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CONVERSANT®
Voice Information System
Local Area Network

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Acknowledgment

This document was prepared by the AT&T Technical Publications Department, Columbus OH.

Contents

	About This Book	iii
	■ Purpose	i
	■ How to Use This Book	ii
	■ Trademarks Used in This Book	ii
	■ How This Book is Organized	iii
	■ Conventions Used in This Book	iv
<hr/>		
1	Local Area Network (LAN) Overview	1-1
	■ WHAT'S IN THIS SECTION	1-1
	■ LOCAL AREA NETWORK (LAN)	1-3
<hr/>		
2	Installing LAN Hardware and Software	2-1
	■ WHAT'S IN THIS SECTION	2-1
	■ INSTALLING THE NP600 BOARD, CABLES, AND DRIVER SOFTWARE	2-2
	■ INSTALLING THE STARLAN BOARD, CABLES, AND NETWORK INTERFACE (NI) DRIVER SOFTWARE	2-19
	■ INSTALLING THE TCP/IP INTERFACE RELEASE 2.0 SOFTWARE	2-27
	■ INSTALLING THE SQL*NET SOFTWARE	2-32
	■ TUNING THE STREAMS PARAMETERS	2-33
<hr/>		
IN	Index	IN-1

Figures

IN	Index	IN-1
-----------	--------------	-------------

	About This Book	i
--	------------------------	----------

1	Local Area Network (LAN) Overview	1-1
	1-1. Network Layering	1-7
	1-2. Sample Network Topology	1-9

2	Installing LAN Hardware and Software	2-1
	2-1. NP600 Network Processor Board Switch/Jumper Locations	2-2
	2-2. Network Type Jumper Settings	2-3
	2-3. NP600 Network Processor Board Switch/Jumper Settings	2-4
	2-4. Connecting the First or Last VIS (AT&T 6386 WGS) to the Thin Ethernet Network	2-7
	2-5. Connecting the First or Last VIS (MAP/100) to the Thin Ethernet Network	2-8
	2-6. Connecting the First or Last VIS (MAP/100C) to the Thin Ethernet Network	2-9
	2-7. Connecting an Intermediate System VIS (AT&T 6386 WGS) to the Thin Ethernet Network	2-10
	2-8. Connecting an Intermediate System VIS (MAP/100) to the Thin Ethernet Network	2-11
	2-9. Connecting an Intermediate System VIS (MAP/100C) to the Thin Ethernet Network	2-12
	2-10. StarLAN-10 Board Switch/Jumper Locations	2-19

Figures

2-11. StarLAN-10 Board Switch/Jumper
Settings

2-20

Tables

IN	Index	IN-1
-----------	--------------	------

	About This Book	i
--	------------------------	---

1	Local Area Network (LAN) Overview	1-1
	1-1. VALUES FOR /etc/hosts/, /etc/hosts.equiv, AND /.rhosts FILES - EXAMPLE	1-4
	1-2. CHARACTERISTICS OF 802.3 MEDIA	1-8

2	Installing LAN Hardware and Software	2-1
----------	---	-----

About This Book

Purpose

This book provides the information needed to use the Local Area Network (LAN) feature. Some of the information supplements information in the generic CONVERSANT® Voice Information System (VIS) documentation.

Included within this book is an overview of the LAN feature, procedures for installing LAN hardware and software, and a tuning parameters.

How to Use This Book

All but the first chapter of this book correspond to an existing VIS book. These chapters can be used together or with the corresponding VIS books.

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How This Book is Organized

The following is a brief description of the contents of each chapter of this book.

- **Chapter 1 - Local Area Network Overview**

This chapter provides an overview of the Local Area Network (LAN).

- **Chapter 2 - Installing LAN Hardware and Software Software**

This chapter contains information on installation and setup procedures for the LAN feature package.

- **Chapter 3 - Tuning Streams Parameters**

This chapter contains information on tuning LAN streams parameters.

Conventions Used in This Book

The following conventions are used in this book:

- Commands and text you type appear in **bold**.
- Directory and files names appear in **bold**.
- Values, instructions, and prompts that appear on the screen are in `constant-width` type.
- Keyboard keys appear in rounded boxes, as in `ENTER`.
- Function keys appear in rounded boxes, as in `F3`.
- Keyboard entries that require you to press `ENTER` afterwards appear as follows:
Enter **installpkg** -- which means type **installpkg** and press `ENTER`.

Related Resources

The following books should be used in conjunction with this book:

- *CONVERSANT Voice Information System Command Reference*
- *CONVERSANT Voice Information System Application Development*

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Local Area Network (LAN) Overview

1

WHAT'S IN THIS SECTION

This section contains an overview of the Local Area Network (LAN) features for the CONVERSANT® Voice Information System (VIS) Version 3.1:

- StarLAN card and driver
OR
Interlan card and driver; and
- AT&T Enhanced TCP/IP networking software.

This document provides the information needed to use the LAN feature. Some of the information supplements information in the generic CONVERSANT VIS documentation. For example, the installation information provided here should be used in conjunction with the information in the *CONVERSANT Voice Information System Installation and Field Service Guide Version 3*.

Document Organization

This document contains the following sections:

- Overview of LAN
- Installing LAN Hardware and Software.

These sections can be used together or with the corresponding VIS document. The section "Installing LAN Hardware and Software" can be inserted at the back of the *CONVERSANT Voice Information System Installation and Field Service Guide Version 3* behind the tab labeled "Optional Features."

Additional Documentation

The CONVERSANT Centralized Voice Management System documentation describes the implementation of the LAN in centrally administering up to 10 VISs. You may order this documentation from the AT&T Customer Information Center (1-800-432-6600) using the order COMCODE 106296759.

The following Enhanced TCP/IP documentation can be ordered from the AT&T Customer Information Center:

- *AT&T Enhanced TCP/IP Reference Manual*, COMCODE 10602951
- *AT&T Enhanced TCP/IP User Guide*, COMCODE 10602969
- *NP600A Network Processor Version 2.1 Installation Guide*, COMCODE 999120781
- *AT&T Enhanced TCP/IP Installation and Administration Guide*, COMCODE 10602944
- *AT&T Enhanced TCP/IP Release Notes*, COMCODE 10620936.

These documents can be ordered as a package using COMCODE 106020977.

LOCAL AREA NETWORK (LAN)

The LAN network allows the hardware components connected to it to communicate with each other. The LAN implementation for the VIS Version 3 network uses the Ethernet (IEEE 802.3 Carrier Sense Multiple Access with Collision Detection [CSMA/CD]) protocol. Layered on top of that implementation is the Transmission Control Protocol/Internet Protocol (TCP/IP) software package. TCP/IP allows each machine on the network to be "addressed" so that it can be distinguished from other machines.

The following is a brief overview of the network addressing arrangement. Refer to the Interlan NP622A Installation Manual, Chapter 3, Network Administration, or the *AT&T Enhanced TCP/IP Installation and Administration Guide*, Chapter 6 for a more complete discussion of the topic.

LAN Addressing

Every host on the LAN network must have a unique network address. The addresses consist of four decimal integers each separated by a dot (.). Four different classes of addresses are possible with the TCP/IP protocol. The default LAN network uses a class A address. However, if you want to assume responsibility for maintaining the network database files, other network architectures are possible.

The first integer of a class A address must be between 1 and 127. This integer represents the network number of the network being defined. The next three integers, separated by dots, represent each individual host on the network. Each of these three integers can have a value between 1 and 255. Each machine on a network must have the SAME network number followed by a **unique** group of the last three numbers. For example, an address of 002.0.0.1 represents a machine referred to as host 1 on network 2.

The network addresses of all machines that are to communicate with each other must be defined in the `/etc/hosts` file of each machine on the network. The `/etc/hosts` file cross-references machine names (the UNIX system `uname`) with network addresses.

There are two other files of which you should be aware. The first, `/etc/hosts.equiv`, gives the same privileges to identical login IDs on all machines on the network. The second, `/.rhosts`, gives root privileges on all machines on the network to any root user logged onto any machine.

