 28653C |
| HP 28673A 10:10 LAN Bridge firmware | Not Compatible | A.01.xx (SNMP over LLC) | C.01.xx (SNMP over IP) |
| HP 28674A Remote Bridge firmware | Not Compatible | A.01.xx (SNMP over LLC) | C.01.xx (SNMP over IP) |

Note: There is no B.01.xx revision firmware for the bridges.

The firmware revisions are given as: A.01.xx and C.01.xx. You only need to check the first three digits of your revision number.

“SNMP over IP” means that the firmware version associated with the bridge manager product allows the simple network management protocol to communicate over internet protocol.

“SNMP over LLC” means that the firmware version associated with the bridge manager product allows the simple network management protocol to communicate over logical link control. LLC is a low-level access method for IEEE 802.3 and Ethernet devices. It operates at the data link layer (layer 2) of the OSI model.

Hub Manager Tips

1. HP 28686C Hub Manager manages the:
 - HP 28682A Fiber-Optic Hub Plus, firmware revision C.01.xx
 - HP 28688A EtherTwist Hub Plus, firmware revision C.01.xx
 - HP 28688B EtherTwist Hub Plus, firmware revision C.01.xx
 - HP 28699A EtherTwist Hub Plus/48, firmware revision C.01.xx

Earlier HP 28688A 12-port Hub Plus products with firmware such as A.01.xx or B.01.xx are not recognized by HP 28686C Hub Manager. A.01.xx or B.01.xx firmware in these units must be updated.

2. Update HP 28688A Hub Plus firmware.

To be managed by the HP 28686C Hub Manager software, previously released 12-port Hub Plus products must be updated with the “C” version firmware using the firmware update utility program provided with the HP 28686C software.

3. Set the IP address and subnet mask.

For the HP 28686C Hub Manager software to recognize and discover any of the hub products, an IP address and subnet mask must be configured through the hub console interface.

Note: HP hubs that have firmware revisions A.01.xx or B.01.xx do not have the hub console interface IPconfig command (IP). You need to update your hub firmware first. Download the “C” version firmware using the firmware update utility provided with the HP 28686C software.

Bridge Manager Tips

-
1. HP 28653C Bridge Manager manages the:
 - HP 28673A 10:10 LAN Bridge, firmware revision C.01.xx
 - HP 28674A Remote Bridge, firmware revision C.01.xxEarlier bridges with firmware such as A.01.xx are not recognized by HP 28653C Bridge Manager. A.01.xx firmware in these units must be updated.
 2. Update HP 28673A 10:10 LAN Bridge and HP 28674A Remote Bridge firmware.

To be managed by the HP 28653C Bridge Manager software, previously released HP 28673A and HP 28674A bridges must be updated with the “C” version firmware using the firmware update utility program provided with the HP 28653C software.

3. Set the IP address and subnet mask.

For the HP 28653C Bridge Manager software to recognize and discover any of the bridges, an IP address and subnet mask must be configured through the bridge console interface.

Note: HP bridges that have firmware revision A.01.xx do not have the bridge console interface’s IPconfig command (IP). You need to update your bridge firmware first. Download the “C” version firmware using the firmware update utility provided with the HP 28653C software.

HP EtherTwist Hubs

Product Note

Questions and Answers

Q. When should I buy the EtherTwist Hub, Hub Plus, or Hub Plus/48?

A. Use the HP 28684A EtherTwist Hub for small networks (<24 computers) that will never grow. These networks typically do not require network management beyond the hub's console port capabilities.

Use the HP 28688A (or HP 28688B) EtherTwist Hub Plus for small-to-medium networks that will grow and require the HP OpenView Hub Manager network management features.

Use the HP 28699A EtherTwist Hub Plus/48 for medium-to-large networks. Use the Hub Plus/48 in combination with the Hub Plus for optimum port counts in your wiring closet or equipment room.

Q. What is the difference between the HP 28688A and the HP 28688B EtherTwist Hub Plus?

A. The HP 28688B will replace the HP 28688A and will provide greater circuit integration and an auto ranging power supply. The HP 28688B does not mask the SQE test signal from a transceiver connected to its AUI port. The HP 28688A does mask this signal. The HP 28688B does not have the console port Loop-back command (LO) that the HP 28688A has.

Q. Can I use the HP 28686A or HP 28686B Hub Manager with the HP 28688B EtherTwist Hub Plus or the HP 28699A EtherTwist Hub Plus/48?

A. No. You must use the HP 28686C Hub Manager with these hubs.

Q. Can I access other hubs on the network from one hub's console port connection?

A. No. You can only access the hub that you are physically connected to. Accessing more than one hub on a network from a single point can be done only with the HP OpenView Hub Manager workstation.

Q. What is the difference between the HP 28684A Hub and the HP 28688B Hub Plus?

A. The HP 28688B Hub Plus can be controlled across the network with the HP 28686C OpenView Hub Manager software; the HP 28684A Hub cannot. The Hub Plus has a station (media access control, or MAC) address; the Hub does not. With the HP 28688B Hub Plus, a user can access the hub's configuration, monitoring, and control functions from a single HP OpenView Hub Manager workstation over the extended LAN. Access to these functions in the HP 28684A Hub is only available through the RS-232 console port. Finally, since the Hub Plus has a station address, link tests can be run between these hubs and other addressable network devices.

Hub Ports

Q. Can I connect a modem to a hub's console port to remotely configure and monitor the hub?

A. Yes. The console port works with Bell 212, V.22, and V.22BIS standards and has been tested with these modems:

- Black Box V.32 (9600 bps)
- Hayes 1200 Smartmodem or HP 92205A (300/1200 bps)
- HP 37212B Support Link (300/1200/2400 bps)
- Racal Vadic MAXWELL 2400 VP (300/1200/2400 bps)
- HP 50759A Support Link (300/1200/2400 bps)
- HP 35031A SupportLink II (300/1200 bps)

See the *HP EtherTwist Hub Installation Guide* for modem configuration details.

Q. What kind of terminals can I connect to the console port on a hub?

A. Any terminal that can communicate using the ASCII TTY driver mode can be connected to the hub's console port. Some specific terminals that have been tested are:

- HP 262X
- HP Series 700
- VT100
- WYSE 50/60
- TVI 900 Series

Note that a personal computer emulating a terminal can also be used to connect to a hub's console port.

Q. How should my terminal (or PC emulating a terminal) be configured when being used to connect to a hub's console port?

A. The following configuration should be used:

- 8 bits/character
- 1 stop bit
- no parity
- Xon/Xoff handshaking
- baud rate of 9600 or less

Q. Should I disable hub ports that are not in use?

A. No. It is best to leave unused twisted-pair ports enabled. Link beat should also be enabled for these ports. The ports are automatically segmented if no twisted-pair connection is made. When connection is made, the ports automatically become active with no need to use HP OpenView Hub Manager or serial port commands to enable them. If the ThinLAN port is to be left unused, disable “ThinWatch” using the serial port or Hub Manager so that the FAULT LED does not blink. Note that hubs are shipped with “ThinWatch” disabled. There is no need to do anything for an unused AUI port.

Q. Can I connect my HP LaserJet IIISi printer to the EtherTwist hub using a twisted-pair cable?

A. Yes. The HP LaserJet IIISi printer offers two network accessories for connecting to Ethernet/802.3 networks: HP network printer interface for Novell NetWare networks (C2059A) and HP network printer interface for 3Com 3+Open networks (C2058B). Use the HP 28685A EtherTwist Transceiver (with the printer interface of your choice) to connect your printer to an EtherTwist hub with a twisted-pair cable.

The HP LaserJet IIISi printer can also use the HP 28683A Fiber-Optic Transceiver to connect directly to a fiber-optic network. The printer has a built-in ThinLAN (BNC) port for direct connection to thin coaxial cable.

Q. Is the AUI port compatible with AUI slide-latch connectors?

A. Yes. HP EtherTwist hubs include an AUI retainer (5062-3351) so that both screw-down and slide-latch connectors can be securely fastened to the hub’s AUI port.

Status LEDs

Q. What does the FAULT LED indicate?

A. When the FAULT LED is on, the hub has failed its self-test. When the FAULT LED is flashing, a port has been segmented (temporarily disabled).

Q. What does it mean if a twisted-pair port LED is flashing?

A. If the port LED is blinking regularly, then the port has been auto-segmented due to collisions or overly long packets. If the port LED is flashing randomly, it may mean that link beat is set incorrectly. If the port is expecting a link beat pulse and is connected to a device that does not supply link beat, the port will be auto-segmented. If a packet is received thereafter, the port will be momentarily enabled and then segmented again causing the port LED to flash.

Q. What does it mean if a twisted-pair port LED is off?

A. Either the port has been manually disabled or it does not detect link beat from the device attached to it.

Link Beat and Auto-Segmentation

Q. When would I want to enable link beat on a hub's twisted-pair port?

A. Link beat improves the reliability of your network by monitoring link integrity, so use it whenever possible. Disable link beat when the port is attached to a device that does not support link beat (non-10BASE-T device).

Q. When would I want to disable link beat on a hub's twisted-pair port?

A. Disable link beat on the hub's port whenever that port will be connected to a PC card or twisted-pair transceiver that does not have link beat capabilities, or any other non-10BASE-T device (like the HP 28664A MAU, the HP 27236A PC card, and the D1808A option 100 and 200 PC cards).

Q. Which ports can be auto-segmented?

A. All of the hub's ports (excluding the RS-232 console port) can be auto-segmented, including the 12 twisted-pair ports, the AUI port, and the ThinLAN port.

Q. What causes the hub to auto-segment a twisted-pair port?

A. When the hub detects excessive collisions or abnormally large packets at a twisted-pair port, or when link beat is enabled and no link beat pulse is detected from the connected device, the hub will auto-segment the port.

Q. What causes a hub to auto-segment the AUI or ThinLAN port?

A. Auto-segmentation of these ports is caused by excessive collisions or abnormally large packets.

Q. What is the difference between using the hub's console port (or using Hub Manager) to manually disable a twisted-pair port and letting the link beat capability on the hub disable the twisted-pair port automatically?

A. Regardless of which method is used, the port LED will go off. A twisted-pair port manually disabled through the console port (or by using Hub Manager) does not turn on the FAULT LED and will not be enabled automatically. Disabling a port in this way denies access to the port until it is manually enabled again. If a twisted-pair port is segmented due to a link beat failure, it will be automatically enabled if the problem is solved.

Connecting Hubs in the Network

Q. Can hubs be cascaded using twisted-pair cable connected between the twisted-pair ports of each hub?

A. Yes. However, a straight-through twisted-pair cable cannot be used. The transmit and receive pairs must be crossed over for this connection. The HP 92214W crossover cable can be used for this purpose. A crossover cable can be made using the cable pinouts shown in the “Cabling” section of this guide. Another option is to perform the crossing at a cross-connect block between the two hubs.

Q. Can the EtherTwist hubs be used as repeaters for connecting thick coax or fiber optics to thin coax (via ThinLAN and AUI ports)?

A. Yes. Both the ThinLAN and AUI ports are active and can be used at the same time.

Q. What is the maximum number of EtherTwist hubs allowed between any two PCs on the network?

A. Four.

Q. How should the hub’s ThinLAN port be used?

A. Multiple hubs can be connected using ThinLAN coaxial cable with BNC “T” connectors. The thin coaxial cable between hubs creates a virtual extended backbone. Up to 30 hubs can be directly connected to one 185-meter segment of thin coaxial cable.

Q. Is it possible to install multiple hubs in a wiring closet to connect to a thick coax or fiber optic backbone?

A. Yes. A single thick coaxial transceiver or fiber optic transceiver can be connected to one hub’s AUI port, with the remaining hubs connected to this hub using thin coaxial cable or cascaded using twisted-pair cable.

Network Troubleshooting

Q. How can I test the path between an HP 28688B EtherTwist Hub Plus and a computer on the network?

A. There are two methods of running such a test. The first is to run the Testlink command (one of the hub’s console port commands) with the computer running the support disk diagnostic in “Testlink Receiver” mode. The second method is to run the “Test Link” program that is included on the “support disk” shipped with the HP EtherTwist network interface cards. The Test Link command is initiated on the computer. Note that neither of these programs can be used to test the path to an HP 28684A EtherTwist Hub since this hub is not addressable. However, the programs can be used to test a path through the HP 28684A hub.

Q. How can I test the path between two HP 28688B/28699A EtherTwist Hub Pluses?

A. There are two ways to test this path. The first is to run a link test described in the Diagnose menu under HP OpenView Hub Manager. The second method is to run the Testlink command from the console port of one hub to the other hub.

Installing a Hub

Q. What installation configurations are possible?

A. HP EtherTwist Hubs include 19-inch rack mounting brackets that can be attached on the front or back of the hub for racking. In addition, the same brackets can be used for horizontal or vertical end-wall mounting as well as for flat-wall mounting. Finally, the brackets may be left off and rubber feet (included with hubs) installed for tabletop stacking. Since the FAULT, POWER, and ACTIVITY LEDs are repeated on both the front and back of the hubs, racking can be done with either side facing the front of the rack.

HP OpenView Network Management

Product Note

Questions and Answers

Q. Can the network device manager software be run on a PC Server?

A. No. HP OpenView network device managers require a dedicated PC.

Q. Can device managers manage hubs and bridges on the other side of an IP router?

A. Yes. Version "A" and "B" cannot (unless router has MAC layer bridging turned on), but version "C" can.

Q. What protocol do the device managers use?

A. HP 28686C and HP 28653C use SNMP (simple network management protocol) over IP (internet protocol). Versions "A" and "B" use SNMP over LLC.

Q. Is it necessary that a specific network operating system be running on a network in order to use the device managers?

A. No. HP OpenView network device managers run independently of the network software. Therefore, it doesn't matter what network operating system software is running on the network. However, no network software can run concurrently on the network management station (PC) with the device manager software.

Q. Can I manage both HP hubs and HP bridges at the same time from the same management station?

A. Yes. Both Hub Manager and Bridge Manager operate under HP OpenView Windows on the same network management station using the same network map. You can click on any HP hub or HP bridge in the network map drawing, depending on which device you wish to manage.

Q. How many total hubs and bridges can I manage with the device managers?

A. A practical limit of 100 devices (hubs and bridges) can be managed by the network device managers. If the number of devices is increased, you may see slower response times from the devices to the network management software.

Q. What features do the device managers have that the hub and bridge console interfaces don't have?

A. The key features include:

- A central location to control all hubs/bridges in the network.
- User-friendly windows interface.
- Ability to map the network for HP and non-HP devices.
- Ability to set alarm thresholds.
- Ability to show alarms on the map.
- Ability to log events and counters for HP and non-HP devices.

Q. Can I have a remote network management station and run the network device managers through a modem?

A. No. Your network management station must be connected to the network in order to communicate with (manage) your hubs/bridges. If your network management station is at a remote site, you can connect your station to the network by using HP Remote Bridges and a WAN link.

Q. What is the difference between HP 28686A Hub Manager and HP 28686B? Difference between HP 28653A Bridge Manager and HP 28653B?

A. The "B" products for both Hub Manager and Bridge Manager include:

- Autodiscovery software.
- Installation script.
- Background polling (added to Bridge Manager).
- Concurrent operation of Hub Manager and Bridge Manager.

Q. What is the difference between HP 28686B Hub Manager and HP 28686C? Difference between HP 28653B Bridge Manager and HP 28653C?

A. The "C" products for both Hub Manager and Bridge Manager include:

- Support of SNMP over internet protocol (IP). This allows hubs and bridges to be managed across router boundaries, as well as allowing some 3rd party devices to be managed.
- Autodiscovery and layout of multiple networks connected by routers.
- Real-time graphical representation of hub and bridge statistics.
- Chronological event log.
- Ability to monitor any SNMP/IP MIB II device.

Q. Can I use the HP 28686A or HP 28686B Hub Manager with the HP 28688B EtherTwist Hub Plus or the HP 28699A EtherTwist Hub Plus/48?

A. No. You must use the HP 28686C Hub Manager with these hubs.

Q. What 3rd party LAN adapter cards can I use in the network management station?

A.

- 3COM EtherLink II (3C503TP)
- 3COM EtherLink/MC (3C523) - PS/2 10BASE-T Card
- 3COM EtherLink (3C503)
- Western Digital EtherCard PLUS 10T
- Western Digital EtherCard PLUS 10T/A - PS/2 10BASE-T Card
- Western Digital ThinLAN Interface WD8003E

Q. Can the HP OpenView device managers manage other 3rd party hubs and bridges that are SNMP and IP compatible?

A. Yes.

Q. Can other 3rd party SNMP-based software products manage the HP hubs and bridges?

A. In order to be managed by an SNMP-based software program, HP hubs and bridges require the 3rd party management system to have the following SNMP attributes:

- MIB II system objects.
- MIB II interface objects.
- HP device-specific extensions to MIB II.
(The extensions can be obtained from the ARPA Internet, VENERA.ISI.EDU, FTP, Login: Anonymous)

Q. How can I find out what firmware versions are on the bridges and hubs I've already installed.

A. There are two ways to get firmware version information:

- On a network management station, use the Identify command.
- On hubs, use the console interface's status command (ST). On bridges, use the console interface's bridge info command (BR).



HP EtherTwist Hubs

Installation Steps

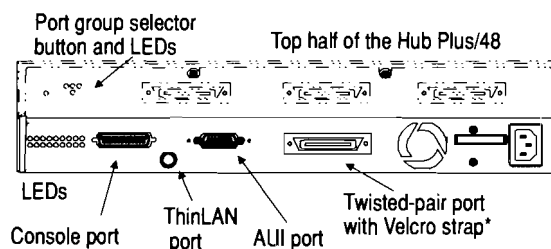
HP 28688B Hub Plus and HP 28699A Hub Plus/48

The HP 28688B Hub Plus and HP 28699A Hub Plus/48 are twisted-pair hubs that connect computers over twisted-pair cable. They are designed to be compatible with Type 10BASE-T networks.

Mount and plug in.

1. Make sure the hub's power cord is correct for your country's ac power receptacle.
2. Mount the hub on wall or table, or in a rack..
3. Attach the power cord to hub. Plug into an electrical outlet.
4. Check these LEDs on the back:
 - All the LEDs should go ON momentarily.
 - **Power** should be ON.
 - **Fault** should go OFF.
 - Disregard the other LEDs for now.

If LEDs are different, the hub may be faulty.

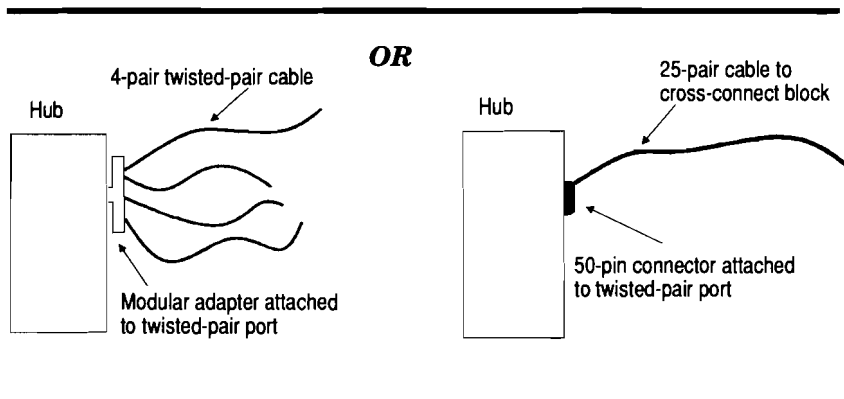


Back of the Hub Plus or Hub Plus/48

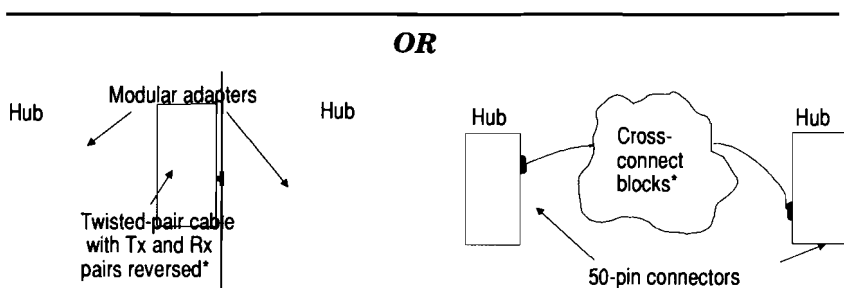
*Use the Velcro strap to secure a 50-pin connector.
For a modular adapter, remove the Velcro strap holder.

For more installation details, see the *HP EtherTwist Hub Installation and Reference Guide*, part number 5090-2692.

Connect computers.

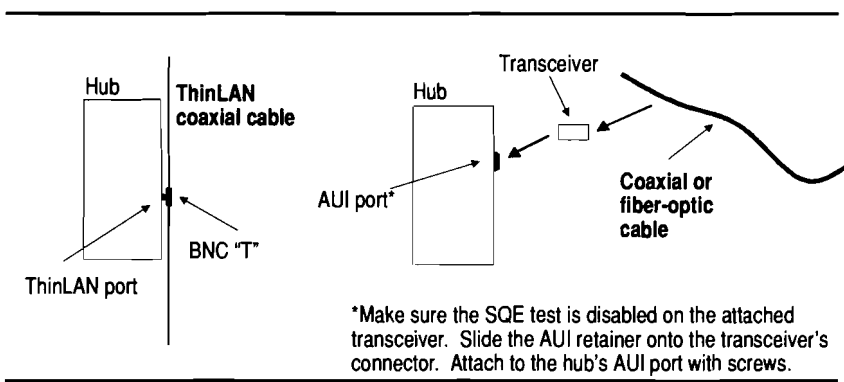


Connect hubs if required.



*Between hubs, Tx and Rx pairs must be reversed. For a wiring diagram, see the "Cabling" section in this technical reference guide.

Connect to a backbone if required.



Notes.

If any twisted-pair port connects to a device that is not compatible with Type 10BASE-T, disable the link beat on that port. For more details, see "Configuration" in chapter 2 of the *HP Ether-Twist Hub Installation and Reference Guide*, p/n 5090-2692.

LEDs on the Back of the Hub

Power (green) is ON if the hub is receiving power. **Activity** (green) is ON when data is being transmitted. **Fault** (yellow) is ON if the hub is faulty, **FLASHING** if a port has been auto-segmented. **Collision** (yellow) is ON when collisions occur on any of the attached cable segments. Each port LED (green) is ON when the port is enabled and functioning normally, **FLASHING** if the port has been auto-segmented. (The LED for an enabled AUI port is ON when nothing is connected to it.)

Technical Reference Guide

**HP EtherTwist
Adapter Cards**



HP EtherTwist Adapter Cards

Technical Data

Product Numbers
27245A, 27246A, 27247A,
27248A, 27267A, 27269A

The HP EtherTwist family of LAN adapter cards includes four Type 10BASE-T cards that allow direct connections to 10-Mbit/s twisted-pair local area networks. This full line covers both clients and servers on the ISA (AT), EISA, and Micro Channel buses, and includes drivers for all the popular network operating systems (NOSs). The EtherTwist adapter cards offer industry-leading reliability, top-rated real-world performance (as judged by a leading industry publication), and value that no competitor's product can match.

The EISA Adapter Card/32 is designed for the demanding environment of an EISA server. The 16-bit Adapter Card/16 works well in server applications in an ISA (AT-type) machine. The Micro Channel Adapter Card/16 does client or server duty in Micro Channel computers. The 8-bit Adapter Card/8 is ideally suited for client nodes in ISA (AT) machines.

The Adapter Card/8 6-Pack is a good starter kit for new networks: it bundles six 8-bit ISA cards with one set of manuals and drivers. The Adapter Card/16 comes in a 6-pack as well.

The EtherTwist adapter cards are part of the HP EtherTwist family of network components. These LAN components—adapter cards, transceivers, hubs, and bridges—provide a high-performance, low-cost hardware foundation for your network.

Features

All HP EtherTwist Adapter Cards

- Connect to hubs via unshielded twisted-pair (telephone) cabling. Shielded twisted-pair cabling can also be used.
- Comply with the IEEE 802.3 Type 10BASE-T standard.
- Support 100 meters of cable to the hub. Greater distances can be achieved with low-loss cable.
- Connect to twisted-pair cable via standard 8-pin modular (RJ-45) jacks. EISA card also offers AUI port for connection to coaxial or fiber-optic cable.
- Break out voice signals through 6-pin modular (RJ-11) jack for systems that route voice and data signals in the same 4-pair twisted-pair cable (all cards except EISA card).

- Provide efficient data transfer using burst DMA transfers or REP I/O.
- Provide 32 Kbytes or 64 Kbytes of on-board static RAM for packet buffering.
- Fully support HP StarLAN 10 networks through configuration of link beat signal.
- Provide drivers for Novell NetWare, LAN Manager (except for EISA card), and other popular network operating systems (NOSs).
- Meet FTZ 1046/84 (level B) standards for radiated emissions.

Specific Features of Individual Cards

EISA Adapter Card/32

- High throughput and low CPU utilization.
- 32-bit EISA backplane connection.
- Burst DMA data transfer (33-Mbyte/s transfer rate).
- 64 Kbytes of on-board static RAM for packet buffering.
- 8-pin modular (RJ-45) jack for 10BASE-T connection.
- AUI port for connection to coaxial or fiber-optic cabling.
- LED indicators for transmit, receive, and link signals.

Adapter Card/16 (ISA) and Adapter Card/16 6-Pack

- 16-bit ISA (AT) backplane connection.
- REP I/O data transfer.
- 64 Kbytes of on-board static RAM for packet buffering.
- 8-pin modular (RJ-45) jack for 10BASE-T connection.
- 6-pin modular (RJ-11) jack for breakout of phone wires.

Micro Channel Adapter Card/16

- 16-bit Micro Channel backplane connection.
- REP I/O data transfer.
- 64 Kbytes of on-board static RAM for packet buffering.
- 8-pin modular (RJ-45) jack for 10BASE-T connection.
- 6-pin modular (RJ-11) jack for breakout of phone wires.

Adapter Card/8 (ISA) and Adapter Card/8 6-Pack

- 8-bit ISA (AT) backplane connection.
- REP I/O data transfer.
- 32 Kbytes of on-board static RAM for packet buffering.
- 8-pin modular (RJ-45) jack for 10BASE-T connection.
- 6-pin modular (RJ-11) jack for breakout of phone wires.

Reliability

The HP EtherTwist adapter cards are designed for reliability, using the latest surface mount technology with fewer parts than competing products. With mean time between failure (MTBF) rates of more than 350 years, these adapter cards are over three times more reliable than the leading competitor's products.

Performance

The EtherTwist adapter cards are designed for superior real-world performance, not just impressive numbers in laboratory benchmarks. In a recent PC Magazine evaluation of Type 10BASE-T adapter cards (October 16, 1990), the HP EtherTwist Adapter Card/8 had the highest performance of 8-bit cards under all types of network loads.

Not only is high throughput important in a LAN card, but low CPU utilization is just as vital. The power of a CPU is needed not only to drive the adapter card, but to perform other functions, like disc I/O, as well. HP EtherTwist adapter cards have some of the lowest CPU utilization figures in their class.

The amount of memory on an adapter card is another important performance consideration. As traffic increases, especially at the server, a card must have enough memory to buffer a number of packets. Otherwise, a full buffer will cause dropped packets, retransmission, and degradation of network performance. The EtherTwist cards have either 32 Kbytes or 64 Kbytes of memory, plenty of memory for the increasing number of applications that require packet buffering. With more memory than any other card in its class, the 32-Kbyte Adapter Card/8 will long outlive its 8-Kbyte competition.

In addition, the software drivers for the EtherTwist cards were designed to optimize performance. The result of all this attention to detail is best-in-class performance, under all types of network loads.

Driver Software

The EtherTwist adapter cards come with drivers for a wide variety of network operating systems (NOSs). You can choose the NOS that best meets your needs and still be able to get the benefits of HP's EtherTwist network hardware, whether you use Novell NetWare, LAN Manager, or any of the other supported NOSs. All software drivers are available at no additional charge. They are either shipped with the product or available electronically on CompuServe or other popular electronic bulletin board services. New drivers can be found on these electronic services as well.

