

EtherWORKS PCI Remote Boot ROM

Installation

Part Number: EK-BOOTR-IN.A01

Revision/Update Information: This is a new manual.

**Digital Equipment Corporation
Maynard, Massachusetts**

June 1996

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Table of Contents

About This Manual
Manual Contents	ix
1 Introduction	1-1
Overview	1-1
Features	1-2
General Features	1-2
MOP-Specific Features.....	1-2
NetWare Specific Features.....	1-2
TCP/IP-Specific Features	1-3
RPL-Specific Features.....	1-3
2 Remote Boot ROM Installation.....	2-1
Installation.....	2-1
Configuring the Remote Boot ROM.....	2-3
EZWORKS Command Line Switches.....	2-5
Command Line Switch Format.....	2-5
Remote Boot ROM Operation.....	2-7
Booting from Local Drives.....	2-7
3 Remote Boot for MOP	3-1

PATHWORKS V4.1	3-1
Preparing the Server for MOP	3-1
Preparing the Client for MOP	3-2

4 Remote Boot for NetWare 4-1

Overview	4-1
Network Requirements	4-1
Creating a Boot Image File	4-2
Create a Boot Diskette	4-2
Run IMGGEN Utility.....	4-3
Using the Remote Boot ROM with Multiple Servers.....	4-5
Creating Multiple Boot Images	4-5
Creating the BOOTCONF.SYS Boot Index File.....	4-5
Using Unique .BAT File Names in Boot Images	4-7
Using IMGGEN to Create Different Boot Images	4-8
Transferring from the Boot Image File to SYS:LOGIN.....	4-8
Batch File Missing Messages	4-9
Boot Process	4-10
NetWare Utilities.....	4-12
MAPGEN Utility	4-12
Using MAPGEN	4-13
MAPGEN Error Messages	4-15
UNRPLFIX Utility.....	4-18
CHKID Utility	4-19
Using CHKID	4-19
CHKID.SYS	4-20
Using CHKID.SYS	4-20
ROMTYPE	4-21
Remote Boot Technical Notes	4-22
BootWare/MSD	4-22
How Does It Work?	4-22
BootWare/MSD Features	4-23
BootWare/MSD Computer Messages.....	4-24
Error Messages	4-25
Questions and Answers	4-27
Multiple Protocol Stacks or Frame Types.....	4-28
Using the Remote Boot ROM With Microsoft Windows V3.1	4-29

Formatting Diskettes Under Windows	4-29
BootWare and Windows Swap Files	4-30

5 Remote Boot for TCP/IP5-1

Overview	5-1
Boot Screen	5-2
Setting Up the Server	5-3
Setting Up the Computer.....	5-3
Creating a Boot Diskette	5-3
Creating a Boot Image File	5-5
TCP/IP Utilities	5-6
IMAGEGEN Utility	5-6
FREEMEM Utility.....	5-7
MAPGEN Utility	5-8
Using MAPGEN	5-8
Using BPPATCH	5-11
Tags.....	5-11
TCP/IP Problems and Errors	5-11
Boot Screen Messages.....	5-11
File Transfer Error Messages	5-12
Using Memory Managers.....	5-13
EMM386.....	5-14
HIMEM.SYS.....	5-14

6 Remote Boot for RPL6-1

Overview	6-1
Computer Screen	6-2
PATHWORKS V5.x	6-3
Preparing the Server for PATHWORKS V5.x	6-3
Preparing the Client for PATHWORKS V5.x.....	6-4
Microsoft LAN Manager.....	6-4
Installation	6-4
Problems and Solutions	6-4
At the Computer	6-5
Searching for DLC RPL Server, retries = nnnnnn.....	6-5
Sending file requests to DLC RPL Server, retries=nn	6-5

Double- or triple-check your PROTOCOL.INI file.....	6-5
NDIS drivers require more memory to load.....	6-6
Boot Block fails to load DOS	6-6
OS/2 boot fails once in a while.....	6-6
OS/2 boot fails	6-6
At the Server.....	6-7
RPL or Remoteboot service does not start.....	6-7
RPLMGR does not start	6-7
Microsoft LAN Manager Documentation.....	6-8
IBM LAN Server	6-8
Installation.....	6-8
Memory Optimization	6-10
Windows NT	6-10
Documentation Error	6-11
Preparing the Windows NT Server.....	6-11
Preparing the Windows NT Client	6-12

A Update InformationA-1

Obtaining the Latest Remote Boot ROM Driver Files.....	A-1
Other Digital Network Adapter Products	A-3
DE45X-AR Remote Boot ROM	A-3
DE20M-AR Remote Boot ROM.....	A-3
Fast EtherWORKS PCI 10/100 (DE500-AA, DE500-XA) Adapter ...	A-3
EtherWORKS Hub 8TX (DELXR) Repeater.....	A-4
EtherWORKS Turbo PCI 10 TP (DE450-TA, DE450-CA) Adapters..	A-4
EtherWORKS 3 Turbo TP (DE204-AB, DE205-AC) Adapters	A-5
EtherWORKS Turbo EISA (DE425-AA) Adapter	A-5
EtherWORKS PCMCIA Turbo (DEPCM-AA, DEPCM-BA) AdaptersA-5	
DEC FDDIcontroller/PCI (DEFPA-UA, DEFPA-MA, DEFPA-AA, DEFPA-DA) Adapters	A-6
DEC FDDIcontroller/EISA (DEFEA-AA, DEFEA-DA, DEFEA-UA, DEFEA-MA) Adapters.....	A-6

Figures

Figure 2-1 Installing the Remote Boot ROM.....	2-2
Figure 2-2 EZWORKS Remote Boot ROM Menu	2-3

Figure 4-1	Sample BOOTCONF.SYS File	4-5
Figure 4-2	Using Unique Batch Files	4-7
Figure 4-3	Example of Batch File Format	4-9
Figure 4-4	Boot Process Flowchart	4-11
Figure 4-5	Using the MAPGEN Utility	4-14
Figure 4-6	Exit the MAPGEN Utility	4-14
Figure 5-1	Example of Boot Screen	5-2
Figure 5-2	Using MAPGEN for Boot Image File	5-9
Figure 5-3	Exit the MAPGEN Utility	5-10

Tables

Table 2-1	General Adapter Command Line Switches.....	2-5
Table 2-2	Remote Boot ROM Command Line Switches	2-6

About This Manual

Manual Contents

This guide describes how to install and configure the EtherWORKS PCI remote boot ROM (DE45D-AR, DE45F-AR) in MOP, NetWare, TCP/IP, and RPL networks.

Intended Audience

This guide is designed for the experienced network installer.

Manual Conventions

Convention	Description
Note	Contains information of special importance.
<i>Italics</i>	In examples, indicates a variable. In text, emphasizes a term or indicates a book title.
Monospaced type	Indicates a literal example of system output.

Introduction

Overview

The EtherWORKS PCI remote boot ROM (DE45D-AR, DE45F-AR) is an implementation of the BootWare remote boot ROM developed by Lanworks Technologies, Inc. and available exclusively from Digital Equipment Corporation. The DE45D-AR and DE45F-AR are hereafter referred to as the remote boot ROM.

When you install the remote boot ROM in the ROM socket of an EtherWORKS Turbo PCI 10 adapter (DE450), your system will be able to load its operating system, network drivers, and other files directly from a network file server, without requiring a boot diskette or a disk drive in your computer.

Once the remote boot ROM takes control of the boot procedure, comprehensive status information is presented throughout the boot procedure to keep you well informed. In addition, all boot images are centrally located on your network file server to simplify changes to boot information.

Features

The general features and main protocol-specific features of the EtherWORKS PCI remote boot ROM are included in the following sections.

General Features

The general features of the remote boot ROM include the following:

- Increases network security and centralizes boot procedures for easier network management
- Supports various network operating systems (NOS)
- Flexible boot options for systems with local hard drives
- FLASH ROM versions can be reprogrammed/reconfigured using the EZWORKS Installation utility software for easy updates or configuration changes
- Includes RomShield antivirus software for NetWare, TCP/IP, and RPL protocols

MOP-Specific Features

The main feature of using the remote boot ROM with the MOP protocol is that it supports the PATHWORKS operating system, V4.x.

NetWare Specific Features

The main features of using the remote boot ROM with the NetWare protocol include the following:

- Supports all versions of NetWare 3.x and 4.x, including Portable NetWare
- Does not require any RPL NLMs to be loaded at NetWare servers
- Includes support for the BootWare/MSD Multi-Server-Director option for improved boot image file management in large networks
- Supports all versions of DOS and OS/2 booting
- Allows selection of different boot images for each computer system
- Includes MAPGEN utility for examining/editing boot image files on the file server, and other useful utilities

TCP/IP–Specific Features

The main features of using the remote boot ROM with the TCP/IP protocol include the following:

- Supports centralized booting of DOS from any TCP/IP network that has a BOOTP, or RARP and a TFTP daemon
- Includes the MAPGEN utility for examining/editing boot image files on the file server, and other useful utilities
- Includes the BPPATCH utility to insert BOOTPTAB fields into text and batch files
- Supports image files up to 2.88 MB

RPL–Specific Features

The main features of using the remote boot ROM with the RPL protocol include the following:

- Supports Microsoft LAN Manager V2.0C, V2.1, V2.2, Microsoft Windows NT Server, IBM LAN Server, and PATHWORKS V5.x and later
- Supports remote boot of DOS and OS/2 (network operating–system dependent)

2

Remote Boot ROM Installation

Installation

The EtherWORKS PCI remote boot ROM is fully compatible with PCI computers, configuring automatically to the adapter's settings in these environments.

Digital offers two remote boot ROMs: the DE45D-AR, 28-pin remote boot ROM and the DE45F-AR, 32-pin FLASH remote boot ROM.

To install the remote boot ROM:

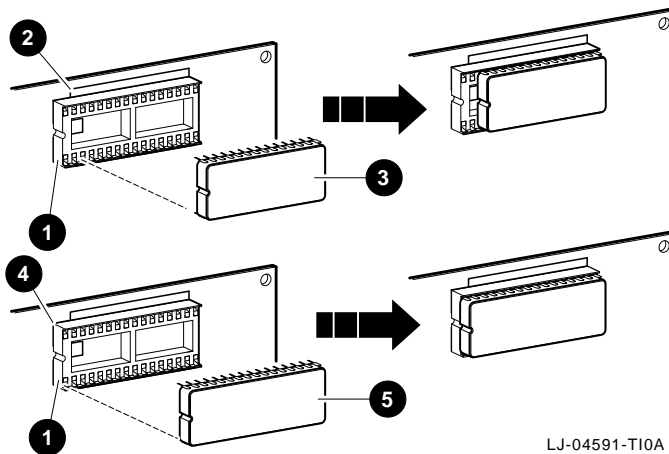
1. Remove the adapter from your system, then place it on a flat surface.
2. Align the remote boot ROM with the corresponding outline on the 32-pin socket ❶ (see Figure 2-1).

Align the DE45D-AR 28-pin remote boot ROM ❸ with the corresponding outline on the socket (smaller outline) ❷.

Align the DE45F-AR 32-pin ROM ❺ with the socket's larger outline ❹, or align the notch in the ROM with the notch in the ROM socket.

3. Align the pins on the ROM with the holes in the ROM socket, then insert the pins during the process. Press firmly on the ROM to make a solid contact.
4. Run the EZWORKS Installation utility to enable the remote boot ROM.

Figure 2-1 Installing the Remote Boot ROM



LJ-04591-T10A

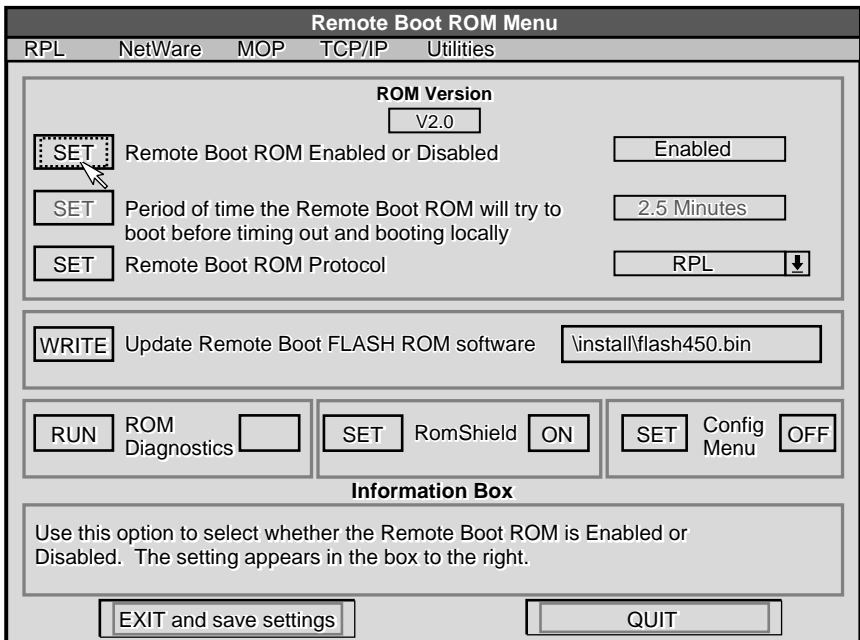
Configuring the Remote Boot ROM

Once you have installed the remote boot ROM on your adapter, and installed the adapter in your system, use the EZWORKS Installation utility to configure the ROM.

