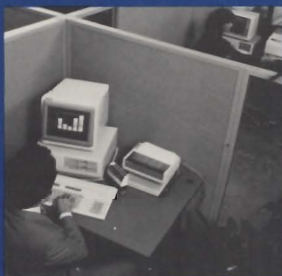


# HEWLETT-PACKARD



---

## HP 28663A StarLAN 10 Hub Installation Guide

---

**HP Computer Museum**  
**[www.hpmuseum.net](http://www.hpmuseum.net)**

**For research and education purposes only.**

# HP 28663A StarLAN 10 Hub Installation Guide



**HEWLETT  
PACKARD**

# Notice

---

**Hewlett-Packard makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.** Hewlett-Packard shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

© Copyright 1988, 1989, Hewlett-Packard Company.

This document contains proprietary information, which is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced or translated to another language without the prior written consent of Hewlett-Packard Company. The information contained in this document is subject to change without notice.

**Hewlett-Packard Company  
8000 Foothills Boulevard  
Roseville, CA 95678 U.S.A.**

## Printing History

---

Edition 1 . . . . . April 1988  
Edition 2 . . . . . October 1988  
Edition 3 . . . . . January 1989

# Safety Considerations

---

## General

This product and related documentation must be reviewed for familiarization with safety markings and instructions before operation.

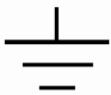
## Safety Symbols



Instruction manual symbol: the product may be marked with this symbol. This refers the user to the instruction manual in order to protect the product against damage.



Indicates hazardous voltages.



Indicates earth (ground) terminal (sometimes used in the manuals to indicate circuit common connected to grounded chassis).

---

## **Warning**

**The Warning sign denotes a hazard. It calls attention to a procedure or practice that, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a Warning sign until the indicated conditions are fully understood.**

---

---

## **Caution**

The Caution sign denotes a hazard. It calls attention to an operating procedure, or practice that, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Do not proceed beyond a Caution sign until the indicated conditions are fully understood and met.

---

---

**Warning****Safety Earth Ground**

**The HP 28663A StarLAN 10 Hub is a safety class I product and is provided with a protective earth terminal. An uninterruptible safety ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and must be secured against any unintended operation.**

**Power Distribution**

**This product and the network on which it is installed should be powered by the same power distribution system.**

**Servicing**

**Any servicing or repair of this product must be performed only by qualified personnel.**

---

# FCC Statement

---

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

If this equipment does cause interference to radio reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Re-orient the receiving antenna.
2. Relocate the computer with respect to the receiver.
3. Move the computer away from the receiver
4. Plug the computer in to a different outlet so that computer and receiver are on different branch circuits.
5. If necessary, the user may consult the dealer or an experienced radio/television technician for additional suggestions.



# VCCI Statement

---

## FOR JAPAN ONLY

This device is a Class 1 ITE (data processing equipment for use in industrial and commercial areas), and meets the VCCI standards for prevention of radio interference in industrial and commercial areas. The operation of this device in residential or adjacent areas may interfere with radio and television reception.

Use this device in accordance with its operating manual.

この装置は、第一種情報装置（商工業地域において使用されるべき情報装置）で商工業地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会（VCCI）基準に適合しております。

従って、住宅地域またはその隣接した地域で使用すると、ラジオ、テレビジョン受信機等に受信障害を与えることがあります。

取扱説明書に従って正しい取り扱いをして下さい。



# Preface

---

## What is in This Guide

This guide describes the HP 28663A StarLAN 10 Hub, tells how to install the hub and verify its operation, and provides information about troubleshooting and replacement parts. The chapters are entitled:

- *General Information*
- *Installation Procedures*
- *StarLAN 10 Connections*
- *Maintenance and Troubleshooting*

## If You Need Help

If you have questions about how to install your HP StarLAN Hub after reading this manual, use the telephone assistance program, HP HelpLine. You can reach the U.S./Canada HP HelpLine at the following toll-free number:

**1-800-858-8867**

The HP HelpLine is open Monday through Friday from 7 a.m. to 9 p.m. Eastern Standard Time.

When you call, a customer support coordinator arranges for an HP support engineer to return your call within two hours. There is a per incident charge for HP HelpLine services, unless you have a support contract with Hewlett-Packard. There is no charge for calls that result from a specific documentation defect or hardware design problem, or if an answer cannot be found.



# Contents

---

## Chapter 1: General Information

Product Description . . . . .	1-1
Physical Description . . . . .	1-3
Cable Connections . . . . .	1-4
AUI Port . . . . .	1-4
Twisted-pair Ports . . . . .	1-5
Switches . . . . .	1-5
LED Indicators . . . . .	1-9
Plug Module . . . . .	1-12
Identification . . . . .	1-13
Operation . . . . .	1-13
Signal Reception and Retransmission . . . . .	1-13
CSMA/CD Operation with Auto-segmentation . . . . .	1-14
Equipment Supplied . . . . .	1-15
Specifications . . . . .	1-16
Physical . . . . .	1-16
Environmental . . . . .	1-16
Electrical . . . . .	1-17
Related Documents . . . . .	1-17

## Chapter 2: Installation Procedures

Product Inspection . . . . .	2-1
Repacking the Product . . . . .	2-2
Storing the Product . . . . .	2-2
Site Preparation . . . . .	2-3
Setting the Voltage . . . . .	2-4

Setting the Switches . . . . .	2-6
Mounting the Hub . . . . .	2-7
Attaching Cables . . . . .	2-10
AUI Port . . . . .	2-10
50-pin Port . . . . .	2-12
Powering Up . . . . .	2-17
Verifying Proper Operation . . . . .	2-17

### **Chapter 3: StarLAN 10 Connections**

Computer to Hub . . . . .	3-3
LAN Card with Internal Transceiver to Hub via 12-port Modular Adapter . . . . .	3-3
LAN Card with External MAU to Hub via 12-port Modular Adapter . . . . .	3-4
LAN Card with Internal Transceiver to Hub via Cross-connect Block . . . . .	3-5
LAN Card with External MAU to Hub via Cross-connect Block . . . . .	3-6
Hub to Hub . . . . .	3-8
Hub to Hub via 12-port Modular Adapter . . . . .	3-8
Hub to Hub via Cross-connect Block . . . . .	3-9
Hub to Coaxial Cable . . . . .	3-11
Hub to Thick Coaxial Cable . . . . .	3-11
Hub to Thin Coaxial Cable . . . . .	3-12
Hub to Bridge . . . . .	3-13
Hub to Bridge via 12-port Modular Adapter . . . . .	3-14
Hub to Bridge via Cross-connect Block . . . . .	3-16
Hub to Bridge via Coaxial LAN Cable . . . . .	3-17

### **Chapter 4: Maintenance and Troubleshooting**

Loopback Test . . . . .	4-1
Self Test . . . . .	4-3

**Appendix A: 50-pin Connector**

Connections through 12-port Modular Adapter . . . . . A-2

Connections through 25-pair Cable . . . . . A-4

**Appendix B: AUI Connector**

**Appendix C: 8-pin Modular Connectors**

**Appendix D: StarLAN 10 Design Rules**

**Glossary**

**Index**

**90-day Limited Warranty Statement**

**Sales and Support Offices**





# General Information

---

This chapter:

- describes the product;
- lists the equipment supplied with the product;
- provides specifications for the product; and
- lists reference documents for further information.

## Product Description

The HP 28663A StarLAN 10 Hub is a ten megabit-per-second (Mbit/s), multiport repeater for a Local Area Network (LAN). The hub controls the flow of communication between equipment over twisted-pair cable and is capable of interconnecting up to 12 computers.

The HP StarLAN 10 hub provides 12 twisted-pair ports for connecting LAN equipment. The StarLAN 10 hub has two functions:

- it retimes and regenerates received signals; and
- it detects simultaneous signal transmissions (collisions) on the ports.

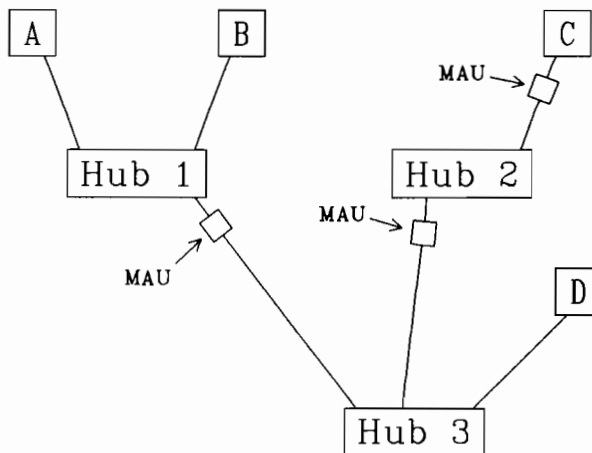
The StarLAN 10 hub also contains an Attachment Unit Interface (AUI) port which you can connect to baseband coaxial LAN cable or to another hub unit via a twisted-pair MAU (Medium Attachment Unit). Two StarLAN 10 hubs can be connected together either through the baseband coaxial LAN cable, or by connecting the AUI port of one

StarLAN 10 hub to a twisted-pair port of another StarLAN 10 hub using an HP 28664A Twisted-pair Medium Attachment Unit (MAU). Chapter 3 contains further information on making these connections.

At the time of this printing, the IEEE 802.3 Type 10BASE-T specification is currently being developed. The HP StarLAN 10 hub will conform to the specification when it becomes final. This specification defines a network, running over unshielded twisted-pair cabling, that has a maximum data transmission rate of ten megabits per second, and uses the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol for regulating traffic on the network.

There may be as many as four Starlan 10 hubs connected together in a path between two nodes (computers) on the network. Each of these hubs is capable of supporting as many additional work stations as there are available ports. Appendix D gives the configuration rules for HP StarLAN 10 networks.

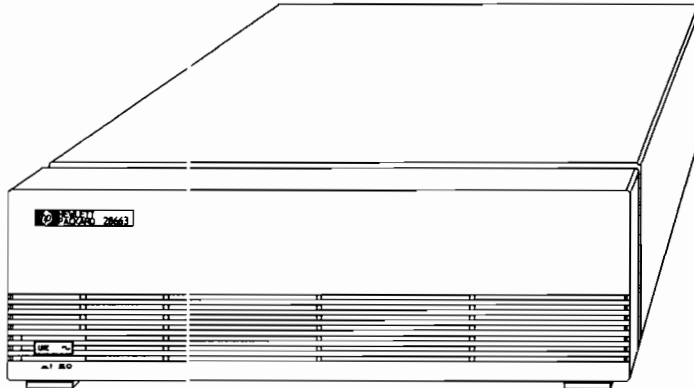
Figure 1-1 illustrates a typical small network containing computers (A, B, C, and D) and HP StarLAN 10 hubs.



**Figure 1-1. Typical StarLAN 10 Network**

# Physical Description

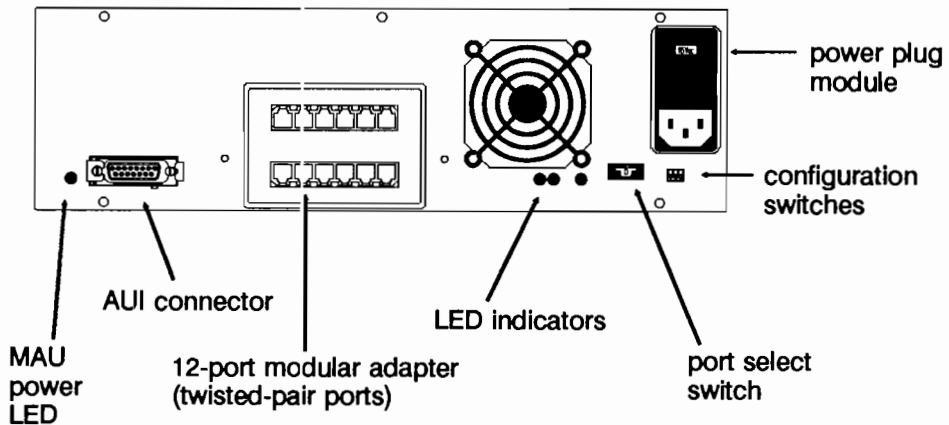
Figure 1-2 shows the front view of a StarLAN 10 hub.



**Figure 1-2. HP 28663A StarLAN 10 Hub**

The front panel contains the hub's power on/off switch.

Figure 1-3 shows the rear panel of the StarLAN 10 hub.



**Figure 1-3. Rear Panel of StarLAN 10 Hub**

The rear panel contains:

- one AUI port;
- one 50-pin connector (which supports 12 twisted-pair ports);
- one 12-port modular adapter (attached to the 50-pin connector);
- several light emitting diodes (LEDs) used to indicate network status, activity, and collision conditions;
- a rotary port select switch;
- three configuration switches; and
- a power plug module.

## Cable Connections

### AUI Port

The 15-pin D connector conforms to the IEEE 802.3 standard for connecting to an AUI cable. This port may be used to connect to:

- another StarLAN 10 hub, via an HP 28664A Twisted-pair Medium Attachment Unit (MAU), or
- a backbone (“thick”) coaxial LAN cable, via an HP 30241A MAU, or
- a thin coaxial LAN cable, via an HP 28641A ThinMAU.

Chapter 3 shows diagrams of these connections. A wiring diagram for the AUI port connector is provided in appendix B.

## Twisted-pair Ports

The 50-pin connector is labeled “PORTS 1 ... 12”. This connector funnels twelve twisted-pair port connections into the StarLAN 10 hub. Each port contains an internal transceiver for transmitting and receiving signals.

A specially-wired 12-port modular adapter is attached to the hub’s 50-pin connector. This adapter routes the pins of the 50-pin connector to the appropriate pins of twelve 8-pin modular jacks. The StarLAN 10 twisted-pair cabling then attaches to those 8-pin jacks via 8-pin modular plugs.

As an alternative, a standard cross-connect block can connect to the hub’s 50-pin connector via a 25-pair cable. The StarLAN 10 twisted-pair wiring is then punched down onto the appropriate pins of the cross-connect block. **This method can be used only if the wiring installation has been certified by the HP WireTest service.** See your HP service representative to arrange for the HP WireTest service. (Appendix A discusses pin assignments for cross-connect blocks. For additional information on using cross-connect blocks, refer to the *HP SiteWire Twisted-pair Cabling Installation Guide*, 5959-2208.)

Chapter 3 shows connection diagrams for both methods of connecting to the 50-pin connector.

