

HP 9000 Series 300 Computer Systems

**HP 98643A LAN/300 Link
Local Area Network Interface Controller
(LANIC)**

Installation Manual



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PRINTING HISTORY

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Each reprinting of this manual will incorporate all past updates; however, no new information will be added. Thus, the reprinted copy will be identical in content to prior printings of the same edition with the user-inserted update information. New editions of this manual will contain new information, as well as updates.

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SAFETY CONSIDERATIONS

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

SAFETY SYMBOLS



Instruction manual symbol: the product 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 (sometimes used in manual to indicate circuit common connected to 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.

CAUTION

STATIC SENSITIVE DEVICES

When any two materials make contact, their surfaces are crushed on the atomic level and 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 through the device can raise the temperature of 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.

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.

SERVICING

WARNING

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

WARNING

This product is not designed for attachment to a network serving an area which contains multiple unconnected power system safety grounds. Before installing this product, verify that all of the power system safety grounds are securely interconnected in the area served by the local network. Special caution should be taken for cable systems run between buildings or exposed to weather environments.

WARNING

Do not connect this product to an ungrounded "thick" network coaxial cable as defined by this manual.

PREFACE

Purpose: This manual provides installation procedures for the HP 98643A LAN/300 Link Local Area Network Interface Controller (LANIC) card. Using this manual, you will be able to install a LANIC card into an HP 9000 Series 300 computer, or upgraded Series 200 computer, 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. Section 1 provides a list of related manuals.

Organization:

Section 1 provides a general overview of the HP 98643A link product.

Section 2 contains instructions for installing the LANIC card, and procedures for verifying that it is operating properly.

Appendix A provides replacement instructions for serviceable parts.

Appendix B provides a list of components that are used to assemble the LANIC card.

Appendix C provides schematic diagrams of the LANIC card.

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.

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DOCUMENTATION GUIDE

Thank you for your purchase of the HP 98643A LAN/300 Link product. To ensure your success with this product, refer to the manuals below for each task listed. (The system manuals shipped with your particular computer system will also be needed, but are not explicitly referenced.)

<u>DESIRED TASK</u>	<u>MANUAL</u>
To install the LAN coaxial cable medium, Medium Attachment Units (MAUs), and Attachment Unit Interface (AUI) cables	5955-7680 Cable and Accessories Installation Manual (order through your nearest HP Sales and Support Office)
To verify proper physical performance of the LAN, or perform hardware troubleshooting procedures	5955-7681 Link Troubleshooting Manual (order through your nearest HP Sales and Support Office)
To install the Input/Output (I/O) card assembly into the host computer	98643-90001 HP 98643A LAN/300 Link LANIC Installation Manual (included with HP 98643A)
To connect a ThinMAU assembly to the I/O card and to the RG58 (A/U or C/U) LAN coaxial cable	28641-90001 HP 28641A ThinMAU Installation Manual (included with HP 28641A)
To install the Hewlett-Packard Network Services/9000 LAN software	50951-90010 HP Network Services/9000 LAN Node Manager's Guide (provided with NS/9000 LAN software product)
To configure your node onto the network, gather node statistics, and perform basic node/network diagnostics	50951-90010 HP Network Services/9000 LAN Node Manager's Guide (provided with NS/9000 LAN software product)
To communicate on the network using Hewlett-Packard Network Services/9000 software	50951-90000 HP Network Services/9000 LAN User's Guide (provided with NS/9000 LAN software product)
To develop custom network services software	50951-90000 HP Network Services/9000 LAN User's Guide (provided with NS/9000 LAN software product)

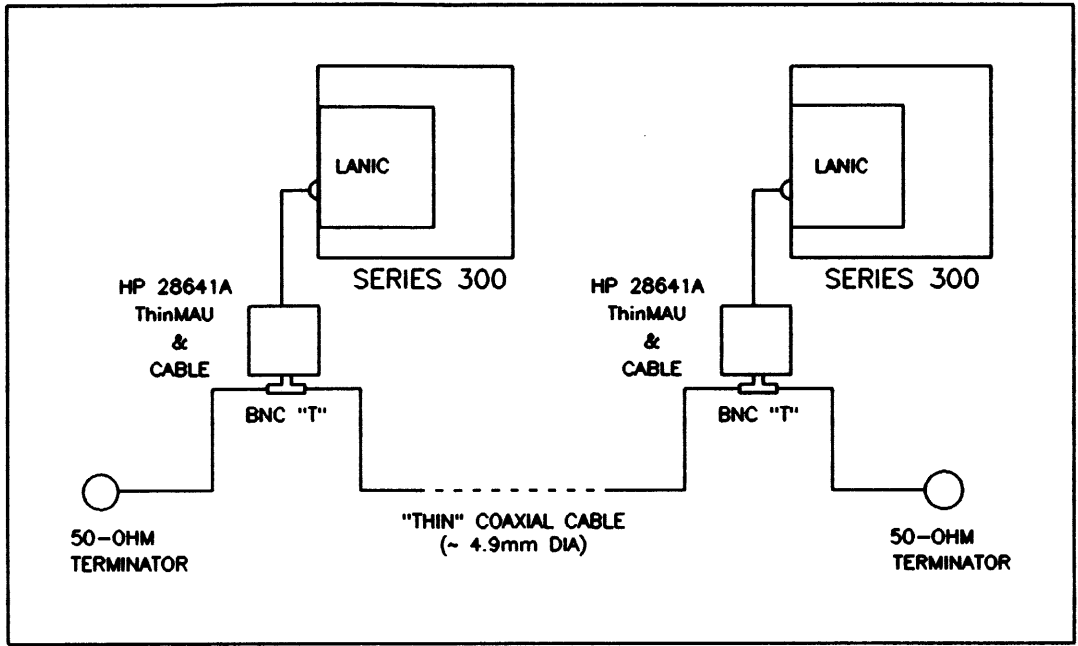


Figure 1-1: Typical IEEE 802.3 Type 10 Base 2 LAN Using the LANIC Card

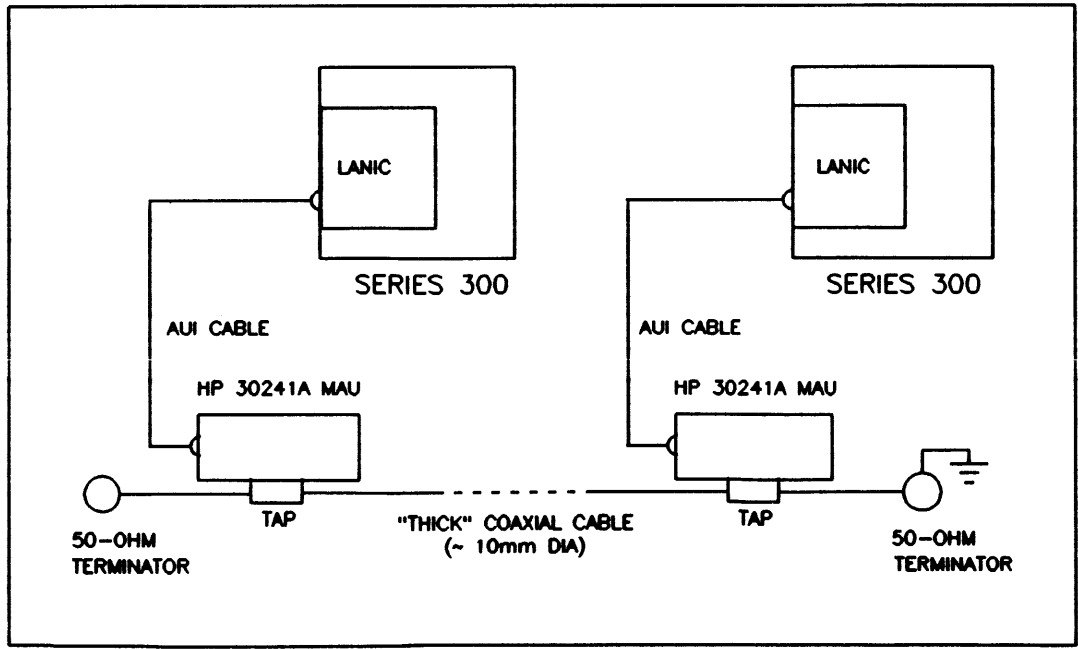


Figure 1-2: Typical IEEE 802.3 Type 10 Base 5 LAN Using the LANIC Card

This manual presents installation instructions for the interface card associated with the HP 98643A LAN/300 link product. This section provides a general overview of the HP 98643A.

PRODUCT OVERVIEW

The HP 98643A LAN/300 link provides connectivity between an HP 9000 Series 300 (or upgraded Series 200) host computer and an IEEE 802.3 or Ethernet 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 HP 98643A operates with *baseband* networks using a *Carrier Sense 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, all without the use of a master node.

