Streaming Tape Software under MS-DOS

User Guide

olivetti

PREFACE

This manual is a user and operations guide for the OLIVETTI 20 MB and 40 MB STREAMING TAPE UNITS (STU 25020/25040). It describes how to use the IRWIN Streaming Tape Software and how to operate the Streaming Tape Unit. This manual shows you:

- how to load the software to control your tape drive
- how to save and restore disk files
- how to care for your tape drive and data cartridges.

To help you use the system as quickly as possible, most of this manual is written in a how-to-do-it style. After you have learned the basic steps, you will be able to use this manual for reference. The steps for the various operations are summarized in Chapter 9 "Reference Section: Summary Of Commands".

If you are new to computers or to the use of hard disks, read through Chapter 8, "Why and How to Back Up Disk Files", before you begin saving disk files.

If you are interested in how your tape drive works, there is a not-too-technical discussion in Appendix A.

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CONTENTS

1. INTRODUCTION

ABOUT THIS CHAPTER

This Chapter offers a brief overview of the system and provides an introduction to its major components.

CONTENTS

Irwin BACKUP Tape systems are high-speed digital tape systems that copy files from your hard disk onto magnetic tape cartridges and restore those files in the event of damage to the originals. These high-capacity data storage devices are also useful for archiving data, storing data off-line, and transferring data between computers.

Each system consists of a tape drive and controlling software compatible with Olivetti MS-DOS. Backup tapes can be made of individual files, groups of files, or the entire hard disk in a single operation.

BEFORE YOU GET STARTED

If you have used your computer for some time, you probably already know how to display disk directories, name and rename files, and transfer files from one directory to another. These are the MS-DOS commands you will use with the tape system.

If your computer is still new and unfamiliar to you, review your MS-DOS manual before installing the software supplied with the tape drive.

Note: Your hard disk must be initialized before you use the tape system. Refer to your "MS-DOS Software Installation Guide" for instructions.

2. TAPE CONTROL SOFTWARE

ABOUT THIS CHAPTER

This Chapter explains how to install the IRWIN tape software and how to configure MS-DOS optimally for running this software.

CONTENTS

LOADING THE TAPE CONTROL SOFTWARE

The program diskette that came with your tape drive contains the control programs you will need to back up and restore data from and to your hard disk. The programs run under Olivetti MS-DOS. Follow the steps below to load the software on your hard disk.

Note: The diskette drive in your computer is probably identified as drive A, and the hard disk as drive C. If not, substitute the correct letters in the steps below.

1. Before doing anything else, make a backup copy of the tape control programs on a diskette, following the instructions in your MS-DOS manual. Then file your original diskette and never use it again except to make additional working copies of the programs.

   Note: To "enter" any of the command statements shown below, or anywhere else in this manual, you must press the **RETURN** , **ENTER** , or ↵ key, as shown in step 2. Your computer will have one of these three keys on its keyboard and its use at the end of each command statement is implied. Where necessary, the word **ENTER** is used in this manual to symbolize all three keys.

2. Log onto the hard disk drive by typing:

   C:
   Then press **ENTER**

3. Access the root directory by entering:

   CD \

4. Create a directory named IRWIN. Enter:

   MD IRWIN

5. Transfer the tape control programs to your hard disk. Enter:

   ```
   COPY A:*.* IRWIN
   ```

   This command transfers the tape control programs from the diskette to the IRWIN directory you created in step 4. Do not continue until the transfer is complete.

6. Remove the program diskette and store it in a safe place. You should not have to use it again unless the programs you just transferred to hard disk are damaged somehow.

   Note: If you already have an AUTOEXEC.BAT file, skip the following step; just modify your existing file by adding the statements shown in step 8.

7. Enter:

   ```
   COPY CON: AUTOEXEC.BAT
   ```

8. Enter the following commands into the AUTOEXEC.BAT file:

   ```
   DATE
   TIME
   PATH C:\IRWIN
   ```

   After the PATH statement, enter any other commands you want to make part of the AUTOEXEC.BAT file. For details, see your MS-DOS manual.

   Note: Enter the words "DATE" and "TIME", not the actual date and time.

   You must include DATE and TIME in the batch file, and you must enter the correct time and date on startup. The tape control programs use these parameters to identify backup tapes.

9. Press the **F6** function key, then press the **ENTER** key.

   The preceding steps create a batch file in the root directory that will be executed automatically each time the computer is turned on. The PATH statement provides an automatic path to the tape control programs from any directory or subdirectory.

CONSTRUCTING OR MODIFYING THE CONFIG.SYS FILE

You can use the BUFFERS command to cause MS-DOS to create and use up to 99 disk buffers. Unless you tell it to do otherwise, MS-DOS only uses two buffers. You will get significantly better performance from the tape programs, and other applications as well, if you use more buffers. About twenty buffers should be optimal for speed and memory utilization. Each additional buffer increases the resident size of MS-DOS by 528-bytes. (See your MS-DOS manual for details.)

USING MS-DOS BUFFERS TO SPEED UP RESTORE OPERATIONS

To minimize the time required to restore files using the File Interchange Program (FIP), change the number of MS-DOS buffers specified in the CONFIG.SYS file according to the following formula:

$$\text{Number of buffers} = \frac{(\text{number of files} \times 32) + \text{average file size}}{512} + 5$$

where:

number of files = number of files in the save set being restored.

average file size = total size of all files being restored divided by the number of files.

Consult your MS-DOS manual for details.

Note: If you already have a CONFIG.SYS file, skip step 1 and modify your existing file by adding the statements shown in step 2. You can use the EDIT Visual File Editor described in your MS-DOS User Guide.

1. Create a CONFIG.SYS file. At the MS-DOS prompt, enter:

   ```
   COPY CON: CONFIG.SYS
   ```

2. Enter the following command into the CONFIG.SYS file:

   ```
   FILES=20
   BUFFERS=20
   ```

3. Press the **F6** function key, then press the **ENTER** key.

4. Reboot your system; press the **CTRL**, **ALT** **DEL** keys simultaneously.

The tape control programs are now ready to run.

DESCRIPTION OF THE TAPE CONTROL PROGRAMS

IMAGE

The IMAGE program lets you transfer a compressed image of your hard disk to tape (BACKUP), or from tape to disk (RESTORE), in a single operation. A menu allows you to select the operation you want to perform.

FIP

The File Interchange Program (FIP) enables you to back up or restore files on an individual or group basis. A group of files is called a save set.

The FIP program operations are initiated by selecting from a menu or by entering commands from the keyboard.

TFORMAT

The Tape Format (TFORMAT) program prepares blank tapes for use by IMAGE and FIP. Two steps are involved: servo writing and formatting. Like the other programs, TFORMAT is driven by menu selections.

USING BATCH FILES

Although not a control program, MS-DOS's batch file processing capability can be used to simplify and customize backup and restore operations. Appendix B provides an example of a batch file.

3. TAPE CARTRIDGES

ABOUT THIS CHAPTER

This Chapter tells you how to handle and care for tape cartridges. It also tells you how to use TFORMAT to servo write and format your tape cartridge.

CONTENTS

INTRODUCTION

Irwin BACKUP Tape systems store data on small tape cartridges, one of which was supplied with your drive. This chapter describes how to handle tape cartridges and how to prepare them for use with your tape drive.

HOW TO LOAD AND UNLOAD TAPE CARTRIDGES

To load a cartridge into the drive, simply insert it with the exposed roller edge towards the drive and the metal face down (Figure 3-1). Before inserting the cartridge, check to make sure the paper insert packaged with the cartridge is not stuck to the underside of the cartridge.

You should feel a definite "click" as the cartridge is seated in the drive. If you don't, withdraw the cartridge and reinsert it. It should now be inserted properly.

If the tape drive's power is on, the tape drive automatically positions the tape to its beginning point, lighting the red "busy" light on the front of the drive. Otherwise, the tape will be positioned as soon as you turn the power on.

To remove the cartridge, press the eject bar.

