NCD

Network Computing Devices

NCD16 User's Manual

NCD16
User's Manual

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

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

You can determine whether this equipment is causing interference by turning it off.

If this equipment does cause interference to radio or television reception, you can try to correct the interference by using one or more of the following methods:

- Turn the television or radio antenna until the interference stops.
- Move this equipment to one side or the other of the television or radio.
- Move this equipment farther away from the television or radio.
- Plug this equipment into an electrical outlet that is on a different circuit from the television or radio. (That is, make certain this equipment and the television or radio are on circuits controlled by different circuit breakers or fuses.)
- Consider installing a rooftop television antenna with coaxial cable lead-in between the antenna and the television.

If necessary, you should consult an experienced radio/television technician for additional suggestions. You might find helpful the following booklet, prepared by the Federal Communications Commission:

"How to Identify and Resolve Radio-TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington,

DC 20402, Stock Number 004-000-00345-4.

Table of Contents

Preface

This manual contains information you need to install, configure, and operate your NCD16. The NCD16 is an intelligent, graphics-oriented device which implements the X11 Release 3 server protocol specification of the X Window System with selected Release 4 features, and operates over an Ethernet network or a serial port.

Organization of this Manual

This manual is organized into seven chapters, a glossary, and an appendix:

Chapter 1 - A Quick Look at the NCD16 contains a description of the NCD16 and a list of equipment supplied.

Chapter 2 - Getting Started describes how to configure, assemble, and connect the NCD16, and how to power it up and log on to a host computer.

Chapter 3 - X Windows Overview provides an overview of the X Window System.

Chapter 4 - Operating the NCD16 explains setup windows and how to run CTERM, Telnet, and terminal emulation sessions.

Chapter 5 - Keyboards explains the keyboards used with the NCD16.

Chapter 6 - Caring for your NCD16 describes how to perform preventive maintenance and cleaning procedures.

Chapter 7 - References lists documents that are available for reference.

Glossary

Appendix A - Specifications describes features and characteristics of the NCD16.

How to Use this Manual

If you have just taken delivery of the NCD16, you should read Chapters 1 and 2. Refer to Appendix A as necessary for specifications, to Chapter 2 if you need to change the hardware configuration, and to Chapter 4 for information on operating the NCD16.

To add memory, refer to Chapter 2. For routine maintenance and cleaning procedures, refer to Chapter 6.

An alphabetized, cross-referenced index is provided at the back of the manual.

We welcome any comments you may have concerning this manual. Address information including electronic mail and FAX is on the inside front cover.

Safety Considerations

This manual contains warning and caution symbols to denote operations which could cause injury to personnel or damage to equipment. Please do not ignore these symbols.

Warning

The warning sign denotes a hazard. It calls attention to a procedure or prac-tice, which, if not correctly performed or adhered to, could result in injury. Make sure you understand the indi-cated conditions before proceeding with the procedure or practice.

Caution

The caution sign calls attention to an operating procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product. Make sure you understand the indicated conditions before proceeding with the procedure or practice.

1 A Quick Look at the NCD16

Introduction

The NCD16 network display station (or X terminal) is an advanced graphics terminal that works with a network of computers to provide a highly productive window environment. The NCD16 includes

- a high-resolution, bit-mapped display
- software that supports version 11 of the X Window System (or X)
- a keyboard
- a three-button mouse

The NCD16 provides a window interface to a wide variety of X Window System client applications running on network-accessible hosts, such as Sun Workstations, VAX and UNIX minicomputers, and suppercomputers. It can initiate X Window System host sessions or--through Telnet, CTERM, or serial sessions--access hosts that do not support X. NCDnet software, available as an option, allows the NCD16 to communicate over DECnet, while another optional package, XRemote, allows the NCD16 to communicate with remote hosts.

The NCD16 has been designed and built based on standards. It supports not only the X Window System, but also Ethernet, TCP/IP (Transmission Control Protocol/Internet Protocol), and DECnet for superior network communications.

The NCD16 complements power with flexibility. An extensive set-up menu system lets you customize default settings and view diagnostic and network management information. A host-based configuration facility is provided to allow convenient, centralized configuration management. For typographic flexibility, eight different fonts are built into the NCD16. Others can be dynamically loaded from hosts over the network.

You will find that the NCD16 and other members of the NCD family of X window displays are ideal for a wide range of applications, including:

- Software development
- Computer-aided engineering, publishing, and design
- Information retrieval
- Office automation

Hardware and Software Components

The NCD16 consists of the following hardware components:

- A high-resolution display monitor assembly including the system power supply
- A base unit containing the digital electronics printed-circuit assembly (PCA) and the Ethernet module
- A keyboard
- A three-button mouse

The software components for the NCD16 are:

- Boot monitor
- X server, an executable module containing the X11 server, operating system, and communications protocols (Internet protocol stack and NCDnet protocol stack or XRemote protocol stack).
- Host-loaded fonts (optional)

The NCD16 software components are distributed as follows:

Component	Distributed as . . .
Boot Monitor	PROMs
X Server	PROMs QIC-24 cartridge 1/2-inch reel-to-reel tape (1600 bpi) TK50 cartridge
Fonts	X server tape font tape
License Pak	Optional with NCDnet

Modes of Operation

The NCD16 operates in one of ten modes:

- X server over TCP/IP Ethernet
- X server over TCP/SLIP (Serial Line Internet Protocol)
- X server over TCP/IP and DECnet
- X server over TCP/IP and DDCMP (Digital Data Communications Protocol)
- X server over DECnet
- X server over DECnet and TCP/SLIP
- X server over DDCMP via serial cable
- Telnet terminal over Ethernet
- ANSI RS-232-C terminal (serial terminal)
- CTERM over Ethernet

The operational mode is selected in the setup menus. The setup menus can be recalled at any time with the Setup key. The setup menus have a number of menus and sessions for manual configuration, diagnostics, statistics, Telnet, CTERM, serial session, and network management.

While in X server mode, the NCD16 can display X client windows from a variety of computers. The number of windows supported varies according to the application and the amount of RAM installed in the NCD16.

When running in the X server mode, you have the ability to open a Telnet session, CTERM session, or terminal session by switching to the setup menu. You can toggle between the X server mode or a session by pressing the Shift and Setup keys simultaneously to enter the most recently viewed setup menu, and by pressing the Setup key to return to X server mode.

For a functional description of XRemote, the software that allows an NCD16 to communicate over a serial line, see the *XRemote User's Manual.*

A complete description of all the features of the NCD16 is presented in *Appendix A, Specifications*.

2 Getting Started

Introduction

This chapter contains information that will allow you to install, configure, and operate the NCD16, including:

- Preinstallation Planning
- Equipment Supplied
- Unpacking and Inspection
- Repacking for Shipment
- Configuring the NCD16 Hardware
- Assembling the NCD16 Components
- Connecting the NCD16 Components
- Connecting the NCD16 to a Network
- Connecting AC Power
- Starting the Server
- Establishing a Connection to a Host
- Accessing the Auxiliary Serial Port
- Configuring NCD16 Software

Warning

Before assembling or connecting the NCD16 components, make sure that the AC power cord is not connected to the display monitor.

Preinstallation Planning

Before installing the NCD16, you should perform the checklist below. You will need help from your system administrator. The NCD release notes are also a guide for the most current information.

- Components — Verify that you have all equipment (see Equipment Supplied).
- Location — Decide on a suitable location for the NCD16.
- Inform your system administrator of the following:

  a. **The type of NCD display station** — NCD16.

  b. **The Ethernet address of your NCD16.** The Ethernet address can be found on the label on the bottom of the base unit. It contains 12 hexadecimal digits and should appear similar to the following:

     00:00:A7:00:02:AB

     With the Ethernet address, your system administrator can assign a network address, prepare a remote configuration file for your unit, and perform the steps to download your NCD16 if that's appropriate.

  c. **Your NCD16 License Key.** If your unit is licensed for NCDnet, you will have received a License Pak with the unit. Your system administrator can enable NCDnet on your NCD16 via NCD's remote configuration capability.

- Ask your system administrator the following:

  a. **What kind of network connection will you be using?** The supported interfaces are a thin Ethernet (sometimes called 802.3 10Base2, or Cheapernet) interface and an Attachment Unit Interface (AUI). The AUI can be connected to thick Ethernet, twisted-pair Ethernet, or other forms of Ethernet that use the same interface as thick Ethernet.

b. **How do you access the X clients?** You can access a host using one or more of the following methods:

   - X Display Manager (XDM)

   - Telnet

   - NCDnet (CTERM)

   - XRemote

   - SLIP

   Your system administrator can tell you which of these facilities are available to you.

c. **How do you modify your login environment?** What to type once you begin an XDM session or log in to a host via the Telnet, CTERM, or serial session. (If you use the Telnet, CTERM, or Serial session to start X applications, you will need to modify your login environment so that the X clients know what display to use.)

- Your system administrator will set up the following:

  a. **Download service** — Perform the steps necessary to download your NCD16, if a download is appropriate.

  b. **Configuration service** — Define a remote configuration file for your NCD16. This is optional. NFS or NCDnet require this service.

  c. **Font service** — Install the font files on the appropriate host.

Equipment Supplied

The NCD16 consists of the following components:

Quantity	Description
1	Monitor display unit with power cord
1	Base unit containing the electronics printed-circuit assemblies (PCAs)
1	User's Manual (this manual)
1	Documentation package
1	Keyboard
1	Three-button mouse
1	NCDnet license (optional)

Unpacking and Inspection

The NCD16 components are contained in four boxes, packed in a single shipping box, as shown in Figure 2-1. Inspect the NCD16 components as described in the following paragraphs.

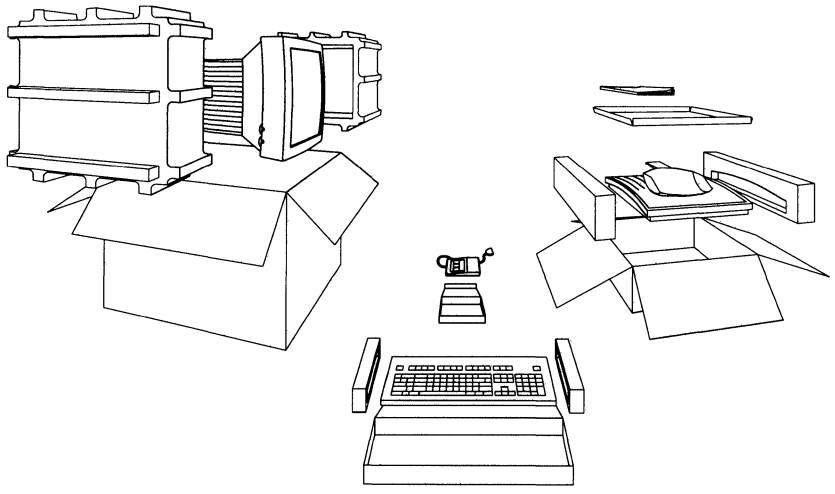


Figure 2-1. Shipping Container Contents

Shipping Container Contents

The units are packed in specially-shaped styrofoam protectors inside the shipping boxes. After unpacking the NCD16 components, inspect each item carefully for evidence of damage. If any item appears to be damaged, notify the shipping carrier and Network Computing Devices, Inc. (the address is contained on the title page of this manual), or the authorized representative from whom you purchased the NCD16. It is recommended that you retain the original shipping carton and packing material in case any NCD16 item has to be returned to Network Computing Devices.

If any item does not meet specifications or does not function properly, notify Network Computing Devices or your authorized representative immediately.

The NCD16 Hardware consists of five components:

- Display Monitor — See Figure 2-2
- Base Unit — See Figure 2-3
- Keyboard — See Figure 2-4
- Mouse — See Figure 2-5
- Power Cable

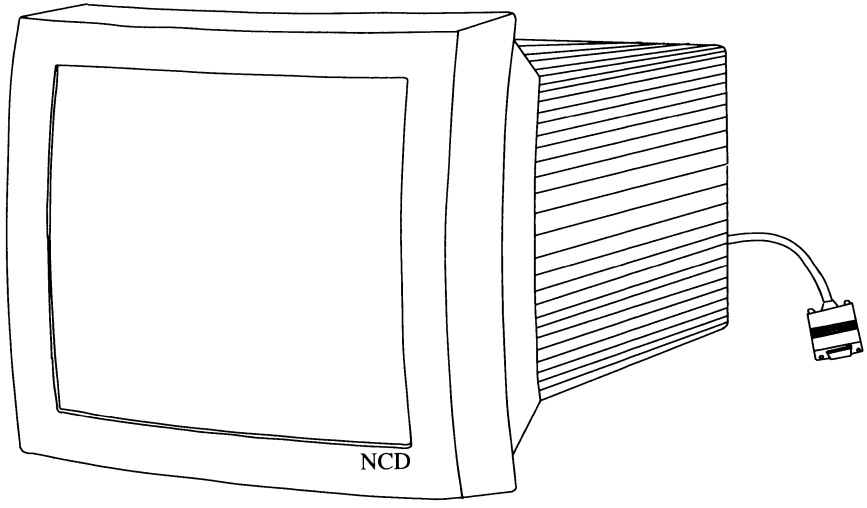


Figure 2-2. Display Monitor

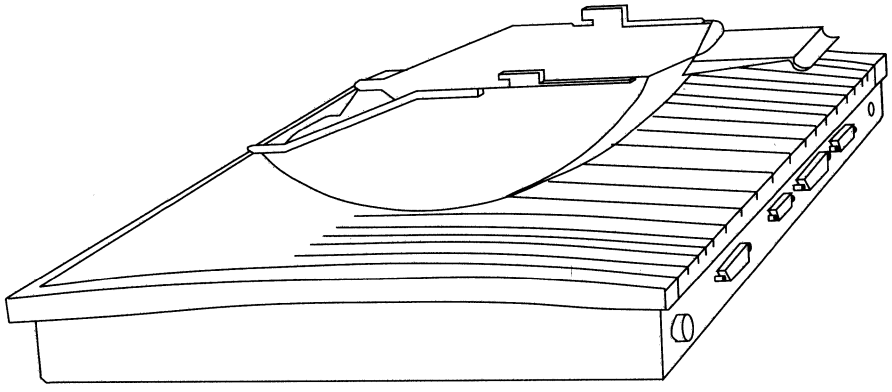


Figure 2-3. Base Unit

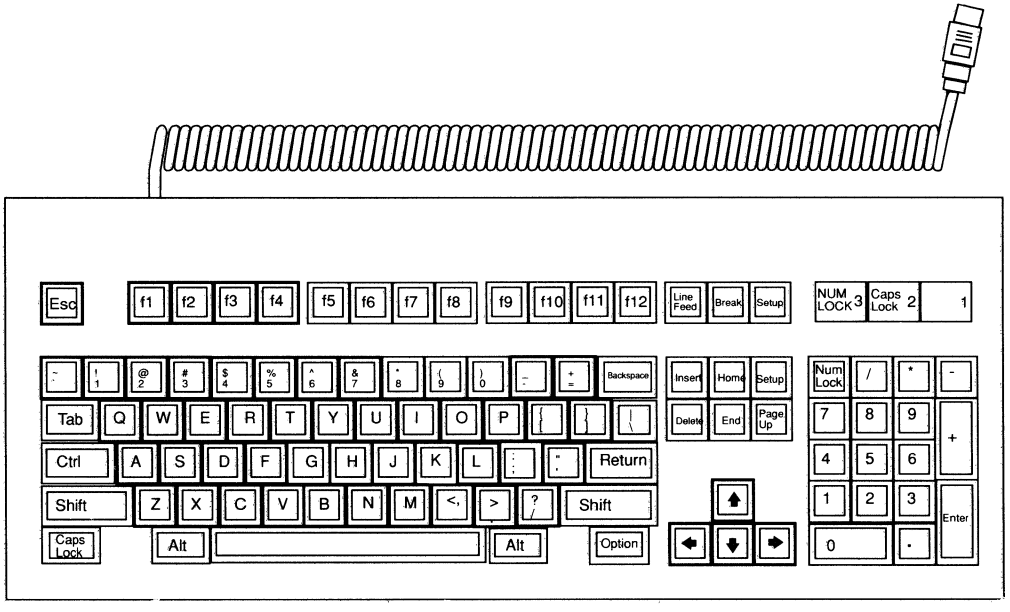


Figure 2-4. Typical Keyboard

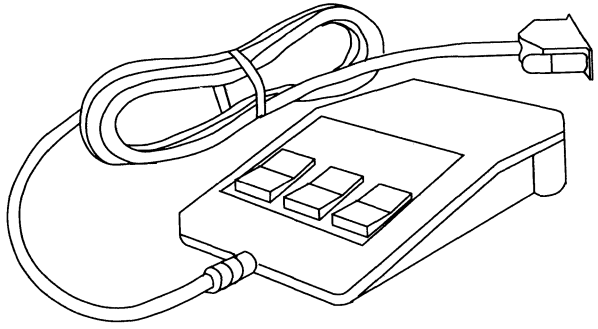


Figure 2-5. Mouse

Repacking for Shipment

If it is necessary to repack any NCD16 item for shipment, use the original carton and packing material, if available. If the original carton and material are not available, use a similar carton and pack the item(s) in suitable packing material; or take the unit to a commercial packing and shipping company for shipment.

Configuring the NCD16 Hardware

The hardware configuration options consist of:

- Setting jumpers on the communications interface module in order to change from thin Ethernet to an attachment unit interface AUI (used for thick, twisted-pair, or fiber-optic Ethernet)
- Adding memory to the main module

If you are using thin Ethernet and do not need to add memory, no hardware configuration is required.

The NCD16 is shipped from the factory configured for thin cable Ethernet. However, if you are going to use an AUI and transceiver to connect the NCD16 to other than thin cable Ethernet, this configuration can be changed by a set of jumpers located on the communications interface module.

Warning

Make sure that the AC power cord is not connected to the NCD16 display monitor.

Caution

Some of the electronic components used in the NCD16 are susceptible to damage by static discharge. Use caution when handling any printed-circuit assembly. If you remove any printed-circuit assembly, hold the assembly by its edges. If possible, rest the assembly on a static-proof mat and wear a grounding strap

Removing the Communications Interface Module

The communications interface module is removed from the rear of the NCD16 base unit as described on the next page.

1. Remove the two screws holding the module in place in the base unit. See Figure 2-6.

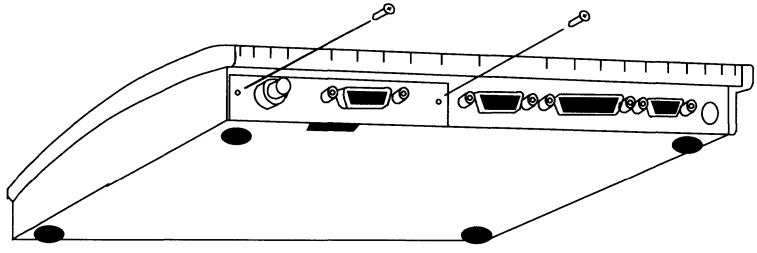


Figure 2-6. Removing the Communications Interface Module Screws

2. Place a flat-blade screwdriver in the slot at the bottom of the base unit and twist it to loosen the communications module. See Figure 2-7.

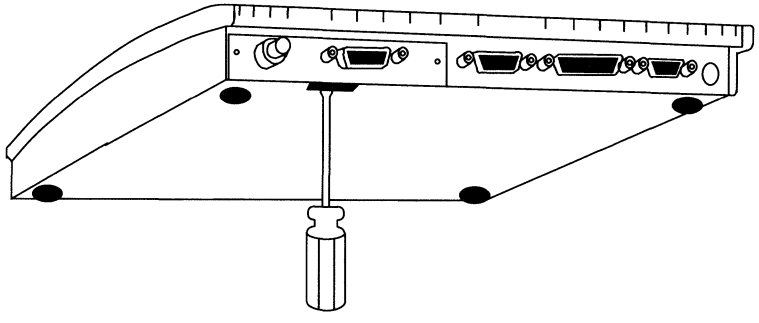


Figure 2-7. Removing the Communications Interface Module

3. Slide the communications module out of the base unit.

Configuring the Jumpers

There are ten jumpers on the Ethernet communications module. Six of these are for configuring the network interface, and the other four impact PROM size and speed. You do not need to change the jumpers unless you are using an external transceiver or are changing from a download to a PROM-based unit. See Figure 2-8 for the locations of the jumpers. The jumpers are described on the following pages.

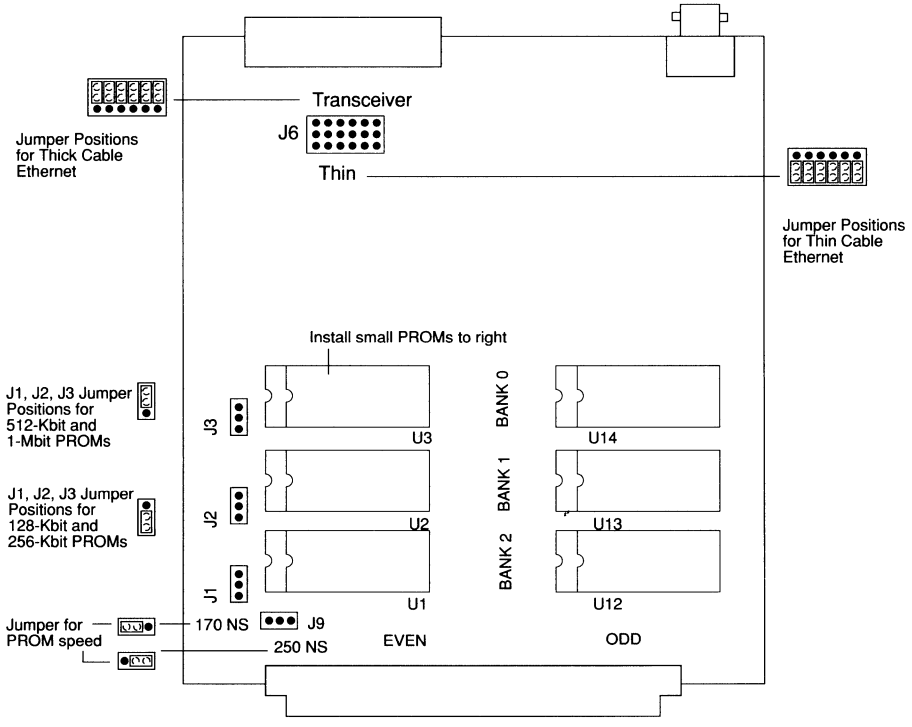


Figure 2-8. Ethernet Communications Module

PROM Size Jumpers

Jumpers J1, J2, and J3 are used to indicate the size of the PROMs installed on the Ethernet communications module. Jumper J1 controls the BANK 2 sockets U1 and U12; J2 controls BANK 1 sockets U2 and U13; and jumper J3 controls the BANK 0 sockets U3 and U14. Setting the jumpers toward the bottom of the communications module (as viewed in Figure 2-8) sets them for 128-Kbit and 256-Kbit PROMs. Setting the jumpers toward the top of the communications module sets the jumpers for 512-Kbit and 1-Mbit PROMs. The top of the communications module is the end where the external connectors TRANSCEIVER and THIN are mounted. See Figure 2-8.

PROM Speed Jumper

Jumper J9 is used to indicate the speed of the installed PROMs. See Figure 2-8 for the location of J9. The jumper is installed to the left for 170-ns PROMs, and to the right for 250-nsd PROMs (see Figure 2-8). PROMs may be mixed speeds of 170 and 250 nanoseconds. If any 250-ns PROMs are installed, the jumper must be set to the 250-ns position (to the speed of the slowest PROMs installed on the board).

Ethernet Jumpers

Jumper J6, which is a set of six jumpers, is used to configure the NCD16 for either a thin cable Ethernet network or for connecting a transceiver from the NCD16 to a thick cable, twisted-pair, or fiber optic Ethernet network.

Note that the unit is shipped from the factory with the jumpers configured for thin Ethernet. Thus you do not need to configure the jumpers if you are going to use thin Ethernet. If you are using other than thin Ethernet, configure the jumpers for your network as follows:

1. Verify the type of network you will be using (the type will have been determined in the preinstallation planning).
2. Check the settings of the jumpers (refer to Figure 2-8).
3. If required for your installation, remove the jumpers and reinstall them in the correct configuration. Refer to Figure 2-8 for configuration settings.

PROM Sockets

PROMs are installed in pairs occupying the EVEN and ODD sockets (as shown in Figure 2-8) starting in BANK 0, then BANK 1, followed by BANK 2. A minimally-configured NCD16 must have two PROMs in BANK 0. The PROMs are labeled to correspond with the BANK 0, BANK 1, BANK 2, EVEN, and ODD legends. There are two differences in the types of PROMs:

- **Physical package size.** The 27128, 27256, and 27512 PROMs are smaller and have fewer pins than 271001 PROMs. The outlines of the PROM sizes are shown in Figure 2-8. Large PROMs occupy the complete outline, while small PROMs must be installed to the right following the smaller outline.
- **PROM speeds.** PROMs come in 170-ns and 250-ns versions. Jumper J9 must be set according to the speed indicated on the PROM labels. In the case of mixed 170- and 250-ns PROMs, J9 must be set to the 250-ns position (the slowest speed).

Boot PROMs are two small PROMs and occupy BANK 0. If the unit is configured with server PROMs, four large PROMs will occupy BANK 1 and BANK 2.

Replacing the Communications Interface Module

Replace the communications interface module by sliding it into the base unit and replacing the two screws that lock the module into the unit.

Adding Additional Memory

The NCD16 has four slots for single in-line memory modules (SIMMs). SIMMs are installed in sets of two for 0.5-, 1.0-, 1.5-, 2.5-, 3.0-, or 4.5-Mbyte configurations. (Note that the 0.5-Mbyte configuration is not supported). Figure 2-9 shows the locations of the SIMM sockets on the main printed-circuit assembly (PCA). When 256-Kbyte and 1-Mbyte SIMMs are mixed, the 1-Mbyte SIMMs should be installed in sockets J8 and J10.