Connection to the Host – The LANIC Card

Included with the HP 98643A is a Local Area Network Interface Controller (LANIC). The LANIC is an input/output (I/O) card that plugs into the I/O backplane of the HP 9000 Series 300 host. The LANIC card edge connector (P1) mates with an I/O backplane connector when the card is inserted into one of the I/O card cage slots.

Connection to a LAN – Applicable Standards

The HP 98643A 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). These standards define baseband, CSMA/CD LANs which feature burst transfer rates of 10 Mbits per second.

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. For this "thin" cable LAN medium, connection of up to 30 nodes on a bus length of 185 meters is supported.

A node's physical connection and electrical access to a thin cable LAN may be provided by a *ThinMAU* (thin cable Medium Attachment Unit) assembly, HP 28641A. ThinMAUs transmit and receive data on

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the thin cable, exchanging data and control signals with the LANIC card. A ThinMAU connects to the LAN via a BNC "T" connector at a node location. The ThinMAU contains a built-in one meter cable for connection directly to the LANIC card.

Note that the HP 28641A ThinMAU comes standard with HP 98643A.

Figure 1-1 illustrates a typical IEEE 802.3 Type 10Base2 LAN connecting HP 9000 Series 300 computers.

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, or "thick" cable. Thick cable LANs feature connection of up to 100 nodes on a single 500 meter bus segment.

A MAU, HP 30241A, connects to and accesses thick cable LANs. Included with the HP 30241A is a fitting, called a "tap", that pierces the coaxial cable and makes the electrical contact with the MAU. An Attachment Unit Interface (AUI) cable joins the MAU with 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 in both connected and unconnected versions.

Figure 1-2 shows a typical IEEE 802.3 Type 10Base5 LAN connection.

ETHERNET. Although very similar, there are some basic differences between the Ethernet and IEEE 802.3 LANs that impact compatible operation.

First, IEEE 802.3 and Ethernet node hardware reference different electrical grounds. Thus, all the hardware of a particular node must conform to one standard or the other. For new nodes, conformance to IEEE 802.3 is recommended. However, since Ethernet hardware may already be installed at a node location, the LANIC card can be configured for Ethernet connection via a jumper on the card. Figures 1-3 and 1-4 illustrate acceptable configurations.

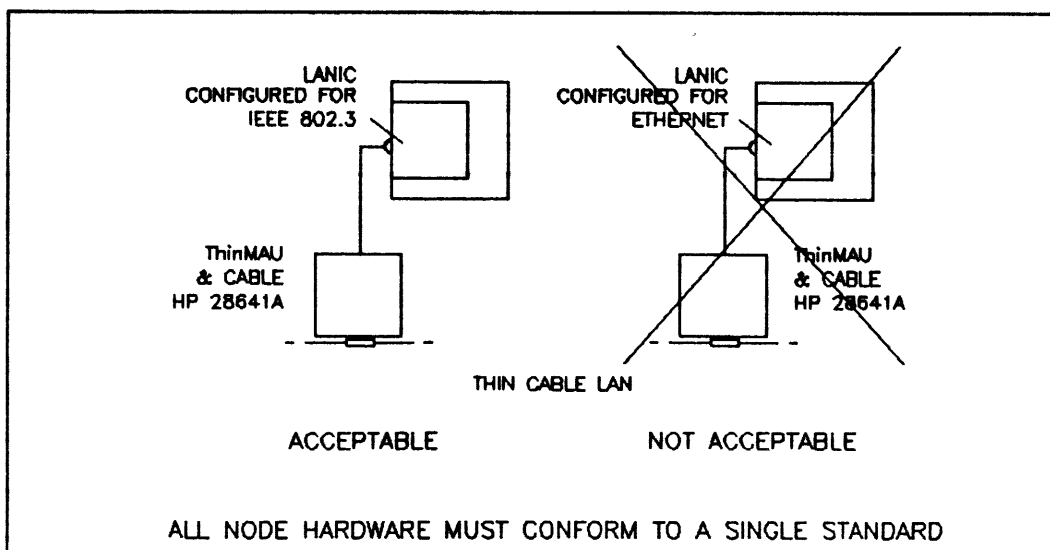


Figure 1-3: Examples of Thin Cable LAN Compatibility

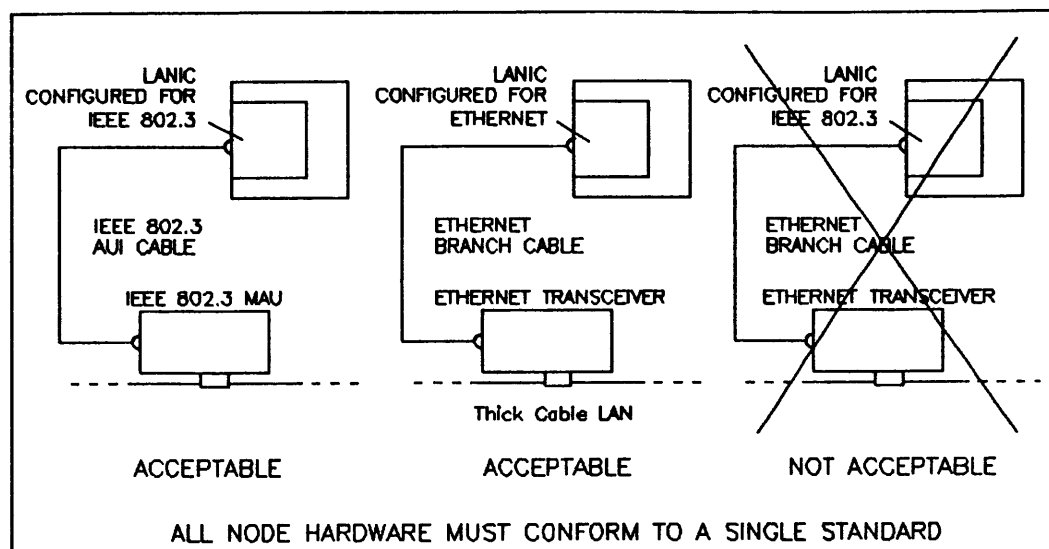


Figure 1-4: Examples of Thick Cable LAN Compatibility

Second, there are functional differences between the standards. An IEEE 802.3 node performs additional services, such as *SQE Heartbeat* and *Jabber Fault Detection*, that are not necessarily provided by an Ethernet node. An SQE (Signal Quality Error) test signal, or heartbeat, is a short burst of collision indicator signal 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.

Finally, the standards differ in how they define the make-up of a packet transmitted on the network. An Ethernet packet differs from an IEEE 802.3 packet. Although the LANIC card will process either type of packet, packet formatting and packet interpretation must be handled in software.

Software

The HP 98643A is supported under HP-UX (Revision 5.0 or later) on HP 9000 Series 300 and upgraded Series 200 systems with Hewlett-Packard software installed.

HP Network Services/9000 LAN software provides a user and node manager interface for setting up and maintaining an HP 9000 node, as well as providing node-to-node communications between supported Hewlett-Packard systems.

Installation and use of node software are discussed in HP Network Services/9000 LAN manuals referenced later. Note that Network Services/9000 LAN software supports both Ethernet and IEEE 802.3 packets.

Link-Level (Node) Address

The link-level address, sometimes referred to as the 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 operations,

General Information

the station address is matched with a received packet's destination address prior to accepting the packet for processing. For transmitted packets, the station address is appended, and the packet's source can be identified.

The station address is assigned at the factory and stored in the card's NOVRAM (nonvolatile static RAM). It is globally administered, that is, it is a unique node address regardless of manufacturer. Refer to Section 2 to determine the address of your LANIC card.

The node's station address is changed if the NOVRAM is physically replaced. NOVRAM replacement information is provided in Appendix A. If the address changes, software reconfiguration and documentation updates to administer your network may be necessary.

Equipment Supplied

Equipment supplied with this product is operationally compatible with the IEEE 802.3 standard. The standard product includes:

<u>Quantity</u>	<u>Part Number</u>	<u>Description</u>
1	98643-66501	LANIC Card Assembly
1	28641A	IEEE 802.3 based Thin cable MAU (ThinMAU) for workstation applications (contains integrated AUI cable). Includes BNC "T" connector.
1	98643-90001	HP 98643A LAN/300 Link LANIC Installation Manual (this manual)

Option 241 deletes the HP 28641A ThinMAU.

Other LAN accessories, including HP 30241A (MAU for "thick" cable LANs) and AUI cables, are ordered separately. Consult your *Hewlett-Packard Computer Users Catalog*, 5953-2450D, or your nearest HP Sales and Support Office.

RELATED PRODUCTS

Similar to the HP 98643A, other products from Hewlett-Packard will give additional computers the ability to connect to an IEEE 802.3 LAN. Included are:

<u>Part Number</u>	<u>Description</u>
27125B	LAN Link for the HP 9000 Series 500
30242A	LAN Link for the HP 3000 Series 37, 39/40/42, 44/48, 64/68
12076A	LAN Link for the HP 1000 A-Series

Consult Hewlett-Packard for a complete list of supported computer systems.