The following are examples of values for all three files:

Table 1-1. VALUES FOR /etc/hosts/, /etc/hosts.equiv, AND /.rhosts FILES - EXAMPLE

```

/etc/hosts
-----
002.0.0.1    cvms    stat_svc remind_svc mtc_svc

002.0.0.2    vis1
002.0.0.3    vis2
002.0.0.4    vis3
002.0.0.5    vis4
002.0.0.6    vis5
002.0.0.7    vis6
002.0.0.8    vis7
002.0.0.9    vis8
002.0.0.10   vis9
002.0.0.11   vis10

002.0.0.12   visd1
002.0.0.13   visd2
    
```

<u>/etc/hosts.equiv</u>	<u>/.rhosts</u>
cvms	cvms root
vis1	vis1 root
vis2	vis2 root
vis3	vis3 root
vis4	vis4 root
vis5	vis5 root
vis6	vis6 root
vis7	vis7 root
vis8	vis8 root
vis9	vis9 root
vis10	vis10 root
visd1	visd1 root
visd2	visd2 root

LAN Hardware

The hardware required for connection to the LAN is:

- NP600 LAN card or StarLAN-10 card
- StarLAN-10 Attachment Unit Interface Adapter (AUI) - if connecting a VIS to a StarLAN-10 Hub and VIS has an NP600 card installed.

The VIS may connect to a LAN that uses twisted-pair wiring, fiber optic cable, or ThinNet coaxial cable. On the AT&T 6386 platform, an expansion cabinet must be used for the network cards to make room in the platform for the LAN card.

LAN Software

The LAN software packages include:

- Network Support Utilities
- Either NP600A or StarLAN 10 driver
- AT&T Enhanced TCP/IP.

Possible Network Architectures

The following are some of the network architectures possible with the VIS Version 3 LAN software. Much more complex network topologies are possible within this framework; however, these are so varied that they cannot all be addressed here. The examples discussed indicate the flexibility of this networking package.

The AT&T Enhanced TCP/IP software implements the standard TCP/IP protocol. The package has been internetworked successfully by AT&T and others with a wide variety of TCP/IP networks. Given this standard and compliant implementation, there is no reason that a VIS running this software cannot be connected successfully to a standard, compliant TCP/IP network.

Figure 1-1 shows the laying of TCP/IP over Ethernet in the context of the first four layers of the ISO Reference Model. This figure illustrates that the styles of ethernet networking differ at the physical layer only. The link layer and above are the same, regardless of the physical layer. Once two segments from different media are connected properly, nodes on one segment can contact nodes on the other transparently. From the point of view of the link layer, it is one physical network.

Layer 3 includes ICMP and ROUTE. ICMP messages are exchanged between hosts and gateways and hosts and hosts to report network errors and to send control information. ICMP messages are sent when an IP message cannot reach its destination (routing error, a gateway overflows [buffering error]), and when gateways want to inform hosts of alternate, shorter routes. ROUTE messages are processed by *routed* and are designed to propagate routing information between interior gateways. This protocol sometimes is called the Routing Information Protocol (RIP). RIP is an example of an interior gateway protocol (IGP). The TCP/IP package includes an implementation of RIP. Most networks understand RIP.

Sockets and TLI are alternative and equivalent application programming interfaces to the network. Sockets was introduced in 1983 as part of the UNIX systems 4.2BSD. Almost every implementation of TCP/IP for the UNIX system includes a sockets interface. TLI was released with the AT&T UNIX system R3. It offers a streams-based interface to the transport layer. As a streams interface, it offers a measure of portability from one protocol suite to another. This implementation of TCP/IP offers both a Sockets and a TLI interface.

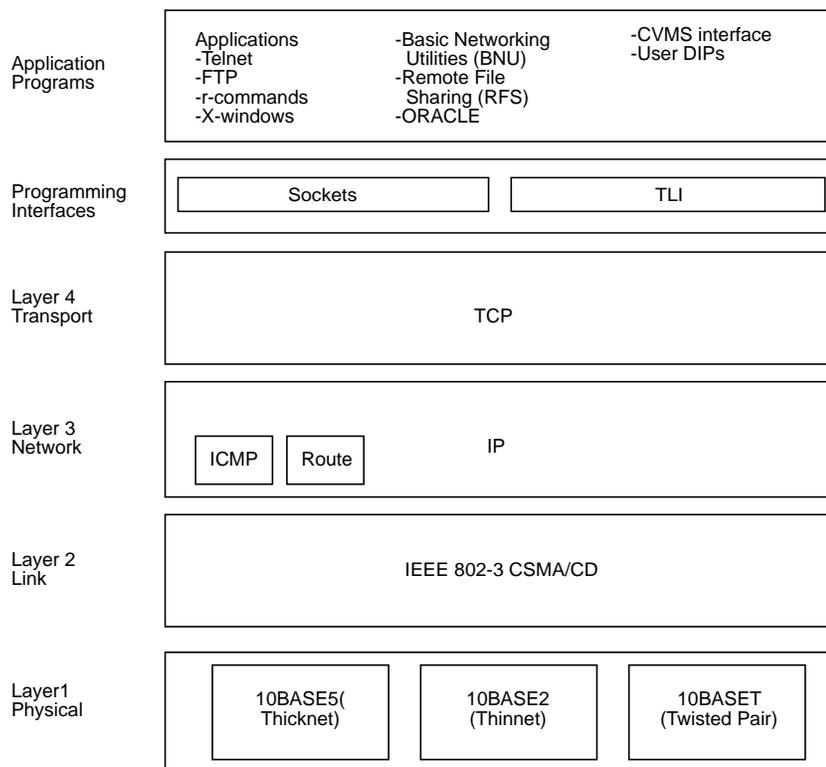


Figure 1-1. Network Layering

Network Media

Network media for 802.3 networks use the following naming scheme:

<data rate * 1Mb/s> <media type (base/broad band)> <segment length * 100m>

Table 1-1 summarizes the characteristics of 10BASE5, 10BASE2, and 10BASET media.

Table 1-2. CHARACTERISTICS OF 802.3 MEDIA

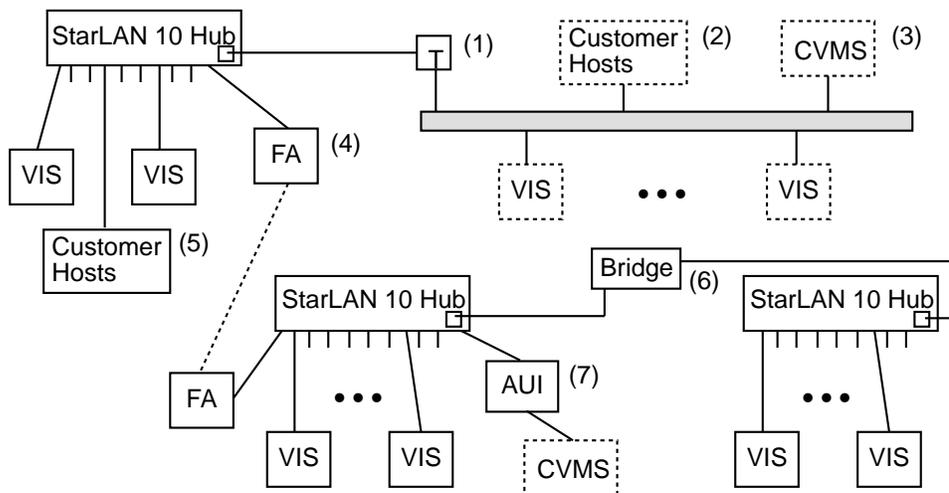
Parameter	10BASE5	10BASE2	10BASET
Transmission medium	50Ω coaxial cable	50Ω coaxial cable	Unshielded twisted pair
Signaling technique	Baseband (Manchester)	Baseband (Manchester)	Baseband (Manchester)
Data Rate (Mb/s)	10	10	10
Maximum segment length (m)	500	185	100
Network span (m)	2500	925	500
Nodes/segment (m)	100	30	-
Node spacing (m)	2.5	0.5	-
Cable diameter(mm)	10	5	0.4-0.6

⇒ NOTE:

Because of the shorter propagation delay through fiber segments, fiber adapters can be spaced up to 2.5km apart. The propagation delay through a fiber segment still must be considered during network design.

Sample Network Topology

Figure 1-2 shows an example of a network topology.



Key:

FA = Fiber Adapter	10BASE2 Ethernet	10BASE2 Hosts	10BASET Hosts
T = Transceiver	Twisted Pair		
AUI = AUI Adapter	Fiber		

Figure 1-2. Sample Network Topology

Issues To Consider

Keep the following issues in mind when designing a network. The numbers in Figure 1-2 correspond to the issues listed below.

1. The link layer and above are the same for twisted pair and coaxial-based ethernet networks. To connect a twisted pair segment and a coaxial segment to the same physical network, a device to propagate the physical signals from one media to the other is required. One way to accomplish this is to use an external transceiver.