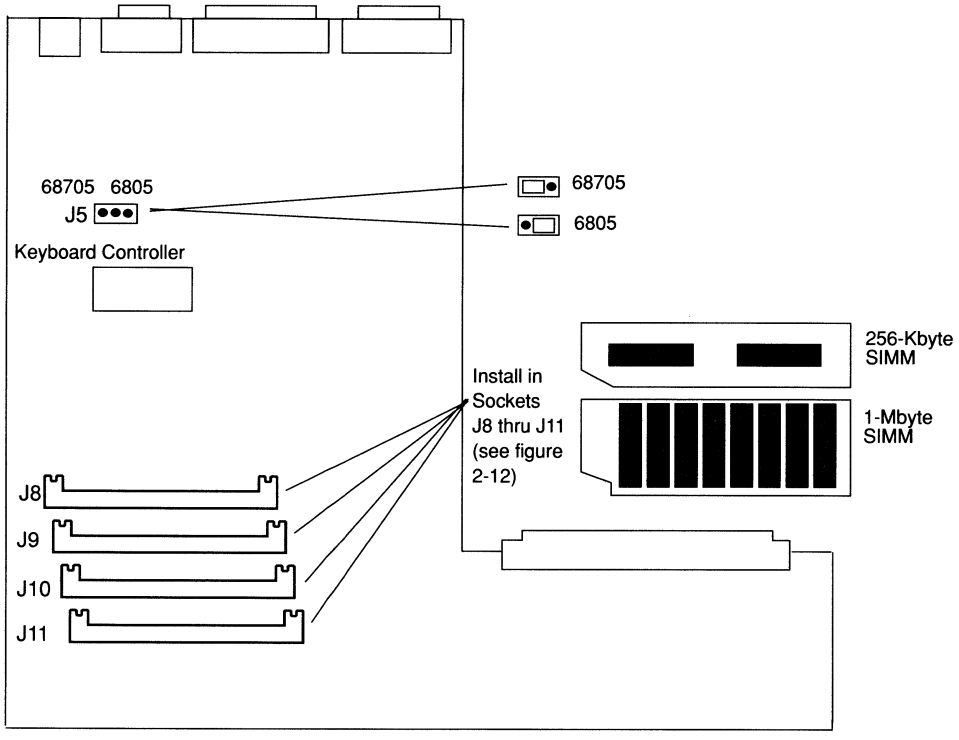


Figure 2-9. SIMM Socket Locations

Optional RAM is furnished in 0.5-Mbyte or 2-Mbyte increments. The 0.5-Mbyte increment consists of two 256-Kbyte SIMMs, each containing two 256-Kbit by 4-bit RAMs. The 2-Mbyte increment consists of two 1-Mbyte SIMMs, each containing eight 1-Mbit by 1-bit RAMs. The specifications for both SIMMs are: 100-ns, low profile (1.1-inch high), 0.047 to 0.054 inch board thickness (0.05 inch nominal), 256K by 8 or 1M by 8.

Warning

Before performing the following procedure, make sure the AC power cord is not connected to the NCD16.

Caution

Memory ICs and other components located on the main PCA are susceptible to damage by static discharge. Use caution when handling the main PCA and make sure you have touched a suitable ground before handling any memory ICs. Hold the main assembly by its edges, and if possible, rest the assembly on a static-proof mat and wear a grounding strap.

Accessing the Main PCA

To gain access to the main PCA:

1. Remove all cables from the display monitor and the base unit.
2. If the display monitor and base unit are attached to each other, separate them as described below.
    a. Turn monitor and base unit upside down and rest on a bench or other flat surface. (Be careful not to scratch the top of the NCD16.)
    b. Locate the locking tab handle at the rear of the display unit. See Figure 2-10.

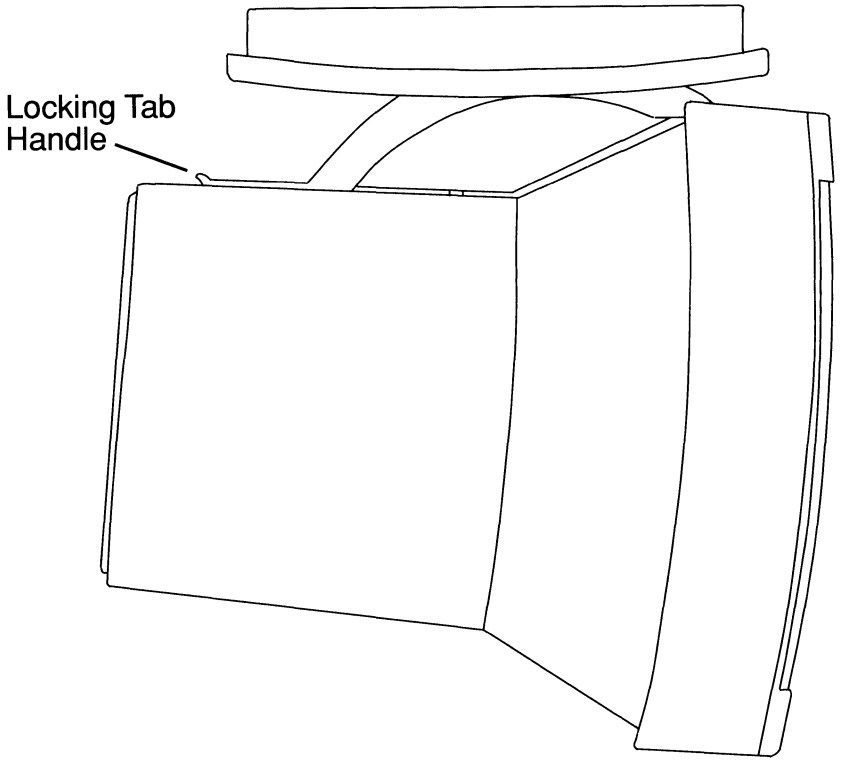


Figure 2-10. Location of Locking Tab Handle

c. Lift up on the locking tab handle. The tabs should disengage. Press your fingers against the base unit while holding the locking tab handle up. Push base unit back and away from the front of the monitor and lift the base unit off the monitor.

3. Place base unit upside down (so that ball on base unit is on the bottom) on a flat surface.

4. With the base unit upside down, remove the two screws (near the front edge of the base) from the bottom of the base unit.
5. Lift slightly the front edge of the base unit's bottom cover and pull toward the front to release the plastic fingers at the rear of the base unit.
6. If it is necessary to remove any SIMMs, proceed as follows:
   a. Place the base unit (with its cover removed) in front of you with the main PCA oriented as shown in Figure 2-9.
   b. Select the SIMMs to be removed.
   c. Use a small flat-blade screwdriver or similar instrument to release the locking tabs on each side of the SIMM socket (see Figure 2-11). Tilt the SIMM toward you and pull it out of the socket.

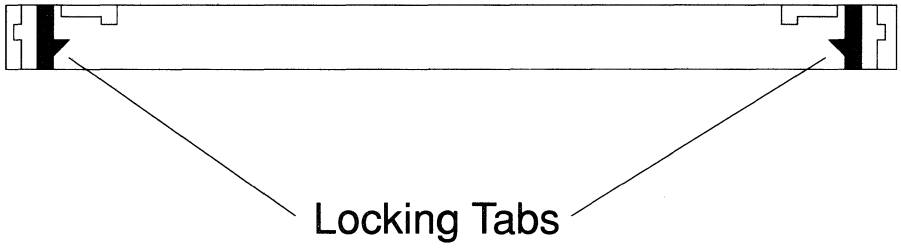


Figure 2-11. SIMM Socket Locking Tabs

7. Allowable configurations for the SIMMs in sockets J8 through J11 are shown in Figure 2-12. Install the SIMMs in sockets J8 through J11 as shown in Figure 2-12 and described below.

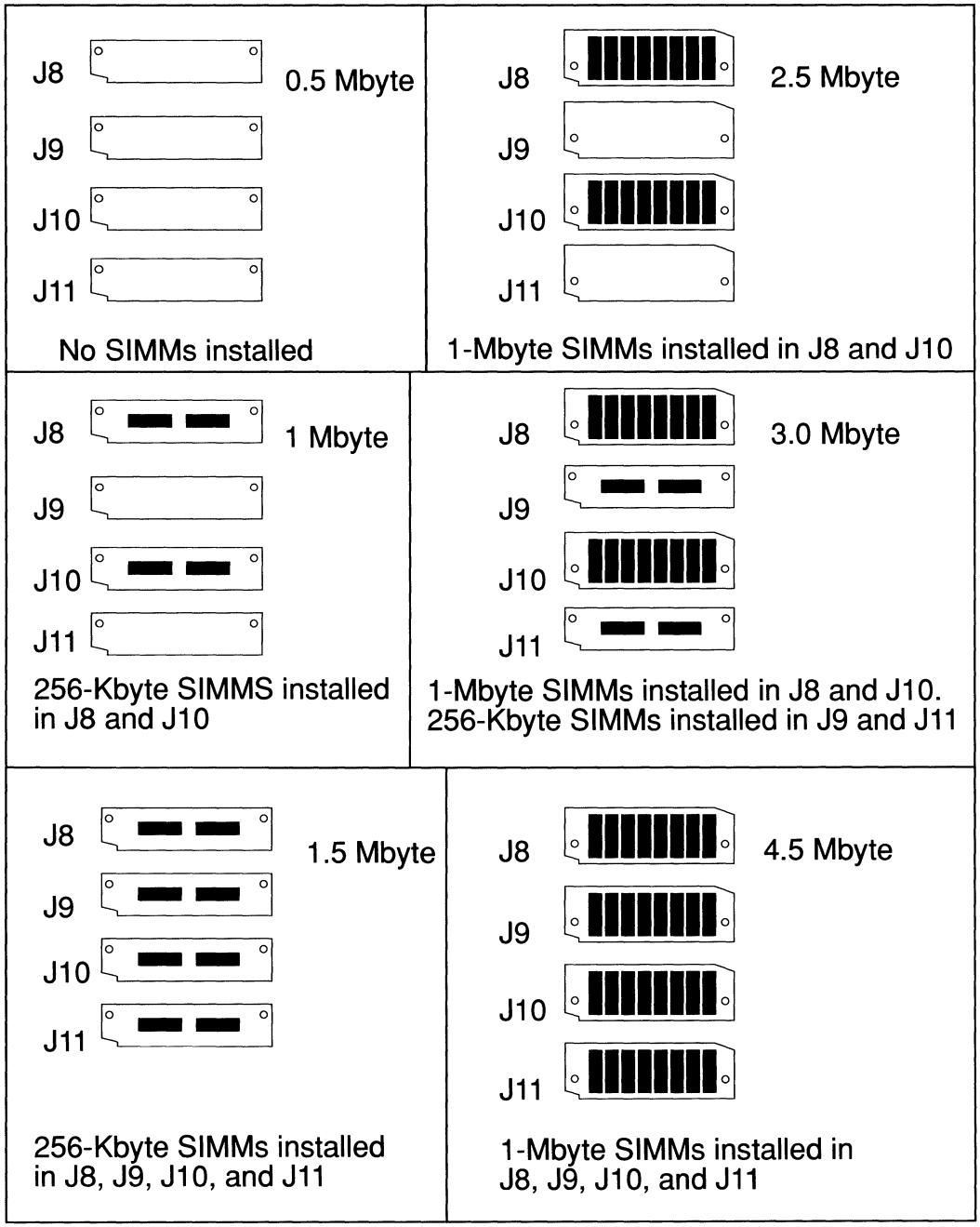


Figure 2-12. Allowable SIMM Configurations

a. Place the base unit on a flat surface in front of you with the main PCA oriented as shown in Figure 2-9.

b. Hold a SIMM by its edges and tilt it toward you. Push it firmly into a socket until you are sure it is seated all the way into the socket. Tilt the SIMM away from you until the two locking tabs, one on each end of the socket, click into place.

8. Once you have installed the additional RAM, replace base unit cover.

9. Right the unit and reconnect the cables.

Testing Memory

Whenever you add memory to the NCD16 or suspect that there may be problems with the terminal's memory, you should run the boot monitor's RAM March test on all banks of installed RAM.

To run this test, you need to enter the boot monitor. You can enter the boot monitor in one of two ways:

- Power up the terminal, then press the Esc key twice while the terminal is searching for an address or downloading the server.
- In the NCD16's setup menu, set "Boot X at Reset" to No, select "Save Power-On Values", then reset the terminal by double-clicking the setup menu's Reset Server button.

Once in the boot monitor, run the extended RAM test as outlined below for each bank of RAM installed. The SIMMs in J8 and J10 make up bank zero. Those in J9 and J11 make up bank 1.

1. At the boot monitor prompt (>), type ex and press Return.
2. To select the RAM March test, type 8 and press Return.
3. Enter the appropriate starting access value for the bank being tested--400000 for bank zero or 600000 for bank one. Press Return.
4. Using the table below, enter the appropriate ending address value for the bank being tested, then press Return.

SIMM Size in bytes	Bank 0 (J8, J10) Ending Address	Bank 1 (J9, J11) Ending Address
256K	47FFFF	67FFFF
1M	5FFFFF	7FFFFF

5. Run the test once by pressing the Return key when asked for a test choice. The diagnostic code will display either

   ```
   Pass - 00000001
   ```

   to signify that the memory is good, a message of the form

   ```
   was A5A5A4A5 s/b A5A5A5A5 at 42C458 March test failure
   ```

   if an error was detected. The first number is what the data was, the second is what was expected and the third is the memory address at which the discrepancy was detected.

6. If an error was detected, note the address of the failure (82C458 in the example above). Counting the bytes form zero to three and form left to right, note the byte or bytes in the test data that differ from the expected data (byte two in the example).

7. Using the table below, look up the first digit of the address at which the failure occurred and the byte that failed. The corresponding table entry gives the location of the failing SIMM.

Byte	400000 to 5FFFFF	600000 to 7FFFFF
0	J8	J9
1	J10	J11
2	J8	J9
3	J10	J11

8. In the example above using the column labeled "400000 to 5FFFFF" (for 42C458) and the row labeled 2 (discrepancy was in byte 2), the table reveals that the SIMM in J8 is failing.

9. Replace any failing SIMMs or remove the entire bank of SIMMs containing the failing SIMM, then rerun the memory test.

10. If you entered the boot monitor by pressing Esc twice and the test passed, you can reset the terminal by typing

    ```
    rs
    ```

    at the boot monitor prompt and pressing Return.

11. If you entered the boot monitor by setting "Boot X at Reset" to No, you need to reboot the terminal using one of the b commands: bd, bp or bt. For information on these commands, refer to the section called *Starting the Server* later in this chapter.

Coprocessor

The coprocessor socket is located at U50 as shown in Figure 2-9. If a coprocessor is installed, pin 1 (as indicated by a special mark on the coprocessor) should be located as shown in Figure 2-9.

Assembling the NCD16 Components

> **Warning**
>
> Make sure the AC power cord is not connected to the NCD16.

Attaching the Display Monitor to the Base Unit

The display monitor is anchored to the base unit via a set of tabs and locking latches on the base unit.

To assemble the display monitor and base unit into a combined assembly:

1. Turn the display monitor upside down and rest it on a flat surface. Use care to avoid scratching the top of the NCD16. A bottom view of the display monitor is shown in Figure 2-13.

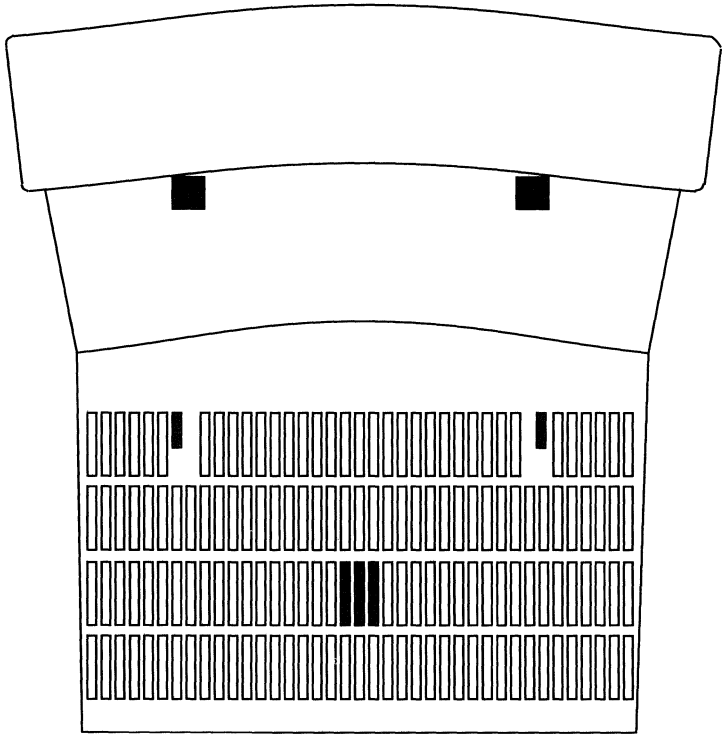


Figure 2-13. Display Monitor, Bottom View

2. Note the locations of the slots on the bottom of the display monitor.
3. Grasp the base unit and turn it upside down so that its top side will connect to the bottom side of the display monitor. See Figure 2–14.

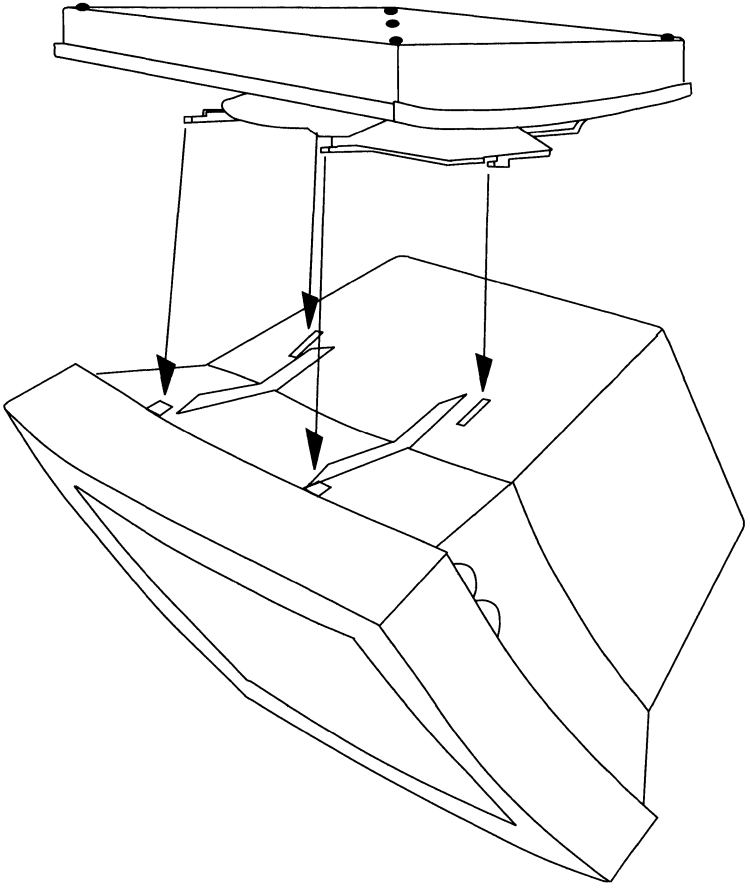


Figure 2-14. Base Unit/Display Monitor Tab and Tab Socket Locations

4. Insert the base unit tabs into the display monitor slots as shown in Figure 2-15. Push the base unit toward the front of the display monitor until the tabs on the base unit are locked into slots on the display monitor.

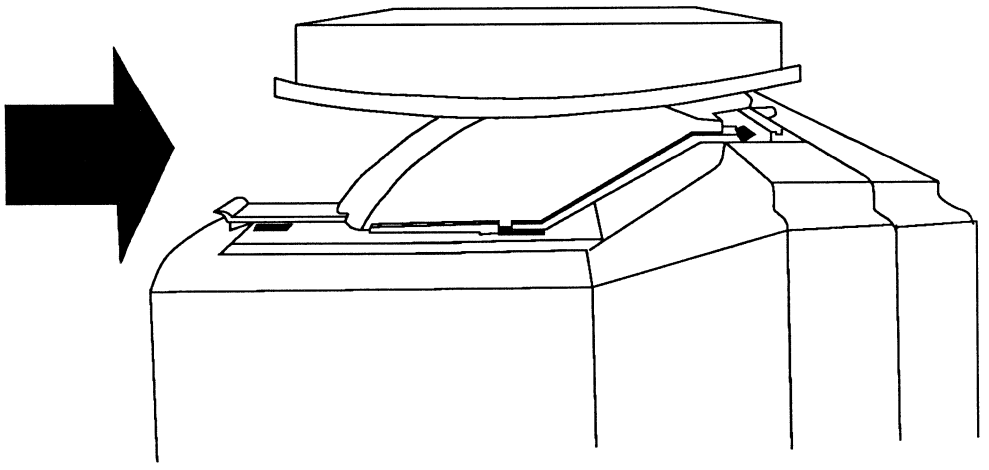


Figure 2-15. Attaching the Base to the Monitor

Caution

Make sure that the base unit and display monitor are locked together before you attempt to turn the assembly right side up.

5. Turn the base unit/display monitor assembly right side up and place it on a flat surface where it will be located. Figure 2-16 shows the assembled unit.

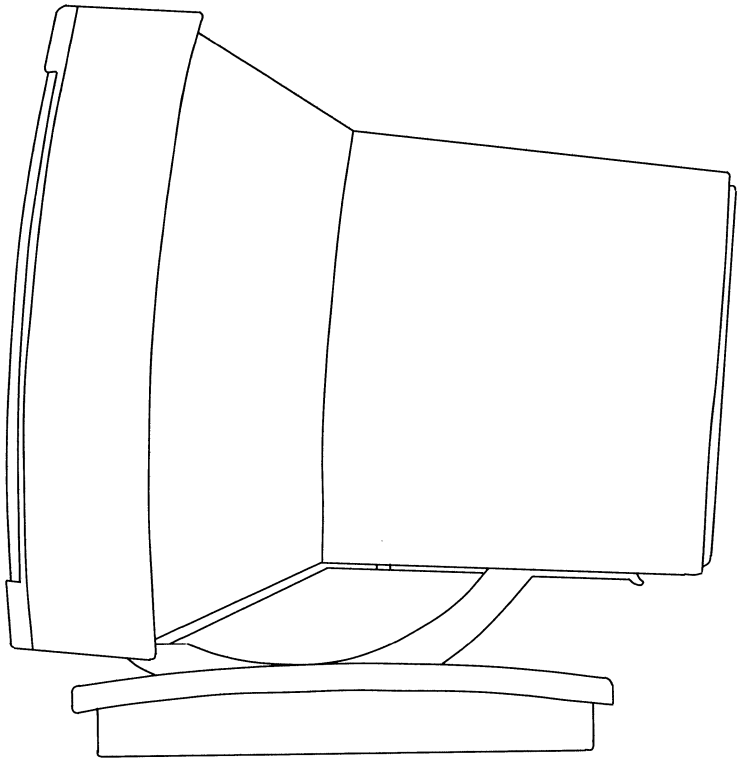


Figure 2-16. Display Monitor/Base Unit Assembly

Connecting the NCD16 Components

The display monitor, keyboard, and mouse all connect to the base unit via connectors located on the rear panel of the base unit. The connectors are illustrated in Figure

2-17. Pinouts for all cables are described in Appendix A, Specifications.

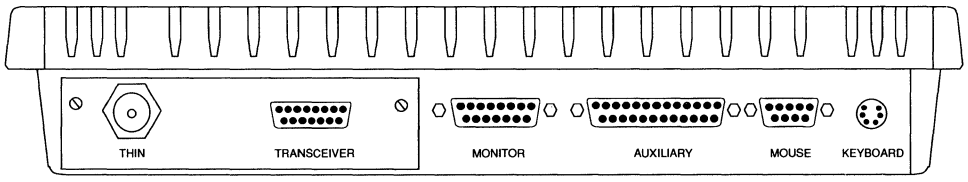


Figure 2-17. Base Unit Connector Locations

Note

The display monitor-to-base unit cable, the keyboard-to-base unit cable, and the mouse-to-base unit cable are all integral parts of the display monitor, keyboard, and mouse, respectively. That is, one end of these cables is permanently attached to their respective units.

Caution

Do not connect the power cord to the NCD16 unless the monitor, keyboard, and mouse cables are all connected. Do not disconnect any of these cables when the NCD16 is powered on.

Connect the NCD16 components as follows:

1. Connect the display monitor cable to the monitor connector on the rear of the base unit. Be sure to tighten the retaining thumbscrews on the connector.
2. Connect the keyboard cable to the keyboard connector on the rear of the base unit.
3. Connect the mouse cable to the mouse connector on the rear of the base unit.
4. Tighten the screws on all connectors.

Caution

Be especially sure that the retaining screws on the display monitor cable are tight. Failure to secure this connector may result in damage to the unit.

Connecting the NCD16 to a Network

The NCD16 connects to a thin cable Ethernet network via a BNC connector on the rear of the base unit or to an AUI cable via a 15-pin D connector (DB-15) on the rear of the base unit. Note that an external transceiver is necessary when connecting to the DB-15 connector.

For details on connecting the NCD16 to a system or modem for XRemote, see the *XRemote User's Manual.*

Thin Cable Ethernet Installation

Connecting the NCD16 to a thin cable Ethernet network is accomplished with a BNC "T" connector as illustrated in Figure 2-18.