Node-to-node communications between Hewlett-Packard systems are supported using HP Network Services Software operating on the systems, as follows: software products are applicable:

HP 50951A NS/9000 Series 300 Single-user	HP 50956A NS/9000 Series 200 (Upgraded)
HP 50952A NS/9000 Series 300 Multi-user	HP 50957A NS/9000 Series 200 (Upgraded)

REFERENCE MANUALS

For Local Area Network (LAN) installation and operation, the following manuals provide supplemental information:

<u>Part Number</u>	<u>Description</u>
50951-90000	HP Network Services/9000 (NS/9000) LAN User's Guide
50951-90010	HP Network Services/9000 (NS/9000) Node Manager's Guide
5955-7680	Cable and Accessories Installation Manual
5955-7681	Link Troubleshooting Manual

NOTE

A hardware reference manual associated with the LANIC interface is not available.

IDENTIFICATION

The LANIC interface card assembly is identified by a ten digit part number and date code. They are printed on a white sticker which is affixed to the board, and appear as follows:

98643-66501
XNNNN

where "X" is a letter and "NNNN" is a number.

SPECIFICATIONS

PHYSICAL

SIZE (includes coverplate and thumbscrews):

Length: 19.7 cm (7.75 inches)
Width: 16 cm (6.3 inches)
Weight: 241 gm (8.5 ounces)

I/O BACKPLANE INTERCONNECT:

One connector (P1), consisting of 100 gold-plated fingers, connects to the host computer's I/O backplane.

DEVICE INTERCONNECT:

One 15-pin female connector connects to AUI or Ethernet branch cables.

Standards: Conforms to IEEE 802.3 or Ethernet Version 1.0 depending on Jumper W1 position.

FUNCTIONAL

CAPACITY:

A single half-duplex (transmit and receive) communication channel with 16 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 of 10 Mbits/second. Throughput capacity is processor and process dependent.

ENVIRONMENTAL

TEMPERATURE & HUMIDITY:

Non-operating: -40 to +75 degrees Centigrade
Operating: 0 to +55 degrees Centigrade ambient
Humidity: 5% to 95% relative humidity (non-condensating)

ELECTROMAGNETIC:

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

ELECTRICAL**POWER:**

<u>Voltage</u>	<u>Current</u>	<u>Power Dissipated</u>
+ 5 VDC	978 mA max.	4.89 W max.
+12 VDC	0.5 A max.	6 W max. (per IEEE 802.3 standard)

INTERFACE STANDARDS:

Electrical levels conform to the IEEE 802.3 standard, and the *de facto* standard Ethernet Version 1.0.

This section contains information on installing and verifying proper operation of the HP 98643A LAN/300 Link LANIC card.

PREPARATION

Because this manual is limited to installation of the LANIC card only, it is assumed that node and network cabling have already been installed. Information on installing the cable medium and other LAN hardware is contained in the *Cable and Accessories Installation Manual*, 5955-7680.

For example, one of the following should already be installed:

- "Thin" RG58 A/U or C/U coaxial cable (approximately 0.19 inch, 4.9 mm diameter) with BNC connectors at each node location, and:
 1. IEEE 802.3 Type 10 Base 2 hardware: HP 28641A ThinMAU with BNC "T" adapter connected to the coax, or
 2. Ethernet based hardware for accessing thin cable LANs.
- "Thick" coaxial cable (approximately 0.4 inch, 10 mm diameter) and:
 1. IEEE 802.3 Type 10 Base 5 hardware: HP 30241A with tap connected to the coax, and AUI cabling from the MAU to the host computer, or
 2. Ethernet based tap and transceiver assembly, and branch cabling to the host computer.

Furthermore, it is assumed that the HP-UX operating system has been installed in the computer. For HP-UX system installation information, refer your *Series 200 HP-UX Systems Administrator Guide*, 98680-90011 or later.

Finally, it is assumed that the NS/9000 LAN software has been installed in the computer. NS/9000 LAN software contains an interactive diagnostic routine that is used to conduct card self-test. Conducting card self-test completes the LANIC card installation. Details of NS/9000 LAN software installation and the LAN diagnostic calls are described in the *HP NS/9000 LAN Node Manager's Guide*, 50951-90010.

INSTALLATION SUMMARY

CAUTION

SOME OF THE COMPONENTS USED IN THIS PRODUCT ARE SUSCEPTIBLE TO DAMAGE BY STATIC DISCHARGE. REFER TO THE SAFETY CONSIDERATIONS INFORMATION AT THE FRONT OF THIS MANUAL BEFORE HANDLING THE CARD.

Take the following steps to install the LANIC card in your HP 9000 Series 300 computer. These steps will be explained in detail in the remainder of this section.

- **REVIEW ALL WARNINGS PRESENTED AT THE BEGINNING OF THIS MANUAL.**
Be sure to follow proper anti-static procedures when handling the LANIC (or any interface cards in your system).
- Make sure that the power drawn by the LANIC card is within the power budget of your computer.
- Note the card's unique link-level (node) address marked on the card's NOVRAM (see Figure 2-1). This address should be entered into a network manager's logbook.
- Set the switches and jumpers on the LANIC card. Switch SW1 defines the select code of the card and an interrupt priority level. Jumper W1 configures the card for operation with either IEEE 802.3 or Ethernet hardware. (Jumper W1 provides for electrical compatibility only and has no effect on protocol.)
- With the computer's power off, install the LANIC card in the computer's backplane.
- Connect the LANIC card to the LAN. As appropriate, attach the AUI cable, the Ethernet branch cable, or the ThinMAU cable, to the 15-pin D connector on the card.
- Power up the computer and verify the proper operation of the LANIC card by performing card self-test. Card self-test is initiated by running the LAN diagnostic routine contained in the NS/9000 LAN software product. If not already loaded, this software must be installed (consult the *HP NS/9000 LAN Node Manager's Guide*, 50951-90010, for details).

POWER CONSIDERATIONS

All I/O cards installed in the computer obtain their operating power from the computer's power supply. For Series 300 systems, sufficient power is available for all supported configurations. For Upgraded Series 200 systems, you may need to calculate whether or not the addition of the LANIC card, with attached node hardware,* will cause an electrical current overload, i.e., overstress the power supply.

CAUTION

DEPENDING ON THE MANUFACTURERS' SPECIFICATIONS, ELECTRICAL CURRENT DRAWN BY MEDIUM ATTACHMENT DEVICES MAY VARY. ENSURE THAT THE DEVICE USED WITH YOUR SYSTEM CONFORMS TO IEEE 802.3 LIMITS. FAILURE TO DO SO MAY CAUSE AN ELECTRICAL CURRENT OVERLOAD IN YOUR SYSTEM.

Power consumption specifications of the card are indicated below. Note that the +12V power dissipated depends on the medium access device used.

<u>Voltage</u>	<u>Current</u>	<u>Power Dissipated</u>
+ 5 VDC	978 mA max.	4.89 W max.
+12 VDC	0.5 A max. 360 mA typ. 380 mA typ.	6 W max. (per IEEE 802.3 standard) 4.32 W typ. (using HP 28641A ThinMAU) 4.56 W typ. (using HP 30241A MAU)

For each power supply voltage, add the power consumed by each card to be plugged into the backplane of your computer, and ensure that the total does not exceed the amount that your computer can provide. Power available from various computers is indicated in the *HP 9000 Series 200 Configuration Information and Order Guide* (09800-90020). If the power available is exceeded, you will need to make other arrangements, e.g., reconfigure your system.

*The node's medium access hardware (MAU, ThinMAU, transceiver) also draws power from the computer via the LANIC card.

DETERMINING THE LINK-LEVEL ADDRESS

The link-level address is the unique node identifier that is used for selective 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 6 digits are:

08 00 09 (Hexadecimal)

The second 6 digits are marked on each LANIC card's NOVRAM (nonvolatile static RAM) in the following form:

98643-81001 (NOVRAM part number)
XX YY ZZ (Hexadecimal)

Thus, the complete link-level address would be 08 00 09 XX YY ZZ (hexadecimal).

The NOVRAM is an IC mounted in a dual-in-line package (DIP) at U56. Refer to Figure 2-1 for approximate location.

It is recommended that the link-level address be entered in a network manager's *logbook*. This logbook should be maintained to promote orderly network changes and additions while serving as a quick reference. Any pertinent information should be included, such as: a network map showing node connection locations, internet addresses, link-level addresses, node names, software directory files, etc.

Note that the link-level address is changed whenever the NOVRAM is physically replaced (should the need arise). Appendix A contains NOVRAM replacement instructions.

