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The Advanced
Networking DOS
That's Easy to Use

Novell DOS™

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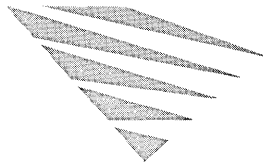


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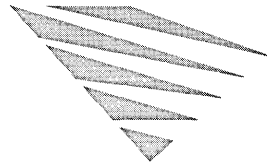
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A *bout This Guide*

This manual describes Novell DOS™7, a disk operating system designed to run on Intel* 8086, 8088, 80286, 386* (and later) and compatible microprocessors.

Novell DOS 7 also includes Personal NetWare™, a networking component that allows you to share your computer's resources with other users on a DOS network.

Before you start using the operating system or the network, read the documentation from the manufacturer of your computer so that you are reasonably familiar with the computer and how it works.

You should also read Chapter 1, "Introduction to Novell DOS 7" and Chapter 4, "Working with Novell DOS 7," which describe the main features of the operating system and explain certain concepts that you should be familiar with before you use the operating system.

Before starting to set up your Personal NetWare network, read the section in Chapter 18, "Introduction to Personal NetWare" which describes terms and concepts related to networking and Personal NetWare in particular.

This manual, the *Novell DOS 7 User Guide*, documents all aspects of the operating system and networking software.

Organization

Refer to the following chapter and appendix summaries to decide which parts of the manual are applicable to you.

- ◆ Chapter 1, "Introduction to Novell DOS 7," introduces this operating system, and some general operating system concepts.

- ◆ Chapter 2, “Installing Novell DOS 7,” explains how to install the operating system.
- ◆ Chapter 3, “Installing Personal NetWare,” explains how to install the network components.
- ◆ Chapter 4, “Working with Novell DOS 7,” describes more operating system concepts, and how to start using the operating system.
- ◆ Chapter 5, “Using the Online Documentation,” explains how you access information in DOSBook, the online manual.
- ◆ Chapter 6, “Editing Text Files,” explains how to use EDIT, a menu-based editor that you can use to create and edit text files.
- ◆ Chapter 7, “Batch Processing,” explains how to store frequently-used sets of commands in either a batch file or a macro. There are also full descriptions of the batch file subcommands.
- ◆ Chapter 8, “Commands,” provides an overview of the operating system command set. This chapter also explains how to edit the command line without retyping the entire command. For detailed descriptions of each operating system command, use DOSBook.
- ◆ Chapter 9, “Configuring the System,” explains how to change the system configuration by using the SETUP program. It also describes CONFIG.SYS and AUTOEXEC.BAT, which are the two main configuration files, and the commands that you can use in CONFIG.SYS.
- ◆ Chapter 10, “Managing Memory,” describes the features offered by the memory management tools, and explains how to use them to maximize the memory available to your applications. This chapter also includes detailed descriptions of the commands required to load the memory management device drivers.
- ◆ Chapter 11, “Improving Disk Performance,” describes two utilities that you can use to get maximum performance from the hard disk: a disk optimizer (DISKOPT) and a cache program (NWCACHE).

- ◆ Chapter 12, “Disk Compression,” describes how to use the Stacker* disk compression program in order to store more information on the hard disk.
- ◆ Chapter 13, “Multitasking and Task Switching,” explains how to install and configure the Task Manager, a program that allows you to switch quickly and easily from one application to another. It also explains how to use all the features provided by the Task Manager menu.
- ◆ Chapter 14, “Securing Information,” describes how to set up and make the best use of operating system security to prevent unauthorized access to information and resources on your computer whether or not it is part of a network.
- ◆ Chapter 15, “Recovering Information,” describes how you can recover deleted data, and how the file recovery commands work together.
- ◆ Chapter 16, “Redirecting Information,” explains how to redirect the input and output of information on your computer.
- ◆ Chapter 17, “Setting Up Code Page Switching,” explains how to set up and use code page switching on your system. The operating system allows you to change between different character sets, so that you can work with documents in different languages using a mechanism called code page switching.
- ◆ Chapter 18, “Introduction to Personal NetWare,” introduces the terms and concepts with which you will need to be familiar before setting up or using the Novell DOS 7 network component.
- ◆ Chapter 19, “Planning Your Network,” is intended for the person who is responsible for setting up the network and describes the issues you should consider before starting to set up the network.
- ◆ Chapter 20, “Setting Up the Network,” describes how to set up the network and how to change the network setup whenever necessary.
- ◆ Chapter 21, “Using the Network,” describes the operations you can perform as a user of the network.

- ◆ Chapter 22, “Optimizing and Maintaining the Network,” describes operations that you should perform occasionally to ensure that the network is operating as efficiently as possible.
- ◆ Chapter 23, “NET Commands,” describes how to use the Personal NetWare NET commands at the operating system prompt to perform user and administration tasks on the network.
- ◆ Chapter 24, “Using Network Diagnostics,” describes how to use the Network Diagnostics program, which allows you to monitor the operation of Personal NetWare in your workgroup.
- ◆ Chapter 25, “Configuring Your Computer for Desktop SNMP Services,” explains the procedures for configuring the workstation services.
- ◆ Chapter 26, “Running IPX and SPX Applications in a Task-Switching Environment,” describes how to use the NetWare® task switching files that provide the data buffers needed to support IPX™ and SPX requests made from applications running in a DOS session.
- ◆ Appendix A, “Troubleshooting,” describes problems you may experience using the operating system and, where possible, their solutions. This appendix also explains error messages displayed when the system either fails to boot or crashes while it is running. For explanations of other error messages, refer to DOSBook.
- ◆ Appendix B, “Preparing the Hard Disk” summarizes how to use FDISK to prepare the hard disk, if the hardware dealer has not already done this, before installing the operating system.
- ◆ Appendix C, “NetWare DOS Requester,” describes the DOS client software that provides the interface between DOS and the network.
- ◆ Appendix D, “Code Pages,” lists the character sets of the code pages supported by the operating system.
- ◆ The Glossary lists terms and their definitions, as used in this manual.

New Features in Novell DOS 7

If you are familiar with an earlier version of this operating system you will find that this new version includes some significant advances in DOS technology.

- ◆ The Personal NetWare networking component enables you to set up a peer-to-peer DOS network so that you can share resources between computers running Novell DOS 7 and MS Windows. Personal NetWare includes a network diagnostics program.
- ◆ The INSTALL and SETUP programs are enhanced to include the new operating systems features.
- ◆ The Task Manager has been enhanced to provide “multitasking” on 386 (and later) computers. This means that you can run multiple applications simultaneously.
- ◆ Security for your computer is enhanced, including the following features:
 - ◆ A “one-time login” allows you to log in to your computer and any Novell® network to which you are connected.
 - ◆ A “screen saver” allows you to lock your computer against unauthorized use without logging out.
- ◆ Search and Destroy is anti-virus software that rids your computer of any existing viruses.
- ◆ The Stacker program allows you to create and work with Stacker compressed drives.
- ◆ NWCACHE is a disk caching program that makes your operating system run faster by reducing the time it spends waiting for data from disk.
- ◆ The EMM386 memory manager is enhanced to support DPMI and multitasking.

- ◆ DOS Protected Mode Services (DPMS) allow DPMS-aware programs to run in protected mode. Novell DOS 7 DPMS-aware programs include DELWATCH, the disk cache (NWCACHE), and the Personal NetWare server (SERVER.EXE).
- ◆ Fastback Express (FBX) is a new program for backing up and restoring data quickly and easily.
- ◆ MS Windows versions of the following programs are included: Search and Destroy, Fastback Express, LOCK, and the network commands. There is also a Novell DOS 7 program group for MS Windows.
- ◆ EDIT, the text editor, has a new menu interface that includes mouse support. Also, DOSBook can now be accessed from within EDIT.
- ◆ The DOSKEY command allows you to create and work with macros.
- ◆ The new debugger, DEBUG, is compatible with other earlier DOS versions. Although DEBUG is not documented in this manual, it is fully documented in DOSBook, the online manual.
- ◆ NetWars is an arcade-style network game that you can play alone or with other network users.

Enhanced Commands in Novell DOS 7

The following commands have been enhanced in this version of the operating system. They are all described in detail in the “Command Reference” chapter of DOSBook, the online manual.

- ◆ CHKDSK
- ◆ COMP
- ◆ DEL
- ◆ DELWATCH
- ◆ DISKCOPY

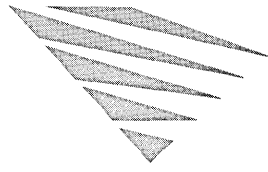
- ◆ DISKOPT
- ◆ DOSBOOK
- ◆ ERASE
- ◆ FC
- ◆ FIND
- ◆ FORMAT
- ◆ LOCK
- ◆ MEM
- ◆ SHARE
- ◆ TASKMGR
- ◆ TREE
- ◆ UNDELETE
- ◆ XCOPY

The following batch file subcommands have been enhanced:

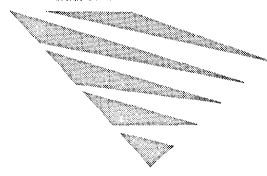
- ◆ CHOICE (new command)
- ◆ IF

The following CONFIG.SYS command have been enhanced:

- ◆ DOS (replaces HIDOS)
- ◆ DRIVPARM
- ◆ STACKS (new command)



Getting Started with Novell DOS 7



chapter

1

Introduction to Novell DOS 7

This chapter describes Novell DOS™ 7 briefly for those who are unfamiliar with operating systems, and lists some of the important features of the operating system. If you are not familiar with operating systems, read this chapter and Chapter 4, “Working with Novell DOS 7,” *before* installing the operating system.

If you are already familiar with operating systems, see “Features of Novell DOS 7” on page 1-5, and then go straight to Chapter 2, “Installing Novell DOS 7,” for an introduction to the installation process.

What is Novell DOS 7?

Novell DOS 7 is a disk operating system (DOS) that coordinates the different parts of your computer to make them work as a single system. The operating system is the link between the physical parts of your computer such as the screen and the keyboard (your hardware) and the applications you run on the computer (your software).

Novell DOS 7 creates the environment in which you interact with your computer and within which your programs work.

The operating system allows you to run applications such as word processors and spreadsheets, and to organize the data you produce from your applications into *files* and *directories* so that you can manage it easily. Refer to Chapter 4, “Working with Novell DOS 7” for more information on files and directories.

Your computer stores the operating system programs that manage your applications and data on *disk*. When the operating system is loaded, these programs are moved from the disk into *memory*. Memory is used for temporary storage of programs and data while they are in use. When the information is no longer being used, the information is stored on the disk again. Refer to Chapter 4, "Working with Novell DOS 7," for more details about memory and the types of disk.

The operating system uses memory to make *multitasking* possible on computers with a 386* processor (or later). When you enable the operating system's multitasking capability, your computer can run more than one program simultaneously.

With the correct hardware, you can use the operating system to link your computer with other computers so that you can share information and resources. When computers are linked together, this is known as a computer *network*. Novell DOS 7 includes Personal NetWare™, which is the software you need to create your own network; see the section "What is a Network?" below.

What is a Network?

A network consists of several computers with network interface boards linked together by special cables. When you have a network of computers, you can share software and resources, such as printers, with other computer users.

Networking allows printers and disks (or parts of disks) which are not physically part of your computer to appear to applications as though they were. This is done by adding new disk drive letters (F:, for example) and printer ports (LPT3, for example) to those that the operating system already knows about. This way, applications can treat all disk drives and printers as though they were part of your desktop computer, even if some of them are physically part of some other computer.

Many applications default to printing on LPT1, so for convenience network software allows you to redirect output being sent to LPT1 so that it actually goes to a networked printer and not to the port on your own computer.

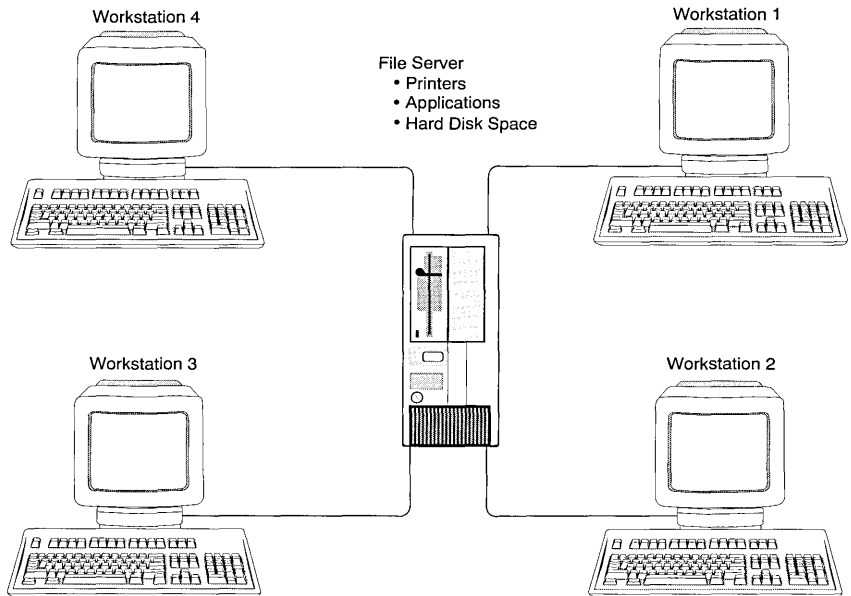
There are two different approaches to creating a network. The following sections explain them.

Client-Server Networking

In a client-server-based network, the server is a computer dedicated to managing the network resources. The server is the central part of the network, holding many resources in one place. Other computers (known as clients) access this central server for applications, data, and hard disk space. The server manages the sharing of application and data files among the clients using these resources. Servers also handle printing by storing print jobs until printers are available, and then directing the print jobs to their respective printer destinations.

When a computer sends a request to the server for a word-processing application and a document, for example, the server sends the application and the document across the network. The application and the document are loaded into the memory belonging to the computer. The server simply supplies the files and stores or prints documents as requested.

Figure 1-1
A Client-server
Network

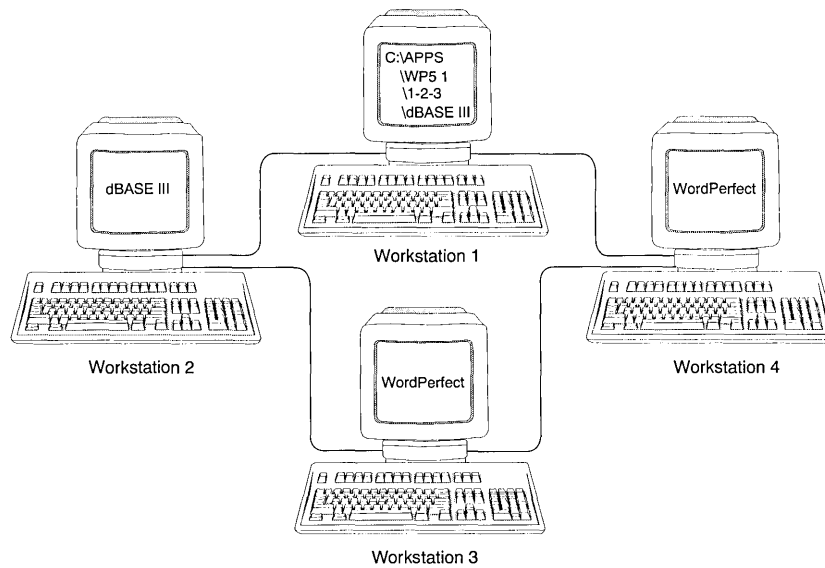


Peer-to-peer Networking

In a peer-to-peer network, any computer with a hard disk drive is a potential server. Any of the computers on the network offering applications, files, printers, and disk drive space to other computers is a server. A computer that makes a request for network resources is called a client. In a peer-to-peer network, resources are not located on a central computer but they are shared by the computer where the resources are resident.

The advantage of the peer-to-peer method is that you can share printers, applications, CD-ROMs, data files, and other resources without the need for them to be centrally located in one place. You also do not have to assign one of your computers solely as a server since any computer can be a server when necessary.

Figure 1-2
A Peer-to-Peer
Network



Personal NetWare

Personal NetWare, the networking system that is included in Novell DOS 7, provides the server and client software that enable you to set up a network, and to connect to Novell® NetWare® servers as well.

The minimum hardware requirements for running Personal NetWare are as follows:

- ◆ Two or more of the following computers with hard disks and a minimum of 640 KB of RAM (if DOS-only) or 2 MB of RAM (if you are running MS Windows) on each computer: IBM* PC, PC/AT*, PC compatible, IBM PS/2*, IBM PS/2 compatible
- ◆ A cabling system (to physically connect the computers)
- ◆ A Network Interface Board for each computer
- ◆ 6 to 8 MB of fixed disk space

Refer to Chapter 18, "Introduction to Personal NetWare," for an introduction to Personal NetWare.

Features of Novell DOS 7

The following sections provide an overview of some of the important features in this operating system.

Online Manual

Novell DOS 7 is supplied with a complete online manual, DOSBook. The online manual contains detailed information about all of the features of the operating system including the basic commands, and the advanced utilities.

Novell DOS 7 also has online help available for all its commands. Refer to Chapter 4, "Working with Novell DOS 7," for more information about online help.

Memory Management

The memory management features include a set of device drivers and commands that enable you to manage memory efficiently and make as much memory as possible available to your applications. There are various device drivers available; the one you need to use depends upon the type of hardware you have. Refer to Chapter 10, "Managing Memory," for an introduction to memory and memory management.

DOS Protected Mode Services

A new DOS Protected Mode Services (DPMS) interface has been added to allow specially-implemented device drivers and TSRs such as disk compressors and disk caches to operate in extended memory on computers that have 286* microprocessors and above. This makes more memory within the first megabyte available to applications and other conventionally-written drivers and TSRs. Both Stacker* (the disk compression program), and NWCACHE (the disk cache) use DPMS. More detailed information about DPMS is available to system developers in the *DOS Protected Mode Services API* guide.

Disk Compression

The disk compression component enables you to keep more information on your hard disk by compressing the data on it. Once you have installed and run this component, it automatically uncompresses and compresses data read from or written to the disk. Refer to Chapter 12, "Disk Compression" for more information about disk compression.

Disk Performance

There are two components of the operating system that improve the performance of your hard disk: NWCACHE and DISKOPT.

- ◆ NWCACHE increases disk access speed by reducing the amount of time taken for data to be read from or written to the disk or diskettes.
- ◆ DISKOPT “optimizes” the disk performance by reorganizing the arrangement of the data on the disk.

Refer to Chapter 11, “Improving Disk Performance,” for more information about NWCACHE and DISKOPT.

Server Networking

The operating system network component, Personal NetWare, allows you to set up your computer as a server so that you can share your data, programs, and printers with other users on the network. You can also share application files if you have the necessary license agreements.

Client Networking

When you install the client software on your computer, not only can it act as a client of a Personal NetWare server on the network, but it can also be a client of a NetWare server. Thus, creating a Personal NetWare network does not conflict with existing NetWare server-based networks. You can also add NetWare servers to your Personal NetWare network to increase the network services available.

Security

Security allows you to use a single username and password to log in to both your machine and the network. As well as this security, you can use the sophisticated anti-virus software to protect your computer against computer viruses.

Multitasking

Multitasking allows you to run tasks in the background simultaneously with a task in the foreground. For example, you could run a document comparison tool in the background and switch to a foreground process such as text editing. The document comparison continues to run while you edit another document.

On computers with 8088, 8086 and 80286 (or compatible) microprocessors you can still switch between tasks but a task will not continue to run when it is in the background.

File Recovery

The DELWATCH and UNDELETE commands enable your computer to keep track of deleted files, and recover them if you accidentally delete them. The backup component, Fastback Express, allows you to save files to any logical DOS device regularly and recover them later if you need them.

MS Windows Support

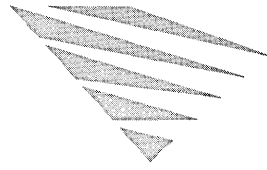
Many of the operating system commands are also written to run under MS Windows. You can load the MS Windows versions of these commands if you run MS Windows on your computer. These commands are placed in a MS Windows program group when you install the operating system.

Running DOS from ROM

Your computer may have DOS in ROM (read-only memory). In this case you will find that the operating system is already installed on your computer and starts automatically when you switch it on.

Extending Your Computer System

You may wish to extend your computer system by adding extra hard disks, memory boards, or diskette drives. You should consult your dealer about what you can use with the operating system if you are in any doubt.



chapter **2** *Installing Novell DOS 7*

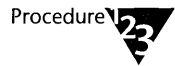
Starting INSTALL



Note

Before you install this operating system, if you already have DOS running on your machine, you may want to use your existing backup command to back up all the information on your hard disk.

To start installing the operating system if you have DOS running on your machine:



Procedure

1. **Run your existing DOS system as you usually do.**
2. **Place the *Novell DOS™ 7 installation diskette* in drive A: or B:.**
3. **Type A:INSTALL or B:INSTALL at the system prompt.**

If you do not have DOS running on your machine:



Procedure

1. **Place the *Novell DOS 7 installation diskette* in drive A:.**
2. **Press <Ctrl><Alt>.**

The installation process starts automatically. To get help on INSTALL, press <F1>. You can quit the INSTALL program at any time by pressing <Alt> X.

Installing Novell DOS 7 from a Network Drive

To install Novell DOS 7 from a network drive, use the XCOPY command with the /H switch to copy all the files, including the system and hidden files, to the network drive. To install it on each computer, the user must change to the network drive, and type INSTALL to run the install program.

The INSTALL Program

Before the installation process begins, INSTALL scans your computer to obtain information about your existing hardware and software. INSTALL also requires information from you. Enter the information INSTALL requires by selecting from a list of options, or typing it in.

The INSTALL program installs the following components:

- ◆ Novell DOS 7 Standard System
- ◆ Networking System
- ◆ MS Windows Utilities

Unless you specify otherwise, INSTALL installs all these components. If you do not have MS Windows, INSTALL does not install the MS Windows part of the operating system. INSTALL calculates how much space is needed for the operating system and for each component, and displays how much space is available on your computer. Unless you have a limited amount of space available, install all the operating system components.

INSTALL uses the information obtained about your computer to create suitable default settings. Accept the default settings for the installation and, if you need to change them, use SETUP after you have installed the operating system.

INSTALL copies the operating system files to the default directories, or to the directories you specify. As the installation progresses, a gauge shows the percentage of the installation completed, and the name of each operating system file is displayed as it is copied.

INSTALL copies the files for the components you selected to install, but does not enable them. You must use SETUP after you have installed the operating system and restarted the computer to enable such features as networking, disk compression, and security.

After Installing

When the installation is complete, INSTALL gives you the options

- ◆ To read the README file which contains important information about the operating system
- ◆ To restart your computer to run Novell DOS 7
- ◆ To view the AUTOEXEC.BAT and CONFIG.SYS files
- ◆ To discard changes to these files

It is recommended that you read the README file before exiting the INSTALL program. You can then exit INSTALL by selecting one of the other options.

Read Chapter 4, "Working with Novell DOS 7" if you are not an experienced DOS user. If you are an experienced computer user, refer to Chapter 8, "Commands" to learn more about this operating system.

Use SETUP to change the default settings for your system, or to enable additional Novell DOS 7 features, such as multitasking and system security. You must restart your machine so that it is running Novell DOS 7 before you can use SETUP. Refer to Chapter 9, "Configuring the System" for detailed information on how to use SETUP.

Copying the System Diskettes (DISKCOPY)

Before going any further, it is a good idea to make copies of your system diskettes. Use the DISKCOPY command to do this. Refer to Chapter 4, "Working with Novell DOS 7" for information about diskettes and commands.

You will need as many blank diskettes as you have system diskettes, and the blank diskettes must all be the same type. DISKCOPY detects whether or not the blank diskettes have been formatted, and if not, formats them before copying. You can also use the FORMAT command to format a diskette.

Type the following command at the system prompt if your machine has a hard disk, and follow the instructions given:

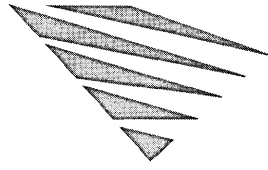
DISKCOPY A: A: <Enter>

If you have a twin-diskette drive system where both diskette drives are the same format, type the following instead:

DISKCOPY A: B: <Enter>



Remember to label the diskettes in the same way that the originals are labelled, so that if you need to use any of the copies you can find the diskette you need easily.



chapter

3

Installing Personal NetWare

Preparing to Install the Network

For an introduction to networks, see “What is a Network?” on page 1-2.

Personal NetWare™ comprises client and server software with which you can set up a peer-to-peer network, and connect to an existing NetWare® network. You can set your computer up to act as a client, or client and server. The client software allows you to connect to NetWare servers, running NetWare versions 2.x, 3.x, and 4.x, and to a Personal NetWare workgroup at the same time.

This chapter describes how to install the network software. It does not cover how to install network cabling. The section “Network Boards” gives general information about network boards; for detailed information, refer to the documentation supplied with the network board.

To install the network, you must do the following:

- ◆ Install the network board.

Each computer that is part of the network must have a network board installed. The network board enables your computer to send information to, and receive it from, other computers that are part of the network. You also need to configure the network board.

- ◆ Use a suitable cable to link the computers.

All the computers that are to be part of this network must be linked together with special cables. There are several types of cable you can use.

- ◆ Join the cable to each network board.

The cable used and the network board must be compatible. In some cases, you need to use a connector to join the cable to the socket in the network board.



If your computer is already part of a network, then cabling and the network board are already in place, and you do not need to do the above.

- ◆ Plan your network.

Decide which computers are to share resources, which computers are to use resources only, and which resources are to be shared. You might also want to ensure that usernames and resource names are consistent, and unique.

- ◆ Configure Personal NetWare.

You must first configure Personal NetWare on a computer that is to share resources. You can then configure it on other computers that are to be part of the network.

- ◆ Create accounts for network users, and create network resources.

Once the network hardware is in place, and you have installed Personal NetWare, you must create accounts for network users, so that they can use the shared resources, such as printers applications and data files. You can set up user accounts and resources for the network using the workgroup administration program, NET ADMIN.



After you have installed Personal NetWare, and loaded the network on your computer for the first time, you can use the program SETUP /FIRST to create a simple network. The program lets you create or join a workgroup, create an account with a username you specify during installation, and specify which resources to share.

Network Boards

When you install the network board, you must configure it. Configuring the network board involves assigning particular values to certain settings on the board. These settings allow the network board to communicate with your computer.

With some network boards, you must configure the board by setting switches on the board manually, before you place it in the slot inside your computer. Other boards have a software program that allows you to configure the board after you have placed it inside your computer. Refer to the documentation for the network board to see if you have to configure the board before or after attaching it to your computer.

It is important that you keep a record of the settings you use to configure the network board, because you might need to supply this information when you configure Personal NetWare.

The settings for which you assign values are:

◆ Interrupt Request Line (IRQ)

The network board uses an interrupt request line to send a signal to the computer's central processing unit (CPU). The network board must use a unique IRQ. The following table shows the IRQs that are commonly used by other devices, and the ones that are most likely to be available. If not used by COM2: and LPT2:, most network boards use IRQ3 or IRQ5.

IRQ	Used by	IRQ	Used by
0	Timer output 0	8	Real time clock
1	Keyboard	9	Available
2	EGA/VGA	10	Available
3	COM2:	11	Available
4	COM1:	12	Available
5	LPT2:	13	Co-processor
6	Diskette	14	Hard disk
7	LPT1:	15	Available



Note If you specify an interrupt for the network board that is already being used by another device, you can still install the network board, but the network software will not run successfully.

◆ Base Input/Output Port (I/O port)

The base input/output port is a channel used by the network board to transfer information to the CPU. All hardware devices must use an I/O port unique to each device. The following table shows the I/O ports and the devices that are most likely to use them. If your computer does not have one of these devices, the interrupt given for the device in the table might be available.

I/O Port	Device	I/O Port	Device
1F0	AT* disk controller	300	
200	Game controller/joystick (200-20F)	320	XT* hard disk interface
220	Novell® network keycard	340	
240		360	LPT1: (378-37F)
260	LPT2: (278-27F)	380	SLDC/Sec Bi-Sync interface (380-38C)
280	LCD display on Wyse* 2108 PC	3A0	Primary Bi-Sync interface (3A0-3A9) Monochrome display (3B0-3BB)
2A0		3C0	EGA display control (3C0-3CF) CGA display control (3D0-3DF)
2C0		3E0	COM3: (3E8-3EF) Diskette controller (3F0-3F7) COM1: (3F8-3FF)
2E0	COM4: GPIB-Adapter 0 (2E1) COM2: Data acquisition		

◆ Base Memory Address

The base memory address specifies the location in memory that the network board uses to exchange information from your computer with other computers on the network. It is also known as the RAM start address. Some network boards do not use RAM; if your network board is one of these, you do not need to specify a value for this setting.

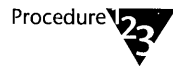
The base memory address often available for the network board is D800 (sometimes written as D8000).

Personal NetWare Initial Configuration

Before you begin configuring Personal NetWare, if you are new to networks, it is strongly recommended that you read Chapter 18, "Introduction to Personal NetWare," and Chapter 19, "Planning Your Network." Decide which computers are to share resources. The first computer on which you configure Personal NetWare must be a computer which you want to use to share resources.

To configure Personal NetWare, you must use the SETUP command. Unless you disabled the network option when you installed the operating system, INSTALL copied the network software to the directory C:\NWCLIENT, or the directory you specified. If you did disable that option when you installed the operating system, keep your installation diskettes close to hand, since SETUP may require some of the files contained on these diskettes in order to configure Personal NetWare.

When you configure the network software, your computer becomes a client for the network, or you can choose to make the computer a server as well. Use the following procedure to do both of these:



1. **Move to the NWDOS directory, and at the system prompt, type**

SETUP <Enter>



To get online help in SETUP, press <F1>.

2. **Choose the *Networking* option.**

If the network files were not copied at installation time, SETUP detects this and prompts you to insert the appropriate installation diskette.

The Network Client/Desktop Server Configuration screen displays.

3. **Select the Primary Network Interface Card.**

If your computer is already connected to a NetWare or NetWare Lite™ network, SETUP detects the type of the network board used and displays the name of the board in the Primary Network Interface Card field.

If SETUP cannot detect the type of network board used, view the list of boards available. Choose one from the list, or if your board is not included in this list, select the *OEM supplied driver* option. SETUP asks you to supply a path name for the driver.

4. Select *Share this computer's resources to allow the computer to share its resources such as disk drives and printers.*

If this is the first computer on which you are configuring Personal NetWare, you must select this option. If you do not want to share the resources of this computer, but to use resources provided by other computers, do not select this option.

5. Select *User of this computer and enter a name.*

Personal NetWare uses the name you supply to generate a name for your computer that identifies it to other computers on the network. It also uses this name to generate names for the disk drives and printers that you want to share, and to give a username to the account it creates. The maximum length for this name is ten characters.

If you are unfamiliar with networks, press <Accept the above and continue> to proceed with the configuration. You do not need to follow the remaining steps in this procedure. Read the sections "Personal NetWare Configuration Summary" on page 3-9 and "After Configuring" on page 3-10 to find out what to do next. If necessary, you can use SETUP to change the default configuration for the network, after you have finished the initial Personal NetWare configuration.

If you are familiar with networks, you can use the remaining options on this screen to change the default configuration.

6. Press <Servers to connect to> to specify the types of servers to which you want to connect your computer.

You can choose to connect to NetWare 2.x, 3.x and 4.x servers, and Personal NetWare workgroups. To save memory, select only the types of servers that are part of the network you use.

7. You can specify a preferred NetWare server, tree, or workgroup.

If you specify a preferred server, tree or workgroup, Personal NetWare attempts to connect you to these when you load the network software.

8. Select the First Network Drive.

The first network drive is the drive used as a login drive. For example, if you have A: and B: as diskette drives, and C: as the hard disk drive, you could assign D: as the first network drive.

9. Press <Accept the above and continue> to return to the main screen.

10. Press <Network Management> to configure the network management, if you use it.

If you use SNMP, select this option. The NMR Network Management module is configured to load automatically; deselect this option if you do not want to use it.

11. Press <Accept the above and continue> to save any changes you have made and return to the main screen.

12. Select <Configure Primary Interface Card> to change the configuration information for the network board.

The information in this screen varies according to the type of network board you are using. SETUP displays the information supplied by the driver for the network board which is specified in the .INS file. If the settings displayed are not the same as the ones you used when you installed the network board you must change these settings displayed in SETUP.

For example, the following fields are displayed if you have an NE2000 board.

◆ INT

This is the interrupt request line that the network board uses to send a signal to the CPU.

◆ PORT

This is the input/output port used by the network board to transfer information to the CPU.

◆ MEM

This is the base memory address that specifies the location in memory used by the network board to exchange information with other computers on the network.

◆ Optional Node Address

This is a means of identifying the board in your machine. The node address is unique to the board in your computer and is optional on Ethernet networks.

◆ Media Frame Type(s)

Information is sent across a network in packets, and the Media Frame Type tells the network drivers what type of header to use for the packets.

If you use NetWare 3.11 or earlier versions, make sure the media frame type 802.3 is specified. If you use NetWare 3.12 or later versions, make sure the media frame type 802.2 is specified.

13. Press <Accept the above and continue> to save the changes you have made and return to the main screen.

Once you have made all the configuration changes, press <Accept the above and continue> and then <Start Installation> to complete the process.



If your computer is already part of a NetWare 2.x, 3.x or 4.x network, the driver and client software already exist on your machine, but SETUP replaces them with the versions supplied with this operating system.

SETUP places a request in your AUTOEXEC.BAT file to run a file called STARTNET.BAT. When you reboot your computer, the request to run STARTNET.BAT lets you choose whether or not to load the network. If you do not load the network when you reboot, you can load it later by running STARTNET.BAT.

Read the following sections “Personal NetWare Configuration Summary” and “After Configuring” on page 3-10 to see what to do next.

Personal NetWare Configuration Summary

The following is a summary of what the SETUP program does as it configures the network.

- ◆ Establishes what network board you have in your computer.
- ◆ Sets the first network drive.
- ◆ Allows you to choose to share resources and lets you enter a name that
 - ◆ is used as a username
 - ◆ can be used as a name that identifies a computer that shares resources to other computers on the network
 - ◆ can be used as a name for certain network resources
- ◆ Prompts you to confirm the network board configuration.
- ◆ Generates the STARTNET.BAT file which loads the network drivers, and places this file in the network directory (C:\NWCLIENT by default).
- ◆ Inserts a query into your AUTOEXEC.BAT file that asks you if you want to load the network.
- ◆ Generates (or updates) the NET.CFG file and places it in the network directory. This file contains configuration information for NetWare and Personal NetWare.
- ◆ Adds the command **SETUP /FIRST** to your STARTNET.BAT file which lets you set up a basic network.

After Configuring

When the initial configuration is complete, quit SETUP and restart your computer. Answer Y to the prompt `Load Network Software` to load Personal NetWare. The **SETUP /FIRST** command in `STARTNET.BAT` runs the SETUP program so that you can

- ◆ Create or join a workgroup
- ◆ Create an account using the name you entered in the *User of this computer* option during initial configuration
- ◆ Specify which resources to share, if you are sharing resources on this computer

SETUP /FIRST displays a welcome screen which describes what the program does; choose to continue or to exit from SETUP /FIRST. If you do not use SETUP /FIRST, a user with *workgroup administrator* privileges must run the workgroup administration program, NET ADMIN, to create a workgroup, place the server in a workgroup, create accounts and specify the shared resources. The procedures for setting up the network with NET ADMIN are described in Chapter 20, "Setting Up the Network."

Note



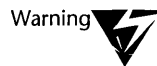
You cannot use SETUP /FIRST on a computer that does not share resources until you have run it on one that does share resources.

SETUP /FIRST prompts you to enter a name for the workgroup. If you are using the first computer on which you have configured Personal NetWare, you must specify a name for the workgroup. Press <Accept the above and continue>. The next screen lets you specify which of the available resources you want to share. The default resources to share are all the hard disk drives on the computer, and the first parallel printer port. Change these, if necessary, and then press <Accept the above and continue>.

When you create a workgroup, an account called the SUPERVISOR account is created. This account has *workgroup administrator* privileges. There is only one SUPERVISOR account in each workgroup.

When you use SETUP /FIRST on computers that share resources, and later on computers that simply use resources, you also create an account for yourself in the workgroup. This account is given a username that is the same as the name you entered in the *User of this computer* option during configuration.

To exit SETUP /FIRST, press <Save Changes and Exit>. You are then logged in to the workgroup using the account created by SETUP /FIRST. This account has the username specified during configuration, and the account has workgroup administrator privileges.



Any account that has workgroup administrator privileges must be given a password to prevent use of the account by anyone other than the proper user.

After you have configured Personal NetWare on the other computers that share resources, you can use SETUP /FIRST to

- ◆ Place them in the workgroup
- ◆ Specify which resources these computers are to share
- ◆ Create a user account using the name specified during configuration

When you use SETUP /FIRST on these computers, select the existing workgroup name instead of typing in a workgroup name. You can also use NET ADMIN to do the above.

After you have configured Personal NetWare on computers that are not going to share resources, you can use SETUP /FIRST to create an account in the workgroup for each user, using the name specified during configuration.

If you run SETUP /FIRST as described above, the following are true:

- ◆ A single workgroup has been created which has at least one server in it.
- ◆ A SUPERVISOR account for the workgroup has been created. This account has workgroup administrator privileges.

- ◆ An account is created in the workgroup, for each user, with a username that is the same as the name specified in the *User of this computer* option during configuration. All these accounts have workgroup administrator privileges. No account has a password as yet.
- ◆ The resources to share (hard disk drives and printers) have been specified.

You now have a simple network set up. You may find that this network is sufficient for your needs. If so, then refer to the sections "Managing Servers" on page 20-14, "Sharing Directories" on page 20-24, and "Sharing Printers" on page 20-32" to learn how to set these up for use.

If you want to create more accounts in the workgroup, or do not want every user to have workgroup administrator privileges, refer to "Creating and Modifying User Accounts" on page 20-6. If you are concerned about security, read Chapter 14, "Securing Information."

If your computer does not share resources, then refer to Chapter 21, "Using the Network" so you can make the best use of the resources available. It is also a good idea to set a password on your account as soon as possible; refer to the section "Changing Your Password" on page 21-35.

Upgrading from NetWare Lite

If you already use NetWare Lite, there is a program, NLMIGRAT, provided with this operating system so that you can easily move from NetWare Lite to Personal NetWare.

Using NLMIGRAT transfers the following components of your NetWare Lite network to Personal NetWare:

- ◆ The NetWare Lite server
- ◆ The user accounts
- ◆ The shared resources
- ◆ The current rights

Checklist



In order to transfer these resources, you must have

- Configured Personal NetWare and chosen to share the resources on a computer that is also a NetWare Lite server before configuring Personal NetWare on any other computer.
- Created a workgroup for the Personal NetWare server using SETUP /FIRST or NET ADMIN.
- Logged in to the workgroup using the SUPERVISOR account.

Once you have configured Personal NetWare on the first computer that shares resources and run SETUP /FIRST, there are two accounts available in the workgroup; a user account and the SUPERVISOR account. The SUPERVISOR account gives you sufficient administrative rights to transfer all the NetWare Lite resources.

To run this program, at the system prompt, type

NLMIGRAT <Enter>

The program transfers the NetWare Lite components in the following order:

- ◆ Server settings
- ◆ User names and accounts
- ◆ Resources
- ◆ Access rights for printers and directories

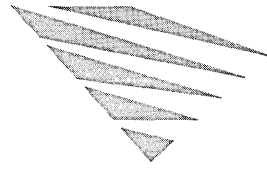
After you have transferred the NetWare Lite components to Personal NetWare, restart your computer, and load the new network.

The upgrade program cannot move the NetWare Lite user passwords because the passwords are encrypted. Once you have loaded Personal NetWare, you must reset each user password. Refer to "Creating and Modifying User Accounts" on page 20-6, to learn how to set passwords.

If all the NetWare Lite resources are not transferred, it might be because the account you used does not have the correct administrative rights. The administrative rights and the NetWare Lite resources you can transfer with those rights are shown as follows:

If your account is the	You can transfer
Server Owner	Server settings, resources (directories and printers), and access rights
Server Manager	Server settings, resources (directories and printers), and access rights
Workgroup Administrator	Workgroup audit, and user accounts

The SUPERVISOR account always has workgroup administrator privileges, and is also the server owner unless another account has been designated the server owner. Use NET ADMIN (the workgroup administration program) to change the level of administrative rights for an account. NET ADMIN is described in Chapter 20, "Setting Up the Network."



chapter

4

Working with Novell DOS 7

This chapter is your starting point for using the Novell DOS™7 operating system.

If you are already an experienced user, or you have used this operating system before, you do not need to read this chapter. Refer to the rest of this manual for more information about the operating system.

Memory

Every computer has memory to store information and to run programs. Memory stores information as patterns of 1's and 0's, called *bits*. A group of eight bits is called a *byte*. A character such as 3 or ? can be represented in one byte of memory. Because computers contain large amounts of memory, however, memory is usually referred to in terms of kilobytes (KB) and megabytes (MB); one KB is 1,024 bytes and one MB is 1,024 KB.

The memory used to run programs is referred to as *Random Access Memory*, or RAM for short.

Disks

Disks provide permanent storage of the programs you use on your computer and the data you accumulate as you use them.

There are several different types of disk you can use: hard disks, diskettes (floppy disks), and memory (or virtual) disks. The following sections give brief descriptions of these types of disk.

There is another type of disk called a removable disk. Examples of these are Syquest* and Bernoulli* drives.

Hard Disks

A hard disk is permanently fixed inside your computer. Hard disks are sometimes referred to as fixed disks.

Diskettes

Diskettes are removable from your computer. They are available in different sizes and capacities; 5.25-inch diskettes have capacities of 360 KB and 1.2 MB while 3.5-inch diskettes have capacities of 720 KB, 1.44 MB, and 2.88 MB.

Always handle diskettes with care.

Protecting Data on Diskettes

To prevent data being copied onto a diskette, or its contents being changed in any way, you can *write-protect* it.

Write-protect a 5.25-inch diskette by placing a tab (usually supplied with the diskette) over the notch in the top right-hand side of the diskette. The diskette is write-protected until the tab is removed. Some 5.25-inch diskettes do not have a notch; these diskettes are permanently write-protected.

The write-protect notch on 3.5-inch diskettes is built into the diskette. To write-protect the diskette, slide the plastic tab up so that a hole appears through the write-protect notch.

Disk Drives

You get access to a disk or diskette through a *drive*. A drive is identified by a letter followed by a colon. The first diskette drive is usually A:, the second diskette drive B:, and the hard disk drive is usually the C: drive. If there is more than one partition on the hard disk, each partition is assigned its own drive letter so that it can be accessed as a separate drive.

Disk Configurations

Computers usually have one of the following disk configurations:

- ◆ A hard disk and a single diskette drive
- ◆ A hard disk and two diskette drives

If you have a hard disk, you will perform most of your work on the hard disk.

Memory Disks

The third type of disk, a memory disk, is not a physical disk but part of your computer's memory that the operating system treats as a disk. This is why a memory disk is also referred to as a *virtual* disk. Use the Novell DOS 7 device driver VDISK.SYS to set up a memory disk; refer to Chapter 9, "Configuring the System" for information on how to do this.

A memory disk only stores data temporarily. When you switch off your computer, or reboot, any data stored in a memory disk is lost. You must use a hard disk or diskettes to store data permanently.

Preparing Disks for Use

Before you can use a hard disk, it must be formatted and partitioned. *Formatting* the disk enables it to store data. *Partitioning* the disk divides it into one or more partitions so that the operating system can store and retrieve data more easily. Also, the operating system must be installed on a primary partition.

If the hard disk manufacturer has already prepared the disk, you do not need to do it yourself. The operating system installation program detects whether your hard disk has been prepared, and gives you appropriate instructions if the hard disk is not prepared. Refer to Appendix B, "Preparing the Hard Disk" for more information.

You may also need to format diskettes before using them. Formatting divides the diskette into sections so that the operating system can store and retrieve data on the diskette. Use the `FORMAT` command to do this; refer to the “Command Reference” chapter of *DOSBook* for more information on `FORMAT`.

Commands

You use a *command* to make your computer carry out a particular task such as copying a file. Commands can act on specified files, groups of files, or entire disks. Command names are usually followed by options which modify the way the computer carries out the command.

The Novell DOS 7 command set includes four different types of command: internal, external, batch file commands, and configuration commands.

The following sections describe the different types of command and how to use them.

Internal Commands

Internal commands are the commands that are loaded into memory when you start up the operating system, because they are used most frequently. They are loaded from a file called `COMMAND.COM`, so it is easy for the operating system to execute them. You can run internal commands whenever the system prompt is displayed.

External Commands

External commands are only loaded into memory when you run them, to save space in memory. External command files have the filename extensions `.COM` and `.EXE`. When you enter an external command at the system prompt, the operating system retrieves the appropriate command file from disk and executes it. The operating system must have access to the directory which contains the external command file.

PATH is an internal command that enables the operating system to locate external commands. Refer to the “Command Reference” chapter of DOSBook for a detailed description of PATH.

Batch File Commands

A file in which you store a sequence of commands you use frequently is called a *batch* file. You can use a batch file to start an application, for example. When you enter the name of the batch file at the system prompt, the commands in the batch file are executed one after the other, as if you are entering them separately.

The operating system provides a special set of commands to use in batch files. These batch file commands are stored the same way as internal commands, except the CHOICE command. Refer to Chapter 7, “Batch Processing” for further information.

Configuration Commands

Configuration commands are used in the file CONFIG.SYS. The operating system reads the CONFIG.SYS file every time you start your computer, and executes all the commands it finds. Many CONFIG.SYS commands are added to the CONFIG.SYS file when you install the operating system or run the SETUP program, but you can also edit CONFIG.SYS yourself. Refer to Chapter 9, “Configuring the System” for more information about the configuration commands.

Entering Commands

You enter commands at the *system prompt*. Whenever you see the prompt, you know that the computer is waiting for you to enter an instruction from the keyboard. The information you enter at the prompt is referred to as the *command line*.

If the operating system is installed on a hard disk, the default system prompt appears as follows:

```
[Novell DOS] C:\>
```

This indicates that C: is the current drive. When you enter a command, the operating system always looks to the current drive.

If you have installed the operating system onto diskettes, then A:\> is shown as the current drive in the system prompt.

After typing the command line, you must always press <Enter> to make the operating system carry out the instructions.

Command names are up to eight characters in length and are usually followed by options that modify the way the operating system carries out the command. For example:

```
DIR C:\LETTERS /2
```

Command options such as C:\LETTERS are known as *parameters*. The parameter C:\LETTERS tells the DIR command which directory's files to list. Command options with a forward slash (/) are referred to as *switches*. You use a switch to select a particular version of the command. The switch /2, for example, tells DIR to display the directory listing in two columns.

Punctuation is usually required to separate command names from their associated options. In general, you include a space between the command name and the options and a space between each option. You must have a space between parameters, and between parameters and switches, but you can type several switches without using a space between them. For example:

```
DEL C:\LETTERS\MAYLET.TXT /CS
```

Sometimes, other symbols are required, such as commas and colons. The MODE command, for example, looks as follows:

```
MODE COM1:9600,N,8,1
```

The "Command Reference" chapter of DOSBook includes the complete syntax for every operating system command as well as an explanation of the syntax.

Editing the Command Line

If you make a mistake when typing a command, you see the following message when you enter the command:

```
Command or filename not recognized
```

You may have simply mistyped the instruction or directed the command to the wrong drive (see “Changing Drives” below). If you make a mistake and you have not yet pressed <Enter>, you can correct the command line by pressing the <Backspace> key which erases the command line one character at a time. You can then type the command line again.

The operating system also has a powerful feature that stores commands entered previously and lets you recall them by pressing the up and down arrow keys. You can then edit and issue them again. You may have enabled this feature when you installed the operating system by setting the HISTORY option to ON. If you did not enable HISTORY, you can enable it at any time by running the SETUP program; see Chapter 9, “Configuring the System” for detailed information about using SETUP and the HISTORY option.

The “Command Reference” chapter of DOSBook contains a complete list of the keys you can use for command line editing. See the sections “Command Line Editing” and “Extended Command Line Editing” in the “Command Reference” chapter of DOSBook, the online manual.

Changing Drives

When you enter a command, the operating system always looks for that command on the current disk drive. If you want a command to operate on another drive, you change drives by entering the new drive letter followed by a colon. For example:

A:

This changes the current drive to drive A: and the default prompt changes to:

```
[Novell DOS] A:\>
```

Any command you enter now operates on the A: drive.

You can tell the operating system to look at another drive without changing the current drive by including the drive letter (and colon) when entering the command. For example:

DIR A:

Getting Online Help for Commands

You can display help text about any command and its options by entering the command followed by */?* or */H*.

You can also use DOSBook to obtain information about the operating system. DOSBook is an online manual. To display information about a particular command, type the following at the system prompt, where *command* is the command you want information about:

DOSBOOK *command* <Enter>

Displaying a Screenful of Data at a Time

Some commands display information that fills more than one screen; text moves off the screen (*scrolls*) so that you miss the first part of the information. This will happen if you enter a DIR command and the listing is very long, for example. You can suspend scrolling in any of the following ways:

- ◆ Press the <Pause> key or <Ctrl> S. To start scrolling again, press any key.
- ◆ Some commands have a switch, */P*, that causes listings to display one screenful at a time.
- ◆ Use the MORE command. Refer to the “Command Reference” chapter of DOSBook for a description of MORE.

Stopping Commands

You can stop a command after entering it by pressing <Ctrl> C or <Ctrl><Break>. Command processing stops and you return to the system prompt.

Working with Files and Directories

Information stored permanently on a hard disk or diskette is organized into *files*. Files contain information such as programs, or the text of a letter or report.

Every file has a name to identify it and (optionally) an extension. A filename extension is separated from the filename by a period (.) and often identifies the class of the file: LETTER.TXT, for example.

Directories are a means of keeping track of your files by organizing them into groups according to contents, project names, user names, classes, and so on. Directories contain information about the files they have stored in them, including file size, time of creation, and when they were last changed. Directories can be arranged in a hierarchical structure so that they can contain other directories (*subdirectories*) as well as files. A directory can also have an extension to its name, but extensions to directory names are not used frequently.

Naming Files and Directories

Filenames and directory names can be up to eight characters in length. A file can have a filename extension of up to three characters. The valid characters to use are letters (A through Z) and numbers (0 through 9).

The following special characters are not valid:

<> = , ; : . * ? [] / \ + |

Also note that the operating system uses special names to identify peripheral devices added to your computer called “reserved device names.” You should not name your files with any of these. There are also some common filename extensions that are used for particular types of files; refer to Table 4-1.

Table 4-1
Reserved Device Names and Filename Extensions

Reserved Device Name	Reserved Filename Extension
CON	.\$\$\$
AUX or COM n	.BAK
PRN or LPT1	.BAS
LPT2	.COM
LPT3	.CPI
NUL	.EXE
CLOCK\$	.SYS

Common File Commands

There are some commands that you will use very frequently with files; refer to Table 4-2.

Table 4-2
File Commands

Command	Purpose
COPY	Copies one or more files between disks, directories, and files.
DIR	Lists the files in the current directory.
MOVE	Moves one or more files between disks and directories.
DEL, ERA, DELQ, ERAQ	Deletes one or more files. DELQ and ERAQ prompt you before deleting each file.

Table 4-2 *continued*
File Commands

Command	Purpose
TYPE	Displays the contents of a text file on the screen.
RENAME (REN)	Changes the name of one or more files.
PRINT	Sends a file to a printer if one is connected to your computer.

Note that Novell DOS 7 has extended versions of COPY, DIR, and DEL. They are XCOPY, XDIR, and XDEL. The “Command Reference” chapter of DOSBook has detailed descriptions of these and all the commonly-used file commands.

Working with Groups of Files

To make it easier for you to use commands with files, the operating system has *wildcards* and *filelists*. Using wildcards and filelists, you can make these commands operate on more than one file at a time.

Wildcards

Use wildcards to partially specify a filename or filename extension so that several files match it. There are two types of wildcard: the question mark (?) and the asterisk (*).

The ? Wildcard

The question mark (?) matches any character in exactly the same position as the question mark. The following example shows this:

CHAPTER?.DOC	matches with	CHAPTER1.DOC
		CHAPTER2.DOC

Therefore, you can use a single command to copy both of these files, by using the ? wildcard in the command line.

The * Wildcard

The asterisk (*) is “shorthand” for several question marks. The asterisk is valid from the position in which it appears to the end of the filename. The following example shows this:

CHAP*.*	matches with	CHAPTER1.DOC
		CHAPTER2.DOC
	and with	CHAPMEM.FAX
		CHAPFAX.BAK



Be careful when you use wildcards. The wildcard *.* , the *global wildcard*, includes all files. Typing DEL *.* would delete all files in a directory. If you use the global wildcard, the operating system prompts you before executing the command. If you want prompting before you delete any files, use DELQ and ERAQ.

Filelists

A filelist is a text file that contains a list of filenames. When you use a filelist at the system prompt, the filelist name is preceded by the @ (at) symbol. This tells the command that the file immediately following the @ is a filelist, and to execute on each file named in the filelist.

Create filelists as text files. There is no limit to the number of filenames you can include, and you can use wildcards within individual filenames (but not in the filelist name). Each filename must be on a separate line or separated from other filenames by a space, tab, or comma.

For example, you could create a filelist called @MYFILE.LST containing the following:

```
FRED . BAT  
BERT . BAT  
* . DAT
```

Then, when you perform an operation on @MYFILE.LST such as copying it, FRED.BAT, BERT.BAT, and all files in the current directory with extension .DAT are copied.

Directory Concepts

The following is a list of concepts that you need to understand to make the most of the operating system's directory structure:

- ◆ The root directory

When you prepare a disk or diskette and start storing files on it, a directory is created called the root directory. It is not practical to have a large number of files in the root directory so the operating system allows you to build up hierarchical directory systems, one for each disk (or drive) on your system.

- ◆ Subdirectories

Directories created from the root directory are called subdirectories. Subdirectories can also contain other subdirectories. As you add more and more directories to the structure, it begins to grow into an inverted "tree," with the root at the top and the branches growing downwards.

- ◆ The current directory

The directory in which you are working is considered the current directory by the operating system. When you carry out a task such as creating a file, the operating system assumes that you want to create the file in the current directory, unless you specify otherwise.

You can move around the directory structure from the root downwards, and up to the root again. You can also go directly to a subdirectory without going through intervening directories. Use the CHDIR (or CD) command to move around the directory structure; refer to the "Command Reference" chapter of DOSBook for a description of CHDIR (CD).

Special Directory Symbols

A directory which contains a subdirectory is known as the “parent” of the subdirectory. All directories except the root have a parent directory. The operating system uses special symbols to indicate the current directory and the parent of the current directory:

- . means the name of the current directory.
- .. means the directory above the current one (the parent directory).

These entries are automatically created by the operating system when you make a directory. When you issue a DIR command, the entries . and .. appear at the top of the listing. You cannot delete the . and .. entries in a directory.

Paths

In a tree directory structure, more than one file or directory can have the same name. For example, both the directories SALES and ACCOUNTS can contain a file called FRANCE.DOC. The operating system distinguishes between the two files called FRANCE.DOC by using a path. The path shows the operating system the route through the directory structure to the files.

Specify a path using a series of directory names, separated by backslashes (\). This traces a route through the tree structure to the desired point. When the first directory in the path is preceded by a backslash, the path begins at the root directory. Paths which begin with a directory name are taken as starting from the current directory.

When you add a filename to a path, it becomes a file specification (or *filespec*). The path in a file specification can contain up to 32 subdirectories but must not exceed 63 characters.

Working with Directories

There are five commands that are used specifically with directories. They are listed in Table 4-3.

Table 4-3
Directory Commands

Command	Purpose
TREE	Lists all the directories on a specified drive.
MKDIR (MD)	Creates a directory.
CHDIR (CD)	Changes your current directory.
RENDIR	Renames a directory.
RMDIR (RD)	Deletes an empty directory.

Refer to the “Command Reference” chapter of DOSBook for a more detailed description of all these commands.

Redirection

Redirection involves changing the way you send information to a command, or receive the result of the command. You can redirect input (what you enter at the keyboard) and output (the result of a command), which is usually sent to the screen.

Redirecting Output

To send output to a file or print device, for example, instead of the screen, use the redirection symbol >. For instance, you could store the output from a DIR command in a file by using redirection. The following command stores the current directory listing in the file MYLIST.DOC:

```
DIR > MYLIST.DOC <Enter>
```

You can also redirect the output from a command to a device, using the device name. The following command, for example, sends the current directory listing to the first parallel printer:

```
DIR > PRN <Enter>
```

Redirecting Input

You can use the redirection symbol < to make a command take its input from a file.

The following command, for example, sorts the contents of the file TELNUMS.DOC into alphabetical order:

```
SORT < TELNUMS.DOC <Enter>
```

Pipes and Filters

In order to use the output from one command as the input to another, you can use a *pipe* (the vertical bar |). The following command, for example, pipes the directory listing through the MORE command:

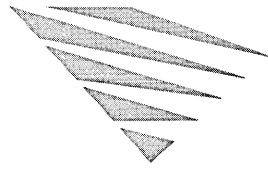
```
DIR | MORE <Enter>
```

MORE displays the listing one screenful at a time.

MORE is a special type of command, known as a *filter* command. Filter commands read input, act upon it and then output the result, often to the screen. The common filter commands are MORE, SORT, and FIND.

You can pipe commands through filter commands and combine them with redirection.

Refer to Chapter 16, "Redirecting Information" for more information on redirection.



chapter

5

Using the Online Documentation

The Novell DOS™ 7 online manual is called DOSBook. It contains detailed reference information about all aspects of the operating system, such as detailed descriptions of the Novell DOS 7 command set. This chapter explains how to start DOSBook and use the online documentation.

Note that some commands, such as DISKOPT and EDIT, have a full-screen interface that includes a Help menu; this provides detailed help text about how to use the utility, and you may find that you do not need to refer to DOSBook for these commands.

Starting DOSBook

To use a mouse in DOSBook, you need to load a suitable mouse driver first: MOUSE.COM, for example.

Start DOSBook by entering the following at the system prompt:

DOSBOOK

A Welcome screen is displayed that lists five options you can choose to find the information you need in various ways. Table 5-1 describes these options.



Note

If you have a monochrome monitor, you may need to type DOSBOOK /B to force the DOSBook display to be black and white rather than shades of gray, which can be difficult to read.

If you require information about a specific topic, you can enter the following at the system prompt:

DOSBOOK *topic*

where *topic* is the name of the subject you want to find, for example, a command name. This takes you directly to the index if a match is found, where you can select it to read the information about the topic.

Table 5-1
Welcome Screen Options

Select this option	To
Introduction	Go to the introductory chapter of DOSBook.
Configuring	Read the chapter about configuring your system.
Commands	Display a table of the DOS commands. Select a command by clicking on it with the mouse or highlight the command by using the <Tab> key and press <Enter>.
Contents	Go to the complete contents list of DOSBook.
Index	Go to the complete index listing for DOSBook.

Select one of these options by clicking on it with the mouse or, if you are using the keyboard, highlight the option by using the <Tab> key and press <Enter>. Repeat this selection procedure to select other highlighted items in DOSBook, for example, chapter titles from the contents list or items from the index.

Help on DOSBook

After you have started DOSBook, press the <F1> key for detailed help about how to use DOSBook. This help fully explains how to move around DOSBook by using either the mouse or the keyboard. It also explains the concept of keywords, and demonstrates how they work in DOSBook.

There is also a Help menu at the top of the DOSBook screen; display this menu either by selecting it with the mouse or by pressing <Alt> H. The menu enables you to access the DOSBook Glossary, Contents, and Index, and lists the short keys associated with these functions. It also lists the short keys for moving between sections of DOSBook.

Searching for Information

You can search for a topic in DOSBook by searching the index for words, or searching for a specific word in the text. To search the index in DOSBook, start typing a word that you wish to find and a search dialog box is displayed. This shows the word that you are typing in. Press <Enter> or click on the <Search> button to search the index. If a match is found, you are taken to that entry in the index where it is highlighted. To read the information about it, press <Enter> or click the mouse button. If no match is found, you are left in the index at the letter that the word started with.

To search for a particular word in the text, open the Search menu by clicking on it with the mouse or by pressing <Alt> S, and select *Search text*. A dialog box displays in which you type a word and then press <Enter>, or click on the <Search> button to search for that word.

When you search the index for a topic you can press <F3> to repeat your last search. Use this to find another entry in the index, because there may be more than one match to the word you are trying to find. You can also use <F3> to repeat your last text search.

Search Menu

Search i ndex	Enables you to search for a topic in the index. You are taken to the entry in the index if a match is found.
Search t ext	Enables you to search for a word in the text.
R epeat last search <F3>	Repeats the above searches allowing you to find another topic in the index or the next word in the text. This option is only available after you have completed a search.

Keywords

This section introduces you to the concept of *keywords*, which are central to the way that you use DOSBook.

In DOSBook, certain words or groups of words are defined as keywords, and are highlighted to distinguish them from the rest of the text. There are two types of keyword, each highlighted differently:

- ◆ Reference keywords
- ◆ Glossary keywords

The form the highlighting takes depends upon the type of monitor and upon the color configuration of your computer; refer to the DOSBook help (press <F1>) to see how they appear on your computer.

Reference Keyword

A *reference keyword* represents a link to another part of DOSBook. If you move the mouse cursor to a reference keyword and click on the keyword, you jump to a point in DOSBook where there is more information related to that keyword. If you are using the keyboard rather than the mouse, use the <Tab> key to select a reference keyword, and then press <Enter>.

To go back to the screen from which you jumped, use the mouse to select the <Backtrack> button at the bottom of the screen, or press <Alt> B.

Glossary Keyword

A *glossary keyword* enables you to display a short note that provides further information about the keyword. If you move the mouse cursor to a glossary keyword and click on the keyword, a new window is opened with a short note about the keyword. If you are using the keyboard rather than the mouse, use the <Tab> key to select a glossary keyword, then hold down the <Enter> key. The note clears from the screen when you release the mouse button or the <Enter> key.

How to Move Around DOSBook

The following tables summarize the buttons you can use to move around DOSBook.

Table 5-2 explains the function of the buttons at the bottom of the DOSBook screen. You must use the mouse to select a button; refer to Table 5-3 for the keyboard alternatives.

Table 5-2
DOSBook Buttons

Use this button	To
<Backtrack>	Jump back to the section you last viewed. (Repeated use of this button enables you to trace back through the screens you have viewed.)
<Next>	Go to the next page.
<Previous>	Go to the page that precedes the current page.
<Exit>	Exit DOSBook.

The table below lists the keys you use to move around DOSBook, and to invoke the various features provided within DOSBook.

Table 5-3
DOSBook Keyboard Commands

To do this	Use these keys
Display the DOSBook Contents.	<Alt> C
Display the DOSBook Glossary.	<Alt> G
Display the DOSBook Index.	<Alt> I
Display the information associated with the selected keyword.	<Enter>
Exit DOSBook.	<Alt> X
Go to the next page.	<Alt> N
Go to the page that precedes the current page.	<Alt> P
Jump back to the section you last viewed. (Repeated use of this button enables you to trace back through the screens you have viewed.)	<Alt> B
Jump to the start of the current section.	<Ctrl><Home>
Jump to the end of the current section.	<Ctrl><End>
Move the text cursor to the start of the current screen display.	<Home>
Move the text cursor to the end of the current screen display.	<End>
Scroll through the text.	<up-cursor> or <PgUp> <down-cursor> or <PgDn>
Select the Help menu.	<Alt> H
Select the next keyword.	<Tab>
Select the previous keyword.	<Tab><Shift>
Select the Window menu.	<Alt> W
Select the Search menu.	<Alt> S
Repeat last text search.	<F3>

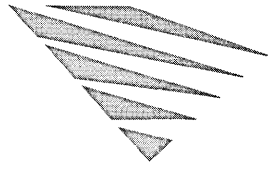
Printing from DOSBook

You can print the section of DOSBook that is currently displayed or print the whole chapter that you are in. Select the *Print section* option from the Window menu. The Print dialog gives you the option to either print to a device or specify a filename. If you enter a filename, the text is saved to that file. Instead of a filename, you can specify an output device, such as LPT2. You can then choose the <Print Section> or <Print Chapter> buttons.