## Switches

There is one switch on the front panel of the hub and four switches on the rear panel.

### LINE switch.

This switch is on the front panel of the hub. To turn on the hub’s power, push it in until it latches. To turn off the hub’s power, push it again and let it return to the out position.

When the setting of the SELF TEST switch (described below) is changed, the new setting does not take effect until the next time the LINE switch is turned on.

## PORT SELECT switch

This is a 16-position rotary switch on the rear panel of the hub. The positions are numbered from 0 to 15. In normal operation, this switch's setting determines what is indicated by the STATUS LED (described below). If the PORT SELECT switch is set to 0, the STATUS LED indicates whether any of the hub's ports has been segmented (automatically isolated from the rest of the network due to a problem). If the switch is set to a number from 1 to 12, the STATUS LED indicates whether the individual twisted-pair port of the same number has been segmented. If the switch is set to 13, the STATUS LED indicates whether the AUI port has been segmented. A switch setting of 14 or 15 has no meaning in normal operation.

If the hub is in self-test mode (as set by the SELF TEST switch, described next), the ACTIVITY, COLLISION, and STATUS LEDs (described below) indicate whether the ports pass the self test. If the PORT SELECT switch is set to 0, the LEDs indicate whether the hub as a whole passes the self test. If the switch is set to a number from 1 to 12, the LEDs indicate whether that particular twisted-pair port passes the self test. If the switch is set to 13, the LEDs indicate whether the AUI port passes the self test. If the switch is set to 14, the LEDs indicate whether the timers are operating correctly. If the switch is set to 15, all LEDs flash to indicate proper LED function.

If the hub is in loopback mode (as set by the LOOPBACK switch, also described below), the setting of the PORT SELECT switch determines which ports are being looped back. If the PORT SELECT switch is set to 0, all ports are looped back. **We recommend that you do not use this setting on an active network.** To prevent looping back on all nodes it is recommended that the rotary switch be set to the port in question **before** setting the loopback switch when troubleshooting. If the PORT SELECT switch is set to a number from 1 to 12, that particular twisted-pair port is looped back. If the PORT SELECT switch is set to 13, the AUI port is looped back. PORT SELECT switch settings of 14 and 15 have no meaning in loopback mode. The STATUS LED indicates the segmentation status regardless of whether the LOOPBACK switch is up or down.



## LOOPBACK switch

The LOOPBACK switch is a toggle switch in the cluster of three switches to the right of the PORT SELECT switch on the rear panel of the hub. In normal operation, no ports are looped back when the LOOPBACK switch is down. When the LOOPBACK switch is up, the port that is selected by the PORT SELECT switch has its input signals looped back to its output pins. All other ports continue to operate normally. **We recommend that you do not set the PORT SELECT switch to 0 while the LOOPBACK switch is up; this causes all ports to be looped back, which will jam the network.**

A port in loopback mode acts like a loopback connector for any twisted-pair wiring that is attached to it. Unlike a typical passive loopback connector, however, a port in loopback mode is active: any signal arriving at the input pins of the port is retimed and regenerated, and sent back through the output pins at full strength. Thus, an external loopback test signal from a computer can travel through a full 100 meters of twisted-pair cable to the hub, and be assured of having enough signal strength to travel back through the cable to the computer.

Chapter 4 covers the use of loopback mode more fully. The LOOPBACK switch has no meaning when the hub is in self-test mode.

## SELF TEST switch

The SELF TEST switch is a toggle switch in the cluster of three switches to the right of the PORT SELECT switch on the rear panel of the hub. When the SELF TEST switch is down, the hub operates normally. When the SELF TEST switch is up, the hub executes its self test continuously. The self test checks the internal operation of the hub circuitry and, when loopback connectors are attached to the AUI and 50-pin ports, checks the input/output operation of the ports as well. **Do not run the hub self test on an active network.**

Note that a change in the setting of the SELF TEST switch does not become effective until the next time the LINE switch is turned on.

When the hub is in self-test mode the **ACTIVITY**, **COLLISION**, and **STATUS LEDs** indicate the status of the test. The **PORT SELECT** switch (described above) controls whether the LEDs show the status of an individual port, the internal circuitry of the hub, or the hub as a whole.

Chapter 4 covers the hub self test more fully.

### **SQE TEST switch**

The **SQE** (signal quality error) **TEST** switch is a toggle switch in the cluster of three switches to the right of the **PORT SELECT** switch on the rear panel of the hub.

The **SQE TEST** switch only affects the **AUI** port and is used in conjunction with the **MAU** that is connected to this port. When the **SQE TEST** switch is in the down position, the **SQE** test signal (sent from the **MAU** attached to the **AUI** port of the hub) is masked out. When the switch is in the up position, the **SQE** test signal sent from an attached **MAU** is not masked out. If the attached **MAU** generates an **SQE** test signal, you should set the **SQE TEST** switch to the down position to enable masking of the **SQE** test signal.

If the hub connects to a **MAU** that does not send the **SQE** test you should set this switch in the up (masking disabled) position. This will give a very slight increase in performance.

In normal operation, **SQE** test masking is enabled when the switch is down; **SQE** test masking is disabled when the switch is up. In the up (no signal masking) position the **StarLAN 10** hub will treat any **SQE** test signal from a **MAU** as a collision.

**SQE** test masking should be enabled for networks that use **IEEE 802.3** protocol or **Ethernet version 2.0** protocol. For networks that use **Ethernet version 1.0** protocol, **SQE** test masking should be disabled (switch up). The **SQE TEST** switch has no meaning when the hub is in self-test mode.



## **Recommended Switch Settings**

The recommended switch settings for normal operation are “all switches down”. This means that the PORT SELECT switch should be set to 0, and the SELF TEST, LOOPBACK, and SQE TEST switches should all be set to the down position. These settings are appropriate for networks using IEEE 802.3 or Ethernet 2.0 protocol. Networks using Ethernet 1.0 protocol should have the SQE TEST switch set to up.

If your network uses HF28664A Twisted-pair MAUs, the same “all switches down” rule applies to the MAUs as well.

## **LED Indicators**

There are four LEDs (light-emitting diodes) on the rear panel. These indicate the status of network activities and various functions of the hub.

### **MAU PWR LED**

This is a green LED labeled “MAU PWR” to the left of the AUI port; it is normally on during operation. This indicates that power is available at the AUI cable connector. If this LED is not lit, either there is no power to the StarLAN 10 hub or the MAU power fuse (in the hub) is bad.

### **ACTIVITY LED**

This is a second green LED, marked “ACTIVITY” and located under the fan grill vent. In normal operation, this LED lights when the hub is receiving data. The intensity and duration of the light indicates the amount of traffic on the network. When this LED is flashing on and off very quickly, it can appear as if it is “on” all the time. At periods of very low network usage you may not be able to detect the illumination from this light.

When the hub is in self-test mode, this LED and the COLLISION and STATUS LEDs together indicate the state of the hub, as described in the section on “LED Indications in Self-test Mode”.

## **COLLISION LED**

This is a yellow LED, marked “COLLISION” and located under the fan grill vent. In normal operation, this LED lights when the hub detects a collision on the network (two packets of data transmitted or received on the network at the same time). The intensity and duration of the light indicates the number of collisions occurring between ports. This LED will stay lit for as long as collisions are occurring. At normal levels of activity on the network collisions are relatively infrequent; as a result, this light may be so dim that it can be difficult to see. In the unlikely event that this LED remains lit, there is probably a serious network problem such as a babbling node, or cable miswiring. The hub will segment off ports causing such problems.

When the hub is in self-test mode, this LED and the **ACTIVITY** and **STATUS** LEDs together indicate the state of the hub, as described in the section on “LED Indications in Self-test Mode”.

## **STATUS LED**

The **STATUS** LED is a red LED, marked “STATUS” and located under the fan grill vent. In normal operation, it indicates the segmentation status of the port selected by the 16-position port select switch. When the LED is on, it indicates that the selected port has been segmented (turned off due to a problem that would be detrimental to the network). When you set this switch to “0”, it indicates the overall network segmentation status of the StarLAN 10 Hub. When you set the switch to a number between 1 and 12, the **STATUS** LED indicates the state of the corresponding twisted-pair port (port 1 through port 12). When the switch is set to 13, the **STATUS** LED indicates the condition of the AUI port. The **STATUS** LED has no meaning when the **PORT SELECT** switch is set to 14 or 15 in normal operation.

When the hub is in self-test mode, this LED and the **ACTIVITY** and **COLLISION** LEDs together indicate the state of the hub, as described next.

## **LED Indications in Self-test Mode**

When the hub is in self-test mode, the **ACTIVITY**, **COLLISION**, and **STATUS** LEDs combine to indicate the state of the hub. One of the three LEDs blinks once per second, with the following meanings:

If the **PORT SELECT** switch is set to 0,

- **Green (ACTIVITY LED)** indicates that all parts of the hub pass the self test,
- **Yellow (COLLISION LED)** indicates that a majority of the ports pass the self test, however between 1 and 6 ports are not passing this test, and
- **Red (STATUS LED)** indicates that the majority of ports (between 7 and 13 ports) do not pass the self test.

If the **PORT SELECT** switch is set to a number between 1 and 12 (twisted-pair ports), or is set to 13 (AUI port),

- **Green (ACTIVITY LED)** indicates that the selected port passes the self test, and
- **Red (STATUS LED)** indicates that the selected port fails the self test.

If the port select switch is set to position 14 (timer test),

- **Green (ACTIVITY LED)** flashes indicate both tuners pass self test,
- **Yellow (COLLISION LED)** flashing indicates only one of the two on board tuners passes self test. These ports would not be automatically desegmented.
- **Red (STATUS LED)** flashing indicate that one timer has not passed self test and the condition of the other timer is unknown.

If the PORT SELECT switch is set to position 15,

- all three LEDs flash once per second to verify that they are working and that none are burned out.

## Plug Module

Power to the StarLAN 10 hub is provided through the power plug module on the rear panel. You can set the StarLAN 10 hub for either 115 volt (ac) or 230 volt (ac) operation at this plug.

A fuse in this module provides protection from excessive electrical current. The StarLAN 10 hub operates on single phase ac line input with frequencies from 50 Hz to 60 Hz. Refer to chapter 2 of this manual for further information on voltage selection and fuse replacement.

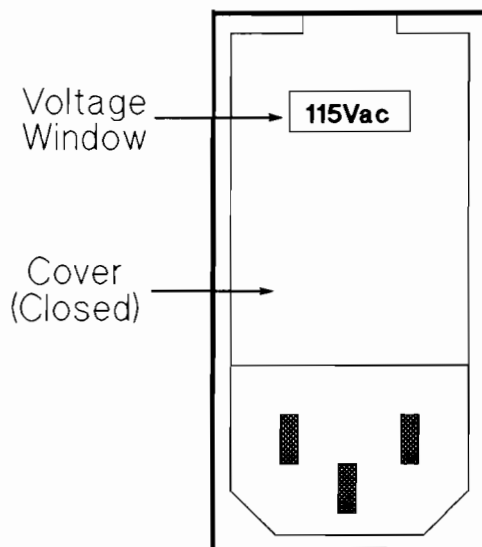


Figure 1-4. Plug Module

## Identification

The StarLAN 10 hub can be identified by the product number label (28663A) on the front panel. Please refer to this number when you are communicating with Hewlett-Packard about this equipment.

## Operation

The StarLAN 10 hub acts as a multiport repeater by transferring any received data packets from one port to all other ports. The StarLAN 10 hub repeats any data received without interpreting the contents of the packets; therefore, you can use a StarLAN 10 hub in networks using either IEEE 802.3 or Ethernet protocol.

## Signal Reception and Retransmission

The StarLAN 10 hub contains one transceiver for each port. Thus there are 12 twisted-pair transceivers and one AUI transceiver.

Each of the transceivers performs two functions for its port.

- receives incoming data packets, and
- retransmits retimed data to the network.

There is a possibility that data packets can be degraded by noise conditions on the network. When incoming data signals are received, they are sent to the controller's receive data bus. This bus is directly connected to the data controller where special circuitry filters any irrelevant signals (noise) that could corrupt the data. The clean signals are retransmitted on the data transmit bus.

When a signal is received by the AUI port or by a twisted-pair port, the controller senses the receiving port and disables that port's transmitter driver. The transmitters of the other ports remain enabled. These transmitters immediately retransmit the received data at proper signal levels and rates.

## **CSMA/CD Operation with Auto-segmentation**

The transceivers in the StarLAN 10 hub follow the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol for network access in accordance with the IEEE 802.3 standard.

When two or more nodes transmit data simultaneously, a situation known as a collision occurs. When the StarLAN 10 hub detects this condition, it immediately stops repeating packets and starts transmitting a collision signal. This signal remains in effect until all twisted-pair ports become idle or disabled.

Collision detection on a coaxial LAN cable (IEEE 802.3 or Ethernet) is slightly different than at the twisted-pair ports. If the coaxial cable is the only segment reporting a collision to the hub, the hub will terminate the collision signal to the AUI port, but will continue with this signal to the twisted-pair ports. This avoids repeater lockup in a multi-repeater network.

If the hub detects an abnormally long transmission (longer than five milliseconds) at a particular port, it automatically segments (disables) that port to prevent it from overloading the network. The hub periodically checks that port to see whether it is still behaving abnormally. As soon as the hub sees normal activity at that port, the port is re-enabled. While the port is segmented, the STATUS LED on the rear panel of the hub is turned on (if the PORT SELECT switch is set to 0 or to the number of the segmented port).

# Equipment Supplied

The HP 28663A product contains the following items:

Quantity	Part Number	Description
1	28663-60002	StarLAN 10 Hub
1	28663-63001	AUI Loopback Connector
1	28663-63002	50-pin Loopback Connector
2	0380-1987	Standoff for 50-pin Connector
1	0362-0819	MAU Coax Tap
1	28645-63003	AUI cable (5 meters)
2	5001-5602	Wall Mounting Bracket
1	28663-90001	Installation Manual (this manual)
1	5959-2258	StarLAN 10 Troubleshooting Manual
1	30241-60102	MAU assembly

Also included is one of the following AC power cards.

