HP 9000 Series 500 Computer Systems

HP 27125B LAN/500 Link Local Area Network Interface Controller (LANIC)

Installation Manual

This Manual Contains
Interface Card and Driver
Installation Information

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Reader Comment Sheet

Information Networks Group

HP 27125B LAN/500 Link LANIC Installation Manual

27125-90001 August 1987

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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.

Edition 1.....July 1985
Edition 2.....August 1987

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.

Grounding

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.

Handling

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.

Preface

Purpose

This manual provides installation procedures for the HP 27125B LAN/500 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 500 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. Chapter 1 provides a list of related manuals.

Organization

Chapter 1 provides a general overview of the HP 27125B link product.

Chapter 2 contains hardware installation instructions and verification procedures for proper card operation.

Chapter 3 provides authorized service personnel with on-card self test information. On-card LED interpretation is included.

Chapter 4 describes replacement procedures for serviceable components: the fuse, NOVRAM and EPROM.

Chapter 5 provides a list of components that are used in the LANIC card assembly.

Chapter 6 provides product history information to help you understand changes made to the product.

Chapter 7 contains a functional block diagram and schematic drawings 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.

Documentation Guide

Thank you for your purchase of the HP 27125B LAN/500 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.)

DESIRED TASK	MANUAL
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	27125-90002 HP 27125B LAN/500 Link LANIC Installation Manual (included with HP 27125B)
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)

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Figures and Tables

General Information 1

This manual presents installation instructions for the HP 27125B LAN/500 Link Local Area Network Interface Controller (LANIC) card. This section provides a general overview of the product.

Product Overview

The HP 27125B LAN/500 link connects an HP 9000 Series 500 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 HP 27125B 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 27125B is a Local Area Network Interface Controller (LANIC). The LANIC is an input/output (I/O) card that plugs into the I/O channel of the HP 9000 Series 500 host computer. An 80-pin receptacle connector (J1), located on the LANIC card, mates with the connector pins on the I/O channel when the card is inserted into the I/O card cage.

Connection to a LAN - Applicable Standards

The HP 27125B 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 10Base5

This LAN category refers to an IEEE 802.3 LAN that uses a 0.4 inch (approximately 10 mm) diameter coaxial cable bus, which we may refer 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-metre bus segment.

Figure 1-1 illustrates a typical IEEE 802.3 Type 10Base5 LAN connecting HP 9000 Series 500 computers. An assembly called a Medium Attachment Unit (MAU), HP 30241A, 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. A one-metre card connector cable, and Attachment Unit Interface (AUI) cables of appropriate length, join the MAU with the LANIC card. A maximum distance of 50-metres 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.

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. We may refer to a LAN using this medium as a "thin" cable LAN, or *ThinLAN*. Connection of up to 30 nodes on a bus length of 185 metres is supported.

Figure 1-2 illustrates a typical IEEE 802.3 Type 10Base2 LAN connecting HP 9000 Series 500 computers. A node's physical connection and electrical access to a thin cable LAN is provided by a *ThinMAU* assembly, HP 28641A. ThinMAUs transmit and receive data on the thin cable, exchanging data and control signals with the LANIC card. A ThinMAU connects to the LAN using BNC connectors at a node location. A BNC "T" adapter is included with the HP 28641A for this purpose. Connection to the LANIC is afforded by a one-metre AUI cable built into the ThinMAU. The ThinMAU connection to the LANIC card is accomplished using a card connector cable (or "stub" cable) supplied with the LANIC card.

Note that an HP 28641A ThinMAU comes standard with the HP 27125B.

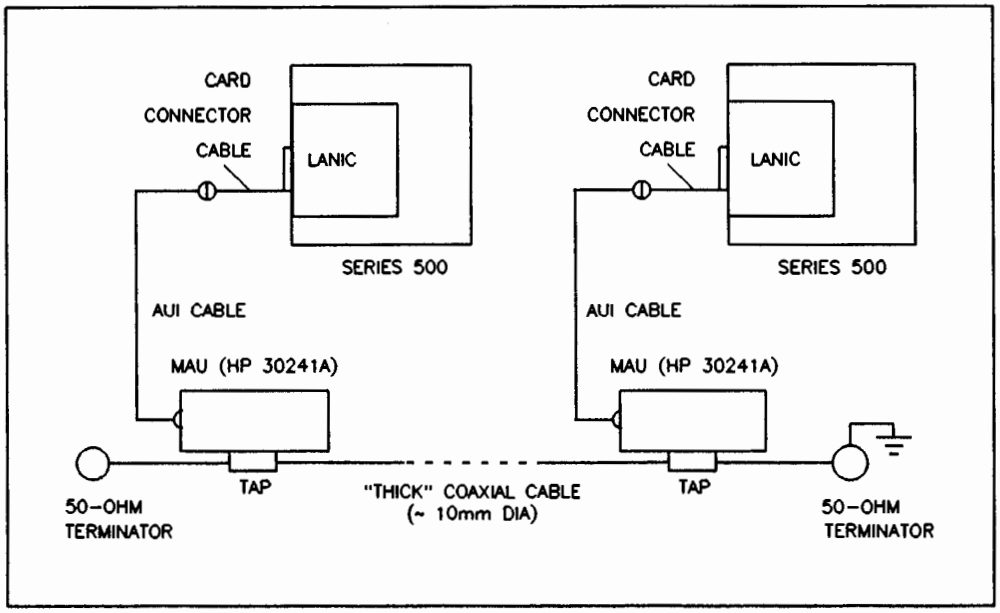

Figure 1-1. Typical IEEE 802.3 Type 10Base5 LAN Using the LANIC Card

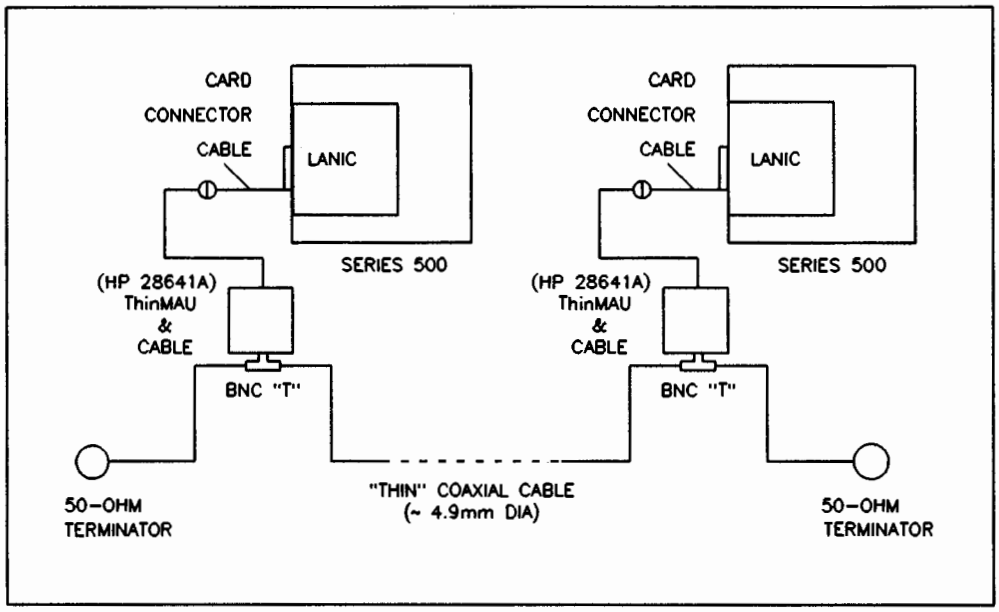

Figure 1-2. Typical IEEE 802.3 Type 10Base2 LAN Using the LANIC Card

Ethernet

Ethernet LANs are very similar to IEEE 802.3 LANs since they utilize the same coaxial cable medium, and can coexist on the same LAN segment. Like the MAU and AUI cables, Ethernet transceivers and branch cables provide access to the LAN. However, there are some basic differences between the Ethernet and IEEE 802.3 standards.

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 (for example, you may have an HP 2285A LAN unit installed, which uses an Ethernet transceiver and branch cable), an optional Ethernet card connector cable is available to make this connection. Figures 1-3 and 1-4 illustrate acceptable configurations.

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 normally 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. Under firmware control, the LANIC senses the type of hardware attached (Ethernet or IEEE 802.3), and interprets the presence or absence of these signals accordingly. Any errors generated by the firmware are left for system software processing.

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.

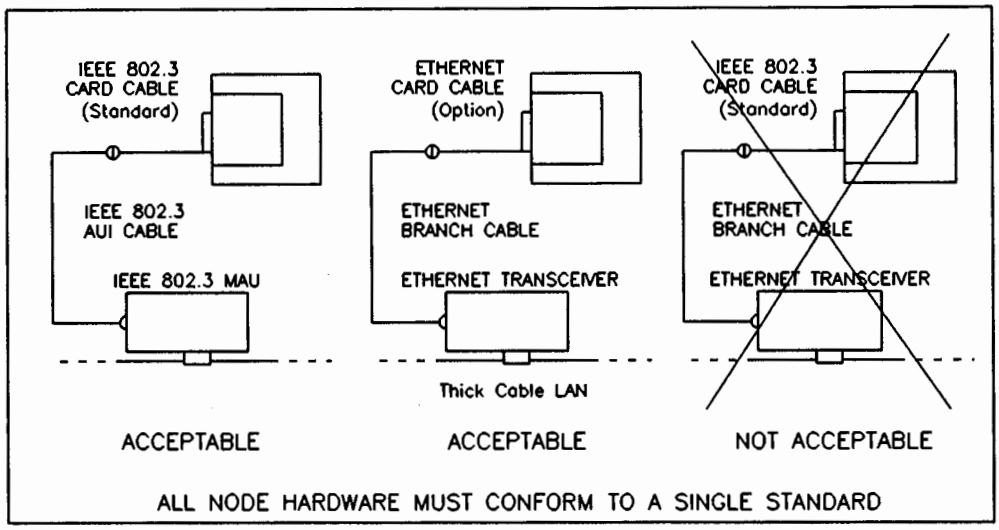

Figure 1-3. Examples of Thick Cable LAN Compatibility

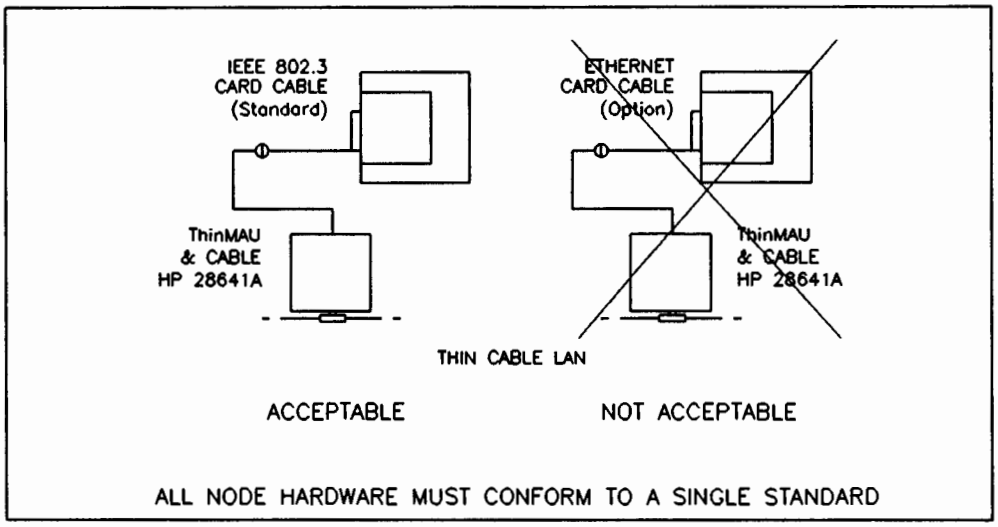

Figure 1-4. Examples of Thin Cable LAN Compatibility

Software

The HP 27125B is supported under HP-UX (Revision 5.0 or later) on HP 9000 Series 500 systems with Hewlett-Packard software installed.

A user and node manager interface is available for setting up and maintaining an HP 9000 node, as well as providing node-to-node communications between Hewlett-Packard computers with appropriate software installed.

Installation and use of Series 500 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 operation, the destination address of a received packet is matched with this address to determine whether or not 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 (nonvolatile static RAM). It is globally administered, that is, it is a unique node address regardless of manufacturer. Refer to Chapter 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 Chapter 4. If a node's station address changes, software reconfiguration and documentation updates to administer your network, may be necessary.