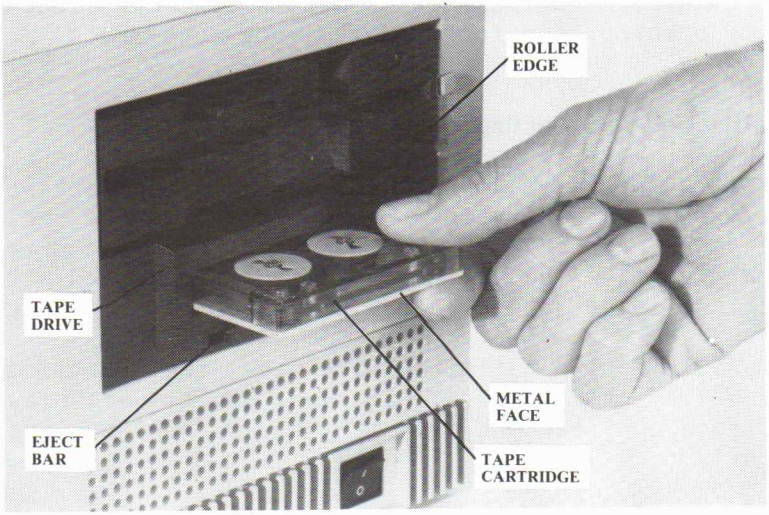

Fig. 3-1 Inserting the Tape Cartridge

HOW TO HANDLE AND CARE FOR TAPE CARTRIDGES

Note: Irwin tape systems use special tape cartridges to store the data contained on your hard disk. Standard DC-100 cartridges will **not** work in the tape drive.

These are the cartridges recommended for use in your Irwin drive:

3M	DC-1000, DC-2000
Irwin	TC 200, TC 400
Olivetti	Mini Tape Cartridge 20Mb or 40Mb

The special tape cartridges used in the drive are ruggedly built, but should be handled with care to preserve the data they contain.

- Never open the cartridge tape's access door or touch the tape itself. One fingerprint can prevent the tape drive from reading data across all tracks.

- Keep the cartridge in its protective box when it is not actually in the tape drive.

- Keep the cartridge away from sources of electromagnetic fields, such as telephones, dictation equipment, mechanical or printing calculators, motors, and bulk tape erasers.

- Keep the cartridge away from heat sources, such as radiators, warm air ducts, registers, and lamps.

- Do not lay cartridges on the CRT, the computer's base unit or the top of the tape drive.

WRITE-PROTECTING A CARTRIDGE

When a tape is full, or when it contains data that you want to protect from accidental erasure, slide the tap marked "RECORD" toward the center (see Figure 3-2). The drive will not attempt to store any data on a tape that is "write-protected" in this way. It will, however, restore files from a write-protected tape to your disk.

To return the cartridge to its "writable" state, push the tab toward the end of the cartridge.

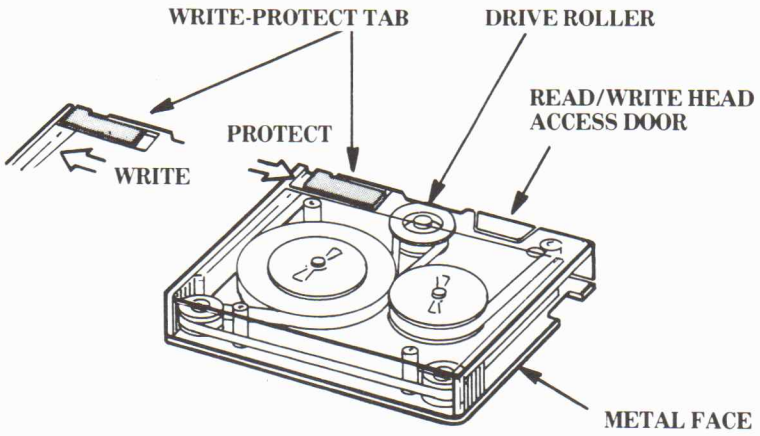

Fig. 3-2 The Tape Cartridge

HOW TO PREPARE A NEW TAPE FOR USE: THE TFORMAT PROGRAM

Like new diskettes for your computer, new or bulk-erased tapes must be prepared for use in the tape system by recording special codes and track signals on them using the TFORMAT program. Ordinarily, this needs to be done to a tape only once. If you are interested in the technical aspects of these processes, see "How the System Works" in Appendix A.

There are two parts to the process: the first (servo writing) records track servo patterns, and the other (formatting) sets up the actual data format.

Note: The tape supplied with your system has already been servo written and formatted, so it is ready to use. Olivetti 20MB and 40MB tapes are already servo written and formatted.

You can servo write and format the tape in one step, or you can do these tasks separately. Follow the steps below.

Note: A previously used tape must be bulk-erased before servo writing to prevent possible conflict between servo signals. Irwin also suggests that you bulk-erase new tapes to eliminate any stray magnetic signals they may contain.

Bulk erasers generate a strong magnetic field that erases all data and other signals from a tape or disk. You can purchase an Irwin bulk eraser from your Olivetti dealer. Be sure to follow the instructions on the box.

1. Insert a bulk-erased, blank tape into the drive.

2. At the MS-DOS prompt, enter:

   TFORMAT

   The TFORMAT menu appears on the screen (See Figure 3-3).

```
Tape Format Program

TFORMAT Menu

1. Start servo write and exit
2. Servo write and wait for completion
3. Servo write and then format tape
4. Format tape only
5. Display tape format parameters
6. Reverify a formatted tape
7. Enter volume name
8. Exit program
```

Fig. 3-3 TFORMAT Menu

3. Select any of the "servo write" operations.

   If the system has trouble servo writing a tape, the red light on the tape drive will begin flashing. If that happens, bulk-erase the tape and try to servo write it again. If the tape fails again, and other tapes successfully complete servo writing, the tape is defective; return it to your dealer. If several tapes fail, see Chapter 6, "In Case of Difficulties".

4. If you selected either "Start servo write and exit" or "Servo write and wait for completion", the tape must still be formatted before it can be used. Select the appropriate choice from the TFORMAT menu.

TFORMAT CHOICES

The first three choices shown in Figure 3-3 refer to servo writing the tape.

Start Servo Write and Exit

This selection starts the servo writing process and returns you to DOS. You can then use your computer for other things while the tape is being servo written. **Remember, you will also have to format the tape before you can use it in the system.**

Servo Write and Wait for Completion

If you choose this option, you will not be able to use your computer while the tape is being servo written. Periodic messages will inform you of the progress and completion of servo writing. If difficulties are encountered, the system will display error messages. **Remember, you will also have to format the tape before you can use it in the system.**

Servo Write and Then Format Tape

This selection both servo writes and formats the tape. Status messages are displayed periodically.

Choices 4 to 6 apply to formatting the cartridge.

Format Tape Only

Formatting maps the entire tape for read and write operations, identifying "blocks" of data. as it formats, the system performs a media check to identify the catalog defective blocks so they will not be used for data. The program also records the date of formatting.

As with all magnetic media, data recorded on the cartridge tape degrades a little each time it is read. Since the tape's format information is written once and then read time and time again, as you use it for backup and restore operations it will begin to degrade over time (but usually only after the tape has been used hundreds of times). If you start to notice an increase in read "retries", symptomized by the tape starting and stopping in the same area over and over again, copy the data to another tape and reformat the original tape.

Display Tape Format Parameters

This selection displays a great deal of information about the cartridge loaded in the Irwin drive. For instance:

- the type of tape
- when it was formatted
- the program used to format it
- which tape program it has been used with
- date of last tape change
- capacity
- % of tape use
- available space.

Reverify a Formatted Tape

This selection lets you verify that a used cartridge (or an old but unused cartridge) still works properly. The operation consists of reading each block of the tape to verify that each block is readable. After this verification, the program lists the bad blocks not

previously cataloged, as well as any blocks that were in the bad block list but can now be read successfully.

Reverify does not erase data files already on the tape, and does not change the bad block list if the cartridge has been used previously. Use this selection when you have trouble restoring files from a tape and it will point you to the source of the problem.

When a cartridge is unused, reverify updates the bad block list for any defective block it detects.

Enter Volume Name

The seventh choice, Enter Volume Name, lets you assign a name to the tape after it has been formatted, or change a name previously assigned. The volume name may be any combination of up to 12 characters, but cannot start with a space (i.e. blank).

4. SAVING DISK DATA ON TAPE

ABOUT THIS CHAPTER

This Chapter tells you how to either save an image of an entire hard disk or how to save a group of files on tape.