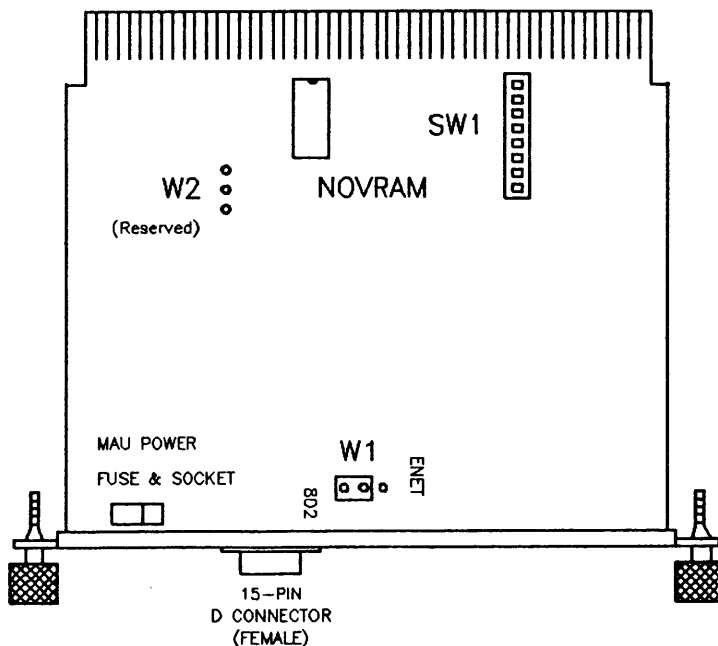


Figure 2-1: LANIC Card Illustration

SWITCHES & JUMPERS

Figure 2-1 shows the location of card switches and jumpers.

Switch SW1

There is one set of dual in-line package (DIP) switches on the LANIC card, SW1, which is used to assign the card's select code and interrupt level. It is an 8 position DIP switch located near the backplane edge connector. Switch positions 5 through 1 (SW1__5 through SW1__1) determine the select code of the card. SW1__1 is the least significant bit (LSB). The setting from the factory is 21, but the select code can be set to any number between 8 and 31 in applicable systems as long as it is unique in the system I/O backplane.

NOTE

Note that the HP 98629 Shared Resource Management (SRM) Interface is also shipped from the factory with default select code 21. If both an SRM card and LANIC card are used in the same computer system, reassign the LANIC card to a new unique select code by resetting the select code switches. HP LAN software will automatically adapt to the new select code.

SW1__6 (LSB) and SW1__7 (MSB) define the card's hardware priority level for interrupting the host CPU. The interrupt priority level must be set to 5. A table of various switch positions and associated priority levels is shown on the next page. Note that the card is shipped from the factory with level 5 set.

Installation

SW1_6 Position	SW1_7 Position	Priority Level
0	0	3
1	0	4
0	1	5
1	1	6

(Note: 0 = ON, 1 = OFF)
Ensure Priority Level 5 is set

SW1_8 is reserved for future use and should be set to 0.

Figure 2-2 illustrates switch SW1 positions when shipped from the factory. If the factory settings need to be changed, reset the select code and interrupt priority level to the desired settings.

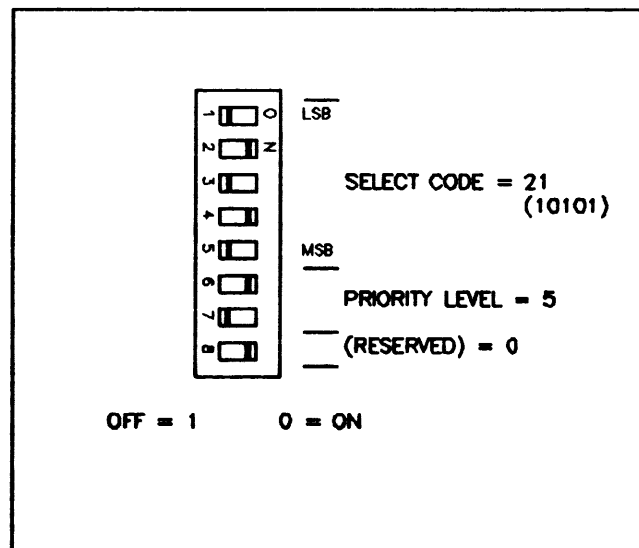


Figure 2-2: Switch SW1 Standard Factory Positions

Jumpers

There are two jumpers on the card. Jumper W1 provides for connection with IEEE 802.3 or Ethernet hardware. Jumper W2 is reserved for future use.

IEEE 802.3/ETHERNET SELECTION. IEEE 802.3 and Ethernet standards differ in the way the pin 1 at the cable connection to the LANIC card is grounded (logic ground versus chassis ground, respectively). In addition, there are differences in the presentation of non-transmit states by the card's serial transmitter to the transceiver (zero differential voltages versus fixed differential voltages).

Prior to installation, the card must be configured to operate with either IEEE 802.3 or Ethernet hardware. It is shipped from the factory for IEEE 802.3 operation, using Jumper W1. Figure 2-3 shows Jumper W1 settings. Ensure Jumper W1 is properly set to the desired configuration.

Note that Jumper W1 provides for hardware compatibility only, and does not impact protocol differences between the standards.

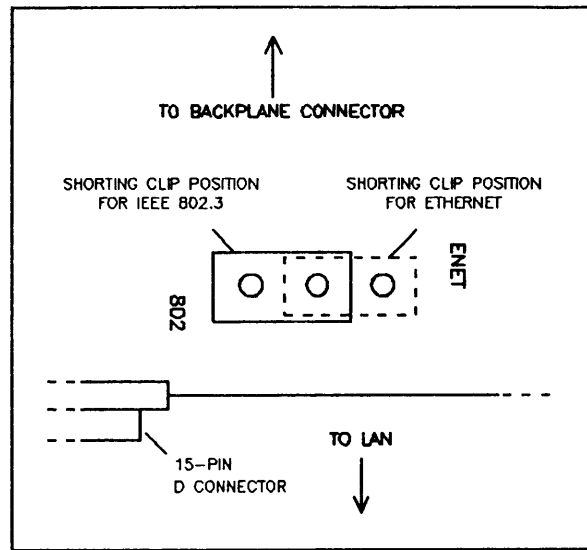


Figure 2-3: Jumper W1 Positions

CARD INSTALLATION

To install the card in the backplane:

1. Turn off the computer's power following the procedures in the *HP-UX Systems Administrator Guide, Series 200*, 98680-90011 or later. Following the procedures will prevent loss of data.
2. Slide the card into the backplane with the component side "up". Note that I/O cards will only fit in every other slot, beginning with the lowest slot, because of the cover plate. Tighten both thumbscrews on each side of the cover plate simultaneously, ensuring the card seats firmly into the computer backplane connectors.

LAN CONNECTION

REVIEW ALL WARNINGS PRESENTED AT THE FRONT OF THIS MANUAL.

This discussion presumes that network and node cabling have been installed up to the LANIC card and host computer (see the PREPARATION paragraph on page 2-1). If not, refer to the *Cable & Accessories Installation Manual*, 5955-7680.

WARNING

THE INTERFACE CABLING AND MEDIA ACCESS DEVICE TO THE COAXIAL CABLE BUS MUST ALL CONFORM TO A SINGLE STANDARD, EITHER IEEE 802.3 OR ETHERNET. IN ADDITION, THE IEEE 802.3/ETHERNET SELECTION JUMPER (W1) MUST BE APPROPRIATELY SET. FAILURE TO DO SO WILL RESULT IN INCOMPATIBLE GROUNDING AND AN ELECTRICAL SHOCK HAZARD.

A cable diagram for an HP IEEE 802.3 Attachment Unit Interface (AUI) connected cable is shown in Figure 2-5. A cable diagram for an Ethernet branch cable is shown in Figure 2-6. Note that the IEEE 802.3 AUI cable contains an overall cable shield that is insulated from individual drain wires (twisted pair shields), which form logical ground. The Ethernet branch cable's shield is shorted to drain wires and chassis ground.

The 15-pin connector on the ThinMAU cable is wired the same as the IEEE 802.3 cable connector.