To configure the remote boot ROM using the EZWORKS Installation utility:

1. Type A>Setup at the prompt to display the Remote Boot ROM Menu.

Figure 2-2 EZWORKS Remote Boot ROM Menu



LJ-4590C.A14

When using the Remote Boot Setup diskette, the Remote Boot ROM Menu appears automatically. If a remote boot ROM is not installed in your computer, or is installed incorrectly, then an error message will appear.

Command line parameters can be used as an alternative method to configure your remote boot ROM. For example:

```
A>Setup/remote=enabled/protocol=RPL
```

See the EZWORKS Command Line Switches section in this chapter for more information.

2. Select the desired options:

Enable the remote boot ROM to establish a remote boot session when the computer is powered up.

Select the period of time to attempt a remote boot before a local boot occurs (MOP only).

Select the appropriate remote boot protocol to be used to establish a remote boot session. For help on a particular protocol, click on that protocol from the menu bar.

- Use the MOP protocol in PATHWORKS V4.1x environments.
- Use the NetWare xxxx protocol in Novell NetWare environments. The xxxx stands for the corresponding frame type configured on the NetWare server performing the remote boot.
- Use the TCP/IP protocol in BOOTP remote boot environments.
- Use the RPL protocol (the default) in PATHWORKS V5.x, Microsoft LAN Manager V2.2, Microsoft Windows NT Advanced Server V3.5x, and IBM LAN Server V3.x, V4.0 environments.

If you have a FLASH ROM version of the remote boot ROM, click on the WRITE button if you wish to update the ROM software.

Run diagnostics to check the integrity of the remote boot ROM.

Click on the RomShield button to turn ON/OFF the antivirus function before a remote boot session is established (for NetWare, TCP/IP, and RPL).

Click on the Config Menu button to turn ON/OFF the ability to change the remote boot settings before a remote boot session is established. When the Initializing Digital... message appears, press Ctrl/Alt/B to enter the Config Menu.

3. Save your changes by selecting the Exit and save settings option.
4. Use either the File option from the menu bar, or press the Esc key to exit the EZWORKS Installation utility.

EZWORKS Command Line Switches

The EZWORKS Installation utility supports command line switches. These switches perform EZWORKS functions when a single Digital EtherWORKS PCI adapter is installed in your computer. The format for the command line switches is not case sensitive; however, all switch fields must be entered without spaces before or after the equals sign (=) and without truncating switch names. (Refer to the following section for the correct command line format.)

Command Line Switch Format

Table 2-1 and Table 2-2 list and describe the available EZWORKS command line switches. For further information, see the EZWORKS.TXT file located in the /INSTALL directory on the Remote Boot Setup diskette.

Table 2-1 General Adapter Command Line Switches

Switch	Description
/help or /?	When these switches are included in the command line, EZWORKS displays help information on the command line switches.
/nodisplay	Turns off screen display except for /?, /help, /status, and any error messages.
/status	Displays current Digital EtherWORKS PCI adapter configuration.

Table 2-2 Remote Boot ROM Command Line Switches

Switch	Description
/cfg=(enable, disable)	Allows you to Enable or Disable the configuration screen for the remote boot ROM. The adapter default is OFF.
/protocol=(mop, rpl...)	Modifies the remote boot protocol to the value you specify. For ROMs V2.0 or earlier, the valid values are MOP, RPL, RPL_19h. For ROMs V2.0 or later, the valid values are MOP, RPL, TCPIP, NETWARE_802_2, NETWARE_802_3, NETWARE_ETHERNET_II. The adapter default is RPL.
/remote=(enable,disable)	Allows you to change your adapter's remote boot setting to Enable or Disable according to the value you specify. The adapter default is Disable.
/rs=(enable, disable)	Allows you to Enable or Disable the RomShield anti-virus protection. The adapter default is Enable.
/timeout-(30secs, 2_5mins)	Selects the period of time the adapter will attempt a remote boot before a local boot occurs (MOP only). The adapter default is 2.5 minutes.
/updateflash	Allows you to write/update an installed remote boot FLASH ROM using the flash450.bin file.

Remote Boot ROM Operation

When you boot your computer, the following will occur:

1. Your computer's memory checks will proceed as usual.
2. The TYPE H TO BOOT FROM HARD DISK message will appear (only if there is a hard disk present in your computer). You have approximately five seconds to choose this option before the connection between your system and the file server is made automatically. To boot from the network without waiting the five seconds, press any other key.
3. When the ROM is booting from the network, you will get an information message indicating the computer's status. If you do not get this message, your ROM may not be installed correctly. Use the EZWORKS Installation utility to check if the ROM is installed correctly.

At this point, you need to set up your server for remote boot. To do this, refer to the appropriate section of this guide for information about your network.

Booting from Local Drives

It is still possible to boot from a local diskette or hard disk, even though the remote boot ROM is installed in your system's adapter:

- To boot from drive A:, insert a bootable diskette into the drive before booting or rebooting your system.
- To boot from your local hard disk (drive C:), remove the diskette from drive A: (or leave the drive door open). The remote boot ROM will detect your local hard disk when you boot your system. The following screen prompt will be displayed:

```
Type H to boot from hard disk
```

You have approximately five seconds to choose this option before the connection between the computer and the file server is automatically made. To boot from the network without waiting the five seconds, press any other key.

If you desire to always boot from the network, and do not want to see this prompt every time you boot your system, some network operating system vendors provide a utility to modify the hard disk's partition table so the remote boot ROM will not recognize it as a bootable device. You can change your hard disk back to a bootable device by running a different utility. For Microsoft LAN Manager and IBM LAN Server, the utilities are RPLENABL and RPLDSABL.

In summary, to boot from your local hard disk, you must enter h or H within five seconds of being prompted to do so. If you enter nothing, or any other key, the remote boot ROM will attempt to boot from the network. Should you desire to always boot from a local drive without having to press any keys, you may do so by placing a bootable diskette in drive A:.

Note

Certain personal computers manufactured by IBM assign local hard disk boot a higher priority than remote boot. For these machines, the remote boot ROM will not prompt the user if a hard disk boot is desired. Use the REPLENABL utility program to disable hard disk boot, or RPLDSABL to enable hard disk boot.

Remote Boot for MOP

PATHWORKS V4.1

Selecting the MOP protocol enables your system to load DOS, network drivers, and other files directly from a PATHWORKS V4.1 file server, without requiring a boot diskette or a system disk drive.

Preparing the Server for MOP

Before the first client is configured, install the EtherWORKS PCI remote boot task image files on the server as follows:

1. Insert the Remote Boot Setup diskette into your computer's disk drive that is connected to a PATHWORKS network operating system (NOS).
2. Copy the PATHWORKS task image files from the diskette to the Personal Computing Systems Architecture (PCSA), V4.1 or later, default file area on the server using the Network Files Transfer (NFT) program:

```
NFT> COPY/BLOCK  
FILE(S) ?: A:\DE450_?.TSK  
TO?: hostname"SYSTEMpassword":SYS$COMMON:[PCSA.LOAD_FILE.V41]
```

The /BLOCK switch is required to preserve the file format during the copy process.

3. Run NETSETUP to prepare the server for client boot requests. Set NETSETUP to Advanced mode by pressing Ctrl/F10 twice. Press the F7 key to return to the previous screen. Select “Another workstation” option for the computer you are configuring, then configure the client as usual. Repeat this process for each remote boot client.
4. Log in to the server and set the Network Control Program (NCP) database entry for each new client name to point to the EtherWORKS PCI remote boot task image file. The following example shows a client configured to use the hardware clock for the scheduler. Replace DE450_H.TSK with DE450_S.TSK for the software clock.

```
NCP> DEFINE NODE client_name
NCP> LOAD FILE
SYS$COMMON:[PCSA.LOAD_FILE.V41]DE450_H.TSK
NCP> SET NODE client_name ALL
```

The installation is complete when the database has been updated for all new nodes. For more information, refer to the *PATHWORKS for VMS Server Administrator's Guide*.

Preparing the Client for MOP

To prepare the client for the MOP protocol:

1. Use the EZWORKS Installation utility located on the Remote Boot Setup diskette to select the following settings for the client:
 - Remote Boot Function = Enable
 - Remote Boot Protocol = MOP
 - Timeout = 2.5 minutes
2. When the selections are complete, reboot the client computer to perform remote boot from the server.

Remote Boot for NetWare

Overview

Selecting the NetWare protocol enables your system to load DOS, network drivers, and other files directly from a NetWare file server, without requiring a boot diskette or a system disk drive.

Network Requirements

The remote boot ROM supports all versions of NetWare from Advanced NetWare V3.x up to and including NetWare V4.x, in single- or multiple-server environments.

The NetWare protocol supports IEEE 802.3, IEEE 802.2, or Ethernet II (8137) standards. The 802.3 Ethernet frame types have been the Novell default up until NetWare V3.12 and NetWare V4.0, when 802.2 became the default. The Ethernet II versions support installations where non NetWare hosts share the Ethernet media with NetWare servers.

Make sure that the Ethernet frame type selected for remote boot is also supported by the file server used to boot the computer.

Unlike the RPL protocol, remote boot for NetWare communicates using native NetWare protocols and does not require any NLMs or VAPs to be loaded at the server to support remote booting. This ensures complete compatibility with all versions of NetWare.

Creating a Boot Image File

Before you can remote boot your computer, you must first create a boot diskette, the same as you would if you were to boot from a disk drive. Next, take a snapshot of the boot diskette to capture its contents and create an image file that will reside on the file server's hard disk.

Create a Boot Diskette

1. Format the diskette

If you have not already done so, format a diskette as a DOS system disk, using the `FORMAT A:/S` command.

If you are using high-density media and not using much of the disk storage space, consider formatting the disk as a low-density disk. This will reduce memory requirements later when you want to edit the disk's image using the MAPGEN utility.

2. Copy the needed files onto a boot diskette

Copy all required device drivers, NetWare DOS computer files, and any other files that you would normally place on a boot diskette.

For ODI drivers, be sure to copy the Novell RPLODI.COM file onto your boot diskette, then modify your .BAT file so that RPLODI is loaded immediately after LSL.

Your AUTOEXEC.BAT file on the boot diskette should look similar to the following:

```
LSL
RPLODI (must be used with all ODI drivers)
DE450
IPXODI
NETX (or VLM)
LOGIN
```

When creating boot image files, it is necessary to ensure that there are sufficient copies of DOS available for each computer using remote boot so as not to infringe upon copyright laws.

Run IMGGEN Utility

The IMGGEN utility supplied on the Remote Boot Setup diskette creates a boot image file from the contents of a boot diskette. (The IMGGEN utility is similar to the Novell DOSGEN utility, creating compatible image files.)

Use the following steps to copy the contents of a boot diskette to the SYS:LOGIN directory on a file server. Note that these steps may be completed on any computer on the network that has a disk drive.

1. Place the boot diskette in any drive of your system, normally drive A.
2. Log in to the network, then change to the directory where you have installed the remote boot utility files.
3. At the prompt, enter IMGGEN A:, then press the Enter key to create the boot file using the IMGGEN utility.

IMGGEN will create a boot image file called NET\$DOS.SYS in the SYS:LOGIN directory of your current server using the files contained on the boot diskette in drive A. This file is now your default boot file. The remote boot ROM installed on an EtherWORKS PCI adapter will use this file to load DOS, the network drivers, and other information so that the computer will boot correctly from the network.

Check to make sure that the NET\$DOS.SYS file exists in the SYS:LOGIN directory.

4. Copy the batch file that loads NETX.EXE (or VLM.EXE) from the diskette to the LOGIN directory.

If you do not do this, you will get a Batch file missing message as NETX or VLM transfers from drive A to SYS:LOGIN, but does not find the batch file that was running on drive A.

While the IMGGEN utility creates the image file, checks the batch files to determine when NETX is loaded. You will be prompted whether to copy the batch file to the LOGIN directory.