CONTENTS

INTRODUCTION

This chapter steps you through performing an IMAGE backup to save the entire contents of the hard disk and using the File Interchange Program (FIP) to save groups of files or individual files you select. Also included is a description of the FIP command mode and information on reusing tapes.

If you are new to the use of a hard disk, read Chapter 8, "Why and How to Back Up Disk Files", before you do the procedures in this chapter.

HOW TO SAVE THE CONTENTS OF THE ENTIRE DISK ON TAPE

To save the contents of the entire hard disk on tape, follow the steps below. You must use a tape that is servo-written and formatted.

Note: If your hard disk is partitioned so that MS-DOS only knows about part of the physical disk space, only that part can be backed up with this program.

To get the most efficient use of available disk and tape storage space, we recommend you run the MS-DOS utility program CHKDSK before you back up your disk using IMAGE. This deletes all unnecessary and temporary files from the disk.

1. At the MS-DOS prompt, enter:

   CHKDSK/F

   If no problems are detected, go to step 3. If CHKDSK detects lost clusters, it will ask you **"Convert lost chains to files (Y/N)?."** If you answer **Y** CHKDSK will convert the lost clusters to files called FILExxxx.CHK in the root directory of the specified drive (where

xxxx starts at 0000 and increases by 1 for each lost chain).

2. With a formatted tape in the drive, type:

   IMAGE

   Note: If you want to turn verify mode on, type:

   IMAGE VERIFY

   The menu shown in Figure 4-1 appears on the screen. Menu choices are explained below.

```
Image Backup Program

IMAGE Menu

1. Image backup to tape
2. Image restore from tape
3. End image
```

Fig. 4-1 IMAGE Main Menu

Image Backup to Tape

This option lets you save a compressed mirror-image of all the data on your hard disk. Each image backup overwrites any data that may already be on the tape; you cannot "append" one image backup to another.

If the tape was previously used, you will be asked whether you want to write over the tape or not. If not, you will have the opportunity to switch tapes.

It takes proportionately less time to save the data on a disk that is not full. If you disk contains more data than the tape can hold, however, you must insert additional cartridges until all the files have been saved. Prompts will be displayed at the proper time. The IMAGE program identifies each tape as it proceeds through the backup. Mark these cartridges to identify their sequence in case it is ever necessary to restore the files.

Note: Additional tapes must be servo written and formatted before starting the image backup. You cannot leave IMAGE and reenter the program.

If you have only one hard disk drive (C:, D:, etc) answer the question about the source disk by pressing **ENTER.**

The volume name of an image tape is always the same as the hard disk's volume name. The time and date of the image backup is obtained from MS-DOS and saved with the volume name.

An image back-up/restore operation compresses the data on your disk and makes all of the unused space contiguous, eliminating any problems with fragmented files.

Image Restore from Tape

This option restores the disk files that were saved with "Image backup". (More on this in Chapter 5, Restoring Disk Data from Tape.)

Caution: Restoring from tape writes over (erases) **ALL** files currently on the disk whether or not they have copies on the tape.

End Image

This option returns you to MS-DOS.

HOW TO SAVE A GROUP OF FILES ON TAPE

If you do not want to save all of the files on your hard disk, you can use the File Interchange Program (FIP) to selectively save files.

FIP procedures can be performed using menus or by entering commands in the command mode. The command mode is identified by a special FIP prompt, >>.

In FIP, files are grouped into what are called "save sets". A file may be any size. You can put as many as 186 save sets on a tape, and use an unlimited number of tapes, so there is theoretically no limit to the amount of data you can save using FIP.

Note that you cannot intermix FIP and image files on the same tape.

Note: The FIP program assumes that your "default drive" is the fixed disk. So be careful to make sure that the default drive is the hard disk drive you want to save/restore files from/to.

USING FIP's MENU MODE TO SAVE AND RESTORE FILES

1. Insert a tape in the tape drive.

2. At the MS-DOS prompt, enter:

   FIP

   The program reads the tape's master directory (if it is a FIP tape) and the list of bad blocks. When it is finished, it displays the menu shown in Figure 4-2.

   Note: If you want to turn on Verify mode, at the MS-DOS prompt, enter:

   FIP VERIFY

File Interchange Program

FIP Menu

1. Backup all files by date and time
2. Backup all files with a specific date
3. Backup all "modified" files
4. Backup selected files
5. Backup directories
6. Restore an entire saveset
7. Restore directories
8. Restore selected files

9. List savesets on current cartridge
10. Set cartridge status to UNUSED
11. Enter FIP command structure
12. Exit program

Fig. 4-2 FIP Main Menu

3. Select the desired program option by entering the associated number and pressing **ENTER.** Each option is described in the text that follows.

Backup All Files by Date and Time

This option allows you to back up all files created on or after a specified date and time. In most systems, this also includes files that were modified on or after the specified date. The program displays the current date and allows you to accept it by simply pressing **ENTER** , or you may enter a different date using the form mm/dd/yy. If you use a date of 1/1/80, selecting this option saves all of the files on this disk. Files with no time and date stamp will be backed up as if dated 1/1/80. After you enter the date, FIP displays the default time, 00:00 (midnight), that

will be used; you can either accept it or enter a different time.

Note: Use a 24-hour clock to enter all time. The clock starts at midnight (00:00) and ends at 11:59 P.M. (23:59).

Backup All Files With a Specific Date

This option allows you to back up only those files that were created or modified on a specified date. The current date is the default.

Backup All Modified Files

This option allows you to back up all files created and modified since the last FIP or DOS BACKUP.

Backup Selected Files

This option allows you to save a single file or a group of similarly named files on tape. The "wildcard" symbols * and ? are used to group similarly named files together.

You will be requested to specify the directory, or select the default (current) directory. The save set will assume the name of the file or group of files you specify, including any "wildcard" symbols. So, if wildcard characters are used, you will probably want to rename the save set.

Backup Directories

This option lets you save all of the files in any specified disk directory. The name of the current directory is displayed and can be accepted by pressing **ENTER** or a different directory name can be chosen. The save set will

have the same name as the directory you save. A maximum of 186 sub-directories within any one directory is allowed. If you have more than 186 sub-directories within a directory restructure the hard disk directory structure or back up each sub-directory individually.

Restore an Entire Save Set

This option allows you to restore a specified save set from tape. For details, see Chapter 5, "Restoring Disk Data from Tape".

Restore Directories

This option allows you to restore all or some of the directories on a FIP tape. For details, see Chapter 5.

Restore Selected Files

This option allows you to restore selected files from a save set, rather than the entire save set. For details, see Chapter 5.

List Save Sets on Current Cartridge

This option lists all of the save sets on the tape.

Set Cartridge Status to UNUSED

This option resets the tape directory to "empty", eliminating access to the data on the tape. You can now reuse the tape.

Enter FIP Command Structure

This option switches the FIP program to a command-driven mode of operation. Command mode is signified by the special FIP prompt >>.

Exit Program

This option returns program control to MS-DOS.

USING FIP's COMMAND MODE TO SAVE FILES

Saving Files

FIP's command mode has more built-in flexibility and lets you do more sophisticated backup and restore operations than does the menu mode. Following is a description of how to save individual files or groups of files using the command mode. Restore operations possible in the command mode are described in Chapter 5. Enter HELP to get an explanation of the FIP commands, or refer to the Reference section of this manual.

1. Create and name the saveset. At the FIP prompt, enter:

   >> CREATE *savesetname*

   You may use any combination of up to 64 characters to name the save set (e.g., "ACCOUNTING___DATA"). Note that spaces cannot be used as part of the name. Use the "___" or "-" character instead.

2. Select the disk files you want to include in the save set:

   >> SELECT *filename1 filename2 filename3*

Note that the file names are separated by spaces.

When entering the names of files to be saved, you can use the standard MS-DOS "wild card" characters -- the "*" and the "?" -- to make the job easier. For example:

*.DAT	Selects all files with the extension .DAT.
INVENT??.*	Selects all files beginning with INVENT, with up to two characters before the extension, and any (or no) extension.
.	Selects all files in current directory.