Note that DOSBook outputs the text in non-PostScript* format. If you want to print on a PostScript printer, you must first run the SCRIPT command. For example, to print to a PostScript printer on LPT1, enter the following command before you run DOSBook:

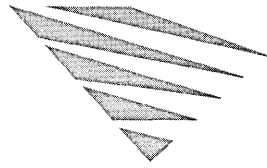
SCRIPT LPT1

SCRIPT will intercept the text that DOSBook sends to LPT1, convert it to PostScript, then pass the PostScript text onto LPT1.



U *sing Novell DOS 7*





chapter

6

Editing Text Files

This chapter describes how to use EDIT, a menu-based editor which you can use to create and edit text files. You can use a keyboard or mouse, and there are shorthand forms for some of the common commands, including WordStar* compatible commands. You can use EDIT to do the following:

- ◆ Create a new file
- ◆ Browse through a file
- ◆ Edit a file

Starting EDIT

To start the operating system editor from the system prompt, type the following:

EDIT <Enter>

The EDIT menu interface displays, showing the Select File to Edit dialog box. The current drive and directory shows in the Files field. The Files window displays a list of the files in the current directory, and the Dir and Drives window displays the subdirectories and the available drives.

EDIT has on-line help available; press <F1> to use it, or select the <Help> button.

There are three ways you can select a file to open within EDIT.

1. Type the filename, including the path if the file is in a different directory, in the File field. To open the file, press <Enter>, or use the mouse to point to the <OK> button and click to select it, or press <Tab> three times to highlight the <OK> button and press <Enter> to select it.



If the filename you enter does not exist, EDIT recognizes this and prompts you to choose whether or not to create the file. Select <OK> if you want to create the file. Select <Cancel> if you do not want to create the file. EDIT returns you to the Open File dialog box.

2. Move to the Dir and Drives window using the mouse or <Tab> key. Select a drive or directory by scrolling through the list, using the <up-cursor> and <down-cursor> keys until you reach the drive or directory you require. Note that as you scroll through the list, the entry in the File field changes to reflect which directory or drive is highlighted in the window.

Press <Shift><Tab> to move back to the Files window. Scroll through the list of files until you find the file you wish to open. Note that the filename in the File field changes as you scroll through the list. Once the correct filename appears in the File field, select <OK> using the mouse, or by pressing <Tab> twice and then <Enter>.



If you type EDIT at the system prompt followed by the path, if needed, and name of a file, EDIT opens that file directly, and does not display the Open File dialog box. If the file does not exist, EDIT prompts you to choose whether or not the file is created. Select <OK> to create it, or <Cancel> to edit a different file.

3. If the file already exists, move the mouse pointer to the filename you want in the list of files and double-click the mouse button.

Using EDIT

To enter text, type as you would using a word processor or typewriter except, when you reach the end of a line, press <Enter> to start a new line. This is because in EDIT there is no “word wrap”; it does not automatically start a new line unless you tell it to do so.

Notice that as you type, at the bottom of the screen, EDIT displays how many characters and columns you are entering, for example:

Chr=108 Col=3

This tells you the current position of the cursor. The directory path and filename are also displayed at the bottom of the screen.

There is a scroll bar at the right side of the EDIT screen. Move the mouse pointer over the scroll bar slider and drag the slider up and down to move through the file.

Inserting and Overwriting Text

EDIT has two modes for entering text: insert (*ins*) and overwrite (*ovr*). When you start EDIT, you are automatically in insert mode. The message *ins* is shown at the bottom right corner of the screen.

When you enter text in insert mode, existing text moves to the right as you type.

To switch to overwrite mode, press `<Ins>` or `<Ctrl> V`. In overwrite mode, if you position the cursor at the point where the new text is to start and begin typing, any existing text is overwritten.

To switch to insert mode again, press `<Ins>` or `<Ctrl> V` again.



Remember that if *ins* is at the bottom of the screen, you are in insert mode. If *ovr* is displayed, you are in overwrite mode.

At the top of the screen is the menu bar. To open a menu, use the mouse to point to the menu name and click on it, or press `<Alt>` and the initial letter of the menu name. To choose an option from the menu, use the mouse to point to the option and click on it, or move the highlight bar over the option using the `<up-cursor>` and `<down-cursor>` keys and press `<Enter>`. You can also type the highlighted letter from the option to select it.

You can select menu options that are followed by `<Alt><character>` by pressing the `<Alt>` key and the given character without opening the menu first.

File menu	
O pen... <Alt> O	Opens a new file.
R ead <Alt> R	Reads another file into the current file at the current cursor position.
S ave <Alt> V	Saves the current file.
D OS shell <Alt> D	Lets you access the DOS system prompt without quitting EDIT.
E xit <Alt> X	Exits EDIT.
Block menu	
S tart	Marks the start of the block at the current cursor position.
E nd	Marks the end of the block at the current cursor position.
H ide/Show	Hides/reveals the block highlight.
C opy	Copies the marked block of text.
M ove	Moves the marked block of text.
D elete 	Deletes the marked block of text.
W rite to file...	Writes the marked block of text to a file.
Search menu	
S earch for string	Searches for the specified text string.
Search a nd replace	Searches for the specified text string and replaces it with another.
R epeat last search <F3>	Performs the previous search again.

Help menu	
H elp for help	Displays help information on using EDIT online help.
C ontents	Displays the list of contents for EDIT online help.
P revious topic	Displays the last help topic read.
D OSBook	Displays DOSBook, the online manual for the operating system.
A bout...	Displays copyright information.

Moving the Cursor

You can move the cursor around your file in steps of one character, one word, or one page, or you can jump directly to the start or end of the file.

To Move the Cursor One Character

- ◆ To the right, <right-cursor> key or <Ctrl> D.
- ◆ To the left, <left-cursor> key or <Ctrl> S.
- ◆ Up one line, <up-cursor> key or <Ctrl> E.
- ◆ Down one line, <down-cursor> key or <Ctrl> X.



On some keyboards the four keys D, S, E, and X form an approximate diamond shape on your keyboard, sometimes called the “cursor-control diamond.” The position of these keys may help you to remember what they do.

To Move the Cursor One Word

- ◆ To the left, <Ctrl><left-cursor> key or <Ctrl> A.
- ◆ To the right, <Ctrl><right-cursor> key or <Ctrl> F.

The keys A and F are also part of the “cursor-control diamond.”

To Move the Cursor One Page

- ◆ To the previous page, <PgUp> or <Ctrl> R.
- ◆ To the next page, <PgDn> or <Ctrl> C.

A “page” is the number of lines displayed on your screen. When you move down a page, some of the previous page will still be displayed on the screen, to make it easier for you to find your place again.

To Move the Cursor to the Start or End of a Line

- ◆ To the beginning of a line, press <Home> or <Ctrl> QS.
- ◆ To the end of a line, press <End> or <Ctrl> QD.

To Move the Cursor to the Start or End of a File

- ◆ To the beginning of a file, press <Ctrl><Home> or <Ctrl> QR.
- ◆ To the end of a file, press <Ctrl><End> or <Ctrl> QC.

Using the Tab Key

You can use the <Tab> key to move the cursor across the page and insert text at set points. The tab stops are preset to every eighth column across the screen. You can think of the <Tab> key as meaning “add space characters until you reach the next tab stop.”

Moving Text Down a Line

If you press <Ctrl> N when editing text, the rest of the line at the cursor is taken down to the next line, while the cursor remains where it is.

Scrolling Through the Text

You can also use the scroll bar at the right hand side of the EDIT screen to move through the text. Move the mouse pointer to the scroll bar slider, click on the slider, and move the slider up or down. The text scrolls, corresponding to the movement of the slider.

Inserting a File at the Cursor

To read in a file, place the cursor where you want the file to be inserted, open the File menu and select *Read*, or press <Alt> R. You can also press <Ctrl> KR. The Select File to Read dialog box displays.

Either type in the name of the file you want to insert, or select it from the Files window, and press <OK>. The file is inserted at the cursor. The remaining text is moved down to accommodate the new text.

Deleting Text

Text can be deleted a character at a time, a word at a time or one line at a time. (You can also delete blocks of text; see “Working With Blocks of Text” on page 6-9.)

Deleting a Character

- ◆ To delete the character the cursor is on, press the <Delete> key or <Ctrl> G.

The character is deleted from the screen, and the text to the right of the cursor shifts to the left to fill the gap.

If you press <Delete> or <Ctrl> G repeatedly, characters will continue to be deleted until you reach the end of the file.

- ◆ To delete the character to the left of the cursor, press the <Backspace> key or <Ctrl> H.

The character is deleted from the screen and the text to the right of the cursor shifts to the left to fill the gap.

If you press <Backspace> or <Ctrl> H repeatedly, characters continue to be deleted until you reach the beginning of the file.

If you press <Delete> at the end of a line, you delete the invisible “newline” character and bring up the next line. Similarly, pressing <Backspace> or <Ctrl> H at the beginning of a line moves that line up to the end of the previous line.



If you want to delete more than one character, it is usually quicker to use one of the key combinations described in the following sections.

Deleting a Word

In EDIT a “word” is defined as a string of characters that starts at the current cursor position and continues up to and including the first following space.

- ◆ To delete a whole word, position the cursor at the beginning of the word to be deleted and press <Ctrl> T.
- ◆ To delete part of a word, place the cursor within the word and press <Ctrl> T. The letters at and beyond the cursor are deleted. The text to the right of the cursor shifts to the left to fill the gap.

Deleting a Line

Position the cursor anywhere in the line to be deleted and press <Ctrl> Y. The line is deleted and lines below it move up to fill the gap.



On some keyboards, the keys G, H, T and Y (for deleting characters, words and lines) are next to each other and form an approximate square. You may find this helps you to remember these commands.

Working With Blocks of Text

You can mark a section or block of text and then move, delete, copy, or store it into a separate file. A block of text can be any size (according to how much disk space you have).

Marking a Block of Text

To mark a block of text, place the cursor at the start of the section you want to mark, open the Block menu, and select the *Start* command to set the start of the block. You can also press <Ctrl> KB. The text is marked with . Move the cursor to the end of the block of text, open the Block menu, and select the *End* command. You can also press <Ctrl> KK. The end of the text block is marked with <K> and the text block is highlighted.

You can also use the mouse to mark a block of text. Move the mouse pointer to where you want the block to start and drag the mouse to where you want the block to end.

Moving a Block of Marked Text

To move a block of marked text, place the cursor where you want the block to be moved to, open the Block menu, and select the *Move* command. You can also press <Ctrl> KV. The text is erased from its original position and moved to where the cursor is. The text moves up to fill the gap.

Deleting a Block of Marked Text

To delete a block of marked text, open the Block menu, and select the *Delete* command. You can also press <Ctrl> KY or , the Delete key. The text is deleted and the text beneath it moves up to fill the gap.

Copying a Block of Marked Text

To copy a block of marked text, move the cursor to where you want the block of text copied, open the Block menu, and select *Copy*. You can also press <Ctrl> KC. The block of text is copied to the cursor position, still marked. The original text remains where it is and is no longer marked.

Storing a Block of Marked Text in a File

To store a block of marked text in a separate file, open the Block menu, and select *Write to file....* You can also press <Ctrl> KW. The Select File to Write dialog box displays.

Either enter the name of the file where the text is to be stored in the File field or select a path, if needed, and filename from the list in the Files window, and select <OK>. The file is created and the block of marked text is written to it. If the file already exists, you are asked:

File already exists, overwrite?

Select <OK> to overwrite the file, <Cancel> if you want to keep the file as it is. If you select <Cancel>, no action is taken; open the Block menu, and select *Write to file...* or press <Ctrl> KW again and enter a different filename.

Hiding the Highlight Block

Once you have set the block markers, you can switch the highlight for the block on or off. Open the Block menu and select *Hide*, or press <Ctrl> KH. The highlight block disappears. To redisplay the highlight block, use the *Show* command which replaces the *Hide* command in the Block menu, or press <Ctrl> KH again.

Note



When a block of text is hidden, you cannot copy, move or delete it.

Saving Your Work

To save changes you have made to a file, open the File menu and select *Save*, or press <Alt> V. EDIT saves the changes and updates the backup file (see “Automatic Backup Files” on page 6-14). You can then carry on editing your file. You can also press <Ctrl> KS to save changes and resume editing the file.

If you want to save your work and start work on a different file, then open the File menu and select *Open...* or press <Alt> O. The Select File to Edit dialog box displays. Either type the name of the new file, or select an existing file from the Files window.

If you have made changes to the file you were working on previously, EDIT detects this, and before opening the new file, EDIT prompts you to choose whether or not to save the current file. Select <Yes> to save it, or <No> to abandon any changes.

You can also press <Ctrl> KD to save changes to a file and start editing a new file.

To save changes and exit from EDIT, open the File menu and choose *Save* and then *Exit*, or press <Alt> V, followed by <Alt> X. You can also press <Ctrl> KX to save changes and exit EDIT directly.

Using Markers

You can insert markers that act as “bookmarks” in a text file. The maximum number of markers you can insert is 10. Once a marker is placed at a particular point in the text, a simple key combination returns you to that point in the text.

Inserting a Marker

To insert a marker in the text, move the cursor to where you want to place the marker. Press <Ctrl><F1> to set the first marker. You can also set the marker by pressing <Ctrl> K<1> where <1> is on the numeric keypad. To set subsequent markers, press <Ctrl><Fn>, or <Ctrl> K<n>, where <Fn> is the next function key up to <F10>, and <n> is the next number on the numeric keypad up to <0>.

Moving to a Preset Marker

To return to a marker already set in the text, press <Alt><Fn> where <Fn> is the function key you used to set the marker, or press <Ctrl> Q<n> where <n> is the number on the numeric keypad you used to set the marker.

Note that any markers set in a file are lost when you either quit editing that file and open a new file, or exit from EDIT.

Searching for and Replacing Strings of Text

You can search for strings of text in EDIT, and replace them with another string.

Searching for a String of Text

To search for a string of text, press <Alt> S to open the Search menu and select the *Search for string* option, or press <Ctrl> QF. The Search dialog box displays. Enter the string which you wish to find in the Search string field.

You can set the following options on a text string search:

- ◆ Ignore case

Select this option if you do not want the search to be case-sensitive.

- ◆ Match whole words only

Select this option if you want the search to locate entire words. For example, if you specify the search string "the," and do not select this option, then words like "their" and "they" are also located.

- ◆ Begin search at file start

Select this option if you want to search the entire file for the string, rather than from the current cursor position.

Press <OK> to start the search.

Searching for and Replacing a Text String

To search for a text string and replace it with another, press <Alt> S to open the Search menu and select the *Search and replace* option, or press <Ctrl> QA.

The Search and Replace dialog box displays. Enter the text string in the Search string field and the replacement text string in the Replacement string field.

The options listed previously are also available in this dialog box as well as the following:

- ◆ Replace without further dialogue

Select this option if you do not want to confirm each replacement each time the search string is found.

Repeating the Previous Search

You can repeat a search by opening the Search menu and selecting the *Repeat last search* option, or by pressing <Ctrl> L or <F3>. The most recent search is repeated with the same options set. Note that if you have set the *Begin search at file start* option, then repeating the search finds the first occurrence of the text string in the file, not the next occurrence from the cursor position.

Quitting EDIT

To quit EDIT, open the File menu and select the *Exit* command, or press <Alt> X.

If you have made changes to a file EDIT prompts you to choose whether to save the changes or not. Select <Yes> to save the changes and exit from EDIT, or <No> to abandon the changes and exit. Select <Cancel> if you do not want to exit from EDIT.

You can also press <Ctrl> KX to exit EDIT and save changes, or <Ctrl> KQ to exit and abandon changes.

Automatic Backup Files

When you open an existing file, a “working copy” of the file is stored in memory. The original file remains on your disk, unaltered.

When you save your edited file, the working copy is stored on the disk and is given the name of the original file. The old file becomes an EDIT backup file with the extension .BAK.

Example

If you open the file MYTEXT.DOC and edit it, when you save the file the following happens:

- ◆ The original file MYTEXT.DOC is renamed to MYTEXT.BAK.
- ◆ The new version is stored with the name MYTEXT.DOC.

You can use backup files to recover files: if the current version is found to be incorrect or accidentally erased, for example.

If you accidentally deleted the file MYTEXT.DOC, you could revert to the .BAK file by typing:

```
COPY MYTEXT.BAK MYTEXT.DOC <Enter>
```

To prevent any filename conflicts, EDIT does not allow you to edit files with the extension .BAK.

Before you start editing a file, make sure that there is enough free space on the disk to store both the original file with the .BAK extension, and the edited version of the file.

Technical Details

- ◆ EDIT produces ASCII files with no embedded specific control characters, so its output can be used for batch and similar files. It allows 8-bit characters to be entered and displayed.
- ◆ There is no size limit on the files you can edit, apart from that imposed by the amount of disk space you have available.
- ◆ The <Enter> key inserts two characters into the file being edited: a carriage return (ASCII code 13) and a line feed (ASCII code 10), in that order. Note that a single CR, a single LF, or a CR/LF pair is always treated as a single character when moving through the text.
- ◆ The <Tab> key inserts a character (ASCII code 09) into the file. On screen the Tab character inserts spaces from the cursor position to the next tab stop. A tab stop is preset at every eighth column across the screen.
- ◆ EDIT does not insert any special End-of-File marker, but recognizes the End-of-File marker <Ctrl> Z (ASCII code 26) used by some older editors.
- ◆ EDIT provides automatic creation of .BAK backup files. It does not allow you to edit files with a .BAK extension.
- ◆ During use, EDIT creates two temporary files. EDIT places these files in the subdirectory given in the TEMP environment variable. If you have not set this variable, EDIT places them in the same directory as the file you are editing. The files are automatically deleted when you quit EDIT.

Writing to the Screen

EDIT writes direct to the screen memory (rather than via BIOS calls) if you have an EGA or VGA display. For all other display types, EDIT writes to the screen via BIOS calls. However, you can force EDIT to write via BIOS calls regardless of the display type by invoking EDIT with the /D switch:

```
EDIT /D <Enter>
```

Command Summary

Table 6-1
Summary of EDIT Commands

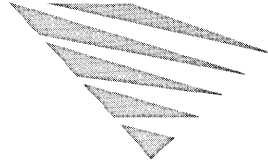
Function	Keys		
Getting Help			
Displays help text	<F1> <Alt> H	<Ctrl> J	Help
Moving the Cursor			
Start of file	<Ctrl><Home>	<Ctrl> QR	
End of file	<Ctrl><End>	<Ctrl> QC	
Start of the line	<Home>	<Ctrl> QS	
End of the line	<End>	<Ctrl> QD	
Character left	<left-cursor>	<Ctrl> S	
Word left	<Ctrl><left-cursor>	<Ctrl> A	
Character right	<right-cursor>	<Ctrl> D	
Word right	<Ctrl><right-cursor>	<Ctrl> F	
Previous line	<up-cursor>	<Ctrl> E	
Next line	<down-cursor>	<Ctrl> X	
Scroll text down one line	<Ctrl><up-cursor>	<Ctrl> W	
Scroll text up one line	<Ctrl><down-cursor>	<Ctrl> Z	
Previous page	<PgUp>	<Ctrl> R	
Next page	<PgDn>	<Ctrl> C	

Table 6-1 *continued*
Summary of EDIT Commands

Function	Keys	
Deleting Text		
Delete character		<Ctrl> G
Delete line		<Ctrl> Y
Delete character to the left	<Backspace>	<Ctrl> H
Delete word to the right		<Ctrl> T
Working with Blocks of Text		
Mark the start of a block of text		<Ctrl> KB Start
Mark the end of a block of text		<Ctrl> KK End
Move a marked block of text		<Ctrl> KV Move
Delete a marked block of text		<Ctrl> KY Delete
Copy a marked block of text		<Ctrl> KC Copy
Store a marked block of text in a file		<Ctrl> KW Write to file
Hide the block markers and highlight		<Ctrl> KH Hide/Show
Saving Files		
Save changes, exit	<Alt> V <Alt> X	<Ctrl> KX Save Exit
Save changes, edit new file	<Alt> V <Alt> O	<Ctrl> KD Save Open
Save changes, resume editing	<Alt> V	<Ctrl> KS Save
Abandon changes, edit new file	<Alt> O	<Ctrl> KQ Open

Table 6-1 *continued*
Summary of EDIT Commands

Function	Keys		
Using Markers			
To insert a marker	<Ctrl> <Fn>	<Ctrl> K<n>	
To go to a marker	<Alt> <Fn>	<Ctrl> Q<n>	
Other Commands			
Switch between insert and overwrite	<Ins>	<Ctrl> V	
Read in a file at the cursor	<Alt> R	<Ctrl> KR	Read
Insert a new line at the cursor		<Enter>	
Insert a new line after the cursor		<Ctrl> N	
Insert a control character at the cursor		<Ctrl> P	
Enter character codes directly into a file		<Ctrl> QN	
Go to the DOS shell	<Alt> D		DOS Shell
Search for a specified text string		<Ctrl> QF	Search for string
Search for and replace a specified text string		<Ctrl> QA	Search and replace
Repeat the previous search	<F3>	<Ctrl> L	Repeat last search



chapter

7

Batch Processing

When you work with the operating system, you usually enter commands at the system prompt and the system executes them. This is referred to as *interactive* processing. There is another kind of processing, however, called *batch* processing.

This chapter describes two methods of batch processing: *batch files* and *macros*.

What is a Batch File?

As you work with the operating system, you will probably find that you enter a command or a sequence of commands over and over again. You may have a set procedure each morning to load a spreadsheet program, for example, and another procedure in the evening to back up the files you created or changed during the day.

Batch processing allows you to collect all the commands you need to carry out a task into a single *batch file* so that you do not need to enter each command individually. When you enter the name of the batch file at the system prompt, each command in the file is executed as if you had entered them one at a time. Using a batch file also ensures that a procedure is carried out in exactly the same way every time.

For example, assume that you use the following commands every day to back up your files:

```
CD \LETTERS <Enter>
```

(to make LETTERS the current directory)

```
ERASE *.OLD <Enter>
```

(to erase all files with the extension .OLD)

```
MD A:\DAYSWORK <Enter>
```

(to create the directory DAYSWORK on the A: drive)

```
COPY *.DOC A:\DAYSWORK <Enter>
```

(to copy all files with the extension .DOC to A:\DAYSWORK)

You can create a batch file that contains all of these commands called DAYOVER.BAT. Then, at the end of the day, you would only need to enter the following to execute all of the commands:

```
DAYOVER
```

Creating Batch Files with EDIT

You can create batch files using EDIT or another word processor.



If you want to use a word processor other than EDIT, make sure that the completed batch file is in ASCII format. Refer to the word processor documentation for more information.

The rules for naming a batch file are the same as for any other file except that you must use the extension .BAT. Also, you must enter each command in the batch file on a separate line.

To create the batch file described in the previous section, for example, type the following at the system prompt:

```
EDIT DAYOVER.BAT <Enter>
```

Because this is a new file, you see a message asking you whether you want to create it. Press <OK> and the EDIT screen is displayed.

Type the commands you want in the batch file, as follows, pressing <Enter> at the end of each line:

```
CD \LETTERS  
ERASE *.OLD  
MD A:\DAYSWORK  
COPY *.DOC A:\DAYSWORK
```

Press <Ctrl> KX to save the file and exit EDIT.

Note



There are several other ways of saving files and quitting EDIT. Refer to Chapter 6, "Editing Text Files" for complete information.

Use this procedure to create any batch file you require.

Creating Batch Files with COPY

Instead of using EDIT or another word processor, you can use the COPY command to create batch files directly at the system prompt.

Use the following version of COPY:

COPY CON *filespec*

When you specify CON as the device, every character you enter is recorded in the destination file you specify (*filespec*), except for the line editing characters you use, such as <Enter> to start a new line or <Ctrl> H to delete the character to the left of the cursor. See the sections "Command Line Editing" and "Extended Command Line Editing" in the "Command Reference" chapter of DOSBook for a complete list of the command line editing keys.

Press <Ctrl> Z or <F6> when you have finished entering your file and close the file by pressing <Enter>.

Running Batch Files

To run a batch file, it must be located in the current directory or in one of the directories in the search path defined by PATH. Refer to the description of PATH in the "Command Reference" chapter of DOSBook for more information about search paths.

Run a batch file by entering its name in the command line; you do not need to include the extension (.BAT).

When the batch file is finished executing, the system prompt returns.

Example

Assume you created the following batch file to copy two sets of files from the current drive to the root directory of the diskette drive: all files in the directory DIRA and then all files with the extension .DAT in the directory DIRB.

```
CD \DIRA
COPY *.* A:\
CD \DIRB
COPY *.DAT A:\
CD\
```

When you run the batch file, you might see something similar to the following at the system prompt as each command in the file is executed:

```
CD \DIRA

then

COPY *.* A:\
PGM1.EXE
PGM2.EXE
PGM3.EXE
3 File(s) copied

then

CD \DIRB

then

COPY *.DAT A:\
MON.DAT
TUES.DAT
WED.DAT
THURS.DAT
FRI.DAT
5 File(s) copied
```

then

CD\

Stopping Batch Files

Press <Ctrl> C to stop a batch file while it is running. You will see the following message:

```
Halt Batch Process (Y/N)?
```

Answer Y for YES and the remaining commands in the batch file are not executed. You return to the system prompt.

Answer N for NO and the remaining commands will be processed.

Displaying Messages

By default, the commands contained in a batch file are displayed during batch file execution. To disable this feature, set the ECHO command to OFF. Enter ECHO by itself at the system prompt to see the current status of ECHO. You can also prevent the display of individual commands in a batch file by preceding the command with @. Refer to the descriptions of @ and ECHO in “Batch File Command Reference” starting on page 7-14.

ECHO can also be used to display messages during batch file execution. When you include a message preceded by ECHO in your batch file, that message displays regardless of whether the ECHO feature itself is set to ON or OFF.

For example, assume you include the following statements at the beginning of a batch file:

```
@ECHO OFF  
ECHO THIS IS MY FIRST  
ECHO BATCH FILE
```

When you run the batch file, the following message is displayed:

```
THIS IS MY FIRST  
BATCH FILE
```

Comments

When ECHO is ON, any comments or remarks that you include in a batch file are also displayed. You include comments by using the REM command; any line in a batch file that begins with REM is ignored during execution (other than being displayed when ECHO is ON).

Using Replacement Variables

By using *replacement variables* in a batch file, you can make the batch file behave differently according to the parameters you enter with the filename when you run the file. When you run the batch file, the variables are replaced by the parameters entered at the system prompt.

Replacement variables are entered as %*n*, where *n* is a number from 0 through 9. %0 represents the batch file name. %1 represents the first parameter at the system prompt, %2 represents the second parameter, %3 the third parameter, and so on.

If you want to use more than 10 parameters, you must also use the SHIFT command in your batch file. SHIFT allows you to change the position of command line parameters by shifting them one parameter position to the left. Refer to the description of SHIFT in "Batch File Command Reference" starting on page 7-14.

If you want to use the % character in a filename within a batch file, you must enter it twice. If the filename is TEST%.DAT, for example, you must enter it in the batch file as TEST%%.DAT. Generally speaking, you should *not* use the % character in filenames.

When you run the batch file at the system prompt, always separate parameters with a space and make sure that they are entered in the correct sequence.

Example

The following batch file MOVEOVER.BAT, if created in C:\AMANDA\LETTERS, copies any file from C:\AMANDA\LETTERS to C:\QUERIES\DONewith and then deletes the original:

```
COPY %1 C:\QUERIES\DONewith  
ERASE %1
```

So to run MOVEOVER.BAT to copy and delete a file called JONES.LET, you would simply type the following:

```
MOVEOVER JONES.LET <Enter>
```

The operating system would then execute the following commands:

```
COPY JONES.LET C:\QUERIES\DONewith  
ERASE JONES.LET
```

To copy and delete SMITH.LET instead, you would type the following:

```
MOVEOVER SMITH.LET <Enter>
```

Using Environment Variables

You can also use environment variables in batch files. Environment variables are similar to replacement variables except that they are not provided in the command line that runs the batch file. Some are pre-defined by the operating system, some are set by specific commands, and some are handled by the SET command. Refer to the description of SET in the "Command Reference" chapter of DOSBook for information about SET.

Table 7-1 lists the standard environment variables.

Table 7-1
Environment Variables

Variable Name	Function
APPEND	The current APPEND search path.
COMSPEC	The location on disk of the command interpreter.
NWDOSCFG	The directory containing the system configuration files.
OS	The current operating system name.
PATH	The current PATH search path.
PEXEC	Used by the PROMPT command.
PROMPT	The current system prompt.
TEMP	The directory used to hold temporary files.
VER	The current operating system version.

To use the current value of an environment variable in a batch file, enclose it in % signs.

For example, the following command changes the current system prompt:

```
PROMPT %OS% $P$G <Enter>
```


Controlling Execution of Commands

Most batch files are more than just commands and variables. You can also use various special batch file subcommands to control the flow of execution within a batch file and perform more complex tasks.

Conditional Execution

Use the IF statement to specify a condition that must be true before a command is run.

You can specify that one string must equal another, for example. Assume that you want to create a batch file called GAME.BAT to start a certain computer game when you type the following command:

```
GAME FUN <Enter>
```

You could include the following statement in GAME.BAT so that the game is started only if %1 (the first parameter in the command line) is FUN. If %1 is not FUN, the operating system skips the PLAY command and processes the next line in the batch file.

```
IF "%1" == "FUN" PLAY
```

After PLAY is finished, the next line of the batch file is processed.

Changing Execution Flow

You can also force processing of a batch file to switch to another part of the file and continue executing commands from that point. You do this by using a *label*, to identify a particular point within the file, and a GOTO command.

For example, when execution reaches the GOTO statement in the following lines, it is forced to jump back to the label START and continue processing from there.

```
:START  
TYPE INFO.TXT  
GOTO START
```

The next example shows a batch file with three GOTOs in it.

```
@ECHO OFF
REM GOTO.BAT - Example of Using GOTOs
GOTO LABEL1
REM This part is never executed
ECHO This part is never executed
:LABEL2
    ECHO The program is at LABEL2
    GOTO END
REM This part is executed first
:LABEL1
    ECHO The program is at LABEL1
    GOTO LABEL2
REM This part is executed last
:END
ECHO This is the end of the file
```

You can use GOSUB instead of GOTO when you want to force execution to a *subroutine* rather than an individual command. Statements are processed until a RETURN command is encountered.

Using IF and GOTO Together

By using GOSUB or GOTO commands together with IF statements, you can run different sections of the batch file according to different conditions.

Many external commands set a return code or “error level” when they finish. The value such a command returns can be tested using an IF ERRORLEVEL command. The following batch file, for example, tests the return code from an XCOPY operation:

```
XCOPY %1 %2
    IF ERRORLEVEL 1 GOTO FAIL
DEL %1
GOTO END
:FAIL
    ECHO Copy Failed - Not Deleting Files
:END
```

You can also specify that a certain file or condition must exist or must be true before a command is executed. The following batch file, for example, uses IF to test whether expanded memory is available before starting a calculator application called CALC:

```
IF EXIST EMMXXXX0 GOTO OK
ECHO EMS memory manager not loaded - Load EMS
ECHO driver
GOTO END
:OK
CALC
:END
```

Refer to the descriptions of IF, GOTO, and GOSUB in “Batch File Command Reference” starting on page 7-14 for more information about using these commands to control batch file execution.

Using System Information

You can use a number of “system information” values in a batch file. These values are like environment variables but in most cases you cannot set their values yourself. They are useful, however, for displaying extra information or for testing to determine the way in which the batch file executes. All the system information variables are listed in Table 7-2.

Table 7-2
System Information Variables

Variable Name	Explanation
AM_PM	a.m. or p.m.
Day	01 to 31
Day_of_Week	Monday, Tuesday, etc.
Hour	1 to 12
NDay_of_Week	1 to 7 (1=Sunday)
Month	01 to 12
Month_Name	May, June, December, etc.
Year	1983, 2016, etc.
Short_Year	83, 95, etc.
Hour24	00 to 23
Minute	00 to 59
Second	00 to 59
Greeting_Time	Morning, Afternoon, or Evening
ErrorLevel	Error return code
OS	Operating system (NWDOS)
OS_Version	Operating system version number

The following variables are only available when you have the NetWare® drivers and shell loaded:

Table 7-3
System Information Variables (NetWare)

Variable Name	Explanation
Login_Name	User's login name
P_Station	Physical station number
Station	Station number

The following statements in a batch file, for example, cause the appropriate greeting (including the greeting time and login name) to display for *any* user. Mail will only be checked, however, if the user is FRED.

```
ECHO "Good %Greeting_Time% %Login_Name%"  
IF NOT "%Login_Name%" == "FRED" GOTO NOMAIL  
ECHO "Checking Mail"  
...  
...  
:NOMAIL
```

Running a Batch File from Inside Another

If you want to run a batch file from inside another batch file, simply include the name of the second batch file inside the first. The second batch file is run when the operating system processes the line containing the name of the file. When it has finished running, you return to the system prompt. The remaining statements in the original batch file are not executed.

To run a batch file from inside another and then return to the original batch file and continue processing, you can use the CALL command in the original file.

The following batch file OUTER.BAT, for example, displays a message and then calls another batch file, INNER.BAT. When INNER.BAT is finished, execution returns to OUTER.BAT and processes the next line (which displays another message):

```
@ECHO OFF  
REM OUTER.BAT  
ECHO I am in OUTER.BAT  
CALL INNER  
ECHO I am back in OUTER.BAT
```

You can call as many batch files as you like from inside another batch file.

Refer to the description of CALL in “Batch File Command Reference” starting on this page for more information.

Batch File Command Reference

Any command you enter at the system prompt can be used in a batch file, using the same syntax as you would use when entering the command at the system prompt. Refer to the “Command Reference” chapter of DOSBook for descriptions of all these commands.

As described previously in this chapter, however, there are also special commands available for use with batch files called *batch file subcommands*. Batch file subcommands allow you to write batch files that are like simple programs. This section describes each of these commands.



Note All batch file subcommands (except CHOICE) are internal commands. CHOICE is an external command that is only used in batch files.

The conventions used in the following command descriptions are the same as those used in the “Command Reference” chapter in DOSBook; refer to this if you need an explanation of the conventions.

@

Format

@ *command*

Explanation

@ prevents the specified *command* from displaying during batch file execution.

Example

The following line in a batch file turns the ECHO feature off and ECHO OFF itself is not displayed:

```
@ECHO OFF
```

?

Format

? ["*message_string*"] *command*

Explanation

The question mark (?) at the beginning of a statement causes the operating system to prompt the user about whether the statement should be processed.

You can also specify the text of the prompt by including it between the question mark (?) and the beginning of the statement, enclosed by double quotation marks.

When you run a batch file containing a ? statement, a response to the prompt is required by the user before processing continues.

Note that the maximum length of a batch file statement (including ?) is 128 characters.

Example

The following statement in a batch file causes the system to prompt the user before deleting all the files with the extension .OLD from C:\ACCOUNTS:

```
?DEL C:\ACCOUNTS\* .OLD
```

So, when the file executes, the user sees the following:

```
DEL C:\ACCOUNTS\* .OLD (Y/N) ?
```

If the user answers Y, the DEL command is run and the files are deleted. If the user answers N, the command is ignored and the next line in the batch file is processed.

:label

Format

```
:label
```

Explanation

A *label* defines a point within a batch file that can be referenced by a GOSUB, GOTO, or SWITCH command within the same file.

Only the first eight characters in a label are recognized; any additional characters are ignored.

Labels are not displayed during batch file execution.

CALL

Format

```
CALL filespec
```

Explanation

CALL runs another batch file before the next statement in the original batch file is processed.

The search path defined by the PATH command is used to locate the second batch file.

Example

The following batch file uses two CALLs to other batch files:

```
REM This file runs BATCH2 and then BATCH3  
CALL BATCH2  
CALL BATCH3
```

CHOICE

Format

```
CHOICE [/C:choices] [/N] [/S] [/T[:]c,nn] [text]
```

Explanation

The CHOICE command is used in batch files to present the user with choices. The user selects from the displayed choices by pressing a key, and CHOICE returns an ERRORLEVEL value that reflects the key pressed. The ERRORLEVEL value can be used by other batch file commands, such as IF, to control what the batch file does next.



Note

CHOICE is an external command that is only used in batch files and is therefore described here rather than in the "Command Reference" chapter of DOSBook.

Command Switches

<code>/?</code> or <code>/H</code>	Displays help text.
<code>/C:choices</code>	Specifies the keys that the user can select from; <i>choices</i> can be any keys that can be used on a command line except <code><Space></code> , <code><Tab></code> , and <code>/</code> . By default, CHOICE displays these key choices after any prompt text specified in the CHOICE command. If <i>choices</i> are not specified, CHOICE displays <code>[Y, N] ?</code> .
<code>/N</code>	Disables the display of the choice keys and the question mark after the prompt text.
<code>/S</code>	Specifies that the choice keys are case-sensitive.
<code>/T:c,nn</code>	Specifies that CHOICE defaults to key <i>c</i> after <i>nn</i> seconds unless the user makes a selection before then. <i>c</i> must be one of the characters specified by the <code>/C</code> switch. If you do not specify the <code>/C</code> switch, <i>c</i> must be Y (for Yes) or N (for No). <i>nn</i> can be in the range 0-99 but if <i>nn</i> is 0, the <code>/T</code> switch is ignored.
<i>text</i>	Specifies the prompt text that precedes the key choices displayed to the user. The text must not include a forward slash (<code>/</code>).

CHOICE returns ERRORLEVEL 1 if the user selects the first of the key choices, ERRORLEVEL 2 if the user selects the second of the keys, and so on. If the user presses `<Ctrl> C` instead of selecting one of the keys, CHOICE returns 0.

If the user enters an invalid CHOICE command, ERRORLEVEL 255 is returned, and help text is displayed.

Examples

If you include the following command in a batch file:

```
CHOICE /C:yne Yes, No, or Exit
```

the user sees the following message when the batch file runs:

```
Yes, No, or Exit [Y,N,E]
```

CHOICE returns ERRORLEVEL 1 if the user presses Y, 2 if they press N, and 3 if they press E.

In the following example CHOICE defaults to Y, unless the user makes a selection within 10 seconds:

```
CHOICE /C:yne /T:y,10 Yes, No, or Exit
```

The next example demonstrates how CHOICE can be used in conjunction with other batch file commands. In this example, the user is given the option to select one of three utilities: DOSBook, EDIT, or SETUP.

```
@echo off  
:start  
  cls  
  echo DOSBOOK  
  echo EDIT  
  echo SETUP  
  echo -----  
  choice /c:desq Select an option or Q to quit  
  if errorlevel 4 goto end  
  if errorlevel 3 goto setup  
  if errorlevel 2 goto edit  
  if errorlevel 1 goto dbook  
:setup  
  setup  
  goto start  
:edit  
  edit  
  goto start  
:dbook  
  dosbook  
  goto start  
:end  
cls
```

Note



The IF statements in this example are true if the ERRORLEVEL value returned by CHOICE is greater than, or equal to, the ERRORLEVEL specified in the IF statement. Therefore, the IF statements are listed with the highest ERRORLEVEL first; if the order was reversed, the batch file would always jump to DOSBook.

ECHO

Format

ECHO [**ON**|**OFF**]*message*]

Explanation

ECHO enables or disables the display of commands during batch file execution when you specify ON or OFF. ECHO is ON by default. To display the current status of ECHO, enter ECHO without a parameter.



@ECHO OFF is often used at the beginning of a batch file to prevent all commands from being displayed, including ECHO OFF itself.

ECHO displays a message during batch file execution when you specify ECHO *message*. Use multiple ECHO statements to display more than one line of message text.

If you type a period immediately after ECHO in a batch file, a blank line appears when you run the batch file.

FOR

Format

FOR %%*variable* **IN** (*fileset*) **DO** *command*

Explanation

FOR executes the specified *command* for each file in a set of files. In sequence, each filename is substituted for the command.

You can use wildcards in filenames; all matching filenames on the current drive will be substituted.

Example

The following statement in a batch file types two files to the screen in turn:

```
FOR %%f IN (ACCT.BAS ACCT2.BAS) DO TYPE %%f
```

GOSUB

Format

```
GOSUB label
```

Explanation

GOSUB causes batch file execution to jump to the specified *label*, process commands until RETURN is found, and then go back to the line immediately after GOSUB and continue processing from there. You *must* use a RETURN with GOSUB.

Example

The following batch file types a text file to the screen and then runs a subroutine to type three more text files before calling a second batch file.

```
TYPE INTRO.TXT  
GOSUB LISTS  
CALL SUMMARY  
EXIT  
:LISTS  
TYPE LISTA.TXT  
TYPE LISTB.TXT  
TYPE LISTC.TXT  
RETURN
```

GOTO

Format

```
GOTO label
```

Explanation

GOTO causes batch file execution to jump to the specified *label* and continue from there.

You must include the label referenced by a GOTO. If the label is not found, you see the following error message:

```
Label xxxxxxxx not found
```

Note that only the first eight characters of a label are recognized.

Example

The following batch file displays a file called INFO.TXT over and over again until you stop the file by pressing <Ctrl> C or <Ctrl><Break>.

```
:START  
TYPE INFO.TXT  
GOTO START
```

IF

Format

```
IF [NOT] condition1 [OR [NOT] condition2] [AND [NOT] condition3] command
```

Explanation

IF specifies conditional execution of commands within a batch file. The *command* is executed when the condition is true. When the condition is not true (or true, if you specify IF NOT), *command* is ignored and the next statement in the batch file is executed.

The conditions can be any of the following:

ERRORLEVEL *n*

This condition is true when the error code produced by the previous program is greater than or equal to *n* (where *n* is a number).

```
string1 =|==|!|=|<> string2
```

This condition is true when the relationship between the specified string (*string1*) and another string (*string2*) matches the specified symbol: "identical to" (= or ==) or "not identical to" (!= or <>). Strings can be literal strings or batch variables (%hour%, for example).

```
#value1 =|==|!|=|<> #value2
```

This condition is true when the relationship between the absolute value of the specified variables matches the specified symbol.

EXIST *filespec*

This condition is true when *filespec* exists, in the specified directory or in the current directory (if no *dirpath* is specified in *filespec*).

DIREXIST *dirpath*

This condition is true when *dirpath* exists, in the specified directory or in the current directory (if no *dirpath* is specified in *dirpath*).

Examples

The following batch file uses several IF statements to test the ERRORLEVEL from an XCOPY operation:

```
REM XCOPY and DEL with ERRORLEVEL Testing
XCOPY %1 %2
IF ERRORLEVEL 5 GOTO FAIL5
IF ERRORLEVEL 4 GOTO FAIL4
IF ERRORLEVEL 3 GOTO FAIL2
IF ERRORLEVEL 2 GOTO FAIL1
DEL %1
GOTO END
:FAIL1
    ECHO Files %1 not found - not deleting files
    GOTO END
:FAIL2
    ECHO Aborted - not deleting files
    GOTO END
:FAIL4
    ECHO Could not start XCOPY - not deleting
        files
    GOTO END
:FAIL5
    ECHO Disk write failure - not deleting files
:END
```

The following IF statement specifies that WHERE IS JOHN? displays only if JOHN is *not* the current value of the %1 parameter. Note that the strings are enclosed by quotation marks; you should always use quotation marks around strings to prevent syntax errors, especially when no parameters are specified:

```
IF "%1" <> "JOHN" ECHO WHERE IS JOHN?
```


The IF statement in the following set of statements means that the commands between DIR B: and the label XYZ will only be executed if MYFILE does not exist in the current directory:

```
IF EXIST MYFILE GOTO XYZ
DIR B:
.
.
:XYZ
.
.
```

PAUSE

Format

```
PAUSE [remark]
```

Explanation

PAUSE delays batch file processing so that an action can be performed, such as changing diskettes.

PAUSE always displays the following message:

```
Strike a key when ready . . .
```

You can specify an additional *remark* of up to 122 characters; this is optional, however.

Example

The following batch file includes a PAUSE command with a remark specified:

```
COPY A:*. * B:  
@ECHO OFF  
PAUSE Insert new disk in DRIVE A:  
COPY A:*. * B:
```

When this batch file runs, the files on the diskette in the A: drive are copied to the diskette in the B: drive. Processing is then suspended and the following message appears on the screen:

```
Insert new disk in DRIVE A:  
Strike a key when ready . . .
```

You can either insert a new diskette and press any key to continue or press <Ctrl> C to stop batch file processing.

REM

Format

```
REM | ; [remark]
```

Explanation

REM or a semi-colon (;) causes the operating system to treat a statement as a comment or *remark*. Any line in a batch file preceded by REM or a semi-colon is not processed.



If ECHO is ON, REM lines will be displayed on the screen as the batch file executes.

The maximum length of *remark* is 123 characters. You can use commas, spaces, and tabs to separate words. Empty comment lines (REM with no *remark*) are useful for adding space to a batch file, making it easier to read and edit.

RETURN

Format

RETURN

Explanation

RETURN causes batch file execution to return to sequential processing of commands after a GOSUB or SWITCH statement.

SHIFT

Format

SHIFT

Explanation

SHIFT allows you to access more than nine command line parameters (%1 to %9) by shifting their position to the left.

When SHIFT is executed, the value in %0 is replaced by the value in %1, %1 is replaced by %2, %2 by %3, and so on up to %8, which is replaced by the value of %9.

Use SHIFT as many times as you need to get all of the parameters in the command line, up to a maximum of 10 at a time. Think of the batch parameters as a “window”; SHIFT simply moves the window one position to the right.

Example

SHIFT is most useful when you are using a batch file to perform a single operation many times and using a varying number of command line parameters.

The batch file COPYX, for example, is designed to copy a number of files to a single destination directory; you would enter the following to run COPYX:

```
COPYX filename1 filename2 filename3... dirpath
```

COPYX.BAT would be written as follows:

```
@ECHO OFF  
IF "%1" == "/" GOTO HELP  
REM COPYX requires at least 2 parameters if  
REM the first parameter is not /?  
IF "%2" == "" GOTO FAIL  
SET COPYX_FILE =  
:LOOP  
    REM If the second parameter is empty, the  
    REM first parameter must be the destination  
    IF "%2" == "" GOTO NO_MORE_FILES  
    REM Otherwise, add the first parameter to the  
    REM list of files to copy  
    SET COPYX_FILE = %COPYX_FILE% %1  
    REM Now SHIFT the parameters so that %1 is  
    REM replaced by %2, etc.  
    SHIFT  
    REM Go back to look at the rest of the  
    REM parameters  
    GOTO LOOP  
:NO_MORE_FILES  
    REM The first parameter now contains the  
    REM destination  
    REM COPYX_FILE contains the list of files to  
    REM copy  
    FOR %%i IN (%COPYX_FILE%) DO XCOPY %%i %1
```

```

GOTO END
:FAIL
ECHO COPYX: At least 2 parameters are
required
GOTO END
:HELP
ECHO COPYX: Multiple file copy program
ECHO Enter: COPYX filename1 filename2...
dirpath
GOTO END
:END
SET COPYX_FILE =

```

SWITCH

Format

```
SWITCH label1, label2[, label3... label9]
```

Explanation

SWITCH causes batch file processing to switch between several different subroutines within the same batch file, depending on the information (*label*) provided by the user. SWITCH also causes the batch file to prompt the user for this information. In effect, SWITCH creates a simple menu interface.

When the label is entered, execution jumps to that label in the batch file and returns to the line following SWITCH when a RETURN command is encountered.

The maximum number of labels you can use in a SWITCH command is nine.

Example

The following batch file defines a SWITCH routine for selecting an application from a list of applications:

```
@ECHO OFF
:BEGIN
CLS
ECHO          APPLICATIONS MENU
ECHO          =====
ECHO 1        Word Processor
ECHO 2        Desktop Publisher
ECHO 3        Database
ECHO 4        Exit
ECHO Choose a number from 1 to 4
SWITCH WP, VP, DB, EX
GOTO BEGIN
:WP
EDIT
RETURN
:VP
CALL VPPROF
RETURN
:DB
CD \DATABASE
DB
RETURN
:EX
```

What are Macros?

A macro is similar to a batch file; it consists of a number of commands that you execute by entering a single name at the system prompt. The main difference between batch files and macros is that macros are stored in RAM rather than on disk and can be run from any directory. This means that they run faster than batch files. Macros use memory that would normally be used by command line HISTORY information, however. Also, macros are lost when you reboot your computer.

The following sections in this chapter, about using macros, describe further differences between batch files and macros.

Creating Macros Using DOSKEY

The operating system provides the DOSKEY command to work with macros.

To create a macro, simply type the DOSKEY command at the system prompt as follows:

```
DOSKEY macroname = commands <Enter>
```

The number of commands you can put in a macro is limited by the length of a single line (127 characters); all the commands in a macro must be on the same line.

Separate each command with \$T (or \$t). The following command line, for example, defines a macro that lists all the .TXT files in the current directory in order of size before copying them to the root directory of the A: drive:

```
DOSKEY CPYTXT = XDIR *.TXT /Z $t COPY *.TXT A:\
```

Besides \$t, there are other special characters you can use in a macro. They are listed in the following table.

Special Character	Meaning
\$L (or \$l)	Equivalent to the less-than sign (<).
\$G (or \$g)	Equivalent to the greater-than sign (>).
\$G\$G (or \$g\$g)	Equivalent to the double greater-than sign (>>).
\$B (or \$b)	Equivalent to the piping symbol (|).

Note the following restrictions about what you can use in macros:

- ◆ You cannot use GOTO commands in macros or start a macro from inside another macro. You can run a batch file from inside a macro, however.
- ◆ Replacement variables are \$1 through \$9 in macros instead of %1 through %9 as in batch files.
- ◆ You can define an environment variable in a macro using SET but you cannot use any environment variables in the macro itself.

Editing Macros

You edit a macro by editing the command line you entered to create it. Use the command line HISTORY feature to recall the command line, edit it, and then re-enter it.

Running and Stopping Macros

To run a macro, enter its name at the system prompt, followed by any parameters required. Make sure you leave a space between the macro name and the parameters.

To stop a macro, press <Ctrl> C. This stops the command that is currently executing. Press <Ctrl> C as many times as necessary to stop every command in the macro.

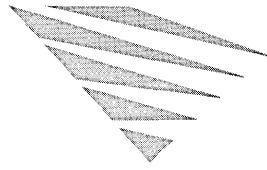
Saving Macros in Batch Files

The best way of saving your macros is to put the commands into a single batch file and then run the batch file whenever you want to make the macros available.

To save macros this way, use the DOSKEY command with the */macros* option and a redirection symbol. The following command, for example, stores *all* the macros currently stored in memory in a batch file called MACROS.BAT:

```
DOSKEY /MACROS >MACROS.BAT
```

Saving macros in batch files also means you can edit them in the future.



chapter **8** *Commands*

This chapter summarizes the operating system commands. It also lists keys you can use to edit the command line.

Command Summary

Table 8-1 lists the commands that you can enter from the command line. The commands are grouped under the following categories:

- Date and Time
- Directories
- Disk Compression
- Disk Management
- Files
- Input/Output
- International Language Support
- Memory Management
- Networking
- Online Help
- Operating System
- Printing Files
- Program Control
- Recovering Files
- Screen Display
- Security

Refer to the “Command Reference” chapter of DOSBook for the syntax of a particular command and for an explanation of how to use that command. For the syntax and explanation of any NET command (to work with the network), refer to the “NET Commands” chapter of DOSBook. Chapter 5, “Using the Online Documentation,” in this manual explains how to access information in DOSBook. You can also display help text for any command by entering the command followed by `/?` or `/H`.

For an alphabetical listing of the operating system commands, refer to the “Command Reference” chapter of DOSBook.



Note

In this manual, batch file subcommands are summarized in Chapter 7, "Batch Processing," and CONFIG.SYS commands are summarized in Chapter 9, "Configuring the System." Chapter 10, "Managing Memory," has information about the configuration commands that help you manage memory. For detailed descriptions of all batch file, CONFIG.SYS, and memory management commands, however, refer to DOSBook.

Table 8-1
Operating System Commands

To do this:	Use this command:
Date and Time	
Display and change the current date	DATE
Display and change the current time	TIME
Change the time and date stamp for files	TOUCH
Directories	
Assign a different drive letter to a drive or directory	ASSIGN
Attach a directory structure to an empty subdirectory on another drive	JOIN
Back up or restore directories	FBX
Display the current directory path or change the current directory	CHDIR or CD
Copy an empty subdirectory structure	XCOPY
Create a new directory	MKDIR or MD
Delete an empty directory	RMDIR or RD
Delete a group of subdirectories and files	XDEL
Display a directory structure	TREE
List the files in a directory	DIR XDIR (more options)
Move a directory	MOVE
Rename a directory	RENDIR
Replace a subdirectory path with a drive letter	SUBST

Table 8-1 *continued***Operating System Commands**

To do this:	Use this command:
Disk Compression	
Create an empty Stacker* drive using available disk space	CREATE
Decompress the data on a Stacker drive	UNSTACK
Display the status of Stacker drives	STACKER
Mount or unmount a Stacker drive	STACKER
Preview drive compression	PREVIEW
Disk Management	
Back up or restore disk contents	FBX
Compare the contents of entire diskettes	DISKCOMP
Copy an entire diskette	DISKCOPY
Display the volume label of a disk drive	VOL
Create, modify, or delete a disk volume label	LABEL
Improve the performance of the hard disk	DISKOPT NWCACHE
Format a diskette or hard disk	FORMAT
Partition and format a hard disk	FDISK
Unformat a diskette	UNFORMAT
Verify the integrity of data on a disk, and make corrections	CHKDSK
Files	
Display or change the password protection level	PASSWORD
Back up or restore files	FBX
Check that data has been written correctly to disk	VERIFY

Table 8-1 *continued***Operating System Commands**

To do this:	Use this command:
Compare two files	COMP FC
Convert .EXE files to .BIN or .COM files	EXE2BIN
Copy or combine files	COPY REPLACE XCOPY (more options)
Delete "pending delete" files	DELPURGE
Change file attributes	ATTRIB
Display the contents of a text file on screen	TYPE
Edit a text file	EDIT
Erase a file (no automatic query for confirmation)	DEL ERASE or ERA XDEL (more options)
Erase a file (automatic query for confirmation)	DELQ ERAQ
Show a directory structure (to locate a file)	TREE
Find a string of characters in a text file	FIND
Move a file	MOVE
Print a file	See Printing Files
Rename a file	RENAME or REN
Recover a file	See Recovering Files
Change the time and date stamp for files	TOUCH
Set a search path for commands or batch files	PATH APPEND
Transfer files between two computers	FILELINK

Table 8-1 *continued*
Operating System Commands

To do this:	Use this command:
Input/Output	
Redirect input and output	CTTY Filter symbol | Redirection symbols >, < and >>
Sort input alphabetically, and write it to an output device	SORT
International Language Support	
Change the active code page for national language support	NLSFUNC CHCP
Display international characters on a CGA monitor	GRAFTABL
Load the appropriate keyboard for the country	KEYB
Select the time and date format, currency symbol, and code page	COUNTRY
Prepare, select, or display a code page	MODE
Memory Management	
Load a program into upper memory	HILOAD/LOADHIGH
Display information about current memory usage	MEM
Disable selected memory features	MEMMAX
Enable or disable the EMM386 memory manager	EMM386
Networking	
Perform network tasks using the NET utility	NET
Use the network administration utility	NET ADMIN
List network users and send messages to them	NET CONSOLE
Use the network diagnostics utility	NET DIAGS
Perform network tasks using the command line	NET commands

Table 8-1 *continued*

Operating System Commands

To do this:	Use this command:
Play the arcade-style network game	NETWARS
Online Help	
Open DOSBook, the online manual.	DOSBOOK HELP
Operating System	
Change system configuration settings	SETUP
Display the version number of the current operating system	VER
Load another copy of COMMAND.COM	COMMAND
Lock your computer temporarily	LOCK
Modify the system prompt	PROMPT
Transfer operating system files and COMMAND.COM to a specified drive	SYS
Printing Files	
Assign and set up a printer	MODE
Print a graphical display by using the <PrtScr> key	GRAPHICS
Print a text file	PRINT COPY
Print a text file to a PostScript* printer	SCRIPT
Program Control	
Create a macro	DOSKEY
Debug a program	DEBUG
Define variable strings in the command processor environment	SET
Enable the sharing of files and data	SHARE

Table 8-1 *continued*
Operating System Commands

To do this:	Use this command:
Enable or disable the stopping of programs with <Ctrl><Break>	BREAK
Load a program during startup	INSTALL
Load and configure the Task Manager	TASKMGR
Terminates a batch file or secondary command processor	EXIT
Recovering Files	
Delete "pending delete" files	DELPURGE
Recover backups	FBX
Recovers lost data from a damaged disk	RECOVER
Recover deleted files	UNDELETE
Save deleted files on disk	DELWATCH
Save the File Allocation Table on disk	DISKMAP
Screen Display	
Change the display mode	MODE
Clear the screen	CLS
Display text on the console a screenful at a time	MORE
Modify the cursor for laptop computers	CURSOR
Modify the system prompt	PROMPT
Security	
Display or change the password protection level for files	PASSWORD
Lock your computer temporarily	LOCK
Scan drives and directories for software viruses	SDSCAN SDRES
Disable security if you cannot access the hard disk	UNSECURE

Command Line Editing

To save you effort when typing commands, the operating system provides command-line editing features. The commands you issue can be stored in memory so that you do not need to re-type a recently-issued command if you make a typing error; you can simply redisplay the command as you first entered it, edit it, and then re-issue it.

The following table lists the command-line editing keys. Refer to the "Command Reference" chapter of DOSBook for a detailed example of how to edit a command line.

Table 8-2
Command Line Editing Keys

Key	Function
<Esc>	Cancels the command line and leaves the original stored command line unchanged.
<Backspace>	Deletes the previous character in the stored command line.
	Deletes the currently highlighted character from the stored command line.
<Ins>	Allows you to insert characters into the stored command line. Any characters you insert are displayed on screen. Switch insert mode off by pressing <Ins> again.
<F1>	Copies and displays one character from the stored command line.
<F2>	Copies all characters up to the specified character from the stored command line (<F2> must be followed by a character).
<F3>	Copies all the remaining characters from the stored command line to the screen.
<F4>	Deletes all characters up to the specified character from the stored command line (<F4> must be followed by a character).
<F5>	Copies the current command line (as edited) to the stored command line; the line is not edited as a command and you can edit it further if you want.
<F6>	Specifies the End-Of-File marker (<Ctrl> Z). If you create a file using the COPY command, for example, press <F6> when you finish entering the text to mark the end of the file.

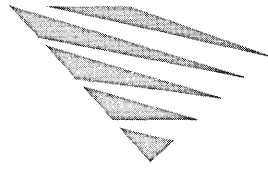
Table 8-2 *continued*

Command Line Editing Keys

Key	Function
<F9>/<F10>	Clears the stored command line.

Extended Command Line Editing

The operating system offers additional command line editing keys, with more advanced functions than those described above. These extended editing keys are described in the “Command Reference” chapter of DOSBook.



chapter

9

Configuring the System

To improve the efficiency of your operating system, and maximize the performance of your programs, you can adjust the way in which the system is configured.

The operating system configuration is defined by the CONFIG.SYS and AUTOEXEC.BAT files, both of which are executed every time you boot the system. This chapter describes these files.

The SETUP program provides a quick and easy way of changing the system configuration at any time after it has been installed. SETUP presents you with a set of menus from which you choose the appropriate options. When you exit SETUP, it automatically makes the necessary changes to CONFIG.SYS and AUTOEXEC.BAT. These changes will take effect the next time you reboot the system. This chapter describes what you can do in SETUP and how to use it.

For some advanced configuration changes, you may need to edit the configuration files directly using EDIT or another text editor. This chapter includes complete descriptions of all the special commands you can use in CONFIG.SYS.



There are three CONFIG.SYS commands (DOS, HIDEVICE/DEVICEHIGH, and HIINSTALL/INSTALLHIGH) that are used for optimizing the way in which the system uses memory. These commands are also described in Chapter 10, "Managing Memory."

Using SETUP to Configure the System

The SETUP program allows you to make most of the changes to the system configuration that you may need without editing the configuration files yourself. Use SETUP to configure any of the following system features:

DOS System & Memory Management

- 386* or 80286 memory manager (EMM386 or HIMEM), DPMS, location of DOS software in memory
- Country and keyboard
- DOS parameters (system PATH, environment parameters, keyboard HISTORY, disk parameters, PROMPT command, directories for temporary and initialization files)
- Optional DOS device drivers and utilities (ANSI.SYS, GRAFTABL, FASTOPEN, SHARE, code page switching)
- Global color set

Disk Compression

- Creating and reconfiguring Stacker* drives

Disk Performance

- VDISK.SYS
- NWCACHE disk cache

Data Protection & Security

- DELWATCH
- DISKMAP
- Anti-virus software
- DOS screen saver/system lock
- Enabling or disabling system security

Task Management

- Task Manager (multitasking or task switching)

Networking

- Interface card
- Personal NetWare server software
- Network management
- Server connections

Starting SETUP

Start SETUP by making NWDOS the current directory, and typing the following command at the system prompt:

SETUP <Enter>

The first menu you see lists the features of the operating system for which you can choose to set options: *DOS System and Memory Management, Disk Compression, Disk Performance, Data Protection and Security, Task Management, and Networking*. Select the area you want to configure and you will see a series of menus relating to that area of the operating system. When you finish changing values and exit SETUP, the appropriate commands are automatically placed in your CONFIG.SYS and AUTOEXEC.BAT files. The next time you boot the system, it is configured with the new settings.

Getting Help in SETUP

SETUP has extensive online help which is “context-sensitive”; simply press the <F1> key when an option is highlighted or when your cursor is on a field for which you want to view help information.

Leaving SETUP

You can leave SETUP at any time and return to the operating system by pressing <Alt> X and choosing to exit to DOS. Your existing system configuration is not affected and you can go back into SETUP at any time to change values. Configuration values will not actually change until you reboot the system.

SETUP Advise Mode

To see a summary of your current system configuration which includes current memory managers, available memory, last physical drive, and (if applicable) recommendations to improve the efficiency of the system, enter the following command:

SETUP /A

By default, this information is also displayed whenever you start the operating system.

Configuring the System by Editing the Configuration Files

It is always easier and safer to use SETUP to make changes to the system configuration. Occasionally, however, you may want to make a change that can only be made by editing the configuration files yourself. Loading a CD-ROM driver, for example, can only be accomplished by manual editing of CONFIG.SYS.

You can use any system command in the AUTOEXEC.BAT file. Refer to the “Command Reference” chapter of DOSBook for information about the syntax and function of each system command.



The HILOAD/LOADHIGH and MEMMAX commands, which are used to manage memory, are also described in Chapter 10, “Managing Memory.”

In the CONFIG.SYS file, you can use any of the CONFIG.SYS commands. For information about the syntax and function of each CONFIG.SYS command, refer to “CONFIG.SYS Command Reference” starting on page 9-9.



Three CONFIG.SYS commands are used to optimize the way in which the system uses memory. These commands (DOS, HIDEVICE/DEVICEHIGH, and HIINSTALL/INSTALLHIGH) are also described in Chapter 10, “Managing Memory.”