If you see a Batch file missing message when your computer is booted, you may also need to copy AUTOEXEC.BAT into the default directory that is specified by the user's LOGIN script, or follow other steps listed in the Batch File Missing Messages section.

Store the boot diskette you just generated in a safe place as it may be required for use at a later date. Your computer can now be booted remotely.

Note

Contrary to instructions provided by Novell, do not use the Novell RPLFIX utility. In some cases, running RPLFIX may cause the remote boot to hang. The remote boot ROM has DOS V5.0 support built in, and does not require RPLFIXing of the boot image file.

5. For multiple computers to boot using this file, the file must be flagged as Shareable. When IMGGEN creates an image file, it will automatically flag the file as Shareable. If you need to manually set the file as Shareable (for example, if you created the image with DOSGEN), use the FLAG command, FLAG NET\$DOS.SYS S, then press the Enter key.
6. If your network has more than one file server, copy the NET\$DOS.SYS and AUTOEXEC.BAT files to each server's SYS:LOGIN directory. (With the BootWare/MSD software, you do not need to copy these files across all file servers.) See the Using the Remote Boot ROM With Multiple Servers section in this chapter.

You have now created a single boot image file to load and boot from the network.

Using the Remote Boot ROM with Multiple Servers

With the BootWare/MSD software option, network administrators can specify the file server from which to boot, and thus need to maintain boot image files on the designated file servers.

Creating Multiple Boot Images

Although many similarly configured computers can boot from the same boot image file, it is more likely that more than one boot image file will be required to suit the differing needs of the computers on your network.

Supporting multiple boot images requires an understanding of three important issues:

1. Creating the BOOTCONF.SYS Boot index file
2. Using unique .BAT file names in boot images
3. Using IMGGEN to create different boot images

Creating the BOOTCONF.SYS Boot Index File

The remote boot ROM is capable of supporting more than one boot image by means of a special boot index file called BOOTCONF.SYS.

The BOOTCONF.SYS file is an index of all the boot image file names and the network and node addresses of each computer that accesses those files (see Figure 4-1). This file must be placed in the SYS:LOGIN directory.

Figure 4-1 Sample BOOTCONF.SYS File

```
0x00100002,0000F8000001=MSDOS50.SYS    MS-DOS 5.0 image
0x00100003,0000F8000002=MSDOS62.SYS    MS-DOS 6.2 image
0x00100004,0000F8000003=ADMIN.SYS     Administrator
```

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The BOOTCONF.SYS file may be created using any ASCII text editor. When using the BootWare/MSD software option, use the MSDEDIT utility provided with BootWare/MSD to edit BOOTCONF.SYS.

Each line of BOOTCONF.SYS should be entered using the following format:

```
0X<network>,<node>=<image file name>
```

If the network number is 1, the node number is 0000F8000000, and the boot image file name is WRKSTN2.SYS, then the appropriate syntax is:

```
0X1,0000F8000000=WRKSTN2.SYS
```

Note that the first character of a BOOTCONF.SYS entry is a zero, not the letter "O". The Ethernet node address is 12 digits long; you do not need to include the leading zeroes.

Entries of this format must be generated for each computer that needs a boot file other than the default NET\$DOS.SYS. The remote boot ROM scans the contents of BOOTCONF.SYS during boot, and if no entry is found that matches the computer's network and node address, the default boot image file NET\$DOS.SYS will be used.

To find your computer's network and node address, use the following NetWare command with the /A option:

```
USERLIST /A
```

The user name marked with an asterisk lists your computer's network number and node address.

You may also put comments on each line entry in BOOTCONF.SYS as long as there is at least one space separating the boot image file name and the comment. In general, it is a good idea to keep comments reasonably short, as the remote boot software must scan through them. Too many comments will add delays to the boot procedure.

If there are multiple file servers on your network and you are not using the BootWare/MSD software option, copies of the boot image files must exist on all servers. This is a requirement since a computer can initially attach to any file server. If your network has multiple file servers, BOOTCONF.SYS and all batch files must also be copied to all file servers.

Using Unique .BAT File Names in Boot Images

When a server contains more than one boot image file in the SYS:LOGIN directory, care must be taken to avoid conflicts with .BAT files. When a computer executes NETX or VLM during its boot sequence, the remainder of currently running .BAT file is executed from the SYS:LOGIN directory, not from the boot image.

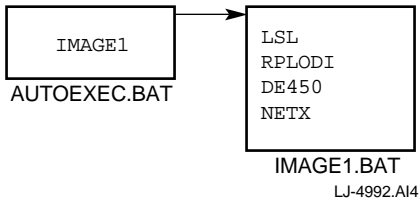
If all of the AUTOEXEC.BAT files in your boot image files are identical, you will not encounter any problems. Your boot images can continue using normal AUTOEXEC.BAT files without any changes.

However, if your AUTOEXEC.BAT files differ from boot disk to boot disk, you need to have each boot image file use a uniquely named .BAT file. Otherwise, you will experience problems when your boot images start running the wrong AUTOEXEC.BAT in SYS:LOGIN when they execute NETX or VLM.

For all versions of NETX V3.x and later, and for all versions of the NetWare DOS Requester, NETX (or VLM.EXE) will transfer to exactly the same batch file name as was being executed in the image file.

The best way to take advantage of this feature is to have your AUTOEXEC.BAT in the DOS image invoke another .BAT file, for example, IMAGE1.BAT. You will also need to copy this .BAT file into SYS:LOGIN (see Figure 4-2).

Figure 4-2 Using Unique Batch Files



When NETX (or VLM) is loaded from IMAGE1.BAT in the image file, it will continue executing from IMAGE1.BAT in SYS:LOGIN. Each image disk can have its own batch file name and thus avoid conflicts in SYS:LOGIN. This method will only work with DOS V3.2 and later.

Using IMGGEN to Create Different Boot Images

Use the following procedure to create multiple boot image files:

1. Create a boot diskette as described earlier in this chapter.
2. Create a boot image file by entering `IMGGEN <disk drive:> <image filename>`, then pressing the Enter key. For example: `IMGGEN A:MSDOS62.SYS`.

Choose a file name that will help you remember something about the contents of the image file, for example, `MSDOS62.SYS`. If you do not specify a file extension, `.SYS` is the default.

3. Flag the customized boot image files as Shareable. At the DOS prompt, enter the following command, then press the Enter key:

```
FLAG <filename> <S>
```

This process can be repeated to create boot image files for all the computers on the network.

Keep track of the network computers and boot image files, as you will need to enter this information in the `BOOTCONF.SYS` file.

Transferring from the Boot Image File to **SYS:LOGIN**

When you execute `NETX` from your image disk, you are normally doing so from within a batch file called `AUTOEXEC.BAT`. DOS sees `AUTOEXEC.BAT` as a text file containing command lines of variable lengths. After reading a command line from the `AUTOEXEC.BAT` file, DOS remembers the starting position (or file offset) of the next line in the file. After completing execution of the current command line, execution in the `AUTOEXEC.BAT` file continues at the previously retained offset.

When you execute NETX (or VLM) from the image disk batch file, NETX senses that BootWare was used to boot the computer, and tells BootWare to clean up. After BootWare does some housekeeping, and removes itself from memory, the image files are closed and drive A is restored. NETX (or VLM) then transfers control to the same batch file in SYS:LOGIN, at the same point where it left off in image disk. In this guide, we call this the NETX Transfer Point. Understanding this transfer point is important in solving problems with missing batch files, and in supporting more than one boot image file in the SYS:LOGIN directory.

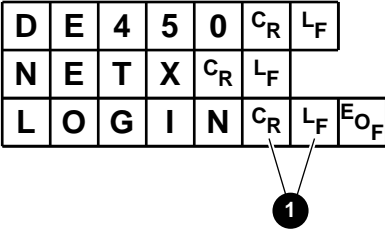
Batch File Missing Messages

There are a number of reasons why you might get the Batch file missing message when booting with a remote boot ROM. Some of these reasons are listed as follows:

Perhaps you forgot to copy your .BAT file to SYS:LOGIN. Remember that once you run NETX or VLM, execution transfers to the exact position in the same .BAT file in SYS:LOGIN. You may also need to copy your .BAT file to the default directory that is assigned by your LOGIN script.

If the LOGIN command was the last line of your .BAT file in SYS:LOGIN, there is a simple solution to the Batch File Missing message. Most text files end with the ASCII End Of File character (EOF, or 1Ah). Each command line within your AUTOEXEC.BAT file ends with a carriage return (CR, or 0Dh) and line feed (LF, or 0Ah) character combination. You can eliminate the Batch file missing message by removing the CR, LF characters after the LOGIN command, but before the EOF character (see ❶, Figure 4-3).

Figure 4-3 Example of Batch File Format



LJ-4991.AI4

If your text editor will not allow you to do this, run the BATCRLF utility. The following command can be used to remove the CR, LF from the LOGIN command line in the GREENPC.BAT file:

```
BATCRLF GREENPC.BAT
```

If the message still persists, or your .BAT file has additional command lines after the LOGIN command, the error message may be caused by not having sufficient rights in SYS:LOGIN to continue reading the .BAT file. No explicit rights to SYS:LOGIN are granted to users when they are created. A solution to this is to grant Read, Open, and Search rights to the group EVERYONE for SYS:LOGIN using the Novell SYSCON utility.

Another cause of the Batch file missing message is a user's login script that changes the mapping of the first network drive from the SYS:LOGIN to some other directory. You can avoid this problem by leaving the first network drive mapped to SYS:LOGIN throughout the entire login script.

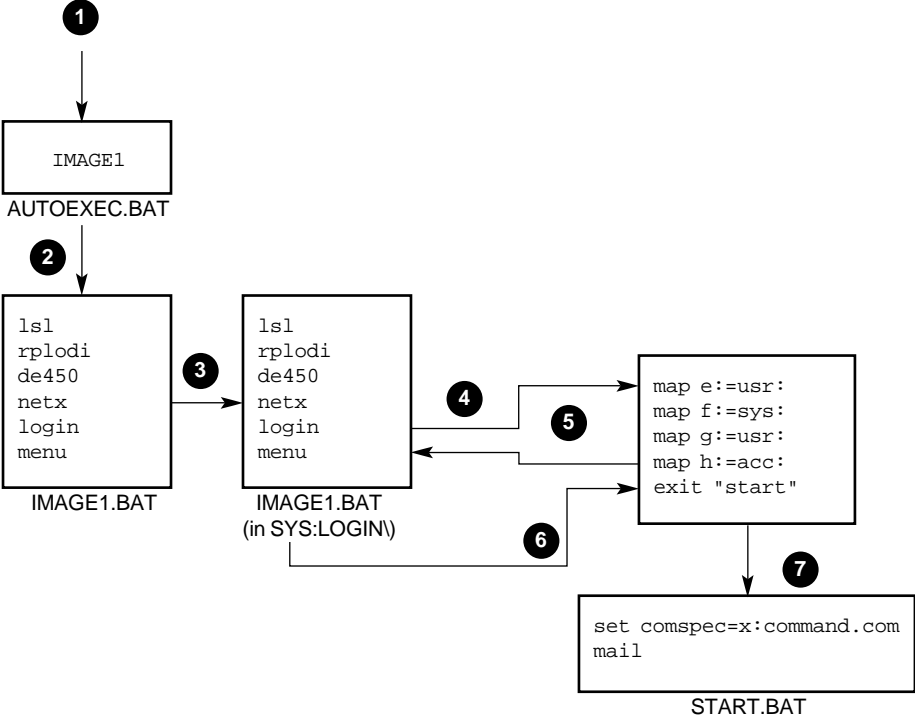
The login script supports a command called EXIT, which can be used to run a .BAT file upon exiting from the LOGIN script. If you are running the LOGIN command from a .BAT file in SYS:LOGIN, and there are further command lines in this file, when you EXIT from your login script with a .BAT file, the remainder of the SYS:LOGIN .BAT file will be processed. Only then will your EXIT .BAT file be processed.

Boot Process

Figure 4–4 shows the boot flowchart. The following list of callouts helps to explain the boot process shown:

- ❶ DOS executes AUTOEXEC.BAT in image file.
- ❷ AUTOEXEC transfers to second batch file.
- ❸ NETX transfers to same batch file in SYS:LOGIN.
- ❹ LOGIN runs login script.
- ❺ Control returns to batch file before exiting login script.
- ❻ When the batch file ends, control returns to the login script.
- ❼ Login script exits and runs START.BAT.

Figure 4-4 Boot Process Flowchart



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NetWare Utilities

This section describes the NetWare utilities that can be used with the remote boot ROM.