To include files from a different disk directory in the save set, change the current directory like this:

```
>> CD \directoryname \subdirectoryname
```

Notice that, unlike MS-DOS, the change directory command requires a space before the directory specification. To identify the current directory, use the CD command without parameters:

```
>> CD
```

If a file selected from the new directory has the same name as one already selected, the second selection will be refused.

To check which files are in the current directory, enter the FIP command:

```
>> DIR
```

3. After you have entered the names of all the files you want to save, you can verify your selections by entering:

```
>> LIST
```

An example of a save set listing is shown in Figure 4-3.

```
>> LIST

Directory of saveset: SOURCE    9/1/87          10:33

*MASTER         .C      UFACE   .C      EXEC    .C      TAPE    .C
 DSKDIR         .C      ERRORS  .C      BUFFER  .C      DIRECT  .C

                        2 file(s) selected      5482 byte(s) selected
```

Fig. 4-3 Save Set Listed

4. To remove the SELECT marker from a file, enter:

```
>> UNSELECT filename1 filename2...
```

You may use wildcards with UNSELECT as well.

If you then type LIST again, the files will still be listed, but without the symbol ("*") that makes a selected file. Only a marked file will be saved on the tape.

5. When you have selected all the files you want to include in the save set, enter:

```
>> BACKUP
```

All of the files you have selected will then be recorded on tape immediately after any other save sets already on the tape. The tape's directory will then be updated to include the new save set.

6. If you want to create another save set on the same tape, you may do so as soon as the tape drive finishes with the first save set. If you want to use a different tape, wait for the operation to finish, then enter:

   >> END

   After FIP displays the command prompt, you can withdraw the tape from the drive and insert a different tape. If you exchange tapes without the END command, you'll be requested to reinsert the previous tape and enter the END command as soon as you try any operations on the new tape.

7. To return to IP's main menu, type:

   >> MENU

   To exit the FIP program and return to DOS from command mode, type:

   >> EXIT

HOW TO RE-USE A TAPE

Once a tape has been used for saving disk data, it may be used again in any of three ways:

- New save sets can be added after those already saved.

- New save sets can be written over the old save sets. To do this, you must set the tape status to UNUSED. Note that the old save sets are lost.

- The tape can be reformatted.

To re-use a tape, first make sure the tape is not write-protected, then insert the cartridge in the drive.

Adding New Files

To add new files to an existing FIP tape, use either menu selections or the command mode to CREATE, SELECT and BACKUP files. The new save set will be added to the tape. If there is not enough room on the tape for the entire save set, FIP will allow you to reduce the size of the save set by UNSELECTing one or more files.

In the command mode, you can check the tape for available space. At the FIP prompt, enter:

```
>> TAPE
```

The number of bytes available for storage and other information will be displayed (see Figures 4-4 and 4-5).

Warning

Any data presently on the tape will be lost when you perform either of the following steps.

```
IRWIN MAGNETICS

Tape formatted: 9/19/86       CERTIFY  1.09
Volume: UNNAMED,     1 of 1
Tape status: USED with FIP version 4.81
Date of last tape change:  6-26-87

 12 tracks
110 blocks per track
16 data sectors per block
2 ecc sectors per block
error correction USED
1024 bytes per sector

1 bad block(s)

location of first free block: track 5  block 97

21,561,344 bytes - tape capacity
49.16 % of the tape has been used
10,993,664 bytes available for backup

>>
```

Fig. 4-4 20 Mb TAPE Information Display

```
IRWIN MAGNETICS

Tape formatted: 9/19/86       CERTIFY  1.09
Volume: UNNAMED,     1 of 1
Tape status: USED with FIP version 4.81
Date of last tape change:  6-26-87

 20 tracks
124 blocks per track
16 data sectors per block
2 ecc sectors per block
error correction USED
1024 bytes per sector

15 bad block(s)

location of first free block: track 5  block 4

40,337,408 bytes - tape capacity
25.80 % of the tape has been used
30,146,560 bytes available for backup

>>
```

Fig. 4-5 40 Mb TAPE Information Display

Writing Over Existing Files

To make sure you have the right tape, run FIP and select menu option "9". This displays the save sets on the tape. Or, in command mode, enter:

```
>> SETS
```

To write over the existing files, select menu option "10". Or, in command mode, type:

```
>> RESET
```

This resets the directory of save sets to empty and allows you to write over the existing data. If you need the data on the tape, copy it to another tape first. The table of bad blocks will be retained. Note that, ordinarily, it is not necessary to reformat a used tape.

Renaming the Tape

You can rename the tape with the command:

```
>> VOL
```

The program will ask you for the new name, which may be any combination of up to 12 characters, but the first character cannot be a space.

Note

If you are resetting or renaming more than one tape, enter END before you exchange tapes.

5. RESTORING DISK DATA FROM TAPE

ABOUT THIS CHAPTER

This Chapter tells you how to either restore an image of an entire disk or how to restore a group of files from tape.

CONTENTS

RESTORING DATA

Using your backup tape and software, you can restore the hard disk in its entirety or only certain files or save sets.

HOW TO RESTORE THE ENTIRE DISK

If you used IMAGE to save everything on your hard disk, the data you saved can be restored from the tape only in its entirety; you cannot replace individual files. Remember, an image restore operation replaces everything that presently exists on your hard disk. Follow the steps below to restore the entire disk.

Note: If you do not see the command sign, >, when you turn on your system, you must load the operating system. You can boot your system from floppy disks containing the operating system and the Irwin software.

1. Insert the tape containing your image files into the Irwin drive.

2. At the MS-DOS prompt, enter:

   IMAGE

   The Image menu will appear, as shown in Figure 5-1.

Image Backup Program

IMAGE Menu

1. Image backup to tape
2. Image restore from tape
3. End image.

Fig. 5-1 Image Menu

Caution

The following operation writes over (erases) all files presently on your hard disk, whether or not they have copies on the tape.

3. From this menu, select "Image restore from tape".

   The operation begins with a check of the tape to make sure it contains an image backup. If it does not, you must use FIP to restore the file on the tape.

   If more than one tape was needed to back up your disk, you'll be prompted to insert additional cartridges at the appropriate times. If you insert a cartridge out

of sequence, you'll be asked for the correct cartridge ("volume").

When restoring your data, a message is displayed reporting a successful transfer or listing the files that may contain errors. If errors are reported, try again using the same tape. If that doesn't work, use an older backup tape.

The disk volume name is set to the name of the volume restored from tape.

If the MS-DOS that you restored to disk from the Image tape is a different version than the version of MS-DOS executing in your computer's memory, you will get the following message:

Insert COMMAND.COM disk in <drive>
and strike any key when ready.

If you see this message, simply reboot the system using the **CTRL ALT DEL** keys, or press your computer's reset button.

4. Reboot your system.

A reboot is needed because MS-DOS might leave invalid directory information in its buffers. In this rare case, commands following the restore operation could scramble data on the hard disk.

HOW TO RESTORE FILES OR SAVE SETS

The FIP program lets you restore individual files or files previously grouped into save sets by one of FIP's "save" options (see Chapter 4, "Saving Disk Data on Tape").

FIP can be used to restore files in either of two ways: using menu selections or by entering commands. Using menu selections, you can restore an entire save set, a complete directory, a group of files, or a single file. In command mode, you can restore an entire save set, several files from the same save set, or a single file.

The FIP program assumes that the MS-DOS "default drive" is the hard disk. So be careful to enter FIP when the prompt shows the correct default hard disk drive.

Note: In the command mode, all files will be restored to the current directory. If you wish to restore the files to another directory, change to a different directory using the CD command.

Follow the steps below to restore files or save sets.

1. Insert the tape containing your files into the Irwin drive.

2. At the MS-DOS prompt, enter:

   FIP

   The program reads the tape's parameters. When finished, the FIP menu shown in Figure 5-2 is displayed.

3. Choose a restore option.

   There are three ways to restore data using FIP; you can restore all of the files in a specified save set, restore all of the files in a specified directory (or

all directories), or restore individual files. Each option is discussed below.

FIP Menu

1. Backup all files by date and time
2. Backup all files with a specific date
3. Backup all "modified" files
4. Backup selected files
5. Backup directories
6. Restore an entire saveset
7. Restore directories
8. Restore selected files
9. List savesets on current cartridge
10. Set cartridge status to UNUSED
11. Enter FIP command structure
12. Exit program.