CONFIG.SYS

When you install the operating system, a CONFIG.SYS file is built for you automatically and stored in the root directory of the disk from which you start the operating system.

The information specified in the CONFIG.SYS file depends on the values you choose during the INSTALL program. Whenever you want to change these values, run SETUP and choose options appropriately.

To view your current CONFIG.SYS file, type the following at the system prompt:

```
TYPE CONFIG.SYS <Enter>
```

You will see something similar to the following:

```
SHELL = C:\COMMAND.COM /P /E:1024  
DEVICE = C:\NWDOS\EMM386.EXE  
BREAK = ON  
BUFFERS = 20  
FILES = 20  
FCBS = 4, 4  
FASTOPEN = 512  
LASTDRIVE = E  
HISTORY = ON, 256, OFF, OFF, OFF  
COUNTRY = 001, ,C:\NWDOS\COUNTRY.SYS
```

All of the commands included in this example are explained in "CONFIG.SYS Command Reference" starting on page 9-9.

You can also view the CONFIG.SYS file in SETUP by choosing the option to view CONFIG.SYS at the end of the SETUP program, if you have made changes.

AUTOEXEC.BAT

The AUTOEXEC.BAT file is a batch file that is run every time you start the operating system to configure it appropriately. When you install the operating system, an AUTOEXEC.BAT file is automatically built for you and stored in the root directory of the disk from which you load the operating system. The file must always be stored on this disk, which is usually your hard disk.

To view your current AUTOEXEC.BAT file, type the following at the system prompt:

```
TYPE AUTOEXEC.BAT <Enter>
```

When you make changes to the system configuration using SETUP, the commands included in AUTOEXEC.BAT may change accordingly. You can view AUTOEXEC.BAT during SETUP by choosing the option to view AUTOEXEC.BAT at the end of the SETUP program, if you have made changes.

Any command that you want to run automatically whenever the system boots can be used in AUTOEXEC.BAT. Refer to the "Command Reference" chapter of DOSBook, where all of the system commands that you may want to add to AUTOEXEC.BAT (or that you will find already included in the file after installation or SETUP) are described in detail.

The following commands are particularly useful in the AUTOEXEC.BAT file:

Table 9-1
AUTOEXEC.BAT Commands

Command	Description
KEYB	KEYB tells the operating system what kind of keyboard you are using. If you have a national keyboard (that is, one different from the standard keyboard used in the USA), you must run the KEYB command each time you start the operating system, to ensure that the characters you type are the same as those displayed on the screen.
PATH and APPEND	<p>PATH tells the operating system where to look for command, program, and batch files.</p> <p>APPEND tells the operating system where to look for any other type of file, such as a data file.</p> <p>Placing PATH and APPEND commands in AUTOEXEC.BAT automatically tailors the system search path to your own directory hierarchy, every time you start the operating system.</p>
SET	SET inserts strings of information into the command processor's master environment. These strings are then available to all programs and applications that you run.
TIME and DATE	<p>TIME and DATE set the system time and date. You need to use TIME and DATE if your computer does not have a battery-powered clock. TIME and DATE prompt you to type in the correct time and date, and then set the system clock for you.</p> <p>Placing TIME and DATE commands in AUTOEXEC.BAT means that you are prompted to set the system clock every time you start the operating system.</p> <p>If you do have a battery-powered clock, the operating system reads it automatically at startup, unless you use TIME or DATE in AUTOEXEC.BAT.</p>
PROMPT	PROMPT changes the default system prompt. For example, you could change it to show the current directory. You can change the prompt at any time, but placing the PROMPT command in AUTOEXEC.BAT (via SETUP) saves you having to define the prompt every time you start the operating system.

Starting Applications in AUTOEXEC.BAT

You can start your favorite software applications automatically by loading them from your AUTOEXEC.BAT file.

For example, assume you have a word processor called WundaWord that is started by typing WW from a directory called \WUNDAWRD. Normally, you would need to type both the following commands:

```
CHDIR \WUNDAWRD <Enter>
```

```
WW <Enter>
```

Edit AUTOEXEC.BAT to add both commands, to load WundaWord automatically every time you start your computer.

Bypassing the Configuration Files

If you want to perform a “clean boot” of your computer by bypassing the CONFIG.SYS and AUTOEXEC.BAT files during startup, press and release <F5> (once only) after the computer finishes its internal tests. This is usually indicated by a beep. The computer will then start with a basic (“clean”) configuration instead of its usual configuration.

Confirming Each Configuration Command

If you want the system to prompt you to confirm each CONFIG.SYS and AUTOEXEC.BAT command during startup, press and release <F8> (once only) after the computer finishes its internal tests. This is usually indicated by a beep. The commands in CONFIG.SYS and AUTOEXEC.BAT are displayed one at a time followed by a prompt; answer Y to execute the command or N to bypass it.

CONFIG.SYS Command Reference

The commands explained in this section can all be used in your CONFIG.SYS file. Remember, however, that it is always easier to let SETUP update CONFIG.SYS automatically rather than to edit the file yourself.

Each command is described in the same way as the internal and external commands are described in the “Command Reference” chapter of DOSBook. Refer to the section called “Command Syntax” for an explanation.



Note Three CONFIG.SYS commands (DOS, HIDEVICE/DEVICEHIGH, and HIINSTALL/INSTALLHIGH) are also described in Chapter 10, “Managing Memory,” because they are used to optimize the way in which the system uses memory.

?

Format

`? [“message_string”] command`

Explanation

When you use ? at the beginning of a statement, the operating system prompts you about whether or not you want the statement executed.

Use ? with DEVICE statements, for example, so that you can choose whether or not to install specific device drivers when you start the operating system. Similarly, use ? in CHAIN statements to choose whether or not to transfer control to a different configuration file.

You can also specify text for the prompt by including a message string between ? and the statement, enclosed by double quotation marks.

A response to the prompt specified by ? is required before you can proceed, unless you set a limit on the amount of time allowed for a response. The statement is then ignored if no response is received. Use the TIMEOUT command to set a time limit for a response; see TIMEOUT.

Note that the maximum length allowed for a command statement, including ? and a message string, is 128 characters. Any statement longer than this will be ignored.

Examples

The following statement means that you will be asked whether or not you want ANSI.SYS loaded (before it loads):

```
?DEVICE = C:\NWDOS\ANSI.SYS
```

So whenever you start the operating system and CONFIG.SYS is executed, you see the following:

```
DEVICE = C:\NWDOS\ANSI.SYS (Y/N) ?
```

If you type Y, ANSI.SYS loads. If you type N, the statement is ignored.

The next statement specifies a message to display when prompting.

```
? "Do you want ANSI.SYS?" DEVICE = C:\NWDOS\ANSI.SYS
```

This statement causes the following to display whenever you boot the operating system:

```
Do you want ANSI.SYS?
```

Answer Y to load ANSI.SYS or N to ignore the statement.

:label

Format

```
:label
```

Explanation

Use **:label** to define a location (*label*) that a GOSUB, GOTO, or SWITCH command can reference; refer to the descriptions of GOSUB, GOTO and SWITCH in this chapter.

Only the first eight characters after the colon are recognized as the label by GOSUB, GOTO, and SWITCH.

Example

The following sequence of statements includes a label (MEMDISK) that is referenced by a GOTO command:

```
? "Do you want a memory disk? (Y/N)" GOTO MEMDISK  
.  
.  
:MEMDISK  
DEVICE=VDISK.SYS
```

BREAK

Format

```
BREAK = ON|OFF
```

Explanation

The value of BREAK determines whether or not you can stop a program while it is running by pressing <Ctrl><Break> or <Ctrl> C.

Set BREAK to ON when you want to be able to do this; the operating system also looks for <Ctrl><Break> or <Ctrl> C when the program is reading to or writing from a disk.

Set BREAK to OFF to disable it; <Ctrl><Break> or <Ctrl> C will only stop the program the next time it reads from the keyboard, writes to the screen, or writes to a printer.

BREAK allows you to stop programs quickly: programs, for example, that do not use standard input and output operations very often, such as programs that perform lengthy calculations before printing the final output.

A BREAK command is overruled if you enter a BREAK command at the command line; refer to the "Command Reference" chapter of DOSBook for a description of BREAK.

Note



Many applications disable this feature; you must use the method documented with the application to stop it.

BUFFERS

Format

BUFFERS = *nn*

Explanation

Use the BUFFERS command to specify the number of buffers you want in memory. Buffers are small areas (blocks) of memory that the operating system uses during disk read and write operations to temporarily store the information being read or written.

You can specify between 3 and 99 buffers. The default number of buffers is 15.

The number of buffers available generally affects the speed at which a program accesses files; the more buffers there are, the faster the program accesses files.

Keep in mind, however, that each buffer you specify uses memory that could otherwise be used for the program itself and for data; if you specify too many buffers, your program may actually run slower than if you specified fewer buffers.

The documentation for your programs should indicate how many buffers to specify. A number between 10 and 30 is generally sensible but you may need more if your program uses a large number of files. A desktop publishing program, for example, may need more than 30 buffers.

CHAIN

Format

CHAIN = *filespec*

Explanation

Use the CHAIN command to transfer control (when CONFIG.SYS is executing) to another configuration file. CHAIN automatically verifies that *filespec* exists. If it does exist, the current configuration file is closed and the operating system begins executing the statements in *filespec*. If it does not exist, processing returns to the original configuration file.



If you use the CHAIN command to transfer control to a configuration file on another drive, you must specify the full path including the drive in all DEVICE and HIDEVICE/DEVICEHIGH statements in that configuration file.

CHAIN is most useful when you are using a system with read-only or ROM disks; CHAIN allows you to change the configuration specified in the ROM-based copy of CONFIG.SYS.

CHAIN is also useful with the ? command; you can group together similar CONFIG.SYS commands into additional CONFIG.SYS files and then execute them with a single conditional statement; refer to the description of ? in this chapter.

Example

The following sequence of statements includes a CHAIN command that tells the operating system to look for the CONFIG.SYS file on drive D: when it reaches the CHAIN command during execution. If a CONFIG.SYS file exists on drive D:, that file will be executed rather than the rest of the one containing the CHAIN command. If CONFIG.SYS does not exist on drive D:, the original CONFIG.SYS continues to execute.

```
BUFFERS = 10  
COUNTRY = 44, ,C:\NWDOS\COUNTRY.SYS  
CHAIN = D:\CONFIG.SYS
```

CLS

Format

```
CLS
```

Explanation

Use the CLS command to clear the screen.

COUNTRY

Format

```
COUNTRY = nnn, cp, [d:]\path\COUNTRY.SYS
```

Explanation

Use the COUNTRY command to load the COUNTRY.SYS file. This file provides the following:

- ◆ Date and time format appropriate for your country
- ◆ Currency symbol of your country
- ◆ Code page to use

In European countries, the preferred date format is day/month/year, in North America the preferred format is month/day/year, and in Japan it is year/month/day.

The COUNTRY.SYS file also affects the DATE, TIME, and TOUCH commands; refer to the “Command Reference” chapter of DOSBook for explanations of these commands.

When specifying the COUNTRY command, you must include the following in addition to the complete filespec of COUNTRY.SYS:

- ◆ Country code (*nmn*)

Specify one of the codes listed in Table 9-2. Note that a country code does not include information about the type of keyboard you are using; refer to the “Command Reference” chapter of DOSBook for a description of the KEYB command.

- ◆ Code page for which country information is required (*cp*)

If you do not specify a code page, the default code page for your country (*nmn*) is assumed. In Table 9-2, the first code page listed in the Code Pages column is the default code page.

Note that the default values may already be set correctly for your country so they may not need to be changed.

Table 9-2
Country Codes and Code Pages

Country	Code	Code Pages
Australia	061	437 850
Belgium	032	437 850
Canada (French)	002	863 850
Denmark	045	865 850
Finland	358	437 850
France	033	437 850
Germany	049	437 850
Hungary	036	852 850
Italy	039	437 850
Latin America	003	437 850
Netherlands	031	437 850
Norway	047	865 850
Portugal	351	860 850
Russia	007	866 850
Spain	034	437 850
Sweden	046	437 850
Switzerland (French)	041	437 850
Switzerland (German)	041	437 850
Turkey	090	857 850
United Kingdom	044	437 850
United States	001	437 850

Example

The following entry in your CONFIG.SYS file would convert the currency symbol and date and time formats to the Italian versions using code page 437:

```
COUNTRY = 039, 437, C:\NWDOS\COUNTRY.SYS
```

CPOS

Format

```
CPOS nn, nn
```

Explanation

Use the CPOS command to position the cursor on the screen.

Specify the row (the first *nn*) to set the vertical position of the cursor. The row number can be from 1 to 25.

Specify the column (the second *nn*) to set the horizontal position of the cursor. The column number can be from 1 to 80.

Example

The following statement causes the cursor to appear on the screen in row 10 and column 10:

```
CPOS 10, 10
```

DEVICE

Format

```
DEVICE = filespec [options]
```

Explanation

Use the DEVICE command to install (and configure) device drivers.

You need device drivers to operate devices (such as printers and keyboards) that are not recognized as default parts of your system. Most device drivers are hardware-specific although a few (such as VDISK.SYS, supplied with the system) are designed for software functions. Device drivers usually have the filename extension .SYS.

You configure device drivers by specifying the appropriate options in the DEVICE statement (*options*) after the name of the driver (*filespec*).

You can use ? in DEVICE statements to be prompted before drivers are loaded; you therefore have the option of loading or not loading a particular driver every time you start the operating system.

Supplied Drivers

Device drivers for the keyboard, the screen, disk drives, the printer, and auxiliary devices are automatically loaded as part of the system startup procedure. The operating system also provides a number of optional device drivers that you can load with DEVICE commands. ANSI.SYS, DISPLAY.SYS, DRIVER.SYS, PRINTER.SYS, and VDISK.SYS are described in detail in this chapter.

Note



EMM386.EXE, HIMEM.SYS, EMMXMA.SYS, and DPMS.EXE are memory managers. They are described in Chapter 10, "Managing Memory."

New Hardware Drivers

Whenever you add a new piece of computer hardware, such as a mouse or a printer, you must copy the device driver supplied with the new hardware onto the drive from which you start the operating system. Then you must use a DEVICE statement in CONFIG.SYS to make sure that the operating system finds the driver and loads it every time you boot the system.

Example DEVICE statements for each optional device driver supplied with the operating system are included in the driver descriptions.

Device Drivers Supplied with the Operating System

This section describes the drivers that are supplied with the system. See Chapter 10, "Managing Memory," for descriptions of the memory managers (EMM386.EXE, HIMEM.SYS, EMMXMA.SYS, and DPMS.EXE).

The DEVICE statements that load the supplied drivers are automatically added to your CONFIG.SYS file when you load drivers using SETUP or INSTALL.

ANSI.SYS

ANSI.SYS is a device driver for the keyboard and the screen. It provides extra options for programs that need to move the cursor, change the screen display, or assign keyboard use. ANSI.SYS options are in the form of ANSI escape sequences, which all start with the ESC character (1B hex). The ANSI.SYS driver can detect escape sequences sent via the normal DOS function calls but it cannot detect character output from the ROM BIOS directly.

ANSI.SYS must be loaded for certain commercial applications; refer to the documentation for your applications to determine whether or not you need ANSI.SYS.

Loading ANSI.SYS

Load ANSI.SYS if it is required by responding to the appropriate prompt during SETUP (or INSTALL). You can also load ANSI.SYS by editing the CONFIG.SYS file directly and adding the following DEVICE statement:

```
DEVICE = C:\NWDOS\ANSI.SYS
```

ANSI.SYS will now be loaded every time you start the operating system.

Using ANSI Escape Sequences

The general form of the ANSI escape sequence is as follows:

- ◆ A one-byte ESC character (hexadecimal 1BH)
- ◆ A one-byte [character (hexadecimal 5BH)
- ◆ One or more decimal numbers separated by semicolons
- ◆ A single command character

Create ANSI escape sequences using a word processor or editor, such as EDIT, that allows you to input the ESC and [control codes. In EDIT, for example, you create the ESC code by pressing <Ctrl> P followed by the <Esc> key.

The following information describes different types of ANSI escape sequences: to position the cursor, to erase, and to change the display mode. Note the following about each of these escape sequences:

- ◆ y and x represent row and column numbers. Row numbers (y) are between 1 and 50, with 1 at the top of the screen, and column numbers (x) are between 1 and 79, with 1 at the far left of the screen. You specify these numbers in ASCII digits. If you do not specify a number (or specify 0), the default value is used.
- ◆ Spaces are shown only to make the sequences easier to read; they are not required.

Positioning the Cursor

Cursor position (CUP): **ESC** [*y;x* **H**

Horizontal and vertical position (HVP): ESC [*y;x* **f**

CUP and HVP position the cursor according to the coordinates specified. The default (and null) value is the top left corner of the screen. CUP and HVP are equivalent.

Cursor up (CUU): **ESC** [*y* **A**

Moves the cursor up *y* rows without changing the column position. This sequence is ignored if the cursor is already at the top of the screen.

Cursor down (CUD): **ESC** [*y* **B**

Moves the cursor down *y* rows without changing the column position. This sequence is ignored if the cursor is already at the bottom of the screen.

Cursor forward (CUF): **ESC** [*x* **C**

Moves the cursor to the right without changing the row position. This sequence is ignored if the cursor is already in the far right column.

Cursor backward (CUB): **ESC** [*x* **D**

Moves the cursor to the left without changing the row position. This sequence is ignored if the cursor is already in the far left column.

Device status report (DSR): **ESC** [**6 n**

Cursor position report (CPR): **ESC** [*y;x* **R**

The DSR sequence instructs the console driver to return the CPR sequence. The CPR sequence reports the cursor position in terms of row and column. CPR is returned via the keyboard input.

Save cursor position (SCP): **ESC** [**s**

Restore cursor position (RCP): **ESC [u**

SCP stores the current cursor position; RCP restores the cursor to that position. The default for RCP, if no SCP was issued, is 0,0. These escape sequences cannot be nested.

Erasing

Erase display (ED): **ESC [2 J**

Erases the display and moves the cursor to the top left of the screen.

Erase line (EL): **ESC [K**

Erases from the cursor position to the end of the row.

Changing the Display Mode

Set graphics rendition (SGR): **ESC [n ; ... ; n m**

Sets various screen modes that remain in effect until a different SGR sequence is issued. The screen mode specified by *n* can be any one of the following:

Table 9-3
Screen Modes

n	Mode
0	Return to the default (which is white characters on a black background)
1	High intensity (bold)
4	Underscore (monochrome displays only)
5	Flashing
7	Inverse video (black characters on a white background)
8	Invisible (black on black)
30	Black foreground
31	Red foreground

Table 9-3 *continued*
Screen Modes

n	Mode
32	Green foreground
33	Yellow foreground
34	Blue foreground
35	Magenta foreground
36	Cyan foreground
37	White foreground
40	Black background
41	Red background
42	Green background
43	Yellow background
44	Blue background
45	Magenta background
46	Cyan background
47	White background

Set screen mode (SM): **ESC** [= n h 1 or **ESC** [= h 1 or **ESC** [? n h

Reset screen mode (RM): **ESC** [= n 1 or **ESC** [= 1 or **ESC** [? n 1

These sequences set and reset the screen operating mode. Specify any one of the following values for *n*:

Table 9-4
Screen Operating Modes

n	Operating Mode
0	40 x 25 monochrome
1	40 x 25 color
2	80 x 25 monochrome
3	80 x 25 color
4	320 x 200 monochrome
5	320 x 200 color
6	640 x 200 monochrome
7	Enables (SM) or disables (RM) wrapping at the end of rows. When enabled, this option "wraps" extra characters on to the next line. When wrapping is disabled, these characters are lost.

Assign a key (KR): **ESC** [*n* ; *n* ; ... *n* **P**

Changes the function of a key. You define the key to change and then define the change.

You can use extended character codes (ECCs) by typing the first variable in the sequence as 0 (NUL) followed by the second key. 0;68;, for example, is the <F10> key. The last variables in the sequence are the character codes for the values you are assigning to the key.

An alternative to specifying a sequence of numbers is to use a string defined as characters and enclosed by double quotation marks. 65;66;67;, for example, can be shown as "ABC";.

The following table lists the codes for function keys <F1> through <F10>, when used alone and with <Shift>, <Ctrl>, and <Alt>.

Table 9-5
Decimal Key Codes

Key	Code	+Shift	+Ctrl	+Alt
<F1>	59	84	94	104
<F2>	60	85	95	105
<F3>	61	86	96	106
<F4>	62	87	97	107
<F5>	63	88	98	108
<F6>	64	89	99	109
<F7>	65	90	100	110
<F8>	66	91	101	111
<F9>	67	92	102	112
<F10>	68	93	103	113
<F11>	133	135	137	139
<F12>	134	136	138	140

Examples

You can try the following example by using EDIT to create a file containing the escape sequences described and then entering the name of the file as the parameter of the TYPE command.

Remember that you must enter the control code for ESC, not the character itself; in EDIT, you produce the ESC code by pressing <Ctrl> P followed by the <Esc> key.

The following escape sequence will position the cursor at row 10, column 10 and print an x at that point:

ESC [10;10HX

The next sequence sets the screen mode to 40x25 color:

ESC [?1H

The following sequence assigns the command XDIR C: to the <F10> key:

ESC [0;68;"XDIR C:";13p

To reset current attributes and then set green as foreground color on a white background:

ESC [0;32;47M

DISPLAY.SYS

DISPLAY.SYS enables code page switching for EGA and VGA displays.

Loading DISPLAY.SYS

DISPLAY.SYS is loaded automatically if you use the SETUP program to install code page switching. You can also install DISPLAY.SYS by editing the CONFIG.SYS file yourself. The format of the statement that loads DISPLAY.SYS is as follows:

DEVICE=C:\NWDOS\DISPLAY.SYS CON=(*type*,*hwcp*,*n* | (*n*,*m*))

Options	
<i>type</i>	The type of active display; specify EGA for EGA and VGA displays. If you do not specify a display type, DISPLAY.SYS checks your hardware to determine the display type you are currently using.
<i>hwcp</i>	The hardware resident code page; DISPLAY.SYS cannot check this, so do not specify it if you are unsure about what to specify.

Options continued

n The number of additional code pages you want to prepare, usually 1. The maximum number you can specify is 12.

Preparing a code page allocates space in memory for it; the amount of memory available for applications is therefore reduced by each code page preparation you specify.

Note that this parameter only prepares for additional code pages. You prepare and select specific code pages using the MODE command, in your AUTOEXEC.BAT file or at the system prompt. Refer to the "Command Reference" chapter of DOSBook for information about the MODE command.

m The number of subfonts stored in memory; the default is for all font sizes to be resident in memory but using *m* reduces the number to increase the amount of available memory. You can specify one of the following values for *m*:

Dsp Type	m	Supported Fonts
EGA	2 (the default)	8*14 and 8*8
EGA	1	8*14
VGA	3 (the default)	8*16, 8*14, and 8*8
VGA	2	8*16 and 8*8
VGA	1	8*16

Refer to Chapter 17, "Setting Up Code Page Switching" for more information about code pages and code page switching.

Examples

The following command defines EGA (or VGA) as the display type and 437 as the hardware code page, with one additional code page to be specified by the MODE command:

```
DEVICE = C:\NWDOS\DISPLAY.SYS CON=(EGA,437,1)
```

The next command is the same as the previous one except that it restricts the number of subfonts stored in memory to 1 (8*14):

```
DEVICE = C:\NWDOS\DISPLAY.SYS CON=(EGA,437,(1,1))
```

DRIVER.SYS

DRIVER.SYS defines the characteristics of a physical disk drive.

Use DRIVER.SYS when you want to add a new logical drive to your system that is a different type: a 3.5-inch diskette drive to a system that uses 5.25-inch drives, for example. Note, however, that DRIVER.SYS would only be necessary if the computer's ROM BIOS does not support 3.5-inch diskette drives. Consult your hardware documentation before using DRIVER.SYS.

If you want to modify the characteristics of a disk drive already recognized by the operating system, use the DRIVPARM command in CONFIG.SYS; refer to the description of DRIVPARM in this chapter.

Loading DRIVER.SYS

The format of the DEVICE statement in CONFIG.SYS that loads and configures DRIVER.SYS is as follows:

```
DEVICE=C:\NWDOS\DRIVER.SYS /D:n [/C] [/F:f] [/H:h]  
[ /N] [/S:ss] [/T:tt]
```

Options

<code>/D:n</code>	The physical drive for which you are defining characteristics; <i>n</i> is 0, 1, 2, and so on.												
<code>/C</code>	Specifies that the drive is able to detect when a diskette is changed.												
<code>/F:f</code>	The type of drive. The possible values are: <table><thead><tr><th>f</th><th>Drive Type</th></tr></thead><tbody><tr><td>0</td><td>360 KB 5.25-inch</td></tr><tr><td>1</td><td>1.2 MB 5.25-inch</td></tr><tr><td>2</td><td>720 KB 3.5-inch (the default)</td></tr><tr><td>7</td><td>1.44 MB 3.5-inch</td></tr><tr><td>9</td><td>2.88 MB 3.5-inch</td></tr></tbody></table>	f	Drive Type	0	360 KB 5.25-inch	1	1.2 MB 5.25-inch	2	720 KB 3.5-inch (the default)	7	1.44 MB 3.5-inch	9	2.88 MB 3.5-inch
f	Drive Type												
0	360 KB 5.25-inch												
1	1.2 MB 5.25-inch												
2	720 KB 3.5-inch (the default)												
7	1.44 MB 3.5-inch												
9	2.88 MB 3.5-inch												
<code>/H:h</code>	The number of drive heads; specify 1 or 2.												
<code>/N</code>	Specifies that the drive is for permanent media.												

Options continued

<code>/S:ss</code>	The number of disk sectors per track that the drive supports; specify a number between 1 and 63.
<code>/T:tt</code>	The number of tracks that the drive supports; specify 40 or 80.

Example

The following statement defines a 720 KB 3.5-inch drive as the second drive:

```
DEVICE = C:\NWDOS\DRIVER.SYS /D:1 /C /F:2 /H:2 /S:9  
/T:80
```

PRINTER.SYS

PRINTER.SYS enables code page switching for printers.

Loading PRINTER.SYS

You can install the PRINTER.SYS driver automatically by using the SETUP program. You can also install it by editing CONFIG.SYS directly. Either way, the format of the DEVICE statement in CONFIG.SYS that installs PRINTER.SYS is as follows:

```
DEVICE = C:\NWDOS\PRINTER.SYS LPTn=(type,hwcp,n)
```

Options

<code>LPTn</code>	<p>The port to which the printer is connected, where <i>n</i> is 1, 2, or 3. You can use PRN instead of LPT1; they are equivalent.</p> <p>You must define each printer that supports code page switching, if you have more than one on your system. There is a limit of three printer definitions in a single DEVICE statement.</p>
-------------------	---

Options continued

<i>type</i>	The type of printer. Specify one of the following: <table><thead><tr><th>Type</th><th>Printer</th></tr></thead><tbody><tr><td>4201</td><td>IBM* 4201 Proprinter*/4202 Proprinter XL</td></tr><tr><td>4208</td><td>IBM Proprinter 4207 XL24/4208 XL24</td></tr><tr><td>5202</td><td>IBM Quietwriter* III</td></tr><tr><td>1050</td><td>Epson FX 850/FX 1050/compatible type</td></tr></tbody></table>	Type	Printer	4201	IBM* 4201 Proprinter*/4202 Proprinter XL	4208	IBM Proprinter 4207 XL24/4208 XL24	5202	IBM Quietwriter* III	1050	Epson FX 850/FX 1050/compatible type
Type	Printer										
4201	IBM* 4201 Proprinter*/4202 Proprinter XL										
4208	IBM Proprinter 4207 XL24/4208 XL24										
5202	IBM Quietwriter* III										
1050	Epson FX 850/FX 1050/compatible type										
<i>hwcp</i>	The hardware resident code page; this is optional.										
<i>n</i>	The number of additional code pages that you want to prepare for the printer, usually 1 or 2. The maximum number you can specify is 12. Preparing a code page allocates space in memory for it; the amount of memory available for your applications is therefore reduced by each code page preparation that you specify.										

Example

The following DEVICE statement in CONFIG.SYS prepares two printers with one additional code page:

```
DEVICE=C:\NWDOS\PRINTER.SYS PRN=(4201,437,1)
      LPT2=(5202,437,1)
```

VDISK.SYS

The VDISK.SYS driver allows you to set up a *memory disk*: a portion of memory that acts as a very fast disk.

A memory disk is fast but only exists while your computer is switched on; when you switch your machine off or reset the computer, everything stored in a memory (or *virtual*) disk is lost. Consequently, anything stored on a virtual disk that you want to keep must be copied to a hard disk or diskette before you switch off power to the computer.

Use the VDISK.SYS driver when you want to store temporary files used by programs or when you are using programs that need to access a lot of information quickly and frequently, such as databases and spreadsheets.

Loading VDISK.SYS

If you do not have extended or expanded memory on your system, a virtual disk is automatically set up in conventional memory. If you do have extended or expanded memory, however, you can specify various options with VDISK.SYS. The format of the DEVICE statement that loads VDISK.SYS is as follows:

```
DEVICE = C:\NWDOS\VDISK.SYS [disksize] [sectsize]  
[maxfiles] [/E:[sectors]] [/X]
```

Options	
<i>disksize</i>	The size of the disk in KB; specify a size between 1 and 256 KB (unless you have extended memory on your system). The default size is 64 KB.
<i>sectsize</i>	The smallest amount of space reserved on the disk. The default is 128 bytes but you can also specify 256 or 512 bytes.
<i>maxfiles</i>	The maximum number of files that can be written to the root directory of the virtual disk. Specify a number between 2 and 512; the default is 64. The number you specify determines the amount of disk space reserved for the disk directory. Keep in mind that specifying a large number of files will waste space unless you actually do copy large numbers of files to the disk.
/E:[<i>sectors</i>]	Locates the virtual disk in extended memory, if extended memory is available on your system. Specify the number of sectors at a time to be transferred between conventional memory and extended memory when the virtual disk is being used; <i>sectors</i> can be a number between 1 and 8 (the default is 8).
/X	Locates the virtual disk in expanded memory, if available on your system. A virtual disk in expanded memory can be up to 32 MB in size.

You must load VDISK.SYS in CONFIG.SYS before any other drivers that use extended memory but after your memory manager, such as EMM386 or HIMEM. If you use SETUP or INSTALL to create a memory disk, however, VDISK.SYS is loaded automatically, in the correct sequence.

Also note that if you use the HIDEVICE/DEVICEHIGH command to load VDISK.SYS in extended memory, you must use the /E switch; refer to Chapter 10, "Managing Memory" for information about using HIDEVICE/DEVICEHIGH.

Examples

The following DEVICE statement defines a virtual disk of 200 KB with a sector size of 256 bytes and a maximum of 32 files:

```
DEVICE = C:\NWDOS\VDISK.SYS 200 256 32
```

The next statement defines a virtual disk of 10,240 KB, located in expanded memory:

```
DEVICE = C:\NWDOS\VDISK.SYS 10240 /X
```

DOS

Format

```
DOS=HIGH | LOW | UMB | HIGH,UMB | UMB,HIGH
```

Explanation

DOS specifies the location of the system software.

If you do not have extended memory, the operating system software is loaded in the lowest part of conventional memory (DOS=LOW).

If your computer has extended memory, however, you can make more conventional memory available to your applications by running the DOS software in the High Memory Area (HMA) and in upper memory (when the HMA is not available). DOS=HIGH,UMB is the default for the operating system when extended memory is available. In order for high or upper memory to be enabled, a memory manager (EMM386 or HIMEM) must be loaded first. Refer to Chapter 10, "Managing Memory" for information about memory managers.

You can also force the operating system software to use the HMA or upper memory exclusively (DOS=HIGH or DOS=UMB).

To change the default location of the operating system, run SETUP, choose *DOS System and Memory Management*, and then choose *Memory Manager*. You can specify Conventional Memory, Upper Memory, or High Memory. SETUP automatically updates the DOS command in CONFIG.SYS and the next time you boot your machine, the new DOS setting takes effect.

Note



When you choose High Memory, DOS=HIGH,UMB is added in CONFIG.SYS. To specify high memory only edit the CONFIG.SYS file manually.

Example

The following command loads the system software in upper memory, if available:

```
DOS=UMB
```

DRIVPARM

Format

```
DRIVPARM = /D:n [/C] [/F:n] [/H:nn] [/I] [/N]  
          [/S:nn] [/T:nn]
```

Explanation

The DRIVPARM command defines the physical characteristics of a specified disk drive. Use it to associate a particular type of physical disk drive with a logical drive. To add a 3.5-inch diskette drive to a computer that does not expect to use 3.5-inch diskette drives, for example, the DRIVPARM command is required to redefine the drive parameters for subsequent use by the operating system.

You can also use DRIVPARM to modify a logical drive already recognized by the operating system but to add and define a new logical drive, you must use the DRIVER.SYS device driver instead.

Refer to the description of DRIVER.SYS in this chapter for information.

Options

<i>/D:n</i>	Specify the single digit that corresponds to the logical drive (drive A, drive C, and so forth.) for which you are defining characteristics.																		
<i>/C</i>	Specifies that the drive is able to detect when a disk is changed.																		
<i>/F:n</i>	Specifies the drive type. Specify one of the following: <table><thead><tr><th>n</th><th>Drive Type</th></tr></thead><tbody><tr><td>0</td><td>160/180 KB or 320/360 KB</td></tr><tr><td>1</td><td>1.2 MB</td></tr><tr><td>2</td><td>720 KB (the default)</td></tr><tr><td>5</td><td>Hard disk</td></tr><tr><td>6</td><td>Tape</td></tr><tr><td>7</td><td>1.44 MB</td></tr><tr><td>8</td><td>Read/write optical disk</td></tr><tr><td>9</td><td>2.88 MB</td></tr></tbody></table>	n	Drive Type	0	160/180 KB or 320/360 KB	1	1.2 MB	2	720 KB (the default)	5	Hard disk	6	Tape	7	1.44 MB	8	Read/write optical disk	9	2.88 MB
n	Drive Type																		
0	160/180 KB or 320/360 KB																		
1	1.2 MB																		
2	720 KB (the default)																		
5	Hard disk																		
6	Tape																		
7	1.44 MB																		
8	Read/write optical disk																		
9	2.88 MB																		
<i>/H:nn</i>	Specifies the maximum number of drive heads; specify a number from 1 through 99. The default depends on the value specified for <i>/F:n</i> .																		
<i>/I</i>	Specifies a 3.5-inch diskette drive that is installed on your computer and uses the existing diskette drive controller. Use this switch when your computer does not support 3.5-inch diskette drives.																		
<i>/N</i>	Specifies that the drive is for permanent media.																		
<i>/S:nn</i>	The number of sectors supported by the drive. Specify a number between 1 and 99. The default depends on the value specified for <i>/F:n</i> .																		
<i>/T:nn</i>	The number of tracks supported by the drive. The default depends on the value specified for <i>/F:n</i> .																		

ECHO

Format

ECHO [*message*]

Explanation

Use the ECHO command to display messages on screen when you start the operating system.

Questions and explanatory messages, for example, are useful as part of your CONFIG.SYS file. Messages you specify with ECHO commands appear in the order in which you enter them in CONFIG.SYS and exactly as you type them in ECHO statements, including any spaces you leave.

Example

The following ECHO statement causes the message **INSTALL CODE PAGE SWITCHING?** to appear on your screen whenever CONFIG.SYS executes:

ECHO INSTALL CODE PAGE SWITCHING?

EXIT

Format

EXIT

Explanation

EXIT forces the system to terminate CONFIG.SYS execution.

FASTOPEN

Format

FASTOPEN = *nnnn*

Explanation

The FASTOPEN command increases the speed at which the operating system accesses files on a hard disk that are being accessed repeatedly. FASTOPEN records the locations of these files so that the operating system does not have to “navigate” along the path every time a file is accessed.

FASTOPEN causes the system to set up a special table of filenames in memory, the size of which you set by specifying the number of entries (*nnnn*). Specify a number between 128 and 32768; the default is 512 entries.

Remember that FASTOPEN improves disk performance but results in less available space in memory; each table entry uses 2 bytes of memory. Consequently, you should not define a table larger than you need.

Example

The following command defines a table size of 512 entries:

FASTOPEN = 512

FCBS

Format

FCBS = *m*, *n*

Explanation

Use the FCBS command to specify the number of files that can be opened by programs at the same time using data structures called File Control Blocks.



Some older applications may require an FCBS statement in CONFIG.SYS rather than a FILES statement; FILES is also used to control the number of files that can be opened simultaneously. Always use the FILES command to control the number of open files allowed unless your application specifically requires an FCBS entry.

For FCBS to have much effect, the SHARE program or networking support must be loaded. Refer to the “Command Reference” chapter of DOSBook for a description of the SHARE command.

Options

<i>m</i>	The number of files that FCBS can open at one time; specify a number from 1 to 255.
<i>n</i>	The number of files opened by FCBS that are protected from automatic closure by the system; specify a number from 1 to 255. If an application attempts to open more than <i>m</i> file(s) by FCBS, all but the first <i>n</i> file(s) may be closed by the operating system.

Example

The following command sets the maximum number of open files allowed to 8 and the number of protected files to 4:

FCBS = 8, 4

FILES

Format

FILES = *nnn*

Explanation

The FILES command specifies the number of files that can be opened simultaneously by programs. The operating system uses this number to determine how much memory to set aside for controlling open files.

Specify a number (*nnn*) between 20 and 255; the default is 20.

You should only specify more than the default number of files (20) if the documentation for an application you are using instructs you to do so or if the application returns error messages indicating that the number of open files allowed is insufficient.

Example

The following command sets the maximum number of open files allowed to 20:

FILES = 20

GOSUB

Format

GOSUB *label*

Explanation

GOSUB forces execution to jump to a group of statements (subroutine) within the same CONFIG.SYS file, execute the subroutine, and then jump back (when a RETURN command is encountered) to the statement immediately after the GOSUB. You must specify a label, and that label must be present in the CONFIG.SYS file to identify the start of the subroutine. A RETURN command must be present to identify and exit from the subroutine.

Example

In the following sequence of statements, execution jumps to the statement after the label and through the following statements before jumping back to the statement after GOSUB when it reaches RETURN:

```
GOSUB memdisk  
exit  
.  
.  
.  
:memdisk  
DEVICE=vdisk.sys  
.  
.  
.  
return
```

GOTO

Format

```
GOTO label
```

Explanation

Use GOTO to change the order in which commands are executed.

GOTO directs the operating system to jump to another part of the file, identified by a label. The *label* parameter must identify a label that is present in the same CONFIG.SYS file.

You can use ? with GOTO commands so that if a certain condition is satisfied, or response received, execution jumps to the appropriate statements.

If you want execution to jump to a certain point in the file and then jump back again, use GOSUB and RETURN commands instead; refer to the descriptions of GOSUB and RETURN in this chapter.

Example

In the following sequence of statements, execution jumps to the label (MEMDISK) if the user enters Y (for Yes) when prompted by the ? statement:

```
? "Do you want a memory disk? (Y/N)" GOTO MEMDISK  
.  
.  
:MEMDISK  
DEVICE=VDISK.SYS
```

HIDEVICE/DEVICEHIGH

Format

```
HIDEVICE|DEVICEHIGH [SIZE=nnnn] filespec
```

Explanation

HIDEVICE or DEVICEHIGH loads an installable device driver into upper memory.

You must specify the name of the device driver (*filespec*) that you want to load high.

If you want to load a device driver that is unable to determine the amount of memory that it will ultimately need, you can also specify the amount of upper memory required for the driver (*SIZE=nnnn*). To determine this amount, load the driver into conventional memory and then run the MEM command to see how much memory the driver uses. Refer to the “Command Reference” chapter of DOSBook for information about MEM and its options.

Example

The following command loads ANSI.SYS into upper memory:

```
HIDEVICE=C:\NWDOS\ANSI.SYS
```

HIINSTALL/INSTALLHIGH

Format

```
HIINSTALL | INSTALLHIGH=filespec [options]
```

Explanation

HIINSTALL or INSTALLHIGH loads and executes a specified program in upper memory rather than conventional memory. HIINSTALL or INSTALLHIGH performs the same function as HILOAD or LOADHIGH except that it is processed as part of CONFIG.SYS rather than at the system prompt or in a batch file (such as AUTOEXEC.BAT).

You must specify the full *filespec* of the program you want to load into upper memory. You can also specify any parameters (*options*) that you want to pass to the program.

The specified program will load and execute in upper memory every time you start the operating system, as long as upper memory is enabled by a memory manager (EMM386 or HIMEM) and is available. Before attempting to load a program into upper memory, you can check to make sure that there is enough upper memory available by running the MEM command; refer to the "Command Reference" chapter of DOSBook for information about MEM and its options.

Example

The following command installs the CURSOR program in upper memory:

```
HIINSTALL=C:\NWDOS\CURSOR.EXE
```

HISTORY

Format

HISTORY = ON[, *nnnn* [, **ON** | **OFF**] [, [**ON** | **OFF**] [, **ON** | **OFF**]] | **OFF**

Explanation

Use the HISTORY command to turn the extended command line editing features on and off. Extended command line editing stores commands you issue in a memory buffer so that you can recall commands that you recently issued and re-issue or modify and re-issue them.

Set HISTORY to ON if you want to be able to recall and modify command lines using the extended editing keys. See the “Command Reference” chapter of DOSBook for a full description of extended command line editing.

Set HISTORY to OFF if you want to disable extended command line editing completely.

You can also enable or disable the command line search mode features specifically; refer to the descriptions of the third and fourth ON/OFF parameters in the options table below.

Options

nnnn

Defines the size of the memory buffer in which commands are stored. The size of the buffer determines how many command lines you can recall. Specify a buffer size between 128 and 4096 bytes. The default is 512 bytes, which allows you to recall approximately 10 commands.

Note that the operating system actually uses two memory buffers of the size you specify; the first buffer stores commands entered in the command line and the second buffer stores commands entered from applications.

[, ON | OFF]

Turns “insert mode” on and off; off is the default. When insert mode is on, characters you enter in the command line are inserted in front of the cursor. When insert mode is off, characters at the cursor position are overwritten.

Options *continued*

[,[ON/OFF]]	This third ON/OFF option enables or disables the command line search feature specifically. Command line search allows you to display the most-recently-entered command that matches the current one by pressing <Ctrl> R.
[,ON/OFF]	The fourth ON/OFF option enables and disables the more sophisticated search feature; this allows you to recall the most-recently-entered command that matches each character you type, by pressing <Ctrl> _.

Example

The following command switches insert mode on and defines a memory buffer of 512 bytes:

```
HISTORY = ON,512,ON
```

INSTALL

Format

```
INSTALL = filespec [options]
```

Explanation

Use the INSTALL command to load a program automatically from CONFIG.SYS when you start the operating system; this saves you from entering the program name in the command line every time you want to use it.

You can specify options to pass to the specified program (*filespec*).

The following programs can be loaded using the INSTALL command:

CURSOR.EXE	NLSFUNC.EXE
GRAFTABL.COM	PRINT.COM
GRAPHICS.COM	SHARE.EXE
KEYB.COM	



To load installable device drivers during startup, use the DEVICE command; refer to the description of DEVICE in this chapter.

Example

The following statement loads the KEYB program (with the UK keyboard option) whenever CONFIG.SYS is executed:

```
INSTALL = C:\NWDOS\KEYB UK
```

LASTDRIVE

Format

```
LASTDRIVE = drive_letter
```

Explanation

Use the LASTDRIVE command to set a different “last drive letter” than the one automatically set by the operating system.

The operating system assigns a drive letter to each actual drive that it finds during startup (including any virtual disk drives) and sets the last drive letter it assigns as the “last drive letter”; all remaining drive letters become invalid. Use LASTDRIVE so that the operating system will recognize drive letters not already assigned.

If you are using the operating system’s network component, set LASTDRIVE to the letter Z.

Example

Assume that your computer has a diskette drive (A:), a hard disk drive (C:), and two virtual disk drives (D: and E:) but you are using a program that requires you to use the SUBST command with drives F: and G:. The following command causes the operating system to recognize drive letters F: and G: as well as A: through E:

```
LASTDRIVE = G
```

REM

Format

```
REM | ; [comment]
```

Explanation

Use REM to add comments to your CONFIG.SYS file. Simply use REM (for “remark”) or a semicolon as the first character in a statement to identify it as a comment; the statement will be ignored when the file is executed.

Comments are useful to clarify the purpose of a command. You can also use the comment markers (REM or ;) without a comment itself to add spaces in the file so that it is easier to read.

Example

The following statements include a DEVICE command that loads the ANSI.SYS driver and a comment preceding it that explains what the DEVICE command does:

```
REM * Load the ANSI driver for Wordmaster  
DEVICE = ANSI.SYS
```

RETURN

Format

RETURN

Explanation

Use RETURN with a GOSUB or SWITCH command to direct execution back to the statement following the GOSUB or SWITCH command after the appropriate subroutine has been executed; refer to the descriptions of GOSUB and SWITCH in this chapter.

SET

Format

SET *name=parameter*

Explanation

Use the SET command to add environment variables to the command processor's master environment.

The name of an environment variable is determined by the commands and device drivers loaded in your system configuration. Applications and batch files such as AUTOEXEC.BAT can then "test" the value (*parameter*) of a variable and execute commands accordingly.

Examples

The following statements include a SET command that specifies a value for the VDISK variable:

```
? "Create a 1Mb RAM Disk" gosub ramdisk
exit
.
.
.
:ramdisk
set VDISK=1024
device=c:\nwdos\vdisk.sys 1024 /X
return
```

The next group of statements (in AUTOEXEC.BAT) tests the value of the VDISK variable (set above) and changes the value of the TEMP variable accordingly.

```
SET TEMP=C:\TEMP
if NOT "%VDISK%" == " " SET TEMP=D:\TEMP
MD %TEMP% >NUL
```

SHELL

Format

```
SHELL = filespec dirpath /P[:filename] [/E:n] [/Mx]
```

Explanation

SHELL defines the name (*filespec*) and location (*dirpath*) of the command processor used by the operating system. By default, COMMAND.COM is loaded from the root directory of the C: drive. Change the SHELL statement in CONFIG.SYS if you want the operating system to use a different command processor or a command processor that is located in a directory other than the root directory.

The /P switch is required with the SHELL command to fix the specified command processor in memory.



Note You can load another copy of the command processor by using COMMAND at the system prompt. Refer to the description of COMMAND in the “Command Reference” chapter of DOSBook for more information.

Options

/P[: <i>filename</i>]	Makes the command processor permanent in memory. The EXIT command (to terminate a secondary command processor) is disabled. The operating system runs AUTOEXEC.BAT by default after COMMAND.COM is loaded; use <i>filename</i> to specify a different batch file, if required.
/E: <i>n</i>	Defines the size of the command processing environment in bytes, where <i>n</i> is a number from 129 to 32,751. The default size is 256; the default is also used if you specify a number outside the valid range.
/M <i>x</i>	Forces the command processor to load in a specific memory area, where <i>x</i> is L (for low), H (for high), or U (for upper). The default is low memory. You must have a memory manager that supports high and upper memory loaded before you can use /MH or /MU. If there is insufficient high or upper memory available, the command processor loads in conventional memory.

Examples

The following statement loads COMMAND.COM from C:\NWDOS rather than from the root directory:

```
SHELL = C:\NWDOS\COMMAND.COM C:\NWDOS /P  
/E:512
```

The COMSPEC environment variable, which defines the path to the command processor, is now set as follows:

```
COMSPEC = C:\NWDOS\COMMAND.COM
```

If you reset COMSPEC using the SET command (at the system prompt or in a batch file), however, this will override the value set in the SHELL statement.

STACKS

Format

STACKS=*n*, *s*

Explanation

The STACKS command supports the use of data stacks for hardware interrupts.

Specify the number of stacks (*n*) as 0 or 8 through 64 and the size of each stack (*s*) as 0 or 32 through 512.

The default STACKS setting is 0,0 for IBM PCs and PC/XTs and 9,128 for other machines.

Example

The following command allocates 8 stacks of 512 bytes each for hardware interrupt handling:

STACKS=8, 512

SWITCH

Format

SWITCH *label1*, *label2* [, *labeln*]

Explanation

Use the SWITCH command to switch between different subroutines within the same CONFIG.SYS file. When CONFIG.SYS executes, SWITCH causes the operating system to prompt you to select a configuration subroutine. Execution then jumps to the selected subroutine.

Each subroutine must start with a label and end with a RETURN statement.

You can use up to 9 labels.

Example

The following statements specify switching between three subroutines.

```
echo = CONFIGURATION 1
echo = CONFIGURATION 2
echo = CONFIGURATION 3
echo = Please select CONFIGURATION 1 2 or 3 ?
switch config1, config2, config3
echo CONFIGURATION COMPLETE
exit
:config1
echo CONFIGURATION 1 selected
return
:config2
echo CONFIGURATION 2 selected
return
:config3
echo CONFIGURATION 3 selected
return
```

These statements would cause the following to display when executed:

```
CONFIGURATION 1
CONFIGURATION 2
CONFIGURATION 3
```

```
Please select CONFIGURATION 1 2 or 3 ?
```

The valid responses to the prompt would be

- ◆ A number (1 through 3) to select a CONFIGURATION.
- ◆ Just the <Enter> key to automatically select CONFIGURATION 1.
- ◆ No response (but with a TIMEOUT condition specified) to automatically select CONFIGURATION 1 after the TIMEOUT limit is reached; refer to the description of TIMEOUT in this chapter.

Assuming you type 2 and press <Enter>, you then see

```
CONFIGURATION 2 selected
```

Then

```
CONFIGURATION COMPLETE
```

TIMEOUT

Format

```
TIMEOUT [=] n
```

Explanation

Use **TIMEOUT** to set a time limit for the amount of time allowed to respond to a ? or SWITCH prompt (see ? and SWITCH); the command is then ignored (for ?) or the first option is assumed (for SWITCH) if you do not enter a response within the **TIMEOUT** limit.

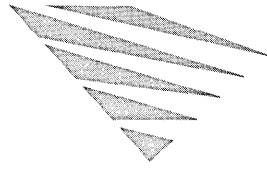
Specify *n* seconds, where *n* is a number, or accept the default of 0, which forces the system to wait indefinitely until a key is pressed.

Note that a **TIMEOUT** setting applies to all ? and SWITCH statements that follow it.

Example

The following statement sets a time limit of 10 seconds for ? and SWITCH prompts:

```
TIMEOUT 10
```

chapter **10** *Managing Memory*

This chapter describes the different kinds of memory that could be available and how you can optimize the way in which the operating system uses that memory.

Types of Memory

The following table describes the different types of memory that your computer may have.

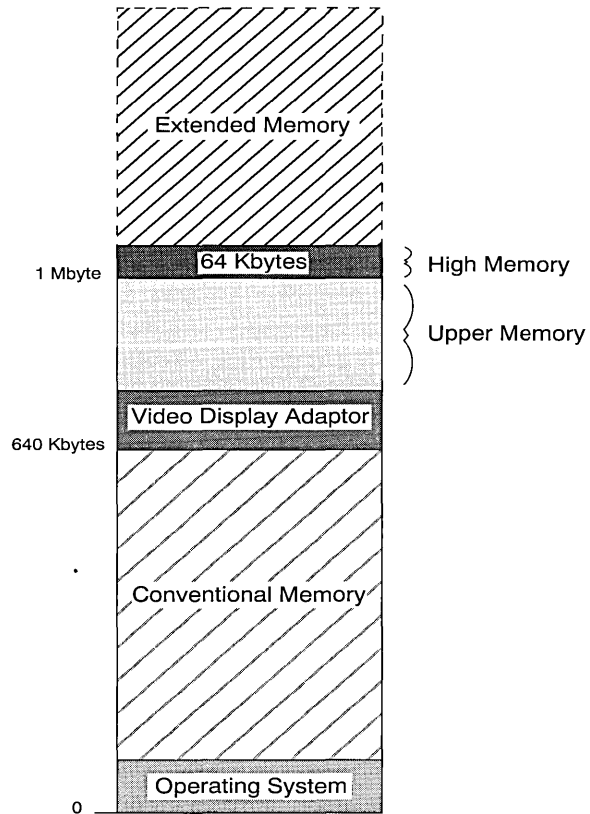
Table 10-1
Types of Memory

Type of Memory	Description
Conventional	The first 640 KB of memory on a computer. Conventional memory is required, and directly addressable, by all DOS-based applications. <i>Lower memory</i> refers to the lowest 64 KB of conventional memory; this is where the operating system and device drivers are usually loaded; the remaining area of conventional memory contains most of your data and programs. Most DOS-based applications can only run in conventional memory but you can optimize your system's memory configuration to take advantage of other memory types and make as much conventional memory as possible available to your applications.
Upper	The 384 KB of memory above conventional memory. This area of memory is used by various elements of your system hardware, such as the video display adapter or network adapter. Unused upper memory, however, may be available for loading device drivers and memory-resident programs.

Table 10-1 *continued*
Types of Memory

Type of Memory	Description
Extended (XMS)	<p>Memory above 1 MB on computers with 80286 and 386* (and later) microprocessors. An extended memory manager is required to use extended memory; Novell DOS™ 7 includes the EMM386 and HIMEM memory managers for this purpose. Some applications, such as MS Windows, require extended memory. XMS (Extended Memory Specification) refers to the protocol that provides a standard interface to upper and extended memory and allows it to be accessed via the Novell DOS 7 memory managers.</p> <p>In order to use extended memory, an 80286 or 386 (and later) computer must run in <i>protected mode</i> as opposed to <i>real mode</i>. 386 (and later) machines can also run in <i>virtual 8086 mode</i>, which means that although the computer appears to be running in real mode as far as an application is concerned, protected mode features are available.</p>
High (HMA)	<p>The first 64 KB of extended memory, also referred to as the <i>High Memory Area</i> or <i>HMA</i>. The operating system, by default, is set to run in high memory so that more conventional memory is available for your applications. The HMA is special extended memory because it can be accessed when the computer is running in real mode; refer to the explanation of real and protected mode in the description of extended memory (above).</p>
Expanded (EMS)	<p>Memory (additional to conventional memory) that some DOS-based applications can use. This memory, which conforms to the Lotus*/Intel*/Microsoft* (LIM) Expanded Memory Specification (EMS), is referred to as <i>expanded</i> or EMS memory. Originally, expanded memory was provided by an expanded memory board fitted inside the computer that came with an expanded memory manager. The EMM386 memory manager, however, can now emulate expanded memory, on a 386 (or later) computer, for applications that need it. Some applications can use EMS memory via a 64 KB part of upper memory called the <i>page frame</i>. This area is reserved in upper memory by the memory manager when expanded memory is required.</p>

Figure 10-1
Memory Map
Showing Upper,
High and Extended
Memory



Displaying the Current Memory Configuration

Before you begin making changes to optimize the way in which your system uses memory, it is important that you know what types of memory are available on your computer and how memory is currently being used.

The MEM command displays extensive information about memory usage. Refer to the “Command Reference” chapter of DOSBook for a detailed description of the MEM command. For a brief description of MEM and its options, simply enter either of the following version of the MEM command at the system prompt:

MEM /?

MEM /H

Novell DOS 7 Memory Managers

To access extended, expanded, or upper memory, the operating system includes memory managers. A memory manager is a special device driver that provides access to different memory types. The memory manager you use depends on what type of hardware you are using.

EMM386

The EMM386 memory manager provides access to the upper memory area. It also uses extended memory to emulate expanded (EMS) memory for those applications that need it.

Use EMM386 if your computer is a 386-based machine or later.

EMM386 is loaded and configured by a DEVICE statement in the CONFIG.SYS file. This statement is automatically placed in CONFIG.SYS when you choose to load the 386 memory manager during SETUP (or INSTALL). The configuration of EMM386 depends on the values you set in SETUP and on changes you make yourself to CONFIG.SYS.

The full syntax of the EMM386 DEVICE statement is as follows:

```
DEVICE = C:\NWDOS\EMM386.EXE [[/] ? | [/] H] [[/] AUTO]
  [[/] COMPAQ [=ON | OFF]] [[/] DPMI [=ON | OFF]]
  [[/] EXCLUDE = start-end [, start-end] ... ]
  [[/] FRAME = AUTO | NONE | address] [[/] GATEA20 = type]
  [[/] INCLUDE = start-end [, start-end] ... ]
  [[/] INT15 = kb] [[/] MULTI [=ON | OFF]] [[/] OFF] [[/] ON]
  [[/] ROM = start-end [, start-end] ... ]
  [[/] USE = start-end [, start-end] ... ]
  [[/] VIDEO [= [start-] end]] [[/] VXD = path]
  [[/] WEITEK = ON | OFF] [[/] WINSTD] [[/] XBDA]
```

The following table describes the EMM386 options. For information about specifying these options, either through SETUP or by editing CONFIG.SYS yourself, see “Making More Memory Available” on page 10-10.

Option	Description
[/? or [/]H	Displays help text.
[/]AUTO	Switches the memory manager ON and OFF automatically, as required. This is the default.
[/]COMPAQ[=ON | OFF]	Controls COMPAQ* support. By default on a COMPAQ computer (386 and later), support is enabled to provide an additional 256 KB of memory. Use the COMPAQ switch if you experience problems and want to disable this support (COMPAQ=OFF).
[/]DPMI[=ON | OFF]	Provides DOS Protected Mode Interface (DPMI) support. If ON or OFF is not specified, ON is assumed. You can also enable or disable DPMI temporarily at the system prompt by entering DPMI=ON or DPMI=OFF.
[/]EXCLUDE= <i>start-end</i> [, <i>start-end</i>]...	Forces the memory manager to exclude the specified areas of upper memory when it searches for usable memory; <i>start</i> and <i>end</i> are the starting and ending segment addresses of each area to exclude.
[/]FRAME=AUTO | NONE | <i>address</i>	Enables expanded (EMS) memory emulation. AUTO (the default) lets the memory manager locate the page frame; NONE disables EMS emulation; <i>address</i> identifies a specific location in upper memory.
[/]GATEA20= <i>type</i>	Specifies handling of control address line A20. The memory manager normally detects the machine <i>type</i> automatically but in certain situations you may need to specify it yourself. Type can be one of the following: AT Standard AT* HP Hewlett-Packard* Vectra* MCA MCA (such as PS/2*) or compatible XMS Third-party XMS driver
[/]INCLUDE= <i>start-end</i> [, <i>start-end</i>]...	Tells the memory manager to test the specified areas of upper memory when it searches for usable memory; <i>start</i> and <i>end</i> are the starting and ending segment addresses of each area to include.

Option	Description <i>continued</i>
[/]INIT15= <i>kb</i>	Reserves the specified amount (<i>kb</i>) of extended memory for use by third-party software that cannot use XMS or expanded (EMS) memory.
[/]MULTI[=ON | OFF]	Provides support for multitasking. This switch is added automatically when you choose to load the multitasking software in SETUP. If ON or OFF is not specified, ON is assumed.
[/]OFF	Turns the memory manager OFF. The computer is permanently in real mode.
[/]ON	Turns the memory manager ON. The computer is permanently in protected/virtual 8086 mode.
[/]ROM= <i>start-end</i> [, <i>start-end</i>]... | AUTO | NONE	Copies slow Read-Only Memory (ROM) into fast Random Access Memory (RAM); <i>start</i> and <i>end</i> specify the starting and ending segment addresses of each area of ROM to copy, AUTO copies all slow ROM to RAM, and NONE disables copying.
[/]USE= <i>start-end</i>	Forces the memory manager to use a specified area of upper memory when it searches for usable memory; <i>start</i> and <i>end</i> are the starting and ending segment addresses of the area to use.
[/]VIDEO[= <i>start-end</i>]	Makes unused video memory space available to applications when all the video memory is not being used by the video display adapter. Video memory (the upper memory immediately above 640 KB) is normally reserved for use by the video display adapter.
[/]VxD= <i>path</i>	Specifies the location of the EMM386 VxD, if necessary, to MS Windows 3.0 or later in Enhanced mode. By default, the VxD is located in the directory from which the memory manager is loaded.
[/]WEITEK=ON | OFF	Enables or disables DOS access to the Weitek* coprocessor, if fitted on your machine.
[/]WINSTD	Provides support for MS Windows 3.0 in Standard (80286) mode. MS Windows 3.0 in Standard mode requires upper memory to be disabled.

Option	Description <i>continued</i>
[/]XBDA	Keeps the extended BIOS data area (XBDA) at the top of conventional memory, for applications that require it to be there. If you enable sharing of video memory (/VIDEO), the memory manager automatically moves the XBDA to the bottom of conventional memory to allow contiguous memory.

HIMEM

The HIMEM memory manager provides access to the upper memory area. The features provided by HIMEM, however, will depend on your hardware. If you are using a 286-based computer with extended memory, the only HIMEM feature you may be able to use is relocation of the DOS software to high memory. If you have a chip set or expanded memory board, you can use other HIMEM features.

Use HIMEM if your computer is 80286-based. Also use HIMEM if you are using a pre-386 machine that has any of the following:

- ◆ A chip set such as Chips and Technologies NeAT* or NeATsx*, LeAPSet* or LeAPSetsx*, and SCAT*
- ◆ An EMS or EEMS expanded memory board and driver
- ◆ Permanent upper RAM



If you are using a machine with one of the chip sets mentioned above, HIMEM can only initialize upper memory if you have enabled Shadow RAM and if Shadow RAM is available. Your machine's hardware setup program, which is normally invoked by a special keyboard sequence during reset, enables Shadow RAM. However, the setup program usually allows you to move ROM into RAM as well; ensure that you leave Shadow RAM available for HIMEM. Otherwise, the only HIMEM feature you will be able to use is the relocation of the operating system software to high memory.

HIMEM is loaded and configured by a DEVICE statement in the CONFIG.SYS file. This statement is automatically placed in CONFIG.SYS when you choose to load the 80286 memory manager during SETUP (or INSTALL). The configuration of HIMEM depends on the values you set in SETUP and on changes you make yourself to CONFIG.SYS.

The full syntax of the HIMEM DEVICE statement is as follows:

```

DEVICE = C:\NWDOS\HIMEM.SYS
  [ /CHIPSET=AUTO | chipset | NONE ]
  [ /EXCLUDE=start-end[ , start-end ]... ]
  [ /INCLUDE=start-end[ , start-end ]... ]
  [ /ROM=start-end[ , start-end ]... | AUTO | NONE ]
  [ /USE=start-end ] [ /VIDEO[=start-end] ] [ /XBDA ]

```

The following table describes the HIMEM options. For information about specifying these options, either through SETUP or by editing CONFIG.SYS yourself, see “Making More Memory Available” on page 10-10.

Option	Description
/CHIPSET= AUTO | <i>chipset</i> | NONE	Specifies the chip set type of your computer. You may need to specify this information if the memory manager has difficulty mapping Shadow RAM into upper memory. AUTO (the default) allows the memory manager to determine the chip set or memory type automatically and NONE disables mapping of Shadow RAM. For a complete list of the values you can specify for <i>chipset</i> , see “Specifying the Chip Set or Memory Type (HIMEM Only)” on page 10-19.
/EXCLUDE= <i>start-end</i> [, <i>start-end</i>]...	Forces the memory manager to exclude the specified areas of upper memory when it searches for usable memory; <i>start</i> and <i>end</i> are the starting and ending segment addresses of each area to exclude.
/INCLUDE= <i>start-end</i> [, <i>start-end</i>]...	Tells the memory manager to test the specified areas of upper memory when it searches for usable memory; <i>start</i> and <i>end</i> are the starting and ending segment addresses of each area to include.
/ROM= <i>start-end</i> | AUTO | NONE	Copies slow Read-Only Memory (ROM) into fast Random Access Memory (RAM); <i>start</i> and <i>end</i> specify the starting and ending segment addresses of an area of ROM to copy, AUTO copies all slow ROM to RAM, and NONE disables copying.
/USE= <i>start-end</i>	Forces the memory manager to use a specified area of upper memory when it searches for usable memory; <i>start</i> and <i>end</i> are the starting and ending segment addresses of the area to use.

