HP 9000 Series 800 Computer Systems

CIO LAN Interface Controller (LANIC)

Installation and Reference Manual

bly: 5062-3313

HEWLETT PACKARD

Notice

Printing History

New editions are complete revisions of the manual. Update packages, which are issued between editions, contain additional and replacement pages to be merged into the manual by the customer. The dates on the title page change only when a new edition or a new update is published. No information is incorporated into a reprinting unless it appears as a prior update; the edition does not change when an update is incorporated.

A software code may be printed before the date; this indicates the version level of the software product at the time the manual or update was issued. Many product updates and fixes do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

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Safety Considerations

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

Safety Symbols

Instruction manual symbol: the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the product against damage.

Indicates hazardous voltages.

Indicates earth (ground) terminal. This symbol is sometimes used in the manual to indicate circuit common connected to a grounded chassis.

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

Caution The caution sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, 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.

Servicing

Warning Any servicing, adjustment, maintenance, or repair of assemblies or sub-assemblies of the computer system must be performed only by qualified personnel.

General

Warning SAFETY EARTH GROUND — The computer in which this product is installed is a safety class I product and is provided with a protective earthing terminal. An uninterruptible safety ground must be provided from the main source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, or before the power cord is removed from the wall receptacle, the interface cable connector must be removed from the computer system and insulated from exposed conductive surfaces.

Warning At infrequent intervals, exposed metal surfaces of the interface cables may be subject to transient hazardous voltages due to strong electrical disturbances (such as lightning or disturbances in the electrical utilities power grid) in the area surrounding the network to which this product is connected. These surfaces should be handled with caution, especially when the interface cables are not connected to a properly grounded computer system.

| **Caution** | STATIC SENSITIVE DEVICES |

When any two materials make contact their surfaces are crushed on the atomic level amd electrons pass back and forth between the objects. On separation, one surface comes away with excess electrons (negatively charged) while the other is electron deficient (positively charged). The level of charge that is developed depends on the type of material. Insulators can easily build up charges in excess of 20,000 volts. A person working at a bench or walking across a floor can build up a charge of many thousands of volts. The amount of static voltage developed depends on the rate of generation of the charge and the capacitance of the body holding the charge. If the discharge happens to go through a semiconductor device and the transient current pulse is not effectively diverted by protection circuitry, the resulting current flow throught the device can raise the temperature of the internal junctions to their melting points. MOS structures are also susceptible to dielectric damage due to high fields.

The resulting damage can range from complete destruction to latent degradation. Small geometry semiconductor devices are especially susceptible to damage by static discharge.

The LANIC card is shipped in a transparent static shielding bag. The card should be kept in this bag at all times until it is installed in the system. Save this bag for storing or transporting the card. When installing the card in the system, do not touch any components. Hold the card by its edges.

FCC Notice

For U.S.A. Only

The Federal Communications Commission (in 47 CFR 15.838) has specified that the following notice be brought to the attention of the users of this product.

FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFACE STATEMENT

Warning: This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a commerical environment. Operation of this equipment in a residential area may 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 or television 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: re-orient the receiving antenna; relocate the computer with respect to the receiver; move the computer away from the receiver; plug the computer into a different branch circuit. If necessary, the user should consult the dealer or authorized field service representative for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

Preface

Purpose

This manual provides installation procedures for the Channel I/O (CIO) *Local Area Network Interface Controller* (LANIC) card. Using this manual, you will be able to install a LANIC card into applicable HP 9000 Series 800 computers for connection to a local area network (LAN).

To completely install and operate a host computer as a network node, this manual must be used in conjunction with other manuals. For example, this manual presumes that node location decisions have been made, and network cabling and accessories have been installed. Cable and accessory installation details are discussed in other manuals. Likewise, information on computer operation and network communication software is available elsewhere. The "Technicial Manual Reference" section in Chapter 8 provides a list of related manuals.

Organization

Chapter 1	provides a general overview of the CIO LANIC product.
Chapter 2	provides site preparation information.
Chapter 3	provides hardware installation and configuration procedures for proper card operation.
Chapter 4	provides a functional description of the product.
Chapter 5	describes removal and replacement procedures for serviceable components.
Chapter 6	provides basic maintenance and troubleshooting information.
Chapter 7	provides a list of replaceable parts used in the LANIC card assembly.
Chapter 8	provides reference information and a glossary of terms.
Chapter 9	contains schematic diagrams for the LANIC card.

Appendix A	provides reference and installation information for the HP 28641A ThinMAU.
Appendix B	provides reference and installation information for the HP 30241A ThickMAU.
Appendix C	provides reference and installation information for Ethernet.
Appendix D	provides reference and installation information for the HP 28664A Twisted-pair MAU.

Comment

Thank you for your selection of this interface and other technological products provided by Hewlett-Packard. As our valued customer, meeting your needs is among our highest goals. To this end, we encourage you to send us your comments and/or suggestions on this or other products, using the Reader Comment Sheet enclosed.

Table of Contents

D   Twisted-pair MAU

1   General Information

This manual presents installation and reference material for the Local Area Network Interface Controller (LANIC) printed circuit assembly (PCA, also referred to as card) and card connector cable (stub cable) used with the Channel I/O (CIO) LAN Link. This chapter provides a general overview of the product.

Product Overview

The LANIC connects an HP 9000 Series 800 host computer to a Local Area Network (LAN). With appropriate network software, the host becomes a *node* on the LAN, and can access and communicate with other nodes.

The LANIC operates with 10 megabit-per-second *baseband* networks using a *CarrierSense Multiple Access with Collision Detect* (CSMA/CD) protocol for network access. Baseband implies that a single channel uses the entire bandwidth available and is shared by all the nodes on the network. CSMA/CD implies that the nodes gain access to the common channel through a contention process whenever the channel is free of traffic, without the use of a master node.

Connection to the Host

The Local Area Network Interface Controller (LANIC) card is an input/output (I/O) card that plugs into the Channel I/O Bus (CIB) of an HP 9000 Series 800 host computer. An 80-pin connector (J1), located on the LANIC card, mates with connector pins on the CIB when the card is inserted into the CIB card cage.

Connection to a LAN

The LANIC is an implementation of the Institute of Electrical and Electronic Engineers (IEEE) LAN standards 802.2 Type 1 and 802.3. In addition, it provides for connection and operation with LANs defined by the *de facto* industry standard, Ethernet (Version 1.0 and 2.0). These standards define baseband, CSMA/CD LANs which feature burst transfer rates of 10 Mbits per second.

The LANIC connects to a LAN via a Medium Attachment Unit (MAU). Refer to the appropriate Appendix for specific information about your MAU.

Software

The LANIC is supported under HP-UX (Revision B.02.00 or later) on HP 9000 Series 800 Computer Systems.

The LANIC supports the Hewlett-Packard LAN/9000 Series 800 link.

Installation instructions for link software are discussed in the *Installing LAN/9000 Series 800* manual, part number 98194-90009. Note that LAN/9000 Series 800 software supports both Ethernet and IEEE 802.3.

All the ARPA Berkeley, NFS, and NS products will run on top of the LAN/9000 Series 800 link software.

Link-Level (Station) Address

The link-level station address is a 12-digit hexadecimal number that uniquely identifies each node. This address is associated with the Data Link Layer (level 2) of the International Standards Organization (ISO) Open Systems Interconnection (OSI) model, and should not be confused with "internet" or other addresses associated with higher layers. During normal node operation, the destination address of a received packet is matched with this address to determine if the packet is accepted for processing. In addition, the node's station address is appended to transmitted packets for source node identification.

The station address is assigned at the factory and stored in the card's NOVRAM (non-volatile, static RAM). It is globally administered, that is, it is a unique node address regardless of manufacturer. Refer to Chapter 3 to determine the address of your LANIC card.

The node's station address is changed if the NOVRAM is physically replaced. To replace the NOVRAM, see Chapter 5. If the address changes, you may need to reconfigure your software and update your network documentation.

Identification

The Product

Up to five digits and a letter (HP 12345B as an example) are used to identify Hewlett-Packard products. The digits identify the product; the letter identifies the revision level of the product.

Interface Card

The card supplied with the LANIC product is identified by a part number printed on a white sticker affixed to the card. In addition to the part number, the card is further identified by a letter and a 4-digit date code (e.g., A-1234). This designation is placed below the part number. The letter identifies the version of the etched circuit on the card. The date code (the four digits following the letter) identifies the electrical characteristics of the card with components mounted. Thus, the complete part number on a card could be as follows:

5062-3313
A-1234

| Note | Note that the date code on your card will be the current revision of the assembly, not the number given in the above example. |

If the card is already installed in the computer backplane, the legend "802.3" is imprinted on the left-hand extractor lever.

Manuals

The hardware reference manual (this manual) supplied with the LANIC product is identified by name and part number. The name, part number, and publication date are printed on the title page of the manual. If the manual is revised, the publication date is changed.

Specifications

LANIC specifications are shown below.

Features

Capacity
Single (transmit or receive) communication channel with up to 64 Kbytes of RAM for buffering both receive and transmit packets.

Transmission mode
CSMA/CD, bit serial, Manchester encoded, variable packet size from 64 to 1518 bytes.

Data Transfer Rate
Transmitted in bursts at 10 Mbits/second. Throughput capacity is processor and process dependent.

Physical Characteristics

Size
19.3 cm by 17.1 cm by 1.59 cm
(7.6 in. by 6.75 in. by 0.75 in.)

Weight
280 grams (10 ounces)

IO Channel Interconnect
One 80-pin female connector (J1) connects to the host computer's Channel I/O Bus (CIB)

Device Interconnect
One 26-pin male connector (J2) connects to a card connector cable (stub cable)

Environmental

Operating
0° to +55° Celsius

Non-operating
–40° to +75° Celsius

Electro-magnetic
Conforms to VDE Level B and FCC Level A for radiated and conducted interference.

Voltage	+5V	+12V*
Current (AMPS)	3.00	0.50
Power (WATTS)	15	6

*This voltage is passed through the card to the MAU. The LANIC does not use the +12V power itself.

Test Equipment and Special Tools

The following items are available from Hewlett-Packard for testing the LAN node:

- HP 92257B MAU Test Fixture

- HP 92257Q ThinMAU Test Fixture

- HP 5061-4977 Twisted-pair MAU Loopback Connector

The above test fixtures are available through the nearest Hewlett-Packard Sales and Support Office. The Loopback Connector comes as part of the Twisted-pair Option. All the above items are also available from the Hewlett-Packard Direct Marketing Division.

Support Strategy

Support of the LANIC is based on the replacement of the LANIC card, MAU, and cables. A defective LANIC card should be returned to Hewlett-Packard for repair. (For instructions on returning a card for repair, refer to the paragraph "Exchange PCAs" in Chapter 7.) The MAUs and cables are not repairable.

Equipment Supplied

Standard equipment supplied with this product is operationally compatible with the IEEE 802.3 standard. Included is one of each of the following:

Part Number	Description
5062-3313	LANIC Card Assembly
5959-2259	CIO LAN Interface Controller
	Installation and Reference Manual (this manual)
28641-60004	ThinMAU
28641-90001	ThinMAU Installation Manual
1250-0781	BNC "T" Connector
1252-1650	BNC "T" Connector Cover

The product also includes the appropriate Link software and associated manuals for your computer system.

The following options are also available:

Option #740 – Deletes the ThinMAU and adds aThickMAU.

Option #840 – Deletes the ThinMAU and adds a Twisted-pair MAU.

Option #841 – Deletes the ThinMAU.

Option #1AW – Hardware only Option.

Option #AA1 – Replaces 1/4-inch tape with 1600 BPI 1/2-inch tape.

Option #0CC – Software Revision Upgrade Option.

2   Site Preparation

Because the Channel I/O (CIO) LAN Link is part of an HP 9000 Series 800 Computer System, this manual assumes that all computer-level site preparation procedures have been followed and that the appropriate cabling has been installed for your type of LAN network. Supported cabling includes one of the following:

1. "Thin" RG58 A/U or C/U coaxial cable (approximately 4.9 mm, 0.019 inch diameter) with BNC connectors at each node location, and:

    a. IEEE 802.3 Type 10BASE2 hardware: HP 28641A ThinMAU with BNC "T" adapter connected to the coaxial cable, or

    b. Ethernet-based hardware for accessing thin-cable LANs.

2. "Thick" coaxial cable (approximately 10 mm, 0.4 inch diameter), and:

    a. IEEE 802.3 Type 10BASE5 hardware: HP 30241A MAU with tap connected to the coaxial cable and AUI cabling from the MAU to the host computer, or

    b. Ethernet-based tap and transceiver assembly, and branch cabling to the host computer.

3. Unshielded twisted-pair cabling which meets HP's SiteWire 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.

    a. Hardware: HP 28664A Twisted-pair MAU connected to StarLAN 10 hub or cabling block.

Furthermore, this manual assumes that the HP-UX operating system (Revision B.02.00 or later) has been installed in the computer. For HP-UX system installation information, refer to the *Installing and Updating HP-UX* manual, part number 92453-90019.

Finally, this manual assumes that LAN/9000 software has been installed in the computer. LAN/9000 software contains an interactive diagnostic routine that can be used to initiate a card self-test (contained on the card). Conducting the card self-test completes the LANIC card installation. Details of LAN/9000 software installation and the LAN diagnostic commands are described in the *Troubleshooting LAN, NS, ARPA Services/9000 Series 800* , part number 98194-90010.

