

PLAN 4000™

File Server
IBM Personal Computer
DOS User's Guide

NESTAR

NESTAR SYSTEMS, INCORPORATED

PLAN 4000 (TM)

FILE SERVER

IBM PERSONAL COMPUTER
DOS USER'S GUIDE

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How to Use This Guide

This guide is designed to provide a description of those PLAN 4000 functions that are specific to the IBM Personal Computer DOS environment.

When familiarizing yourself with the PLAN 4000 system, read first the General Information Manual.

For information pertaining to your network's file servers, which allow you to share hard disk memory with other network users, read the File Server User's Manual. A bibliography of PLAN 4000 system manuals and guides appears at the end of this guide.

The material in this document applies to Version 2.0 of the File Server software.

We welcome criticisms and suggestions. Forms for reporting program errors and documentation errors or inadequacies are provided at the back of this manual.

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Chapter 1

Starting Up

1.0 Introduction

This guide assumes that you are familiar with the IBM Personal Computer, with DOS, and with the PLAN 4000 system as described in the General Information Manual and the File Server User's Manual.

1.1 Starting Up

IBM Personal Computer users boot their system by inserting a diskette in the built-in minidisk drive. The diskette is formatted for DOS, and will load a bootstrap program, which in turn loads the DOS operating system.

1.2 Booting Your IBM Personal Computer Workstation

To start your IBM Personal Computer for use with virtual disks on the PLAN 4000 network, you need to have a boot diskette containing:

- a modified DOS BIOS and COMMAND.COM file
- INSTALL.NET program
- COMMS.NET file (containing network access procedures)
- DRIVERS.NET file (containing virtual device drivers).

STARTUP

It may also contain a PROFILE.NET configuration file.

Boot diskettes are available from your system manager. Creating boot diskettes is described in the File Server Installation and Operation Manual.

Using this diskette, follow the "How to Start DOS" instructions in Chapter 1 of the IBM DOS Manual.

For the reader interested in technical information, the boot process operates as follows:

The modified BIOS calls INSTALL.NET, which first loads the network access procedures from COMMS.NET and the virtual device drivers from DRIVERS.NET. Once the virtual device drivers have been successfully loaded, INSTALL sets drives E: through O: to be virtual, on the assumption that they can only possibly be accessed via the file server. Drives A: through D: remain 'real' so after booting you can access up to four floppy drives at your station.

INSTALL then looks for the file PROFILE.NET on the boot diskette. If this is present, INSTALL follows the directions in it regarding the library and work volumes, as follows:

- If PROFILE.NET specified a library volume name, INSTALL will mount this volume on drive L: (for library) with RO,SHR (READ/ONLY, SHaRed) access. The normal library volume for the IBM PC under the DOS operating system is

//LIB/IBMP/DOS

- If PROFILE.NET specified automatic mounting of a virtual work volume, a message

^Mounting <pathname> as work volume^

will be displayed, and the work volume will be mounted on drive F:, with the access rights specified by PROFILE.NET.

- If PROFILE.NET did not specify automatic mounting of a virtual work volume, a prompt

^Name of work volume to use: <pathname>^

will be displayed, where <pathname> is taken from the PROFILE.NET work volume entry component and will be empty if the component was empty. You may then edit or replace the pathname displayed before pressing ENTER, whereupon the specified volume will be mounted on drive E: and the boot will continue.

If the volume cannot be mounted, an error message will be displayed and you will be prompted again for a pathname.

If the pathname is null (empty), then the work drive will be set real and booting will continue.

- If PROFILE.NET did not exist, no library or work volumes are mounted and booting will continue from the real diskette.

Once INSTALL.NET has finished processing PROFILE.NET, it returns control to DOS. DOS then finishes the boot process by executing AUTOEXEC.BAT from drive A: if the file exists; if not, DOS will prompt for the date.

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A number of error messages may be displayed during startup:

1. "There is no file COMMS.NET present"

or

"Error while reading COMMS.NET"

followed by

"Do you wish to use the Network? (Y/N): "

Either of these messages indicate that the INSTALL.NET program has been unable to load the network access procedures. If you answer "Y", it will prompt:

"Insert a system disk containing COMMS.NET into first drive Press any key when ready"

If you answer "N", it will continue the boot as a standalone workstation.

2. "There are no Interface Cards available"

or

"Error during network initialization"

followed by

"Do you wish to use the network? (Y/N): "

These messages indicate that INSTALL.NET has not found or has failed to initialize any Network Interface Cards. Answering "N" will cause the boot to continue for standalone use.

3. `There is no file DRIVERS.NET present`

or

`The file DRIVERS.NET is empty`

or

`Error while reading DRIVERS.NET`

or

`Error while reading module VDISK`

followed by

`Do you wish to use virtual devices? (Y/N): `

or

`Do you wish to use virtual disk? (Y/N): `

INSTALL.NET has been unable to load virtual disk drivers. If you answer `N` you will be able to issue network commands from your workstation, but unable to use virtual disks. If you answer `Y` you will be prompted to insert a diskette containing DRIVERS.NET.

1.3 Creating New Boot Diskettes for Network Use

To prepare a blank diskette (or one whose contents are no longer required) for use as a Network Boot Diskette:

1. Set your default drive to be a bootable NESTAR disk and FORMAT the blank diskette using the /S option. The easiest way to do this is to get an existing network boot disk (from your system manager if you don't

STARTUP

already have one) and boot using that. The original network boot disk will be in drive A: and that will be the default drive once the booting process has stopped.

It is very important that your default drive is set to a bootable network disk because the `^/S^` option copies the system files from the default drive. If the default drive is not a network diskette, then you will not be able to use any network facilities from the newly formatted disk.

2. Use the DOS COPY command to copy

```
INSTALL.NET  
COMMS.NET  
DRIVERS.NET  
PROFILE.NET (if desired)
```

and any other files wanted (possibly including the modified FORMAT command and other DOS external commands) to the new diskette.

3. If necessary, use the SETPROF utility (Section 4.1) to specify the desired PROFILE.NET options.

Chapter 2

Using the Network

2.0 Shared Disk Organization

PLAN 4000 users share mass storage by using "virtual diskettes" that are portions of shared network hard disks. These virtual diskettes are formatted for use in various operating systems.

PLAN 4000 names refer to shared network disks and to the shared virtual volumes on them.

2.1 Virtual Volumes of Variable Size

As described in the File Server User's Manual, when virtual volumes are "mounted" on a "virtual drive" for use, they appear to be DOS minidiskettes of (possibly) different sizes, with directories and files arranged according to DOS naming conventions.