Option	Description <i>continued</i>
/VIDEO[= <i>start-]end</i>]	Makes unused video memory space available to applications when all the video memory is not being used by the video display adapter. Video memory (the upper memory immediately above 640 KB) is normally reserved for use by the video display adapter.
/XBDA	Keeps the extended BIOS data area (XBDA) at the top of conventional memory, for applications that require it to be there. If you enable sharing of video memory (/VIDEO), the memory manager automatically moves the XBDA to the bottom of conventional memory to allow contiguous memory.

EMMXMA

EMMXMA is a memory manager that provides EMS (expanded) memory for applications that can take advantage of it.

EMMXMA converts extended memory on XMA-compatible memory cards to expanded memory, which is mapped to a 64 KB window in upper memory.

To load and configure EMMXMA, add a DEVICE statement to the CONFIG.SYS file as follows:

```
DEVICE = C:\NWDOS\EMMXMA.SYS
  [ /FRAME=address ] [ /KB=nnnn ]
```

The following table describes the EMMXMA options:

Option	Description
/FRAME= <i>address</i>	Specifies the hexadecimal address for the start of the 64 KB mapping window. If you do not specify this option, EMMXMA automatically searches upper memory between C000H and DFFFH for a free 64 KB window.
/KB= <i>nnnn</i>	Specifies the total amount of extended memory to be allocated for EMS (expanded memory). If you do not specify this option, all available memory is used for EMS.

Making More Memory Available

Most programs require conventional memory; when a program fails to run, it is often because there is insufficient conventional memory available for it. You can make more conventional memory available for applications by minimizing the amount of conventional memory used by the operating system, device drivers, and other memory-resident programs. You can maximize the amount of available conventional memory in the following ways, all of which are described in detail in this chapter:

- ◆ Use the SETUP program to load and configure the memory manager (EMM386 or HIMEM), load DOS Protected Mode Services (DPMS), and run DOS in the High Memory Area (HMA).
- ◆ Use commands at the system prompt or in a batch file to load and execute programs in upper memory (HILOAD or LOADHIGH) and control lower, upper, and video memory areas (MEMMAX).
- ◆ Edit CONFIG.SYS manually to enable advanced memory manager options, run programs in upper memory (HIINSTALL/INSTALLHIGH), and load device drivers into upper memory (HIDEVICE/DEVICEHIGH).

Optimizing Memory Using SETUP

SETUP is a program that allows you to make changes to the system configuration. Refer to Chapter 9, "Configuring the System" for information about how to start the program. The following sections describe how to use the memory management portions of SETUP.

Loading and Configuring the Memory Manager

Before you can take advantage of extended, expanded, or upper memory, you must load a memory manager that enables these memory types. To load the memory manager, run SETUP, choose *DOS System and Memory Management*, choose *Memory Manager*, and then choose to load either the 386 (and later) memory manager (EMM386) or the 80286 memory manager (HIMEM), depending on your hardware.

After you choose to load a memory manager and exit SETUP, the CONFIG.SYS file is automatically updated with a DEVICE statement that loads the memory manager. The next time you boot your machine, the memory manager is automatically loaded and configured as specified in the DEVICE statement.

The options available for the memory managers are described in "Novell DOS 7 Memory Managers" on page 10-4. You can set many of these values in SETUP; the following sections describe how to do this.

Copying Slow ROM into Fast RAM (EMM386 and HIMEM)

The EMM386 and HIMEM memory managers can automatically copy data from read-only memory (ROM), which often executes slowly, to Random Access Memory (RAM), which executes much faster. EMM386 and HIMEM ensure that the RAM to which they copy ROM has the same address. Copying ROM to RAM is particularly useful when you have a video card that calls ROM to output characters, for example; character output will be faster.

To specify the ROM option in SETUP, choose to load either EMM386 or HIMEM, choose to configure the memory manager, and then choose to copy ROM to RAM.

If you want to specify particular memory areas from which to copy ROM, choose <Advanced Options screen>. You will see a memory table that can help you specify areas of memory. See "Advanced Memory Options" on page 10-13 for more information.

Providing LIM 4.0 EMS Support (EMM386 Only)

EMM386 can use extended memory to emulate an expanded memory driver, for applications that use LIM EMS 4.0 (expanded) memory. This means that expanded memory is available without a special add-on memory board.

To provide expanded memory support, enable the EMM386 FRAME option by running SETUP, choosing to configure EMM386, and then selecting LIM 4.0 EMS support.

If you want to specify the location in memory for the LIM EMS page frame, choose <Advanced Options screen>. You will see a memory table that can help you specify a location. See “Advanced Memory Options” on page 10-13 for more information.

Supporting MS Windows 3.0 in Standard Mode (EMM386 Only)

If you are using MS Windows 3.0 in Standard (80286) mode, the program will not normally run under EMM386. EMM386 can support MS Windows 3.0 in Standard mode, however, if you choose to enable the WINSTD option, to disable upper memory. Do this by running SETUP, choosing to configure EMM386, and then selecting support for MS Windows 3.0 in Standard mode.

Using Spare Video Memory Space for RAM (EMM386 and HIMEM)

The video memory on your computer immediately above 640 KB is used by EGA/VGA video display adapters for displaying high resolution graphics. If high resolution graphics are not required, however, EMM386 and HIMEM can make the spare memory available for applications. This can provide up to 96 KB of additional memory, depending on the kind of video display adapter you have: 64 KB if you have an MDA, Hercules*, or EGA/VGA (monochrome) adapter and 96 KB if you have a CGA or EGA/VGA (color) adapter.

To make spare video memory available, run SETUP, choose to configure EMM386 or HIMEM, and select to use spare video memory space for RAM. If you specify this option, the default is to use all spare video memory space, beginning at segment address A000. You can specify an ending segment address for the memory, but only by editing CONFIG.SYS yourself; refer to for the table of EMM386 options in “Novell DOS 7 Memory Managers” on page 10-4 for the VIDEO option syntax.



If you have an EGA or VGA video display adapter, /VIDEO only *reserves* video memory. Before it can be made available, you must also run MEMMAX +V to enable the use of video memory. If you want to use graphics, you must return the video memory to the video display adapter by running MEMMAX -V. MEMMAX +V and MEMMAX -V can be run at the system prompt or in AUTOEXEC.BAT. See “Enabling and Disabling Lower, Upper, and Video Memory” on page 10-16 for more information about the MEMMAX command.

Loading DPMI (EMM386 Only)

You can load the DOS Protected Mode Interface (DPMI) if you are using programs that require it.

To load DPMI, run SETUP, choose to configure EMM386, and then choose to load DPMI. When you exit SETUP, the DPMI option is automatically added in CONFIG.SYS and when you next boot the machine, this change takes effect.

To temporarily enable or disable DPMI, you can use the following command at the system prompt:

DPMI=ON | OFF

Reserving Extended Memory for non-XMS/LIM Applications (EMM386 Only)

EMM386 can reserve a certain amount of extended memory for applications that cannot use XMS or LIM 4.0 EMS (expanded) memory.

To specify the amount of reserved memory in SETUP, choose to configure EMM386 and then enter the amount. This will automatically set the INT15 option and the change will take effect the next time you boot the machine.

Advanced Memory Options

If you choose <Advanced Options screen> when configuring EMM386 or HIMEM in SETUP, you see a table which indicates how memory is currently being used. You can set the following options for EMM386 or HIMEM on this screen:

- ◆ Specific areas of ROM to copy to RAM (ROM option). Specify the starting and ending addresses of each memory area. You can also specify AUTO (which copies all slow ROM to RAM) or NONE (to disable copying of ROM). If you do not specify this option, NONE is the default.

- ◆ Memory areas that should be tested by the memory manager when it searches for usable memory (INCLUDE option). Use this option when you know about an area of memory that you suspect is available but which normal scanning by the memory manager would define as not available. Specify the starting and ending addresses of each memory area; the default, if you do not specify this option, is to let EMM386 or HIMEM determine which memory areas are available.
- ◆ Memory areas to exclude when the memory manager searches for usable memory (EXCLUDE option). Specify the starting and ending addresses of each memory area that you do not want the memory manager to use; the default, if you do not specify this option, is to let EMM386 or HIMEM determine which memory areas are available.

You can also set the following option, if you are using EMM386:

- ◆ Location of the LIM 4.0 EMS page frame (FRAME option). This is where EMM386 will establish a 64 KB window in upper memory, as long as 64 KB of contiguous memory is available at that address. You can specify an address or you can specify NONE (to disable expanded memory emulation) or AUTO (to let the memory manager search between addresses C000H and FFFFH and find its own location for the window). If you do not specify this option, the default is AUTO.

Running DOS in High or Upper Memory

If you do not have extended memory, the operating system software is loaded in the lowest part of conventional memory (DOS=LOW).

If your computer has extended memory, however, you can make more conventional memory available to your applications by running the DOS software in the High Memory Area (HMA) and in upper memory (when the HMA is not available). DOS=HIGH,UMB is the default for the operating system when extended memory is available. In order for high or upper memory to be enabled, a memory manager (EMM386 or HIMEM) must be loaded first. Refer to "Loading and Configuring the Memory Manager" on page 10-10 for information about memory managers.

You can also force the operating system software to use the HMA or upper memory exclusively (DOS=HIGH or DOS=UMB).

To change the default location of the operating system, run SETUP, choose *DOS System and Memory Management*, and then choose *Memory Manager*. You can specify Conventional Memory, Upper Memory, or High Memory. SETUP automatically updates the DOS command in CONFIG.SYS and the next time you boot your machine, the new DOS setting takes effect.



When you choose High Memory, DOS=HIGH,UMB is added in CONFIG.SYS. To specify high memory only edit the CONFIG.SYS file manually.

Loading DPMS Software

Load the DOS Protected Mode Services (DPMS) driver (DPMS.EXE) when you are using Stacker* disk compression, the NWCACHE program, DELWATCH, or the Personal NetWare server (SERVER.EXE), all of which use DPMS to reduce the amount of space they occupy in conventional memory. DPMS allows these programs to run in protected mode, outside of conventional memory. Load the DPMS software by running SETUP, choosing *DOS System and Memory Management*, choosing *Memory Manager*, and then choosing to load DPMS. You must have a memory manager (EMM386 or HIMEM) loaded before DPMS can load.

Optimizing Memory at the System Prompt

The following sections describe the commands you can use at the system prompt to optimize memory, assuming that upper memory is made available by a memory manager (EMM386 or HIMEM).

Running a Program in Upper Memory

You can load and execute a specified program in upper memory, rather than conventional memory, by using the HILOAD or LOADHIGH command at the system prompt. This command can be abbreviated to LH. The full syntax of the command is as follows:

```
HILOAD | LOADHIGH | LH [/?|/H] filespec
```

If you specify */?* or */H*, you see online help about the HILOAD/LOADHIGH command.

You must specify the *filespec* of the program you want to load high. This program will load and execute in upper memory, as long as upper memory is enabled by a memory manager (EMM386 or HIMEM) and is available.



Note

You cannot use HILOAD/LOADHIGH if you are using a third-party memory manager because third-party memory managers use different methods of mapping upper memory from EMM386 or HIMEM. Third-party memory managers usually provide their own utilities to load programs into upper memory.

The program will remain in upper memory until the next time you start the operating system.

If you want to load a program high every time you start the operating system, place the HILOAD or LOADHIGH command in AUTOEXEC.BAT rather than running it every time at the system prompt.

It is recommended that you load the following programs high if you want to use them: CURSOR.EXE, GRAPHICS.COM, GRAFTABL.COM, and JOIN.EXE. The following programs, however, will attempt to load themselves high by default, so there is no need to load them high yourself: KEYB.COM, NLSFUNC.EXE, and SHARE.EXE.

Enabling and Disabling Lower, Upper, and Video Memory

You can control lower, upper, and video memory at the system prompt, when required, by using the MEMMAX command. MEMMAX allows you to temporarily enable and disable memory areas. Some applications may not work properly when certain memory types are enabled or disabled.

The full syntax of the MEMMAX command is as follows:

```
MEMMAX [/?|/H] [-|+L] [/L] [-|+U] [/U] [-|+V] [/V]
```

If you specify */?* or */H*, you see online help about the MEMMAX command.

When you load the DOS software into high or upper memory, the lower (conventional) memory normally used by DOS is made available to applications. Some applications, however, will not work correctly in lower memory and may require lower memory to be disabled. Use MEMMAX -L to disable lower memory and MEMMAX +L to re-enable it. Use MEMMAX /L to display the current status of lower memory.

Because some applications are sensitive to upper memory, it is disabled by default when you start the operating system. Unless you are using HILOAD or LOADHIGH (which automatically enables and then disables upper memory), you may need to enable upper memory yourself in order to load device drivers and programs high. Use MEMMAX +U to enable upper memory and MEMMAX -U to disable it again. Use MEMMAX /U to display the current status of upper memory.

When you are using an EGA or VGA video display adapter, and you reserved video memory space by configuring the memory manager, you will need to enable the video memory with MEMMAX +V before it can be used by applications. To disable the use of video memory, use MEMMAX -V. Use MEMMAX /V to display the current status of video memory.

If you want a MEMMAX command to take effect every time you start the operating system, place it in AUTOEXEC.BAT rather than running it every time at the system prompt.

Switching EMM386 Between Protected Mode and Real Mode

The EMM386 memory manager is enabled automatically when it is required, providing extended memory according to the way in which it is configured in CONFIG.SYS. Some applications require the computer to be running in real mode, rather than protected or virtual 8086 mode, when they load. You can temporarily place the computer into real mode at the system prompt by disabling EMM386. Use EMM386 at the system prompt as follows:

```
EMM386 [ [ / ] AUTO | OFF | ON ]
```

EMM386 OFF puts the computer in real mode, EMM386 ON puts it back in protected/virtual 8086 mode, and EMM386 AUTO (the default) lets the memory manager turn itself off if possible but stays on when required.



Note

You may not be able to turn EMM386 off at the system prompt if the memory manager is providing upper memory or some other feature that requires protected mode. If this is the case, you must add the OFF option to the EMM386 DEVICE statement in CONFIG.SYS yourself by editing the file.

EMM386 Weitek Coprocessor Support

You can enable or disable DOS access to the Weitek coprocessor, if fitted on your machine, at the system prompt. Use EMM386 as follows:

```
EMM386 [ / ]WEITEK=[ ON | OFF ]
```

Optimizing Memory by Editing CONFIG.SYS

The following sections describe ways in which you can edit CONFIG.SYS to optimize memory usage.

If you are editing CONFIG.SYS yourself, ensure that the EMM386 or HIMEM memory manager is loaded before any other device driver that uses extended, high, upper, or expanded memory.

Advanced Memory Manager Options

There are certain EMM386 and HIMEM options that you can *only* enable by editing the DEVICE statement in CONFIG.SYS yourself. These options are described in the following sections.

Specifying the Chip Set or Memory Type (HIMEM Only)

HIMEM automatically detects the type of chip set on your computer (or EMS or permanent upper RAM). If the chip set or memory type is supported, HIMEM maps Shadow RAM into upper memory accordingly. You can use the CHIPSET option, however, when you experience difficulty mapping Shadow RAM or if you want to prevent mapping. Add the following to the DEVICE statement that loads HIMEM in CONFIG.SYS:

```
[ / ]CHIPSET=AUTO | chipset | NONE
```

AUTO (the default) allows HIMEM to determine the chip set or memory type automatically. NONE disables mapping of Shadow RAM.

You can specify any of the following as *chipset*:

Value	Explanation
AM286ZX	For Advanced Micro Devices Am286ZX/LX chip set.
EMSALL	For all EMS upper memory, including the page frame. This option disables use of EMS by all other programs.
EMSUMB	For EMS 4.0 or EEMS upper memory blocks. An EMS 4.0 or EEMS memory manager must also be loaded before HIMEM.
HEDAKA	For Ever-Success HEDAKA D60 chipset.
NEAT	For Chips and Technologies NeAT, NeATsx, LeAPSet, or LeAPSetsx chip set.
RAM	For permanent upper RAM. You must also use the /USE option to define the location of the RAM to HIMEM; see "Making an Area of Upper Memory Available (EMM386 and HIMEM)" on page 10-21.
SCAT	For Chips and Technologies SCAT chip set.

Controlling Support for COMPAQ Computers (EMM386 Only)

If you are using a COMPAQ 386 (or later) computer with at least 1 MB of memory, EMM386 automatically enables support to provide an additional 256 KB of extended memory. If you experience problems and want to disable this support, however, add the following option to the EMM386 DEVICE statement in CONFIG.SYS:

```
[ / ]COMPAQ=OFF
```

Setting the Machine Type for GATEA20 (EMM386 Only)

Normally, EMM386 automatically detects your machine type and controls address line A20 accordingly. If necessary, however, you can specify this information by adding the following option to the EMM386 DEVICE statement in CONFIG.SYS:

```
[ / ]GATEA20=type
```

You can specify any of the following as *type*:

Value	Explanation
AT	Standard AT or compatible.
HP	Hewlett-Packard Vectra.
MCA	Any machine with Micro Channel* Architecture (MCA), or a machine that is compatible with MCA in its method of switching gate A20. Many IBM* PS/2 machines are of this type.
XMS	Any machine with a third-party XMS driver loaded before EMM386 which provides gate A20 switching via the XMS interface.

Making an Area of Upper Memory Available (EMM386 and HIMEM)

You can make specific areas of upper memory available even if the memory manager would normally define them as not usable. Do this by adding the following option to the EMM386 or HIMEM DEVICE statement in CONFIG.SYS, where *start* is the hexadecimal starting segment address of each memory area and *end* is the hexadecimal ending segment address:

```
[ / ]USE=start-end[ , start-end ] . . . ]
```



Note

Because USE can map RAM over any hardware or ROM present in the specified memory area, you should not use it unless you are very experienced in allocating upper memory. Also, use conditional statements when you experiment with USE in CONFIG.SYS or have a bootable diskette available containing copies of your original CONFIG.SYS and AUTOEXEC.BAT files, in case you encounter problems.

Specifying Location of the VxD to MS Windows (EMM386 Only)

For MS Windows 3.0 or later in Enhanced mode, you can specify the location of the EMM386 VxD. The default location is the location from which EMM386 is loaded. If you need to specify a different location, add the following option to the EMM386 DEVICE statement in CONFIG.SYS, where *path* is the VxD location:

```
[ / ]VXD=path
```

Preventing Relocation of the Extended BIOS Data Area (EMM386 and HIMEM)

When you enable the use of spare video memory by applications, the memory manager moves the extended BIOS data area to the bottom of conventional memory. This is because its presence at the top of conventional memory would prevent that being contiguous with video memory. Certain applications, however, are sensitive to relocation of the extended BIOS data area. To prevent relocation, add the following option to the EMM386 or HIMEM DEVICE statement in CONFIG.SYS:

```
[ / ]XBDA
```

Running a Program in Upper Memory

You can load and execute a specified program in upper memory, rather than conventional memory, by using the HIINSTALL or INSTALLHIGH command in CONFIG.SYS. HIINSTALL or INSTALLHIGH performs the same function as HILOAD or LOADHIGH except that it is processed as part of CONFIG.SYS rather than at the system prompt or in a batch file (such as AUTOEXEC.BAT).

The full syntax of the command is as follows:

```
HIINSTALL | INSTALLHIGH=filespec [options]
```

You must specify the full *filespec* of the program you want to load high. You can also specify any parameters (*options*) that you want to pass to the program.

This program will load and execute in upper memory every time you start the operating system, as long as upper memory is enabled by a memory manager (EMM386 or HIMEM) and is available. Before attempting to load a program into upper memory, you can check to make sure that there is enough upper memory available by running the MEM command; refer to the “Command Reference” chapter of DOSBook for information about MEM and its options.

Loading Device Drivers in Upper Memory

You can load an installable device driver into upper memory by replacing the DEVICE command in CONFIG.SYS with a HIDEVICE or DEVICEHIGH command.

The full syntax of the HIDEVICE or DEVICEHIGH command is as follows:

```
HIDEVICE | DEVICEHIGH [SIZE=nnnn] filespec
```

You must specify the name of the device driver (*filespec*) that you want to load high.

If you want to load a device driver that is unable to determine the amount of memory that it will ultimately need, you can also specify the amount of upper memory required for the driver (`SIZE=mmm`). To determine this amount, load the driver into conventional memory and then run the MEM command to see how much memory the driver uses. Refer to the “Command Reference” chapter of DOSBook for information about MEM and its options.

Additional Tips for Managing Memory

Because Novell DOS 7 is designed to work on any IBM-compatible personal computer and with any software application, there is no single memory configuration that is ideal for all situations. You may need to experiment before memory usage is optimized for your particular software and hardware.

Consider the following issues when you are experimenting with memory.

Disabling Expanded Memory

When you are using applications that do not require expanded memory, make sure that you disable expanded memory emulation when configuring EMM386 so that the page frame in upper memory is not defined. This saves 64 KB of memory. See “Providing LIM 4.0 EMS Support (EMM386 Only)” on page 10-11 for information about how to do this. If you are using HIMEM, use the `CHIPSET=EMSALL` option; see “Specifying the Chip Set or Memory Type (HIMEM Only)” on page 10-19 for more information.

Load Order

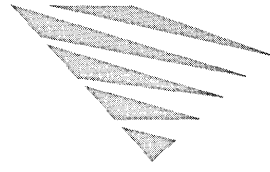
Load the device drivers and TSRs that occupy the most memory first. The documentation for a device driver or TSR may indicate the amount of RAM it requires. If not, however, you can load the driver or program into conventional memory and then use the MEM command to determine how much memory it uses. Refer to the “Command Reference” chapter of DOSBook for a detailed description of the MEM command and its options.

There are some exceptions to loading the largest device drivers and TSRs first; some programs need to be loaded in a particular order. Always read the documentation carefully before you install a device driver or TSR.

Some device drivers and TSRs temporarily require more memory when loading or "initializing" than they occupy afterwards. In these cases, the loading order may need to be changed to fit the program into upper memory. If a device driver or TSR does not find the required upper memory, it will automatically be placed in conventional memory. MEM can display the location of each program loaded in conventional and upper memory. Refer to the "Command Reference" chapter of DOSBook for a description of MEM.

Add-on Cards

If your computer has add-on cards that use RAM addresses, configure the cards so that the memory addresses used are close together and near the bottom or the top of upper memory. Address a network board, for example, immediately above the video memory area instead of somewhere in the middle of upper memory. Consult the documentation for the card for more information.



chapter **11** *Improving Disk Performance*

This chapter describes two programs that you can use to make the best use of your hard disk or diskette drive.

- ◆ DISKOPT “optimizes” disk performance by re-arranging data on the disk.
- ◆ NWCACHE makes your system run faster by caching data to reduce the amount of time your computer spends waiting for it.

Optimizing a Disk

DISKOPT is a “disk optimizer” that will improve the performance of a disk by doing the following every time you run it:

- ◆ Defragment files.

As programs read and write to the disk, files on the disk can become broken into multiple pieces of data that are stored in different locations. This is referred to as file *fragmentation*. It takes much longer for the system to read and write fragmented files than it does to read and write unfragmented files.

- ◆ Defragment free space.

The areas of free space between files are made contiguous and moved to the end of the disk.

Optionally, DISKOPT can also do the following:

- ◆ Change the location of files within the same directory so that they are physically adjacent
- ◆ Sort directories on the disk according to a specified criterion such as size or name

Before Running DISKOPT

Before you run DISKOPT, be aware that it can take some time, depending on the amount of data and degree of file fragmentation on the disk. The more often DISKOPT is run, however, the shorter the time each DISKOPT operation will take.

You can stop disk optimization at any time by pressing the <Esc> key but do not attempt to reboot the system or switch off the computer while DISKOPT is still running.

Also, take the following precautions before starting DISKOPT:

- ◆ Back up the data on the disk. If you need information about how to back up data, refer to the explanation of the FBX command in the “Command Reference” chapter of DOSBook.
- ◆ Ensure that no other program will use the hard disk while optimization is in progress. This is especially important to remember if your machine is a Personal NetWare server or if you are using the Task Manager or TSRs, for example, or the NWCACHE disk cache.
- ◆ Be aware that DISKOPT ignores system files; you can only include a system file in optimization by changing the file attribute. Refer to the explanation of the ATTRIB command in the “Command Reference” chapter of DOSBook for information about changing file attributes.

Starting DISKOPT

There are two ways of using DISKOPT: interactively using the DISKOPT screen and menus or by using a command line. Either way, you start the program by entering the DISKOPT command at the system prompt.

Using DISKOPT Menus

Type the following at the system prompt:

DISKOPT <Enter>

Optionally, you can also specify the letter of the drive you want to optimize. If you do not, however, DISKOPT will provide you with a list of drives from which to choose.

The DISKOPT screen consists of four elements: a title bar, the optimization “methods,” the legend describing the symbols used in the graphical representation of data on the disk, and the graphical representation itself.

- ◆ The title bar contains the names of four pull-down menus: Optimize, Method, Sort, and Help.
- ◆ The optimization methods indicate how much DISKOPT will do to the disk. You can change the optimization methods using the menus.
- ◆ The rest of the screen illustrates how much space on the disk is currently allocated. Read the legend at the bottom of the screen to identify the various symbols that represent blocks of data in the picture of the disk. Once you start to optimize the disk, the picture will change to indicate how data is being read and then rewritten by DISKOPT.

Note



The default methods are displayed unless you specified different methods in the command line; see “Using the DISKOPT Command Line” on page 11-6.

Open a pull-down menu by clicking on it with your mouse or by pressing the <Alt> key along with the highlighted letter in the menu name.

Once a menu is open, you can move between the four menus using the <left-cursor> and <right-cursor> keys.

Close a menu by either selecting an option, pressing <Esc>, or clicking on it twice with your mouse.

Select any of the options in an open menu by clicking on them with the mouse or by moving the selection bar with the cursor keys and pressing <Enter>. You can also select an option by typing the highlighted letter in the option name. For example, to sort by date, press <Alt> S to open the Sort menu and then D to select the *Date* option.

Changing the Optimization Method

You can change the current optimization method (the method displayed on the screen) by using the Method menu. The options on this menu are as follows:

Menu Option	Explanation
Full O ptimization	Defragments files and free space. No directory sorting is always the default.
Full Optimization with File R eorder	Defragments files and free space on the disk and moves files within the same directory so that they are physically adjacent. This method is slower than Full Optimization only.
F ile Defragment Only	Defragments files but not free space. This method is very fast but leaves gaps of free space between files.
Free S pace Defragment Only	Defragments free space without defragmenting files.
Sort D irectories Only	Sorts directories only; files and free space are not defragmented. Use the Sort menu to change the sort criteria (alphabetically by name is the default).
Full Optimization with R estack	Defragments the disk and recompresses data. Use this option on Stacker* drives which have been converted from DoubleSpace and SuperStor* drives.

Sorting Directories

If you chose an optimization method that includes directory sorting, you can specify the criteria for sorting by using the Sort menu. The options on this menu are as follows:

Menu Option	Explanation
N ame	Sorts directory entries alphabetically by name. This is the default.
E xtension	Sorts directory entries alphabetically by file extension.
D ate	Sorts directory entries by date, from oldest to most recent.
S ize	Sorts directory entries by size, from smallest to largest.
N o sort	Leaves directory entries unsorted.

Starting Optimization

Start optimization, choose another disk drive, or cancel DISKOPT by using the Optimize menu. The options on this menu are as follows:

Menu Option	Explanation
C hange drive <Alt> D	Allows you to specify a different disk drive.
O ptimize disk	Starts disk optimization for the selected disk drive. You see a message indicating that DISKOPT is analyzing the disk. The screen reflects data movement while optimization is in progress. You see another message when optimization is finished.
E xit <Alt> X	Cancels DISKOPT and returns you to the system prompt.

You can interrupt optimization by pressing <Esc> and you can exit from the DISKOPT screen at any time by pressing <Alt> X. Do not, however, attempt to reboot the system or switch off the computer while DISKOPT is still running.

Using the DISKOPT Command Line

To bypass the DISKOPT menu options, simply enter the DISKOPT command followed by the appropriate command switches.

The full syntax of the DISKOPT command is as follows:

```
DISKOPT [/?|/H] [d:] [/B] [/Mx] [/O] [/Sx]
```

Command Switches	
/? or /H	Displays help text.
/B	Specifies a monochrome (no color) DISKOPT screen.
/Mx	Specifies the optimization method, where x can be one of the following: 1 Full Optimization 2 Full Optimization with File Reorder 3 File Defragment Only 4 Free Space Defragment Only 5 Sort Directories Only 6 Full Optimization with Restack
/O	Starts optimization immediately. The optimization and sorting methods used depend on how you specified the /M and /S switches. The default method is automatically determined by DISKOPT; the default for /S is to leave directories unsorted.
/Sx	Specifies the directory sort criteria, where x can be one of the following: a Sort alphabetically by name. e Sort alphabetically by file extension. d Sort chronologically by date. s Sort by file size, from smallest to largest. n Leave unsorted.

Caching Disk Data

Because of the high degree of repetition built into DOS disk processing, *caching* disk data, which eliminates repetitive disk accesses, provides significant improvements in disk performance. A *cache* is an area in memory that keeps copies of the data read from and written to your hard disk and diskettes. When a disk read is requested, data that is already in the cache is delivered directly from the cache to your program. Because the data is already in memory, it can be delivered faster. When the cache is full, the least recently used data is discarded (or written to disk) to make space for newer data.

In Novell DOS™7, disk caching is provided by NWCACHE, which includes the following features:

- ◆ Caches data on all types of compressed drives (Stacker, SuperStor, DoubleDisk)
- ◆ Shares memory with other applications automatically
- ◆ Reduces its resident memory requirements by using DPMS to load itself into extended memory, if available

The following sections in this chapter explain how to use NWCACHE and all of its features.

Memory Requirements

If DOS Protected Mode Services (DPMS) is loaded, NWCACHE will use it to load itself into extended memory. This means that the size of the resident NWCACHE code in conventional or upper memory can be kept down to maximize the memory available to your applications. For information about loading DPMS, refer to Chapter 10, "Managing Memory."



The cache Lookahead buffer cannot load into extended memory. For more information about memory and the Lookahead buffer, refer to "Using Upper Memory" on page 11-19.

The resident memory requirements for NWCACHE are as follows:

Resident program:	5 KB	(10 KB if DPMS is not used)
Lookahead buffer:	4 to 16 KB	
Control tables (for extended memory cache):	0 KB	(1 KB plus 3 KB per megabyte of cache if DPMS is not used)
Control tables (for expanded memory cache):	0 KB	

Note



If your system configuration requires double buffering of disk transfers, an additional 2 KB of resident conventional memory will be required by the DBLBUF.SYS driver. See "Configuration Issues" on page 11-18 for more information about double buffering.

Various command options affect the placement and utilization of memory. See the next section, "Loading and Configuring NWCACHE" on page 11-9, for information about these command options.

If your system CPU is an 80286 and has extended memory installed, you should load the HIMEM memory manager before adding NWCACHE to your system. Using HIMEM resolves compatibility issues that arise when different programs attempt to share extended memory.

If your system CPU is a 386* or later, you should install the EMM386 memory manager before adding NWCACHE to your system. EMM386 allows using upper memory for program loading, and will allow you to convert extended memory to EMS memory if needed.

Refer to Chapter 10, "Managing Memory," for information about loading HIMEM or EMM386.

Loading and Configuring NWCACHE

The NWCACHE start-up command and its options determine the size of the cache and the type of memory it will use, which drives will be cached, where the cache program will be loaded, the Lookahead buffer size and location, and initial operational settings for the cache.

When NWCACHE loads into memory, it automatically caches all available disk drives; refer to “Selecting Drives to Cache” on page 11-13 for information about including or excluding specific drives.

The full syntax of the NWCACHE start-up command is as follows:

```
NWCACHE [/?|/H] [d[:]|d[:]+|d[:]-] [maxsize|minsize]
[/A20] [[/BE|/BL|/BU][=size]] [/CHECK]
[/DELAY=ON|OFF|time] [/E] [/L] [/LEND=ON|OFF]
[/MU[X]|/ML[X]] [/W=size] [/X=address]
```

You can use the start-up command at the system prompt to load and configure NWCACHE. To load the cache automatically every time you start the operating system, however, use the SETUP program or edit the start-up command line in AUTOEXEC.BAT. Refer to “Using SETUP to Load NWCACHE” on page 11-11 for more information.

Table 11-1
NWCACHE Start-up Options

Options	
/? or /H	Displays start-up help.
d[:]+	Forces caching of drive <i>d</i> with delayed write mode enabled. Refer to “NWCACHE Write Modes” on page 11-14 for information about write modes.
d[:]-	Excludes DOS drive letter <i>d</i> from caching. Note that you cannot use an NWCACHE control option to re-enable caching for a drive disabled at start-up.
d[:]	Forces caching of drive <i>d</i> as a write-through drive.
maxsize	Specifies the maximum size of the cache. By default, NWCACHE uses all available expanded or extended memory up to 7670 KB (the maximum size of the cache).

Table 11-1 *continued***NWCACHE Start-up Options**

Options	
<i>minsize</i>	Specifies the minimum size of the cache. The default is based on the amount of available memory, as described in the section "Setting the Cache Size" on page 11-15.
/A20	Suppresses enhanced A20 mode, if you are using the extended memory cache. This option degrades cache performance, and should be used only when required to resolve unusual compatibility problems. Also, you can only use it if an XMS memory manager is <i>not</i> loaded.
/BE[=size]	Loads the Lookahead buffer into EMS memory and, optionally, specifies the buffer size (4 to 16 KB). The /BE option should be used with care, as some add-on memory boards are very slow and can reduce cache performance substantially.
/BL[=size]	Loads the Lookahead buffer into conventional memory and, optionally, specifies the buffer size (4 to 16 KB). This is the default. See "Setting the Lookahead Buffer Size" on page 11-15 for more information about the Lookahead buffer.
/BU[=size]	Loads the Lookahead buffer into upper memory and, optionally, specifies the buffer size (4 to 16 KB).
/CHECK	Enables a cache memory diagnostic test when the cache is started.
/DELAY=OFF	Disables write delay, and sets all drives to write-through mode.
/DELAY=ON	Enables write delay. The default is 5000 milliseconds.
/DELAY= <i>time</i>	Specifies the write delay value in milliseconds (50 to 5000). When the write delay value is 50 or more, write requests may be accumulated in the cache before being written to the drive.
/E	Forces the use of EMS memory for the cache.
/L	Forces the use of conventional memory for the cache.
/LEND=ON	Enables or disables sharing of cache memory with other programs which require XMS or EMS memory. When lending is enabled, NWCACHE monitors allocation requests for XMS and EMS memory, and automatically reduces the cache size to fulfil the request. When the requesting program releases the borrowed memory, it is returned to the cache. Refer to "Sharing Cache Memory" on page 11-16 for more information.
/LEND=OFF	

Table 11-1 *continued*
NWCACHE Start-up Options

Options	
/ML[X]	Loads NWCACHE into conventional memory. /ML overrides the default of using DPMS to load NWCACHE into extended memory; to load NWCACHE into conventional memory and into extended memory via DPMS, use the /MLX option.
/MU[X]	Loads NWCACHE into upper memory (memory addresses above 640 KB and below 1 MB), if available. /MU overrides the default of using DPMS to load NWCACHE into extended memory; to load NWCACHE into upper memory and into extended memory via DPMS, use the option /MUX. Do not use this option if you are using Maximize (386MAX*), Optimize (QEMM*), or a similar product to assign fixed upper memory addresses.
/W=size	Sets the delayed write data limit (0 to 7670 KB). This option limits the amount of delayed write data which can be accumulated in the cache. If the limit is set to 0, write requests for all drives are satisfied immediately. If the limit is set to a non-zero value <i>n</i> , no more than <i>n</i> KB of delayed write data will be held back before writing. If you do not set this option, the entire cache area may be used for write data.
/X[=address]	Forces the use of extended memory for the cache. If no memory manager is loaded, but the computer has extended memory, specify the location of the cache buffer in <i>address</i> (above 1024 KB). You cannot specify the location if you have EMS memory.

Using SETUP to Load NWCACHE

You can load and configure NWCACHE using the SETUP program. Start SETUP, choose *Disk Performance* from the SETUP main menu, and then select the *NWCACHE disk cache*. The start-up command line will be added to AUTOEXEC.BAT when you exit SETUP and the cache will load automatically the next time you reboot the system.

If you load the cache using SETUP, you can also specify the following cache settings:

- ◆ Maximum and minimum sizes for the cache (*maxsize* and *minsize*)
- ◆ Enable or disable write delay (/DELAY=ON/OFF)

- ◆ Enable or disable memory lending (/LEND=ON|OFF)

All other cache settings will be set to the default values. To change these settings, edit the start-up command line in AUTOEXEC.BAT yourself.

Refer to Chapter 9, "Configuring the System," for general information about the SETUP program and how to use it.

Controlling NWCACHE

The NWCACHE control command and its options allow you to display cache status, enable and disable caching, flush data from the cache, modify the cache program settings, and quit the cache.

The full syntax of the NWCACHE control command is as follows:

```
NWCACHE [/?|/H] [-|+] [d[:]|d[:]-|d[:]+]
          [/DELAY=ON|OFF|time] [/Q|/U] [/S] [/SIZE=MIN|MAX]
```

Use the control command line at the system prompt after the cache is started. The next time you reboot the system or reload the cache after unloading it, however, the cache settings will return to the values set in the start-up command line.

Table 11-2
NWCACHE Control Options

Options	
/? or /H	Displays cache control help text.
-	Flushes and disables the cache. This option completes any pending delayed writes, clears all drive data from cache memory, and disables the cache. Disk reads and writes are subsequently performed without caching, although NWCACHE remains in memory. You can re-enable caching with the + option.
+	Flushes and enables the cache. This option completes any pending delayed writes, clears all drive data from cache memory, and resets the cache statistics to zero. If the cache was previously disabled with the - option, caching is re-enabled.
d[:]+	Re-enables caching of drive <i>d</i> . Write delay enabled.

Table 11-2 *continued*

NWCACHE Control Options

Options	
<i>d[:]-</i>	Excludes DOS drive letter <i>d</i> from caching.
<i>d[:]</i>	Identifies DOS drive letter <i>d</i> as a write-through drive.
/DELAY=ON	Enables write delay. The default delay is 5000 milliseconds.
/DELAY= <i>time</i>	Specifies the write delay value in milliseconds (50 to 5000). When the write delay value is 50 or more, write requests for delayed write may be accumulated in the cache before being written to the drive.
/DELAY=OFF	Sets all drives to write-through. This option completes any pending delayed writes and sets all cached drives to write-through mode. Write delay may subsequently be re-enabled, either for all the drives with the /DELAY=ON option, or for individual drives using the <i>d+</i> control option.
/Q or /U	<p>Quits the cache. This option completes any pending delayed writes, permanently releases all buffer, cache, and control table memory, and attempts to remove the cache program from memory.</p> <p>NWCACHE may be unable to remove the cache program if another program has rehooked the system interrupt vectors. In this case, you must first remove the other program(s) from memory and then repeat the control command with the Q option.</p>
/S	Displays cache status. This option completes any pending delayed writes before displaying the cache status.
/SIZE=MIN /SIZE=MAX	Minimizes or maximizes cache size. This option completes any pending delayed writes, clears all drive data from cache memory, and either reduces cache memory to its minimum size or attempts to increase cache memory to its maximum start-up size.

Selecting Drives to Cache

NWCACHE automatically caches all fixed and removable disk drives. This includes any Stacker, SuperStor, or DoubleDisk compressed drives. RAM drives and remote network drives are excluded from caching as are CD-ROM or Bernoulli* drives and any other non-block devices.

You can use the *d:* and *d:-* start-up options to override NWCACHE's default selection of cached and non-cached drives. See "Loading and Configuring NWCACHE" on page 11-9 for more information.

NWCACHE Write Modes

NWCACHE supports three different protocols for writing data to the disk: write-through, buffered write, and delayed write. When you load and configure the cache during installation or SETUP, write-through mode is enabled for all drives, by default.

Write-through Mode

In write-through mode, write request data is written to the drive immediately. NWCACHE uses write-through mode to access drives with non-standard formats, which may not operate reliably with delayed or buffered writes. You can use the *d:* and /DELAY=OFF start-up options to override default settings and enable or disable write-through mode for specific drives. See "Loading and Configuring NWCACHE" on page 11-9. You can also use the *d+*, /DELAY=OFF and /DELAY=ON control options to do the same things once the cache is loaded into memory; see "Using SETUP to Load NWCACHE" on page 11-11.

Delayed Write Mode

NWCACHE can be configured to access fixed disks in delayed write mode, in which write requests are held in the cache for a few seconds before the data is written to the disk. NWCACHE uses the delay to eliminate duplicate sector writes and to combine multiple write requests into fewer and larger physical writes, reducing the number of disk accesses and the time required for writing.

You can use the /DELAY=*time* option (start-up or control) to change the default write delay value. See "Loading and Configuring NWCACHE" on page 11-9 and "Using SETUP to Load NWCACHE" on page 11-11 for more information.

Buffered Write Mode

Diskettes and other removable media drives are normally accessed in buffered write mode. Buffered write processing uses the Lookahead buffer to combine successive write requests into a single disk write for faster access. Buffered writes offer many of the benefits of delayed writes, while maintaining data integrity when the removable media is changed.

Setting the Lookahead Buffer Size

NWCACHE uses a special area of memory called the *Lookahead buffer* to consolidate multiple read and write requests into larger read or write commands, to minimize disk activity and increase system speed.

Lookahead efficiency is a critical factor in system performance. If too few sectors are read in, sequential file access is slowed; if too many sectors are read in, random disk access is slowed. Lookahead continually monitors the pattern of disk activity to dynamically select the best Lookahead size for each disk transfer.

NWCACHE normally allocates 16 KB of resident memory to the Lookahead buffer. You can, however, use the /BL, /BU, and /BE options to force the buffer to load into conventional, upper, or EMS memory. The buffer is loaded in conventional memory, by default. Refer to "Using Upper Memory" on page 11-19 for more information about memory and the Lookahead buffer. You can also set a different Lookahead buffer size by specifying *size* when you use the /BL, /BU, or /BE option. See "Loading and Configuring NWCACHE" on page 11-9 for more information.

Setting the Cache Size

The maximum and minimum size values for the cache are set when the cache is started. These values are determined by the amount of memory available and by the minimum and maximum sizes specified in the start-up command; see "Loading and Configuring NWCACHE" on page 11-9. You can also switch between the minimum and maximum cache size values after start-up by using the /SIZE=MIN and /SIZE=MAX control options; see "Using SETUP to Load NWCACHE" on page 11-11.

If a cache size specification is included in the start-up command, NWCACHE attempts to allocate a cache of that size. If no cache size is specified, or if the specified size cannot be allocated, NWCACHE will allocate as much memory as possible to the cache. The initial allocation size is assigned as the maximum cache size value.

If a valid minimum cache size value is included in the start-up command, NWCACHE will set the minimum cache size to this value. If no minimum size is specified, NWCACHE establishes a minimum size based on the amount of available memory, as follows:

Available Memory	Minimum Size
to 384 KB	0 KB
to 512 KB	32 KB
to 1 MB	64 KB
to 2 MB	512 KB
to 4 MB	1024 KB
to 6 MB	1536 KB
6 MB +	2048 KB

Sharing Cache Memory

NWCACHE's /LEND option allows automatic sharing of cache memory with other programs. With lending enabled, NWCACHE monitors other programs' requests for allocation of XMS and EMS memory, and reduces the cache size if needed to fulfil the request. When the requesting program releases the borrowed memory, NWCACHE automatically returns it to the cache. The cache size is kept between its established minimum and maximum sizes during lending. Lending is enabled by default when you install NWCACHE but you can also use the /LEND start-up option to disable it. See "Loading and Configuring NWCACHE" on page 11-9 for more information.

Displaying Cache Status

Cache status is automatically displayed when the cache is loaded. You can also display cache status at any time after that by using the /S control command switch; see "Using SETUP to Load NWCACHE" on page 11-11 for more information.

The top portion of the cache status display shows the current cache memory size and type, the minimum cache size, the current write mode for the cached drives, and the cache options currently in effect.

If caching is disabled, the message `Cache is inactive` will be displayed. If `Cache is inactive` is followed by an error code, a serious problem exists. An error code of 99 indicates that some other program is writing data into NWCACHE's control tables. Any other error code indicates a problem with your system's memory manager.

The disk usage statistics include the following information:

- ◆ The number of read requests DOS made, the number of physical disk reads that were actually performed, and the percentage of reads saved because the data was in the cache. The higher the percentage, the more benefit the cache is providing.
- ◆ The number of write requests that DOS made, the number of physical disk writes actually performed, and the percentage of disk writes saved.

The error statistics include the following:

- ◆ The number of memory manager errors. These are totalled whenever an error is detected in the computer's extended or expanded memory system.
- ◆ The number of disk transfer errors. These are totalled whenever an error is reported from your disk. DOS normally performs up to 5 retries for each error before displaying an error prompt. The NWCACHE status display counts *all* errors, including errors corrected by DOS retries. A large number of disk errors may indicate a serious problem which could significantly degrade system performance.

- ◆ The number of “ignore” error responses. Errors ignored by the user are totalled whenever a disk error is detected while performing a buffered or delayed write, and an ignore response is entered to the `Retry or Ignore?` prompt. Ignore responses may leave corrupted data on the disk.

The cache disk usage statistics are cleared and reset to zero whenever the cache is enabled or disabled. Disk error statistics are cumulative, and are unaffected by enabling or disabling of the cache.

Turning Off Power or Rebooting Your Machine

If you wish to turn off your system, first issue a cache disable command to ensure that any pending delayed writes are completed before the power is turned off.

The format of the cache disable command is as follows:

NWCACHE -

If you reboot your computer while delayed writes are pending, NWCACHE will complete all pending delayed writes before resuming the reboot sequence.

Configuration Issues

When you choose to enable NWCACHE via `SETUP`, a NWCACHE start-up command is inserted in `AUTOEXEC.BAT`, according to the options you choose in `SETUP`. Some configuration issues, however, especially the use of upper memory and correct load order, may require you to manually edit `CONFIG.SYS` or `AUTOEXEC.BAT`.

Setting DOS Buffers

The NWCACHE Lookahead facility greatly reduces the need for DOS buffers. For best performance, you should use 10 or fewer DOS buffers. This means your `CONFIG.SYS` file should set `BUFFERS` to 10 or less.

Using Upper Memory

If you are using a 386 (or later) computer, you may have upper memory available. NWCACHE will load into this upper memory by default, making more conventional memory available for running programs. NWCACHE may, however, still place the cache program or control tables in conventional memory if you do not have enough upper memory to complete loading. See "Loading and Configuring NWCACHE" on page 11-9 for more information about the /ML[X] and /MU[X] options.

The Lookahead buffer is loaded in conventional memory by default. You can use the /BU option, however, to load it in upper memory. If you experience problems when the Lookahead buffer is loaded in upper memory (when you are using certain SCSI systems, for example), try keeping the buffer in conventional memory or use double buffering (see the following section).

Double Buffering

Some SCSI disk systems do not operate normally in advanced CPU configurations and the system may "hang" when programs are loaded high. This may indicate a need for double buffering of disk transfers. The operating system includes a double buffering program named DBLBUF.SYS. You can enable double buffering by manually inserting the line below in your CONFIG.SYS file at or near the beginning of this file, before any lines which load memory or network device drivers:

```
DEVICE=C:\NWDOS\DBLBUF.SYS
```

DBLBUF.SYS must be loaded into conventional memory; do not attempt to load DBLBUF.SYS high.

Load Order

Loading programs in the correct order will avoid compatibility problems. The programs listed below are grouped into two categories, depending on whether they must be loaded before or after NWCACHE.

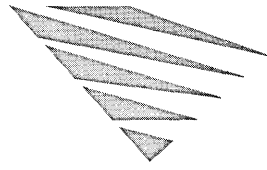
Load the following before NWCACHE:

- ◆ XMS managers (such as HIMEM.SYS)
- ◆ EMS and VCPI managers (such as EMM386)
- ◆ DOS extenders (such as DPMS and DPMS managers)
- ◆ Add-on disk drivers (such as DRIVER.SYS)
- ◆ Double buffering drivers (such as DBLBUF.SYS)

Load the following after NWCACHE:

- ◆ Any DOS network (including Personal NetWare™)
- ◆ Multitasking programs (such as Task Manager)

Other programs can be loaded before or after NWCACHE, as desired.



chapter **12** *Disk Compression*

The Stacker* program allows you to increase the capacity of a disk so that there is more space available for your data and programs.

Stacker uses *data compression*. Compressing a file makes it use less space by eliminating repetitive pieces of information. After compressing the drive by running Stacker on it, you use it exactly as you did before running Stacker. Data, however, is automatically compressed when written to the drive and automatically decompressed when read back from the drive.

The amount by which a disk drive can be compressed depends on the type of files stored on it. Word processor files usually compress to half their original size, for example, while spreadsheet files compress even more. Programs and command files tend to compress less because they do not contain very much repetitive data.

This chapter describes the Stacker program and how to use it.

Before Compressing a Drive

You should perform the following tasks before running the Stacker program.

Back Up the Contents of the Drive

Before making any changes to an entire disk drive, it is always a good idea to make a backup copy of its contents. Refer to the description of the FBX command in the “Command Reference” chapter of DOSBook for information about how to back up an entire disk drive.

Log Off the Network

If your computer is connected to the network, log off the network. You cannot compress network drives.

Remove Copy-Protected Software

If you have copy-protected software on the disk drive you want to compress, remove it; some copy-protected software may interfere with the compression process. You can replace the software on the disk drive after the compression process is finished. Refer to the documentation of specific applications for information about removing them from a disk and then replacing them again.

Exit Any Shell

Compression can only be done through the SETUP program under DOS. If you are using any other operating environment, such as MS Windows or GeoWorks*, exit from it before compressing a disk drive.

Check for Sufficient Free Space

The Stacker program requires working space on the disk drive being compressed. Make sure that there is at least 1 MB of free space on the drive. If you want to compress a bootable drive (usually drive C:), Stacker needs at least one percent of the total space plus an additional 45 KB of free space.

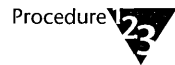
Compressing a Drive

You can compress any of the following:

- ◆ An existing hard disk drive including all the data on the drive
- ◆ The free space on an existing hard disk drive
- ◆ A blank diskette

You compress a disk drive using the SETUP program. Refer to Chapter 9, "Configuring the System" for general information about SETUP and how to use it.

After starting SETUP, do the following:



1. Choose *Disk Compression* from the main menu.

SETUP offers to reboot the computer to disable any software, such as TSRs and device drivers, that might interfere with the compression process.

2. Choose to reboot if you are aware of any such software.

It is recommended that you always choose to reboot.

SETUP displays a list of the disk drives currently available on your system, along with the type and capacity of each drive.

3. Select the drive you want to compress or cancel compression and return to the SETUP main menu.

When you choose a drive, SETUP displays the current status of the drive: the total amount of space and the amount of free space (in KB).

4. You can now choose to compress all of the data on the drive or to compress the free space only to create a new Stacker drive.

If you are compressing a diskette, the Stacker program will only compress a blank diskette; you cannot compress existing data on a diskette or any other type of removable drive.

Compressing the Entire Hard Disk Drive

Compressing the entire drive means that all existing data on the drive will be compressed. After the drive is compressed, there will be more free space.

Procedure



- 1. Choose to compress the entire drive and SETUP displays a message that it is ready to begin compression. Then choose to begin compression or, if you have changed your mind, you can cancel compression and return to the SETUP main menu.**

You see several different processes as the drive is compressed. They are as follows:

- ◆ Stacker begins by compressing all the files on the drive. You see a “progress bar” that indicates how much Stacker has completed so far.
- ◆ Once the files are compressed, Stacker runs the DISKOPT disk optimizer on the drive so that the files on the Stacker drive will not be fragmented. You see the DISKOPT display; refer to Chapter 11, “Improving Disk Performance” for a complete description of DISKOPT and how it works.
- ◆ After DISKOPT is complete, Stacker scans the drive so that it can avoid any problem areas. You see a progress bar that indicates how much of the drive verification Stacker has completed so far.

For a detailed description of how Stacker is working, refer to “The Compression Process” on page 12-6.

- 2. When compression is finished, you see the size of the stacked disk and the amount of free space, before and after compression.**
- 3. If you choose to restart the operating system. SETUP reboots the computer and you can use all of your disk drives the same way you have always done.**

The compressed drive is automatically mounted and available for use.

After compressing a drive and rebooting, you will also notice that an additional drive, using the next available drive letter, has been created. This is the uncompressed drive associated with the Stacker drive. For information about this drive and its function, refer to "The Compression Process" on page 12-6.

Creating a Compressed Drive From Free Space on a Hard Disk

Instead of compressing an entire hard disk drive, you can choose to use all the free space on the drive to create a new Stacker drive. You compress free space the same way you compress the entire drive; refer to "Compressing the Entire Hard Disk Drive" on page 12-4 for a description. The only differences are as follows:

- ◆ Stacker only scans the disk space to verify its integrity; it does not compress files.
- ◆ An uncompressed drive is not created along with the new Stacker drive.

Creating a Compressed Diskette

If you are compressing a diskette, you can *only* compress a blank diskette; you cannot compress any existing data. When you compress a diskette, all existing data will be deleted before the diskette is compressed. After the diskette is compressed, any new data written to it will automatically be compressed.

Instead of using SETUP, you can quickly compress a blank diskette by using the CREATE command at the system prompt. Refer to the "Command Reference" chapter of DOSBook for information about the syntax and function of the CREATE command.

Converting DoubleSpace and SuperStor Drives

If you have DoubleSpace or SuperStor compressed drives on your computer, SETUP can automatically convert these drives to Stacker drives.

SETUP automatically detects the presence of DoubleSpace or SuperStor drives when you choose *Disk Compression* from the main menu. When prompted, choose whether or not to convert all DoubleSpace and SuperStor drives to Stacker drives.

After converting drives via SETUP, it is a good idea to make sure your data is as safe as possible by recompressing your data using DISKOPT. The DISKOPT program includes an option to perform a full optimization and “restack” of the drive. For information about running DISKOPT, refer to Chapter 11, “Improving Disk Performance.”

The Compression Process

When you are compressing existing data, the Stacker program works on an uncompressed disk drive as follows:

1. Stacker reserves a certain amount of space on the drive to remain uncompressed: 1 MB if the drive is bootable and 100 KB for any other drive. This uncompressed drive contains the files that need to remain uncompressed: IBMBIO.COM and IBMDOS.COM, for example, if the drive is bootable. The Stacker configuration file (STACKER.INI) and device driver (STACKER.BIN) are also stored in the uncompressed drive.
2. Stacker creates the STACVOL.DSK file to hold all the data on the drive. The STACVOL file fills the rest of the drive and will become the Stacker (compressed) drive.
3. Stacker compresses all the files on the drive and stores them in the STACVOL file.
4. Stacker creates a logical drive for the STACVOL file which is double the size of the file itself. The next available drive letter is used for the new logical drive.

5. Stacker switches drive letters so that you access the data on the compressed drive with the original drive letter, as you did before compression. Normally, only DOS needs to access the uncompressed drive.

When you are compressing the free space on a drive to create a new Stacker drive, the Stacker program works the same way except that it does not compress files and it does not create an uncompressed drive. The new Stacker drive (containing the STACVOL file) is mounted as the next available drive letter when you reboot the system.

Accessing Compressed Drives (STACKER.BIN and STACKER.INI)

The operating system needs information about how to access a compressed drive once it has been created.

When you run the Stacker program in SETUP, it copies the Stacker device driver, STACKER.BIN, to the root directory of your boot drive. STACKER.BIN remains uncompressed. It is loaded into memory at system startup before any device driver; other device drivers are loaded in CONFIG.SYS.

STACKER.BIN is configured specifically for your system. To do this, SETUP creates a hidden configuration file in the root directory of your boot drive called STACKER.INI, which sets the compression speed and defines STACVOL files as logical drives. Normally, you will not need to edit this file; SETUP creates and changes it automatically for you.

Mounting and Unmounting Compressed Drives

After the Stacker program is run on any of your disk drives, compressed drives are automatically mounted when you boot the system and available to use. You may, however, need to unmount a compressed disk to access the uncompressed drive. You will also need to unmount compressed diskettes before you can run the DOS DISKCOPY or FORMAT commands on them.

Unmount a compressed drive using the STACKER command at the system prompt. To mount a compressed drive, you can also use the STACKER command. Refer to the description of the STACKER command in the "Command Reference" chapter of DOSBook for more information.

Checking Compressed Drives

The Stacker program includes a way of checking the current status of your compressed drives, checking the integrity of those drives, and displaying information about them such as the compression ratio.

Displaying Drive Status

You can use the STACKER command at the system prompt to display a report on the status of each drive. Refer to the "Command Reference" chapter of DOSBook for information about the syntax and function of the STACKER command.

Checking Drive Performance and Usage

To check Stacker drive integrity, use the CHKDSK command. CHKDSK includes options that apply specifically to Stacker drives. Refer to the description of CHKDSK in the "Command Reference" chapter of DOSBook for more information.

Viewing Stacker Information in MS Windows

After you run Stacker, a Stacker pull-down menu is added to your File Manager the next time you go into MS Windows.

Choose one of the following from this menu:

◆ File Info

If you choose *File Info*, you see the name, type of file, size of the file, and compression ratio for the files selected. The bottom left corner of the screen contains the Sort Order buttons. The bottom right corner of the screen displays Overall Info, including the actual compression ratio for the files selected as well as the total bytes contained in the file.

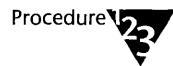
◆ Disk Info

If you choose *Disk Info*, you see the KB used and free for the entire compressed drive plus the expected and actual compression ratios for that drive.

Creating MS Windows Permanent Swap Files

When you are running MS Windows in 386 Enhanced mode, it frees memory and speeds up performance by swapping information from memory to a "swap file" on your hard disk (virtual memory). You can display or change the swap file settings by using the standard MS Windows Virtual Memory dialog box but you will not be able to create a permanent swap file on a Stacker drive.

To be able to create a permanent swap file on a Stacker drive, you must display and change information about your system's virtual memory as follows:



1. In the Main group, choose the Control Panel icon.
2. In the Control Panel window, choose the Virtual Memory icon.

The Virtual Memory dialog box appears, which displays the current swap file settings.

3. Choose the <Change> button, to change the drive location, size, and type for the swap file.

The dialog box expands, enabling you change the settings. You can now select a Stacker drive to contain a permanent swap file. You cannot create a temporary swap file on a compressed drive, however.

For further information about MS Windows swap files, refer to the appropriate section of your MS Windows documentation.

Decompressing a Compressed Drive

On rare occasions, you may want to decompress all the data on a compressed drive. You can reverse the compression process by using the UNSTACK command.

Note



You cannot decompress a compressed diskette.

UNSTACK removes all the files from the compressed drive, decompresses them, places them back on the uncompressed drive it created when you originally compressed the drive, and deletes the STACVOL file. Refer to “The Compression Process” on page 12-6 for information about how Stacker compresses the drive.

Start decompressing a drive by typing the following at the system prompt, where *d* is the drive letter of the compressed drive:

```
UNSTACK d: <Enter>
```

You see a display that shows the progress made so far in decompressing the drive.

Before it starts decompressing, Stacker checks to make sure all the data will fit on the uncompressed drive. If they will not fit, you are informed and Stacker indicates how much additional space is required. Delete enough files or move them to another disk drive before running UNSTACK again.

The UNSTACK display will also prompt you twice before proceeding to decompress the drive; this is a safety precaution.

Using a Compressed Diskette on a Computer Without Stacker

When you use a compressed diskette on a computer on which the Stacker program has been installed, the compressed diskette is automatically mounted. If you want to use a compressed diskette on a computer on which Stacker has not been run, however, you will need to manually mount the diskette and make it available for use.

An unmounted Stacker drive contains the following files only:

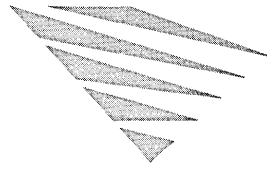
- ◆ STACVOL.DSK, the file containing the compressed data
- ◆ STACKER.EXE, the program that mounts the Stacker drive
- ◆ README.STC, which identifies this drive as a Stacker drive and tells you to run STACKER on it

To make the compressed drive available on a non-Stacker computer, simply run STACKER by typing the following at the system prompt, where *d* is the drive letter of the compressed drive:

```
STACKER d: <Enter>
```

If you need to unmount the compressed drive, type the following at the system prompt:

```
EXIT <Enter>
```

chapter **13** *Multitasking and Task Switching*

The operating system provides you with the ability to run more than one application at the same time. The program that provides this feature is referred to as the “Task Manager.”

Running multiple applications simultaneously, and being able to switch between them, means that your most frequently-used applications are always available instantly. You can also run multiple copies of the same application, such as a word processor. You can load multiple TSRs, to make the best use of memory.

You add applications as “tasks” to a menu, which you can display at any time. When you switch from one task to another, the task you switch from is “swapped out” to memory, or to a “swap file” on disk.

If your computer has a 386* processor (or later) with at least 2 MB of extended memory, you can use the Task Manager as a “multitasker,” running multiple tasks simultaneously and switching between them. Alternatively, you can use the Task Manager as a “task switcher” only, in which case you can switch between applications but those you switch from are suspended in the background until you return to them. If your computer is 80286-based, with at least 3 MB of memory, you can only use the Task Manager as a task switcher.

Loading and Configuring the Task Manager

You can load and configure the Task Manager using SETUP (or INSTALL). SETUP will add a statement to AUTOEXEC.BAT to load TASKMGR.EXE and will also provide the necessary memory management. Once loaded, the program is available at any time; there is no need to load it at the system prompt every time you want to use it.

You can load the Task Manager at the system prompt using the TASKMGR command. If you are loading the task switcher only, you can configure the Task Manager this way. To load the Task Manager at the system prompt as a multitasker, the EMM386 memory manager must be configured for multitasking with the /MULTI switch. When you use the TASKMGR command, the program will only remain available until the next time you boot the machine.

Using SETUP to Load the Task Manager

Start SETUP and choose *Task Management* from the main menu. You can then set options for the Task Manager. If you are using the Task Manager as a task switcher only, you can also specify the type of memory you want the Task Manager to use. SETUP automatically updates the appropriate files (TASKMGR.INI, AUTOEXEC.BAT, and the EMM386 memory manager in CONFIG.SYS) when you exit the program. The next time you boot your machine, the changes take effect and the Task Manager is loaded automatically and as you specified in SETUP.

Multitasking or Task Switching

Choose to load either the multitasking or the task switching software. To use the multitasking software, your computer must have at least a 386 processor.

Task Manager Options

After you choose to load either the multitasking or the task switching software, choose to configure the Task Manager. You can set the following options:

- ◆ The key combination that activates the Task Manager menu. The shift key activates the “hot key” and the hot key (in combination with the shift key) displays the Task Manager menu. The default shift and hot key combination is <Ctrl><Esc>.



If you are loading the task switcher only and if you are going to load GeoWorks as a task, you *must* use <Ctrl><Esc> because GeoWorks intercepts all other key combinations. If you are using MS Windows with the task switcher, specify a key combination *other than* <Ctrl><Esc>.

- ◆ Global Drives and Paths. Choose this option to make drive mappings “global.” This means that any network resource you map to a drive letter in a task will be recognized in all subsequent tasks you add.

You can also set the following option, if you are loading the multitasking software:

- ◆ Foreground/background ratio. This value specifies the amount of processor time that will be allocated to the tasks running in the background. A value of 10, for example, means that the current (foreground) task gets ten times as much processor time as any single background task. If you had ten tasks running in the background, the current task would get fifty percent of total processor time. The default foreground/background ratio is 5.