MAPGEN Utility

The MAPGEN utility for Novell networks gives the network administrator the ability to examine or edit the contents of DOS boot image files generated by the IMGGEN and DOSGEN utilities.

MAPGEN maps a named boot image file to a specified local computer's disk drive. Having mapped an image file to a specific drive, the network administrator can examine or modify the contents of the image file just as easily as working with the original boot image diskette.

Without the MAPGEN utility, viewing or modifying boot images is a tedious procedure. First, the boot image diskette must be located and inserted into the computer's disk drive. If changes are made to the contents of the diskette, the IMGGEN program must be run to refresh the contents of the boot image file on the network file server. MAPGEN is easy to use; it follows the syntax of the NetWare MAP command. Any local computer disk drive can be overlaid with a MAPGEN image drive. When the MAPGEN drive is removed, normal operation is restored to the local drive.

The benefits of the MAPGEN utility include the following:

- Contents of boot image files can be viewed/modified directly.
- Allows easy support of multiple boot images.
- IMGGEN images can be maintained by users of diskless or remote computer systems.

Using MAPGEN

Copy the MAPGEN.COM file from the Remote Boot Setup diskette to the SYS:LOGIN directory of all file servers that require it.

Before running MAPGEN, make sure that you have a copy of the COMMAND.COM file in your current directory, or in your search drive mappings.

To map a boot image file to a local disk drive, complete the following steps:

1. Set the default directory to SYS:LOGIN.
2. Determine the name of the boot image file that requires viewing or modification. This can be done by examining the contents of the BOOTCONF.SYS file.
3. Issue the following MAPGEN command:

```
MAPGEN <local_drive_letter>:=<image file_name> [/option]
```

The /option field is one of the following:

```
A - use EMS memory  
E - use XMS memory  
C - use conventional memory
```

If no option is specified, MAPGEN first tries XMS, then EMS, and then conventional memory to find enough available memory to store the entire boot image file.

For example, to use MAPGEN to examine or change a boot image file called NET\$DOS.SYS on drive A:, enter the following command:

```
MAPGEN A:=NET$DOS.SYS
```

It is important to note that there may be an upward compatibility problem between earlier versions of DOS and later DOS versions of the IMGGEN image files. For example, if the computer is booted using DOS V3.3 and you attempt to use MAPGEN to access a boot image file created using DOS V5.0, a warning message will be displayed.

If you are using VLM versions of the Novell drivers with diskless computers, drive A may be mapped to a network drive. Use the Novell MAP REMOVE A: command to remove this drive mapping prior to running MAPGEN (see Figure 4-5).

Figure 4-5 Using the MAPGEN Utility

```
C:\PUBLIC>mapgen a:=net$dos.sys

MAPGEN: Boot file disk emulator v1.8
Copyright (C) Lanworks Technologies Inc. 1987 - 1993. All rights reserved.

Boot diskette image 1440K
XMS memory used

Drive A: mapped to NET$DOS.SYS

...loading new COMMAND.COM
...type "EXIT" to remove drive and optionally save changes

Microsoft(R) MS-DOS(R) Version 6.20
(C)Copyright Microsoft Corp 1981-1993.

F:\LOGIN>
```

LJ-4989.A14

At this point, you may change the current drive to A:, then begin to view or edit the contents of the boot image file as required. DOS commands and text editors can be used to change or modify the files.

When you have completed working with the boot image file, change the current or default directory back to SYS:LOGIN by entering EXIT, then pressing the Enter key. The message shown in Figure 4-6 will then be displayed (assuming XMS memory was used). Reply accordingly to return to the DOS prompt.

Figure 4-6 Exiting the MAPGEN Utility

```
F:\LOGIN>exit

MAPGEN drive A: removed from XMS memory

Update image file NET$DOS.SYS (Y/N)?
```

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MAPGEN Error Messages

The following messages are related to the MAPGEN utility:

Invalid command syntax.

MAPGEN command is not being issued in the proper format. See the Using MAPGEN section for proper command syntax.

Network shell is not loaded.

MAPGEN command has been issued on a computer system without first having loaded the network shell (NETX or VLM). Load the appropriate network shell, then run MAPGEN again.

MAPGEN error: cannot overlay a hard drive.

MAPGEN can only overlay diskette drives.

MAPGEN error: cannot overlay B: in a single-diskette system.

On a computer system with a single diskette drive, the boot image file may only be mapped to drive A:.

MAPGEN error: COMMAND.COM must be in current directory or search drive.

MAPGEN could not find a copy of the COMMAND.COM file in the current directory or in your search drive mappings.

MAPGEN warning: DOS on image file is newer than what is currently running.

Make sure the version of DOS used when you booted your computer is at least as new as the version of DOS within the image file.

MAPGEN error: drive letter <driveletter>: is not a local drive.

MAPGEN operates only by mapping the boot image file to a local computer diskette drive; reissue the command using one of the local diskette drives.

MAPGEN error: error reading image file.

MAPGEN error: error writing image file.

MAPGEN error: error opening image file.

MAPGEN has encountered an error opening the image file for READ or WRITE access. Ensure that the proper image file is being addressed, or recreate the boot image using the IMGGEN command and retry.

MAPGEN error: MAPGEN currently supports images up to 2.88M.

MAPGEN only supports the following 5.25 inch formats: 160K, 360K, 1.2M, and the following 3.5 inch formats: 720KB, 1.44MB, 2.88MB.

MAPGEN error: not enough available memory.

To read or modify the boot image file, a copy of the file must be loaded into the computer's memory. The minimum available free RAM for this purpose is 160KB, which varies with the size of the boot image file. Remove any terminate-and-stay-resident software, or increase the computer's memory capacity.

MAPGEN warning: file is flagged as READ ONLY.

MAPGEN will not write to the file because it has been flagged READ ONLY. The file must be flagged READ/WRITE to update the file contents.

MAPGEN warning: insufficient rights in this directory.

MAPGEN cannot access the image file; you do not have sufficient rights to OPEN and READ files in the directory.

MAPGEN warning: no WRITE privileges in this directory.

MAPGEN cannot update any changes made to the image file; you have no WRITE privileges in the current directory.

MAPGEN warning: no EMS installed.

MAPGEN warning: requires EMS 3.2 or newer.

MAPGEN warning: not enough EMS memory available.

These messages indicate MAPGEN has problems with your EMS memory interface. MAPGEN will not use EMS memory in these cases.

MAPGEN warning: EMS error code: *xx*.

An error was encountered while writing or reading EMS memory.

MAPGEN warning: no XMS installed.

MAPGEN warning: requires XMS 2.0 or later.

MAPGEN warning: not enough XMS memory available.

These messages indicate MAPGEN has problems with your XMS memory interface; MAPGEN will not use XMS memory in these cases.

MAPGEN warning: XMS error code *mn*.

An error was encountered while writing or reading XMS memory.

MAPGEN warning: COMSPEC not set, MAPGEN may not execute properly.

If the COMSPEC environment variable is not set, you may encounter problems running MAPGEN under some versions of DOS, particularly DRDOS V6.0.

UNRPLFIX Utility

UNRPLFIX is used in cases when the remote boot ROM is used with boot image files that have been unnecessarily RPLFIXed.

RPLFIX is a Novell utility that alters a boot image file to provide DOS V5.0 compatibility to earlier boot ROMs. All versions of the remote boot ROM have built-in DOS V5.0 support and do not require RPLFIX.

In some cases, an RPLFIXed boot image will cause the remote boot ROM to hang after the Jumping to boot record message appears on the screen. If your boot image is RPLFIXed, then you should remove the RPLFIX modification by running UNRPLFIX.

For example, to UNRPLFIX a boot image called LABDOS6.SYS, enter the following command line:

```
UNRPLFIX LABDOS6.SYS
```

If the boot image was not previously RPLFIXed, then an error message will be displayed; otherwise, UNRPLFIX will indicate that the RPLFIX modification was successfully removed.

BATCRLF Utility

The BATCRLF utility helps to eliminate the Batch file missing message that may occur after LOGIN. BATCRLF is meant to be used in cases when the .BAT file contains the LOGIN command as the last command in the .BAT file. It removes the trailing carriage return and line-feed characters from the .BAT file. This tells DOS not to terminate processing of the .BAT file at this command, rather than continuing after LOGIN and not being able to find the .BAT file (which serves no purpose at that point).

To use BATCRLF, enter `BATCRLF BATfilename`, where *BATfilename* is the name of the .BAT file that executes the LOGIN command.

If BATCRLF finds that there is no LOGIN command within the .BAT file or that LOGIN is not the last command within the .BAT file, an error message is issued; otherwise, BATCRLF will indicate that it has successfully processed the .BAT file.

CHKID Utility

The CHKID utility allows you to control the execution of a batch file relative to the node address of a specific computer system on the network.

You may want to use CHKID if you have created a boot image file that is used by several computers and you want to execute different .BAT file instructions for one or more of these computers.

The CHKID command can be issued within a batch file (for example, AUTOEXEC.BAT) with either a node address, a range of addresses, or any combination (up to 128 characters on the command line). CHKID will check the network to determine if the present computer address falls in the range of the addresses specified on the command line. If valid, the DOS ERRORLEVEL is set to 0; otherwise, the ERRORLEVEL is set to 1. Based on the ERRORLEVEL value, the flow of the batch file may be redirected as required by the computer.

Using CHKID

Copy the CHKID.COM file from the Remote Boot Setup diskette to the SYS:LOGIN directory of all file servers that require it.

There is a batch file provided on the diskette called AUTOID.BAT. This file gives a sample structure for an AUTOEXEC.BAT-type batch file using the CHKID command.

If you have never used the batch file ERRORLEVEL command before, it is important to know that you must test for the highest value of ERRORLEVEL first. If you test for ERRORLEVEL == 0, you will match both conditions. The correct method is to test for ERRORLEVEL == 1, and to branch based on this condition.

CHKID.SYS

The CHKID.SYS utility allows you to control the execution of commands in the CONFIG.SYS file relative to the node address of a specific computer on the network.

Use CHKID.SYS if you have created a boot image file that is used by several computers and you want to execute different commands in the CONFIG.SYS file on one or more of these computers.

CHKID.SYS compares a list of node addresses on the command line with the node address of the local computer. If the local address matches an address in the command line, the next line in the CONFIG.SYS file will be executed. If the addresses do not match, then the next line is not executed. Addresses on the command line may include a specific address, ranges of addresses, or both.

Using CHKID.SYS

Copy the CHKID.SYS file from the Remote Boot Setup diskette to the boot image file that requires it. (It must be in the image file, not in SYS:LOGIN.)

The following is the required usage and command syntax for CHKID.SYS:

```
device=chkid.sys [v] [x] id id1-id2
```

There are two optional parameters, v and x. The v parameter will display verbose messages of the status of CHKID while it is executing. This is only used during testing of a system using CHKID.

The x parameter reverses the condition of the address checking. Normally, the next line of the CONFIG.SYS will only be executed if the addresses match. If you include the x parameter, then the next CONFIG.SYS line will not be executed for the address that matched.

Examples:

If your computer's node address is C0F9B544 and your CONFIG.SYS file included the following, then the HIMEM.SYS file will be loaded only on the computer with the C0F9B544 address:

```
device=chkid.sys C0F9B544  
device=himem.sys
```

If you changed the CONFIG.SYS file to the following, then the HIMEM.SYS file will not be loaded on the computer with the C0F9B544 node address, but will be loaded at all other addresses:

```
device=chkid.sys x C0F9B544  
device=himem.sys
```

ROMTYPE

The ROMTYPE utility will return the type code value of the remote boot ROM in a computer. This value can be used in a batch file to load the correct driver for the Digital EtherWORKS adapter. A sample batch file, ROM.BAT, is included on the Remote Boot Setup diskette.

ROMTYPE will also display the type code on the screen if you include the `-t` switch on the same line when you start the utility.

If the remote boot ROM is not present, the utility will return a type code of 0.

All Digital EtherWORKS PCI adapters are assigned a type code value. See the ROMTYPE.DOC file on the Remote Boot Setup diskette for a list of current type codes.

Remote Boot Technical Notes

This section contains technical information that may be helpful to remote boot ROM for NetWare users.

BootWare/MSD

The BootWare Multi-Server Director (BootWare/MSD) software option simplifies the management of remote boot image files in networks with multiple file servers. Prior to the availability of BootWare/MSD, networks with multiple file servers had to keep copies of all boot image files across all file servers, since it was not possible to predict which file server would be asked to provide boot services. In large networks, this sometimes meant having many different network administrators maintaining hundreds of boot image files across large numbers of file servers.