Equipment Supplied

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

Quantity	Part Number	Description
1	27125-60001	LANIC Card Assembly
1	27125-90002	HP 27125B LAN/500 Link LANIC Installation Manual (this manual)
1	27125-63001	IEEE 802.3 LANIC Card Connector Cable (Stub Cable)
1	28641A	ThinMAU (Medium Attachment Unit) and BNC "T" connector

Option 001 substitutes an Ethernet-based stub cable, part number 27125-63002, for the standard cable. Due to incompatibility with the Ethernet cable, the 28641A is deleted.

Option 002 provides replacement firmware only, EPROMs 27125-81006 and 27125-81007.

Option 241 deletes the HP 28641A ThinMAU only. All other hardware is supplied.

For the latest availability of other HP LAN accessories, consult your *HP Computer Users Catalog*, 5953-2450D, or your nearest HP Sales and Support Office.

Related Products

Similar to the HP 27125B, other products from Hewlett-Packard will give additional computers the ability to connect to an IEEE 802.3 LAN. These include:

Part Number	Description
98643A	LAN Link for the HP 9000 Series 300
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 the latest list of supported computer systems.

Node-to-node communications between Hewlett-Packard computers are supported using HP Network Services software. For the HP 9000 Series 500, the following software products are applicable:

HP 50953A or R (for single-user systems)
HP 50954A or R (for multi-user systems)

Reference Manuals

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

Part Number	Description
09050-90050	HP 9000 Series 500 Configuration Information and Order Guide
50951-90000	HP Network Services/9000 (NS/9000) LAN User's Guide
50951-90010	HP Network Services/9000 (NS/9000) LAN Node Manager's Guide
97089-90049	HP-UX Systems Administrator Guide, Series 500
5955-7680	Cable and Accessories Installation Manual
5955-7681	Link Troubleshooting Manual

NOTE

A hardware reference manual associated with the 27125B LANIC interface is not available. However, Serviceable Parts, Component Parts List, and Schematics are provided in Chapters 4, 5, and 7 respectively.

Specifications

Physical

Size

Length: 19.3 cm (7.6 inches)
Width: 17.1 cm (6.75 inches)
Weight: 280 gm (10 ounces)

I/O Channel Interconnect

One 80-pin female connector (J1) connects to the host computer's I/O channel.

Device Interconnect

One 26-pin male connector (J2) connects to a card connector cable.

Standards: Conforms to IEEE 802.3 with cable 27125-63001.
Conforms to Ethernet Version 1.0 with cable 27125-63002.

Functional

Capacity

A single half-duplex (transmit and receive) communication channel with up to 32 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 and Humidity

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

Electromatic

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

Electrical

Power

Voltage	Current	Power Dissipated
+ 5 VDC	4A maximum	15W maximum
+12 VDC	0.5A maximum	6W maximum (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.

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:

27125-60001
X-nnnn

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

Installation 2

This section contains information on installing and verifying proper operation of the HP 27125B LAN/500 Link LANIC card.

Preparation

Because this manual is limited to installation of the LANIC card, 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 *LAN Cable and Accessories Installation Manual*, 5955-7680.

For example, one of the following should already by 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 10Base2 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 (10Base5 hardware: HP 30241A MAU 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 (Revision 5.0 or later) has been installed in the computer. For HP-UX system installation information, refer to the *HP-UX Systems Administrator Manual, Series 500*, part number 97089-90049.

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 can be used to initiate a card self test (contained on the card). 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*, part number 50951-90010.

Installation Summary

CAUTION

Static discharge can destroy components on an interface card. Handle the interface card by its anti-static container or by the ejectors on the card. Do not touch the electrical traces or set the card on any surface other than its anti-static container.

For a discussion of static sensitive devices, refer to the safety considerations information at the front of this manual.

Take the following steps to install the LANIC card in your HP 9000 Series 500 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 and MAU (or ThinMAU) is within the power budget of your computer.
- Determine the card's unique link level (node) address marked on the card's NOVRAM (see figure 2-1). This address should be entered in a network manager's log book.
- Ensure the jumper shorting clip at jumper W3 is removed from the card.
- With the power to your computer off, install the LANIC card into one of the computer cardcage I/O slots.
- If the node hardware is IEEE 802.3 based, connect the standard IEEE 802.3 card connector cable to the LANIC. If the node hardware is Ethernet based, connect the optional Ethernet card connector cable to the LANIC. The other end of this cable can be connected to the LAN, either directly to a medium attachment device (e.g., MAU) or to extension cabling (e.g., AUI cables).
- Verify the proper operation of the LANIC card by checking the results of self test.

Power Considerations

All I/O cards installed in the computer obtain their operating power from the computer power supply. You need to calculate whether or not the addition of the LANIC card, with attached IEEE 802.3 MAU, ThinMAU, or Ethernet transceiver,* 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.

Voltage	Current	Power Dissipated
+5 VDC	3A maximum	15W maximum
+12 VDC	0.5A maximum	6 W max. (per IEEE 802.3 standard)
	360mA typical	4.32 W typ. (using HP 28641A ThinMAU)
	380mA typical	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 power required does not exceed the amount that your computer can provide. The *HP 9000 Series 500 Configuration Information and Order Guide*, part number 09050-90050. will help you determine your computer system's available power. If the power available is exceeded, you will need to make other arrangements, e.g., reconfigure your system.

*The medium access hardware (MAUs, transceivers) also draw 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 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 6 digits are:

08 00 09 (Hexadecimal)

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

XX YY ZZ (Hexadecimal)

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

The NOVRAM, part number 27125-81001, is an IC mounted in a dual in-line package (DIP) at location U26. Refer to figure 2-1 for approximate location..

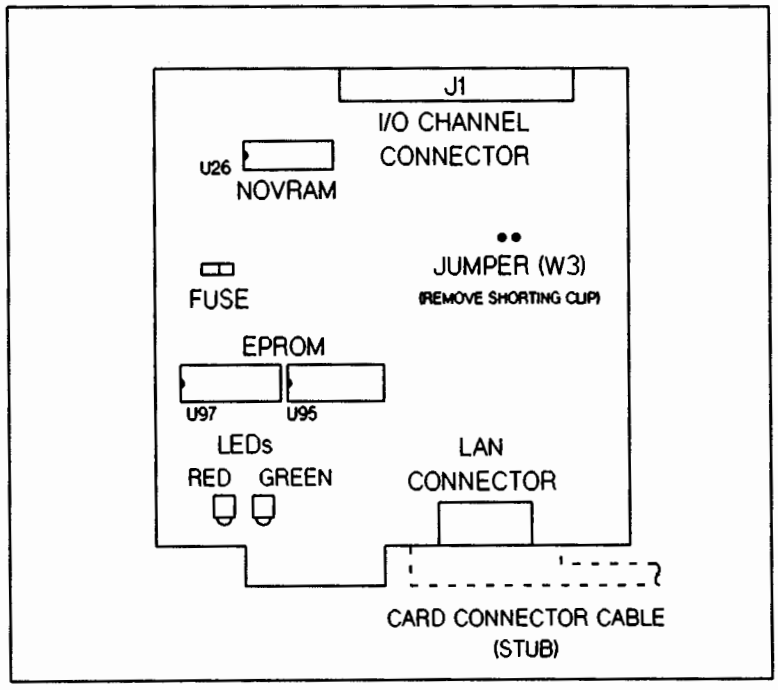

Figure 2-1. LANIC Card Illustration

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). Chapter 4 contains NOVRAM replacement instructions.

Jumpers

The card contains a two-post jumper, designated "W3". Cards with date codes before "B-2644" may contain a jumper shorting clip installed. This jumper shorting clip **must be removed before installing the card**.

Cards with date codes "B-2644" (or later) are shipped from the factory without the jumper shorting clip.

If shorting clip removal is necessary, **be sure to observe antistatic precautions; prevent any possibility of static discharge to the card.**

To remove the shorting clip, locate the jumper. Refer to figure 2-1 for its approximate location. (Designator "W3" is not marked on the card. The jumper is near reference designator "U52", which applies to a nearby IC.) Remove the jumper shorting clip by hand. Simply lift the shorting clip from the two jumper posts; the clip can be discarded. The posts will be exposed and no longer electrically connected.

Card Installation

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

1. Turn off the computer's power following the system shutdown procedures in the *HP-UX Systems Administrator Manual, Series 500*, part number 97089-90049. This will prevent corruption of the file system.

CAUTION

Always turn off the computer's power before installing or removing an interface card (and associated cabling). Opening the computer's interface card cage door while the computer is on results in an immediate powerdown of the system. Any data and programs resident in computer memory at that time are lost.

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2. Access the I/O card cage using procedures appropriate for your computer system.

3. Select an appropriate slot in which to insert the card. The slot determines the select code of the card, uniquely identifying the card to the host computer. The LANIC card can be placed in any I/O slot. However, certain slots may be reserved for specific I/O cards when installed. Refer to the installation instructions for your computer system and other I/O interface cards to identify reserved slots.

4. Remove the LANIC card from its anti-static package. Hold the card by its ejectors and slide the card into the selected slot. Consult your system installation manual for correct card orientation. Be careful not to damage components or traces on the card or on adjacent cards. Press firmly on the ejectors to seat the card in the slot, ensuring good electrical contact with the I/O channel. The ejectors should be flush with the card when the card is fully seated.

LAN Connection

This discussion presumes that cabling up to the LANIC and host computer has been installed. If not, refer to the *LAN Cable and Accessories Installation Manual*, part number 5955-7680.

WARNING

The coaxial cable bus access device (MAU/transceiver) and cabling to the LANIC card must all conform to the same standard, either IEEE 802.3 or Ethernet. Failure to do so will result in incompatible grounding and an electrical shock hazard.

Determine whether your node hardware conforms to IEEE 802.3 or Ethernet, and read the appropriate paragraphs below.

NOTE

For HP 9050 computer systems, a "grounding grommet" on the interface cable electrically grounds the cable shield to the system chassis. This reduces electromagnetic "noise" generated for compliance with RFI limits. This grommet is NOT used with HP 9020, 9030, and 9040 computers, nor with HP 97098A Extenders; these systems utilize the metal grounding plate on the connector hood. On HP 9020, 9030, 9040 computers, and HP 97098A extender, forcing a grommet-to-chassis connection may damage your cable.

IEEE 802.3 Node

If the coaxial cable attachment device and interface cabling to the LANIC are based on the IEEE 802.3 standard, the IEEE 802.3 LANIC card connector cable, part number 27125-63001, must be used. This cable is provided with the standard product. A cable diagram is provided in figure 2-2(a).

Install this cable by connecting the female 26-pin connector to the LANIC card (see figure 2-1 for orientation). Connect the female 15-pin D connector to the node's AUI or ThinMAU cables, or directly to the MAU. Figure 2-2(b) is an AUI cable diagram.

Ethernet Node

If the coaxial cable attachment device and interface cabling to the LANIC are based on the Ethernet standard, the Ethernet LANIC card connector cable, part number 27125-63002, must be used. This cable is available as an option. A cable diagram is provided in figure 2-3(a).

Install this cable by connecting the female 26-pin connector to the LANIC card (see figure 2-1 for orientation). Connect the female 15-pin D connector to the node's branch cable or directly to the transceiver. Figure 2-3(b) is an Ethernet branch cable diagram.