8120-1351	United Kingdom Power Cord
8120-1369	Australian Power Cord
8120-1289	European Power Cord
8120-1378	United States/Canada 125V Power Cord
8120-0698	United States/Canada 250V Power Cord
8120-2104	Swiss Power Cord
8120-2956	Danish Power Cord
8120-4753	Japanese Power Cord
8120-4211	South Africa Power Cord

The following options apply to this product:

Option	Description
#241	Deletes MAU and tap and 5-meter AUI cable
#242	Deletes thick MAU and Adds a thin MAU

# Specifications

## Physical

Width: 32.5 cm (12.8 in.)  
Depth: 32.5 cm (12.8 in.)  
Height: 10.0 cm (3.9 in.)  
Weight: 4.9 kg (10.8 lb)

## Environmental

### Operating

Temperature: 0° to +55°C (+32° to +131°F)  
Relative Humidity: 5% to 95% @ 40°C (104°F) non-condensing  
Altitude: 4.6 km (15,000 feet)

### Non-operating

Temperature: -40° to +70°C (-67° to +158°F)  
Relative Humidity: 90% @ 65°C (149°F) non-condensing  
Altitude: 15.3 km (50,000 feet)

### Electromagnetic

Conforms to VDE Level B and FCC Class A for radiated and conducted interference.



## Electrical

### Power Consumption

Voltage (ac):	115 volts (nominal)	230 volts (nominal)
Current:	0.5 amps (max)	0.25 amps (max)
Power:	40 watts (max)	40 watts (max)
Frequency:	48–66 Hz	

### Cable Interface

Signal levels at the AUI port conform to the IEEE 802.3 standard.

## Related Documents

*HP 28664A Twisted-pair MAU Installation Guide, 28664-90001*

*HP 27236A StarLAN 10 Interface Card Installation Guide, 27236-90001*

*HP StarLAN 10 Hardware Troubleshooting Guide, 5959-2258*

*HP SiteWire Twisted-pair Cabling Installation Guide, 5959-2208*

*HP StarLAN 10 Cabling Specification Note, 5958-9013*

*Planning Guide For LANs—HP Office Share Network, 50909-90003*



# Installation Procedures

---

This chapter:

- discusses site preparation,
- provides instructions for configuring and mounting the StarLAN 10 hub, and
- provides instructions for attaching cables.

The instructions in this chapter describe the set-up of the hub for normal operation. For information on running diagnostic tests (loopback test and self test), refer to chapter 4, *Maintenance and Troubleshooting*.

## Product Inspection

---

### Note

We recommend that you keep the shipping carton and packing material. These will be useful in case the HP 28663A StarLAN 10 hub must be returned to Hewlett-Packard at some future date.

---

If you observed evidence of damage when you received the carton containing the HP 28663A product, inspect all items carefully. Retain the shipping carton and packing material for the carrier's inspection. If any item appears to be damaged, notify the carrier's representative and nearest Hewlett-Packard Sales and Support Office (a list of HP Sales

and Support Offices is contained at the back of this manual). The HP Sales and Support Office will arrange for repair or replacement of the defective item without waiting for any possible claims against the carrier to be settled.

Using the “Equipment Supplied” information in chapter 1, ensure that the product contains all components and is complete. If the product is incomplete, or if an incorrect component has been furnished, notify the nearest Hewlett-Packard Sales and Support Office.

## **Repacking the Product**

If it ever becomes necessary to repack the product for shipment, pack the item in the original packing material, if available. If the original material is not available, good commercial packing material should be used. Commercial packing and shipping companies have facilities to repack this product.

## **Storing the Product**

If the product is to be stored, ensure that it is placed in a cool, dry environment. For protection, we recommend that you repack the StarLAN 10 hub in its original container (or one that is similar). Place the hub in a location where it will be safe from excessive physical contact, mishandling or moisture.

## Site Preparation

Before installing the StarLAN 10 hub, the local area network wiring should be installed and meet certain requirements:

- StarLAN 10 wiring must meet HP's SiteWire requirements. (Wiring that conforms to the American Telephone and Telegraph Company's Premises Distribution System (PDS) also meets these requirements.) If you are in doubt about whether your wiring meets these specifications, HP's WireTest service can verify your wiring. Contact your HP support representative for details on HP WireTest.
- Wiring of 8-pin and 50-pin twisted-pair connectors must conform to PDS standards. Instructions for wiring these connectors can be found in the *HP SiteWire Twisted-pair Cabling Installation Guide* (5955-2208).
- The design of your StarLAN 10 network must conform to the rules given in appendix D of this manual.

---

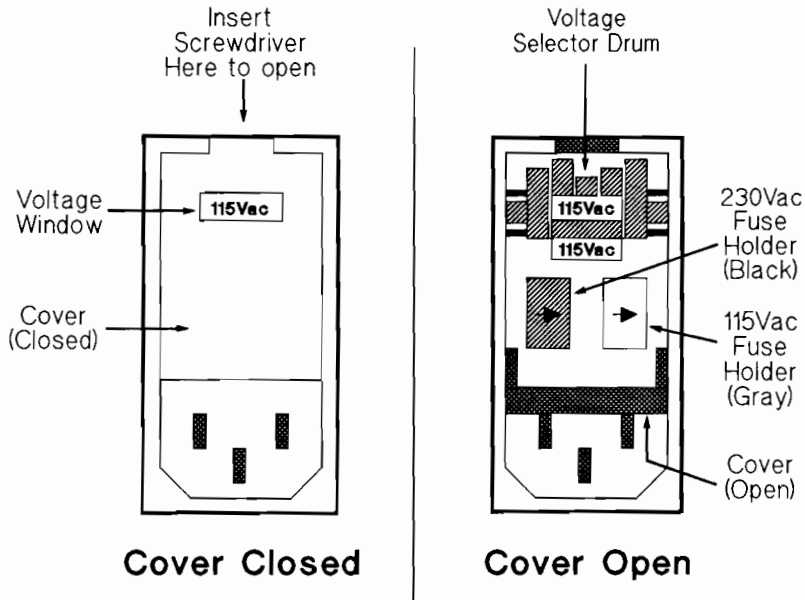
### Caution

Ensure all cables to be connected to the StarLAN 10 hub will not be strained. Such straining may cause damage to cables or jeopardize the integrity of LAN connections.

---

# Setting the Voltage

The StarLAN 10 hub obtains its power through the plug module located on the rear panel. Along with a power cord connection, the power module contains a protective fuse and a voltage selector drum for selecting either 115 or 230 volts ac. See figure 2-1. Refer to chapter 1 under "Equipment Supplied" for the power cord options.



**Figure 2-1. Power Module with Voltage Selector Drum and Fuseholders**

As shown in figure 2-1, the present voltage setting is indicated in the small window in the cover of the power module.

If it is necessary to change the voltage setting for your location, perform the following:

---

### **Note**

Ensure that the power cord is removed before setting the ac line voltage. The voltage selector drum is not accessible with the power cord installed.

---

1. With a small flathead screwdriver or similar tool, pry open the plastic hinged cover by inserting the head of the tool into the top of the cover. This will expose the voltage selector drum. See figure 2-1.
2. The voltage selector drum must be completely removed from its socket in the power module. If you have very nimble fingers, this can be done by hand; otherwise use tweezers or a similar tool to pull the drum straight out of the power module. Once you have removed it, note that it has duplicate indicators (115 Vac, 115 Vac, 230 Vac, and 230 Vac).
3. Rotate the voltage selector drum to the desired value and reinstall it into its socket so that when the plastic cover is closed, the desired voltage setting will be visible through the window in the cover. You can choose either one of the duplicate indicators.

---

### **Caution**

Ensure that the proper fuse is installed into the right side of the power module at all times. If the proper fuse is not used, damage to the StarLAN 10 hub may result.

---

4. If you change the voltage, you must also change the fuse. The StarLAN 10 hub is shipped with two fuses; the black fuseholder holds the fuse for 230 Vac operation; the gray fuseholder holds the fuse for

115 Vac operation. The proper fuseholder must be on the right-hand side of the power module. Note the arrows pointing to the right on the fuseholders and on the inside of the open cover. That's a reminder that the proper fuse for the selected voltage must be on the right hand side of the power module. Also, the fuseholders will only fit into the power module with the arrows on the fuseholders pointing right.

Figure 2-1 shows the voltage selector drum set at 115 Vac with the gray fuseholder on the right. If you need to change the voltage selector drum to 230 Vac, you must also move the black fuseholder to the right-hand side. The gray fuseholder could then be stored in the left hand side of the power module.

5. Close the plastic hinged cover by pressing it firmly until it snaps and locks into place.

## Setting the Switches

The switches to be set are all on the rear panel of the StarLAN 10 hub. (Figure 1-2 shows the locations of the switches.) The switch settings given here are for normal operation. Refer to chapter 4, *Maintenance and Troubleshooting*, for the switch settings used for diagnostic testing.

To set the switches for normal operation:

1. Set the PORT SELECT switch to 0. (In this position, the STATUS LED monitors the segmentation status of all ports of the hub.)
2. Set the LOOPBACK switch to the down position.
3. Set the SELF TEST switch to the down position.
4. Set the SQE TEST switch to the position appropriate for the MAU being used on the AUI connector. If you are using an HP 30241A, an HP 28641A, or an HP 28664A MAU, the switch should be set to the down position. If you are using a non-HP MAU, and this MAU does not send an SQE test signal, then the switch should be set to the up position.



## Mounting the Hub

After ensuring that the ac voltage is set correctly and the proper fuse is installed, you are ready to mount the StarLAN 10 hub. You can choose either rack mounting or wall mounting for the hub. You can rack mount your StarLAN 10 hub in an HP 92211-series Design Plus equipment cabinet available from Hewlett-Packard. Follow the mounting instructions included with the cabinet.

Your StarLAN 10 hub may also be mounted on a piece of plywood or similar material attached to a wall in a wiring closet. This allows for easy cable connection. Figure 2-2 shows the preferred mounting position.

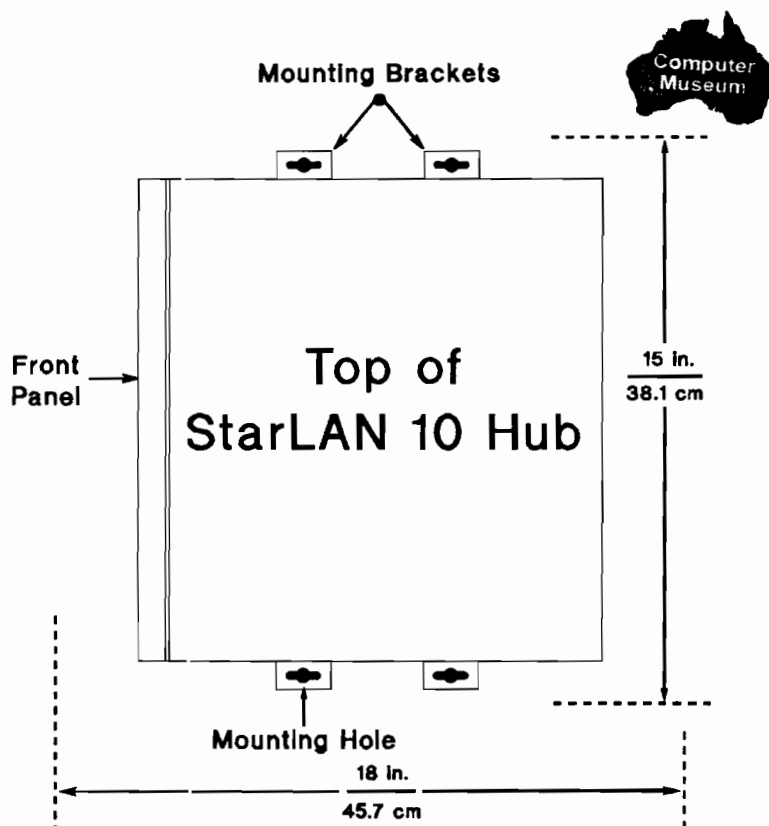


Figure 2-2. Preferred Mounting Position of the StarLAN 10 Hub

---

### **Note**

If necessary, the StarLAN 10 hub can be mounted to a wall in other than the preferred mounting position shown in figure 2-2. For example, you could mount it so the mounting brackets were horizontal and the front panel of the StarLAN 10 Hub faced down. Just ensure that you maintain the same clearances given in figures 2-2 and 2-3.

---

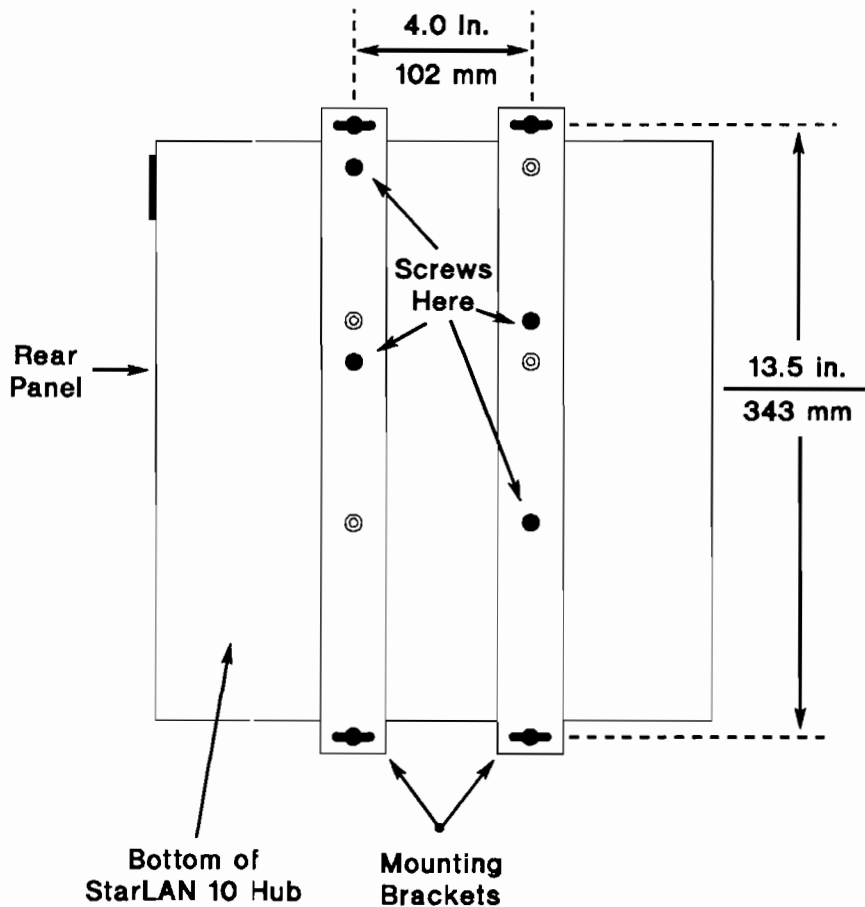
The StarLAN 10 hub is shipped with two mounting brackets.