With BootWare/MSD, network administrators can specify the file server from which a computer will boot, thereby needing to maintain boot image files on the file servers they designate.

BootWare/MSD also simplifies BOOTCONF.SYS maintenance by providing a powerful BOOTCONF.SYS editor and report generator.

BootWare/MSD installs as an NLM on NetWare V3.x or V4.x file servers.

How Does It Work?

The BootWare/MSD NLM is normally installed on one file server in the network. Installing BootWare/MSD on multiple servers will offer fault tolerance, at the expense of having to maintain multiple copies of the boot list.

At boot time, the computers first broadcast a special packet that is monitored by all file servers on the local network segment. One or more file servers will reply with the location of the BootWare/MSD NLM. The remote boot ROM then sends a request directly to the BootWare/MSD NLM. Upon receiving this request, the BootWare/MSD NLM does a rapid scan of its list of computer entries.

If a matching computer entry is found, BootWare/MSD replies with information as to which file server and boot image file that computer should boot from. If no matching entry is found, BootWare/MSD will reply with the name of a boot image file (providing that the NODEFAULT command line option was not specified at NLM load time).

- If the computer receives no reply from BootWare/MSD in a reasonable length of time, then the remote boot ROM defaults to its normal mode of operation and attempts to boot from any file server.

BootWare/MSD makes use of the normal BOOTCONF.SYS file to define computer nodes and their corresponding boot image files. Extensions have been defined to the BOOTCONF.SYS syntax to include file server information. A DOS utility called MSDEDIT is provided, which allows the network administrator to add, delete, or modify computer and file entries in BOOTCONF.SYS. This utility also sorts computer entries to speed up search times in large installations. BootWare/MSD operates on a memory-based copy of BOOTCONF.SYS to further reduce any performance impact on the file server.

BootWare/MSD Features

The BootWare/MSD features include the following:

- Supports NetWare V3.x and V4.x file server platforms
- Handles up to 2048 computer entries
- BootWare/MSD console displays detailed computer boot information
- Minimal impact on file server performance or resources
- DOS MSDEDIT utility simplifies BOOTCONF.SYS maintenance
- Coexists with boot ROMs from other vendors

BootWare/MSD Computer Messages

The following messages are related to MSD operations:

MSD: no reply

The remote boot ROM within your computer has broadcast a message in an attempt to communicate with BootWare/MSD, but no reply was received. This message will occur in cases where BootWare/MSD is not installed on at least one server on your network, or if the server in which BootWare/MSD is installed is not currently operational.

This message may also occur within the first few minutes of BootWare/MSD being loaded at a file server, as it takes several minutes for all file servers on the network to be aware of the existence of BootWare/MSD.

After this message is issued, the remote boot ROM will default to its normal operation, and will attempt to contact any available file server for its boot image.

MSD: [msdname] found server <servername>

This message will appear on your computer during normal operation. It indicates the name of the BootWare/MSD that serviced the request, and the name of the file server from which the boot image file will be retrieved.

MSD: [msdname] server <servername> is unavailable

This message will appear at your computer if BootWare/MSD is unable to locate the file server that was specified in the BOOTCONF.SYS entry defined for your computer.

After this message is issued, the remote boot ROM BootWare will default to its normal operation, and will attempt to contact any available file server for its boot image. When a file server is finally reached, the remote boot ROM will first try to open the file name specified for its computer in BOOTCONF.SYS. If this fails, it will try to open the default boot image file, NET\$DOS.SYS.

Error Messages

This section describes the following generic error messages:

Not enough memory (min. 512 KB).

The computer requires at least 512KB of RAM. Add more RAM as required.

The network interface board is not working.

The remote boot ROM had problems initializing the network adapter. The problem is usually caused by a mismatch between the adapter's actual configuration and the configuration expected by ROM. Check for a configuration problem, or for a conflict with other options.

MSD: no reply

This is not an error message, but merely an indication that the remote boot ROM could not locate the BootWare/MSD module on your network. BootWare/MSD is an optional software package used to specify which file server a given computer on your network should boot from. Refer to the BootWare/MSD section earlier in this chapter for further information.

File server could not be found.

Either the file server is down, or not responding to connection requests. Check that your computer is connected to an active cable segment.

Error opening boot file.

The main reason why this message could appear is that you have more than one file server on your network, and some of them do not have the needed boot files in their SYS:LOGIN directories. Refer to the Using the Remote Boot ROM with Multiple Servers section earlier in this chapter.

It is also possible that the file exists, but it is open and locked by another station. Check that the file exists and is flagged as shareable. Use the MONITOR command (or NLM) on the file server console to check if the file is in use by another connection.

Another reason could be that you have run DOSGEN to generate your boot image file (NET\$DOS.SYS or equivalent), but you generated this file in the SYS:SYSTEM directory. All boot image files need to be in the SYS:LOGIN directory.

Error reading boot diskette file.

An error occurred while reading the boot image file. This problem is usually caused by a hardware-related difficulty that caused the read to fail after many retries, and earlier error messages. If other messages were displayed, refer to their explanations for suggestions on what the problem could be.

Rx<n>, Tx <n>

These messages may appear during the boot process on a heavily congested network. It is normal to get several of these messages in a row, but if many of them appear consecutively, it usually indicates a network problem.

Rx1 indicates that a packet was received whose contents the remote boot ROM did not like.

Rx2 indicates that the remote boot ROM timed-out while waiting for a packet. This message may appear continuously, indicating that the Ethernet frame type used is not supported at the server.

With some ODI drivers, you may see Rx2 messages if you have forgotten to load RPLODI before loading the ODI driver. Check that RPLODI.COM is being loaded.

In other cases, Rx2 may appear indicating an improper network cable connection.

“<”, “>”

The “>” and “<” messages appear only after IPX.COM (or your board-specific ODI driver) has loaded, but before NETX or VLM has completed execution. The > symbol indicates that IPX had problems transmitting data on the network, while the < symbol indicates that there was a problem with receiving data from IPX. Since the remote boot ROM has managed to get this far in the boot sequence, the problem is usually a configuration mismatch between your adapter and IPX.

There are several reasons why the > message could appear; either you have loaded the wrong IPX (perhaps for a different LAN adapter), or the IPX you have loaded does not match your network adapter's configuration. If the remote boot ROM does not use interrupts, check that the adapter's interrupt jumper is set to the setting expected by IPX.

Questions and Answers

This section contains information in a question and answer format that may help you if you should have a problem using remote boot for NetWare.

⇒ Immediately after the Jumping to boot record message, the computer just hangs.

The cause of this problem may be that you have used RPLFIX on the remote boot ROM, which has built-in DOS V5.0 support and does not require RPLFIXing the boot image. In some cases, these versions may even hang when a boot image is RPLFIXed.

⇒ When running DOSGEN or MAPGEN, an error message saying “file in use during OPEN” appears. This also happens when updating the BOOTCONF.SYS file.

When a remote boot ROM hangs after the Jumping to boot record message but before NETX or VLM has executed, the boot image file (and possibly the BOOTCONF.SYS file) remains open and cannot be updated. The files will automatically close within 15 minutes when the file server terminates the computer's inactive connection, but may also be closed by manually clearing the connection using the MONITOR console command (or NLM) at the file server or remote console.

⇒ The RAM disk software does not work on a diskless computer. Also, the LOGIN directory appears as drive A: boot and the RAM disk is gone.

Use a program called MKDRIVEA.COM, which can be found on the Remote Boot Setup diskette. The file MKDRIVEA.DOC describes how and when to use MKDRIVEA.COM.

⇒ Even though COMSPEC is set correctly in the login script, DOS still has problems reloading COMMAND.COM when exiting an application.

Setting COMSPEC from within the LOGIN script does not always work. It is recommended that COMSPEC be set from a .BAT file that is called by the login script's EXIT command.

⇒ When attempting to support two different protocol stacks on a computer (TCP/IP and IPX), there are numerous problems.

Various drivers exist today that allow support of both IPX and TCP/IP (or other) protocol stacks within your computer. Refer to the following section for more information.

Multiple Protocol Stacks or Frame Types

Ethernet versions of the remote boot ROM are available for IEEE 802.3, 802.2, or Ethernet_II frame types.

- The remote boot ROM frame type must be supported at the file server. This may mean adding support for an additional frame type at the file server. The following example shows how a DE450 adapter's file server driver can support both IEEE 802.2 and 802.3 frame types:

```
load DE450 port=300 mem=c800 int=a frame=ETHERNET_802.2 name=first
```

```
bind ipx to first net=1234
```

```
load DE450 port=300 mem=c800 int=a frame=ETHERNET_802.3 name=second
```

```
bind ipx to second net=1235
```

Most server drivers are re-entrant. One instance of the driver exists in the file server; with two instances of data, one for each frame type, with a negligible impact on file server resources.

- No changes need to be made to the computer's NET.CFG file in most cases, as long as the following rules are observed:

The first (or default) frame type in the Link Driver section is used by RPLODI, and must be supported at the file server. This frame type does not have to be the same as that supported by the remote boot ROM; it could be different.

If multiple frame types are specified in the Link Driver section, and IPX is to be bound to a frame type other than the first frame type, then a line needs to be added that ties in IPX to the specific frame type. For example, to force IPX to use 802.2, the following statement would suffice:

```
Protocol IPX E0 ETHERNET_802.2
```

The remote boot ROM will communicate with the file server using its specific frame type until the ODI driver in the image file loads. At that point, the ODI driver will take over and will communicate with the server using its specified frame type.

Using the Remote Boot ROM With Microsoft Windows V3.1

When loading Windows V3.1 in 386 enhanced mode, it is common to get an Invalid path for EMM386 error message. If this happens, add the "/y=[path]" switch to the EMM386 entry in your CONFIG.SYS file. For example:

```
device = emm386.exe /y=x:\dos\emm386.exe
```

In this example, *x:\dos* is the directory on the network where EMM386 resides.

This problem occurs because the remote boot ROM generates a virtual A: disk while loading files in CONFIG.SYS and AUTOEXEC.BAT. This disk is destroyed once NETX is loaded. However, both EMM386 and WINA20 handler remember that they are loaded from the A: drive. When Windows starts, it goes to a nonexistent A: drive to search for EMM386 or WINA20.

Formatting Diskettes Under Windows

When you boot with a remote boot ROM, Windows will not allow you to format a diskette in drive A:. If you do, the message "Cannot format the MS-DOS startup drive" will appear. As a preventative measure, Windows will not allow you to format a disk in the drive used for booting.

The only way you can format a diskette is in a DOS box. If you want to format a bootable diskette with system tracks, you will need a diskette containing DOS. The format program will prompt you to insert this diskette so it can copy the system tracks from it.

BootWare and Windows Swap Files

If you do not have a local hard drive, it is recommend that the swapfile feature be disabled. This will reduce the time it takes for Windows to load, and will reduce network traffic when Windows is running. Do not disable swap files unless you have enough memory in your computer. If you will be running one or two DOS windows, then 4 MB of memory should be sufficient; heavy Windows usage will require at least 8 MB of memory.

If you have a local hard drive, then set the swap-file feature to use the local hard drive instead of the network.

Remote Boot for TCP/IP

Overview

To boot the computer, the remote boot ROM first sends a broadcast to all the servers on the network to see if one of them has the required information for the computer (IP address and boot image file name). When the computer receives a response from a server, it will then know the IP address, the name of the boot image file, and the IP address of the server that has the image file.

The computer then sends a request to the server to transfer a copy of the boot image file. This image file is saved in the computer's memory. When the end of the file is reached, the remote boot ROM will clear the computer screen and turn control over to the file that was just downloaded.

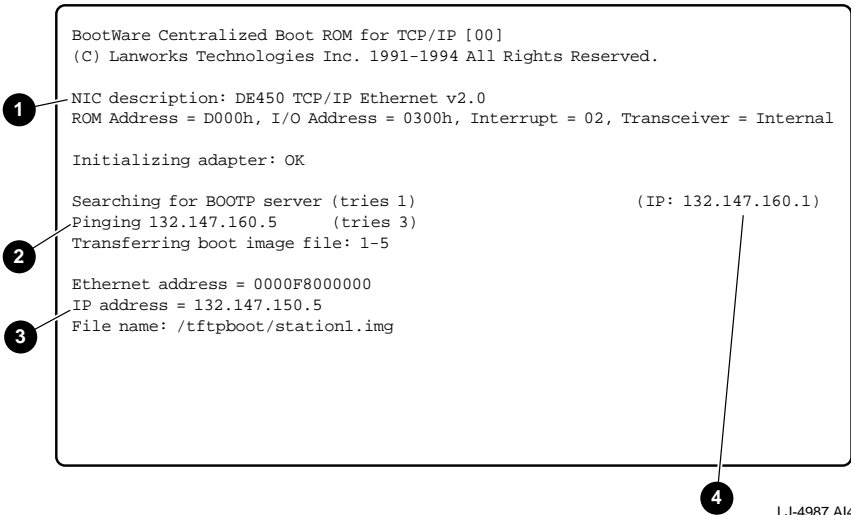
Normally, the boot image file will then set itself up as a drive A: RAM disk and reset the computer. When the computer is reset this time, there is a bootable disk in the new drive A: (the RAM disk). The computer will boot from this disk just as it would from a diskette.