Transceivers have two jacks: an AUI jack and a coaxial cable interface. Disable the SQE signal on the external transceiver. Connect the transceiver to the AUI port on a hub, then connect the transceiver's coaxial interface to the coaxial network.

⇒ NOTE:

This applies to 10BASE2 and 10BASE5, the only difference being in the transceiver's coaxial interface.

As an alternative, 10BASE2 and 10BASE5 segments can be connected with AT&T's Coaxial Adapter. The coaxial adapter is a two-port repeated with a single 10BASE5 port and a BNC port for 10BASE2.

2. Customer hosts based on 10BASE2 can be connected to existing networks as they have in the past. CONVERSANT VIS and Centralized Voice Management System (CVMS) systems based on NP-600 cards can connect directly to such networks. Assuming the network administration has been done properly, DIPs on the VISs can communicate with customer hosts as well as with hosts on other segments of the network.
3. The only network card available for the CVMS is the NP-600 card. With its BNC port, it can connect directly to the 10BASE2 networks.

With an external 10BASE5 transceiver, the CVMS can be connected to a 10BASE5 network through its AUI.
4. The StarLAN 10 fiber adapter performs media conversion between twisted pair and fiber optic cable. It is used in environments where the distance between network devices is greater than 100 meters. A fiber link may be up to 2.5 kilometers.
5. Customer hosts based on 10BASE5 can connect to existing networks as they always have. VISs based on StarLAN-10 NAU cards can connect directly to such networks. Assuming that the network administration has been done properly, DIPs on the VIS can communicate with customer hosts as well as with hosts on other segments of the network.
6. A bridge can be used to physically isolate two networks. In large, high-traffic networks, they can be used to preserve bandwidth while maintaining a single logical network.

Bridges monitor the Destination Addresses of the frames transmitted on each LAN segment. If the destination address indicates that the bridge must forward the frame from one segment to another, it will do so. Otherwise, the frame remains untouched on the originating segment. Only traffic that needs to travel from one segment to another does so.

Bridges operate on the link layer only. They do not impact higher layer protocols.

7. An AUI adapter permits a network endpoint with an AUI port to connect to a 10BASET network. As such, AUI adapters can be used to connect VISs with NP-600 cards or customer equipment with AUI ports to StarLAN hubs.

Installing LAN Hardware and Software

2

WHAT'S IN THIS SECTION

⇒ NOTE:

This is a supplement to the *CONVERSANT Voice Information System Installation and Field Service Guide Version 3*.

This section contains the procedures for installing the hardware and software associated with the Local Area Network (LAN) feature. Specifically, this section includes:

- Installing the NP600 Board, Cables, and Driver Software
- Installing the StarLAN Board, Cables, and Driver Software
- Installing the TCP/IP software.

INSTALLING THE NP600 BOARD, CABLES, AND DRIVER SOFTWARE

NP600 Network Processor Board Settings

Verify that the switches on the NP600 Network Processor board are set according to the illustrations below. If they are not, reset them before installing the NP600 Driver software.

Figure 2-1 shows the location of the switches and jumpers on the NP600 Network Processor board. Figures 2-2 and 2-3 show the possible settings for the switches/jumpers, depending on your configuration.

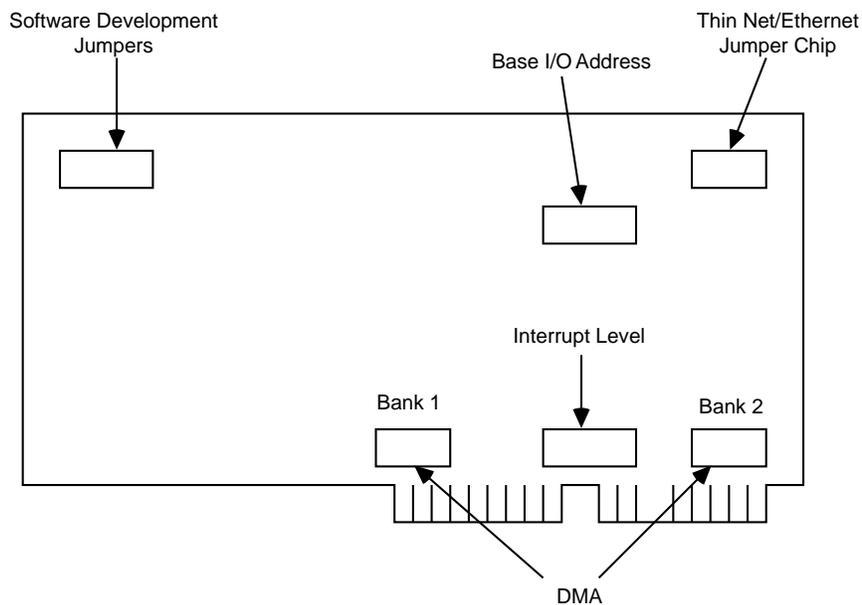


Figure 2-1. NP600 Network Processor Board Switch/Jumper Locations

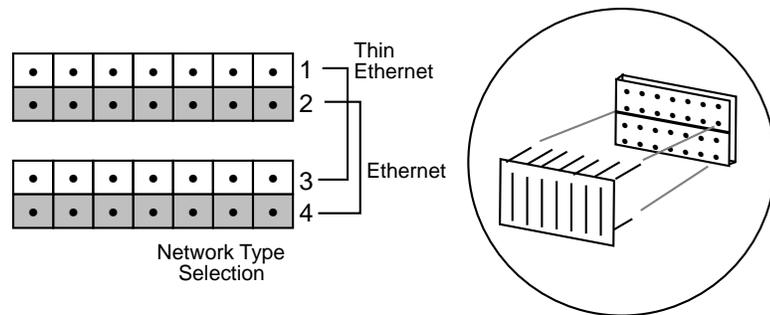


Figure 2-2. Network Type Jumper Settings

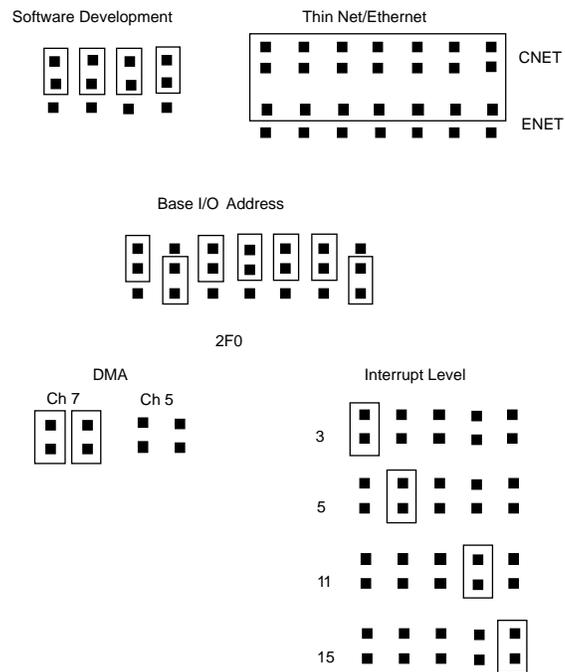


Figure 2-3. NP600 Network Processor Board Switch/Jumper Settings

Installing the NP600 LAN Cable

Prerequisites

Make sure the LAN cards are installed in the VISs. Use the output from the Configuration Program to determine the slot position. As noted in Section 1 of this guide, the VIS on the AT&T 6386 platform must have an expansion cabinet in order for there to be room in the platform for the LAN card.

Before you connect the LAN card to the network, make sure you have the following equipment:

- Thin Ethernet RG-58 cable segments are used to construct the LAN. The **total** length of **all** cable segments cannot exceed 185 meters (610 feet). Interlan's NA2020 Thin Ethernet cable is available in lengths of 20, 60, and 100 feet. It is recommended that cable lengths be as short as possible.
- A BNC T-Connector, which you attach to the LAN card's BNC connector. Then connect the network cable(s) coming from one or two adjacent systems to the T-Connector. A T-Connector comes with the LAN card.
- A 50-ohm BNC terminator, such as the MICOM-Interlan NA2034, also is required at both ends of the LAN. Use the terminator with the first and last systems on the network. The terminator connects to one arm of the T-Connector. Two terminators are needed for each LAN network.

Installing the NP600 LAN Cable - Procedure

To connect the LAN card to the Thin Ethernet network, follow these steps, as shown in Figures 2-4 through 2-9.

⇒ NOTE:

The slots shown in Figures 2-4 through 2-9 are samples only! This may not be the exact location of the LAN hardware in your system.