Shared disk storage on the network is implemented by the use of "virtual volumes". You, as a network user, have the option of creating volumes that, at your workstation, appear to be real diskettes of (optionally) different sizes, formatted for use in the DOS environment. These volumes are in reality portions of your network's shared disks.

Virtual volumes for use with IBM PC DOS should be given type 'I'.

Virtual volumes under DOS range from 10 to 32752 blocks in size (giving 5KB to 16MB volume sizes). Access and usage protection for virtual disks is described in Chapter 3 of the File

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Server User's Manual.

To create a virtual volume from the DOS environment, see Section 2.4.

2.2 Drives

Each user station operating under DOS has 15 devices available for real or virtual diskette drives (drives A to O).

Real drives are local, private diskette drives attached directly to the user station; virtual drives allow access to volumes that reside on a system disk connected to a (shared) file server station.

The installed Network Drivers contain the status of these real and virtual devices, as well as that of Network file server command and station-to-station message channels.

There is a standard way of setting up drives under DOS. This is:

- drives A: through D: remain 'real', so you can access floppy disks directly attached to your station;
- drive E: is the standard work volume, as set up by the INSTALL mechanism and PROFILE.NET;
- drive L: is the library volume, as set up by the INSTALL mechanism and PROFILE.NET. The virtual volume //LIB/IBMPC/DOS is the standard library volume;
- drives F: through K:; and M: through O: are additional virtual volumes that initially have nothing mounted on them.

This setup is implemented by the standard boot process as described in Section 1.2. You can of course change this setup once the station has booted by running the NET program, as described in Section 2.3. All the examples in this manual assume this setup.

2.3 Network File Server Commands:the NET Program

Virtual disks are created, "mounted", renamed, deleted, and otherwise manipulated using the network NET program.

The NET program is an interactive DOS command program supplied by Nestar that allows a user to enter file server commands at the keyboard. NET is generally made available as an executable file in the default library volume, which is mounted at startup on drive L: via the SETPROFILE utility. If NET is not found there, the system manager will know where it is installed.

There are two ways of typing in information for use by the NET program. you can either enter parameters on the same line as the NET command, or you can enter no parameters and the program will repeatedly prompt you for input. The first method, with parameters on the same line, is useful in batch (.BAT) files that you use to set up an environment for a particular application. For example, here is a batch file that would back up a particular volume:

```
L:NET SET DIR /MAIN/USERS/ME/FIN;
MOUNT WORK1,F:; MOUNT BACK1,G:;RW
ERASE G:*. *
COPY F:*. * G:*. *
L:NET UNMOUNT G:
```


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On the first line, we are using the concatenation facility of the NET program, as described in Section 2.7. You can also use this technique to set up an environment for a program and then run it, as in:

```
L:NET MOUNT /MAIN/USERS/ME/FIN/WORK1,C:RW;  
MOUNT /MAIN/SALES/FORE,D:  
L:MODELPROG
```

In this example, the batch file would implement your wish to use your modelling program on the ssales forecast figures without updating them and to create variant models on the WORK1 volume.

The remaining examples in this and following sections will be in the second form, where the program is called with no parameters, and prompts the user for them.

Commands handled by the NET program are normally local commands (displaying or changing system information within the workstation), or file server commands, which are passed to the file server for execution. There is also a special INIT (initialize) command within the NET program that is described in the next section. If a file server command produces an error message or other information, this is passed back to the workstation for display. A complete list of error messages is found in Appendix A.

NET then redisplay on the user station screen its prompt (:) for another file server command to be entered. The cycle repeats until Q <return> is entered; then control returns to the DOS command level.

The following printout shows a sample session. User responses are shown in lower case to

distinguish them from information displayed by DOS and NET. (Actually, commands can be entered in either upper or lower case.)

```
L>net
: create lunch,t=i
109,ROOT DIR NOT SPECIFIED; NO DEFAULT
: set dir /main/users
```

[No message in response to a command indicates that the command was successfully executed.]

```
: show dir
/main/users
:mount lunch,f:,rw
:q
L>
```

In this example, a user runs the NET program, which allows him or her to send commands to the file server. The user wishes to mount a virtual volume on drive F: for use across the network.

The user does not enter the volume's full pathname, perhaps assuming that a part of the pathname will be added by a default set at startup by a "SET DIR" command.

No such default "partial" pathname has been set, however, and an error message is returned. The user then sets a default partial pathname, /MAIN/USERS, for future convenience, and asks that it be displayed ("SHOW DIR"). The user then mounts the desired volume and quits the NET program. NET commands are discussed in detail in the File Server User's Manual.

In addition to the commands that it sends to the file server, NET responds to a number of local commands that it executes itself. These commands are concerned with displaying the drive status

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(real or virtual) associated with each DOS drive.

Local NET commands are described in Section 2.6, and the special INIT command is described in the next section.

2.4 Creating Virtual Volumes

To be able to use virtual volumes under DOS, you must both create the volume at the file server and format the disk for use under DOS. For standard DOS 1.1-sized volumes, of 160KB and 320KB, you can use the file server CREATE command and the DOS FORMAT utility to do this. For non-standard volume sizes, you must use the INIT command of NET, which performs both the CREATE and the FORMAT operations.

The INIT command has the following form:

```
INIT pathname,drive[,SIZE=size][,SYS]
```

For example, to create and format a 1MB file, you could say

```
INIT /MAIN/USERS/ME/1MB,F:,SIZE=2048
```

INIT performs the following actions:

1. It tries to create the volume 'pathname' with type 'I' and the specified 'size'. The default size is 640 blocks, which is equivalent to a standard 320KB double-sided diskette. 'size' can be between 10 and 32767, corresponding to virtual volume sizes of 5KB and 16MB.

2. If `'pathname'` already exists, INIT will ask you to confirm that you wish to format the virtual volume as a DOS disk with the prompt:

`<pathname>` already exists, OK to format (Y/N):

If you answer `'N'`, INIT will not format the virtual volume.

If you answer `'Y'`, INIT will format the volume on the assumption that it is of type `'I'` and the specified size (either `'size'` from the command line or 640 blocks if you did not specify a size). Therefore, if you CREATE a virtual volume and then use INIT to format it, it is your responsibility to ensure that the type is `'I'` and the specified size is correct.

3. INIT tries to mount the volume in RW,UPD mode on the specified drive. It must be able to do this in order to format the volume. If INIT is unable to mount the volume on the drive for this usage, it will issue the error message as returned by the file server and quit.
4. INIT ensures that the drive is set virtual. Therefore, you can INIT volumes on drives A: to D:, which are normally left as real drives.
5. INIT will write the necessary boot and directory information on the volume to match the size specified.

