M O L E C U L A R   C O M P U T E R

T A P E   B A C K U P

U S E R S   G U I D E

MOLECULAR COMPUTER
251 River Oaks Pkwy
San Jose, CA 95134

(408) 262-2122

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CHAPTER 1

OVERVIEW OF TAPE BACKUP

The Tape Backup Utility provides Molecular systems with the capability of performing either off-line or on-line backing up of data that resides on the system hard disk(s) to a 1/4-inch cartridge streaming tape drive. In addition, either file-by-file or streaming backup can be performed.

All Molecular Supermicro Series and Supermicro X computers can be operated in either the on-line or the off-line mode to perform tape backup and restore operations. The Molecular Series 9 computer can be operated in <u>only</u> the on-line mode for tape backup/restore operations.

For on-line tape backup/restore operations, and for streaming mode backup/restore operations, a Tape Application Processor (T.AP) is required in your system.

The purpose of this manual is to provide you with the information you will need to perform tape backup operations on your Molecular system using the LTAPE and STREAM programs on the Tape Utility Diskette.

----NOTE----

In order to perform the tape backup
operations described in this manual,
the operator must have the SYSTEM
Volume of n/STAR assigned somewhere
in their User Profile. Since the
SYSTEM Volume usually is assigned
only to the person designated as the
System Administrator, this manual is
intended primarily for use by the
System Administrator. Assigning the
SYSTEM Volume to the User Profile of
a user other than the System Admin-
istrator can jeopardize security of
the entire system and discretion is
advised in doing so.

1.1 GENERAL INFORMATION

The Supermicro Series and the Supermicro X Series computers use Archive 8-inch tape backup units. The Series 9 and Series 36 computers use Wangtek 5 1/4-inch tape backup units. All of these units will perform either off-line or on-line tape backup. However, to perform on-line tape backup requires the use of a Tape Application Processor (T.AP) board which operates in conjunction with the tape backup unit. In addition, two tape backup programs are available: the LTAPE program and the STREAM program. Information on these products and features is provided below.

----NOTE----

> The Tape Application Processor (T.AP) must be used with n/STAR Version 2.62 or later.

1.1.1 Tape Backup Unit Types.

Supermicro Series and Supermicro X Series computers employ horizontally-mounted Archive Sidewinder 1/4-inch cartridge streaming tape drives, as follows:

Molecular Model No.	Description
SM 20-T	Archive 3020I (old) or Archive 3020L (new) 30 ips, 20MB, 8-inch
SM 45-TU	Archive 9045L upgrades SM 20-T 90 ips, 45MB, 8-inch

For installation instructions for these units in Supermicro Series and Supermicro X Series computers, refer to the Tape Backup Unit Installation Instruction as referenced in Paragraph 1.3.

Series 9 computers employ the Wangtek Series 5000 1/4-inch cartridge streaming tape drive, as follows:

Molecular Model No.	Description
MC 45-T	Wangtek Series 5000 90 ips, 45MB, 5 1/4-inch

The Wangtek unit is mounted vertically in the Series 9 computer. Installation instructions for this unit can be found in the Series 9 Installation Manual as referenced in Paragraph 1.3.

1.1.2 Tape Application Processor (T.AP).

For on-line and streaming tape backup operations, the tape backup unit must be used in conjunction with a Tape Application Processor (T.AP/8015 or T.AP/8020). T.AP installation instruction for a Supermicro Series or a Supermicro X Series computer can be found in the T.AP Installation Instructions manual as referenced in Paragraph 1.3. Installation instructions for the T.AP can be found in the Series 9 Installation Manual as referenced in Paragraph 1.3.

1.1.3 Tape Utility Diskettes.

Two backup tape programs are available: (1) the LTAPE program which is used for file-to-file backup (either off-line or on-line), and (2) the STREAM program which is used for streaming backup.

The LTAPE and the STREAM programs are available on either an 8-inch or a 5 1/4-inch diskette. Both programs are included on the same Tape Utility Diskette as follows:

Diskette	Part Number
5 1/4-inch Tape Utility Diskette Double-Sided/Double-Density Use Volume name: FLOPPY9S	88002391
8-inch Tape Utility Diskette Single-Sided/Single/Density Use Volume name: FLOPPY	88002451

----NOTE----

As received from the factory, the Tape
Utility Diskette is not bootable and
must be make bootable using the SYSGEN
program as specified in your Installa-
Manual or User's Guide.