3   Installation / Configuration

| Caution | Some of the components used in the LANIC card are susceptible to damage by static discharge. Refer to the safety considerations information at the front of this manual before handling the card. The card is shipped in a transparent static shielding bag. The card should always be kept in this bag until it is installed in the computer system. When handling the card outside of this container, do not touch any components. Hold the card by its edges. |

Inspection

After unpacking the LANIC product, keep the shipping carton and packing materials. These items will be useful in case any item has to be returned to Hewlett-Packard later. If you notice evidence of damage when you open the carton containing the LANIC product, inspect all items carefully. If any item appears to be damaged, notify the nearest Hewlett-Packard Sales and Support Office.

If any item does not meet specifications, or if the LANIC does not pass the start-up and verification procedures described later in this chapter, notify the nearest HP Sales and Support Office immediately. HP Sales and Support people will arrange for repair or replacement of the defective item without waiting for any possible claims against the carrier to be settled.

Repacking

If it becomes necessary to repack any item for reshipment, use the original carton and packing material, if available. If original material is not available, good commercial packing material should be used. Commercial packing and shipping companies have the facilities to repack the items for shipment. BE SURE TO OBSERVE ANTI-STATIC PRECAUTIONS.

Storage

If the LANIC card is to be stored, it should be placed in the original plastic anti-static bag used for shipping. If the original bag is not available, use one of equivalent quality and size. It is also a good idea to enclose the card and plastic bag in the original shipping carton (or a similar carton if the original one is not available). No special containers are required to store the cable(s) or the MAU.

Power Requirements

The LANIC draws its power from the host computer through the back-plane. LANIC power requirements are listed in the "Environmental" section of Chapter 1, and summarized below:

+5V @ 3A; +12V @ 0.5A

Consult your system hardware manuals for any configuration limitations imposed by the addition of a LANIC card.

Determining the Link-Level Address

The link-level address is a unique node identifier used for selective address filtering of LAN data packets. This address is represented by a 12-digit hexadecimal number. From Hewlett-Packard, this address is globally administered; it is unique across manufacturers. The first six digits are:

08 00 09 $_{HEX}$

The second six digits are marked on the LANIC card's NOVRAM (non-volatile static RAM) in the following form:

XX YY ZZ $_{HEX}$

Thus, 08 00 09 00 3E E9 $_{HEX}$ might be the complete link-level address.

The NOVRAM is an integrated circuit (IC) mounted in a dual in-line package (DIP) at location U26. Refer to Figure 3-1 for approximate location.

The link-level address should be entered on the network map. Some system managers find it helpful to record the link-level address in a system logbook. They use it to promote orderly network changes and additions. All pertinent information is included: the internet addresses, link-level addresses, node names, software directory files, etc. The network map is also part of the logbook.

Note that the link-level address is changed whenever the LANIC is replaced or when the NOVRAM is physically replaced (should the need arise). Chapter 5 contains NOVRAM replacement instructions.
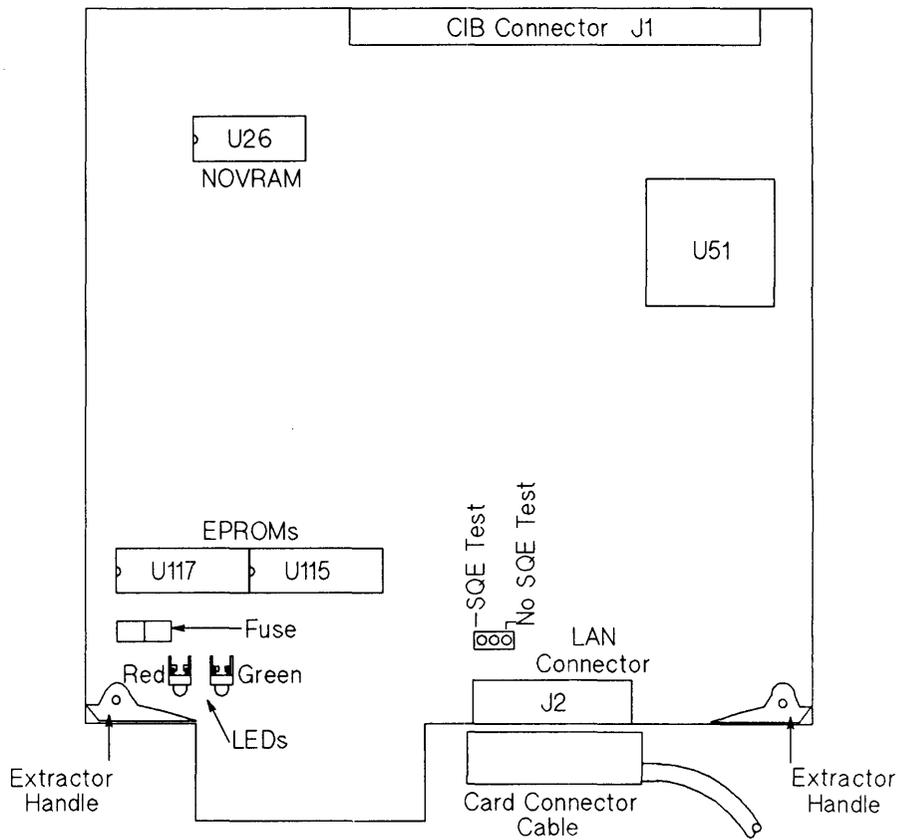
Figure 3-1. LANIC Card Key Component Locations

SQE Jumper Setting

The card contains a three-post SQE (Signal Quality Error) jumper located directly behind the LAN Connector (J2) shown in Figure 3-1. The placement of the shorting clip will determine if the SQE Test function is *enabled* or *disabled*. The SQE test function is an implementation of the IEEE 802.3 standard.

A jumper shorting clip is installed at the factory in the "SQE TEST" position which *enables* the SQE test signal. As you hold the card by the extractor handles, the shorting clip is positioned on the left side of the three-post jumper, Figure 3-2(A). All IEEE 802.3 installations should have the jumper in this position.

(A) SQE Enabled Position   (B) SQE Disabled Position
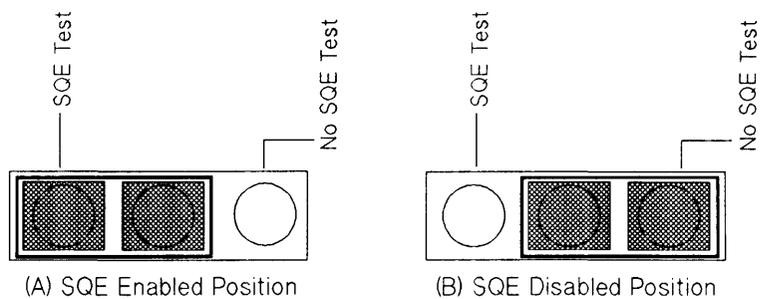
Figure 3-2. SQE Jumper Position

Some Ethernet 1.0 transceivers do not support SQE Test and therefore, this function must be *disabled* on the LAN card. (Refer to the specifications for the transceiver you are using.)

To *disable* the SQE test signal, move the jumper shorting clip to the "NO SQE TEST" position, or the right side of the three-post jumper, Figure 3-2(B).

| **Caution** | Be sure to observe anti-static precautions to prevent any possibility of static discharge to the card. |

To move the shorting clip to the "NO SQE TEST" position, follow the procedures below.

1. Position the card so the extractor handles are toward you.

2. Remove the shorting clip by lifting it from the jumper posts labeled "SQE TEST".

3. Replace the shorting clip by moving it one jumper post to the right and sliding it down onto the jumper posts labeled "NO SQE TEST" leaving the leftmost pin exposed. See Figure 3-2(B).

Installation

Installing the LANIC Card

The general procedures for installing an interface card are described in your computer system installation manual. You should refer to your systems manual before performing the steps below.

Caution	All system power must be off before attempting to install the LANIC card.

1. Log in at the system console and shut down the operating system. Refer to the *HP 9000 System Administrator's Guide,* part number 92453-90004 (furnished with your computer system), for instructions on shutting down the operating system.

2. Turn off power to the host computer system.

3. Install the LANIC card in any authorized slot in the card cage of the computer. See the systems manual for slot dependencies.

4. Ensure that all LAN connections for this node are correct and recheck them before applying power to the computer.

LAN Node Connection

This manual assumes that the LAN cable and cable connectors have been installed. LAN cable and connector installation information for your type of LAN can be found in the following:

- *LAN Cable and Accessories Installation Manual* (coaxial cable LANs)

- *Twisted-pair Cabling Installation Guide* (unshielded twisted-pair LANs)

If the node is based on the Ethernet standard, you must ensure that an Ethernet transceiver has been installed on the coaxial cable.

Warning | The MAU/transceiver and cabling to the LANIC card must all conform to the same standard, either IEEE 802.3 or Ethernet. Failure to comply will result in incompatible grounding and an electrical shock hazard.

Installing the Cables

The same card connector (stub) cable (part number 27125-63009) is used for LAN nodes based on either the IEEE 802.3 standard or the Ethernet Standard. To install the cable, connect the 26-pin connector to the LANIC card. Refer to Table 8-1 for connector cable pin assignment.

For AUI cable connection procedures, refer to the AUI cable connection procedures listed in the Appendix under the type of MAU you have.

Start-Up and Verification

Once you are sure that the card and all cables are installed correctly, start up the system by turning on computer power.

The LANIC card is configured into the computer system by HP-UX system administration commands. These are explained in detail in the *HP 9000 System Administrator's Guide*, part number 92453-90004.

The LANIC card contains a self-test in EPROM. This self-test is initiated whenever the card is reset (for example, during the system power-up and booting process, or upon command from the LAN diagnostic).

While the self-test is running, a red LED on the LANIC (see Figure 3-1 for approximate location) will light for approximately two seconds, then go out if the card passes self-test. When the LANIC self-test passes this point successfully, the test continues by checking the cables in an External Loopback Test. If the External Loopback test fails, the red LED will blink on and off for 32 seconds at 320 millisecond intervals (approximately 50 on-off pairs). This will likely mean that the card is

good, but there is a problem external to the card (for example, the card connector cable, the MAU, the AUI cable).

After self-test, the green LED on the card will be on continuously to indicate that power is applied to the MAU.

If the red LED stays on or if the green LED does not come on, refer to Chapter 6, "Troubleshooting".

Installing the Software

Refer to the *Installing LAN/9000 Series 800* manual, part number 98194-90009, for information on installing the LAN Link software. If you will be using one of the other available software services, refer to the appropriate manual included with the software for installation procedures.

4   Functional Description

The CIO LAN Link is an implementation of the IEEE 802.3 10 megabit LAN standard and is used to allow HP 9000 Series 800 Computer Systems to communicate with other computer systems over a local area network (LAN). The IEEE 802.3 LAN standard defines a bus utilizing CSMA/CD (Carrier Sense Multiple Access with Collision Detect) as the access method.

The link consists of a LAN Interface Controller, interface cables, and Medium Attachment Unit (MAU). The MAU connects to a LAN cable for transmission and reception of signals on the LAN; the interface cables connect the MAU to the LANIC; and the LANIC provides the interface between the LAN and the computer system.

The LANIC is an intelligent DMA channel which communicates with the host system via the Channel I/O Bus (CIB). On the network end of the LANIC, the AUI cable carries bit-serial data and control information to and from the MAU, which attaches directly to the network LAN cable. A functional block diagram of the LANIC is shown in Figure 4-1; schematic diagrams are in Chapter 9.
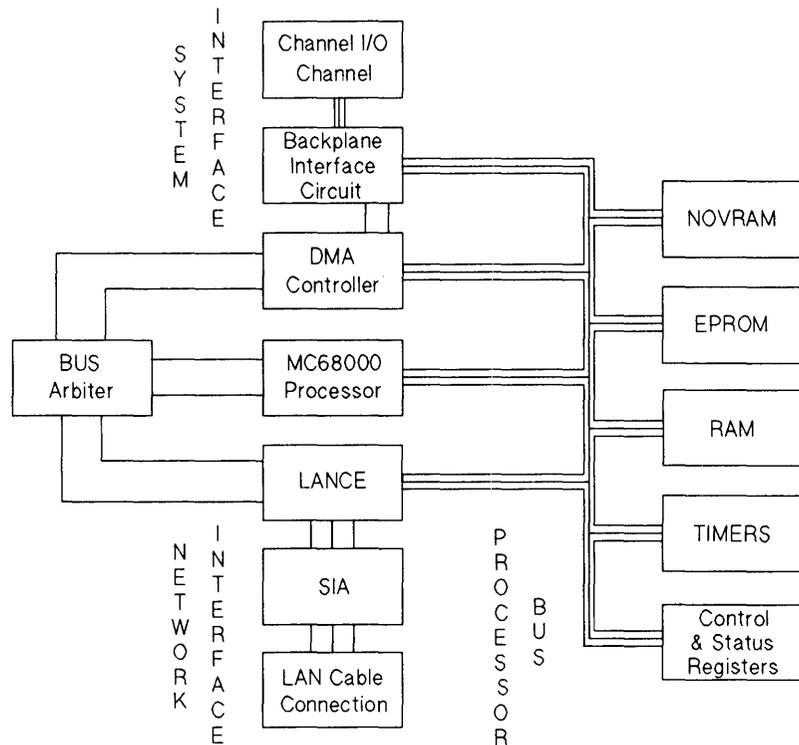

Figure 4-1. LANIC Functional Block Diagram

Microprocessor

An MC68000 microprocessor provides the local intelligence for controlling the card's activities. Among other things, it executes the system channel I/O bus (CIB) protocol and controls the flow of data from the host computer through the system interface to memory, and through the network interface onto the network cable.