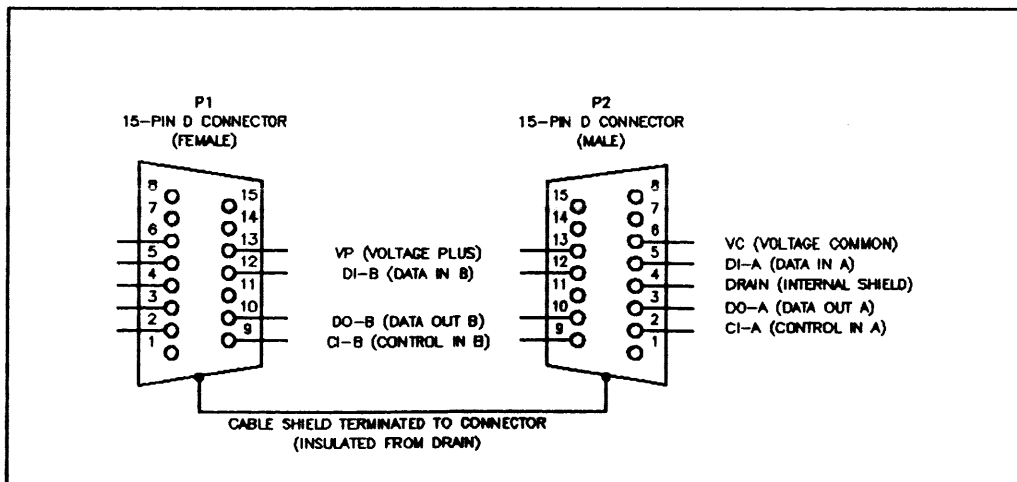


Figure 2-5: IEEE 802.3 AUI Cable Diagram

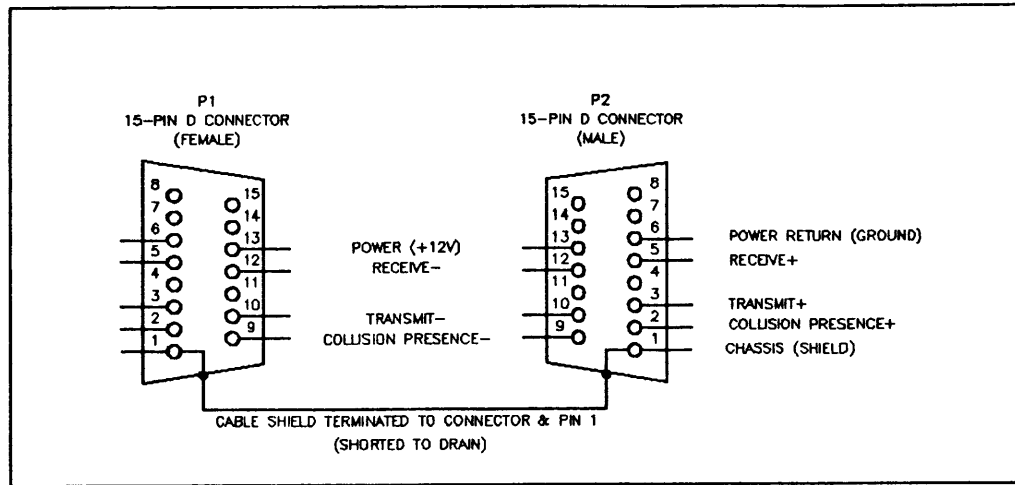


Figure 2-6: Ethernet Branch Cable Diagram

Following the instructions below, connect the male end of the IEEE 802.3 AUI cable, Ethernet branch cable, or ThinMAU cable (whichever is installed) to the 15-pin female D connector on the LANIC card. 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. This is illustrated in Figure 2-7.

- a) Slide the hold-down clip to the "open" position (see Figure 2-7(A)).
- b) Align the plug and socket, then connect them firmly.
- c) Slide the hold-down clip to the "locked" position (see Figure 2-7(B)). This hold-down clip prevents accidental cable disconnection during operation.

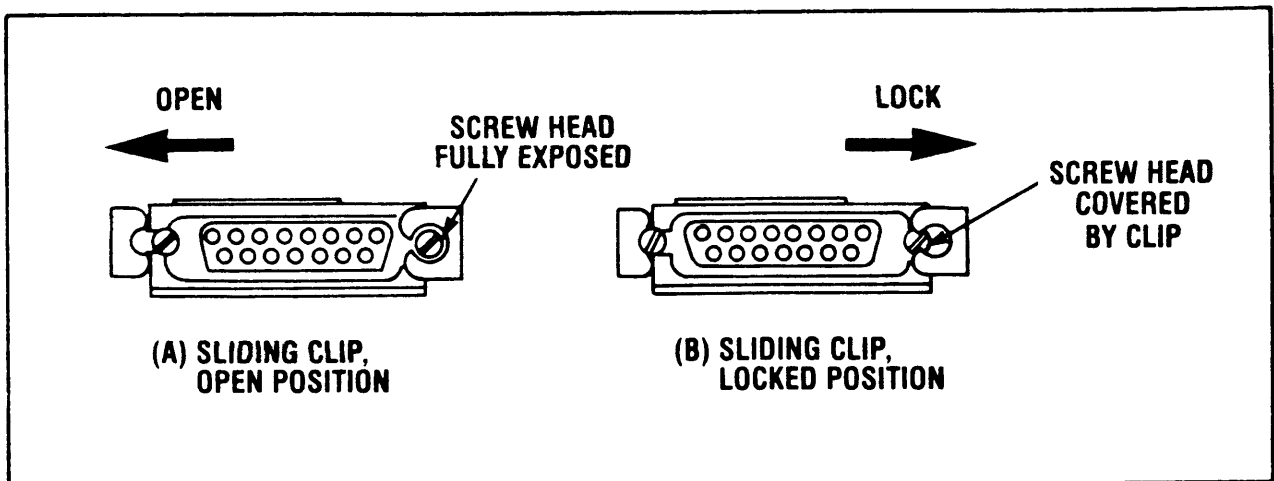


Figure 2-7. Securing Cable Hold-Down Clips

VERIFICATION

After installation, you should verify that the LANIC card is operating properly. Although the card does not contain onboard intelligence for conducting a self-test, a LANIC card self-test routine can be run in the host computer to test various card functions. This routine is provided with the HP Network Services/9000 LAN software products.

1. Verify that the card is properly seated in the backplane.
2. With HP Network Service/9000 LAN software installed on the system, run the LANDIAG program. From this program, you can initiate the card self-test, and observe card status. Refer to the *HP NS/9000 LAN Node Manager's Guide*, 50951-90010, for details on software installation, and commands to conduct self-test. (Note: you must be the "Super-User" to initiate card self-test routines.)
3. If card self-test fails, as revealed by failure messages on the console, consult your nearest HP Sales and Support Office.

NOTE

The self-test performs an external loopback test. An external loopback failure will result if a ThinMAU or MAU is not connected to the LANIC card, to the coaxial cable, or is faulty.

CARD REMOVAL

To remove the card from the backplane:

1. Turn off the computer's power following the procedures in the *HP-UX Systems Administrator Guide, Series 200*, 98680-90011 or later. Following the procedures will prevent loss of data.

CAUTION

ALWAYS TURN OFF LINE POWER TO THE COMPUTER BEFORE INSTALLING OR REMOVING AN INTERFACE CARD (AND ASSOCIATED CABLING). FAILURE TO DO SO MAY RESULT IN DAMAGE TO THE INTERFACE OR THE ATTACHED I/O DEVICE.

2. Disconnect the interface cable.
3. Unseat the card from the backplane by simultaneously unscrewing the two thumbscrews on each side of the cover plate.
4. Slide the card out of the card cage. Remember to use antistatic handling procedures whenever you are handling the card.

MAINTENANCE

Field repair of the LANIC card is limited to replacement of the MAU power fuse or NOVRAM by qualified personnel. Instructions for replacing these components are contained in Appendix A.

If other faults are isolated to the LANIC card (for example, from self-test), replacement of the card is required. To exchange a LANIC card, remove it from the system and prepare it for reshipment to Hewlett-Packard in accordance with the instructions presented below.

NOTE

UNAUTHORIZED BOARD REPAIR, INCLUDING COMPONENT
REPLACEMENT OR SUBSTITUTION, WILL INVALIDATE
WARRANTIES ASSOCIATED WITH THIS PRODUCT.

RESHIPMENT

If any parts are to be returned to Hewlett-Packard for any reason, attach a tag identifying the owner and indicating the reason for shipment. Include the part number of each returned unit.

Pack the item in the original factory packing material, if available. If the original material is not available, good commercial packing material should be used. Reliable commercial packing and shipping companies have the facilities and materials to repack the item. **BE SURE TO OBSERVE ANTI-STATIC PRECAUTIONS.**

Return the item to the nearest Hewlett-Packard Sales and Support Office.

REPLACING SERVICEABLE PARTS

CAUTION

SOME OF THE COMPONENTS USED IN THIS PRODUCT ARE SUSCEPTIBLE TO DAMAGE BY STATIC DISCHARGE. REFER TO THE SAFETY CONSIDERATIONS INFORMATION AT THE FRONT OF THIS MANUAL BEFORE HANDLING THE CARD. COMPONENT REPLACEMENT SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

Removal and installation of card components should be performed at a static-safe workstation.

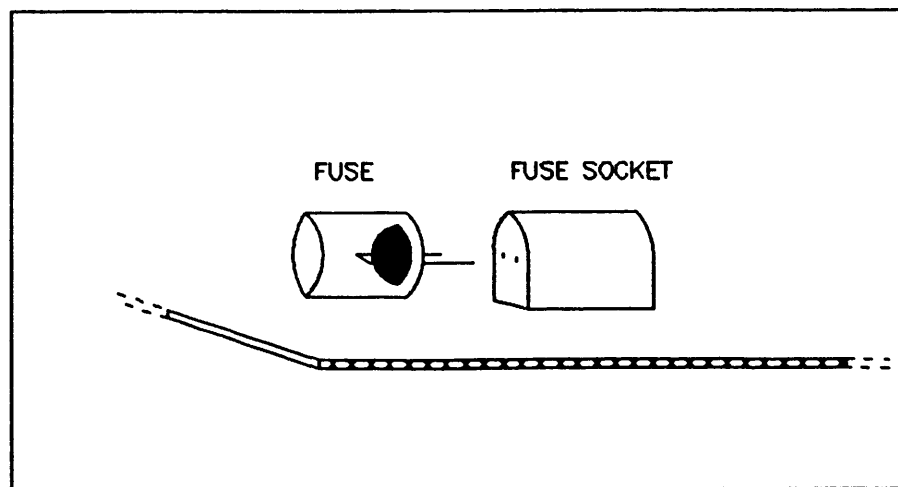
The MAU power fuse and NOVRAM are the only field replaceable components on the LANIC card. These components fit into sockets; soldering is neither authorized nor required.