After the computer has fully booted and connected to the network, a utility program (FREEMEM) can be used to remove the boot RAM disk (and restore drive A: to the local diskette drive, if there is one). The program then releases all the memory that was used to boot the computer.

Boot Screen

When booting your computer with the remote boot ROM, the computer screen will look similar to the one shown in Figure 5-1. The list of callouts explains the screen's fields.

Figure 5-1 Example of Boot Screen



- ❶ Description of the network adapter, including the settings the remote boot ROM is using.
- ❷ If doing an ARP to find TFTP server, the remote boot ROM will display “pinging” and the IP address of the host. The “tries” number indicates how many pings it has sent.
- ❸ The IP address for this host, received from the BOOTP or RARP server.
- ❹ The IP address of the host that responded to the BOOTP or RARP broadcast.

Setting Up the Server

Before a computer system can use the remote boot ROM, you need to set up a server to provide the computer with the information it needs. If you have multiple servers on your network, only one of them needs to be set up for remote booting.

Setting Up the Computer

Before you can use the remote boot ROM in your computer, you must first create a regular boot diskette, the same as you would if you were to boot from a diskette drive.

The next step involves taking a snapshot of the boot diskette, capturing its contents, and creating an image file that will reside on the file server's hard disk.

Creating a Boot Diskette

1. Format the diskette

If you have not already done so, format a diskette as a DOS system diskette, using the command:

```
FORMAT A: /S
```

Once you have formatted the diskette, it is a good idea to run the CHKDSK command (provided with DOS), to make sure that the diskette contains the required system files.

The remote boot ROM is able to work with any size diskette as the source for the image file, but it is recommended that you use the smallest sized diskette to reduce the amount of memory that is needed to boot the computer.

2. Copy the needed files onto the boot diskette

Copy all needed files to the diskette to connect the computer to the network. This includes a CONFIG.SYS and any device drivers, and an AUTOEXEC.BAT to load the required network files. If you are mapping network directories to a local drive, the AUTOEXEC.BAT file on the diskette should transfer control to a batch file on the network drive.

Note

If you are using a memory manager, see the Using Memory Managers section for any restrictions that may apply.

The following is an example of an AUTOEXEC.BAT file using FTP Software Inc. PC/TCP software to map the /PUBLIC directory, on the server called TEST, to local drive E:

```
prompt $p$g
lsl
DE450
odipkt
ethdrv
idrive
idmnt UNIX test /public e: pcnfs nobody
e:
init
```

At the end of this AUTOEXEC file, control is transferred to another batch file (INIT.BAT) located on the network drive. This second batch file should then change the DOS COMSPEC variable so that DOS will be able to find a copy of COMMAND.COM after the image is released from memory. The FREEMEM program is then executed to release all the memory used during booting and to restore drive A: as a local drive (FREEMEM must be run from a network drive). For more information, see the TCP/IP Utilities section.

To execute the FREEMEM program, use the following command:

```
set comspec = e:\dos\command.com freemem
```

Following the FREEMEM program, you can have any other commands needed to start the computer.

Once the boot diskette is created, boot the computer using this diskette to confirm that it is working correctly. When you are confident the boot diskette is correct, you can use it to create the image file.

Creating a Boot Image File

The IMAGEGEN utility, supplied on the Remote Boot Setup diskette, creates a boot image file from the contents of a boot diskette.

The following steps will copy the contents of the diskette to a directory on a file server. These steps may be completed on any network computer containing a diskette drive.

1. Place the Remote Boot Setup diskette in any computer drive, normally drive A:.
2. Log in to the network, then change directories so the directory for the boot images is your current directory (usually the /TFTPBOOT directory).
3. At the DOS prompt, use the IMAGEGEN utility to create the boot file. IMAGEGEN requires two parameters: a local drive letter and an image file name. For example, to create an image of the diskette in drive A: called station1.img, enter the following:

```
imagegen a: station1.img
```

IMAGEGEN usually creates an extended memory image file. If the computer does not have extended memory, include the option to create a conventional memory image. See the TCP/IP Utilities section for more information on the IMAGEGEN utility. This image file can also be created on a hard disk in a computer that is not connected to the network, then transferred to the server on a diskette.

4. For computers to boot using this file, the file must have world-readable permission. You can use the UNIX command `chmod` to change the file permissions. For example:

```
chmod o=r station1.img
```

Store the boot diskette you just generated in a safe place as it may be required for use at a later date. The computer can now be booted using the remote boot ROM.

You now have created a single boot image file that any computer with the remote boot ROM installed can load and boot from the network.

You can now reboot the computer to make sure the image file works.

TCP/IP Utilities

This section describes the TCP/IP utilities that can be used with the remote boot ROM.

IMAGEGEN Utility

The IMAGEGEN utility is used to create a boot image file from a diskette. Before you can use IMAGEGEN, you must create a diskette that will boot DOS and connect the computer to the network.

The command line syntax for IMAGEGEN is:

```
imagegen [/w|/c] <diskette drive letter>  
<image file name>
```

By default, IMAGEGEN will create an extended memory image file (allowing images to 2.88 MB). To create a conventional memory image (for use on computers without extended memory), use the `/c` option. A conventional memory image is limited to approximately 400 KB.

IMAGEGEN can also create an image file that can be written to by using the `/w` option. This will create a RAM diskette for drive A: while the computer boots. This RAM diskette will remain in memory until you run FREEMEM. (If you do not run FREEMEM, the RAM diskette will remain in memory and can be used by the computer.)

IMAGEGEN can create image files with subdirectories. All that is required is to have the subdirectories on the source diskette.

For example, to create a boot image file called station1.img from the diskette in drive A:, enter the following command line:

```
imagegen a: station1.img
```

To create the same image and be able to write to the RAM diskette, enter the following command line:

```
imagegen /w a: station1.img
```

Once the boot image file is created, it should be copied to the image file directory on the network. The file must have world-readable permission.

FREEMEM Utility

The FREEMEM utility releases all the memory that was used to transfer the boot image file from the server after the computer has booted. It also changes drive A: back to the local diskette drive (drive A: is used as a RAM diskette while the computer is booting from the image file).

Notes:

- Before you can use FREEMEM, you must change your DOS COMSPEC variable to a DOS directory on the network; otherwise, you will get an error when DOS tries to reload COMMAND.COM after FREEMEM terminates.
- FREEMEM cannot be included in the image file; it must be executed from a network drive (or local hard drive).
- After using FREEMEM, you should have the same amount of memory available that you have when you boot from the diskette used to create the image file.

MAPGEN Utility

The MAPGEN utility gives you the ability to examine or edit the contents of DOS boot image files generated by the IMAGEGEN utility.

MAPGEN maps a named IMAGEGEN image file to a specified local computer diskette drive. You can then examine or modify the contents of the image file just as easily as working with the original image diskette.

Without MAPGEN, viewing or modifying an image file is a tedious procedure. First, the image diskette must be located and inserted into the computer's diskette drive. Then, if changes are made to the contents of the disk, the IMAGEGEN program must be run to refresh the contents of the boot image file on the network file server.

MAPGEN is easy to use. Any local computer diskette drive can be overlaid with a MAPGEN image drive. When the MAPGEN drive is removed, normal operation is restored to the local drive.

The benefits of MAPGEN include the following:

- Contents of boot image files can be viewed/modified directly
- Allows for easy support of multiple boot images
- Boot images can be maintained by users of diskless or remote computers

Using MAPGEN

To use the MAPGEN utility, copy the MAPGEN.COM file located on the Remote Boot Setup diskette to a publicly accessible directory on the network.

Before running MAPGEN, you must also make sure that you have a copy of COMMAND.COM in your current directory, or in your search path.

The command syntax for the MAPGEN program is:

```
MAPGEN <local drive letter>:=<boot image file name> [/option
```

The option field is one of the following:

```
A - use EMS memory  
E - use XMS memory  
C - use conventional memory
```

If no option is specified, MAPGEN first tries XMS, then EMS, and then conventional memory to find enough available memory to store the entire boot image file.

Before using MAPGEN, you should first change your default directory to the directory that contains your boot image files.

For example, to use MAPGEN to examine or change a boot image file called station1.img on your computer's drive A:, you must enter the following command:

```
mapgen a:=station1.img
```

A display similar to the one shown in Figure 5-2 will appear.

Figure 5-2 Using MAPGEN for Boot Image File

```
C:\PUBLIC>mapgen a:=station1.img

MAPGEN: Boot file disk emulator v1.8
Copyright (C) Lanworks Technologies Inc. 1987 - 1993. All rights reserved.

Boot diskette image 1440K
XMS memory used

Drive A: mapped to STATION1.IMG

...loading new COMMAND.COM
...type "EXIT" to remove drive and optionally save changes

Microsoft(R) MS-DOS(R) Version 6.20
      (C)Copyright Microsoft Corp 1981-1993.

C:\PUBLIC>
```

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At this point, you may change the current drive to A: and begin to view or edit the contents of the boot image file as required. DOS commands and text editors can be used to change or modify the files.

When you have completed working with the boot image file contents, change the current or default directory to your boot image file directory by entering `exit`. The message shown in Figure 5–3 will be displayed (assuming XMS memory was used). Reply accordingly to the update prompt to return to the DOS prompt.

Figure 5-3 Exiting the MAPGEN Utility

```
C:\PUBLIC>exit  
  
MAPGEN drive A: removed from XMS memory  
  
Update image file STATION1.IMG (Y/N)?
```

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MAPGEN Error Messages

For an explanation of MAPGEN error messages, see the MAPGEN Error Messages section in Chapter 4.

BPPATCH Utility

The BPPATCH utility is used to replace parameters from the BOOTP reply packet into text files. This allows one common image file to be used by several computers. The parameters are unique to each computer (for example, the IP address) being specified in the BOOTPTAB file on the server and replaced in the image file when the computer boots.

Note

The BPPATCH utility must be run before the FREEMEM utility.

Using BPPATCH

To use BPPATCH, you first need to put tags into your text files (batch files, configuration files, and so forth) to indicate which BOOTP fields you want to replace. Then run BPPATCH and specify the files to be patched on the command line. You can specify more than one file at a time. For example, if you wanted to patch the files START.BAT and PCTCP.INI, use the following command:

```
bppatch start.bat  
start
```

Tags

All tags begin with the character sequence “#@”, followed by a three-character tag name. Additional # characters are used to specify the tag length, counting from the first # character to the last # character. Make sure the tag is large enough to contain all characters in the field. If the field is smaller than the tag length, then pad the field with spaces. If the field is larger than the tag length, then truncate the field.

For a complete list of available tags, see the BPPATCH.DOC file located on the Remote Boot Setup diskette.

TCP/IP Problems and Errors

This section describes the following error messages:

Boot Screen Messages

Searching for BOOTP server (tries x).

If the computer has stopped at this prompt and the retry count is increasing, it means that no reply has been received from the BOOTP daemon on the server. Check for the following:

1. A proper connection to the file server exists. Can you connect to the server if you boot from a diskette?

2. Your server is running a BOOTP daemon. You may want to try running the daemon in standalone mode to see if it is getting the request from the computer. Running the daemon in standalone mode will require moving it from the INETD.CONF file and starting it with the `-s` option. The daemon should also have a debug mode where it will display information on the screen for each request and reply.

Transferring boot image file (x-y).

The two numbers in the parenthesis, x and y , indicate retries and packet number respectfully. During a normal transfer the first number, the retries, should remain at 1 and the second number, the packet number, should increase.

If the retry count is increasing, but the packet number is not, it indicates the computer is not receiving any packets from the TFTP daemon. If the packet number remains at 1, make sure your server is running TFTP.

If both the retry count and the packet number are increasing, it indicates the transfer is progressing correctly, but the computer is not receiving packets as fast as it wants. This is usually caused by a busy network.

File Transfer Error Messages

Most file transfer errors originate at the server. Some common file transfer errors are as follows:

File transfer error.

If all you see is File transfer error: with no description, it indicates the computer received an error packet, but the sending host did not indicate what the error was.