System Interface

The system interface portion of the card contains all the components that transport data between the CIB and card memory.

The primary components are the AM9516 Direct Memory Access (DMA) Controller and the Backplane Interface Circuit (BIC) chip. The BIC is a custom gate array that provides all control signals needed for interfacing to the CIB. The DMA Controller is used to transfer data quickly between card memory and the CIB with minimal MC68000 control.

Memory Registers

Thirty-two Kbytes of EPROM provide program storage of firmware for the MC68000 processor.

Sixty-four Kbytes of static RAM serve as the primary location for data interchange. The RAM stores 32 incoming and eight outgoing data packets, provides the processor with stack and variable space, and provides processor communication paths with the DMA Controller and the LANCE (described below).

A 32-byte NOVRAM (non-volatile static RAM) stores the link-level (node) address of the card and other configuration parameters that must be retained after power-down.

Two timers, using a 10-MHz crystal-controlled reference, are used. One timer generates an interrupt to the MC68000 every 10 milliseconds for timing various software functions. The other timer interrupts the MC68000 whenever the LANCE has been continuously transmitting for more than 4 milliseconds, which exceeds the time required to transmit a legal packet size.

A control register is used to control the operation of the NOVRAM, the timers, and the self-test LED. A Status register stores information that indicates power available to the MAU, and transmission error information.

Network Interface

The network interface consists of components that:

- exchange data with memory,

- encode/decode data for transmission/reception,

- and transmit/receive data on the cable.

An AM7990 Local Area Network Controller for Ethernet (LANCE) chip performs the link-level functions for an IEEE 802.3 or Ethernet node. For transmission these include: deference, random back-off and retry, parallel-to-serial conversion, and CRC (cyclical redundancy check) generation. For reception, these include: address filtering, serial-to-parallel conversion, and CRC checking.

An AM7992 Serial Interface Adapter (SIA) chip performs Manchester encoding and decoding of the serial data stream. It recovers a receive clock from the incoming data, and creates a transmit clock via a crystal oscillator (external to the chip). In addition, it interfaces TTL (transistor/transistor logic) signals of the LANCE and the differential signals of the attached cable.

Bus Arbiter

Since more than one device can assume control of the processor bus (e.g., DMA Controller, MC68000, LANCE), the bus arbiter watches for bus requests and determines which device will gain bus access. The LANCE is given the highest priority to minimize the number of packets lost due to unavailable resources. If either the MC68000 or DMA Controller has the bus, and the LANCE requests it, the bus will be released after completing the current bus cycle.

5   Removal and Replacement

This chapter contains removal and replacement procedures for the CIO LAN Link. These procedures are limited to the LANIC card, the LANIC card connector cable, and the fuse, NOVRAM, and EPROMs on the LANIC card. Refer to the appropriate MAU Appendix for AUI and MAU removal and replacement information.

Warning

Before attempting removal of any card or cable from the system, the operating system must be shut down and the system power must be turned off. If you leave the power on, you risk electric shock and damage to the computer. Detailed instructions can be found in the *HP 9000 System Administrator's Guide*, part number 92453-90004.

Caution

Some of the components used on the LANIC card are susceptible to damage by static discharge. Refer to the safety considerations information at the front of this manual before handling the LANIC card. When handling the card, do not touch any components. Hold the card by its edges.

LANIC Card and Connector Cable

Removing the Card Connector (Stub) Cable

Remove the card connector cable (stub cable) as follows:

1. Shut the operating system down and turn computer system power off.

2. Disconnect the cable from connector J2 on the LANIC card.

3. Disconnect the 15-pin D connection between the card connector cable and the AUI cable.

Removing the LANIC Card

Remove the LANIC card as follows:

1. Shut the operating system down and turn off power to the computer system.

2. Disconnect the cable from connector J2 on the LANIC card.

3. Remove the card by grasping the extractor handles on each side of the card, and pulling the handles toward you. Once the card starts out of the card cage, pull it all the way out using the extractor handles.

Replacing the LANIC Card

| Note |

If your are replacing a defective card with an exchange assembly, be sure to remove the EPROMS from the defective card and install them on the exchange assembly before installing the new card.

Replace the LANIC card as follows:

1. Be sure the operating system is shut down and the power to the computer system is off before installing the card.

2. Insert the replacement LANIC card in the same slot from which the original card was removed. Push on the handles on the outside edges of the card to lock the card in place. (Follow the installation instructions in Chapter 3 for card installation.)

Replacing the LANIC Card Connector Cable

Replace the LANIC cable as follows:

1. Shut the operating system down and turn power off to the computer system.

2. Connect the 15-pin D connector end of the cable to the AUI cable connector. Be sure to slide the clip mechanism so that the connectors are locked together.

3. Connect the cable to connector J2 on the edge of the LANIC card.

Replacing Components on the LANIC Card

Replaceable components on the LANIC card are limited to the MAU power fuse, NOVRAM and EPROMs. These components fit into sockets; soldering is not required and may damage the components.

| Caution | Removal and installation of card components should be performed at a static-free work station. |

The Fuse

Order the 125V, 5A fuse from Hewlett-Packard under part number 2110-0520. Contact your Hewlett-Packard Sales and Support Office.

With the component side of the LANIC card up, locate the fuse. Figure 3-1 in Chapter 3 shows the approximate fuse location.

Remove the fuse from its socket by gently pulling it free.

| Caution | Excessive prying or pressure can damage the fuse holder or the card. |

Test the fuse for a broken element using an ohmmeter or continuity tester. The fuse should be replaced if an "open" circuit is indicated. You should always check the fuse first when the green LED is not on when the computer is supplying the LANIC with power.

Installation of a known good fuse simply requires inserting it into the empty fuse socket.

NOVRAM or EPROM

At some point, it may be necessary to replace the NOVRAM or EPROM. For example, NOVRAM or EPROM faults may be revealed by card self-test, or EPROM firmware may require updating.

Note that a replacement NOVRAM will contain a new unique link-level address assigned at the factory. When using Hewlett-Packard LAN software, it may be necessary to reconfigure the node onto the network when a new NOVRAM is installed. The node or network logbook must be updated with the new address.

With the component side of the LANIC card up, locate the NOVRAM or EPROMs. Refer to Figure 3-1 in Chapter 3 for approximate location. Part numbers and associated socket locations will be as follows:

Component:	1818-4372	1818-4373	27125-81001
Type:	EPROM	EPROM	NOVRAM
Location:	U115	U117	U26

Remove the component from its socket, without damaging the socket. An IC removal tool reduces any chance of ruining the chip, socket, or board.

Caution

Excessive prying and pressure can damage the socket and component; use great care during removal.

When installing the replacement component, note the half-circle notch located on one end. The notch shows the orientation of the IC, and must be matched with a similar notch on the empty socket. Ensure that the IC pins are aligned with the socket receptacles. It may be necessary to adjust the pins (bow them inward or outward) for proper alignment. Gently press the IC into place to properly seat the pins. If pressure is not applied uniformly, the pins on one side or the other may fold and collapse without properly mating in their sockets. (Note: If this happens, remove the IC, straighten the pins, and try again. If extensive damage occurred, you may need a new chip.)

6   Troubleshooting

Major hardware subassemblies of the link are categorized as field replaceable units (FRUs); troubleshooting is used to identify a defective FRU. The link includes the LAN interface controller (LANIC) card, the LANIC card connector cable, and the applicable Medium Attachment Unit. (Refer to the appropriate Appendix for additional MAU information.)

This chapter summarizes the diagnostic used to identify problems on the link in order to isolate a defective FRU.

Safety Considerations

Warning

Before attempting to remove or replace any card or cable in the system, follow the power down instructions in the system manual. Failure to turn off the power creates an electrical shock hazard and may damage the card or the computer.

Caution

Some of the components used on the LANIC card are susceptible to damage by static discharge. Refer to the safety considerations at the front of this manual before handling the LANIC card. When handling the card, do not touch any components. Hold the card by its extractors or by its edges.

Troubleshooting Strategy

Any malfunction on the LANIC card is remedied on a card exchange basis. To exchange the LANIC card, remove it from the system as explained in Chapter 5, and prepare it for reshipment to Hewlett-Packard in accordance with the instructions in the paragraph "Exchange PCAs" in Chapter 7. Hewlett-Packard Company will neither repair nor exchange cables or MAUs.

Maintenance

Preventive Maintenance

There are no specific preventive measures for the LANIC. When the host computer scheduled maintenance is done, it is a good idea to:

- Check the card connector cable (stub cable) for visible damage and wear.

- Check the MAU and the AUI cable for damage and wear.

- Check that the LANIC is properly seated in the card cage.

Maintenance Aids

To test and troubleshoot the LANIC, you will need one of the following:

- HP 92257B MAU Test Fixture (used with the HP 30241A MAU)

- HP 92257Q ThinMAU Test Fixture (used with the HP 28641A ThinMAU)

- HP 5061-4977 Loopback Connector (used with the HP 28664A Twisted-pair MAU)

It is helpful to have a set of known good spares to exchange for suspected faulty parts.

Local Area Network Device Adapter Diagnostic

The Local Area Network Device Adapter Diagnostic (LANDAD) is the part of the Online Diagnostic Subsystem used to detect a failure in one or more of the LANIC FRUs.

This section gives a brief description of LANDAD. For more detailed information refer to the *Online Diagnostic Subsystem Manual, Volume 1.*

LANDAD Capabilities

LANDAD can:

- Identify the product type and node (link-level) address of the LANIC.

- Report the status of the LANIC.

- Report the link statistics of the LANIC.

- Reset the LANIC.

- Initiate self-test on the LANIC.

- Execute a local or external loopback.

- Send TEST or XID (exchange identification) packets to a remote node and interpret the results.

- Perform tests that check AUI cable and MAU operation.

If you are familiar with LANDAD and merely want to run the program, skip this introduction and go to the "Running LANDAD" section.

Minimum Configuration

Hardware

The hardware needed to run LANDAD consists of an HP 9000 Series 800 computer, a LANIC card, a LANIC card connector cable, and a MAU attached to the network. Refer to the appendices for information that applies to your particular MAU.

Software

Required software includes an HP-UX operating system and the Online Diagnostic Subsystem (of which LANDAD is a part).

LANDAD Operational Modes

Before you run LANDAD, make sure the LAN is set up for the test sections you will run. Many sections can be run without affecting the rest of the network, but some go out onto the medium and read or write either to the card you are testing or to other nodes. LANDAD has two different modes as described below:

- **Normal Mode** – LANDAD tests which use this mode will not destroy data on that LANIC, other Network Nodes on the LAN, or other devices on the system. An example of a normal mode test is a request for link level statistics. The sections that run in normal mode are: 1, 3, 4, 6, 7, 9, and 10.

- **Destructive Mode** – Tests using this mode will destroy data on the LANIC and affect other users on the system. If you plan to run tests in this mode, be sure that you are the only system user before you begin. An example of a destructive mode test is self-test, which will bring the LANIC off-line and destroy any data transfer in process. Sections which run in destructive mode are: 2, 5, 8, 11, and 12.

Remember, to run a destructive test in LANDAD, you must use the system console or a terminal attached to a different LANIC from the one you want to test.

Description of LANDAD Sections

The LANDAD sections and steps are summarized below.

Section Number	Diagnostic Function
1.	More Help
2.	Reset
3.	Identify
4.	Local Loopback (to LANIC and back)
5.	Self-test
6.	Status
7.	Link Statistics Step 71 - Read and decode link statistics Step 72 - Reset link statistics
8.	External Loopback
9.	Remote Node Test
10.	Remote XID Test
11.	AUI Cable Fault Isolation Test
12.	Offline MAU Test Step 121 - Two-Terminator Test Step 122 - One-Terminator Test

Section 1 — More Help

More Help is an interactive section which allows you to obtain more information about a particular section or step than is given when typing help at the Online Diagnostic Subsystem prompt. This section provides a means for all users from any terminal to obtain additional information about any LANDAD section or step.

Section 2 — Reset   Reset causes a reset of the LANIC to its power-on state. All pertinent data needed by the LANIC to operate properly will then be downloaded to the LANIC. If, after a reset of a LANIC that is offline due to bad hardware, the LANIC indicates that it passed its self-test, the LANIC will be put into the online state.

Note	It is better to do a self-test command (section 5) to bring the LANIC back online because it checks status of the LANIC card and displays what has failed if the LANIC contains a fault.

Section 3 — Identify   Identify causes a Status command to be issued to the LANIC. This command then decodes the information obtained and displays it in descriptive terms. This section can be used to determine what the LANIC hardware and firmware datecodes are. It is also useful in that if it executes successfully, the path from the diagnostic to the LANIC is at least partially functional.

Section 4 — Local Loopback   Local Loopback will test the data path from the diagnostic to the card and back. A self-addressed frame is transmitted and a byte-for-byte comparison of the transmitted data is compared with the returned data to determine if it has been corrupted. Since the LANIC only loops back the frame if the transmission onto the network medium is successful, this test also checks all components from the network medium to the driver. If the transmission is not successful, the suspected problem is returned.

Section 5 — Self-test   Self-test tells the LANIC to perform a hardware self-test. If the returned self-test status is abnormal, messages indicating the problem are displayed. Since selftest brings the card offline and aborts all current information transfers, it should only be done when absolutely necessary. If self-test passes, it will put the LANIC into the online state. If message LANDADWARN 6005 is ever displayed, selftest should be run to first determine if the LANIC is functional, and if it is, to put the card back online.