FUSE

The 125V, 5A fuse is orderable 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. Refer to Figure 2-1 in Section 2 of the manual for fuse location. It is near the front plane D connector.

Remove the fuse from its socket by gently pulling it free. The figure below shows the fuse separated from the fuse socket.



Note that excessive prying or pressure can cause damage. Test the fuse for broken element using an ohm-meter or continuity tester. The fuse should be replaced if an "open" circuit is indicated.

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

Replacing Serviceable Parts

After fuse replacement, install the card into the computer following the instructions presented in this manual.

NOVRAM

At some point, it may be necessary to replace the NOVRAM; for example, NOVRAM faults may be revealed by card self-test.

Consult your nearest HP Sales and Support Office to obtain a replacement NOVRAM, 98643-81001.

Note that a replacement NOVRAM will contain a new unique link-level address assigned at the factory. Node or network software and network administrative documentation may require updating to reflect the new address.

With the component side of the LANIC card up, locate the NOVRAM (U56).

Remove the component from its socket, ensuring that no damage occurs to the socket. An IC (integrated circuit) removal tool is recommended; however, a fine, rigid device such as a very thin flathead screwdriver can be used to initially loosen the NOVRAM IC from its socket. **Note that excessive prying and pressure can damage the socket and component, so extra care should be taken during removal.**

When installing the replacement component, note the half-circle tab located on one end. This tab denotes orientation of the IC, and must be matched with a similar tab 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, a new component may be required.)

After successful NOVRAM replacement, install the card into the computer following the instructions presented in Section 2.

COMPONENT PARTS LIST

APPENDIX

B

This appendix contains a list of component parts used in the LANIC card assembly.

Component Parts List

Table B-1. Component Parts List

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	98643-66501	2	1	PCA DIO LAN	28480	98643-66501
C1				NOT ASSIGNED		
C2				NOT ASSIGNED		
C3	0160-4801	7	2	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
C4	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
C5	0160-4835	7	21	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C6	0160-4832	4	1	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-4832
C7				NOT ASSIGNED		
C8	0160-4831	3	1	CAPACITOR-FXD 4700PF +-10% 100VDC CER	28480	0160-4831
C9	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C10	0180-0374	3	3	CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
C11-				NOT ASSIGNED		
C21				NOT ASSIGNED		
C22	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
C23	0180-0374	3		CAPACITOR-FXD 10UF+-10% 20VDC TA	56289	150D106X9020B2
C24	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C25	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C26	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C27	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C28	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C29	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C30	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C31	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C32	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C33	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C34	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C35	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C36	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C37	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C38	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C39	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C40	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C41	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C42	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
F1	2110-0520	6	1	FUSE 5A 125V NTD .348X.25	75915	273005
J1	1252-0229	1	1	CONN-RECT D-SUBMIN 15-CKT 15-CONT	28480	1252-0229
K1	0410-1564	4	1	XTAL 20.0 MHZ	28480	0410-1564
R1				NOT ASSIGNED		
R2	0698-6698	3	4	RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R3	0698-6698	3		RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R4	0698-6698	3		RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R5	0698-6698	3		RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R6	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
R7	0757-0274	5	3	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
R8-				NOT ASSIGNED		
R12				NOT ASSIGNED		
R13	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
R14	0757-0274	5		RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
R15-				NOT ASSIGNED		
R19				NOT ASSIGNED		
R20	1810-0279	5	4	NETWORK-RES 10-SIP4.7K OHM X 9	01121	210A472
R21	1810-0279	5		NETWORK-RES 10-SIP4.7K OHM X 9	01121	210A472
R22	1810-0279	5		NETWORK-RES 10-SIP4.7K OHM X 9	01121	210A472
R23	1810-0279	5		NETWORK-RES 10-SIP4.7K OHM X 9	01121	210A472
SW1	3101-2747	5	1	8-POS AI DIP SW	28480	3101-2747
T1	1810-0739	2	1	DIP TRANSFORMER	28480	1810-0739
U1-				NOT ASSIGNED		
U10				NOT ASSIGNED		
U11	1818-3198	9	2	IC CMOS 65536(64K) STAT RAM 150-NS 3-S	28480	1818-3198
U12				NOT ASSIGNED		

Table B-1. Component Parts List (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
U13	1818-3198	9		IC CMOS 65536(64K) STAT RAM 150-NS 3-S	28480	1818-3198
U14				NOT ASSIGNED		
U15	1820-2488	3	1	IC FF TTL ALS D-TYPE POS-EDGE-TRIG	01295	SN74ALS74N
U16				NOT ASSIGNED		
U17	PPNR 43487	5	1	AH7992 (SIA)	28480	PPNR 43487
U18-				NOT ASSIGNED		
U30						
U31	1820-3378	2	6	IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378
U32	1820-3145	1	7	IC DRVR TTL ALS BUS OCTL	28480	1820-3145
U33	1820-3378	2		IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378
U34	1820-3145	1		IC DRVR TTL ALS BUS OCTL	28480	1820-3145
U35	1820-3828	7	1	IC MISC NMOS	28480	1820-3828
U36				NOT ASSIGNED		
U37	1820-3378	2		IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378
U38	1820-3145	1		IC DRVR TTL ALS BUS OCTL	28480	1820-3145
U39	1820-3438	5	4	IC MUXR/DATA-SEL TTL ALS 2-T0-1-LINE	28480	1820-3438
U40	1820-3438	5		IC MUXR/DATA-SEL TTL ALS 2-T0-1-LINE	28480	1820-3438
U41	1820-2557	7	2	IC DRVR TTL AS LINE DRVR HEX 2-INP	01295	SN74AS804N
U42	1820-3145	1		IC DRVR TTL ALS BUS OCTL	28480	1820-3145
U43	1820-3100	8	1	IC DCDR TTL ALS BIN 3-T0-8-LINE 3-INP	28480	1820-3100
U44	1820-3608	1	1	IC INV TTL AS HEX	28480	1820-3608
U45	1820-3981	3	1	IC PRGMBL-LGC TTL S PAL	28480	1820-3981
U46-						
U50				NOT ASSIGNED		
U51	1820-3378	2		IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378
U52	1820-3145	1		IC DRVR TTL ALS BUS OCTL	28480	1820-3145
U53	1820-3378	2		IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378
U54	1820-3145	1		IC DRVR TTL ALS BUS OCTL	28480	1820-3145
U55	1820-3472	7	1	IC COMPTR TTL ALS IDENTITY 8-BIT	28480	1820-3472
U56	98643-81001	9	1	PROG. 1818-3165	28480	98643-81001
U57	1820-3378	2		IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378
U58	1820-3145	1		IC DRVR TTL ALS BUS OCTL	28480	1820-3145
U59	1820-3438	5		IC MUXR/DATA-SEL TTL ALS 2-T0-1-LINE	28480	1820-3438
U60	1820-3438	5		IC MUXR/DATA-SEL TTL ALS 2-T0-1-LINE	28480	1820-3438
U61	1820-3590	0	1	IC GATE TTL AS OR QUAD 2-INP	28480	1820-3590
U62				NOT ASSIGNED		
U63	1820-1427	8	1	IC DCDR TTL LS 2-T0-4-LINE DUAL 2-INP	01295	SN74LS156N
U64	1820-3143	9	1	IC FF TTL ALS D-TYPE POS-EDGE-TRIG DUAL	28480	1820-3143
U65	1820-3980	2	1	IC PRGMBL-LOGIC TTL S PAL	28480	1820-3980
U66-						
U99				NOT ASSIGNED		
U100	1820-2557	7		IC DRVR TTL AS LINE DRVR HEX 2-INP	01295	SN74AS804N
U101	1820-2096	9	2	IC CNTR TTL LS BIN DUAL 4-BIT	01295	SN74LS393N
U102	1820-2096	9		IC CNTR TTL LS BIN DUAL 4-BIT	01295	SN74LS393N
W1	1251-4670	2	2	CONNECTOR 3-PIN M POST TYPE	28480	1251-4670
W2	1251-4670	2		CONNECTOR 3-PIN M POST TYPE	28480	1251-4670
XU1-						
XU30				NOT ASSIGNED		
XU56	1200-0539	7	1	SOCKET-IC 18-CONT DIP	28480	1200-0539
	0515-0055	8	2	SCREW-MACH M3 X 0.5 6MM-LG PAN-HD	28480	0515-0055
	0515-0076	3	2	SCREW-MACH M3 X 0.5 6MM-LG 90-DEG-FLH-HD	28480	0515-0076
	0590-1445	0	4	THREADED INSERT-NUT M3 X 0.5 CARB-STL	28480	0590-1445
	1251-0220	0	1	LOCK-SUBMIN D 15 CONT CONN	28480	1251-0220
	1258-0141	8	1	JUMPER-REM	28480	1258-0141
	2110-0691	2	1	FUSEHOLDER-BIPIN SKT 5A 125 V	28480	2110-0691
	98643-00001	9	1	I/O COVER PLATE	28480	98643-00001
	98643-26501	8	1	PC BOARD	28480	98643-26501