To mount the StarLAN 10 hub to plywood, perform the following:

1. Make sure you have a vacant space at least 15 inches by 18 inches on which to mount the StarLAN 10 hub. The 18 inches allows good air-flow through the hub and provides easy access for attaching and detaching cables, and observing the LEDs when the StarLAN 10 hub is mounted on the wall. The 15 inches side-to-side allows one inch clearance along each side.
2. Turn the StarLAN 10 hub over and lay it down gently on a soft cloth or other soft surface (to protect the StarLAN 10 hub top cover from scratches). Ensure that the StarLAN 10 ports on the rear panel are facing left (see figure 2-3). Remove the four screws from the bottom of the hub box.
3. Lay the two mounting brackets on the bottom panel so the two holes in each bracket line up with two holes in the bottom panel (see figure 2-3). Also, make sure the countersunk sides of the bracket screw holes are facing you.

Attach the mounting brackets to the bottom panel of the StarLAN 10 hub using the four flathead screws supplied. Figure 2-3 shows the holes that should be used. In this figure, the blacked-out holes are the places you would install the screws.

4. Mark the wall in the space to be used for mounting the StarLAN 10 hub using dimensions shown in figure 2-3. Drill one hole at each of those marks using a 3 mm (0.125 inch) diameter drill bit.



**Figure 2-3. Bottom View of the StarLAN 10 Hub with Mounting Brackets**

5. Screw four wood screws three-quarters of the way into the four holes.

6. Turn the StarLAN 10 hub over (with mounting brackets attached), pick it up, and slip the large holes at each end of the mounting brackets over the wood screws on the wall. If the StarLAN 10 hub is mounted on the wall, the rear panel would be to the right side, and the front panel to the left side. Slide the hub to the left so that the wood screws are pushed into the smaller right side of the mounting brackets.

Follow the instructions in the next sections to complete the installation of the StarLAN 10 hub.

## Attaching Cables

There are two connectors on the StarLAN 10 hub to which you can attach cables: the AUI connector and the 50-pin connector. The next few paragraphs explain how to attach cables to these connectors.

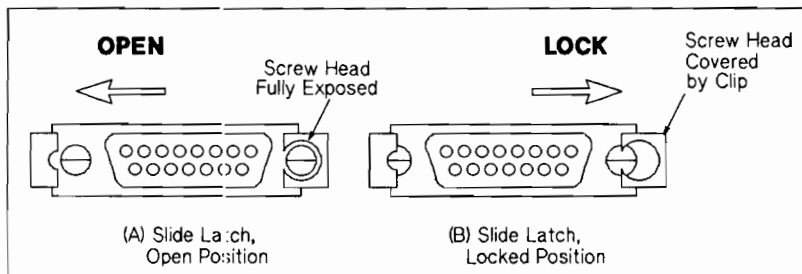
### AUI Port

The AUI port on the back panel of the StarLAN 10 hub is a 15-pin, D-type, female connector with a slide latch. To the AUI connector you can attach an AUI cable from:

- an HP 28664A Twisted-pair MAU (for attachment to twisted-pair LAN cable),
- an HP 28641A ThinMAU (for attachment to thin coaxial LAN cable),  
or
- an HP 30241A MAU (for attachment to thick coaxial LAN cable).

To attach an AUI cable to the AUI port, do the following:

1. Turn the StarLAN 10 hub off.
2. Facing the rear of the StarLAN 10 hub, push the slide latch to the OPEN position, as shown in figure 2-4.
3. Push the male AUI cable connector onto the AUI port connector, making sure it slides all the way on and fits snugly.
4. Push the slide latch on the AUI port to the LOCK position (as shown in figure 2-4) to lock the AUI cable connector in place. If the slide latch will not slide easily to the LOCK position, wiggle the AUI cable connector slightly in order to help slide the latch to its locking position.



**Figure 2-4. Open and Lock Positions of the AUI Port Slide Latch Connector**

## 50-pin Port

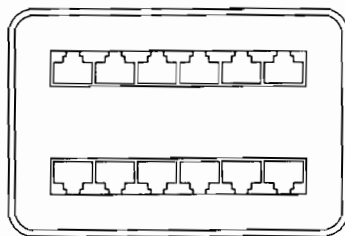
The twisted-pair wiring is connected to the back of the StarLAN 10 hub via a standard 50-pin connector marked “PORTS 1 ... 12”. The hub is shipped from the factory with a 12-port modular adapter attached to the 50-pin connector. This adapter breaks out the signals from the 50-pin connector to twelve 8-pin modular jacks.

Alternatively, you can use one of the following two connectors if your wiring installation has been certified by the HP WireTest service:

- a standard “right-angle” 50-pin connector (attached to a 25-pair twisted-pair cable that typically runs to a cross-connect block), or
- a straight-out 50-pin connector (attached to a 25-pair twisted-pair cable that typically runs to a cross-connect block).

## 12-port Modular Adapter

Figure 2-5 shows a front view of the 12-port modular adapter. The hub is shipped from the factory with the 12-port modular adapter attached to the 50-pin connector on the hub’s back panel.



**Figure 2-5. 12-port Modular Adapter**

---

### Note

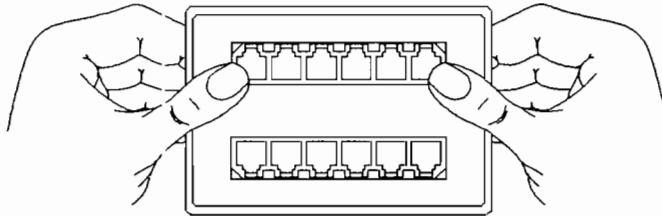
If your cabling runs from a 12-port modular adapter to a cross-connect block, any unused ports (that do not connect to a computer or other device) must be unplugged at the 12-port modular adapter.

---

## Preparation for Alternative Cabling

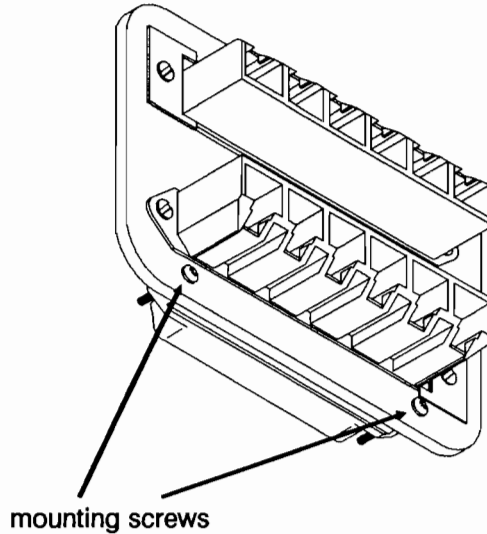
If you choose to use one of the alternative cabling schemes, you must first detach the 12-port modular adapter from the hub's 50-pin connector. Do the following:

1. Remove the cover of the 12-port modular adapter. To do this, place your thumbs on the 8-pin modular ports, as shown in figure 2-6, and grasp the back edge of the cover with your fingers. Gently pull outward with your fingers until the cover unlatches from the body of the adapter. Separate the cover from the adapter body.



**Figure 2-6. Removing the Adapter's Cover**

2. Unscrew the mounting screws (shown in figure 2-7) that secure the adapter to the hub's 50-pin connector.



**Figure 2-7. Adapter Mounting Screws**

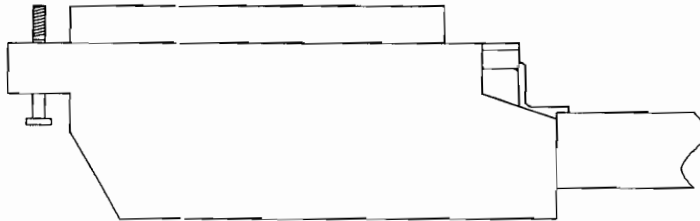
3. Detach the adapter body from the hub's 50-pin connector.
4. Save the 12-port adapter components (body, cover, and mounting screws) in case you want to use the adapter at a later time.

The hub is now ready for you to attach cabling that uses a right-angle connector or a straight-out connector.



## Right-angle Connector

Figure 2-8 shows a right-angle connector. You can use this connector if your wiring installation has been certified by the HP WireTest service. The cable from the right-angle connector usually runs to a cross-connect block, where connections to the twisted-pair LAN cabling can be made.



**Figure 2-8. Right-angle 50-pin Connector**

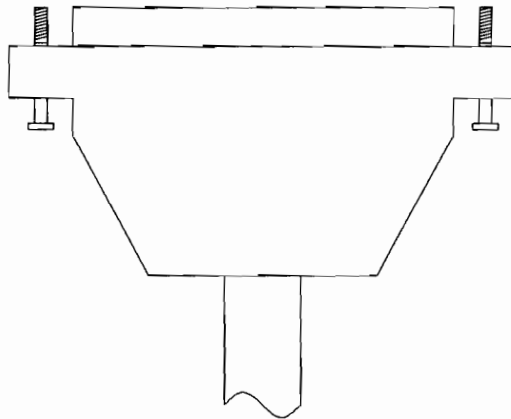
To connect a right-angle connector to the hub:

1. Unscrew the hexagonal standoff bolts located on either side of the 50-pin connector on the back of the hub. Save the standoff bolts in case you need to use them with a 12-port modular adapter or a straight-out connector at a later time.
2. Attach a cable clamp to the back of the hub. A universal cable clamp that incorporates a Velcro® hold-down strap (manufactured by Siemon Company as part number S-UHA-R-1) is generally available from distributors of telecommunications equipment. The body of this clamp fits around the 50-pin connector on the back panel of the hub and attaches to the hub with two #4-40 × 0.375" machine screws.
3. Push the right-angle connector onto the hub's 50-pin connector until it seats firmly.
4. Fasten the Velcro strap around the right-angle connector so that it is held in place securely.

Refer to chapter 3 for more details on connecting twisted-pair cabling to the cross-connect block.

## Straight-out Connector

Figure 2-9 shows a straight-out 50-pin connector. You can use this connector if your wiring installation has been verified by the HP WireTest service. The cable from the straight-out connector usually runs to a cross-connect block, where connections to the twisted-pair LAN cabling can be made.



**Figure 2-9. Straight-out 50-pin Connector**

The straight-out connector has two mounting screws that can screw into the mounting holes on the hub's 50-pin connector. This holds the straight-out connector firmly in place. To attach a straight-out connector to the hub:

1. Push the straight-out connector onto the hub's 50-pin connector until it seats firmly.
2. Screw the connector's screws into the hexagonal standoff bolts on either side of the 50-pin connector.

Refer to chapter 3 for more details on connecting twisted-pair cabling to the cross-connect block.

## Powering Up

Make sure you are using the correct power cord for your location. Refer to the “Equipment Supplied” section in chapter 1.

---

### Warning

When connecting power, be sure the power cord is the proper one to use at your location. To avoid possible electrical shock, ensure the power receptacle is properly grounded. If there is any doubt, consult a qualified electrician.

---

Check the ac line voltage indicator through the window in the power module for the correct ac voltage setting. If the voltage needs to be changed or if you are not sure the proper fuse is installed, refer to the section in this chapter called “Setting The Voltage” before proceeding.

Plug the ac power cord into the power module, then plug the other end into an ac power source, such as a wall receptacle. Push in the LINE switch on the front panel to power up the StarLAN 10 hub.

## Verifying Proper Operation

When you apply power to the StarLAN 10 hub, and **all switches are set in normal (operational) position**, you can verify that the hub is working properly by performing a visual check of the LEDs on the rear panel.

- The green MAU PWR LED will normally be “on”. If this LED is not lit, it indicates that there is no power to the hub or that the MAU power fuse is bad.
- The ACTIVITY LED is also green and may be flashing depending on the incoming signals on the network. This LED will be off at “power up” if there is no traffic on the network.

- The COLLISION LED is yellow and may also be flashing depending on the number of collisions occurring on the network. This LED will be off at “power up” if there is no network traffic.
- The STATUS LED is red and indicates the status of the port selected by the rotary switch. This LED could also be off at “power up” if there is no traffic on the network.

Chapter 4, *Maintenance and Troubleshooting*, contains instructions for running a loopback test to check the operation of an individual port, and a self test to check the operation of the hub itself. If you encounter problems with the StarLAN 10 hub, or the attached network, consult the *HP StarLAN 10 Hardware Troubleshooting Guide* (5959-2258) for additional information on fault isolation and problem resolution.

## StarLAN 10 Connections

---

This chapter describes the connections between the various components of an HP StarLAN 10 network. The components that can be connected together in a StarLAN 10 network include:

- LAN interface cards in computers. These cards can be:
  - LAN cards with internal StarLAN 10 transceivers (built onto the card). These cards have an 8-pin modular jack for direct connection to twisted-pair LAN cabling. (Check with your local HP representative for information on supported cards. The HP 27236A StarLAN 10 Interface Card for personal computers is one such card.)
  - LAN cards with AUI ports (15-pin female D-type connectors). These are the same interface cards that are used in 10 Mbps coaxial-cable local area networks. (Check with your local HP representative for information on supported cards.) This type of LAN interface card connects to twisted-pair cabling through an HP 28664A Twisted-pair MAU (medium attachment unit).
- HP 28664A Twisted-pair MAU. The MAU connects to an AUI port (such as that on a LAN interface card or a StarLAN 10 hub) and converts the signals to a form suitable for twisted-pair cabling.
- HP 28663A StarLAN 10 Hub
- HP 28648A Bridge (10 Mbps to 10 Mbps)
- HP 28647A Bridge (10 Mbps to 1 Mbps)

Note that HP StarLAN 10 components are not compatible with the similarly-named HP StarLAN components. Specifically, you cannot connect an HP StarLAN card to an HP StarLAN 10 hub, or an HP StarLAN 10 card to an HP StarLAN hub. In addition, the maximum cable length specifications are different for HP StarLAN and HP StarLAN 10, even though the cable types and connectors are the same. You can, however, interconnect HP StarLAN and HP StarLAN 10 networks through an HP 28647A Bridge.