1.2 TAPE BACKUP PERFORMANCE

Performance measurements of the various tape backup options
available, as discussed in this manual, indicate the following
factors:

LTAPE performance depends upon the characteristics of the
files being processed. Backing up many small files
takes longer than backing up fewer files with the same
total capacity. The limiting factor is File Processor
throughput, not tape speed.

LTAPE in off-line mode performance is about 300 Kbyte/minute.

LTAPE used in on-line mode will be approximately 20% faster
than in off-line mode - about 360 Kbyte/minute.

LTAPE used with OLTSERVE will be approximately 45% faster
than in off- line mode - about 500 Kbyte/minute.

Archive Bit (ARC), when used to select only modified files,
in most cases will significantly reduce the amount of
data being written during backup and therefore will
significantly reduce the time needed to perform backup.

STREAM will operate at streaming speeds with underruns, which
means on 30 ips drives it will backup at approximately 1
Mbybe/minute; on 90 ips drives it will backup at approx-
imately 3 Mbyte/minute.

1.3 REFERENCE DOCUMENTS

Document	Molecular Document Number
Series 9 Installation Manual......................	87100630
On-Line Tape Processor (T.AP) Installation Instructions and User Reference Manual........	87100540
n/STAR System Administrator's Guide..............	87100670
MICRO 45-TU Tape Backup Unit Installation........ Instructions	87100740
MICRO 20-T Tape Backup Unit Installation .... Instructions	87100730-11
Molecular Modular Interconnect (MMI) User's Guide and Installation Instructions..........	87100580

CHAPTER 2

TAPE BACKUP TUTORIAL

This chapter discusses reasons for tape backup (Paragraph 2.1), the types of backup programs available (Paragraph 2.2), considerations to take into account when performing backup (Paragraph 2.3), and backup and restore procedures (Paragraph 2.4).

2.1 REASONS FOR TAPE BACKUP

Tape backup is the operation by which the data on the hard disk(s) is copied onto magnetic tape cartridge(s). Tape restore is the operation by which the data on the cartridges is restored onto the hard disk. Some of the reasons you may want to backup and restore data on a Molecular computer system are as follows:

2.1.1 Failure Protection.

One of the principle reasons for tape backup is failure protection. Failure protection means to guard against:

1. disk failure (either the magnetic media or the drive mechanism).

2. loss of data resulting from software failure (either the operating system or application programs).

3. user errors such as entering incorrect data or erasing the wrong data.

4. administrative errors, such as a system which is not set up or maintained properly, resulting in loss of data.

2.1.2 Space Management.

Another inportant reason for tape backup is for space management. For space management in your system, you can use tape backup to:

1. make archive copies of data, making space available for other data.

2. make "snapshots" of the disk, so that you can have an image of the disk in a certain condition for either historical or troubleshooting purposes.

3. create a baseline from which to work if a revised application or operating system fails, requiring you to return to the older version.

4. effect disk restructuring -- relocating files, volumes, or partitions to other physical locations on the hard disk.

2.1.3 Transportability.

Transportability of data files is necessary if you need to:

1. distribute software.

2. move data into either new hardware or software.

3. move data onto a new system.

2.1.4 Privacy and Security.

For privacy and security, tape backup permits you to:

1. remove personal data from a system when not in use.

2. provide limited access to files when not in use.

2.1.5 Journaling and Transaction Logging.

For journaling and transaction logging, tape backup provides you with a method of keeping permanent records of system use.

2.2 TAPE BACKUP PROGRAMS

There are two tape backup programs that can be used with the tape backup option. One is LTAPE, which is a comprehensive utility for performing backup and restore operations down to the file level, if desired. In addition, it allows you to verify the data on the tape and to display and print tape directories. LTAPE performs data integrity checks by writing a short segment, re-winding, reading the data, and comparing the two. The other program is STREAM, which performs streaming backup. In stream-ing, the tape is kept moving as long as there is data to be written. Both programs support multiple-cartridge backup/restore.

Streaming is much faster than the file-by-file operation performed by LTAPE. On the other hand, the backup and restore operations are performed on entire disk images which means you can only backup or restore one entire hard disk at a time and not specify individual files, Volumes, or partitions to be backed up.