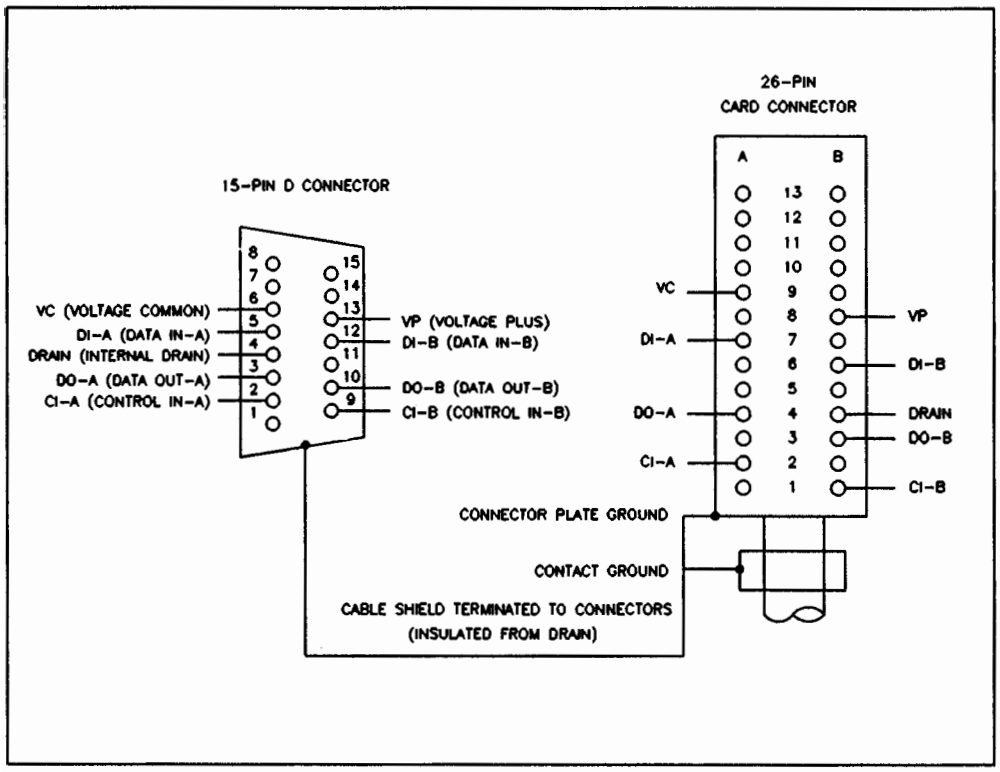

Figure 2-2(a). IEEE 802.3 LANIC Card Connector Cable Diagram

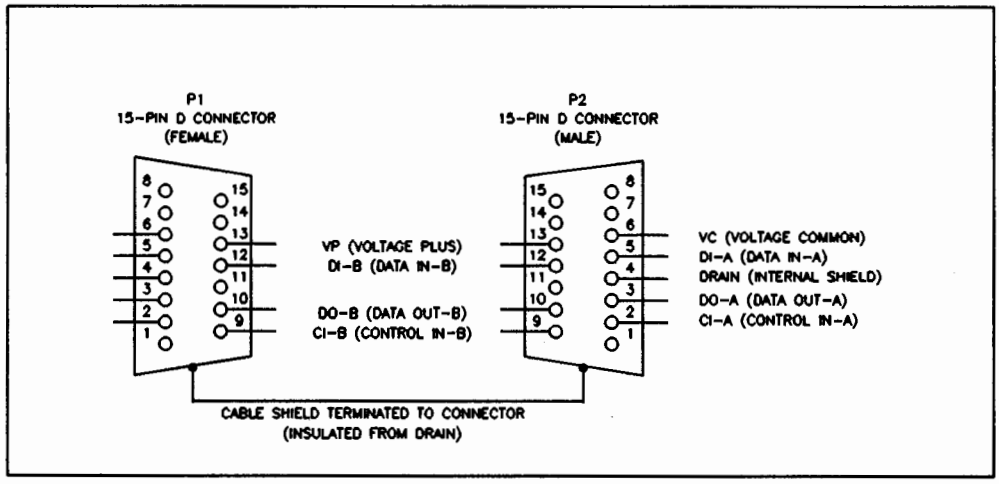

Figure 2-2(b). IEEE 802.3 AUI Cable Diagram

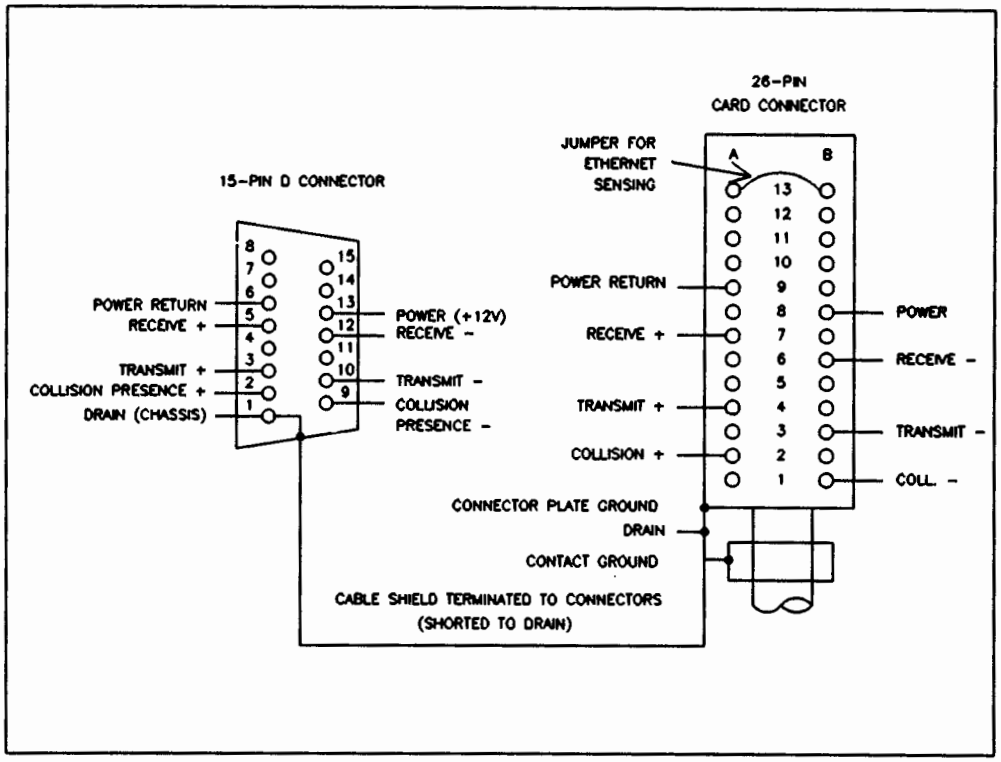

Figure 2-3(a). Ethernet LANIC Card Connector Cable Diagram

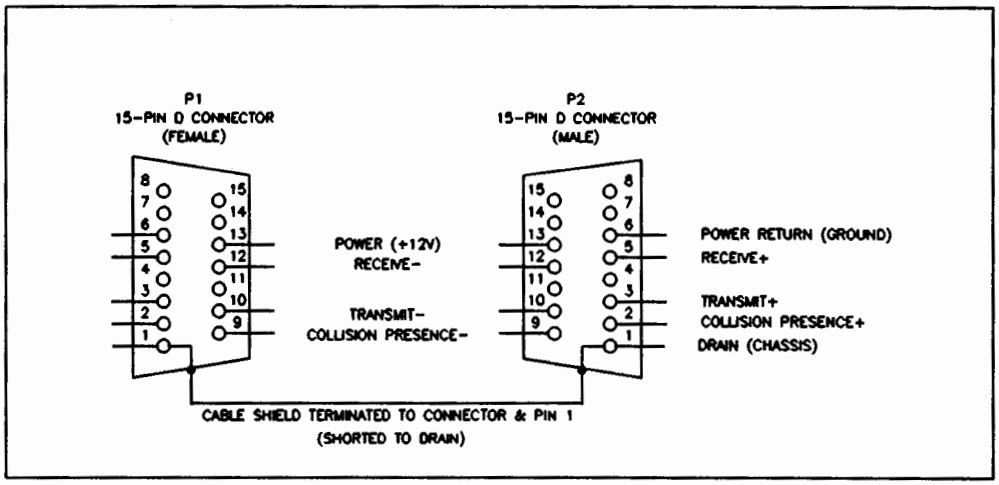

Figure 2-3(b). Ethernet Branch Cable Diagram

D Connectors

This is illustrated in figure 2-4. 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 2-4(A)).

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

c) Slide the hold-down clip to the "locked" position (see figure 2-4(B)). This hold-down clip prevents accidental cable disconnection during operation.

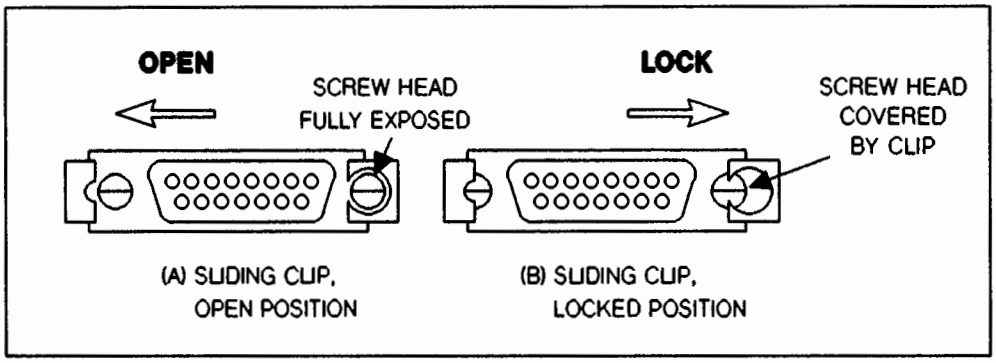

Figure 2-4. Securing Cable Hold-Down Clips

Verification

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

Power to the computer cannot be applied while the I/O card cage door is open, due to a safety interlock feature. In most cases, this door is solid; when it is closed card status LEDs are not visible. Therefore, card self test results are NOT directly observable from the card.

WARNING

DANGER: Any attempt to defeat the safety interlock and operate the computer with the I/O card cage door open will cause exposure to hazardous current and energy. Such operation is limited to qualified service personnel.

The product does not comply with mandatory electromagnetic radiation and interference regulations when the I/O card cage door is open.

Card self test LED information provided in Chapter 3 is for authorized service personnel use. No operator information is provided in Chapter 3.

Power-up your computer following procedures compatible with your computer and operating system. You can obtain an indication that the LANIC card is working properly in several ways:

a. Most system models have a Computer Service Panel that contains LEDs (light emitting diodes) for each I/O slot. These LEDs provide an indication of whether or not the interface card in the specified slot failed to pass self test. Consult your computer system installation manual for interpretation of these LEDs.

b. System test software will provide console messages relating I/O slot status. This is useful for systems that do not have a Computer Service Panel. Consult your computer system manuals for console messages.

c. With HP Network Services/9000 LAN software installed on the system, the **LANDIAG** routine can be run to initiate self test, and observe card status. Refer to the *HP NS/9000 LAN Node Manager's Guide*, part number 50951-90010, for detailed calls and procedures.

Card Removal

To remove the card from the I/O card cage:

1. Turn off the computer's power using the system shutdown procedures described in the *HP-UX Systems Administrator Manual, Series 500*, part number 97089-90049. This will help to prevent corruption of the file system.

CAUTION

Always turn off the computer's power before installing or removing an interface card (and associated cabling). Opening the computer's interface card cage door while the computer is on results in an immediate powerdown of the system. Any data and programs resident in computer memory at that time are lost.

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2. Access the I/O cards using procedures appropriate for your computer system.
3. Disconnect the card connector cable from the LANIC card.
4. Unseat the card from the I/O channel by simultaneously lifting on the two card ejectors.
5. Holding the card by the two ejectors, slide the card out of the card cage. **Remember to use anti-static handling procedures whenever you are handling the card. Place the card in an anti-static, conductive container.**

Maintenance

Field repair of the LANIC card is limited to replacement of the onboard fuse, EPROM, or NOVRAM. Figure 2-1 shows the location of these components. Instructions for replacing these components are contained in Chapter 4.

If other faults are isolated to the LANIC card, 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 item of the HP 27125B is to be shipped to Hewlett-Packard for any reason, attach a tag identifying the owner and indicating the reason for shipment. Include the part number of the item being shipped.

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. Commercial packing and shipping companies have the facilities and materials to repack the item. **BE SURE THAT ANTI-STATIC HANDLING AND SHIPPING PRECAUTIONS ARE OBSERVED.**

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

Card Self Test 3

The LANIC interface card contains a card self test in EPROM. I/O card self tests are generally initiated upon system power-up or reset. The system power-up sequence holds the I/O backplane in reset a short time, and the boot-up process resets the backplane several times. You may want to consult the system manuals for additional information.

The LANIC card self test includes the following:

- A CRC algorithm confirms the contents and accuracy of ROM contents.
- A procedure verifies that reads and writes can be performed on all RAM locations.
- Functional tests on VLSI chips are performed.
- The onboard MC68000 processor is exercised.
- An external loopback test to the MAU or transceiver is preformed.

The LANIC card contains Light Emitting Diodes (LEDs) that reflect self test status and MAU power available. **Access to and observation of these LEDs is limited to authorized service personnel.**

Card LED Interpretation

There are two LEDs on the LANIC card; the approximate location of each LED is shown in figure 2-1.

Green LED

The green LED is used to determine power availability to the medium attachment device (such as the MAU). When power is applied to the card, and the onboard fuse is known to be good, the green LED should turn on and stay on. If not, it is likely that the onboard fuse is blown. (An indication of a blown fuse is the green LED is off while the red LED is on. See the Red LED paragraphs below.) Remove the card using instructions in Chapter 2, and check the fuse using the instructions in Chapter 4.

The cause of a blown fuse must be isolated and corrected. A test for an electrical short in the node cabling would be an obvious start. (Note that pin 13 in the 15-pin D connector is the +12 Volt line.) Refer to the *LAN Link Hardware Troubleshooting Manual*, part number 5955-7681, for additional information.