The cabling used for StarLAN 10 connections is 4-pair unshielded twisted-pair cable. The cable has a modular 8-pin plug either at both ends (when routed through a 12-port modular adapter) or at one end (when routed through a cross-connect block). You can custom-build the cable yourself (according to the instructions in the *HP SiteWire Twisted-pair Cabling Installation Manual*, 5959-2208), or you can purchase pre-assembled cables from Hewlett-Packard. The pre-assembled cables are:

- HP 92268A (4 meters, connectors at both ends)
- HP 92268B (8 meters, connectors at both ends)
- HP 92268C (16 meters, connectors at both ends)
- HP 92268D (32 meters, connectors at both ends)

The StarLAN hub is shipped from the factory with a 12-port modular adapter for routing the signals from the hub to twelve 8-pin modular jacks. This is a specially-wired adapter that routes the signals for each port to pairs 2 and 3 (pins 1, 2, 3, and 6) of each jack. Alternatively, you can route your cabling through a cross-connect block. The *HP SiteWire Twisted-pair Cabling Installation Manual* describes how to punch down a cable on a cross-connect block.

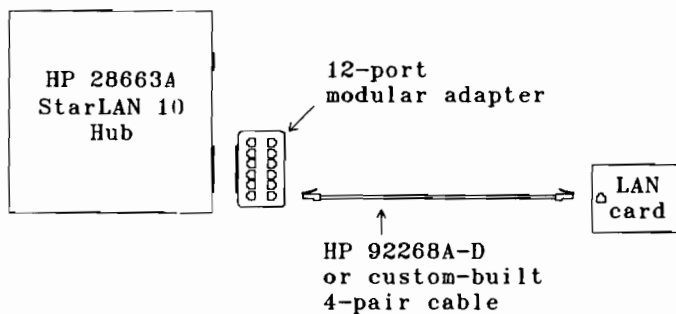
The sections below describe the various possible connections between the HP StarLAN 10 components.

# Computer to Hub

Figures 3-1 through 3-4 show four general methods of connecting a computer's LAN interface card to a StarLAN 10 hub. The four methods are the permutations of two LAN card connections (LAN card with internal transceiver and LAN card with external MAU) and two hub connections (12-port modular adapter with and without cross-connect block).

## LAN Card with Internal Transceiver to Hub via 12-port Modular Adapter

Figure 3-1 shows the parts used in this method and how they connect.



**Figure 3-1. LAN Card with Internal Transceiver to Hub via 12-port Modular Adapter**

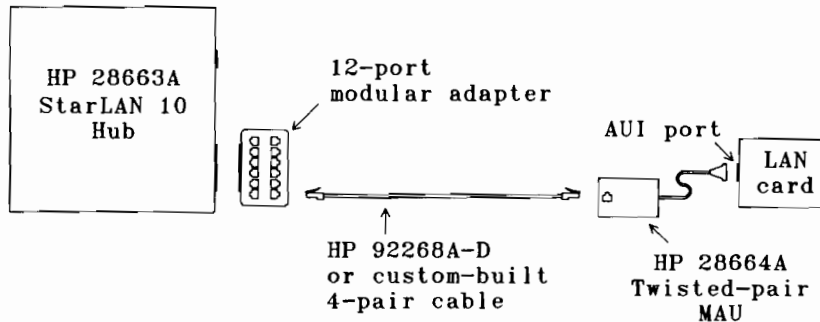
The steps in making this connection are:

1. Make sure that the LOOPBACK switch on the computer's LAN card is set to the NORMAL position.
2. Plug one end of the 4-pair twisted-pair cable into the 8-pin modular jack on the LAN card. (Some LAN cards have two jacks, one for phone connections and one for data. Make sure you plug into the data jack. This jack is labeled "LAN" on the HP 27236A StarLAN 10 Interface Card.)

3. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the hub.
4. Plug the other end of the 4-pair twisted-pair cable into one of the jacks of the 12-port modular adapter.

## LAN Card with External MAU to Hub via 12-port Modular Adapter

Figure 3-2 shows the parts used in this method and how they connect.



**Figure 3-2. LAN Card with External MAU to Hub via 12-port Modular Adapter**

The steps in making this connection are:

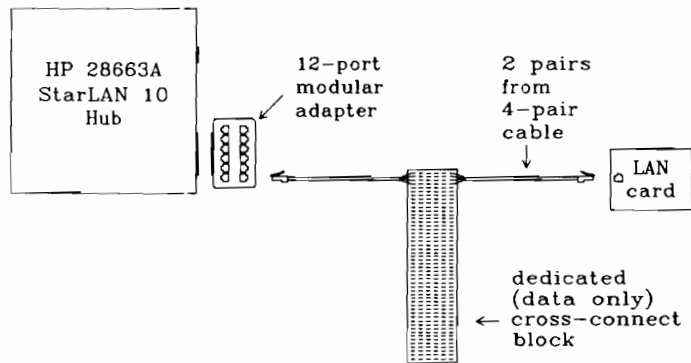
1. Make sure that the LOOPBACK switch on the twisted-pair MAU is set to the NORMAL position.
2. Plug the AUI connector of the twisted-pair MAU into the AUI port of the LAN interface card. (On some cards you may need to set a switch or jumper to route the signals through the AUI port; check the card's reference manual for this information.)



3. Plug one end of the 4-pair twisted-pair cable into the 8-pin modular jack on the twisted-pair MAU.
4. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the hub.
5. Plug the other end of the 4-pair twisted-pair cable into one of the jacks of the 12-port modular adapter.

### LAN Card with Internal Transceiver to Hub via Cross-connect Block

Figure 3-3 shows the parts used in this method and how they connect.



**Figure 3-3. LAN Card with Internal Transceiver to Hub via Cross-connect Block**

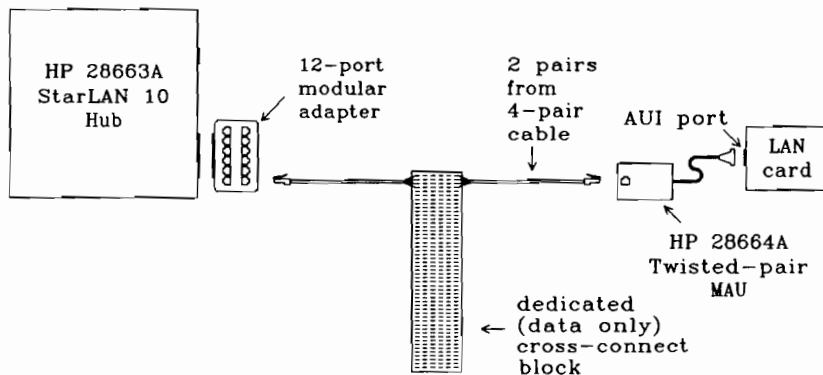
The steps in making this connection are:

1. Make sure that the LOOPBACK switch on the computer's LAN card is set to the NORMAL position.
2. Plug one end of the first 4-pair twisted-pair cable into the 8-pin modular jack on the LAN card. (Some LAN cards have two jacks, one for phone connections and one for data. Make sure you plug into the data jack. This jack is labeled "LAN" on the HP 27236A StarLAN 10 Interface Card.)

3. Take the other end of the first 4-pair cable and punch down the wires of pairs 2 and 3 (white/orange, orange/white, white/green, and green/white) onto the appropriate pins of the cross-connect block. (Appendix A discusses pin assignments on the cross-connect block.)
4. Take the second 4-pair cable and punch down the wires of pairs 2 and 3 onto the same rows of pins as the corresponding wires from the first cable.
5. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the hub.
6. Plug the other end of the second 4-pair cable into one of the jacks of the 12-port modular adapter. Note: Make sure that all unused ports are disconnected at the adapter.

## LAN Card with External MAU to Hub via Cross-connect Block

Figure 3-4 shows the parts used in this method and how they connect.



**Figure 3-4. LAN Card with External MAU to Hub via Cross-connect Block**

The steps in making this connection are:

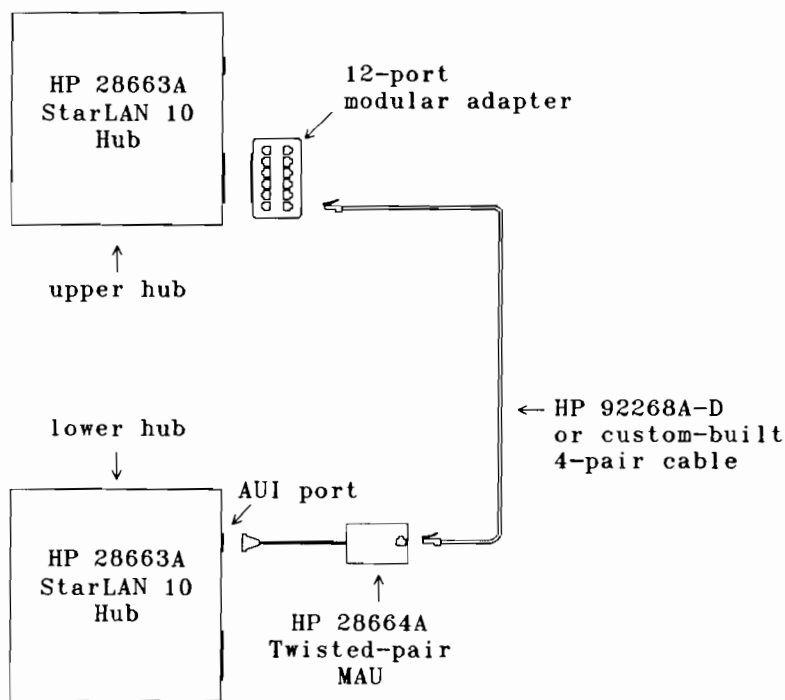
1. Make sure that the LOOPBACK switch on the twisted-pair MAU is set to the NORMAL position.
2. Plug the AUI connector of the twisted-pair MAU into the AUI port of the LAN interface card. (On some cards you may need to set a switch or jumper to route the signals through the AUI port; check the card's reference manual for this information.)
3. Plug one end of the first 4-pair twisted-pair cable into the 8-pin modular jack on the twisted-pair MAU.
4. Take the other end of the first 4-pair cable and punch down the wires of pairs 2 and 3 (white/orange, orange/white, white/green, and green/white) onto the appropriate pins of the cross-connect block. (Appendix A discusses pin assignments on the cross-connect block.)
5. Take the second 4-pair cable and punch down the wires of pairs 2 and 3 onto the same rows of pins as the corresponding wires from the first cable.
6. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the hub.
7. Plug the other end of the second 4-pair cable into one of the jacks of the 12-port modular adapter. Note: Make sure that all unused ports are disconnected at the adapter.

# Hub to Hub

Figures 3-5 and 3-6 show the two general methods of connecting one StarLAN 10 hub to another. One method uses a 12-port modular adapter alone and the other uses the adapter with a standard cross-connect block.

## Hub to Hub via 12-port Modular Adapter

Figure 3-5 shows the parts used in this method and how they connect.



**Figure 3-5. Hub to Hub via 12-port Modular Adapter**

To connect the two hubs:

1. Make sure that the LOOPBACK switch on the twisted-pair MAU is set to the NORMAL position.

2. Connect the AUI connector of the twisted-pair MAU to the AUI port (15-pin D connector) of the first hub.
3. Plug one end of a 4-pair twisted-pair cable into the 8-pin modular jack on the twisted-pair MAU.
4. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the second hub.
5. Plug the other end of the 4-pair twisted-pair cable into one of the 8-pin modular jacks on the 12-port modular adapter.

### Hub to Hub via Cross-connect Block

Figure 3-6 shows the parts used in this method and how they connect.

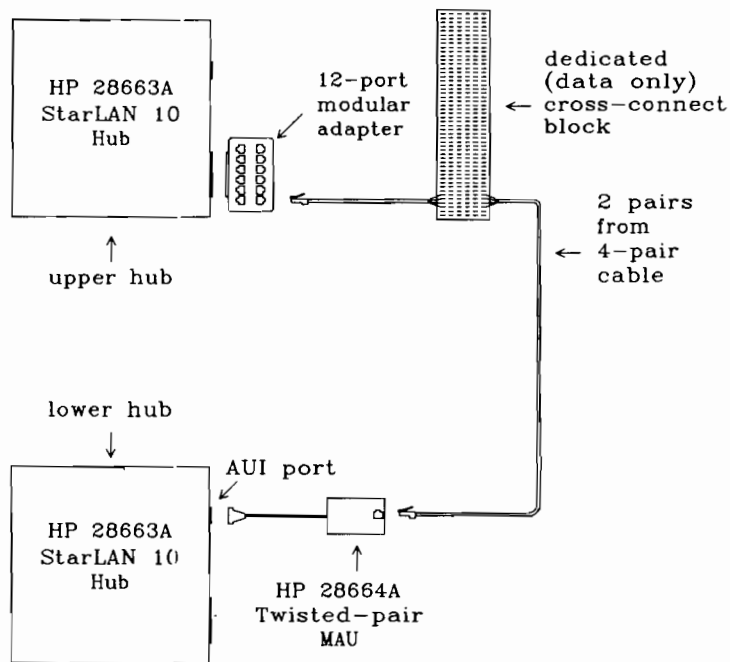


Figure 3-6. Hub to Hub via Cross-connect Block

To connect the two hubs:

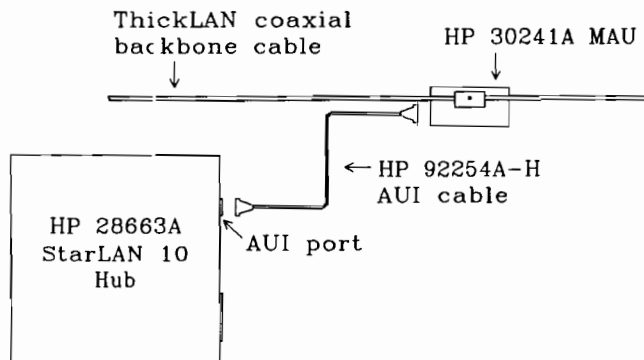
1. Make sure that the LOOPBACK switch on the twisted-pair MAU is set to the NORMAL position.
2. Connect the AUI connector of the twisted-pair MAU to the AUI port (15-pin D connector) of the first hub.
3. Plug the 8-pin modular plug of the first 4-pair cable into the 8-pin modular jack on the twisted-pair MAU.
4. Take the other end of the first 4-pair cable and punch down the wires of pairs 2 and 3 (white/orange, orange/white, white/green, and green/white) onto the appropriate pins of the cross-connect block. (Appendix A discusses pin assignments on the cross-connect block.)
5. Take the second 4-pair cable and punch down the wires of pairs 2 and 3 onto the same rows of pins as the corresponding wires from the first cable.
6. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the second hub.
7. Plug the other end of the second 4-pair cable into one of the jacks of the 12-port modular adapter. Note: Make sure that all unused ports are disconnected at the adapter.