Note	If this section completes successfully, it will put the LANIC into the online state, even if it is in the offline state when the section is called.

Section 6 — Status   Status is used to obtain information about the current state of the LANIC.

Section 7 — Link Statistics

Link Statistics displays the link statistics stored by the LANIC. It also allows you to reset these link statistics.

This function has two steps: Step 71 is the default step. It reads link statistics from the LANIC and decodes them. To invoke this step, enter:

```
DUI > run landad pdev=X.Y section=7   <RETURN>
```

Where "X" is the system dependent channel address, and "Y" is the slot number. For more details, refer to the "Hardware Addressing" section of your *System Administrator's Manual*.

The second function is the reset statistics function, step 72. This function is disruptive since it modifies data on the LANIC. Since step 72 is not a default step, you must enter the following:

```
DUI > run landad pdev=X.Y section=7 step=72   <RETURN>
```

Step 71 - Read and Display Link Statistics

This step requests link level statistics from the LANIC and displays the statistics.

Step 72 - Reset Link Statistics

This step resets the link statistics on the LANIC.

Section 8 — External Loopback

External Loopback first takes the card offline and then tells the LANIC to perform an external loopback test. This test transmits and receives a frame off the network cable. If this test passes, the following hardware appears to be functional.

1. This Network Cable Segment. (Use an ohmmeter/TDR to verify.)

Note	ThickMAUs (30241-60102) and ThinMAUs (28641-60004) with date code A-2735, are unable to detect network cable shorts. To determine if the cable is connected properly, it may be tested with an ohmmeter/TDR.

2. Both 50 ohm terminators.

3. The MAU connection to the LAN.

4. The MAU.

5. The AUI cable(s).

6. The card connector cable.

7. The LANIC.

Note	If this section completes successfully, it will put the LANIC into the online state, even if it is in the offline state when the section is called.

Section 9 — Remote Node Test

Remote Node Test checks the ability of this node to bounce a packet off another node connected to the same physical network. When there are repeaters in the network, the packet is bounced off a node in the same logical network. This is useful for two reasons: First, it shows the node can communicate with a remote node. Second, it can point to upper level software problems. If a frame can be bounced off another node using the diagnostic, but normal NS communications do not work, the hardware is working, so the problem is in the upper level software.

This section sends an IEEE 802.2 test frame. This test frame can be any length from 60 bytes (a minimum 802.3 frame) to 1514 bytes (a maximum length 802.3 frame). The default is 500 bytes. When a test response frame is received from the remote station, its length is checked for being either a minimum size frame or for being the specified length -0/ + 1. If the response frame is not a minimum size frame, then the data is checked against the data sent. If it is not the same, then the test frame part of the test fails.

This section will allow communication only to individual network addresses. If you input a broadcast or multicast address as a response to the Remote Node Address prompt, an error message will be issued and you will be prompted again for a valid remote node address.

Note

The remote node MUST be capable of responding to IEEE 802.2 test frames, and that node must be in a state to answer those frames. For example, most systems must have the LANIC device driver installed and operating before test frames will be answered.

Note

Part of what this section tests is the receive threshold of the MAUs at the two nodes involved in the test. The worst case for this is when the two nodes are the maximum 500 metres (185 metres for ThinLAN) apart. Therefore, the test results are most significant if you attempt to bounce frames off the most distant node.

Section 10 — Remote XID Test

Remote XID Test allows you to send IEEE 802.2 XID command frames to a specified remote node and receive the response frame from the remote node. This section also decodes the response and displays the type of service available at the remote node.

You are prompted for both the 6-byte remote node address and the 1-byte DSAP of the service on the remote system to which the XID frame should be sent. The addresses that you give must be individual addresses, i.e., they cannot be broadcast or multicast. Should you input one of these illegal addresses, an error message will be issued and you will be prompted again for a valid address.

Section 11 — AUI Cable Fault Isolation

AUI Cable Fault Isolation isolates a broken cable in the AUI cable segment. This is done by repeatedly sending external loopback frames and checking to see if the frame loopback was successful.

To run this section connect a terminated loopback fixture to the end of the stub cable and start the text. Next, disconnect the loopback hood at the stub cable, reconnect the stub cable to the AUI cable, and connect the loopback fixture to the other end of the AUI cable. If there are multiple AUI cables, continue doing this until all the AUI segments are tested.

If the AUI cable segment passed the test, a "P" is printed. If it did not · pass, one of the following fail codes will appear on the screen.

Fail Code	Description
L	Loss of carrier error possible broken AUI cable
R	Retry fault possible bad loopback hood
I	Infinite deferral possible bad loopback hood

Note	As you disconnct and reconnect the loopback test fixture to the different AUI segments, the Loss of Carrier error code (L) will print o the screen when the cable is disconnected.

Note	The last thing this section does is reset the LANIC. If the reset is successful, the LANIC is put into the online state, even if it is in the offline state when the section is called.

Section 12 — Offline MAU Test

Offline MAU Test provides a way to verify that a MAU is operating properly. In order to run this test, the MAU should be taken off the network cable and the terminated loopback test fixture for your MAU should be attached to it. (See the "Test Equipment and Special Tool" section in Chapter 1 for test fixture part numbers.) You then run the first step of the test (Step 121).

1. **Step 121 — Two-terminator Test**
   This step expects that the loopback hood has both 50-ohm terminators attached. The test sends out a group of eight external loopback frames to the MAU. These frames should be transmitted and received successfully.

2. **Step 122 — One-terminator Test**
   Step 122 of this section asks you to take one of the 50-ohm terminators off the loopback hood. It then sends eight external loopback frames to the MAU. These should all fail, indicating that Retry Errors have occurred. This step uses the same activity indicators as the AUI Fault Isolation Section.

For detailed instructions to run this test, refer to the *Online Diagnostic Subsystem Manual Volume 1*.

| Note | This test is not applicable for the Twisted-pair MAU. |

| Note | The last thing that this section does is reset the LANIC. If the reset is successful, the LANIC is put into the online state, even if it is in the offline state when the section is called. A subtle side effect also occurs after this test is run. Since the last external loopback frame sent out when running this test fails due to retry faults when using a healthy MAU, any additional status requests (section 3,4,6,7,9,10) will indicate that a retry fault occurred. After you verify that the MAU is functional, you should connect the MAU to a working network and then run section 2, RESET, to reset the retry fault condition. |

Running LANDAD

LANDAD is accessed via the Online Diagnostic Subsystem. To bring up the Online Diagnostic Subsystem enter the following command to the HP-UX system prompt:

`#/usr/diag/bin/sysdiag` <RETURN >

The system responds with the following prompt indicating that access has been gained to the Online Diagnostic User Interface (DUI).

`DUI>`

To run the diagnostic, enter:

`DUI> run landad pdev=X.Y` <RETURN>

Note

"X" is the system dependent channel address, and "Y" is the slot number of the LANIC card.

If there is an error, such as failure to find a LANIC as the specified device, the LANDAD diagnostic will terminate and the Online Diagnostic Subsystem prints an error message.

Since LANDAD is a subset of the Online Diagnostic Subsystem, any time you terminate LANDAD operation, control returns to the Online Diagnostic Subsystem. To do so, enter "exit" to terminate the diagnostic at any LANDAD prompt. The first letter "E", or the entire word "EXIT", in either upper or lower case, will terminate LANDAD execution. If you exit in this manner, the following message is displayed:

LANDAD Prompt > `e` <RETURN>

`Exiting LANDAD per user request...`

Any time the program is executing, you may enter an interrupt character (the default is CONTROL C) to halt operation. When it detects the break, one of two things will occur, depending on whether the diagnostic can suspend the operation. If so, it will print the following message and return control to the Online Diagnostic Subsystem.

LANDAD suspended per user request...

You may then either resume or abort the diagnostic. If the diagnostic has progressed to a point where it cannot suspend, the following message will be printed:

Unable to suspend in current state, Aborting LANDAD...

At this point, LANDAD will be aborted and control will return to the Online Diagnostic Subsystem.

Example of a Diagnostic Session

The following example illustrates running sections 1, 2, 3, 4, and 7 of the diagnostic. User input is shown in this typeface. Note that section 1 -- More Help, pauses after printing the first paragraph. If you need information about other sections, enter the appropriate section number. If you want to continue to section 2, merely press < RETURN > (see the example below).

```
login:  root   < RETURN>
Password:  XXXXXX   <RETURN >   (see your system manager)
Welcome to HP-UX.    [Release X.X]

WARNING:  YOU ARE SUPERUSER ! !

#/usr/diag/bin/sysdiag  <RETURN>

******************************************************************
******                                                     ******
******              ONLINE DIAGNOSTIC SUBSYSTEM            ******
******                                                     ******
******            (c)  Hewlett-Packard Co.    198X        ******
******                 All Rights Reserved.               ******
******                 Version X.XX.XX                     ******
******                                                     ******
******************************************************************



DUI > run landad pdev=X.Y section=1,2,3,4,7    < RETURN >

******************************************************************
******                                                     ******
******         LANDAD LAN Device Adapter Diagnostic        ******
******                                                     ******
******            (c)  Hewlett-Packard Co.  198X          ******
******                 All Rights Reserved.               ******
******                 Version X.XX.X.XX                   ******
******                                                     ******
******************************************************************


Welcome,  Today is Wed Nov 04 11:01:19 198X
```

Section 1 -- More Help

   This Section allows you to get more information on all of the sections
   [1..12] of this diagnostic. Please indicate the number of the section
   for which you need more information. Entering a <return> to the prompt
   exits this section.

More Help >> < RETURN >

End of Section 1 -- More Help

Section 2 -- Reset

End of Section 2 -- Reset

Section 3 -- Identify

   CIO card ID byte = $06 (LANIC)
   Hardware Datecode = 2512
   Hardware Revcode = 4
   Firmware Datecode = 2620
   CIO Firmware ID = 1

NOVRAM (Permanent) station address = $08-00-09-00-3E-E9
RAM (Currently Active) station address = $08-00-09-00-3E-E9

End of Section 3 -- Identify

Section 4 -- Local Loopback

   Logging SSAP with driver...
   Sending data to LANIC...
   Receiving data from LANIC...
   A frame has been sucessfully transmitted onto the network media
   Path to LANIC is functional.

End of Section 4 -- Local Loopback

Note   LANDAD will return the hardware date and revision codes and the
firmware date code currently valid on your board.

Section 7 -- Link Statistics

Step 71 - Read and Display Link Statistics
Link level statistics have been read successfully.

Transmit Statistics
    TOTAL frames transmitted without error   1
        First time transmits   1
        Deferred transmits 0
        One collision transmits   0
        More than one collision transmits 0
    TOTAL frames NOT transmitted   0
        Retry error 0 Late collision   0
        Loss of carrier during transmit   0
    No heartbeat detected after transmission   0
    No free transmit buffers 0
    TDR of last retry error   0
    LANCE restarts   0
Receive Statistics
    TOTAL frames received without error   1
    Frames rejected by address filter 0
    Frames rejected due to CRC errors   0
    Frames rejected due to alignment errors 0
    Frames rejected due to oversize length   0
    LANCE indicated one or more frames lost   0
    No free receive buffers   0
End of Step 71 - Read and Display Link Statistics

End of Section 7 -- Link Statistics

landad terminated (pid 454). Exit status = 0.
DUI > E <RETURN >

7   Replaceable Parts

This chapter contains information on replaceable parts for the LANIC.

Note	Customer repair, including replacing parts on the LANIC card, is not recommended by Hewlett-Packard. Customers who perform component level replacement will invalidate the 90-day warranty and render the card ineligible for exchange.

Ordering Information

To order replacement or exchange FRUs, or to obtain information on the parts, address the order or inquiry to the nearest Hewlett-Packard Sales and Support Office.

To order a part, specify the following information:

1. Identification of the CIO LAN Link interface or part.

2. Check digit (CD).

3. Description and function of the part.

4. Quantity required

Field Replaceable Units

All major assemblies of the CIO LAN Link are Field Replaceable Units (FRUs). The FRUs include the LANIC card, the major components of the Medium Attachment Unit (MAU), the connecting cables, the NOV-RAM, EPROMS and MAU power fuse.

Exchange Assemblies

Table 7-1 lists the current assembly which qualifies for the HP exchange program, that is, a defective card can be exchanged for a refurbished card.

Table 7-1. Exchange Assembly Part Number

HP Part Number	Exchange Assembly Part Number	Description
5062-3313	5062-3331	CIO LANIC Card

If the LANIC card is to be returned to Hewlett-Packard for service or repair, remove the firmware EPROMS (U115 and U117), attach a tag identifying the owner and indicate the type of service or repair required. Include the part number and date code of the card.

Note	The firmware EPROMs must be removed from the LANIC card before it is returned for service or repair. The EPROMs are *NOT* included with the exchange assembly.

Pack the card in the original factory packaging material if available. If the original packaging material is not available, wrap the card in suitable cushioning material (Air Cap TH-240 Cushioning or equivalent) and place the card in a corrugated carton (200-pound test material). Seal the carton securely and mark it FRAGILE to ensure careful handling.

Component Parts

There are only a few LANIC card components which qualify as field replaceable units. These parts are available through any Hewlett-Packard Sales and Support Office. Table 7-2 lists the components along with all the necessary information to order these parts.