File transfer error: file not found.

This message comes from the TFTP daemon on the server. It usually means the TFTP daemon could not find the file the computer requested. The full file name is displayed on the computer screen. Make sure this file name is correct and that the file exists.

File transfer error: access violation.

This message comes from the TFTP daemon on the server. It usually indicates that the boot image file does not have world-read permission.

File transfer error: image file too large.

While downloading the boot image file from the server, the image file has filled all the available conventional memory in the computer. The only way to correct this is to decrease the size of the image file, or use an extended memory image. See the TCP/IP Utilities section for further information.

Error: not enough extended memory for image.

While downloading the boot image file from the server, the image file has filled all the available extended memory in the computer. The only way to correct this is to decrease the size of the image file, or add more memory in the computer.

File transfer error: no image file name specified, system halted.

The computer received a response from the BOOTP daemon, but there was no boot image file name specified in the response. Check the BOOTPTAB file to make sure the entry for the computer is correct.

This error can also occur if you have selected ARP or RARP but have not entered a file name into the ROM.

Using Memory Managers

The only currently supported memory manager is EMM386 included with DOS. Other memory managers, such as QEMM and 386Max, will give error messages when you try and load them when the boot image file is in extended memory.

EMM386

If you are using EMM386, include the additional command line option `/y`.

The `/y` option allows you to specify a path for EMM386 after the computer has booted. If you try and run Microsoft Windows after booting from the network, you will get an Invalid path for EMM386 message. This is because Windows needs access to the EMM386 file, and because the computer was booted from the network, the original file is no longer available. Using the `/y` option, you can specify a network path so Windows can access EMM386 from the network. For example:

```
device=emm386.exe /y=e:\dos\emm386.exe
```

HIMEM.SYS

If you are using MSDOS 6.2, use the `/TESTMEM:OFF` option with the HIMEM.SYS option to disable the extended memory RAM test. For example:

```
device=himem.sys /TESTMEM:OFF
```

6

Remote Boot for RPL

Overview

Remote Program Load (RPL) is a protocol originally defined by IBM that allows computers to start up by downloading files from a file server.

The remote boot ROM does not support the Novell NetWare RPL protocol. NetWare users should select the NetWare protocol.

Computer Screen

When booting with the remote boot ROM, your computer screen will look similar to the one shown in Figure 6-1.

Figure 6-1 Example of Computer Screen at Boot

```
BootWare Centralized Boot ROM for RPL [00]
(C)Copyright Lanworks Technologies Inc. 1991-1994 All Rights Reserved.

NIC description: DE450 Ethernet v2.0
ROM Address = D000h, I/O Address = 0300h, IRQ = 05, Transceiver = External
Initializing adapter: adapter initialized successfully

Searching for RPL server, retries: 00001

Sending file request to RPL server, retries = 0001
Waiting for data frame with sequence number: 00005

Node ID = 0000F8000000                                     Elapsed time: 00:00:15
```

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PATHWORKS V5.x

The remote boot ROM is supported by PATHWORKS V5.x.

Preparing the Server for PATHWORKS V5.x

To prepare the server for PATHWORKS V5.x:

1. Find the file RPL.MAP that is located in the \\lanmanager.rpl directory.
2. Edit the file and add lines to enable your computer to receive the EtherWORKS PCI adapter's remote boot.

Find the boot block record fields and add the following lines to the last few lines of the boot block record field:

```
yyyyyyyyyyyyy BBLOCK\NETBEUI\DE450\DOSBB.CNF 2 6 A  
~DOS~Digital~DECpc~DE450  
08002b ~ \ \ \ ~ RDOSPCI 1 ~~~~
```

```
yyyyyyyyyyyyy BBLOCK\NETBEUI\DE450\DOSBB.CNF 2 6 A  
~DOS~Digital~DECpc~DE450  
0000F8 ~ \ \ \ ~ RDOSPCI 1 ~~~~
```

3. Copy the driver (DE450.DOS) from the EtherWORKS PCI driver distribution diskette
\\lanmanger.rpl\bblock\ndis
4. Create a directory called DE450:

```
\\lanmanger.rpl\bblock\netbeui
```

The new directory should look like the following:

```
\\lanmanger.rpl\\bblock\netbeui\DE450
```

5. Copy the DOSBB.CNF and PROTOCOL.INI files from the \RPL\PATHWRKS directory on the Remote Boot Diskette.
6. Run the RPL Manager utility to create a new computer record that contains the DE450 adapter. This is the same as adding a computer record in the computer fields of the RPL.MAP file.

Preparing the Client for PATHWORKS V5.x

To prepare the client for PATHWORKS V5.x:

1. Use the EZWORKS Installation utility located on the Remote Boot ROM Setup diskette to select the following settings for the client:

```
Remote Boot Function = Enable  
Remote Boot Protocol = RPL
```

2. When the selections are complete, reboot the client computer to perform remote boot from the server.

Microsoft LAN Manager

Installation

The remote boot ROM for RPL is supported by LAN Manager, Versions 2.0C, 2.1X, and 2.2.

The following files are located in the \RPL\MSLANMGR directory on the Remote Boot Setup diskette:

- Sample RPL.MAP, RPLMGR.INI files
- Sample DOSBB.CNF, PROTOCOL.INI files

OS/2 V2.X remote boot was not supported by Microsoft LAN Manager when this guide was published.

Problems and Solutions

Chapter 13 of Microsoft's *The LAN Manager Administrator's Guide* has a section devoted to troubleshooting any problems related to remote boot.

At the Computer

Searching for DLC RPL Server, retries = nnnnnn

If the computer screen stops at this message and the retry count is incrementing, it indicates that the remote boot ROM cannot find an active LAN Manager server running the remote boot service.

Check for the following:

1. A proper connection to a file server exists
2. At least one server is running the remote boot service
3. The LAN Manager RPL service is rejecting computer requests because the RPL service does not support the network adapter you are using

Sending file requests to DLC RPL Server, retries=nn

If this message appears on your computer screen indicating a high retry count, there is a synchronization problem. In cases where a slow computer is connected to a fast server, some retries are normal. The computer cannot keep up with the file server's data transfer rate.

A possible solution is to set field 5 of the RPL.MAP server record entry to "A" instead of "N". This will cause the file server to wait for a send request after sending each file block.

Double- or triple-check your PROTOCOL.INI file

Make sure the configuration specified in the PROTOCOL.INI file matches that of your adapter. Even if there is an error in your PROTOCOL.INI file, your NDIS driver will probably load okay. Problems occur afterwards when NETBEUI or NETBIND is loaded, or when the remote boot ROM fails to transfer DOS or OS/2 system files to the computer.

Check for the following:

1. That there are no typographical errors in the PROTOCOL.INI file
2. That the configuration in the PROTOCOL.INI file matches the computer's adapter configuration

Not all NDIS drivers use the same keywords to identify parameters in the `PROTOCOL.INI` file. Refer to the `/NDIS2/README.TXT` file on the DE450 distribution diskette for the keywords to use.

NDIS drivers require more memory to load

After the NDIS driver is loaded, you may see the following message: The program needs more memory `XX K` (`DE450.DOS`). The computer failed to boot. The `XX` indicates the amount of additional memory (in kilobytes) needed.

In the `DOSBB.CNF` file, the second parameter of a `DRV` entry specifies the amount of additional memory to allocate to the driver.

For example, if originally the NDIS `DRV` entry is:

```
DRV BBLOCK\NDIS\DE450.DOS ~ ~ ~
```

The boot block reports that 5 KB of additional memory is needed. Change the entry to:

```
DRV BBLOCK\NDIS\DE450.DOS ~ 5 ~
```

Boot Block fails to load DOS

After `RPLBIND1` and `RPLBIND2` are executed, the boot block printed the following message:

```
"Non-system disk or disk error"  
Replace and press any key when ready"
```

The message is printed when the boot block fails to load DOS from the server.

Check for the following:

```
DOSXX system files are copied correctly to  
\LANMAN\RPL\RPLFILES\BINFILES\DOSXXX.
```

Make sure that the attributes `HIDDEN` and `SYSTEM` are removed from the files `IO.SYS` and `MSDOS.SYS`. If you are using IBM PC-DOS, rename `IBMBIO.XXX` and `IBMDOS.XXX` to `IO.SYS` and `MSDOS.SYS`.

OS/2 boot fails once in a while

Microsoft LAN Manager specifies that the network adapter must be set to interrupts 2, 9, 10, 11, or 15 to boot OS/2. Interrupts 3, 4, 5, 6, and 7 are not supported by OS/2.

OS/2 boot fails

Make sure that the HIDDEN attribute is removed from the OS2LDR and OS2KRNL files.

At the Server

Check the server error log, which may provide useful diagnostic information.

RPL or Remoteboot service does not start

Double check the RPL.MAP file. Make sure there are no typographical errors. If you are not booting a particular OS (for example, OS/2 V1.21), make sure all boot block information related to the particular OS is commented out. Information in RPL.MAP is commented out by placing a “;” in front of a record.

RPLMGR does not start

Check if the RPLFILES share is set up properly. If not, enter the following command line:

```
NET SHARE RPLFILES = C:\LANMAN\RPL\RPLFILES
```

For OS/2 remote boot, make sure the BINFILES and TMPFILES exist and point to the correct directory. If not, enter the following command lines:

```
NET SHAREBINFILES=C:\LANMAN\RPL\  
RPLFILES\BINFILES/UNLIMITED  
  
NET SHARE TMPFILES=C:\LANMAN\RPL\  
RPLFILES\TMPFILES /UNLIMITED
```


Microsoft LAN Manager Documentation

The following LAN Manager V2.2 documents contain useful information during remote boot ROM installation and configuration.

<u>Document</u>	<u>Related Information</u>
Installation and Configuration Guide	NDIS driver options
Administrator's Guide	Booting Workstations Remotely (Chapter 13)
Administration Reference	Net Start Remoteboot command Net Share command Rpldsabl, Rplenabl utilities Rplinst utility Rplmgr utility Rplsetup utility

IBM LAN Server

Installation

The remote boot ROM for RPL is supported by the IBM LAN Server, V3.0.

This chapter is not a replacement for OS/2 LAN Server documentation on setting up the remote boot service. Refer to Chapters 13 and 14 in the *OS/2 LAN Server Network Administrator Reference Volume 3: Network Administrator Tasks* manual.

The following sample installation files can be found in the \RPL\IBMLANSV directory on the Remote Boot Setup diskette:

- Sample RPL.MAP
- Sample DOSDE450.CNF, OS2DE450.CNF, and PROTOCOL.INI files

It is recommended that you examine the configuration examples found in the EZWORKS Installation utility.

Note

RPL and RIPL refer to the same remote boot protocol in this chapter.

1. Follow IBM OS/2 LAN Server documentation and set up the RIPL service on the server. Start the RIPL service to verify if the installation is correct.
2. Stop the remote boot service (NET STOP RPL) and back up the files:

```
RPL.MAP
NDISDD.PRO (for OS/2 RIPL only)
```

3. In RPL.MAP, add the following entries for DOS and OS/2:

```
YYYYYYYYYYYYY DOSDE450.CNF 3 10 A IBMLAN$ DOS~DE450 ~ ~ , , , Z
R_DE450

YYYYYYYYYYYYY OS2DE450.CNF 3 10 A ~ OS2~2.0~DE450 ~ ~ , , , ~
R_20_DE450~ ~
```

4. In the \IBMLAN\RPL directory, create the DOSDE450.CNF and OS2DE450.CNF files, where DOSDE450 and OS2DE450 correspond to the second field of the Server Record Field in RPL.MAP.

The user can copy the DOSDE450.CNF and OS2DE450.CNF files from an existing directory and make the following modifications:

Change the path of PROTOCOL.INI to point to \IBMLAN\RPL\DOS\DE450.

Change the name of the NDIS driver.

DOS RIPL Setup

5. Create the subdirectory \IBMLAN\RPL\DOS\DE450. Copy the PROTOCOL.INI file from an existing setup (\IBMLAN\RPL\DOS\ETHERNET\PROTOCOL.INI for Ethernet and \IBMLAN\RPL\DOS\TOKENRNG\ PROTOCOL.INI for Token–Ring). Edit the BINDING and DRIVERS sections to reflect the change in adapter.
6. Copy the DOS device driver, DE450.DOS, to the \IBMLAN\RPL\DOS directory.

OS/2 RIPL Setup

7. Create the subdirectory IBMLAN\RPL\IBMCOM\DE450. Create the following files under the new subdirectory:

CONFIG.20 and PROTOCOL.INI

The user can copy the CONFIG.20 and PROTOCOL.INI files from an existing directory and make the following modifications:

For the PROTOCOL.INI file, edit the BINDING and DRIVERS sections.