You can set the following options if you are loading the task switcher only:

- ◆ The path for the swap file. This is a file on the hard disk that will be used when there is no more RAM available for the Task Manager. The default location for the swap file is C:\NWDOS\TMP. Before specifying a different location, make sure that there is enough free space available at that location for all the tasks that you want to run.

To increase task swapping speed, swap tasks to a memory disk. To calculate the size of the memory disk required, load all the tasks you want to run and note the size of the swap file created on the hard disk. Then create a memory disk that is slightly larger. Use the VDISK.SYS device driver in CONFIG.SYS to create a memory disk. You can enable VDISK.SYS with the SETUP program. Refer to Chapter 9, “Configuring the System” for information about creating memory disks.

Allocating Memory for the Task Manager (Task Switching Only)

The Task Manager can use extended or expanded (EMS) memory, rather than conventional memory, if these memory types are available. Refer to Chapter 10, “Managing Memory” for information about enabling extended or expanded memory.

The Task Manager uses extended memory, if available, by default. You can change the amount of extended memory to reserve for the program; by default, 1024 KB is reserved. You can also specify 0 KB to disable the use of extended memory.

If you want the Task Manager to use expanded memory, specify the amount of expanded memory to reserve for the program. The default is 0 KB (use of expanded memory is disabled).

To change memory settings for the multitasker, you must edit the TASKMGR.INI file directly. Refer to the following section, "Changes Made by SETUP" for information about TASKMGR.INI.

Limiting the Amount of Memory Used per Task

Whether you are using the multitasker or the task switcher, you can specify the maximum amount of extended or expanded memory that can be used by any single task. The limit you specify applies to whichever type of memory the Task Manager is configured to use. Some applications will try to allocate all the available extended or expanded memory to themselves when they load; in this case, there may not be any further memory available for other applications.

To change memory settings for the multitasker, you must edit the TASKMGR.INI file directly. Refer to the following section, "Changes Made by SETUP" for information about TASKMGR.INI.

Changes Made by SETUP

When you load and configure the Task Manager using SETUP, the appropriate changes are made to the TASKMGR.INI file, the AUTOEXEC.BAT file, and the EMM386 memory manager in CONFIG.SYS.

The TASKMGR.INI File

The configuration of the Task Manager is defined in a file called TASKMGR.INI, a special configuration file used only by the Task Manager. TASKMGR.INI is stored in the C:\NWDOS directory by default or in the directory specified by the NWDOSCFG environment variable; you can specify a different directory for configuration files in SETUP. You can also set the NWDOSCFG variable yourself using the SET command; refer to the "Command Reference" chapter of DOSBook for a description of the SET command.

TASKMGR in AUTOEXEC.BAT

The TASKMGR command loads the Task Manager software. When you load and configure the Task Manager in SETUP, the TASKMGR command is automatically added to AUTOEXEC.BAT, so that the software loads every time you start the operating system. You can also use TASKMGR at the system prompt; refer to "Loading the Task Manager at the System Prompt" on page 13-7 and "Working with Tasks at the System Prompt" on page 13-14.

EMM386 DPMI Support (Multitasking Only)

If you load the multitasking software, DOS Protected Mode Interface (DPMI) support is also provided via the EMM386 memory manager. DPMI allows applications to access the protected mode features on 386 (and later) computers. The DPMI switch, which enables DPMI support to improve multitasker performance, is automatically added to EMM386 in CONFIG.SYS, along with the MULTI switch, when you choose to load the multitasking software in SETUP. Refer to Chapter 10, "Managing Memory" for more information about the EMM386 memory manager.

Task and System Environments

When you choose to load the Task Manager, be aware of the relationship between the *local* environment that each task create and the operating system's *global* environment, which each task w inherit. If you load a TSR as a task, for example, it can only be use within the task and will only use memory available within that tas The Task Manager program is loaded into the global environmen which includes all currently-loaded device drivers, TSRs, and all currently available memory. Anything that you want all tasks to share must, therefore, be loaded before the Task Manager.

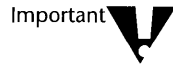
You should attempt to keep the number of programs loaded global to a minimum because each program loaded before the Task Manager reduces the amount of memory available to the applications you load as tasks. Programs you should load before tl Task Manager, however, could include the following:

- ◆ Print spoolers, which allow you to print files without stoppin the computer from performing other tasks at the same time. you load a print spooler within a task, you can only use it whi that task is active.
- ◆ Network drivers.
- ◆ Mouse drivers.
- ◆ The MEMMAX command. You cannot use MEMMAX while using the Task Manager so you should make sure that you specify the appropriate switches (such as +V to enable sharin of video memory) before you load the Task Manager.

Because the Task Manager is loaded in AUTOEXEC.BAT (by the TASKMGR command) and the statements in AUTOEXEC.BAT are processed in the order in which they appear, any changes to the global environment that you want all tasks to share must be locat before the TASKMGR command. If necessary, you may need to ec the AUTOEXEC.BAT file yourself using EDIT or another text edit

Using Disk Utilities

Before loading the Task Manager, you should also run any disk utilities (such as disk optimizers and disk editors) that you want to use. Some of these will work under the multitasker, but you may see a warning message when they load.



Using disk utilities while the Task Manager is loaded could result in disk corruption.

Loading the Task Manager at the System Prompt

You can load and configure the Task Manager at the system prompt, using the TASKMGR command. The changes you make using TASKMGR are only effective until the next time you boot your machine. Permanent loading and changes to the configuration of the Task Manager can only be made via SETUP or by editing TASKMGR.INI, AUTOEXEC.BAT, and CONFIG.SYS yourself. Refer to "Changes Made by SETUP" on page 13-4 for information about Task Manager configuration.

Different TASKMGR options are available depending on whether you previously loaded the multitasking or the task switching software using SETUP.

If the multitasking software is loaded, the only options available when loading the Task Manager at the system prompt are as follows:

TASKMGR [/?|/H] [/M] [/S?|/SH] [/S]

Command Switches	
/? or /H	Displays help text for the multitasker.
/M	Allows you to switch tasks using the numeric keys on the keyboard, when you are using a keyboard that does not have a separate numeric keypad.
/S? or /SH	Displays help text for the task switcher only.
/S	Loads the task switcher instead of the multitasker, even if the multitasking software was enabled in SETUP.

If the multitasker is not enabled, use the TASKMGR command as follows:

```
TASKMGR [/?|/H] [/D=dirpath] [/E[=nnnn]] [/F] [/M]
          [/V[:1]] [/X[=nnnn]]
```

Command Switches

<code>/?</code> or <code>/H</code>	Displays help text.
<code>/D=<i>dirpath</i></code>	Specifies the location (<i>dirpath</i>) of the swap file. The swap file is used for storing suspended tasks when there is no RAM available. The default is C:\NWDOS\TMP.
<code>/E[=<i>nnnn</i>]</code>	Allocates the specified amount of extended memory (<i>nnnn</i> KB) to the Task Manager. Tasks will be swapped to extended memory. If you do not specify an amount, or if you specify an amount greater than the amount available, all the available extended memory is used. To disable the use of extended memory and reserve it for applications, specify <code>/E=0</code> .
<code>/F</code>	Saves user-defined fonts and code pages when you switch tasks.
<code>/M</code>	Allows you to switch tasks using the numeric keys on the keyboard, when you are using a keyboard that does not have a separate numeric keypad.
<code>/V[:1]</code>	Forces a VGA display to be accessed in the same way as an EGA display. Try <code>/V:1</code> first, then <code>/V</code> if necessary.
<code>/X[=<i>nnnn</i>]</code>	Allocates the specified amount of expanded (EMS) memory (<i>nnnn</i> KB) to the Task Manager. Tasks will be swapped to expanded memory. If you do not specify an amount, or if you specify an amount greater than the amount available, all the available expanded memory is used. To disable the use of expanded memory and reserve it for applications, specify <code>/X=0</code> .

Using the Task Manager Menu

Press <Ctrl><Esc> (or the shift and hot key combination you specified during SETUP) to display the Task Manager menu.

The Task Manager menu appears in the top right corner of the screen. If you are running a graphics application, such as a drawing package, the screen clears before the menu appears; you return to the application when you exit the menu.

The menu has two parts: a task list on the left side, which lists the tasks you add, and an option list on the right side. The initial options (before you add any tasks) are *About TaskMgr*, *Create new task*, and *Remove TaskMgr*.

Select an option from the Task Manager menu by pressing the key shown to the right of the option; press to remove the Task Manager, for example. You can also select an option by clicking your mouse on it. Each of the menu options are explained in the following sections of this chapter.



If you are using a non-enhanced keyboard, you can press <F2> and <F4> instead of <Ins> and .

When you display the menu before adding any tasks, the task list already contains one task, COMMAND, that represents your current session. Tasks are listed in the menu in the order in which you add them. Your current task (the one you are, or were most recently, using) is indicated by an arrow in the task list.

To move around the task list, use one of the following:

- ◆ The <up-cursor> and <down-cursor> keys
- ◆ The <Spacebar> (which moves down the menu and then jumps to the top)
- ◆ The <Tab> and <Shift><Tab> keys (which move ahead or back a task respectively)

To cancel the Task Manager menu, press <Esc>. Cancelling the menu does not unload the Task Manager program; it simply removes the menu from the screen.

Adding Tasks

You can add tasks up to the limit of your available memory but you should limit the Task Manager to the tasks you use frequently.

A task, once loaded, remains loaded until you delete it, unload the Task Manager program, or reboot the computer. If you load a TSR as a task, the Task Manager automatically recognizes it as a TSR so that even when you are not running the program, it stays loaded as a task and appears in the Task Manager menu.

Before adding a task, make sure there is enough space for it. Check the amount of space already used by selecting the *About TaskMgr* option on the Task Manager menu; refer to "Showing the Space Available for Tasks" on page 13-11 for information about this option. Graphics applications can require up to 800 KB. If you try to add a task and there is not enough space for it, you see a warning message. Remove an existing task and continue.

To add a task, do the following:

Procedure



1. **Press <Ctrl><Esc> (or the shift and hot key combination you specified) to display the Task Manager menu.**
2. **Select the option to create a new task by pressing the <Ins> key or clicking your mouse on the option.**

You return to the system prompt.

3. **Display the Task Manager menu again.**

There is now a second task called COMMAND in the task list and the option to delete a task now appears in the menu, replacing the option to remove the Task Manager. Press <Esc> to cancel the menu.

4. **Start the application that you want to add as a task.**

Start the application in the same way that you would normally start it; change to the appropriate drive and directory, for example, or run the appropriate batch file. As an example, start EDIT; type EDIT and press <Enter>.

EDIT (or whichever application you started) is now loaded as a task.

5. **Once the application is loaded, the Task Manager menu can be displayed by pressing <Ctrl><Esc> (or the shift and hot key combination you specified) as before.**

The application appears in the task list as the second task.

Note that the task name in the list can be a maximum of 8 characters long, so if the name of an application is longer than 8 characters, the Task Manager shows an abbreviated version of the name. Also, if the Task Manager cannot determine the name, you see Task *n* as the task name, where *n* is the number of the task in the list.

6. **Continue to add applications between which you want to switch.**

Remember that you can only switch between applications that you add as tasks to the Task Manager menu.

7. **If you add the maximum number of tasks (20), the option to create a new task disappears from the menu so that you cannot add another task.**

Adding COMMAND.COM as a Task

The Task Manager is designed for running multiple applications but you can also load several copies of the command processor (COMMAND.COM) as separate tasks. You can then use COMMAND at the system prompt to customize the local environment for each COMMAND.COM. Refer to the “Command Reference” chapter of DOSBook for information about using COMMAND.



Note If you already have more than one copy of COMMAND.COM loaded before you load the Task Manager, you can only load the Task Manager from the original COMMAND.COM.

Showing the Space Available for Tasks

Select the *About TaskMgr* option on the Task Manager menu to see how much space your current tasks are using and how much space is left; this information is useful when you are deciding whether or not to add more tasks.

Switching Tasks

When you switch tasks, and if you are using the multitasking software, the task you leave continues to run. If you are using the task switching software only, the task you leave is suspended in the background and stored in memory or in the swap file.



Note

When you are using communications software such as electronic mail or file transfer, make sure you do not switch tasks while the communications software is sending or receiving data via the serial port on your computer; if you do, data may be lost. Use the application to stop the remote card sending data before you switch tasks or adjust the foreground/background ratio setting.

You switch between the tasks in the task list using the menu. Move the highlight bar to the task and press <Enter> or click your mouse on the task.

You can switch between tasks and bypass the menu by doing one of the following:

- ◆ Press <Ctrl> and + (on the numeric keypad) to switch to the next task listed on the menu
- ◆ Press <Ctrl> and – (on the numeric keypad) to switch to the previous task listed on the menu
- ◆ Press <Ctrl> and the number of the task (on the numeric keypad), if you know the number of the task on the menu and it is one of the first nine tasks

If you are using a keyboard that does not have a numeric keypad, add the /M switch to the TASKMGR command line in AUTOEXEC.BAT. Refer to “Loading the Task Manager at the System Prompt” on page 13-7 for information about the TASKMGR command switches.

Problems Switching Tasks?

If you try to switch tasks and get a message warning you that there is insufficient space available, save any changes you want to keep in the current application and exit from it.

If you try to switch tasks and the Task Manager does not switch or you try to display the Task Manager menu from within a task and you cannot, the current application may have taken control of the keyboard from the Task Manager; it is no longer interpreting your keystrokes because the application is intervening and reading the keystrokes directly.

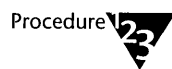
Use the SETUP program to change the Task Manager shift key (<Ctrl> by default) to a different key or key combination; the preferred alternative is <Ctrl><Left-shift> (the <Left-shift> key is the <Shift> key on the left side of the keyboard).

If the problem still remains, refer to the documentation for the application; it may have a "system" option that selects the command processor, COMMAND.COM. Selecting this option will take you to the system prompt and you should then be able to switch tasks. When you switch back to the application's task, you must type EXIT <Enter> at the system prompt to return to the application itself.

Deleting Tasks

You can only delete a task when there is more than one task in the task list. When the system prompt is the only task (COMMAND), the option to delete a task is replaced by the option to remove the Task Manager.

To delete a task, do the following:



1. **Switch to the task you want to delete.**
2. **Exit the application running as the task.**
3. **Display the Task Manager menu.**

The name on the menu for the task you are deleting is replaced by COMMAND (representing the system prompt).

- 4. The task you are deleting is your current task, since it is the task you most recently used. Press to delete it or click your mouse on the option.**

If you did not exit the application running as the task, you are asked whether you really want to delete it; type Y for YES or N for NO. Be careful; if you delete a task with open files, you may lose data.

- 5. After you delete a task, the task at the top of the task list becomes the current task.**

Unloading the Task Manager Without Rebooting

To unload the Task Manager without rebooting the machine, do the following:

- ◆ Delete all tasks you added until the option to remove the Task Manager appears on the Task Manager menu.
- ◆ Select the option by pressing or clicking your mouse on it.

You return to the system prompt and the Task Manager is no longer loaded. The software is not removed from your hard disk, however; you can reload the Task Manager at any time by either rebooting the machine (if you previously loaded the Task Manager in SETUP) or by using the TASKMGR command. Refer to "Using SETUP to Load the Task Manager" on page 13-2 and "Loading the Task Manager at the System Prompt" on page 13-7 for more information.

Working with Tasks at the System Prompt

If you are using the multitasker, you can use the TASKMGR command at the system prompt to add and delete tasks without using the Task Manager menu. If you are using the task switching software only, you can also change the name of a task and specify a limit on the amount of expanded memory used by any single task.

Use the TASKMGR command as follows:

```
TASKMGR [/?|/H] [/C command] [/K:nn] [/L=nnnn]  
          [/N[:nn] name] [/N[:nn]]
```

If the multitasking software is loaded, /C and /K are the only switches you can use.

Command Switches	
/? or /H	Displays help text.
/C <i>command</i>	Adds a task to the Task Manager menu, where <i>command</i> is the command or batch file that starts the application you are adding as a task. Specify <i>command</i> exactly as you would enter it at the system prompt. When you add a task using /C, make sure that you wait approximately 10 seconds before pressing any keys; this pause allows the Task Manager to regain control of the keyboard after the application you are adding loads.
/K: <i>nn</i>	Removes the specified task, where <i>nn</i> is the number of the task on the Task Manager menu. If you are using the multitasker, you cannot delete the current task.
/L= <i>nnnn</i>	Limits the amount of expanded memory (to <i>nnnn</i> KB) that any single task is able to use, when the Task Manager is configured to use expanded (EMS) memory.
/N[: <i>nn</i>] <i>name</i>	Names a task, which is either the current task (by default) or task <i>nn</i> on the Task Manager menu. The <i>name</i> you specify can be a maximum of eight characters in length. This name overrides the name automatically determined by the Task Manager when the task is created.
/N[: <i>nn</i>]	Restores the default task name, for either the current task (by default) or task <i>nn</i> on the Task Manager menu.

Rebooting While the Task Manager is Loaded

If you press <Ctrl><Alt> while the Task Manager is loaded, or if you run SETUP and then restart the operating system, the computer will not reboot immediately. Instead, you are prompted to delete your current task. When all current tasks are deleted and you press <Ctrl><Alt> again, you are asked to confirm that you want to remove the Task Manager.

This is a safety feature to prevent the computer from rebooting while several applications are running or suspended in the background with open files. You should avoid trying to reboot when you are working with a file; the application may be reading or writing the file.

Once the Task Manager has been removed, press <Ctrl><Alt> again to reboot the computer.

Task Manager Troubleshooting

This section describes some common problems that you might experience when using the Task Manager and what you can do about them.

Cannot Run MS Windows as a Task

If you are using the multitasker, you can run MS Windows 3.1 as a task but in Standard mode only. If you are using the task switcher only, however, you can run MS Windows 3.1 as a task in either Standard or Enhanced mode. No earlier versions of MS Windows are supported.

Open File Limit Too Low

The operating system expects only one application to be loaded at a time so when you are using the Task Manager to load multiple applications, you may need to increase the limit to the number of files that can be open simultaneously. If the current limit is too low, you will see a message telling you that an application cannot start because of this.

To increase the open files limit, run SETUP to change the FILES value in CONFIG.SYS. The value you specify depends on the requirements of your applications; if a word processor and a spreadsheet, for example, require 20 files each, you must specify a value of at least 40. Refer to the documentation for your applications to determine the ideal number of open files required. Do not specify more than the required number because each file has memory assigned to it.

Errors Running Multiple Copies of the Same Application

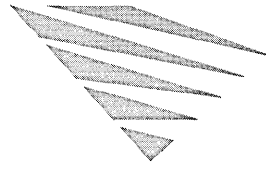
If you load more than one copy of an application and you get an error message, the problem could be the result of either of the following:

- ◆ The application is designed to run as if it is the only application currently running.

Possible solution: Use the ATTRIB +R command to set the application's overlay and .EXE files to "read-only." An application uses overlay files when it cannot fit entirely into memory; the main file is loaded and the rest of the application is divided between overlay files, which are loaded into memory only when required. The documentation for your application should identify the overlay and .EXE files.

- ◆ The application creates temporary files with fixed names so that the second copy of the application interferes with the temporary files belonging to the first copy.

Possible solution: Refer to the documentation for the application to determine whether there is an environment variable you can use to specify where temporary files are created. Then use this variable to specify a different location for each temporary file. If the application creates its temporary files in the local directory (where it is loaded), load each copy of the application in a different directory.



chapter **14** *Securing Information*

There are four aspects to keeping information secure with this operating system:

- ◆ **Securing information on a standalone computer**

Use standalone security when the computer is not part of a network. Standalone security prevents unauthorized users logging in to the computer, or booting it from a diskette drive and accessing the hard disk. This is known as hard disk security.

- ◆ **Securing information on a networked computer**

When you use a computer as a Personal NetWare server, there are certain things that you need to be aware of to keep your information secure. Use security on a computer that is part of the network to grant access to information and devices only to those users who need it.

- ◆ **Securing information against viruses**

The anti-virus software, Search and Destroy, is an up-to-date virus detection program, able to remove most types of virus. Search and Destroy has a scanner and memory-resident program, both of which you can use to detect and remove virus infection and prevent viruses from being transmitted to the hard disk from diskettes.

- ◆ **Securing information using backups**

When you take a backup of the information on the computer, you make a copy of the information that you can use if some information is lost or corrupted. For a backup to be useful, you must take regular backups so that you have a recent copy of the information.

Enabling Security

Before you enable security, it is recommended that you scan the computer for viruses, take a backup of the hard disk, and remove any options to load other operating systems. To enable security, use the SETUP program as follows:

Procedure



1. **At the system prompt, type the following:**

SETUP <Enter>

2. **Select the *Data Protection and Security* option, and then select *Configure Security*.**

SETUP shows whether security is currently enabled or disabled. If you are enabling security for the first time, select the *Enable Security* option.

3. **You are prompted to enter a password.**

This password is the master key password. You must use alphanumeric characters for the password. The maximum length for a password is 15 characters.

Note



When you choose a password, do not choose one that is too easy to guess, such as your own name, but do not use one that you find hard to remember. Use a nonsense word, or put some numbers into a word to make it harder for anyone to guess your password.

This password is used with both standalone and network security.

Warning



Do not forget the master key password. If you enable security and specify a master key password, you must enter this password before you can gain access to the computer.

4. **Save the changes you made and exit SETUP.**

Now, when you reboot your computer, you are prompted for the master key password before you gain access to your computer.

If your computer is not part of a network, read the following section “Security on a Standalone Computer” to learn about using security on your computer. If your computer is part of a network, read the section “Security With the Network” on page 14-4. To learn about protecting your computer against viruses whether it is part of a network or not, read the section “Security Against Computer Viruses” on page 14-8. For an introduction to taking backups, read the section “Security with Backups” on page 14-16.



Once you enable security, you might find that some third party disk utilities report errors in the partition table. You can ignore these messages. However, if you suspect that the disk is corrupted, do not try to use a third party utility to correct this until you have disabled security and restarted your computer.

Security on a Standalone Computer

When a computer is not part of a network, there are several ways to keep the information on the computer secure from unauthorized access. They are as follows:

- ◆ Hard disk security
- ◆ Screen saver lock
- ◆ File and directory password protection

Using the Master Key Password to Protect the Hard Disk

The master key password prevents unauthorized users from gaining access to your computer unless they know this password. When you reboot your computer, the operating system detects that security is enabled and prompts for the master key password. You must enter the password in order to obtain access to the operating system.

You set the master key password when you enabled security in SETUP. You can also use SETUP to change this password.

Security also protects the hard disk from unauthorized access by denying access to the hard disk, when an attempt is made to boot an operating system from diskette.

If you have more than one operating system loaded on your hard disk, you must supply the master key password to load any other operating systems as well as Novell DOS™7.

Locking your Computer with the Screen Saver

Use the screen saver to lock your computer if you are going to leave it unattended for a short while and do not want to switch it off. You can invoke the screen saver from the command line or in MS Windows, or you can use it as a TSR. To use it as a TSR, set a timeout limit so that if there has been no user input for the specified time, the screen saver locks the screen automatically. In order to regain access to your computer you must enter the master key password, or the password you specified when you started the LOCK program.

Refer to the description of the LOCK command in the “Command Reference” chapter of DOSBook for more details about locking your computer. Note that you can use LOCK whether or not you have enabled security on your computer.

Protecting Files and Directories with Passwords

You can protect files and directories individually by assigning passwords to them. Refer to the description of the PASSWORD command in the “Command Reference” chapter of DOSBook to learn how to use this command to assign passwords to files and directories.

Security With the Network



Note Refer to Chapter 3, “Installing Personal NetWare” for a description of how to install the network software, and to Chapter 20, “Setting Up the Network,” for a description of how to set up the network.

In order to keep information secure on a computer that is part of the network, there are various issues that you need to consider. When you load the network software on a computer so that it can be a Personal NetWare server, you are opening up access to the resources available on that computer. You need to ensure that all users have access to the resources that they need, but also to make sure that unauthorized access is not possible.

The following is a brief description of some of the features of the operating system network that you can use to make sure that information on your computer is secure. For a more detailed description of any of these aspects of workgroup administration refer to Chapter 20, "Setting Up the Network," and Chapter 21, "Using the Network."

Using Access Rights

You can set access rights on shared directories and shared printers. Access rights set the level of access for that resource. When you assign access rights, you need to consider both the default access rights that apply to the resource, and the non-default rights that you can give to a particular user for that particular resource. Make sure that the default access rights for the shared directory are suitable for the workgroup as a whole, and assign non-default rights only when needed. The following is a list of rights available for shared directories.

Right	Explanation
All	This gives users all rights to the shared directory.
None	This stops users from having any access to the shared directory.
Read	This allows users to read files in the shared directory and execute them where appropriate.
Write	This allows users to write to files in the shared directory, create and delete files, but not read them.

Shared printers have the rights ALL or NONE.

Setting Passwords on Accounts

If you want to ensure that accounts on the network are secure, give each account a password. When you create an account, specify that the account requires a password. Then give a password for the account. Tell the user of the new account what the password is, so the user can log in and change that password.

The SUPERVISOR Account

In order to be secure, this account must have a password. If you do not set a password for this account, anyone can log in to your workgroup and change the way the workgroup, accounts, and resources are set up.

It is a good idea to reserve use of the SUPERVISOR account for workgroup or server administration only. Use another account for day-to-day work.

The GUEST Account

While user accounts have passwords set on them, you may like to have an account that does not belong to any one user. This is often called the GUEST account. Since this account is meant to give limited access to anyone, you may not want to set a password on this account. If you do not set a password on the account, make sure that the default access rights for all resources are suitable for an account that anyone could use, and assign non-default access rights where appropriate. You could also alter the login times for the account, restricting use of the GUEST account to office hours, for example.

If you do set a password on this account, you can change the settings so that a user of the GUEST account cannot change the password.

Creating Local Users

When you enable security on a computer that is a Personal NetWare server, you can give local access to workgroup users by creating local users for the computer. A local user must enter a username and password to gain access to the resources on that computer when the computer is switched on. When you make a local user account, you can give access for that account to the hard disk, diskette drives, printer, one-time login facility, and the serial communication ports.

Assigning Workgroup Administrator Privileges

If you give an account workgroup administrator privileges, then the user for that account can make changes to the way in which the workgroup and the resources are set up. Make sure that you only give workgroup administrator privileges to users that you want to be able to perform workgroup administration tasks.

Choosing the Security Loadable Module

The security loadable module is one of the modules that is loaded automatically. In order to save space in memory, you can choose not to load some of the modules. If you do not load the security module, then access rights no longer apply, and all users have access to all the resources.

Disabling an Account

If you suspect that an account is being misused, you can disable that account. The account still exists in the user database but no-one can use the account.

Using the Master Key Password

The master key password is the one you set when you enabled security. On a computer that has local users, you can use this password in place of any user password.

Protecting the Hard Disk on the Client or Server

Once you have enabled security, the hard disk is protected from access via the diskette drive. If anyone attempts to boot up your machine using a diskette, they are unable to gain access to the hard disk, no matter what operating system they are trying to load.

Locking the Client or Server

The LOCK screen saver is available on both server and client computers. Local users can use LOCK as a TSR, and specify a timeout period. Once LOCK is invoked, either by elapsed time or from the command line, you must type in the user password for that account to regain access to that computer.

On a client computer, use the master key password to regain access after using LOCK. Refer to the description of LOCK in the "Command Reference" chapter of DOSBook for more information on using the screen saver and locking your computer.

Protecting Files and Directories with Passwords

You can use the PASSWORD command to protect files and directories, but note that you will not be able to access a file or directory that is protected by a password across the network. You can only access such a file or directory from the machine that holds that file or directory.

Security Against Computer Viruses

A computer virus is a computer program that can replicate itself. In order to replicate itself, the virus must first attach itself to a host program, and when the host program is run, the virus program is activated too. Some viruses also contain code that damages other data on the computer. This code can be generated randomly, continuously, or can be triggered by external events, such as the date.

Search and Destroy anti-virus software comprises a memory-resident program, loaded when you boot your computer, and a scanner that searches your hard disk and drives for viruses. You can also use the scanner to remove viruses from the hard disk.

Installing Search and Destroy

Use SETUP to load Search and Destroy. Once you have loaded Search and Destroy, the memory-resident monitor scans memory every time you reboot your computer. To protect files on the hard disk from being infected, run the Search and Destroy scanner regularly. Use the scanner on diskettes with contents you are not sure of to prevent any viruses from being transmitted to your computer's hard disk from an infected diskette.

The Search and Destroy Scanner (SDSCAN)

Once you have installed the scanner, you can run it in three ways.

- ◆ By using the full screen interface DOS version
- ◆ By using the MS Windows version if you have MS Windows on your machine
- ◆ By using the scanner from the command line

Refer to the "Command Reference" chapter of DOSBook for a description of using the scanner at the command line. The following sections describe how to use the DOS and MS Windows versions of the scanner.

Using the Scanner Under DOS

To use the DOS scanner, type the following at the system prompt:

```
SDSCAN <Enter>
```

The scanner first checks memory for viruses and then tests itself in order to prevent its own infection. The Search and Destroy Virus Scanner/Remover screen displays.

This screen displays the operations and drive groups available. The operations are:

Operation	Explanation
Start scanning	Select this to start the scanning operation on the drive listed in the Drive Groups field.
Options...	Select this to list the options available for the scanning operation; see "Using the Scanner Options" on page 14-11.
Quit SDScan	Select this to leave the Search and Destroy virus Scanner/Remover screen.
List viruses	This lists all the viruses that Search and Destroy knows about. Note that some viruses are included in the same "family" of viruses and not listed individually.

Select an operation by moving the highlight using the cursor keys, and press <Enter> to start the operation.

Scanning a Drive, Directory or File

You can use the scanner on hard disk drives, network drives, diskettes, directories and files. Select the *Start scanning* option to begin scanning the default drive. The default is the hard disk drive(s). Use the *Drive Groups* option to change the drive to scan.

Changing the Drive to Scan

Move the highlight to the Drive Groups field by pressing <Tab>. Use the cursor keys to move between the different options. Press <Spacebar> when the highlight is over the correct drive group.

Selecting a Directory or File to Scan

To scan a specific file or directory, select the *File/directory...* drive group. You can then either type the name of the file or directory you want to scan, or to see a list of directories and files on the current drive, press <F10>.

Using the Scanner Options

Select *Options...* to display the scanner options. The scanner options enable you to change which files the scanner scans, whether a report is generated and the scanner's action upon finding a virus. An asterisk next to an option shows its current setting.

Select an option by moving the highlight over it using the cursor keys and pressing <Spacebar>. The scanner options are:

- ◆ Look for boot sector viruses:
*Yes No

This option tells the scanner whether to scan the disk's boot block or partition table. The default is Yes.

- ◆ Check:
*Program files All files

This option tells the scanner whether to search just executable program files, or all the files including program and data files. The default is to check just the program files because, so far, viruses only attach themselves to executable files.

- ◆ Scan:
Archive files (ZIP, LHA, ARJ): *Yes No
Compressed EXEs (LZEXE, PKLITE, DIET): *Yes No

This option tells the scanner to search archive and compressed files for viruses. The default is Yes.

- ◆ Generate report to: _____

If you enter a filespec in this field, Search and Destroy creates a report of the search according to the filespec given. If you do not want the report, leave the field blank. Specify PRN to send the report to a printer.

- ◆ Append to existing report:
Yes *No

This option tells Search and Destroy to add each new report to the existing report file. The default is No.

◆ When a file is found to be infected:

This option tells Search and Destroy what action to take if a virus is found. Choose from the following options:

◆ *Prompt user

Prompt user means that the scanner alerts you when it detects a virus, and requires a response before removing the virus. This is the default.

◆ Report only

Report only means that the scanner reports that a virus is present and takes no further action.

◆ Remove virus

Remove virus means that the scanner removes the virus automatically.

If you select the Scanner Options in order to check their current settings but do not want to change any of them, press <Esc> to leave *Options...* To save changes made to the settings, press <Ctrl><Enter>.

Listing the Known Viruses

Select this option if you want to see which viruses are currently known to Search and Destroy. Not all the individual viruses known to Search and Destroy are listed, because some are classed as being a member of the same virus family and the virus family is listed.

Quitting the Scanner

Select the *Quit SDScan* option to exit the scanner.

Using the Scanner Under MS Windows

If you installed the MS Windows version of Search and Destroy's scanner, you can run the scanner from within MS Windows. INSTALL sets up a program icon for you to use. Select the Search and Destroy program icon to make this the active window.

The screen has a list of drives to the left; drives to scan are marked by ticks. At the base of the screen are three buttons for changing the drives to scan. Note that where your computer does not have a particular type of drive, you cannot press the button for that drive. On the right are buttons for

- ◆ Starting the scanner
- ◆ Exiting the scanner
- ◆ Changing the scanner options
- ◆ Listing the known viruses

The scanner also has three menus available; Scan, Options, and Help.

Scan	Options	Help
Drive(s)	Scanning...	Contents
File	Report...	Using help
Exit		About...

Starting the Scanner

To start scanning the selected drives, select the *Drive(s)* option from the Scan menu, or press the <Scan for Viruses> button.

Changing the Drives to Scan

To change the current drives, select a different drive from the drives list, or use the buttons at the base of the screen.

To scan a specified file, use the *File* option from the Scan menu.

Changing the Scanning Options

To change the scanner options, use the *Scanning...* option from the Options menu, or press the <Options> button. The options you can change are listed below.

Option	Explanation
Scanning scope	Changes the scope of the scanner between program files and all files. The default is Program files.
Scanning options	Selects whether archive and compressed files are scanned. The default is to scan both Archive files and Compressed programs.
When a virus is found	Determines the scanner's action on finding a virus. Choose between Prompt, Remove, and Report only. The default is for the scanner to prompt the user when a virus is found.
Report	Specifies the name of the report file. The scanner generates a report only when there is an entry in the Report field. The default is for the scanner not to generate a report. To enter a path and filename for the report, type the path and filename directly into the report field, or press the <Browse...> button. To view an existing report file, select the <i>Report...</i> option from the Options menu.
Scanning Icon	Selects the icon the scanner uses during the scan operation. The default is the Sniffy hound icon. Enable the Scan Iconized option if you want the scanner screen minimized while it scans.

Listing the Known Viruses

Select the <List Viruses> button to see a list of the viruses recognized by the scanner. Note that some viruses are listed under the family of viruses they belong to rather than as individual viruses.

Drag and Drop

You can scan files using MS Windows “drag and drop” function.

- ◆ Open the scanner icon to make it active. You can minimize the scanner icon if you prefer.
- ◆ Open the File Manager and open the directory containing the file you want to scan.
- ◆ Select the file to be scanned and drag the file onto the scanner icon.

When you release the mouse button the scanner scans that file.

Getting Help on Using the Scanner

There is an extensive online help available with the scanner. Select the *Contents* option from the Help menu to see a list of contents. Select the *Using help* option to learn how to use the online help.

The Search and Destroy Memory-Resident Monitor (SDRES)

Once installed, the memory-resident monitor checks memory for viruses every time you restart your computer. It is called from AUTOEXEC.BAT.

You can also run it at the command line by typing

SDRES

followed by options that you can use to change the way SDRES runs from your AUTOEXEC.BAT or CONFIG.SYS files. Refer to the description of SDRES in the “Command Reference” chapter of DOSBook for more information about these options.



Note If you installed the MS Windows version of Search and Destroy, the SDRES icon appears in the Novell DOS 7 window to let you know that SDRES Windows version is present and working on your computer.

Security with Backups

When you take a backup, you make a copy of the information on your machine. You can use this copy to replace lost or corrupted information. If there is only one copy of the information kept in one place, for example, on the hard disk, and the hard disk is corrupted in some way, you lose all that information. With a backup copy, it only takes a short time to restore the lost information.

The operating system comes with its own backup facility, FBX. Refer to the “Command Reference” chapter of DOSBook for a full description of how to use FBX.

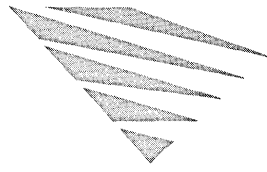
Before you start taking backups, it is a good idea to plan how often you need to take backups and what type of backup you need to make.

You can perform a full backup of your hard disk, copying every single file on the hard disk, or a partial backup where you only copy some of the files according to particular criteria.

One backup plan might be to take a full backup once a week, and at the end of each day, take a partial backup of the files that have changed since the last backup was made. It is possible to specify this in FBX, or use other criteria to make a partial backup. You can even select individual files to backup. However, you must set your own backup plan according to what information is essential, or changes frequently. Once you have made a backup plan, carry it out rigorously.



A full backup of a hard disk is time-consuming and, if you are copying files to diskette, can use a lot of diskettes. Make sure that you have a plentiful supply of diskettes and labels. Write the label for each diskette using the name displayed as files are being copied to that diskette.



chapter **15** *Recovering Information*

The operating system provides several methods of recovering deleted data. The chances of successfully recovering a deleted file depend on which method the operating system is able to use. This chapter provides an overview of file recovery and the recovery aids you can use to make this easier and more successful. See the command descriptions in the “Command Reference” chapter of DOSBook for more information about how to use the file recovery commands.

File Recovery Aids

Before you actually start deleting files, you should know how to use two utilities that the operating system provides to aid file recovery after delete operations: DISKMAP and DELWATCH. File recovery without either of these two methods is referred to as *unaided*.

DISKMAP

DISKMAP is a utility that copies and saves the File Allocation Table (FAT) of a disk. The FAT is like an index to a disk that records the location and size of all files on the disk. Running DISKMAP on a regular basis means that you always have a recent copy of the FAT, and the operating system can therefore retrieve information about a deleted file that it would not normally be able to retrieve. Refer to the “Command Reference” chapter of DOSBook for a description of DISKMAP.

DELWATCH

DELWATCH is another utility provided with the operating system that actually saves deleted files on the disk. Instead of removing a deleted file, DELWATCH simply marks it as a *pending delete* file. The file appears to be deleted, however. Using DELWATCH means that you are fairly sure of successfully recovering a deleted file. Refer to the "Command Reference" chapter of DOSBook for a description of DELWATCH.

Recovering Deleted Files (UNDELETE)

Use the UNDELETE command to recover deleted files, regardless of which method the operating system is able to use: DELWATCH, DISKMAP, or unaided. UNDELETE automatically determines and displays the method available.

By typing UNDELETE on the command line without a file specification, you can use a full-screen menu version of the UNDELETE command. The screen you see contains a list of the deleted files in your current directory and a series of menu options from which to choose. The list displays information about deleted files. You can select any of the following menu options:

- ◆ Start UNDELETE for a selected file
- ◆ Change the current disk drive
- ◆ Select a file or group of files
- ◆ Sort the files in the list by name, extension, date, size, or recovery method available
- ◆ Display different kinds of online help
- ◆ Exit from UNDELETE and return to the system prompt

By typing UNDELETE on the command line with a file specification, you start UNDELETE for the specified file.

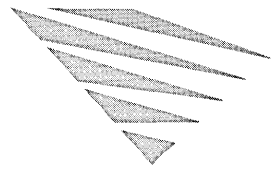
For example, to recover a file called REPORT.TXT that you deleted from your current directory, you can do either of the following:

- ◆ Type UNDELETE to use the full-screen version, select REPORT.TXT in the list of deleted files, and choose the *Undelete* option from the File menu.
- ◆ Type the following in the command line:

```
UNDELETE REPORT.TXT <Enter>
```

You are prompted about proceeding before UNDELETE attempts to recover REPORT.TXT.

Refer to the explanation about UNDELETE in the “Command Reference” chapter of DOSBook for more information about using this file recovery feature.



chapter **16** *Redirecting Information*

Normally, you enter information at the keyboard, which is the *standard input device*, and the information is sent to your screen, which is the *standard output device*. You can redirect this flow of information and send it to a place other than your screen, such as a file or printer.

Note that *input* is simply what you enter at the keyboard, such as a command, while *output* is the result of that command.

Redirecting Output

Instead of your information being sent to the screen you can send it to a file or print device. To do this you use the redirection symbol `>`.

For example, to redirect a DIR listing to a file called MYLIST.DOC instead of displaying it on the screen, enter the following:

```
DIR >MYLIST.DOC
```

If MYLIST.DOC does not exist, it is created for you. If it does exist, the original is overwritten, so be careful when redirecting to an existing file.

Instead of the filename, you can enter a file specification, if the file to which you want to redirect output is not on the current drive:

```
DIR >A:\REPORT\MYLIST.DOC
```

Redirecting Output to or from a Device

You can redirect output to a device rather than a file or command. Typical devices are printers, plotters, and modems.

As discussed in Chapter 4, "Working with Novell DOS 7," devices are often named according to the communication port on the computer to which they are connected. Printers can be called PRN or LPT n , (where n could be 1, 2 or 3). Table 16-1 lists the device names and shows how they can be used with redirection.

Table 16-1
Device Names and Redirection Use

Device	Description	Use
CON	User console (the keyboard and the screen).	Input and output
AUX or COM1	First serial communication port.	Input and output
COM n	Second and subsequent serial ports where n is 2, 3, or 4, depending on the particular computer.	Input and output
PRN or LPT1	First parallel printer.	Output
LPT2	Second parallel printer.	Output
LPT3	Third parallel printer.	Output
NUL	All output from this device is discarded. No input is returned from the device. It is used to discard unwanted output.	Input and output

For details on how to set up a port for a particular device, refer to the "Command Reference" chapter of DOSBook for a description of the MODE command. The form of the command for redirecting to a device is:

```
command >device
```

For example, the following command sends the DIR listing of drive A: to the printer rather than to the screen:

```
DIR A: >PRN <Enter>
```

Appending Output

You can append the output of a command to the end of a file, using the redirection symbol `>>`. For example, to add a file `INDEX.DAT` to the end of an existing file called `BOOK.TXT`, enter:

```
TYPE INDEX.DAT >>BOOK.TXT
```

`BOOK.TXT` now contains the contents of both files.

Redirecting Input

Sometimes it is useful to make the contents of a file the input for a command. You achieve this by using the redirection symbol `<`.

For example, to make a file called `TELEPH.DOC` the input to the `SORT` command (which sorts the contents of a file into alphabetical order), enter

```
SORT <TELEPH.DOC
```

`SORT` takes the file, sorts its contents alphabetically, and outputs the result to the screen.

Taking this a step further, to store the output of `SORT` into a file instead of just displaying it on screen, enter

```
SORT <TELEPH.DOC >TELELIST.DOC
```

`SORT` takes the `TELEPH.DOC` file, sorts it into alphabetical order, and stores the result in the file `TELELIST.DOC`.

Using Pipes and Filters

Pipes

Sometimes you may find it convenient to use the output from one program as the input to another. For example, the DIR command often produces a listing so long that all of it cannot fit on the screen. In this case, you can connect the output of DIR to the input of the MORE command, which displays output one screenful at a time, by using a pipe. The piping symbol is | (a vertical bar). You would invoke the DIR and MORE commands together as follows:

DIR | MORE

You can pipe as many commands as you like. Piping is often used with filter commands (MORE is a filter command).



Note

When you pipe programs together, the data piped between them is stored by the operating system in temporary files it creates on the default disk; there must be sufficient space on the disk for them and the disk should not be write-protected. The temporary files are removed when the operation is complete.

Filters

The operating system has several commands that act as filters and can be piped together. A filter command reads your input, acts upon it in some way, and then outputs the result, usually to the screen. The following table lists the main filter commands.

Command	Function
<code>SORT</code>	Arranges data into alphabetical order before displaying it on the screen.
<code>MORE</code>	Displays the contents of a file a screenful at a time.
<code>FIND</code>	Extracts specified items of data to display.

For example, SORT is often used with the DIR command to sort the listing produced, by filename or by file size for example. Entering the following in the command line sorts the DIR listing in reverse alphabetical order; the /R switch causes sorting from last to first rather than from first to last.

DIR | SORT /R

The following command sorts a file called NAMELIST.DOC using SORT. SORT arranges the contents of the file into alphabetical order before it is displayed on the screen:

SORT <NAMELIST.DOC <Enter>

Assume NAMELIST.DOC contains the following names:

HENRY
SALLY
JAMES
SUE
FRED

The SORT command would therefore arrange them into alphabetical order as follows:

FRED
HENRY
JAMES
SALLY
SUE

In the following command line, DIR and FIND are piped together to search for (FIND) and list (DIR) a directory called TEMP:

DIR | FIND TEMP <Enter>

Combining Pipes with Redirection Symbols

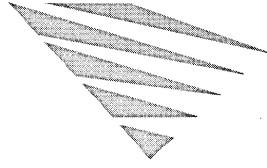
You can also use piping and redirection together. For example:

```
DIR | SORT >DIRSORT <Enter>
```

This command produces a directory listing which is sorted into alphabetical order and then stored in DIRSORT.

The following command sorts a file called TELE.LST into alphabetical order and displays the result a screenful at a time:

```
SORT <TELE.LST | MORE <Enter>
```



chapter **17** *Setting Up Code Page Switching*

The operating system allows you to use the range of characters required in a number of national languages by interpreting the different language-specific characters using a mechanism called code page switching.

Usually you only need to set your computer up for code page switching if you

- ◆ Receive foreign language ASCII documents in which some letters become unintelligible characters when displayed or printed.
- ◆ Use an application that is difficult to read on the screen because some graphics characters, such as boxes, appear as letters.

If you are not in any of these situations, you probably do not need to use code page switching, or to read the information in this chapter.

What is Code Page Switching?

When you press a key on a keyboard (a letter, symbol, or number), the computer receives a numeric code that represents the way in which that keystroke is to be displayed, printed, and stored.

Up to 256 codes are available to represent lower and upper case letters, numbers, punctuation marks, and all the mathematical symbols on your keyboard. This may seem to be more than enough, but it is not possible to represent all the letters and characters used in every language in one character set of 256 codes. For example:

- ◆ Some languages have a much larger alphabet than others and include many accented characters. On most keyboards these accented characters are produced by adding extra single keystroke characters. These key combinations are known as *dead keys*.
- ◆ Many graphics characters such as \llcorner and \lrcorner can be entered.

Character Sets

To accommodate these differences, a number of character sets are available. The numeric code entered when you press a key represents a different character depending on which character set is in use.

The most common character set (known as 437) is used for several languages including English, German, and French. Character sets 865 and 860 contain the characters needed for Danish and Portuguese respectively. In these character sets, some symbols available in 437 have been removed to make room for the extra letters needed. For example, the code for *f* (franc) has been used for *Ó* in 860.

Definition of a Code Page

The character sets are stored in a table called a code page. The operating system allows you to change the code page that your computer uses, allowing you to view in its original form a document created using a different code page. Appendix D, "Code Pages" lists the characters available from different code pages.

Hardware Code Page

The hardware code page is the standard code page built into your computer. Additional code pages are provided in the Code Page Information or .CPI files in your software. Table 17-1 shows the national prepared code pages supported by the operating system. There is also an international code page, Code Page 850, that can be used in any of the countries (see Table 17-1).

Table 17-1
National Prepared Code Pages

Country	Code Pages Used	
Australia	437	850
Austria	437	850
Belgium	437	850
Canada (English)	437	850
Canada (French)	863	850
Denmark	865	850
Finland	437	850
France	437	850
Germany	437	850
Hungary	852	850
Italy	437	850
Latin America	437	850
Netherlands	437	850
Norway	865	850
Portugal	860	850
Russia	866	850
Spain	437	850
Sweden	437	850

Table 17-1 *continued*

National Prepared Code Pages

Country	Code Pages Used	
Switzerland (French)	437	850
Switzerland (German)	437	850
Turkey	857	850
United Kingdom	437	850
United States	437	850

Code Page 850

To simplify the exchange of computerized documents between countries, the International Standards Organization (ISO) defined a new code page called 850, for use across national boundaries. This standard, ISO 8859/1, can be used instead of local code pages and reduces the need for code page switching because the sender and the recipient always use the same code page.

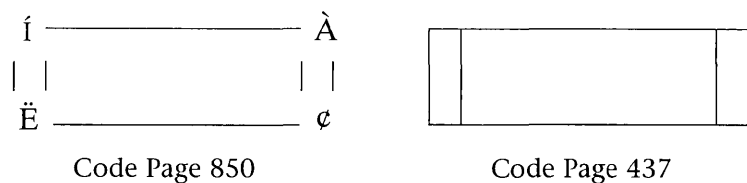
Limitations of Code Page 850

In Code Page 850 it was not possible to keep the original code for every character in every local code page. For example, two characters in 437, the Yen ¥ and Cent ¢ signs, have been moved and some graphics characters have been removed to make room for characters frequently used in the other languages.

In most cases you should be able to use either your local code page or the international Code Page 850, but there may be occasions when you need to switch code pages while you work.

Some applications are written specifically for Code Page 437, especially those that use line-drawing characters. These applications may produce displays which are difficult to read when run under Code Page 850. Typically, graphics corners and joints become accented letters.

The following is an example of a display that was intended for use in Code Page 437 and how it looks in Code Page 850.



If you are running an application that uses line-drawing characters that are not available in the code page delivered on your computer, run the application under the code page in which it was written. By switching to the original code page, you get a display that is easier to read.

Summary

- ◆ If the local code page is not supported by your hardware, you can use code page support to remedy this.
- ◆ If you need to work in more than one language, use Code Page 850 for all new work.
- ◆ If you receive a document in a language that was created in a local code page, use that code page. If your local language is not covered by a specific code page, use Code Page 850.
- ◆ If you use an application that was written for a particular code page, or that uses line-drawing characters, use the code page that it was written in.

Hardware Supported

The operating system supports code page switching on EGA and VGA displays and on the following printers:

- ◆ IBM* Proprinter* (4201) and Proprinter XL (4201)
- ◆ IBM Proprinter X24 (4207) and XL24 (4208)
- ◆ IBM Quietwriter* III (5202)
- ◆ Epson* FX850 and FX1050 printers
- ◆ Printers compatible with the above printers

Setting Up for Code Page Switching

You can set up your system initially to allow code page switching either when you install the operating system or later using the SETUP program (see Chapter 9, "Configuring the System"). Either way, you configure your system to use code page switching by answering a few questions. You need to

- ◆ Say that you want code page switching
- ◆ Define which printer(s) will be configured for code page switching if required
- ◆ Select the code page the operating system is to use as the default (that is, the one that will be active when the computer is switched on)

Just follow the on-screen prompts provided.

When you finish installation or SETUP, make sure all printers supporting code page switching are switched on and online before you reboot your system.

When you set up code page switching, certain commands are automatically placed in the CONFIG.SYS and AUTOEXEC.BAT files, reflecting the parameters that you selected. The keyboard, display and printer are set up to use code page switching each time the system is turned on. Fonts for the default code page (which are held in the .CPI files) are downloaded to all the devices that support code page switching.

Example Configuration Files

This section provides an example of a CONFIG.SYS file and AUTOEXEC.BAT file for a system with one printer set up to use Code Page 850 as the default code page.



Note The hardware code page (that is, the character set available as standard with your computer) is always prepared for use. The INSTALL and SETUP programs configure your system to allow one alternative code page. The example files described in this section are set up to allow you to switch from Code Page 850 to the hardware code page by entering the CHCP (Change Code Page) command at the system prompt (see “Working with Code Pages” on page 17-10 in this chapter for a description of CHCP).

A brief explanation of the commands is given below the example. Refer to the “Command Reference” chapter of DOSBook and Chapter 9, “Configuring the System,” for detailed descriptions of all the parameters.

Example CONFIG.SYS File

```
SHELL = C:\COMMAND.COM /P /E:512
BREAK = ON
BUFFERS = 15
FILES = 20
FASTOPEN = 512
LASTDRIVE = E
HISTORY = ON, 256
COUNTRY = 044,850,C:\NWDOS\COUNTRY.SYS
DEVICE = C:\NWDOS\DISPLAY.SYS CON=(EGA,,1)
DEVICE = C:\NWDOS\PRINTER.SYS LPT1=(4201,,1)
```

COUNTRY.SYS, PRINTER.SYS and DISPLAY.SYS are the drivers that support code page switching.

COUNTRY.SYS

COUNTRY.SYS provides the date and time format appropriate for your country, the currency symbol of your country, and the code page to use. In European countries, for example, the preferred date format is day/month/year whereas in the United States the preferred format is month/day/year and in Japan it is year/month/day.

PRINTER.SYS and DISPLAY.SYS

PRINTER.SYS and DISPLAY.SYS load the drivers for the display and printer. The drivers define the number of code pages (in addition to the hardware code page) that can be used (1 in the example). Memory is set aside for each of these code pages, reducing the memory available to run applications. The maximum number of code pages you can prepare is 12.

Example AUTOEXEC.BAT File

```
@ECHO OFF
PATH C:\NWDOS
VERIFY OFF
KEYB UK+,850
MODE CON: CODEPAGE PREPARE=((850)
    C:\NWDOS\EGA.CPI)
MODE LPT1: CODEPAGE PREPARE=((850)
    C:\NWDOS\4201.CPI)
NLSFUNC
CHCP 850
```

KEYB, MODE, NLSFUNC and CHCP are the commands that support code page switching.

KEYB

Sets the keyboard nationality and the code page that will be used for the keyboard.

MODE device PREPARE

Prepares a code page for a display or printer. Code pages must be prepared before they can be selected. Several code pages can be prepared for one device in one statement, the maximum being the number defined in the `DEVICE=PRINTER.SYS` or `DEVICE=DISPLAY.SYS` statement.

You do not need to prepare the hardware code page. Note that there are other `MODE` code page options, described in the next section.

NLSFUNC

Provides support for extended country information and enables you to use the `CHCP` command to select code pages for all devices set up to use them.

CHCP

Selects a code page for all the devices that are set up for code page switching. In the example, 850 will be the active code page when the system is turned on. The keyboard, display and printer will be set up for Code Page 850.

Working with Code Pages

Changing Between Code Pages

When you have set the system up for code page switching, it is simple to switch from the default code page to any other that was prepared (that is, the hardware code page and any other code page defined in a MODE PREPARE command). You do this using the CHCP command.

Loading NLSFUNC

However, before you can use CHCP, NLSFUNC must be loaded. This can be done at installation. Typing NLSFUNC on its own at the command line loads the program if it is not already installed.

To change the code page on all devices, from the system prompt type:

```
CHCP CP <Enter>
```

where *CP* is the number of the code page that you want to use now. When the operation is complete, the system prompt is returned.

The code page is changed on all the devices (displays and printers) that were defined as supporting code page switching in the CONFIG.SYS file.

Note



All printers supporting code page switching must be switched on and be online when the CHCP command is used. The system may take some time to report an error if the printer is not switched on or is off-line.

Using MODE SELECT

You can use the MODE SELECT command to change the code page on a single device. If you do this, however, you will find that the country information and some other information used by the device is set up differently to the rest of the system.

Changing a Code Page Temporarily

You may find the MODE SELECT command useful if you want to change a code page temporarily on only part of the system. For example, you may want to display a document in a local code page without printing the document.

Listing your Current Code Pages

You can display currently prepared and selected code pages for screens or printers using the MODE command as follows:

```
MODE device CODEPAGE [/STATUS]
```

The selected code page number is displayed, followed by a list of hardware code pages defined in the CONFIG.SYS file and code pages prepared using the MODE PREPARE command.

For example if you type:

```
MODE LPT1 CP <Enter>
```

You see a display similar to this:

```
Active codepage for device LPT1 is 850
```

```
hardware codepages:
```

```
codepage 437
```

```
prepared codepages:
```

```
codepage 437
```

```
codepage 850
```

```
Completed codepage status function
```

See the “Command Reference” chapter of DOSBook for more information.

Refreshing Lost Code Pages

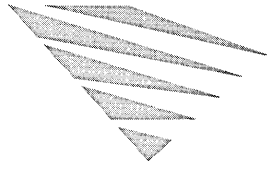
If you select a code page for a printer, then turn the printer off, the code page information may be lost. If this happens, you can reload the fonts for the active code page on to the printer by using the `MODE CODEPAGE REFRESH` command:

```
MODE device CODEPAGE REFRESH
```

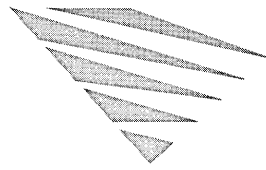
For example:

```
MODE LPT1 CODEPAGE REFRESH <Enter>
```

refreshes the code page on the printer connected to port LPT1. See the “Command Reference” chapter of DOSBook for more information.



N*etworking with Novell DOS 7*



chapter **18** *Introduction to Personal NetWare*

This chapter explains the ideas and terms you will need to know in order to use Personal NetWare™, the networking component of Novell DOS™ 7.

Personal NetWare supplies you with server and client software that enables you to set up a network, and connect to a Novell® NetWare® server. You can choose whether to run your machine as a client, or client and server. You can also set it up as a peer-to-peer network, or as a server-based one, or combine the two approaches depending on what resources you need to share between which users.

Personal NetWare Concepts

Servers

Any computer with a hard disk, running DOS or MS Windows, and attached to the network may be set up as a Personal NetWare *server*. Any software or device on (or attached to) a server can be shared with other computers on the network. These shared resources include printers, space on the server's hard disk, applications, and CD-ROMs. All computers, including servers, can be used to run DOS and MS Windows programs, because the networking software runs unobtrusively in the background.

If there are NetWare servers on the same network, you can connect to them as well as connecting to a workgroup. The term "shared directory," as used in this manual, includes "NetWare volume." Also, the term "shared printer" includes NetWare print queues.

Workgroups

For convenience and security the network can be divided into *workgroups*, each containing one or more Personal NetWare servers. A workgroup consists of a number of users who require the same access to certain information. Rather than making a file or directory available to any user on the network, you can make it available to the members of a workgroup only.

Clients

A computer that uses the resources of servers is called a *client*. It makes logical connections, via the network software, to shared directories and printers. The terms “connect” and “disconnect,” as used in this manual, only refer to software connections, not physical (cable) attachments. Connecting to network directories and printers is called “mapping” and “capturing” respectively in Novell NetWare, but the term “connect” is used in this manual wherever possible.

User Accounts

Every user has an *account* in each workgroup of which they are a member. You connect to a *workgroup*, NetWare servers and/or a NetWare Directory Services™ tree by *logging in*. This involves typing your account's *username* and, if necessary, your password.

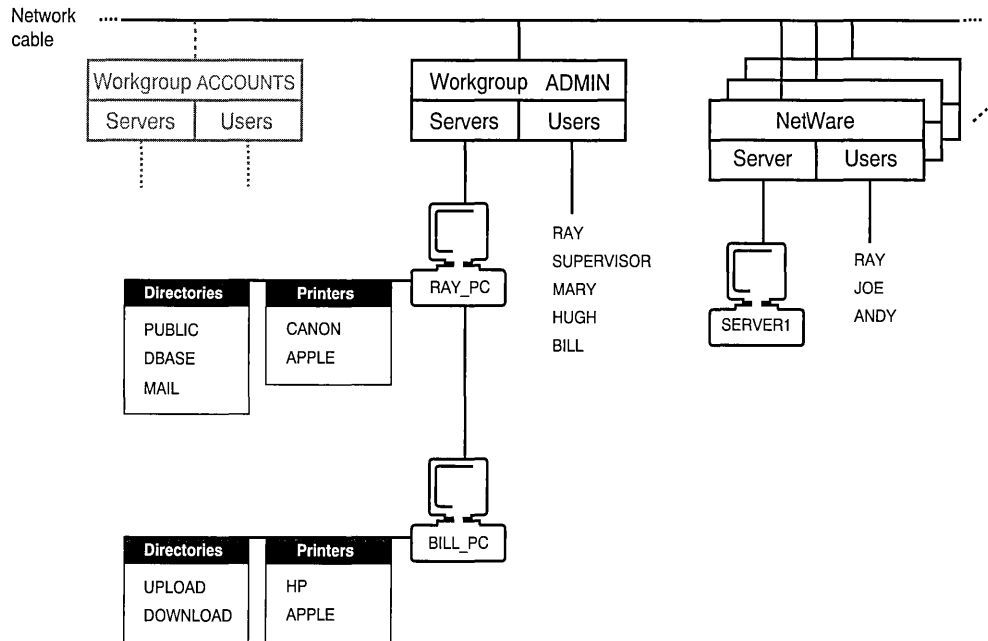
Each workgroup has a user called SUPERVISOR who has *workgroup administrator privileges*. Other users can be given workgroup administrator privileges as well, allowing them to create new user accounts and workgroups and perform other administrative functions.

A Personal NetWare server has an *owner* who can change the server's settings. Anyone else to whom the owner has granted the right (such as the SUPERVISOR) can also do this. Server settings include the rights of all or specific users to access each shared resource belonging to that server.

Figure 18-1 shows a network with a workgroup called ADMIN, whose members can use shared directories and printers on two Personal NetWare servers. The user called Ray also has an account on a NetWare server SERVER1, so he can use its volumes and printers as well as using those on RAY_PC and BILL_PC.

Members of workgroup ADMIN cannot use shared directories or printers in the workgroup ACCOUNTS unless they are members of ACCOUNTS. Even if you have accounts in two or more workgroups, you can only be logged in to one at a time.

Figure 18-1
Overall Structure of a Network



Sending Messages

As well as sharing disks and printers, you can send short NetWare messages to other users who are logged in to the same workgroup or server. Messages appear on their screens immediately.

Sharing Resources

To share one of your disk drives or printers, enable the server software when you install Personal NetWare. Then, use SETUP /FIRST or run the NET ADMIN program to specify which printers and or disk drives are to be shared and with whom. Often, you will not want to share an entire disk drive but only some of the subdirectories on it.

You give the server and each shared directory and printer a name. Tell the other users in your workgroup these names and what they may use them for. They do not need to know the DOS directory path or printer port number you are using, only the name you give them.

Connecting to the Network

Before you run an application that is to use shared drives or printers, you must do the following two things:

1. Log in to identify yourself and your workgroup.
2. Connect disk drive letters and printer port numbers to the shared drives and printers you want to use.

Each time you switch on or reboot your computer you must log in and connect by running the NET program. To automate the process, you can save your current connections in a batch file which will then run automatically every time you log in.

Components of Personal NetWare

Personal NetWare includes the following components:

- ◆ Personal NetWare Server

A DOS TSR (SERVER.EXE) with support for up to 50 users per workgroup.

- ◆ Universal Client (Link Support Layer™, network board drivers, IPXODI, NetWare DOS Requester™)

- ◆ Installation Programs

Installation programs for both DOS and MS Windows. There is also an upgrade program for NetWare Lite™ users.

- ◆ Network Security

Allows a single password for both Personal NetWare and NetWare 4.x servers. Access rights are compatible with NetWare 4.x but they are in a simpler format for Personal NetWare users.

- ◆ User Programs

DOS-based and icon-based (MS Windows) programs for network user tasks, such as drive mapping, that are common across all versions of NetWare including Personal NetWare and NetWare 2.x through 4.x.

- ◆ Administration Programs

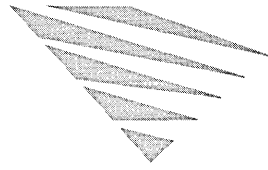
DOS-based and icon-based (MS Windows) programs for network administration tasks that are common across all versions of NetWare including Personal NetWare and NetWare 2.x through 4.x.

- ◆ Network Diagnostics

A diagnostics program designed for network troubleshooting and planning.

- ◆ NetWars

An arcade-style network game for one to four players.



chapter **19** *Planning Your Network*

This chapter is aimed at the person who is responsible for installing and maintaining the network. To get the most out of Personal NetWare™, it is worth doing some planning before configuring the software. Before you start creating servers, workgroups, and user accounts, consider your answers to the following questions:

- ◆ How many workgroups are required?
- ◆ Which computers should be servers?
- ◆ Where should security be enabled?
- ◆ Which workgroup should each server be in?
- ◆ Which printers should be shared?
- ◆ Should any printers be moved to more convenient locations?
- ◆ Who should have accounts in each workgroup?