Specifications

Hardware Characteristics

| | HP 27248A | HP 27247A/ HP 27269A | HP 27246A | HP 27245A/ HP 27267A |
|----------------------------|---|-------------------------|--|-------------------------|
| Environmental: | | | | |
| Operating Temperature | 0°C to +55°C (+32°F to +131°F) | | | |
| Relative Humidity | 15% to 95% @ 40°C condensing | | | |
| Power Requirements: | | | | |
| Typical | 1.9A + 5v | 0.85A + 5V | 1.2A + 5V | 0.65A + 5V |
| Maximum | 2.0A + 5V | 0.95A + 5V | 1.4A + 5V | 0.70A + 5V |
| Physical: | | | | |
| Dimensions | 22.9 cm by 12.1 cm 9.0 in. by 4.75 in. | | 13.8 cm by 8.6 cm 5.45 in. by 3.4 in. | |
| Weight | 147 grams (5.2 oz) | 94 grams (3.3 oz) | 116 grams (4.1 oz) | 94 grams (3.3 oz) |

Driver Compatibility

Note: NDIS 1.0 is a generic driver specification. The LAN Manager product from Microsoft works with it as does Banyan Vines, PC/TCP Plus, and many other products. New vendors are announcing support for this driver specification continually. Check with the NOS vendor for support of the driver specification.

New drivers are continually being written and different NOSs tested for HP EtherTwist Products. Check with your HP representative or authorized HP dealer for the latest software compatibility list.

| Network Operating Systems (NOS) | HP 27248A | HP 27247A/ HP 27269A | HP 27246A | HP 27245A/ HP 27267A |
|---|-----------|-------------------------|-----------|-------------------------|
| Novell NetWare 286 v. 2.15 | | ✓ | ✓ | ✓ |
| Novell NetWare 386 (ODI Server) | ✓ | ✓ | ✓ | ✓ |
| HP LAN Manager OS/2 ¹ | | ✓ | ✓ | ✓ |
| HP LM/X | | ✓ | ✓ | ✓ |
| 3Com 3+Open v. 1.1 ¹ | | ✓ | ✓ | ✓ |
| SCO Unix ² V/386 release 3.2 | | ✓ | ✓ | ✓ |
| Banyan Vines ¹ | | ○ | ○ | ○ |
| FTP Inc. PC/TCP Plus ¹ | | ○ | ○ | ○ |
| FTP Inc. PC/TCP ³ | | ○ | ○ | ○ |
| HP OfficeShare III | | | ✓ | ✓ |

1 = Via NDIS Driver
2 = Via Streams Driver
3 = Via Packet Driver

✓ = Tested by HP
○ = Software vendor claims compatibility with driver.
This configuration not tested by HP.

HP Wire Test and Cabling

HP EtherTwist local area networks use twisted-pair (telephone) cabling. Two pairs of 22, 24, or 26 AWG unshielded twisted-pair cable are required for each connection. (Standard 4-pair telephone cable allows running telephone signals in the same cable with the LAN data.) Shielded twisted-pair cable can also be used.

The HP WireTest Service is available to qualify your existing telephone cabling for a Type 10BASE-T local area network. Contact your local HP Sales and Support Office or your HP Authorized LAN Dealer for information and availability of this service.

System Requirements

The HP 27245A Adapter Card/8, HP 27267A Adapter Card/8 6-Pack, HP 27247A Adapter Card/16, and HP 27269A Adapter Card/16 6-Pack are intended for use in PCs with an ISA backplane (including HP Vectras, Compaq DeskPros, and IBM PC/XT/ATs and PS/2s with AT backplanes). The HP 27246A Micro Channel Adapter Card/16 is intended for use in PCs with a Micro Channel backplane (including IBM PS/2 models with Micro Channel backplanes). The HP 27248A EISA Adapter Card 32 is intended for use in PCs with EISA backplanes (including Hewlett-Packard and Compaq EISA computers).

Warranty

All members of the HP EtherTwist adapter card family are warranted for one year against defects. Check with your local Hewlett-Packard Sales and Support Office or your HP Authorized LAN Dealer for more information.

Ordering Information

HP 27245A EtherTwist Adapter Card/8

HP 27246A EtherTwist MCA Adapter Card/16

HP 27247A EtherTwist Adapter Card/16

HP 27248A EtherTwist EISA Adapter Card/32

HP 27267A EtherTwist Adapter Card/8 6-Pack

HP 27269A EtherTwist Adapter Card/16 6-Pack

Each of these products (except the HP 27248A EISA Card) must be ordered with a local language option for documentation (no cost). One of the following options must be chosen:

Option ABA — English
Option ABD — German
Option ABE — Spanish
Option ABF — French
Option ABZ — Italian

Related product: One HP 28689B Troubleshooting Kit should be purchased for each LAN installation.

HP EtherTwist Adapter Cards

3rd Party Compatibility List



Network Operating Systems

HP designs EtherTwist adapter cards to operate with industry-standard hardware and software products. Based on limited testing, HP believes the following products achieve compatibility with HP's EtherTwist adapter cards.

HP relies in part upon information from the suppliers of the products and makes no warranty, expressed or implied, with respect to the following products' operation or compliance with worldwide regulatory requirements. HP advises customers to conduct independent examination to determine suitable levels of compatibility for the customer's individual needs.

| HP EtherTwist Adapter Card | Network Operating System |
|-----------------------------------|---|
| HP 27245A, 27246A, 27247A | Novell NetWare v2.15 client and server |
| HP 27248A | Novell NetWare v 2.15 (client only) |
| HP 27245A, 27246A, 27247A, 27248A | Novell NetWare v3.0 and v3.1 |
| HP 27245A, 27246A, 27247A | Microsoft LAN Manager v2.0, 3Com 3+Open LAN Manager v1.1 HP LAN Manager |
| HP 27245A, 27246A | HP OfficeShare B.00.02 or later |
| HP 27245A, 27246A, 27247A | SCO UNIX V/386 release 3.2, Open Desktop |
| HP 27245A, 27246A, 27247A | NDIS 1.0 compatible Network Operating Systems |

Check with HP for the latest list of network operating systems that have been tested with the HP EtherTwist adapter cards.

HP EtherTwist Adapter Cards

3rd Party Compatibility List

Personal Computers

HP designs EtherTwist adapter cards to operate with industry-standard hardware and software products. Based on limited testing, HP believes the following products achieve compatibility with HP's EtherTwist adapter cards. This is not an exhaustive list of compatible PCs.

Please check with the network operating system (NOS) vendors for a list of PCs that have been certified with their products.

HP relies in part upon information from the suppliers of the products and makes no warranty, expressed or implied, with respect to the following products' operation or compliance with worldwide regulatory requirements. HP advises customers to conduct independent examination to determine suitable levels of compatibility for the customer's individual needs.

| HP EtherTwist Adapter Card | Personal Computers (compatible) |
|---------------------------------------|--|
| HP 27245A | HP Vectra PC family IBM PC/XT/AT IBM PS/2 model 25, 30 Compaq Portable Compaq Deskpro Epson Compuadd 325 (386/25) Olivetti M300 (386/16) ACER 1100/25 (386/25) AST 386/33 Toshiba T8500 model (386/25) Hyundai 286C |
| HP 27246A | IBM PS/2 models: 50, 60, 70, 80 |

| HP EtherTwist Adapter Card | Personal Computers (compatible) |
|---------------------------------------|--|
|---------------------------------------|--|

| | |
|-----------|---|
| HP 27247A | HP Vectra PC family IBM PC AT Compaq Portable Compaq Deskpro Epson 3Com 3S/40x Tandy 3000 and 4000 Honeywell 286, 386 Wyse 3225 Zenith |
| HP 27248A | HP Vectra PC 486 family Compaq 386/33, 386C, 486C, Model 3000 Dell 425/E |

Check with HP for the latest list of personal computers that have been tested with the HP EtherTwist adapter cards.

The following products are known to be incompatible with HP's EtherTwist adapter cards.

| HP EtherTwist Adapter Card | Personal Computers (incompatible) |
|---------------------------------------|--|
|---------------------------------------|--|

| | |
|-----------|---|
| HP 27247A | Epson 386/25, 386/SX Hyundai 286C IBM PS/2 model 25, 30 |
|-----------|---|

HP EtherTwist Adapter Cards

3rd Party Compatibility List

Type 10-BASE-T Network Devices

HP designs EtherTwist adapter cards to operate with industry-standard hardware and software products. Based on limited testing, HP believes the following products achieve compatibility with HP's EtherTwist adapter cards.

HP relies in part upon information from the suppliers of the products and makes no warranty, expressed or implied, with respect to the following products' operation or compliance with worldwide regulatory requirements. HP advises customers to conduct independent examination to determine suitable levels of compatibility for the customer's individual needs.

| HP Product | 3rd Party Product | Configuration |
|---|---|--|
| 27245A, 27246A, 27247A PC adapter cards | Synoptics 3030 concentrator with 10BASE-T module | adapter cards connected to concentrator module |
| 27245A, 27246A, 27247A PC adapter cards | 3Com's multiconnect with 10BASE-T module | adapter cards connected to concentrator module |
| 27245A, 27246A, 27247A PC adapter cards | Cabletron MMAC-3 with MR-9000PT concentrator module | adapter cards connected to concentrator module |

HP EtherTwist Adapter Cards

Product Note

Questions and Answers

Note: The questions and answers in this section cover specifically the EtherTwist LAN adapter cards. For more information on network operating systems, see the “Product Note—Network Operating Systems” included in this technical reference guide.

Q. When should I disable link beat on an HP EtherTwist adapter card?

A. Disable link beat on a card when it is connected to an HP 28663A StarLAN 10 Hub or any other device that is not Type 10BASE-T compliant.

Q. If a PC card has link beat enabled and does not detect any link beat pulses, what happens?

A. The card will stop transmitting until it detects link beat from the hub.

Q. How do I read the hardware switch settings on the PC cards?

A.

HP 27245A EtherTwist Adapter Card/8, and HP 27247A EtherTwist Adapter Card/16:

The *HP EtherTwist PC Link Installation Guide* (p/n 27245-90001) provides a clear description of how to interpret I/O base address and link beat switch settings on the card. Note that the direction of the arrow indicates the side of the switch that is to be depressed. If your HP 27245A switch is a rotary dial switch, then each setting defines an I/O base address AND a link beat setting. The installation manual also provides instructions on how to interpret these settings.

HP 27246A EtherTwist Micro Channel Adapter Card/16:

The *HP EtherTwist Micro Channel Link Installation Guide* (p/n 27246-90001) provides a clear description of how to interpret the link beat switch setting. There is no I/O base address switch on the micro channel card; the address is set using the IBM System Reference Diskette.

HP 27248A EtherTwist EISA Adapter Card/32:

There are no switches on this card; however, there is a jumper used for selecting the type of LAN connector. The *HP EtherTwist EISA Adapter Card/32 Installation Guide* (p/n 27248-90001) explains how to set the jumper for either the AUI or the RJ45 connector. The manual also explains how to set the DMA channel, interrupt level (IRQ), and link beat using the EISA configuration utility.

Q. Is the HP 27248A EISA Adapter Card/32 a bus master card?

A. No. However, the card uses burst DMA data transfer, which in turn utilizes the DMA subsystem on the PC's motherboard. This DMA subsystem provides bus mastering so the performance of the HP 27248A EISA card will be equivalent to that of a bus master card.

Q. Which network operating systems can be run over the EtherTwist adapter cards?

A.

- HP 27245A EtherTwist Adapter Card/8 and HP 27246A EtherTwist Micro Channel Adapter Card/16
 - Novell NetWare v2.15
 - Novell NetWare 386
 - SCO Unix V/386 release 3.2, Open Desktop
 - 3Com 3+Open 1.1
 - HP LAN Manager A.00.00 or later
 - Microsoft LAN Manager v2.0
 - HP OfficeShare B.02.00 or later
- HP 27247A EtherTwist Adapter Card/16
 - Novell NetWare v2.15
 - Novell NetWare 386
 - SCO Unix V/386 release 3.2, Open Desktop
 - 3Com 3+Open 1.1
 - HP LAN Manager A.00.00 or later
 - Microsoft LAN Manager v2.0
- HP 27248A EtherTwist EISA Adapter Card/32
 - Novell NetWare v2.15 (Client only)
 - Novell NetWare 386

Q. What is included on the support disk that is shipped with the cards?

A. The support disk contains a diagnostic test program, a set of drivers, and various configuration files. The diagnostic test program (TEST.EXE) is used to verify proper operation of the LAN card and to assist in troubleshooting this hardware. The drivers allow the cards to be used with the various network operating systems listed above. The disk supplied with the Micro Channel cards also contains an adapter description file that is necessary for adding HP EtherTwist cards to Micro Channel machines. The EISA and PC adapter card support disks contain configuration files for using the EISA configuration utility when adding those cards to an EISA machine.

Q. What are the testing capabilities of the diagnostic program that is included on the “support disk”?

A. The program runs on the station containing the card to be tested and provides three main functions:

- Test Card—Performs a self-test on the installed card.
- Loopback—Tests some of the card transceiver circuitry if a loopback connector is attached.
- Test Link—Tests the card and the path between the local card and another addressable device on the network.

The necessary loopback connectors are included in the HP 28689B Extended LAN Troubleshooting Kit.

Q. Can I test the communication path between my EtherTwist hub and any other devices on the network?

A. If you wish to test the link from an EtherTwist Hub Plus to a PC on the network, you must first run the support disk diagnostic program in Testlink Receiver mode on the PC. Then execute the testlink command (TE) from the hub console interface.

The same test can be performed in the reverse direction. That is, if you wish to test the link from the PC to the hub, execute the Test Link diagnostic program (found on the support disk) on your PC. You will be prompted for the station address (MAC address) of the destination device. The station address is printed on the back of the hub or can be displayed by entering the console interface’s status command (ST) on the hub.

Other devices on the network that have station addresses must be able to send an IEEE 802.2 test response packet in order to respond to the console interface’s testlink command (TE) from the EtherTwist hub. Note that the testlink command is not applicable for the HP 28684A EtherTwist Hub because it is not an addressable device.

Q. Can the diagnostic test program included on the “support disk” be run under OS/2 and DOS?

A. Yes. When running under OS/2, the system must be running in MS-DOS compatibility mode.

HP EtherTwist Adapter Cards

Installation Steps

HP 27245A and HP 27247A

The HP 27245A EtherTwist Adapter Card/8 and HP 27247A EtherTwist Adapter Card/16 connect a personal computer to a twisted-pair cable. They are designed to be compatible with Type 10BASE-T networks.

Check the basics.

Systems

These cards are compatible with certain personal computers that have IBM PC, XT, or AT architecture. The computer must have MS-DOS version 3.3 or later, or OS/2 version 1.1 or later.

Network Software Driver Preparation

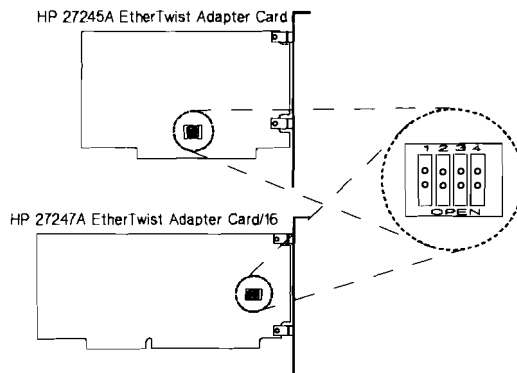
- **Novell NetWare v2.15.** For a new installation, copy the Novell driver files from the \HPNOVEL subdirectory of the Support Disk to a work disk with volume label LAN_DRV_424.
- **Novell NetWare 386 Servers.** No preparation is necessary.
- **HP LAN Manager and 3Com 3+Open v1.1** (based on Microsoft OS/2 LAN Manager). For a new installation, copy the driver files from the subdirectories \NDIS\DOS and \NDIS\OS2 on the Support Disk to working copies of DOS or OS/2 drivers disks, respectively, as follows:
 - *for DOS:* Copy the files to the subdirectory named \3OPEN\DOSDRV\MAC on a working copy of the DOS Drivers Disk.
 - *for OS/2:* Copy the files to the subdirectory named \3OPEN\OS2DRV\MAC on a working copy of the OS/2 Drivers Disk.

Anti-Static Handling

Work in static-free area if possible. Handle the card by its edges and do not touch components. Touch the computer chassis frequently to equalize static charge.

Set the I/O base address.

Make sure the I/O address range does not conflict with another card in the computer. To set the base address, use switches 1 through 3. (Address range includes the base address and the next 31 addresses.)



| I/O Base Address | Switch Settings |
|---------------------------------------|-----------------|
| 200h | |
| 240h | |
| 280h | |
| 2C0h | |
| 300h factory default | |
| 320h do not use on HP Vectra CS | |
| 340h | |

Note: Normally, switch 4 will remain at the factory setting (CLOSED). If you are connecting to a device that is not compatible with Type 10BASE-T networks (such as HP StarLAN 10 Networks), disable link beat by moving switch 4 to the OPEN position. For more details, see the *HP EtherTwist PC Link Installation Guide* (27245-90001).

Install and test.

Install card. See "Installing the Card" in chapter 2 of the *HP EtherTwist PC Link Installation Guide*.

Test card. Make sure the ANSI.SYS driver is installed in your CONFIG.SYS file. Boot the DOS operating system. Insert the Support Disk in drive A. Enter A:TEST and follow the prompts.

Attach 4-pair twisted-pair cable to the LAN port of card.

For more information about interrupt channels, see the *HP EtherTwist PC Link Installation Guide*, part number 27245-90001.

HP EtherTwist Micro Channel Adapter Card/16

Installation Steps

HP 27246A

This interface card connects a personal computer with Micro Channel architecture to twisted-pair cable. It is designed to be compatible with Type 10BASE-T networks.

Check the basics.

Systems

This card is compatible with certain personal computers that have Micro Channel architecture. The computer must have MS-DOS version 3.3 or later, or OS/2 version 1.1 or later.

Network Software Driver Preparation

- **Novell NetWare v2.15.** For a new installation, copy the Novell driver files from the \HPNOVEL subdirectory of the Support Disk to a work disk with volume label LAN_DRV_424.
- **HP LAN Manager and 3Com 3+Open v1.1** (based on Microsoft OS/2 LAN Manager). For a new installation, copy the driver files from the subdirectories \NDIS\DOS and \NDIS\OS2 on the Support Disk to working copies of DOS or OS/2 drivers disks, respectively, as follows:
 - *for DOS:* Copy the files to the subdirectory named \3OPEN\DOSDRV\MAC on a working copy of the DOS Drivers Disk.
 - *for OS/2:* Copy the files to the subdirectory named \3OPEN\OS2DRV\MAC on a working copy of the OS/2 Drivers Disk.

Anti-Static Handling

Work in static-free area if possible. Handle the card by its edges and do not touch components. Touch the computer chassis frequently to equalize static charge.

Add the .ADF file.

Add the adapter description file (.ADF) to your Reference Diskette:

1. Insert the work copy of your computer's Reference Diskette into drive A. Start the computer.
2. Follow prompts to the main menu. Choose "Copy an option diskette" from the menu. When prompted for the option diskette, use the Support Disk shipped with this card.

Install and test.

Note: If you are connecting to a device that is not compatible with Type 10BASE-T networks, disable link beat by moving switch 1 on the card to the OPEN position. For more details, see the *HP EtherTwist Micro Channel Link Installation Guide* (27246-90001).

Install card. See the *HP EtherTwist Micro Channel Link Installation Guide* for instructions.

Set Options. Start your computer's Reference Diskette. Follow the prompts. Answer "yes" to the "Automatically configure the system" question.

Test card. Make sure the ANSI.SYS driver is installed in your CONFIG.SYS file. Start the computer. With DOS running, insert the Support Disk in drive A. Enter A:TEST and follow the prompts.

Attach 4-pair twisted-pair cable to the LAN port of card.

For more information about interrupt channels, see the *HP EtherTwist Micro Channel Link Installation Guide*, part number 27246-90001.

HP EtherTwist EISA Adapter Card/32

Installation Steps

HP 27248A

This interface card connects a personal computer to an IEEE 802.3 or Ethernet network. The card has two LAN connectors:

- an 8-pin modular (RJ-45) connector for attaching twisted-pair cable (compatible with Type 10BASE-T).
- an AUI connector for attaching an AUI cable or transceiver.

Check.

Systems

This card is compatible with personal computers that have an Extended Industry Standard Architecture (EISA) backplane.

Network Software Drivers

The HP 27248A is intended for use primarily in a network file-server system. Therefore, the driver supplied with the card is for use with **Novell NetWare 386**. (A Novell NetWare v2.15 client driver is also available.)

Copy the Novell driver file, HP386E32.LAN, from the Support Disk to the disk and directory containing the NetWare 386 product files.

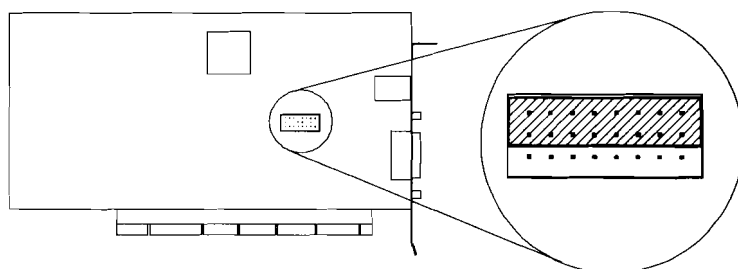
HP will continue to develop new drivers for the HP 27248A. Ask your HP representative for the latest list of drivers.

Anti-Static Handling

Work in static-free area if possible. Handle the card by its edges and do not touch components. Touch the computer chassis frequently to equalize static charge.

Set the LAN port selection jumper.

There is a jumper on the HP 27248A for selecting which LAN port (twisted-pair or AUI) will be used to connect the card to the network. The default jumper position enables the twisted-pair port. To enable the AUI port, change the jumper position to the bottom two rows of pins (labeled AUI). For more details, see the *HP EtherTwist EISA Adapter Card / 32 Installation Guide* (p/n 27248-90001).



Install and configure.

Install card. See your computer's installation manual for instructions.

Copy the EISA Configuration File. Start the computer. With DOS running, copy the card's configuration file (!HWP1840.CFG) from the Support Disk to the disk and directory containing your system's EISA configuration utility files.

Run the EISA Configuration Utility. From your system's DOS prompt, change directories to the EISA configuration utility directory and enter `cf` to run the EISA configuration utility. On the "System Configuration Overview" screen you should see that the card labeled "HP EtherTwist EISA LAN Adapter/32" has been "Auto-Added".

View the Card's Configuration. Use the cursor-control keys to highlight the "HP EtherTwist EISA LAN Adapter/32" label and then press ENTER. The resulting "System Configuration Detailed View" screen will show the card's configuration. The configurable parameters are:

- Interrupt level
- DMA channel
- Link beat setting

To keep the configuration shown, press `Ctrl-X` and then press `S` to save the configuration and exit from the configuration utility. When you exit from the configuration utility, your system will automatically be rebooted.

If you want to change the card's configuration, see "Changing the Card's Configuration" in chapter 2, "Installation" of the card's installation guide.

Verify the card.

You can verify that the card is properly installed by checking the LEDs on the card and by using the test program from the support disk.

LEDs. If the card is properly installed, and if the default settings for the LAN port selection jumper (twisted-pair port enabled) and link beat (enabled) are used, the LED pattern is:

Tx - ON
Rx - ON

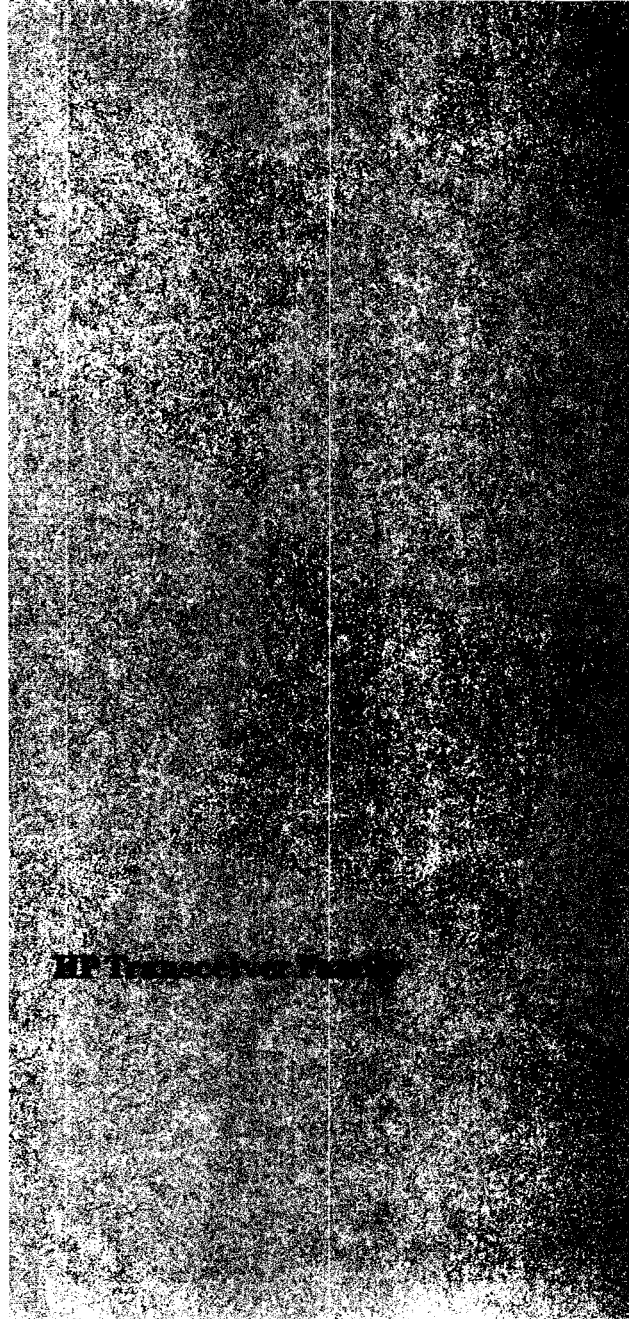
The LED patterns for other configurations are described in chapter 2, "Installation" of the card's installation guide.

Test program. To test the card more thoroughly, use the test program from the Support Disk. Insert the Support Disk in drive A. Enter A:TEST and follow the prompts. (Note: to run this test, the ANSI.SYS driver must be installed in your CONFIG.SYS file.)

Attach the network cable.

Attach a 4-pair twisted-pair cable to the twisted-pair port, or attach a transceiver or AUI cable to the AUI port on the card. (Make sure you are using the port that matches the setting of the LAN port selection jumper.) If you use the AUI port, make sure you secure the attachment with the AUI retainer that came with the card.

Technical Reference Guide



HP Transceiver Family



Technical Data

Product Numbers HP 28685A, HP 28683A, and HP 28641B

- **HP 28685A EtherTwist Transceiver**
- **HP 28683A Fiber-Optic Transceiver**
- **HP 28641B ThinLAN Transceiver**

The HP family of transceivers provides connection from any AUI (attachment unit interface) port to twisted-pair, fiber-optic, or thin coaxial cable. The transceivers can connect directly (or with an AUI cable) to the AUI port of any network device or any computer system's LAN adapter card.

The transceivers send and receive data, detect collisions on the network, and protect the network's reliability by monitoring malfunctions between the network device's AUI port and the transceiver itself. They also support both IEEE 802.3 and Ethernet protocols. LEDs provide a quick visual assessment of the status of your network.

Use the EtherTwist transceiver to connect your AUI device to Type 10BASE-T twisted-pair cable. Use the fiber-optic transceiver to connect your AUI device to fiber-optic cable. Use the ThinLAN transceiver to connect your AUI device to thin coaxial cable.

Features

(all transceivers)

- Provides an AUI connector that attaches to any device's AUI port directly or via an AUI cable.
- Supports both IEEE 802.3 and Ethernet (version 1.0 and 2.0) devices.
- Provides a compact, space-saving design. Allows quick and easy installation by the user.
- Operates transparently to network operating systems.