2.2.1 The LTAPE Program.

The LTAPE program performs file-oriented backup. This means that the LTAPE program provides you with a means to back up selected files (Volumes) or ranges of files. LTAPE contains a tape backup option menu that provides you with 6 options for tape backup operation: (1) backing up disk files to tape; (2) restoring disk files from tape; (3) verifying tape; (4) listing tape directory; (5) re-tensioning tape; and (6) quitting the LTAPE program.

There are two methods of backup supported by the LTAPE program: (1) off-line backup, and (2) on-line backup. For on-line backup operations, your system must use the T.AP board.

With the off-line backup method, the tape drive is controlled by the File Processor and operation must be performed in the Diag-nostic Mode. This method is called off-line because all users must be logged off before you can operate in Diagnostic Mode.

With the on-line backup method, the tape drive is controlled by circuitry on a Tape Application Processor (T.AP) board. Since the T.AP controls operation and data transfers, operation is performed in Multiuser Mode; hence the name on-line backup.

During on-line backup operations, the LTAPE program locks each file while backing it up. No user can access a file while it is being backed up. The file locking scheme also means that if a system user is accessing a file that is to be backed up, backup will not occur since the file is already open. The backup operator's screen will indicate which file has not been backed up at the time that the LTAPE program attempts to access that file. At the end of the backup operation, the screen will summarize the number of files that have not been backed up.

Since the LTAPE program performs file-oriented backup, to run this program requires that the backup operator make decisions as to which files (or Volumes) they wish to backup. The LTAPE program will ask the operator to select specific backup functions depending upon how they want their files to be backed up. These functions include the following:

1. Volume Locking Backup.

2. Setting the Archive Bit (ARC).

3. Change-Only Backup.

These backup functions are explained below.

Volume Locking Backup. During on-line tape backup operations with the LTAPE program, a volume locking scheme can be used. During volume locking, the LTAPE program places a Write-Password on each volume to be backed up. Users attempting to access these volumes will be allowed to open a file for Read-Only functions, but will receive an error message if a write operation is attempted. This covers all files in the volume, not just the file currently in use by the LTAPE program. Upon completion of the backup operation, the LTAPE program will return all write passwords to their original values.

At the beginning of a Volume Locking Backup, the LTAPE program RENAME's the VOLUMES.SYS file on the MAINT volume (DRV:=A, USR:=15) to BACKUP.SYS, produces a copy of BACKUP.SYS to a new VOLUMES.SYS, and sets the Write-Password (WPW:=) of each volume to be backed up to BACKUP (WPW:=BACKUP). Upon normal termination of the program, the new VOLUMES.SYS is ERAsed, and BACKUP.SYS is RENAMEd to VOLUMES.SYS, restoring the original write-passwords. In the event of abnormal program termination,

the original VOLUMES.SYS will not be restored, and use of Diagnostic Mode to access the MAINT volume would be necessary. After entering the 'B' drive (B:) and 'USER 15', all that would be necessary is to ERAse VOLUMES.SYS, and RENAME BACKUP.SYS to VOLUMES.SYS, thereby restoring the correct values.

During operation of the LTAPE program, a prompt will ask you if you want to do Volume Locking backup. If you answer NO to this question, you will be asked to enter the DRV and USR letter/number designation (see Volume ID Chart and/or Volume Profiles of relevant Volumes) of each file (Volume) you want backed up. However, if you answer YES, the volume locking function will be operative. In this case, you can designate Volumes to be backed up simply by entering the desired Volume names.

Changed-Only Backup. Performing change-only backup is a function that works in conjuction with the setting of the Archive Bit. Change-only backup means that you wish to backup only those files that have been modified (a Write operation has been performed in the file) since the last time you performed a tape backup.

During operation of the LTAPE program, a screen prompt will ask you if you wish to perform change-only backup. If you select the change-only backup function, only those files will be backed up that have their Archive Bit cleared (not set).

Setting the Archive Bit (ARC). Setting of the Archive Bit is a function of doing changed-only backup. If you elect to do changed-only backup, only those files that do not have their ARC bit set will be backed up.

During operation of the LTAPE program, a prompt will ask you if you want the Archive Bit set. If you answer YES to this question, the ARC bit will be set for each file you have specified to be backed up. Once these files have been backed up, the ARC bit will be cleared for any file the first time that a user modifies that file (performs a Write function). When the ARC bit is cleared, the file will be flagged for another backup operation. Therefore, if you specify changed-only backup the next time you use the LTAPE program for tape backup, only those files that have been written to since the last backup will be backed up this time.