With the card reinstalled, if the green LED still does not light or stay lit, the card is faulty and should be replaced.

Red LED

The red LED, when on, generally indicates that self test is in progress or self test failed.

Upon initiation of card self test, the card's red LED should light for approximately two seconds, indicating that self test is in progress, and then go out. This is the normal sequence and indicates that the card self test passed.

There are, however, a few items to be aware of:

1. If the external loopback test portion of the self test fails, the red LED will blink for approximately 32 seconds. However, failure of the external loopback test will not cause self test to fail. The card may not be connected to the LAN, and it is undesireable to indicate a self test failure in this case.

2. Due to multiple initiations of self test during power-up and boot-up sequences, the card's red LED may turn on and off a few times.

3. If a card, which has passed self test and is operating properly (red LED off), suddenly indicates a failure (red LED turns on), one of three events has probably occurred:

   a. If the green LED is off, the onboard fuse has blown.

   b. If the green LED is on, the system software has attempted an illegal request, or

   c. If the green LED is on, a hardware fault on the card has been detected during operation.

If the red LED lights and stays lit after two seconds, a self test failure is indicated. The card is defective and should be replaced.

If the LED does not light at all, check that the card is properly seated in the I/O card slot. If it still does not light, the card is defective and should be replaced.

In summary, the red LED will turn on: a) when the card is reset, b) when self test starts, c) if the onboard fuse is blown, d) if the card firmware detects a hardware fault while operating, or e) if the system software violates the I/O backplane protocol.

The LED will remain on: a) while the card is held in reset, b) a self test failure occurs, or *c*, *d*, or *e* (defined above) occurs.

The LED will blink for approximately 32 seconds during self test if the external loopback test fails, then turn off if no other faults were detected.

Replacing Serviceable Parts 4

CAUTION

Some of the components use 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.

CAUTION

Always store and transport static sensitive devices in conductive containers.

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

Replaceable components on the LANIC card are limited to the fuse, NOVRAM and EPROMs. 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 Chapter 2 for the approximate fuse location.

Remove the fuse from its socket by gently pulling it free. Figure 4-1 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 ohmmeter 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.

After fuse replacement, install the card into the computer following the instructions presented in Chapter 2.

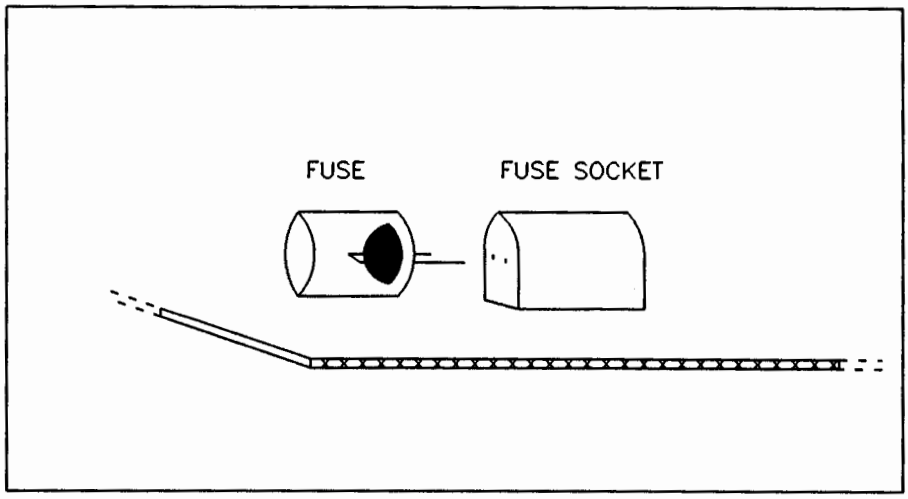


Figure 4-1. MAU Power Fuse and Socket

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. Node or network logbooks should be updated to reflect the new address.

With the component side of the LANIC card up, locate the NOVRAM or EPROMs. Refer to figure 2-1 in Chapter 2 for approximate location. Part numbers and associated socket locations should be as follows:

Component	Location
27125-81006 EPROM	U95
27125-81007 EPROM	U97
27125-81001 NOVRAM	U26

Remove the component from its socket, ensuring that no damage occurs to the socket. An IC removal tool is recommended; however, a fine, rigid device such as a very thin flathead screwdriver can be used to initially loosen the IC from the 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 Chapter 2.

Component Parts List 5

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

Table 5-1. Component Parts List

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
	27125-60001	9	1	PCA-CIO LAN	28480	27125-60001
C1	0180-0116	1	1	CAPACITOR-FXD 6.8UF+-10% 35VDC TA	56289	150D685X9035B2
C2	0180-0228	6	1	CAPACITOR-FXD 22UF+-10% 15VDC TA	56289	150D226X9015B2
C3	0160-4835	7	30	CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C4	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C5	0180-0100	3	1	CAPACITOR-FXD 4.7UF+-10% 35VDC TA	56289	150D475X9035B2
C6	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C7	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C8				NOT ASSIGNED		
C9				NOT ASSIGNED		
C10	0180-0373	2	1	CAPACITOR-FXD .68UF+-10% 35VDC TA	56289	150D684X9035A2
C11	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C12	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C13	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C14	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C15	0180-2690	0	1	CAPACITOR-FXD 3.3UF+-10% 15VDC TA	56289	150D335X9015A2
C16	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C17	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C18	0160-4808	4	1	CAPACITOR-FXD 470PF +-5% 100VDC CER	28480	0160-4808
C19	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C20	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C21	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C22	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C23	0160-4831	3	2	CAPACITOR-FXD 4700PF +-10% 100VDC CER	28480	0160-4831
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	0160-6500	7	2	CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-6500
C31	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C32	0160-6500	7		CAPACITOR-FXD .01UF +-10% 100VDC CER	28480	0160-6500
C33				NOT ASSIGNED		
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	0160-4801	7	2	CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
C38	0160-4801	7		CAPACITOR-FXD 100PF +-5% 100VDC CER	28480	0160-4801
C39	0160-4831	3		CAPACITOR-FXD 4700PF +-10% 100VDC CER	28480	0160-4831
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				NOT ASSIGNED		
C43	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C44	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C45	0160-4847	1	1	CAPACITOR-FXD 1000PF +-10% 100VDC CER	28480	0160-4847
C46	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
C47	0160-4835	7		CAPACITOR-FXD .1UF +-10% 50VDC CER	28480	0160-4835
CR1	1902-1404	5	1	DIODE-ZNR 14.5V PD=5W TC=+.088% IR=5UA	28480	1902-1404
CR2	1901-0518	8	1	DIODE-SM SIG SCHOTTKY	28480	1901-0518
CR3				NOT ASSIGNED		
CR4	1990-0967	8	1	LED-LAMP LUM-INT=4MCD IF=15MA-MAX BVR=5V	28480	1990-0967
CR5	1990-0968	9	1	LED-LAMP LUM-INT=4MCD IF=15MA-MAX BVR=5V	28480	1990-0968
F1	2110-0520	6	1	FUSE 5A 125V NTD .348X.25	75915	273005
J1	1251-7276	0	1	CONN-POST TYPE .100-PIN-SPCG 80-CONT	28480	1251-7276
J2	1252-1740	3	1	CONN-POST TYPE .100-PIN-SPCG 26-CONT	28480	1252-1740
R1	0757-0401	0	2	RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
R2	0757-0401	0		RESISTOR 100 1% .125W F TC=0+-100	24546	C4-1/8-T0-101-F
R3	0757-0465	6	2	RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
R4	0757-0465	6		RESISTOR 100K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1003-F
R5	1810-0277	3	3	NETWORK-RES 10-SIP2.2K OHM X 9	01121	210A222
R6	1810-0277	3		NETWORK-RES 10-SIP2.2K OHM X 9	01121	210A222
R7	0757-0278	9	1	RESISTOR 1.78K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1781-F
R8	0757-0418	9	1	RESISTOR 619 1% .125W F TC=0+-100	24546	C4-1/8-T0-619R-F
R9	1810-0277	3		NETWORK-RES 10-SIP2.2K OHM X 9	01121	210A222

Table 5-1. Component Parts List (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
R10				NOT ASSIGNED		
R11				NOT ASSIGNED		
R12	0698-3440	7	1	RESISTOR 196 1% .125W F TC=0+-100	24546	C4-1/8-T0-196R-F
R13	0698-6698	3	4	RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R14	0698-6698	3		RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R15	0698-6698	3		RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R16	0698-6698	3		RESISTOR 40.2 .25% .125W F TC=0+-50	28480	0698-6698
R17	0757-0274	5	1	RESISTOR 1.21K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1211-F
U1				NOT ASSIGNED		
U10				NOT ASSIGNED		
U11	1820-2862	7	1	IC-DS 3667	28480	1820-2862
U12	1820-1633	8	3	IC BFR TTL S INV OCTL 1-INP	01295	SN74S240N
U13				NOT ASSIGNED		
U14	1820-1470	1	1	IC MUXR/DATA-SEL TTL LS 2-TO-1-LINE QUAD	01295	SN74LS157N
U15	1820-1298	1	1	IC MUXR/DATA-SEL TTL LS 8-TO-1-LINE	01295	SN74LS251N
U16-U20				NOT ASSIGNED		
U21	1820-1633	8		IC BFR TTL S INV OCTL 1-INP	01295	SN74S240N
U22	1820-1633	8		IC BFR TTL S INV OCTL 1-INP	01295	SN74S240N
U23	1820-2657	8	4	IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U24	1820-1437	0	1	IC MV TTL LS MONOSTBL DUAL	01295	SN74LS221N
U25				NOT ASSIGNED		
U26	1818-3165	0	1	IC NMOS 256-BIT STAT RAM 300-NS 3-S	28480	1818-3165
U27	1820-1729	3	1	IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
U28-U31				NOT ASSIGNED		
U32	1820-3121	3	2	IC TRANSCEIVER TTL ALS BUS OCTL	28480	1820-3121
U33	1820-3121	3		IC TRANSCEIVER TTL ALS BUS OCTL	28480	1820-3121
U34-U40				NOT ASSIGNED		
U41	1820-2975	3	1	IC-BIC C2000	28480	1820-2975
U42	1820-0684	7	1	IC INV TTL S HEX 1-INP	01295	SN74S05N
U43	1820-1240	3	1	IC DCDR TTL S 3-TO-8-LINE 3-INP	01295	SN74S138N
U44				NOT ASSIGNED		
U45	1818-3198	9	4	IC CMOS 65536(64K) STAT RAM 150-NS 3-S	28480	1818-3198
U46				NOT ASSIGNED		
U47	1818-3198	9		IC CMOS 65536(64K) STAT RAM 150-NS 3-S	28480	1818-3198
U48-U51				NOT ASSIGNED		
U52	1820-2634	1	2	IC INV TTL ALS HEX	01295	SN74ALS04N
U53	1820-4194	2	1	IC-Prog Array Logic SN74PAL16R4ACN	28480	1820-4194
U54				NOT ASSIGNED		
U55	1818-3198	9		IC CMOS 65536(64K) STAT RAM 150-NS 3-S	28480	1818-3198
U56				NOT ASSIGNED		
U57	1818-3198	9		IC CMOS 65536(64K) STAT RAM 150-NS 3-S	28480	1818-3198
U58-U60				NOT ASSIGNED		
U61	1820-1851	2	1	IC ENCDR TTL LS	01295	SN74LS148N
U62	1820-2774	0	1	IC GATE TTL ALS NAND DUAL 4-INP	01295	SN74ALS20N
U63	1820-2635	2	1	IC GATE TTL ALS AND QUAD 2-INP	01295	SN74ALS08N
U64	1820-0682	5	1	IC GATE TTL S NAND QUAD 2-INP	01295	SN74S03N
U65	1820-3100	8	1	IC DCDR TTL ALS BIN 3-TO-8-LINE 3-INP	28480	1820-3100
U66	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U67	1820-2634	1		IC INV TTL ALS HEX	01295	SN74ALS04N
U68-U72				NOT ASSIGNED		
U73	1820-3828	7	1	IC MISC NMOS	28480	1820-3828
U74				NOT ASSIGNED		
U75	1820-3378	2	2	IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378
U76				NOT ASSIGNED		
U77	1820-3905	1	2	IC TRANSCEIVER TTL ALS BUS OCTL	28480	1820-3905
U78-U80				NOT ASSIGNED		
U81	1820-3926	6	1	IC-16BIT, 10MHZ, PIN-GRID-ARRAY PKG MPU	28480	1820-3926
U82				NOT ASSIGNED		
U83	1820-3927	7	1	IC-UNIVERSAL DMA CONTROLLER (UDC) 6MHZ	28480	1820-3927
U84				NOT ASSIGNED		
U85	1820-3378	2		IC LCH TTL ALS D-TYPE NEG-EDGE-TRIG OCTL	28480	1820-3378