1. Using the T-Connector that was shipped with your LAN card, connect the center barrel of the T-Connector to the BNC Connector on the card's mounting bracket.
Figure 2-4 shows the 6386 WGS.
Figure 2-5 shows the MAP/100.
Figure 2-6 shows the MAP/100C.

⇒ NOTE:

If you are connecting the LAN to a MAP/100C platform, use the connector as shown in Figure 2-6.

2. Push the connector in and turn the knurled collar clockwise until you feel it lock into place.

 **NOTE:**

You cannot attach two systems together directly using Thin Ethernet cable; you must use the one of the connectors, as shown in Figure 2-4, Figure 2-5 or Figure 2-6.

3. If this is the first or last system on the network, attach a 50-ohm terminator to one arm of the T-Connector. Push the terminator in and turn the knurled collar clockwise to lock.

In the same manner, connect the end of the Thin Ethernet cable coming from the adjacent system to the other arm of the connector (Figure 2-4, Figure 2-5 or Figure 2-6).

4. If this is not the first or last system on the network, attach the ends of the Thin Ethernet cable coming from the adjacent systems to each arm of your system's connector. Push in the cable and turn to lock (Figure 2-7, Figure 2-8, or Figure 2-7)

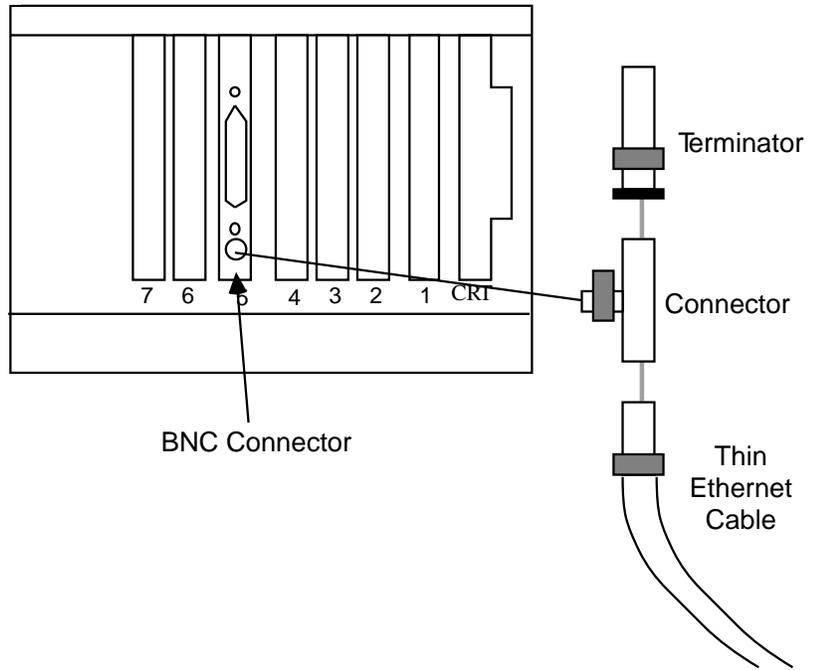


Figure 2-4. Connecting the First or Last VIS (AT&T 6386 WGS) to the Thin Ethernet Network

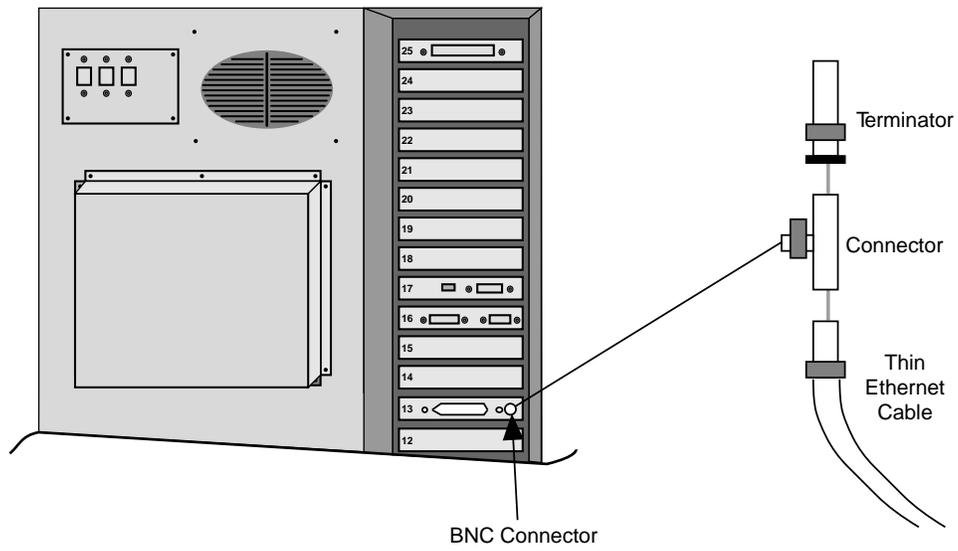


Figure 2-5. Connecting the First or Last VIS (MAP/100) to the Thin Ethernet Network

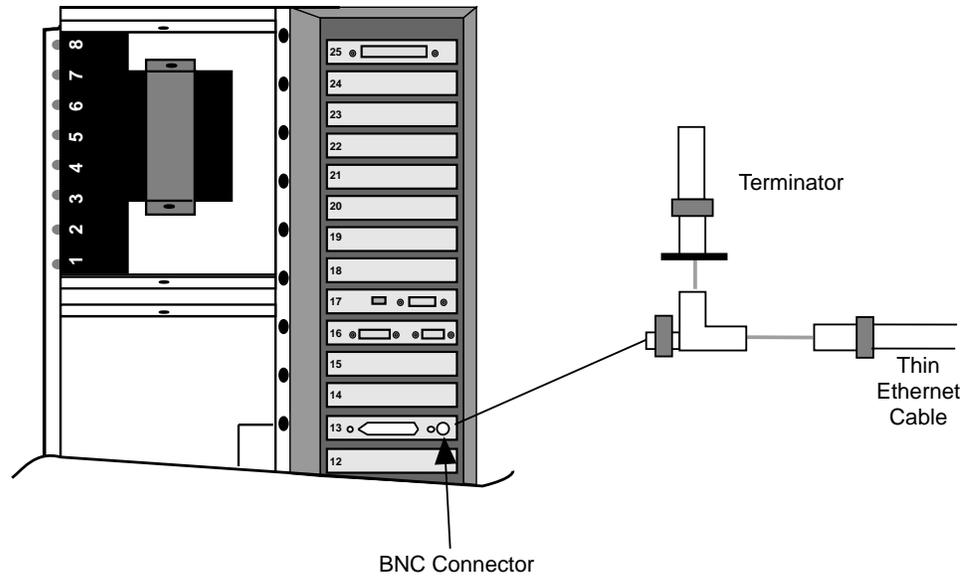


Figure 2-6. Connecting the First or Last VIS (MAP/100C) to the Thin Ethernet Network

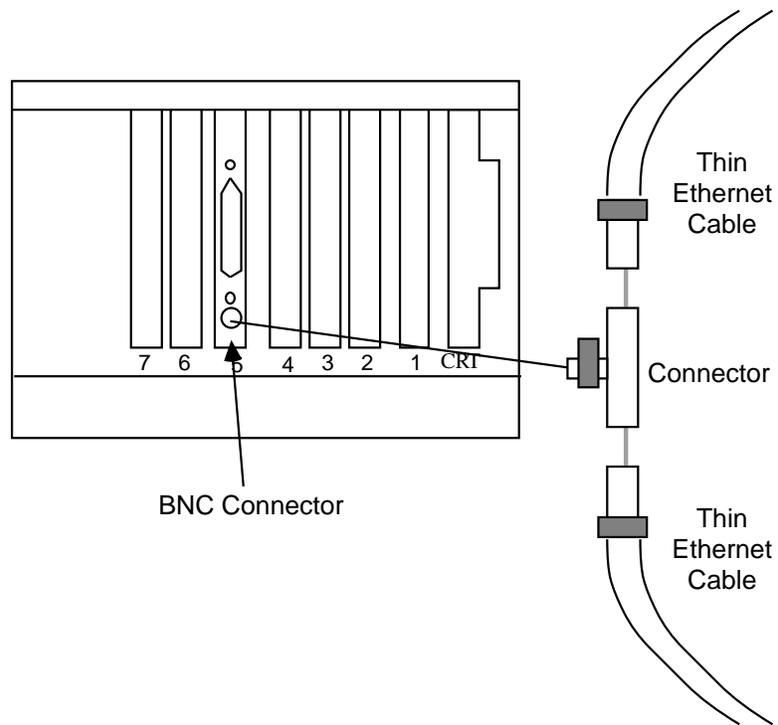


Figure 2-7. Connecting an Intermediate System VIS (AT&T 6386 WGS) to the Thin Ethernet Network