Features of Individual Transceivers

EtherTwist Transceiver

- Provides compatibility with IEEE 802.3 Type 10BASE-T networks as well as with HP StarLAN 10 networks.
- Connects to twisted-pair cable via 8-pin modular (RJ-45) jack.
- Supports 22, 24, or 26 AWG unshielded twisted-pair cable. Shielded cable can also be used.
- Supports 100 meters of twisted-pair cable to any AUI compatible device. Longer distances are possible using low-loss cable.
- Provides user-selectable switches for link beat and SQE test.
- Provides LED power indicator for quick notification that transceiver is functioning.

Fiber-Optic Transceiver

- Provides compatibility with the IEEE 802.3 FOIRL standard.
- Connects to fiber-optic cable via two ST connectors (Tx and Rx).
- Supports both 62.5/125- μ m and 50/125- μ m fiber-optic cable.
- Can be used in a point-to-point fiber-optic configuration with the HP 28673A 10:10 LAN Bridge and in star configurations with the HP 28682A Fiber-Optic Hub Plus.
- Supports up to 1 km of fiber-optic cable distance in a point-to-point configuration.
- Provides user-selectable switches for loopback test and SQE test.
- Provides LEDs for quick visual indication of power, transmission activity, collision detection, and light status.

ThinLAN Transceiver

- Provides compatibility with IEEE 802.3 Type 10BASE2 networks.
- Connects to thin coaxial cable via ThinLAN (BNC) port.
- Provides user-selectable SQE test switch.
- Provides LED power indicator for quick notification that transceiver is functioning.

Specifications

Hardware Compatibility

The HP 28685A EtherTwist Transceiver, the HP 28683A Fiber-Optic Transceiver, and the HP 28641B ThinLAN Transceiver are each designed to provide an AUI connection for LAN devices that are compatible with the IEEE 802.3 or Ethernet Version 1.0 or 2.0 standards.

Software Compatibility

The HP transceivers are transparent to network operating systems.

Standards Adherence

- IEEE 802.3 Type 10BASE-T
- IEEE 802.3 FOIRL
- IEEE 802.3 Type 10BASE2

Emissions:

VCCI Class 1, FTZ 1046/84 (VDE level B), FCC part 15 Class A, CISPR-22 level A CISPR-22 level B (HP 28683A only)

Safety:

UL 1950, IEC 950/EN60950, CSA 220, CSA 950

Compact Size

The HP transceivers are about the size of a 1-inch (2.5 cm) stack of business cards. This compact design allows you to use the transceivers in places where larger, bulkier transceivers could never fit. You can attach the transceiver directly to the AUI port on a computer system's LAN adapter card or to the AUI port on an EtherTwist hub. (You don't have to use an AUI cable.) This not only saves you money on cables, but it also eliminates an additional source of potential failure in your cabling scheme. The HP transceivers can also be connected using up to 50 meters of AUI cable.

Characteristics

| | HP 28685A | HP 28683A | HP 28641B |
|-------------------------|---|--|---|
| Environmental: | | | |
| Operating Temperature | 0°C to +55°C +32°F to +131°F | | |
| Relative Humidity | 5% to 95% @ 40°C (104°F) noncondensing | | |
| Electrical: | | | |
| Voltage Requirements | 9.0–15.75 V | 10.5–15.75 V | 10.2–15.75 V |
| Power Consumption | 1.0 W typical 2.6 W maximum | 1.8 W typical 2.4 W maximum | 2.0 W typical 2.6 maximum |
| Physical: | | | |
| Connectors | - Standard IEEE 802.3 AUI 15-pin - Modular 8-pin | - Standard IEEE 802.3 AUI 15-pin - ST fiber-optic (Tx/Rx) | - Standard IEEE 802.3 AUI 15-pin - BNC |
| Switches Enable/Disable | - SQE Test - Link Beat | - SQE Test - Loopback Test | - SQE Test |
| Dimensions | 9.52 cm by 4.34 cm by 2.41 cm (3.75 in. by 1.71 in. by 0.95 in.) | | |
| Weight | 85 grams (3.0 oz) | 75 grams (2.6 oz) | 85 grams (3.0 oz) |

Optical Characteristics for HP 28683A Fiber-Optic Transceiver

| | 62.5/125 μm fiber | 50/125 μm fiber |
|---------------------|------------------------------------|------------------------------------|
| Optical Receiver | -30 dBm typical -27 dBm minimum | -30 dBm typical -27 dBm minimum |
| Optical Transmitter | -12 dBm typical -17 dBm minimum | -12 dBm typical -17 dBm minimum |
| Optical Budget | 10 dB | 6 dB |
| Wavelength | 820 nm | 820 nm |

Warranty

The HP 28685A EtherTwist Transceiver, the HP 28683A Fiber-Optic Transceiver, and the HP 28641B ThinLAN Transceiver are warranted for one year against defects. Check with your local HP Sales and Support Office or your HP Authorized LAN Dealer for more information.

Ordering Information

HP 28685A EtherTwist Transceiver
HP 28683A Fiber-Optic Transceiver
HP 28641B ThinLAN Transceiver

HP Transceiver Family

Product Note

Tips for Using the HP Transceivers

The following are a few helpful tips and reminders to consider when using any of the HP transceivers.

1. **SQE Test switch.** (To enable or disable?)

Each HP transceiver has an external switch called “SQE Test” which can enable or disable the transceiver’s SQE Test function. The purpose of the SQE Test is to test the transceiver’s AUI functionality. Specifically, it is used to test the integrity of the connection between the transceiver’s AUI port and an end node. When SQE Test is enabled, the transceiver sends an SQE Test signal on its AUI port.

When you are connecting a transceiver to the AUI port of any end node or any device expecting the SQE Test signal, you should always enable the transceiver’s SQE Test. For example, a computer system that has a network adapter card with an AUI port is an end node.

This chart shows the SQE test configuration when using the HP transceivers with the following HP network products.

| | |
|----------------------------------|---------|
| HP 28684A EtherTwist Hub | disable |
| HP 28688A EtherTwist Hub Plus | disable |
| HP 28688B EtherTwist Hub Plus | disable |
| HP 28699A EtherTwist Hub Plus/48 | disable |
| HP 28682A Fiber-Optic Hub Plus | disable |
| HP 28673A 10:10 LAN Bridge | disable |
| HP 28674A Remote Bridge | disable |
| HP LaserJet IIISi Printer* | enable |
| System LAN cards with AUI Port | enable |

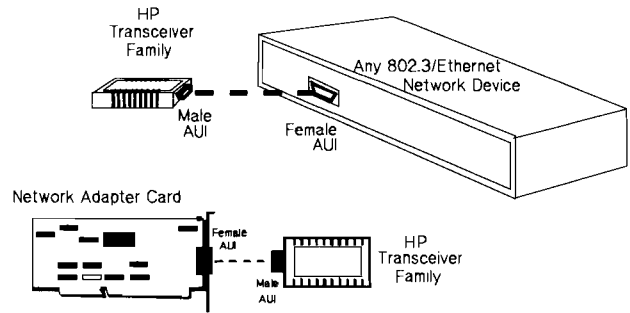
* The HP LaserJet IIISi Printer offers two network accessories: HP network printer interface for Novell NetWare networks (C2059A), and HP network printer interface for 3Com 3+Open networks (C2059B).

-
2. Attaching transceivers to the AUI port of a network device or a computer's LAN adapter card.

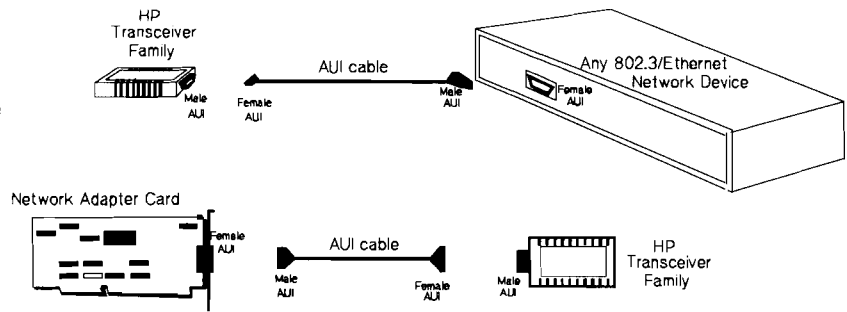
There are two ways to do this:

- a. **Directly.** The transceiver's (male) AUI connector attaches directly to the (female) AUI connector of a network device or a computer's LAN adapter card.
- b. **With an AUI cable.** You can use an AUI cable (ranging from 0.5 m to 50 m in length) between the transceiver and a network device or a computer's LAN adapter card. (The AUI cable has a male connector on one end and a female connector on the other.)

Direct Connection



Connection with an AUI cable



HP Transceiver Family

Product Note

Questions and Answers

Q. When should I disable link beat on the EtherTwist transceiver?

A. If the transceiver is attached via twisted-pair cable to an HP 28663A StarLAN 10 Hub (which is not Type 10BASE-T compliant) or any other device that doesn't support link beat, then link beat should be disabled on the transceiver.

Q. If the EtherTwist transceiver has link beat enabled, what happens when it does not receive a link beat pulse from a connected device?

A. The transceiver will stop transmitting until it receives a link beat pulse. Depending on the type of device connected and the network software running on it, an error message may appear on the device giving an indication of a "loss of carrier" hardware error.

Q. When should I disable SQE (Signal Quality Error) test on a transceiver?

A. If the transceiver is connected to an Ethernet Version 1.0 LAN device, or if the transceiver is connected to the AUI port of a hub or a repeater, then SQE test should be disabled on the transceiver, using the appropriate dip switch.

Q. Do I need to use an AUI cable with a transceiver?

A. In most cases, the transceiver's AUI connector will attach directly to the AUI port on a device. If this is not possible, an AUI cable can be used.

Q. If I suspect that a transceiver is defective, what should be done?

A. Run a communication test across the transceiver. If the test fails, replace the transceiver with a known good transceiver and test the link again. The HP 28641B ThinLAN Transceiver and the HP 28683A Fiber-Optic Transceiver have a Loopback Test switch. When this switch is enabled, a loopback test can be run through the transceiver out to a coaxial or fiber-optic loopback connector, respectively, and back. If this loopback test fails, the transceiver may be faulty.

Q. To what can the HP transceiver's AUI port connect?

A. Any AUI port that complies with the 802.3 AUI standard and supports 802.3 or Ethernet protocols can be connected to the HP transceiver's AUI port.

HP Transceiver Family

Installation Steps

HP 28685A EtherTwist Transceiver

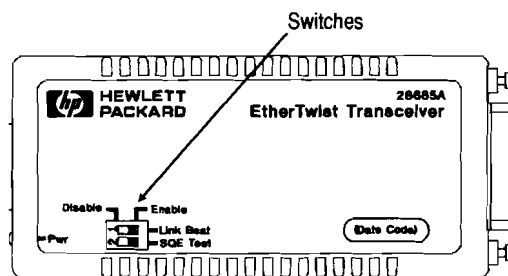
The HP EtherTwist Transceiver connects an IEEE 802.3 AUI port to twisted-pair cable. This transceiver is compatible with the IEEE 802.3 Type 10BASE-T standard.

Attach the transceiver to an AUI port.

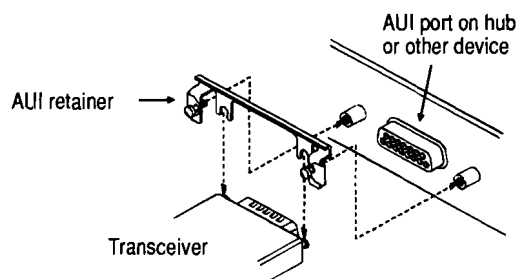
Check SQE Test switch: Factory setting is enabled. Disable it if connecting to:

- a hub or repeater's AUI port
- an Ethernet 1.0 adapter card

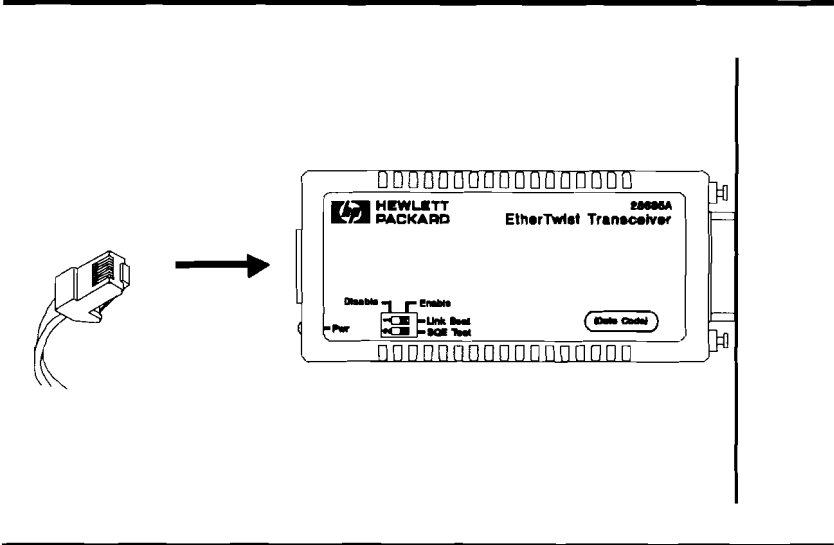
Check Link Beat switch: Factory setting is enabled. Disable it if the other end of the twisted-pair cable connects to a device incompatible with Type 10BASE-T networks.



Secure to the AUI port: If the port does not have a slide latch (for example, an HP EtherTwist hub), then use the AUI retainer (included) as shown here.



Attach twisted-pair cable.



HP Transceiver Family

Installation Steps

HP 28683A Fiber-Optic Transceiver

The HP Fiber-Optic Transceiver connects an IEEE 802.3 or Ethernet device to a fiber-optic network. It is designed to attach directly to an AUI port. It is compatible with the IEEE 802.3 Fiber-Optic Inter-Repeater Link standard.

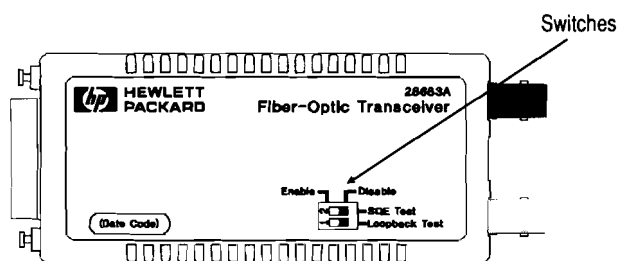
Attach the transceiver to an AUI port.

Check SQE Test switch: Factory setting is disabled. Enable it if connecting to:

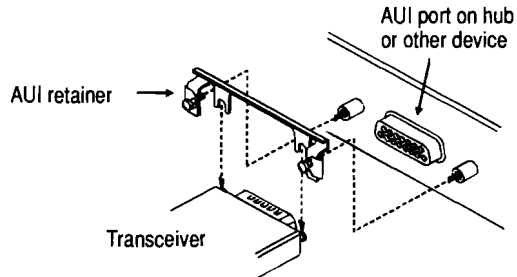
- AUI port on a LAN card in a computer or PC
- another device expecting SQE (heartbeat) signals

Disable it if connecting to a hub or repeater's AUI port.

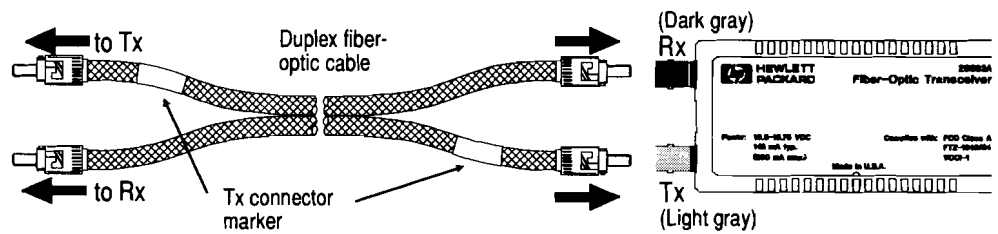
Check Loopback Test switch: Factory setting is disabled. Enable it only for troubleshooting with a loopback test.



Secure to the AUI port: If the port does not have a slide latch (for example, an HP EtherTwist hub), then use the AUI retainer (included) as shown here.



Attach fiber-optic cable.

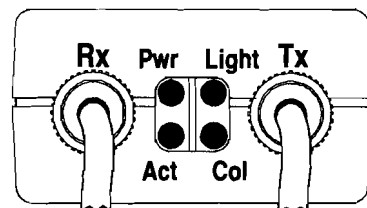


The two fibers may be labeled “Tx” and “Rx” at both ends. If there is a blank label on just one of the two fibers, as shown here, attach it to “Tx”. Use this rule at both ends of the cable.

Check the LEDs on the end of the transceiver.

Pwr should go ON when the transceiver is connected to the AUI port of a network device supplying power.

Light should go ON when a cable transmitting light is connected to the transceiver’s Rx port. If not, you may have connected the wrong fiber. (You must connect the fiber attached to the Tx port of the device at the other end.) Try switching the fibers.



HP Transceiver Family

Installation Steps

HP 28641B ThinLAN Transceiver

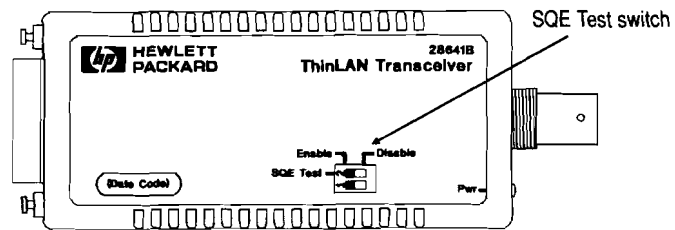
The HP ThinLAN Transceiver is used to connect an IEEE 802.3 or Ethernet network device to a ThinLAN coaxial network. It is designed to attach directly to an AUI port. It is compatible with the IEEE 802.3 Type 10BASE2 standard.

Set the SQE Test switch (if required).

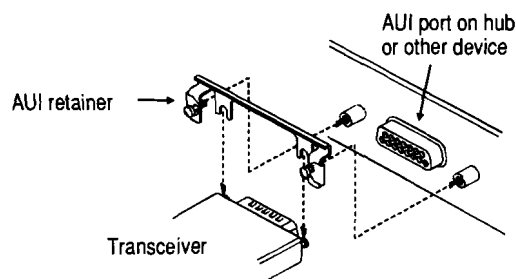
Check SQE Test switch: The factory setting is enabled. Keep SQE Test enabled if attaching to:

- an AUI port on a LAN card in a computer or PC
- another device expecting SQE (heartbeat) signals

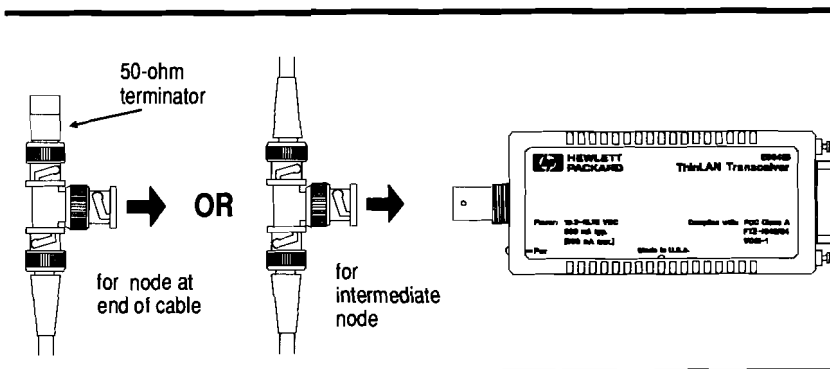
Disable SQE Test if attaching to a hub or repeater's AUI port.



Secure to the AUI port: Turn the network device's power off and attach the transceiver to the AUI port. If the port does not have a slide latch (for example, an HP EtherTwist Hub), then use the AUI retainer as shown here.



Attach coaxial cable.



Check the transceiver LED.

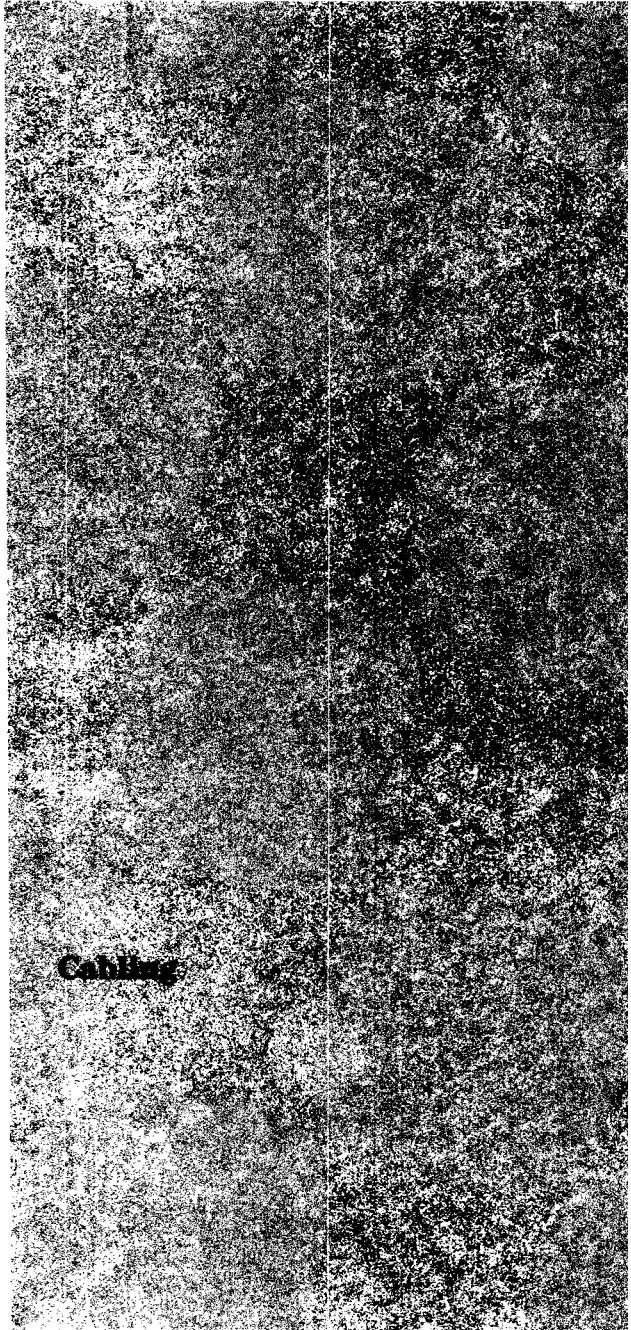
The **Pwr** LED should go ON when the transceiver is connected to the AUI port of a network device and the device is powered on.

At any time, if the **Pwr** LED is OFF when it should be ON, make sure that:

- The network device is powered on.
- The transceiver is firmly attached to the device.

If the LED is still OFF, the transceiver may be faulty.

Technical Reference Guide





Cabling

Specification Note

Type 10BASE-T Cabling

Following are key parameters of the cabling specifications defined in the Type 10BASE-T addition to the IEEE 802.3 standard.

Twisted-Pair Cable

All cabling must be twisted-pair (at least 2 twists per foot, 6 twists per meter). Untwisted cable must not be used. This includes even short pieces of flat cable.

Cable should be unshielded if possible. Shielded twisted-pair cable may be used. It is recommended that the shield be grounded at one and only one end (the hub end) of the cable.

Attenuation

Attenuation must be less than or equal to 10 dB at 5 MHz to 10MHz.

The maximum attenuation of a complete cable path between a transmitter and the corresponding receiver is 11.5 dB at all frequencies between 5 MHz and 10 MHz. This consists of a maximum of 10 dB attenuation for the cable, plus a 1.5 dB allocation for connectors (cross-connect blocks, wall jacks, etc.).

The attenuation of PVC-insulated cable is temperature dependent. At temperatures greater than 40°C (104°F), it may be necessary to use a less temperature-dependent cable such as a plenum-rated cable.

Characteristic Impedance

The differential characteristic impedance at frequencies between 5 MHz and 10 MHz must be between 85 and 110 ohms.

Pair-to-Pair Crosstalk

The minimum near-end, differential crosstalk attenuation between each twisted pair and each other pair in the same cable bundle must be greater than or equal to the values shown for each cable type.

4-pair cable
* 30.5 dB at 5 MHz
* 26 dB at 10 MHz

25-pair cable
* 35 dB at 5 MHz
* 30.5 dB at 10 MHz

Multiple Disturber Crosstalk

The minimum near-end, differential crosstalk attenuation between multiple disturbing wire pairs and a disturbed pair in the same cable must be greater than or equal to the values shown when the pairs are driven with synchronized sine waves.

- * 27.5 dB at 5MHz
- * 24.9 dB at 7.5 MHz
- * 23 dB at 10 MHz

The HP 28687A Wire Test Instrument can determine if a cable is suitable for a Type 10BASE-T network by testing attenuation, crosstalk, continuity, and burst noise.

Cabling

Tested Cables List

Cables Suitable for HP EtherTwist Networks

Previously Hewlett-Packard has tested twisted-pair cable for suitability in HP EtherTwist (Type 10BASE-T) networks. HP no longer tests cables for suitability as most cable manufacturers now test for and specify their cables to the Type 10BASE-T cabling specifications. The most recent, January 1990, list of HP tested cable is repeated here for convenience only. It is not an exhaustive list. For cables not listed here please check the manufacturer's cable specifications against the Type 10BASE-T specifications or use the HP 28687A Wire Test Instrument to test and verify cable. HP recommends that you work with a qualified LAN cable installer or cable distributor to provide a complete cabling solution for you or your customer.

Even though cables are suitable for HP EtherTwist networks, installation and environmental factors may cause poor performance. The HP 28687A Wire Test Instrument should be used to verify twisted-pair cable installations.