Table 5-1. Component Parts List (continued)

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
U86				NOT ASSIGNED		
U87	1820-3905	1		IC TRANSCEIVER TTL ALS BUS OCTL	28480	1820-3905
U88-						
U90				NOT ASSIGNED		
U91	1820-2024	3	2	IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
U92	1820-2024	3		IC DRVR TTL LS LINE DRVR OCTL	01295	SN74LS244N
U93	1820-4195	3	1	IC-Prog Array Logic SN74PAL16R6ACN	28480	1820-4195
U94				NOT ASSIGNED		
U95	1818-3424	4	2	IC NMOS 65536 (64K) EPROM 200-NS 3-S	28480	1818-3424
U97	1818-3424	4		IC NMOS 65536 (64K) EPROM 200-NS 3-S	28480	1818-3424
U98-						
U101				NOT ASSIGNED		
U102	PPNR 43487	5	1	AM7992 (SIA)	28480	PPNR 43487
U103				NOT ASSIGNED		
U104	1820-1366	4	1	IC XLTR TTL CLOCK DRVR TTL-TO-MOS 1-INP	04713	MMH0026CP1
U105	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U106	1820-0683	6	1	IC INV TTL S HEX 1-INP	01295	SN74S04N
U107	1820-2657	8		IC GATE TTL ALS OR QUAD 2-INP	01295	SN74ALS32N
U108-						
U111				NOT ASSIGNED		
U112	1810-0739	2	1	DIP TRANSFORMER	28480	1810-0739
U113				NOT ASSIGNED		
U114	1820-3466	9	1	IC FF TTL ALS D-TYPE POS-EDGE-TRIG COM	28480	1820-3466
U115	1820-2078	7	3	IC CNTR TTL LS DECD DUAL 4-BIT	01295	SN74LS490N
U116-						
U123				NOT ASSIGNED		
U124	1820-2078	7		IC CNTR TTL LS DECD DUAL 4-BIT	01295	SN74LS490N
U125				NOT ASSIGNED		
U126	1820-2078	7		IC CNTR TTL LS DECD DUAL 4-BIT	01295	SN74LS490N
W1	0811-3716	2	4	RESISTOR ZERO OHM	28480	0811-3716
W2				NOT ASSIGNED		
W5	0811-3716	2		RESISTOR ZERO OHM	28480	0811-3716
W6	0811-3716	2		RESISTOR ZERO OHM	28480	0811-3716
W7	0811-3716	2		RESISTOR ZERO OHM	28480	0811-3716
XU1-						
XU25				NOT ASSIGNED		
XU26	1200-0539	7	1	SOCKET-IC 18-CONT DIP DIP-SLDR	28480	1200-0539
XU27-						
XU94				NOT ASSIGNED		
XU95	1200-0567	1	2	SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0567
XU96				NOT ASSIGNED		
XU97	1200-0567	1		SOCKET-IC 28-CONT DIP DIP-SLDR	28480	1200-0567
Y1	0410-1564	4	1	XTAL 20.0 MHZ	28480	0410-1564
	0403-0527	2	2	CIO EXT HNDL BLK	28480	0403-0527
	1251-5380	3	1	CONNECTOR 2-PIN M POST TYPE	28480	1251-5380
	2110-0691	2	1	FUSEHOLDER-BIPIN SKT 5A 125 V	28480	2110-0691
	27125-80001	1	1	PCB-CIO LAN	28480	27125-80001

Table 5-2. 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
04713	MOTOROLA SEMICONDUCTOR PRODUCTS	PHOENIX	AZ	85008
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

Product History 6

This section provides product history information as documented by this manual.

NOTE

Product identification date code changes indicated below are not contiguous; intermediate minor changes may have occurred that are not reflected.

Release	Description
Edition 1	The HP 27125B product supersedes HP 27125A by incorporating HP 28641A ThinMAU into the standard product structure. Therefore, manual 27125-90001 (HP 27125A) is superseded.
Update 1	Removed superfluous temperature dependence information for ThinLAN cable lengths.
Update 2	On-card firmware (in EPROM) was upgraded to blink the red LED for about 32 seconds on external loopback test failure during self test. Other firmware changes affected MAU power fuse testing, and corrected incoming data handling problems (on rare occasions, only the first 4 bytes of an incoming packet were DMA'd, or, the last byte of an incoming packet was corrupted). Applicable component part numbers were updated or corrected. The date code advanced to "B-2620".
Update 3	Jumper W3 shorting clip will no longer be shipped with the product. Installation instructions have been modified to accommodate this change. Applicable component lists were modified. The date code advances to "B-2644".
Edition 2	Printed circuit assembly was modified to prevent rare occurrence of "Babble" at power-up. Applicable components modified. The date code advances to C-2648. (Hardware revision code is 2, or Rev C as noted from LAN Diagnostic.) PROM firmware modified to prevent card from entering a state where card would not receive packets. Firmware PROM part numbers updated. The date code advances to D-2727.

LANIC Card Schematics 7

erf *hp2688 name rastre r8c07f01

Figure 7-1 below shows a functional block diagram of the LANIC card.

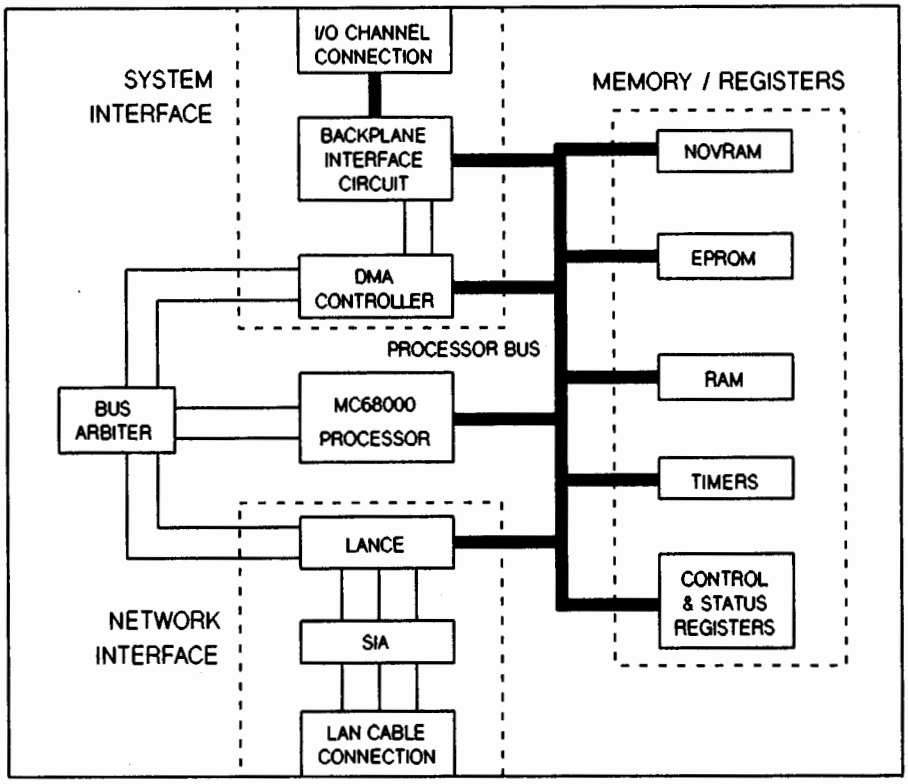


Figure 7-1. Functional Block Diagram of the LANIC

PROCESSOR. An MC68000 microprocessor provides the local intelligence for controlling the card's activities. Among other things, it executes the system I/O channel 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. This portion of the card contains all the components that transport data between the system I/O channel 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 I/O channel. The DMA Controller is used to transfer data quickly between card memory and the I/O channel with minimal MC68000 control.

MEMORY/REGISTERS. Sixteen (16) Kbytes of EPROM provide program storage of firmware for the MC68000 processor.

Thirty-two (32) Kbytes of static RAM serve as the primary location for data interchange. The RAM stores incoming and 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 (nonvolatile static RAM) stores the link-level (node) address of the card and other configuration parameters that must be retained after power-down.

Using a 10 MHz crystal-controlled reference, two timers 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 Selftest LED. The Status Register stores information that indicates the type of cable attached (IEEE 802.3 or Ethernet Version 1.0), power available to the medium attachment device (e.g., MAU), and transmission error information.

NETWORK INTERFACE. This part of the card 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.

LANIC card schematic diagrams are provided on the following pages.