## Hub to Coaxial Cable

You can connect a StarLAN 10 hub to a baseband coaxial LAN cable through the hub's AUI port. You can connect to an HP ThickLAN thick coaxial cable using an HP 30241A MAU, or to an HP ThinLAN thin coaxial cable using an HP 28641A ThinMAU. Additional information on connections to coaxial LAN cabling can be found in the *LAN Cable and Accessories Installation Manual* (5955-7680).

### Hub to Thick Coaxial Cable

Figure 3-7 shows the connection from a StarLAN 10 hub to a thick coaxial LAN cable.



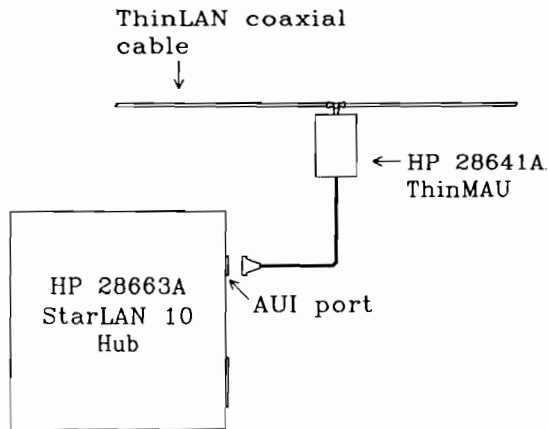
**Figure 3-7. Hub to Thick Coaxial LAN Cable**

The procedure for making this connection is:

1. Connect one end of an AUI cable to the AUI port on the hub.
2. Connect the other end of the AUI cable to a MAU attached to the thick coaxial LAN cable.

## Hub to Thin Coaxial Cable

Figure 3-8 shows the connection from a StarLAN 10 hub to a thin coaxial LAN cable.



**Figure 3-8. Hub to thin coaxial LAN cable**

The procedure for making this connection is:

1. Connect the ThinMAU's AUI connector (at the end of the short cable) to the AUI port on the hub.
2. Connect the ThinMAU to the thin coaxial cable at a BNC T-connector on the cable. Simply attach the T-connector to the ThinMAU's BNC connector.





## Hub to Bridge

Figures 3-9 through 3-11 show various possible connections between a StarLAN 10 hub and an HP 28648A 10-Mbps-to-10-Mbps Bridge. From the bridge a connection is typically made to a coaxial LAN cable. (It can also be made to another twisted-pair subnetwork.)

(You can use the same methods to connect a StarLAN 10 hub to an HP 28647A 10-Mbps-to-1-Mbps Bridge. The cabling between the hub and the bridge's AUI port is the same as for the HP 28648A bridge. For the connection of the bridge to the 1-Mbps StarLAN network, refer to the instructions in the bridge's installation manual.)

Note that a bridge is necessary only if you need separation (address filtering and/or regeneration of signals) between different portions of your network. If you don't need that separation, you can make a connection directly from the AUI port of a StarLAN 10 hub to a MAU attached to a coaxial LAN cable. (Figures 3-7 and 3-8 show such connections.)

There are three methods for making the connection from the hub to the bridge:

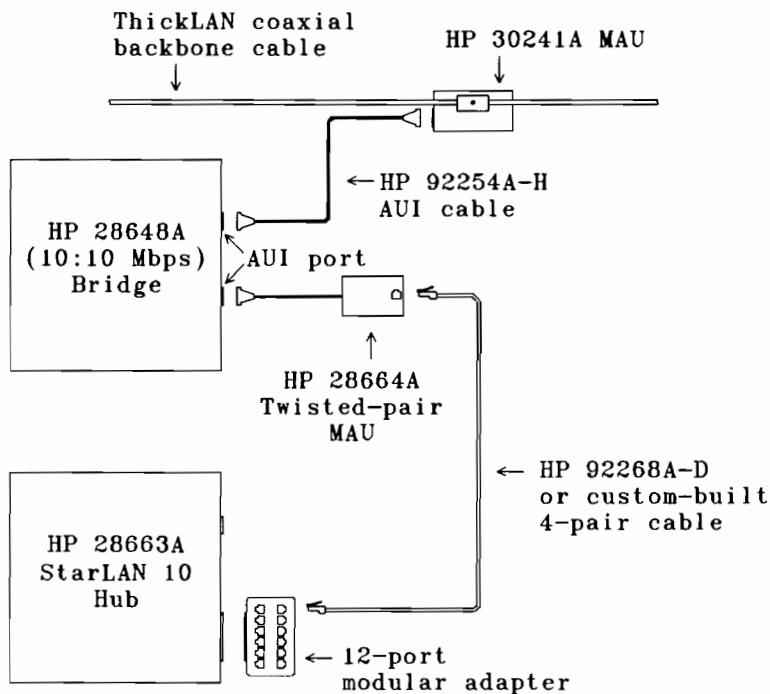
- through one of the hub's twisted-pair ports, via a 12-port modular adapter,
- through one of the hub's twisted-pair ports, via a 12-port modular adapter and a cross-connect block, or
- through the hub's AUI port, via coaxial LAN cable.

The first two methods are generally much simpler; the third is more complicated, but is useful if you have already used up all 12 twisted-pair ports on your hub.

Our procedures and drawings show connections to ThickLAN coaxial cable using an AUI cable and an HP 30241A MAU. Alternatively, you can connect to a ThinLAN cable using an HP 28641A ThinMAU.

## Hub to Bridge via 12-port Modular Adapter

Figure 3-9 shows the first method of connecting a hub to a bridge, using a 12-port modular adapter.



**Figure 3-9. Hub to Bridge via 12-port Modular Adapter**

The procedure for making these connections is:

1. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the hub.
2. Plug one end of a 4-pair twisted-pair cable into one of the 8-pin modular jacks on the 12-port modular adapter.
3. Make sure that the LOOPBACK switch on the twisted-pair MAU is set to the NORMAL position.

4. Plug the other end of the 4-pair twisted-pair cable into the 8-pin modular jack on the twisted-pair MAU.
5. Connect the AUI connector of the twisted-pair MAU to one of the AUI ports on the bridge.
6. Connect one end of an AUI cable to the second AUI port of the bridge.
7. Connect the other end of the AUI cable to a MAU attached to a coaxial LAN cable.

## Hub to Bridge via Cross-connect Block

Figure 3-10 shows the second method of connecting a hub to a bridge. This method uses a standard cross-connect block with a 12-port modular adapter. It also uses a two 4-pair twisted-pair cables, each with an 8-pin modular plug on one end.

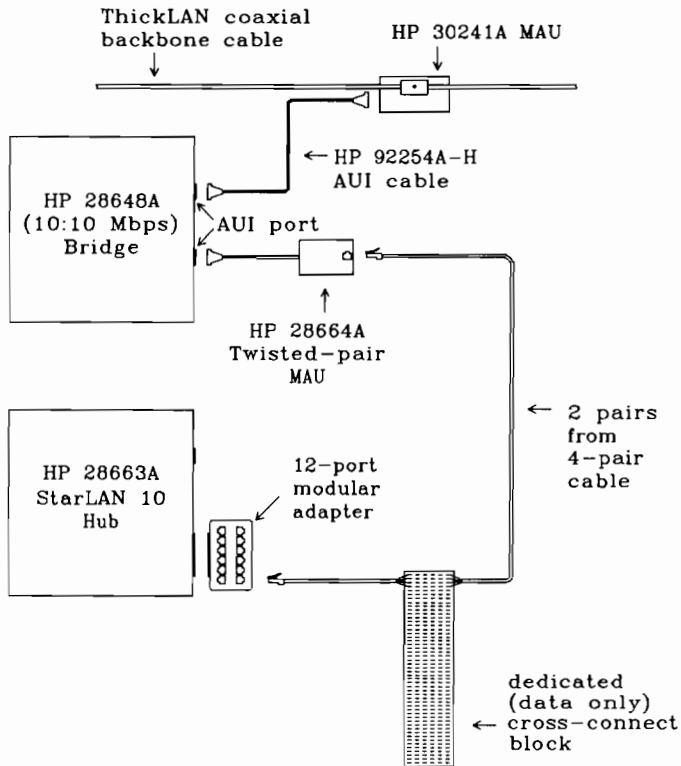


Figure 3-10. Hub to Bridge via Cross-connect Block

The procedure for making the connections is:

1. Make sure that the 12-port modular adapter is securely attached to the 50-pin connector on the rear panel of the hub.
2. Plug one end of the first 4-pair cable into one of the jacks of the 12-port modular adapter.
3. Take the other end of the first 4-pair cable and punch down the wires of pairs 2 and 3 (white/orange, orange/white, white/green, and green/white) onto the appropriate pins of the cross-connect block. (Appendix A discusses pin assignments for cross-connect blocks.)
4. Take the second 4-pair cable and punch down the wires of pairs 2 and 3 onto the same rows of pins as the corresponding wires from the first cable.
5. Make sure that the LOOPBACK switch on the twisted-pair MAU is set to the NORMAL position.
6. Plug the 8-pin modular plug on the other end of the second 4-pair cable into the 8-pin modular jack on the twisted-pair MAU.
7. Connect the AUI connector of the twisted-pair MAU to one of the AUI ports of the bridge.
8. Connect one end of an AUI cable to the other AUI port of the bridge.
9. Connect the other end of the AUI cable to an HP 30241A MAU attached to a coaxial LAN cable.

## **Hub to Bridge via Coaxial LAN Cable**

Figure 3-11 shows the third method of connecting a hub to a bridge. This method differs from the first two in that the connection does not go through the 50-pin port of the hub. Instead, this method uses the hub's AUI port. This makes it necessary to route the signal from the hub through a section of coaxial LAN cable to get it to the bridge. While this is a more complicated connection method than the previous two, it might

be useful in cases where all twelve ports from the hub's 50-pin connector are already connected to computers or to other hubs.

We describe here the connection via ThickLAN coaxial backbone cable. Note that you can also use ThinLAN cable (and ThinMAUs) in the analogous fashion to make this connection.

Note also that the coaxial backbone LAN cable between the hub and the bridge can be a short section of cable for the sole purpose of connecting the hub and the bridge, or it can be an ordinary section of cable in use as part of a coaxial network segment. (In the latter case, the hub and the bridge just look like two more connections, as far as the coaxial part of the network is concerned.)

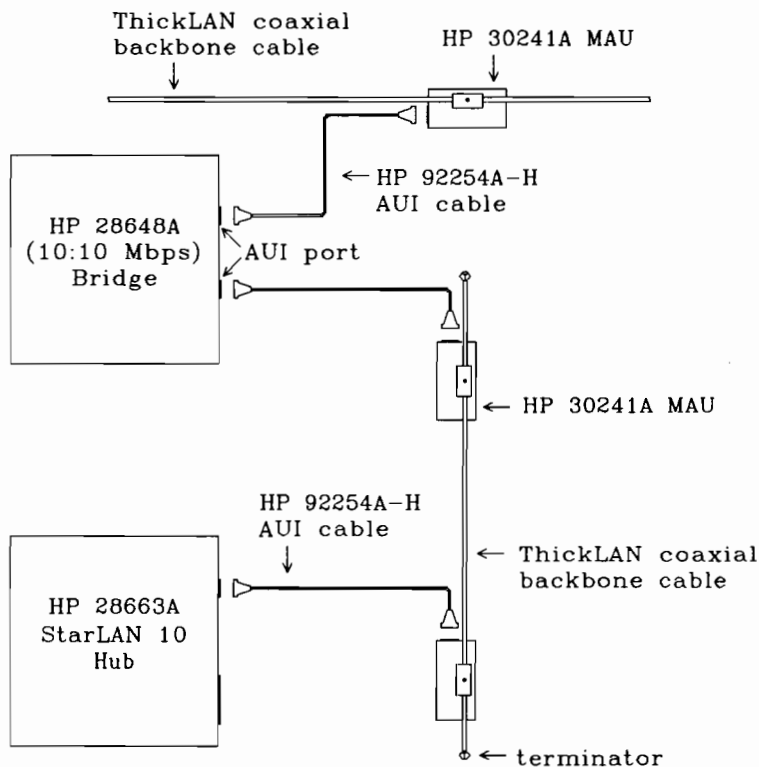


Figure 3-11. Hub to a Bridge via Coaxial LAN

To connect a StarLAN 10 hub to a bridge via a coaxial LAN cable:

1. Connect one end of an AUI cable to the AUI port of the hub.
2. Connect the other end of the AUI cable to a MAU attached to a coaxial LAN cable.
3. Connect a second AUI cable to a different MAU on that coaxial LAN cable.
4. Connect the other end of the second AUI cable to one of the AUI ports on the bridge.
5. Connect a third AUI cable to the other AUI port on the bridge.
6. Connect the other end of the third AUI cable to a MAU attached to a second coaxial backbone LAN cable.





# Maintenance and Troubleshooting

---

Chapter 2 explained how to set up the HP 28663A StarLAN 10 Hub for normal operation. This chapter explains how to set up the hub for two diagnostic tests – the loopback test and the self test – that are not used in normal operation. These tests can be useful in diagnosing problems with your hub or your network.

This is by no means a complete description of how to troubleshoot your hub or your network. For more information on troubleshooting, refer to the *HP StarLAN 10 Hardware Troubleshooting Guide* (5959-2258).

## Loopback Test

You can put the StarLAN 10 hub into a loopback mode so that signals coming in on the input pins of a port will be looped back to that port's output pins after retiming and regeneration. In effect, this allows the hub to act as an active loopback connector for twisted-pair wiring.

The hub makes a loopback connector with a difference, however. With an ordinary loopback connector (just a couple of passive pieces of wire connecting inputs to outputs), there is a severe limitation on the distance over which the loopback connector can be used. That's because the loopback connector just turns the signal around and sends it the same distance again to the point of origin. For example, if a LAN card in a computer is sending out an external loopback signal to test a 100-meter length of twisted-pair cabling, that signal travels the 100 meters from the LAN card to the loopback connector, and another 100 meters back

to the card. That's twice as long as the maximum distance of StarLAN 10 cabling.