Fig. 5-2 FIP Menu

Option 6 - Restore an Entire Save Set

To restore an entire save set, select option "6". The program will prompt for the name of the directory the files are to be restored to. If none is specified, all files in the save set will be restored to the current directory.

The save set you select must exist on the tape. If you don't know which save sets are on the tape, first select option "9" to list them.

Option 7 - Restore Directories

With this option, you can only restore data that was saved using the "Backup Directories" option. On tape, each disk directory is stored as an individual save set, or as several linked save sets. Save sets are linked whenever you save a disk directory that has more than 500 files. When you restore any member of a linked save set (i.e. any part of a disk directory), all of the linked save sets are restored automatically. To restore only part of a linked disk directory, you must use option "6" or "8".

If the directory read from tape no longer appears on the hard disk, it is automatically created. Directories created this way are placed at the proper point in the directory hierarchy using information read from tape.

Option 8 - Restore Specified Files

Use this option to restore individual files or a group of files. You can use wildcard characters to group files together. For example, *.COM specifies all command files.

You must specify the save set where the file is stored on tape and the hard disk directory where you want it restored to. The current hard disk directory is the default.

If these selections do not offer enough flexibility, select option "11" to enter the command mode. Operations possible in the command mode are described in the following text.

USING FIP's COMMAND MODE TO RESTORE FILES

The FIP command mode has more built-in flexibility and lets you do more sophisticated restore operations than are possible using menu selections. Following is a description of how to restore individual files or groups of files using FIP commands.

1. Select option "11" from the FIP menu to enter the command mode. The FIP prompt >> is displayed.

2. To list the save sets that are on the tape, at the FIP prompt enter:

   >> SETS

   As shown in Figure 5-3, this lists all the save sets and tells when each one was saved on tape.

```
Tape used with FIP program      Volume: Unnamed, 1 of 1

1. SOURCE                 9/1/87          11:53
2. ACCOUNTS               9/17/86          8:01
3. MANUSCRIPTS            9/17/86         11:52

                Press any key to continue
```

Fig. 5-3 Listing of Save Sets

3. Next, specify the save set you want to restore:

   >> OPEN *savesetnumber*

   where *savesetnumber* is the number of one of the save sets listed by the SETS command.

4. You can list the files in the save set by then entering:

   >> LIST

5. See Figure 5-4, part A. To restore files from the opened save set, you must select the ones you want to include. Or you can use "wildcard" characters to help with the selection process. To include the entire set, simply enter:

   >> SELECT *.*

   See Figure 5-4, part B. If you don't want to restore all of the files, you may type the name of each file to be restored, as in:

   >> SELECT filename1 filename2 filename3

   Or you can use "wildcard" characters to help with the selection process.

6. Confirm you selection by again entering LIST. Notice that the selected files are marked with an asterisk (*), and unselected files are not marked. (See Figure 5-4, part C). To remove a file from the selected list, enter:

   >> UNSELECT filename

   Here is a timesaving hint. If you want to restore all but a few of the files, use SELECT *.* to select all of the files in the save set, then UNSELECT the ones you don't want. The use of the wildcards is described in Chapter 4.

```
>>LIST

Directory of saveset:  SOURCE  9/1/87  10:33
MASTER  .C             UFACE   .C      EXEC    .C      TAPE    .C
DSKDIR  .C             ERRORS  .C      BUFFER  .C      DIRECT  .C

        9 file(s)       0 file(s) selected      0 byte(s) selected
```

PART A.

```
>>SELECT *.*
>>LIST

Directory of saveset:  SOURCE  9/1/87  10:33
*MASTER .C             *UFACE   .C     *EXEC    .C     *TAPE    .C
*DSKDIR .C             *ERRORS  .C     *BUFFER  .C     *DIRECT  .C

     9 file(s)       9 file(s) selected      10982 byte(s) selected
```

PART B.

```
>>UNSELECT ERRORS.C
>>LIST

Directory of saveset:  SOURCE  9/1/87  10:33
*MASTER .C             *UFACE   .C     *EXEC    .C     *TAPE    .C
*DSKDIR .C             ERRORS   .C     *BUFFER  .C     *DIRECT  .C
*FIP    .C

     9 file(s)       8 file(s) selected      9764 byte(s) selected
```

PART C.

Fig. 5-4 Typical Save Set Directory

Caution: The files being restored in the following step will replace files with the same names in the current disk directory. If you want to preserve existing disk files, use MS-DOS to rename them before restoring.

7. The following step restores files to the current disk directory. You can change directories like this:

   >> CD *directoryname*

8. After specifying the proper disk directory and selecting the files you wish to restore, enter:

   >>RESTORE

   The selected files are then restored to the current directory. When the restore operation is finished, a message reports a successful transfer or lists the files that may contain errors. After transfer, the save set is closed. You may then open another save set, either to restore it or to examine its directory.

6. IN CASE OF DIFFICULTIES

ABOUT THIS CHAPTER

This Chapter tries to troubleshoot most of the problems you may encounter during backup and restore operations. It covers what to do if the tape would not restore or a tape operation malfunctions. Also included are the error messages you will encounter along with an explanation of each.

CONTENTS

WHAT TO DO IF YOUR TAPE WILL NOT RESTORE

If you try to restore data and get a message that the system is unable to accurately restore some part of it, the problem may be temporary. A speck of dust or other contaminant may have interfered with reading the tape and another attempt might prove successful, even though built-in routines make the system try several times after an unsuccessful read.

At the end of a restore operation, those files that could not be read accurately are listed, with a message that they may contain errors.

Things to Try:

1. Clean the tape drive's read/write head, then try the restore operation again. (See Chapter 7, "Drive Maintenance".)

2. If repeated tries do not permit restoring the files, it's likely that the tape has been damaged or contaminated. To check this, use the TFORMAT program to reverify it. Reverify reads the entire tape and may find bad blocks that were not cataloged previously. If this is the case, you must either make corrections to the disk file with an editor, or restore the defective file again from another source, such as an earlier backup tape.

Good backup practice helps prevent losing valuable data by maintaining more than one copy of important files. See Chapter 8 for a discussion of backup philosophy. Always treat your tape cartridges with care, as detailed in "How to Handle and Care for the Tape Cartridges" in Chapter 3.

WHAT TO DO IF A TAPE OPERATION MALFUNCTIONS

If a power interruption occurs during a backup or restore operation, simply start over when the power returns. The incomplete files will be replaced by the new copy.

If the drive itself fails during a backup or restore operation, or if you get an unexpected increase in restore failures, try the following steps before you return it to your dealer.

1. Clean the read/write head, then try the operation again. See Chapter 7 for drive maintenance information. If the problem persists, continue with the following steps.

2. Try a different tape, preferably one that has never been used. Servo write and format the tape, and try both backup and restore operations. If the drive operates normally with a different tape, then the problem is likely to be with the tape you were using.

3. If the drive runs but does not transfer data, the cable connection to the computer may be at fault. Disconnect the cable and work the plug in and out several times. Sometimes a very small amount of corrosion forms on electrical contacts, interfering with the passage of the data signals. Secure the connector and try the operation again.

4. If the tape drive itself has ever been opened, the cable connection inside the drive may be loose, or making incomplete contact. Open the drive and move the cable connection in and out several times. Reassemble the drive and try the operation again.

5. If the drive won't run and its red light doesn't come on, even when the tape is removed and replaced, try the following:

- Turn off all power to the computer and the drive for 5 seconds, then start over.

- Check all power connections.

- If you are using a 4250 board, check its fuses.

ERROR MESSAGES

In the course of using either IMAGE or FIP, you will receive a number of messages on the display. Most of these simply tell what the system is doing, ask questions for you to answer at the keyboard, or give instructions for you to follow. However, if the system has trouble executing an operation, it may display one or more messages that tell you about the problem. Whether you can correct the problem or not, make a note of these messages in case you need to discuss the problem with your dealer.

IMAGE Error Messages

In the list below, only "problem" messages are included. They are in alphabetical order.

BAD BLOCK(S) IN NON-REDIRECTABLE PART OF TAPE

The tape is not usable. Try reformatting the tape. If that doesn't work, the tape is defective and cannot be used with IMAGE or FIP.