All of these issues are discussed in this chapter. Also consider who should make the decisions; it may make sense to appoint someone to ensure that the workgroup and server names you create are unique and helpful. It may also be more efficient and secure for one person to do all the software installation.

How Many Workgroups Are Required?

Unless you have a very large number of computers or are concerned about security, you should create just one workgroup to start with. You can create more workgroups later and move specific servers and users between workgroups. You must give each workgroup a name (up to 15 characters).

If you decide to create several workgroups, remember that a user can only log in to one at a time so only one set of resources or another can be used.

The networks on different sites can be connected together through devices called *routers*. For the best performance and security, you should create different workgroups at different sites. Users at one site can log in to workgroups at another site, however.

If you have NetWare® 2.x, 3.x or 4.x, you may prefer to use Personal NetWare to create NetWare clients only. You need to create workgroups only if you want Personal NetWare (desktop) servers. You can use Personal NetWare or NetWare commands to control NetWare.

Which Computers Should Be Servers?

If you want the greatest flexibility, you should make every computer in the network a server. Only a server can share its disks, directories and printers, so if two users want to share data it is easiest if both of them are servers.

The costs of making a computer a server are that its user may notice a performance degradation when other users are accessing it, and that the server software occupies memory while it is running. The amount of memory available to DOS applications is reduced by 40 KB or more. Consider these factors when deciding how many servers you need and which computers to make servers.

Should Security Be Enabled and Where?

It is recommended that you enable security on any computer that is to be a server. Do this to prevent someone impersonating the owner of the server and gaining unauthorized access to it. When you enable security on a server, it is the network software that validates user access rights, whether the user is trying to log in at the keyboard or over the network.

Access over the network to any server is controlled by two further levels of security. Firstly, users must log in by typing a username and password (which is never displayed on the screen), and secondly every shared resource can have a list of specific users who are allowed to read and/or write it.

You can use the same username and password to log in to the network as the ones you use to start up your computer. This is referred to as “one-time login.” Logging in this way is easier and secure because it encrypts your password as soon as you type it. Refer to Chapter 14, “Securing Information,” for detailed information about the security features available on each computer and how they work.



If you are concerned about security, give the SUPERVISOR account a password as soon as you create the first workgroup; by default, it has none.

Which Workgroup for Each Server?

Unless you have only one workgroup, you need to decide which workgroup to place each server in. You must also give this information to network users. Remember that you can change a server’s workgroup at any time.

Which Printers Should Be Shared?

When you decide which printers to share, make sure you inform network users of the printer names, locations, and suggested uses.

Printers are attached to servers. They are available to the members of the server’s workgroup.

Should Printers Be Moved?

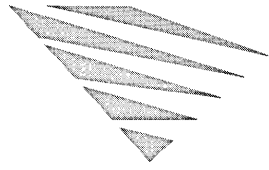
You may want to move printers to more accessible locations before setting up the network. Any printer that needs its paper type changed often, for example, should be physically located near someone who is willing to do this.

Which Accounts Should Be Created?

The workgroups you create will probably reflect existing divisions within your organization. Remember the following when deciding which accounts to create within a workgroup:

- ◆ You can give users accounts in more than one workgroup but a user can only be logged in to one workgroup at a time.
- ◆ You can give any user workgroup administrator privileges.
- ◆ You can specify exactly who can change the settings for each server, and who can use each shared directory and printer.
- ◆ There are no restrictions on how many people can log in with the same username at the same time, nor on where they do so.

As well as creating accounts for individual network users, you may want to create special-purpose accounts, such as a GUEST account. A GUEST account must not have workgroup administrator privileges.



chapter **20** *Setting Up the Network*

This chapter explains how to set up the network and how to change the network configuration. Before setting up your network, it is recommended that you read the previous chapter in this manual, Chapter 19, “Planning Your Network.”

If you ran SETUP /FIRST after you installed the network, as described in the section “After Configuring” on page 3-10, you have already set up a basic network and the following are true:

- ◆ A single workgroup has been created which has at least one server in it.
- ◆ A SUPERVISOR account for the workgroup has been created. This account has workgroup administrator privileges.
- ◆ Accounts are created for all users whether their computers share resources (client-servers) or simply use the resources provided by other computers (clients only). All these accounts have workgroup administrator privileges. No account has a password yet.
- ◆ The resources to share (hard disk drives and printers) have been specified.

You may find that this network is sufficient for your needs. If so, refer to the sections “Managing Servers” on page 20-14, “Sharing Directories” on page 20-24, and “Sharing Printers” on page 20-32 to learn how to set these up for use. If you do not want every user of the workgroup to have administrative privileges, or if you want to create other accounts in the workgroup, refer to “Creating and Modifying User Accounts” on page 20-6.

If you did not use SETUP /FIRST, you must set up the network as described in this chapter. The tasks you need to perform to set up the network are listed as follows in the best order for doing them.

- ◆ Creating a Server (20-2)
- ◆ Creating a Workgroup (20-3)
- ◆ Creating and Modifying User Accounts (20-6)
- ◆ Changing a Server's Workgroup (20-11)
- ◆ Managing Servers (20-14)
- ◆ Sharing Directories (20-24)
- ◆ Sharing Printers (20-32)

Creating a Server

When you install Personal NetWare™, you create a server by selecting the option *Share this computer's resources*. You can choose to share any of your drives or printers. To create a server on a computer, if you did not select this option during installation, run SETUP and choose the option *Share this computer's resources*.

Note that when you add a computer to an existing workgroup, at least one server must be switched on and running in the workgroup in order for SETUP to be able to detect the workgroup.

Once a server is created, its owner should be aware of the following obligations to other users.

- ◆ Other users cannot access the server unless it is running DOS and the network software is loaded.
- ◆ Do not reboot or switch off the computer without checking to make sure that other users do not have connections to it. They could lose information, although the network software attempts to reconnect users if you immediately restart the server.

If this is the first server on the network, leave it running while other users install Personal NetWare.

Creating a Workgroup

When you create the first server on the network, you can create a new workgroup for this server by using `SETUP /FIRST` immediately after configuring, and entering a name for the workgroup. If you do not use `SETUP /FIRST`, or if you later create another workgroup, the local server (that is, the server that is loaded on the computer in front of you) becomes the first server in the new workgroup.

Before you can create a workgroup you must do the following:

Checklist



- Make sure the server that you want to add to the workgroup is loaded.

If a workgroup has been created already, and the server has been added to it, you must also

- Log in to the server's current workgroup.
- Make sure you are the server owner or have rights to manage the server.

Also, you should have decided the following:

- ◆ A name for the new workgroup. All workgroup names on a network should be different; otherwise users will find them difficult to distinguish.
- ◆ Whether you want the server's existing shared resources (directories and printers) to be moved to the new workgroup or deleted.

- ◆ Whether you want the new workgroup to have the same list of routes as the old one.

Routes are the identifiers used for network communications. If your network boards are all the same type and connected to the same network, you only need one route to address them. You will need multiple routes only if you have a complex configuration, including a router or a NetWare® server acting as a router. In those cases, whoever installed the NetWare or other network should be able to advise you about routes.

- ◆ Whether you want to reset the new workgroup's user database, or copy it from the server's previous workgroup.

If you reset the user database the following occur:

- ◆ The new workgroup is created with just one user called SUPERVISOR, without a password.
- ◆ The owner of the server is set to SUPERVISOR.
- ◆ You are logged in to the new workgroup as SUPERVISOR.

If you do not reset the user database

- ◆ Users of the old workgroup are also given accounts in the new one, with the same passwords and privileges, and with the same rights on your server.
- ◆ You are logged in to the new workgroup with the same username as you had in the old one.

You can create a new workgroup from DOS or MS Windows.

Creating a Workgroup from DOS

Procedure



1. At the system prompt, type

```
NET ADMIN <Enter>
```

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. If this is the first workgroup you are creating, ignore Step 3 and proceed to Step 4.

3. If you are not logged in, you can log in now by choosing *Login...* from the Workgroup menu.
4. Choose *Create...* from the Workgroup menu.
5. Type in the new workgroup's name.
6. Select whether to move the existing shared resources, if any, to the new workgroup.
7. Select whether to copy the known routes to the new workgroup.
8. Select whether to reset the user database.
9. Choose the <OK> button to proceed.

The server is now in the new workgroup. The next step is to create user accounts in the new workgroup.

If the SUPERVISOR account does not have a password yet, give a password for the SUPERVISOR account now. The section, "Creating and Modifying User Accounts" on page 20-6, describes how to assign passwords.

Creating a Workgroup from MS Windows

Procedure



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.

To choose an object, double-click it or highlight it and press <Enter>.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

Note that if the <Include non-connected resources> button is selected, you can adjust the widths of both sides of the window. The left side shows current connections, the right side shows other objects.

3. **If you are creating the first workgroup, ignore Step 4 and proceed to Step 5.**
4. **Select an existing workgroup.**
5. **From the File menu, choose *New...*, or press <Ins>.**
The Create New dialog appears.
6. **In the Type list box, choose *Workgroup*.**
7. **In the Name text box, enter a name for the new workgroup.**
8. **Choose the <OK> button.**
9. **In the Create Workgroup dialog which appears**
 - 9a. **Choose whether to move the existing shared resources to the new workgroup.**
 - 9b. **Choose whether to copy the known routes to the new workgroup.**
 - 9c. **Choose whether to reset the user database.**
 - 9d. **Choose the <OK> button.**

The server is now in the new workgroup. The next step is to create user accounts in the new workgroup.

If the SUPERVISOR account does not have a password yet, give a password for the SUPERVISOR account now. The following section, "Creating and Modifying User Accounts," describes how to assign passwords.

Creating and Modifying User Accounts

Users with workgroup administrator privileges (such as SUPERVISOR) can create, modify, disable, or delete a workgroup's user accounts.

If you have NetWare on your network, you should use the same account usernames that already exist in NetWare, so that you can use the one-time login facility.

Before you can create or modify a user account

Checklist



- You must be logged in to the appropriate workgroup.
- You must have workgroup administrator privileges.
- Decide whether to give the user workgroup administrator privileges. A workgroup administrator can
 - ◆ Create workgroups.
 - ◆ Create, modify or delete any user's account except the SUPERVISOR account.
 - ◆ Reconfigure any server which has workgroup administrator rights set to ALL (or READ and WRITE). Refer to "Configuring a Server" on page 20-14.
 - ◆ View and delete the workgroup's audit log. Refer to "Audit Log" on page 22-4.
 - ◆ View and delete the workgroup's error log. Refer to "Error Log" on page 22-6.

Warning



Always give a password to any account that has workgroup administrator privileges to prevent use of the account by anyone other than its proper user.

You can create or modify an account from DOS or MS Windows.

Creating or Modifying an Account from DOS

Procedure



1. At the system prompt, type

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. If you are not logged in, you can log in now by choosing *Login...* from the Workgroup menu.
3. Choose *Users* from the View menu.

4. Refer to the following table for information about what to do next.

To	Do this
Create a user account	<ol style="list-style-type: none">1. Choose <i>Add...</i> from the File menu or press <Ins>. The Add User dialog appears.2. Type the username (up to 15 characters, no spaces) and choose <OK>. The Account Properties dialog appears.3. Complete the dialog as described on page 20-9.
Modify a user account	<ol style="list-style-type: none">1. Select a username from the list.2. Choose <i>Properties...</i> from the File menu or press <Alt><Enter>. The Account Properties dialog appears.3. Complete the dialog as described on page 20-9.
Rename an account	<ol style="list-style-type: none">1. Select a username from the list.2. Choose <i>Rename...</i> from the File menu or press <F3>.3. Edit the name field in the dialog that appears.
Delete a user account	<ol style="list-style-type: none">1. Select a username from the list.2. Choose <i>Delete...</i> from the File menu or press .

The Account Properties dialog has the following fields:

Field	Purpose
User's full name	Provides the user's full name.
Account disabled	Allows you to disable an account temporarily.
Workgroup Administrator	Gives the user workgroup administrator privileges.
Allow to change password	Allows the user to change their own password. Normally enabled, but you should disable it for GUEST accounts.
Password required	Ensures the account always has a password.
<Login Times...>	Allows you to specify, in half hour units, when this user is allowed to be logged in. During a restricted time the user cannot log in.
<Password...>	Allows you to give the account a new password. Note that you do not have to know its existing password.
Min. length, Unique, Changes required, and Days between changes	Control passwords to ensure security standards are maintained. Uniqueness tests that an old password is not reused. Changes required forces a user to change the password regularly.

5. If you are creating a workgroup, configure the server next, as described in "Configuring a Server" on page 20-14.


Creating or Modifying an Account from MS Windows

Procedure



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.
2. Open the NetWare window, unless it is already open.
From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.
3. Double-click the workgroup's icon in the NetWare window to select it and show its objects.

4. Refer to the following table for information about what to do next.

To	Do this
Create a user account	<ol style="list-style-type: none">1. From the File menu, choose <i>New...</i>, or press <Ins>. <p>The Create New dialog appears.</p> <ol style="list-style-type: none">2. In the Type list box, select <i>User</i>.3. In the Name text box, type the username (up to 15 characters, no spaces).4. Choose the <OK> button. <p>The Account Configuration dialog appears.</p> <ol style="list-style-type: none">5. Complete the dialog as described on page 20-11.
 Note	The account has no password initially. Set it, if required, as described next.
Set a user's password	<ol style="list-style-type: none">1. Select the relevant username from the list in the NetWare window.2. From the File menu, choose <i>Properties...</i>, or press <Enter>.3. Choose the <Set Pass...> button on the User Information dialog. <p>The Set Password dialog appears.</p> <ol style="list-style-type: none">4. Complete the dialog. You must type the new password twice to ensure that it is correct.
Modify a user account	<ol style="list-style-type: none">1. Select the relevant username from the list in the NetWare window.2. From the File menu, choose <i>Properties...</i>, or press <Enter>.3. Choose the <Configure...> button. <p>The Account Configuration dialog appears.</p> <ol style="list-style-type: none">4. Complete the dialog as described on page 20-11.
Delete a user account	<ol style="list-style-type: none">1. Select a username from the list in the NetWare window.2. Choose <i>Delete...</i> from the File menu or press .

The Account Configuration dialog has the following fields:

Field	Purpose
Login name	The username which the user types when logging in. Must be one word of up to 15 characters.
User's full name:	Provides the user's full name.
Account disabled	Allows you to disable an account temporarily.
Workgroup Administrator	Gives the user workgroup administrator privileges.
Allow to change password	Allows the user to change their own password. Normally enabled, but you should disable it for GUEST accounts.
Password required	Ensures the account always has a password.
Min. length, Unique, Changes required, and Days between changes	Control passwords to ensure security standards are maintained. Uniqueness tests that an old password is not reused. Changes required forces a user to change the password regularly.

5. If you are creating a workgroup, configure the server next, as described in "Configuring a Server" on page 20-14.

Changing a Server's Workgroup

After creating a workgroup, move those servers to it whose resources you want to share with users in that workgroup. You can also change the workgroup of any server at any other time.

Before you can move a server to a new workgroup, you must do the following:

Checklist



- You must be working on the server whose workgroup you want to change.
- You must log in to the server's current workgroup, if any.
- You must be the server owner or have rights to manage the server.

- At least one server in the workgroup to which you want to move must be available (running).
- You must have a username and password for the workgroup to which you want to move the server.

You can change a server's workgroup from DOS or MS Windows.

Changing a Server's Workgroup from DOS

Procedure



1. At the system prompt, type

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. Select your server from the list.
3. Choose *Properties...* from the File menu, or press <Enter>.
4. In the Server Properties dialog, choose the <Set Workgroup...> button.

The dialog that appears lists all the local workgroups in which at least one server is running. It does not, initially, list remote workgroups on a wide area network.
5. To include remote workgroups, choose the <Find workgroup...> button. This may take a minute or more.
6. Select the required workgroup from the list.
7. Select whether to move the existing shared resources to the new workgroup.

If you do not select this option, the server's shared printer and shared directory information is lost. If the server has no shared resources, this option is not selectable.

8. Choose the <OK> button to continue.

9. **Confirm that you want to log out of the old workgroup and in to the new one.**

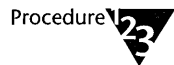
You cannot proceed without doing this.

10. **Give your username and password for the new workgroup.**

The server is now in the new workgroup.

If you want to create or change shared directories or printers, or to change the rights of users in the workgroup to manage and use the server, refer to the section "Managing Servers" on page 20-14.

Changing a Server's Workgroup from MS Windows



1. **In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.**

To "choose" an object, double-click it or highlight it and press <Enter>.

2. **Open the NetWare window, unless it is already open.**

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

Note that if the <Include non-connected resources> button is selected, you can adjust the widths of both sides of the window. The left side shows current connections, the right side shows other objects.

3. **Double-click the workgroup's icon in the NetWare window to show its objects.**

4. **Select the server's name.**

5. **From the File menu, choose *Properties...***

The Server Information dialog appears.

6. **Choose the <Set Workgroup> button.**

The Change Workgroup dialog appears. It lists all local workgroups in which at least one server is available.

7. **Choose the <All Workgroups> button if the desired workgroup is not shown because it has no servers on your local network.**
8. **From the list box, choose the required workgroup.**
9. **Choose the <OK> button.**

The Login dialog appears. You must log in to continue.
10. **Type your username, if not shown correctly, and your password.**
11. **Choose the <OK> button to log in.**
12. **Choose the <Close> button to close the Server Information dialog.**

Managing Servers

When you create a server, you can allow the software to set default values for all settings. With knowledge of your requirements, or by observing network and server statistics, you may be able to choose more optimal values yourself. Also, you can select which users have the rights to manage the server.

As well as configuring a server, you can synchronize server clocks and obtain performance information about the server.

Configuring a Server

You can display the server configuration dialogs to see what the current server settings are, or to change them. Change them only if experience tells you that server performance can be improved by doing so.

Before you can configure the server, you must do the following:

Checklist



- You must log in to the server's workgroup.
- You must be the server's owner or have rights to manage the server.
- The server must be available (running).

You can display or change a server's settings from DOS or MS Windows.

Configuring a Server from DOS

Procedure



1. At the system prompt, type

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. Select the server that you want to configure.

If the server is listed as not available, you cannot configure it.

3. Choose *Properties...* from the File menu, or press <Enter>.

If the Server Properties dialog shows that more than one connection exists, someone else is connected to the server, so you may not be able to reconfigure the server.

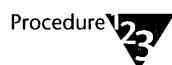
4. In the Server Properties dialog, choose the <Configure...> button.

The Server Configuration dialog appears. The dialog has the following fields:

Field	Purpose
Description	This can give more information about the server.
Owner	The owner can always configure the server. Only the owner may change this field.
Workgroup Administrator Rights	ALL means any workgroup administrator can configure the server. NONE means they cannot, unless they are named as a Server Manager with rights set to ALL.
Automatic Configuration	Selects one of three sets of server parameters. You can choose between maximum performance, minimum use of memory, or a balance between these. In the Advanced Settings dialog you can change any of the server configuration parameters that affect memory and performance.

Field	Purpose <i>continued</i>
<Server Managers...>	A list of users who are server managers with more or fewer rights than the default. Set the rights to ALL or NONE.
<Advanced Settings...>	Displays the Advanced Settings dialog, which shows settings which you can change in order to improve the server's performance or memory usage. Some of these are explained in "Advanced Server Settings" on page 20-19.
<Loadable Modules...>	Displays a dialog which lets you specify which server components you want to be loaded. You can reduce the amount of memory the server uses by not loading unused modules, but if you load DPMS the modules load in extended memory, so have very little impact on conventional memory.

Renaming a Server from DOS



1. At the system prompt, type

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

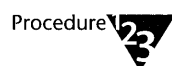
2. Select the server that you want to rename.

If the server is listed as not available, you cannot rename it.

3. Choose *Rename...* from the File menu, or press <F3>.

Configuring a Server from MS Windows

This procedure performs all server configuration functions except for setting which users have the right to configure the server. To set these rights, see "Setting Users' Rights to Configure a Server from MS Windows" on page 20-18.



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. Choose (double-click) the workgroup's icon in the NetWare window. This shows the workgroup's objects.

4. Select the server.

5. From the File menu, choose *Properties...*

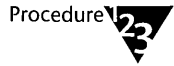
The Server Information dialog appears.

6. Choose the <Configure...> button.

The Server Configuration dialog appears. The dialog has the following fields:

Field	Purpose
Server Name:	The name all users see in server lists. Make sure no one is connected to the server when you rename it.
Owner:	The owner can always configure the server. Only the owner may change this field.
Description:	A longer name that could give more information about the server.
Allow Server to Load	Can be deselected to disable the server and free up 40 KB or more of memory temporarily. You must reboot the computer before this takes effect, though you can often unload the client and server by typing VLM /U <Enter> SERVER U <Enter>
Parameters	Settings which you can change in order to improve the server's performance or memory usage. These are explained in "Advanced Server Settings" on page 20-19.
Modules	Lets you specify which server components you want to be loaded. You can reduce the amount of memory the server uses by not loading unused modules, but if you load DPMS, the modules load in extended memory so have very little impact on conventional memory.

Setting Users' Rights to Configure a Server from MS Windows



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. Choose (double-click) the workgroup's icon in the NetWare window. This shows the workgroup's objects.

4. Select the server.

5. From the File menu, choose *Rights...*

The Rights dialog appears, showing workgroup administrators' rights and a list of all users.

6. To change the rights of all workgroup administrators, except those explicitly excluded in Step 7, change the READ and WRITE settings together.

7. To change the rights of any user, select the user from the list, then give them one of the following rights:

◆ **Default:**

If the user is a workgroup administrator, their rights will be those set for workgroup administrators. Otherwise, they will be none.

◆ **Explicit: Read and Write:**

The user is allowed to manage the server.

◆ **Explicit: Neither Read nor Write:**

The user is not allowed to manage the server, even if they are a workgroup administrator.

Advanced Server Settings

The advanced settings allow you to fine-tune server performance. In most cases, the default server configuration values provide suitable performance. Change them only if performance deteriorates.

Before changing settings for a server, make sure you know the statistics and configuration settings that are related to the performance problem. You can obtain statistics about network traffic and server performance by displaying the server Statistics dialog, as described in “Obtaining Performance Statistics” on page 20-20.

The following are examples of situations that could require you to change the server configuration:

- ◆ If the response time of the server increases, try increasing the size and number of buffers. You could also use SETUP to change the BUFFERS statement in CONFIG.SYS.
- ◆ If you get errors from the server indicating that files cannot be opened, increase the number of buffers. You could also use SETUP to change the FILES statement in CONFIG.SYS.
- ◆ If shared directories or printers are suddenly unavailable, check the maximum number of connections allowed and increase it if necessary.

When setting the size and number of buffers, consider the following:

- ◆ If you have a server sharing numerous applications in the workgroup, you may want to increase the size and number of its directory and receive buffers.

Increasing the receive buffer size allows clients to request more data from or send more data to the server with each read and write operation. When more data is sent, fewer requests are necessary so you get better performance from the server.

- ◆ The number of receive buffers does not need to be more than two above the number of simultaneous connections but it should not exceed 12 receive buffers.

- ◆ Generally, 8 to 12 receive buffers and 1 to 4 I/O buffers are sufficient.
- ◆ Using multiples of 512 bytes, increase the receive buffer size to the maximum supported by the network topology (for example, Ethernet or token ring) up to a maximum of 4096 bytes. However, increasing the size of the receive buffer increases the size of the server software when it is in RAM. If you enter too large a number, the network software uses the highest value that the network board can transmit or receive. Refer to the documentation for the network board to find out the maximum receive buffer size supported by the network topology.

Obtaining Performance Statistics

Once a server has been running, you can display information about its performance measurements. You can then use these in deciding how to improve performance, as described in “Configuring a Server” on page 20-14.

Before you can view the server’s performance statistics, you must do the following:

Checklist



- You must log in to the server’s workgroup.
- You must be the server owner or have rights to manage the server.

You can display the performance statistics from DOS or MS Windows.

To Display the Performance Statistics from DOS

Procedure



1. At the system prompt, type

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

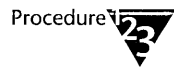
2. In the Servers view, select the required server.
3. Choose *Properties...* from the File menu, or press <Enter>.

4. In the Server Properties dialog, choose the <Statistics...> button.

The statistics show the cumulative and current values and the configured limits. These are explained in “Configuring a Server” on page 20-14.

5. In the Server Statistics dialog, choose the <Next...> button to see more statistics.

To Display the Performance Statistics from MS Windows



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. Choose (double-click) the workgroup’s icon in the NetWare window. This shows the workgroup’s objects.

4. Select the server.

5. From the File menu, choose *Properties...*

The Server Information dialog appears.

6. Choose the <Statistics...> button.

The Server Statistics dialog appears, showing current and cumulative values and configured limits. These are explained in “Configuring a Server” on page 20-14.

Setting a Server's Local Security

Network clients can only access the shared resources on a server, according to the user's rights. The person sitting at the server's keyboard can perform many more operations on the server. If you are concerned about the security of a server, you can restrict the operations that different users can perform at its keyboard by enabling security.

Before you can set local security for a server, you must do the following:

Checklist



- The computer must have security enabled. To enable security, use SETUP.
- You must be working on the server for which you want to set local user security.
- You must log in to the server's workgroup.
- You must be the server owner or have rights to manage the server.

To set local security for a server, do the following:

Procedure



1. At the system prompt, type

```
NET ADMIN <Enter>
```

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. Choose *Machine Security* from the Workgroup menu.

The Local Security dialog appears. It has a list of local users who are allowed to use the computer. Initially, the list is empty. You may add names, delete them, or modify their rights. Each user may be given rights to log in, to use the diskette drives and serial and parallel ports, and to have a one-time login script.

If there is at least one local user, you are asked for your name and password whenever the computer is rebooted. If not, you are asked for the Master Key password.

Synchronizing Server Clocks

Some applications, such as databases, depend on accurate time-stamping of files. If you are saving files on different computers, it can be important that their clocks are synchronized.

Before you can synchronize the server clocks, you must do the following:

Checklist



- You must log in to the workgroup.
- You must have workgroup administrator privileges.

You can synchronize server clocks from DOS or MS Windows.

To Synchronize Server Clocks from DOS

Procedure



1. **At the system prompt, type**

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. **Choose *Sync Server Time...* from the Workgroup menu.**

A dialog appears in which you can set the current date and time.

3. **Choose the <OK> button to set all servers in the workgroup to this date and time.**

To Synchronize Server Clocks from MS Windows

Procedure



1. **In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.**

2. **Open the NetWare window, unless it is already open.**

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. **Select the workgroup's icon in the NetWare window.**

4. From the File menu, choose *Properties...*

The Workgroup Connection Information dialog appears.

5. Choose the <Sync Servers> button.

The Date and Time Synchronization dialog appears.

6. Set the correct date and time, then choose the <OK> button to synchronize servers to that time.

Sharing Directories

Server owners can share DOS directories, subdirectories, and files on their hard drives (including CD-ROM drives) with other users in the same workgroup.

The server owner, or any other user with the right to manage the server, specifies that the drive or directory is to be shared, gives it a name, and specifies who can access it. Then, any user who logs in can connect to the shared directory, if they have the rights to do so, by mapping an unused DOS drive letter to it. All references subsequently made to files or subdirectories on that drive actually refer to files or subdirectories within the shared directory on the server.

You can use shared directories for many purposes, including the following:

- ◆ Sharing a single copy of an application program so that there is no need to keep a copy on each client's hard disk. This is further explained in "Sharing an Application" on page 20-30. Ensure that you only share applications that are licensed for network use.
- ◆ Sharing data: static, read-only, or dynamically changing information. The system makes sure that only one user at a time can change the contents of a file.
- ◆ Sharing spare space on hard disks.

Note that some applications may require that particular files be in a root directory. A shared directory to which a client has mapped a drive letter appears to applications as a root, regardless of its actual DOS path. Subdirectories within a shared directory do not, but you can make any subdirectory be a shared directory in its own right, and users can map to it, if it must behave as a root.

Directory Security

You can choose which workgroup users are allowed to access each of your directories and what type of access they have. For example, all workgroup administrators might be given read and write access, while GUEST can only read.

You cannot individually set access rights to each file in a shared directory, but you can set access rights to subdirectories within a shared directory. You do this by declaring a subdirectory to be a shared directory itself. For example, even if all users have all rights to C:\PUBLIC, you could restrict C:\PUBLIC\PRIVATE to be readable only by yourself by making it a shared directory in its own right. If C:\PUBLIC\PRIVATE was not a shared directory, then access rights to it would be the same as to C:\PUBLIC.

There are four levels of access rights, any of which may be made the default or given to certain named users. They are as follows:

Access Right	Description
ALL (READ - WRITE)	Users can perform all operations on files in the directory.
WRITE	Users can create new files and write to existing files. They cannot read or execute existing files, or scan the directory.
READ	Users can read and execute existing files and scan the directory.
NONE	Users can connect to the directory but they have no rights in it. Users can have rights to a subdirectory within it, if the subdirectory itself is made a shared directory.

If you want to restrict access to a shared directory, assign READ, WRITE, or NONE as the default user access rights, and specify the usernames of anyone who is to have ALL rights.

You cannot access password-protected files (on servers running Novell DOS™) across the network.

Naming Shared Directories

When you create a shared directory, you give it a name which should describe the contents of the directory to help users locate applications and files.



Note

Do not confuse the name of the shared directory with its DOS name. For example, the DOS path C:\PUBLIC\CUST.DAT identifies a directory called CUST.DAT which could be given the name NEW_CUSTOMERS as a shared directory.

It is sometimes best not to include the name of the server in the name of the directory. Excluding the server name makes it possible to move a directory to another server without having to change workgroup users' batch files to access the moved directory, although login scripts explicitly specify server names.

Creating, Modifying, and Removing Shared Directories

Before you can manage shared directories, you must do the following:

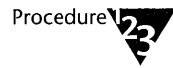


Checklist

- You must log in to the server's workgroup.
- You must be the server owner or have rights to manage the server.
- Before deleting or moving a shared directory, make sure that no user has an open connection to it. Refer to "Closing Down Your Server" on page 21-42.

You can manage shared directories from DOS or MS Windows.

To Create, Modify or Delete a Shared Directory from DOS



1. At the system prompt, type

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. Choose *Shared Directories* from the View menu.

The screen changes to show all existing shared directories on all servers in your workgroup.

3. The following table shows the procedures for managing shared directories.

To	Do this
Share an existing directory or create a shared directory	<ol style="list-style-type: none">1. Choose <i>Add...</i> from the File menu or press <Ins>. <p>The Add Shared Directory dialog appears.</p> <ol style="list-style-type: none">2. Type a name for the directory and select the server it is on, then choose the <OK> button. The name need not be the same as the directory's DOS name. It may have up to 15 characters, but no spaces. <p>The Directory Properties dialog appears.</p> <ol style="list-style-type: none">3. Type the actual DOS path or choose the <Browse Path...> button to see the list of directories on the server. If the directory does not already exist, you may create it now by choosing the <Create...> button on the Browse Path dialog.4. Complete the Directory Properties dialog according to what you want to do.
Modify access rights to a shared directory	<ol style="list-style-type: none">1. Select the directory from the list.2. Choose <i>Properties...</i> from the File menu or press <Alt><Enter>. <p>The Directory Properties dialog appears.</p> <ol style="list-style-type: none">3. Complete the dialog according to what you want to do.

To	Do this <i>continued</i>
Move a shared directory to a different location on the same server	<ol style="list-style-type: none"> 1. Select the directory from the list. 2. Choose <i>Properties...</i> from the File menu or press <Alt><Enter>. 3. Edit the DOS path.
Rename a shared directory	<ol style="list-style-type: none"> 1. Select the directory from the list. 2. Choose <i>Rename...</i> from the File menu or press <F3>. 3. Edit the name in the dialog that appears. <p>This affects the name other network users see, not the DOS name.</p>
Stop sharing a directory	<ol style="list-style-type: none"> 1. Select the directory from the list. 2. Choose <i>Delete...</i> from the File menu or press . <p>This does not delete the DOS directory or any of its contents. It merely stops network users connecting to it.</p>

The Directory Properties dialog has the following fields:

Field	Purpose
Default Access Rights	<p>Sets the rights of all users except those listed in <User Rights...>.</p> <p>Refer to "Directory Security" on page 20-25.</p>
<Browse Path...>	Shows you all existing DOS directories. Allows you to select one of these or to create a new one.
<User Rights...>	<p>Lets you control who may do what with a directory. Typically used either to give the server owner more rights or to give guests fewer rights than the default.</p> <p>The User Rights dialog lists all users who have non-default rights. You can add or remove usernames and modify individual users' rights.</p>
Suggested Drive	Allows you to specify the drive letter to which users should map this directory. This is only used if the mapping is made by the NET MAP command without specifying a drive letter.

To Create, Modify or Delete a Shared Directory from MS Windows

Procedure



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.
2. Open the NetWare window, unless it is already open.
From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.
3. Choose (double-click) the workgroup's icon in the NetWare window. This shows the workgroup's objects.
4. The following table shows the procedures for managing shared directories.

To	Do this
Share an existing directory	<ol style="list-style-type: none">1. Choose (double-click) the required server's icon. This shows its drives.2. Choose the required drive icon to show its first level directories.3. If necessary, choose the required directory icon to show lower level subdirectories. Repeat until the required subdirectory is visible.4. From the File menu, choose <i>Share...</i> The Share dialog appears, showing the name by which the directory will be known on the network. By default, this name is the same as its DOS name.5. If desired, type a name for the directory. The name need not be the same as the directory's DOS name. It can have up to 15 characters, but no spaces.6. Choose the <OK> button. The Rights dialog appears.7. Set the default rights for all unspecified users.8. If desired, set the rights of specific users by selecting the user's name, then setting a combination of read and/or write rights. Repeat for all the users who are to have non-default rights.9. Choose the <Close> button on the Rights dialog. The directory is now shared. It will appear in the NetWare and Drives windows of all the workgroup's users.

To	Do this <i>continued</i>
Modify access rights to a shared directory	<ol style="list-style-type: none"> 1. Select the directory in the NetWare window. 2. From the File menu, choose <i>Rights...</i> <p>The Rights dialog appears.</p> <ol style="list-style-type: none"> 3. Set the default rights for all unspecified users. 4. To set the rights of a specific user, select the user's name, then set a combination of read and/or write rights. Repeat for all the users who are to have non-default rights. 5. Choose the <Close> button.
Stop sharing a directory	<ol style="list-style-type: none"> 1. Select the directory in the NetWare window. 2. From the File menu, choose <i>Delete...</i> or press . <p>Note that this does not delete the DOS directory or any of its contents. It merely stops network users connecting to it.</p>

Sharing an Application

One of the uses of a shared directory is to share an application. This allows you to keep just one copy of the application on a server. It is easier to maintain, and saves disk space on users' computers.

Many applications, however, need special attention if installed onto a network server. Consider the following:

- ◆ They may keep a file with the users' preferences and hardware configurations. These files must not be shared.
- ◆ They may be network-aware. If so, they may need to know what network type they are running on so that they can control it directly.
- ◆ They may modify system files such as CONFIG.SYS and AUTOEXEC.BAT when you install them.
- ◆ Their license conditions may prohibit network use. Always check this before installation.

Before installing an application, know the hardware configurations of the computers that will use it.

Assume you are installing the application TESTAPP.EXE, for example, and the installation program asks what kind of monitor will be used with the application. Some of the computers on your network might have a VGA screen, but others have EGA. You should install TESTAPP.EXE for EGA, because VGA screens can display EGA, but not vice versa.

If you are a client, connected to the server and have ALL (or READ and WRITE) rights for the directory onto which you want to install the application, you can install applications that do not read or modify system files. In general, though, it is easier if the server owner installs the application onto its hard disk, then shares the directory it is in. The procedure described below follows this method.

Before you can share an application, you must do the following:



- You must be working on the server where you want to install the application.
- You must be the server owner, or have rights to manage the server.

To share an application, do the following:



- 1. Install the application on a hard drive.**
 - 1a. Follow the installation instructions in the documentation for the application.**
 - 1b. If the application's installation program prompts you for your network type, select the DOS-based (or "other," IBM* COMPATIBLE, NETBIOS, or PEER-TO-PEER) option instead of the NetWare option.**
 - 1c. Make sure the server's AUTOEXEC.BAT loads SHARE with sufficient locks and file handles (/L and /F parameters), depending on how many files the application opens simultaneously.**

Refer to the description of the SHARE command in the "Command Reference" chapter of DOSBook.

1d. Separate shared and non-shared files into different directories.

Ideally, each user's preference and configuration files should be stored on their own hard disks, not on the server. The application's installation instructions should tell you how best to achieve this.

1e. Make sure you have sufficient connections and tasks on the server to do the job.

Refer to "Configuring a Server" on page 20-14.

2. Log in to the server's workgroup.

3. Make the application directory shared with READ access.

Refer to "Sharing Directories" on page 20-24. Make the default access rights READ, to allow multiple users to run the application simultaneously. If, for some reason, you have to allow users to write to the directory, you could make executable files read-only using the ATTRIB command. Refer to the "Command Reference" chapter of DOSBook for a description of ATTRIB.

4. Tell users the name of the shared directory, so they can connect to it and run the application as described in "Using Shared Directories and NetWare Volumes" on page 21-8.

Sharing Printers

Any printer attached to a server's parallel ports or serial ports can be shared with other users of the workgroup. The network software ensures that each print job is complete before it is printed, so that the printouts do not become muddled. It can also print a banner, identifying the user, before each job, and can tell the user when printing is complete.

If you have NetWare on your network, you might prefer to use NetWare's facilities for sharing printers because they are more comprehensive.

When you send a file to print on a shared printer, that file is stored as a print job in a print queue. The print queue stores each print job until the printer is ready to print it.



Note that if you want to print on a printer which, while physically attached to your computer, is being shared with other network users, you must not do so by sending your output to the printer's physical port. You must connect to it as a shared printer, as described in "Using Shared Printers and NetWare Print Queues" on page 21-18.

Creating and Modifying Shared Printers

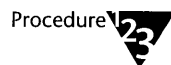
Before you can share a printer, you must do the following:



- You must log in to the server's workgroup.
- You must be the server owner or have rights to manage the server.
- Before deleting or moving a shared printer, make sure that there are no print jobs waiting to print in the print queue, and that no user has an open connection to it. Refer to "Closing Down Your Server" on page 21-42.

You can manage shared printers from DOS or MS Windows.

To Create, Modify or Delete a Shared Printer from DOS



1. **At the system prompt, type**

NET ADMIN <Enter>

The Workgroup Administration program loads, showing the Servers view. To display online help, press <F1>.

2. **Choose *Shared Printers* from the View menu.**

The screen changes to show all existing shared printers on all servers in your workgroup.

3. Refer to the following table to see what to do next.

To	Do this
Share a printer	<ol style="list-style-type: none">1. Choose <i>Add...</i> from the File menu or press <Ins>. <p>The Add Shared Printer dialog appears.</p> <ol style="list-style-type: none">2. Type a name for the printer. The name should tell users which printer it is or what they should use it for.3. Select the server and the actual port to which the printer is physically connected, then choose the <OK> button. <p>The Printer Properties dialog appears.</p> <ol style="list-style-type: none">4. Complete the dialog as described in the following table.
Modify a shared printer's settings	<ol style="list-style-type: none">1. Select the printer from the list.2. Choose <i>Properties...</i> from the File menu or press <Alt><Enter>. <p>The Printer Properties dialog appears.</p> <ol style="list-style-type: none">3. Complete the dialog as described in the following table.
Move a printer to a different port or server	<ol style="list-style-type: none">1. Stop sharing the printer, as described next.2. Move the printer's interface cable to the desired port/server.3. Follow the steps in "Share a printer" above. Give it the same name as before.
Rename a shared printer	<ol style="list-style-type: none">1. Select the printer from the list.2. Choose <i>Rename...</i> from the File menu or press <F3>.3. Edit the name in the dialog that appears.
Stop sharing a printer	<ol style="list-style-type: none">1. Select the printer from the list.2. Choose <i>Delete...</i> from the File menu or press .

The Printer Properties dialog has the following fields:

Field	Purpose
Server Port:	Shows you to which port the printer is physically attached.
Default Access Rights:	Sets the user rights to the printer except for those explicitly listed in <User Rights...>. ALL means users can use the printer and modify their own jobs in the queue. NONE means a user cannot use the printer.
Characters Per Second	Sets the maximum rate at which characters will be sent to the printer. Up to a point, increasing this will improve printer performance. Beyond that point, it will merely interrupt the server unnecessarily, and so slow the computer down.
Error Wait Time	The time, in seconds, that the server waits for a printer that is not accepting data. At the end of this time, a message pops up on the server's screen, alerting the owner to the problem.
<Serial Settings...>	Allows you to set the parameters of the serial port. This only applies to printers attached to COM1 or COM2.
<User Rights...>	Allows you to give non-default access rights to users for the printer.
<Setup Strings...>	Lets you create and name one or more strings of characters which will be sent to the printer at the start of any job that requests it. The names are those that users select in the Printer Settings dialog of the NET program; see "Connecting to a Printer" on page 21-19. The string is a sequence of two-character hexadecimal numbers representing bytes, separated by spaces. For example: 0A 0D
<Form Names...>	Lets you give names to the paper or form types that the printer uses. When a print job requires a form other than the one currently loaded, a pop-up message on the server's screen requests the server's owner to change the paper manually to the specified form.

Field	Purpose <i>continued</i>
<Advanced Info...>	<p>Displays additional settings that you can use to change the way the printer is set up.</p> <ul style="list-style-type: none">• Startup Form Name is the form type which is assumed to be loaded into the printer at start-up.• Old Print Jobs allows you to hold, delete or print jobs which are still in the queue from the previous session when the server starts up.• Use Console Timeout allows you to say for how long pop-ups should be displayed on the server's screen.• Spool Location allows you to specify in which directory the print queue's spool files should be placed.

To Create, Modify or Delete a Shared Printer from MS Windows



- 1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.**
- 2. Open the NetWare window, unless it is already open.**

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.
- 3. Choose (double-click) the workgroup's icon in the NetWare window. This shows the workgroup's objects.**

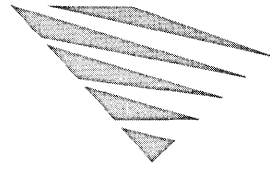
4. The following table shows the procedures for managing shared printers.

To	Do this
Share a printer	<ol style="list-style-type: none">1. Choose (double-click) the required server's icon to show its printer ports.2. Select the port to which the printer is attached.3. From the File menu, choose <i>Share...</i> <p>The Share dialog appears, showing the name by which the printer will be known on the network. By default, this name is the same as its DOS port number.</p> <ol style="list-style-type: none">4. Type a name for the printer. The name can have up to 15 characters, but no spaces.5. Choose the <OK> button. The Rights dialog appears. See "Modify access rights to a printer" Steps 3 to 5, below. <p>The printer is now shared. It will appear in the NetWare window of all the workgroup's users.</p> <ol style="list-style-type: none">6. (Optionally) confirm or change the print queue's configuration. See "Configure a print queue" on page 20-38.
Modify access rights to a printer	<ol style="list-style-type: none">1. Select the printer in the NetWare window.2. From the File menu, choose <i>Rights...</i> <p>The Rights dialog appears.</p> <ol style="list-style-type: none">3. Set the default rights for all unspecified users, either to both read and write or to neither.4. If desired, set the rights of specific users by selecting the user's name, then setting both read and write rights on or off. Repeat for all the users who are to have non-default rights.5. Choose the <Close> button.

To	Do this <i>continued</i>
Configure a print queue	<ol style="list-style-type: none"> 1. Select the printer from the NetWare window or the Printers window. 2. From the File menu, choose <i>Properties...</i> <p>The Print Queue Configuration dialog appears. It is described in the table below.</p> <ol style="list-style-type: none"> 3. Choose the <Close> button.
Stop sharing a printer	<ol style="list-style-type: none"> 1. Select the printer in the NetWare window. 2. From the File menu, choose <i>Delete...</i> or press .

The Print Queue Configuration dialog has the following fields:

Field	Purpose
Startup Form Name	The form type which is assumed to be loaded into the printer at start-up. This field is blank if no forms are defined for the printer.
Forms...	Opens the Forms window in which you can specify the names of forms.
Characters Per Second	Sets the maximum rate at which characters will be sent to the printer. Up to a point, increasing this will improve printer performance. Beyond that point, it will merely interrupt the server unnecessarily, and so slow the computer down.
Error Wait Time	The time, in seconds, that the server waits for a printer that is not accepting data. At the end of this time, a message pops up on the server's screen, alerting the owner to the problem.
Console Timeout	Allows you to say for how long pop-ups should be displayed on the server's screen. The default is forever.
Spool Location	Allows you to specify in which directory the print queue's spool files should be placed.
Old Print Jobs	Allows you to hold, delete or print jobs which are still in the queue from the previous session when the server starts up.



chapter **21** *Using the Network*

This chapter describes the various tasks you can perform when using the Novell DOS™ 7 network. To understand this information, you do not need to have read the previous chapter, Chapter 20, “Setting Up the Network,” but you need to be familiar with the terms and concepts described in Chapter 18, “Introduction to Personal NetWare.” The following is a list of the tasks described in this chapter.

- ◆ Logging In (21-2) and Logging Out (21-41)
- ◆ Connecting to Shared Directories (21-9)
- ◆ Sharing Data on Shared Directories (21-13)
- ◆ Running Applications on Shared Directories (21-14)
- ◆ Connecting to a Printer (21-19)
- ◆ Printing a File (21-25)
- ◆ Viewing and Changing Print Queues (21-26)
- ◆ Viewing and Changing Printer Status and Forms (21-29)
- ◆ Sending Messages to Other Users (21-30)
- ◆ Receiving Messages from Other Users (21-32)
- ◆ Viewing Your Account Details (21-33)
- ◆ Changing Your Password (21-35)
- ◆ Changing Your NetWare Directory Services Context (21-37)
- ◆ Saving Connections (21-38)

Logging In

You must load the network software before you can log in to the network.

Providing a Password for Security

When you start the operating system, your computer determines whether or not security has been enabled on it. If it has, you are asked to provide a password. If your computer is a server, it may have a list of users who are allowed to use it. If so, you are asked for your username as well as your password.

You must type your user password, not the computer's Master Key Password, to take advantage of the one-time login feature described in the next section. Refer to "Configuring a Server" on page 20-14 for information about how to set up security.

Loading Network Software

Once the Novell DOS 7 network software has been installed and enabled (as described in Chapter 3, "Installing Personal NetWare"), you are asked whether or not you want to load it, every time you start the operating system.

If you answer N (for No), you can use your computer exactly as you did before you enabled the network software. None of the network software is in your computer's memory so you have the maximum amount of memory available to run applications. If you decide later that you want to use the network, simply type the following command at the system prompt:

STARTNET <Enter>

This command loads the network software, just as though you had answered Y to "Load Network Software?"



If you answer Y, or later run STARTNET, the network software is loaded into your computer's memory. If your computer is set up as a Personal NetWare™ server, other users can connect to it from this point.

Task Switching: Local and Global Connections

Important



You cannot load the network software while the Task Manager or a similar program is running. You must first unload the Task Manager, which means you must close all your tasks. After loading the network software you can load the Task Manager.

All network connections made before you load the Task Manager are global, so you can use shared printers and directories in any task. Any connections you make subsequently are, by default, local to the task in which they are made. Each task has its own copy of the global connections, so changes made within one task do not affect other tasks. You can delete or change drive and printer connections without affecting other tasks. You can print to the same or different printers simultaneously from different tasks.

This can greatly increase the number of connections to Personal NetWare servers, which each support only a preset number of connections. It might be necessary to increase that number if many clients use task switching. See "Configuring a Server" on page 20-14.

Under MS Windows in enhanced (386*) mode, you can choose whether you want connections to be local to each task or global. Global connections are the same in each application and DOS window, even those already running when you make or change a connection. Thus, for example, changing the current directory on a drive in one DOS window affects all other windows if connections are global.

Note that if you run several NetWare[®]-aware applications that communicate with NetWare servers at a low level (the IPX level), you must run the supplied program TBMI2.COM in order that they may work together correctly under the Task Manager. See Chapter 13, "Multitasking and Task Switching," for details about the Task Manager.

Logging In to the Network

When the network software is loaded, it tries to log you in to the network as a user. If security and the one-time login facility are enabled on your computer you have already given a username and password, so these are used. Otherwise, you must type them now.

In any of the following circumstances a login will not succeed:

- ◆ The username or password are incorrect.
- ◆ The password has expired.
- ◆ The user account has been disabled.
- ◆ The login time restrictions on your account prevent you from logging in at that time.

These factors can be controlled by any user with workgroup administrator privileges. See "Creating and Modifying User Accounts" on page 20-6.

If you have ever previously logged in and saved your connections to a login script, those connections (to Personal NetWare and NetWare servers, directories and printers) are remade now. See "Saving Connections" on page 21-38 for further details.

After logging in, you can connect to shared directories and printers on Personal NetWare servers, and to their NetWare equivalents: NetWare volumes and NetWare printer queues. These operations are described starting with "Using Shared Directories and NetWare Volumes" on page 21-8.

Eventually, you will want to log out. Refer to "Logging Out" on page 21-41 for information.

Logging In to a NetWare Server or Directory Services Tree

Once the networking software is loaded into your computer's memory, you can log in to NetWare servers or NetWare Directory Services™ at any time, using the same or a different username in each.

After logging in, if you save your connections they will be remade the next time you log in to the network.

If you want to run your NetWare login script for the specified NetWare server or tree, use the NetWare LOGIN command. Otherwise, use any of the methods described in the following sections.

Logging In to a Different Workgroup or Account

You can change your workgroup, or use a different account by logging in with the new workgroup name, or username for the account.

Note



As with most network functions, you can log in by typing a command line or interactively from the system prompt or MS Windows. The MS Windows NetWare Tools™ program is, by default, selected by pressing the “hotkey” <F6>. You can change this on the NetWare Settings panel which you see when you choose “Network” in the MS Windows Control Panel.

Logging in from DOS, Non-interactive

Using the command line to log in is the quickest if you are at the system prompt.

- ◆ To log in as a different user or to a different workgroup, use the NET LOGIN command. See the “NET Commands” chapter of DOSBook for details.
- ◆ To attach to a NetWare server, use the NET CONNECT command. See the “NET Commands” chapter of DOSBook for details.

Logging in from DOS, Interactive

Procedure



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. If the workgroup, server or tree to which you wish to log in is not listed

2a. Choose *Include...* from the View menu.

2b. Select the types of connection you are interested in.

2c. If you want to connect to a remote workgroup, choose the <Find workgroup...> button. You may have to wait while the entire network is searched.

- 2d. Choose the <OK> button to return to the NetWare view.
3. Select your workgroup or the NetWare tree or server to which you wish to log in.
4. Choose *Connect...* in the File menu or press <Enter>.

The Login dialog appears.
5. If you are logging in to a workgroup, and you want it to become your default workgroup, select *Join workgroup*.
6. Type your username and password, then choose the <OK> button.

If your account has no password, leave the password blank. When you type a password, asterisks display on the screen. If you think you have made a mistake, press <Backspace>. If you do make a mistake, you must repeat the login procedure.
7. When you have finished using NET, choose *Exit* from the File menu, or press <Alt> X.

The first time you use NET, you might want to connect to directories and printers before you exit.

Logging in from MS Windows

Procedure



1. In Program Manager, choose the Personal NetWare icon in the Novell DOS 7 window.

To choose an object, double-click it or highlight it and press <Enter>.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. Choose the <Include non-connected resources in list> button.

Button names are shown along the bottom of the main window when the mouse is over a button.

You may need to make the NetWare window wider to see both sides.

4. All local trees, NetWare servers and workgroups are listed on the right side of the NetWare window. Remote workgroups are not shown. Use one of the following two steps:

4a. For a local workgroup, tree or server, choose the one to which you wish to log in.

4b. For a remote workgroup

- ◆ Select the workgroup to which you are already logged in.
- ◆ Choose *Properties...* from the File menu.
- ◆ On the Workgroup Connection Information dialog, choose the <Change> button.
- ◆ On the Change Workgroup dialog, choose the <All workgroups> button to search for remote workgroups.
- ◆ Select the desired workgroup when it appears.
- ◆ Choose the <OK> button.

The Login dialog appears.

5. Type your username and password, then choose the <OK> button.

If the username and password are correct, you are now logged in. The workgroup, server or tree appears in the left side of the NetWare window to show that you are connected to it.

6. If you have logged in to a different workgroup, and want to make it your default workgroup for the future, choose the <Set Preferred> button on the Workgroup Connection Information dialog.

If the dialog is not open, you can open it by selecting the workgroup, then choosing *Properties...* from the File menu.

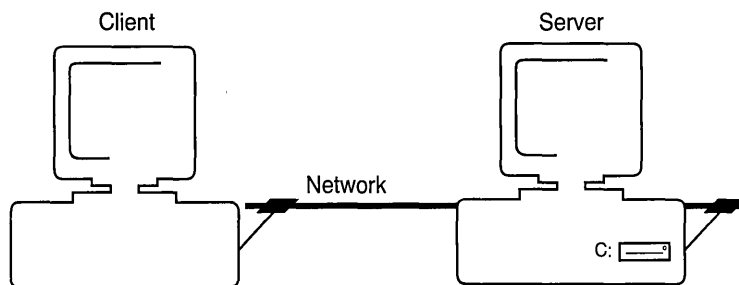
Using Shared Directories and NetWare Volumes

To use shared directories on Personal NetWare servers and volumes on NetWare servers, you must first connect to them. This connection establishes a mapping between a DOS drive letter and the selected directory. Note that in NetWare the term "map" is used for connecting to a volume.

As far as DOS, MS Windows, and applications are concerned, your computer has acquired another hard disk. Note, however, that you may not perform "low-level" operations such as formatting the disk.

You can use shared directories to store shared data and shared applications, or simply to increase the disk space available to your computer. Sharing data is discussed in "Sharing Data on Shared Directories" on page 21-13. Sharing applications is discussed in "Running Applications on Shared Directories" on page 21-14.

Figure 21-1
Sharing Directories



Step 1	SERVER shares C:\PUBLIC as "COMMON1"
Step 2	CLIENT connects F: to "COMMON1"
Step 3	CLIENT can now read and write on F:

Connecting to Shared Directories

Connections are maintained for as long as you are logged in, or until you delete them, but are lost when you log out unless you have saved them. Refer to "Saving Connections" on page 21-38.

Before you can connect to a shared directory, you must do the following:

Checklist



- You must log in to the server's workgroup or NetWare server. Refer to "Logging In" on page 21-2.
- The directory must exist as a shared directory (if it is on a Personal NetWare server) or NetWare volume. Refer to "Sharing Directories" on page 20-24.
- You must have rights to read or write files in the directory. Rights are controlled by the server's owner. Refer to "Sharing Directories" on page 20-24.

Make connections using one of the following three procedures:

Connecting to Shared Directories from DOS, Non-interactive

Use the NET MAP command. See the "NET Commands" chapter of DOSBook for details.

Connecting to Shared Directories from DOS, Interactive

Procedure



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Choose *Drives* from the View menu.

The Drive view appears. It shows all your drive letters and whether they are local (physically part of your computer), unused, or already connected over the network to a shared directory or NetWare volume.

3. Refer to the following table to see what to do next.

To	Do this
Connect (map) a drive letter to a shared directory or NetWare volume	<ol style="list-style-type: none">1. Highlight the drive letter you want to use. You can select any letter. If the letter is a local drive, that drive will be unusable while the network connection exists, so do not select C: if your computer is a server.2. Choose <i>Connect...</i> from the File menu or press <Enter>. <p>If the drive is already connected, you are prompted to confirm that you want to connect it to a different network directory.</p> <ol style="list-style-type: none">3. Select the desired directory from the list that appears.
Change the current directory (CD) of any drive letter.	<ol style="list-style-type: none">1. Highlight the drive letter you want to change.2. Choose <i>Properties...</i> from the File menu3. Select the desired directory from the list that appears. You can go several levels down the directory tree, if you wish, but you cannot go higher than the shared directory itself, which is treated as a "root" directory.
Disconnect a drive letter from a shared directory or NetWare volume	<ol style="list-style-type: none">1. Highlight the drive letter.2. Choose <i>Disconnect...</i> from the File menu or press .

Connecting to Shared Directories from MS Windows




Note

When first made, connections are not permanent. They last only until you switch off or reboot the computer, unless you make them permanent. See "Make a connection permanent," in the following procedure.

By default, connections are local, not global. This means, for example, that a drive connection is not visible inside a DOS window opened before the connection was made. See "Make connections global" in the following procedure.

There are two ways to connect to shared directories. If you are in File Manager, you can choose the *Network Connections...* command from the Disk menu. This opens a window almost identical to the one described in Step 3 of the procedure below. Refer to on-line help for a fuller explanation. If you are not in File Manager, use the following procedure.

Procedure 

1. In Program Manager, choose the Personal NetWare icon in the Novell DOS 7 window.

2. Open the Drives window, unless it is already open.

From the Window menu, choose *Drives*, or double-click the Drives icon in the main window.

Note that the window shows the complete path to the current directory of network connections as:

```
\\server\volume\dir1\dir2 \<current_dir>
```

The space indicates the location of the root directory. On Personal NetWare shared directories, this must be at the shared directory itself.

3. If you want to connect to a NetWare 4.x server, and the server's volumes are not shown, change your current context. See "Changing Your NetWare Directory Services Context from MS Windows" on page 21-38.

4. Refer to the following table to see what to do next.

To	Do this
Connect (map) a drive letter to a shared directory or NetWare volume	<ol style="list-style-type: none">1. Select the shared directory or NetWare volume from the list on the right side of the window.2. (Optionally, on NetWare volumes only - not Personal NetWare shared directories) if you want to connect to a subdirectory within the volume, double-click on the icon to open it. Repeat for each level of subdirectory. Select whichever subdirectory you wish to be the root.3. Drag the selected directory across to the required drive letter, or select the drive letter, then choose <i>Connect...</i> from the File menu. You can select any drive letter. If the letter is a local drive, that drive will be unusable while the network connection exists, so do not select C: if your computer is a server. If the letter is already connected, the existing connection will be deleted.
Connect (map) a drive letter to a shared directory or NetWare volume and set the current directory (CD).	<ol style="list-style-type: none">1. Select the directory you want to be the current directory from the list on the right side of the window. If it is not visible, choose (double-click) the shared directory or NetWare volume, then do the same, in turn, to each subdirectory in the path.2. Select the required drive letter.3. From the File menu, choose <i>Connect...</i>4. Edit the Source path field to insert a space between the volume's name and the backslash which follows it. The path up to the space becomes the root path. On NetWare volumes - not Personal NetWare shared directories - this may be a subdirectory within the volume.5. Choose the <OK> button.
Make a connection permanent	<ol style="list-style-type: none">1. Select the connection from the list on the left side of the window.2. From the File menu, choose <i>Permanent</i>. Note that the Permanent Connections box in the NetWare Settings dialog must be enabled for this to take effect. See "Saving Connections" on page 21-38. Permanent connections are distinguished in the Drives window by having different icons from temporary ones. <p>You can make a permanent connection temporary by choosing <i>Permanent</i> a second time.</p>

To	Do this <i>continued</i>
Make connections global	<ol style="list-style-type: none"> 1. From the Main window in Program Manager, choose "Control." 2. In the Control Panel, choose "Network." 3. In the NetWare Settings dialog, select "Global Drives & Paths." <p>(See also "Task Switching: Local and Global Connections" on page 21-3.)</p>
Display information about a volume	<ol style="list-style-type: none"> 1. Select the shared directory or NetWare volume from the list on the right side of the window. 2. From the File menu, choose <i>Properties...</i> 3. The server type and disk space are displayed.
Display information about a mapped directory	<ol style="list-style-type: none"> 1. Choose the drive letter, or select it and choose <i>Properties...</i> from the File menu. <p>A dialog is displayed. It tells you whether the drive is local or networked, whether it is searched in your current PATH, and whether the connection is permanent.</p>
Disconnect a drive letter from a shared directory or NetWare volume	<ol style="list-style-type: none"> 1. Select the drive letter. 2. From the File menu, choose <i>Disconnect...</i>

Sharing Data on Shared Directories

In order that several users can read data files at the same time, ensure that

- ◆ the users' access rights to the directory are set to READ.

or

- ◆ the file itself has the read-only attribute which you can set using the DOS ATTRIB command.

If you try to edit or otherwise modify the file you are denied access to it. To modify a shared data file you must first stop it from being shared by resetting its read-only attribute; then you can modify it before setting it to read-only again. If you are denied access when you try to modify the file, you will know that some other user is reading the file. You could broadcast a message asking them to close it.

Running Applications on Shared Directories

To run an application which has been installed on a Personal NetWare or NetWare server, you may first have to perform some initialization steps on your client computer. These vary greatly from application to application, and should be described in the application's documentation. In general, though, you follow a procedure similar to those described in this section.

If you expect to run the application more than once, you can save time by creating a batch file that automates the procedure. This is described in the second procedure in this section.

If you expect to run the application so frequently that you are willing to dedicate one of your drive letters permanently to it, you can save a little more time by following the third procedure described in this section.

If you use MS Windows, follow the fourth procedure.



Note

In all the procedures, an application called THISAPP.EXE in a shared directory called THISDIR on a server called THISSERVER is used as an example. THISAPP will be run on drive M:.

Before you can run an application from a shared directory, you must do the following:



Checklist

- The application must have been installed as described in "Sharing an Application" on page 20-30.
- You must log in to the server's workgroup or NetWare server. Refer to "Logging In" on page 21-2.
- You must have rights to read files in the application's directory. Rights are controlled by the server's owner. Refer to "Sharing Directories" on page 20-24.

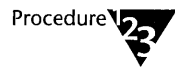
- Your CONFIG.SYS file must set sufficient FILES and BUFFERS, depending on how many files the application opens simultaneously.

Find out if the application has a different way to configure the number of open files. Clipper*-compiled applications often have a separate configuration method.

If you need to change the number of FILES or BUFFERS, use SETUP to edit CONFIG.SYS, then reboot the computer for the changes to take effect.

Running a Shared Application Once

To run a shared application once, do the following:



- 1. Connect a suitable drive letter to the application's directory on the server.**

Follow the procedure described in "Connecting to Shared Directories" on page 21-9. Some applications may have been installed so that they can only be run on a specific drive letter, but often the choice is yours.

- 2. Make the application's drive letter the current drive.**

This is not needed by all applications, but, for example, in the THISAPP example you would type the following at the system prompt:

M: <Enter>

- 3. Give the command to run the application.**

For example, in the THISAPP example you would type

THISAPP <Enter>

From MS Windows, you could double-click on THISAPP.EXE in the File Manager.

Creating a Batch File To Run a Shared Application

To create a batch file to run a shared application, do the following:



1. Use EDIT or any other text file editor to create the batch file.

The batch file could be called, say, RUNAPP.BAT. This file should be on your own hard disk in a directory named in your PATH command. Its contents could be as follows:

```
NET MAP M: THISSERVER\THISDIR
M:
THISAPP
NET MAP DEL M:
```

You can run this batch file at any time while you are logged in to the workgroup.

The NET MAP command is explained in the “NET Commands” chapter of DOSBook.

2. Enter the command to run the application (via the batch file).

For example, in the THISAPP example you would type

```
RUNAPP <Enter>
```

From MS Windows, you could double-click on RUNAPP.BAT in the File Manager, or create a program item to run RUNAPP.BAT from the Program Manager.

This method is not suitable for MS Windows applications.

Assigning a Drive Letter to a Shared Application

To dedicate a drive letter to a shared application, do the following:



1. Connect a suitable drive letter to the application’s directory on the server.

Follow the procedure described in “Connecting to Shared Directories” on page 21-9. Some applications may have been installed so that they can only be run on a specific drive letter, but often the choice is yours.