2.2.2 The STREAM Program.

The STREAM program is much simpler in operation and supports only one type of backup mode: entire disk image. This program requires the use of a Tape Application Processor (T.AP).

When using the STREAM program, you simply specify whether you want to backup or restore data, and which physical hard disk drive you want to backup or restore.

The STREAM program runs in a quasi-online mode. That is, the the system is operated in the Multi-User Mode for tape backup operations and in the Diagnostic Mode for disk restore operations. However, the T.AP must be used for both operations.

2.3 BACKUP CONSIDERATIONS

If you are responsible for the integrity of data on your system, you should consider the following before deciding upon how often or how much data to back up:

1. The importance of certain data files.

2. The type of user environment.

3. Integrity of application software and operating system (problems in either can cause loss of data).

4. Time available for backup (which may be downtime to system users, depending upon backup method and type of application being used).

5. Time available for recovery (of course, if data is lost, there will be time for recovery, since this will take much less time than recovering lost data).

Whenever a backup plan is implemented, tradeoffs such as the following will have to be made:

1. The amount of time required to perform routine backups may offset the "odds" of data being lost. The frequency of backup is an individual decision which will be affected, among other things, by previous experience and confidence in systems and users.

2. A file-by-file backup requires traversing the operating system logical structure to gather data. In a complex operating system such as n/STAR, this means a large amount of disk seeking (which translates into slow backups).

3. An image backup requires an equal amount of image space to restore, and may not be suitable for transferring data from one system to another for this reason.

4. Hostile user environments require more frequent and more complete backups. (You should consider protecting important data by passwords and by isolating potentially dangerous commands - refer to the Installation Manual for your system for more information.)

5. Highly volatile or critical data files may require almost continuous backups and recoveries.

6. Disks often contain many static data and program files which do not require frequent backups (although in this case you must be sure to keep a backup copy containing some version of all data files).

7. The rate of data change is typically quite constant within a particular user environment and will affect your decisions on the acceptable type and frequency of backup.

2.4 BACKUP AND RESTORE PROCEDURES

When backing up and restoring data, the procedures to use depend upon the method and mode used to back up the data in the first place. This section explains how to restore data depending upon the method used to back up the data. Three methods are covered: (1) full backup done on a daily basis; (2) full backup done on a weekly basis and daily backup only of files that have been modified; and (3) full backup done on a weekly basis and daily backup of different ranges of files.

2.4.1 Full Backup Daily.

If you perform a full backup on a daily basis, and if data is lost, restore the data to the hard disk by restoring the last full daily backup.

2.4.2 Full Backup Weekly/Modified Files Daily.

If you perform a full backup once per week, and backup only modified files every day, restore the data to the hard disk as follows:

1. Restore the last full backup.

2. Restore each daily modified backup, beginning with the first one following the last full backup, until you have restored all daily backup available.

2.4.3 Full Backup Weekly/Incremental Ranges Daily.

If you perform a full backup once per week, and then backup a different range of files, volumes, or partitions on a daily basis, restore data to the hard disk as follows:

1. Restore the last full backup.

2. Restore the incremental range with the latest backup copy available for each range

CHAPTER 3

SELECTING AND USING TAPE CARTRIDGES

This chapter describes how to select tape cartridges (Paragraph 3.1), how to care for tape cartridges (Paragraph 3.2), how to set the Write Protect switch (Paragraph 3.3), and how to insert and remove the tape cartridge (Paragraph 3.4).

3.1 SELECTING TAPE CARTRIDGES

The Tape Backup System requires special tape cartridges. Use only the following cartridges:

1. Wangtek qualified streaming tape cartridge.
2. Archive qualified streaming tape cartridge.
3. Cipher qualified streaming tape cartridge.
4. 3M (Scotch) DC-300XLP cartridge.
5. DEI qualified (10,000 fci) streaming tape cartridge.

With all the cartridges, ensure that:

1. No stickers or foreign matter is attached to the bottom of any cartridge.

2. The aluminum base is not damaged by dropping, etc.

3. Check cartridge movement while inserting the tape. If cartridge is out of dimensional specifications do not force cartridge into place. Replace the cartridge.

These cartridges will provide 20 megabytes of data storage on the SM 20-T tape drives, and 45 megabytes of data storage on the SM 45-TU and MC 45-T tape drives. In streaming mode (if supported on your system) it will hold approximately 20 megabytes.

Use of nonqualified or nontested tape cartridges may work during initial usage, but will not necessarily ensure data reliability

throughout the cartridge life.