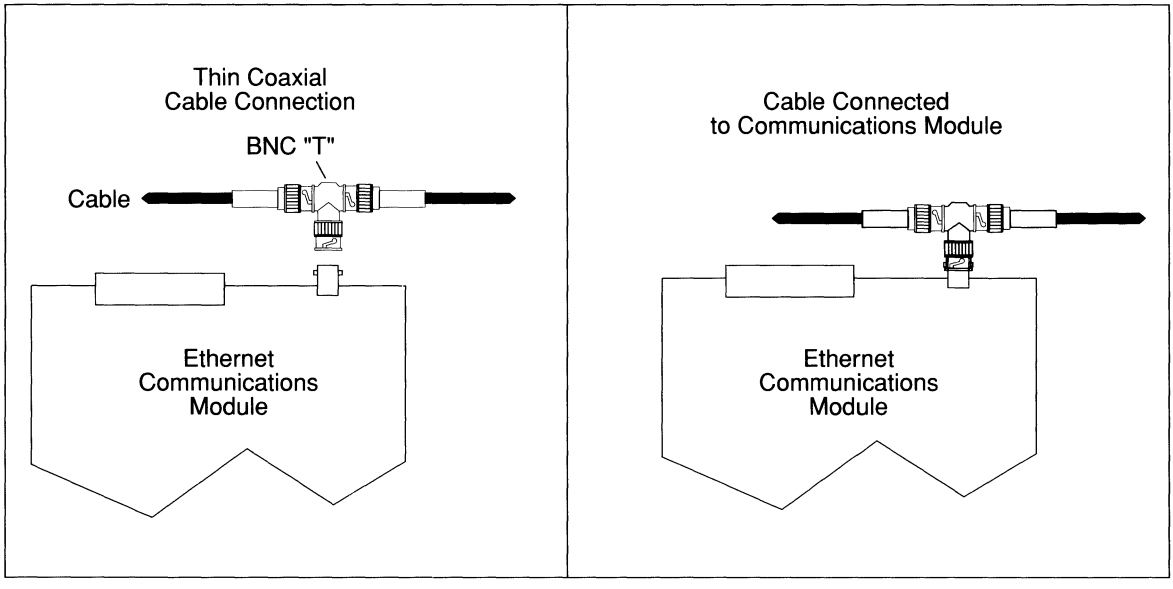


Figure 2-18. Thin Cable Ethernet Connection

1. As shown in Figure 2-17, connect the BNC "T" connector to the thin coaxial network cable at an appropriate location on the cable.
2. Connect the BNC "T" connector to the BNC connector on the back of the NCD16 base unit.

External Transceiver Cable Installation

As noted, if you are not using thin Ethernet, an external transceiver must be connected via an AUI cable. The connection to a typical external transceiver used with the NCD16 is illustrated in Figure 2-18.

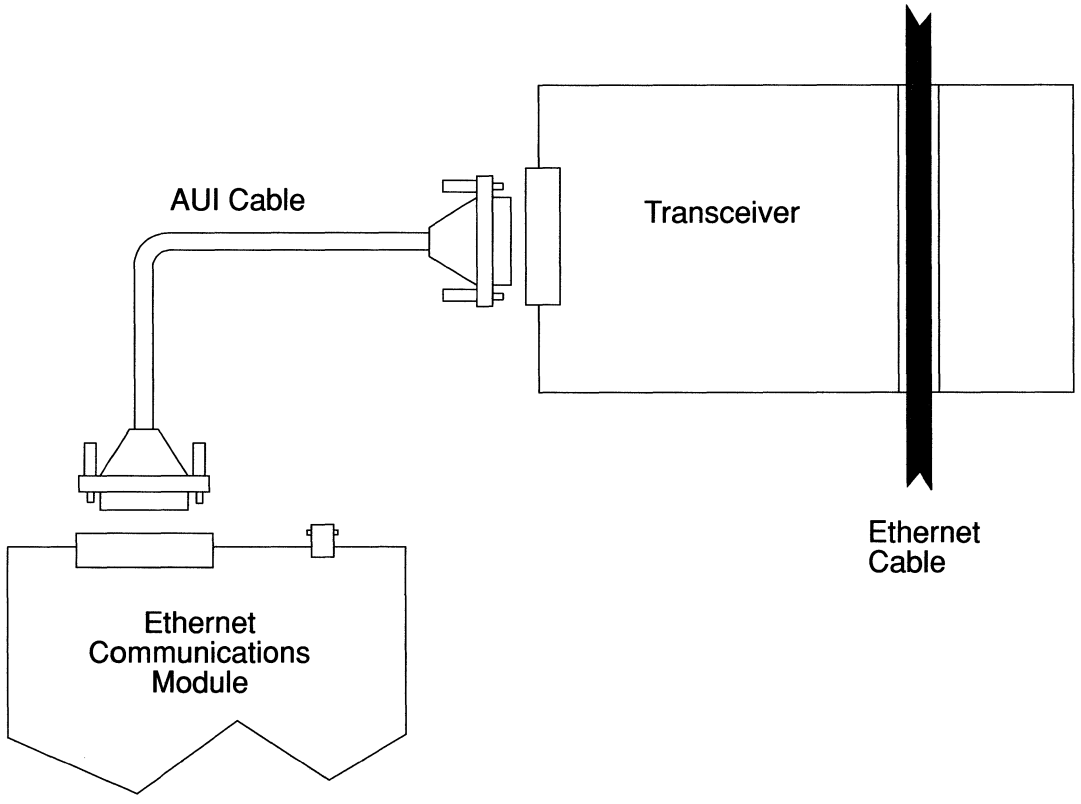


Figure 2-18. Connecting a Transceiver to the NCD16

To connect the NCD16 to the external transceiver, connect the AUI cable (furnished with the transceiver) to the 15-pin connector labeled "TRANSCEIVER" on the back of the base unit.

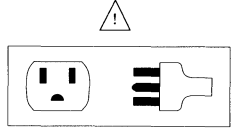
Connecting AC Power

Warning

Do not connect the power cord to the NCD16 unless the display monitor, keyboard, and mouse are all connected to the base unit connectors.

This product is equipped with a 3-wire grounding-type plug (a plug having a third (grounding) pin). This pin will fit only a grounding-type AC outlet.

If you are unable to insert the plug into the outlet, contact a licensed electrician to replace the outlet with a properly-grounded outlet.



Do not defeat the purpose of the grounding-type plug.

To apply power to the NCD16, make sure the display monitor power switch, located on the right side of the unit, is off. (The switch is off in the 0 position, and on in the 1 position.) Then plug the power cord into the back of the display monitor unit and into a wall outlet.

Set the power switch, located on the right side of the display monitor unit, to ON (to the 1 position).

Starting the Server

When power is applied to the NCD16, the boot monitor tests the unit and a display similar to the following example will appear on the screen.

```
Boot Prom V2.1.0
Testing available memory          1.0 Mbytes
Network controller passed         00:00:A7:00:02:AB
Keyboard controller               V2.00
```

Once the self-test has been successfully completed, the boot monitor (depending on configuration information stored in non-volatile RAM) will perform one of the following:

1. Enter the boot monitor. A > prompt is displayed. Note that no cursor is displayed in the boot monitor. The message will appear similar to the following:

   ```
   Network Computing Devices NCD16 Boot Monitor
   >
   ```

2. Load the server from PROM (only works on units with server PROMs). The message will read similar to the following:

   ```
   Found server code at 0x40000
   Unpacking text ... Unpacking data ... Done
   ```

3. Load the server via the network. The message will appear similar to the following:

   ```
   Searching for IP address...
   Using IP address - 192.043.153.079
   ................
   Loaded
   ```

or

```
Searching for host ..

..........

Loaded
```

This is followed by server initialization messages.

If the server is successfully loaded, it displays a "root-weave" window (a dark gray pattern), and, depending on configuration parameters, will display one of the built-in sessions such as the Telnet, CTERM, or Serial Session.

If only the root weave screen is displayed, the Setup key can be used to display the main setup menu. When the setup menus are displayed, pressing the Setup key returns the unit to the X server mode. When in X server mode, pressing the Shift and Setup keys simultaneously enters the most recently viewed menu or session. In other words, the Setup key toggles between the setup menus or sessions and X server mode.

Should the server fail to load, an error message and prompt is displayed. Download can fail for a number of reasons, such as:

- You are not connected to the network.
- No download available.
- The appropriate network code is not running on the download hosts.
- Your Ethernet address has not been entered in the host data base.

Check your network connection. Then check the jumper settings. If everything appears to be correct, see your system administrator for assistance.

You can manually download the server using TFTP by entering the boot command:

```
bt Xncd {NCD IP address} {host IP address}
```

where,

Xncd is the optional server image

NCD IP address is your unit's internet address in hex or decimal dot notation (optional)

host IP address is the TFTP host's internet address in hex or decimal dot notation (optional)

Or you can manually download the server using MOP by entering the boot command:

```
bd Xncd
```

where

```
Xncd – optional server image
```

If you cannot get the server to load, refer to the system administrator's manual for more information on the boot monitor, or see your system administrator for assistance.

To boot the server from PROMS use the command:

```
bp
```

To use X you must first create an authenticated connection to a host. This can be done using the X Display Manager (XDM) or by logging into a host. On the NCD16 you can log into a host using the Telnet, Serial, or CTERM sessions. The following paragraphs describe using XDM or host login to start X clients.

Establishing a Connection to a Host

There are several ways to establish an initial connection with a host system to allow applications to be run on the NCD19.

- X Display Manager
- Telnet
- NCDnet using CTERM
- XRemote
- SLIP

Each of these is discussed in the following paragraphs.

Starting an XDM Session

The XDM login window may be displayed over the root-weave window when the server starts as shown in Figure 2-20. This depends on configuration parameters. If there is no XDM login window displayed and you want to use XDM, press the Setup key and select the X Server Parameters menu. In the lower portion of that setup menu you will find the XDM Parameters section. These parameters control XDM on the NCD16. See Chapter 4, Operating the NCD16, for further information.

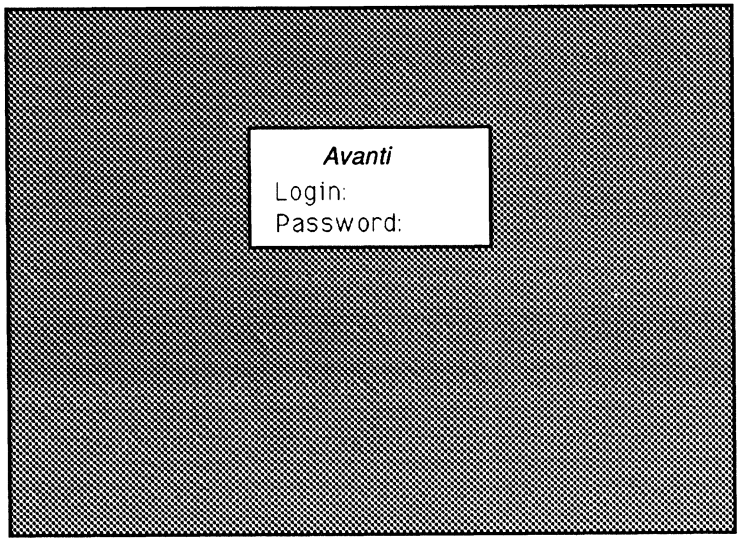


Figure 2-20. XDM Login Window

Once the XDM login window appears, log in by typing your user name followed by a return and your password followed by a return. This will cause an XDM session to be started for you

by executing your .xsession file (found in your home directory), or by starting an xtermif you have no .xsession file. If the last command in your .xsession file exists the system and the session is terminated. Consult your system administrator if you have trouble.

Starting a Telnet Session

The Telnet session window may be displayed over the root–weave window when the server starts (see Figure 2-21). This depends on configuration parameters. If there is no Telnet session displayed and you need to use Telnet, press the Setup key and select the Telnet session. See Chapter 4, Operating the NCD16, for further information.

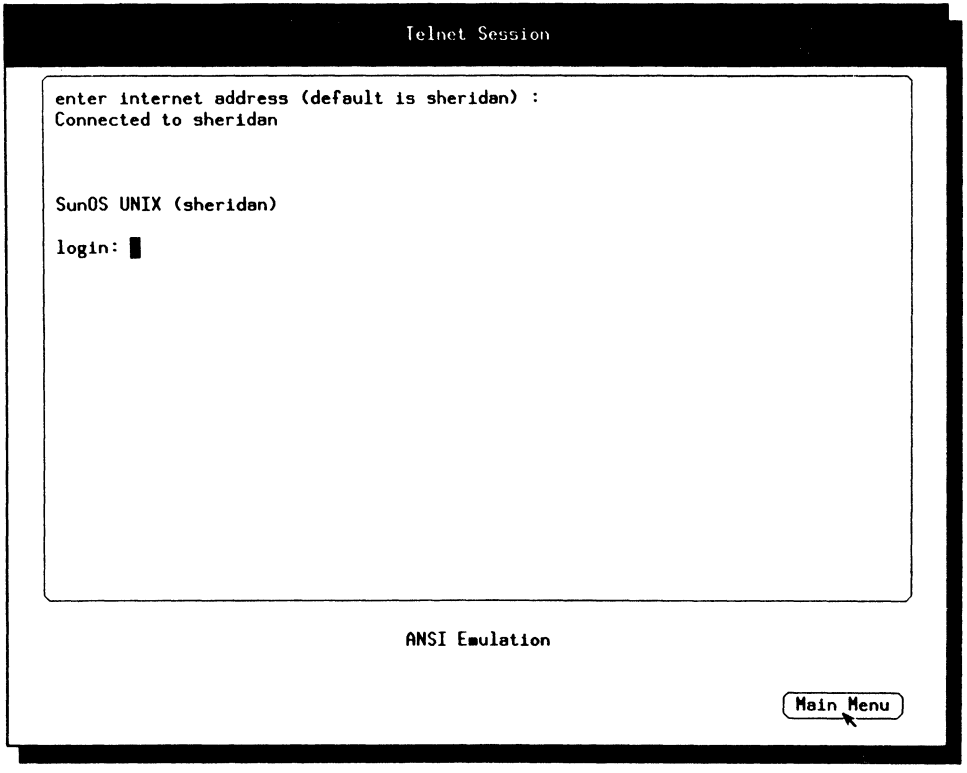


Figure 2-21. Telnet Session Window

This allows you to log in to a host that supports Telnet and start an X client on your NCD16.

You must first connect to the host system. The prompt looks like:

```
enter internet address (default is xyz):
```

To choose the default host, simply press Return. Otherwise, specify a host with either

IP addr - decimal-dot notation (i.e., 192.43.153.16)

or

host - host name

You can use a host name if your network provides a name service. Consult your system administrator if you have trouble. You can then log in to the host.

Starting an X Client

After logging in you must inform potential X clients of your server address. For example, on UNIX systems:

```
% setenv DISPLAY NCDhost:0
```

This sets the DISPLAY variable in your environment. NCDhost is your unit's host name assigned by the system administrator in the host data base. If you don't know your host name, or host name service is not available on your network, you can enter your internet address (available in the Network Parameters setup window).

You can then start a client such as XTERM:

```
% xterm &
```

or a window manager, such as uwm:

```
% uwm &
```

You must exit the setup windows in order to use the X client. The setup windows freeze any underlying X server activity.

Starting with DECnet

NCDnet is a licensed option that allows your NCD16 to access DECnet. In order to use NCDnet the license key must be installed, and then you may connect to a DECnet host using CTERM.

License Key Installation

Normally your system administrator will install your license key for you via remote configuration. You can verify your license key by selecting the Licenses Features setup menu. (This menu is described in Chapter 4, Operating the NCD16.) If NCDnet has been installed, the menu should indicate:

```
Licensed Features:  NCDnet
```

If the NCDnet license key has not been installed, you can install it by entering the

12-letter license key found on your License Pak shipped with your unit in the License Key field in the setup menu. First select the License Key field by clicking with the left mouse button. You may use either upper or lower case to enter the key followed by pressing the return key. If the key is correct, NCDnet will appear as a licensed feature. Then go to the main menu and save the current configuration in NVRAM. The License Key field will remain visible until you reboot your unit.

If the license key is incorrect, Bad Key will appear on the screen. Contact your system administrator or NCD if you have a problem with the license key.

Starting a CTERM Session

The CTERM session is only available if the NCD16 has been configured with the correct license key to allow the use of NCDnet.

The CTERM session might be displayed over the root-weave when the server starts; this depends on configuration parameters. If there is no CTERM session displayed and you need to use CTERM, press the Setup key and select the CTERM session. See Chapter 4, Operating the NCD16, for additional information.

If the CTERM session menu choice is not present, there are two possible causes:

1. You are not running the correct version of the server.
2. You are running the small memory image version of the server.

In either case, see your system administrator for assistance.

The CTERM session is shown in Figure 2-21.

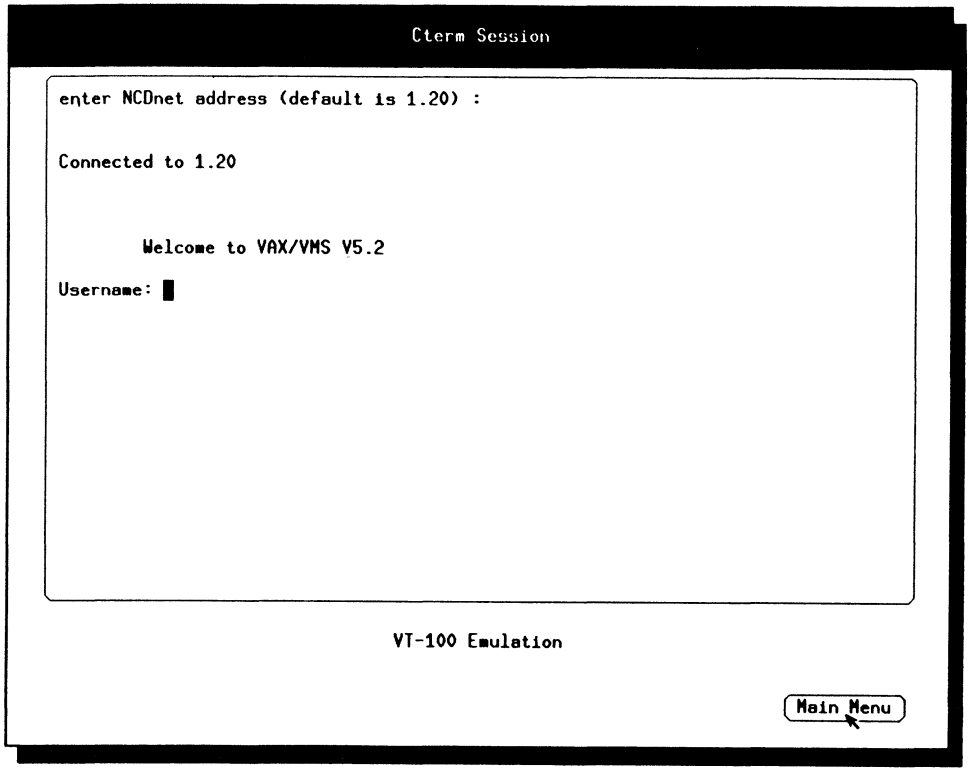


Figure 2-21. CTERM Session Menu

The CTERM session allows you to log in to a host that supports CTERM and start an X client on your NCD16.

First you must connect to the host system. The prompt in the CTERM session looks like:

```
enter NCDnet address (default is xyz):
```

If the system you want to connect to is xyz, simply press Return. If you do not see a default, like xyz, in the prompt you will have to type a host name or address. A host name is the DECnet node name of the host. A host address is simply the DECnet node address (e.g., 3.75).

You can only use a host name if the NCD16 has been configured with a list of name-to-address pairs. See your system administrator if you have trouble.

Once you have selected the host, log in.

If the host is a VMS machine in which an NCD boot or font tape has been installed, the account NDS_LOGIN provides the simplest means of starting the DECwindows system. This account has no password and only allows access to start DECwindows on a remote X device. Log in as NDS_LOGIN and then exit the setup windows by pressing the Setup key. After a short delay, you should see the DECwindows login banner.

Once the DECwindows login banner appears, you can log in and you'll be running DECwindows on your NCD16.

If the host is an ULTRIX machine, simply log in to the host and follow the directions in the paragraph "Starting an X Client".

Using XRemote

XRemote is an optional software product that allows the NCD16 to run the X Windows System protocol efficiently over a serial connection.

With the addition of an XRemote PROM set, the NCD16 can be configured to use the X server using a serial line rather than Ethernet using the XRemote communication and compression protocols.

See the *XRemote User's Manual* for more detailed information on XRemote configuration and operation.

Using the X Server Over TCP and SLIP

The NCD16 can be configured to use the X server using a serial line rather than Ethernet by using the TCP protocols over SLIP (Serial Line Internet Protocol). The use of SLIP varies widely with the host or gateway providing the SLIP service at the other end of the serial line.

In order to use SLIP follow the steps below:

1. Configure the serial port. Go to the Serial Parameters setup window. The suggested configuration of the Auxiliary Port Parameters is as shown on the next page.

Parameter	Suggested Value	Comments
Data Bits	8	Required
Stop Bits	1	Must match receiver's configuration
Parity	None	Must match receiver's configuration
Handshake	DTR/DSR or RTS/CTS	Choose to match modem or other equipment
Baud Rate	38400	Choose to match modem or other equipment; as high as possible

2. Configure the serial port for a serial session by selecting *Terminal Session* on the *Use Port for* field.
3. Go to the Serial Session window. Establish the connection to the receiving equipment. If you are using a modem, dial the telephone and make a connection to the receiving equipment's modem. Then if you are using a gateway, establish a connection with the gateway. Otherwise, log into the SLIP host.
4. Set the receiving equipment into 'SLIP' mode. On some UNIX operating systems this might involve the *slattach* command. For gateways, there might be a *SLIP* command.

5. Set the system internet address. Go to the Protocol Parameters window and enter your unit's decimal-dot internet address in the *System's IP Address* field. This address can either come from your system administrator or may have been issued and displayed to you by your gateway when the receiver entered 'SLIP' mode.

   If your unit's internet address is unchanging you can avoid step 5 in the future by saving the configuration in NVRAM.

6. Set the gateway internet address. Set the receiver's decimal-dot internet address in the *Default Gateway* field in the Protocol Parameters window. If the receiver's internet address is unchanging you can avoid this step in the future by saving the configuration in NVRAM.

7. Switch serial port. The serial port must be changed to be the unit's network connection, disconnecting Ethernet and connecting to the serial port. Go to the Serial Parameters window and select *Network Interface* on the *Use Port for* field. This reconfiguration takes place immediately.

8. Verify the connection. Go to the Network Management window and ping the host using the Network Test Utility. Enter the host's internet address and click on the TEST field. If you have problems, contact your system administrator.

You can now use Telnet to start X clients on the host machine. Using Telnet and starting an X client are described elsewhere in this chapter.

Accessing the Auxiliary Serial Port

The NCD16 can be configured to allow host computer access to the Auxiliary serial port on the back of the NCD16.

The serial port is accessed using a utility that opens a connection to a well known TCP port number on the NCD16. This provides a bidirectional connection on which data transmitted to the NCD16 is sent out on the serial port and data arriving on the serial port is transmitted to the host. The Serial Port Parameters are used to control the configuration and can be set directly through the Serial Port Parameters or by remote configuration.

Sources for a sample application are provided on all UNIX system distribution tapes provided by NCD. See your system administrator for more information on this sample utility.

Configuring NCD16 Software

There are two methods for configuring NCD16 software: remote configuration and Setup menus. Many of the configuration parameters are saved in non-volatile memory (NVRAM), which allows the user or system administrator to set values once upon installation and then be free from these details when the NCD16 is booted in the future.

Remote configuration allows the system administrator to create ASCII configuration files for one or more NCD16s and then centrally administer the configuration information without having to physically contact each NCD16. The file

```
/usr/lib/X11/ncd/configs/<NCD IP address>
```

or

```
NCD_CONFIGS: [000000] AA_NNNN.DAT
```

is read from a host at the time the server is initialized.

<NCD IP address> is the NCD16's uppercase hexadecimal internet address. For example, a unit with internet address 192.43.153.57 translates to a file name C02B9939.

AA_NNNN.DAT is a file whose name is composed of the DECnet area (AA) and node (NNNN) number at the NCD16. For example, if the DECnet address is 1.25, the configuration file name is 01_0025.DAT.

Should the above file not exist, the server also tries

```
/usr/lib/X11/ncd/configs/ncd_std
```

or

```
NCD_CONFIGS: [000000] NCD_STD.DAT
```

as a configuration file. If no configuration file exists, the server then uses parameters found in NVRAM.

Remote configuration file errors are displayed in the diagnostic session. The use of remote configuration is controlled by the Network Parameters setup menu and is enabled by the Remote Configuration parameter. The method for accessing the remote configuration files is controlled by the Config File Access parameter, which offers either TFTP, NFS or NCDnet. The host providing the remote configuration files is selected with the Configuration Server parameter.

Refer to the system administrator's manual for more information. The set of remote configuration parameters is described there, along with the description of the file format. Chapter 4, Operating the NCD16, contains a complete description of the setup menus.

3 X Window System Overview

Introduction

This chapter contains a brief overview of the X Window System. It is assumed that you are familiar with the X Window System, and the brief overview presented here should be considered merely as a refresher. Refer to the *X Window System User's Guide for Version 11*, by Tim O'Reilly, Valerie Quercia, and Linda Lamb, published by O'Reilly and Associates, Inc., for a complete discussion of the X Window System. This document is available at computer book stores.

The X Window System, also referred to as "X" in this manual, was originally developed by MIT in the C programming language for workstations running UNIX; however, it is not confined to a particular operating system or to specific hardware. For example, X will run under many variations of UNIX, such as 4.3BSD UNIX, ULTRIX-32, etc.; and other operating systems such as VAX/VMS and MS/DOS. In addition, any computer hardware running one of these various operating systems can support the X Window System.

The X Window System is divided into two parts: the *display server*, and *application clients*. These two parts can reside on the same computer or be separated over a network. As implemented by the NCD16, the display server resides on the NCD16, where it provides graphics display capabilities and monitors user input, and the application client resides on a host computer. Thus, the computational power for the application program does not need to reside on the NCD16, which can instead use its powerful microprocessor to display graphics and track the mouse and keyboard. The host computer, which can range from a workstation to a minicomputer to a supercomputer, hosts the application client and performs all of the client's computational functions. This separation of functions over a network is conceptually illustrated in Figure 3-1.