Table 7-2. Replaceable Component Parts

Reference Designation	HP Part Number	C D	Description
F2	2110-0520	6	Fuse
U26	27125-81001	3	NOVRAM
U115	1818-4372	3	EPROM
U117	1818-4373	4	EPROM

New Assemblies

Those FRUs that cannot be exchanged can be ordered as new parts. Table 7-3 lists all items which qualify as new assemblies.

Table 7-3. New Assembly Part Numbers

HP Part Number	Description
27125-63009	LANIC Card Connector Cable
28641-60004	ThinMAU Assembly (without BNC "T")
28664-60001	Twisted-pair MAU assembly
30241-60102	ThickMAU Assembly (without tap)
0362-0819	ThickMAU Coaxial Tap
1250-0781	ThinMAU BNC "T" Connector
5061-4977	Loopback Connector
92254E	6-metre AUI Cable

8 Reference

This chapter contains a list of other technical manuals and related documents which will be of assistance to you, and a glossary of terms.

Technical Manual Reference

Other technical manuals which might be required are listed below:

LAN/9000 Series 800 Manuals

Installing LAN/9000 Series 800	98194-90009
Troubleshooting LAN, NS, ARPA Services/9000 Series 800	98194-90010
LAN/9000 Series 800 LLA Programmer's Guide	98194-90006
LAN/9000 Series 800 Berkeley IPC Programmer's Guide	98194-90003
HP 9000 NetIPC Programmer's Guide	98194-90002
LAN Reference Pages	98194-90004
HP 9000 Series 800 Networking Overview: LAN, X.25, NS, ARPA and NFS	50980-90021
NS Cross-System Network Manager Reference Manual	5958-8564
This Manual	5959-2259

NS/9000 Series 800 Service Manuals

Installing Network Services (NS)/9000 Series 800	98194-80008
Using Network Services (NS)/9000 Series 800	50980-90040
Network Services Reference Pages	50951-90031
NS Cross-System NFT Reference Manual	5958-8563

ARPA Services/9000 Series 800 Manuals

Installing ARPA Services/9000 Series 800	98194-90007
Using ARPA Services/9000 Series 800	50980-90001
ARPA/Berkeley Services Reference Pages	50952-90032

NFS Services/800 Mauals

Using and Administering NFS Services/800	50970-90000
Programming and Protocols for NFS Services/800	50970-90010
NFS Services Reference Pages	50970-90030

MAU Manuals

ThinMAU Installation Manual	28641-90001
Twisted-pair MAU Installation Guide	28664-90001

Other Manuals

Online Diagnostic Subsystem Manual, Volume 1	09740-64013
Cable and Accessories Installation Manual	5955-7680
HP SiteWire Twisted-pair Installation Guide	5959-2208
HP StarLAN 10 Hardware Troubleshooting Guide	5959-2258
HP 9000 System Administrator's Guide	92453-90004
Installing and Updating HP-UX	92453-90019

Table 8-1. LANIC Card Connector Cable Pin Assignment

26-pin Card Connector Pin Number	Signal Name	15-pin Connector Pin Number
1A	Chassis Ground	1,4
1B	Collision (–)	9
2A	Cossision (+)	2
2B	Chassis Ground	1, 4
3A		
3B	Transmit (–)	10
4A	Transmit (+)	3
4B	Drain	
5A	Chassis Ground	1, 4
5B		
6A		
6B	Receive (–)	12
7A	Receive (+)	5
7B		
8A	Chassis Ground	1, 4
8B	Power	13
9A	Power Return	6
9B		
10A		
10B		
11A		
11B		
12A		
12B		
13A		
13B		
Plate GND		
Contact GND		
Foil shield on each twisted pair.		

Glossary of Terms

The following terms are defined as they are used in Hewlett-Packard computer networking products manuals. The glossary is an all-inclusive list of terms used in a broad range of technical manuals and therefore some of the terms defined might not be used in this manual.

ASCII American Standard Code for Information Interchange, a data communications code set defining letters, characters and machine or control commands (such as end of line, or line feed). ASCII uses seven bits to define these characters, and duplicate them (as for a second font) or as a parity check bit.

AUI Attachment Unit Interface. The cable that connects the card (and card connector cable) to the MAU.

Baud Unit of signaling speed expressed as the number of signal event changes (as phase, frequency or amplitude) per second. As a function of both the modulation scheme and the transmission carrier frequency, it is rarely the same as "bits per second". When two bits are combined to form a signal unit, the baud rate is half the bps (the signal unit is call a "digit"), and has four levels, or states.

bps Bits per second, the speed of data transmission over a communications channel.

Broadcast A communication method of sending a message to all devices on a link simultaneously.

Card The Printed Circuit Assembly (see PCA).

CCITT *Comite Consultatif International Telephonique et Telegra Telephique,* International Telegraphy and Telephoney Consultative Committee. A part of the International Telecommunications Union of the United Nations. Responsible for establishing protocols for the Post, Telegraph and Telephone (PTT) ministries in most countries except the U.S.A. and Canada. (See also EIA)

CIB Channel I/O Bus, a Hewlett-Packard proprietary Communications I/O bus used in HP Precision Architecture computers.

CRC

Cyclic Redundancy Check. A method of using a polynomial to perform error checking. The polynomial is an algebraic function used to generate a constant from the message bit pattern. This constant, derived and accumulated in both the transmitter and receiver, is used to divide the binary numeric value of the character. The quotient is discarded and the remainder added to the next character, which is again divided. This continues until the last character, when the remainder is transmitted to the receiver for comparison with the receiver's remainder. When the remainders are equal, the system can safely assume there were no errors in the transmission of the data.

CSMA/CD

Carrier Sense Multiple Access/Collision Detect. A protocol for Local Area Network access. It works when each node monitors, or "listens", to the transmission line before and during a transmission. If it hears another station transmitting, it delays any any packet it would have sent out. If two nodes start to transmit at the same (electronic) time, both stations recognize this as an error condition, and after a random delay, will attempt to retransmit the packets involved.

Cyclic Redundancy Check

See CRC.

DIP

Dual In-line Package. A type of integrated circuit package with two parallel rows of contact pins. The chips on most Hewlett-Packard products are of the DIP type.

Distributed System

See DS.

DMA

Direct Memory Access. The transfer of data directly to or form memory of the host computer. DMA capability vastly increases the speed of data transmittals to the host from the peripheral.

Download

The process of transferring a block of information from one Computer system to another, or from a computer to a microprocessor on a card which is a part of the computer.

Driver

In a hardware sense, a driver refers to a circuit which is capable of supplying specific current and voltage requirements. In a software sense, a driver is a program that is capable of controlling a specific input/output device.

DS

Distributed System. A term used to refer to networks using Hewlett-Packard Distributed Systems hardware and software products.

EPROM	Erasable, Programmable, Read-Only Memory. A semiconductor device which cannot be altered by the user. Access to memory addresses which hold the programmed code by the CPU is completely random. It is available instantly on power-up, since it is not power dependent (that is, it is non-volatile). An EPROM can be erased, usually by exposure to ultraviolet light.
Firmware	Software code packaged in read-only memory (EPROM/ROM).
FCS	Frame Checking Sequence. In IEEE 802.3 applications, a 32-bit CRC-sequence. The sequence is appended to each frame and used to verify data transmission.
Host	The computer housing and controlling the PCA.
IEEE	Institute of Electrical and Electronic Engineers. IEEE investigates a wide variety of electronic and communications areas, and makes recommendations based on their findings. These recommendations often become standards (as IEEE 802.3) for users and vendors in the fields involved.
Interface	A device providing electrical and mechanical compatibility between two communicating devices.
ISO	International Standardization Organization.
Jitter	In data communications, the variation of the signal from the reference timing position. This variation can include amplitude, time, frequency, or phase distortion.
LAN	Local Area Network. A set of computers (or similar devices) communicating over a limited distance of between 10 and 10,000 meters. The transmission medium may be twisted pair cable, coaxial cable, radio broadcast, or fiber optics. LAN is recognized as a cost-effective approach to office automation. Ideally, a user should not be aware of the mechanics of the LAN, i.e., it should be "transparent."
LANIC	Local Area Network Interface Controller.
Link	The hardware (modems, wires, etc.) and the logical path used to transmit data between two (or more) points in a communications network.
MAU	Medium Attachment Unit. A MAU is a piece of hardware which allows a network node to access the physical medium of the network. It is particularly used to identify such a device used for ThickLAN cable networks. A ThinMAU provides the same attachment for ThinLAN systems.

Node A device, such as a computer, that is physically and logically connected to a network.

NS Network Services. A system of hardware and software that allows users of one node to access the data and programs on any other node in the system. NS is a stream system, allowing several outstanding operations to occur before requiring a reply to any of them.

Octet A sequence of eight bits, i.e., a byte.

PCA Printed Circuit Assembly. Circuit cards are commonly referred to as PCAs. The term is ambiguous because it can refer to either the substrate material with the conducting traces in place, or to the card with all of its electronic components mounted. In this manual, it refers to the latter.

Polynomial Checking See CRC.

SAP Service Access Point. In the OSI model, all of the interactions between a service user and a service provider take place at a SAP.

Tap The device which allows a MAU (defined earlier) to physically access the transmission cable in a local area network.

XID Exchange Identification. An IEEE 802.3 link level controller command used to exchange indications of the types of services supported between SAPs (see above).

9 Schematics and Diagrams

This chapter contains schematic logic diagrams of the LANIC card.
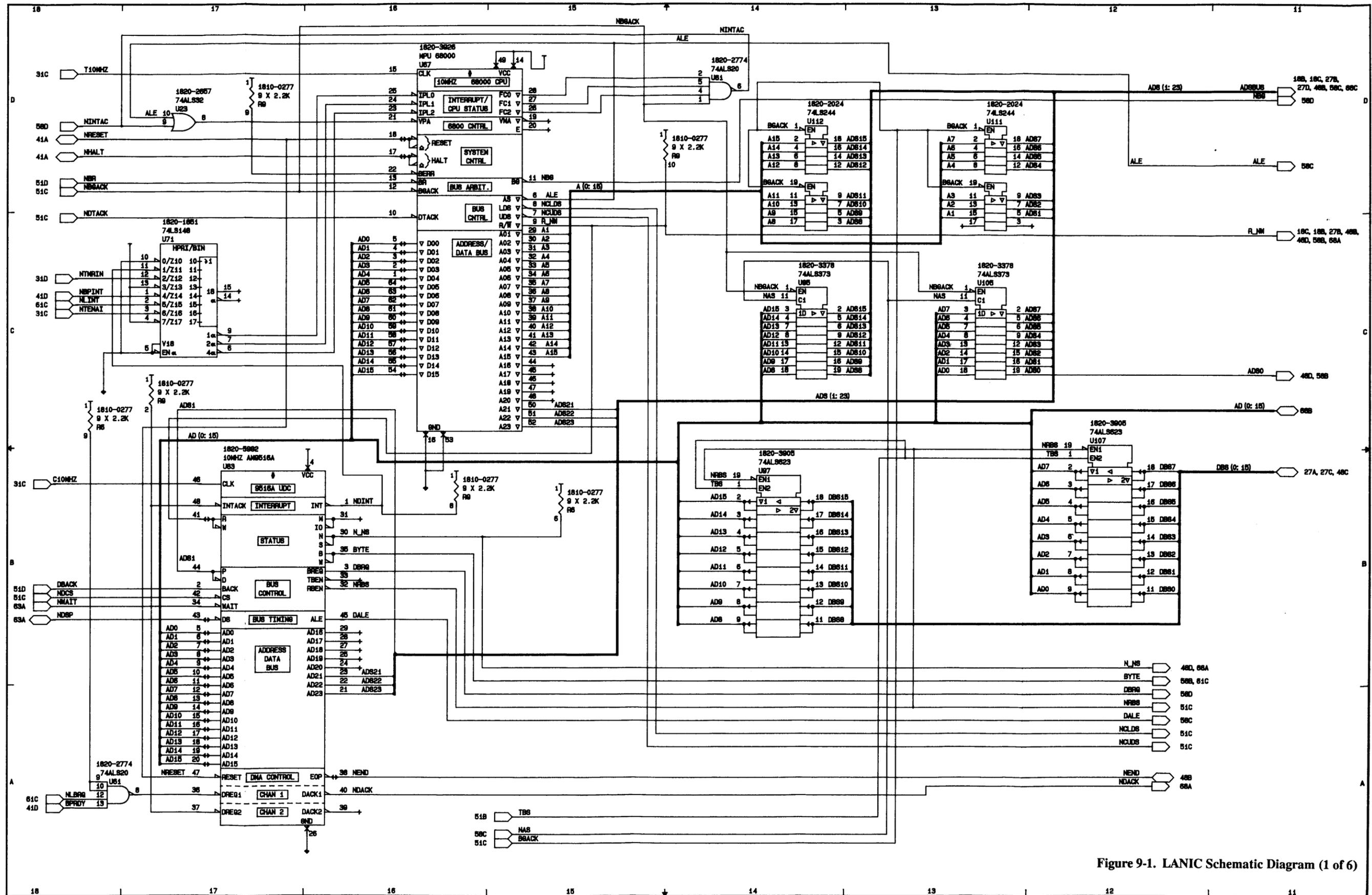
Figure 9-1. LANIC Schematic Diagram (1 of 6)
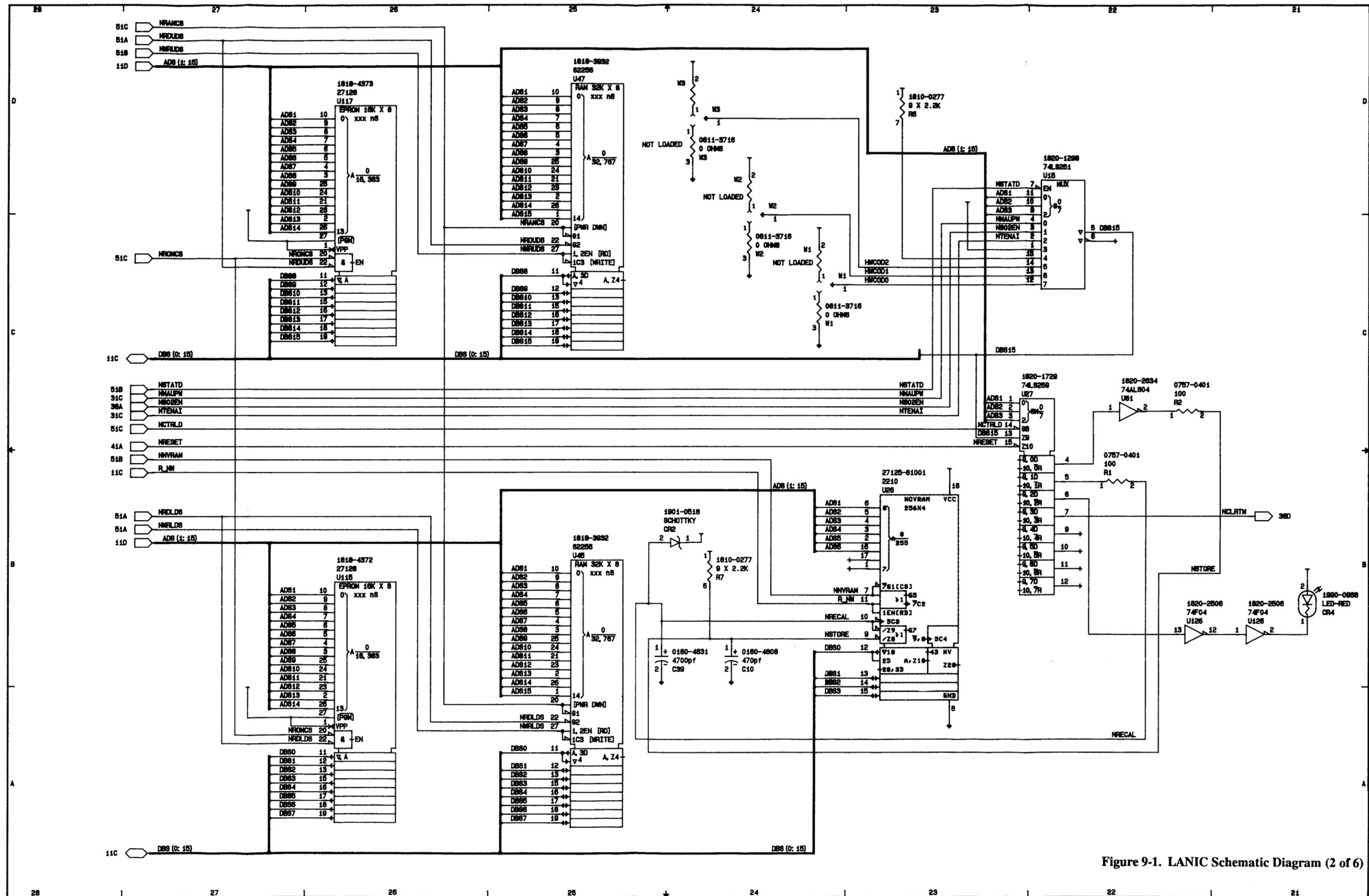
Figure 9-1. LANIC Schematic Diagram (2 of 6)