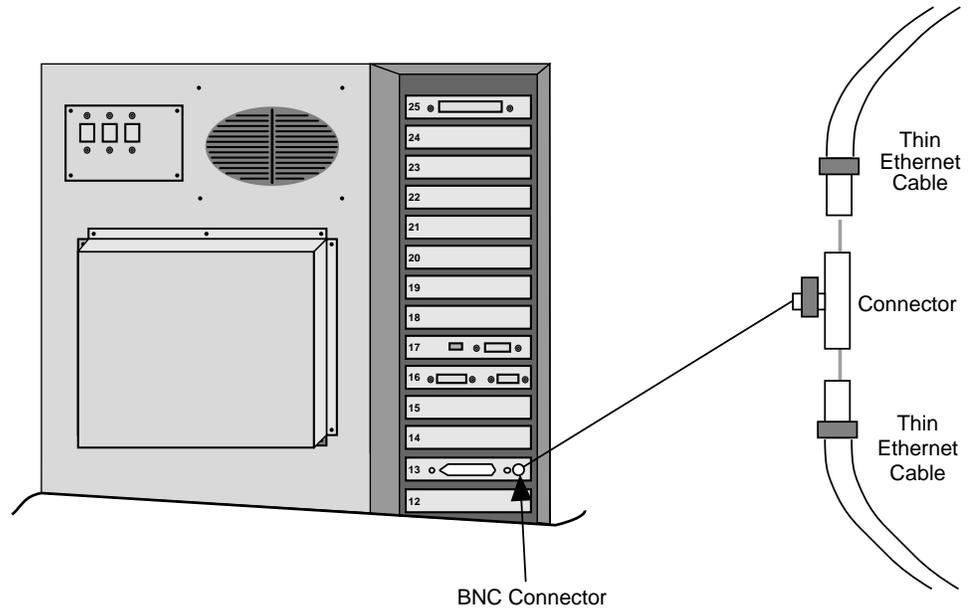


Figure 2-8. Connecting an Intermediate System VIS (MAP/100) to the Thin Ethernet Network

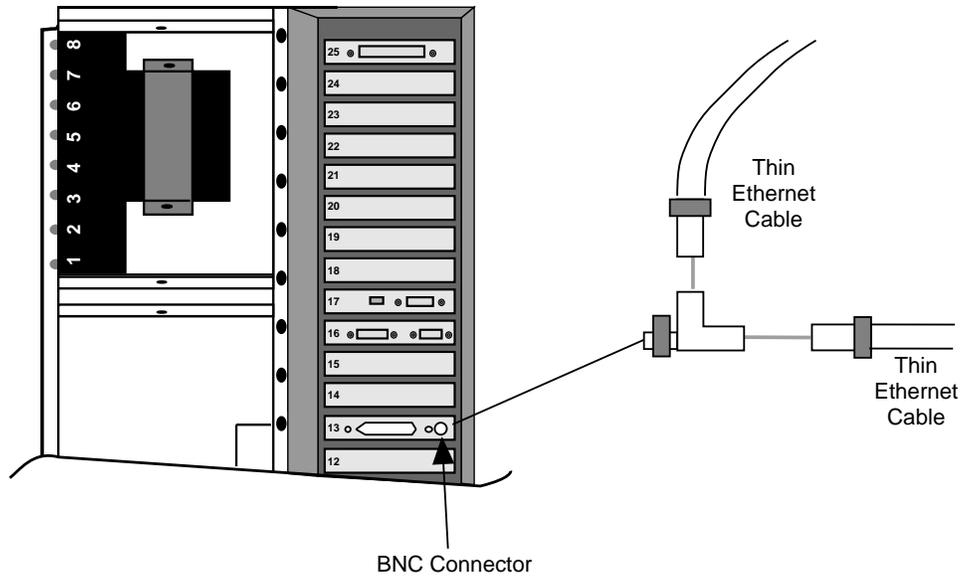


Figure 2-9. Connecting an Intermediate System VIS (MAP/100C) to the Thin Ethernet Network

Installing the NP600A Driver Software

The procedures for installing and removing the NP600A Driver software are provided on the next few pages. Before installing any of them, however, perform the following pre-installation procedures.

Pre-Installation Procedures

Before installing the NP600A Driver software, you must do the following:

1. Make a complete backup of your file system (refer to the *AT&T UNIX* System V/386 Operations/System Administration Guide* for more information).
2. Remove any previous releases of the NI Driver/NP600A software from your system, using the instructions provided with that release.
3. Install the Editing Utilities Package.
4. Install the Face and FMLI Packages.
5. Install the Network Support Utilities Package.
6. Determine a unique node name for your system. Use the UNIX system **uname -S** command to set the system's official host name.
7. The following information must be known about the network and about any other network to which you have access through the immediate network:
 - The domain name, if you plan to run a nameserver.
 - The network number.
 - The network name and any aliases.
 - The internet address, official host names, and any aliases for each host on the network.

Names of hosts and networks must conform to the following restrictions:

- Each name is limited to 32 characters in length.
- Names must not contain any of the following characters: \$? { } [] * !.

* Registered trademark of UNIX System Laboratories, Inc.

The output of the **hostname** command gives the official name of the host. This name ordinarily should be, but is not necessarily, the same as that returned by the UNIX System **uname -n** command.

Space Requirements

The NP600A software requires approximately 100 blocks of space in the **root (/)** file system and approximately 750 blocks of space in the **/usr file system**.

The system checks automatically for free space in the **root** and **/usr** file systems as part of the installation process. The installation procedures will not allow you to install the NP600A software if there is not enough free space.

If sufficient free space is not available, a message is displayed telling you how many blocks are needed. To create free disk space, you can remove other utilities, directories or files that you have created. To ensure that adequate space is available, remove at least 100 blocks more than the amount specified in the message.

Installing the NP600A Network Processor Version 3.2 Software - Procedure

To install the NP600A Network Processor software, you must be logged in as **root** and must be in the multi-user mode.

⇒ NOTE:

The default value for the NP600A's DMA channel number is 1 (one), whereas the possible choices are 1, 3, 5, and 7. Your NP600A can provide slightly improved performance if you select either DMA channel 5 or 7 (16-bit channels) instead of 1 or 3 (8-bit channels). The chosen value must be set consistently, both in the software and on the NP600A board.

The prompts and messages displayed on the monitor are shown in italic type.

1. Type **installpkg**, then press . The following message is displayed if the cartridge tape utilities are installed:

Confirm

Please indicate the installation medium you intend to use.

Strike "C" to install from CARTRIDGE TAPE or "F" to install from FLOPPY DISKETTE.

Strike ESC to stop.

2. Press **F**. The following message is displayed:

Confirm

Please insert the floppy disk.

If the program installation requires more than one floppy disk, be sure to insert the disks in the proper order, starting with disk number 1. After the first floppy disk, instructions will be provided for inserting the remaining floppy disks.

Strike ENTER when ready or ESC to stop

3. Insert the floppy disk into the drive, close the latch, then press **Enter**.

Installation is in progress -- do not remove the floppy disk.

Installing the NP600A Network Processor Version 3.2

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The following files are being installed:

/etc/init.d/np

/usr/include/sys/np.h

/usr/include/sys/np_dpi.h

.

:

.

/usr/option/npdriv.name

751 blocks

4. If you are...

- a. installing the software for the first time, the following is displayed:

The NP hardware options configuration information is being checked against the values already being used by other drivers (and hardware) in this system.

Please wait...

- b. re-installing the software and you saved the configuration information when you removed the NP software, the following is displayed:

The NP hardware options configuration information was saved during an earlier removal of this package. Do you wish to use this saved information? Enter y (for yes) or n (for no):

Press **y**, then .

The following is displayed:

Restoring NP hardware options configuration information ...done

The NP hardware options configuration information is being checked against the values already being used by other drivers (and hardware) in this system.

Please wait...

- i. If the NP driver configuration information does not conflict with any other driver or hardware configuration information, the configuration information is displayed with a message asking you to press either **CANCEL** to keep this configuration information or **CONTINUE** to change the configuration information.

If you choose to change the configuration information, the next step in this procedure tells you how to change an existing configuration file entry.