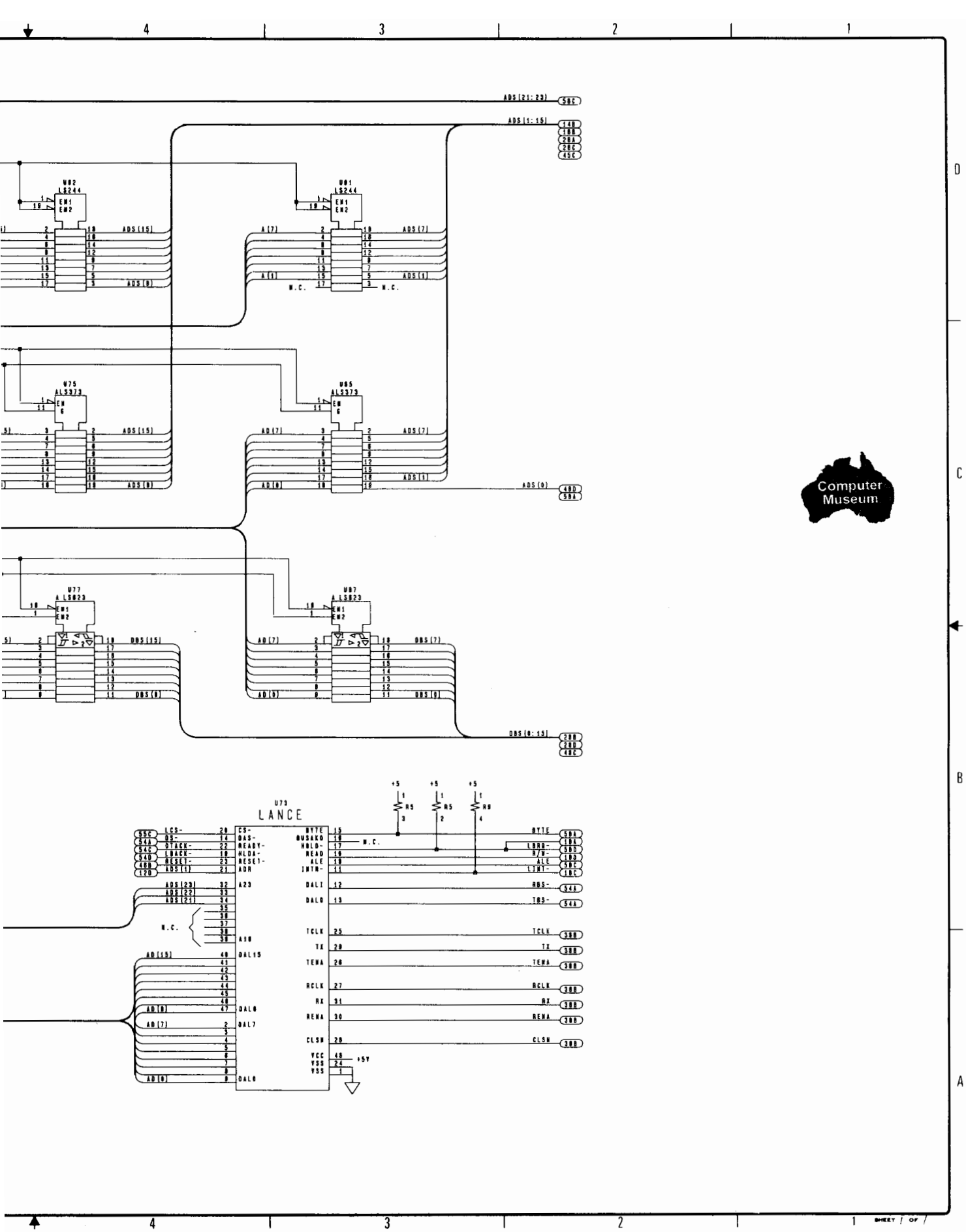
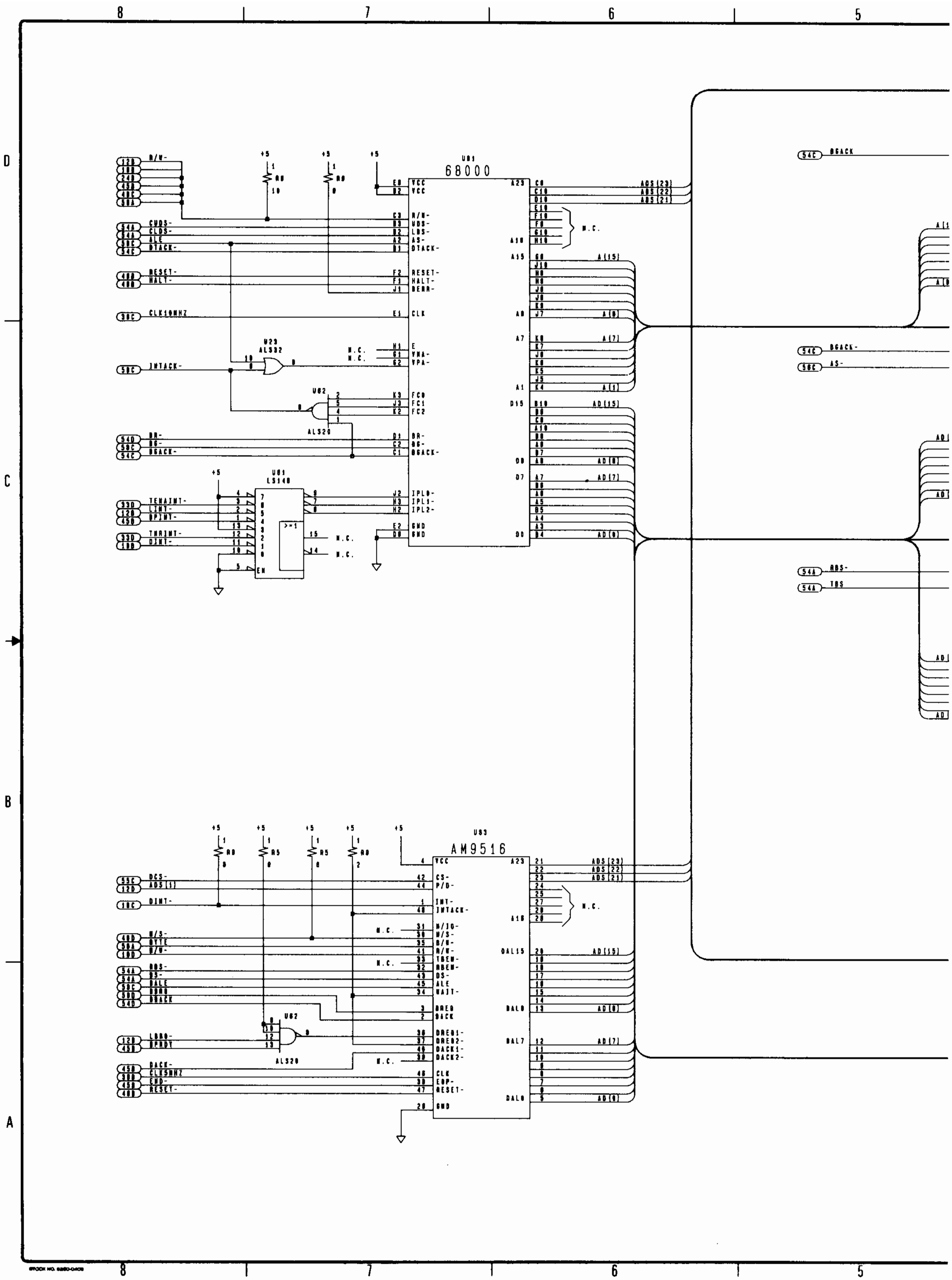
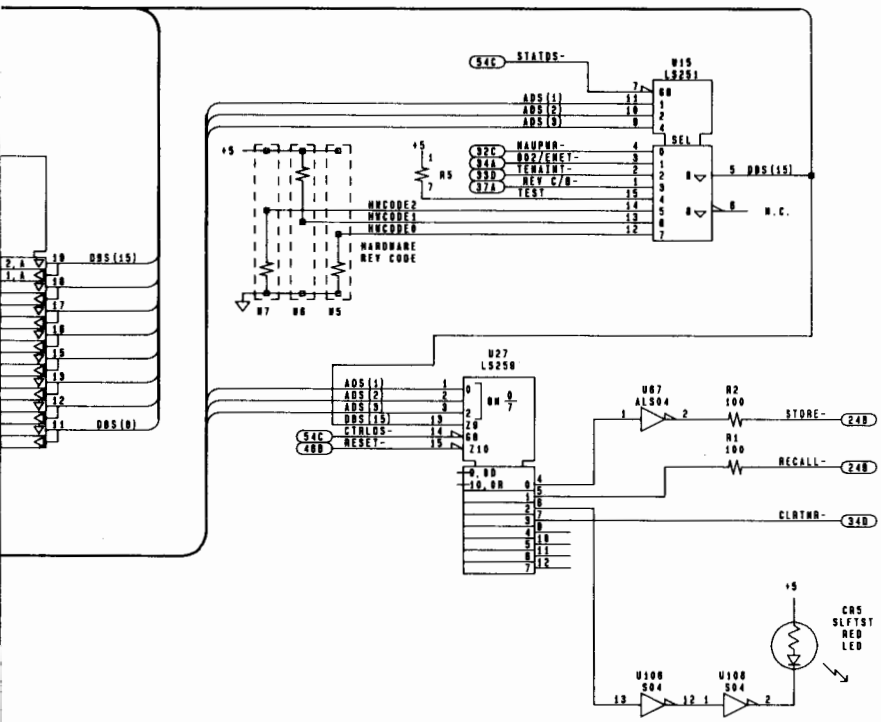


Figure 7-2. LANIC Card Schematic
(Sheet 1 of 5)


8
7
6
5
D
C
B
A
U01
68000
U83
AM9516
U23
ALS32
U02
ALS20
U01
LS148
+5
VCC
GND
R/W-
CUDS-
CLDS-
ALE
DTACK-
RESET-
HALT-
BERR-
CLK10MHZ
INTACK-
BR-
BG-
BGACK-
UDS-
LDS-
AS-
CLK
VMA-
VPA-
FC0
FC1
FC2
IPL0-
IPL1-
IPL2-
A23
A15
A8
A7
A1
D15
D8
D7
D0
ADS(23)
ADS(22)
ADS(21)
A(15)
A(8)
A(7)
A(1)
AD(15)
AD(8)
AD(7)
AD(0)
N.C.
DCS-
DINT-
CS-
INT-
INTACK-
DAL15
DAL8
DAL7
DAL0
DREQ
DACK
CLK5MHZ
EOP-
RBS-
TBS
BYTE



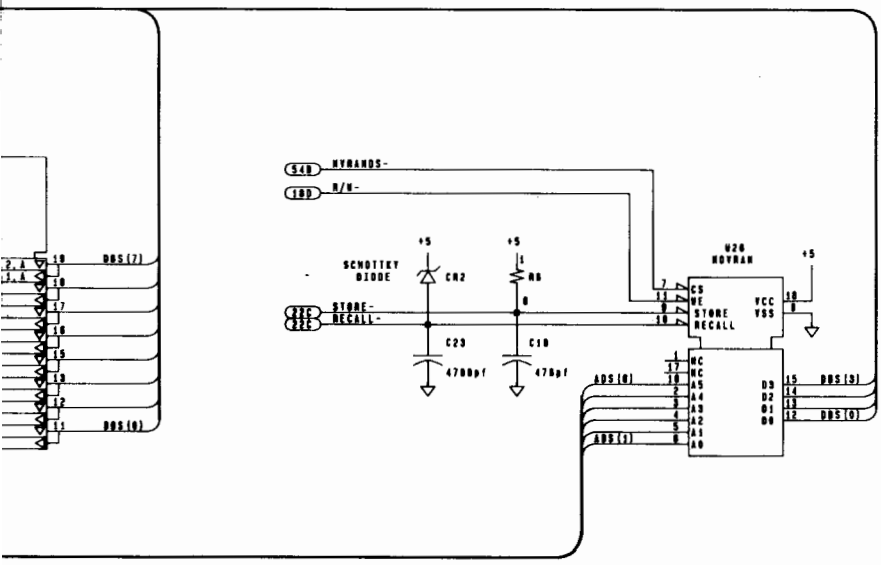
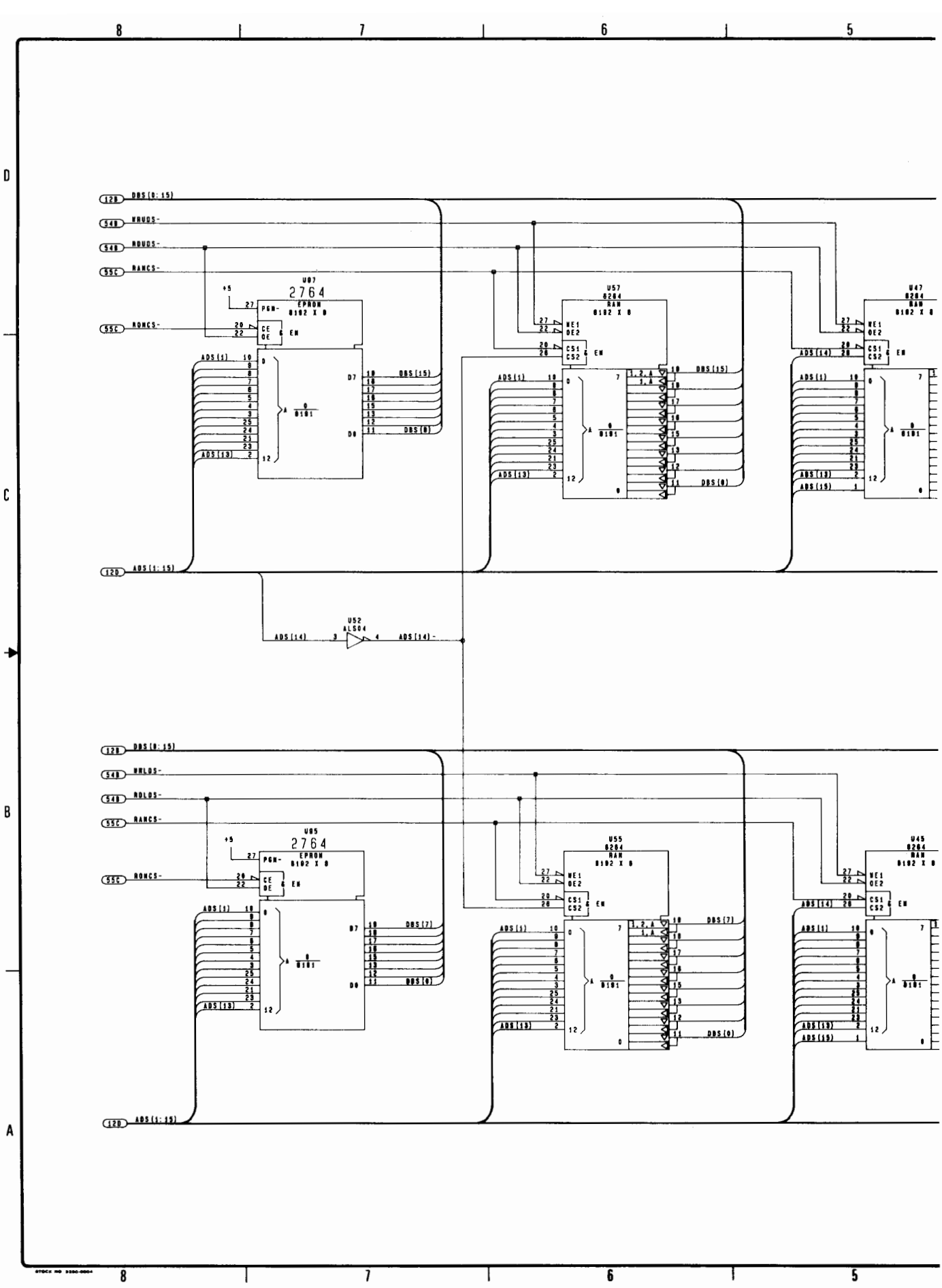


Figure 7-2. LANIC Card Schematic
(Sheet 2 of 5)


8
7
6
5
D
C
B
A
DBS(0:15)
WRUDS-
RDUDS-
RAMCS-
ROMCS-
ADS(1:15)
U87
2764
EPROM
8192 X 8
PGM-
CE
OE
EN
D7
D0
DBS(15)
DBS(8)
U57
6264
RAM
8192 X 8
WE1
OE2
CS1
CS2
DBS(0)
U47
6264
RAM
8192 X 8
ADS(14)
ADS(15)
U52
ALS04
ADS(14)-
WRLDS-
RDLDS-
U85
U55
U45
DBS(7)