Asia Pacific

| Vendor | Part Number | Description | Cable Length (Maximum Allowed) |
|--------------------------------|--------------------|----------------------------------|--|
| Pirelli | 323/6522 | Australian Telecom cable, 3-pair | 100 meters |
| Duratube & Wire Ltd. | 1293 | 4-pair | 100 meters |
| Hua Eng. Wire & Cable Co. Ltd. | PT/183/87(W) | Singapore Telecom cable, 4-pair | 100 meters |

Europe

| Vendor | Part Number | Description | Cable Length (Maximum Allowed) |
|-----------------------|--------------------|---|--|
| British Telecom | 035144 | 4-pair | 100 meters |
| Duratube & Wire Ltd. | DI5004B | 4-pair, 24 gauge | 130 meters |
| Eb DataKabel | PTS 03102 | 2-pair, 22 gauge, shielded | 65 meters |
| Lapp Kabel | 29304R | 2-pair | 100 meters |
| Muckenhaupt & Nusselt | — | MUNFLEX-CY-0, 2x2x0.25mm ² , 2-pair, shielded | 65 meters |
| Nokia Jamak | 263850 | 2-pair, 1 drain wire | 80 meters |
| Nokia Datajamak | 408881 | 2-pair, 1 drain wire | 90 meters |
| Nokia MHS | 416515 | 3-pair | 100 meters |
| SEL Kabelwerke | ITT-21100292 | 4-pair | 100 meters |
| SEL Kabelwerke | 554-982 | 2-pair, shielded | 70 meters |
| Siemens | 45412-E20-B7 | 20-pair | 150 meters |

United States

| Vendor | Part Number | Description | Cable Length (Maximum Allowed) |
|-----------------|------------------------|---|-----------------------------------|
| AT&T | 403101140 | 4-pair, 24 gauge, D-inside wire | 100 meters |
| AT&T | 106371487 | 4-pair, 24 gauge, shielded | 185 meters |
| Anixter | CM-00424BAG-3 | 4-pair, 24 gauge | 100 meters |
| Anixter | CM-02524BAG-3 | 25-pair, 24 gauge | 100 meters |
| Anixter | CMP-00424G-3 | 4-pair, 24 gauge, plenum rated | 100 meters |
| Anixter | CMP-02524G-3 | 25-pair, 24 gauge, plenum rated | 100 meters |
| Belden | 9566 | 6-pair, 24 gauge | 100 meters |
| Belden | 1154A | 4-pair, matches IBM Type 3 specifications | 100 meters |
| Hewlett-Packard | 92179D | terminal cable | 70 meters |
| Hewlett-Packard | 92268A | 4-pair, 24 gauge, straight-through cable terminated with 8-pin modular plugs, 4 meters | — |
| Hewlett-Packard | 92268B | 4-pair, 24 gauge, straight-through cable terminated with 8-pin modular plugs, 8 meters | — |
| Hewlett-Packard | 92268C | 4-pair, 24 gauge, straight-through cable terminated with 8-pin modular plugs, 16 meters | — |
| Hewlett-Packard | 92268D | 4-pair, 24 gauge, straight-through cable terminated with 8-pin modular plugs, 32 meters | — |
| Hewlett-Packard | 92268M | 4-pair, 24 gauge, 100 meters | — |
| Hewlett-Packard | 92268N | 4-pair, 24 gauge, sold in 300 meter sections | 100 meters |
| Hewlett-Packard | 92268S | 3-pair, 24 gauge, 6-pin to 8-pin adapter cable, 5 meters | — |
| IBM * | 4716748 | Type 1, 2-pair, 22 gauge, shielded | 340 meters |
| IBM * | 4716739 | Type 2, 2-pair data grade, 22 gauge, shielded | 340 meters |
| IBM * | 4716739 | Type 2, 4-pair voice grade, 24 gauge | 200 meters |
| IBM | depends on distributor | Type 3, 4-pair, 24 gauge | 100 meters |
| IBM * | 4716743 | Type 6, 2-pair, 26 gauge, shielded | 225 meters |
| IBM * | 6339583 | Type 9, 2-pair, 26 gauge, shielded | 235 meters |
| Nothern Telecom | — | IBDN cable, 3- or 4-pair, 24 gauge | 100 meters |

* These cables have a characteristic impedance of 150 ohms. Impedance discontinuities (connecting 150 ohm cable to 100 ohm cable) cause signal reflections that can increase the error rate or even disable the network. To reduce the effects of impedance discontinuities, do not use lengths of 150 ohm cable less than 75 meters. If lengths less than 75 meters cannot be avoided, then 150-ohm to 100-ohm impedance matching devices (transformers) must be used on each twisted-pair connection. When these transformers are attached to the 150-ohm cables the maximum allowed length is slightly reduced. When HP EtherTwist and HP StarLAN 10 hardware components are mixed in a network, use transformers on any length of 150-ohm cabling.

| Cable Description | Maximum Allowed Length with Transformers |
|--------------------------|---|
| IBM Type 1 | 320 meters |
| IBM Type 2 | 320 meters |
| IBM Type 6 | 210 meters |
| IBM Type 9 | 220 meters |

Transformers can be ordered from:

North Hills Electronics
1 Alexander Place
Glen Cove, NY 11542

phone: (516) 671-5700

FAX: (516) 759-3327

| Part Number | Transformer Description |
|--------------------|--|
| L1E3382 | IBM Data Connector to 8-pin jack |
| L1E3331 | IBM Data Connector to 8-pin plug (12 feet long) |

Transformer pin-out:

| IBM connector | 8-pin modular (RJ-45) connector |
|----------------------|--|
| red | pin 3 |
| green | pin 6 |
| orange | pin 1 |
| black | pin 2 |

Cabling

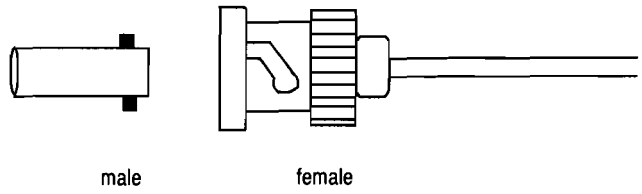
Product Note

Cable Connections for HP EtherTwist Networks

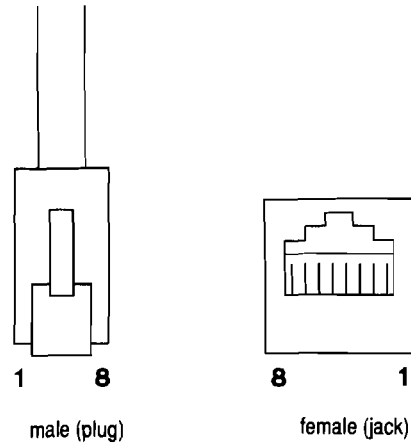
| Product | Available Connections (Ports) |
|---|--|
| HP 28684A EtherTwist Hub and HP 28688A/28688B EtherTwist Hub Plus | 1 BNC, 1 female AUI, 1 female 50-pin telco (12 twisted-pair ports), 1 female 25-pin RS-232 (console port) |
| HP 28699A EtherTwist Hub Plus 48 | 1 BNC, 1 female AUI, 4 female 50-pin telco (48 twisted-pair ports), 1 female 25-pin RS-232 (console port) |
| HP 28685A EtherTwist Transceiver | 1 8-pin modular (RJ-45) jack (female), 1 male AUI |
| HP 28641B ThinLAN Transceiver | 1 BNC, 1 male AUI |
| HP 27245A Adapter Card/8, HP 27246A Micro Channel Adapter Card, and HP 27247A Adapter Card/16 | 1 8-pin modular (RJ-45) jack (female), 1 6-pin modular (RJ-11) jack (female) |
| HP 27248A EISA Adapter Card/32 | 1 8-pin modular (RJ-45) jack (female), 1 female AUI |
| HP 28638A 12-port Modular Adapter | 1 male 50-pin telco, 12 8-pin modular (RJ-45) jacks (female) |

Connectors

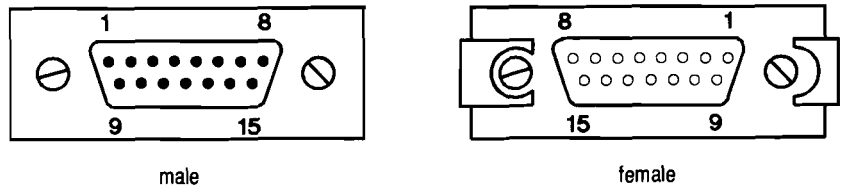
BNC Connectors



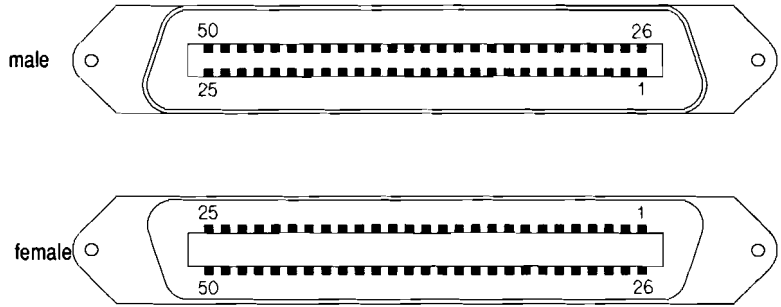
8-Pin Modular (RJ-45) Connectors



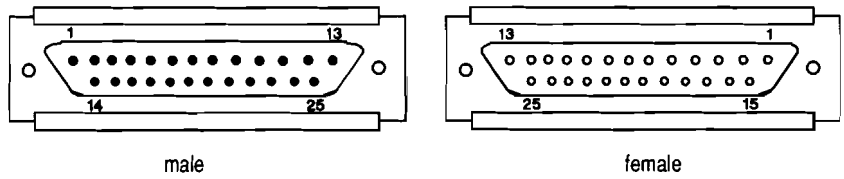
15-Pin D (AUI) Connector



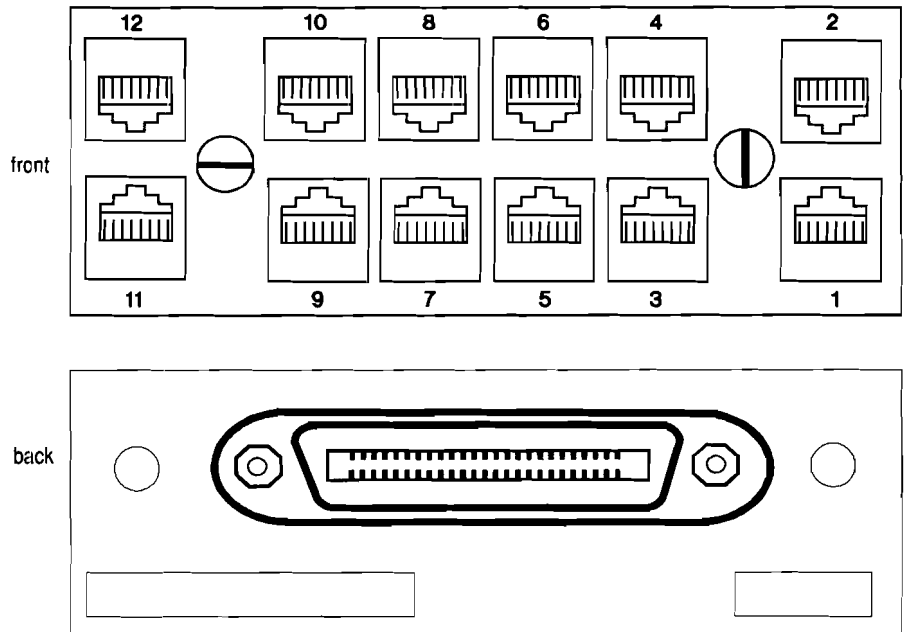
50-Pin Telco Connector



Standard 25-Pin RS-232-C Connector



HP 28638A 12-Port Modular Adapter



Twisted-Pair Cables

4-Pair Twisted-Pair Cable (258A wiring)

| 8-pin plug (male) | | 8-pin plug (male) | |
|-------------------|---|-------------------|----------|
| hub Rx+ | 1 | 1 | data Tx+ |
| hub Rx- | 2 | 2 | data Tx- |
| hub Tx+ | 3 | 3 | data Rx+ |
| | 4 | 4 | not used |
| | 5 | 5 | not used |
| hub Tx- | 6 | 6 | data Rx- |
| | 7 | 7 | not used |
| | 8 | 8 | not used |

Note: Pins 1 and 2 must be wired to a twisted pair. Pins 3 and 6 must be wired to a twisted pair.

Available HP cables: 92268A/B/C/D

6-Pin to 8-Pin Adapter Cable

| 6-pin plug (male) | | 8-pin plug (male) | |
|-------------------|---|-------------------|----------|
| 1 | 3 | 3 | data Rx+ |
| 2 | 1 | 1 | data Tx+ |
| 3 | 4 | 4 | not used |
| 4 | 5 | 5 | not used |
| 5 | 2 | 2 | data Tx- |
| 6 | 6 | 6 | data Rx- |
| | 7 | 7 | not used |
| | 8 | 8 | not used |

Available HP cable: 92268S

4-Pin to 8-Pin Adapter Cable

| 4-pin plug (male) | | 8-pin plug (male) | |
|-------------------|---|-------------------|----------|
| (position 2) | 1 | 3 | data Rx+ |
| (position 3) | 2 | 1 | data Tx+ |
| (position 4) | 3 | 2 | data Tx- |
| (position 5) | 4 | 6 | data Rx- |
| | | 4 | not used |
| | | 5 | not used |
| | | 7 | not used |
| | | 8 | not used |

No HP cable available.

Crossover Cable

(For twisted-pair port to twisted-pair port connection between hubs)

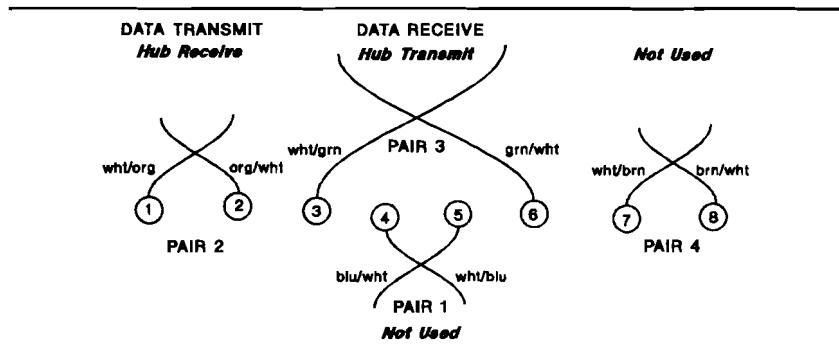
| 8-pin plug (male) | | 8-pin plug (male) |
|-------------------|-------|-------------------|
| (white/orange) 1 | _____ | 3 |
| (orange/white) 2 | _____ | 6 |
| (white/green) 3 | _____ | 1 |
| 4 | _____ | 4 |
| 5 | _____ | 5 |
| (green/white) 6 | _____ | 2 |
| 7 | _____ | 7 |
| 8 | _____ | 8 |

Available HP cable: 92214W

Common 4-Pair-Cable Color Coding Scheme

| Plug/Jack Pin No. | Wire Color (base/stripe) | Pair |
|-------------------|--------------------------|------|
| 1 | white/orange | 2 |
| 2 | orange/white | 2 |
| 3 | white/green | 3 |
| 4 | blue/white | 1 |
| 5 | white/blue | 1 |
| 6 | green/white | 3 |
| 7 | white/brown | 4 |
| 8 | brown/white | 4 |

258A 8-pin Modular Plug/Jack Wiring



15-Pin to 15-Pin AUI Cable

| 15-pin female | 15-pin male |
|---------------|------------------|
| 2 _____ | 2 CIA |
| 3 _____ | 3 DO A |
| 4 _____ | 4 DI shield |
| 5 _____ | 5 DIA |
| 6 _____ | 6 voltage common |
| 9 _____ | 9 CI B |
| 10 _____ | 10 DO B |
| 12 _____ | 12 DI B |
| 13 _____ | 13 voltage plus |

Available HP cables: 92254A/.../H, 92254J, 92264D

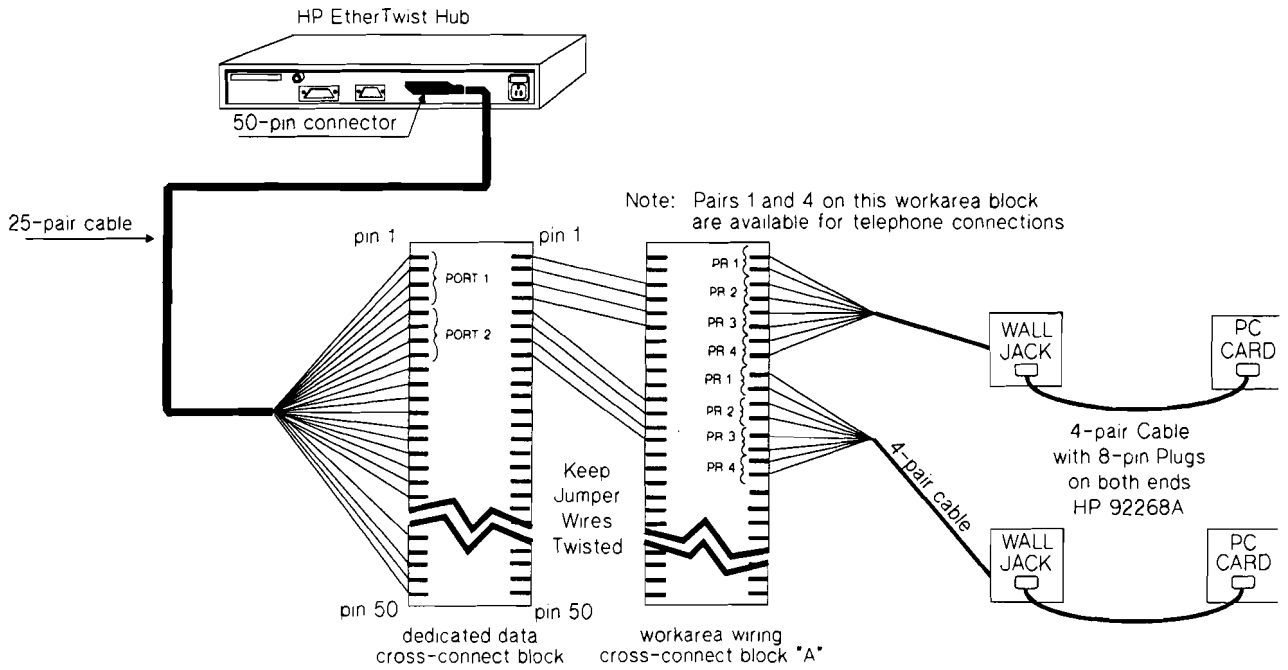
Standard 25-Pair Cable

| | 50-pin male/female | _____ | 50-pin male/female | |
|---------|-----------------------|-------|-----------------------|----------|
| hub Rx+ | 26 | _____ | 26 | pair 1 |
| hub Rx- | 1 | _____ | 1 | pair 1 |
| hub Tx+ | 27 | _____ | 27 | pair 2 |
| hub Tx- | 2 | _____ | 2 | pair 2 |
| hub Rx+ | 28 | _____ | 28 | pair 3 |
| hub Rx- | 3 | _____ | 3 | pair 3 |
| hub Tx+ | 29 | _____ | 29 | pair 4 |
| hub Tx- | 4 | _____ | 4 | pair 4 |
| hub Rx+ | 30 | _____ | 30 | pair 5 |
| hub Rx- | 5 | _____ | 5 | pair 5 |
| hub Tx+ | 31 | _____ | 31 | pair 6 |
| hub Tx- | 6 | _____ | 6 | pair 6 |
| hub Rx+ | 32 | _____ | 32 | pair 7 |
| hub Rx- | 7 | _____ | 7 | pair 7 |
| hub Tx+ | 33 | _____ | 33 | pair 8 |
| hub Tx- | 8 | _____ | 8 | pair 8 |
| hub Rx+ | 34 | _____ | 34 | pair 9 |
| hub Rx- | 9 | _____ | 9 | pair 9 |
| hub Tx+ | 35 | _____ | 35 | pair 10 |
| hub Tx- | 10 | _____ | 10 | pair 10 |
| hub Rx+ | 36 | _____ | 36 | pair 11 |
| hub Rx- | 11 | _____ | 11 | pair 11 |
| hub Tx+ | 37 | _____ | 37 | pair 12 |
| hub Tx- | 12 | _____ | 12 | pair 12 |
| hub Rx+ | 38 | _____ | 38 | pair 13 |
| hub Rx- | 13 | _____ | 13 | pair 13 |
| hub Tx+ | 39 | _____ | 39 | pair 14 |
| hub Tx- | 14 | _____ | 14 | pair 14 |
| hub Rx+ | 40 | _____ | 40 | pair 15 |
| hub Rx- | 15 | _____ | 15 | pair 15 |
| hub Tx+ | 41 | _____ | 41 | pair 16 |
| hub Tx- | 16 | _____ | 16 | pair 16 |
| hub Rx+ | 42 | _____ | 42 | pair 17 |
| hub Rx- | 17 | _____ | 17 | pair 17 |
| hub Tx+ | 43 | _____ | 43 | pair 18 |
| hub Tx- | 18 | _____ | 18 | pair 18 |
| hub Rx+ | 44 | _____ | 44 | pair 19 |
| hub Rx- | 19 | _____ | 19 | pair 19 |
| hub Tx+ | 45 | _____ | 45 | pair 20 |
| hub Tx- | 20 | _____ | 20 | pair 20 |
| hub Rx+ | 46 | _____ | 46 | pair 21 |
| hub Rx- | 21 | _____ | 21 | pair 21 |
| hub Tx+ | 47 | _____ | 47 | pair 22 |
| hub Tx- | 22 | _____ | 22 | pair 22 |
| hub Rx+ | 48 | _____ | 48 | pair 23 |
| hub Rx- | 23 | _____ | 23 | pair 23 |
| hub Tx+ | 49 | _____ | 49 | pair 24 |
| hub Tx- | 24 | _____ | 24 | pair 24 |
| | 50 | _____ | 50 | not used |
| | 25 | _____ | 25 | not used |

Common 25-Pair-Cable Color Coding Scheme
(50-pin connector)

| Pin # on 50-Pin Connector | Wire Color base/stripe | Pair/Port | Pin # on 50-Pin Connector | Wire Color base/stripe | Pair/Port |
|---------------------------|------------------------|-----------|---------------------------|------------------------|-----------|
| 26 | white/blue | 1 | 38 | black/green | 13 |
| 1 | blue/white | 1 | 13 | green/black | 13 |
| 27 | white/orange | 2 | 39 | black/brown | 14 |
| 2 | orange/white | 2 | 14 | brown/black | 14 |
| 28 | white/green | 3 | 40 | black/slate | 15 |
| 3 | green/white | 3 | 15 | slate/black | 15 |
| 29 | white/brown | 4 | 41 | yellow/blue | 16 |
| 4 | brown/white | 4 | 16 | blue/yellow | 16 |
| 30 | white/slate | 5 | 42 | yellow/orange | 17 |
| 5 | slate/white | 5 | 17 | orange/yellow | 17 |
| 31 | red/blue | 6 | 43 | yellow/green | 18 |
| 6 | blue/red | 6 | 18 | green/yellow | 18 |
| 32 | red/orange | 7 | 44 | yellow/brown | 19 |
| 7 | orange/red | 7 | 19 | brown/yellow | 19 |
| 33 | red/green | 8 | 45 | yellow/slate | 20 |
| 8 | green/red | 8 | 20 | slate/yellow | 20 |
| 34 | red/brown | 9 | 46 | violet/blue | 21 |
| 9 | brown/red | 9 | 21 | blue/violet | 21 |
| 35 | red/slate | 10 | 47 | violet/orange | 22 |
| 10 | slate/red | 10 | 22 | orange/violet | 22 |
| 36 | black/blue | 11 | 48 | violet/green | 23 |
| 11 | blue/black | 11 | 23 | green/violet | 23 |
| 37 | black/orange | 12 | 49 | violet/brown | 24 |
| 12 | orange/black | 12 | 24 | brown/violet | 24 |
| | | | 50 | violet/slate | 25 |
| | | | 25 | slate/violet | 25 |

Hub-to-Workarea Wiring Using Cross-Connect Blocks



(Refer to table on next page.)

| Pin # on hub's 50-pin connector | 25-pair Wire Color base/stripe | Data cross-connect block pin # | Workarea cross-connect block "A" pin # | Workarea plug/jack pin # | Workarea Wire Color base/stripe |
|---------------------------------|--------------------------------|--------------------------------|---|--------------------------|---------------------------------|
| 26 | white/blue | 1 | 3 | 1 | white/orange |
| 1 | blue/white | 2 | 4 | 2 | orange/white |
| 27 | white/orange | 3 | 5 | 3 | white/green |
| 2 | orange/white | 4 | 6 | 6 | green/white |
| 28 | white/green | 5 | 11 | 1 | white/orange |
| 3 | green/white | 6 | 12 | 2 | orange/white |
| 29 | white/brown | 7 | 13 | 3 | white/green |
| 4 | brown/white | 8 | 14 | 6 | green/white |
| 30 | white/slate | 9 | 19 | 1 | white/orange |
| 5 | slate/white | 10 | 20 | 2 | orange/white |
| 31 | red/blue | 11 | 21 | 3 | white/green |
| 6 | blue/red | 12 | 22 | 6 | green/white |
| 32 | red/orange | 13 | 27 | 1 | white/orange |
| 7 | orange/red | 14 | 28 | 2 | orange/white |
| 33 | red/green | 15 | 29 | 3 | white/green |
| 8 | green/red | 16 | 30 | 6 | green/white |
| 34 | red/brown | 17 | 35 | 1 | white/orange |
| 9 | brown/red | 18 | 36 | 2 | orange/white |
| 35 | red/slate | 19 | 37 | 3 | white/green |
| 10 | slate/red | 20 | 38 | 6 | green/white |
| 36 | black/blue | 21 | 43 | 1 | white/orange |
| 11 | blue/black | 22 | 44 | 2 | orange/white |
| 37 | black/orange | 23 | 45 | 3 | white/green |
| 12 | orange/black | 24 | 46 | 6 | green/white |
| | | | Workarea cross-connect block "B" pin # | | |
| 38 | black/green | 25 | 3 | 1 | white/orange |
| 13 | green/black | 26 | 4 | 2 | orange/white |
| 39 | black/brown | 27 | 5 | 3 | white/green |
| 14 | brown/black | 28 | 6 | 6 | green/white |
| 40 | black/slate | 29 | 11 | 1 | white/orange |
| 15 | slate/black | 30 | 12 | 2 | orange/white |
| 41 | yellow/blue | 31 | 13 | 3 | white/green |
| 16 | blue/yellow | 32 | 14 | 6 | green/white |
| 42 | yellow/orange | 33 | 19 | 1 | white/orange |
| 17 | orange/yellow | 34 | 20 | 2 | orange/white |
| 43 | yellow/green | 35 | 21 | 3 | white/green |
| 18 | green/yellow | 36 | 22 | 6 | green/white |
| 44 | yellow/brown | 37 | 27 | 1 | white/orange |
| 19 | brown/yellow | 38 | 28 | 2 | orange/white |
| 45 | yellow/slate | 39 | 29 | 3 | white/green |
| 20 | slate/yellow | 40 | 30 | 6 | green/white |
| 46 | violet/blue | 41 | 35 | 1 | white/orange |
| 21 | blue/violet | 42 | 36 | 2 | orange/white |
| 47 | violet/orange | 43 | 37 | 3 | white/green |
| 22 | orange/violet | 44 | 38 | 6 | green/white |
| 48 | violet/green | 45 | 43 | 1 | white/orange |
| 23 | green/violet | 46 | 44 | 2 | orange/white |
| 49 | violet/brown | 47 | 45 | 3 | white/green |
| 24 | brown/violet | 48 | 46 | 6 | green/white |
| 50 | violet/slate | 49 | | | |
| 25 | slate/violet | 50 | | | |

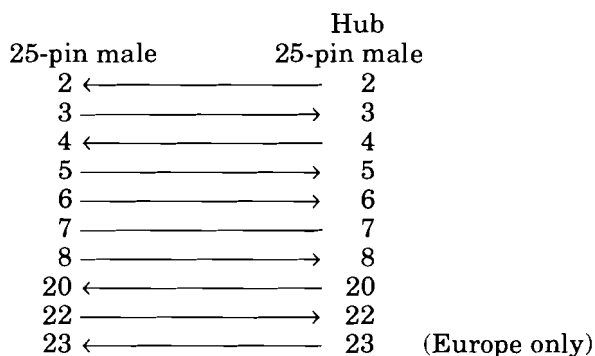
RS-232 Cable and Connector Pin-Outs

Hub 25-Pin Female Connector

| Pin | US | CCITT | DIN |
|-----|---------|-------|-----|
| 1 | CHS GND | 101 | |
| 2 | TX | 103 | D1 |
| 3 | RX | 104 | D2 |
| 4 | RTS | 105 | S2 |
| 5 | CTS | 106 | M2 |
| 6 | DSR | 107 | M1 |
| 7 | GND | 102 | |
| 8 | CD | 109 | M5 |
| 20 | DTR | 108 | S1 |
| 22 | RI | 125 | M3 |
| 23 | SR | 111 | |

RS-232-C Modem Cable

(minimum pin-out)

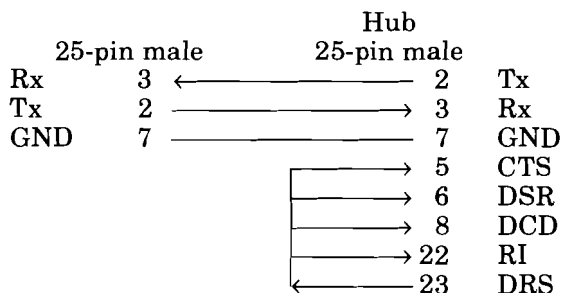


Available HP Cables: 13242M/N, 17355M. (HP 31391A has one 25-pin female and one 25-pin male connector.)