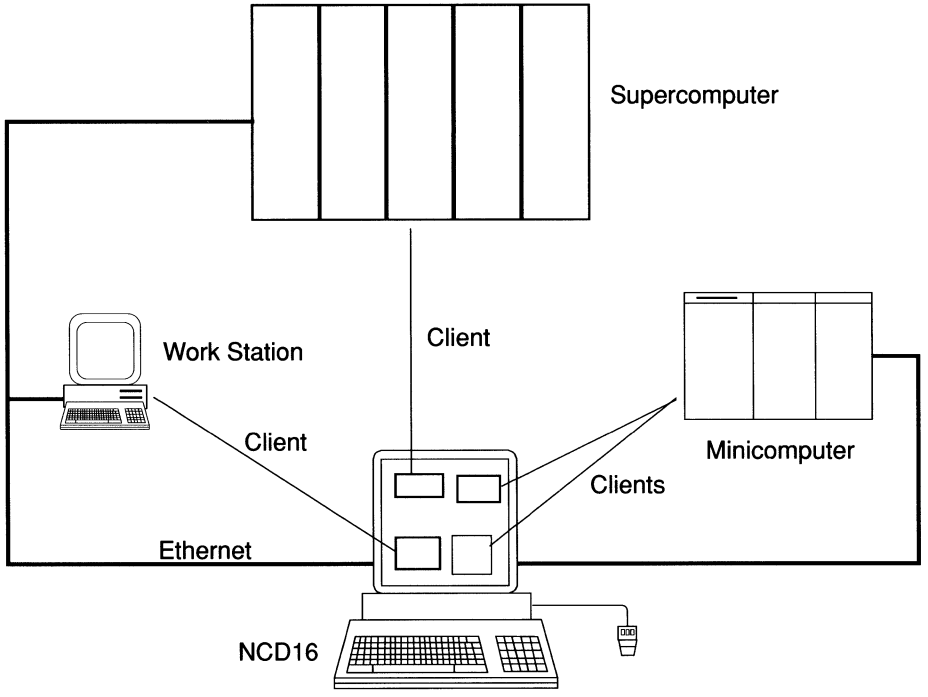


Figure 3-1. NCD16 Using X Window System Over a Network

NCD16 X Display Server

The X display server implemented by the NCD16 performs the following functions:

- Supports the X Window System protocol, which allows X clients (application programs residing on a host computer) to communicate with the NCD16.
- Performs the network tasks required for the NCD16 to connect to host computers over Ethernet or RS-232-C.
- Controls the keyboard and mouse interfaces.
- Provides powerful graphics hardware and software response to user input and client applications.

Application Clients

Application clients, also referred to merely as clients, are programs which perform a large variety of tasks and may reside on one or most host computers. The clients described here are part of the MIT distribution; brief descriptions are provided for the clients most tied to controlling the NCD16:

xdm	X Display Manager. This is a login-style daemon used to initialize the connection between the NCD16 and a host system
xlsfonts	Displays fonts available to the server
uwm	UNIX Window Manager. This is used to move, resize, create icons and manipulate windows on the display
twm	The Window Manager. An alternative window manager, part of the X contributed distribution.
xterm	Terminal emulator
xset	User preference utility. This is used to control server parameters such as font paths, bell volume, key click, and mouse acceleration
xfd	Displays a font
bdftosnf	BDF (Bitmap Distribution Format) to SNF (Server Normal Form) font compiler. This program converts fonts from the portable format — BDF, which is ASCII plain text, to the server internal format. NCD distributes a number of fonts in SNF, which can be used by the NCD server. By using the NCD-provided bdftosnf, other fonts can be converted to NCD format.
xfed	Font editor. Can be used to modify BDF files. This client is part of the X contributed distribution.
xmodmap	Modifies keyboard key maps

xev	Displays contents of X events. Useful for experimenting with keyboard key settings, mouse buttons and mouse border crossings
xsetroot	Sets the background, or root window pattern

Fonts

The characters and cursors seen on the display station are accessed as fonts. A font is a collection of pre-rendered characters of certain style and size. Clients explicitly ask for a font, and then ask the server to display individual characters (or more properly, in X, glyphs). The NCD server comes with eight built-in fonts and is dependent on host services for dynamic font service to satisfy other client font requests. Fonts are maintained in formatted data files on one or more hosts. The NCD server opens font files and reads in the data when the font is initially accessed. These files are kept in a format known as Server Normal Form (SNF).

In addition to the font files themselves there are two additional files: *fonts.dir* and *fonts.alias.* These files are used to map font names to files. The fonts.dir file maps font names to files while fonts.alias is a secondary mechanism to provide alternative fonts. If an application asks for a particular font by name, and that font is not available, a fonts.alias file can be created to map to a font name that does exist.

At the time the NCD server is initialized, a default font path list is scanned, and the fonts.dir and fonts.alias files found in each font directory are opened, read and added to the server's internal tables. Then when a client requests a font, the tables are checked, and if the font name is found the corresponding font file is opened and read into the server's internal font database. In addition, the server has fonts built in internally to assist with initial installation, or in case it is not possible to obtain font service from a host machine. The internal fonts are:

10x20	8x13	cursor	fixed
6x10	9x15	fg-22	vtsingle

By default the NCD server uses a font path set to:

```
built-ins
/usr/lib/X11/ncd/fonts/misc
/usr/lib/X11/ncd/fonts/100dpi
/usr/lib/X11/ncd/fonts/75dpi
```

or on VMS

```
built-ins
ncd_fonts: [000000] misc
ncd_fonts: [000000] 700DPI
ncd_fonts: [000000] 750DPI
```

This search path (or order) can be changed by the use of the xset client or by remote configuration. For example, to add a directory of fonts to the search path, type the following command:

```
% xset fp+ /usr/lib/X11/ncd/fonts/oldx11
```

The current font path may be displayed by typing:

```
% xset q
```

The font path, by default, is reset to the default whenever the server is reset. The server is reset whenever the last client disconnects. This can be overridden in the NCD server by selecting the *Retain X Settings* option in the Setup parameters. Failures of the font mechanism are reported in the diagnostic window of the NCD16.

Color Database

Color intensities are maintained in the file:

```
/usr/lib/X11/ncd/rgb.txt
```

or on VMS

```
ncd_fonts: [000000] rgb.txt
```

This file is opened when the NCD16 server is initialized, and contains a list of color names and their black or white alias. This allows some color applications to run on the NCD16 monochrome server.

Defaults and Resources

The X clients use a large number of defaults — known as resources in X — in order to pass information to a client other than on the command line. These defaults are contained in a file called *.Xdefaults*, which is used by clients such as xterm. This file is typically read by the application when it is initialized. In addition to the .Xdefaults file, the program *xrdb* can be used to maintain a server resource database. By maintaining the database in the server, multiple copies of the .Xdefaults file do not have to be maintained on each client host machine.

An example of a use of the .Xdefaults file is xterm's usage of backing store. In order to inform an xterm client that backing store is to be set to *when mapped*, the following line is added to the .Xdefaults file in your home directory:

```
xterm*backingStore: whenmapped
```

Another useful file is the *.uwmrc* file. This file is opened and read when the uwm window manager is initialized. It provides a mechanism for controlling user preferences in the window manager, such as the mouse keys, and the choice and function of menu items in popup windows. A sample .uwmrc is shipped with the NCD boot or font tape.

XHOST Security

The NCD16 normally allows any host to connect to the display station. The xhost client program can restrict access to the NCD16. Xhost can create and manipulate the access control list and can also enable and disable access control restriction. Both the access control list and the enabling and disabling of access control are maintained inside the NCD server.

One side effect of the use of xhost for access control is that after enabling access control using xhost, you may not be able to disable access control using the xhost client. This is due to the fact that once access control is in effect, existing client connections are unaffected, but new connections are only permitted to the hosts in the access control list. When xhost is run it attempts to make a connection.

If the host running the xhost client program is not on the access list, and access control is enabled, xhost fails. Be sure to include the host running the xhost program on the access control list before enabling access control.

Using xhost for access control on the NCD16 is only a partial solution to access control. The problem is that until xhost is run, any client program can connect to the NCD16. This problem can be circumvented by providing the access control list and enabling access control via remote configuration. This ensures that access control will be enabled as the server comes up, and will prevent unauthorized connections. See the system administrator manual regarding use of this feature.

4 Operating the NCD16

Introduction

The NCD16 is operated via a set of "menus" that appear on the display. These menus are explained in this chapter. Also covered here are the operating controls for the unit.

Operating Controls

The operating controls on the NCD16 are a power switch, located on the lower right of the display monitor bezel; and brightness and contrast controls, located on the lower left of the display monitor bezel.

The power switch is used to apply power to the NCD16.

Brightness and Contrast Controls

Two NCD16 control adjustments, "brightness" and "contrast," are located on the lower left of the display monitor bezel, see Figure 4-1. Both controls, or knobs, have marks to indicate their center position.

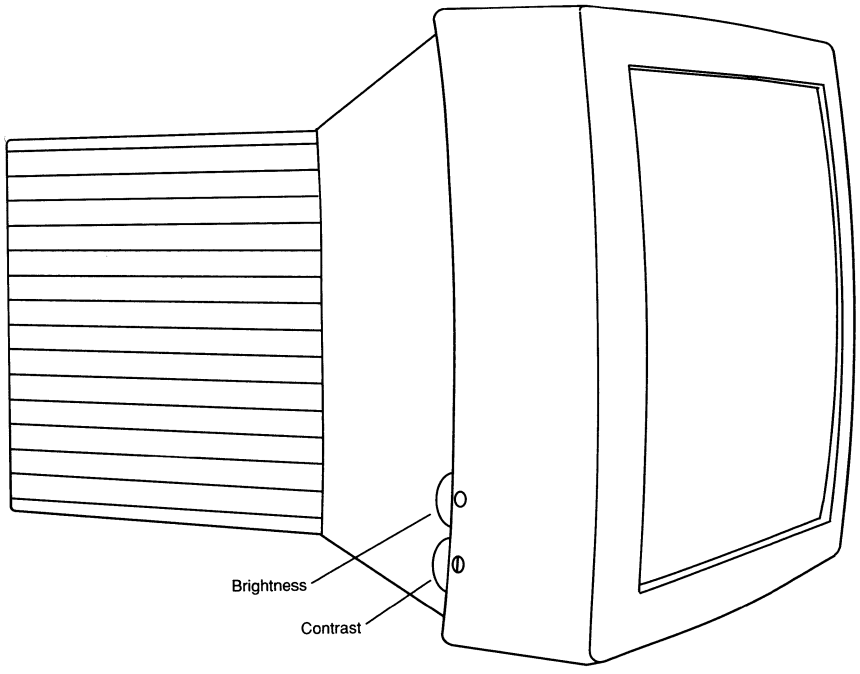


Figure 4-1. NCD16 Controls

The brightness control adjusts the light level of "black" video — the brightness of the screen background. The contrast control adjusts the level of "white" video — the brightness of the screen foreground. The labeling of these controls is non-intuitive. One would think that brightness (and the use of the sun symbol) adjusts how white the screen is, not how black it is. In order to avoid confusion, the terms "white" and "black" video or "whiteness" and "blackness" are used to describe how these controls operate.

Normal Control Setting

Control	Knob Position
Brightness	Minimum
Contrast	Center Detent

The contrast control is adjusted to set the level of white to suite personal taste. The brightness control is not normally used, and exists to satisfy the European ergonomic specifications (described below). Increasing contrast increases brightness while decreasing focus. This is an inherent feature of monitor design. The best focus is achieved at minimum whiteness. You can adjust contrast to the optimum tradeoff between whiteness and focus.

As contrast increases, whiteness increases until the display "blooms". This is the point at which display quality is no longer acceptable. You can then decrease the contrast control below the bloom, setting the monitor to its maximum whiteness. The maximum whiteness position varies as the display ages, and consequently can not be preset by the factory.

European Control Setting

Control	Knob Position
Brightness	Center
Contrast	Center Detent

European ergonomic specifications require a minimization of the ratio of brightness between foreground and background levels of illumination. By increasing contrast to the center position, the background level of whiteness is increased, and reduces the difference between the white foreground and the dark background.

The Setup Key

The NCD16 has a comprehensive set of setup menus that allows manipulation of most configuration parameters. In addition, there is a set of built-in sessions — such as a Telnet session.

There is a special key, the **Setup** key, on the keyboard that provides access to these menus and sessions.

When the screen is displaying only X Windows information, depressing the Setup key will cause the Main Menu to be displayed. Pressing the **Setup** key again causes the displayed menu or session to be removed from the screen.

When the screen is displaying only X Windows information, and the **Setup** key is pressed in conjunction with the the **Shift** key, the last displayed menu or session is displayed again. In this way you can toggle between X Windows and one of the setup menus or built-in sessions. Pressing both keys while in a menu has the same effect as pressing the Setup key alone — you return from the current menu or session.

Setup Menus and Built-in Sessions

The NCD16 has a set of menus and sessions that allow you to do several things:

- Manipulate most configuration parameters
- View many of the network statistics
- View diagnostic messages
- Connect to another network node via standard protocols

The Main Menu provides access to all of the underlying menus and sessions. From the Main Menu you can access parameters for:

- User preferences
- The network
- The network protocols
- The serial port
- Licensed features

In addition, the Main Menu provides access to the diagnostic session, which displays all warning and error messages produced by the NCD16, as well as the following management menus useful for diagnosing problems:

- Network statistics
- Protocol specific statistics
- Protocol specific management data
- Network management

The Network Management menu provides such diagnostic and management utilities as:

- A network test utility (ping or MIRROR)
- Remote configuration
- Password protection
- Host access control

From the Main Menu you can access the following built-in sessions:

- Telnet
- CTERM
- Serial

Many of the windows contain oval buttons. Moving the cursor over a button and clicking any mouse button causes a change to the selection displayed inside the button. Some buttons cycle through a selection of options, while other buttons require typing to fill in the required information. For buttons that cycle, pressing the left mouse button cycles "down", while the middle and right buttons cycle "up" through the selections. At the Main Menu level, clicking on one of the submenu buttons displays the selected submenu.

The values displayed in the windows are the operational values used by the server. These values can come from NVRAM (Non-Volatile RAM) or be overridden by a remote configuration loaded via the network. Any fields modified in the windows take effect:

- Immediately, or
- On exit of the setup windows, or
- On server reset.

Only values that have been saved in NVRAM will take effect on reset. Fields that take effect on setup exit or reboot are noted, otherwise fields with no notation take effect immediately or on setup exit.

Main Menu

The Main Menu is shown in Figure 4-2. The parameters are explained below.

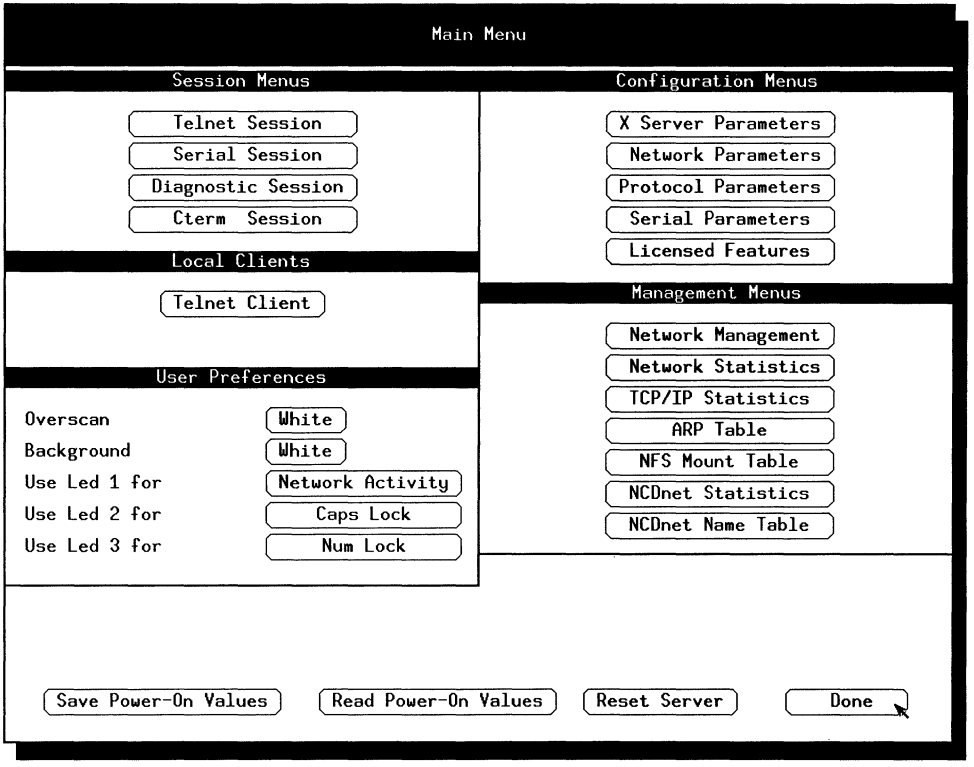


Figure 4-2. Main Menu

Save Power-On Values — Stores the values currently displayed in the setup windows in NVRAM. Clicking on this field displays "Configuration values saved for power-on" in the area above this button.

Read Power-On Values — Loads NVRAM values into operational memory, which is

	displayed in the windows. Clicking on this field overrides values delivered by the network.
Reset Server	Clicking here restarts the unit. A second click is required to confirm the reset.
Done	Exits setup menu.

Session Menus

Session Menus are "terminal-like" windows. The types of sessions are described briefly below and in greater detail in subsequent sections.

Telnet Session	Selects Telnet ANSI terminal emulation.
Serial Session	Selects an ANSI terminal emulation window using auxiliary RS-232-C port.
Diagnostic Session	Selects console output window, displays memory information.
CTERM Session	Selects CTERM session, which provides VT100 terminal emulation.

User Preferences

These are visual changes that are stored in NVRAM. Changes made here can be stored in NVRAM by clicking "Save Power-On Values" in the Main Menu. These buttons cycle through a selection of options. The options are listed first, with the first option being the factory setting. Each option change goes into effect immediately when the button is clicked, allowing you to assess the change before saving in NVRAM. The options available are described below.

Overscan	On or Off
	Sets screen border to white or black.
Background	White or Black
	Sets menus to either a white background with black characters, or a black background with white characters.

Use Led 1 for	X Led 1 or Network Activity Available for an X client; otherwise signals network data received by your unit.
Use Led 2 for	Caps Lock or X Led 2 Indicate latched state of Caps Lock key; otherwise is available for an X client.
Use Led 3 for	Num Lock or X Led 3 Indicates latched state of Num Lock key; otherwise is available for an X client.

Clicking on a button in the Session, Configuration and Management Menus selects a submenu.

Configuration Menus

These submenus control configuration parameters stored in NVRAM. The Menu options are described briefly below and in greater detail in subsequent sections.

X Server Parameters	Controls server options such as backing store and the use of XDM.
Network Parameters	Controls booting, downloading, and services such as remote configuration and font service.
Protocol Parameters	Controls all TCP/IP and NCDnet configuration parameters.
Serial Parameters	Controls auxiliary RS-232-C port and its usage as a terminal or for SLIP.
Licensed Features	Controls which optional licensed software features are enabled.

Management Menus

These submenus pertain to network management. The options available are described briefly below and in greater detail in subsequent sections.

Network Management	Controls ping or MIRROR utility, remote configuration, password and xhost security.
Network Statistics	Displays traffic and errors on Ethernet and serial line.
TCP/IP Statistics	Displays IP, ICMP, UDP, TFTP, TCP information.
ARP Table	Displays a list of know Ethernet address/IP address translations.
NFS Mount Table	Shows the NFS mounts currently in use for font and configuration file access.
NCDnet Statistics	Displays NCDnet traffic and error information.
NCDnet Name Table	Displays the mapping of DECnet node names to addresses.

Telnet Session

This menu, shown in Figure 4-3, is an ANSI X3.64 terminal emulation window running Telnet.

```
enter internet address (default is ):
```

Type either a host name or a host internet address. If a default Telnet host has been entered in the Network Parameters window, its name will appear here. The name is resolved to an internet address using a name service. Type of name service is selected in the Network Parameters menu.

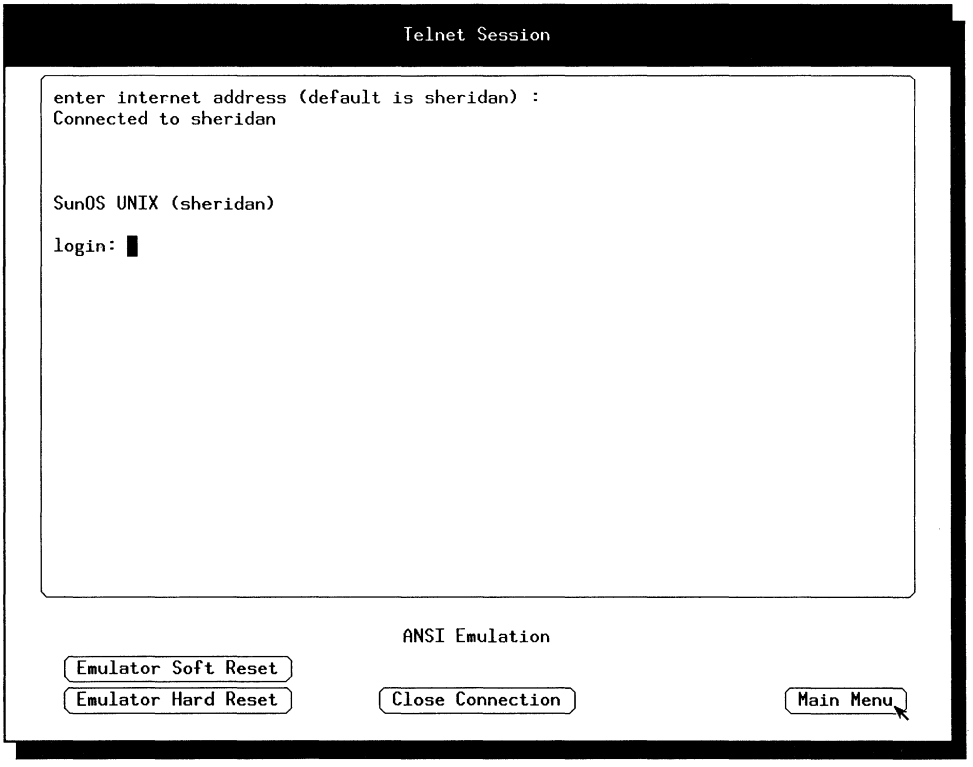


Figure 4-3. Telnet Session Menu

The Telnet Session menu buttons perform the following tasks:

Emulator Soft Reset	Resets scroll region to entire session window and character set to default
Emulator Hard Reset	Resets scroll region to entire session window and character set to default and also resets cursor to upper left and clears screen.
Close Connection	Closes the Telnet session immediately
Main Menu	Returns to the Main Menu.

Serial Session Menu

This menu, see Figure 4-4, provides an ANSI X3.64 terminal emulation using the auxiliary serial port. The Serial Parameters menu enables the serial port.

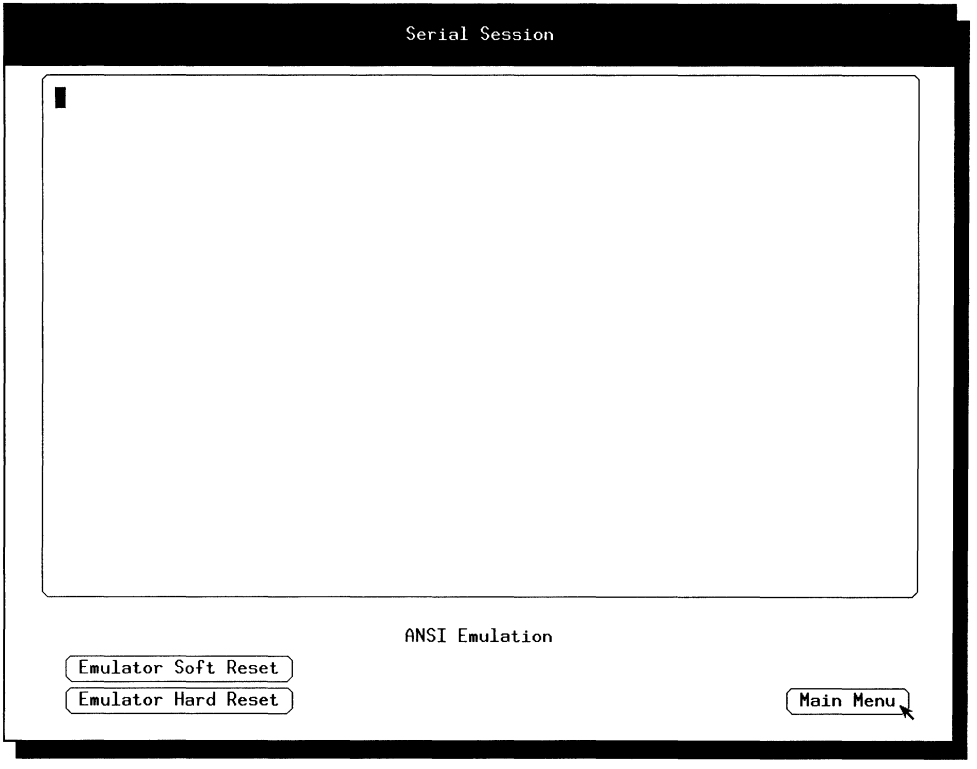


Figure 4-4. Serial Session Menu

The Serial Session menu buttons perform the following tasks:

Emulator Soft Reset	Resets scroll region to entire session window and character set to default
Emulator Hard Reset	Resets scroll region to entire session window and character set to default and also resets cursor to upper left and clears screen.
Main Menu	Returns to the Main Menu.

Diagnostic Session Menu

The diagnostic session menu, shown in Figure 4-5, is an output-only window. The area inside the large rectangle is used for console output by the server while it is running.

```
Server 2.1.0 09/18/89 downloaded
```

This indicates the server version and date, and that it was downloaded.

```
Keyboard controller V2.00
```

Indicates the 6805 version of firmware in the keyboard controller.

```
Boot Prom V2.1.0
```

Indicates version of boot PROM software.