Figure 9-1. LANIC Schematic Diagram (3 of 6)

Figure 9-1. LANIC Schematic Diagram (4 of 6)
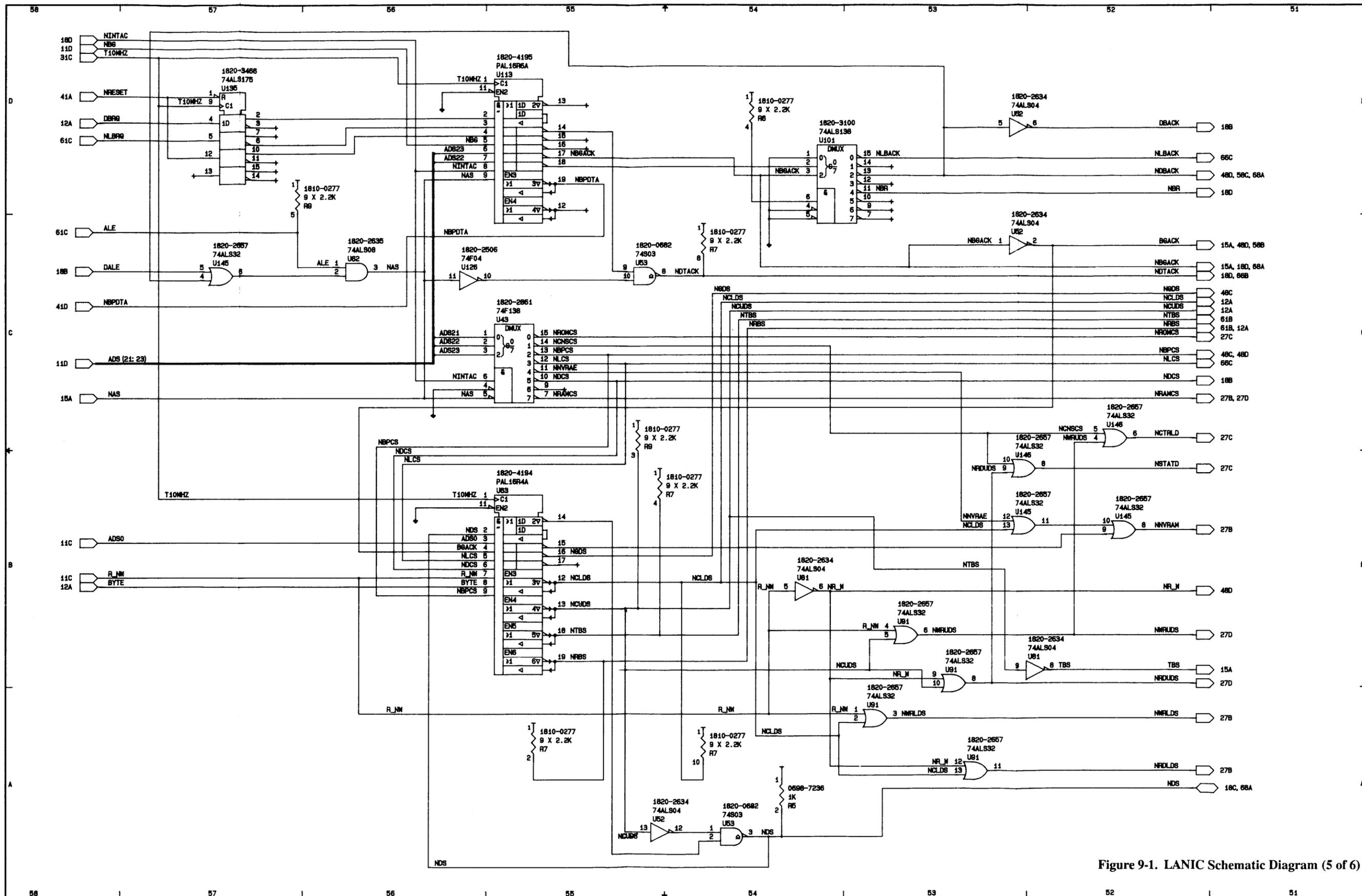
Figure 9-1. LANIC Schematic Diagram (5 of 6)
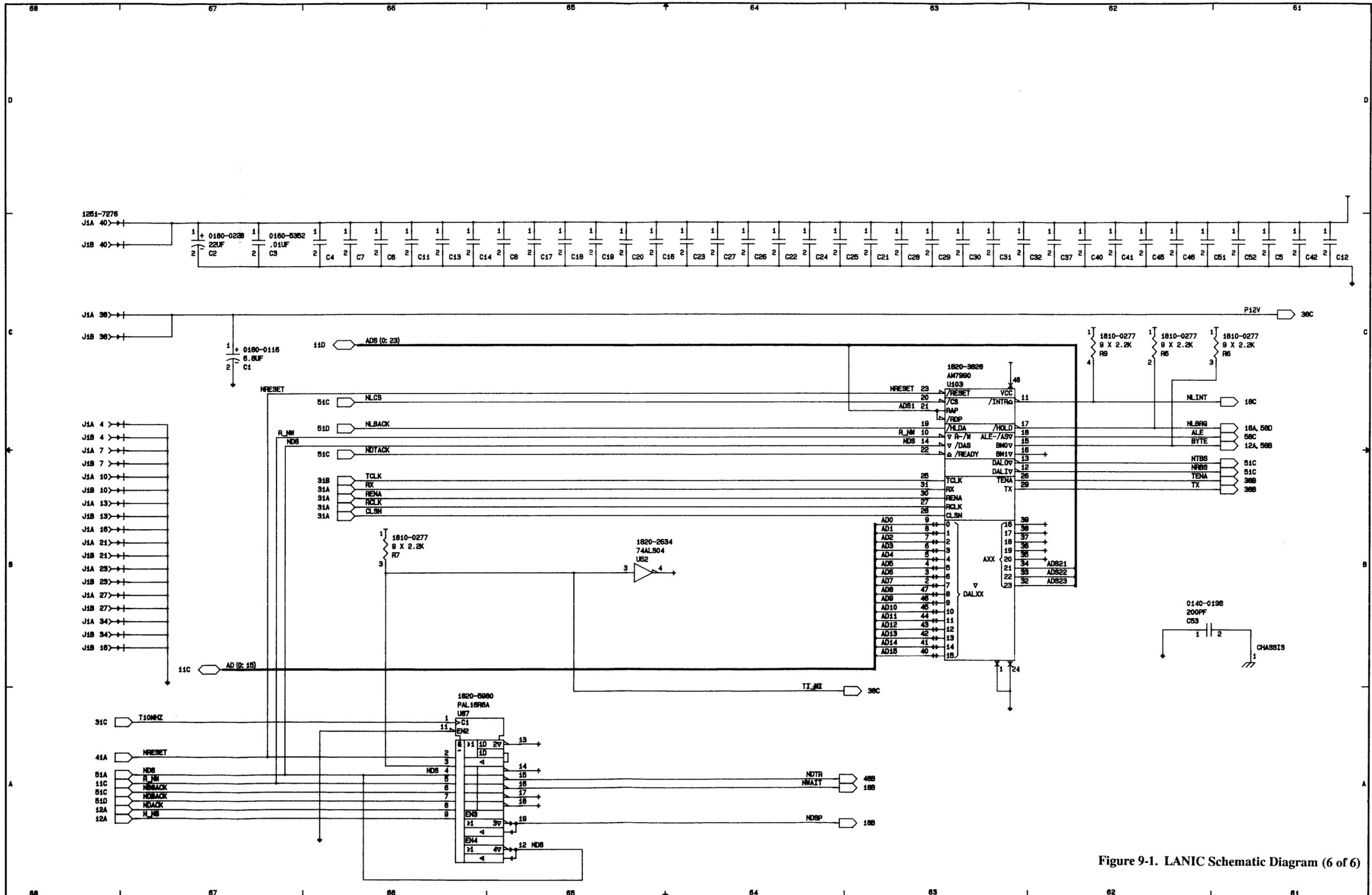
Figure 9-1. LANIC Schematic Diagram (6 of 6)

A   HP 28641A ThinMAU

The ThinMAU is specifically designed for connection to the 10 Mbps IEEE 802.3 Type 10BASE2 "ThinLAN" coaxial cable. The ThinMAU includes a ThinMAU with an integrated 1-meter Attachment Unit Interface (AUI) cable, a BNC "T" Connector, a T-connector Cover and the ThinMAU Installation Manual.

The following information is included in this Appendix:

- Detailed description of IEEE 802.3 Type 10BASE2 (referred to as "ThinLAN").

- ThinMAU Specifications

- Instructions for connecting the AUI cable.

- Diagnostic Set-up information.

For detailed ThinMAU installation and removal procedures, refer to the *ThinMAU Installation Manual* (part number 28641-90001) supplied with the ThinMAU.

IEEE 802.3 Type 10BASE2

This LAN category uses an RG58 A/U or C/U coaxial cable medium that is approximately 0.19 inch (4.9 mm) in diameter. This cable is referred to as ThinLAN cable in this manual. ThinLAN allows connection of up to 30 nodes on a coaxial cable length of up to 185 metres long.