- ii. If the information appears to conflict with other driver or hardware options configuration information, the conflicting information is displayed with a message that you must correct all conflicts before you can rebuild the UNIX system successfully.

You may correct the conflicts either by changing the NP driver options configuration or another driver or hardware configuration. To make changes, press **CANCEL** and continue with the next step.

5. To change an existing configuration file entry, use the following procedure.
 - a. At the NP600A Network Processor Administration window, highlight **Hardware Configuration**, then press **Enter**.
 - b. At the NP Hardware Options Configuration window, highlight **Change - change an existing configuration file entry**, then press **Enter**.
 - c. At the Change NP Hardware Options Configuration: NP Board 0 window, press **CHOICES** to display the possible IRQ Line numbers.

Use the arrow key to move the cursor and arrow (>) to the desired value, then press **Enter**. The IRQ Line number automatically changes to the selected value.

⇒ NOTE:

If you are using a MAP/100 or MAP/100C platform, it is possible that you will have to disable the second serial port, since it uses the same interrupt setting as the LAN hardware. To disable this port see the procedure "MAP/100 and MAP/100C Setup" in your *CONVERSANT VIS Installation and Field Service Guide, Version 3*.

- d. To select the I/O address, press **CHOICES**, then select the desired value.
- e. To select the DMA Channel number, press **CHOICES**, then select the desired value.
- f. The values you choose may be in conflict with another board in the system. Any conflict will be reported to you when you press **SAVE**. Repeat the procedures until correct, non-conflicting values have been entered.
- g. If no conflicts have been detected, the following is displayed after you press **SAVE**:

This change will not be effective until the UNIX Operating System has been rebuilt, and the machine has been shut down and rebooted.

Strike CONTINUE to rebuilt the UNIX System, or CANCEL to quit.

6. Once the driver is configured, you must rebuild the UNIX system in order to use the NP driver. However, you first must load the TCP/IP software. Refer to the subsection entitled "Installing The TCP/IP Software" later in this section.

Removing the NP600A Network Processor Version 3.2 Software - Procedure

The prompts and messages displayed on the monitor are shown in italic type.

1. Type **removepkg**, then press .
- The system displays a numbered list of the installed packages.
2. Type the number that corresponds to the NP software, then press .
- Press to confirm that you want to remove the NP software.
3. Press **y**, then in response to the prompt about saving the configuration information in the file `/etc/conf/sdevice.d/np`.
4. Press **y**, then in response to the prompt about rebuilding the UNIX Operating System (unless you plan to re-install the software immediately).

INSTALLING THE STARLAN BOARD, CABLES, AND NETWORK INTERFACE (NI) DRIVER SOFTWARE

StarLAN-10 Board Settings

Verify that the switches on the the StarLAN board are set according to the illustrations below. If they are not, reset them before installing the TCP/IP software.

Figure 2-10 shows the location of the switches and jumpers on the StarLAN-10 board. Figure 2-11 shows the switch and jumper settings for the board.

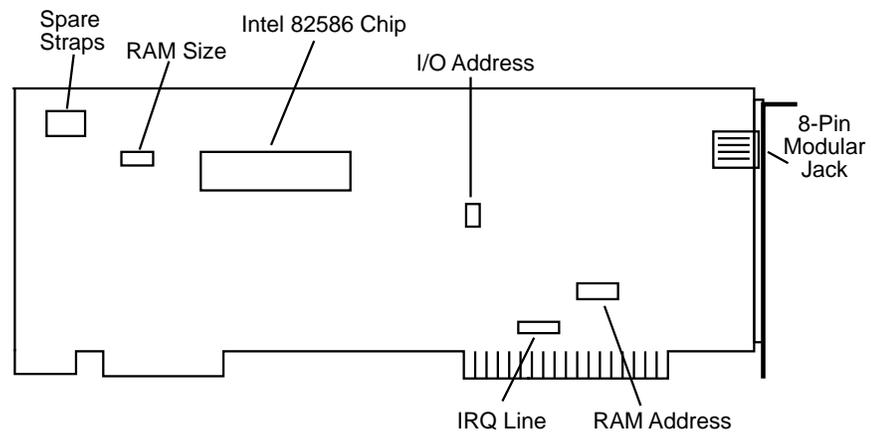


Figure 2-10. StarLAN-10 Board Switch/Jumper Locations

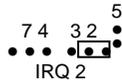
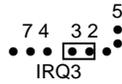
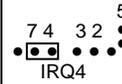
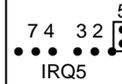
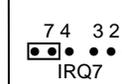
Option	Default Option	Alternate Settings			
IRQ Line	 IRQ 2	 IRQ 3	 IRQ 4	 IRQ 5	 IRQ 7
I/O Address	 I/O 360-367	 I/O 368-36F			
RAM Address	 RAM Address C0000	 RAM Address A0000	 RAM Address A4000	 RAM Address A8000	 RAM Address AC000
		 RAM Address B0000	 RAM Address B4000	 RAM Address B8000	 RAM Address BC000
		 RAM Address C4000	 RAM Address C8000	 RAM Address CC000	 RAM Address D0000
		 RAM Address D4000	 RAM Address D8000	 RAM Address DC000	 RAM Address E0000
		 RAM Address E4000	 RAM Address E8000	 RAM Address EC000	
RAM Address	 RAM Size 16 Kbytes	 RAM Size 64 Kbytes			

Figure 2-11. StarLAN-10 Board Switch/Jumper Settings

Connecting the StarLAN Cables to a Hub

Refer to the *StarLAN 10 Hub Unit Installation Guide* for information about connecting the StarLAN cables to a hub.

Installing the StarLAN NI Driver Software

The procedures for installing and removing the StarLAN NI Driver software are provided on the next few pages. Before installing any of them, however, perform the following pre-installation procedures.

Pre-Installation Procedures

Before installing the NI Driver, you must do the following:

1. Make a complete backup of your file system (refer to the *AT&T UNIX System V/386 Operations/System Administration Guide* for more information).
2. Remove any previous releases of the NI Driver/NP600A software from your system, using the instructions provided with that release.
3. Install the Editing Utilities Package.
4. Install the Face and FMLI Packages.
5. Install the Network Support Utilities Package.
6. Determine a unique node name for your system. Use the UNIX system **uname -S** command to set the system's official host name.
7. The following information must be known about the network and about any other network to which you have access through the immediate network:
 - The domain name, if you plan to run a nameserver.
 - The network number.
 - The network name and any aliases.
 - The internet address, official host names, and any aliases for each host on the network.

Names of hosts and networks must conform to the following restrictions:

- Each name is limited to 32 characters in length.
- Names must not contain any of the following characters: \$? { } [] * !.

The output of the **hostname** command gives the official name of the host. This name ordinarily should be, but is not necessarily, the same as that returned by the UNIX System **uname -n** command.

Space Requirements

The NI driver software requires approximately 100 blocks of space in the **root (/)** file system and approximately 750 blocks of space in the **/usr** file system. The TCP/IP software requires approximately 800 blocks of space in the **root (/)** file system and approximately 6500 blocks of space in the **/usr** file system.

The system checks automatically for free space in the **root** and **/usr** file systems as part of the installation process. The installation procedures will not allow you to install the NI Driver software if there is not enough free space.

If sufficient free space is not available, a message is displayed telling you how many blocks are needed. To create free disk space, you can remove other utilities, directories or files that you have created. To ensure that adequate space is available, remove at least 100 blocks more than the amount specified in the message.

Installing The Network Interface Driver Release 2.0 Software - Procedure

⇒ NOTE:

You must be logged in as **root** and must be in the multi-user mode.

The prompts and messages displayed on the monitor are shown in italic type.

1. Type **installpkg**, then press **Enter**. The following message is displayed if the cartridge tape utilities are installed:

Confirm

Please indicate the installation medium you intend to use.

*Strike "C" to install from CARTRIDGE TAPE
or "F" to install from FLOPPY DISKETTE.*

Strike ESC to stop.

2. Press **F**. The following message is displayed:

Confirm

Please insert the floppy disk.

If the program installation requires more than one floppy disk, be sure to insert the disks in the proper order, starting with disk number 1.

After the first floppy disk, instructions will be provided for inserting the remaining floppy disks.

*Strike ENTER when ready
or ESC to stop*

3. Insert the floppy disk into the drive, close the latch, then press **Enter**.

Installation is in progress -- do not remove the floppy disk.