For the CONFIG.20 file, load the proper NDIS driver.

8. Copy the OS/2 device driver, DE450.OS2, to the \IBMLAN\RPL\IBMCOM\MACS directory.
9. For OS/2 remote boot, add the following statement to the end of the file \IBMLAN\RPL\NDISDD.PRO:

```
DE450 .DOS           DE450
```

10. Start the RPL service again. When creating the new RIPL computer, the R_20_DE450 and R_DOS_DE450 should appear as valid selections in the list for Server Record ID.

Memory Optimization

Under LAN Server V3.0, memory overhead is associated with DOS remote boot. For this reason, a remote boot computer has less conventional memory available for application use. However, it is still possible to load the redirector high by using the /HIM and /UMB parameters for the DOS LAN Requester. Refer to Chapter 4 in the *LAN Server V3.0 Network Administrator Reference Volume 2: Performance Tuning* for further information.

Windows NT

Setting up the remote boot ROM for the Windows NT Server is similar to that of Microsoft LAN Manager. The key difference is that the RPL.MAP and RPLMGR.INI files are replaced by a remote boot database. The RPLCMD utility is used to access records in the remote boot database.

Documentation Error

The remote boot chapter in the *Windows NT Installation Guide* states that after copying the MS-DOS files to the systemroot\RPL\RPLFILE\BINFILE\DOSxxx directory, the IO.SYS and MSDOS.SYS files must be flagged as HIDDEN and SYSTEM. However, the result is the “Non-system disk...Press any key to continue” error message immediately after logging in. Contrary to what the guide claims, the HIDDEN and SYSTEM attributes must be REMOVED from the IO.SYS and MSDOS.SYS files using the File Manger.

Preparing the Windows NT Server

To prepare the Server for Windows NT V3.51:

1. Copy the driver (DE450.DOS) from the EtherWORKS PCI driver distribution diskette to the following directory:

```
\\winnt35\rpl\bblock\ndis
```

2. Create the subdirectory named DE450 under the following directory:

```
\\winnt35\rpl\bblock\netbeui
```

The newly created directory should look like the following:

```
\\winnt35\rpl\bblock\netbeui\de450
```

3. Copy the DOSBB.CNF and PROTOCOL.INI files from the \rpl\win_nt directory on the Remote Boot Setup diskette to the following directory:

```
\\winnt35\rpl\bblock\netbeui\de450
```

Run the DOS utility RPLCMD and enter the following information:

```
Adapter Boot Config Profile Service Vendor Wksta [Quit]: b
Add Del Enum: a
```

```
BootName=DOS_DE450
BootComment=DOS DE450
Acknowledgment of the last RemoteBoot frame is requested.
VendorName=0000F8
BbcFile=BBLOCK\NETBEUI\DE450\DOSBB.CNF
WindowSize=0x0
```

```
Adapter Boot Config Profile Service Vendor Wksta [Quit]: c
Add Del Enum: a
```

```
ConfigName=DOS622_DE450
ConfigComment=DOS 6.22 DE450
Configuration is enabled.
BootName=DOS_DE450
DirName=DOS
DirName2=DOS622
DirName3=(null)
DirName4=(null)
FitShared=FITS\DOS622.FIT
FitPersonal=FITS\DOS622P.FIT
```

5. Run the RPL Administrator utility to add the new DE450 computer (see the *Windows NT Installation Guide* for setting up network adapters, profiles, and computers).

Preparing the Windows NT Client

To prepare the client for Windows NT V3.51:

1. Use the EZWORKS Installation utility located on the Remote Boot Setup diskette to select the following settings for client setup:

```
Remote Boot Function = Enable
Remote Boot Protocol = RPL
```

2. As an alternative, use the following command line switch:

```
A>Setup/REMOTE=ENABLED/PROTOCOL=RPL
```

3. When the selections are complete, reboot the client PC to perform remote boot from the server.

Update Information

Obtaining the Latest Remote Boot ROM Driver Files

The Remote Boot Setup diskette included in your EtherWORKS PCI Remote Boot ROM kit can become outdated as operating system software evolves. The latest versions of the driver files can be found on the Internet, CompuServe, World Wide Web, and the Network Product Business Bulletin Board Service (NPB BBS) by using the following procedures:

- **Internet**

1. Perform an anonymous ftp connection to **ftp.digital.com**. Your login name is anonymous.
2. Enter your password. (Use your Internet electronic mail address as your password.)
3. Using uppercase and lowercase letters (as shown), change your directory to the following:

```
cd /pub/DEC/adapters/ethernet/bootr/release  
cd /pub/DEC/adapters/ethernet/bootr/interim
```

The release directory contains the driver file included in the current manufacturing released (shipping) kit. The interim directory contains bug fixes and functional enhancements added since the last manufacturing release.

4. Select image mode before extracting binary (non-ASCII) files:

```
ftp> i
```

Retrieve a driver file, as in the following example:

```
ftp> get driver.ZIP
```

Enter quit to exit ftp.

Use the *-d* option to extract subdirectories and files:

```
C:\> pkunzip -d driver.ZIP
```

- **CompuServe:**

1. Enter Go decpci to select the DECPCI forum and enter the LAN Controllers library.
2. Select the *Browse* option to scroll through the library titles.
3. Click on the remote boot ROM title, then press the Return key to display the description of the remote boot ROM file.
4. Select the *Retrieve* option to copy the file to your system.

For information on how to obtain a CompuServe account in the U.S., call 1-800-848-8990.

- **World Wide Web**

Enter the following universal resource locator (URL) to access Digital's adapter Home Page on the World Wide Web:

```
http://ftp.digital.com/pub/DEC/adapters/home.html
```

- **Network Product Business (NPB) World Wide Web:**

For more information on other Digital networking products, go to:

```
http://www.networks.digital.com/
```

Other Digital Network Adapter Products

The EtherWORKS PCI Remote Boot ROM is part of a complete family of low-cost network adapters and boot ROMs developed by Digital Equipment Corporation. Other products include the following:

DE45X–AR Remote Boot ROM

This option ROM is installed on an EtherWORKS Turbo PCI 10 adapter (either DE450–CA or DE450–TA) in a DOS–based system. The installed ROM can be configured and tested using the EZWORKS Installation utility. The DE45X–AR remote boot ROM enables your computer to perform a remote boot using the MOP or RPL protocols.

Digital offers the following remote boot ROMs to be used with the EZWORKS Turbo PCI 10 adapter:

- DE45D–AR, 28-pin remote boot ROM
- DE45F–AR, 32-pin upgradable FLASH remote boot ROM

DE20M–AR Remote Boot ROM

This option ROM is installed on an EtherWORKS 3 Turbo adapter (either DE204 or DE205) in a DOS–based system. The installed ROM can be configured and tested using the EZWORKS Installation utility. This remote boot ROM enables your computer to perform a remote boot using the MOP or RPL protocols.

Fast EtherWORKS PCI 10/100 (DE500–AA, DE500–XA) Adapter

This 32–bit adapter is a dual–speed adapter that uses a single connector for either a 10 Mb/s or a 100 Mb/s IEEE 802.3 Ethernet network connection. The adapter automatically senses and adjusts to either speed. The Fast EtherWORKS PCI 10/100 adapter is software configurable to operate in full–duplex mode, increasing aggregate bandwidth up to 20 Mb/s and 200 Mb/s. Easy installation of this adapter is ensured by using the EZWORKS Installation utility. The Fast EtherWORKS PCI adapter supports IEEE 802.3u auto–negotiation (DE500–AA) and IEEE 802.3 auto–sensing (DE500–XA) functions. In addition, the DE500–AA model provides optional boot ROM support (FLASH or OTP) up to 128 Kbytes.

The device drivers for this product include NetWare, Windows for Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO UNIX, UnixWare, Digital UNIX, and OpenVMS. The EtherWORKS PCI 10/100 adapter supports twisted-pair connections. A Lifetime Warranty is included.

EtherWORKS Hub 8TX (DELXR) Repeater

This smart 8-port Class II 100BASE-TX repeater complies with the IEEE 802.3u standard. The Hub 8TX is used for 100 Mb/s Ethernet networks. It can link two to eight PCs or workstations using Category 5 unshielded or screened twisted-pair (UTP or ScTP) cables to form a simple, fast Ethernet LAN. The Hub 8TX also contains a daisy-chain port to connect to another compatible repeater using twisted-pair cable. The Hub 8TX is ready to run with all network operating systems and protocols. A Lifetime Warranty is included.

EtherWORKS Turbo PCI 10 TP (DE450-TA, DE450-CA) Adapters

These 32-bit, low-cost 10 Mb/s PCI Ethernet adapters feature DMA bus master design with a fast cut-through FIFO buffer (2 x 256B FIFOs). These adapters are easy to install on DOS-based systems by using the EZWORKS Installation utility. The Turbo PCI 10 adapters provide optional remote boot ROM interface for RPL, MOP, and other future protocols. The device drivers for these products include NetWare, Windows for Workgroups, Windows NT, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO UNIX, UnixWare, Digital UNIX, and OpenVMS. The DE450-TA adapter supports twisted-pair connections; the DE450-CA adapter supports twisted-pair, ThinWire, and AUI connections. A Lifetime Warranty is included.

EtherWORKS 3 Turbo TP (DE204–AB, DE205–AC) Adapters

These adapters are high-performance, 16-bit ISA adapters designed to meet client/server needs. These low-cost adapters feature 128 KB of on-board buffer RAM that is dynamically allocated for optimal transmit/receive performance. The device drivers for these products include NetWare, Windows for Work Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, Packet Driver, SCO UNIX, UnixWare, Digital UNIX, and OpenVMS. Two models are offered: the DE204-AB supports twisted-pair connection; the DE204-AC supports ThinWire, twisted-pair, and AUI connections. A Lifetime Warranty is included.

EtherWORKS Turbo EISA (DE425–AA) Adapter

This adapter is a 32-bit Ethernet adapter that maximizes throughput without compromising CPU time or network performance. Ideal for intensive server-based applications, this adapter features a fast cut-through FIFO buffer (2x 256B FIFOs). The adapter supports full duplex, for operation of 20 Mb/s. The device drivers for these adapters include NetWare, Windows for Workgroups, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, Packet Driver, SCO UNIX, UnixWare, Digital UNIX, and OpenVMS. The DE425-AA adapter supports ThinWire, twisted-pair, and AUI connections. A Lifetime Warranty is included.

EtherWORKS PCMCIA Turbo (DEPCM–AA, DEPCM–BA) Adapters

These credit card sized adapters are designed to link laptop and notebook systems to 10 Mb/s Ethernet networks—quickly and affordably. These adapters for PCMCIA-compliant (Type II) PCs feature a highly integrated single-chip design, easy installation, hot-swapping capabilities, and card and socket services. The device drivers for these adapters include NetWare, Windows for Workgroups, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, Packet Driver, SCO UNIX, UnixWare, Digital UNIX, and OpenVMS.

DEC FDDIcontroller/PCI (DEFPA–UA, DEFPA–MA, DEFPA–AA, DEFPA–DA) Adapters

As the first PCI FDDI adapters in the industry, these custom high–performance, low–cost 32–bit adapters feature on–board CPU for SMT processing, DMA chip, and 1 MB buffer. Full–duplex capability extends bandwidth to 200 Mb/s. The device drivers for these adapters include NetWare, Windows for Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO UNIX, UnixWare, Digital UNIX, and OpenVMS. These adapters can be used with PCI–based Alpha, Intel, MIPS, and PowerPC systems. Four models are offered: UTP SAS and DAS, and MMF SAS and DAS. A Lifetime Warranty is included.

DEC FDDIcontroller/EISA (DEFEA–AA, DEFEA–DA, DEFEA–UA, DEFEA–MA) Adapters

These custom high–performance, low–cost 32–bit adapters feature on–board CPU for SMT processing, DMA chip, and 1 MB buffer. Full duplex capability extends bandwidth to 200 Mb/s. The device drivers for these adapters include NetWare, Windows for Workgroups, Windows NT, Windows 95, PATHWORKS, LAN Manager, LAN Server, Banyan VINES client, SCO UNIX, UnixWare, Digital UNIX, and OpenVMS. These adapters can be used with Alpha, Intel, MIPS, and PowerPC systems. Four models are offered: MMF SAS and DAS, and UTP SAS and DAS. A Lifetime Warranty is included.

To order these products, contact an authorized Digital distributor or Digital sales representative. For more information, call 800–457–8211 in the U.S. and Canada, 508–692–2562 in other locations, or your local sales office.