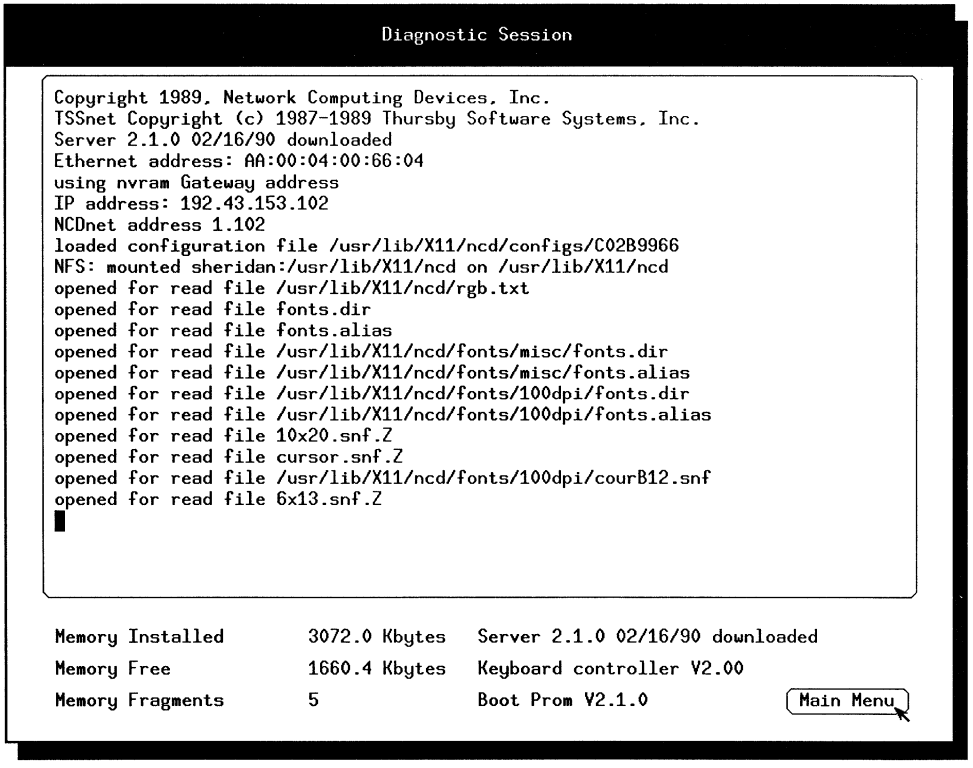


Figure 4-5. Diagnostic Session menu

Memory Installed	Displays size of main memory.
Memory Free	Displays currently available memory.
Memory Fragments	This is the number of pieces of memory on the free list that cannot be joined together.
Main Menu	Clicking here returns to the Main Menu.

CTERM Session Menu

This menu, shown in Figure 4-6, is a VT100 terminal emulation window running CTERM.

```
enter NCDnet address (default is ):
```

Type either a host name or a host address. If a default CTERM host has been entered in the Network Parameters window, its name will appear here. The name is resolved to an address using the mappings shown in the NCDnet Name Table.

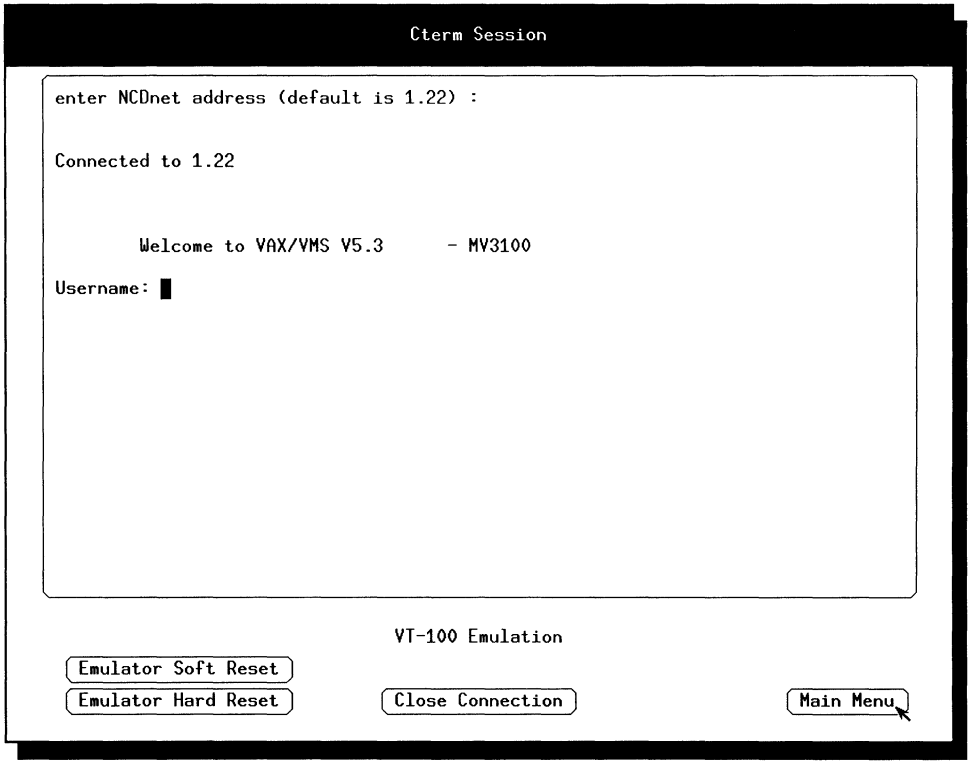


Figure 4-6. CTERM Session Menu

Emulator Soft Reset	Resets scroll region to entire session window and character set to default
Emulator Hard Reset	Resets scroll region to entire session window and character set to default and also resets cursor to upper left and clears screen.
Close Connection	Closes the CTERM session immediately
Main Menu	Returns to the Main Menu.

X Server Parameters

The X server parameters menu is shown in Figure 4-7. Select and define options as follows.

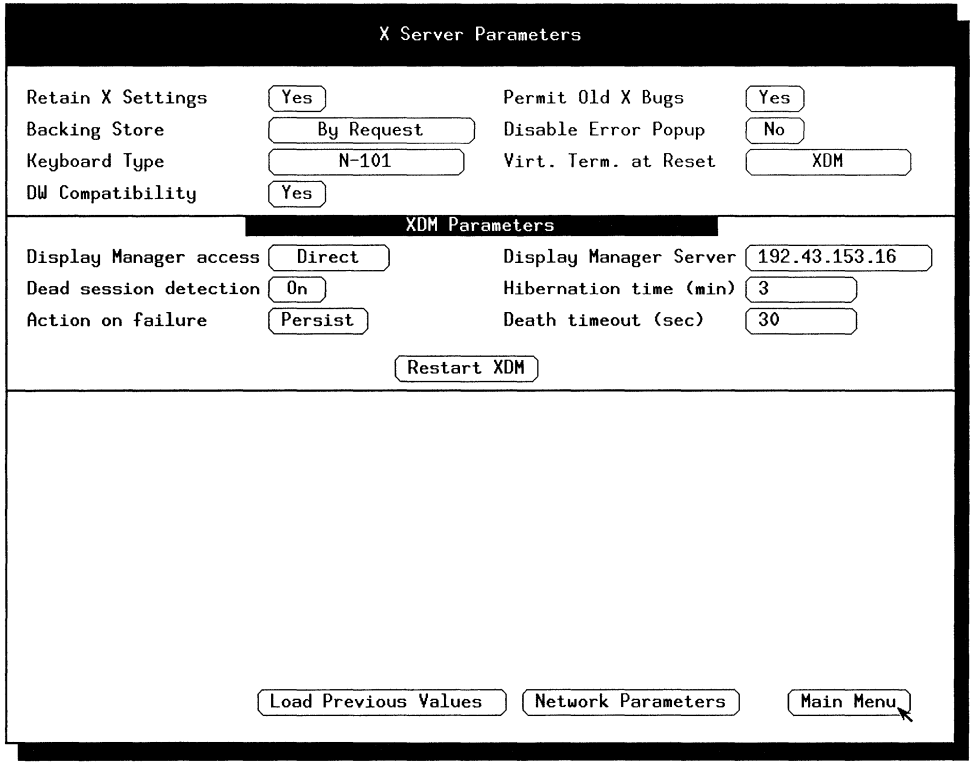


Figure 4-7. X Server Parameters Menu

Retain X Settings

Yes or No

This field directs the X server to retain or discard various X server default parameters when the last X client disconnects from the X server. If set to Yes, the X server's font path, resource data base, keyboard parameters, pointer control parameters, and screen saver parameters are retained.

Backing Store

By Request, Disabled or Auto. When Mapped

Sets the server default for backing store to the selected value. Backing store is an off-screen image of a win-dow that will improve the performance of redrawing the window when it is exposed. However, this is done at the expense of more memory consumption.

Selecting Disabled turns backing store off. Selecting By Request causes the server to provide backing store if requested by the application. Selecting Auto. When Mapped causes the server to provide backing store for a window when that window is mapped, even if the application did not request backing store. Disabled is suggested if memory consumption is an issue. Changing these selections takes place immediately. For example, changing to Disabled discards any backing store that may currently be in use.

Keyboard Type

N-101, N-97, VT220 VMS, VT220
ULTRIX, IBM PS/2, Belgium, Canadian, Danish, French, German, Italian, Norwegian, Portuguese, Spanish, Swedish, Finnish, Swiss, or UK

Indicates the type of keyboard in use. When the NCD16 is reset using the boot monitor rs command or upon power-up, the keyboard identifier is read from the keyboard. This button allows you to choose between different keyboards that report the same identifier. Note that if you change keyboards, you may need to reset the NCD16 to force it to reread the keyboard identifier.

The table below lists the currently supported keyboards:

Keyboard ID	Choices
AB83	N-101, IBM PS/2, or Cherry International keyboards (Belgian, Canadian, Danish, French, German, Italian, Norwegian, Portuguese, Spanish, Swedish/Finnish, Swiss, UK)
AB84	VT220 VMS or VT220 ULTRIX
AB85	N-97

DW Compatibility

Yes or No

Causes all modifiers (control, shift, alt, etc.) to be presented to applications as if they were left modifiers (e.g. the right shift key is reported as Shift_L). This mode is necessary if you use DECwindows.

Permit Old X Bugs

Yes or No

If yes, allows certain erroneous behavior from past releases of X. Same as the bc flag of xset.

Disable Error Popup

Yes or No

If yes, the error notification popup will be disabled and errors will only be logged to the Diagnostic Session. This error notification popup is used to report serious situations and errors to the user.

Virt. Term. at Reset

XDM, Serial, CTERM, Telnet, Telnet Client, or None

Selects action to be taken at server reset.

If Telnet Client is specified a local Telnet client is started.

XDM Parameters

This section defines all of the XDM parameters. Each is described in more detail below.

Display Manager Access

Broadcast, Direct, Indirect

Selects the type of XDMCP request made by the X server. The XDMCP request can be directed to a particular host or broadcast. If directed to a specific host, the session can be directly on that host or the daemon on that host can indirectly provide the session on another host.

Dead Session Detection

Off or On

Used to enable dead session detection on the NCD16. See the next two parameters for more information.

Action on Failure

Persist or Stop

If an XDM session connection with a host cannot be established the NCD16 will either stop trying or persist indefinitely in trying to make a connection depending on the setting of this parameter.

Display Manager Server

If the Display Manager Access is Direct or Indirect this defines the host to which display manager connection requests are sent.

Hibernation Time (min)

Specifies the number of minutes that there must be no activity (this includes things like clocks) before the first xdm keep-alive is sent to the host. These keep alives are sent at ever increasing intervals of time until the Death Timeout time has expired. If this occurs, all of the clients are terminated. If a keep-alive is acknowledged, the hibernation timer resets.

Death Timeout (sec)	The number of seconds the server will wait for the display manager to respond to a keep-alive before the session is terminated.
Restart XDM	Clicking here restarts the XDM session. A second click is required to confirm the reset. This causes all windows to be destroyed and all client processes to be terminated.
Load Previous Values	Restores all of the parameters in this menu to the values present when the menu was first entered.
Network Parameters	Provides a shortcut to the Network Parameters menu.
Main Menu	Returns to the Main Menu.

Network Parameters Menu

The network parameters menu is shown in Figure 4-8. The numerical addresses required here must be provided by you system administrator. Your system administrator will know which services are available and appropriate. Changes made here can be ;made permanents and stored in NVARM by clicking "Save Power-On Values" in the Main Menu. If you have made changes, but wish to restore the values that were present when the window first appeared, click "Load Previous Values".

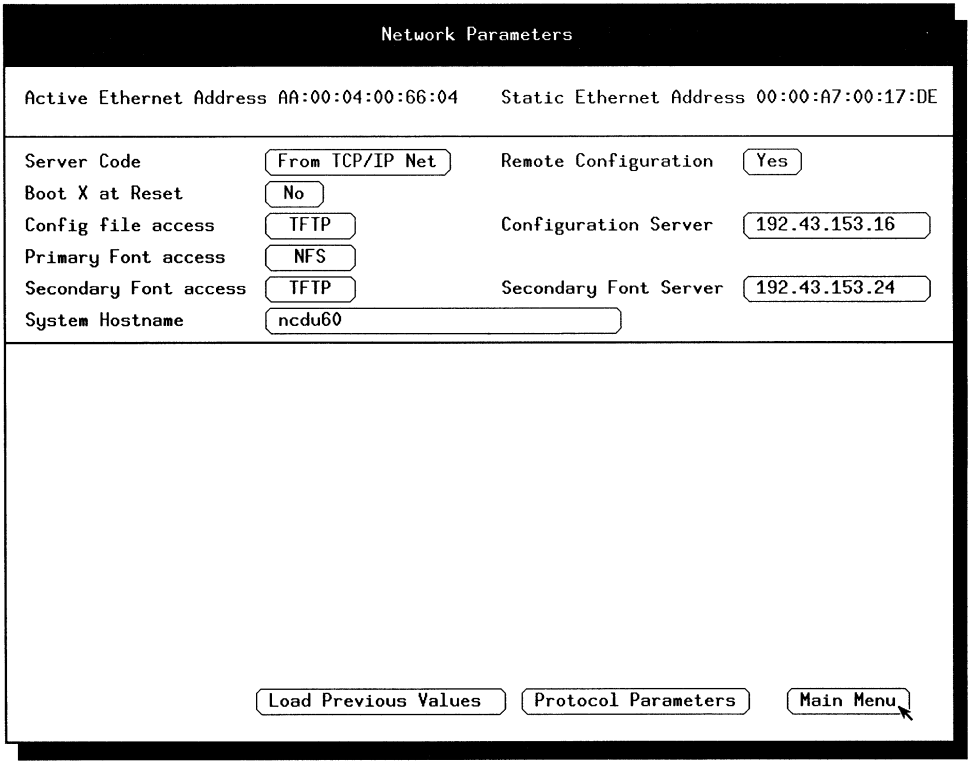


Figure 4-8. Network Parameters Menu

Active Ethernet Address

This is the Ethernet address currently in use by this unit. The value is either the static Ethernet address, or an address derived from the unit's NCDnet area and node number, in the case where the unit is running the NCDnet protocol.

Static Ethernet Address

This is the unique value assigned to the unit.

Server Code

From TCP/IP Net, From NCDnet, or In PROM

This field informs the boot PROM where to find the server code at boot time. If you select From TCP/IP Net, the boot PROM attempts to load the server from the Ethernet using the TCP/IP boot protocols BOOTP, RARP, and TFTP. Selecting From NCDnet causes the boot PROM to attempt to load the server from the Ethernet using the DECnet MOP protocol. Selecting In PROM causes the boot PROM attempts to load the server from PROM.

Remote Configuration

Yes or No

Determines whether a remote configuration file is loaded when the server is first initialized after reset.

Boot X at Reset

Yes or No

This field directs the boot PROM to load or not to load the server image. If this field is set to No, the boot PROM stops in the boot monitor at reset time. If set to Yes, the boot PROM attempts to run the server according to the setting of the Server Code field described above.

Config file access

TFTP, NCDnet, or NFS

This field controls the access method used for the remote configuration file. When set to TFTP, the X server uses the Internet TFTP protocol to the designated Configuration Server for reading or writing the unit's configuration file.

If set to NCDnet, the X server uses the DECnet DAP protocol to the designated Configuration Server to access the unit's configuration file. If set to NFS, the X server temporarily mounts "boothost:/usr/lib/X11/ncd/configs" on its internal path "/usr/lib/X11/ncd/configs" and then uses NFS to access the configuration file.

Configuration Server

This field contains the address of the configuration server. If the Config file access field is set to TFTP, this field contains an IP address. If the Config file access field is set to NCDnet, this file contains an NCDnet address. If the Config file access field is set to NFS, this field is unused.

Primary Font Access

TFTP, NCDnet, or NFS

This field controls the access method used for font file access. If set to TFTP, the X server uses the Internet TFTP protocol to the designated Configuration Server for reading font files. If set to NCDnet, the X server uses the DECnet DAP protocol to the designated Con-figuration Server to access font files. If set to NFS, the X server uses NFS to access font files. The hosts involved with the NFS lookups are specified in the unit's NFS Mount table which is controlled by remote configuration parameters.

Primary Font Server

This field contains the address of the primary font server. If the Primary Font access field is set to TFTP, this field contains contains an IP address. If the Primary Font access field is set to NCDnet, this field contains an NCDnet address. If the Primary Font access field is set to NFS, this field is unused.

Secondary Font access	TFTP, NCDnet, or NFS This field controls the access method used for font access. Refer to the description of the Primary Font access field.
Secondary Font Server	This field contains the address of the secondary font server. The secondary font server is used if the primary font server does not respond. If the primary font server responds to a request, but denies access or indicates other problems, then the secondary font server is not used.
System Hostname	This field contains a string which is used as this unit's hostname for NFS access. Please note that this is internally used by NFS requests generated by the X server. Do not confuse this with the name or address of a host acting as an NFS or TFTP server, or with the name or address of any host which will run X clients to this X server.
Load Previous Values	Clicking on this item restores all of the parameters in this menu to the values present when the menu was first entered.
Protocol Parameters	Clicking here returns you to the Protocol Parameters menu.
Main Menu	Clicking here returns to the Main Menu.

Protocol Parameters Menu

This menu, shown in Figure 4-8, is divided into two sections: one for parameters pertaining to TCP/IP protocol and one for parameters pertaining to NCDnet protocol.

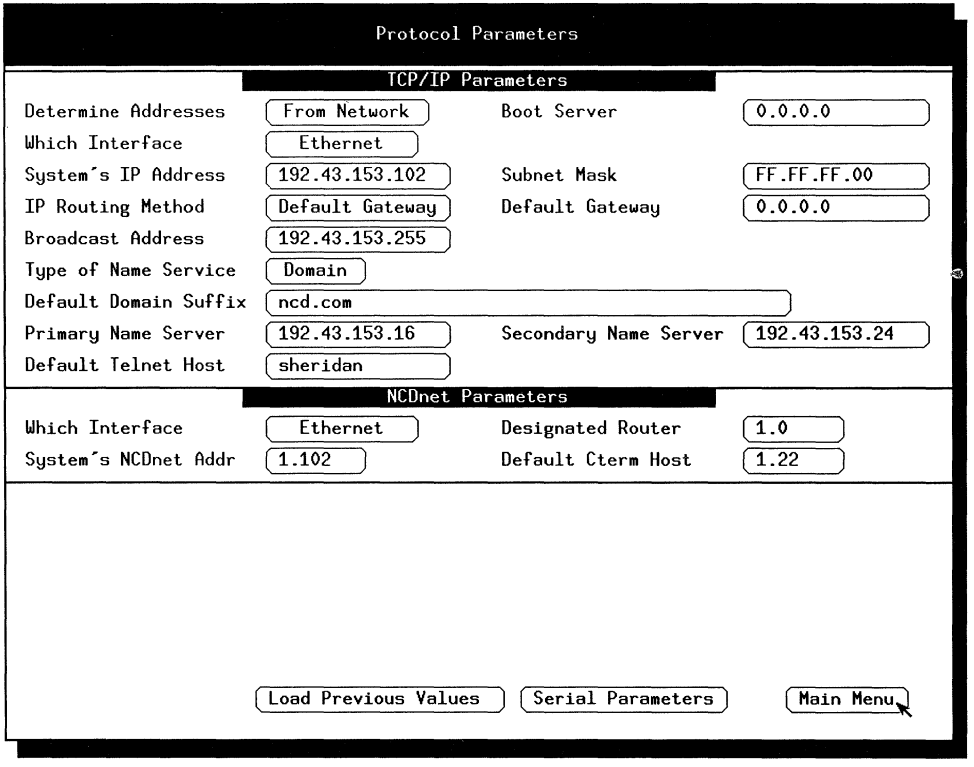


Figure 4-8. Protocol Parameters Menu

TCP/IP Parameters

Determine Addresses

From Network or From NVRAM

This field directs both the boot PROM and the X server as to where the TCP/IP addresses should be obtained. If set to NVRAM, the system's IP address, boot server's IP address, subnet mask, and default gateway are read from NVRAM. If set to From Network, the system's IP address and the boot server's IP address are determined using network protocols. In addition, the subnet mask and default gateway may be determined using network protocols.

Boot Server

This field is the IP address of the host which will respond to TFTP requests in order to boot the X server. If BOOTP is used, the address of the boot server may be provided by the BOOTP protocol, and this field would be unused. This field must be set if Determine Addresses is set to From NVRAM.

Which Interface

Ethernet, None, or Serial Line

This field selects the interface over which the TCP/IP protocols will be run. Selecting Ethernet automatically enables the use of the ARP protocol, and application of the Subnet Mask field. Selecting Serial Line switches the active interface to be the serial auxiliary port. Additionally, the serial line must be configured as a network interface in order for SLIP to be in operation. Selecting None is not recommended.

System's IP Address

This field contains the IP address of the unit.

Subnet Mask

This field contains the subnet mask in hex-dot notation.

IP Routing Method

Default Gateway or Proxy ARP

Controls method used to locate router to another network. This is used when TCP/IP requests are made that are destined for a network other than the one specified in the address of the NCD16.

Selecting Default Gateway causes the Default Gateway field of the TCP/IP Parameters to be used to locate the gateway.

	Selecting Proxy ARP tells the NCD16 to assume some node on the local network is providing proxy ARP service for the network in question which results in the NCD16 issuing an ARP request on the local network. The node providing proxy ARP should then return the address of the router which is then used by the NCD16. Note that the Default Gateway field is not used.
Default Gateway	Address in decimal-dot notation, of the gateway to use. When using SLIP, set this to the IP address of the equipment running SLIP.
Broadcast Address	Address in decimal-dot notation, of the broadcast address.
Type of Name Service	IEN-116 or Domain Set to the type of name service used by your network. Name service is used when a host name must be converted to an address. (For example, the Telnet host name in a Telnet session.) If name service is not available, set primary and secondary name server fields to 0S.
Default Domain Suffix	This field will be appended to "Domain" name service searches.
Primary Name Server	This is the IP address for name service entered in decimal notation. If you wish to use a host name for Telnet service, this field must be valid.
Secondary Name Server	This address will be used when there is no response from the primary name server. The value is entered in decimal-dot notation.
Default Telnet Host	You may enter either a name (if your network provides a name service) or an IP address. This allows you to skip entering a host name in the Telnet menu when connecting to Telnet.

NCDnet Parameters

These parameters control the operation of NCDnet. The NDC16 must be licensed for NCDnet for this submenu to have any effect.

Which Interface — Ethernet, None, or Serial Line

This field selects the interface over which the NCDnet protocols will be run. Selecting Serial Line switches the active interface to be the serial auxiliary port. Additionally, the serial line must be configured as a network interface in order for DDCMP to be in operation. Selecting None disables the NCDnet protocol.

System's NCDnet Addr — This field shows the DECnet area and node number under which this unit is operating. This field affects the Ethernet address with which the unit operates.

Designated Router — This field shows the DECnet area and node number of the designated router in the DECnet network.

Default Cterm Host — This field shows the DECnet area and node number of the default host for connection under a CTERM session.

Load Previous Values — Clicking on this item restores all of the parameters in this menu to the values present when the menu was first entered.

Serial Parameters — Clicking here switches you to the Serial Port Parameters menu.

Main Menu — Clicking here returns to the Main Menu.

Serial Port Parameters Menu

The serial parameters menu is shown in Figure 4-9. All fields on this menu cycle through a selection of options. The options are listed, with the first option being the factory setting. Changes made here can be stored in NVRAM by clicking "Save Power-On Values" in the Main Menu. If you have made changes, but wish to restore the values that were present when the window first appeared, click "Load Previous Values".

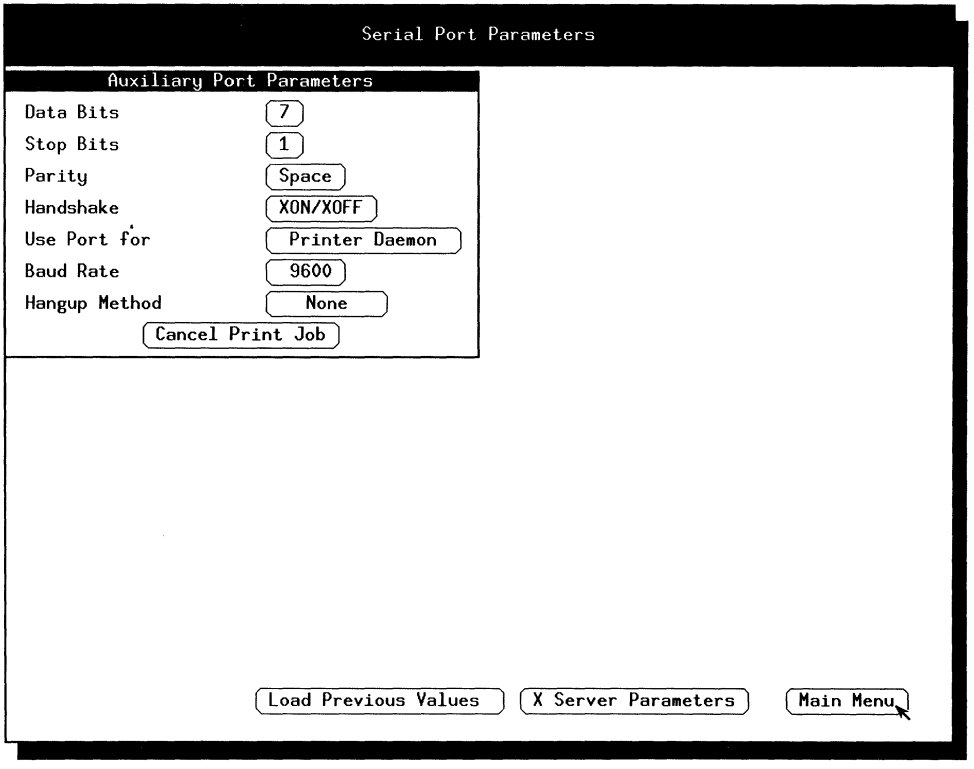


Figure 4-9. Serial Port Parameters Menu

Auxiliary Port Parameters

This is the RS-232-C port labeled "Auxiliary" on base unit rear panel.