If you use a StarLAN 10 hub in loopback mode, on the other hand, you can test the full 100-meter length of your cabling. That's because the signal from the LAN card covers its normal 100-meter distance to the hub, and then **the hub regenerates the signal** before sending it back the 100-meter distance to the LAN card. At no point does the distance exceed the 100-meter limitation.

While the hub has one port in loopback mode, all other ports continue to operate normally.

Note that, while it is possible to put all ports into loopback mode at the same time, **we recommend that you limit loopback mode to one port at a time**. If you put all ports into loopback mode, all traffic coming to the hub will be looped back to its point of origination. Not only does this serve no useful diagnostic purpose, it also causes large amounts of spurious traffic which will jam your network. (Every transmission will result in a collision.)

Here's how to put a single port of the StarLAN 10 hub into loopback mode:

1. Make sure that the hub is in normal operating condition, with both the SELF TEST and LOOPBACK switches on the rear panel of the hub in the down positions. (For purposes of the loopback test, the position of the SQE TEST switch does not matter; for most networks, however, the SQE TEST switch should be down for normal operation. Refer to chapter 2 for more information on setting the SQE TEST switch for normal operation.)
2. Set the PORT SELECT switch for the port you want to test. To test a twisted-pair port, set the switch to the number of the port. To test the AUI port, set the switch to 13. **Do not set the switch to 0**, as that will set all ports into loopback mode and will jam the network.
3. Set the LOOPBACK switch to the up position. This will set the selected port into loopback mode.
4. Run your diagnostic tests, using the selected port in loopback mode.

5. When the testing is done, return the LOOPBACK switch to the down position and then set the PORT SELECT switch to 0.

## Self Test

The hub's self test checks the operating condition of the hub's circuitry. It is meant as a stand-alone test for diagnosing problems with the hub and the network. It is not meant to be used during normal network operation.

The hub self test checks the internal circuitry of the hub. It also checks the functioning of the input/output ports by sending signals out through the ports to loopback connectors and back into the ports again, and comparing the input and output signals to make sure that they are the same. The loopback connectors used in this test are supplied as part of the HP 28663A StarLAN 10 Hub product.

To run the hub self test, do the following:

1. Make sure that the hub's power is off. (The power switch is on the front of the hub.)
2. Disconnect any cable from the hub's AUI port.
3. Disconnect any cables from the hub's 50-pin connector. If your connection to the twisted-pair hub is through a 12-port modular adapter, you will have to first remove the cover of the adapter, next unscrew the two mounting screws that hold the adapter body to the hub, and then remove the adapter body from the hub. If your connection to the hub is through a 50-pin connector, you will have to detach the connector from the hub either by unscrewing the connector (in the case of a straight-out connector) and detaching it from the hub, or by unfastening the Velcro® retainer (in the case of a right-angle connector) and detaching the connector from the hub.
4. Attach an AUI loopback connector (28663-63001) to the hub's AUI port.

5. Attach a 50-pin loopback connector (28663-63002) to the hub's 50-pin port.
6. Set the hub's PORT SELECT switch to 0.
7. Set the hub's SELF TEST switch to the up position.
8. Turn the hub's power on. The self test will start executing, and will continue executing until the power is turned off again. The results of the self test will flash continuously on the red, yellow, and green (ACTIVITY, COLLISION, and STATUS) LEDs on the hub's rear panel. The meanings of the LEDs depend on the setting of the PORT SELECT switch, as follows:

If the PORT SELECT switch is set to 0,

- Green (ACTIVITY LED) indicates that all parts of the hub pass the self test,
- Yellow (COLLISION LED) indicates that some ports (between 1 and 6) fail the self test but that a majority of ports pass, and
- Red (STATUS LED) indicates that a majority of ports (between 7 and 13) fail the self test.

(Note that the hub will indicate a failure if the loopback connectors are not firmly in place.)

If the PORT SELECT switch is set to a number between 1 and 12 (twisted-pair ports), or is set to 13 (AUI port),

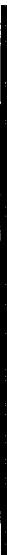
- Green (ACTIVITY LED) indicates that the port passes the self test, and
- Red (STATUS LED) indicates that the port fails the self test.

If the PORT SELECT switch is set to 14,

- Green (ACTIVITY LED) indicates that the on-board timers pass the self test,
- Yellow (COLLISION LED) indicates that the 5-millisecond timer is good and the one-half-second timer is bad, and
- Red (STATUS LED) indicates that the 5-millisecond timer is bad and the state of the one-half-second timer is unknown.

If the PORT SELECT switch is set to 15, the three LEDs on the hub's rear panel will blink at a one-half-second interval to allow a visual check that they are functioning properly.

9. When you have finished reading the results of the self test, turn the hub's power off.
10. Set the SELF TEST switch to the down position.
11. Set the LOOPBACK and SQE TEST switches for normal operation.
12. Set the PORT SELECT switch to 0.
13. Remove the AUI loopback connector from the AUI port and reconnect the normal network wiring.
14. Remove the 50-pin loopback connector from the 50-pin port and reconnect the normal network wiring.
15. Turn the hub's power on and resume normal operation.



## 50-pin Connector

---

This appendix gives the pin assignments of the hub's 50-pin (twisted-pair) connector.

Figure A-1 shows the pin numbers for the female 50-pin connector on the rear panel of the hub and for the male 50-pin connector that attaches to it. The male 50-pin connector can be part of the 12-port modular adapter, or it can be part of a 25-pair cable that runs to a cross-connect block.



Figure A-1. 50-pin Connectors

# Connections through 12-port Modular Adapter

Table A-1 shows the wiring of the 12-port modular adapter used with the StarLAN 10 hub. This adapter connects the data lines from the 50-pin connector of the StarLAN 10 hub to twelve 8-pin modular jacks.

The 50-pin connector on the 12-port modular adapter is a male connector, as shown at the bottom of figure A-1.





**Table A-1. 12-port Modular Adapter: Hub to Twelve 8-pin Jacks**

Pin # on 50-pin Connector	Jack #	Pin # on Jack	Pin # on 50-pin Connector	Jack #	Pin # on Jack
26	1	1	38	7	1
1	1	2	13	7	2
27	1	3	39	7	3
2	1	6	14	7	6
28	2	1	40	8	1
3	2	2	15	8	2
29	2	3	41	8	3
4	2	6	16	8	6
30	3	1	42	9	1
5	3	2	17	9	2
31	3	3	43	9	3
6	3	6	18	9	6
32	4	1	44	10	1
7	4	2	19	10	2
33	4	3	45	10	3
8	4	6	20	10	6
34	5	1	46	11	1
9	5	2	21	11	2
35	5	3	47	11	3
10	5	6	22	11	6
36	6	1	48	12	1
11	6	2	23	12	2
37	6	3	49	12	3
12	6	6	24	12	6
			50	none	none
			25	none	none

# Connections through 25-pair Cable

---

## Note

The preferred method of connection to the StarLAN 10 hub's twisted-pair ports is through the 12-port modular adapter. Connection through a 25-pair twisted-pair cable is permitted only if your wiring installation has been certified by the HP WireTest service.

---

If the connection from a StarLAN 10 hub to a cross-connect block is made through a 25-pair twisted-pair cable, the cable has a male 50-pin connector on one end; on the other end the individual conductors are punched down onto the pins of the cross-connect block.

Table A-2 shows the standard wiring assignments for the conductors of a 25-pair cable. For each conductor, the table shows which pin that conductor connects to on the 50-pin connector, and which pin that conductor connects to on the cross-connect block. The conductor listings show the major color first and the minor color second.

**Table A-2. Wiring Assignments for 25-pair Cables**

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

Table A-3 shows typical wiring for a data-only cross-connect block. This wiring allows the cross-connect block to break out the signals from the StarLAN 10 hub's 50-pin (twisted-pair) connector to twelve 4-pair twisted-pair cables.

The 25-pair cable coming from the hub connects to one side of the cross-connect block. Pairs 2 and 3 of twelve 4-pair cables connect to the other side of the block, and run to the devices (computers, hubs, bridges) that are attached to the hub. The conductor listings show the major color first and the minor color second.

Pairs 1 and 4 of each 4-pair cable are not connected to the cross-connect block.

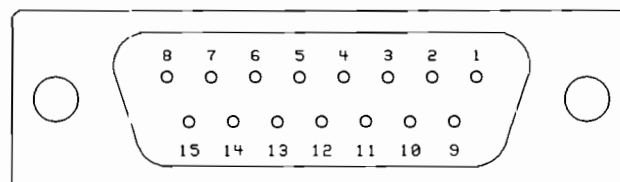
**Table A-3. Data-only Cross-connection: 25-pair to Twelve 4-pair Cables**

25-pair Side	Pin #	4-pair Side	25-pair Side	Pin #	4-pair Side
white/blue	1	white/orange	black/green	25	white/orange
blue/white	2	orange/white	green/black	26	orange/white
white/orange	3	white/green	black/brown	27	white/green
orange/white	4	green/white	brown/black	28	green/white
white/green	5	white/orange	black/slate	29	white/orange
green/white	6	orange/white	slate/black	30	orange/white
white/brown	7	white/green	yellow/blue	31	white/green
brown/white	8	green/white	blue/yellow	32	green/white
white/slate	9	white/orange	yellow/orange	33	white/orange
slate/white	10	orange/white	orange/yellow	34	orange/white
red /blue	11	white/green	yellow/green	35	white/green
blue/red	12	green/white	green/yellow	36	green/white
red/orange	13	white/orange	yellow/brown	37	white/orange
orange/red	14	orange/white	brown/yellow	38	orange/white
red/green	15	white/green	yellow/slate	39	white/green
green/red	16	green/white	slate/yellow	40	green/white
red/brown	17	white/orange	violet/blue	41	white/orange
brown/red	18	orange/white	blue/violet	42	orange/white
red/slate	19	white/green	violet/orange	43	white/green
slate/red	20	green/white	orange/violet	44	green/white
black/blue	21	white/orange	violet/green	45	white/orange
blue/black	22	orange/white	green/violet	46	orange/white
black/orange	23	white/green	violet/brown	47	white/green
orange/black	24	green/white	brown/violet	48	green/white
			violet/slate	49	none
			slate/violet	50	none



# AUI Connector

This appendix gives pin assignments for the StarLAN 10 hub's AUI port.



**Figure B-1. AUI Connector**

**Table B-1. AUI Pin Assignments**

Pin	Circuit	Description
3	DO-A	Data Out Circuit A
10	DO-B	Data Out Circuit B
11	DO-S	Data Out Circuit Shield (not used)
5	DI-A	Data In Circuit A
12	DI-B	Data In Circuit B
4	DI-S	Data In Circuit Shield
7	CO-A	Control Out Circuit A (not used)
15	CO-B	Control Out Circuit B (not used)
8	CO-S	Control Out Circuit Shield (not used)
2	CI-A	Control In Circuit A
9	CI-B	Control In Circuit B
1	CI-S	Control In Circuit Shield
6	VC	Voltage Common
13	VP	Voltage Plus
14	VS	Voltage Shield (not used)
Shell	PG	Protective Ground (conductive shell)



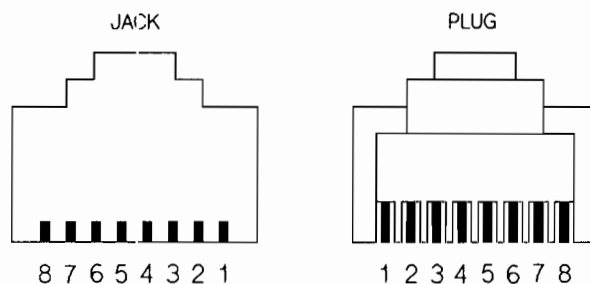


## 8-pin Modular Connectors

---

This appendix gives the pin assignments of the 8-pin modular plugs and jacks used with a StarLAN 10 network.

Figure C-1 shows the pin number assignments for a standard 8-pin modular plug and the matching jack.



**Figure C-1. 8-pin Modular Plug and Jack**

Table C-1 shows the standard wiring assignments for 4-pair twisted-pair cables. For each conductor the table shows which pin that conductor connects to on an 8-pin modular plug or jack, and which signal is carried on that pin.

**Table C-1. Wiring Assignments for 4-pair Cables**

Pin # on Plug or Jack	Conductor Color	Signal
1	white/orange	DTE transmit +
2	orange/white	DTE transmit -
3	white/green	DTE receive +
4	blue/white	Phone ring
5	white/blue	Phone tip
6	green/white	DTE receive -
7	white/brown	Adjunct power +
8	brown/white	Adjunct power -

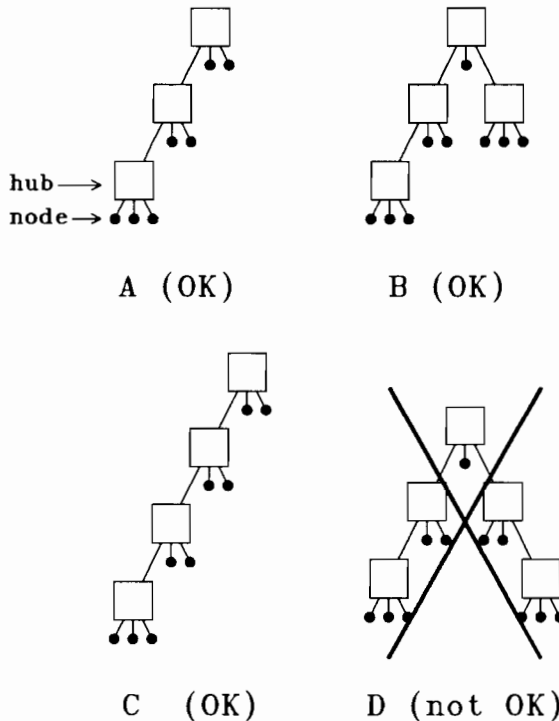
## StarLAN 10 Design Rules

---

This appendix gives the design rules for StarLAN 10 networks. The rules are few and simple:

1. All connections to a StarLAN 10 network are made through a StarLAN 10 hub.
2. All computers connect through the hub's twisted-pair ports. (Connection to another hub or to a coaxial LAN cable can be made through the hub's AUI port.)
3. The maximum length of twisted-pair cabling between the hub and any attached device (computer or other hub) is 100 meters. This length includes all pieces of twisted-pair cable in the signal path; for instance, it includes the cable between a computer and a wall jack, as well as the cable between a cross-connect block and a hub.
4. There can be a maximum of two cross-connect blocks in the twisted-pair cabling between the hub and any attached device (computer or other hub).