Installing the AT&T 386 Network Interface Release 2.0

*Copyright (c) 1989 AT&T
All Rights Reserved*

The following files are being installed:

/etc/init.d/ni

/usr/include/sys/ni.h

/usr/include/sys/ni_macdef.h

.

.

.

/usr/option/nidriv.name

647 blocks

4. If you are...
 - a. installing the software for the first time, the following is displayed:

*The NI hardware options configuration information is being checked against the values already being used by other drivers (and hardware) in this system.
Please wait...*

- b. re-installing the software and you saved the configuration information in the file /etc/conf/sdevice.d/ni when you removed the NI software, the following is displayed:

*The NI hardware options configuration information (the contents of the file /etc/conf/sdevice.d/ni) was saved during an earlier removal of this package. Do you wish to use this saved information?
Enter y (for yes) or n (for no):*

Press **y**, then .

The following is displayed:

Restoring NI hardware options configuration information ...1 block

*The NI hardware options configuration information is being checked against the values already being used by other drivers (and hardware) in this system.
Please wait...*

- i. If the NI driver configuration information does not conflict with any other driver or hardware configuration information, the configuration information is displayed with a message asking you to press either **CANCEL** to keep this configuration information or **CONTINUE** to change the configuration information.

If you choose to change the configuration information, the next step in this procedure tells you how to change an existing configuration file entry.

- ii. If the information appears to conflict with other driver or hardware options configuration information, the conflicting information is displayed with a message that you must correct all conflicts before you can rebuild the UNIX system successfully.

You may correct the conflicts either by changing the NI driver options configuration or another driver or hardware configuration. To make changes, press **CANCEL** and continue with the next step.

5. To change an existing configuration file entry, use the following procedure.
 - a. At the AT&T 386 Network Interface Installation window, the screen titled **Hardware Configuration**, appears automatically.
 - b. At the NI Hardware Options Configuration window, highlight **Change - change an existing configuration file entry**, then press **Enter**.
 - c. At the Change NI Hardware Options Configuration: NI Board 0 window, press **CHOICES** to display the possible IRQ Line numbers.

Use the arrow key to move the cursor and arrow (>) to the desired value, then press **Enter**. The IRQ Line number automatically changes to the selected value.
 - d. To select the I/O address, press **CHOICES** to toggle between the values 360 and 368. Use the configuration program to determine the address to use.
 - e. To select the RAM size, press **CHOICES** to toggle between the values 16k and 64k.
 - f. To select the RAM address, press **CHOICES** to display a list of the possible addresses. Use the arrow keys to move the cursor to the desired value, then press **Enter** to make the selection. The RAM address automatically changes to the selected value.
 - g. The values you choose may be in conflict with another board in the system. Any conflict will be reported to you when you press **SAVE**. Repeat the procedures until correct, non-conflicting values have been entered.
 - h. If no conflicts have been detected, the following is displayed after you press **SAVE**:

This change will not be effective until the UNIX Operating System has been rebuilt, and the machine has been shut down and rebooted.

Strike CONTINUE to rebuilt the UNIX System, or CANCEL to quit.

6. Once the driver is configured, you must rebuild the UNIX system in order to use NI driver. However, you first must load the TCP/IP software. Refer to the subsection entitled "Installing The TCP/IP Software" later in this section.

Removing the Network Interface Driver Release 2.0 Software - Procedure

The prompts and messages displayed on the monitor are shown in italic type.

1. Type **removepkg**, then press **Enter**.
The system displays a numbered list of the installed packages.
2. Type the number that corresponds to the NI software, then press **Enter**.
Press **Enter** to confirm that you want to remove the NI software.
3. Press **y**, then **Enter** in response to the prompt about saving the configuration information in the file */etc/conf/sdevice.d/ni*.
4. Press **y**, then **Enter** in response to the prompt about rebuilding the UNIX Operating System (unless you plan to re-install the software immediately).

INSTALLING THE TCP/IP INTERFACE RELEASE 2.0 SOFTWARE

Prerequisites

- Either the NP600A or StarLAN NI software must be installed before loading the TCP/IP software.
- Any previous releases of the TCP/IP software must be removed from your system, using the instructions provided with that release.
- To install the TCP/IP software, you must be logged in as **root** and be in the multi-user mode.

Space Requirements

The TCP/IP software requires approximately 800 blocks of space in the **root (/)** file system and approximately 6500 blocks of space in the **/usr** file system.

The system checks automatically for free space in the **root** and **/usr** file systems as part of the installation process. The installation procedures will not allow you to install the TCP/IP software if there is not enough free space.

If sufficient free space is not available, a message is displayed telling you how many blocks are needed. To create free disk space, you can remove other utilities, directories or files that you have created. To ensure that adequate space is available, remove at least 100 blocks more than the amount specified in the message.

⇒ NOTE:

When you set up your UNIX system environment, you should have set your machine's node name. TCP/IP uses this node name as the official host name during installation. To avoid confusion, this name should be unique within the network to which your host is attached. This should be done before beginning the installation of TCP/IP software.

Installing the TCP/IP Release 2.0 Software - Procedure

The prompts and messages displayed on the monitor are shown in italic type.

1. Type **installpkg**, then press . The following message is displayed:

Confirm

Please indicate the installation medium you intend to use.

*Strike "C" to install from CARTRIDGE TAPE
or "F" to install from FLOPPY DISKETTE.*

Strike ESC to stop.

2. Press . The following message is displayed:

Confirm

Please insert the floppy disk.

*If the program installation requires more than one floppy
disk, be sure to insert the disk in the proper order,
starting with disk number 1.*

*After the first floppy disk, instructions will be provided
for inserting the remaining disks.*

*Strike ENTER when ready
or ESC to stop.*

3. Insert the floppy disk, close the latch, then press .

The system displays messages identifying the files that are being copied from the floppy disk to the hard disk. If there is a problem, the system responds with messages indicating the source of the problem and the action to be taken.

4. Insert the remaining TCP/IP diskettes (2, 3, and 4) in numerical order, pressing after you insert each one.

NOTE:

Leave disk 4 in the drive until the procedure is complete

5. After diskette 4 is loaded, the system asks if you want to run the *nameserver* on this host. The recommended response is **n**.
6. The system then asks if you want to run this host as a resolver. The recommended response is **n**.

7. The system prompts you to set up the /etc/hosts file. If the /etc/hosts has been saved previously (/etc/hosts.SAVE exists from a previous installation), the system asks the following question:

*Do you wish to use the previously saved NETWORK and HOST files?
[y,n]:*

8. Answer **y** to restore saved versions of these files. Answer **n** to create new versions of these files.
9. If you have not saved /etc/hosts previously, or if you answered **n** to the question above, the system displays the sequence of prompts given below (your response is shown in **bold type**):

*enter host's network number> <network n#>
Your host's network number is <network n#>. Is this what you want?
(default n) [y,n]*

⇒ NOTE:

If you are re-entering your host's network number and the number has leading zeros, exclude those leading zeros when entering the number. Example:

If your number is
135.008.013.218
you must enter this number as
135.8.13.218

*enter name of network host is on> <network_name>
Your name of network host is <network_name>. Is this what you
want? (default n) [y,n]*

*enter alias your network is known by> <alias_name>
Your alias network is <alias_name>. Is this what you want? (default
n) [y,n]*

*enter host's internet number> <internet n#>
Your host's internet number is <internet n#>. Is this what you want?
(default n) [y,n]*

enter alias names host will be known by> <alias names>

10. If this is not the first time this software has been loaded, the system prompts you to specify whether you want to use the values saved in the `inet/init.cf` file. If you want to use these parameters, press `y`; if you want to establish new parameters, press `n`.
11. After you make these entries, the system displays the host's official name and asks you to enter the alias names by which the host will be known.
12. At the prompt asking if you want to enter other host information, press `y` if you want to add more hosts (then follow the prompts) or press `n` to continue with the TCP/IP software installation.
13. At the prompt asking if you wish to have the TFTP daemon enabled, it is recommended that you press `n`.
14. At the prompt asking if you wish to have the ROUTE daemon enabled, it is recommended that you press `n`.
15. At the prompt asking if you wish to have the FTP daemon logging enabled, it is recommended that you press `n`.
16. If RFS is installed, the system asks if you wish to have RFS enabled. It is recommended that you press `n`.
17. At the prompt asking how many pseudo ttys you wish to have, it is recommended that you use the default value of 8.
18. When the software has been installed, the system rebuilds UNIX. To complete the install/remove process a shutdown is now being initiated automatically. Make sure your floppy drive is empty. If you are installing or removing controller boards, you may power down the system after the shutdown is complete. Press `Enter` when ready for the shutdown, or `Esc` to stop. When the shutdown is complete, start the system and follow the steps given later in this section to tune the STREAMS parameters.