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6. If you have specified the 'SYS' keyword, INIT will also copy across the system file COMMAND.COM. If you leave out the 'SYS' keyword, this file will not be copied across.
7. When INIT exits successfully, it leaves the newly formatted drive mounted for RW,UPD usage on the specified drive.
8. Do not format the disk with the DOS FORMAT program. This will change the usable size to 640 blocks.

The technical details of the INITIALization process are described in Appendix C.

We recommend that you use the INIT command for creating and formatting all virtual volumes. You can use the normal CREATE command to create virtual volumes of types other than 'I'. For example, you may wish to create a type 'T' volume that will not be specific to the DOS operating system.

Note that the size of the created volume may be slightly smaller than the size you specify. For example, if you specify a size of around 2000 (for a 1MB volume), the size will be rounded down to a multiple of 8. This is due to DOS' file accessing techniques; details are given in Appendix C.

2.5 Using Virtual Volumes In DOS

Suppose that, as a brand new user, you want to write new programs or run existing ones on the PLAN 4000 system. What must you do to get started?

In general, you (or the system manager) must: Boot an existing DOS diskette that gives you access to a shared library containing the NET program (usually //LIB/IBMPC/DOS on drive L:).

Use the NET program's INIT command to create and format a DOS virtual volume, using a drive in the range E: through K: for READ/WRITE access. (As this discussion describes a general example of how to use the network, we have excluded other drives. However, you can mount virtual volumes on any drive. See Section 2.2 for details on standard usage.)

Use the DOS COPY command to copy files from a real disk inserted in one of the user station diskette drives to the new virtual volume if desired.

Use the normal system software to create, compile, and link programs, just as on a standalone IBM Personal Computer.

For example, say that an educator has a set of arithmetic courses which he previously ran on a standalone IBM Personal Computer. Now he wants to present these same courses on the PLAN 4000 system.

Let's assume that he is authorized to allocate space on the shared disk /MAIN, in the directory COURSES. He wants to create a virtual volume called ARITHMETIC on it. He would run the NET program and give the INIT command:

```
INIT /MAIN/COURSES/ARITHMETIC,F:,SYS
```

(Assume that no protection of the new virtual volume is desired and that the size of a real diskette is satisfactory.)

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Then, using the COPY command, he would transfer files from the real disk to his virtual one.

2.6 Local NET Commands

In addition to the commands that it sends to the file server, the command program NET responds to a number of local commands that it executes itself. These commands are concerned with changing and displaying the drive status (real or virtual) of each available drive.

2.6.1 SHOW DRIVES

This command displays the status of the DOS drives. the drives about which information is displayed are A: through D:, plus all drives E: through O: which are virtual (which is normally all of them). The information display consists of the following:

- the drive letter.
- REAL or VIRTUAL indication. If VIRTUAL, then the station number of the file server is displayed.

The SHOW DRIVES display has the following format:

| DRIVE | SECTORS | STATUS |
|-------|---------|---------------|
| A: | ----- | REAL |
| B: | ----- | REAL |
| C: | ----- | REAL |
| D: | ----- | REAL |
| E: | ----- | VIRT:STN=\$FE |
| F: | ----- | VIRT:STN=#FE |
| G: | ----- | VIRT:STN=\$FE |
| . | | |
| . | | |

2.6.2 SHOW FS

This command displays the default "command channel" to which file server commands are currently being sent. On the IBM PC, the "command channel" consist of a file server station number.

```
FS COMMAND CHANNEL IS:STN=$FE
```

2.6.3 SET X:[Y:]... VIRTUAL

This command can be used to allow access to virtual volumes. 'X:' and 'Y:' represent the drive names that you wish to be set virtual, and should be in the acceptable drive range 'A:' through 'O:'. For example:

```
SET C: D: VIRTUAL
```

2.6.4 SET X:[Y:]... REAL

This command is the opposite of the previous command, and the same rules of syntax apply. The result of executing

```
SET B: REAL
```

is that accesses to drive B: will now be directed to disk drives directly attached to the IBM PC rather than to the file server. Note that, although this command allows you to set drives E: through O: real, it is not possible to attach diskette drives corresponding to these letters to an IBM PC. You will normally have to further restrict the letters you can use to those drives that you can address on your machine. For example, if you have an IBM PC with two diskette drives on it, you will only be

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able to use drives A: and B: as real drives.

2.6.5 SET FS [,STN \$nn]

Sets the default file server station to \$nn, for file server commands issued by NET or by subsequently run programs.

2.7 Other NET Inputs

The NET program also accepts the following inputs:

- | | |
|---------------------|---|
| ;<anystring> | Ignored as a comment. |
| PRINT<anystring> | Displays the text on the console. |
| command;command;... | Multiple NET commands are allowed on the same input line if they are separated by a semi-colon. |
| %filename | Causes commands to be read in from the DOS text filename specified. |
| NOECHO command | Commands from a file (initiated by %filename) are usually displayed when they are executed; NOECHO suppresses this. |

Chapter 3

Programming

3.0 Using File Server Commands Within A Pascal Program

The shared library contains object files containing "units" that allow the Pascal user to write programs that issue commands to the file server.

The units are:

CMDUNIT - a Pascal unit that allows programs to issue file server or local commands (i.e., any command accepted by the NET utility program). In fact, this is the unit that the NET utility program uses. This unit's object file is CMDUNIT.OBJ; its interface file is CMDUNIT.ITF.

NETUNIT - a Pascal unit that allows programs to issue commands to the file server (local commands are NOT accepted here) and optionally gets responses back for processing by the program. In addition, NETUNIT contains routines that allow direct station-to-station communication. This unit's object file is NETUNIT.OBJ; its interface file is NETUNIT.ITF.

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When using either of NETUNIT or CMDUNIT, the following additional files must be linked into the main program:

```
ZL4ITF.OBJ
ZVD.OBJ
GETMEM.OBJ
ZAP.OBJ
ESCHIT.OBJ
```

To link CMDUNIT into a program, you will also need ZFORMAT.OBJ.

3.1 CMDUNIT

If the user wants to execute file server or local commands (just as the NET utility program does), then the Pascal procedure CMD or CMDLOOP in CMDUNIT should be used.

The CMD procedure has the form:

```
CMD (COMMAND, OPTIONS)
```

where:

COMMAND is a string variable whose value is the file server command or local command to be executed.

OPTIONS is an integer variable which must be set to:
0 - don't echo command if error.
1 - do echo command if error.