5. Between any two nodes (computers) on the network there can be a maximum of 4 StarLAN 10 hubs. Figure D-1 shows some examples of valid and invalid configurations for networks using only twisted-pair LAN cabling.

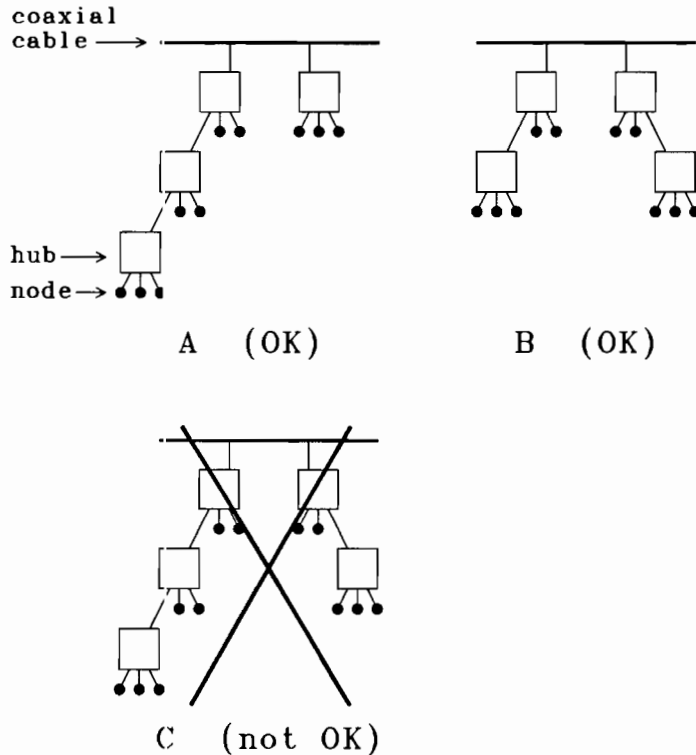


**Figure D-1. Configuration Examples, Twisted-pair Cabling Only**

Examples A, B, and C are all valid because there are no more than four hubs between the two most widely separated nodes on the network. Note, however, that example C has limited growth potential.

Example D is an invalid configuration. In example D there are 5 hubs between the two most widely separated nodes on the network; this exceeds the limit of 4 hubs between nodes.

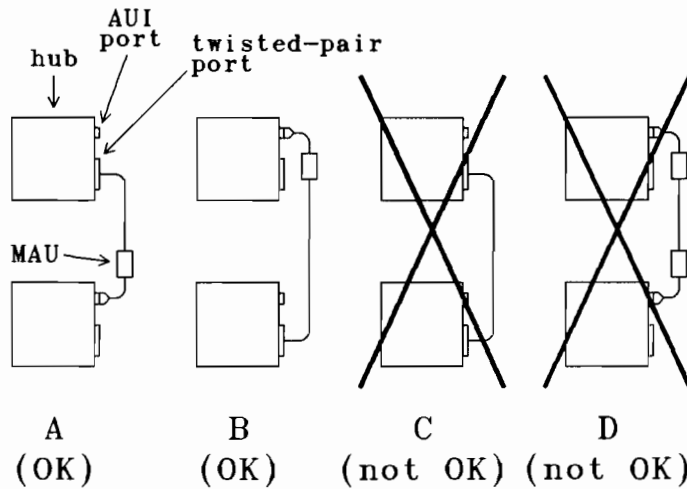
Figure D-2 shows similar examples for StarLAN 10 networks that are connected by a backbone coaxial LAN cable (either ThinLAN or ThickLAN). In these cases, the coaxial cable must be a single section (up to 500 meters for a ThickLAN cable or 185 meters for a ThinLAN cable) with no repeaters.



**Figure D-2. Configuration Examples, Twisted-pair And Coaxial Cabling**

Examples A and B in the figure show valid configurations, since the most widely separated nodes on the network have no more than 4 hubs between them. Note, however, that example A has limited growth potential. Example C is an invalid configuration because the most widely separated nodes have 5 hubs between them.

6. A twisted-pair connection between two hubs must go through one twisted-pair port and one AUI port. Figure D-3 shows examples.



**Figure D-3. Connections between Hubs**

Examples A and B are valid. In each case the connection goes from the AUI port of one hub to one of the twisted-pair ports of the other hub. Example C is invalid because the connection goes between two twisted-pair ports. Example D is invalid because the connection goes between two AUI ports.

# Glossary of Terms

---

The following terms are defined as they are used in Hewlett-Packard computer networking products manuals.

<b>AUI</b>	Attachment Unit Interface. A cable that connects a MAU to the AUI port of the StarLAN 10 hub.
<b>AUI Port</b>	The 15-pin connector port on the back panel of the StarLAN 10 hub.
<b>Auto-segmentation</b>	The process of automatically isolating a LAN segment from the rest of the network when that segment is faulty for greater than 5 milliseconds.
<b>Babble</b>	A continuous transmission.
<b>CSMA/CD</b>	Carrier Sense, Multiple Access with Collision Detect.
<b>Ethernet</b>	A local area network standard.
<b>Frame</b>	A block of data (within a packet) that contains address information and control information.
<b>IEEE 802.3</b>	Institute of Electrical and Electronic Engineers standard protocol for local area networks.
<b>IEEE 802.3 - Type 10BASE2</b>	10 MHz, CSMA/CD on thin-cable with topology of 185 meters maximum and 30 nodes maximum.
<b>IEEE 802.3 - Type 10BASE5</b>	10 MHz, CSMA/CD on thick-cable with topology of 500 meters maximum and 100 nodes maximum.

<b>IEEE 802.3 - Type 10BASE-T</b>	10 Mhz, CSMA/CD on twisted-pair cable with star topology and 100 meters maximum.
<b>LAN</b>	Local Area Network.
<b>LED</b>	Light Emitting Diode.
<b>MAU</b>	Medium Attachment Unit.
<b>MBPS</b>	Megabits per second.
<b>Node</b>	Device attached to a network; for the purpose of this manual, node means "computer".
<b>Packet</b>	A block of data (containing a frame) whose maximum length is fixed.
<b>Repeater</b>	A device which retransmits signals from one segment of coaxial cable to another, joining two similar LANs.
<b>Segment</b>	A section of thin coaxial cable (up to 185 meters) or thick coaxial cable (up to 500 meters).
<b>Thick Cable - type 10BASE5</b>	10 mm coaxial cable used in the Ethernet/802.3 segments.
<b>Thin Cable - type 10BASE2</b>	5mm coaxial cable used in the Ethernet/802.3.
<b>Thin LAN</b>	Local Area Networks using thin coaxial cable.
<b>Thick LAN</b>	Local Area Networks using thick coaxial cable.
<b>Twisted-pair</b>	Two conductor wires; intertwined along their length. These typically come in cables of 4 pairs or 25 pairs.



# Index

---

- A**
  - ACTIVITY LED ... 1-9
  - Adapter
    - 12-port modular ... A-2, 2-12, 3-2
  - Attaching cables ... 2-10
  - Attachment unit interface
    - See:* AUI
  - AUI connector ... B-1
  - AUI port ... 1-4, 2-10
  - Auto-segmentation ... 1-14
  
- B**
  - Bridge connections ... 3-13
  - Bridges ... 3-1-3-2
  
- C**
  - Cable connections ... 1-4
  - Cables
    - attaching ... 2-10
  - Cabling
    - twisted-pair ... 3-2
  - Card
    - LAN ... 3-1
  - Coaxial cable connections ... 3-11
  - COLLISION LED ... 1-10
  - Computer connections ... 3-3

## C

*(continued)*

### Connections

- cable ... 1-4
- computer to hub ... 3-3
- hub to bridge ... 3-13
- hub to coaxial cable ... 3-11
- hub to hub ... 3-8
- to hub ... 3-1

### Connector

- AUI ... B-1
  - 8-pin modular ... C-1
  - 50-pin ... A-1
  - right-angle ... 2-15
  - straight-out ... 2-16
- Cross-connect block ... A-4, 3-2
- CSMA/CD ... 1-14

## D

### Design rules

- HP StarLAN 10 ... 2-3, D-1

### Diagnostic testing ... 4-1

### Documents

- related ... 1-17

## E

### 8-pin modular connector ... C-1

### Equipment supplied

- hub ... 1-15

## F

### 50-pin connector ... A-1

### 50-pin port ... 1-5, 2-12

### Functions

- hub ... 1-1

### Fuse

- power ... 1-12

## G

### Guides

- related ... 1-17

## H

- HP 28663A
  - product description ... 1-1
- HP 28663A StarLAN 10 hub
  - See:* Hub
- HP StarLAN 10
  - connections ... 3-1
  - design rules ... 2-3, D-1
- HP StarLAN 10 networks
  - hub ... 3-13
- Hub
  - cable connections ... 1-4
  - connections ... 3-1, 3-8
  - equipment supplied ... 1-15
  - functions ... 1-1
  - HP StarLAN 10 ... 3-13
  - installation ... 2-1
  - LED indicators ... 1-9
  - mounting ... 2-7
  - operation ... 1-13
  - product description ... 1-1
  - specifications ... 1-16
  - switches ... 1-5

## I

- Installation
  - attaching cables ... 2-10
  - hub ... 2-1
  - mounting the hub ... 2-7
  - powering up ... 2-17
  - product inspection ... 2-1
  - setting switches ... 2-6
  - setting voltage ... 2-4
  - site preparation ... 2-3
  - verifying proper operation ... 2-17
- Interface cards
  - LAN ... 3-1

## L

- LAN cards ... 3-1
- LED indicators
  - ACTIVITY ... 1-9
  - COLLISION ... 1-10
  - hub ... 1-9
  - MAU PWR ... 1-9
  - self-test mode ... 1-11, 4-4
  - STATUS ... 1-10
- Light-emitting diode
  - See:* LED
- LINE switch ... 1-5
- LOOPBACK switch ... 1-7, 2-6
- Loopback test ... 4-1

## M

- Maintenance ... 4-1
- Manuals
  - related ... 1-17
- MAU PWR LED ... 1-9
- MAUs ... 3-1
- Medium attachment unit
  - See:* MAU
- Modular adapter
  - 12-port ... A-2, 2-12, 3-2
- Modular connector
  - 8-pin ... C-1
- Mounting the hub ... 2-7

## O

- Operation
  - hub ... 1-13

## P

- PDS ... 2-3
- Plug module ... 1-12
- Port
  - AUI ... 1-4, 2-10
  - 50-pin ... 1-5, 2-12
  - twisted-pair ... 1-5, 2-12
- PORT SELECT switch ... 1-6, 2-6

## **P**

*(continued)*

Power plug module ... 1-12  
Powering up ... 2-17  
Premises Distribution System  
    *See:* PDS  
Product description  
    hub ... 1-1  
Product inspection ... 2-1

## **R**

Rack mounting ... 2-7  
Recommended switch settings ... 1-9  
Related documents ... 1-17  
Right-angle connector ... 2-15

## **S**

Segmentation ... 1-10, 1-14  
Self test ... 4-3  
SELF TEST switch ... 1-7, 2-6  
Self-test mode  
    LED indicators ... 1-11, 4-4  
Setting switches ... 2-6  
Setting voltage ... 2-4  
Site preparation ... 2-3  
Specifications  
    hub ... 1-16  
SQE TEST switch ... 1-8, 2-6  
StarLAN 10 cabling ... 3-2  
StarLAN 10 hub  
    *See:* Hub  
STATUS LED ... 1-10  
Straight-out connector ... 2-16

## **S**

*(Continued)*

### Switches

hub ... 1-5

LINE ... 1-5

LOOPBACK ... 1-7, 2-6

PORT SELECT ... 1-6, 2-6

recommended settings ... 1-9

SELF TEST ... 1-7, 2-6

setting ... 2-6

SQE TEST ... 1-8, 2-6

## **T**

### Test

loopback ... 4-1

self test ... 4-3

Troubleshooting ... 4-1

12-port modular adapter ... A-2, 2-12, 3-2

Twisted-pair cabling ... 3-2

Twisted-pair port ... 1-5, 2-12

## **V**

Verifying proper operation ... 2-17

## **W**

Wall mounting ... 2-7

# **90-Day Limited Hardware Warranty**

---

Hewlett-Packard warrants the HP StarLAN 10 Hub against defects in materials and workmanship for a period of 90 days from receipt by the end user, except when used as part of an HP system. If HP receives notice of such defects during the warranty period, HP will either, at its option, repair or replace products which prove to be defective.

Should HP be unable to repair or replace the product within a reasonable amount of time, Customer's alternate exclusive remedy shall be a refund of the purchase price upon return of the product.

If this product was purchased as part of an HP system in a coordinated shipment, it is warranted against defects in material and workmanship during the same period as the HP system.

## **Exclusions**

The above warranty shall not apply to defects resulting from improper or inadequate maintenance by Customer; customer-supplied software or interfacing; unauthorized modification or misuse; operation outside of the environmental specifications for the product; or improper site preparation and maintenance.

The selection and use of media, supplies, and consumables is the customer's responsibility. Hewlett-Packard reserves the right to exclude from the warranty or service agreement any repairs for damage to HP products which HP reasonably determines or believes were caused by use of non-HP media or cleaning supplies. Hewlett-Packard will, upon request, repair such damage on a time and material basis.

## **Obtaining Warranty Service**

To obtain warranty service, products must be returned to a service facility designated by HP. HP may repair on-site at the option of the customer. Customer is responsible for travel charges when on-site repair is requested.

Warranty service for products purchased as part of a system will be subject to service in accordance with the system support services.

Customer shall prepay shipping charges for products returned to HP for warranty service and HP shall pay for return of the products to Customer. However, Customer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

### **Warranty Limitations**

HP makes no other warranty, either expressed or implied with respect to this product. HP specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Some states or provinces do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion may not apply to you. However, any implied warranty of merchantability or fitness is limited to the 90-day duration of this written warranty.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state, or province to province.

### **Exclusive Remedies**

The remedies provide herein are Customer's sole and exclusive remedies. In no event shall HP be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory. Some states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

HP offers complete service and maintenance worldwide. Maintenance agreements are available for HP peripheral products. Advantages of these agreements to the customer include a fixed annual cost, individualized cost-effective contracts, and a choice of response time. Current rates can be determined by contacting your local HP Sales and Support Office.