2. Save connections.

Follow the procedure described in "Saving Connections" on page 21-38.

3. Use EDIT or any other text file editor to edit AUTOEXEC.BAT.

Add the application's drive letter to the end of the PATH statement. For example, if the original line is

```
PATH C:\;C:\NWDOS;C:\NWCLIENT
```

change it to

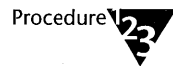
```
PATH C:\;C:\NWDOS;C:\NWCLIENT;M:
```

4. At the system prompt, type the command to run the application.

For example, in the THISAPP example you would type

```
THISAPP <Enter>
```

Using MS Windows to Run a Shared Application



1. Connect a suitable drive letter to the application's directory on the server. Make the connection permanent.

Follow the procedure described in "Connecting to Shared Directories" on page 21-9. Some applications may have been installed so that they can only be run on a specific drive letter, but often the choice is yours.

2. In Program Manager, create a program item for the application. Set the Working Directory to the mapped drive letter.

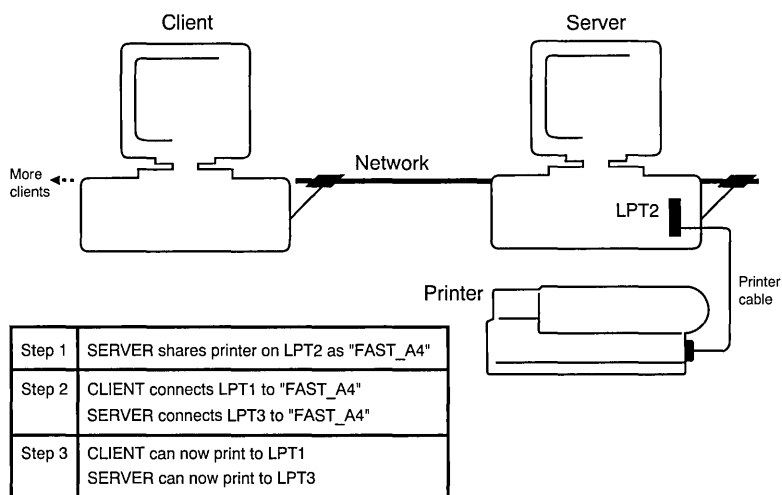
3. To run the application, double-click on its icon in Program Manager.

Using Shared Printers and NetWare Print Queues

To use shared printers on Personal NetWare servers and NetWare print queues, you must first connect to them. This connection establishes a mapping between a printer port and the selected printer's queue. Note that in NetWare the term "capture" is used for connecting to a printer.

As far as DOS and MS Windows applications are concerned, the printer is connected to the port on your computer.

Figure 21-2
Sharing Printers



Connecting to a Printer

Follow one of the three procedures below, depending on your preferences and whether you are using MS Windows.

Before you can connect to a shared printer, you must do the following:

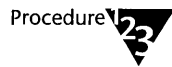


- You must log in to the server's workgroup or NetWare server. Refer to "Logging In" on page 21-2.
- The printer must be a shared printer (if it is on a Personal NetWare server) or NetWare print queue. Refer to "Sharing Printers" on page 20-32.
- You must have rights to use the printer. Rights are controlled by the server's owner. Refer to "Sharing Printers" on page 20-32.

Connecting to a Printer from DOS, Non-interactive

Use the NET CAPTURE command. See the "NET Commands" chapter of DOSBook for details.

Connecting to a Printer from DOS, Interactive



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Choose *Printers* from the View menu.

The Printer Port view appears. For each of your printer ports this shows whether they are already connected over the network to a shared printer or NetWare print queue.

3. Refer to the following table to see what to do next.

To	Do this
Connect (capture) a port to a shared printer or NetWare print queue	<ol style="list-style-type: none">1. Select the port you want to use. You can select any number. If there is a printer physically attached to that port on your computer, that printer will be unusable while the network connection exists. If the port is already connected to a different shared printer, the existing connection is broken, if you choose to connect the port to a different printer when prompted.2. Choose <i>Connect...</i> from the File menu or press <Enter>.3. Select the desired shared printer or NetWare print queue from the list that appears, then choose the <OK> button.4. Change the port settings as described next.
Change the settings of a port	<ol style="list-style-type: none">1. Select the port.2. Choose <i>Properties...</i> from the File menu or press <Alt><Enter>.3. Make any changes you need in the Printer Settings dialog, described in the following table. <p>Note these important settings for PostScript* printers: No form feed, tab expansion or banner.</p>
Disconnect a port from a shared printer or NetWare print queue	<ol style="list-style-type: none">1. Select the port.2. Choose <i>Disconnect...</i> from the File menu or press .

The Printer Settings dialog has the following fields:

Field	Purpose
AutoEndcap	(Automatic End Capture) Automatically closes each print job when the application that created the job terminates.
Banner	Prints a full page banner before each job to identify the username and job or filename. Make sure Banner is not selected for PostScript printers. If you use MS Windows, you can set the banner text with NetWare Tools.
Direct	Specifies whether the printer should start printing the job before it has been closed. The potential danger in this is that if the client never closes the job, and if Printer wait is set to zero, no-one else can use the printer.
Form Feed	Sends a form feed character to the printer at the end of each job to make it eject the last page. Make sure Form Feed is not selected for PostScript printers.
Keep	This option can only be set using the MS Windows NetWare Tools. If selected, jobs which have been partly sent when the client-server connection is broken are kept in the queue.
Job hold	Stops print jobs from printing until you explicitly release them. Until then, the jobs will remain in the printer's queue. See "Viewing and Changing Print Queues" on page 21-26.
Notify	Pops up a message on your screen when each of your print jobs finishes printing, so you know when to go to collect the printout.
Form name	Allows you to specify which of several paper types should be used. When one of your jobs is ready to print, a message pops up on the screen of the Personal NetWare server, asking its user to load the requested paper into the printer. This field is blank if the printer has no forms defined for it. You can specify which form is currently in the printer. See "Viewing and Changing Printer Status and Forms" on page 21-29.
Setup string	Allows you to specify which of several setup strings should be used. The setup string, if used, is sent to the printer before each of your jobs. This field is blank if the printer has no setup strings defined for it.

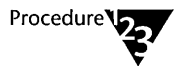
Field	Purpose <i>continued</i>
Copies	You can ask for up to 250 copies. Copies are not collated.
Tab expansion	You can specify how many spaces the tab character should be replaced by. Make sure this is set to zero for PostScript printers.
Timeout / Printer wait (seconds)	Sets the time for which the printer waits before deciding that a job is finished, if no more output is received during that time. A wait of zero is taken to mean "forever."

Connecting to a Printer from MS Windows

There are two ways to connect to shared printers. If you are in Print Manager, you can choose the *Network Connections...* command from the Options menu. This opens a window almost identical to the one described in Step 3 of the procedure below. Refer to online help for a fuller explanation. If you are not in Print Manager, use the following procedure.



If Print Manager is enabled and you select Print Net Jobs Direct, you get the best performance without losing the ability to view and control queues. Print Net Jobs Direct is in the Network Options dialog which you open by choosing *Network Settings...* from the Options menu of Print Manager.



1. **In Program Manager, choose the Personal NetWare icon in the Novell DOS 7 window.**
2. **Open the Printers window, unless it is already open.**

From the Window menu, choose *Printers*, or double-click the Printers icon in the main window.
3. **If you want to connect to a NetWare 4.x server, and the server's printers are not shown, change your current context. See "Changing Your NetWare Directory Services Context from MS Windows" on page 21-38.**

4. Refer to the following table to see what to do next.

To	Do this
Connect (capture) a port to a network printer	<ol style="list-style-type: none">1. Select the printer from the list on the right side of the window.2. Drag it across to the required port, or select the port, then choose <i>Connect...</i> from the File menu. You can select any port. If the port has a local printer attached to it, that printer will be unusable while the network connection exists. If it is already connected, the existing connection will be closed.3. Verify and, if needed, change the port settings. See "Change the settings of a port," below. <p>When first made, connections are not permanent. They last only until you quit MS Windows. See "Make a connection permanent," below.</p> <p>By default, connections are local, not global. This means, for example, that a connection is not visible inside a DOS window opened before the connection was made. See "Make connections global" on page 21-13.</p>
Change the settings of a port	<ol style="list-style-type: none">1. Select the port (from the left side of the window).2. From the File menu, choose <i>Properties...</i>3. Make any changes you need in the Printer Settings dialog, described on page 21-21. <p>Note the important settings for PostScript printers: No form feed, tab expansion or banner.</p>
Make a connection permanent	<ol style="list-style-type: none">1. Select the connection from the left side of the window.2. From the File menu, choose <i>Permanent</i>. Note that the Permanent Connections box in the NetWare Settings dialog must be enabled for this to take effect. See "Saving Connections" on page 21-38. Permanent connections are distinguished in the Printers window by having different icons from temporary ones. <p>You can make a permanent connection temporary by choosing <i>Permanent</i> a second time.</p>

To	Do this <i>continued</i>
Make connections global	<ol style="list-style-type: none"> 1. From the Main window in Program Manager, choose "Control." 2. In the Control Panel, choose "Network." 3. In the NetWare Settings dialog, select "Global Drives & Paths." <p>(See also "Task Switching: Local and Global Connections" on page 21-3.)</p>
Disconnect a port from a network printer	<ol style="list-style-type: none"> 1. Select the port. 2. From the File menu, choose <i>Disconnect...</i>

Notes

After connecting to a shared printer, you can use the corresponding port name (LPT1, for example) in practically all DOS commands and within all applications. As output goes into a print queue, you may wish to see the contents of each print queue, and re-order it, or change the settings of any of your jobs in the print queue. Refer to "Viewing and Changing Print Queues" on page 21-26 for information about this.

The connections are maintained for as long as you are logged in, but are lost when you log out unless you have saved them or made them permanent. Refer to "Saving Connections" on page 21-38 for information about saving connections.

Each print job is closed when any of the following occurs:

- ◆ The application closes it. Not all applications do this.
- ◆ The wait time is exceeded without any further characters being sent.
- ◆ The application terminates (if autoendcap is selected).
- ◆ The user opens and closes the LPT port as a DOS device. For instance, by typing

```
ECHO <Ctrl> L > LPT1 <Enter>
```

- ◆ Client-server communications are broken, perhaps by a cable becoming detached. In this case, the job is discarded unless Keep is selected.
- ◆ The client closes the connection by NET CAPTURE DEL or NET LOGOUT.

Printing a File

You can print a file on a shared printer using the following methods:

- ◆ Use a Print command from within an application. Some applications default to LPT1.; others allow you to select the port number.
- ◆ Use the printer port number with any DOS command that allows you to specify a destination file or device. For example, if you have connected a shared (non-PostScript) printer to LPT2:

```
DIR > LPT2 <Enter>
```

```
COPY ANYFILE.TXT LPT2 <Enter>
```

- ◆ Use the SCRIPT command if you have a PostScript printer. For example:

```
SCRIPT ANYFILE.TXT LPT2 <Enter>
```



If you use SCRIPT as a TSR and use the NET program to print out a file then make sure that the timeout value for SCRIPT is less than the printer wait time. Refer to the description of the Printer Settings dialog in this chapter, and the description of SCRIPT in the "Command Reference" chapter of DOSBook for more information.

- ◆ Use the Print File command from the Print Queues view of the NET program. This is described in the following section, "Viewing and Changing Print Queues."
- ◆ From MS Windows, drag the file's icon from File Manager to Print Manager's icon or window. It is printed on the default printer.

Viewing and Changing Print Queues

Because a print job goes into a print queue before it is printed, you can change its settings up to the point when it starts printing. You can add a file to the queue, change the order of your jobs in the queue, put them on hold, or delete the job.

You cannot do all these tasks using MS Windows Print Manager. You may need to use the NET program.

Before you can view a print queue, you must do the following:

Checklist



- You must log in to the server's workgroup or NetWare server. Refer to "Logging In" on page 21-2.
- You must have workgroup administrator privileges to control other users' print jobs.

Using Print Queues from DOS

Procedure



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view.
To display online help, press <F1>.

2. Choose *Select Print Queue...* from the Printing menu.

3. Select the required printer or queue from the list.

The Printer Queue view appears. This shows all the jobs currently in the selected queue.

4. Refer to the following table to see what to do next.

To	Do this
Add a file to the queue	<ol style="list-style-type: none">1. Choose <i>Print file...</i> from the Printing menu or press <Ins>.2. Type the file's name in the Print File dialog. <p>For PostScript printers, the file must contain PostScript.</p> <p>If you have connected a port to this printer, your connection settings are used. If not, one copy of your file is printed with no banner, no notification, default form, final form feed. While the job is in the queue you can change these.</p>
Change the settings of a print job	<ol style="list-style-type: none">1. Select the job.2. Choose <i>Job settings...</i> from the Printing menu or press <Enter>.3. Make any changes you need in the Printer Job Settings dialog, described below.
Change the status of a print job between "holding" and "ready"	<ol style="list-style-type: none">1. Select the job.2. Choose <i>Job settings...</i> from the Printing menu or press <Enter>.3. Change the Job Hold field in the Printer Job Settings dialog.
Change the order of jobs in the queue	<ol style="list-style-type: none">1. Select the job you want to move. You can only move your own jobs.2. Choose <i>Move job...</i> from the Printing menu.3. Type the new job number. Jobs are printed in number order.
Delete a print job	<ol style="list-style-type: none">1. Select the job.2. Choose <i>Delete job...</i> from the Printing menu or press .
View the queue of a different printer	<ol style="list-style-type: none">1. Choose <i>Select print queue...</i> from the Printing menu.

The Printer Job Settings dialog's fields are similar to those in the Printer Settings dialog (see the table on page 21-21) except that the Print Job Settings dialog does not have the AutoEndcap, Direct, Setup string and Printer wait fields.

Viewing Print Queues from MS Windows: Using Print Manager

If Print Manager is enabled, you can use it to view queues and delete your jobs from them. You enable or disable Print Manager on the Printers dialog box in the MS Windows Control Panel. Print Manager shows all your jobs in the queue, even if they were created while Print Manager was disabled.

If Print Net Jobs Direct is selected you cannot change the order of jobs in a queue with Print Manager, but you can with NET (see the previous procedure).

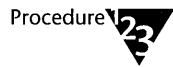


- 1. Start the Print Manager from Program Manager.**

Refer to online help if you are not familiar with Print Manager.

- 2. View and reorder queues, hold, resume or delete any of your jobs, as required.**

Viewing Print Queues from MS Windows: Using Personal NetWare



- 1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.**

- 2. Open the Printers window, unless it is already open.**

From the Window menu, choose *Printers*, or double-click the Printers icon in the main window.

- 3. In the Printers window, choose the printer or port (double-click, or select and press <Enter>).**

The printer's queue window opens, showing all jobs in the queue.

To	Do this
Put one of your jobs on hold, or take it off hold	<ol style="list-style-type: none"> 1. Select the job. 2. Choose the <Pause> or <Resume> button, as appropriate. <p>Note that the job's icon changes color. Paused jobs are not printed, but remain in the queue indefinitely.</p>
Delete one of your jobs	<ol style="list-style-type: none"> 1. Select the job. 2. Choose the <Delete> button.
Close the window	<ol style="list-style-type: none"> 1. Choose the <Close> button.

Viewing and Changing Printer Status and Forms

You can view and change the status of shared printers attached to Personal NetWare servers (but not NetWare servers). The status is either "Printing" or "Holding."

If the printer supports several named forms, you can specify which is currently loaded.

Note that you must use the NET utility to perform these functions - not the MS Windows Print Manager.

Before you can view or change the status of printers, you must do the following:



- You must log in to the server's workgroup. Refer to "Logging In" on page 21-2.
- You must have workgroup administrator privileges.



To view or change the status of a printer or form, do the following:

1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view.
To display online help, press <F1>.

2. Choose *Select Print Queue...* from the Printing menu.

3. Select the required printer from the list.

The Printer Queue view appears. This shows all the jobs currently in the selected queue.

4. Choose *Printer status...* from the Printing menu.

5. Change the status field, or specify the current form.

Sending Messages to Other Users

You can send a one line message to any or all workgroup users or users logged in to a NetWare server. This can be very useful if you are a server's owner and want to draw other users' attention to a new or changed setting, for example.

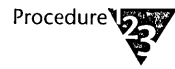
Users can stop messages from appearing on their screens, so your message might not get through. Users only see messages when they are logged in. Messages are not held until the user logs in.

Before you can send a message to another user, you must log in to the same workgroup or NetWare server as the other user. Refer to "Logging In" on page 21-2.

Sending Messages from DOS, Non-interactive

Use the NET SEND command. See the "NET Commands" chapter of DOSBook for details.

Sending Messages from DOS, Interactive



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Choose *Send message...* from the File menu.
3. Select the workgroup or NetWare server from the list of servers.
4. Select "All connected users" or one or more usernames by highlighting each name and pressing <Spacebar> to select them.

Only logged-in users are shown in the list.

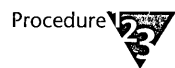
5. Type the message in its field.

You do not need to include your username, as this is added automatically.

6. Choose the <OK> button to send the message.

Remember that you cannot be sure that a user has not disabled message reception. Your message might not be seen.

Sending Messages from MS Windows



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. In the left side of the window, select the workgroup, user or group of users to whom you want to send a message

To see USERS, make sure the <Include users in lists> button is selected, and double-click the workgroup or server to display logged-in users.

To see GROUPS, make sure the <Include groups in lists> button is selected, and double-click the NetWare server to display logged-in groups. (Groups are defined only on NetWare servers.)

4. From the File menu, choose *Properties...*
5. Type your message in the Message field.
6. Choose the <Send> button.

Receiving Messages from Other Users

If a user sends a message to you while you are logged in, it appears on your screen, unless you have turned off message reception, as described below.

If your screen is in text mode, the message replaces the top line of the display. You must press <Ctrl><Enter> to remove it. Anything you type before pressing <Ctrl><Enter> is lost. It does not go to the application you are currently running. When you press <Ctrl><Enter>, the message disappears, the original top line reappears, and you can continue with whatever you were doing.

If you are running MS Windows, the message appears as a pop-up window in the center of the screen. The window has an <OK> button. You must click on it or press <Enter> to close the window and continue.

Controlling Message Reception

You can stop messages from being displayed, or set a timeout value so that the message is only displayed for a short time.

Controlling Message Reception from DOS

Procedure



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Choose *Message reception...* from the File menu.
3. Select or deselect <Receive messages>.
4. If you select <Receive messages>, you can enable a timeout.
5. If you select <Use timeout>, you can specify a timeout in seconds.

With no timeout, a message stays on the screen indefinitely, until the user removes it. With a timeout, the message disappears if the user has not already cleared it after the time has expired.

Controlling Message Reception from MS Windows



1. Either
 - 1a. Press the Network Hotkey (<F6> by default) then choose "NetWare Settings..." (<Alt> S), or
 - 1b. Choose "Network" from the Control Panel.
2. In the NetWare Settings dialog, select or deselect Broadcasts in the Message Reception area.

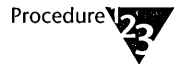
Viewing Your Account Details

You can display the details of your own account. The details shown include:

- ◆ whether you have workgroup administrator privileges
- ◆ whether you are allowed to change your own password
- ◆ whether your password is required, its minimum length, and if you are required to change it periodically.

Before you can view your account details, you must log in to the workgroup. Refer to "Logging In" on page 21-2.

Viewing Your Account Details from DOS



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Choose *Show account...* from the File menu.

The details of your account are shown. You cannot change them. Their meanings are explained in “Creating and Modifying User Accounts” on page 20-6.

Viewing Your Account Details from MS Windows



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. In the left side of the window, double-click your workgroup to display usernames.

Make sure the <Include users in lists> button is selected.

4. Select yourself from the list.

5. From the File menu, choose *Properties...*

6. Choose the <Configure> button.

The User Account Configuration dialog displays. The information it shows is described in “Creating and Modifying User Accounts” on page 20-6.

Changing Your Password

If your account has a password which you are allowed to change, change it regularly, even if the account properties do not specify that you must.

If you have an account in several workgroups or on several NetWare servers you could have a password for each account. One-time login demands that all your accounts have the same password and username. Also, to be practical, it is very difficult to remember several passwords. Therefore, change all your accounts' passwords at the same time, and keep them the same as each other.

Before you can change your password, you must do the following:

Checklist



- You must log in to the workgroup or NetWare server of your account. Refer to "Logging In" on page 21-2.

Changing Your Password from DOS, Non-interactive

To change your workgroup password, use the NET SETPASS command. See the "NET Commands" chapter of DOSBook for details.

To change your password on a NetWare server or tree, use the NetWare SETPASS command. Refer to your Novell NetWare documentation for details.

Changing Your Password from DOS, Interactive

Procedure



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Highlight the workgroup or NetWare server on which you want to change password.
3. Choose *Properties...* from the File menu.

4. **Type in your new password, press <Tab>, repeat the password.**

If you are changing your password on a NetWare server, you must type in the old password first.

5. **Choose the <OK> button to commit to the new password.**

Your account details may impose a minimum length on your password. Use the *Show account...* command from the File menu to find out what the minimum length is.

Changing Your Password from MS Windows

Procedure



1. **In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.**

2. **Open the NetWare window, unless it is already open.**

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. **In the left side of the window, select yourself in the list of users under the workgroup or server where you want to change your password.**

To see USERS, make sure the <Include users in lists> button is selected, and double-click the workgroup or server to display logged-in users.

4. **From the File menu, choose *Properties...***

Your User Information dialog appears.

Your account details may impose a minimum length on your password. To find out if this is the case, display your account details by choosing the <Configure...> button.

5. **Choose the <Set Pass...> button.**

6. **Type your old and new passwords into the boxes provided, then choose the <OK> button.**

7. **Choose the <Close> button to close the User Information dialog.**

Changing Your NetWare Directory Services Context

This is only of concern to users on NetWare 4.x networks. This section does not apply to any other user.

Within NetWare Directory Services you have a “current context.” This is a node in the tree within which the NET utility searches for servers and users. You can change the current context in order to broaden, narrow, or simply change the part of the tree that will be searched.

If you set your current context to the root of the tree, searches may take a long time and include lots of servers in which you have no interest, so you should normally set the current context to include just the part of the tree that contains the resources you actually want to use.

Before you can change your context, you must log in to NetWare Directory Services. Refer to “Logging In” on page 21-2.

Changing Your NetWare Directory Services Context from DOS, Non-interactive

Use the NET CONTEXT command. See the “NET Commands” chapter of DOSBook for details.

Changing Your NetWare Directory Services Context from DOS, Interactive

Procedure



1. At the system prompt, type

NET <Enter>

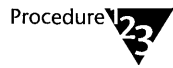
The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Choose *Current context...* from the File menu.

The Directory Services dialog appears. It shows the current organization “O=” and organization unit “OU=” with the smallest unit shown first.

3. To go down the tree, choose a container from the list. To go up, choose “..”.

Changing Your NetWare Directory Services Context from MS Windows



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.

The NetWare, Drives and Printers window in Personal NetWare all show the current context. The context is shown alongside an icon which is either an organization icon if the context is the root of the tree, or an up-arrow.

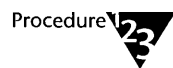
2. To go up the tree, choose the up-arrow icon in any window.
3. To go down the tree, choose the tree, organization or organization unit you want to open.

Saving Connections

You can save all your current connections to shared directories and printers on Personal NetWare and NetWare servers, so that they are reconnected automatically when you next log in. The NET SAVE command also allows you to create a batch file which contains the same connection commands. You can execute the batch file when you need to remake the connections.

Note that if a task switcher is running, only connections that exist in the current task (including those you made before you started the task switcher), are saved.

Saving Connections from DOS, Non-interactive



1. You can save connections either as a login script, which is executed automatically when you next log in, or as a batch file which you can execute on demand. In either case the contents are identical, but the filename and location are not.

- 1a. To save a login script, type the following at the system prompt:

```
NET SAVE /S <Enter>
```

See "Saving Connections from DOS, Interactive," below, for details of the script file created.

- 1b. To create a batch file, type the following at the system prompt:

NET SAVE [[*path*\]*filename*.BAT] <Enter>

If you omit the filename, NWLOGIN.BAT is created. By default it is in the current directory on the current drive. See "Saving Connections from DOS, Interactive," below, for details of the contents of the batch file created.

Saving Connections from DOS, Interactive

Procedure



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Choose *Save script...* from the File menu.

All your current connections are saved to a login script file (in C:\NWCNTL\MAIL by default) which is executed the next time you log in. Its name is unique to your workgroup username. Current connections include any made within MS Windows.

The file contains the following types of statement:

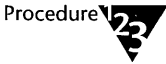
- ◆ **NET LOGIN** <*username*> to log you in to your workgroup.
- ◆ **NET CONNECT** <*server*> <*username*> to attach to NetWare servers (if any).
- ◆ **NET MAP** to connect your drive letters to shared directories and NetWare volumes.

For example, NET MAP F:=ANYDIR:ANYSUBDIR connects your drive F: to the shared directory ANYDIR, and changes the current directory on F: to ANYSUBDIR.
- ◆ **NET CAPTURE** to connect your printer ports to shared printers and NetWare printer queues.
- ◆ **SET** to record your environment variables; PATH is an important one.

3. (Optionally) use the *Edit script...* command from the File menu to edit the script file, if needed.

Saving Connections from MS Windows

Selected connections can be remade each time you restart MS Windows. Note that connections are not closed when you exit from MS Windows to DOS. The NET SAVE command described above can be used after you exit from MS Windows if you wish to remake the connections when you next log in, without needing to start MS Windows.



1. Each drive and printer connection can be made permanent, or left as temporary, by choosing *Permanent* from the File menu in the Personal NetWare program.

Note how the connection's icon changes. Temporary connections' icons are gray rectangles.

Choosing <Permanent> a second time makes the connection temporary again.

2. Select the "Permanent" box in NetWare Settings to enable reconnections.

Reach the NetWare Settings dialog from the Network icon in the MS Windows Control Panel.

Logging in Using Saved Connections

If you have a login script on the computer at which you are working, logging in runs it automatically. If you have the same username and password in your workgroup and on each NetWare server and tree to which you log in, you need only type the name and password once.

If you use MS Windows and selected <Permanent> in NetWare Settings, the next time you start MS Windows those connections you made permanent will be remade. If this requires logging in to any servers, you are prompted for your password. Instead of giving a password, you can choose the <Cancel> button, then either the <Skip> button to omit the connection for this session, or the <Remove> button to delete it permanently.

Logging Out

The best way to disconnect from the network is to type a NET LOGOUT command. This immediately tells all servers that your connections are closed. This allows server owners to see that there are no connections to their server, and switch the server off or reboot it without causing data loss or corruption.

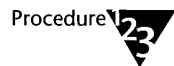
If you switch off or reboot your computer while you are logged in to the network, the system eventually realizes that your computer is not responding and logs you out. Meanwhile, server owners cannot switch their computers off confidently, so it is recommended that you always log out explicitly, if possible.

You can also selectively disconnect from any workgroup or server, leaving your other connections open.

Logging Out from DOS, Non-interactive

Use the NET LOGOUT command. See the “NET Commands” chapter of DOSBook for details.

Logging Out from DOS, Interactive



1. At the system prompt, type

NET <Enter>

The NetWare User program loads, showing the NetWare view. To display online help, press <F1>.

2. Highlight the workgroup or NetWare server from which you want to log out.
3. Choose *Disconnect...* from the File menu, or press .

Logging Out from MS Windows

Procedure



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.
2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.
3. In the left side of the window, select the workgroup or server from which you want to log out.
4. From the File menu, choose *Logout*.

Closing Down Your Server

Warning



If your computer is a server, you can inadvertently cause other users to lose information and time if you switch it off or reboot it while they are using its shared files or printers. To minimize the possibility of this, the server intercepts the <Ctrl><Alt> reboot command. It displays a pop-up window, informing you of the number of open connections and files. Unless these numbers are zero, you should not continue with rebooting.

However, if they have AUTO.VLM loaded, clients have some protection against short disconnections. If the server loses power for a few moments, or is rebooted, AUTO.VLM attempts to remake connections to it when it becomes available again.

Before you can close down the server, you must log in to your server's workgroup. Refer to "Logging In" on page 21-2.

The best procedures for closing down your server, before you attempt to reboot it or switch it off, are as follows.

Closing Down a Server from DOS



1. At the system prompt, type

NET DOWN <Enter>

If there are no active connections other than your own, this closes your server. You can now reboot your computer or switch it off.

If there are active connections, NET DOWN warns you. It allows you to close the server anyway, but offers the choice of not doing so. It is safest to do the following.

2. At the system prompt, type

NET CONSOLE <Enter>

The NET CONSOLE program's window appears. It shows full details of users and their connections, and allows you to broadcast a message to them.

3. Send a message to active users.

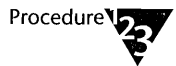
Assuming they respond by closing their files, you can safely close the server.

4. Exit from NET CONSOLE.

5. At the system prompt, type

NET DOWN <Enter>

Closing Down a Server from MS Windows



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. In the left side of the window, double-click your workgroup to display servers.

4. Select your server.

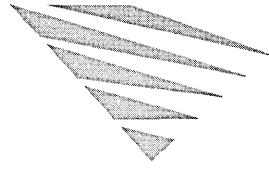
5. From the File menu, choose *Properties...*

In the Server Information dialog, you can see if there are any connected users (other than yourself).

6. For each connected user

To	Do this
Send the user a message	<ol style="list-style-type: none">1. In the NetWare window, select the user.2. From the File menu, choose <i>Properties...</i>3. In the User Information dialog, type the message, then choose the <Send> button.
See if the user has any open files on your server	<ol style="list-style-type: none">1. Select the user from the list on the Server Information dialog.2. Choose the <Open Files> button.
Disconnect the user	<ol style="list-style-type: none">1. Choose the <Disconnect User> button on the Server Information dialog. <p>Note that you cannot disconnect yourself this way.</p>

7. When you are satisfied that no other user has open files on your server it is safe to reboot or switch off your computer.



chapter **22** *Optimizing and Maintaining the Network*

This chapter describes tasks that should be performed from time to time to make sure that the network is running as efficiently as it can.

This chapter includes information about the following tasks:

- ◆ Network Management (22-1)
- ◆ Optimizing Server Performance (22-2)
- ◆ Backing Up Workgroup-Related Data (22-2)
- ◆ Restoring Workgroup-Related Data (22-3)
- ◆ Audit Log (22-4)
- ◆ Error Log (22-6)
- ◆ Uninstalling Network Software (22-8)

Network Management

The network supports SNMP network management, described in Chapter 25, “Configuring Your Computer for Desktop SNMP Services.” To allow SNMP to manage each computer, use SETUP at each computer to enable it.

Optimizing Server Performance

You can fine-tune server configuration to improve performance. Display the statistics about current server configuration and performance, and then use these to change server settings. Displaying statistics is described in “Obtaining Performance Statistics” on page 20-20. Changing the network configuration is described in “Configuring a Server” on page 20-14.

Because the hard disk performance of a server may be important to all users, run DISKOPT regularly to defragment files and free space. DISKOPT can only be used by the user who is physically working on the server and only when the network software is *not* loaded.

When optimizing a server’s hard disk, you should also consider scanning it for viruses, in addition to a regular virus scan. This is described in Chapter 14, “Securing Information.”

Backing Up Workgroup-Related Data

The network maintains data about the servers, shared resources, and users. Some of this data is kept in a distributed database, with a copy at each server. Other, server-specific, information is kept only at the server to which it refers. To minimize the danger of the workgroup data being corrupted, it is recommended that you regularly back it up, using NET ADMIN’s backup command.

Then, if it ever appears that data is corrupted, possibly as the result of a server crashing, you can restore the data from the backup copy.

Before you can back up workgroup data, you must do the following:

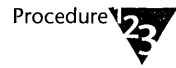
Checklist



- You must log in to the server’s workgroup. Refer to “Logging In” on page 21-2.
- You must have workgroup administrator privileges as well as the right to manage this server.

You can back up any server if you have appropriate rights for that server. You do not have to be using the server locally in order to take a backup.

To back up workgroup data, do the following:



1. At the system prompt, type
`NET ADMIN` <Enter>
2. Highlight the server to back up from the list of servers.
3. Select *Properties...* from the File menu.
4. Select the <Backup Databases...> button.
5. Specify the name of the directory into which the data should be saved.

It is a good idea to keep more than one backup, in differently named directories. The backup consists of several files in one directory within the directory you specify. The directory name is the same as the server name, with the extension .BAK.

Restoring Workgroup-Related Data

If it appears that the workgroup-related data has become corrupt, perhaps as a result of a server crashing, you can restore the data from the last backup made, as described in the previous section.

Before you can restore workgroup data, you must do the following:



- You must log in as a local user of the Personal NetWare™ server which is to be restored.
- You must log in to the server's workgroup. Refer to "Logging In" on page 21-2.
- You must have workgroup administrator privileges as well as the right to manage this server.



To restore workgroup data, do the following:

1. **At the system prompt, type**
NET ADMIN <Enter>
2. **Highlight the server from the list of servers.**
3. **Select *Properties...* from the File menu.**
4. **Select the <Restore Databases...> button.**
5. **Specify the name of the directory from which the data should be restored.**
6. **In addition to the server-specific data, specify which parts of the workgroup data you want to restore.**



This replaces the workgroup data on every server in the workgroup, and loses any changes that have been made since the backup.

Although you can specify which of the workgroup, user and resource databases you want to restore, in almost all cases you should restore them together or not at all.

Audit Log

For each workgroup, an audit log is kept, unless it has been turned off. The log records full details each time any of the following occurs:

- ◆ A server is switched on and becomes available.
- ◆ A server is switched off or closed down.
- ◆ A user logs in or out.

You can turn audit logging on or off, and display, save, or delete the log.

Checklist



Before you can use the audit log, you must do the following:

- You must log in to the workgroup. Refer to "Logging In" on page 21-2.
- You must have workgroup administrator privileges.

You can maintain the audit log from DOS or MS Windows.

Maintaining the Audit Log from DOS

Procedure



1. At the system prompt, type

NET ADMIN <Enter>

2. Select *Audit Log...* from the Workgroup menu.

The log is displayed. It shows all events in the workgroup known to the servers that are currently available. If any server is "down" its events are not shown. The log is ordered by time and date.

3. Refer to the following table to see what to do next.

To	Do
Turn auditing on or off	1. Select or deselect the "Auditing Enabled" check box.
Save the log to a file	1. Choose the <Save As...> button. 2. Specify the file's path and name. The saved file is an ASCII text file which can be edited and printed.
Delete the log	1. Choose the <Delete...> button.

4. When you have finished, select the <OK> button.

Maintaining the Audit Log from MS Windows

Procedure



1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare window.

2. Open the NetWare window, unless it is already open.

From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.

3. Select the workgroup from the list on the left side of the NetWare window.

4. From the File menu, choose *Properties...*

5. In the Workgroup Connection Info dialog, choose the <Audit Log...> button.

The audit log appears. Scroll it to see all events.

6. Refer to the following table to see what to do next.

To	Do this
Turn auditing on or off	1. Select or deselect the "Workgroup auditing active" check box.
Save the log to a file	1. Choose the <Save as...> button. 2. Specify the file's path and name. The saved file is an ASCII text file which can be edited and printed.
Delete the log	1. Choose the <Clear Log> button.

7. Choose the <Close> button to close the dialog.

Error Log

For each workgroup, an error log is kept. The log records full details each time an error occurs.

You can display, save, or delete the log.

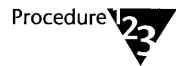
Before you can use the error log, you must do the following:



- You must log in to the workgroup. Refer to "Logging In" on page 21-2.
- You must have workgroup administrator privileges.

You can maintain the error log from DOS or MS Windows.

Maintaining the Error Log from DOS



1. At the system prompt, type

NET ADMIN <Enter>

2. Select *Error Log...* from the Workgroup menu.

The log is displayed. It shows all error messages in the workgroup known to the servers that are currently available. If any server is "down" its errors are not shown. The log is ordered by time and date.

3. Do either of the following.

To	Do
Save the log to a file	<ol style="list-style-type: none">1. Choose the <Save As...> button.2. Specify the file's path and name.
Delete the log	<ol style="list-style-type: none">1. Choose the <Delete...> button.

4. When you have finished, select the <OK> button.

Maintaining the Error Log from MS Windows

Procedure



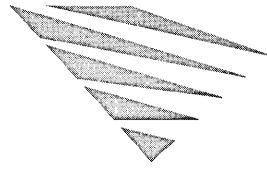
1. In Program Manager, choose the Personal NetWare icon in the Personal NetWare group window.
2. Open the NetWare window, unless it is already open.
From the Window menu, choose *NetWare*, or double-click the NetWare icon in the main window.
3. Select the workgroup from the list on the left side of the NetWare window.
4. From the File menu, choose *Properties...*
5. In the Workgroup Connection Info dialog, choose the <Error Log...> button.
The error log appears in a scrollable field.
6. Refer to the following table to see what to do next.

To	Do this
Save the log to a file	<ol style="list-style-type: none">1. Choose the <Save as...> button.2. Specify the file's path and name. <p>The saved file is an ASCII text file which can be edited and printed.</p>
Delete the log	<ol style="list-style-type: none">1. Choose the <Clear Log> button.

7. Choose the <Close> button to close the dialog.

Uninstalling Network Software

To uninstall the network software on your computer, you must edit AUTOEXEC.BAT to remove the reference to STARTNET.BAT. You can reclaim the disk space used by the network software by deleting the contents of the directory it is in (C:\NWCLIENT and C:\NWCNTL, by default).



chapter **23** *NET Commands*

This chapter introduces the commands that network users can enter at the system prompt. These commands largely duplicate the interactive functions described in Chapter 20, "Setting Up the Network," Chapter 21, "Using the Network," and Chapter 22, "Optimizing and Maintaining the Network." The choice of using these commands or using the NET program depends on which you find quicker and easier. Refer also to the following section, "Why Use NET Command Lines?"

Chapter 18, "Introduction to Personal NetWare," explains the ideas, terms, and operations you need to use the network. Refer to this information if you are not already familiar with it.

In addition to the commands listed in this chapter, NetWare[®] commands can be used to achieve many of the same functions, if you are a NetWare client, where they relate to NetWare servers. In some cases, you must use a NetWare command to refer to a NetWare server and a NET command to refer to a workgroup. This is stated where appropriate in the full descriptions of the NET commands, in the "NET Commands" chapter of DOSBook.

To use the interactive NET program, rather than NET command lines, type one of the following at the system prompt:

NET <Enter>

NET ADMIN <Enter>

NET CONSOLE <Enter>

NET DIAGS <Enter>

These operations are all described in Chapter 20, "Setting Up the Network," Chapter 21, "Using the Network," and Chapter 22, "Optimizing and Maintaining the Network."

If you type any other form of the NET command, it executes that command line and returns to the system prompt. A few commands ask you for a password or to press Y to confirm them but other than this they are not interactive.

Why Use NET Command Lines?

NET command lines have the following uses:

- ◆ Individually, they are quicker than running the interactive NET programs.
- ◆ Some commands can *only* be used in command lines.
- ◆ The output from command lines can be saved to a file, or printed, to provide a permanent record.
- ◆ NET command lines can be put into batch files.

NET SYNC and NET WAIT, for example, do not have an interactive equivalent because they are intended for use in batch files *only*.

Putting NET commands into batch files simplifies reconnecting to the network, especially when they are used in conjunction with the NET SAVE command. User Bryan, for example, could put the following lines in a file called UPDATEX.BAT:

```
NET MAP G: LIVEDATA  
NET MAP T: TOOLS  
T:UPDATEX G:MARCH %1  
NET MAP DEL G:  
NET MAP DEL T:
```

NET Command Summary

The NET commands fall into the following groups:

- ◆ Connection commands
 - ◆ List available resources
 - ◆ Inquire about existing resources
 - ◆ Make and break connections
- ◆ Settings commands
 - ◆ Inquire about network settings
 - ◆ Change certain network settings
- ◆ Function commands
 - ◆ Administration: write to the audit log, share resources, synchronize, close servers
 - ◆ User features: get online help, print files, send messages, save connections

These commands are all listed in the following tables. Most commands require parameters that are not shown in the tables; for information about these parameters, refer to the full command descriptions in the “NET Commands” chapter of DOSBook.

Connection Commands

You can list available resources, and display, make, or change any connection to them. Use the following NET commands.

Table 23-1
Connection Commands

	To list	To inquire about	To connect	To disconnect
your workgroup		NET INFO	NET LOGIN	NET LOGOUT
any workgroup	NET WGFIN NET WGLIST		NET JOIN	NET LOGOUT
NetWare servers	NET SLIST	NET CONNECT	NET CONNECT	NET LOGOUT
directories	NET WDLIST	NET MAP	NET MAP	NET MAP DEL
printers	NET WPLIST	NET CAPTURE	NET CAPTURE	NET CAPTURE DEL
users	NET ULIST			
server extensions	NET XLIST			

Note that the output normally seen on your screen can be saved to a file or printed. For example, the following command sends a list of connected (mapped) drive letters to a file named FLIST.TXT:

```
NET MAP >FLIST.TXT <Enter>
```

Settings Commands

You can inquire about and change many (but not all) settings. Other settings can only be changed by running NET ADMIN interactively, as described in Chapter 20, "Setting Up the Network."

Table 23-2
Settings Commands

	To inquire about	To set
your computer's details	NET INFO	
your workgroup password		NET SETPASS
message reception	NET RECEIVE	NET RECEIVE ON/OFF/ <i>time</i>
rights to a directory	NET RIGHTS	NET RIGHTS ADD
audit logging	NET AUDIT	NET ADMIN
NetWare 4.x context	NET CONTEXT	NET CONTEXT
protocol retries and timing	NET LINK	NET LINK
watchdog timer		NET SETDOG

Function Commands

You can perform the following miscellaneous administrative and user functions.

Table 23-3
Function Commands

Function	Use
Write an entry in the audit log	NET AUDIT
Share a directory or printer	NET SHARE
Synchronize servers' clocks	NET NTIME
Synchronize batch files	NET SYNC
Synchronize client's clock	NET TIME

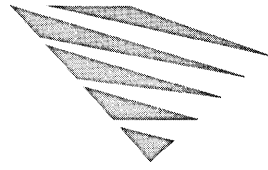
Table 23-3
Function Commands

Function	Use <i>continued</i>
Wait	NET WAIT
Close your server	NET DOWN
Get help on any NET command	NET HELP <i>command</i>
Print a file	NET PRINT
Send a message	NET SEND
Save connections	NET SAVE

Before Running NET Commands

Before you run NET commands at the system prompt, be aware of the following:

- ◆ The network software must be installed on your computer.
- ◆ The client software must be loaded. Normally, this means that you must have run STARTNET.BAT.
- ◆ Some commands require you to be logged in. This is noted in the detailed command descriptions in the “NET Commands” chapter of DOSBook. If you are not logged in, commands that relate to your current workgroup use the last workgroup you logged in to in the current session, if any, or the workgroup set in your NET.CFG file.
- ◆ Almost all commands can be entered at the system prompt or can be placed in a batch file.



chapter **24** *Using Network Diagnostics*

The Personal NetWare™ Network Diagnostics utility allows you to monitor the operation of the network. The information it provides is primarily of interest to users who have a good technical understanding of how networks function. In particular, Network Diagnostics enables you to do the following:

- ◆ View and monitor another workgroup or network
- ◆ Compare traffic for servers and clients
- ◆ Compare server utilization
- ◆ Compare server and client disk information
- ◆ View server and client configuration information
- ◆ View server and client statistics
- ◆ Test server and client connections

There are DOS and MS Windows versions of Network Diagnostics. The two versions provide similar functionality, but some features are unique to the DOS version. These additional DOS features are described in “Features Specific to Network Diagnostics in DOS” on page 24-4.

Enabling Network Diagnostics

By default, network diagnostics are enabled when you install the networking software. To disable or re-enable network diagnostics after installation, do the following:

Procedure



1. **At the system prompt, type**

SETUP <Enter>

2. **Choose the *Networking* option.**

You can now page through the network configuration screens.

3. **Select or deselect the option *Load NMR Network Management module*, then save the changes and exit SETUP.**

SETUP automatically adds (or removes) the command VLM=NMR.VLM to the NET.CFG file on your computer. If the command is added, this VLM™, the Network Management Responder, is loaded automatically when you restart the operating system.

4. **Restart the operating system, and answer Y to the prompt**

Load Network Software (Y/N)

Starting Network Diagnostics in MS Windows

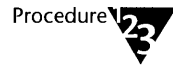
Network Diagnostics in MS Windows provides a graphical interface to the diagnostics tasks. Information about how to perform these tasks is provided in the online help in Network Diagnostics.

Checklist



- You must be logged in; see "Logging In" on page 21-2.
- You must have enabled Network Diagnostics; see the previous section "Enabling Network Diagnostics."

To access Network Diagnostics, do the following:



1. Open the Program Manager "Personal NetWare" group.
2. Choose the "Network Diagnostics" icon.

The Network Diagnostics window appears.

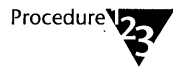
3. Use the online help within the Network Diagnostics utility for more information.

Starting Network Diagnostics in DOS

Network Diagnostics in DOS provides all the diagnostic features included in the MS Windows version. It also has some additional features, which are described in the next section, "Features Specific to Network Diagnostics in DOS."



- You must be logged in; see "Logging In" on page 21-2.
- You must have enabled Network Diagnostics; see "Enabling Network Diagnostics" on page 24-2.



1. At the system prompt, type

PNWDIAGS <Enter>

or

NET DIAGS <Enter>

The Main Menu appears.

Features Specific to Network Diagnostics in DOS

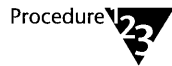
The DOS version of Network Diagnostics has two options that are not available in the MS Windows version.

- ◆ The *Select Data* option enables you to view another workgroup or network, and manage network name files *without leaving the workgroup you are in*. It also enables you to associate network names.
- ◆ The *Save LANalyzer Name File* option saves files created through the *Associate Network Names* option as files that can be viewed in Novell's LANalyzer® for Windows product.

Viewing Another Workgroup

You can view and monitor activity in any known workgroup on your network. By selecting a workgroup, you can view statistics and user activity associated with it.

To view another workgroup, do the following:



1. **Start Network Diagnostics as described in the section “Starting Network Diagnostics in DOS” on page 24-3.**
2. **Choose *Select Data* from the Main Menu.**
3. **Choose *Select a Workgroup* from the Data Selection Items menu.**
A list of available workgroups appears.
4. **Choose a new workgroup and press <Enter>.**

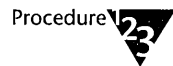
The new workgroup name is displayed at the top of the screen. All options selected will apply only to that workgroup.

Some workgroups on the network may not immediately appear. To search for a workgroup not currently displayed, use the NET WGFIND command before entering Network Diagnostics in DOS.

Viewing A Network

You can view and monitor activity on a network by selecting it. All known network segments are available for viewing. Each network is identified by a unique hexadecimal number called a *network number*.

To view another network, do the following:



1. **Start Network Diagnostics as described in the section “Starting Network Diagnostics in DOS” on page 24-3.**

2. **Choose *Select Data* from the Main Menu.**

3. **Choose *Select a Network* from the Data Selection Items menu.**

A list of available network numbers appears with your current network number highlighted.

4. **Choose a new network segment and press <Enter>.**

5. **To view nodes on the selected network, return to the Main Menu and choose *View Configuration*.**

All network computers (nodes), including clients and servers currently connected to the selected network, are displayed.

Only the node addresses are displayed. You can display the list of server names and login names by using the *Associate Network Names* option.

Associating Network Names

After node addresses are listed using the *Select a Network* option, login and server names can be viewed for each node address.

Be aware that, depending on the number of nodes connected to the selected network segment, obtaining the login and server names of each node could be quite time consuming.

To associate network names, do the following:



1. Choose *Select Data* from the Main Menu.
2. Choose *Select a Network* from the Data Selection Items menu.
3. Choose a network.
4. Choose *Associate Network Names* from the Data Selection Items menu.
5. Choose *Find Diagnostics User Names* from the Network Names menu.

The Diagnostics utility searches the network and compiles server and login names for each node address.

6. To view the names associated with each node, return to the Main Menu and choose *View Configuration*.

After searching the network, server names, login names, and node addresses are displayed. Diamonds appear next to any associated names obtained from a previously saved network name file.

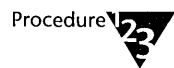
The names and addresses are saved to a file and may be accessed and updated through the *Use Diagnostics Name File* option in the Network Names menu.

Refreshing Data

The *Refresh the data* option refreshes the workgroup or network information since a diagnostic option was selected or since the last refresh.

Refreshed data displays all computers (nodes) that are found in a workgroup or network. It will not display nodes that have logged out.

To refresh data, do the following:

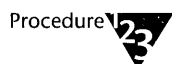


1. Choose *Select Data* from the Main Menu.
2. Choose *Refresh the data* from the Data Selection Items menu.

Saving LANalyzer Name Files

You can save files that can be used with Novell's LANalyzer for Windows product. When using LANalyzer for Windows, each node can be viewed by its name, rather than by its node address.

To save the name files, do the following:



1. **Start Network Diagnostics** as described in the section "Starting Network Diagnostics in DOS" on page 24-3.
2. Choose *Save LANalyzer Name File*.
3. Type a filename and, if desired, a path.

Comparing Traffic for Servers and Clients

Network traffic information can help you determine if a particular computer is overloaded or having problems.

Comparing Traffic in MS Windows

If you use MS Windows, start Network Diagnostics as described in "Starting Network Diagnostics in MS Windows" on page 24-2. Refer to "Graph Node Traffic" in the online help in Network Diagnostics for information about traffic comparison procedures.

Comparing Traffic in DOS

To compare traffic, do the following:

Procedure



1. **Start Network Diagnostics** as described in the section “Starting Network Diagnostics in DOS” on page 24-3.

2. **Select *Compare Data*.**

The Select Nodes menu appears with the following choices:

- ◆ *All Nodes*, for computers running as client, server, or both
- ◆ *Servers*, for computers running server software only
- ◆ *Clients*, for computers running client software only

3. **Select the computers (nodes) you want to view traffic information about: all nodes, servers, or clients.**

The Compare Options menu appears.

4. **Choose *Traffic*.**

Network traffic information is displayed for the nodes you selected. For help with this screen, press <F1>.

5. **Press <ESC> to exit.**

Comparing Server Utilization

You can view two different measures of Personal NetWare server utilization.

- ◆ Ratio of local requests to remote requests processed by the computer
- ◆ Actual number of packets a server is processing

Server utilization information can help you decide how to allocate current resources and help you plan for distributing future resources.

In addition to these statistics, Network Diagnostics in DOS also displays the following information:

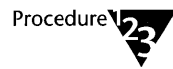
- ◆ Connection information
- ◆ Number of open files
- ◆ Server activity

Comparing Server Utilization in MS Windows

If you use MS Windows, start Network Diagnostics as described in “Starting Network Diagnostics in MS Windows” on page 24-2. Refer to “Graph Server Utilization” in the online help in Network Diagnostics for information about comparing server utilization.

Comparing Server Utilization in DOS

To compare server utilization, do the following:



1. **Start Network Diagnostics as described in “Starting Network Diagnostics in DOS” on page 24-3.**

2. **Select *Compare Data*.**

The Select Nodes menu appears with the following choices:

- ◆ *All Nodes*, for computers running as client, server, or both
- ◆ *Servers*, for computers running server software only
- ◆ *Clients*, for computers running client software only

3. **Select the computers (nodes) you want to view server utilization information about: all nodes, servers, or clients.**

The Compare Options menu appears.

4. **Choose *Local/Remote Utilization* or *Server Utilization*, depending on the kind of server information you want to view.**

Server utilization information for the kind of computers you selected appears. For help with this screen, press <F1>.

5. Press <ESC> to exit.

Comparing Server or Client Disk Information

Disk information can help you determine current resource efficiency and plan for future resources. You can view the information in the following ways:

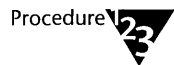
- ◆ Physical resource information, such as available hard drive space and CPU type
- ◆ Activity levels for computers and hard drive usage

Comparing Disk Information in MS Windows

If you use MS Windows, start Network Diagnostics as described in “Starting Network Diagnostics in MS Windows” on page 24-2. Refer to “Graph Node Disk Space” in the online help in Network Diagnostics for more information.

Comparing Disk Information in DOS

To compare disk information, do the following:



1. **Start Network Diagnostics as described in the section “Starting Network Diagnostics in DOS” on page 24-3.**
2. **Select *Compare Data*.**

The Select Nodes menu appears with the following choices:

- ◆ *All Nodes*, for computers running as client, server, or both
 - ◆ *Servers*, for computers running server software only
 - ◆ *Clients*, for computers running client software only
3. **Select the computers (nodes) you want to view disk information about: all nodes, servers, or clients.**

The Compare Options menu appears.

4. Choose *Resource Distribution* or *Resource Efficiency*, depending on the kind of disk information you want.

Resource information for the kinds of computers you selected appears. For help with this screen, press <F1>.

5. Press <ESC> to exit.

Viewing Server and Client Configuration Information

Configuration information provides information about a computer's physical components, such as memory, drives, operating system, and network cards.

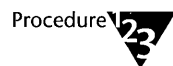
Configuration information regarding software components such as cache and server is also included.

Viewing Configuration Information in MS Windows

If you use MS Windows, start Network Diagnostics as described in "Starting Network Diagnostics in MS Windows" on page 24-2. Refer to "View Node Statistics and Configuration" in the online help in Network Diagnostics for more information.

Viewing Configuration Information in DOS

To view the configuration information, do the following:



1. Start Network Diagnostics as described in the section "Starting Network Diagnostics in DOS" on page 24-3.
2. Select *View Configuration*.

The Select Nodes menu appears with the following choices:

- ◆ *All Nodes*, for computers running as client, server, or both
- ◆ *Servers*, for computers running server software only
- ◆ *Clients*, for computers running client software only

- 3. Select the computers (nodes) you want to view configuration information about: all nodes, servers, or clients.**

If you choose *All Nodes*, all nodes are listed by either server name (if server software is running) or user login name (if server software is not loaded but the user is logged in).

If you choose *Server*, all server names and server node addresses are listed.

If you choose *Client*, all user login names and node addresses are listed.

- 4. Select the specific computer (node) you want to view configuration information about.**

Configuration information for the computer you selected appears. For help with this screen, press <F1>.

- 5. Press <ESC> to exit.**

Viewing Server and Client Statistics

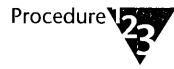
Server and client statistics provide information about the networking software on a computer, such as media frame type, network packet requests, error counts, and server and workgroup names.

Viewing Statistics in MS Windows

If you use MS Windows, start Network Diagnostics as described in "Starting Network Diagnostics in MS Windows" on page 24-2. Refer to "View Node Statistics and Configuration" in the online help in Network Diagnostics for information about how to view statistics.

Viewing Statistics in DOS

To view statistics, do the following:



1. **Start Network Diagnostics as described in the section “Starting Network Diagnostics in DOS” on page 24-3.**

2. **Select *View Statistics*.**

The Select Nodes menu appears with the following choices:

- ◆ *All Nodes*, for computers running as client, server, or both
- ◆ *Servers*, for computers running server software only
- ◆ *Clients*, for computers running client software only

3. **Select the kinds of computers you want to view statistics for: all nodes, servers, or clients.**

If you choose *All Nodes*, all computers are listed by either server name (if server software is running) or user login name (if server software is not loaded but the user is logged in).

If you choose *Server*, all server names and addresses are listed.

If you choose *Client*, all user login names and node addresses are listed.

4. **Select the specific computer (node) you want to view statistics for.**

Statistical information for the computer you selected appears. For help with this screen, press <F1>.

5. **Press <ESC> to exit.**

Testing Server and Client Connections

You can test connections in the following ways:

- ◆ Connections between two specific computers (nodes) on the network (for DOS only)
- ◆ Connections between all computers on the network

Testing Connections in MS Windows

If you use MS Windows, start Network Diagnostics as described in “Starting Network Diagnostics in MS Windows” on page 24-2. Refer to “Test Workgroup Connections” in the online help in Network Diagnostics for information about how to test connections.

Testing Connections in DOS

To test connections, do the following:



1. Start Network Diagnostics as described in the section “Starting Network Diagnostics in DOS” on page 24-3.

2. Choose *Test Connections*.

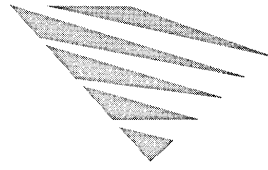
The Connection Tests menu appears, listing the following available tests:

- ◆ *Point to point* tests communication between two specific computers on the network
- ◆ *All points* tests communication between all computers on the network

3. Select *Point to point test* or *All points test*, depending on what connections you want to test.

For help with the results of either test, press <F1>.

4. Press <ESC> to exit.



chapter **25** *Configuring Your Computer for Desktop SNMP Services*

Simple Network Management Protocol (SNMP) is an industry-standard protocol for communication between a network management console and the network devices that the console is to monitor. This chapter explains how to enable desktop SNMP services on your computer, and how to modify the NET.CFG file to implement additional SNMP options. The chapter is primarily for supervisors of networks in which an SNMP-based network management system is implemented.

Introduction

Through the SNMP agent provided with Personal NetWare™, workgroups can be managed from Novell's NMS™ (NetWare Management System™), from other industry-standard SNMP management consoles, or from other third-party management systems.

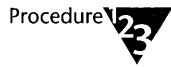
Personal NetWare includes the following components:

- ◆ HOSTMIB, the Host Resources MIB (Management Information Base), which collects information about any computer that is running Novell DOS™ 7.
- ◆ PNW, which collects information about a Personal NetWare server.
- ◆ PNWTRAP, which notifies the management console of certain events on the Personal NetWare server, such as logins or the entry of invalid passwords.

Note that you require additional software running on a network management console to monitor the information collected by the SNMP agent, and you should refer to the documentation for that software to find out how to use it with the Personal NetWare agent.

Enabling Desktop SNMP Services

By default, desktop SNMP services are not enabled when you install the networking software. To enable desktop SNMP services, do the following:



1. At the system prompt, type

SETUP <Enter>

2. Choose the *Networking* option.

3. Choose the <Network Management> button.

4. Select *Load SNMP Agent*, then save the changes and exit SETUP.

SETUP does the following:

- ◆ Modifies the STARTNET.BAT file on your computer to load HOSTMIB.EXE, the Host Resources MIB, and STPIPX.COM, the Desktop SNMP transport provider.
- ◆ Modifies the NET.CFG file on your computer to load the necessary VLMs, and sets the appropriate VLM™ options in NET.CFG.
- ◆ Reads the addresses of the NetWare Management Services (NMS) consoles from the bindery of the attached server if the computer is attached, and copies them to your NET.CFG file as trap target addresses.
- ◆ Prompts the user to enter the trap target addresses if not attached, then copies these addresses to the NET.CFG file.

5. Restart the operating system and answer Y to the following prompt:

Load Network Software (Y/N)?

Note



Personal NetWare network management support includes the files PNWTRAP.MIB and PNW.MIB; these files are needed on the network management console to enable the console to view the data collected at the desktop. The files are held in the directory C:\NWCLIENT. Refer to the documentation provided with the network management console to find out how to integrate the MIBs with the software on the console.

Setting the Time Zone Parameter

Use the DOS SET command at the system prompt or in a batch file to set the correct time zone for your area, as follows:

```
SET TZ = time_zone
```

If the time zone is not set in your computer's environment, traps for SNMP may report an incorrect time.

Configuring the HOSTMIB.INI File

The Host Resources MIB does not return information about devices attached to the host computers, such as printers, modems, and tape drives. If the network management console is to display details of such devices, you must list them in the HOSTMIB.INI file. This file is located in the directory to which you installed Personal NetWare (C:\NWCLIENT by default) on your computer. Use a text editor to enter a short description of each device. For example:

```
# Sample configuration file for HOSTMIB.EXE  
  
# List of all printers connected to host  
[printers]  
HP LaserJet IIip on LPT1:  
#NEC P20 on LPT2:  
  
# List of all modems connected to host  
[modems]  
Hayes Optima 144 on COM1:
```

```
# List of all tape drives connected to host
[tapes]
#Colorado DJ10
HP 35480A SCSI DAT (4-8 GB)

# other devices obtained via DOS APIs
```

Sample NET.CFG File for Desktop SNMP Services

A sample of the NET.CFG for SNMP services is as follows:

```
Link Driver NE2000
  PORT 300
  INT 3
  FRAME Ethernet_802.2
  MEM D0000

Netware DOS Requester
  USE DEFAULTS = ON
  VLM = WSSNMP.VLM
  VLM = WSTRAP.VLM
  VLM = WSREG.VLM
  VLM = WSASN1.VLM
  VLM = MIB2IF.VLM
  VLM = PNW.VLM
  VLM = PNWTRAP.VLM
  PREFERRED WORKGROUP = PN_WORLD
  WORKGROUP NET = 04a23500:FFFFFFFFFFFF
  PREFERRED SERVER = ENGINEERING
  FIRST NETWORK DRIVE = F
  NAME CONTEXT = "OU=TECHSUPPORT"

DESKTOP SNMP
  sysName = ""
  sysLocation = ""
  sysContact = ""
  snmpEnableAuthenTraps = ON
  Enable Monitor Community = SPECIFIED
  monitor community = "public"
```



```
Enable Control Community = SPECIFIED
control community = "public"
Enable Trap Community = SPECIFIED
trap community = "public"
asynchronous timeout = 20
```

TRANSPORT PROVIDER IPX

```
trap target = 04a68900:00001b0ef8f8
trap target = 04a26700:00001b1e1ef8
```

TRANSPORT PROVIDER UDP

```
trap target = 123.123.111.111
trap target = 222.121.111.122
```

Conventional Memory Usage

If you are willing to trade conventional memory for performance, you can load one or more Desktop SNMP VLM files in conventional memory.



Note To load all VLM files in conventional memory, use the VLM /MC switch when running the VLM manager.

To load a Desktop SNMP VLM in conventional memory, place lines of the following form in the NET.CFG file:

Netware DOS Requester

```
VLM = VLMName.VLM
Load low VLMName = On
```

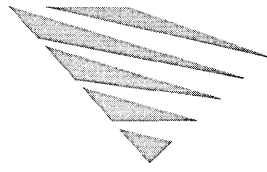
For example, to load Desktop SNMP while loading WSASN1.VLM and WSREG.VLM in conventional memory, place the following lines in NET.CFG:

Netware DOS Requester

```
VLM = WSSNMP.VLM
VLM = WSTRAP.VLM
VLM = WSREG.VLM
VLM = WSASN1.VLM
Load low WSREG = On
Load low WSASN1 = On
```

Where to Go from Here

After you have completed the initial configuration of the desktop SNMP agent, you can modify the SNMP options in the NET.CFG file to meet your specific network requirements. Refer to the “NET.CFG Options Reference” chapter in DOSBook for a description of these modifications.



chapter **26** *Running IPX and SPX Applications in a Task-Switching Environment*

Introduction

The NetWare® task-switching files provide the data buffers needed to support IPX™ and SPX requests made by applications running in a DOS session. You may need this support if you use a DOS task switcher, or if you switch DOS sessions within MS Windows in standard or real mode. If your application does require the NetWare task-switching files and you do not use them, the session fails and your computer may hang.

This chapter describes how to use the NetWare task-switching files, and gives advice about which parameters to review in NET.CFG if problems arise while you are using these files.



Note If you are not sure whether your application needs task-switching support, go ahead and run the task-switching files; they use only a small amount of memory. After running the application, enter the command line parameter /D and look at the number in the "Far Call Usage" field. If this number is zero, your application has not used the task-switching files, so you can run it without them.