Component Parts List

Table B-2. Code List of Manufacturers

Mfr Code	Manufacturer Name	Address	Zip Code
01121	ALLEN-BRADLEY CO	MILWAUKEE WI	53204
01295	TEXAS INSTR INC SEMICOND COMPNT DIV	DALLAS TX	75222
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD PA	16701
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO CA	94304
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS MA	01247
75915	LITTLEFUSE INC	DES PLAINES IL	60016

SCHEMATICS

APPENDIX

C

This appendix contains schematic diagrams of the LANIC card.

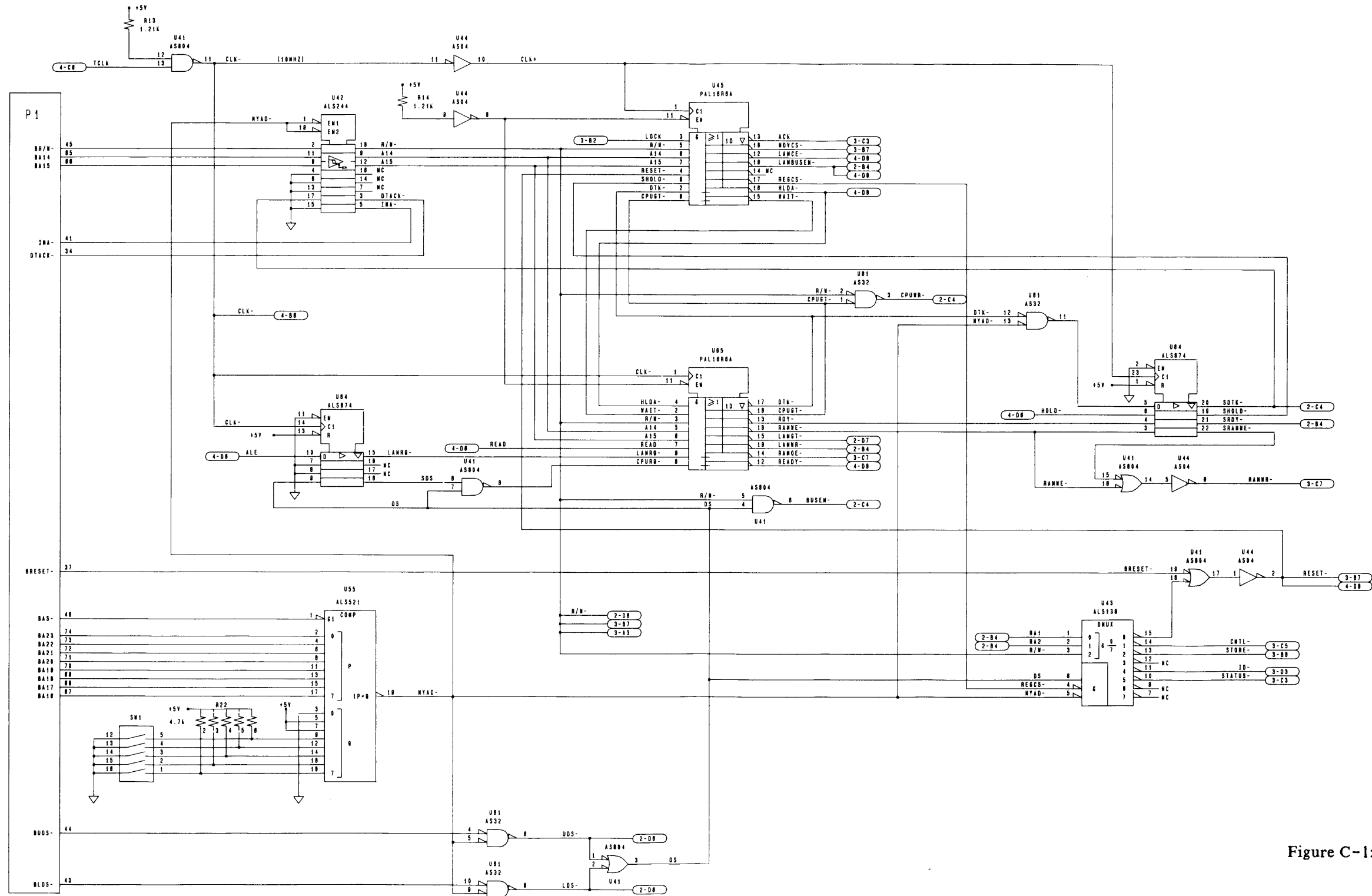


Figure C-1: LANIC Card Schematic (Sheet 1 of 4)

8 7 6 5 4 3 2 1

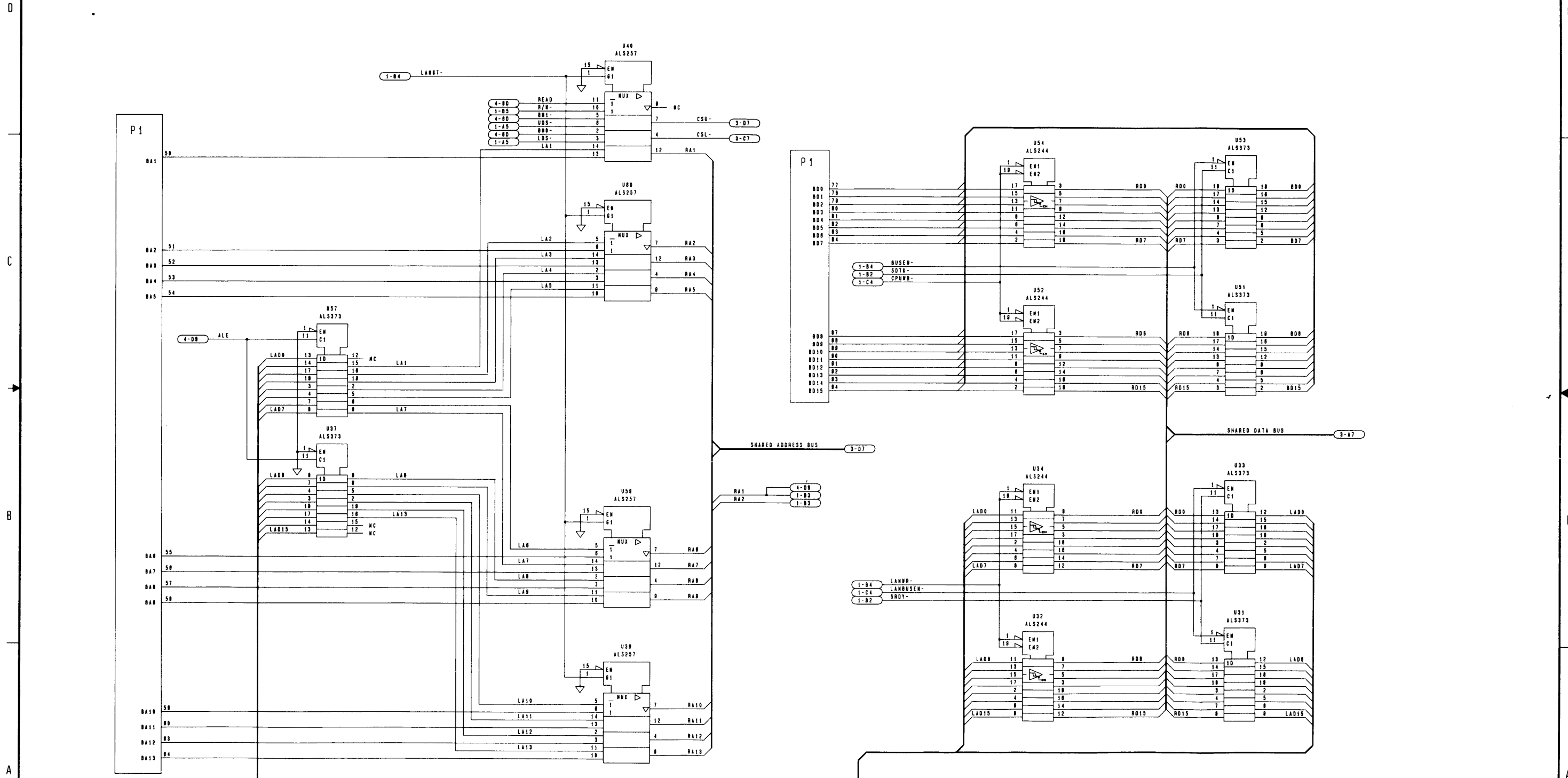


Figure C-1: LANIC Card Schematic (Sheet 2 of 4)