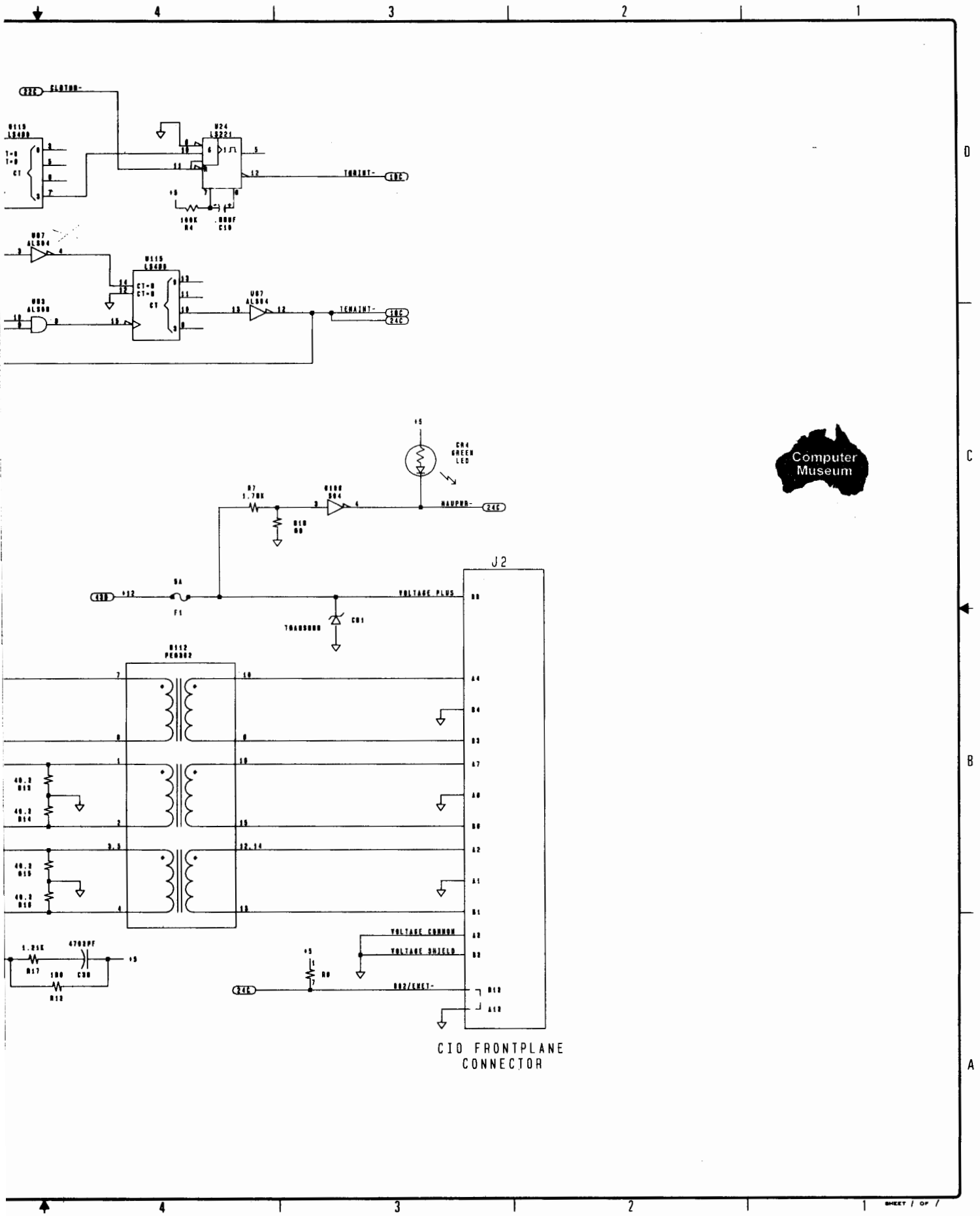
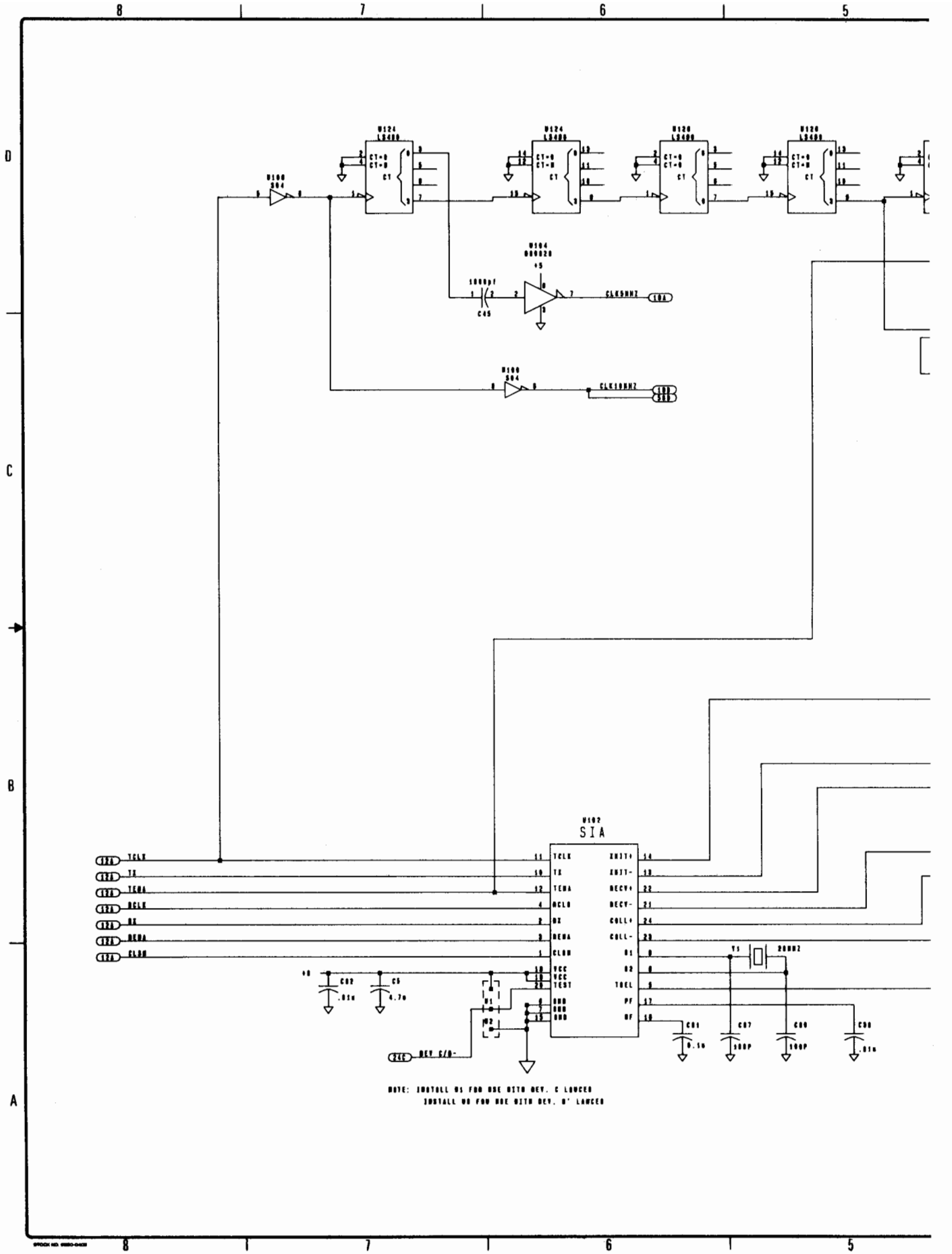


Figure 7-2. LANIC Card Schematic
(Sheet 3 of 5)


8
7
6
5
D
C
B
A
U124
LS488
U100
S04
U104
888828
+5
1000pF
C45
CLK50MHZ
CLK10MHZ
U102
SIA
TCLK
TX
TENA
BCLK
BX
BENA
CLSN
+5
C82
.01u
C5
4.7u
U1
U2
DEV C/D-
Y1
20MHZ
C81
0.1u
C87
100P
C89
100P
C88
.01u
NOTE: INSTALL U1 FOR USE WITH DEV. C LANCES
INSTALL U2 FOR USE WITH DEV. D' LANCES

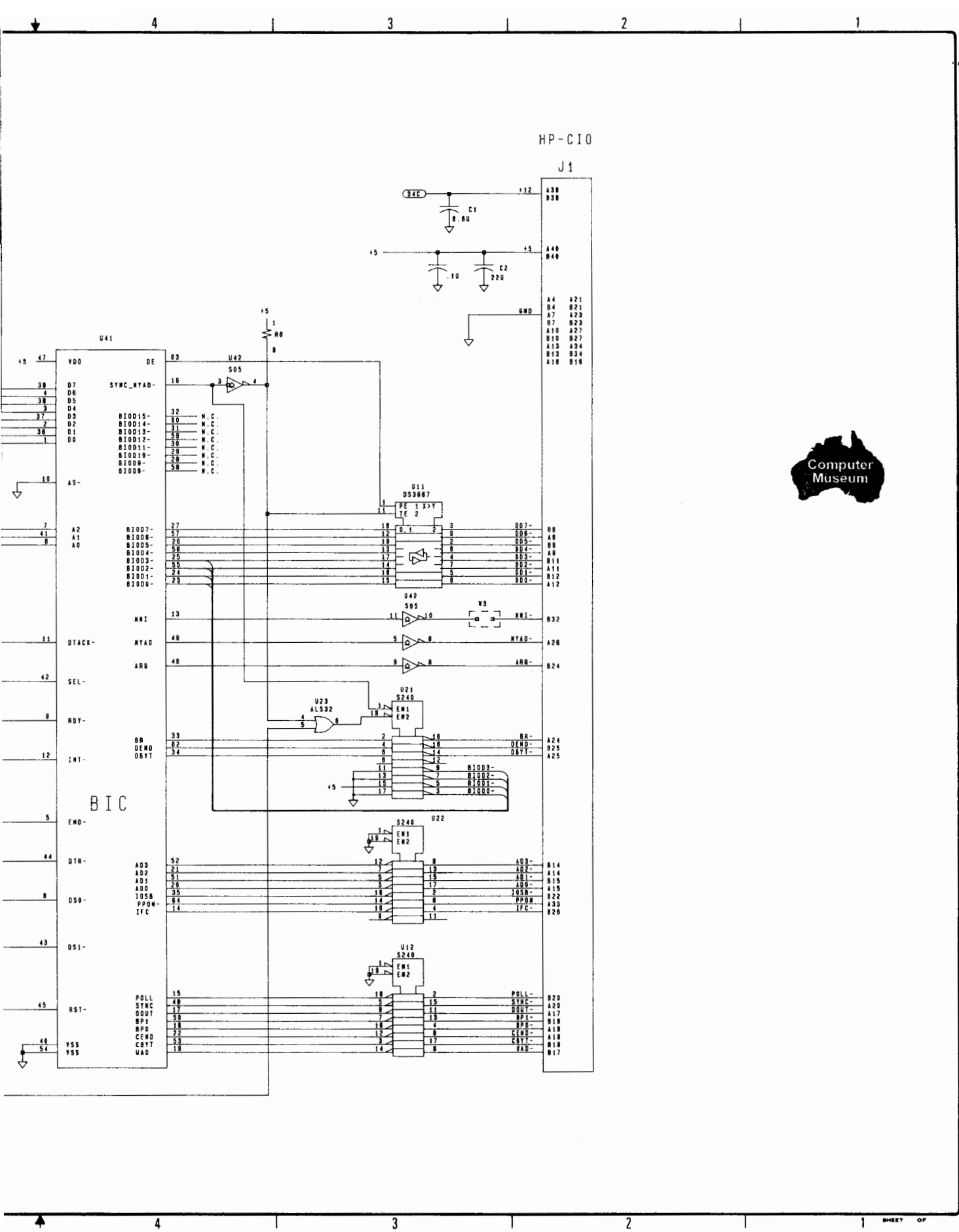
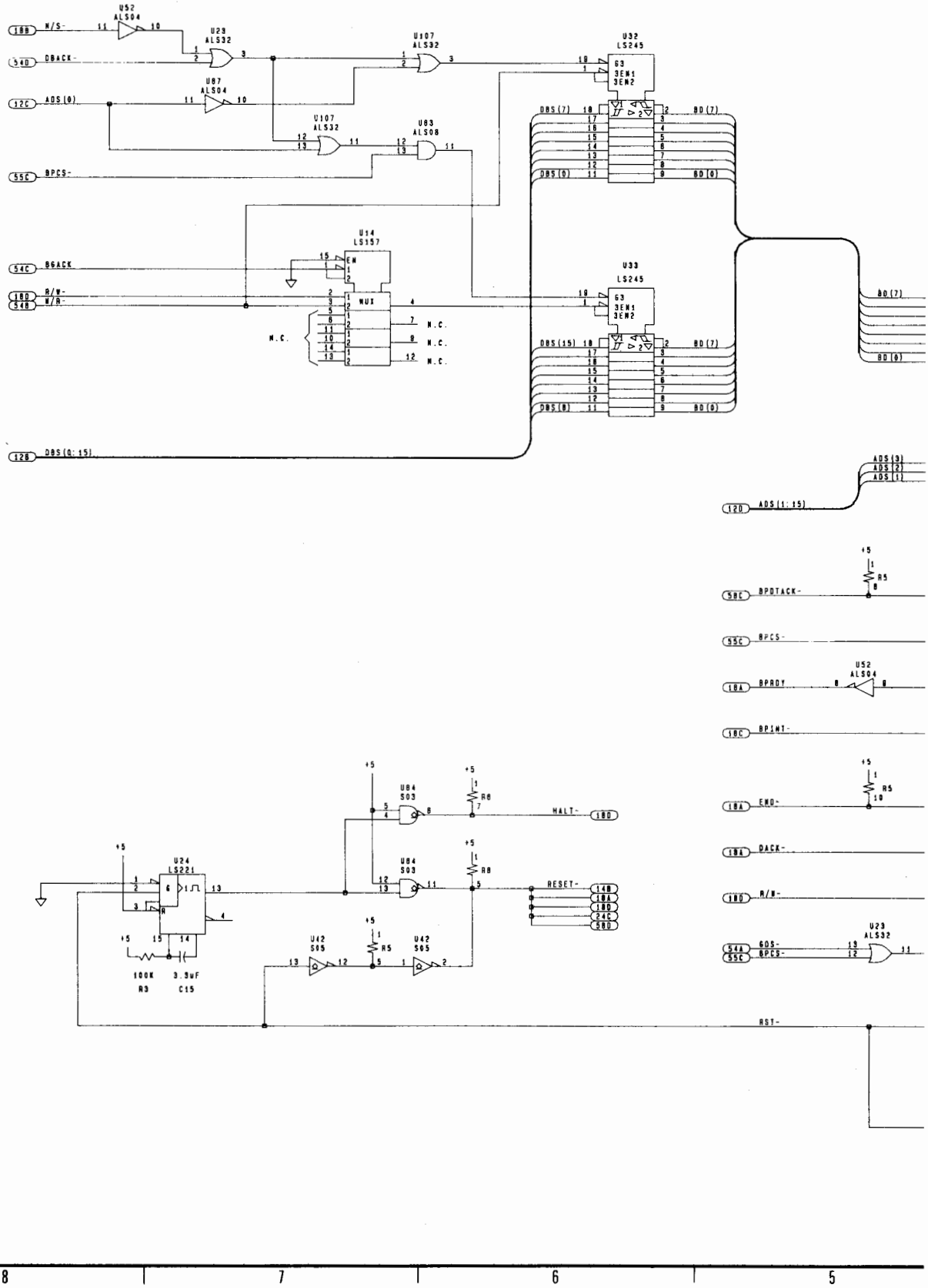