BAD SYSTEM SECTOR(S) ON OBJECT DISK

Your hard disk has bad sectors in the system reserved area, file allocation table area, or root directory area. This problem is possibly curable by reformatting your disk or by using a different partition.

BLOCK FAILURE...

If the system is writing to tape (saving files), it will skip over the indicated block, and the block will be added to the bad block list. If it is reading from tape (restoring files), there will be errors in the restored data. Another message will show what file is affected. Restore that file from a different tape.

CANNOT READ BAD BLOCK TABLE
CANNOT READ HEADER BLOCK
CANNOT READ (WRITE) REDIRECT TABLE

The tape is not usable. Try reformatting the tape to re-establish the defective data. If that doesn't work, the tape cannot be used with IMAGE or FIP.

DISK ERROR READING (OR WRITING) <MSG>

If the program asks **"Retry (Y/N) [Y]"** you have a chance to correct the problem before pressing **ENTER** to try again, or press **N** to cancel the operation. The *MSG* in parentheses after this message is a MS-DOS error message. See your MS-DOS manual for an explanation. The problem is not in the tape or the tape system, but in a disk or MS-DOS routine. Consult your dealer if it persists.

DISK DRIVE PARAMETERS ARE SIGNIFICANTLY DIFFERENT

Data on the tape is from a different kind or size of hard disk and cannot be recorded on your fixed disk. Data should be restored to the original kind of hard disk, or to roughly the same size partition.

FAILED IMAGE COPY

Something went wrong, causing the image copy to be aborted

by the program. This message will always be preceded by a more informative, explanatory message.

FILE NOT COMPLETELY COPIED: *XXXX*

XXXX refers to a file name, including a complete path.

This file could not be copied because of bad sectors on the tape or hard disk. If *XXXX* is a directory name, then additional files in that directory are probably lost.

IMAGE FAILURE

This message may accompany other messages that describe the problem more specifically. It indicates that the operation has been cancelled, and probably cannot be performed. If you are attempting a restore operation, try a different backup tape.

INTERNAL ERROR

The IMAGE program is faulty. Try copying the program again from the original program diskette. If the IMAGE program still does not work, request a replacement diskette from your dealer. This message is also displayed when there is not enough RAM in your system for the required buffers. The minimum system required is 128kb of RAM.

NOT ENOUGH BUFFER SPACE TO CHECK DIRECTORY *XXXX*

Did not have enough RAM to check the validity of a subdirectory (*XXXX*). This directory should be checked. Most likely nothing will be wrong, but some files may have been shortened.

NOT ENOUGH SPACE FOR QUEUES

There is not enough available memory in the computer for the program to run. The problem is not in the tape or the tape system.

PARTIALLY SUCCESSFUL IMAGE COPY

Some data was lost during the copy because of unreadable or unwritable sectors on the tape or disk. This message is always proceeded by messages about specifically affected files. Files not mentioned should be all right.

REDIRECTION TABLE OVERFLOW

The tape has a large number of bad blocks. Try reformatting the tape or bulk erase, servo write, and reformat the tape to see if some of the bad blocks can be eliminated. If most of the bad blocks cannot be eliminated by these steps, the tape is defective; discard it and use another.

SOURCE TAPE MAJOR (MINOR) VERSION DOES NOT MATCH PROGRAM VERSION

This means that the tape was written by a version of IMAGE that is different from the one currently being used. If the operation continues to run, ignore the message. If the operation is cancelled, consult your dealer.

SOURCE TAPE VOLUME DOES NOT MATCH EXPECTED VOLUME

In a multiple-tape image restore operation, you have inserted the wrong volume number. Eject the cartridge and insert the proper one.

SOURCE TAPE VOLUME TOTAL DOES NOT MATCH PREVIOUS TOTAL

This message indicates that the tape you have inserted is probably from a different backup operation. Check the cartridge.

TAPE IS NOT AN IMAGE TAPE

The tape was not written from the IMAGE program and cannot be read. If it was written using FIP, use FIP to restore.

TAPE ALREADY USED IN THIS BACKUP

The same tape was inserted twice during a multiple tape backup. Make sure that you correctly identify the tape then insert the proper tape.

VOLUME FAILURE...

The tape cannot be used as it is. Try reformatting the tape, or bulk-erase, servo write, then reformat the tape. If you still get this message after trying both of these steps, discard the tape.

XXXXX **IS NOT THE SAME AS ORIGINAL SOURCE TAPE NAME** *YYYYY*

The tape is from a different backup operation. Insert the proper tape. (*XXXXX* and *YYYYY* are tape volume names.)

WARNING...

A problem which is rectifiable (in which case retry may be attempted) or only affects a single file.

DD/MM/YY IS NOT THE SAME AS ORIGINAL SOURCE TAPE DATA

The tape is from a different backup operation. Locate and insert the proper tape. This message appears only during a multiple tape restore operation.

TFORMAT Error Messages

Any of the following messages can be displayed while you are in the process of servo writing or formatting a data cartridge. When any error occurs, follow these steps to correct the problem:

1. Remove the cartridge, reinsert it, and try again. If you are in the process of servo writing, the cartridge has to be bulk-erased before retrying the operation. If this doesn't work, see step 2.

2. Use a different data cartridge. If the operation now works, the initial data cartridge is defective. If this doesn't work, try step 3.

3. Your tape system is probably defective. return it to your dealer for repair.

NO MESSAGE, BUT LIGHT IS BLINKING

At the beginning of servo writing this indicates an edge-of-tape or write mechanism problem; during servo writing it indicates a tape problem.

FORMAT ERROR - one retry

Problem with data transfer, floppy controller, or DMA during format routine.

READ BLOCK ERROR

Problem with data transfer, floppy controller, or DMA during read routine.

RETRY FAILURE (NO ID) - CANNOT VERIFY TRACK. BULK ERASE CARTRIDGE, THEN SERVO WRITE

ID read problems during read.

SEEK TRACK ERROR

Problem with floppy controller during seek.

WRITE MAP ERROR

Problem with data transfer, floppy controller, or DMA during write routines.

FIP Error Messages

ABNORMAL TAPE CONDITION

Tape run off reel or invalid cartridge. Repair or replace the cartridge.

CANNOT CREATE FILE

Hard disk access error (see MS-DOS error table). Do a CHKDSK before retrying the backup.

CANNOT FIND DATA BLOCK

Tape positioning error. Retry the restore. If it fails again, reformat the tape. Use a prior backup to restore the file(s).

CANNOT FIND FIRST FREE BLOCK

Retry the backup. If it fails again, reformat the tape.

CANNOT FIND SAVE SET DIRECTORY

Retry the restore. If it fails again, reformat the tape.

CANNOT FIND SAVE SET TO VERIFY

Retry the backup. If it fails again, reformat the tape.

CANNOT OPEN FILE

Hard disk access error (see MS-DOS error table). Do a CHKDSK before retrying the backup.

CANNOT READ BAD BLOCK MAP, INSERT ANOTHER CARTRIDGE

Leading block has lost headers or has CRC errors.

CARTRIDGE NOT FORMATTED

Format the cartridge and retry the operation.

DISK FULL

Your hard disk is full. You must delete some files from

disk if you want to continue with the restore operation.

DISK WRITE (READ) ERROR

As stated (see MS-DOS error table). Do a CHKDSK before retrying the restore (backup).

ERROR READING SAVE SET DIRECTORY

Retry the restore. If it fails again, reformat the tape. Use a prior backup to restore the file(s).

ERROR VERIFYING BAD BLOCK MAP

Retry the operation. If it fails again, reformat the tape.

ERROR VERIFYING MASTER DIRECTORY

Retry the operation. If it fails again, reformat the tape.

ERROR WRITING BAD BLOCK MAP

Retry the operation. If it fails again, reformat the tape.

ERROR WRITING MASTER DIRECTORY

Retry the operation. If it fails again, reformat the tape.

FILENAME ALREADY SELECTED

File already selected in current save set.

MASTER DIRECTORY FULL

The maximum number of save sets has been saved on the tape. Reset the tape or use a new one.

MAXIMUM DIRECTORIES/SAVE SET EXCEEDED

Files from too many different directories selected for backup in a single save set. Do backup of current save set and create a new save set for the additional files.

NO MATCH FOR FILE NAME

File not found in current directory, upon selecting file for inclusion in a save set for backup.