Examples:

```
CMD('show mounts',0);
CMD('show drives',0);
```

```
CMD(`mount /MAIN/A,D1; MOUNT /MAIN/B,D2`,1);
```

For programs in which the user enters file server or local commands from the keyboard until the user types QUIT or <escape>, the CMDLOOP procedure is provided. It has the form:

```
CMDLOOP (PROMPT);
```

where:

```
PROMPT    is the string variable whose value
           is the prompt to be issued to the
           user.
```

Examples:

```
CMDLOOP(`: `);
CMDLOOP(`FS command or QUIT: `);
```

The following program, COMMAND, demonstrates the use of CMDLOOP to execute file server commands. This is, in fact, the complete source listing of the NET utility program:

```
(*$INCLUDE `CMDUNIT.ITF`*)
PROGRAM COMMAND;
USES CMDUNIT;

BEGIN
    CMDLOOP(`: `)
END.
```

3.2 NETUNIT

To execute a file server command and get the return code back for evaluation by the program, use the FSCMD procedure. The procedure has the form:

PROGRAMMING

```
RC := NFSCMD (NIL,COMMAND,RESPONSE);
```

where:

RC is an integer representing the "return code" sent back by the file server (see Appendix A for a list of return codes and their meanings). A return code of 0 means no errors.

NIL is a "virtual channel" pointer. Specify NIL for the default file server.

COMMAND is a string variable whose value is the file server command to be executed.

RESPONSE is a string "VAR" variable whose value is set to the last response line sent back by the file server. If the command has been executed successfully, then the last response is usually "OK". Otherwise, the last response contains the error message text.

All intermediate response lines are written to the screen.

To execute a file server command and get all the responses back for evaluation, (including those usually displayed on the screen without program intervention), use the NFSCMD1 procedure. The procedure has the form:

```
RC := NFSCMD1 (NIL,COMMAND,RESPONSE,NEWCMDFLAG,  
              DONEFLAG);
```

where:

- RC is an integer representing the "return code" sent back by the file server.
- NIL is a "virtual channel" pointer. Specify NIL for the default file server.
- COMMAND is a string variable whose value is the file server command to be executed when NEWCMDFLAG is set to TRUE. When NEWCMDFLAG is set to false it is ignored.
- RESPONSE is a string "VAR" variable whose value is set to the next (or first) response line sent back by the file server.
- NEWCMDFLAG is a boolean variable whose value is TRUE when a command is initially sent to the file server. It is FALSE on successive calls which get the next response lines.
- DONEFLAG is a boolean "VAR" variable. Its initial value is ignored and it is set to TRUE if this is the last response line and FALSE if there are more response lines.

For example, a program fragment might contain:

```

CMD := `file server command`;
RC := NFSCMD1 (NIL,CMD,RSP,TRUE,DONE);
WHILE NOT DONE DO BEGIN
...process RSP (RC not valid until DONE=TRUE)
  RC := NFSCMD1(NIL,CMD,RSP,FALSE,DONE);
END;

```

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...process final RSP and RC

If you write an application in PASCAL that uses NETUNIT to mount volumes and also uses files, you should observe the following restriction: Do not mount onto a drive that already has files open on it. If you do not observe this restriction, DOS will not close the files on the original diskette or virtual volumes and you may lose data on the previously mounted and new mounted volumes.

3.3 A Sample Program

The following program, MININET, demonstrates the use of NFSCMD to send commands to the file server with a Pascal program. The MININET program will get an input line from the user and send it to the file server for execution.

MININET differs from NET in the following ways:

1. Both the code number and reply returned by the file server are displayed on the console.
2. The commands referring to the user's own drives (SHOW DRIVES, SHOW SLOT, SET drive) are not available in MININET. They are executed by the NET program, using CMDUNIT, not by the file server.

```

(*$INCLUDE ^NETUNIT.ITF^*)
PROGRAM MININET;
USES NETUNIT;
VAR
  RC: INTEGER;
  CMD,REPLY: STRING;
BEGIN
  WRITELN (^Mini Command Program^);
  REPEAT
    WRITE (^FS COMMAND? ^); READLN (CMD);
    IF LENGTH (CMD) <> 0 THEN BEGIN
      RC := NFSCMD (NIL,CMD,REPLY);
      (* Send command to default file server *)
      WRITELN (RC,',',',',REPLY)
    END
  UNTIL LENGTH (CMD) = 0;
  (*All done if nothing typed *)
  WRITELN (^Ciao.^)
END.

```

A sample execution of the MINICMD program :

```

Mini Command Program
FS COMMAND? show date
DATE IS 03/10/81
FS COMMAND? foo
1,ILLEGAL COMMAND
FS COMMAND?
Ciao.

```


Chapter 4

Additional Utilities

4.0 Introduction

In addition to the BOOT program (Appendix B) and the NET program (Section 2.2), the PLAN 4000 system provides a number of utility programs for use at the individual network stations. Before attempting to execute them, ask your System Manager for the names of the volumes on which they reside at your installation, (usually a volume called /MAIN/LIB/IBMPC/DOS).

SETPROF allows you to create a small virtual volume (called a "profile record") that contains preset defaults for your station address. These defaults will be used by the BOOT program when you power on your machine.

STARTUP executes a file of commands on the user's boot volume at initialization time.

SETPROF

4.1 SETPROF Utility Program

The SETPROF (set profile) program allows you to create a PROFILE.NET virtual volume that will mount library and work volumes for you at boot time. This program asks you four questions:

- 'Library volume name'. Here you should specify a full path name of the library volume you want to use. If you wish to have no library volume mounted, type <space> <return>. The library volume is mounted on drive L:.
- 'Work volume name'. Here you should specify a full path name of the library volume you want to use. If you wish to have no work volume mounted, type <space> <return>. The work volume is mounted on drive E:. The following two questions also apply to the work volume.
- 'Work volume usage'. Here you should specify the way you want to use the work volume. Usage of volumes is described in the File Server User's Manual in section 3.10. The normal usage you will want to apply is 'RW', which will allow you to write to the volume after booting it and other users to read it. If you type <space> <return> here, the volume will be mounted with 'RO,SHR' usage.
- 'Auto Mount (Y/N)'. If you respond 'Y' to this question, the work volume will be automatically mounted at boot time. If you respond 'N', the boot process will display the work volume name and ask you to hit <return> to accept the work volume or to enter another work volume name to mount.

For more information on the boot process and the mounting of library and work volumes, see Section 1.2.

You can specify a drive parameter (e.g., 'B:') to SETPROF. This will direct SETPROF to look for the virtual volume PROFILE.NET on the specified drive. For example, "SETPROF B:" will read and write the virtual volume "B:PROFILE.NET". If you do not specify the drive parameter, SETPROF reads and writes PROFILE.NET on the default drive.

STARTUP

4.2 STARTUP Command Program

STARTUP is a facility that allows users to issue file server commands automatically when booting the user station. This allows automatic configuration of the user's environment for user convenience or to provide a "turnkey" system.