C-5/C-6

8 7 6 5 4 3 2 1 SHEET OF

8

7

6

5

4

3

2

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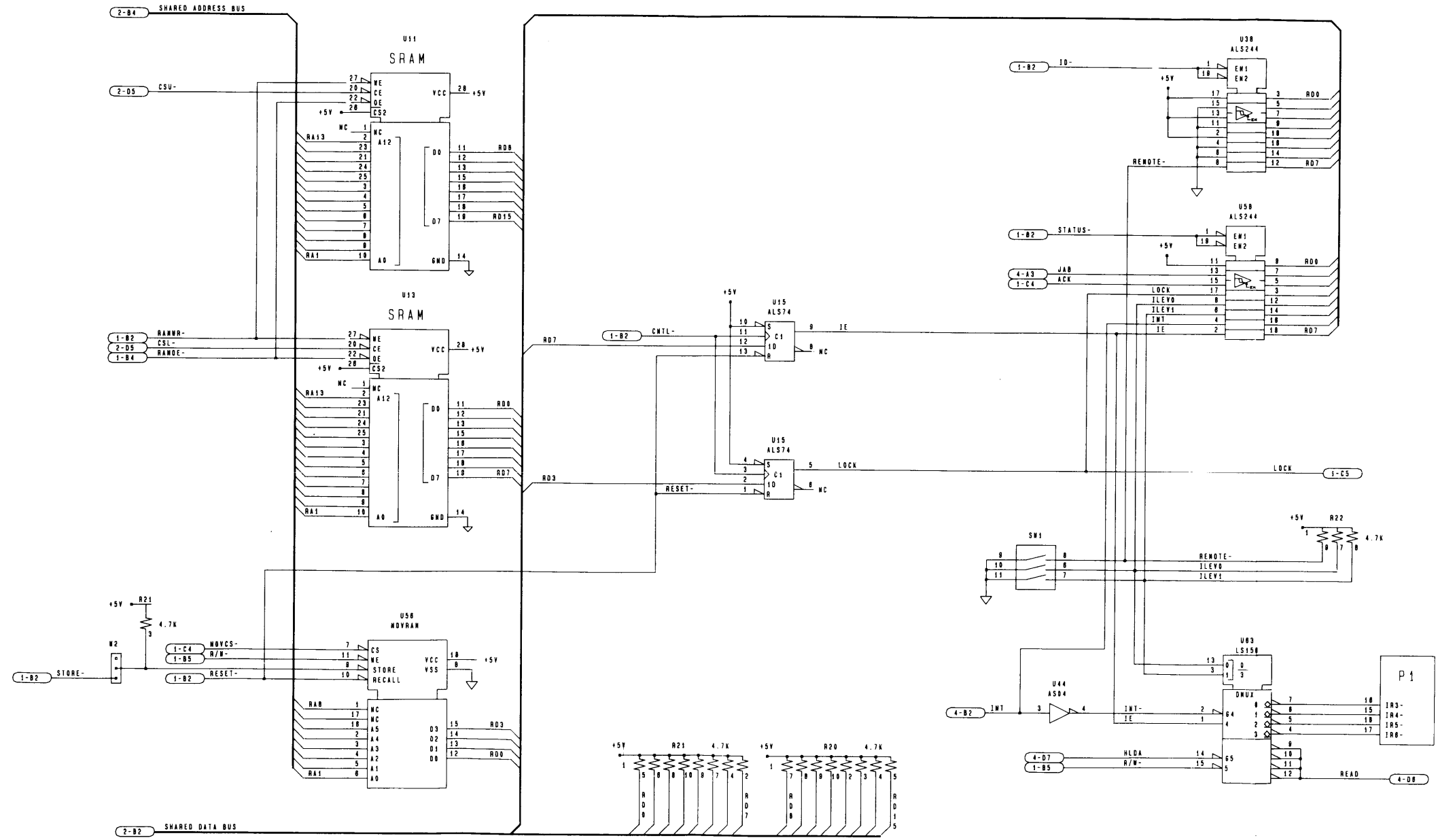


Figure C-1: LANIC Card Schematic (Sheet 3 of 4)

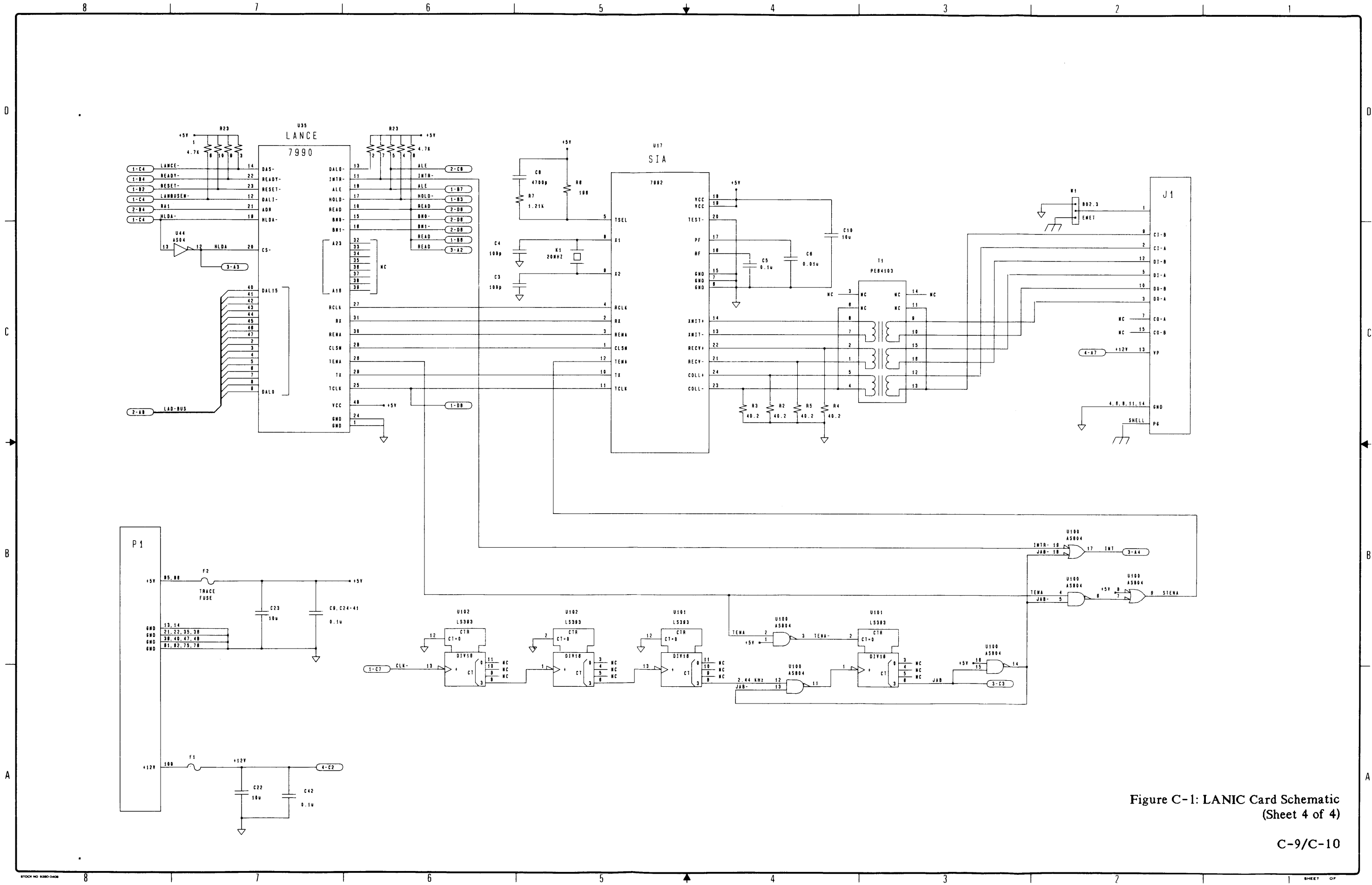


Figure C-1: LANIC Card Schematic (Sheet 4 of 4)

READER COMMENT SHEET

**HP 98643A LAN/300 Link Local Area Network Interface Controller (LANIC)
Installation Manual**

98643-90001 June 1985

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 this manual convenient in size, arrangement, and readability? Yes No

Comments:

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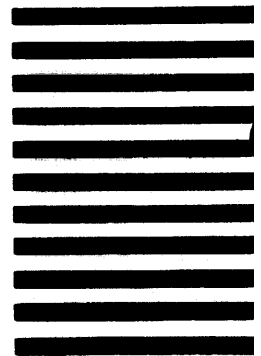
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