SAVESET DIRECTORY FULL

Maximum number of files selected for that save set. Back up current save set and create a new save set for the additional files.

SAVE SET IS XX KILOBYTES GREATER THAN TAPE CAPACITY

Shrink save set or insert new cartridge.

7. DRIVE MAINTENANCE

ABOUT THIS CHAPTER

This Chapter tells you how to clean the tape drive's read/write head and capstan.

CONTENTS

INTRODUCTION

You should clean your tape drive's read/write head and capstan every month or so. Electronics stores carry materials and/or kits which can be used to clean both. Use 90% isopropyl alcohol and non-abrasive, non-linting swabs. DO NOT USE COSMETIC SWABS SUCH AS Q-TIPS. If you begin to experience read or write errors, format failures, or unusually large numbers of bad blocks, clean the head and capstan before concluding that either the tape or the drive is defective.

Both the head and capstan are accessible through the flip-up cartridge door. The capstan is the horizontal wheel in the center of, and 1 3/4 inches inside, the opening; the head is beside and to the right of the capstan. Allow one minute for residual alcohol to evaporate before using the drive. Never apply a lubricant to the drive or head positioning components.

CLEANING THE READ/WRITE HEAD

Gently rub an alcohol-dampened swab against the surface of the head. If necessary, use a second swab until further rubbing does not discolor the swab. These swabs may also be used to clean the capstan.

CLEANING THE CAPSTAN

Rub an alcohol-dampened swab against the surface of the capstan using an up-and-down motion. Gently push the edge of the capstan with the tip of the swab to rotate additional uncleaned surface into view. Do **not** clean the read/write head with a swab used to clean the capstan.

8. WHY AND HOW TO BACK UP DISK FILES

ABOUT THIS CHAPTER

This Chapter presents reasons, possible strategies and techniques for backing up disk files onto tape cartridges.

CONTENTS

INTRODUCTION

There are at least four reasons for using a tape backup system with your hard disk:

1. To protect active files on a day-to-day basis, so that if something happens to the disk or its files, you won't lose more than a day's work.

2. To store inactive files, such as last year's business records, text files of published documents, or source code for compiled programs.

3. To store infrequently used files when you begin to run short of disk space.

4. To store active data files as a historical record (audit trail) of transactions or events.

PROTECTING YOUR ACTIVE FILES

Most computer owners use backup tape drives to protect their active data files. Since any storage system can lose data, either through a mistake or a failure of the system, it makes good sense to have at least one other copy of the data. Because a hard disk holds so much data, backing it up with copies on diskettes is time consuming and expensive. High-speed tape is the logical alternative.

The simplest technique for providing a backup tape is to use the IMAGE program to copy the entire hard disk to tape. It can be started and left to run unattended when you don't need the computer for other tasks.

After getting some experience with your system, you may find that much of the data on your hard disk doesn't change from day to day. The operating system, language software, and application programs, for example, will seldom change. In business systems, only the data files containing records of sales, inventories, etc., are likely to be updated

frequently. In these cases , you can save time by using FIP to back up only those files that have been changed since making the last backup copy.

HOW OFTEN?

The interval between each backup depends upon your application and how much time it would take you to re-enter the lost data. In general, don't risk more data than you can easily replace if the system malfunctions.

HOW MANY TAPES?

Tapes can be reused many times. You could maintain your backup with a single tape, at the end of each day saving the entire contents of your disk. If something happened the next day, your one backup tape could restore your system to where it was at the beginning of the day.

However, if you have only one tape, and something happens to it (spilled coffee, stepped on, or whatever), it's all over. Or, if the disk fails during back up, you will have lost the previous backup tape as well as the current data you were attempting to save.

It is more prudent to use three tapes on a rotating basis so that you always write on the oldest version. Then you always have two more recent versions in case problems develop. This is termed the "grandfather-father-son" backup strategy, and is used in large data processing operations. Remembering which tape is the most recent tape can be a nuisance, but you can always load the tape and examine its directory to see when it was last used for backup.

Many users save their entire disk at predetermined time intervals, such as weekly, and save only the changing data files at the end of each day. While one tape may be able to hold more than one day's files, they reserve a tape for

each day of the week. For example, you could use FIP to back up your active data files at the end of each day except Friday. Each Friday and on the last day of the month, you would do an IMAGE backup, saving everything on the disk. Follow the grandfather-father-son strategy for the image tapes, rotating tapes each third period. Daily, use the tape you have set aside for that day (Monday tape, Tuesday tape, etc.), writing over what was written there the previous week. Mark the tapes in some way to clearly identify them, such as with different colored labels.

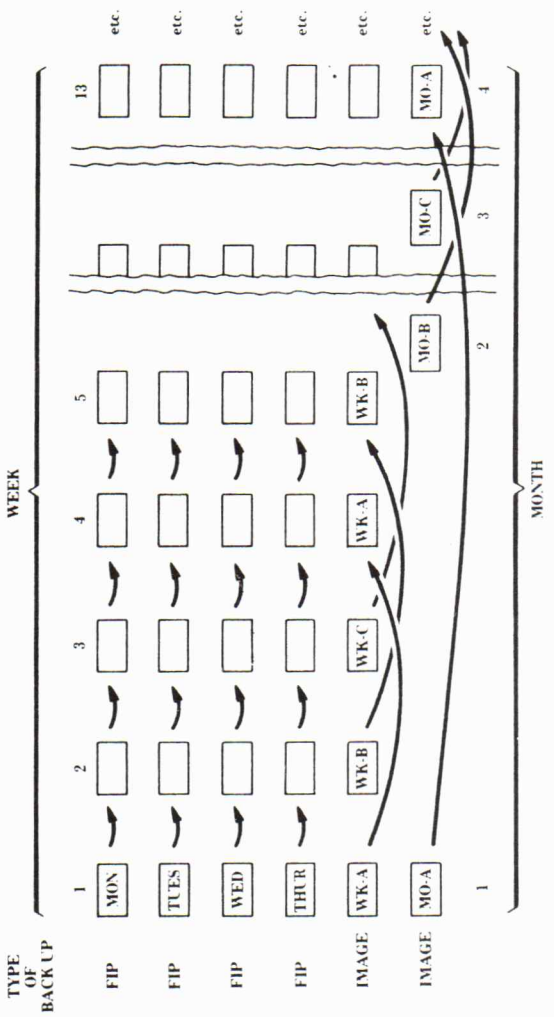

Fig. 8-1 Seven-Day Backup

As shown in Figure 8-1, this strategy uses a total of 10 tapes, but it provides a very effective backup library. Using such a scheme, you can recover infrequently used files lost months before and just discovered missing.

HISTORICAL TAPES

If your application is one in which you want a historical record of the changes in a particular set of files, then you may want to reserve certain tapes for specific files, adding new versions to the tapes at regular intervals. For example, your invoices and payroll files could be saved regularly, under different save set names on the same tape:

SAVE SET NAME	CONTENTS
PAY___100184	PAYROLL SEPTEMBER 1984
PAY___110184	PAYROLL OCTOBER 1984
PAY___120184	PAYROLL NOVEMBER 1984

9. REFERENCE SECTION: SUMMARY OF COMMANDS

ABOUT THIS CONTENTS

This Chapter provides a quick reference for all the Streaming Tape Software menu items and commands.

CONTENTS

IMAGE MENU SELECTIONS

1. **Image backup to tape.** Make a backup copy of the entire disk contents.

2. **Image restore from tape.** Copy a tape made with image backup onto the hard disk. (Replace everything on the disk.)

3. **End Image.** Return to MS-DOS.

FIP MENU SELECTIONS

1. **Backup all files by date and time.** Selects files modified after a stated date and time and saves them on tape.

2. **Backup all files with a specific date.** Selects files modified or created on a specific date.

3. **Backup all "modified" files.** Selects all files modified or created since the last FIP or MS-DOS BACKUP.

4. **Backup selected files.** Saves a single file or a group of similarly named files.

5. **Backup directories.** Saves all the files in a specified directory.

6. **Restore an entire saveset.** Restores a specified save set to a specified directory.

7. **Restore directories.** Restores a specified directory or directories.

8. **Restore selected files.** Restores a selected file or group of files from a save set.