Data Bits

7 or 8

Selects the number of data bits. This field should be set to agree with the equipment connected to the Auxiliary port.

Stop Bits

1 or 2

Selects the number of stop bits. This field should be set to agree with the equipment connected to the Auxiliary port.

Parity

None, Space, Mark, Odd, or Even.

Selects the form of parity generated and expected. This field should be set to agree with the equipment connected to the Auxiliary port.

Handshake

None, RTS/CTS, DTR/DSR, or XON/XOFF

This field controls the type of flow control handshaking used on the auxiliary serial port. Selecting None disables flow control. Selecting RTS/CTS causes the unit to raise the RTS signal when input space is avail-able, and to lower RTS when the input buffers are nearly full. In addition, the DCE must raise CTS when it can accept data from the unit, and the unit will stop sending data when the DCE lowers CTS. Selecting DTR/DSR causes the unit to raise the DTR signal when input space is available, and to lower DTR when the input buffers are nearly full.

Additionally, the DCE must raise DSR when it can accept data from the unit, and the unit will stop sending data when the DCE lowers DSR. Selecting XON/XOFF causes the unit to send an XOFF (^S) character signal when input space is low, and to send an XON (^Q) character when input space is available. In addition, the DCE must send an XOFF (^S) to the unit to stop the unit's data transmission, and must send an XON (^Q) to re-enable output from the unit. Do not select XON/XOFF when the serial port is in use for SLIP.

Use Port for

Terminal Session, Debug Output, Printer Daemon, or Network Interface

This field controls what function the serial port will serve. Selecting Terminal Session configures the port for use as a serial ANSI terminal session, typically connected to a modem, host computer, or terminal multiplexer. Selecting Debug Output causes the X server's "console" messages, which always appear in the Diagnostic Session, to be duplicated on the serial port. Selecting Network Interface allows the port to be used as a SLIP or DDCMP network transport interface. One of the Which Interface fields in the Protocol Parameters menu must also be set to Serial Line in order to operate SLIP or DDCMP. (You can't run both SLIP and DDCMP simultaneously.)

Baud Rate

A range from 50 to 38400, including 1200, 2400, 4800, 9600, and 19200 baud.

Hangup Method

Use Break, Use DTR, or None

Specifies the action to be taken when the Auxiliary port connection is closed. This occurs when the host side of the Auxiliary port connection closes the connection. It will also occur if the NCD16 side of the Auxiliary port connection is closed by the X server.

None — no action is taken on the Auxiliary port.

Use Break — a long (3 second) break is sent out on the Auxiliary port.

	Use DTR — DTR is dropped on the Auxiliary port.
Cancel Print Job	Immediately, and if necessary, forcibly terminates the network connection to the NCD network display station that is being used to communicate via the Auxiliary serial port. IF the connection can be closed without force, the Hangup Method specified will take effect. If the connection must be closed forcibly (e.g., the Auxiliary port is stopped due to flow control), the Hangup Method will not occur.
Load Previous Values	Restores all fields on this menu to the values found when initially entered.
X Xerver Parameters	Selects X Server Parameters menu, as a shortcut.
Main Menu	Clicking here returns to the Main Menu.

Licensed Features Menu

The licensed features menu, shown in Figure 4-10, displays the features for which the unit is licensed, and allows you to enter a new license key.

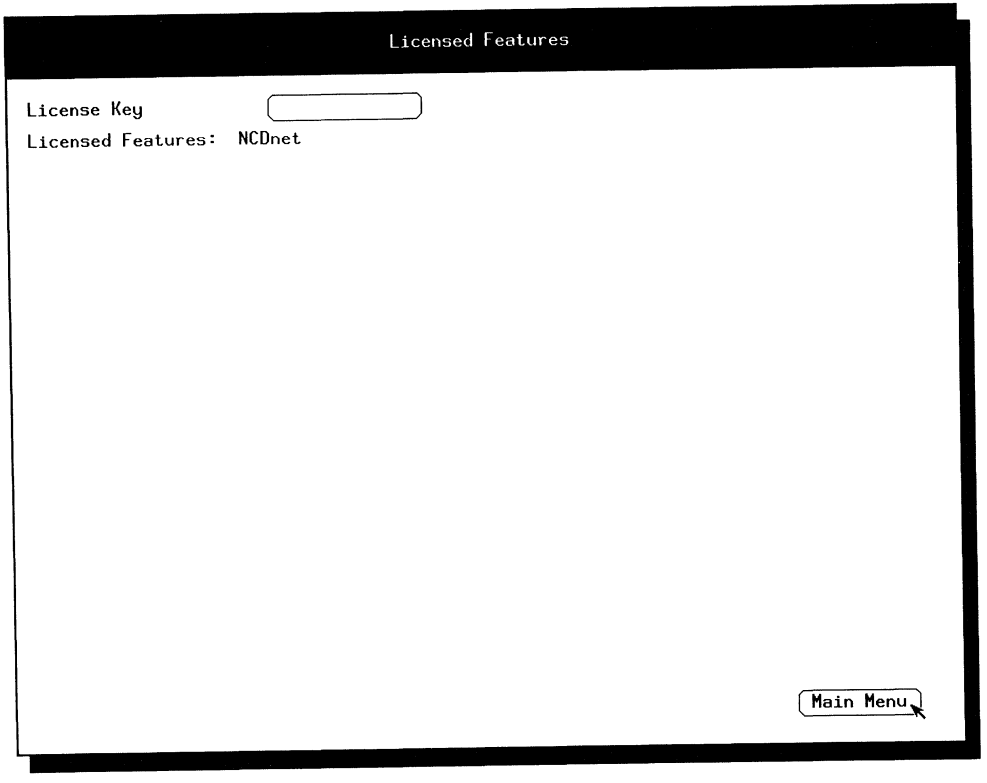


Figure 4-10. Licensed Features Menu

License Key	Clicking in this item allows you to enter a new license key via the keyboard. If an incorrect key is entered, a "Bad Key" message is printed near the bottom of the menu. After entering a correct key, you should go back to the Main Menu and save the parameters in NVRAM for subsequent usage. After reboot, the license key will not be displayed, but the Licensed Features field will reflect that the license is operative.
Licensed Features	None, or NCDnet This field shows the features which are licensed.
Main Menu	Clicking here returns you to the Main Menu.

Network Management Menu

The network management menu is shown in Figure 4-11.

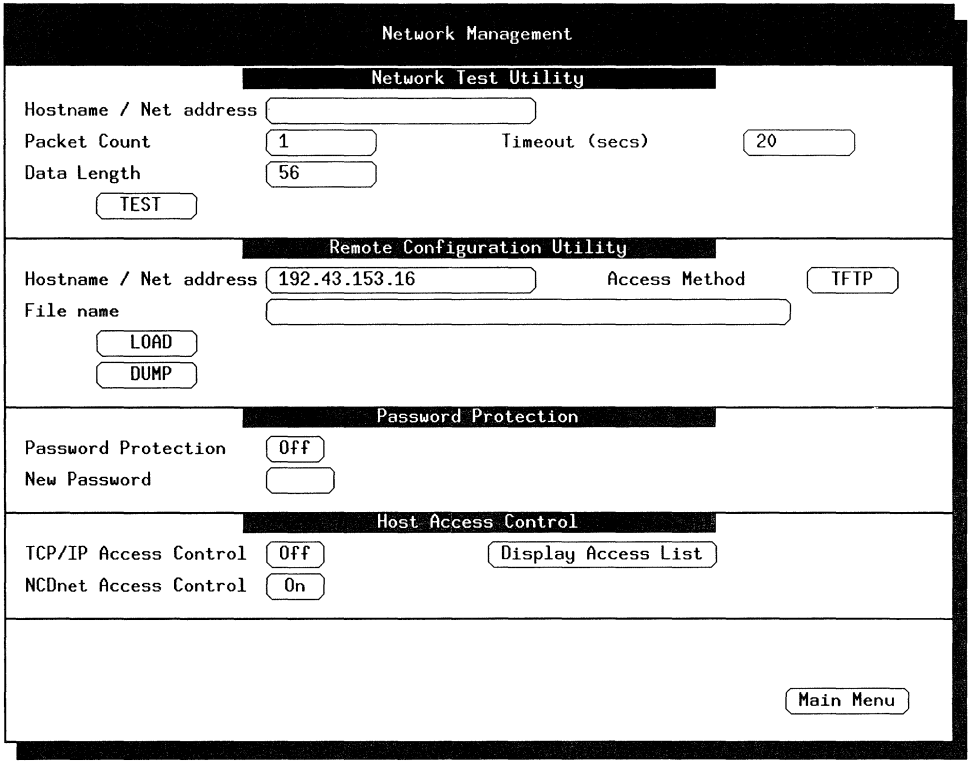


Figure 4-11. Network Management Menu

Network Test Utility

This utility provides a simple check for network attachment. The protocol used is either ping (ICMP ECHO) or MIRROR. The test used is determined by the format of the Host name/Net address. This can be used to check that the unit is successfully connected to the network, or that a particular host is alive and responding.

Host name / Net address	Type in the name, IP address, or DECnet address of the host that you wish to ping. A name ending in :: is assumed to be a DECnet name.
Packet Count	When a DECnet host is specified, this field specifies the number of test packets sent. When an Internet host is specified, this count has no effect and only one test packet is sent.
Timeout (secs)	20 is the default setting. You may enter another value if you wish.
Data Length	56 is the default setting, which is the Ethernet minimum packet size. You may enter another value if you wish.
TEST	Clicking this button transmits n single test packets (where n is the packet count described above). Each click sends another packet. The button background is inverted while waiting for an answer. The success or failure is printed out to the right of this button. An-other click at this time sends the packet again.

Remote Configuration Utility

This portion of the menu allows remote configuration to be exercised immediately. The LOAD button downloads the file from the specified host; the file is interpreted; any errors are reported in the Diagnostic Session menu; and the new configuration takes effect. The DUMP button provides the ability to recapture changes made locally in a specified file on a specified host.

Host name / Net address	A host name may be entered if a name service is avail-able. Otherwise use an internet address in decimal-dot notation or a DECnet address.

Access Method	TFTP, NFS, or NCDnet Selects the file access method used to access the remote configuration file.
File name	Enter a file name. For the LOAD function, the default is this unit's uppercase hex internet address. There is no default for the DUMP function.
LOAD	Clicking this button causes the specified file to be loaded from the specified host and interpreted.
DUMP	Clicking this button causes the current configuration to be written into the specified file on the specified host. If you are using TFTP for configuration file access, the file must already exist, be written to by any user, and have a length of zero bytes.

Password Protection

A password can be provided to protect the Network Parameters, Serial Parameters, and Network Management (this menu) menus.

Password Protection	Off or On Clicking On enables password protection. The pass-word must be provided when selecting a protected menu, otherwise the menu cannot be viewed.
New Password	A four-character password can be entered. The pass-word is not displayed. This field is protected by turning on password protection and exiting this menu. This field will not be displayed unless the correct password is entered.

Host Access Control

Host Access Control (Xhost) is a security service.

TCP/IP Access Control	Off or On Controls access by hosts using TCP/IP. Off grants access to all hosts, On restricts access to hosts provided in the remote configuration file and those loaded using the Xhost program.

NCDnet Access Control	Off or ON Controls access by hosts using DECnet. Off grants access to all hosts; On restricts access to hosts provided in the remote configuration file.
Display Access List	Displays the current access control list.
Main Menu	Clicking here returns to the Main Menu.

Access Control List Menu

The Access Control List menu is shown in Figure 4-12.

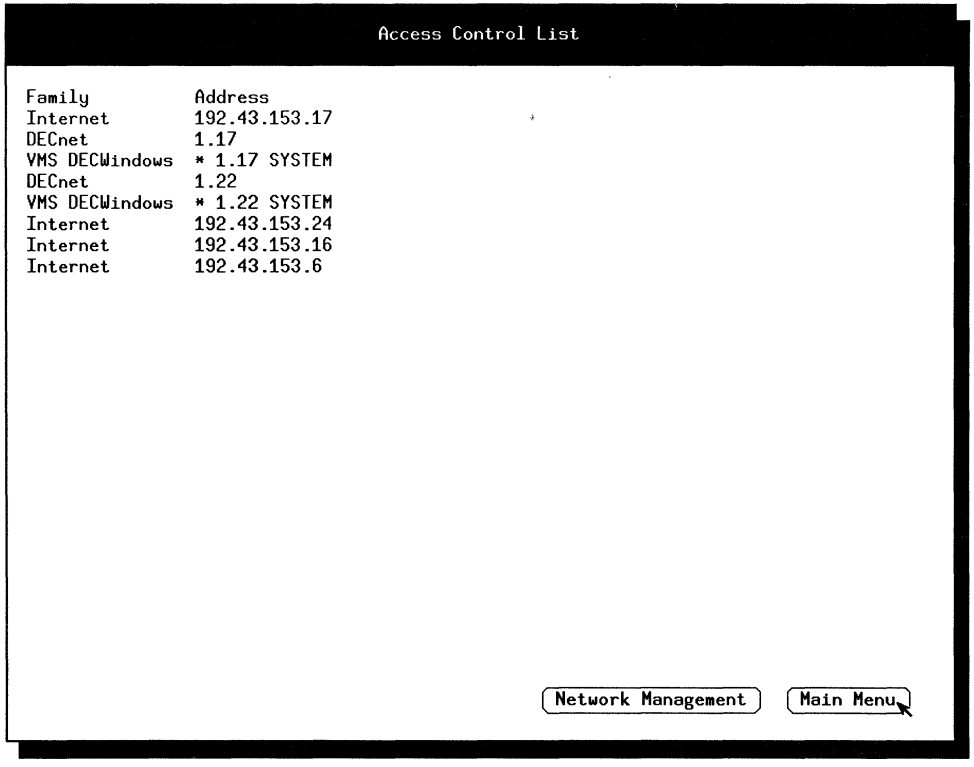


Figure 4-12. Access Control List Menu

Family	Lists the protocol family of the host
Address	Lists the host address
Network Management	Shortcut to the Network Management menu
Main Menu	Shortcut to the Main Menu

Note

DECnet hosts will appear twice in the Access Control List. Once with "DECnet" as the family, and once with "VMS DECwindows". This is done to allow access from either an ULTRIX or VMS DECnet host. It is necessary because the different DEC operating systems use different forms of access control information.

Network Statistics

The network statistics menu is shown in Figure 4-13.

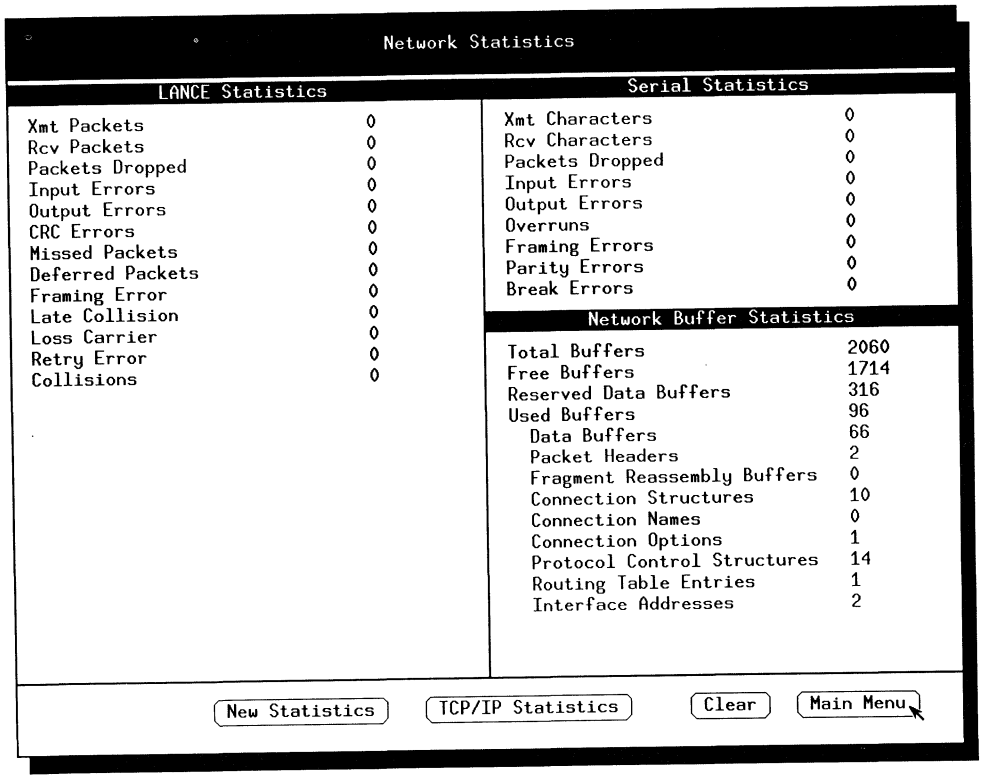


Figure 4-13. Network Statistics Menu

LANCE Statistics	Provides information on the Ethernet driver. LANCE is a trademark of AMD, and is the name of the Ethernet controller chip used by this unit.
Serial Statistics	Provides information on the auxiliary serial port. The first five are counters for the software interface to the serial hardware. The remainder are statistics gathered directly from the serial hardware.
Network Buffer Statistics	Provides information on network buffer utilization.
New Statistics	Clicking this button will update this menu with the most-recently collected statistics.
TCP/IP Statistics	Clicking here selects the TCP/IP Statistics menu, as a shortcut.
Clear	All statistical information is reset. Statistics are kept beginning at server reset. Boot statistics are not shown here. These are available using the boot monitor.
Main Menu	Clicking here returns to the Main Menu.

TCP/IP Statistics

The TCP/IP statistics, shown in Figure 4-14, are the statistics for the protocols used by this unit.

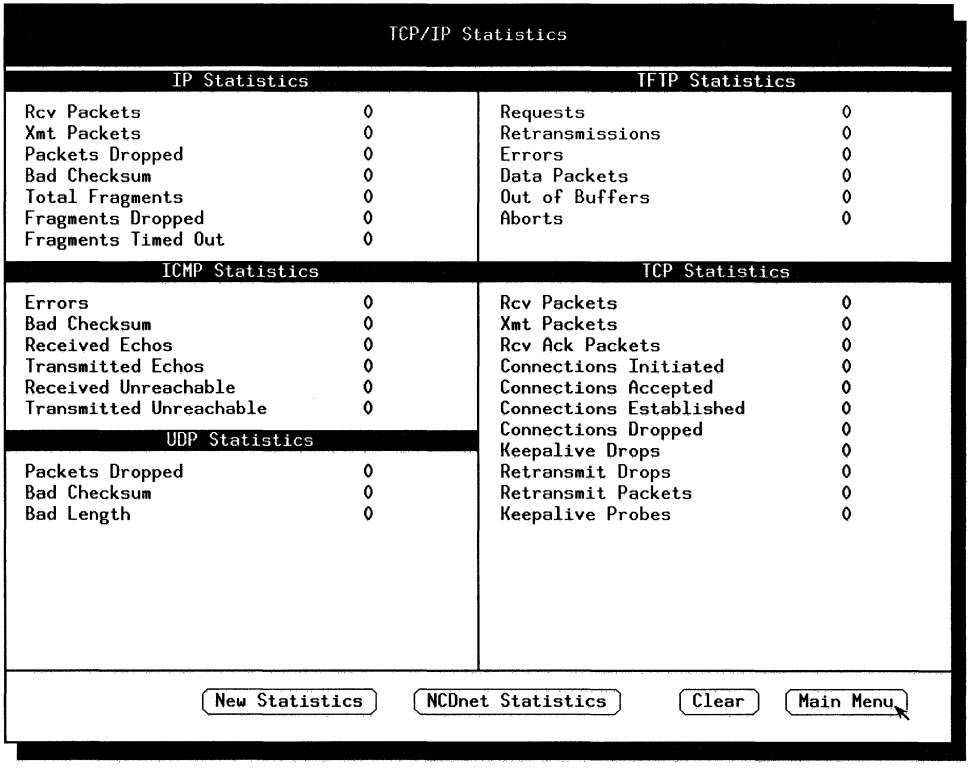


Figure 4-14. TCP/IP Statistics Menu

IP Statistics	Statistics for the IP protocol layer
TFTP Statistics	Statistics for the TFTP protocol layer
ICMP Statistics	Statistics for the ICMP protocol layer
TCP Statistics	Statistics for the TCP protocol layer
UDP Statistics	Statistics for the UDP protocol layer
New Statistics	Clicking this button will update this menu with the most recently-collected statistics
NCDnet Statistics	Clicking here selects the Network Statistics menu, as a shortcut
Clear	All statistical information is reset
Main Menu	Clicking here returns to the Main Menu

ARP Table

The ARP Table menu, shown in Figure 4-15, shows the results of ARPs (Address Resolution Protocol) performed by this unit. This table is created to translate IP addresses to Ethernet addresses. It is used by the server whenever a packet is sent to a particular IP address.

Figure 4-15. ARP Table Menu

Clear	Flushes this table, which forces the server to relearn the Ethernet address for each IP address that it wishes to reach.
Main Menu	Clicking here returns to the Main Menu.

NFS Mount Table Menu

The contents of the NFS Mount Table menu, shown in Figure 4-16, are alterable only via the remote configuration file. The menu shows the path name translations which take place when a font is accessed.

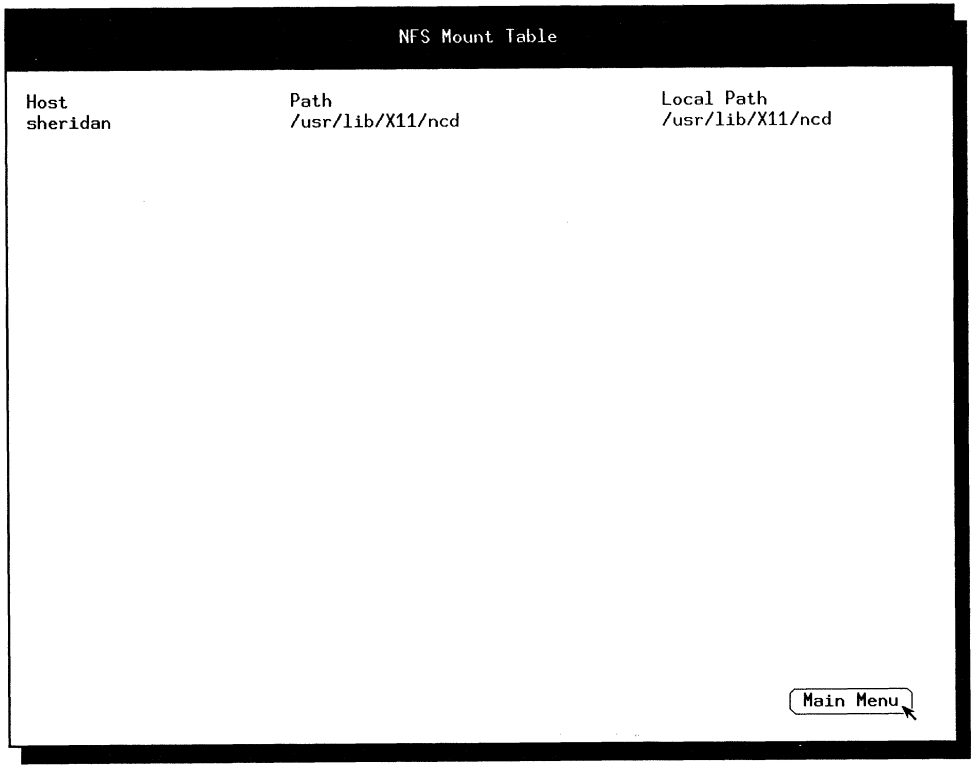


Figure 4-16. NFS Mount Table Menu

Host	The host that will be consulted for resolution of a file name which matches the local path for this entry.
Path	The mount point on that host where the file name resolution will begin on this host.
Local Path	The local path which is matched in table entry will be used to resolve the path name currently being resolved.
Main Menu	Clicking here returns to the Main Menu.

NCDnet Statistics Menu

The NCDnet menu, shown in Figure 4-17, shows various counters from the internals of the NCDnet protocol stack.

Figure 4-17. NCDnet Statistics Menu

New Statistics	Clicking this item gathers and displays a new set of statistics.
Network Statistics	A shortcut to the Network Statistics menu.
Clear	Clicking this item clears the counters.
Main Menu	Clicking here returns to the Main Menu.

NCDnet Name Table Menu

The NCDnet Name Table menu, shown in Figure 4-18, shows the mapping of DECnet names to DECnet addresses for NCDnet. This menu must be configured via remote configuration.