RS-232-C Cable for Terminal or 25-Pin

HP Vectra PC

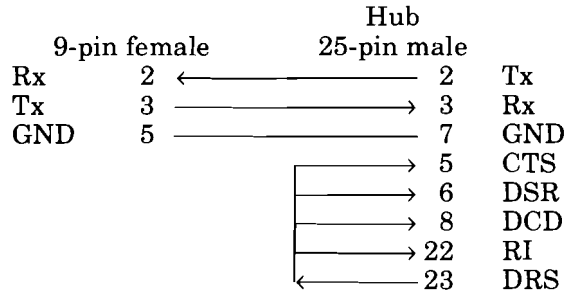
(minimum pin-out)



Available HP Cables: 13242G, 40242G

RS-232-C Cable for 9-Pin HP Vectra PC

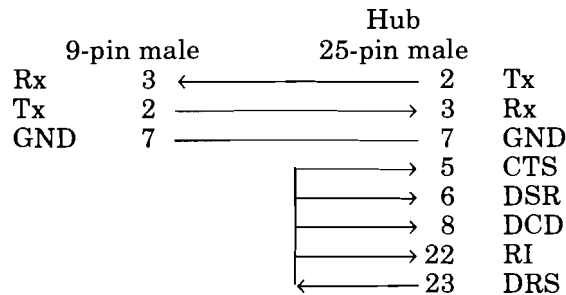
(minimum pin-out)



Available HP Cable: 24542G

RS-232-C Cable for HP 110

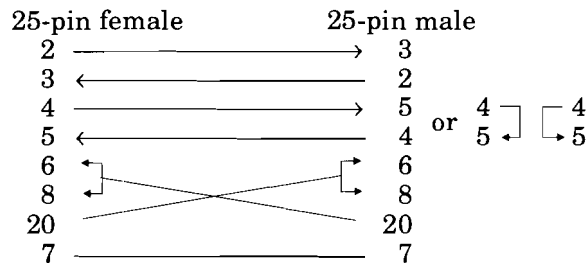
(minimum pin-out)



Available HP Cable: 92221P

Null Modem Adapter for Direct Terminal Connection (use with modem cable)

(minimum pin-out)



No HP adapter available.

Note: If any of the cables listed for direct terminal connection are used, DTR (pin 20) and RTS (pin 4) must be ON, or high, on your terminal or in your terminal emulation program.

12-Port Modular Adapter Wiring

| Pin # on 50-Pin Connector | Pair | Port # on Modular Adapter | Pin # on 50-Pin Connector | Pair | Port # on Modular Adapter |
|---------------------------------|------|---------------------------------|---------------------------------|------|---------------------------------|
| 26 | 1 | } Port 1 | 38 | 13 | } Port 7 |
| 1 | 1 | | 13 | 13 | |
| 27 | 2 | | 39 | 14 | |
| 2 | 2 | } Port 2 | 14 | 14 | } Port 8 |
| 28 | 3 | | 40 | 15 | |
| 3 | 3 | | 15 | 15 | |
| 29 | 4 | } Port 3 | 41 | 16 | } Port 9 |
| 4 | 4 | | 16 | 16 | |
| 30 | 5 | | 42 | 17 | |
| 5 | 5 | } Port 4 | 17 | 17 | } Port 10 |
| 31 | 6 | | 43 | 18 | |
| 6 | 6 | | 18 | 18 | |
| 32 | 7 | } Port 5 | 44 | 19 | } Port 11 |
| 7 | 7 | | 19 | 19 | |
| 33 | 8 | | 45 | 20 | |
| 8 | 8 | } Port 6 | 20 | 20 | } Port 12 |
| 34 | 9 | | 46 | 21 | |
| 9 | 9 | | 21 | 21 | |
| 35 | 10 | } Port 7 | 47 | 22 | } Port 11 |
| 10 | 10 | | 22 | 22 | |
| 36 | 11 | | 48 | 23 | |
| 11 | 11 | } Port 8 | 23 | 23 | } Port 12 |
| 37 | 12 | | 49 | 24 | |
| 12 | 12 | | 24 | 24 | |
| | | | 50 | 25 | } not used |
| | | | 25 | 25 | |

Cabling

Product Note

Twisted-Pair Cabling Schemes for HP EtherTwist Networks

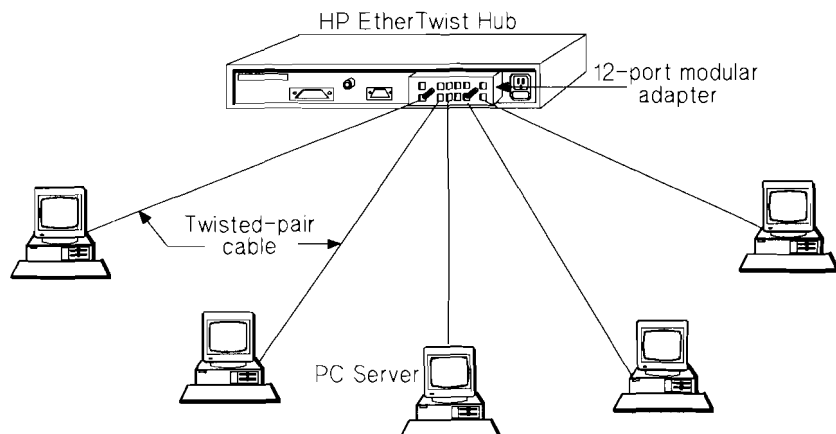
Installation Requirements

- Use approved cable, compatible with cable specifications defined in the Type 10BASE-T addition to the IEEE 802.3 standard.
- The cable must be twisted-pair cable.
- Modular plugs must be 8-pin.
- Existing cable must be tested using the HP 28687A Wire Test Instrument before it can be used in the network.
- It is recommended that newly installed twisted-pair cable be tested using HP 28687A Wire Test Instrument.
- It is recommended that the cable run through no more than four cross-connect blocks.

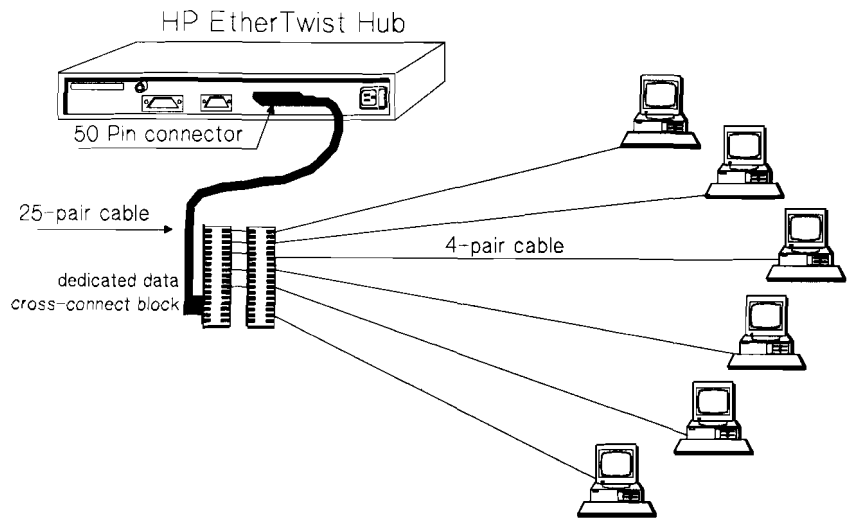
Note: Flat untwisted cable must not make up any portion of the cabling in an HP EtherTwist network.

Connection examples

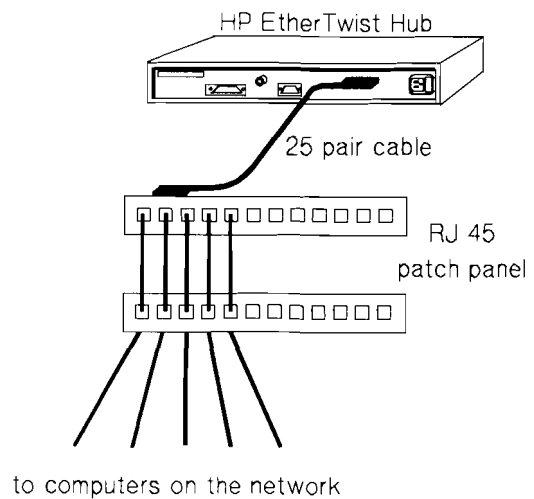
Example A



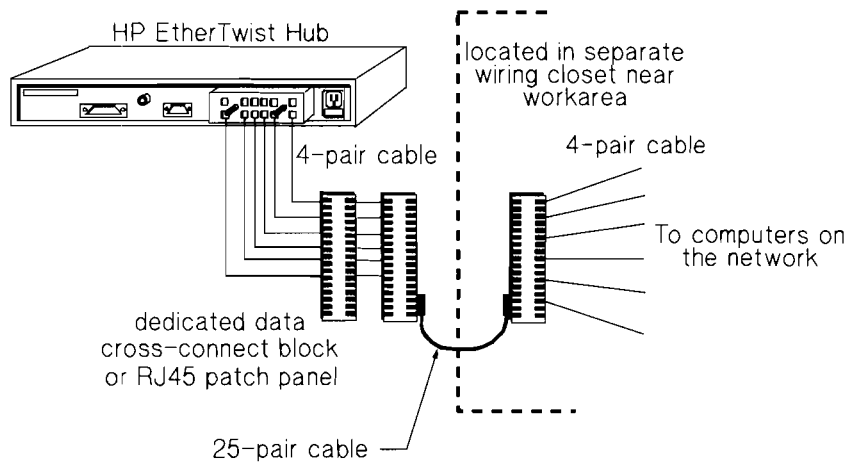
Example B



Example C

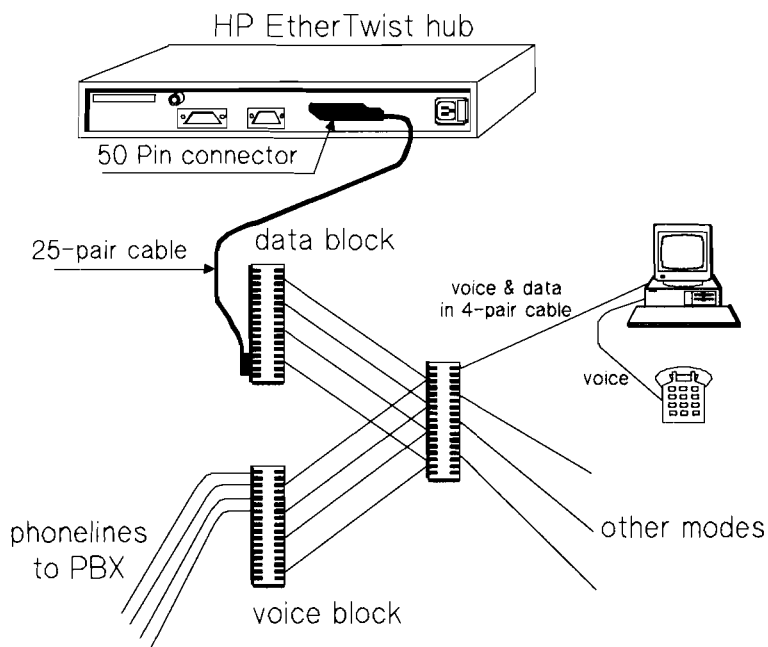


Example D

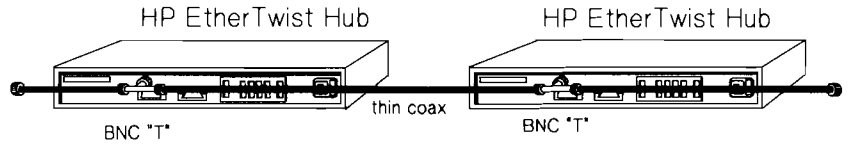


For pin-out details, see the “Cable Connections for HP EtherTwist Networks” section in this guide.

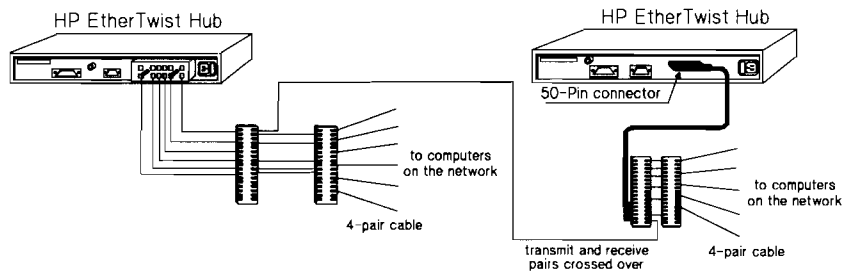
Example E



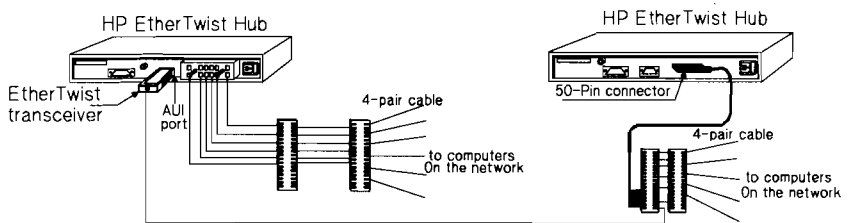
Example F



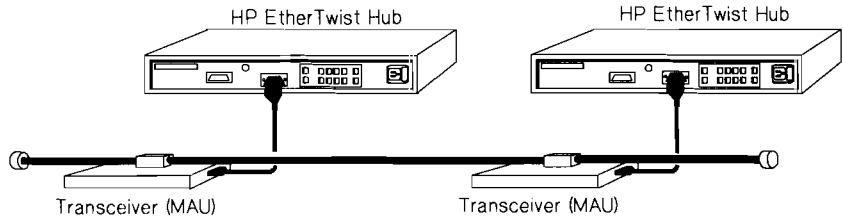
Example G



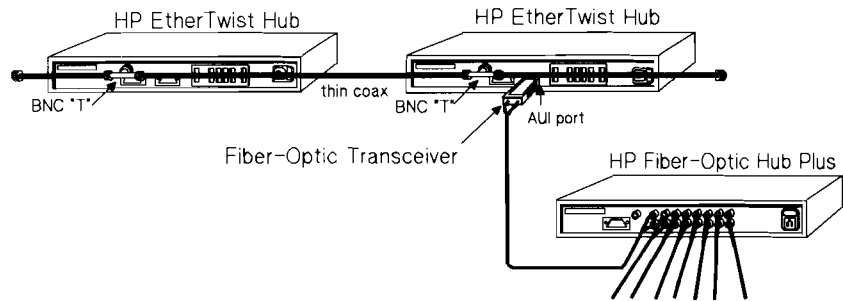
Example H



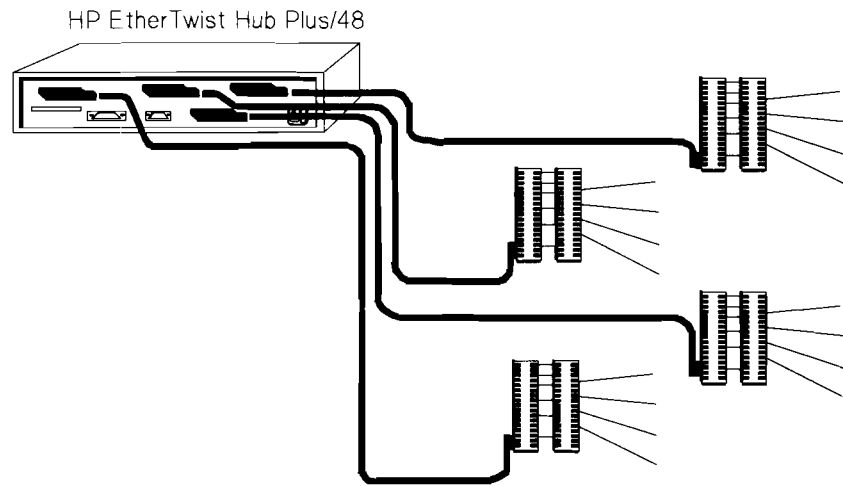
Example I



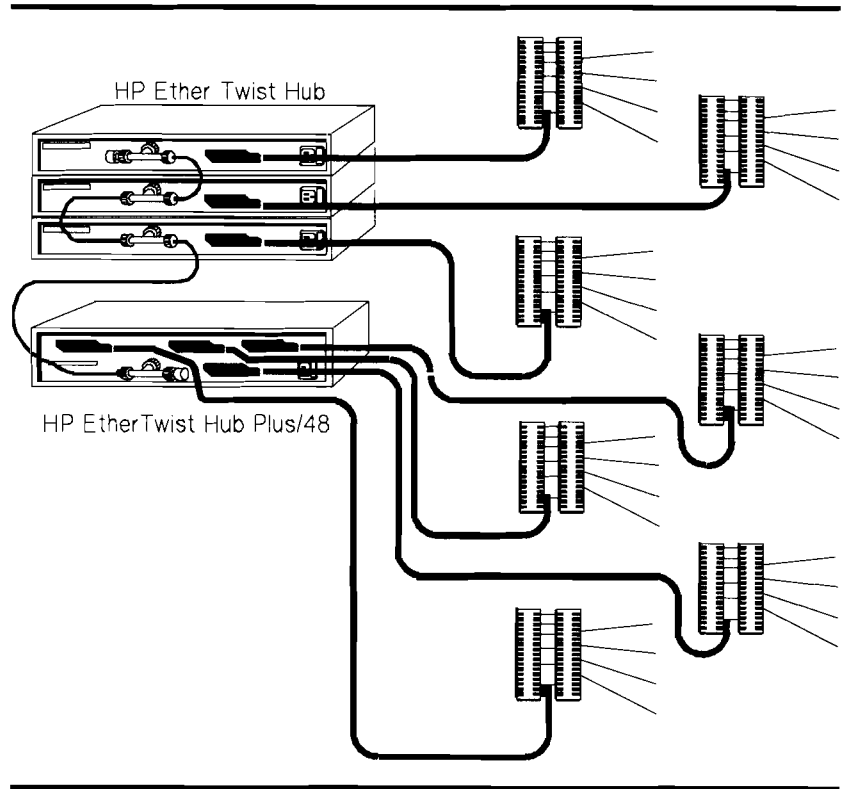
Example J



Example K



Example L

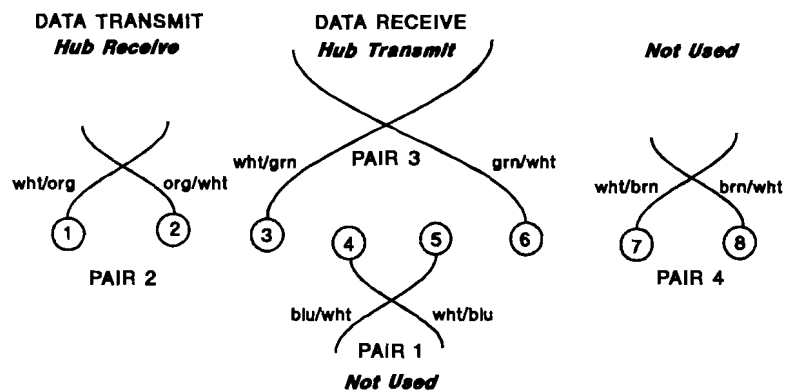


Cabling

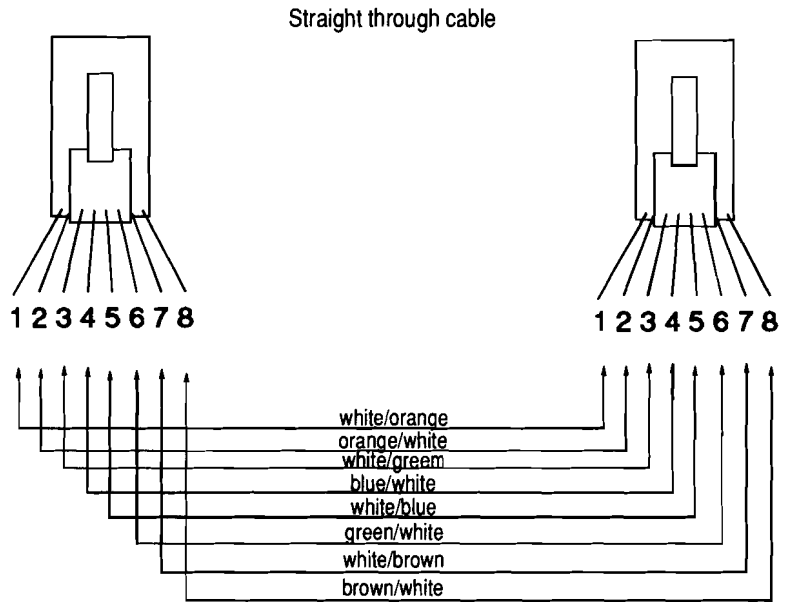
Product Note

Twisted-Pair Cabling Tips

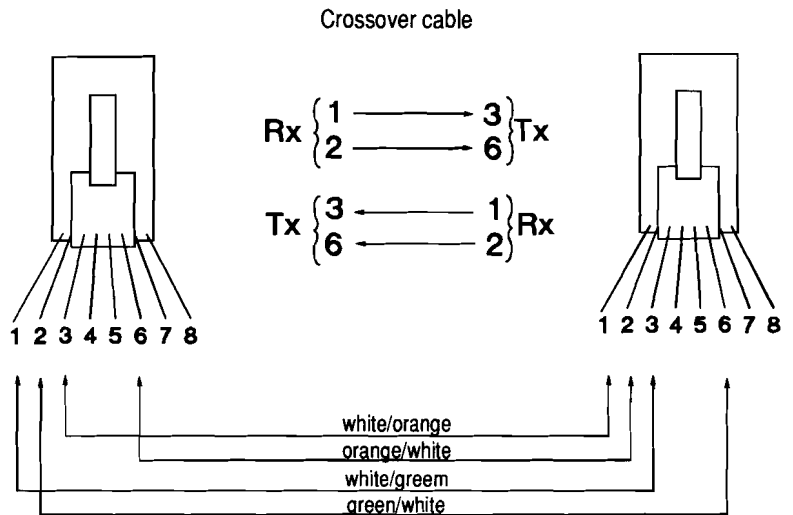
1. Untwisted cable, including flat cable, must not make up any portion of the network cabling.
2. When connecting to cross-connect blocks, keep a pair twisted all the way up to the connecting pins of the cross-connect block. Pairs not kept twisted in this way are susceptible to crosstalk.
3. When making twisted-pair connections, keep conductors of a pair together. Do not form a pair by taking a conductor of one pair and twisting it with a conductor of another pair.



4. For hub-to-EtherTwist transceiver and hub-to-PC connections, cables must be wired “straight through”, meaning that a pin at one end connects to a pin with the same number at the other end.

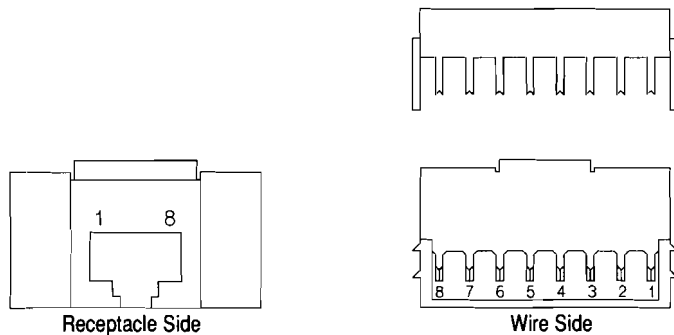


5. For hub-to-hub connections between twisted-pair ports, direct connections between PC adapter cards, and back-to-back EtherTwist transceiver connections, transmit and receive pairs must be crossed over (not wired “straight through”). A crossover cable, HP part number 92214W, can make the cross-over connection.



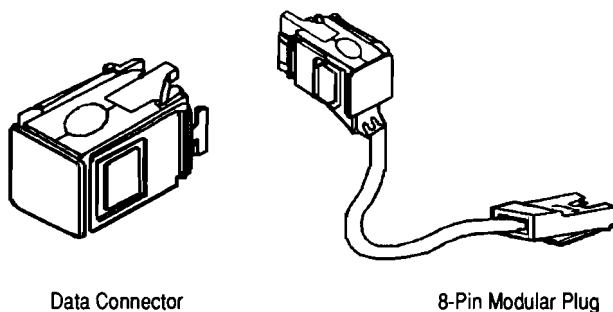
-
6. If shielded twisted-pair cable is used, it is recommended that the shield be grounded. The shield should be grounded at the hub end of the cable and make good contact with a grounding post. The workstation end of the shield should be cut back and wrapped with electrical tape or heatshrink tubing. At the hub end of the cable, grounding the shield requires stripping back the cable's jacket and exposing twisted pairs. Unjacketed pairs can form gaps that are susceptible to magnetic fields. Twist the pairs more tightly at these exposed areas to reduce this susceptibility.

 7. Use an 8-position modular jack adapter to terminate some twisted-pair cables with conductors that are too large to fit into 8-pin modular plugs.
-



8-position modular jack adapter
IBM # 6091030

8. HP EtherTwist connections to IBM Type 1 or Type 2 (data grade pairs) cable require an adapter. You can make an adapter using a short piece of twisted-pair cable with an 8-pin plug on one end and an IBM data connector (IBM # 8310574) on the other end. You can also purchase an adapter from MOD-TAP System. Remember, for 150-ohm cable (IBM Type 1 and 2), less than 75 meters long 150-ohm to 100-ohm impedance matching devices must be used. Some 150- to 100-ohm impedance matching devices (transformers) provide the connection from IBM data connector to 8-pin modular connector. (For more details, see the Tested Cables List.)



IBM data connector and adapter cable

| MOD-TAP part number | Description |
|----------------------------|----------------------------------|
| 13-328-1 | IBM data connector to 8-pin plug |
| 13-318-1 | IBM data connector to 8-pin jack |

Cabling

Product Note

Bundling Different Signal Types in the Same Cable

Laboratory tests were conducted to determine the extent of crosstalk interference produced when HP EtherTwist signals and other signal types run in the same 4-, 25-, 100-, or 200-pair cable bundle.

HP EtherTwist and RS-232

HP EtherTwist and RS-232 signals can run on twisted pairs enclosed in the same cable bundle without interference to either signal type. Combining HP EtherTwist and RS-232 signals in the same cable bundle is supported at the specified RS-232 distance of 50 feet (15 meters).

HP EtherTwist and Phones

HP EtherTwist signals can run in the same cable bundle with telephone signals. Some older analog phone systems may require noise reduction equipment available from a local telephone company. The HP Wire Test Instrument is available to verify that HP EtherTwist will work in your operating environment.

RS-232 and Phones

RS-232 and telephones **cannot** share the same cable bundle. RS-232 can run in the same cable bundle with phones only if asynchronous data units (ADUs) are used at each end of the RS-232 lines. The ADU allows RS-232 lines to be extended beyond their specified 50 feet and converts the unbalanced RS-232 signal to a balanced signal. RS-232 with ADUs can be run 2000 feet at 19.2K baud and 4500 feet at 9600 baud.

HP EtherTwist, Phones, and RS-422

RS-422 signals can run in the same bundle with HP EtherTwist signals and phone lines. ADUs are not required with RS-422. RS-422 can be run 4000 feet. Combining HP EtherTwist signals with RS-422 and phones is supported at the maximum allowed length of HP EtherTwist segments.

HP EtherTwist and Token Ring

HP EtherTwist and Token Ring signals **cannot** share the same cable bundle.

Cabling

Product Note

Questions and Answers

Q. Can a 4-pin telephone jack be used with HP EtherTwist Networks?

A. Yes. However, a special cable must be used that has a 4-pin plug on one end and an 8-pin plug on the other end (for attachment to HP EtherTwist hardware). Note that no voice pairs are available. Both pairs are used for data.

Q. Can a 6-pin telephone jack be used with HP EtherTwist Networks?

A. Yes. However, a special cable must be used that has a 6-pin plug on one end and an 8-pin plug on the other end (for attachment to HP EtherTwist hardware). One pair is available for voice. This specially wired 6-pin to 8-pin cable is available from HP as product number 92268S.

Q. Can I use 4-pin or 6-pin modular plugs with HP EtherTwist hardware?

A. No. The HP EtherTwist hardware requires 8-pin modular plugs. However, 2-pair or 3-pair cable can be used since HP EtherTwist uses only two pairs.

Q. Can a 25-pair cable that is terminated with a 50-pin connector attach to the hub's 50-pin connector?

A. Yes.

Q. When is the 12-port modular adapter (HP 28638A) used?

A. Use the 12-port modular adapter when you want to connect 2-, 3-, or 4-pair cables directly to the hub with 8-pin modular plugs. (Note that four of these modular adapters would be required for the HP 28699A Hub Plus/48.)



Technical Reference Guide

**HP Wire Test
Instrument**



HP Wire Test Instrument

Technical Data

**Product Number
HP 28687A**

The HP 28687A Wire Test Instrument verifies and troubleshoots twisted-pair cabling for Type 10BASE-T networks. It quickly performs the necessary tests to evaluate the key parameters specified by the Type 10BASE-T addition to the IEEE 802.3 standard: crosstalk attenuation, signal attenuation at specified frequencies, burst noise, and continuity.