Figure 7-2. LANIC Card Schematic
(Sheet 4 of 5)


U52 ALS04
U23 ALS32
U87 ALS04
U107 ALS32
U83 ALS08
U32 LS245
U33 LS245
U14 LS157
M/S-
DBACK-
ADS(0)
BPCS-
B6ACK
R/W-
W/R-
DBS(0:15)
DBS(7)
DBS(0)
DBS(15)
DBS(8)
BD(7)
BD(0)
N.C.
ADS(3)
ADS(2)
ADS(1)
ADS(1:15)
BPDTACK-
BPRDY
BPINT-
END-
DACK-
R/W-
GDS-
U24 LS221
U84 S03
U42 S05
HALT-
RESET-
RST-
100K R3
3.3uF C15
R5
R6
R8

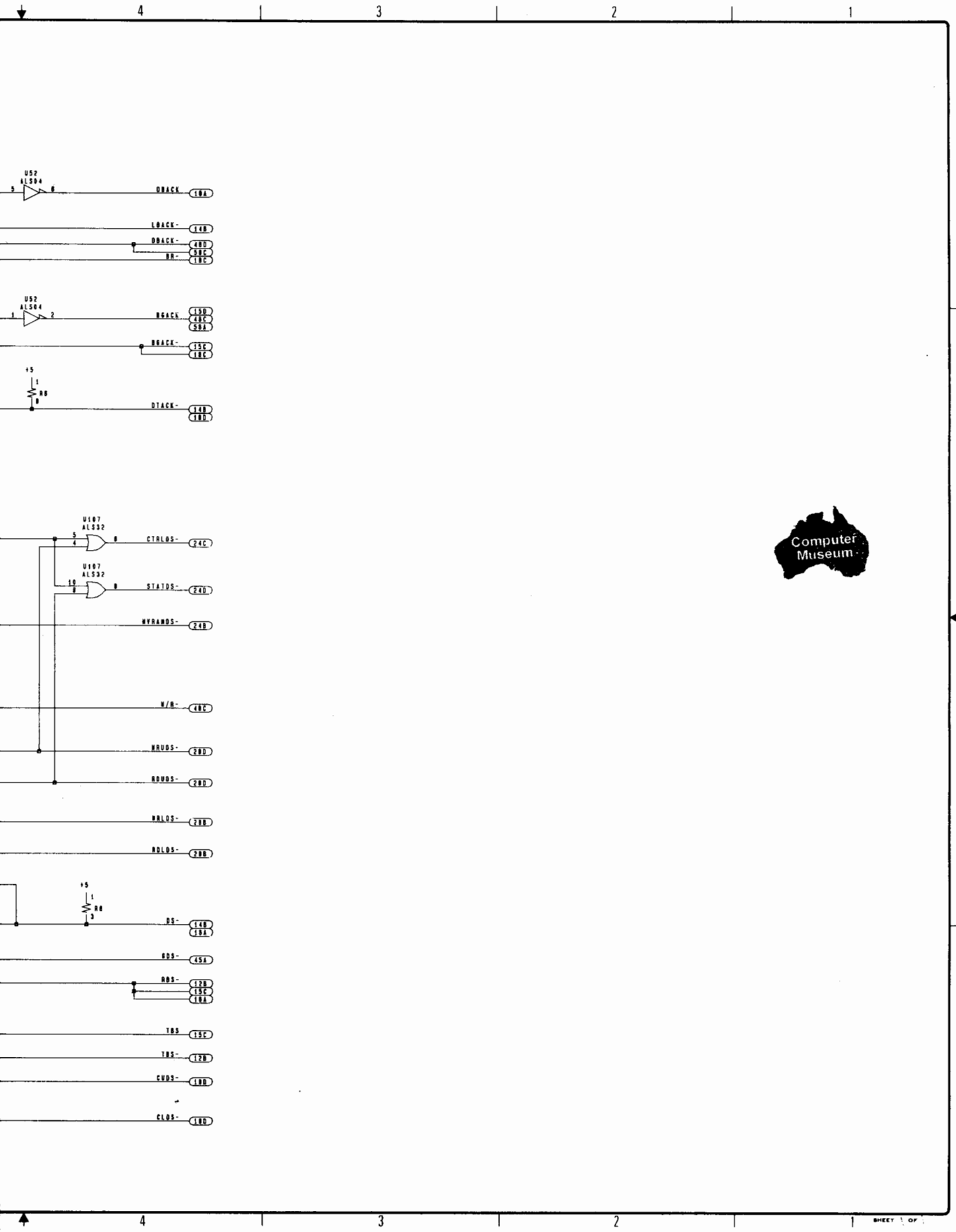
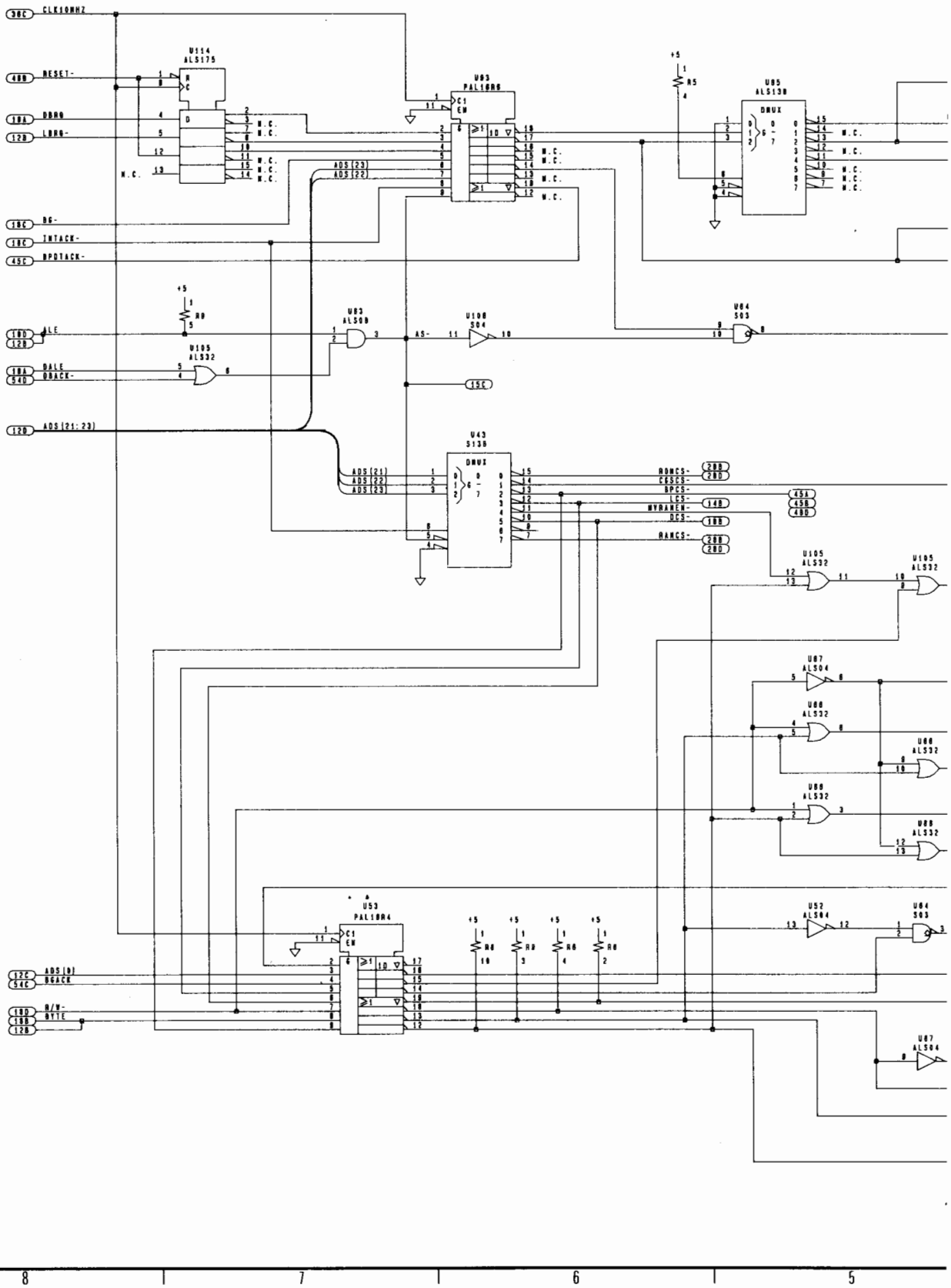


Figure 7-2. LANIC Card Schematic
(Sheet 5 of 5)


8
7
6
5
D
C
B
A
38C CLK10MHZ
48B RESET-
18A DBR0
12B LBR0-
U114 ALS175
U83 PAL16R6
U85 ALS138
DMUX
+5
R5
M.C.
ADS(23)
ADS(22)
18C BG-
18C INTACK-
45C BPDTACK-
+5
R9
18D 12B ALE
U83 ALS08
U108 S04
U84 S03
AS-
18A 54D BALE BBACK-
U105 ALS32
15C
12B ADS(21:23)
U43 S138
ADS(21)
ADS(22)
ADS(23)
RAMCS-
CESCS-
BPCS-
LCS-
MYRAMEN-
DCS-
RAMCS-
U105 ALS32
U105 ALS32
U87 ALS04
U88 ALS32
U88 ALS32
U88 ALS32
U88 ALS32
U53 PAL16R4
+5
R6
R2
R6
R6
12C 54C ADS(0) BGACK
18D 18B 12B R/W- BYTE
U52 ALS04
U84 S03
U87 ALS04

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