9. **List save sets on current cartridge.** Displays a directory of the tape.

10. **Set cartridge status to UNUSED.** "Clears" a cartridge so it can be reused.

11. **Enter FIP command structure.** Access the FIP commands.

12. **Exit program.** Return to MS-DOS.

FIP TYPED COMMANDS

BACKUP	Copies the save set from disk to tape.
CD	Identifies current directory.
CD DirName	Changes to another directory.
CLOSE	Closes one save set to open or create another.
CREATE	Establishes a save set for backup.
DIR	Lists files in current directory.
END	After finishing with one tape, permits loading another.
HELP	Displays a list of commands and other helpful information about FIP.
LIST	Lists the files in the current save set.
MENU	Returns to menu from command mode.
OPEN	Specifies a save set from tape master directory.
RESET	"Erases" the tape.

RESTORE	Copies the selected files from tape to disk.
SELECT	Chooses disk files for, or from, a save set.
SETS	Lists the save sets on the tape.
TAPE	Displays information, other than contents, about a tape.
UNSELECT	De-selects files from a save set.
VOL	Names a tape.

TFORMAT MENU SELECTIONS

1. **Start servo write and exit.** Record servo patterns on tape while computer is used for something else.

2. **Servo write and wait for completion.** Record servo patterns without exiting program (status messages are displayed.)

3. **Servo write and then format tape.** Record servo patterns, then immediately record tape format.

4. **Format tape only.** Format a tape cartridge that has already been servo written.

5. **Display tape format parameters.** Display tape title, date of formatting, and list the bad blocks.

6. **Reverify a formatted tape.** Read an entire tape to make sure it can be used, and list any differences from the bad block list that are detected.

7. **Enter volume name.** Add or change the name of a tape.

8. **Exit program.** Return to MS-DOS.

A. THEORY OF OPERATION

ABOUT THIS CHAPTER

This Appendix describes how the Streaming Tape Unit works.

CONTENTS

HOW THE SYSTEM WORKS

The tape drive uses special mini data cartridges. With these, you can store 20 MB or 40 MB of data on a single tape. The system compresses disk data as it transfers it to the tape by eliminating unused space that may occur on the disk.

The data is recorded on several data tracks, the first of which starts at the head and goes to the tail. The second track is recorded from the tail to the head, and the third from head to tail, etc. This is called serpentine tracking and allows the tape to write/read continuously without rewinding at the end.

FORMATTING

Before it can be used for data backup, a blank tape must have two patterns recorded on it. Each pattern performs an important role during backup and restore operations.

The servo system permits the drive mechanism itself to be simple yet precise. The head is positioned across the tape by means of a stepper motor turning a spiral cam. Roughly positioned on a track, the head senses the locations of the servo path marker and is automatically centered between them by small adjustments to the stepper motor.

After servo-writing, the tape must be formatted. During this phase, special "layout" data is recorded on the tape, then the tape is read to make sure the data was recorded properly. At the same time, indicators are written at "block" intervals. If a tape block contains a spot that cannot be recorded or read reliably, the block is listed in a "bad block" table at the beginning of the tape. Bad blocks are skipped over during subsequent save and restore operations.

Each tape track contains 85 (20 MB), or 124 (40 MB) blocks of data. The first block on the first track contains tape

identification, data of formatting, the table of bad blocks, and other information needed by the system. The second and third blocks contain tables of where data is located on the tape. The data is stored in sequential blocks on the tape (Figure A-1).

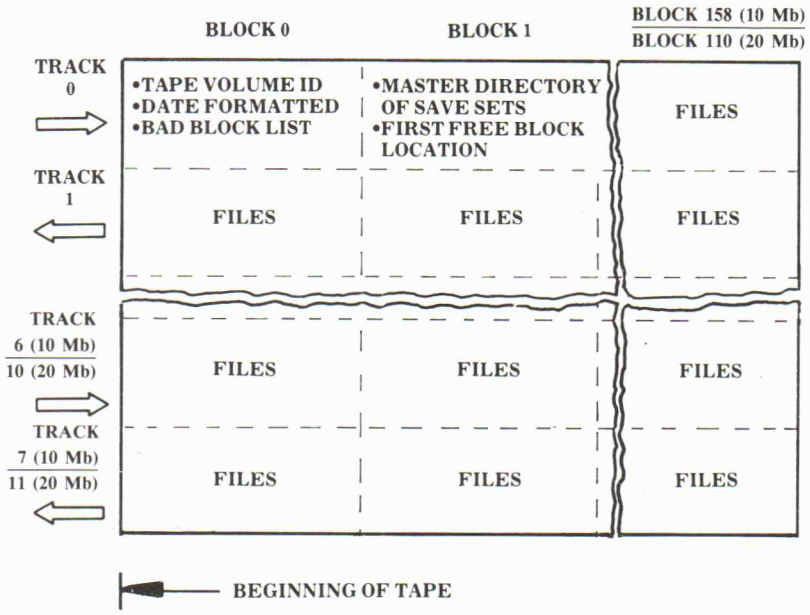

Fig. A-1 How the Tape Data is Arranged

The verify feature is turned off by default because the drives have Irwin's automatic error correction (ECC) feature. With ECC, every block of data has an additional capacity for redundant information, called ECC. These redundant bytes are appended to every data block. The user can decide whether or not to verify as an additional safety mechanism. Bear in mind, however, this doubles the backup time. The default is verify off.

Restoring Data

A restore operation consists of reading the data from the tape. If a portion of the tape is unreadable, the tape stops and the block is reread several times, if necessary, to obtain the data. As the tape has ECC, the damaged blocks are reconstructed based on the redundant data. It is assumed that the MS-DOS utility, CHKDSK, has been run prior to the restore operation.

Two Ways to Back Up the Disk

Either of two operations may be used to back up disk files: Image backup, in which the entire disk is recorded on tape in a single pass, and file-oriented backup (FIP), in which individual files are grouped in save sets and recorded on tape. Both techniques use a streaming mode of operation to the greatest extent possible.

In Image backup, all the parts of the hard disk known to MS-DOS are transferred to tape, except for empty sectors. Individual files cannot be subsequently restored. It's all or nothing.

In file-oriented backup, directories are written on the tape that allow you to identify the save sets and the individual files contained in them. If you wish, you can back up all files by directory and maintain your directory structure. Hidden system files will not be backed up.

B. USING BATCH FILES FOR BACKUP OPERATIONS

ABOUT THIS CHAPTER

This Appendix shows you an example of an MS-DOS batch file, which enables you to automate the backup procedure. You can write your own script files which follow your backup procedure.

CONTENTS

INTRODUCTION

Batch programs enable even inexperienced users to back up and restore files easily and reliably. Batch files eliminate the need for knowledge of the program functions and reduce the operations to simple one-word commands entered directly from MS-DOS.

See your MS-DOS manual for more information about batch programming.

To illustrate, a simple example is shown below.

BATCH FILE EXAMPLE

To execute this program, at the MS-DOS prompt the operator simply enters:

SAVEIT

The program then erases the existing data on the tape and saves all of the files with a .DAT extension in the PAYROLL directory. The batch program uses two files: one to call FIP (SAVEIT.BAT) and the other to provide the responses to FIP that are ordinarily entered using the keyboard (SAVEIT.RSP). The SAVEIT.BAT file may be in the current directory or any directory specified in the DOS path. The SAVEIT.RSP file may be in any directory, as long as the complete path is specified as shown below.

File: SAVEIT.BAT

Command	Comments
SAVEIT<SAVEIT.RSP	Redirects MS-DOS standard input. Refer to your MS-DOS manual for details.

File: SAVEIT.RSP

Command	Comments
10	Menu selection -- "ERASE"/RESET tape
4	Menu selection -- back up selected files
Y	Confirms selection
*.DAT	Selects all files with .DAT extension
\PAYROLL	Selects the PAYROLL directory
Data_Files	Names the save set "Data_Files"
12	Menu selection -- exit FIP program

The first two lines of the SAVEIT.RSP file permit using the same save set name each time the backup is performed, erasing the previous save set on the tape.

See your MS-DOS Manual for more information about batch programming and redirection of standard input. Note that you will have to reset your computer upon completion of the operation to regain use of the keyboard.

INDEX

V

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