Figure A-1 illustrates a typical IEEE 802.3 Type 10BASE2 LAN connecting HP 9000 Series 800 computers. A node's physical connection and electrical access to a ThinLAN cable is provided by the ThinMAU. ThinMAUs transmit and receive data on the ThinLAN cable, exchanging data and control signals with the LANIC card. A BNC "T" connector connects the ThinMAU to the ThinLAN cable. Next a 1-metre AUI cable (which is built into the ThinMAU) connects to the card connector cable or "stub" cable which attaches directly to the LANIC card.
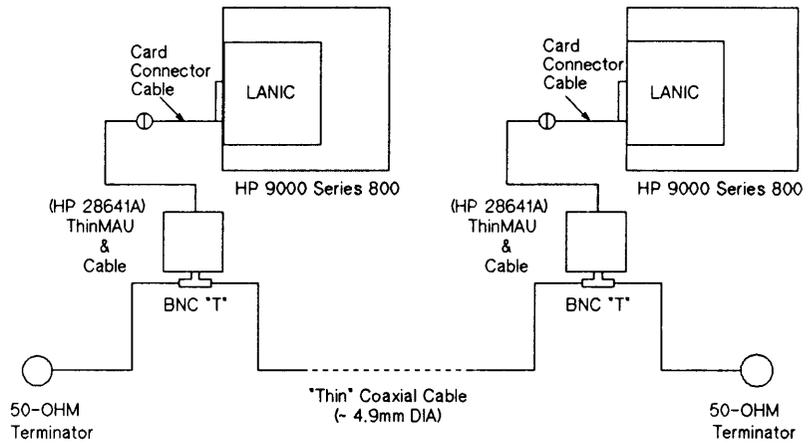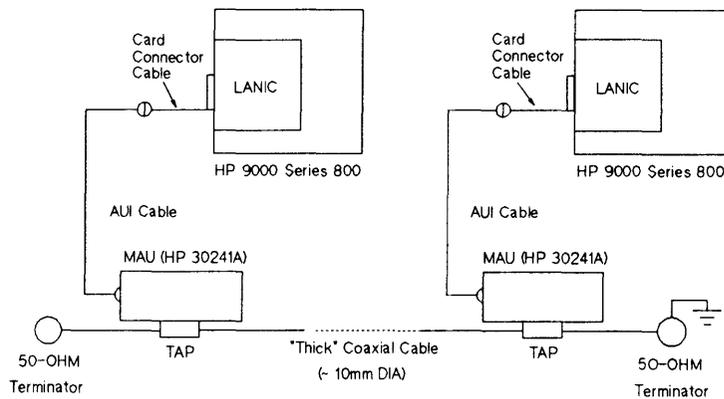

Figure A-1. Typical IEEE 802.3 Type 10BASE2 LAN

Specifications

Features
- Compatible with IEEE 802.3 Type 10BASE2 standard protocol.

- Carrier-Sense Multiple Access with Collision Detection (CSMA/CD) protocol controls network access using no master node.

- Every node on the network cable is accessible by any other node on the network with no store and forward.

- 10 megabit-per-second hardware data transfer rate.

- Each 185-meter cable segment supports up to 30 nodes.

- VLSI implementation for reliability and lower cost.

- Microprocessor off-loads host computer and gathers network statistics.

Functional Specifications

Environmental Characteristics

Operating Temperature:	0°C to 55°C	
Humidity:	5% to 95% relative at 40°C non-condensing	

Physical Characteristics

Dimensions:	10 cm (4 in.) by 15.2 cm (6 in.) by 2.5 cm (1 in.)	
Approximate Weight:	454 grams (16 oz)	

Electrical Characteristics

Power Requirements:	8.0 to 13.5 volts	
Power Consumption:	4.3 watts (typical); 5.1 watts (maximum)	
Electrical Isolation:	500 Vac RMS from coax to AUI cable	

Connecting the AUI Cable

Once the card connector (stub) cable has been installed, connect the 15-pin connector of that cable to the AUI cable of the ThinMAU. (Refer to Figure A-1.) Be sure to push the slide latch mechanism so that the connectors lock together.

D Connectors

When connecting the 15-pin D connectors, be certain that the connector hold-down hardware is secure. The hold-down hardware is a sliding clip mechanism that captures the slotted studs on the opposing connector.

a. Slide the hold-down clip to the "open" position (see Figure A-2(A)).

b. Align the plug and socket, then connect them firmly.

c. Slide the hold-down clip to the "locked" position (see Figure A-2(B)). This hold-down clip prevents accidental cable disconnection during operation.

OPEN   Screw Head Fully Exposed   **LOCK**   Screw Head Covered by Clip

(A) Slide Latch, Open Position   (B) Slide Latch, Locked Position
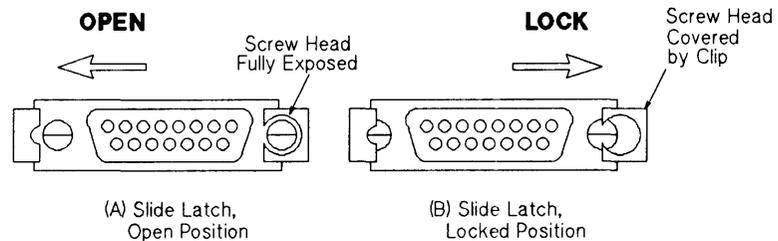
Figure A-2. Securing Cable Hold-DownClips

Diagnostic Set-up

To further isolate a LAN problem, it may be necessary to disconnect the ThinMAU from the LAN cable and attach it to a loopback test fixture (HP 92257Q) and re-run the appropriate diagnostic tests. Doing this will help determine if a problem is located in one of the Field Replaceable Units or somewhere else on the LAN. This type of diagnostic setup, including hardware and software components, is shown in Figure A-3.
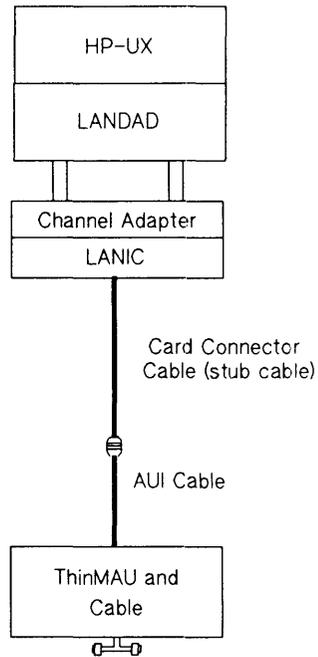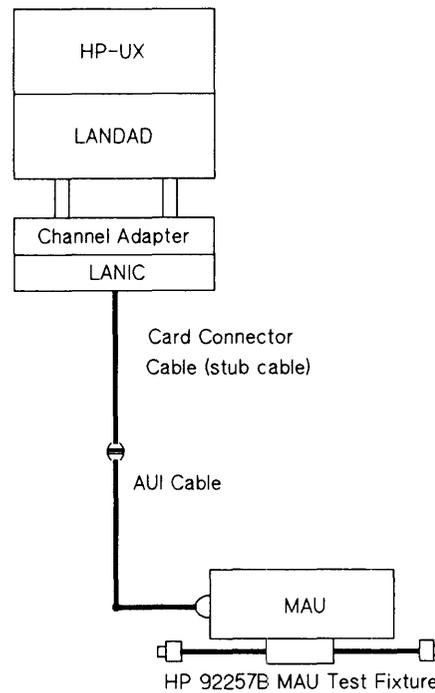
Figure A-3. ThinLAN Diagnostic Test Setup

B HP 30241A ThickMAU

The ThickMAU is specifically designed for connection to the 10 Mbps IEEE 802.3 Type 10BASE5 "thick" Local Area Network coaxial cable. The ThickMAU includes a 6-meter AUI cable, a ThickMAU, and a Coaxial Tap.

The following information is included in this Appendix:

- Detailed description of IEEE 802.3 Type 10BASE5 (referred to as "thick" cable).

- ThickMAU Specifications.

- Instructions for connecting the AUI Cable.

- Diagnostic Set-up information

For detailed ThickMAU installation and removal procedures refer to the *Cable and Accessories Installation Manual,* part number 5955-7680, available from HP Direct Marketing Division.

IEEE 802.3 Type 10BASE5

This LAN category refers to an IEEE 802.3 LAN that uses a 0.4 inch (approximately 10 mm) diameter coaxial cable bus, referred to as "thick" cable. Thick cable LANs feature 10 Mbits per second transfer rates and connection of up to 100 nodes on a single 500-meter bus segment. Figure B-1 illustrates a typical IEEE 802.3 Type 10BASE5 LAN connecting HP 9000 Series 800 computers. The Medium Attachment Unit (MAU), serves as the node's access vehicle to the coaxial cable bus. The MAU transmits and receives data on the coaxial cable, and exchanges data and control signals with the LANIC card.

Included with the 30241A MAU is a fitting, or "tap", which pierces the coaxial cable and makes the electrical contact with the MAU. An AUI (Attachment Unit Interface) cable of the appropriate length connects the MAU to a 1-meter card connector ("stub") cable which connects to the LANIC card. A maximum distance of 50-meters is allowed between the LANIC card and the MAU; AUI cabling is available from Hewlett-Packard in a variety of lengths either pre-fitted with connectors or left with raw ends.

Figure B-1. Typical IEEE 802.3 Type 10Base5 LAN

Specifications

Features
- Compatible with IEEE 80.23 Type 10BASE5 standard protocol.

- Carrier-Sense Multiple Access with Collision Detection (CSMA/CD) protocol controls network access using no master node.

- On-board node self-test that checks the operation of the node hardware including the AUI and ThickMAU.

- Every node on the network cable is accessible by any other node on the network when properly configured.

- 10 megabit-per-second hardware data transfer rate.

- Each 500-meter cable segment supports up to 100 nodes.

- VLSI implementation for reliability and lower cost.

- Microprocessor off-loads host computer and gathers network statistics.

Functional Specifications

Environmental Characteristics

Storage Temperature:	–10°C to 65°C
Operating Temperature:	0°C to 55°C
Humidity:	5% to 95% relative at 40°C non-condensing
	NOTE – Not suitable for installation in ducts, plenums or other environmental air spaces according to the National Electrical Code Article 300-22 b&c or equivalent.

Physical Characteristics

MAU Dimensions:	31 cm (12.2 in.) long by 9.5 cm (3.75 in.) wide by 3 cm (1.2 in.) deep
Tap Dimensions:	7.5 cm (3 in.) by 3 cm (1.2 in.) by 2.5 cm (1 in.)

Electrical Characteristics

**Power
Requirements:**   9.0 to 15.75 volts

**Power
Consumption:**   4.6 watts (typical); 6 watts (absolute maximum)

**Electrical
Isolation:**   500 Vac RMS from coax to AUI cables

Connecting the AUI Cable

Once the card connector (stub) cable has been installed, connect the 15-pin connector of that cable to AUI cable or directly to the MAU. Be sure to push the sliding clip mechanism so that the connectors lock together.

D Connectors

When connecting the 15-pin D connectors, be certain that the connector hold-down hardware is secure. The hold-down hardware is a sliding clip mechanism that captures the slotted studs on the opposing connector.

a. Slide the hold-down clip to the "open" position (see Figure B-2(A)).

b. Align the plug and socket, then connect them firmly.

c. Slide the hold-down clip to the "locked" position (see Figure B-2(B)). This hold-down clip prevents accidental cable disconnection during operation.
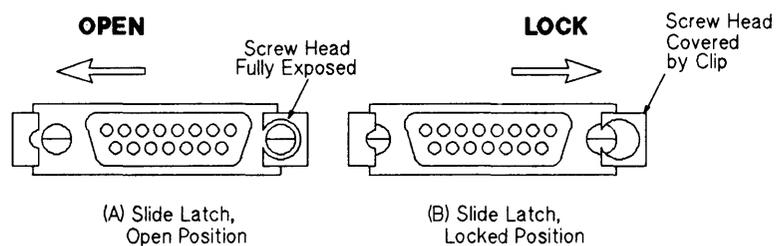
Figure B-2. Securing Cable Hold-Down Clips

Diagnostic Set-up

To further isolate a LAN problem, it may be necessary to disconnect the ThickMAU from the LAN cable and attach it to a loopback test fixture (HP 92257B) and re-run the appropriate diagnostic tests. Doing this will help determine if a problem is located in one of the Field Replaceable Units or somewhere else on the LAN. This type of diagnostic set-up, including hardware and software components, is shown in Figure B-3.

```
          ┌─────────────────────┐
          │                     │
          │       HP-UX         │
          │                     │
          ├─────────────────────┤
          │                     │
          │       LANDAD        │
          │                     │
          └──┐ ┌──────────┐ ┌───┘
          ┌──┴─┴──────────┴─┴───┐
          │   Channel Adapter   │
          ├─────────────────────┤
          │        LANIC        │
          └──────────┬──────────┘
                     │   Card Connector
                     │   Cable (stub cable)
                     │
                     ⊖
                     │   AUI Cable
                     │
                   ┌─┴──────────────────┐
                 ┌─┤                    │
                 └─┤        MAU         │
                   │                    │
                   └──┬─────────────────┘
               ▭──────┴────────────▭
          HP 92257B MAU Test Fixture
```

Figure B-3. Thick Cable LAN Diagnostic Test Setup

C   Ethernet

Ethernet LANs are very similar to IEEE 802.3 LANs. Since they use the same coaxial cable medium, Ethernet nodes may co-exist on the same LAN segment with IEEE 802.3 nodes. (See Figure C-1.) Like the MAU and AUI cables, Ethernet transceivers and branch cables provide access to the LAN.
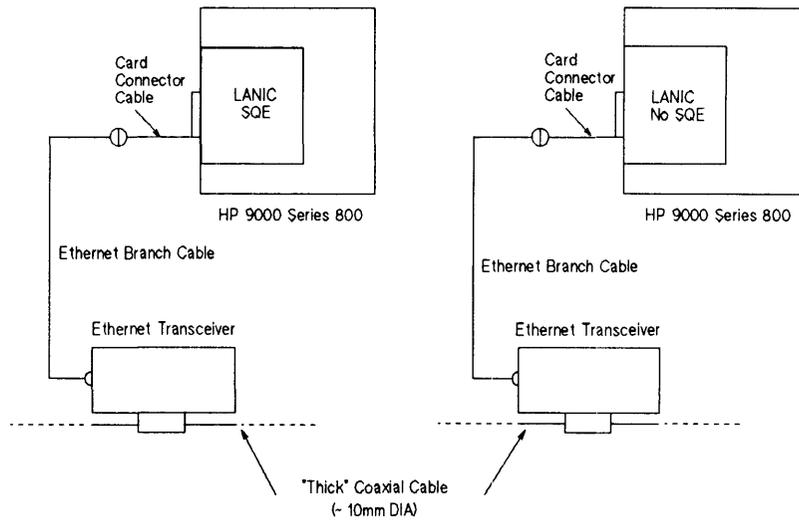
Figure C-1. Typical Ethernet Type 10BASE5 LAN

Ethernet and IEEE 802.3 Comparisons

There are some basic differences between the Ethernet and IEEE 802.3 standards which must be taken under consideration when installing an Ethernet transceiver:

1. The hardware for IEEE 802.3 and Ethernet nodes reference different electrical grounds.

   a. All the hardware of a particular node must conform to either one standard or the other, but not both. For new nodes, conformance to IEEE 802.3 is recommended.