STARTUP is usually invoked by having AUTOEXEC.BAT on drive A: with the following contents:

```
E:  
L: STARTUP STARTCMD
```

This sets the default drive to E: and then runs L:STARTUP to read commands from the text file called E:STARTCMD.

STARTUP read commands from the filename specified in the command line when STARTUP is called. If no filename is specified, it attempts to read the STARTCMD file from the current disk.

<command> ::= <verb><blanks><optional-operand>

The legal <verb> <operand> sequences are as follows:

; <anystring> Ignored as a comment.

PRINT<anystring> Prints the string on the screen.

CLEAR Clears the screen.

STARTUP

- NET<fileserver command>Executes file server or local command (e.g., MOUNT or SET DRIVE).
- NOECHO <command> Executes <command> but doesn't print it.
- SHOW FORMDATE Displays the date and time on the screen. The format is:

Day-dd-Mon-Year hh:mm:ss
- SET DATE Sets the DOS system date and time to the current date (from the file server), as if the user had used the Date and Time commands in DOS.
- QUIT Exits the STARTUP program.

STARTUP

Example

```
; this is startcmd.txt
CLEAR
PRINT
PRINT --> THIS IS /MAIN/USERS/ABC/1 <--
PRINT
set date
noecho show formdate
noecho net set drive c: d: virtual
net set dir /main/users
net set prvpw=xxx
net mount abc/temp,f:,rw,shr
PRINT
```

This list of program commands begins with a comment ignored by the STARTUP program ("this is startcmd.txt"). Then the screen is cleared and "THIS IS /MAIN/USERS/ABC/1" is printed on the user station screen.

The program then sets the system date to the current file server date, and displays the date.

Drives c: and d: are then set to virtual (Chapter 2 discusses real and virtual drives in the DOS environment). A default partial pathname is set, as well as a private password that may be required to access directories or virtual volumes.

The virtual volume /MAIN/USERS/ABC/TEMP is mounted on drive F: for shared, read/write use.

Appendix A

Error and Information Messages

When the file server receives a file server command from a user station, it executes the command, if possible, and, in any case, returns two variables:

- return code - an integer between 0 and 200
- return message, such as OK, ILLEGAL COMMAND, or TYPE=IBM PC DOS

Messages are of several types:

- information, such as OK, IN USE, TYPE=BINARY
- user errors such as syntax errors or attempting to access a Network file without the necessary access rights
- system errors such as memory full or disk full; these should be reported to the system manager.

In this list, messages are classified as:

general syntax

pertaining to a specific command

system errors

file system errors.

ERRORS

General Syntax (0-19)

0,OK

(Not an error.) The command was syntactically correct and was executed without error.

1,ILLEGAL COMMAND

The command verb cannot be recognized, or cannot be executed from this user station operating system environment. The command verb is the first word of the command, and must be separated from the rest of the command with one or more blanks.

2,NAME PARAMETER REQUIRED

The first parameter of the command must be a non-null pathname.

3,UNRECOGNIZED PARAMETER

A keyword parameter was not recognized. Check the spelling carefully, and make sure that it is properly separated from the previous and following items with commas.

5,ILLEGAL STATION NUMBER

A station number must be specified as a two-digit hexadecimal number preceded with \$, in the range \$1 to \$FE. Example: "\$2D".

7,PARAMETER APPEARS TWICE

A keyword parameter appears more than once in a single command. There can only be one occurrence of a keyword parameter, even if multiple occurrences have the same value.

8, ILLEGAL TYPE PARAMETER

The "T=" value is not one of the legal volume types. It must be one of the following:

| | |
|----------------------------|----------------|
| P (Apple // Pascal) | B (binary) |
| D (Apple // DOS), | S (system) |
| C (Apple // CP/M) | Y (directory) |
| 3 (Apple /// SOS) | T (text) |
| U (IBM PC p-SYSTEM PASCAL) | I (IBM PC DOS) |

Example: T=P

9, COMMAND TOO LONG

A file server command must be no longer than 80 characters. In unusual cases where this is a problem, long commands can often be shortened by using a default directory, or by assigning access rights in a subsequent PROTECT command.

10, PARAMETER TOO LONG

The new name given as the second parameter of the RENAME command must be no more than 15 characters long. Remember that RENAME changes only the last name in the sequence of names which constitute a pathname. If you wish to change the name of a directory, give the pathname of the directory itself as the first parameter of RENAME.

ERRORS

11,ILLEGAL PROTECTION PARAMETER

The value of the PUBACC, GRPACC, or PRVACC protection item is incorrect. The value must be some combination of the letters RWECD (read, write, erase, create, and delete), or may be null. For example, "GRPACC=RW" or "PUBACC=".

12,NO STATION CMD; USE \$NN PREFIX

The "station" command has been removed. Use "\$nn <command>" where nn is the station number on whose behalf you wish to issue the command. (file server console only.)

13,ILLEGAL NUMBER (NEGATIVE OR TOO BIG)

The number was less than 0 or bigger than 32767. Number may be specified in decimal, or in hexadecimal preceded by \$. Examples: "42", "\$1A3".

19,HELP FILE NOT FOUND

There is no HELP file for the word used as an operand of the HELP command. Use the HELP command with any parameters to see what the possible HELP parameters are. (The system manager has the option of removing all HELP files to save space.)

Create (20-25)

20,TYPE PARAMETER REQUIRED (T=?)

The type parameter was missing. Example:"T=D".

21,SIZE OUT OF RANGE (<0B OR >32752B)

The value of the SIZE parameter was negative or greater than 32752 blocks. Each block is 512 bytes. Other units that can be specified are C (characters), and K (1024 bytes). If the units are omitted, B (512-byte blocks) is assumed. Examples: "SIZE=280", "SIZE=2000S".

23,SIZE PARAMETER REQUIRED WITH T=B, =T

The SIZE parameter must be specified to create a binary volume. The size may be an overestimate of the size of the data to be BSAVED into the volume, but it must not be less.

24,SIZE OUT OF RANGE (<1C OR >48K)

The limits on the size of a binary (T=B) file are between 1C (one byte) and 48K (49152 bytes) regardless of the units used in the specification.

Delete (25-29)

29,CURRENTLY MOUNTED OR DEFAULT DIR

You cannot delete a volume which is currently mounted by any station, or which is the default directory (see the SET DIR command) of any station.

Mount (30-34)

30,DRIVE REQUIRED

You must specify what drive the volume is to be mounted on. Example: "D4".

ERRORS

31,IN USE

The volume you asked to mount is in use by another station. You are therefore denied exclusive use of that volume.