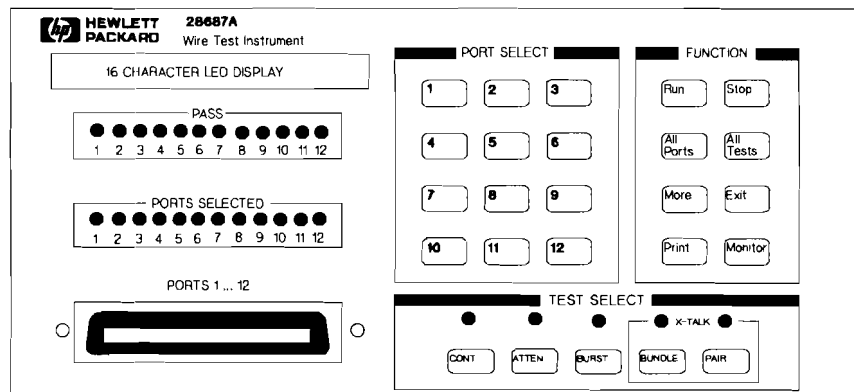
The HP 28687A Wire Test Instrument is a result of HP's commitment and leadership role in the Type 10BASE-T arena, as well as HP's experience in the development of high-quality test instruments. *"This full-function portable instrument gives you a better way to verify and troubleshoot twisted-pair LAN cabling."*

Features

- Tests key parameters for Type 10BASE-T networks: crosstalk attenuation, signal attenuation at specified frequencies, burst noise, and continuity. (Crosstalk attenuation and signal attenuation are measured using 5-MHz sine wave, 10-MHz sine wave and 10-Mbit/s

pseudo-random Manchester-encoded data.)

- Evaluates both bundled 25-pair and individual 4-pair twisted-pair cabling.
- To ensure reliability, the HP 28687A performs self-test and calibration during power on and recalibrates periodically during use.
- Weighing less than 10 pounds, this portable unit can be easily carried to where you need it.
- The Monitor function lets you take up to a 24-hour look at the cabling for identification of intermittent cabling problems. Data can be printed out as it is collected, or printed and reviewed at the end of the test period.
- The 16-character alphanumeric display steps you through the test procedures and provides you with diagnostic information on each test performed for each twisted-pair.
- Prints out a hard copy of your test results by connecting to any printer that supports the standard RS-232 interface.
- Easy to read LEDs indicate which pairs you have selected for testing, which tests you have selected, and which pairs passed or failed.
- For quick wiring connections, the HP 28687A has a built-in 50-pin Telco connector and comes bundled with a 12-port modular adapter for 8-pin jack connections



Functional Description

Complete Testing of Type 10BASE-T Cable

Twisted-pair cable, unlike coaxial cable, allows for variations in physical characteristics and has dynamic performance requirements such as crosstalk, signal attenuation, and installation-dependent specifications. Tools developed for the telephone industry are not specialized to test for these specification requirements. The HP 28687A Wire Test Instrument can quickly identify problems in these areas. Designed specifically to verify compliance with the Type 10BASE-T addition to the IEEE 802.3 standard, the HP 28687A Wire Test Instrument lets you easily verify and troubleshoot twisted-pair LAN cabling.

Easy to Use

This lightweight portable unit saves time by simplifying the complex task of testing twisted-pair cabling. Individual tests or combinations of tests can be run—5 LEDs indicate which tests you have selected. Up to 24 pairs (12 ports) can be tested simultaneously—LEDs indicate which pairs you have selected. The alphanumeric display steps you through the test procedures and gives you complete diagnostic information when you want it. An RS-232 printer port also allows you to print a hard copy of the results. Twelve green LEDs indicate whether the pairs have passed or failed the test(s). Intermittent cabling problems can be identified by pushing the MONITOR button, which performs the selected tests for up to 24 hours.

Troubleshooting and Verification

Network downtime is expensive. While the costs of a downed network cannot always be quantified, daily business depends on a functional network. With the HP 28687A Wire Test Instrument, cable problems can be easily and quickly identified.

To avoid intermittent problems and performance degradation problems, both new and in-place twisted-pair cabling should be evaluated prior to use as LAN media. The HP 28687A Wire Test Instrument verifies the suitability of in-place twisted-pair cable for your Type 10BASE-T application before you install your network.

Electrical Specifications

| Voltage (ac) RMS | Maximum Current RMS | Maximum Power | Frequency Range |
|------------------|---------------------|---------------|-----------------|
| 100–120 volts | 0.5 amp | 30 watts | 50/60 Hz |
| 200–240 volts | 0.3 amp | 30 watts | 50/60 Hz |

Maximum Input Voltage:

| | |
|--------------------|--|
| Common Mode: | 500 volts |
| Differential Mode: | 24 Volts @ $f \leq 60$ Hz, 1.5 Volts @ $f > 60$ Hz |

Measurement Specifications

| | Measurement Range | Accuracy | Resolution |
|-----------------------|-------------------|--------------|------------|
| Signal Attenuation | 0–15 dB | ± 0.5 dB | 0.1 dB |
| Crosstalk Attenuation | 0–36 dB | ± 1.0 dB | 0.1 dB |
| Burst Noise | 232 mV minimum | ± 32 mV | |

Measurement made through a 3-pole Butterworth low-pass filter with a 3-dB cut off at 15 MHz.

Source Characteristics:

| | |
|--------------------|--|
| Frequency Range | 5-MHz sine wave, 10-MHz sine wave, 10-Mbit/s pseudo-random Manchester-encoded data |
| Output Level Range | 1.25 volts peak \pm 250 mV |
| Impedance | 100 ohms \pm 10 ohms |
| Output Connector | 50-pin Telco connector |

Receiver Characteristics:

| | |
|-------------------|------------------------------|
| Frequency Range | 5 MHz to 15 MHz |
| Input Level Range | 20 mV peak to 1.5 volts peak |
| Impedance | 100 ohms \pm 10 ohms |
| Input Connector | 50-pin Telco connector |

Functional Specifications

Physical Specifications

Dimensions:

Width: 27.9 cm (11.0 in.)

Depth: 34.3 cm (13.5 in.)

Height: 15.9 cm (6.3 in.)

Weight: 4.1 kg (9.0 lb)

Environmental Specifications

Environment Temperature

Operating: 0°C to +55°C

(32°F to 131°F)

Nonoperating: -40°C to 70°C

(-40°F to 158°F)

Relative Humidity

Operating: 5% to 95% at 40°C

(104°F) Noncondensing

Nonoperating: 5% to 90% at

65°C (149°F) Noncondensing

Altitude

Operating: 0-4.6 km

(15,000 ft)

Nonoperating: 0-15.3 km

(50,000 ft)

Approvals

RFI (Radio Frequency Inter-

ference): FCC Class A, FTZ-

1046/84 (level B), CISPR-22

Class A, VCCI Class 1

Safety: CSA C22.2-220 for

ITE. Compliance with UL 478,

UL 1244 and IEC 348.

Ordering Information

The HP 28687A Wire Test Instrument includes a Wire Test instrument, an operating manual, 12 loopback hoods, one 12-port modular adapter, one test results pad and a power cord.

Warranty

The HP 28687A Wire Test Instrument is warranted for 1 year against defects. Check with your local Hewlett-Packard Sales and Support Office for more information.

Accuracy specified at 100-ohm line impedance.

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





HP Wire Test Instrument

Product Note

Testing and Troubleshooting Twisted-Pair Cable

When to Test Cable

The purpose of the HP 28687A Wire Test Instrument is to verify that twisted-pair cable meets the key cable specifications of the Type 10BASE-T addition to the IEEE 802.3 standard. This instrument measures crosstalk attenuation, signal attenuation, and burst noise, and detects continuity faults.

Twisted-pair cable should be tested when it is newly installed. Testing will verify that suitable cable has been properly installed. Sometimes poor-quality cable is substituted and installed; then, when the customer starts up his or her network for the first time there are problems. Testing the cable prior to starting up the network can save time, money, and frustration for the customer.

Twisted-pair cable should be tested when it is part of an existing cabling system. Taking advantage of cable that is already in place can be a major savings in the overall cost of the network. However, good records of the existing cabling system are rarely available. The cable type and length of installed cable is often unknown. Testing with the HP 28687A Wire Test Instrument will verify the suitability of the cable for a Type 10BASE-T network and identify any opens, shorts, or miswires in the existing cabling system. Testing the cable with the wire test instrument assures you and your customer that the cable is good.

Twisted-pair cable should be tested as part of the troubleshooting procedure when isolating faults in a network. Being able to quickly identify or eliminate the cable as being faulty can greatly reduce network down time. Whenever you call Hewlett-Packard for assistance in troubleshooting a network failure, you may be asked to provide measurement information on key parameters of the twisted-pair cabling. The HP 28687A Wire Test Instrument will provide you with this information.

Tips for Testing Twisted-Pair Cable

Test twisted-pair cable using the HP 28687A Wire Test Instrument.

Test twisted-pair cable from **end-to-end**. Test cable from the end that attaches to the hub to the other end that attaches to the transceiver or interface card in the PC. Testing portions of this entire length is an **incomplete** test of the cable and will provide inaccurate test results.

All pairs that will be used in a Type 10BASE-T network must be tested in the configuration in which they will be used.

Run all of the tests—crosstalk, attenuation, burst noise, and continuity—on the twisted-pair cabling. Running a subset of these tests does not provide a complete test of the cable.

When running the attenuation and continuity tests, attach the “CONT, ATTEN, BURST” side of the loopback hood to the far end of the cable.

Run the crosstalk test from both ends of the cable. All other tests can be run from the telecommunications closet end (hub end) of the cable. If the crosstalk test is not run from both ends of the cable, some cable failures will go undetected.

When running crosstalk tests, do not place loopback hoods on the far end of the cable. Leave the cable open. (Note that an unconnected IBM data connector will short transmit to receive.)

Always run the pair crosstalk test from the work-area end of the cable. Run the pair crosstalk test from the hub end any time there are **no** 25-pair cables in the path from hub to PC.

Run the bundle crosstalk test from the hub end whenever there are 25-pair cables anywhere in the path from hub to PC.

If it is not known whether or not there is a 25-pair cable in the path from hub to PC, run the pair crosstalk test.

When running the bundle crosstalk test, be sure to include all 24 pairs of a 25-pair bundle in the test. (The Wire Test Instrument can test up to 24 pairs at one time.)

Troubleshooting Twisted-Pair Cable Failures

Things to check that can cause crosstalk failures:

- **Untwisted cable.** Untwisted cable can be flat cable or round cable. Flat cable is easily identified by its appearance and is often found between the wall jack and PC. Round untwisted cable can be identified by stripping off about 2 feet of the outer sheath and checking the pairs for twists. There should be at least 2 twists per foot.
- **Split pairs.** A split pair is one conductor of one pair paired with one conductor of another pair.
- **Untwisted pairs close to cross-connect block connections.** Twisted-pair cable should be twisted all the way up to the connecting pins of the cross-connect block.

-
- **Transmit pair shorted to receive pair.** If a loopback hood (that connects transmit to receive) is attached to one end of the cable, the crosstalk test will fail. When testing an IBM cabling system, remember that an unconnected IBM data connector will short transmit to receive.
 - **Retest crosstalk with pairs terminated.** Attach the XTALK side of the loopback hood to the far end of the cable. This side of the loopback hood terminates the transmit and receive pairs with 100 ohms. If the cable fails this test it cannot be used in the network. If the terminated cable passes the crosstalk test but fails the crosstalk test when not terminated, it can be used in the network. The crosstalk test on unterminated cable is a worst-case test.
 - **Poor-quality cable.** Some cables are not designed to transmit high-speed data.

Things to check that can cause signal attenuation failures:

- **Conductors of a twisted pair separated.** Sometimes the pairs of unsheathed cable (used for connections between cross-connect blocks) separate too much (more than a centimeter). This separation will change the impedance of the pair and can cause the attenuation test to fail.
- **Too many cross-connect blocks in the path.** Four cross-connect blocks is the recommended maximum. Cross-connect blocks can induce signal reflections that can cause attenuation test failures.
- **Ambient temperature.** The attenuation of PVC-insulated cable is temperature dependent. At temperatures greater than 40°C (104°F) signal attenuation increases.
- **Cable length.** Cable that is too long will fail attenuation tests. Typical telephone cable can be 100 meters long. Some high-performance cables can run longer than 100 meters before the signal attenuation becomes too great.
- **Loading coils or RC filter networks attached to the cable.**
- **Poor-quality cable.** Some cable is not designed for high-speed data transmission.

Things to check that can cause burst noise failures:

- **Noisy environment.** When cable runs in electrically noisy environments (near big electric motors for example) burst noise will be detected. The noise source must be removed or the cable re-routed.

-
- **Any cables that fail the burst noise test should be monitored for several hours.** The HP 28687A Wire Test Instrument has the capability to monitor burst noise on a cable for up to 24 hours. Monitoring burst noise will show periods throughout the day where noise is present. If burst noise is high for a short time only once a day, it may be tolerable. If burst noise in a cable is present frequently throughout the day, that cable should not be used in the network.

Things to check when continuity failures are reported:

- **16-character display on the HP 28687A Wire Test Instrument.** When a cable fails continuity, the instrument's display will tell you exactly what the failure is. It will report which pins are shorted, opened, or miswired.
- **Fix the reported error and retest continuity.**

HP Wire Test Instrument

Product Note

Questions and Answers

Q. When using the HP 28687A instrument to test installed cable, must the crosstalk test be run from both ends of the cable?

A. Yes. If this test is not run from both ends, some cable faults may go undetected.

Q. When using the HP 28687A instrument to test installed cable, must all of the tests be run from both ends of the cable?

A. No, only the crosstalk test must be run from both ends.

Q. Must a loopback hood be attached to the other end of the cable when the burst noise test is run?

A. No. The burst noise test can be run with or without a loopback hood attached.

Q. What symptoms will be seen on the network if burst noise is present in a twisted-pair cable?

A. Data corruption, retransmissions, and collisions.

Q. How can I get an HP 28687A Wire Test Instrument?

A. Contact your local HP sales office for assistance in placing an order.

Q. What comes with the HP 28687A Wire Test Instrument?

A. The instrument is shipped with one 12-port modular adapter (HP 28638A), 12 loopback hoods (part number 28687-63003), an operating manual, a results table pad, and power cord.

Q. Does the HP 28687A Wire Test Instrument test for all of the Type 10BASE-T cable specifications?

A. No, all the cable specifications are not tested. However, the specifications that are key in determining whether or not the cable will operate in a Type 10BASE-T network are tested.

HP Wire Test Instrument

Product Note

HP 28687A Quick Reference Guide

Part I. Run Tests in Telecommunications Closet:

1. Turn on the instrument.
2. Connect cable(s).
3. Push PAIR for X-TALK test or BUNDLE if testing 25-pair cable.
4. Push PORT SELECT button(s) (1 ... 12) or ALL PORTS.
5. Push RUN (push STOP to stop test).
6. Read results: PASS LEDs, MORE, or PRINT.
7. Connect loopback hood(s) (in work area).
8. Push CONT, ATTEN, BURST or ALL TESTS.
9. Push RUN (push STOP to stop test).
10. Read results: PASS LEDs, MORE, or PRINT.
11. Disconnect cable(s), loopback hood(s), turn off instrument.
12. To complete testing, go to work-area ends.

Part II. Run PAIR test at work-area ends:

13. Turn on the instrument.
14. Connect cable.
15. Push PAIR for X-TALK test.
16. Push PORT SELECT button(s) (1 ... 12).
17. Push RUN (push STOP to stop test).
18. Read results: PASS LEDs, MORE, PRINT.
19. Disconnect cable(s), connect next cables, and repeat steps 15 through 18 until all pairs are tested.



Technical Reference Guide

**Network Operating
Systems**

Network Operating Systems

Product Note

Installation Overview— Novell NetWare v2.15

For HP 27245A, 27246A, and 27247A adapter cards

When using the “floppy disk” method of generation, the Novell NetWare installation program expects to find drivers on a disk with a special volume name. To copy the driver files:

1. Insert a new disk in drive A.
2. Format the disk by entering:
FORMAT A: /V
3. When you are prompted for a volume name, enter:
LAN_DRV_424
4. The Novell NetWare drivers on the Support Disk are in a subdirectory named \HPNOVEL. Copy the entire contents of that subdirectory to the root directory of the disk you just formatted. You do not need to copy the \HPNOVEL\HP386 subdirectory to the new disk. The new disk will be the work disk.
5. During NetWare generation, use this work disk when selecting the LAN driver using the “load and select” option. Once the driver is loaded and when prompted, select as the driver one of the following:
“Hewlett-Packard PC LAN/AT for NetWare” for the HP 27245A Adapter Card/8
“Hewlett-Packard PC LAN/MC for NetWare” for the HP 27246A Micro Channel Adapter Card/16
“Hewlett-Packard PC LAN/16 for NetWare” for the HP 27247A Adapter Card/16.

When using the “hard disk” or “network” method of generation, the Novell NetWare program expects to find the drivers in the same directory as the other NetWare driver subdirectories (e.g. LAN_DRV_.001 and LAN_DRV_.002). To copy the driver files:

1. Create a subdirectory named “LAN_DRV_.424” under the same directory as the NetWare driver subdirectories.
2. The Novell NetWare drivers on the Support Disk are in a subdirectory named \HPNOVEL. Copy the entire contents of that subdirectory you just created. You do not need to copy the \HPNOVEL\HP386 subdirectory.
3. During NetWare generation, choose the “load and select” option to add the HP driver to the list of existing drivers. Once the driver is loaded and when prompted, select as the driver one of the following:

“Hewlett-Packard PC LAN/AT for NetWare” for the HP 27245A Adapter Card/8

“Hewlett-Packard PC LAN/MC for NetWare” for the HP 27246A Micro Channel Adapter Card/16

“Hewlett-Packard PC LAN/16 for NetWare” for the HP 27247A Adapter Card/16.

Novell NetWare Configuration Combinations for HP 27245A, HP 27246A, and HP 27247A cards

The Novell NetWare v2.15 driver only uses one of 20 combinations of interrupt channel (IRQ) and I/O base address. Normally, you will choose the first combination available during the Novell NetWare installation process. Other combinations are provided to resolve conflicts with the needs of other cards in your personal computer. These are the combinations, in the sequence presented:

IRQ 3, I/O Base = 300h
IRQ 4, I/O Base = 300h
IRQ 5, I/O Base = 300h
IRQ 7, I/O Base = 300h
IRQ 9, I/O Base = 300h

IRQ 3, I/O Base = 340h
IRQ 4, I/O Base = 340h
IRQ 5, I/O Base = 340h
IRQ 7, I/O Base = 340h
IRQ 9, I/O Base = 340h

IRQ 3, I/O Base = 240h
IRQ 4, I/O Base = 240h
IRQ 5, I/O Base = 240h
IRQ 7, I/O Base = 240h
IRQ 9, I/O Base = 240h

IRQ 3, I/O Base = 200h
IRQ 4, I/O Base = 200h
IRQ 5, I/O Base = 200h
IRQ 7, I/O Base = 200h
IRQ 9, I/O Base = 200h

Once you have selected the IRQ and I/O base address, continue with the NetWare generation process to create the network operating system, workstation shell, or NetWare bridge modules.

Note for HP Vectra 486 Users

If you have used EasyConfig (with the HP Vectra 486) to select an interrupt channel and I/O base combination, you must be sure to choose the same combination when configuring NetWare. As with any ISA card, EasyConfig will not actually read or set any parameters on the card. The utility will simply help you choose from available system resources (I/O base address and interrupt channel) that have not been allocated to other cards. For the card to operate properly, you must manually set the hardware switches to their appropriate settings, and you must also set the interrupt channel via NetWare. Setting these values using Easy-Config ensures that the system resources allocated to your card will not be given to other cards.

Use one of the following files (found on the Support Disk) to configure the HP Vectra 486:

!HWP1820.CFG (for the HP 27245A adapter card)

!HWP1830.CFG (for the HP 27247A adapter card)

For HP 27248A EISA adapter card

Note:

The HP NetWare v2.15 driver for the HP 27248A EtherTwist EISA PC adapter card is a client driver only. There is currently no HP NetWare v2.15 server driver available for the EISA card.

When using the “floppy disk” method of shell (client) generation, the Novell NetWare installation program expects to find drivers on a disk with a special volume name. To copy the driver files:

1. Insert a new disk in drive A.
2. Format the disk by entering:
FORMAT A: /V
3. When you are prompted for a volume name, enter:
LAN_DRV_424
4. The Novell NetWare drivers on the Support Disk are in a subdirectory named \NW286\SHELL. Copy the entire contents of that subdirectory to the root directory of the disk you just formatted. You do not need to copy the \NW3863.0 subdirectory to the new disk. The new disk will be the work disk.
5. During NetWare shell generation, use this work disk when selecting the LAN driver using the “load and select” option. Once the driver is loaded and when prompted, select the driver:
“HP EtherTwist EISA LAN Adapter/32 for NetWare”

When using the “hard disk” or “network” method of shell generation, the Novell NetWare program expects to find the drivers in the same directory as the other NetWare driver subdirectories (e.g. LAN_DRV_.001 and LAN_DRV_.002). To copy the driver files:

1. Create a subdirectory named “LAN_DRV_.424” under the same directory as the NetWare driver subdirectories.
2. The Novell NetWare drivers on the Support Disk are in a subdirectory named \NW286\SHELL. Copy the entire contents of that subdirectory you just created. You do not need to copy the \NW3863.0 subdirectory.
3. During NetWare shell generation, choose the “load and select” option to add the HP driver to the list of existing drivers. Once the driver is loaded and when prompted, select the driver:

“HP EtherTwist EISA LAN Adapter/32 for NetWare”

Network Operating System

Product Note

Installation Overview— Novell NetWare v3.x

For HP 27245A, 27246A, and 27247A adapter cards

Note:

HP NetWare v3.0 drivers apply only to servers. For generating client shells, see the "Novell NetWare v2.15" instructions in this guide.

Note:

The HP NetWare v3.0 server drivers can be used with NetWare v3.1 and v3.11. The NetWare v3.1 feature of multiple packet transmissions is available with the HP NetWare 3.0 server driver. However, the NetWare v3.1 feature of multiple frame type support is not available with these drivers.

These instructions assume that you have completed the process of installing Novell NetWare 386 on your system.

1. Copy one of the following files from the \HPNOVEL\HP386 subdirectory of the Support Disk to the disk and directory containing the SERVER.EXE file:
 - "HP386A8.lan" for the HP 27245A Adapter Card/8
 - "HP386M16.lan" for the HP 27246A Micro Channel Adapter card/16
 - "HP386A16.lan" for the HP 27247A Adapter Card/16
2. As part of the Novell NetWare file server setup process, you will generate two batch command files, STARTUP.NCF and AUTOEXEC.NCF. The STARTUP.NCF file typically contains commands to load the disk driver and name space support (support for non-DOS file naming conventions). The AUTOEXEC.NCF file is used to complete the server startup process (loading and binding network drivers). STARTUP.NCF is stored on the disk you boot from (either a hard disk DOS partition or floppy disk). AUTOEXEC.NCF is stored in and runs from the server's system directory under the "SYS" volume (SYS:system). These files are accessed using Novell NetWare's INSTALL NLM (network loadable module).

Using the INSTALL NLM, create or edit the AUTOEXEC.NCF file to include commands to load the HP driver for your LAN card, and bind the driver to the IPX transfer protocol. For example:

```
load driver_name port=io_base int=IRQ
bind ipx to driver_name net=net_number
```

where:

- *driver_name* specifies the HP EtherTwist PC Adapter card driver.
- *io_base* specifies the I/O base address.
- *IRQ* specifies the interrupt channel.
- *net_number* defines a network number.

A sample AUTOEXEC.NCF file is:

```
file server name SERVER1
ipx internal net 999
load C:\HPNOVEL\HP386A8 port=300 int=5
bind ipx to HP386A8 net=135
mount all
```

where,

- SERVER1 is a user-selected name for the server system
- 999 is a user-selected internal network number
- C:\HPNOVEL\ defines the path, drive and directory, for the HP driver file, HP386A8

For more details on what else to include in the AUTOEXEC.NCF file, see the Novell NetWare 386 manuals.

Note for HP Vectra 486 Users

If you have used EasyConfig (with the HP Vectra 486) to select an interrupt channel and I/O base combination, you must be sure to choose the same combination when configuring NetWare. As with any ISA card, EasyConfig will not actually read or set any parameters on the card. The utility will simply help you choose from available system resources (I/O base address and interrupt channel) that have not been allocated to other cards. For the card to operate properly, you must manually set the hardware switches to their appropriate settings, and you must also set the interrupt channel via NetWare. Setting these values using EasyConfig ensures that the system resources allocated to your card will not be given to other cards.

Use one of the following files (found on the support disk) to configure the Vectra 486:

!HWP1820.CFG (for the HP 27245A adapter card)

!HWP1830.CFG (for the HP 27247A adapter card)

For HP 27248A EISA adapter card

Note:

HP NetWare v3.0 drivers apply only to servers. For generating client shells, see the "Installation Overview—Novell NetWare v2.15" section in this guide.

Note:

The HP NetWare v3.0 server drivers can be used with NetWare v3.1 and v3.11. The NetWare v3.1 feature of multiple packet transmissions is available with the HP NetWare 3.0 server driver. However, the NetWare v3.1 feature of multiple frame type support is not available with these drivers.

These instructions assume that you have completed the process of installing Novell NetWare 386 on your system.

1. Copy the driver file, HP386E32.LAN from the support disk to the disk and directory containing the SERVER.EXE file. The driver file is in the directory \NW3863.0\SERVER on the support disk.
2. As part of the Novell NetWare file server setup process, you will generate two batch command files, STARTUP.NCF and AUTOEXEC.NCF. The STARTUP.NCF file typically contains commands to load the disk driver and name space support (support for non-DOS file naming conventions). The AUTOEXEC.NCF file is used to complete the server startup process (loading and binding network drivers). STARTUP.NCF is stored on the disk you boot from (either a hard disk DOS partition or floppy disk). AUTOEXEC.NCF is stored in and runs from the server's system directory under the "SYS" volume (SYS:system). These files are accessed using Novell NetWare's INSTALL NLM (network loadable module).
3. Using the INSTALL NLM, create or edit the AUTOEXEC.NCF file to include commands to load the HP driver for the HP EISA LAN card, and bind the driver to the IPX transfer protocol. For example:

```
load C:\HPNOVEL\HP386E32 slot = slot_number  
bind ipx to HP386E32 net = network_number
```

where:

- HP386E32 is the file name of the HP EISA LAN card driver.
- *slot_number* is the number of the expansion slot in which the HP EISA LAN card is installed.
- *network_number* is the Novell network number for the network attached to the HP EISA LAN card.



A sample AUTOEXEC.NCF file is:

```
file server name SERVER1
ipx internal net 999
load C:\HPNOVEL\HP386E32 slot=3
bind ipx to HP386E32 net=135
mount all
```

where,

- SERVER1 is a user-selected name for the server system
- 999 is a user-selected internal network number
- C:\HPNOVEL\ defines the path, drive and directory, for the HP driver file, HP386E8

For more details on what else to include in the AUTOEXEC.NCF file, see the Novell NetWare 386 manuals.

Network Operating System

Product Note

***Installation Overview—
Microsoft LAN Manager
2.0 with HP 27245A,
HP 27246A, and
HP 27247A adapter
cards***

The SETUP.EXE utility that ships with LAN Manager 2.0 requires a different directory structure for the LAN adapter card driver than the NETSETUP.EXE that shipped with LAN Manager 1.0 products.

For New Installations

1. Copy all files and the directory structure from the sub-directories, MSLANMAN.DOS and MSLANMAN.OS2 on the support disk to the root directory of a clean work disk. A volume name for this work disk is not necessary.
2. Follow the installation procedures outlined in the Microsoft LAN Manager 2.0 manuals, using the work disk you just created, when installing any of the HP EtherTwist PC LAN adapter cards with Microsoft LAN Manager 2.0
3. After installing the driver, you must edit the master protocol.ini file. This file is usually located in the LANMAN directory. This directory may have an extension of DOS, OS2, or no extension at all. To edit the file, change the BINDINGS parameter of the protocol which is binding to the driver, to "HPLAN".