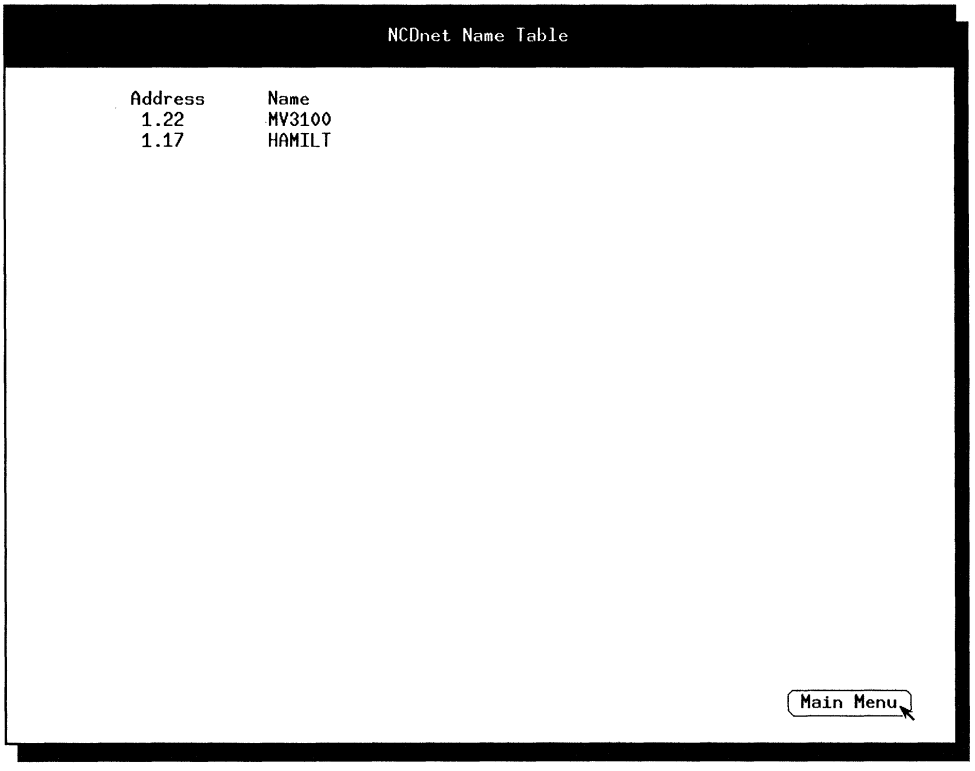


Figure 4-18. NCDnet Name Table Menu

Address DECnet address of the node.

Name DECnet node name associated with the address.

Main Menu Clicking here returns to the Main Menu.

Warnings About Memory

The NCD16 displays warning messages when X clients consume too much of its memory.

The first warning message, which is displayed only if backing store is enabled, is shown in Figure 4-19.

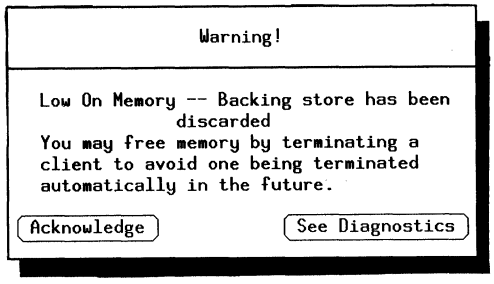


Figure 4-19. The First Low On Memory Warning

This warning message contains two buttons: "Acknowledge" and "See Diagnostics." Click on "Acknowledge" to return to your window manager. Click on "See Diagnostics" to display the diagnostics screen in the setup menus. The second and third warning messages also contain these buttons.

If your X clients consume still more memory the NCD16 displays a second message, whether or not backing store is enabled.

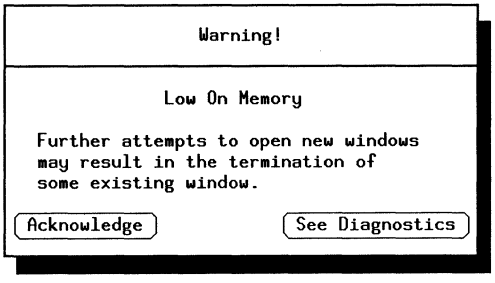


Figure 4-20. The Second Low On Memory Warning

If, after the second message has been displayed, clients continue to consume more memory, the NCD16 displays a third message, which is shown in Figure 4-21.

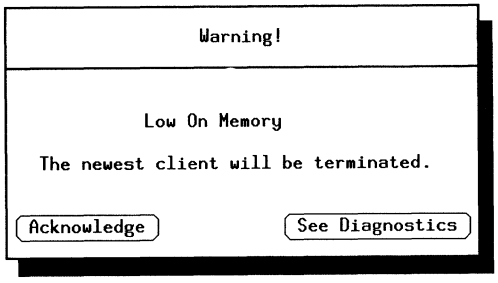


Figure 4-21. The Third Low On Memory Warning

You can change the memory level below which the NCD16 displays these messages. Edit your configs file (by default, /usr/lib/X11/ncd/configs/*IP_address*), and change the value of the variable called "low memory level." This variable sets the lowest number of free bytes the NCD16 should have in memory. If it has fewer, it displays one of the warning messages described above. Once you have assigned "low memory level" a new value, use the set up menus to load your revised configs file.

You can prevent these warning messages from being displayed by selecting "Disable Error Popup" in the X Server Parameters setup menu.

If these messages appear regularly, you should consider installing more memory in your terminal.

5 Keyboards

Introduction

Several keyboards are available with the NCD16.

- A 97-key keyboard, N-97.
- A 101-key IBM PS/2-style keyboard, N-101.
- A 105-key VT220-compatible keyboard.
- Various international keyboards.

Each keyboard is electrically compatible with IBM PS/2 keyboards and is recognized when the NCD16 boots.

Each key, when pressed, transmits a keycode from the server to the client application. The keycodes generated by the N-97 keyboard are shown in Figure 5-1; the keycodes generated by the N-101 keyboard are shown in Figure 5-2; the keycodes generated by the VT220-compatible keyboard are shown in Figure 5-3. The Setup key on the N-97 and N-101 keyboards does not transmit a code to the client application. On the V220-compatible keyboard, pressing F3 while holding Compose Character does not transmit a keycode. These keys are defined locally and are used to select the Setup windows.

A keycode is assigned a meaning by associating it with one or more keysyms, which are names defined by the X protocol for the symbols printed on the keys on a keyboard. Tables 5-1, 5-2, 5-3, and 5-4 show the default keysyms assigned to the keycodes generated by the NCD keyboards. The client program xmodmap is used to display and manipulate the assignment of keys to keysyms.

All NCD supplied keyboards are capable of providing different keycodes for the left and right modifier keys (e.g., shift or alt). Some software packages do not operate properly when more than one shift key is defined. In addition, there appear to be very few applications that care about the distinction between right and left modifiers. Therefore, the NCD X server, by default will report events involving a right modifier key as a left modifier event. This can be changed using the DW Compatibility button in the X Server Parameters menu or the DW Compatibility parameter in remote configuration.

Key Reassignment

The keyboard keys can be reassigned by using the xmodmap client program. A key is changed by assigning a different keysym value to the key's keycode value.

The following is an example to reassign the Escape and tilde keys. Some keyboards place the Escape key in the upper lefthand corner of the main key block, which is where the tilde key is located on the N-101 keyboard. You can reassign Escape to be this key, and move the tilde elsewhere. First, create the following file, named *keymap*:

```
!  This file moves the Esc to tilde, and tilde to the
   Option key
!
!  Keycode and keysyms by default:
!  0x08          Escape
!  0x0E          quoteleft asciitilde (`~)
!  0x58          Control_R (Option)
!
!  Assign Esc to the key marked tilde
   keycode 0x0E = Escape
!  Assign tilde and back quote to Option
   keycode 0x58 = quoteleft asciitilde
```

Then run the xmodmap program:

```
% xmodmap keymap
```

The keys have now been reassigned. In order to verify the change, type:

```
% xmodmap -pk
```

There are two keysyms per keycode. Keycodes range from 7 to 132.

```
Keycode     Keysym      (Keysym)          ...
Value       Value       (Name)            ...
 7
 8 0xff1b   (Escape)
 9
 .
 .
 .
 14         0xff1b      (Escape)
 .
 .
 .
 88         0x0060      (quoteleft)       0x007e       (asciitilde)
 .
 .
 .
 132        0xffad      (KP_Subtract)
```

Note the additional Escape definition (the original Esc key is still valid) and the reassignment of *quoteleft* and *asciitilde* to the Option key.

A second example is the swap of the Delete and Backspace keys. On some systems, Delete is used to erase a character, rather than Backspace. Create the following file, *keymap*, then type *xmodmap keymap* to set the new mappings:

```
! File to swap Backspace and Delete keys
!
! Keycode and keysyms by default
!   0x66          Backspace
!   0x64          Delete
!
 keycode 0x66 = Delete
 keycode 0x64 = Backspace
```

A third example is the reassignment of the upper four keypad keys to function keys, as compatible with DEC VT-style keyboards. Create the following file called *keymap*:

```
! File to map PF1, PF2, PF3, PF4 to numeric pad Num
    Lock / * -
!
! Keycode and keysyms by default:
!  0x76      Num_Lock
!  0x77      KP_Divide
!  0x7E      KP_Multiply
!  0x84      KP_Subtract
!
 keycode 0x76 = KP_F1
 keycode 0x77 = KP_F2
 keycode 0x7E = KP_F3
 keycode 0x84 = KP_F4
```

Then enter the following commands:

```
% xmodmap -e "remove mod5 = Num_Lock"
% xmodmap keymap
```

In addition to modifying the key mappings, the Num Lock key must be removed from the list of modifier keys, which is the function of the first xmodmap command.

Modifier Key Reassignment

Modifier keys are keys used by client programs to change the effect of a key. For example , the shift key is a modifier key that changes the letter typed from lower case to upper case. The X protocol defines three modifier keys: shift, lock, and control, . The NCD server sets additional modifier keys, depending on the keyboard. To display the current modifier key state, type:

```
% xmodmap          # on N-101 keyboard
xmodmap:           up to two keys per modifier, (keycodes in
                   parentheses)

shift              Shift_L (0x12),
lock               Caps_Lock (0x11)
control            Control_L (0x14), Control_R (0x58)
mod1               Alt_L (0x19), Alt_R (0x39)
mod2
mod3
mod4
mod5               Num_Lock (0x76)
```

The above is the default state for an N-101 keyboard. If you are using the VT220-compatible keyboard, xmodmap produces the output shown below.

```
xmodmap:           up to two keys per modifier, (keycodes in
                   parentheses)

shift              Shift_L (0x12)
lock               Caps_Lock (0x14)
control            Control_L (0x11)
mod1               Alt_L (0x19)
mod2
mod3
mod4
mod5
```

Most keys on the keyboard are repeating keys. The Setup key and modifier keys are non-repeating. Assigning a key to a modifier makes it no longer repeat, while removing a key as a modifier allows it to repeat.

The xmodmap client is discussed further in *X Window System User's Guide for Version 11*, published by O'Reilly and Associates. The list of available keysyms is described in Appendix H of *Xlib Reference Manual for Version 11*, published by O'Reilly and Associates. The include file <*X11/keysymdef.h*> also contains the list of keysyms.

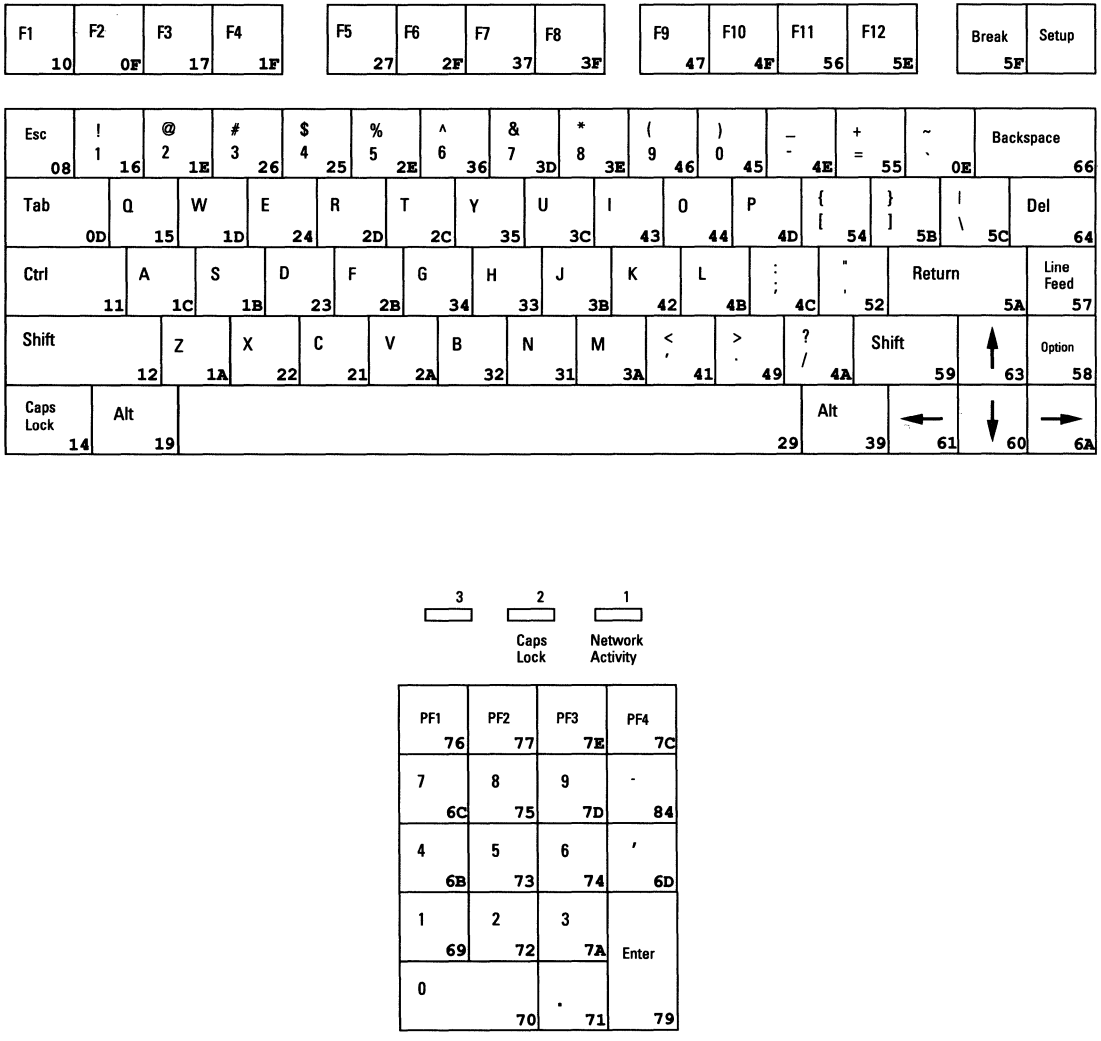


Figure 5-1. N-97 Keyboard Key Codes

Table 5-1. N-97 Keycodes and Keysyms

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key Name	Shifted Keysym Key Name
7			2A	v	V
8	Escape		2B	f	F
9			2C	t	T
A			2D	r	R
B			2E	5	percent
C			2F	F6	
D	Tab		30		
E	quoteleft	asciitilde	31	n	N
f	F2		32	b	B
10	F1		33	h	H
11	Control_L		34	g	G
12	Shift_L		35	y	Y
13			36	6	asciicirum
14	Caps Lock		37	F7	
15	q	Q	38		
16	1	exclamation	39	Alt_R*	
17	F3		3A	m	M
18			3B	j	J
19	Alt_L		3C	u	U
1A	z	Z	3D	7	ampersand
1B	s	S	3E	8	asterisk
1C	a	A	3F	F8	
1D	w	W	40		
1E	2	at	41	comma	less
1F	F4		42	k	K
20			43	i	I
21	c	C	44	o	O
22	x	X	45	0	parenright
23	sd	D	46	9	parenleft
24	e	E	47	F9	
25	4	dollar	48		
26	3	numbersign	49	period	greater
27	F5		4A	slash	question
28			4B	l	L
29	space		4C	semicolon	colon

* This Keycode will only exist if DW Compatibility is set to No. This is not the default.

Table 5-1. N-97-Keycodes and Keysyms (continued)

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key Name	Shifted Keysym Key Name
4D	p	P	6F		
4E	minus	underscore	70	KP_0	
4F	F10		71	KP_Decimal	
50			72	KP_2	
51			73	KP_5	
52	quoteright	quotedbl	74	KP_6	
53			75	KP_8	
54	bracketleft	braceleft	76	KP_F1	
55	equal	plus	77	KP_F2	
56	F11		78		
57	Linefeed		79	KP_Enter	
58	Control_R*		7A	KP_3	
59	Shift_R *		7B		
5A	Return		7C	KP_F4	
5B	bracketright	braceright	7D	KP_9	
5C	backslash	bar	7E	KP_F3	
5D			7F		
5E	F12		80		
5F	Break		81		
60	Down		82		
61	Left		83		
62			84	KP_Subtract	
63	Up				
64	Delete				
65					
66	BackSpace				
67	Insert				
68					
69	KP_1				
6A	Right				
6B	KP_4				
6C	KP_7				
6D	KP_Separator				
6E					

* This Keycode will only exist if DW Compatibility is set to No. This is not the default.

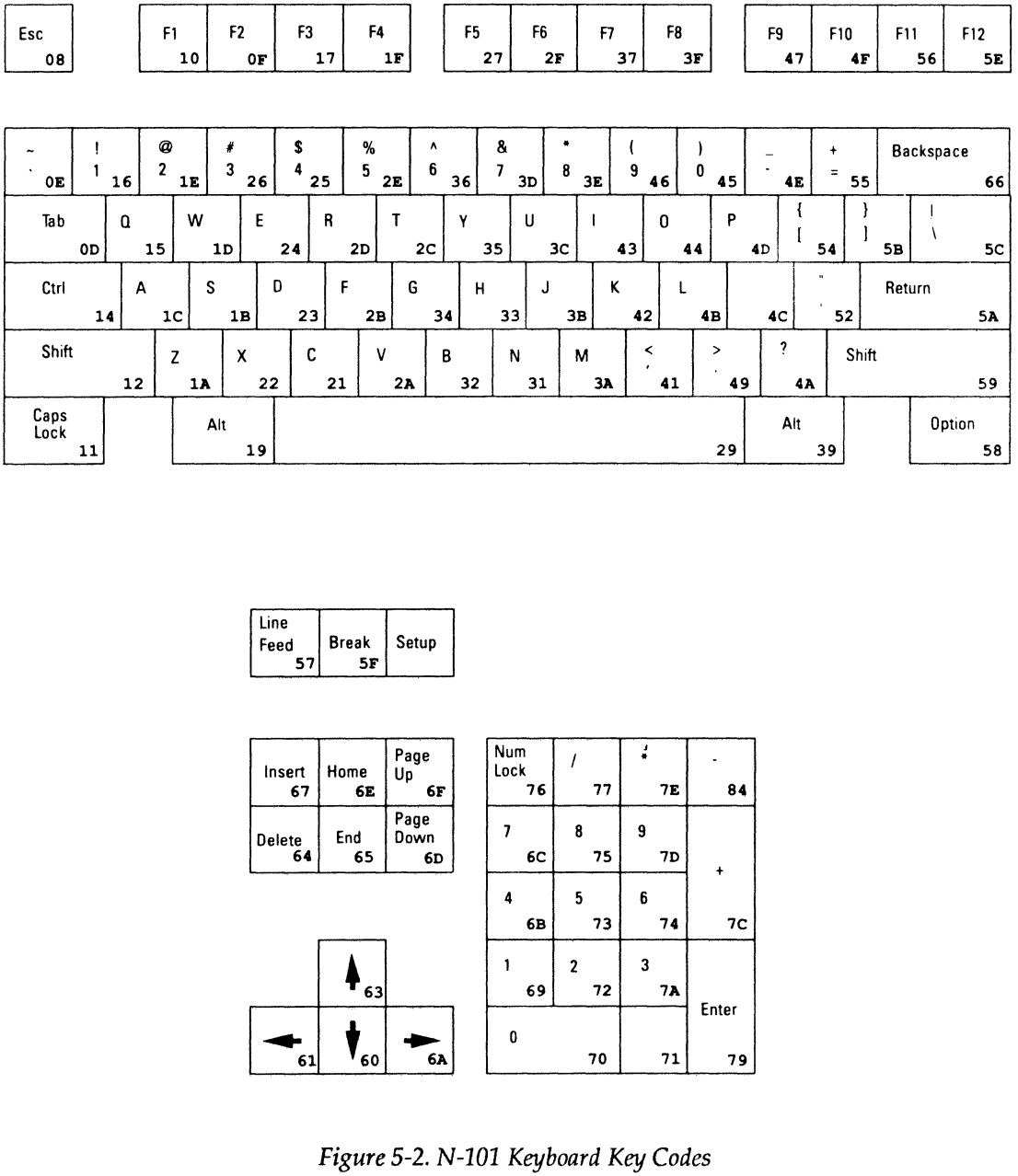


Figure 5-2. N-101 Keyboard Key Codes

Table 5-2. N-101 Keycodes and Keysyms

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key Name	Shifted Keysym Key Name
08	Escape		2A	V	
09			2B	F	
0A			2C	T	
0B			2D	R	
0C			2E	5	percent
0D	Tab		2F	F6	
0E	quoteleft	asciitilde	30		
0F	F2		31	N	
10	F1		32	B	
11	Caps_Lock		33	H	
12	Shift_L		34	G	
13			35	Y	
14	Control_L		36	6	asciicircum
15	Q		37	F7	
16	1	exclamation	38		
17	F3		39	Alt_R*	
18			3A	M	
19	Alt_L		3B	J	
1A	Z		3C	U	
1B	S		3D	7	ampersand
1C	A		3E	8	asterisk
1D	W		3F	F8	
1E	2	at	40		
1F	F4		41	comma	less
20			42	K	
21	C		43	I	
22	X		44	O	
23	D		45	0	parenright
24	E		46	9	parenleft
25	4	dollar	47	F9	
26	3	numbersign	48		
27	F5		49	period	greater
28			4A	slash	question
29	space		4B	L	

* This Keycode will only exist if DW Compatibility is set to No. This is not the default.

Table 5-2. N-101 Keycodes and Keysyms (continued)

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key name	Shifted Keysym Key Name
4C	semicolon	colon	6F	Prior	
4D	P		70	KP_0	
4E	minus	underscore	71	KP_Decimal	
4F	F10		72	KP_2	
50			73	KP_5	
51			74	KP_6	
52	quoteright	quotedbl	75	KP_8	
53			76	Numlock	
54	bracketleft	braceleft	77	KP_Divide	
55	equal	plus	78		
56	F11		79	KP_Enter	
57	Linefeed		7A	KP_3	
58	Control_R*		7B		
59	Shift_R*		7C	KP_Add	
5A	Return		7D	KP_9	
5B	bracketright	braceright	7E	KP_Multiply	
5C	backslash	bar	7F		
5D			80		
5E	F12		81		
5F	Break		82		
60	Down		83		
61	Left		84	KP_Subtract	
62					
63	Up				
64	Delete				
65	End				
66	Backspace				
67	Insert				
68					
69	KP_1				
6A	Right				
6B	KP_4				
6C	KP_7				
6D	Next				
6E	Home				

* This Keycode will only exist if DW Compatibility is set to No. This is not the default.

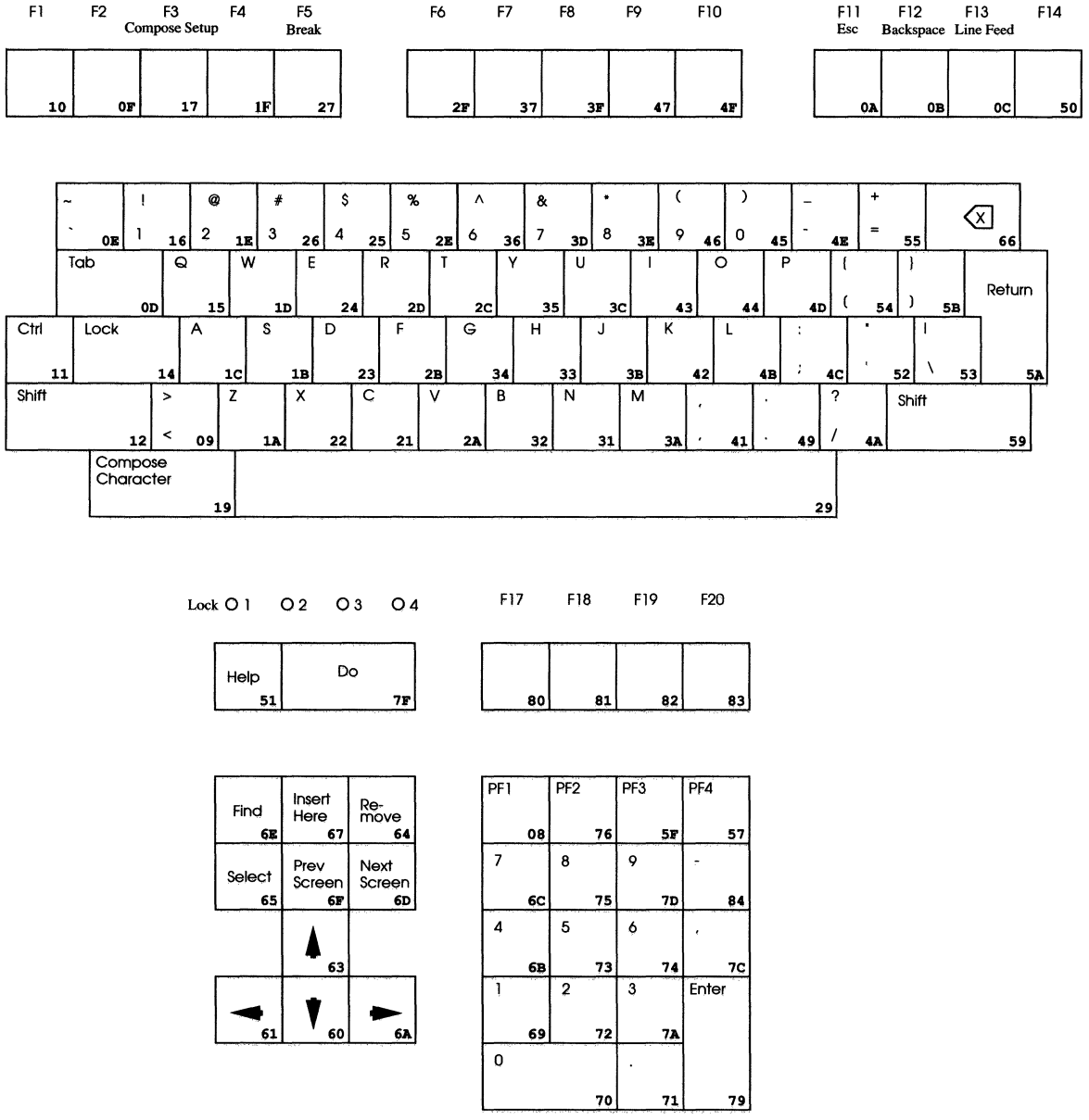


Figure 5-3. VT220-Compatible Keyboard Key Codes

Table 5-3. VT-220 Compatible Keycodes and Keysyms for VMS

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key Name	Shifted Keysym Key Name
7			2C	T	
8	KP_PF1		2D	R	
9	less	greater	2E	5	percent
0A	F11		2F	F6	
0B	F12		30		
0C	F13		31	N	
0D	Tab		32	B	
0E	quoteleft	asciitilde	33	H	
0F	F2		34	G	
10	F1		35	Y	
11	Control_L		36	6	asciicircum
12	Shift_L		37	F7	
13			38		
14	Capslock		39		
15	Q		3A	M	
16	1	exclamation	3B	J	
17			3C	U	
18			3D	7	ampersand
19	Alt_L		3E	8	asterisk
1A	Z		3F	F8	
1B	S		40		
1C	A		41	comma	comma
1D	W		42	K	
1E	2	at	43	I	
1F	F4		44	O	
20			45	0	parenright
21	C		46	9	parenleft
22	X		47	F9	
23	D		48		
24	E		49	period	period
25	4	dollar	4A	slash	question
26	3	numbersign	4B	L	
27	F5		4C	semicolon	colon
28			4D	P	
29	space		4E	minus	underscore
2A	V		4F	F10	
2B	F		50	F14	

Table 5-3. VT220-Compatible Keycodes and Keysyms for VMS (continued)

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key Name	Shifted Keysym Key Name
51	Help		74	KP_6	
52	quoteright	quotedbl	75	KP_8	
53	backslash	bar	76	KP_F2	
54	bracketleft	braceleft	77		
55	equal	plus	78		
56			79	KP_Enter	
57	KP_F4		7A	KP_3	
58			7B		
59	Shift_R *		7C	KP_Separator	
5A	Return		7D	KP_9	
5B	bracketright	braceright	7E		
5C			7F	Menu	
5D			80	F17	
5E			81	F18	
5F	KP_F3		82	F19	
60	Down		83	F20	
61	Left		84	KP_Subtract	
62	F3				
63	Up				
64					
65	Select				
66	Delete				
67	Insert				
68					
69	KP_1				
6A	Right				
6B	KP_4				
6C	KP_7				
6D	Next				
6E	Find				
6F	Prior				
70	KP_0				
71	KP_Decimal				
72	KP_2				
73	KP_5				

* This Keycode will only exist if DW Compatibility is set to No. This is not the default.