32,IN EXC USE

The volume you asked to mount is in exclusive use by another station. You are therefore denied any use of the volume.

34,RW NOT ALLOWED ON DIRECTORIES

You are not allowed to mount a directory (T=Y) volume for write access.

Unmount (35-39)

35,DRIVE OR "ALL" REQUIRED

You must specify a drive number or "ALL" on the UNMOUNT command. Examples: "UNMOUNT D1", "UNMOUNT ALL".

36,NOT CURRENTLY MOUNTED

The drive number specified in the UNMOUNT command does not have any virtual volume mounted on it by the file server.

Lock (40-44)

40,ILLEGAL LOCK NAME

A lock name must be 1 to 15 characters long.

41, IN USE

The lock name specified is in use by another station. You are therefore denied exclusive use of the lock.

42, IN EXC USE

The lock name specified is in exclusive use by another station. You are therefore denied any use of the lock.

Unlock (45-49)

45, NOT HELD

The lock name specified is not currently held by your station.

BSAVE, BRUN, BLOAD (50-55)

50, CMD NOT ALLOWED FROM THIS STATION

The BSAVE/BLOAD/BRUN/OFF commands may only be executed from an Apple // user station.

51, NOT BINARY

The pathname identifies a volume which is not binary (T=B). Only binary volumes can be used for BSAVE, BLOAD, or BRUN commands.

52, NOT PREVIOUSLY SAVED

The binary volume was created but has never had any data written into it using the BSAVE command. It can not not be used with BLOAD or BRUN until it has been BSAVED into.

ERRORS

53, FROM PARAMETER REQUIRED

For BSAVE, the FROM parameter, which specifies the memory area from which data is to be taken, must be provided. Example: "FROM=\$1000".

54, SIZE PARAMETER REQUIRED

For BSAVE, you must provide the SIZE parameter on the BSAVE command to indicate how much data is to be saved. This value must be less than or equal to the size of the volume specified on the original CREATE command. Example: "SIZE=256.C".

55, FILE WAS THERE; REP NOT SPECIFIED

Data has already been saved in the binary volume. To replace that data, you must specify "REPLACE" as a parameter in the BSAVE command.

Set/List (57-58)

57, FILE IS NOT A DIRECTORY

The pathname given in a SET DIR command identifies a volume which is not a directory (T=Y).

58, USE: SET TIME [YYMMDD] [,HH[MM]]

If the date parameter was supplied, it was incomplete or contained invalid fields. If the time of day parameter was supplied, it contained invalid fields.

Show (59-69)

59,TYPE=SYSTEM

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is a system volume (T=S).

60,SHOW OPTION NOT RECOGNIZED

The operand of a "SHOW" command was not recognized. Check the spelling and make sure there are no extraneous items in the command.

61,DRIVE REQUIRED

For the "SHOW TYPE" command you must specify the drive number on which the volume is mounted. Example: "SHOW TYPE D12".

62,NOT CURRENTLY MOUNTED

The drive number specified has no volume mounted on it by the file server.

63,TYPE=APPLE // CP/M

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an Apple // CP/M volume. (T=C).

64,NO DEFAULT DIRECTORY SET

(Not necessarily an error.) This response to the "SHOW DIR" command indicates that there is no default directory established for this station by the file server.

ERRORS

65,TYPE=APPLE // PASCAL

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an Apple // Pascal volume (T=P).

66,TYPE=APPLE // DOS

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an Apple // DOS volume (T=D).

67,TYPE=BINARY

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is a binary volume (T=B).

68,TYPE=DIRECTORY

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is a directory (T=Y).

69,UNKNOWN TYPE

The volume mounted on the drive for which you did a "SHOW TYPE" is not a standard volume type.

70,yymmddhhmmssw

(Not an error.) Returns date and time information in encoded form. For example, the FS command `TIMESTAMP` returns the current year, month, day, hour, minute, second, and day of the week in the form 70,8104301859381 (that is, 6:59 P.M., Sunday, April 30, 1981).

71,--t--tt--t-t----

(Not an error.) Returns types of virtual disks currently mounted on drives 1-16 (Y,P,D,B,S,C,3,I,U,T). The system responds to the FS command SHOW TYPES using this format.

72,TODAY IS DD-MON-YYYY HH:MM:SS

(Not an error.) This is the response to the SHOW TIME command.

73,TYPE=TEXT

(Not an error.) The volume mounted on the drive for which you did the SHOW TYPE is a text volume (T=T).

74,TYPE=APPLE /// SOS

(Not an error.) The volume mounted on the drive for which you did the SHOW TYPE is an Apple /// SOS volume (T=3).

75,TYPE=IBM PC DOS

(Not an error.) The volume mounted on the drive for which you did the SHOW TYPE is an IBM PC DOS volume (T=I).

76,TYPE=IBM PC P-SYSTEM PASCAL

(Not an error.) The volume mounted on the drive for which you did a "SHOW TYPE" is an IBM PC p-System Pascal volume (T=U).

ERRORS

Local Commands (90-92)

90,DRIVE(S) REQUIRED (LOCAL COMMAND)

A drive number, or list of drive numbers, is required for this command. Example: "SET C: D: VIRTUAL".

91,DRIVE NUMBER CAN NOT BE USED

There are 15 drives (also called "volumes") in DOS: A - O.

System Errors (94-99)

94,NOT CONNECTED

This is a network error that indicates that the connection to another station has been terminated prematurely.

95,UNRECOGNIZABLE NETWORK RESPONSE

The last response message from file server did not contain a numeric error code, as expected. This may indicate incorrect logic in the use of NETUNIT procedures from within any programs.

96,NO NETWORK CARD IN SLOT

The slot number specified does not have a Nestar network interface card installed, or the card is defective.

97, FILE SERVER MEMORY FULL

The file server has no space left for tables needed to complete your request. This does NOT refer to memory space in the user station.

98, NETWORK ERROR

The network routines were unable to complete the transaction. The error may be transient; see the description of NETUNIT for more information. This error does not occur from most user level programs, such as NET.

99, USER ABORT

The network abort key <escape> was pressed while a network transaction was queued up or in progress. The transaction was aborted.

File System Errors (100-140)

101, END OF FILE OR RECORD OUT OF RANGE

An attempt was made to read a block or sector of a volume which is outside the legal range for that volume.

102, FILE NOT FOUND

The volume specified by the pathname was not found, or one of the directories in the pathname was not found. Check the spelling of each filename in the pathname. If the name does not begin with a slash, check that the current default directory is the correct one.

ERRORS

103,BAD DELIMITER IN PATHNAME

A delimiter other than "/" or ":" was found in a pathname. Make sure that you have not omitted a comma separating the pathname from other operands in the command.