Here is an example of a simple protocol.ini file where the NETBEUI protocol and HPLAN driver are being loaded and bound:

```
[PROTOCOL MANAGER]
DRIVERNAME = PROTMAN$

[NETBEUI_XIF]
  Drivename = netbeui$
  BINDINGS = "HPLAN_NIF" ← This is the original BINDINGS
                           as created by SETUP.EXE.
  BINDINGS = "HPLAN" ← This is the edit that will allow
                       NETBIND to work properly.

[HPLAN]
  Drivename=HPLAN$
  ioaddress = 0x300
  interrupt = 3
  maxhwtrans = 8
  maxswtrans = 2
  maxmulticast = 5
```

Note for HP Vectra 486 Users

If you have used EasyConfig (with the HP Vectra 486) to select an interrupt channel and I/O base combination, you must be sure to choose the same combination when configuring LAN Manager. As with any ISA card, EasyConfig will not actually read or set any parameters on the card. The utility will simply help you choose from available system resources (I/O base address and interrupt channel) that have not been allocated to other cards. For the card to operate properly, you must manually set the hardware switches to their appropriate settings, and you must also set the interrupt channel via LAN Manager. Setting these values using EasyConfig ensures that the system resources allocated to your card will not be given to other cards.

Use one of the following files (found on the Support Disk) to configure the Vectra 486:

!HWP1820.CFG (for the HP 27245A adapter card)
!HWP1830.CFG (for the HP 27247A adapter card)

Network Operating System

Product Note

***Installation Overview—
3+Open and
HP LAN Manager with
HP 27245A, HP 27246A,
and HP 27247A adapter
cards***

For New Installations

1. Copy the driver files from the subdirectories \NDIS\OS2 and \NDIS\DOS on the Support Disk to the working copies of the 3+Open or HP LAN Manager driver disks for OS/2 drivers and DOS drivers, respectively. The HP driver files under \NDIS\OS2 should be copied to the subdirectory \3OPEN\OS2DRV\MAC on the disk containing the OS/2 drivers. Files under \NDIS\DOS should be copied to the subdirectory \3OPEN\DOSDRV\MAC on the disk containing the DOS drivers.

For Existing Installations

2. If it is not a new installation, the 3+Open or HP LAN Manager software should already reside on the server's hard disk drive. The driver files must be copied to the appropriate subdirectories on the hard drive before configuring the server or Netstations to use the HP adapter cards. The driver files from the subdirectories \NDIS\OS2 and \NDIS\DOS on the Support Disk must be copied to the server subdirectories, x:\3OPEN\OS2DRV\MAC and x:\3OPEN\DOSDRV\MAC respectively. The "x" is the drive designator of the server's hard drive.
3. After the driver files are copied properly, proceed either with the installation of 3+Open or LAN Manager, or with configuration of the previously installed network operating system software. In either case, the server and Netstations must be configured using Netsetup. You must choose a network adapter card, which determines which driver to use. For an IBM AT-compatible server or Netstation, you must also select the I/O base address and interrupt channel.

From the network adapter card menu, select the option corresponding to your network adapter card. This will cause 3+Open or HP LAN Manager to "bind" the appropriate driver to the protocol chosen for the card during initialization.

-
4. Refer to the appropriate 3Com 3+Open or HP LAN Manager manuals for detailed instructions on configuring other network resources (such as server name, server type, etc.).
 5. Complete Netsetup and exit.

For DOS Netstations

6. Replace the current PROTMAN.DOS file by copying the \NDIS\DOS\PROTMAN.DOS file from the Support Disk to the workstation subdirectory x:\3OPEN\DOSWKSTA\LANMAN\DRIVERS. The CONFIG.SYS file on the Netstation can be checked to verify that this is the subdirectory from which the system will load the PROTMAN.DOS file.

Note for HP Vectra 486 Users

If you have used EasyConfig (with the HP Vectra 486) to select an interrupt channel and I/O base combination, you must be sure to choose the same combination when configuring 3+Open or HP LAN Manager. As with any ISA card, EasyConfig will not actually read or set any parameters on the card. The utility will simply help you choose from available system resources (I/O base address and interrupt channel) that have not been allocated to other cards. For the card to operate properly, you must manually set the hardware switches to their appropriate settings, and you must also set the interrupt channel via 3+Open or HP LAN Manager. Setting these values using EasyConfig ensures that the system resources allocated to your card will not be given to other cards.

Use one of the following files (found on the Support Disk) to configure the Vectra 486:

- !HWP1820.CFG (for the HP 27245A adapter card)
- !HWP1830.CFG (for the HP 27247A adapter card)

Network Operating Systems

Product Note

Questions and Answers

General

Q. Where can I get the latest drivers for my network operating system?

A. Novell NetWare and NDIS drivers are shipped on the Support Disk that comes with each LAN card. If driver enhancements or patches are made after the Support Disks have been manufactured, or if new drivers become available, the latest revisions will be made available on CompuServe and HPNN (Hewlett-Packard News Network). You may also contact your HP technical support organization for the latest drivers.

Q. Are all drivers distributed on the Support Disk?

A. No. New drivers are available through CompuServe, HPNN, or via your HP technical support organization.

Q. Is there a packet driver for the EtherTwist adapter cards, and what network operating systems can I run with it?

A. Yes. It is a public domain driver that allows the EtherTwist cards (except the HP 27248A EtherTwist EISA Adapter Card/32) to be used with network operating systems that support packet drivers. Packet drivers for HP EtherTwist cards are available through the Clarkson University Bulletin Board Service by calling (315) 268-6667.

Novell

Q. What is the maximum number of HP EtherTwist adapter cards that can be installed in a Novell internal or external bridge?

A. Four.

Q. How is a Novell internal or external bridge counted in the network topology.

A. The Novell internal bridge or external bridge should count as an HP bridge in the network topology. There can be no more than 7 bridges in the path between any two end nodes on the network.

Q. What Novell NetWare drivers are provided with HP EtherTwist LAN adapter cards?

A. Novell NetWare v2.15 drivers for server and client shells are provided for the following cards:

- HP 27245A EtherTwist Adapter Card/8
- HP 27246A EtherTwist Micro Channel Adapter Card/16
- HP 27247A EtherTwist Adapter Card/16
- HP 27248A EtherTwist EISA Adapter Card/32 (Client only)

Note: These Novell NetWare 2.15 drivers are used to generate NetWare 3.0 and 3.1 client shells.

Novell NetWare 386 ODI Server drivers are provided for the following cards:

- HP 27245A EtherTwist Adapter Card/8
- HP 27246A EtherTwist Micro Channel Adapter Card/16
- HP 27247A EtherTwist Adapter Card/16
- HP 27248A EtherTwist EISA Adapter/32

These drivers were written to the NetWare 3.0 server driver specification, but they will work with NetWare 3.1 and 3.11 as well.

Q. What driver(s) do I use to generate Novell NetWare 386 client shells?

A. When generating a client shell using Novell's SHGEN program, use the Support Disk that came with your LAN card. The SHGEN program will use the NetWare 2.15 client drivers until such time as HP releases NetWare ODI client drivers. Therefore, NetWare 386 client shells can be generated for the following cards:

- HP 27245A EtherTwist Adapter Card/8
- HP 27246A EtherTwist Micro Channel Adapter Card/16
- HP 27247A EtherTwist Adapter Card/16
- HP 27248A EtherTwist EISA Adapter Card/32

3Com

Q. Can I use the 3Com 3+Open driver included with the support disk when running 3Com 3+?

A. No. The 3+Open driver is an NDIS driver and 3Com 3+ does not follow that specification. Consult your HP representative for the latest list of supported network operating systems.

Q. How many HP EtherTwist adapter cards can I put into a 3Com 3+Open server?

A. One. Currently the NDIS driver does not support multiple cards, nor does the 3COM software.

Microsoft LAN Manager 2.0

Q. Can the NDIS 1.0 driver supplied with HP EtherTwist LAN cards be used with Microsoft LAN Manager 2.0?

A. Yes. Microsoft has certified the HP NDIS 1.0 driver and EtherTwist adapter cards with their LAN Manager 2.0 product. However, Microsoft has implemented a new installation process with LAN Manager 2.0. Instead of using the NETSETUP.EXE utility, you will use a utility called SETUP.EXE. SETUP.EXE requires a new directory structure which was not present on Support Disks shipped prior to May 1, 1991. If your Support Disk does not contain a subdirectory called \MSLANMAN then you must obtain a copy of the needed files and directory structures from CompuServe, HPNN, or your HP technical support organization.

Other NDIS 1.0-compatible Network Operating Systems

Q. Will HP EtherTwist cards work with Banyan Vines, FTP PC/TCP Plus, or other NDIS-compatible network operating systems?

A. HP provides an NDIS 1.0-compatible driver for the EtherTwist adapter cards (excluding the HP 27248A EISA adapter card). HP will support that driver with other network operating systems that are compatible with the NDIS 1.0 specification. Note that some network operating systems that are compatible with the NDIS specification require the directory structure described in the Microsoft LAN Manager 2.0 section above.

HP OfficeShare

Q. Which EtherTwist LAN cards are supported with HP OfficeShare?

A. The following EtherTwist LAN cards have drivers for HP OfficeShare III version B.02.00 or later:

- HP 27245A EtherTwist Adapter Card/8
- HP 27246A EtherTwist Micro Channel Adapter Card/16

Q. How do I configure OfficeShare to use my EtherTwist LAN card?

A. During installation, when asked what type of LAN card you have, you are given the following choices:

1. HP StarLAN 10 PC Link II (HP 27240)
2. HP StarLAN 10 Micro Channel Link (HP 27241)
3. HP ThinLAN/StarLAN 10
4. HP StarLAN
5. HP Serial Network

Choose number 1 if you are using the HP 27245A card.
Choose number 2 if you are using the HP 27246A card.





Technical Reference Guide

**LAN Topology and
Configuration
Guidelines**



LAN Topology and Configuration Guidelines

Product Note

HP EtherTwist Networks

When planning the network topology, count hubs as repeaters and follow these rules:

1. Plan your cable segment lengths as follows:
 - For typical twisted-pair telephone cable, limit segment lengths to 100 meters. Longer lengths are possible if high-performance cables are used (see "Cabling" section).
 - For thin coaxial cable, limit segment lengths to 185 meters.
 - For thick coaxial cable, limit segment lengths to 500 meters.
 - For fiber optic cable, limit segment lengths to 1 kilometer.
 - Each thin coaxial cable segment can have a maximum of 30 electrical connections.
 - Each thick coaxial cable segment can have a maximum of 100 electrical connections.
2. For any network or subnetwork that does not include bridges,
 - There can be no more than 4 repeaters between any two computers.
 - There can be no more than 3 segments of coaxial cable between any two computers.
3. There can be no more than 7 HP bridges between any two computers on the network. Each time a bridge is crossed, the repeater and coaxial cable segment count is reset to zero. Cable segments and repeaters count as in rule 2 above.

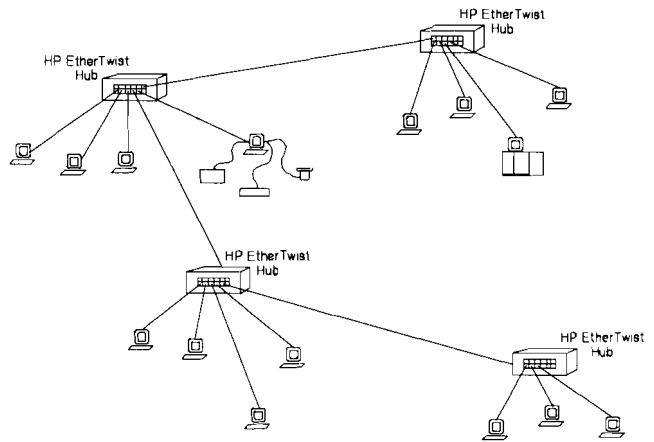
It is best not to cascade (via twisted-pair cable) more than 2 hubs off of a coaxial backbone connection. This will make network expansion easier.

For more detail, see the *LAN Topologies for HP EtherTwist Family of Networking Products*, HP part number 5091-0665E, and the *Technical Reference Guide for Site LANs and Multisite LANs*, HP part number 5091-0666E.

Sample Network Configurations

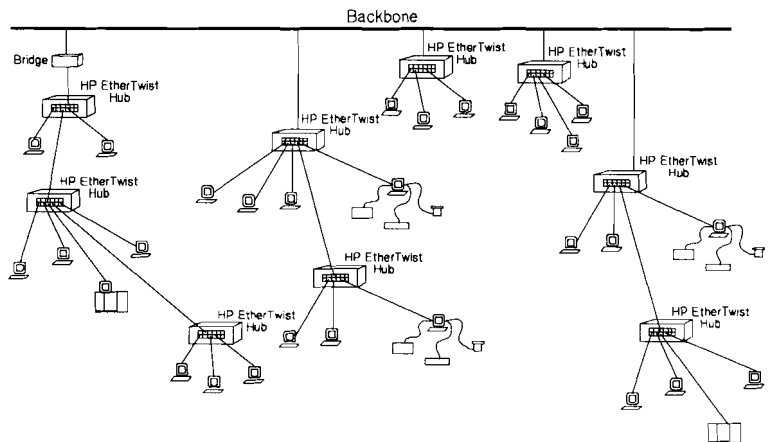
Example 1:

Four hubs can be cascaded since there is no backbone.



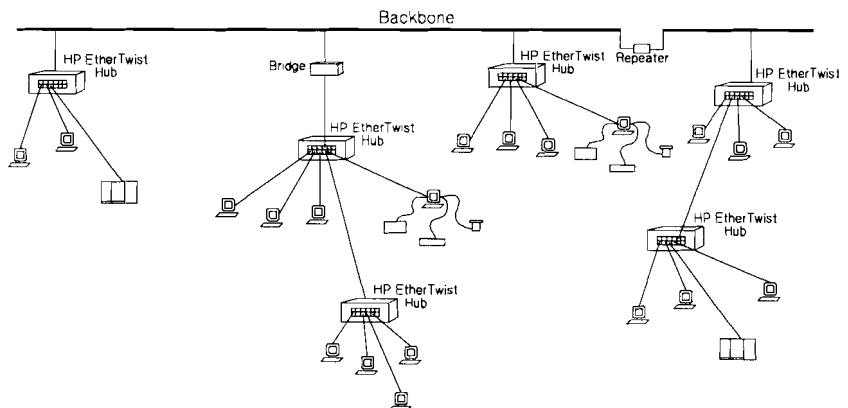
Example 2:

Unless a bridge is used, no more than two hubs are cascaded from the backbone. Crossing a bridge restarts the repeater count to allow for more cascading.



Example 3:

Two hubs can be cascaded on one side of a backbone repeater. On the other side of the repeater, a bridge must be used to connect cascaded hubs to the backbone.



Technical Reference Guide

Troubleshooting

HP EtherTwist Family of Network Products

Product Note

Network Troubleshooting Tips

These troubleshooting tips will get you started on troubleshooting a network. This is not an exhaustive troubleshooting section, but it will help you become familiar with the set of diagnostic tools that is shared by the HP EtherTwist family of network products.

The approach to troubleshooting a network (large or small) can be divided into three main parts:

1. **Check the basics.** Check for the simplest and most common network hardware problems.
2. **Systematic troubleshooting (non-disruptive).** If a quick check of the basics doesn't find the problem, then use a systematic troubleshooting method.
3. **Systematic troubleshooting (disruptive).** Diagnostic tools that test individual network components usually require that you momentarily disrupt the network. These tests should be used last.

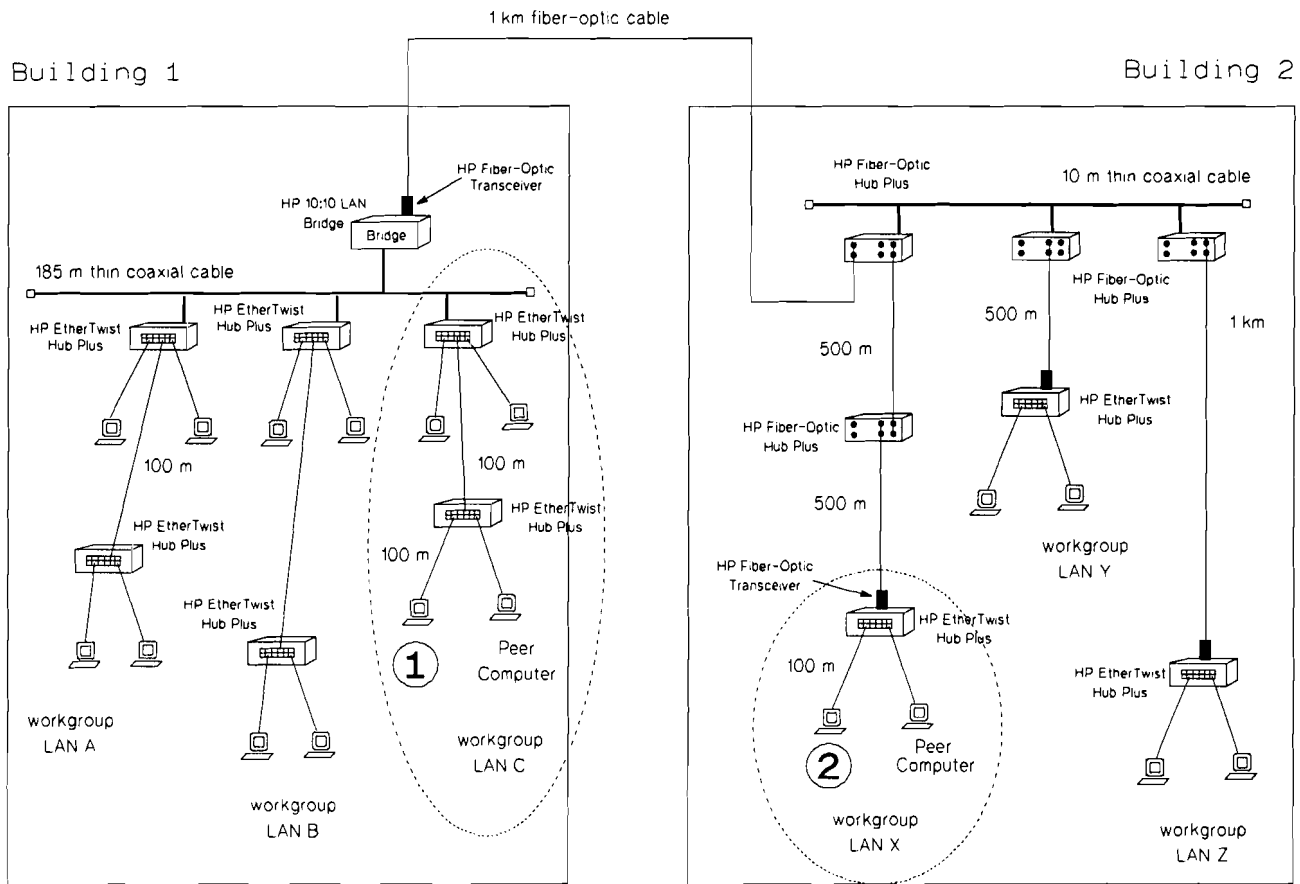
The objective is to isolate a particular network component as the cause of the network problem. Note that there are some limitations to these troubleshooting procedures:

- They cover the network hardware only (that is, the HP EtherTwist family of network products).
- They will not find problems in your network software, nor will they find problems in your application software.
- They may not find intermittent problems.

The following example network and network problem is used to illustrate the troubleshooting approach.

This site LAN consists of two buildings: building 1 has three workgroup LANs (A, B, and C) and building 2 has three workgroup LANs (X, Y, and Z). A bridge is used to make the fiber-optic connection between building 1 and 2. The bridge also filters traffic between the two buildings.

In this example, node 1 of workgroup LAN C (located in building 1) cannot communicate with node 2 of workgroup LAN X (located in building 2).

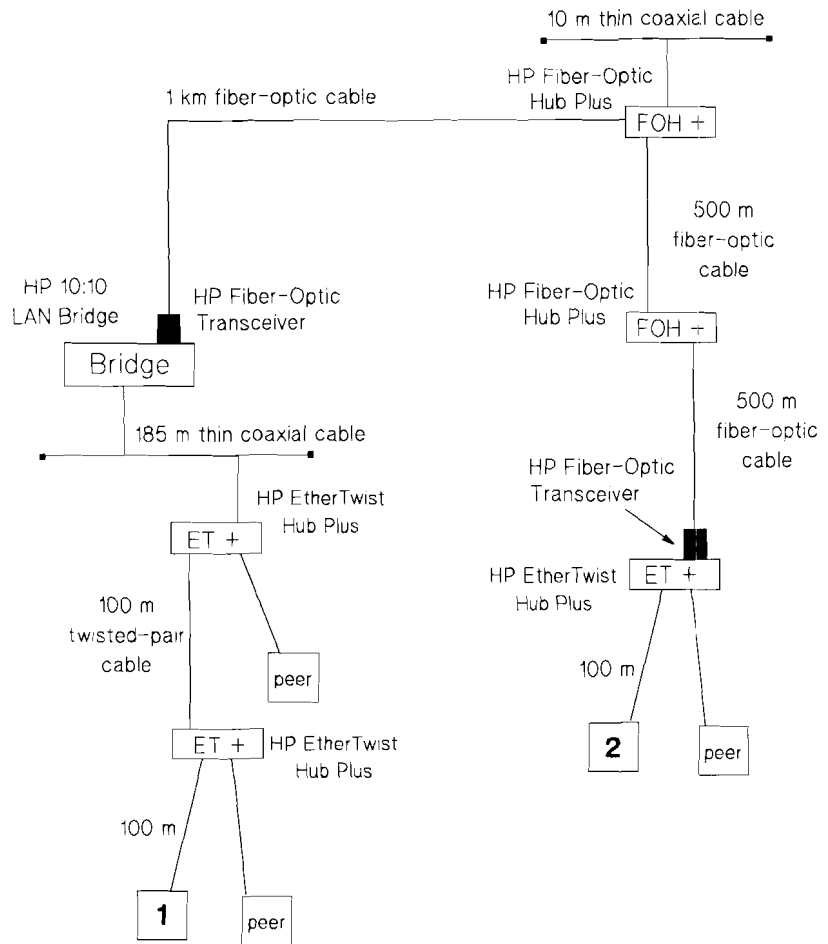


The following abbreviations are used (for convenience) in the illustrations in this section.

- ET + : HP EtherTwist Hub Plus
- FOH + : HP Fiber-Optic Hub Plus
- FOT : HP Fiber-Optic Transceiver
- peer : A computer that is attached to the same network device or workgroup LAN. (This computer is usually in close proximity to the nodes being tested.)

To begin, consider your network problem as a two-node problem. The two nodes are the two computers (node 1 and node 2) that were involved when you discovered the problem.

Determine which components are in the path between node 1 and node 2. This includes all LAN adapter cards, transceivers, hubs, bridges, cabling, cross-connect blocks, and so on. Sketch a map of the path, showing the components and their cables in the order that a signal would travel to get from node 1 to node 2.



Check the Basics

Here is a list of the basic checks for the communication path between node 1 and node 2:

- _____ Be sure all devices are plugged in and receiving power.
- _____ Be sure cable connections to all devices are secure.
- _____ For thin coaxial cable, make sure that it is properly terminated.
- _____ For fiber-optic cable connections, make sure that the “transmit” fibers are connected to the “Tx” receptacles and the “receive” fibers are connected to the “Rx” receptacles.
- _____ Check LEDs on hubs, transceivers, and bridges. If any problem conditions are indicated through the LEDs, follow the instructions discussed in the product reference manuals.
- _____ Check switch settings on LAN adapter cards, and transceivers. (There are no external switches on the HP hubs, and bridges.)
- _____ For each hub that has a transceiver attached (to the AUI port), make sure the transceiver SQE test switch is disabled.
- _____ On hubs and bridges, use the console interface status command (ST) to check device configuration.
- _____ Check for error messages at the two computers.
- _____ Be sure you have a valid network (software) configuration that matches your LAN adapter card at the two computers. (Check: I/O Base Address and IRQ assignments, appropriate driver for the LAN adapter card and network operating system.)
- _____ Make sure that you have not exceeded the limit for maximum networks. For topology rules, see the *LAN Topologies for HP EtherTwist Family of Network Products Guide* (p/n 5091-0665E).
- _____ Check recent changes in cabling. If there has been a recent change to the network, try changing back to the original topology and see if the problem persists.
- _____ For twisted-pair cabling, make a visual inspection for:
 - cable’s color codes
 - polarity of color codes
 - straight-through wiring
 - proper contact with connector or cross connect block
 - twisted pairs (not flat or untwisted)

Systematic Troubleshooting (Non-disruptive)

If a quick check of the basics doesn't find the problem, then you need to use a systematic method. First use the diagnostic tests that will not disturb the normal operation of the network.

Initial Remote Node Test

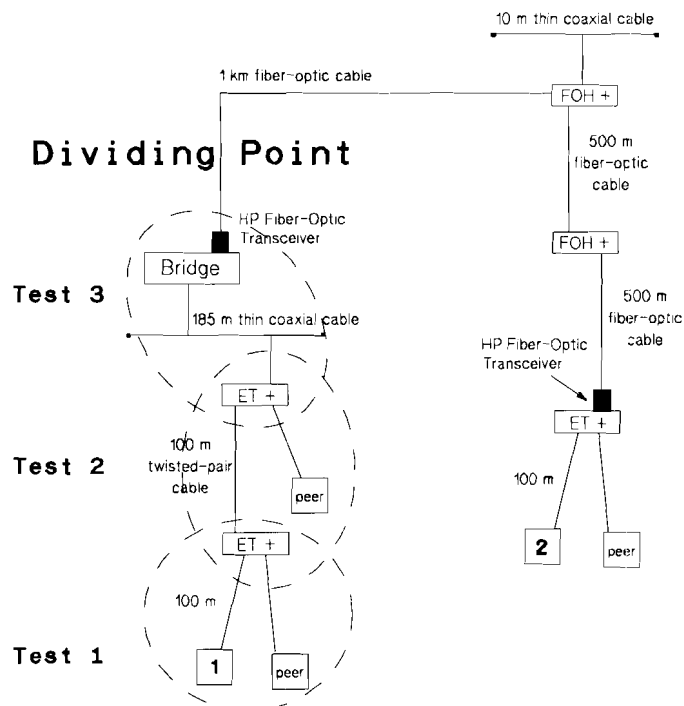
Begin by running a remote node test between node 1 and node 2. (A remote node test means that test packets can be sent from one node to the other.) Make sure the network operating system (Novell NetWare or 3Com 3+Open, for example) is not loaded on the nodes to be tested.

Using the HP Support Disk (provided with every HP PC adapter card), run the **Test Link** command on node 1 and run the **Test Receiver** command on the node 2.

If the remote node test passes, you are finished with troubleshooting your network hardware. Since passing the remote node test indicates that node 1 can communicate with node 2 over the network hardware, the problem must be in the network software or in the application software. Use the diagnostic and troubleshooting tools provided by your network software and/or your application software.