Table 5-4. VT-220 Compatible Keycodes and Keysyms for ULTRIX

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key Name	Shifted Keysym Key Name
7			2C	T	
8	KP_PF1		2D	R	
9	less	greater	2E	5	percent
0A	Escape		2F	F6	
0B	Backspace		30		
0C	Linefeed		31	N	
0D	Tab		32	B	
0E	quoteleft	asciitilde	33	H	
0F	F2		34	G	
10	F1		35	Y	
11	Control_L		36	6	asciicircum
12	Shift_L		37	F7	
13			38		
14	Capslock		39		
15	Q		3A	M	
16	1	exclamation	3B	J	
17			3C	U	
18			3D	7	ampersand
19	Alt_L		3E	8	asterisk
1A	Z		3F	F8	
1B	S		40		
1C	A		41	comma	comma
1D	W		42	K	
1E	2	at	43		I
1F	F4		44	O	
20			45	0	parenright
21	C		46	9	parenleft
22	X		47	F9	
23	D		48		
24	E		49	period	period
25	4	dollar	4A	slash	question
26	3	numbersign	4B	L	
27	F5		4C	semicolon	colon
28			4D	P	
29	space		4E	minus	underscore
2A	V		4F	F10	
2B	F		50	F14	

Table 5-4. VT220-Compatible Keycodes and Keysyms for ULTRIX (continued)

Keycode Value	Keysym Key Name	Shifted Keysym Key Name	Keycode Value	Keysym Key Name	Shifted Keysym Key Name
51	Help		74	KP_6	
52	quoteright	quotedbl	75	KP_8	
53	backslash	bar	76	KP_F2	
54	bracketleft	braceleft	77		
55	equal	plus	78		
56			79	KP_Enter	
57	KP_F4		7A	KP_3	
58			7B		
59	Shift_R *		7C	KP_Separator	
5A	Return		7D	KP_9	
5B	bracketright	braceright	7E		
5C			7F	Menu	
5D			80	F17	
5E			81	F18	
5F	KP_F3		82	F19	
60	Down		83	F20	
61	Left		84	KP_Subtract	
62	F3				
63	Up				
64					
65	Select				
66	Delete				
67	Insert				
68					
69	KP_1				
6A	Right				
6B	KP_4				
6C	KP_7				
6D	Next				
6E	Find				
6F	Prior				
70	KP_0				
71	KP_Decimal				
72	KP_2				
73	KP_5				

* This Keycode will only exist if DW Compatibility is set to No. This is not the default.

6 Caring for Your NCD16

Introduction

This chapter offers tips for taking care of your NCD16.

Preventive Maintenance

The are no preventive maintenance procedures required for the NCD16. However, it will be useful to check the following items on a periodic basis:

- Check all cables for visible damage and wear.
- Check connectors to ensure that the cables are mounted tightly; that the retaining screws are tight; and that there is no strain on the connector/cable junctions.
- Check that the NCD16 is located so that it receives proper air ventilation for cooling purposes.
- Check that the location is reasonably free of dust and dirt.

Caring for the Keyboard

The keyboard is a rugged unit that should provide trouble-free service. However, it is susceptible to damage if liquids are spilled on it. Use care not to spill coffee or soft drinks on the keyboard. If an accident should occur and liquid is spilled on the keyboard, let it dry then try its operation. If the keyboard does not operate properly, contact NCD for repair or replacement.

Cleaning the Mouse

The mouse might accumulate some dust or lint after a period of time. To clean the mouse:

1. Make sure that the NCD16 power is OFF.
2. Disconnect the mouse from the base unit.
3. Turn the mouse upside down so that you can see the ball. Rotate the ball counter-clockwise until the ball cover can be removed. Turn the mouse right-side up and the ball and cover should drop into your hand. If not, shake the mouse until the ball and cover drop from the mouse.
4. Blow out dirt and lint from the body of the mouse. If some dirt or lint still remains, use an adhesive tape to clean the ball socket. If this fails, use a cotton swab dipped in alcohol to clean the ball socket.
5. Wipe the ball with a clean, lint-free cloth or paper towel.
6. Replace the ball in the mouse. Replace the ball cover by laying it on the ball in the ball socket and turning the cover clockwise.

7 References

NCD Documentation

Other documents that you should have available for reference are:

- *NCD Release Notes* — These notes discuss specific host administration issues as well as release-specific issues.

Suggested Reading

"X Reference Set"

- *X Library Reference Guide.*

  Ira Chayut and Camille Cook. A System Publications, Inc.

- *X User Reference Guide.*

  Ira Chayut, Camille Cook, Anatole Olczak. A System Publications, Inc.

- *X Tool Kit Reference Manual.*

  Ira Chayut. A System Publications, Inc.

"The Definitive Guides to the X Window System"

- *Volume Zero: X Protocol Reference Manual.*

  Robert W. Scheifler. O'Reilly & Associates, Inc.

- *Volume One: Xlib Programming Manual.*

  Adrian Nye. O'Reilly & Associates, Inc.

- *Volume Two: Xlib Reference Manual.*

  Adrian Nye. O'Reilly & Associates, Inc.

- *Volume Three: X Window System User's Guide.*

  Tim O'Reilly, Valerie Quercia, Linda Lamb. O'Reilly & Associates, Inc.

Introduction to the X Window System.

Oliver Jones. Prentice Hall, Inc.

X Window System, C Library and Protocol Reference.

Rovert W. Scheifler, James Gettys, Ron Newman. Digital Press.

X/Open Portability Guide; Window Management.

X/Open Company, Ltd. Prentice Hall.

X Window Systems: Programming and Applications with Xt.

Douglas A. Young. Prentice Hall.

X Manual Set (boxed 3-volume set).

A System Publications, Inc.

X Window Applications Programming.

Eric F. Johnson, Kevin Reichard. Management Information Source, Inc.

X Window Toolkit Programming.

Cimarron Taylor, Peter Shipley, Mark Yatabe, John Muster Lurnix.

Glossary

ANSI	American National Standards Institute
Application clients	Application programs which can be run under the X Window system
ARP	Address Resolution Protocol
AUI	Attachment Unit Interface
bitmap	Bitmap editor for X
Boot Monitor	Program that monitors the boot download
Boot Server	Host computer that downloads the NCD16
Boot Image	Code downloaded to the NCD16 at boot-up
BOOTP	Boot protocol; provides information for down loading the NCD16
Broadcast Address	The address used to send information to all equipment on the network
Client	X Window application program
Configuration Server	Host computer providing configuration parameters
Crashed Image Upload	A memory image of a system that has crashed
CTERM	A DECnet network virtual terminal emulator

Daemon	An application that is run without a terminal
Demon	See daemon
Display server	See X server
Domain Name Server Requestor	The client portion of domain name service
Ethernet Driver	A program that receives and demultiplexes the various packet types available over the network
Ethernet	A type of network using coaxial cable (thin or thick), twisted-pair cable, or fiber-optic cable
Ethernet Address	An address identifying a module on an Ethernet network
ICMP	Internet Control Message Protocol
Internet Address	Address of a node on the network using the Internet
IP	Internet Protocol
IP Address	Internet Protocol Address. See Internet address
LANCE	A trademark of AMD, LANCE is the name of the Ethernet controller chip in the NCD16
MIRROR	A test that checks for DECnet network attachment
NVRAM	Non-volatile RAM (memory)

Ping	A test that checks for TCP/IP network attachment
Primary Name Server	Host providing name service
Primary Font Server	Host used for downloading fonts
Primary Gateway	Equipment used to connect two or more networks
RARP	Reverse Address Resolution Protocol
Remote Configuration	Allows operational parameters to be set from a central administrative computer and downloaded to the NCD16
Root Weave Window	The name given the display when the NCD16 X server runs
Secondary Name Server	Host used when there is no response from the primary name server
Secondary Font Server	Host used when there is no response from the primary font server
Serial Session	A program that allows the NCD16 to emulate an ANSI X3.64 terminal
Server	A station on a network providing a service, such as making a file or printer available
SIMM	Single In-line Memory Module
SLIP	Serial Line Internet Protocol, a protocol that allows the NCD16 to be used over an asynchronous RS-232-C port
TCP	Transmission Control Protocol

TCP/IP	Transmission Control Protocol/Internet Protocol
Telnet	A TCP/IP network virtual terminal interface
Telnet Session	A program that allows the NCD16 to emulate a Telnet ANSI X3.64 terminal
TFTP	Trivial file transfer protocol
Thick Ethernet	A network using thick coaxial cable
Thin Ethernet	A network using thin coaxial cable
UDP	User Datagram Protocol
Uploader	A utility in the boot monitor
uwm	UNIX Window Manager
xbiff	Mailbox flag for X
xcalc	Scientific calculator for X
X Clients	See application clients
xclock	Analog/digital clock
X display server	See X server
xdm	X Display Manager

xdpr	Dump X window Directly to Printer
xedit	Text editor for X
xfd	Font Displayer for X
xhost	Security feature that restricts access to the server
xload	Load average display for X
xlsfonts	Server font list displayer for X
xpr	Print an X window dump
X server	Executable module that obeys the X11 protocol
xset	A user preference utility for X
xterm	Terminal emulator for X
xwd	Dump an image of an X window to a file
X Window System	A set of network protocols developed by MIT for workstations

Appendix A - Specifications

Introduction

This appendix contains specifications for the NCD16. Included are:

- Descriptions of NCD16 features
- Performance Characteristics
- Physical Dimensions
- Controls and Indicators
- Power Requirements
- Environmental Operating Range
- Connections
- Connector Pinouts

Display Monitor

Size:	16-inch diagonal, square format
Resolution:	1024 by 1024 pixels, with 105 dots per inch
Refresh Rate:	70 Hz, non-interlaced
Phosphor:	Paper white

Base Unit

The base unit contains the digital electronics and consists of two main components: a main board and a communications module.

The main board contains a microprocessor, keyboard interface, mouse interface, display interface, and auxiliary RS-232-C interface.

Microprocessor:	12.5 MHz MC68000
Graphics Assist:	Proprietary
Memory Configurations:	0.5, 1.0, 1.5, 2.5, or 4.5 Mbyte of DRAM

The communications module contains both PROM software and network hardware. There are two types of PROMs:

- Boot PROMs
- Server PROMs

The network hardware consists of a LANCE controller, an on-board transceiver and connector for thin Ethernet (IEEE 802.3 10Base2), and a standard AUI connector.

SIMMs

100ns, Low-profile (1.1 inch)

256K by 8 or 1M by 8

0.047 to 0.054 inches thick

Keyboard

Three keyboards are available:

- N-97, 97-key
- N-101, 101-key
- VT220-compatible, 105-key

All keyboards are electrically compatible with IBM PS/2 keyboards.

Mouse

Industry-standard, 3-button, 200-dpi optomechanical mouse. The mouse is connected to a standard RS-232-C 9-pin "D" connector on the base unit. The mouse interface is a standard RS-232-C interface using 5-byte Mouse Systems, Inc. protocol or Microsoft Mouse protocol with automatic baud rate detection which provides support for 9600-baud or 1200-baud.

Software

Software consists of the following major components:

- Boot Monitor
- Remote Configuration File
- Server
- Fonts

The boot monitor is contained in PROMs, while the server may be downloaded or placed in server PROMs. There are eight fonts built into the server, and other fonts may be downloaded. The download server, download fonts, and miscellaneous utilities, are available on magnetic tape.

Boot Monitor

The boot monitor contains:

- Self-test Diagnostics
- Downloader
- RARP
- MOP
- ARP
- TFTP
- Hardware Trap Handler
- Uploader
- Diagnostic Commands

Remote Configuration File

The remote configuration file is interpreted by the server at initialization. Remote configuration allows central administration of configuration information, some of which can be manually entered into the display station's memory and NVRAM.

Server

The server contains:

- X11 server with shape extension and XDMCP support
- Telnet
- ANSI X3.64 and VT100 RS-232-C Terminal Emulation
- Setup Menus
- Communications Software
- NFS

- **Options**

  NCDnet

  DAP

  CTERM

  DDCMP

Fonts

The following resident fonts are supported:

- 10x20
- 6x10
- 8x13
- 9x15
- cursor
- fg-22
- fixed
- vt single

Additional fonts are loaded on demand using TFTP or NFS.

Setup Windows

The Setup Windows provide access to the following features:

- **User Preference Control**

  LEDs

  Screen Saver

  Backing Store

  Overscan

- **Built-In Sessions**

  Telnet Session

  Serial Session

  Diagnostic Session

- **Configuration Menus**

  Network Configuration Parameters

  Licensed Features

  Protocol Parameters

  Serial Configuration Parameters

- **Management Menus**

  Network Management

  TCP/IP Statistics

  Protocol Statistics

  NFS Mount Table

  ARP Table

- **Options**

  CTERM Session

  NCDnet Statistics

  NCDnet Name Table

Communications Software

The network display stations include protocol software required to:

- Support the X Window System's X-wire protocol called Transport Level Services
- Support network terminal emulation called Virtual Terminal Services
- Support accessing files for download and fonts called File Transfer Services
- Support configuration and management called Network Management Serv-ices

Transport Level Services

Transport level services include:

- **Ethernet Driver.** The driver receives and demultiplexes multiple packet types. If a packet arrives for an unknown type, it is discarded. If a packet of IEEE 802.2 format is received (length field where the Ethernet type field is), it is discarded. The driver supports multicast and broadcast packets.
- **Serial Line Internet Protocol (SLIP) Driver.** This driver is compatible with RFC1055, and implements serial line internet protocol over the RS-232-C asynchronous port.
- **BOOTP.** This is the preferred boot protocol. If not available, RARP is used. This is compatible with RFC 95.
- **ARP.** Address Resolution Protocol. This is compatible with RFC 826.
- **RARP.** Reverse Address Resolution Protocol. This is compatible with RFC 903.
- **Trivial File Transfer Protocol (TFTP);** RFC783 (IEN133). Used at boot to download the server. Also used for configuration parameter loading, dynamic font loading, and core image upload.
- **Internet Protocol (IP).** This is compatible with MIL-STD-1777, and RFC791 as required for an end-node only (no router support).
- **Transmission Control Protocol (TCP).** This is compatible with MIL-STD-1778 and RFC 793.
- **User Datagram Protocol (UDP).** This is compatible with RFC 768.
- Optionally, **NCDnet.** DECnet compatible protocols.

Virtual Terminal Service

In addition to the X server software, the virtual terminal service runs on top of the transport level services, and includes the user side of the Telnet remote terminal access protocol compatible with MIL-STD-1782, and RFCs 854, 855, 857, and 858. Optionally, CTERM can be used. CTERM is a terminal access protocol that is compatible with DEC protocols.

File Transfer Services

The file transfer services run on top of the transport level services and include:

- **Trivial File Transfer Protocol (TFTP).** This is compatible with RFC783. A single TFTP session can be active at any one time.
- **NFS.** Network File System. This is compatible with RFC 1094, RFC 1057, and RFC 1014.
- Optionally, **DAP (Data Access Protocol).** A DECnet-compatible file transfer protocol.

Network Management Services

The network management protocols supported are:

- **Internet Control Message Protocol (ICMP).** This is compatible with RFC792.
- **Domain Name Server Requestor.** This is compatible with RFC883 and RFC1035.
- **IEN 116 Name Service.**

The management setup menus offer the following network management services:

- Ping facility
- Network statistics
- Protocol statistics
- ARP table
- Download and upload of remote configuration
- Optionally, MIRROR. An NCDnet equivalent of Ping

Hardware Performance Characteristics

Area Copy Rate:	20 Mpixels/second
Fill Rate:	40 Mpixels/second
Scroll Rate:	40 lines/second
Character Draw Rate:	10,000 characters/second
Network Performance:	>150 packets/second

Controls and Indicators

Monitor

- Power Switch
- Brightness
- Contrast

Base Unit

- Power-on LED
- Speaker, X-defined click and beep

Keyboard

Three LEDs, which indicate:

- Num Lock
- Shift Lock
- Blink on Network Activity

The keyboard LEDs are also user configurable.

Physical Dimensions

Display Monitor and Base Unit

Size:	38.1 cm high by 35.6 cm wide by 35.6 cm deep (15 by 14 by 14 inches)
Weight: 1	5.4 kg (34 pounds)

N-97 Keyboard

Size:	4.0 cm high by 41.6 cm wide by 15.5 cm deep (1.6 by 16.4 by 6.1 inches)
Weight:	1.4 kg (3.1 pounds)

N-101 Keyboard

Size:	4.5 cm high by 48.8 cm wide by 20.1 cm deep (1.3 by 19.2 by 7.9 inches)
Weight:	2.3 kg (5 pounds)

VT220 Keyboard

Size:	3.9 cm high by 48.6 cm wide by 20.8 cm deep (1.5 by 19.1 by 8.2 inches)
Weight:	1.4 kg (3.1 pounds)

Mouse

Size:	2.5 cm high by 6.6 cm wide by 9.7 cm deep (1 by 2.6 by 3.8 inches)
Weight: 1	13 grams (4 ounces)

Power Requirements

AC Voltage:	115/230 Vac, 50/60 Hz	
Consumption:	125 W @ 115 Vac	
Environmental Operating Range:		
	Temperature:	0 °C to +40 °C
	Humidity:	10% to 90% non-condensing
	Altitude:	Up to 3048 meters (10,000 feet)

Connections

The following connectors are located on the rear panel of the base unit:

- 15-pin male DB15 connector for display monitor
- 25-pin female DB25 connector for RS-232-C interface (used for auxiliary port, ANSI terminal emulator, or SLIP terminal emulator)
- 9-pin male DB9 connector for mouse
- 7-pin male connector for keyboard

Connector Pinouts

Connector J1 - Keyboard

Six-pin, mini-DIN female connector

Pin	Signal
1	Keyboard Data
2	Reserved
3	Ground
4	+5V dc
5	Keyboard Clock
6	Reserved

Connector J2 - Mouse

Nine-pin, DB9P male connector. J2 is compatible with IBM PC/AT serial port.

Pin	Signal	EIA Circuit	Signal Direction
1	Data Carrier Detect	CF	IN
2	Receive Data	BB	IN
3	Transmit Data	BA	OUT
4	Data Terminal Ready	CD	OUT
5	Signal Ground	AB	--
6	Data Set Ready	CC I	N
7	Request To Send	CA	OUT
8	Clear To Send	CB	IN
9	Not Connected		
	Shell Protective Ground	AA	--

Connector J3 - Auxiliary Port

RS-232-C, DB25S female connector. The following baud rates are supported:

50, 75, 110, 134.5, 150, 200, 300, 600, 1050, 1200, 1800, 2000, 2400, 4800, 7200, 9600, 19200, 38400

Pin	Signal	EIA Circuit	Signal Direction
1	Chassis Ground	AA	--
2	Transmit Data	BA	OUT
3	Receive Data	BB	IN
4	Request To Send	CA	OUT
5	Clear To Send	CB	IN
6	Data Set Ready	CC	IN
7	Signal Ground	AB	--
8	Data Carrier Detect	CF	IN
9	Through 19 Not Connected		
20	Data Terminal Ready	CD	OUT
21	Through 25 Not Connected		
	Shell Protective Ground	AA	--

Connector J5 - Transceiver -- IEEE 802.3 10BASE5

Pin	Circuit	IEEE 802.3 Signal	Ethernet II Signal
1	CI-S	Control In Circuit Shield	Chassis Shield
2	CI-A	Control In Circuit A	Collision Presence+
3	DO-A	Data Out Circuit A	Transmit+
4	DI-S	Data In Circuit Shield	Not Used (Ground)
5	DI-A	Data In Circuit A	Receive+
6	VC	Voltage Common	12V Ground
7	CO-A	Not Used	Not Connected
8	CO-S	Option Shield	Not Connected
9	CI-B	Control In Circuit B	Collision Presence-
10	DO-B	Data Out Circuit B	Transmit-
11	DO-S	Data Out Circuit Shield	Not Used (Ground)
12	DI-B	Data In Circuit B	Receive-
13	VP	Voltage Plus	+12V
14	VS	Voltage Shield	Not Used (Ground)
15	CO-B	Not Used	Not Connected
Shell	PG	Protective Ground	Chassis Ground

The only electrical difference between the IEEE 802.3 transceiver cable and the Ethernet II AUI cable is the circuit shield lines on pins 4, 11, and 14. For the NCD16, these signals are connected to ground. The +12V supply has a 1-ohm resistor in series as a fuse.

Connector J8 - Thin Net

IEEE 802.3 10BASE2. This is a BNC connector.

Modem-to-NCD Serial Cable

Pinouts for this cable are shown in figure A-1. Both ends of the cable should be terminated in male DB-25 connectors.

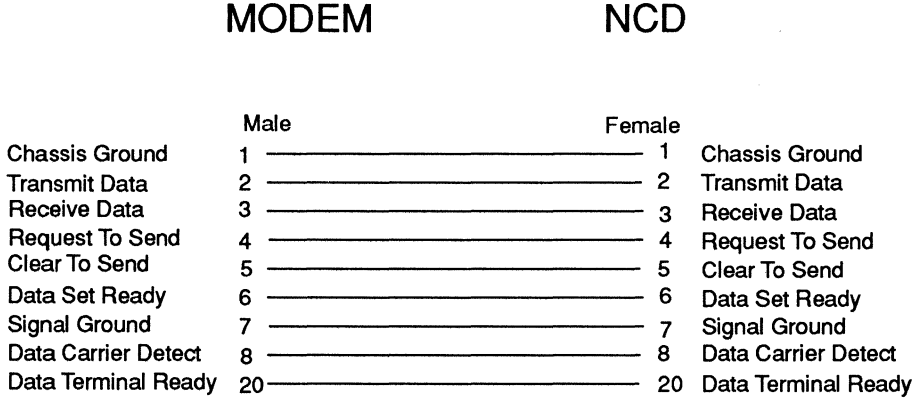


Figure A-1. Modem-to-NCD Serial Cable Pinouts

Sun-to-NCD Serial Cable

Pinouts for this cable are shown in figure A-2.

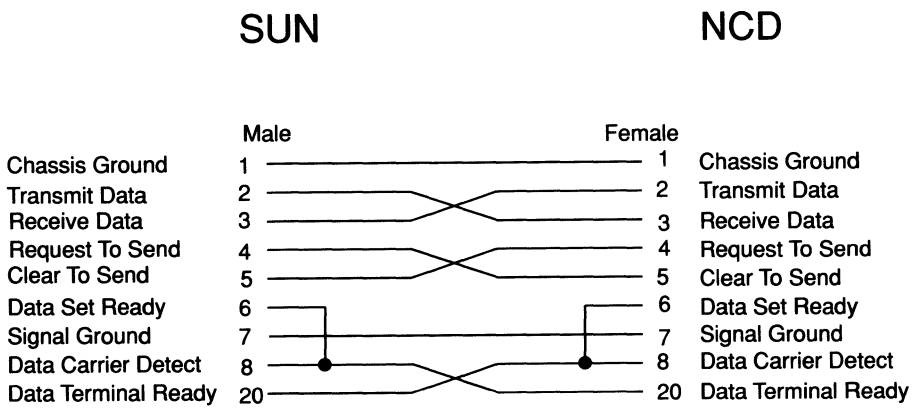


Figure A-2. Sun-to-NCD Serial Cable Pinouts

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