104,FILE NAME OR PASSWORD TOO BIG

A single filename (the part between slashes in a pathname), or password (the part after a colon in a pathname) is longer than the maximum of 15 characters.

105,NO ACCESS FOR READ TO DIRECTORY

You have been denied read access to a directory which is part of the specified pathname.

106,NON DIRECTORY FOUND IN PATHNAME

One of the names in the pathname (other than the last name) identifies a volume which is not a directory (T=Y). Only the last thing in a pathname can be other than a directory.

107,END OF PATHNAME IS A DIRECTORY

The pathname specifies a directory (T=Y) in a context where a non-directory volume is required.

109,ROOT DIR NOT SPECIFIED NO DEFAULT

The specified pathname does not begin with a slash, and there is no default directory recorded for this station by the file server. If you wish to completely specify the pathname, begin with a slash and the name or number of the

disk unit. If you wish to use the current default directory, do not begin the pathname with a slash. You may use the "SHOW DIR" command to find out the current default directory, and the "SET DIR" command to establish one.

110,NO ACCESS FOR READ

You have been denied read access to the volume specified by the pathname, or to a directory along the path.

111,NO ACCESS FOR WRITE

You have been denied write access to the volume specified by the pathname.

112,NO ACCESS FOR APPEND (not yet implemented)

You have been denied append access to the volume specified by the pathname.

113,NO ACCESS FOR ERASE

You have been denied erase access to the volume specified by the pathname. Erase access is necessary to delete the file.

114,NO ACCESS FOR CREATE

You have been denied access to create or rename an entry in one of the directories specified in the pathname.

ERRORS

115,NO ACCESS FOR DELETE

You have been denied access to delete or rename an entry in one of the directories specified in the pathname.

116,CANT DELETE NON-EMPTY DIRECTORY

The pathname specified in a DELETE command identifies a directory, and that directory is not empty, that is, it still points to other volumes. Only empty directories can be deleted by a single file server DELETE command.

117,FILE SERVER MEMORY FULL

The file server has no space left for tables needed to complete your request. This does NOT refer to memory space in the user station.

118,DISK FULL

There is not enough contiguous space left on the disk unit to create the volume. The LIST command when used to display the root directory will give information about the space available on a disk unit. Example: "LIST /MAIN".

119,DIRECTORY FULL

There is not enough space left to create more entries in the directory, and the directory cannot be expanded. Directories are automatically expanded as necessary to accomodate new entries.

120,INTERNAL ERROR

An internal error has been detected by the file server. Additional information is written on the console of the file server. That information and the circumstances surrounding the error should be transmitted to your support organization for diagnosis. The file server should be restarted as soon as practical.

121,UNINITIALIZED DISK

The disk unit has not been initialized. All disks must be formatted and initialized using the file server FORMAT DISK utility; see the File Server Installation and Operation Manual.

122,WRONG SOFTWARE VERSION

The disk format is not compatible with version of the file server currently running. (This error cannot occur with any file servers so far released.)

123,FILE ALREADY EXISTS

The file you have asked to create, or the new name used in a RENAME command, already exists in the directory.

124,DISK I/O ERROR, SUBCODES x,y

A hardware I/O error was detected. The details of the error are described in the subcodes; for more information see the table of I/O errors in Appendix A of the File Server Installation and Operation Manual.

ERRORS

125,VERIFY FAILED (BAD MEMORY)

All disk write operations are verified by reading back the recorded data and comparing it to the data stored in memory. This error indicates that the disk data did not compare correctly. It sometimes indicates a memory error in the file server, and not a disk error.

128,BAD UNIT NUMBER IN PATHNAME

The first item after the initial slash in a pathname is a number, but it is not in the legal range for unit numbers (1 to 4).

130,NEED PRIVATE PASSWORD FOR PROTECT

In order to execute the PROTECT command for any volume, the private password must be specified in the pathname or as a default private password. The password must be specified whenever the volume has a non-null private password, regardless of the access rights currently assigned to the volume.

131,UNIT NAME NOT FOUND

The name after the initial slash of a pathname is not the name of a disk unit currently recognized by the file server. You can also use the unit number in place of a name, if you wish.

133,DISK NOT READY

The disk unit specified is not ready. The one minute warmup period after initial power up may not have elapsed. It may also indicate a controller or disk drive failure.

Appendix B

Quick Reference List - File Server Commands

CREATE pathname,type[,size][,sectors]
 [,protection][,drive][,usage]

- creates and optionally mounts a new virtual disk (size restricted to 640 blocks; see INIT)

DELETE pathname

- deletes a virtual disk from system

HELP [command name] or ? [command name]

- displays list of commands or syntax of specified command

INIT pathname, drive, size

- creates, mounts and initializes a DOS virtual disk (T=I) of any size

LIST [pathname] [,VERBOSE] [,NESTED]

- lists entries in default or specified directory

LOCK lockname [,usage]

- locks "lockname" for exclusive (EXC) or shared (SHR) use
- Default: EXC

MOUNT pathname, drive [,usage]

- establishes correspondence between a

COMMAND LIST

virtual disk and a drive

PROTECT [pathname] [protection]

- modifies passwords or access rights for a virtual disk or directory

RENAME oldpathname, newname

- renames specified NFS file

SET DIR pathname

- sets default directory

SET [GRPPW=password] [PRVPW=password]

- sets default group or private password

SHOW DATE

- displays date as MM/DD/YY

SHOW INFO

- displays information on opened virtual volume

SHOW DIR

- displays name of current default directory

SHOW LOCK [lockname]

- lists all stations using specified lockname

SHOW [ALL] LOCKS

- displays all locks set at own station or held in file server

COMMAND LIST

SHOW [ALL] MOUNTS [pathname]

- gives information on virtual disks mounted on the file server

SHOW PROTECTION [pathname]

- displays group, private and public access rights for virtual disk or directory addressed by pathname

SHOW STATION

- displays own station number

SHOW TIME

- returns current date, time and day of week

SHOW TYPE drive

- displays type of virtual disk mounted on the drive specified

SHOW TYPES

- displays types of virtual disks mounted on drives 1-14, corresponding to drives B: through 0:

SHOW VOLS

- displays names of system disk units currently operational

TIMESTAMP

- returns encoded form of the current date and time

COMMAND LIST

UNLOCK lockname or UNLOCK ALL

- releases locked usage on a lockname or on all locknames currently held

UNMOUNT drive or UNMOUNT ALL

- cancels previous mount(s)