Testing Each Communication Path

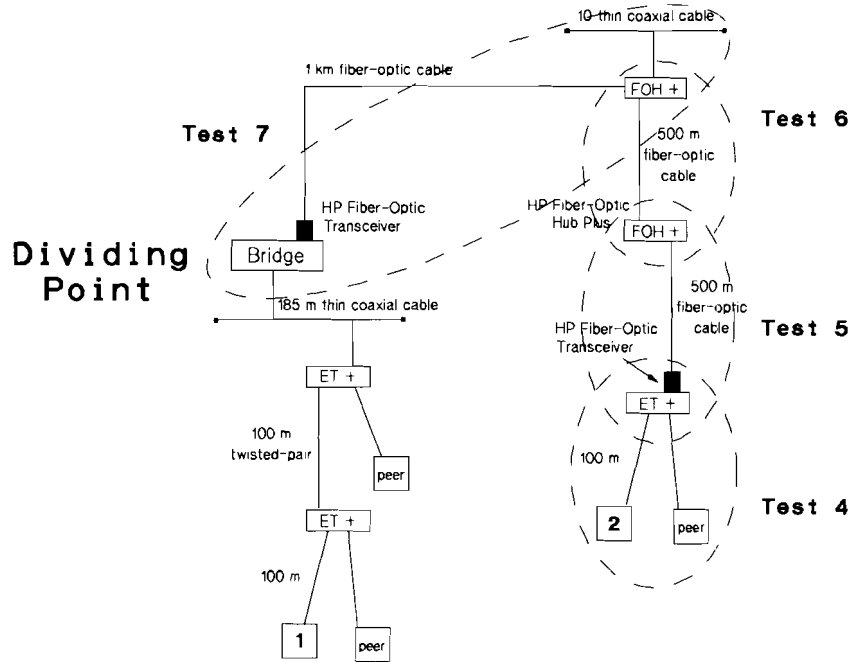
If the remote node test between node 1 and node 2 fails, then the objective at this point is to test the various communication paths (circled in dotted-line) starting from node 1 and moving up towards the bridge. (Since there is a bridge in the path between node 1 and node 2, it is used as a dividing point in the network.)



-
- Test 1** Run a remote node test between node 1 and a peer computer in its subnetwork. Using the HP Support Disk, execute the Test Link command on node 1 and execute the Test Receiver command on the peer computer.
- Test 2** Test the communication path between two hubs. You can do this in one of three ways:
- Establish a console interface session on one hub. Execute the testlink command (TE) to the other hub. (This method applies to the HP EtherTwist Hub Plus or HP Fiber-Optic Hub Plus only.)
 - Using HP OpenView Hub Manager, run the remote node test as described under the Diagnose menu. (This method applies to the HP EtherTwist Hub Plus or HP Fiber-Optic Hub Plus only.)
 - Run a remote node test between node 1 and a peer computer that is connected to the other hub. This isn't exactly a direct test between two hubs, but if this test passes, you will know that the communication path between the two hubs is OK. (You might use this method if you don't have HP OpenView Hub Manager, or a terminal handy. This step would apply to HP EtherTwist hubs that cannot be managed by Hub Manager.)
- Test 3** Test the communication path between a hub and a bridge. You can do this in one of four ways:
- Establish a console port session on the hub. Execute the testlink command (TE) to the bridge. (This method applies to the HP EtherTwist Hub Plus or HP Fiber-Optic Hub Plus only.)
 - Using HP OpenView Hub Manager, perform the remote node test as described under the Diagnose menu.
 - Establish a console port session on the bridge. Execute the testlink command (TE) to the hub.
 - Using HP OpenView Bridge Manager, run the remote node test as described under the Diagnose menu. (This method applies to the HP EtherTwist Hub Plus or HP Fiber-Optic Hub Plus only.)

If the systematic communication tests from node 1 to the bridge passes, then you know that the network hardware located on the left-side of the bridge is operational.

Now test the various communication paths (circled in dotted-line) starting from node 2 and moving up towards the bridge. You can also start testing from the bridge and move towards node 2. However, problems are likely to be found closer to the computer where changes can frequently occur.

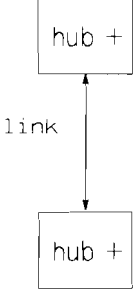
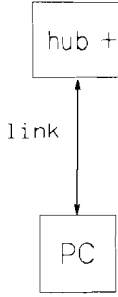
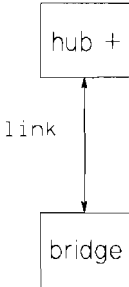
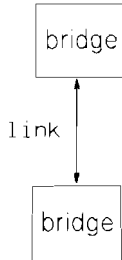


- Test 4** Run a remote node test between node 2 and a peer computer in its subnetwork as described in test 1.
- Test 5** Test the communication path between two hubs as described in test 2.
- Test 6** Test the communication path between two hubs.
- Test 7** Test the communication path between a hub and a bridge as described in test 3.

The following chart summarizes the methods for testing the link between two network devices. Detailed information on how to run diagnostic tests and to interpret the test results is provided in the individual product manuals.

Non-disruptive Diagnostic Tests

(links: twisted-pair, fiber-optic, or coaxial)

| | |
|---|--|
|  | <ul style="list-style-type: none"> - Initiate console port session on one hub. Execute testlink command (TE) to the other hub. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> - Log onto a network management station. - Run a remote node test as described under the Diagnose menu using Hub Manger. |
|  | <ul style="list-style-type: none"> - Using support disk, execute Test Link command on PC to hub. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> - Log onto a network management station. - Run a remote node test as described under the Diagnose menu using Hub Manger. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> - Using support disk, execute Testlink Receiver command on PC. - Initiate console port session on the hub. Execute the testlink command (TE) to the PC. |
|  | <ul style="list-style-type: none"> - Initiate console port session on the hub. Execute testlink command (TE) to the bridge. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> - Initiate console port session on the bridge. Execute testlink command (TE) to the hub. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> - Log onto a network management station. - Run a remote node test as described under the Diagnose menu using Hub Manger. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> - Log onto a network management station. - Run a remote node test as described under the Diagnose menu using Bridge Manager. |
|  | <ul style="list-style-type: none"> - Initiate console port session on one bridge. Execute testlink command (TE) to the other bridge. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> - Log onto a network management station. - Run a remote node test as described under the Diagnose menu using Bridge Manager. |





















Systematic Troubleshooting (Disruptive)

After performing non-disruptive testing, you may need to perform some disruptive tests to further pin point the network problem. These are self-tests and loopback tests of the components and they usually require that you momentarily disrupt the network. To perform these tests, you will need the:

- HP Extended LAN Troubleshooting Kit, HP 28689B (includes various loopback connectors for the HP EtherTwist family of network products.) Note that the pin-outs for loopback connectors can be found in the appendix of each product manual.
- HP Wire Test Instrument, HP 28687A (for testing twisted-pair cable.)
- HP Optical Loss Test Set, HP 8140A (for testing fiber-optic cable.)
- The HP Support Disk (included with all HP PC LAN adapter card products.)

The following chart shows the loopback connectors used with the HP EtherTwist family of network products.

Loopback Connectors for HP EtherTwist Family of Network Products

| | | |
|--|---|---|
| <p>10:10 LAN Bridge</p>  BNC  console port  AUI | <p>Fiber-Optic Hub Plus</p>  fiber-optic  BNC  console port  AUI | <p>ThinLAN Transceiver</p>  BNC |
| <p>Remote Bridge</p>  BNC  console port  AUI  V.35 | <p>EtherTwist Hubs</p> <ul style="list-style-type: none"> - HP 28684A - HP 28688A  BNC  50-pin twisted-pair  AUI <hr/> <ul style="list-style-type: none"> - HP 28688B - HP 28699A  console port  console port | <p>Fiber-Optic Transceiver</p>  fiber-optic |
| <p>TEST4_gal</p> | <p>PC LAN Adapters:</p> <ul style="list-style-type: none"> - HP EtherTwist Family - ThinLAN  8-pin twisted-pair  BNC | |

Note: The fiber-optic loopback connector is not included in the HP Extended LAN Troubleshooting Kit, HP 28689B. It can be ordered separately, HP part number 5041-3738.

The following chart is a quick reference on how to perform a self-test and loopback test on each device of the HP EtherTwist family of network products. For details on how to perform the tests and how to interpret the test results, refer to the individual product manuals.

Disruptive Diagnostic Tests

| HP Network Product | Internal Self-Test (tests internal circuitry) | Testing the Ports (tests transmit and receive circuitry) |
|---|---|---|
| PC LAN Adapter Cards: – HP EtherTwist Family – ThinLAN | – Execute Test Card command from the support disk. | – Attach the loopback connector. – Execute Loopback Test command from the support disk. |
| HP EtherTwist Hubs: – HP 28684A – HP 28688A | Initiate self-test in one of three ways: 1. Cycle power on the hub. 2. Execute the reset command (RE) from the hub console interface. 3. Run self-test under the Diagnose menu from Hub Manager. | – Attach the loopback connectors to any port(s) you wish to test. – Execute the loopback command (LO) from the hub console interface. |
| HP EtherTwist Hubs: – HP 28688B – HP 28699A | Initiate self-test in one of three ways: 1. Cycle power on the hub. 2. Execute the reset command (RE) from the hub console interface. 3. Run self-test under the Diagnose menu from Hub Manager. | Attach a known good cable to the port and choose one of the following ways to run a test between the hub and an addressable device connected at the other end of the cable: 1. Execute the testlink command (TE) from the hub console interface. 2. Execute the ping command (PI) from the hub console interface. 3. Use Hub Manager to test the link. |
| Hub – Fiber-Optic Hub Plus | Initiate self-test in one of three ways: 1. Cycle power on the hub. 2. Execute the reset command (RE) from the hub console interface. 3. Run self-test under the Diagnose menu from Hub Manager. | – Attach the loopback connectors to any port(s) you wish to test. – Execute the loopback command (LO) from the hub console interface. |

| HP Network Product | Internal Self-Test (tests internal circuitry) | Testing the Ports (tests transmit and receive circuitry) |
|--|---|---|
| Transceivers: – EtherTwist – Fiber-Optic – ThinLAN | No internal self-test. | <ol style="list-style-type: none"> 1. Enable the transceiver's external Loopback Test switch.* 2. For transceiver attached to HP 28684A/HP 28688A, follow the same instructions for testing hub ports. 3. For transceiver attached to HP 28688B/HP 28699A, follow the same instructions for testing hub ports. 4. For transceiver attached to HP fiber-optic hubs, follow the instructions for testing hub ports. 5. For transceiver attached to HP bridges, attach a loopback connector and execute console interface reset command (RE). <p>* Remember to disable the Loopback Test switch when you are done with the test.</p> <p>(No loopback test on HP 28685A EtherTwist Transceiver.)</p> |
| | Testing the Bridge Only | Testing the Bridge and LANs |
| Bridges: – 10:10 LAN – Remote | <ol style="list-style-type: none"> 1. Attach the bridge's loopback connectors to Port 1 and Port 2.* 2. Initiate self-test in one of four ways: <ul style="list-style-type: none"> • Cycle power on the bridge. • Press the RESET button on back of the bridge. • Execute the reset command (RE) from the bridge console interface. • Run self-test under the Diagnose menu from Bridge Manager. | <ol style="list-style-type: none"> 1. The bridge is attached to LANs on Port 1 and Port 2.* 2. Follow the same instructions for initiating self-test on the bridge. <p>* Remember, port 1 of the bridge has two connectors (AUI and BNC) to choose from. Only one can be used at any time. (Choose only one to test first and rerun the test if you wish to test the other.)</p> |

In addition to running diagnostic tests on the individual network products, you can test individual cable segments.

Twisted-pair cable test. Use the HP 28687A Wire Test Instrument to take these measurements:

- continuity
- crosstalk
- attenuation
- burst noise

Fiber-optic cable test. Use a fiber-optic power meter (HP 8140A Optical Loss Test Set) to check that cable attenuation, from end-to-end is less than the optical budget specification for your fiber-optic cable. The optical budget for 62.5/125 μm fiber is 10 dB and the optical budget for 50/125 μm fiber is 6 dB for HP fiber-optic products.

Technical Reference Guide

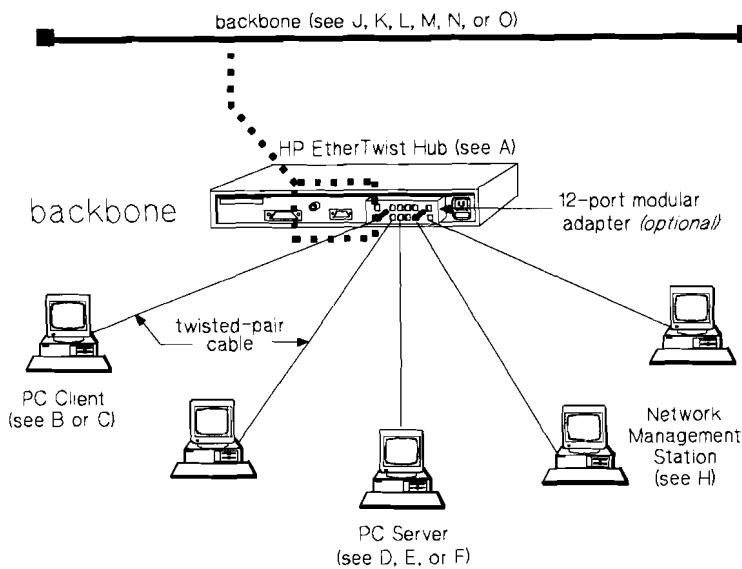
Ordering Information



HP EtherTwist Networks

Ordering Guide

Workgroup LAN



To create an HP EtherTwist network, the following items are needed:

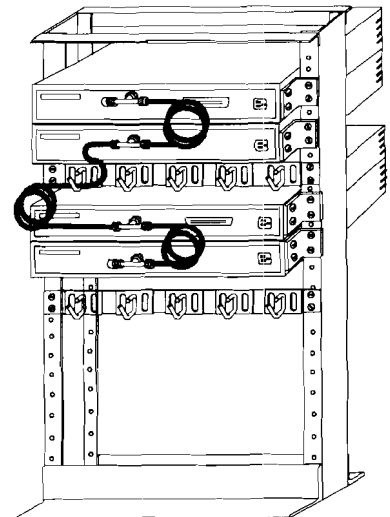
- at least one hub,
- at least one server,
- clients,
- interface cards or HP EtherTwist transceivers for all system connections, and
- twisted-pair cabling.

The letters referenced on the illustration correspond to the ordering sections that follow.

The HP EtherTwist family of network devices fits neatly and securely in a 19-inch equipment rack. The illustration shows a configuration with:

- 19-inch equipment rack.
- Cable guide.
- Mounting brackets.

The illustration also shows thin coaxial connections between EtherTwist devices creating a virtual extended backplane. See section J for ordering details.



| Product Number | Description |
|---|---|
| A. What you need to order for a single hub subnetwork. | |
| 28684A* | EtherTwist Hub, Hub Plus, or Hub Plus/48. |
| 28688B* or 28699A* | Includes hub, documentation, rack-mount hardware, AUI retainer. |
| 28638A (optional) | 12-port Modular Adapter for Hub (1 for each 50-pin connector on the hub). Includes adapter for 50-pin connector to twelve 8-pin jacks, documentation. <i>Note:</i> This modular adapter is not included with the EtherTwist hubs. |
| B. What you need to order to connect one PC AT client to the LAN. | |
| 27245A* or 27247A* | EtherTwist Adapter Card/8 or Adapter Card/16. Includes adapter card, Support Disk with LAN drivers and diagnostic tool, documentation. |
| 27267A* (optional) | EtherTwist Adapter Card/8 6-pack. Includes 6 8-bit ISA adapter cards, 1 set of documentation and Support Disk. |
| 27269A* (optional) | EtherTwist Adapter Card/16 6-pack. Includes 6 16-bit ISA adapter cards, 1 set of documentation and Support Disk. |
| — | Qualified twisted-pair cable and connectors (see item K). |
| — | Network Operating System (NOS) client software. |
| — | Must have one hub twisted-pair port available. |
| C. What you need to order to connect one PC Micro Channel client to the LAN. | |
| 27246A* | EtherTwist Micro Channel Adapter Card/16. Includes adapter card, Support Disk with LAN drivers and diagnostic tool, documentation. |
| — | Qualified twisted-pair cable and connectors (see item K). |
| — | Network Operating System (NOS) client software. |
| — | Must have one hub twisted-pair port available. |
| D. What you need to order to connect one PC AT server to the LAN. | |
| 27247A* | EtherTwist PC Adapter Card/16. Includes adapter card, Support Disk with LAN drivers and diagnostic tool, documentation. |
| — | Qualified twisted-pair cable and connectors (see item K). |
| — | Network Operating System (NOS) server software. |
| — | Must have one hub twisted-pair port available. |
| E. What you need to order to connect one EISA PC server to the LAN. | |
| 27248A | EtherTwist EISA Adapter Card/32. Includes adapter card, Support Disk with LAN drivers and diagnostic tool, documentation. |
| — | Qualified twisted-pair cable and connectors (see item K). |
| — | Network Operating System (NOS) server software. |
| — | Must have one hub twisted-pair port available. |

* Order appropriate language and line cord option (see item P).

| Product Number | Description |
|----------------|-------------|
|----------------|-------------|

F. What you need to order to connect one PC Micro Channel server to the LAN.

- 27246A* EtherTwist Micro Channel Adapter Card/16.
Includes adapter card, Support Disk with LAN drivers and diagnostic tool, documentation.
- Qualified twisted-pair cable and connectors (see item K).
- Network Operating System (NOS) server software.
- Must have one hub twisted-pair port available.

G. What you need to order to connect one system LAN card (with AUI port) to the LAN.

- 28685A EtherTwist Transceiver.
Includes transceiver (medium attachment unit), documentation.
Does not include AUI cable.
- Qualified twisted-pair cable and connectors (see item K).
- Network Operating System (NOS).
- AUI cable (*optional*).
- Must have one hub twisted-pair port available.

H. What you need to order for one PC-based hub management station.

- 27245A, EtherTwist LAN Adapter Card.
- 27246A, Includes adapter card, Support Disk with LAN drivers and diagnostic tool,
- 27247A documentation.
- or
- 3rd party See list of tested 3rd party LAN adapter cards in the “Network Management Question
LAN and Answer” section of this technical reference guide.
adapter
card
- 28686C HP OpenView Hub Manager software.
Includes Hub Manager disk, HP OpenView Windows disks, hub manager training
disks, HP IP software, documentation.
- MS-DOS 3.3 or later.
- MS Windows 3.0 or later.
- Personal computer (with at least 2 Mbytes of RAM), color monitor, and mouse.
- RS-232 cable for console port connection to a hub (see section I).
Used to configure the IP address of the hub(s) to be managed.

* Order appropriate language and line cord option (see item P).

| Product Number | Description |
|----------------|-------------|
|----------------|-------------|

I. What you need to order for a console port connection to the EtherTwist hubs.

For direct terminal connections:

| | |
|----------------------|--|
| 13242G, 40242G | 25-pin male to 25-pin male cable. |
| 13242H | 25-pin male to 25-pin female cable. |
| 24542G | 25-pin male to 9-pin female cable. |
| 92221P | 9-pin male to 25-pin male (for use with HP 110 portable computer) cable. |
| BlackBox # EVNBPC | 25-pin male to 9-pin female cable. |
| Tandy # 26-1496 | 25-pin male to 25-pin female null modem adapter (for use with a straight through modem cable). |

For modem connections:

| | |
|------------------------------|--|
| 13242M, 13242N, 17355M | 25-pin male to 25-pin male straight through modem cable. |
| 31391A | 25-pin male to 25-pin female straight through modem cable. |

J. What you need to order for “racking and stacking” your HP EtherTwist hubs and other HP network devices (fiber-optic hub plus, LAN bridge, remote bridge).

| | |
|---|---|
| 46298D | 19-inch free-standing equipment rack. Can accommodate up to 48 EtherTwist Hubs or Hub Pluses, or up to 24 Hub Plus/48s. |
| 5957-8467 <i>(optional)</i> | Floor bolt set. Bolts rack to concrete floors. |
| 35199D <i>optional</i> | 19-inch cable guide (height=1.75 inches). Includes 5 metal rings for keeping cables organized. Order 1 cable guide for every 2 or 3 hubs in the rack. |
| — | Hub brackets (ship with hubs). Used for hanging hubs in 19-inch rack. |
| 92214U | Thin coaxial cable assembly. Includes 0.5 meter thin coax, 1 “T” connector, 1 50-ohm terminator. Order 1 cable for each hub in the rack. |
| 92227P | Thin coaxial 50-ohm terminator pair. Order 1 pair for one thin coaxial backbone (not needed if 92214U cables ordered). |
| 28638A <i>optional</i> | 12-port Modular Adapter. Includes adapter for 50-pin connector to twelve 8-pin jacks. Used to connect 2-, 3-, or 4-pair twisted-pair cables with 8-pin (RJ-45) plugs directly to the hub. Order 1 for each hub in the rack (order 4 for each Hub Plus/48 in the rack). |
| 92214R, 92214S, 92214T <i>optional</i> | 25-pair cable with male 50-pin connectors on each end (5 feet, 10 feet, 25 feet, respectively). Used to connect hub’s 50-pin connector to a pre-wired cross-connect block or patch-panel block. Order 1 cable for each Hub or Hub Plus in the rack (order 4 cables for each Hub Plus/48 in the rack). |

* Order appropriate language and line cord option (see item P).

| Product Number | Description |
|----------------|-------------|
|----------------|-------------|

K. Additional support and ancillary products for use with HP EtherTwist networks.

- 28689B EtherTwist Troubleshooting Kit (*order one per installation*).
Includes 50-pin loopback connector, AUI loopback connector, RS-232 loopback connector, 8-pin loopback connector, BNC loopback connector, and V.35 loopback connector.
- 28687A Wire Test Instrument.
Includes 12 loopback hoods, one 12-port modular adapter, documentation.

Twisted-Pair Cables and Connectors:

- 92268A 4-meter twisted-pair cable.
Includes 8-pin modular plugs on each end.
- 92268B 8-meter twisted-pair cable.
Includes 8-pin modular plugs on each end.
- 92268C 16-meter twisted-pair cable.
Includes 8-pin modular plugs on each end.
- 92268D 32-meter twisted-pair cable.
Includes 8-pin modular plugs on each end.
- 92268N 300-meter twisted-pair cable (no connectors, cut to length).
- 92268P 8-pin modular plugs (package of 25).
- 92268J 8-pin modular wall jack (package of 12).
- 92268S 6-pin to 8-pin adapter cable (5 meters long).
- 92268T 8-pin modular plug crimp tool.
Includes 25 8-pin modular plugs.
- 92214W Crossover cable with coupler.
Includes 8-pin modular plugs on each end (20 cm long).

Note: *For other suitable twisted-pair cables, see the "Cabling" section of this Technical Reference Guide .*

AUI Cables:

- 92264D 1-meter thin AUI cable, terminated.
Includes 1 male and 1 female connector. Outer jacket material made of PVC.
- 92254J 5-meter thin AUI cable, terminated.
Includes 1 male and 1 female connector. Outer jacket material made of PVC.
- 92254A–D 6-, 12-, 24-, 48-meter thick AUI cables, terminated.
Includes 1 male and 1 female connector. Outer jacket material made of FEP Teflon.
- 92254E–H 6-, 12-, 24-, 48-meter thick AUI cables, terminated.
Includes 1 male and 1 female connector. Outer jacket material made of PVC.

Thin Coaxial Cables:

- 92227A–H 1-, 2-, 4-, 8- 16- 32- 64-, 128 meter thin coaxial cables, terminated.
Outer jacket material made of PVC.
- 92227S 300-meter thin coaxial cable, unterminated.
Outer jacket material made of PVC.
- 92227T 100-meter thin coaxial cable, unterminated.
Outer jacket material made of FEP (Teflon).
- 92227U 300-meter thin coaxial cable, unterminated.
Outer jacket material made of FEP (Teflon).

* Order appropriate language and line cord option (see item P).

| Product Number | Description |
|----------------|-------------|
|----------------|-------------|

**K. Additional support and ancillary products for use with HP EtherTwist networks.
(continued)**

Thick Coaxial Cables:

| | |
|--------|--|
| 92253A | 23.4-meter thick coaxial cable, unterminated. Outer jacket material made of FEP (Teflon). |
| 92253B | 23.4-meter thick coaxial cable, terminated. Outer jacket material made of FEP (Teflon). |
| 92253C | 117-meter thick coaxial cable, unterminated. Outer jacket material made of FEP (Teflon). |
| 92253D | 500-meter thick coaxial cable, unterminated. Outer jacket material made of FEP (Teflon). |
| 92253E | 23.4-meter thick coaxial cable, unterminated. Outer jacket material made of PVC. |
| 92253F | 23.4-meter thick coaxial cable, terminated. Outer jacket material made of PVC. |
| 92253G | 117-meter thick coaxial cable, unterminated. Outer jacket material made of PVC. |
| 92253H | 500-meter thick coaxial cable, unterminated. Outer jacket material made of PVC. |

Coaxial Connectors:

| | |
|--------|--|
| 30241B | Thick coaxial cable tap. |
| 92253J | Package of 4 "N" connectors. |
| 92253K | Package of 2 barrel connectors and 2 barrel insulators. |
| 92253L | Package of 1 non-grounded 50-ohm terminator, 1 grounded 50-ohm terminator, and 1 insulator. Used with thick coaxial cable. |
| 92256E | Thick coaxial cable surge protector. |
| 92229B | Crimp tool for "N" connectors. Requires die found in 92256A product. |
| 92256A | Thick coaxial cable installation tool kit. Includes coaxial cable stripper and hex crimp die for 92229B crimp tool. |
| 92227L | Package of 2 crimp-on style BNC connectors. |
| 92227M | Thin coaxial cable installation tool kit. Includes cable stripper and crimp tool. |
| 92227N | "T" connector with insulating cover. Includes 1 connector. |
| 92227P | Thin coaxial 50-ohm terminator pair. |
| 92227Q | Thin coaxial loopback connector. Includes 1 "T" connector, 1 50-ohm terminator pair, and insulating cover. |
| 92227R | Insulating cover for "T" connector. |

* Order appropriate language and line cord option (see item P).

| Product Number | Description |
|----------------|-------------|
|----------------|-------------|

L. Network documentation and product data available from HP for EtherTwist networks.

- 5959-2208 *HP SiteWire Twisted-pair Cabling Installation Guide*
 - 5955-7680 *HP LAN Cable and Accessories Installation Manual*
 - 5091-0665E *LAN Topologies for HP EtherTwist Family of Products*
 - 5091-0666E *Technical Reference Guide for Site LANs and Multisite LANs*
-

M. What you need to order for thin coaxial backbone connections to other network devices that have no thin coax (BNC) port but do have an AUI port.

- 28641B ThinLAN transceiver.
 - 92227N "T" connector.
 - Thin coaxial cable.
 - AUI cable (optional).
-

N. What you need to order for ThickLAN backbone connections to the hub and other network devices.

- 30241A HP Thick MAU (transceiver). Includes coaxial cable tap. (Older thick MAUs with date code D-3017 or earlier cannot be used with HP 28699A Hub Plus/48 or HP 28688B Hub Plus. Newer thick MAUs with date code F-3105 or later can be used with these products.)
 - Thick coaxial cable.
 - AUI cable.
-

O. What you need for fiber optic backbone connections to the hub and other network devices.

- 28683A Fiber-Optic Transceiver.
 - AUI cable (optional).
-

* Order appropriate language and line cord option (see item P).

| Product Number | Description |
|----------------|-------------|
|----------------|-------------|

P. Language and Line Cord Options.

HP EtherTwist Hubs

| <i>Option</i> | <i>Language</i> | <i>Line Cord</i> |
|---------------|-----------------|------------------|
| ABA | English | U.S. |
| ABB | English | Europe |
| ABC | English | U.S. |
| ABD | English | Europe |
| ABE | English | Europe |
| ABF | English | Europe |
| ABM | English | Latin America |
| ABP | English | Switzerland |
| ABQ | English | Switzerland |
| ABU | English | United Kingdom |
| ACE | English | Denmark |
| ABZ | English | Europe |
| ABG | English | Australia |
| ACF | English | Japan |

HP EtherTwist Adapter Cards (HP 27245, HP 27246)

| <i>Option</i> | <i>Language</i> | <i>Line Cord</i> |
|---------------|-----------------|------------------|
| ABA | English | not applicable |
| ABD | German | not applicable |
| ABE | Spanish | not applicable |
| ABF | French | not applicable |
| ABZ | Italian | not applicable |

HP 27247A EtherTwist Adapter Card/16

| <i>Option</i> | <i>Language</i> | <i>Line Cord</i> |
|---------------|-----------------|------------------|
| ABA | English | not applicable |

HP 27248A EtherTwist EISA Adapter Card/32

No options available.

HP 28687A Wire Test Instrument

| <i>Option</i> | <i>Language</i> | <i>Line Cord</i> |
|---------------|-----------------|---|
| none | English | appropriate line cord ships automatically |

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