Task Switching in DOS

You *must* use the NetWare task-switching files if

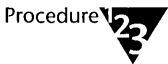
- ◆ Your application bypasses the NetWare DOS Requester™ and accesses IPX or SPX directly, *and*
- ◆ You will be switching between applications in DOS.



Note

The term “switching” is used here to refer to task switching, whereby background tasks are suspended, rather than to multitasking. If you run the Novell DOS™ Task Manager as a multitasker, you do not need to use the NetWare task-switching files described in this chapter. Refer to Chapter 13, “Multitasking and Task Switching,” for a description of task switching and multitasking.

To use the NetWare task-switching files in DOS



Procedure

1. At the system prompt, type

```
TBMI2 <Enter>
```

2. Start the Novell DOS 7 task switching software.

Task Switching in MS Windows

The NetWare task-switching files help non-MS Windows IPX and SPX programs work in a task-switching environment.

You *must* use the task-switching files if

- ◆ You will be switching between DOS sessions, *and*
- ◆ Your application bypasses the NetWare DOS Requester and accesses IPX or SPX directly, *and*
- ◆ You are running in standard or real mode

Do not use the task-switching files if you will not be switching between DOS sessions, or if you are running in enhanced mode.

If you are running MS Windows 3.0, see the following section “Task Switching with MS Windows 3.0.” If you are running MS Windows 3.1, see “Task Switching with MS Windows 3.1” on page 26-3.

Task Switching with MS Windows 3.0

The task-switching files for MS Windows 3.0 are TBMI2.COM and TASKID.COM.

Load TBMI2 at the command line before you begin MS Windows; load TASKID in Windows after opening a system prompt.



1. At the system prompt, type

TBMI2 <Enter>

2. Start MS Windows.

3. Start a DOS session.

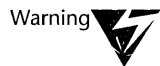
4. At the new system prompt, load TASKID. Type

TASKID <Enter>

For each system prompt you open, repeat Step 5 before running an application from that prompt.

5. When you close a DOS session with the EXIT command, unload TASKID by typing

TASKID /U <Enter>



If you do not unload TASKID before you close the session, your computer may hang. You do not need to unload TBMI2 after you exit MS Windows unless you want to free memory.

Task Switching with MS Windows 3.1

The task-switching file for MS Windows 3.1 is TBMI2.COM.

Load TBMI2 at the command line before you begin MS Windows.



1. At the system prompt, type

TBMI2 <Enter>

2. Start MS Windows.

Using Command Line Parameters with TBM12 or TASKID

You can use any of the following command line parameters with TBM12 or TASKID.

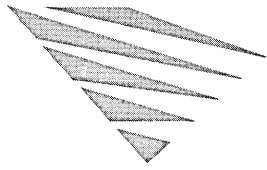
Table 26-1
TBM12 or TASKID Command Line Options

Option	Description
<code>/?</code> or <code>/H</code>	Displays help text.
<code>/Cfilename</code>	Specifies an alternative configuration file that TBM12 should use; the default is NET.CFG. Do not put a space between <code>/C</code> and the filename. For example, you would type TBM12 /CTBM12 . CFG <Enter> at the system prompt.
<code>/D</code>	Displays diagnostic information.
<code>/I</code>	Displays version information.
<code>/U</code>	Unloads TBM12 after you exit MS Windows.

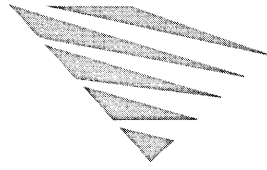
Troubleshooting TBM12

If you have problems while using TBM12, you may need to change configuration parameters in the NET.CFG file. View configuration parameters by typing "TBM12 /D" at the system prompt, and check the values associated with

- ◆ "Max Buffers Used," which tells you how many buffers are used.
- ◆ "Configured Data ECBs," which tells you how many buffers are available. If the number of buffers used approaches or equals the number of buffers available, increase the number of buffers available using the "ECB Count" and "Data ECB Count" parameters in the configuration file.
- ◆ "Unavail Buffer Count." If it is more than zero, increase the number of buffers available using the "ECB Count" and "Data ECB Count" parameters in the NET.CFG file. Refer to the "NET.CFG Options Reference" chapter of DOSBook for information about "ECB Count" and "Data ECB Count."



A*ppendixes*



appendix

A *Troubleshooting*

This appendix describes problems you may experience with the operating system and suggests possible solutions. It is divided into three parts: the first part describes general conditions that commonly cause problems; the second part describes problems specific to certain areas, such as memory and the Task Manager; the third part explains fatal error messages.



Note

For a complete explanation of any error message that you see when using the operating system, consult DOSBook; from within DOSBook, type the following:

TROUBLESHOOTING <Enter>

Common Error Conditions

This section represents a “checklist” of some common conditions which can cause errors when you are using the operating system.

When absolutely nothing happens, remember to wait before assuming there is a problem; some programs take time to execute and some errors, such as disk I/O errors, cause the operating system to retry an operation many times before reporting an error. Once you are experienced with the operating system, you will know when a command is taking too long to complete.

No DOS partition prepared on your hard disk

You cannot access your hard disk until you prepare a DOS partition. Refer to the “Command Reference” chapter of DOSBook for a detailed description of FDISK, the disk partitioning utility.

Hard disk unit not switched on

An external hard disk unit may have its own electrical connection.

Peripheral devices not connected properly

Check that peripheral devices are properly connected to your computer and to electrical outlets.

File is read-only

If a file is set to read-only, you cannot edit the file. Refer to the "Command Reference" chapter of DOSBook for information about using the ATTRIB command to set the file to read-write.

Operating system cannot find file

By default, the operating system looks for a file in the current directory of the current drive and in any directories specified in your current PATH. You must specify the appropriate directory if the file is located elsewhere.

File is password-protected

You must provide the correct password in order to access a file if the file is password-protected. Refer to Chapter 14, "Securing Information," for information about using passwords and security.

Incorrect version of the operating system being used

Many system commands will only run under the version of the operating system with which they are shipped. Refer to the description of the SETVER command in the "Command Reference" chapter of DOSBook for more information.

Diskette used incorrectly or damaged

The way in which you use diskettes is the source of many errors. Remember the following points:

- ◆ Always handle diskettes carefully.
- ◆ Make sure that the diskette is correctly inserted and that the drive door is closed.

- ◆ Make sure that the disk you are using is the correct type for the drive.
- ◆ Double-sided drives can read single and double-sided diskettes. Single-sided drives can access single-sided diskettes only.
- ◆ Some drives can only access certain types of diskette. The description of the FORMAT command in DOSBook includes information about diskette types.
- ◆ Make sure that the diskette is not physically write-protected.
- ◆ Your diskette may be damaged. Use the COPY command to copy information to a new disk; refer to the description of COPY in the DOSBook chapter “Command Reference.” Replace any files you cannot copy with backups, if available. If you do not have backup copies, you must recreate the files. You can use the CHKDSK command to verify the condition of your disks. CHKDSK will not damage your disks in any way. Refer to the description of CHKDSK in DOSBook, “Command Reference.”

File is corrupted

Files can be corrupted for many reasons but power failure is probably the most common cause.

If files are corrupted after you run a program that you wrote yourself, debug the program carefully; the program may be overwriting files or corrupting a directory.

To replace a damaged file, use your backup copy. If you do not have a backup copy, you may have to recreate the file.

Problems and Solutions

This section describes specific problems you could encounter with various operating system features and solutions to these problems.

Problems with Memory

Insufficient conventional memory

- Explanation** You are running out of conventional memory.
- Action** First, ensure that you are optimizing memory usage on your system; refer to Chapter 10, "Managing Memory" for detailed information.
- If you think you have made all the necessary changes but still run out of memory, try the following:
- ◆ Use MEMMAX +L to make sure that lower memory has not been disabled by an earlier command or batch file.
 - ◆ Use the /VIDEO option with EMM386.EXE or HIMEM.SYS (if you are not using high-resolution graphics) to reserve video memory, before loading applications. Then enable video memory using MEMMAX +V at the system prompt or in AUTOEXEC.BAT.

Computer will not boot

- Explanation** Conflicting use of upper memory. Most likely, the memory manager is moving something into an area of upper memory also required by a hardware device driver.
- Action** Determine the cause of the problem by performing a "clean boot" and then editing CONFIG.SYS and AUTOEXEC.BAT to turn off lines one at a time (using REM or ?). Reboot after disabling lines that you suspect may be causing the problem to see if the problem remains. Refer to Chapter 9, "Configuring the System," for information about performing clean boots.

If you determine that the memory manager is causing the problem by occupying an area of upper memory required by something else, use the /EXCLUDE option with your memory manager (EMM386.EXE or HIMEM.SYS) to exclude the area of memory causing the problem. Refer to the descriptions of EMM386.EXE and HIMEM.SYS in Chapter 10, "Managing Memory" for more information.

Packed file is corrupt

- Explanation** An application written with packing utilities is running in lower memory (the first 64 KB of conventional memory) because the memory manager has relocated the operating system. Lower memory is normally occupied by the operating system and the application you are running does not expect lower memory to be available.
- Action** Disable lower memory before you run the application (MEMMAX -L). Re-enable lower memory after exiting the application (MEMMAX +L).

Program reports no EMS available

- Explanation** The program you are using requires EMS (expanded) memory but determines that none is available. The program may be assuming that the LIM page frame starts at a specific address.
- Action** Make sure that the LIM page frame address is defined the same way by EMM386.EXE (or EMMXMA.SYS) as it is in SETUP or in the documentation for the program. Remember that the /FRAME option defines the address of the page frame. Use the advanced memory management options in SETUP.

Program does not load into upper memory

- Explanation** One of the following:
- ◆ Upper memory is not available
 - ◆ Upper memory is not enabled
 - ◆ The memory manager is not correctly loaded
 - ◆ The program is expanding when loaded

Action Check that upper memory is available by running the MEM command. Upper memory blocks that are available will be marked as FREE in the "Type" column of the MEM listing.

If MEM indicates that upper memory is not being used, check that the memory manager you are using (EMM386.EXE or HIMEM.SYS) is correctly loaded in CONFIG.SYS. Pay particular attention to the /FRAME, /INCLUDE, and /EXCLUDE options to make sure that any addresses in upper memory are correctly specified. A common error, for example, is to specify a letter O rather than the digit 0. Also make sure that if you do not require expanded memory, the /FRAME option is set to NONE.

Check that upper memory is enabled. HILOAD or LOADHIGH automatically enables and disables upper memory when you use it in AUTOEXEC.BAT to load a program high. You can still use MEMMAX +/- U at the system prompt to enable and disable upper memory.

Finally, if sufficient upper memory is shown as available but a HILOAD/LOADHIGH, HIINSTALL/INSTALLHIGH, or HIDEVICE/DEVICEHIGH command is still failing to put a program in upper memory, refer to the information about expanding files in Chapter 10, "Managing Memory. The program you are trying to load could be expanding when it initializes and using more RAM than it will ultimately need. Therefore, there is not enough memory for the program to initialize itself in upper memory.

Problems with the Task Manager

Task terminates abnormally (task switching only)

Explanation The swap file may have increased in size.

Action Exit the Task Manager and delete the swap file to create more disk space. A new swap file with the same name will be created automatically.

Task reports insufficient EMS

Explanation The task you are running in expanded memory is not finding sufficient memory in which to run. Possibly, you have too many tasks currently loaded.

Action Remove some tasks from the Task Manager or change the maximum amount of EMS allowed per task and start the original task again.

Error Messages

There is a full list of error messages in DOSBook. This section explains error messages that may be generated in situations in which you are unable to access DOSBook, for example if the operating system crashes or fails to boot correctly.

Abort, Retry, Ignore, Fail ?

Source Several commands

Explanation Typically this message follows an error in a read or write operation.

Action You can respond by typing A, R, I or F.

If the reason for the error is obvious (such as no diskette in the target drive) then correct the error and type R to try again. A (for abort) stops the current operation. I (for ignore) results in the next stage of the current operation continuing, as if the error had not been detected. F (for fail) lets the current operation know that there is an error, and it may therefore continue or stop. In both the last two cases (ignore and fail) there is a risk of data being corrupted.

Bad or missing file

Source DOS startup procedure

Explanation The operating system either cannot find or cannot read the CONFIG.SYS file on the root directory of your startup disk.

Action Alter the CONFIG.SYS file and then restart the operating system. See the description of CONFIG.SYS in Chapter 9, "Configuring the System," for information.

Can't load DOS file

- Source DOS startup procedure
- Explanation The IBMDOS.COM file may be missing or corrupt.
- Action Start the operating system from your startup diskette. You will then need to copy the system files from that startup diskette back to the hard disk or diskette that failed. You can do this with the SYS command. Type SYS /? or SYS /H at the system prompt to see online information about SYS.

Command or filename not recognized

- Source Any command
- Explanation You have typed an invalid command.
- Action Check the spelling (Chapter 8, "Commands" explains how to recall, edit, and reissue commands) and re-enter the command. Also check the path to ensure that the required program, if spelled correctly, should be found.

Data error

- Source Any application
- Explanation There is an error accessing the device specified.
- Action Check the device (for example make sure it is connected properly). If the device being accessed is a disk drive (hard or diskette), this error implies that data on the disk is corrupt. Make backups of all non-corrupt files on the disk, and then either reformat the disk, or use a different disk.

Disk full

- Source Any command
- Action Erase some unwanted files from your disk and try again.

Drive not ready

- Source Any command
- Explanation The diskette is not correctly in the drive, or the drive door is still open.

Error reading system area

Source FDISK
Explanation This message implies a hardware failure.
Action Contact your dealer.

Failed to get current path on drive...(OS error code ...)

Source Several commands
Explanation This is probably an error on the disk in the drive mentioned or a problem with the disk drive itself.
Action Consult your dealer.

File not found

Source Several commands
Explanation The command cannot find the file specified in your command line.
Action Check the spelling of the filespec. If the filespec was spelled correctly, use DIR or XDIR to check the contents of other directories for the location of the specified file.

I/O error ...

Source Any application
Explanation An Input/Output error occurred while accessing the requested device. In the case of a diskette drive, this may mean a corrupt diskette.

IBMBIO.COM read error

Source Diskette system loader
Explanation The programs used to startup the operating system from diskette are corrupt or in the wrong order.
Action Start DOS from a different startup diskette. If you want to use the failed startup diskette again you will need to reformat it using the /S (copy system files) switch within FORMAT.

Illegal drive in Path Specification

- Source Several commands
- Explanation You specified a drive that is not assigned in your system, or you mistyped the drive specification.
- Action Retype the command with a valid drive.

Incorrect version of operating system

- Source Several commands
- Explanation The version numbers are different between the operating system running on your computer and the file containing the utility that you have just tried to load.
- Action The best solution is not to keep any old version of the operating system on your disks.

Insert a boot diskette in A: then PRESS Ctrl/Alt/Del...

- Source DOS hard disk system loader
- Explanation This message follows any error message that arises from the hard disk system loader. The effect is to get you to restart the operating system from your startup diskette. No system files can be found.
- Action Use the SYS command or re-install the operating system, as there are no files on the disk.

Internal error: System tables too large

- Source Task Manager
- Explanation The configuration on your computer is too complex, there is not enough memory to describe it and it has exceeded the internal structures created by the Task Manager.
- Action Consult your dealer with details of your configuration, explaining the error message you received.

Invalid partition table

- Source DOS hard disk system loader
- Explanation More than one partition is marked as bootable (that is, able to start DOS), a non-existent partition is marked as bootable, or there is a hard disk failure.
- Action Restart the operating system from diskette. Appendix B, "Preparing the Hard Disk" describes how to use FDISK to set the bootable partition. Note that FDISK formats the disk, and you will lose any data on the disk.

No operating system

- Source Hard disk system loader
- Explanation This message originates in software that your supplier provides with the hard disk.
- Action Start the operating system from the diskette. Copy DOS onto the hard disk and then use FDISK to make the system partition "bootable" (that is, capable of loading DOS when the computer is started).

Not enough memory Not enough memory for ... Not enough memory to ...

- Source Several commands
- Explanation There is insufficient free memory for the command to work.
- Action Free some memory by creating a smaller memory disk, or by removing memory-resident programs, or device drivers that you do not need. Then try the command again.

Not ready error

- Source Any application
- Explanation The device you are trying to access is not responding. In the case of a diskette-drive, this usually means there is no diskette in the drive, or the drive door is not shut. With hard disks, this error may mean a hardware failure.
- Action Check that your diskette is inserted correctly into the diskette drive, and the door is shut. For hard disks, contact your dealer.

Operating system error

Source Several commands

Action If you get this error message, make a note of the situation in which it occurred, and contact your dealer.

Operating system load error

Source DOS hard disk system loader

Explanation The computer cannot read the operating system's loader file.

Action Restart the operating system from diskette. Use FBX to save the files on the partition onto diskette. Use FDISK to delete and then recreate the partition. Then use FBX again to recover your files.

Physical Media Error

Source Several commands

Explanation The operating system was unable to read from or write to a disk. The disk has probably been corrupted.

Action Copy as many files as you can from the corrupt disk to another disk and then reformat or dispose of the first disk.

Sector not found

Source Any application

Explanation The requested sector on the disk is not present, or is corrupt. With diskette-drives, this usually means that the diskette in the drive has not been formatted.

Seek error

Source Any application

Explanation The disk drive being accessed was physically unable to move its read/write heads to the requested location. This generally means a disk controller hardware failure.

Action Contact your dealer.

Unknown error code

Source Several commands

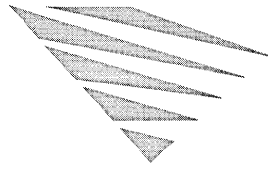
Action If you get this error message, make a note of the situation in which it occurred, and contact your dealer.

Use another boot disk

Source Diskette system loader

Explanation The programs used to startup the operating system from diskette are corrupt, or in the wrong order.

Action Startup DOS from a different startup diskette. If you want to use the failed startup diskette again you will need to run the *SYS* command. Enter *SYS /?* or *SYS /H* at the system prompt to see online information about *SYS*.



appendix

B

Preparing the Hard Disk

This appendix describes how to use FDISK, a menu-driven program, to format the hard disk prior to installation.

Preparing a New Hard Disk (FDISK)

All disks (hard disks and diskettes) need to be prepared before you can work with them. This process is called partitioning and formatting (in the case of hard disks) and formatting (in the case of diskettes).

Once the operating system is installed, you can use the FORMAT command at any time to format diskettes; refer to the “Command Reference” chapter of DOSBook for a complete description of the FORMAT command.

Use the FDISK program to prepare a hard disk, if it has not already been prepared. In most cases, your dealer will already have done this for you.

The following description of FDISK assumes that you are preparing a hard disk for the first time, during system installation, and that you need to prepare a DOS primary partition. Once you have installed the operating system, refer to the “Command Reference” chapter of DOSBook for complete information about using FDISK to delete an existing partition, select a bootable partition, display the logical drives in an extended partition, or select an alternative fixed disk.

The maximum size of a partition is 2 GB (2048 MB) but you can create smaller partitions if you want.

You can use FDISK to create one primary DOS partition and one extended DOS partition which can contain as many logical drives as you require. You *must* create a primary DOS partition in which to install the operating system. An extended partition with logical drives allows you to pass information between DOS partitions on the disk as if between different drives.

If you divide a hard disk into a primary partition and an extended partition containing two logical drives, for example, you can address the partitions as follows: C: is the primary partition, D: is the first logical drive in the extended partition, and E: is the second logical drive in the extended partition.

When you run the INSTALL program, FDISK is automatically started for you if your hard disk is not prepared. You see the current partition status of the hard disk and a main menu of options.

To create a DOS partition, do the following:

Procedure



1. Select the *Create DOS partition* option on the main menu.
2. Select the type of partition you are creating from the next set of options:
 - ◆ Create DOS primary partition
 - ◆ Create DOS extended partition
 - ◆ Create logical drive in extended partition
3. Proceed to the sections "Creating a DOS Primary Partition," "Creating a DOS Extended Partition," and "Creating a Logical Drive in a DOS Extended Partition," as required.

Remember that you must at least create a primary DOS partition to install the operating system.

4. After you have created all the partitions and logical drives that you want on the hard disk, the INSTALL program asks you to reboot your computer by pressing <Ctrl><Alt>. Leave the *Startup* diskette in drive A: and restart the installation program.

INSTALL will now load the operating system into the primary DOS partition automatically.

Creating a DOS Primary Partition

You can only create a DOS primary partition when no primary partition already exists on the disk. Do the following:



1. Select the *Create DOS primary partition* option.

You are asked whether you want to use all the available space on the disk.

1a. Type Y and press <Enter> if you want to use all the space.

Note that if you accept this default, there will not be any space left for an extended DOS partition.

Continue with Step 3 below.

1b. Type N and press <Enter> if you want to use only some of the available space.

Note that the DOS primary partition must be large enough to hold the operating system that you want to install.

Continue with Step 2 below.

2. You are prompted for the disk size in whole megabytes or the starting and ending cylinders for the partition (if you do not specify a size), if you answered N to the previous prompt.

Note that the operating system requires at least 20 cylinders.

3. If you answered Y to the previous prompt, FDISK assumes you want to use all available cylinders.

4. If FDISK finds a defective track on the system area of the disk, it does not create the partition and prompts you for another starting cylinder number. You are also prompted for a new number if there is insufficient space at a cylinder.

5. You are prompted to provide a disk label of up to 11 characters; this is optional.

6. You return to the FDISK main menu, which displays the details of the new partition. Press <Esc> to leave the FDISK program or choose the option to create an extended partition (see the following section, "Creating a DOS Extended Partition").

Creating a DOS Extended Partition

You can create a DOS extended partition only if no extended partition already exists on the drive and you did not use all the disk space for the primary partition. Do the following:

Procedure



1. **Select the *Create DOS extended partition* option from the main menu.**
2. **You are asked to specify the size in megabytes or the starting and ending cylinders for the partition.**

After you specify the partition size, you return to the FDISK main menu, where the details of the new DOS extended partition are displayed.

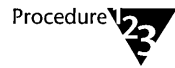
Note that you cannot use an extended partition until you have created at least one logical drive in it; see the following section, "Creating a Logical Drive in a DOS Extended Partition."

3. **Press <Esc> to leave FDISK or choose the option to create a logical drive in the extended partition.**

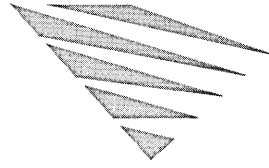
You cannot use an extended partition until you have created a logical drive in it.

Creating a Logical Drive in a DOS Extended Partition

You can create a logical drive only if you have already created an extended partition. Do the following:



1. Select the *Create logical drive in extended partition* option from the main menu.
2. The screen displays the current status of the extended partition and you are asked to specify the starting and ending cylinders for the logical drive.
3. You can specify a label for the logical drive. The first logical drive is usually drive D:
FDISK displays the details of the logical drive just created.
4. Press <Esc> to return to the main menu. You can create another logical drive on the hard disk if there is space.
5. Press <Esc> to leave FDISK.



appendix

C

NetWare DOS Requester

The NetWare DOS Requester™ is DOS client software that provides the interface between DOS and the network. It consists of individual modules that provide various network services. The NetWare DOS Requester is loaded when you run the file STARTNET.BAT. This file also loads drivers that the NetWare DOS Requester needs in order to communicate with the network hardware.

Network Drivers

When you run STARTNET.BAT, it loads three network driver modules, described in Table C-1.

Table C-1
NetWare DOS Requester Network Driver Modules

Driver	Description
IPXODI	<p>Delivers requests and replies between a computer and the network.</p> <p>Also handles packet sequencing and acknowledgment for the workstation-server connection (for example, SPX).</p> <p>Takes requests that the NetWare DOS Requester has determined are for the network, “packages” them with transmission information (such as their destination), and hands them to the LSL™.</p>
LSL	<p>Puts the packaged requests from the IPXODI into the proper format for transmission on the particular physical network that the computer is running on.</p> <p>Also takes replies for the computer from the network (via the LAN driver), removes the network-specific information it has added, and passes the reply to IPXODI.</p>

Table C-1 *continued*

NetWare DOS Requester Network Driver Modules

Driver	Description
LAN driver	Takes requests from the LSL and sends them to the network. It also receives replies from the network and passes them to the LSL. This driver is specific to the network board installed in your computer.

When the network driver modules load, they refer to the NET.CFG file, which contains information about the network board settings. The modules use the entries under the "Link Driver" heading in NET.CFG. Refer to the "NET.CFG Options Reference" chapter of DOSBook for details of all the configuration options that can be specified in NET.CFG.

NetWare DOS Requester Modules

After the network driver modules have been loaded, STARTNET.BAT loads the first NetWare DOS Requester module, VLM.EXE. This is the VLM™ memory and module manager. It manages the other modules, deciding where the modules are loaded into memory, and the order in which they are loaded. The modules refer to the Netware DOS Requester section in NET.CFG for any parameters that they require.

Table C-2 summarizes the individual NetWare DOS Requester modules.

Table C-2

NetWare DOS Requester Modules

Module	Description
VLM.EXE	Controls communication between the individual VLMs, and VLM memory usage.
AUTO.VLM	Auto-reconnect services.
BIND.VLM	Connects to NetWare® 2.x or 3.x servers.
CONN.VLM	Connection Table Manager. Enables a computer running the NetWare DOS Requester to establish a configurable number of connections with multiple NetWare servers.

Table C-2 *continued*
NetWare DOS Requester Modules

Module	Description
FIO.VLM	File input/output module that implements a basic file-transfer protocol.
GENERAL.VLM	Miscellaneous functions for NETX.VLM and REDIR.VLM.
IPXNCP.VLM	Transport protocol implementation for IPX™.
MIB2IF.VLM	SNMP MIB-II support for interfaces group.
MIB2PROT.VLM	SNMP MIB-II support for TCP/IP groups.
NDS.VLM	Connects to NetWare Directory Services™.
NETX.VLM	Provides backward compatibility with the older NETX shell.
NMR.VLM	Network management diagnostic responder for IPX.
NWP.VLM	NetWare protocol multiplexor. NWP services include establishing and destroying connections, logins and logouts, and broadcast messages.
PNW.VLM	Connects to Personal NetWare™ servers.
PNWMIB.VLM	Personal NetWare server MIB.
PNWTRAP.VLM	SNMP trap module.
PRINT.VLM	Network printing support.
REDIR.VLM	DOS redirector.
RSA.VLM	RSA encryption for NetWare Directory Services re-authentication.
SECURITY.VLM	Enhanced security services.
TRAN.VLM	Transport protocol multiplexor.
WSASN1.VLM	Required for the diagnostic responder (see WSSNMP.VLM).
WSREG.VLM	Required for the diagnostic responder (see WSSNMP.VLM).
WSSNMP.VLM	Network management diagnostic responder for SNMP.
WSTRAP.VLM	Required for the diagnostic responder (see WSSNMP.VLM).

VLM Manager (VLM.EXE)

The VLM Manager has a number of options that you can use when the NetWare DOS Requester is loading or running. These options allow you to override entries in NET.CFG. For example, you can specify a different preferred server to that given in NET.CFG.

The format of the command is

VLM [*option*]

Option	Description
/?	Displays help text.
/C	Specifies an alternative configuration file; the default is the NET.CFG file in C:\NWCLIENT. The format of the option is <i>/C=[path\] filename</i>
/D	Displays VLM.EXE diagnostics.
/Mmemtype	Specifies that VLM.EXE should attempt to load into the specified <i>memtype</i> , where <i>memtype</i> can be one of the following: C – conventional memory E – expanded memory X – extended memory
/PS= <i>server_name</i>	Specifies the preferred server, that is, the server you want to attach to when you first log in. This option overrides the parameter <code>PREFERRED SERVER = <i>server_name</i></code> in the NET.CFG file.
/PT= <i>tree_name</i>	This option is relevant only to users of NetWare 4.x. It specifies which Directory tree you want to use when you first log in. The /PT option overrides the parameter <code>PREFERRED TREE = <i>tree_name</i></code> in the NET.CFG file.
/U	Unloads VLM.EXE from memory.
/Vx	Specifies the level of detail in messages, where <i>x</i> is a number, 0 through 4. 0 – Displays copyright and critical errors only 1 – Also displays warning messages 2 – Also displays VLM module names 3 – Also displays configuration file parameters 4 – Also displays diagnostics messages

Loading the NetWare DOS Requester

The /M option enables you to specify which area of memory the NetWare DOS Requester should first attempt to load into; extended, expanded, or conventional. If you want the requester to load into extended or expanded memory, you must first have installed the appropriate memory manager to gain access to that memory. Chapter 10, "Managing Memory," describes the different memory managers and how you install them.

If you use the /ME or /MX option, the NetWare DOS Requester attempts to load much of its code into, respectively, expanded or extended memory. Some code will always remain in conventional memory, but the exact amount of conventional memory used will depend upon the amount of extended or expanded memory available to the NetWare DOS Requester.

If you do not specify which memory you want to use, the NetWare DOS Requester looks first for extended memory, and then for expanded memory.

Reconfiguring the NetWare DOS Requester

The ability to unload the NetWare DOS Requester enables you to test different configurations without rebooting the computer. Simply edit the NET.CFG file as required, then unload the NetWare DOS Requester by entering the following command at the system prompt:

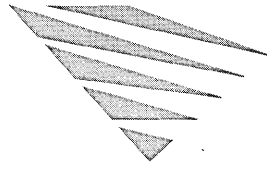
```
VLM /U
```

If you run VLM at the system prompt again, with any command line options that you require, the NetWare DOS Requester modules will reload, and will refer to the edited NET.CFG file as they do so.



Note

VLM.EXE is a TSR; be sure it is the last TSR loaded before you attempt to unload it.



appendix **D** *Code Pages*

This appendix shows the code pages supported by Novell DOS™ 7. To enter a character, hold down the <Alt> key while you type the decimal value shown in the table.

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
0/00h								
1/01h	☺	☺	☺	☺	☺	☺	☺	☺
2/02h	☼	☼	☼	☼	☼	☼	☼	☼
3/03h	♥	♥	♥	♥	♥	♥	♥	♥
4/04h	♦	♦	♦	♦	♦	♦	♦	♦
5/05h	♣	♣	♣	♣	♣	♣	♣	♣
6/06h	♠	♠	♠	♠	♠	♠	♠	♠
7/07h	•	•	•	•	•	•	•	•
8/08h	◼	◼	◼	◼	◼	◼	◼	◼
9/09h	○	○	○	○	○	○	○	○
10/0Ah	◼	◼	◼	◼	◼	◼	◼	◼
11/0Bh	♂	♂	♂	♂	♂	♂	♂	♂
12/0Ch	♀	♀	♀	♀	♀	♀	♀	♀
13/0Dh	♪	♪	♪	♪	♪	♪	♪	♪
14/0Eh	♫	♫	♫	♫	♫	♫	♫	♫
15/0Fh	☀	☀	☀	☀	☀	☀	☀	☀
16/10h	▶	▶	▶	▶	▶	◀	◀	◀
17/11h	◀	◀	◀	◀	◀	▶	▶	▶
18/12h	↕	↕	↕	↕	↕	↕	↕	↕
19/13h	!!	!!	!!	!!	!!	!!	!!	!!

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
20/14h	¶	¶	¶	¶	¶	¶	¶	¶
21/15h	§	§	§	§	§	§	§	§
22/16h	—	—	—	—	—	—	—	—
23/17h	↕	↕	↕	↕	↕	↕	↕	↕
24/18h	↑	↑	↑	↑	↑	↑	↑	↑
25/19h	↓	↓	↓	↓	↓	↓	↓	↓
26/1Ah	→	→	→	→	→	→	→	→
27/1Bh	←	←	←	←	←	←	←	←
28/1Ch	└	└	└	└	└	└	└	└
29/1Dh	↔	↔	↔	↔	↔	↔	↔	↔
30/1Eh	▲	▲	▲	▲	▲	▲	▲	▲
31/1Fh	▼	▼	**	**	▼	▼	▼	▼
32/20h								
33/21h	!	!	!	!	!	!	!	!
34/22h	"	"	"	"	"	"	"	"
35/23h	#	#	#	#	#	#	#	#
36/24h	\$	\$	\$	\$	\$	\$	\$	\$
37/25h	%	%	%	%	%	%	%	%
38/26h	&	&	&	&	&	&	&	&
39/27h	'	'	'	'	'	'	'	'

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
40/28h	((((((((
41/29h))))))))
42/2Ah	*	*	*	*	*	*	*	*
43/2Bh	+	+	+	+	+	+	+	+
44/2Ch	,	,	,	,	,	,	,	,
45/2Dh	-	-	-	-	-	-	-	-
46/2Eh	.	.	.	.	.	.	.	.
47/2Fh	/	/	/	/	/	/	/	/
48/30h	0	0	0	0	0	0	0	0
49/31h	1	1	1	1	1	1	1	1
50/32h	2	2	2	2	2	2	2	2
51/33h	3	3	3	3	3	3	3	3
52/34h	4	4	4	4	4	4	4	4
53/35h	5	5	5	5	5	5	5	5
54/36h	6	6	6	6	6	6	6	6
55/37h	7	7	7	7	7	7	7	7
56/38h	8	8	8	8	8	8	8	8
57/39h	9	9	9	9	9	9	9	9
58/3Ah	:	:	:	:	:	:	:	:
59/3Bh	;	;	;	;	;	;	;	;

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
60/3Ch	<	<	<	<	<	<	<	<
61/3Dh	=	=	=	=	=	=	=	=
62/3Eh	>	>	>	>	>	>	>	>
63/3Fh	?	?	?	?	?	?	?	?
64/40h	@	@	@	@	@	@	@	@
65/41h	A	A	A	A	A	A	A	A
66/42h	B	B	B	B	B	B	B	B
67/43h	C	C	C	C	C	C	C	C
68/44h	D	D	D	D	D	D	D	D
69/45h	E	E	E	E	E	E	E	E
70/46h	F	F	F	F	F	F	F	F
71/47h	G	G	G	G	G	G	G	G
72/48h	H	H	H	H	H	H	H	H
73/49h	I	I	I	I	I	I	I	I
74/4Ah	J	J	J	J	J	J	J	J
75/4Bh	K	K	K	K	K	K	K	K
76/4Ch	L	L	L	L	L	L	L	L
77/4Dh	M	M	M	M	M	M	M	M
78/4Eh	N	N	N	N	N	N	N	N
79/4Fh	O	O	O	O	O	O	O	O

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
80/50h	P	P	P	P	P	P	P	P
81/51h	Q	Q	Q	Q	Q	Q	Q	Q
82/52h	R	R	R	R	R	R	R	R
83/53h	S	S	S	S	S	S	S	S
84/54h	T	T	T	T	T	T	T	T
85/55h	U	U	U	U	U	U	U	U
86/56h	V	V	V	V	V	V	V	V
87/57h	W	W	W	W	W	W	W	W
88/58h	X	X	X	X	X	X	X	X
89/59h	Y	Y	Y	Y	Y	Y	Y	Y
90/5Ah	Z	Z	Z	Z	Z	Z	Z	Z
91/5Bh	[[[[[[[[
92/5Ch	\	\	\	\	\	\	\	\
93/5Dh]]]]]]]]
94/5Eh	^	^	^	^	^	^	^	^
95/5Fh	-	-	-	-	-	-	-	-
96/60h	,	,	,	,	,	,	,	,
97/61h	a	a	a	a	a	a	a	a
98/62h	b	b	b	b	b	b	b	b
99/63h	c	c	c	c	c	c	c	c

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
100/64h	d	d	d	d	d	d	d	d
101/65h	e	e	e	e	e	e	e	e
102/66h	f	f	f	f	f	f	f	f
103/67h	g	g	g	g	g	g	g	g
104/68h	h	h	h	h	h	h	h	h
105/69h	i	i	i	i	i	i	i	i
106/6Ah	j	j	j	j	j	j	j	j
107/6Bh	k	k	k	k	k	k	k	k
108/6Ch	l	l	l	l	l	l	l	l
109/6Dh	m	m	m	m	m	m	m	m
110/6Eh	n	n	n	n	n	n	n	n
111/6Fh	o	o	o	o	o	o	o	o
112/70h	p	p	p	p	p	p	p	p
113/71h	q	q	q	q	q	q	q	q
114/72h	r	r	r	r	r	r	r	r
115/73h	s	s	s	s	s	s	s	s
116/74h	t	t	t	t	t	t	t	t
117/75h	u	u	u	u	u	u	u	u
118/76h	v	v	v	v	v	v	v	v
119/77h	w	w	w	w	w	w	w	w

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
120/78h	x	x	x	x	x	x	x	x
121/79h	y	y	y	y	y	y	y	y
122/7Ah	z	z	z	z	z	z	z	z
123/7Bh	{	{	{	{	{	{	{	{
124/7Ch	|	|	|	|	|	|	|	|
125/7Dh	}	}	}	}	}	}	}	}
126/7Eh	~	~	~	~	~	~	~	~
127/7Fh	⌠	⌠	⌠	⌠	⌠	⌠	⌠	⌠
128/80h	Ç	Ç	Ç	Ç	Ç	Ç	Ç	А
129/81h	ü	ü	ü	ü	ü	ü	ü	Б
130/82h	é	é	é	é	é	é	é	В
131/83h	â	â	â	â	â	â	â	Г
132/84h	ä	ä	ä	ä	ã	Â	ä	Д
133/85h	à	à	û	à	à	à	à	Е
134/86h	å	å	ć	å	Á	¶	å	Ж
135/87h	ç	ç	ç	ç	ç	ç	ç	З
136/88h	ê	ê	ı	ê	ê	ê	ê	И
137/89h	ë	ë	ë	ë	Ê	ë	ë	Й
138/8Ah	è	è	ó	è	è	è	è	К
139/8Bh	ï	ï	ó	ï	Ì	ï	ï	Л

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
140/8Ch	î	î	î	î	Ô	î	î	М
141/8Dh	ì	ì	Ž	ı	ì	=	ì	Н
142/8Eh	Ä	Ä	Ä	Ä	Ã	À	Ä	О
143/8Fh	Å	Å	Ć	Å	Â	Ş	Å	П
144/90h	É	É	É	É	É	É	É	Р
145/91h	æ	æ	Ł	æ	À	È	æ	С
146/92h	Æ	Æ	Í	Æ	È	Ê	Æ	Т
147/93h	ô	ô	ô	ô	ô	ô	ô	У
148/94h	ö	ö	ö	ö	ö	Ë	ö	Ф
149/95h	ò	ò	Ĺ	ò	ò	Ï	ò	Х
150/96h	û	û	Ĳ	û	Ú	û	û	Ц
151/97h	ù	ù	Ś	ù	ù	ù	ù	Ч
152/98h	ÿ	ÿ	Ŝ	Ï	ì	□	ÿ	Ш
153/99h	Ö	Ö	Ö	Ö	Õ	Ô	Ö	Щ
154/9Ah	Ü	Ü	Ü	Ü	Ü	Ü	Ü	Ъ
155/9Bh	ç	ø	Ť	ø	ç	ç	ø	Ы
156/9Ch	£	£	ř	£	£	£	£	Ь
157/9Dh	¥	Ø	Ľ	Ø	Ù	Ù	Ø	Э
158/9Eh	Pt	×	×	Ş	Pt	Û	Pt	Ю
159/9Fh	f	f	č	Ş	Ó	f	f	Я

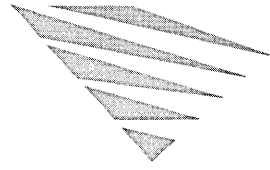
Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
160/A0h	á	á	á	á	á	ı	á	а
161/A1h	í	í	í	í	í	´	í	б
162/A2h	ó	ó	ó	ó	ó	ó	ó	в
163/A3h	ú	ú	ú	ú	ú	ú	ú	г
164/A4h	ñ	ñ	Ñ	ñ	ñ	..	ñ	д
165/A5h	Ñ	Ñ	ą	Ñ	Ñ	˘	Ñ	е
166/A6h	а	а	Ž	Ǧ	а	з	а	ж
167/A7h	о	о	ž	ǧ	о	-	о	з
168/A8h	ı	ı	Ɔ	ı	ı	î	ı	и
169/A9h	Г	®	ę	®	ò	Г	Г	й
170/AAh	г	г		г	г	г	г	к
171/ABh	½	½	ž	½	½	½	½	л
172/ACH	¼	¼	č	¼	¼	¼	¼	м
173/ADh	ı	ı	š	ı	ı	¾	ı	н
174/AEh	«	«	«	«	«	«	«	о
175/AFh	»	»	»	»	»	»	□	п
176/B0h	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
177/B1h	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
178/B2h	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
179/B3h	|	|	|	|	|	|	|	|

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
180/B4h	+	+	+	+	+	+	+	+
181/B5h	=	Á	Á	Á	=	=	=	=
182/B6h	-||	Â	Â	Â	-||	-||	-||	-||
183/B7h	⌋	À	Ě	À	⌋	⌋	⌋	⌋
184/B8h	⌋	©	§	©	⌋	⌋	⌋	⌋
185/B9h	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
186/BAh	||	||	||	||	||	||	||	||
187/BBh	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
188/BCh	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
189/BDh	⌋	¢	Ž	¢	⌋	⌋	⌋	⌋
190/BEh	⌋	¥	ž	¥	⌋	⌋	⌋	⌋
191/BFh	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
192/C0h	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
193/C1h	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
194/C2h	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
195/C3h	⌋	⌋	⌋	⌋	⌋	⌋	⌋	⌋
196/C4h	—	—	—	—	—	—	—	—
197/C5h	+	+	+	+	+	+	+	+
198/C6h	⌋	ã	Ǻ	ã	⌋	⌋	⌋	⌋
199/C7h	⌋	Ã	ǻ	Ã	⌋	⌋	⌋	⌋

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
200/C8h	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
201/C9h	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
202/CAh	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
203/CBh	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
204/CCh	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
205/CDh	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
206/CEh	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
207/CFh	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
208/D0h	⌞	û	đ	ø	⌞	⌞	⌞	⌞
209/D1h	⌞	D	Đ	a	⌞	⌞	⌞	⌞
210/D2h	⌞	Ê	Ď	Ê	⌞	⌞	⌞	⌞
211/D3h	⌞	Ë	Ě	Ë	⌞	⌞	⌞	⌞
212/D4h	⌞	È	ď	È	⌞	⌞	⌞	⌞
213/D5h	⌞	ı	Ň		⌞	⌞	⌞	⌞
214/D6h	⌞	í	í	í	⌞	⌞	⌞	⌞
215/D7h	⌞	î	î	î	⌞	⌞	⌞	⌞
216/D8h	⌞	ï	ě	ï	⌞	⌞	⌞	⌞
217/D9h	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
218/DAh	⌞	⌞	⌞	⌞	⌞	⌞	⌞	⌞
219/DBh	■	■	■	■	■	■	■	■

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
220/DCh	■	■	■	■	■	■	■	■
221/DDh	ı	ı	ı	ı	ı	ı	ı	ı
222/DEh	ı	ı	ı	ı	ı	ı	ı	ı
223/DFh	■	■	■	■	■	■	■	■
224/E0h	α	Ó	Ó	Ó	α	α	α	ρ
225/E1h	β	β	β	β	β	β	β	σ
226/E2h	Γ	Ô	Ô	Ô	Γ	Γ	Γ	Τ
227/E3h	π	Ò	Ń	Ò	π	π	π	υ
228/E4h	Σ	ō	ń	ō	Σ	Σ	Σ	φ
229/E5h	σ	Õ	ň	Õ	σ	σ	σ	χ
230/E6h	μ	μ	š	μ	μ	μ	μ	Ц
231/E7h	τ	þ	š		τ	τ	τ	Ч
232/E8h	Φ	þ	Ř	×	Φ	Φ	Φ	Ш
233/E9h	Θ	Ú	Ú	Ú	Θ	Θ	Θ	Щ
234/EAh	Ω	Û	ř	Û	Ω	Ω	Ω	Ъ
235/EBh	δ	Ù	Ů	Ù	δ	δ	δ	Ы
236/ECh	∞	γ	ý	ì	∞	∞	∞	Ь
237/EDh	φ	Υ	Ý	ÿ	φ	φ	φ	Э
238/EEh	ε	-	ţ	-	ε	ε	ε	Ю
239/EFh	∩	'	'	'	∩	∩	∩	Я

Decimal Value/ Hex Value	Code Page 437	Code Page 850	Code Page 852	Code Page 857	Code Page 860	Code Page 863	Code Page 865	Code Page 866
240/F0h	≡	-	-	-	≡	≡	≡	Ë
241/F1h	±	±	"	±	±	±	±	ë
242/F2h	≥	=	ˆ		≥	≥	≥	€
243/F3h	≤	¾	˘	¾	≤	≤	≤	€
244/F4h	ƒ	Œ	˘	Œ	ƒ	ƒ	ƒ	ï
245/F5h	Œ	§	§	§	Œ	Œ	Œ	ï
246/F6h	÷	÷	÷	÷	÷	÷	÷	ÿ
247/F7h	≈	˘	˘	˘	≈	≈	≈	ÿ
248/F8h	°	°	°	°	°	°	°	°
249/F9h	•	..	..	..	•	•	•	•
250/FAh	.	.	.	.	.	.	.	.
251/FBh	√	1	ů	1	√	√	√	√
252/FCh	n	3	Ř	3	n	n	n	N ^o
253/FDh	2	2	ř	2	2	2	2	□
254/FEh	■	■	■	■	■	■	■	■
255/FFh								



Glossary

Access rights

Access rights determine what a user can do with a particular resource. Resources have default access rights that can be superseded by the access rights given to a user.

Account

An account is needed for each user in a workgroup. It is the means whereby a user who attempts to log in to a workgroup is recognized as a valid member of the workgroup.

Ambiguous filename

A filename that contains either of the wildcard characters ? or *. When you replace characters in a filename with these wildcard characters, you create an ambiguous filename and can easily reference more than one file in a single command.

Application

A piece of software used to carry out a particular task, like a word processor or graphics package.

ASCII

The American Standard Code for Information Interchange is a standard code for representing numbers, letters and symbols. An ASCII text file is a file that can be intelligibly displayed on the video screen or printed on paper.

AUTOEXEC.BAT

This is a configuration file which the operating system executes every time it is started. The easiest way to change the configuration parameters in the AUTOEXEC.BAT file is to use the SETUP program.

Backup

A copy of a file, directory, or disk made for safe keeping.

Batch file

A file containing a sequence of commands. When you type the name of the file at the command line, each command in the file is carried out in turn, just as if you had typed the commands individually. The filename becomes in effect a “command” in itself. Batch filenames can be up to eight characters in length, but must always have the extension .BAT.

Baud rate

The baud rate is the number of bits transmitted per second in serial communications.

Bernoulli drives

A cartridge drive system supplied by Iomega* Corporation. The Bernoulli* cartridges are high-capacity removable media.

Bit

A bit is the smallest unit of memory in a computer. Bits are electronic switches. They are given values to indicate whether they are switched on or off; 0 is off and 1 is on. Eight bits are equal to one byte, or character. See also *Byte*.

Buffer

An area of memory that temporarily stores data during information transfer.

Built-in command

See *Internal command*.

Byte

A unit of memory or disk storage usually used to represent one character. See also *Bit*.

Client

A computer that uses services, such as shared directories and printers, provided by other computers (servers) on the network.

Cluster

A group of contiguous sectors on a disk; a sector is the smallest unit of allocation for files on the disk.

Code page

A code page is a table stored in your computer which defines the particular character set required by a specific national language.

Code page switching

This is a mechanism the operating system uses to allow you to use the range of characters needed in a variety of national languages. Using it you can switch between the different character sets needed by differing languages.

Command

A short program designed for a specific task.

Command line

The command followed by any other relevant information given at one time to the computer, to enable it to carry out your instructions. The command line ends when you press the <Enter> key.

Communication port

A socket to which another computer may be attached usually via a cable, thus allowing the computers to communicate with each other.

CONFIG.SYS

A configuration file which the operating system executes every time it is started. It contains various commands used to set up your system for items like keyboard and country information. The easiest way to change the configuration parameters in the CONFIG.SYS file is to use the SETUP program.

Context

The context defines which part of the NetWare Directory Services™ tree is searched for users, servers, and resources.

Conventional memory

Memory below 640 KB, sometimes called *base* memory. It is generally where the operating system and applications are loaded. It is usually referred to as RAM (Random Access Memory).

Current directory

The current place on the disk where filenames are stored so that the operating system can find the files when needed. The current directory name is displayed on the command line if you add the command **PROMPT \$p\$g** to your AUTOEXEC.BAT file.

Current disk drive

The drive on which the operating system first looks for files. The current drive letter is usually displayed in the system prompt.

Cursor

A blinking line or block on the screen that indicates where your next keystroke will have an effect.

Data bits

Refers to the number of bits used to define a character on serial data transmission, usually 7 or 8. When connecting two computers together via the communication ports, it is important to set the same number at each end.

Default

A pre-set value used by a computer until it is specifically changed by a user.

Device

A device is a piece of hardware attached to a computer (usually a peripheral), for example a printer or mouse.

Device driver

Device drivers are programs that are loaded alongside the operating system to operate hardware devices which are not recognized as a default part of the system. Device drivers usually have the extension .SYS.

Directory

A place on a disk where filenames are stored so that the operating system can find the files when needed. Each disk can contain many directories.

Disk

Magnetic medium used for storing information.

Disk accelerator

See *Disk cache*.

Disk cache

A disk cache is an area of RAM memory used to store data accessed frequently from disk. If your applications want to access a disk for data, it can become time-consuming. To speed up the process of reading and writing data to and from disk, you can set up a cache. Whenever data is read from or written to disk, a check is made to see if a copy is in the cache first. If it is in the cache, the copy is used. Caches are very useful for increasing the performance of applications that have to access a lot of data from disk, like databases and spreadsheets.

Diskette

A disk that can be removed from the drive (also known as a *floppy disk*).

Disk operating system

A collection of programs that manages computer resources and other programs on a computer.

Drive

The device that holds and reads a hard disk or diskette.

EDIT

A program that allows you to create and edit ASCII text files.

EMM

Expanded Memory Manager; see Chapter 10, "Managing Memory" for information.

EMS

Expanded Memory Specification; see Chapter 10, "Managing Memory" for information.

Enter key

The key that tells the operating system to carry out a command. Also referred to as Return or ↵.

Environment

A source of information within the operating system used by all applications, often called the *global* environment. It is where the PATH, PROMPT and SET variables are stored.

Environment variables

Variables that define the current operating system environment, for example, the version number or search path.

Esc key

The key that usually allows you to exit a screen or process.

Executable

This means “programs that can be run by the computer.” Executable code is a series of instructions that can be carried out by the computer. Executable programs usually have the extension .EXE or .COM.

Expanded memory

Expanded memory is often known as LIM memory. The LIM EMS standard was jointly devised by Lotus*, Intel* and Microsoft*. EMS is the Expanded Memory Specification. It describes ways in which a program may access up to 32 MB of memory outside conventional memory. Programs that use expanded memory include spreadsheets, databases, and other programs that need access to large amounts of data. See Chapter 10, “Managing Memory” for more details.

Extended memory

Memory above 1 MB on 80286, 386* and i486*-based computers; see also Chapter 10, “Managing Memory” for information.

External command

Commands that are used less often than other commands, and so are not automatically loaded into memory. To save space they are stored on disk instead. They have the file extension .COM or .EXE. When you enter an external command, the operating system retrieves the “command file” from disk and runs it. The memory used by the command is freed when it has finished its work. See also *Internal command*.

File

A collection of related instructions or data stored on disk.

File Allocation Table (FAT)

The File Allocation Table is a kind of index which exists at the start of every disk, and is used by the operating system to locate entries for files.

FILELINK

A utility used to transfer files between two computers connected by their serial or communication ports.

Filelist

A list of filenames in a file. The file containing the filelist is identified by an @ character in front of its filename. Some commands that usually operate on only one file per command line can, by using a filelist, be made to operate on several files.

Filename and filename extension

The name assigned to a file. A filename can include a primary filename of 1 through 8 characters and an optional filename extension of 1 through 3 characters. A period (.) separates the filename from the filename extension.

Filespec

Short for file specification. The combination of drive letter, path, and filename that identifies a file uniquely to the operating system.

Fixed disk

See *Hard disk*.

Floppy disk

See *Diskette*.

Format

The process by which the operating system prepares a disk for use by writing electronic markers onto the disk, so that the system can store and retrieve files. FDISK is used to prepare partitionable disks for use. FORMAT is used to format disks and diskettes. When you format a disk, except in special circumstances (see the description of FORMAT in the "Command Reference" chapter of DOSBook), all the information previously stored on it is erased, so take care when using this command.

Gigabyte (Gbyte or GB)

A unit of storage in a computer denoting 1024 Mbytes. It is usually denoted as 1 Gbyte or 1 GB.

Hard disk

A disk for storing information that is not removable from the computer. It usually has large storage capacity and provides fast access to data.

Hexadecimal

Hexadecimal numbers are numbers in base 16. Hexadecimal uses the numbers 0-9 and A, B, C, D, E, F. The letters are equivalent to the numbers 10, 11, 12, 13, 14, 15 in decimal (base 10). Hexadecimal numbers are used as a shorthand for binary.

High memory

The first 64 KB of extended memory.

Image file

A file used to store an *image* of a diskette; that is, an exact copy of the diskette's contents.

Input

Information going into the computer, usually from typing at the keyboard or from a program reading from disk.

I/O

Abbreviation for input/output.

Internal command

An operating system command that usually resides in memory. Internal commands respond quickly because they do not have to be loaded from disk.

IPXODI

Inter-Packet Exchange Open Data-Link Interface; adds transmission information to data being sent across the network. See Appendix C, "NetWare DOS Requester" for more details.

Kilobyte (Kbyte or KB)

1024 bytes, denoted as 1 Kbyte, 1 KB or 1 K. 32 Kilobytes equal 32 KB. 1024 KB equal 1 Megabyte (or MB), over one million bytes.

Label	A marker within a batch or CONFIG.SYS file. It is used to indicate the specific point that execution jumps to, following a GOSUB, GOTO, CHOICE, or SWITCH statement.
LIM	See <i>Expanded memory</i> .
Link driver	Also known as the LAN driver. Specific to the network board installed in the computer, it provides an interface between the network board and the rest of the operating system.
Logical drive	The operating system's internal representation of a drive. It may refer to an actual disk device, or to a group of directories specified using the SUBST command.
Lower memory	The lowest part of conventional memory, where the operating system and installable device drivers are commonly loaded.
LSL	Link Support Layer; serves as an intermediary between IPXODI and the link driver. See Appendix C, "NetWare DOS Requester" for more details.
Macro	A macro consists of a number of commands that are executed when the macro name is entered at the command line. The macro is lost when you reboot the computer.
Master key password	The password that the operating system prompts you for if security is enabled when you start the computer. The master key password controls access to the entire operating system.
Megabyte (Mbyte or MB)	A unit of storage in a computer denoting 1024 KB. It is usually denoted as 1 Mbyte or 1 MB.

Memory

Memory is where the computer stores data and programs. It is measured in bytes. One byte is equal to a group of eight bits. A bit is the smallest unit of memory in a computer. Each bit has the value 0 or 1. Memory is thought of in bytes because one byte of memory can be used to represent a character such as a, ?, or 4. One thousand and twenty-four bytes is equal to one kilobyte (KB). As computers contain a lot of memory, memory is usually talked about in terms of KB rather than bytes.

Memory disk

A portion of computer memory that is made to act like a very fast disk. You store your files on it in the same way as on a physical disk. Information stored on a memory disk is lost when the computer is switched off or when the operating system is restarted. Memory disks are therefore best used for temporary storage of expendable data. They are also referred to as RAM disks or *virtual* disks.

MIB

Management Information Base; a database containing information about the device on which it resides. It can be read by network management software running on another computer.

Modem

Modulator/Demodulator. A device which converts a digital signal from a computer into an analog signal which can then be transmitted down telephone lines and decoded by a modem at the receiving end.

Multitasking

The ability to run more than one application simultaneously and to switch between these applications while they continue to run.

NET.CFG

A configuration file that defines configuration options for such network components as the network board and the NetWare DOS Requester™. It is read by the network drivers loaded when you run STARTNET.BAT. SETUP automatically creates or updates NET.CFG when you install the Novell DOS™ 7 network software.

NetWare Directory Services

NetWare Directory Services is a feature of NetWare® 4.x. It enables users and administrators to access any network service without needing to know the physical location of the server providing that service.

NetWare DOS Requester

DOS client software that intercepts and prepares requests for the transmission of data across the network.

Network

A network is two or more computers linked together by cables. The computers contain network boards and run network software to enable them to send and receive information.

One-time login

An operating system configuration, whereby the username and password input when you start the computer also log you into the network.

Operating system

See *Disk operating system*.

Output

Data that the computer sends to the console, disk, printer, or some other device.

Parallel

The carrying out of several tasks at the same time. For example in parallel communications, 8 bits of a byte would be transmitted together (see also *Serial*).

Parent directory

A parent directory is the directory immediately above the current one in the directory structure. The operating system uses the symbol .. to indicate the parent directory.

Parity

A means of checking that data has been transferred correctly, either between computers across a communications link, or between components inside a single computer, such as a disk and memory.

Partition

A partition is a section of a hard disk created by the FDISK disk preparation utility.

Password

A series of characters needed to gain access to a computer, file, directory, or network.

Path

The description of the route through the directory hierarchy to a subdirectory or file. A drive letter can also be included at the beginning of the path.

PC

An abbreviation for *personal computer*.

Peripheral

An external device connected to the computer. Peripherals are generally used for input and output. Examples include disks, modems, and printers.

Piping

The process where the output from one program is made to be the input for another.

Program

A series of specially coded instructions that perform a specific task when executed by a computer.

Prompt

The display on the screen that shows you that the operating system is ready to receive a command. The standard system prompt can be changed by using the PROMPT command.

RAM

Random Access Memory is a type of memory that is used to load and run programs from. It can be thought of as the computer's workspace. The more complex a task you want to do, the more RAM memory your computer needs. It is memory that can be read to, as well as written from, in any order. See also *ROM* and *Shadow RAM*.

RAM disk

See *Memory disk*.

Read-only (RO)

An attribute that can be assigned to a file or directory. When switched on, the read-only attribute allows you to read from the file but not to write any changes to it.

Real time

A system where execution depends on critical timing criteria. For example a system may be required to respond to some event within a given time.

Replacement variables

Variables in batch files that are replaced by the parameters you enter in the command line when you run the batch file.

RETURN

See *Enter key*.

ROM

Read-Only Memory. This is a type of memory which you can only read or copy; you cannot alter its contents. It is normally used to contain the computer's diagnostic programs, and a very basic input/output system (or BIOS).

Root directory

The main directory that the operating system creates on disk when the disk is formatted.

Route

A route determines which computers are accessible from yours across the network. A route has two parts separated by a colon; the network address and the machine address.

Router

A computer running software that manages the transfer of data between network cabling systems.

Scrolling

Scrolling means to move text up or down on a screen so that you can read it all.

SCSI

Small Computer System Interface; an industry-standard definition of the hardware and software needed for a host computer and a peripheral to communicate.

Serial

The carrying out of tasks one after the other. For example, in serial communications, each byte is transferred one bit at a time (see also *Parallel*).

Server

A computer that provides services, such as shared printers and directories, to other computers (clients) on a network.

Server manager

The server manager is a user who has the right to manage a Personal NetWare™ server and change its configuration. Server managers are named explicitly as one of the server properties.

Server owner

The server owner is the person who is in charge of the computer on which the Personal NetWare server is loaded. The server owner is named explicitly as one of the server properties.

Session

A session at your computer is the time between switching on and when you next switch off.

SETUP

A menu-driven program which allows you to change the standard system configuration.

Shadow RAM

RAM in upper memory into which data and code can be copied from ROM. The RAM is given the same addresses as the ROM, so that in effect shadows the ROM. The term Shadow RAM is used to describe any RAM in upper memory that can potentially be used for shadowing ROM.

SNMP

Simple Network Management Protocol; an industry-standard protocol for communicating with devices on the network to retrieve information about them.

Spooler

A print spooler provides a queueing system for files you want to print. This way files can be printed while your computer performs other tasks.

SPX

Sequenced Packet Exchange; a protocol within IPXODI that verifies that data has been successfully sent across the network.

STARTNET.BAT

A batch file that loads the network drivers. It is called by AUTOEXEC.BAT if you answer Y (for Yes) to the prompt which asks you if you want to load the network software.

Stop bits

A term used in serial data transfer to distinguish where one character starts and another stops; communication programs normally add one, or sometimes two, stop bits on the end of each character. Like data bits, it is important that the number of stop bits set up agrees at both ends of the line.

Strings

A sequence of characters, such as "hello" or "arc132."

Subdirectory

Any directory that is not the root directory on a disk can be called a subdirectory.

Switch

An option that modifies the way in which the computer carries out a command.

System prompt

The display on the screen that shows you the operating system is ready to receive a command. The standard system prompt can be changed by using the PROMPT command.

Task Manager

The Novell DOS program that manages multitasking and task switching.

Task switching

The ability to switch between applications. The application that you have switched to most recently is the only one that runs; tasks you have switched from are suspended in the background until you switch back to them.

TBM12

Task-Switched Manager Buffer for IPX/SPX™; it enables IPX™ and SPX programs to work in a task switching environment.

Timeout

The operating system sets a time limit for response to a command, so it can detect if something is taking too long to respond (for example a printer may have inadvertently been switched off), and return an error message.

TSR (Terminate-and-Stay-Resident) program

A program that leaves some of its code in the computer's memory when you exit the program and return to the system prompt. Therefore it does not have to be reloaded from disk every time it is executed.

Upper memory

Memory located above the normal DOS limit of 640 KB and below the beginning of extended memory at 1024 KB (1 MB) that is addressable by 16-bit processors. Parts of this memory are reserved for DOS and BIOS functions.

Username

Each account has a username that the user of the account types in to log in to the network and uses to gain access to the network resources.

Utility

A program that enables you to perform certain operations such as copying, erasing, or editing files.

Variable

In batch files, a variable is a character that is substituted for a filename when the batch file is run.

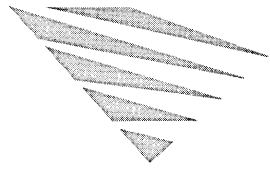
- Video memory**
A special area of memory used by the hardware which operates the computer's display or monitor.
- Virtual disk**
See *Memory disk*.
- Virtual Loadable Module (VLM)**
A modular executable program with a group of logically-related features or APIs.
- Virus**
A program that attaches itself to a host program, and is activated when that host program runs. A virus often contains code that damages other data on the computer.
- Volume label**
The name given to a disk for identification. It is set by the LABEL command. You can display the volume label on a disk using the VOL command.
- Wildcard characters**
Special characters that match certain specified items; there are two wildcard characters, ? and *. The ? can be substituted for any single character in a filename or filename extension (or both) and the * can be substituted for one or more characters in the filename or filename extension, or both.
- Wildspec**
The same as *filespec* except that you can use wildcard characters in the command syntax to specify groups of files.
- Workgroup**
A group of users on a network who have information or resources that they wish to share among themselves. A workgroup must include at least one computer configured as a Personal NetWare server.
- Workgroup administrator**
A user given workgroup administrator privileges can change the way the workgroup and its resources are set up.

Write-protected

A write-protected disk, directory or file can be read but not altered or erased. Disks are write-protected physically, usually by the absence or presence of a notch on the diskette casing. Files are write-protected via the ATTRIB command (setting the read-only attribute), and files and directories can be write-protected via the PASSWORD command.

XMS

Extended Memory Specification, which defines a protocol that controls access to high, upper, and extended memory on Intel 80286, 386, and i486-based personal computers.



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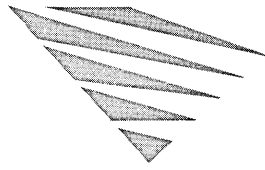
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