Parameters

access rights: set of letters from RWECD (read, write, erase, create, and delete)

drive: d:, where d=letter A to 0

filepath: name[:password] [/filepath]

lockname: name of lock (same restrictions as name)

name: name of disk unit, directory, or virtual disk.(1-15 characters; no commas, control characters, slashes, colons, returns or unprintable characters; imbedded blanks ok; first character any ok character)

number: if decimal: between -32768 and 32767, inclusive; if hex: between \$0 and \$FFFF, inclusive

password: a secret word used to gain access to protected volumes. Same restrictions as name, except control characters allowed.

pathname: /unitname/filepath or filepath (80 characters max.) An initial slash indicates first field is a unit name; no initial slash indicates current default directory is to be prefixed to pathname.

protection: protect item [,protection]

protect item:

- ,GRPPW=password
- ,PRVPW=password
- ,PUBACC=access rights (Default: R)
- ,GRPACC=access rights (Default: PUBACC)
- ,PRVACC=access rights (Default: varies)

COMMAND LIST

size: SIZE=number [.size-unit]

size-unit:

C: character--- (1 byte)
B: block----- (512 bytes)
blank: block (512 bytes)
K: (1024 bytes)

type:

T=B (binary) T=S (system)
T=C (Apple // CP/M) T=T (textfile)
T=D (Apple // DOS) T=U (IBM PC p-System)
T=I (IBM PC DOS) T=Y (directory)
T=P (Apple // Pascal) T=3 (Apple /// SOS)

unitname: 1,2,3 or 4[:password]; or
name[:password]

usage: EXC(EXclusive), SHR(SHARed), or
UPD(UPDate); RO(Read/Only) or RW(Read/Write)

Local NET Commands

SHOW DRIVES

SHOW FS

SET drive [drive...] REAL|VIRTUAL [STN \$nn]

SET FS [STN \$nn]

Other NET Inputs

drive: A:...0:

drive-status: R, REAL, or V, VIRTUAL

Appendix C

Technical Information on
Variable-Sized DOS VolumesC.1 Disk Layout

The INIT command in the NET program must decide how to lay out a DOS virtual volume based on the size specified by the user. There are two main parameters to be calculated from the size, which will determine all other aspects of the layouts.

The first parameter is the cluster size. The cluster is also known as the "allocation unit", and is the number of 512 byte sectors that DOS allocates to files in each unit. Each cluster requires 12 bits in the FAT (File Allocation Table). PLAN 4000 system support for DOS 1.1 limits each FAT to one sector of 512 bytes. Therefore, the maximum number of clusters that can be supported by this scheme is 341. DOS reserves the first two clusters anyway and will never allocate them, so the cluster size must be at least the virtual volume size divided by 339. In fact, DOS also requires that the virtual volume size will be a power of 2, so the INIT program will round the "volume size / 339" number up to a power of two. The following table shows where the various cluster sizes come into effect:

VARIABLE VOLUMES

| Cluster Size | | Volume Size | |
|----------------|--------------|---------------|--------------|
| <u>Sectors</u> | <u>Bytes</u> | <u>Blocks</u> | <u>Bytes</u> |
| 1 | 512 | 10 | 5K |
| 2 | 1K | 340 | 170K |
| 4 | 2K | 680 | 340K |
| 8 | 4K | 1360 | 680K |
| 16 | 8K | 2720 | 1.360M |
| 32 | 16K | 5440 | 2.720M |
| 64 | 32K | 10880 | 5.440M |
| 128 | 64K | 21760 | 10.880M |

The second parameter that INIT must calculate is the number of directory entries, which is also the number of files it is possible to create. INIT works this out by using the following table:

| Directory Allocation | | Volume Size | |
|----------------------|------------------------|---------------|--------------|
| <u>Entries</u> | <u>Sectors for Dir</u> | <u>Blocks</u> | <u>Bytes</u> |
| 64 | 4 | <=340 | <=170K |
| 112 | 7 | <=680 | <=340K |
| 224 | 14 | <=2720 | <=1.360M |
| 339 | 22 | >2720 | >1.360M |

Once INIT has calculated these two parameters, it can lay out the volume.

C.2 Modifications Required For Variable Volumes

To support variable volume sizes, the PLAN 4000 DOS support must make various changes to most components of DOS and the network support. These changes are detailed below.

1. The area reserved for the boot record must have a volume size descriptor patched into it. The boot record is in logical sector 0 (head 0, track 0, sector 1). The volume size descriptor contains information required by DOS on the cluster size, the number of directory entries, the total size of the volume and other related information. The INIT command in NET writes this information, and it is read when a volume is mounted by the mechanism described in number 2, below.
2. A special entry point is added to the BIOS to "zap" DOS's volume descriptor table. This is given a drive number that may be a real diskette or a virtual volume. The "zap" routine reads the boot record from the drive and "zaps" DOS's volume descriptor table with the information read from the disk. This routine will work with real diskettes that have a standard (unmodified) DOS 1.1 or DOS 1.0 boot record on them, and also with virtual volumes that have not been initialized for use by DOS.
3. The BIOS "read sectors" and "write sectors" routines have also been modified. There are two reasons for modifying these routines from the DOS 1.1 standard. First, DOS 1.1 only caters to drives of 160KB or 320KB; it will discard logical sector numbers greater than 640. Second, the standard BIOS maps 320KB drives (when accessed as files, but not when accessed through INT 25 or INT 26 calls) to use both heads on track 0 before starting on track one.

The modified routines first determine if the disk being looked at is a valid DOS disk of 160KB or 320KB. If this is the case, it uses the original BIOS read/write routines.

VARIABLE VOLUMES

Otherwise, it makes calls to the INT 13 handler directly, mapping logical sector numbers to head/track/sector parameters in the same way as outlined in the INT 25/26 descriptions.

Notice that the standard DOS disk sizes are accessed in the same way, regardless of whether the disk is a real diskette or a virtual volume. This is important for 320KB disks, because any other approach would mean that a real diskette when DISKCOPIed onto a virtual volume would have all the information in its files misaligned.

4. In NETUNIT, the FSCMD and FSCMD1 functions have been modified to "zap" drives that have been successfully MOUNTed or CREATED.

Note: If virtual volumes are mounted directly at the file server, the zap will not have been done. This will lead DOS to use the wrong cluster size and number of directory entries. So, if you wish to access DOS files on a DOS virtual volume, do not mount the volume directly at the file server.

5. In CMDUNIT, the "SET d REAL/VIRTUAL" commands have also been modified to zap the drive whose status has been changed.

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| File Server User's Manual | SC40-0200 |
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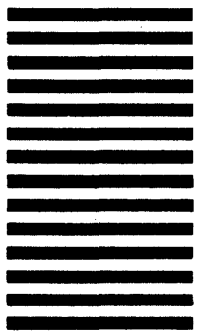
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