Removing the TCP/IP Release 2.0 Software - Procedure

There are some cases, such as when new releases of TCP/IP are issued, when it is desirable to remove entirely the TCP/IP software. This removal procedure uses the **removepkg** utilities to stop all running network-related processes and remove all network software from the hard disk.

The **removepkg** utilities remove all files associated with TCP/IP. All other files are left undisturbed.

The **removepkg** utilities automatically save the following files:

- /etc/hosts
- /etc/hosts.equiv
- /etc/networks
- /etc/protocols
- /.rhosts
- /usr/etc/inetinit.cf
- /etc/named.boot
- /etc/resolv.conf
- /usr/local/domain/named.ca
- /usr/local/domain/named.hosts
- /usr/local/domain/named.local
- /usr/local/domain/named.rev.

To remove the TCP/IP software, use the following procedure.

1. Type **removepkg**, then press .
- The system displays a numbered list of the installed packages.
2. Type the number that corresponds to the TCP/IP software, then press .
- Press to confirm that you want to remove the TCP/IP software.
3. The **removepkg** procedure first stops all daemons associated with TCP/IP, then removes all files installed with the TCP/IP software. The system displays a list of all the files it is deleting.

After the software is removed, the system displays a message telling you that the new UNIX system kernel will be generated automatically and that the system then will be rebooted.

INSTALLING THE SQL*NET SOFTWARE

⇒ NOTE:

The Base ORACLE† software package (and Extended ORACLE, if needed) must be installed before the SQL*Net† software is loaded.

1. Insert the SQL*Net floppy disk in the drive, then type **installpkg** .
2. The system displays a warning that the VIS must be stopped in order for the software installation to continue and that it will be started automatically when the installation is complete.
Press **y** to continue with the installation.
3. The VIS displays several messages as it installs the SQL*Net software, then returns the prompt when it is complete.

Removing the SQL*Net Software

1. Insert the SQL*Net floppy disk in the drive, then type **removepkg** .
2. The system displays a warning that the VIS must be stopped in order for the software to be removed to continue and that it will be started automatically when the removal is complete.
Press **y** to continue with the removal.
3. The VIS displays several messages as it removes the SQL*Net software, then returns the prompt when it is complete.

† Registered trademark of Oracle Corporation

TUNING THE STREAMS PARAMETERS

The network software, as it is delivered, is configured to support a modest amount of network activity. If your application uses the network heavily, you will need to tune various parameters of the operating system to support the heavier load. It is impossible to predict the number of resources you will need without understanding something about the load you will put on the network.

A good way to determine how many streams resources you will need is to tune the streams resources to reasonably high levels and run a load test. At the completion of the test, use the tool `crash` to print out the statistics on resource utilization.

At the crash prompt, type **strstat**.

You will see the following table:

ITEM		CONFIG	ALLOC	FREE	TOTAL	MAX	FAIL
streams		96	59	37	256	63	0
queues		512	346	166	778	370	0
message blocks		2520	269	2251	12283510	613	0
data block totals		2016	269	1745	11286750	612	149314
data block size	4	512	13	499	1038155	344	0
data block size	16	200	160	40	935329	181	149314
data block size	64	256	66	189	7363476	96	0
data block size	128	500	0	499	823751	43	0
data block size	256	320	27	293	683153	39	0
data block size	512	70	0	70	14871	15	0
data block size	1024	50	0	50	12262	7	0
data block size	2048	100	3	97	415741	16	0
data block size	4096	8	0	8	12	1	0

Count of scheduled queues: 0

The number of streams corresponds to the tunable `NSTREAM` and the number of queues to `NQUEUE`. `NQUEUE` should always be 4 times `NSTREAM`.

The parameters `NBLKxxx` correspond to the various data block lines. The `CONFIG` column contains the number of the parameter that is built into the system. `ALLOC` contains the number currently allocated. `FREE` the number currently free. `MAX` contains the most that have ever been allocated at any one time. `FAIL` contains the number of times the kernel tried to get a block of a given size and failed. The number of data blocks for any size that has a non-zero entry in the `FAIL` should be tuned up. The other parameters should be between 120% and 150% of the `MAX` figure. (The kernel reserves a certain number (usually 20%) of the blocks for use by high priority processes, so you can get `FAILS` without `MAX` reaching `CONFIG`).

To tune up a parameter, use

`/etc/conf/bin/idbuild/d -m [parameter]`

for each variable you would like to change. Rebuild the kernel with

`/etc/conf/bin/idbuild`

and reboot. The new resources will now be available.

To increase the number of TCP endpoints that you can use at any one time, you must allocate them in the kernel. One endpoint is needed for every logical network connection on your machine. To see all of the connections on a machine, type "netstat -a." Each entry corresponds to a network port, and each network port marked "tcp" uses an endpoint. To change the number of endpoints allocated, edit the file `/etc/conf/pack.d/tcp/space.c` with vi. Update the `#define NTCP` with the number of endpoints your application requires.

Each TCP or UDP entry reported by netstat needs to have a part of the data structures sized by NUMTIM and NUMTRW. Therefore, those parameters should be at least as big as the largest number of network endpoints you will be using at any one time.

Each time you use rlogin or telnet to establish a login session with a host over a TCP/IP network, you use a pseudo-tty port, in addition to a TCP endpoint. If you are already using all of your pseudo-tty ports, attempts to log in to the machine again will fail. To increase the number of pseudo tty ports that you can use at any one time, you must allocate them in the kernel. One endpoint is needed for every login connection on your machine you need on your machine at any one time. To see how many pseudo-tty connections are in use, use the who command. Each user that is logged in on a machine `ttyp[n]` is using one connection. To change the number of pseudo-tty ports allocated, edit the file `/etc/conf/pack.d/tty_ptc/space.c` with vi. Update the `#define NPTY` with the number of ports your application requires.

If you tune any of these numbers too high, you will waste memory. If you are too careless with memory, voice system performance will suffer.

⇒ NOTE:

Packages other than LAN use these resources. You should be careful to ensure that there are adequate resources for all packages. In particular, the ASAI package uses streams resources heavily.

Index

A

Additional Documentation, 1-2

B

Book Use, ii

C

Connecting the StarLAN Cables to a Hub, 2-21
Contents of Each Chapter, iii

D

Document Organization, 1-2

I

Installing The NP600 Board, Cables, and Driver Software, 2-2
 Installing the NP600 Driver Software, 2-13, 2-14, 2-18
 Installing the NP600 LAN Cable, 2-5
 NP600 Network Processor Board Settings, 2-2
Installing the NP600 Driver Software, 2-13, 2-14, 2-18
Installing the NP600 LAN Cable, 2-5
Installing the SQL*Net Software, 2-32
 Removing the SQL*Net Software, 2-32
Installing The StarLAN Board, Cables, and Network Interface Driver Software, 2-19
 Connecting the StarLAN Cables to a Hub, 2-21

Installing The StarLAN Board, Cables, and Network Interface Driver Software (Continued)
 Installing the StarLAN NI Driver Software, 2-21, 2-22, 2-26
 StarLAN-10 Board Settings, 2-19
Installing the StarLAN NI Driver Software, 2-21, 2-22, 2-26
Installing the TCP/IP Interface Release 2.0 Software, 2-27
 Prerequisites, 2-27
 Procedure, 2-28
 Removing the TCP/IP Release 2.0 Software, 2-31

L

LAN Addressing, 1-3
LAN Hardware, 1-5
LAN Software, 1-5
Local Area Network, 1-3
 LAN Addressing, 1-3
 LAN Hardware, 1-5
 LAN Software, 1-5
 Network Media, 1-8
 Possible Network Architectures, 1-5
 Sample Network Topology, 1-9

N

Network Media, 1-8
NP600 Network Processor Board Settings, 2-2

O

Overview of Book,
 Contents of Each Chapter, iii

P

Possible Network Architectures, 1-5
Prerequisites, 2-27
Procedure, 2-28

R

Related Resources, v
Removing the SQL*Net Software, 2-32
Removing the TCP/IP Release 2.0 Software,
2-31

S

Sample Network Topology, 1-9
StarLAN-10 Board Settings, 2-19

T

Tuning the Streams Parameters, 2-33

U

Using the book, ii

W

What's in this Section,
 Additional Documentation, 1-2
 Document Organization, 1-2