2. There are functional differences between the standards.

   a. An IEEE 802.3 node performs additional services, such as *SQE Heartbeat* and *Jabber Fault Detection,* that are not normally provided by an Ethernet node. An SQE (Signal Quality Error) test signal, or heartbeat, is a short burst of collision indicator signals sent from the MAU to the LANIC after each data packet transmission. It tests for proper operation of collision detection circuitry. Jabber Fault Detection prevents a faulty node from monopolizing the LAN by terminating excessive transmission at the MAU. The MAU isolates itself from the coaxial cable and returns SQE signals to the LANIC.

      Under firmware control, the LANIC senses the type of hardware attached (Ethernet or IEEE 802.3) via the SQE jumper setting, and interprets the presence or absence of these signals according-ly. Any errors generated by the firmware are left for system software processing.

3. The standards differ in how they define the make-up of a packet transmitted on the network.

   a. An Ethernet packet differs from an IEEE 802.3 packet. Because the LANIC card will process either type of packet, packet format-ting and packet interpretation must be handled in software.

Ethernet Installation

To install your Ethernet transceiver to the coaxial cable, refer to the installation procedures included with the Ethernet product.

Installing the Branch Cable

The branch cable is connected to the card connector ("stub") cable with a 15-pin D connector. When connecting the D connectors, be certain the connector hold-down hardware is secure. The hold-down hardware is a sliding clip mechanism that captures the slotted studs on the opposing connector.

a. Slide the hold-down clip to the "open" position (see Figure C-2(A)).

b. Align the plug and socket, then connect them firmly.

c. Slide the hold-down clip to the "locked" position (see Figure C-2(B)). This hold-down clip prevents accidental cable disconnection during operation.
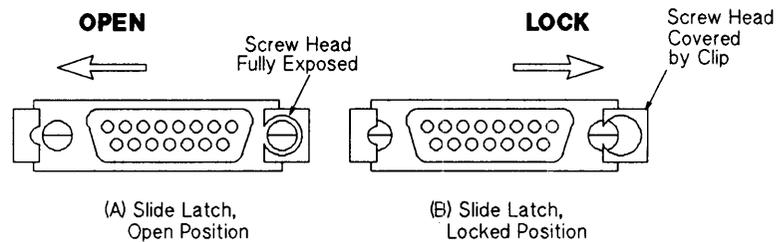
Figure C-2. Securing Cable Hold-Down Clips

D

HP 28664A
Twisted-pair MAU

The Twisted-pair MAU is a Medium Attachment Unit capable of adapting 10 Mbps 802.3 or Ethernet Local Area Network Interface Controllers (LANICs) for use over unshielded twisted-pair cabling. The Twisted-pair MAU option includes the MAU with an integrated 1-meter Attachment Unit Interface (AUI) cable, a loopback connector, and the *Twisted-pair MAU Installation Guide.*

The following information is included in this Appendix:

● General overview.

● Twisted-pair MAU specifications.

● Instructions for connecting the AUI cable.

● Diagnostic Set-up information.

For detailed Twisted-pair MAU MAU installation and removal, refer to the *Twisted-pair MAU Installation Guide* (part number 28664-90001) supplied with the Twisted-pair MAU.

General Overview

In the LAN configuration, the LANIC card connects to the integrated AUI cable of the Twisted-pair MAU via the the Card Connector (stub) cable. The MAU then attaches to a StarLAN 10 hub or cross-connect block via a 4-pair unshielded twisted-pair cable. You can custom-build the cable yourself (according to the instructions in the *HP SiteWire Twisted-pair Cabling Installation Guide*, 5959-2208) or purchase it pre-assembled, with an 8-pin modular connector at both ends, from Hewlett-Packard. The pre-assembled cables are:

HP 92268A (4 meters)
HP 92268B (8 meters)
HP 92268C (16 meters)
HP 92268D (32 meters)

The following shows a typical Twisted-pair MAU configuration.
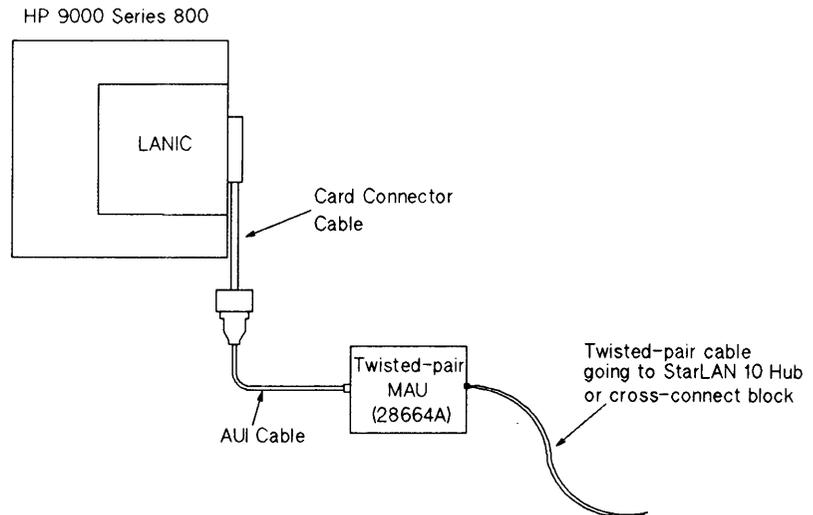
Figure D-1. Typical 802.3 LAN with a Twisted-pair MAU

Specifications

Features

- Compatible with IEEE 802.3 standard protocol for 10 Mbps networks.

- 8-pin modular jack for simple installation.

- Integrated 1-meter AUI cable.

- Supports both IEEE 802.3 and Ethernet Version 1.0 and Version 2.0 protocols.

- LED power indicator.

- Compact, convenient design.

- Support of existing wiring through HP WireTest Service.

- Customer installable.

Functional Specifications

Environmental Characteristics

Operating Temperature:	–10°C to 55°C	
Relative Humidity:	5% to 90% at 40°C (104°F)	

Physical Characteristics

Dimensions:	10 cm (4 in.) by 15.2 cm (6 in.) by 2.5 cm (1 in.)	
Approximate Weight:	383 grams (13.5 oz)	

Electrical Characteristics

Voltage Requirements:	9.75 to 13.5 volts	
Power Consumption:	5.4 watts (typical); 6.75 watts (maximum)	

Connecting the AUI Cable

Once the card connector (stub) cable has been installed, connect the 15-pin connector of that cable to the AUI cable of the Twisted-pair MAU. (Refer to Figure D-1.) Be sure to push the slide latch mechanism so that the connectors lock together.

D Connectors

When connecting the 15-pin D connectors, be certain that the connector hold-down hardware is secure. The hold-down hardware is a sliding clip mechanism that captures the slotted studs on the opposing connector.

a. Slide the hold-down clip to the "open" position (see Figure D-2(A)).

b. Align the plug and socket, then connect them firmly.

c. Slide the hold-down clip to the "locked" position (see Figure D-2(B)). This hold-down clip prevents accidental cable disconnection during operation.

OPEN Screw Head Fully Exposed

(A) Slide Latch, Open Position

LOCK Screw Head Covered by Clip

(B) Slide Latch, Locked Position
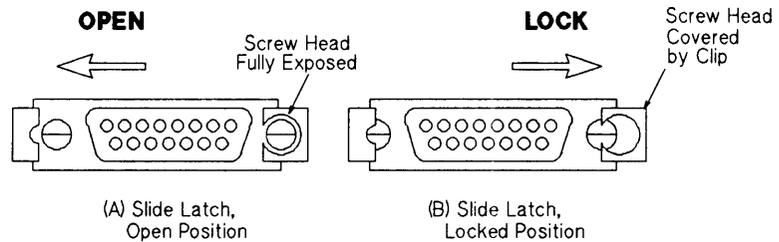
Figure D-2. Securing Cable Hold-DownClips

Diagnostic Set-up

When running most of the diagnostic tests, the Twisted-pair MAU will be connected to the network. When running the tests in this manner, the Loopback switch located on the Twisted-pair MAU will remain in the "NORMAL" position.

If it becomes necessary to isolate a LAN problem, you will need to disconnect the Twisted-pair MAU from the twisted-pair LAN cable, attach it to a loopback connector (HP 5061-4977) and re-run the appropriate diagnostic tests. Doing this will help determine if a problem is located in one of the Field Replaceable Units or somewhere else on the LAN.

Whenever you run the diagnostics using the loopback connector, the loopback switch located on the Twisted-pair MAU must be in the "TEST" position as shown in Figure D-3. If the loopback switch is not in this position, your test results will be inaccurate. This type of diagnostic set-up, including hardware and software components is shown in Figure D-4.

Note	Be sure to change the Loopback switch back to the "NORMAL" mode once testing is complete.

For more details on Twisted-pair troubleshooting refer to the *HP StarLAN 10 Hardware Troubleshooting Guide*, part number 5959-2258.
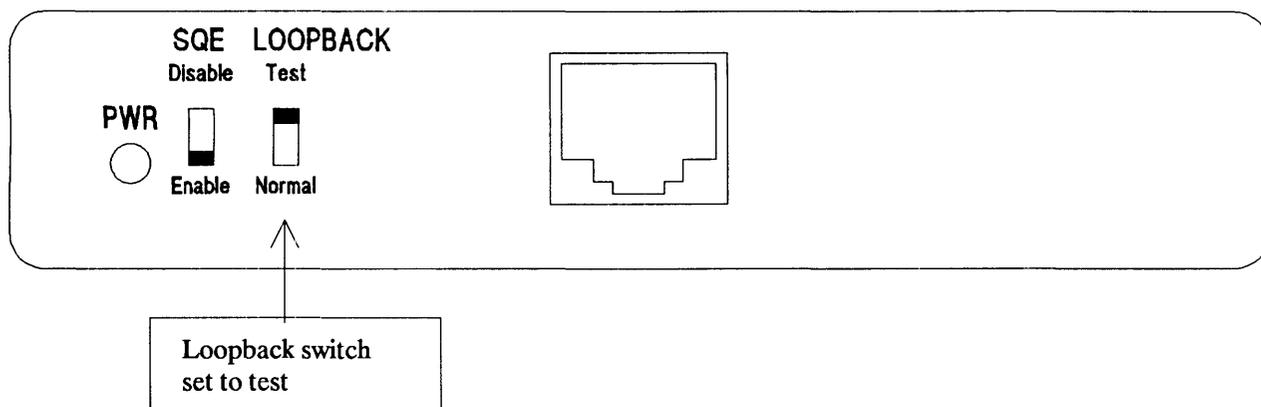
Figure D-3. Loopback Switch in Test Position
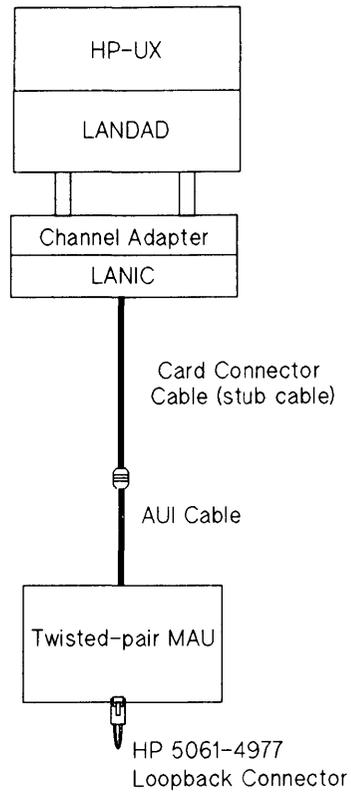
Figure D-4. Twisted-pair Diagnostic Test Setup

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Reader Comment Sheet

CIO LAN Interface Controller (LANIC)
Installation and Reference Manaul

5959-2259   September 1988

We welcome your evaluation of this manual. Your comments and suggestions help us to improve our publications. Please explain your answers under "Comments", below, and use additional pages if necessary.

Is this manual technically accurate?   ____ Yes   ____ No

Are the concepts and wording easy to understand?   ____ Yes   ____ No

Is the format of the manual convenient in size, arrangement, and readability?   ____ Yes   ____ No

Comments:

This form requires no postage if mailed in the U.S. For locations outside the U.S., your local company representative will ensure that your comments are forwarded.

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