Select tape cartridges with care -- recreating lost data can be expensive and time-consuming.

3.2 CARING FOR TAPE CARTRIDGES

Tape cartridges should be handled with care. When not in use, all cartridges should be kept in their protective cases and stored on edge in a safe place, away from extremes of heat and cold, magnetic fields, and potential contamination.

Before removing a tape cartridge from the tape backup unit, you should rewind the tape so that it is positioned at the beginning and ready to use again. In normal use, the LTAPE program does this for you. Never store a tape without first rewinding it to its beginning. Use the LTAPE Option (T) to re-tension (rewind).

You will not encounter problems with tape cartridges so long as they are operated within the environmental limits of the Molecular system.

If the storage environment is not the same as the operating environment, the cartridge should be conditioned prior to use by leaving it in the operating environment for a period of time equal to or greater than the time away from the operating environment, up to a maximum of eight hours. In addition, if the cartridge has been exposed to either temperature extreme since its last use, we recommend that it be retensioned using the LTAPE menu selection before using the cartridge for backup purposes.

In addition to these storage considerations, follow these guidelines for troublefree operation:

1. Avoid touching the actual recording media in any way.

2. Do not manually move the tape from one hub to the other.

3. Retension the tape if any of the following conditions apply:

   Previous use in a start/stop mode.

Prolonged storage time.
Storage at a temperature extreme.
Physical shock.
Excessive read/write errors.

4. Be sure the Molecular is turned on before you insert a
    tape cartridge in the drive slot. Likewise, only turn
    the system off after you have removed the tape cart-
    ridge.

5. Never remove a cartridge from the tape drive unit while
    the tape is moving. This will destroy information
    stored on the cartridge. Wait until the function is
    complete and the tape has stopped moving. (On Wangtek
    tape drives, wait until the indicator light stops blink-
    ing on and off and remains on steadily -- this means
    that the tape has stopped moving.)

Be aware that the tape cartridge, like all contact recording
media, has a useful life span and will wear out. Excessive
errors or abnormal noise may indicate a worn out cartridge or an
impending failure. Data on the suspect cartridge should be
duplicated as soon as possible and the cartridge should be taken
out of service and discarded.

3.3 WRITE PROTECT SWITCH

To protect your valuable data once you have recorded it onto a
tape, the cartridge has a Write Protect switch which, when set to
the SAFE position, will prevent writing on or erasing the tape.
Figure 3-1 shows the Prite Protect switch. Use a coin or screw-
driver to turn the switch on the tape cartridge so the arrow
points to the desired position.

(See Illustration on the next page)
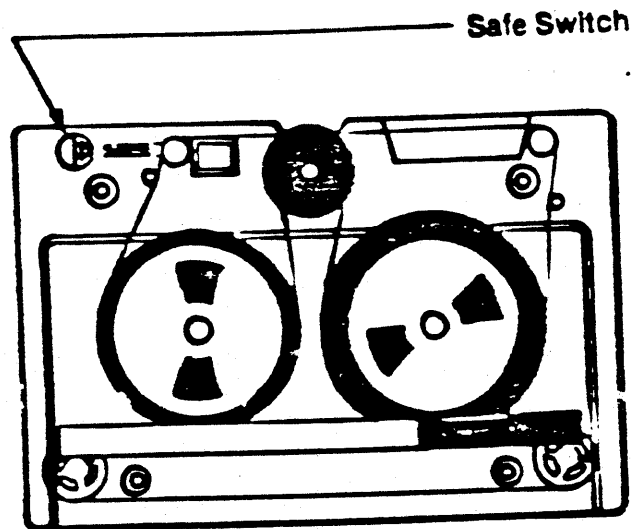
Figure 3-1. Tape Cartridge Write Protect Switch.

3.4 INSERTING AND REMOVING A TAPE CARTRIDGE

The procedure for inserting and removing a tape cartridge depends upon the type of tape backup unit used in your system.

3.4.1 Archive Tape Backup Units.

If your system employs an Archive tape backup unit, as described in Paragrah 1.1.1 of this manual, insert and remove the tape cartridge as follows:

Inserting Cartridge. Position the cartridge with the metal bottom plate down and the tape path pointing toward the tape drive, as shown in Figure 3-2. Slide the cartridge into the tape drive slot until you feel some resistance, then push it until it snaps into place.

Removing Cartridge. Make sure that the tape is not in motion. Grasp the tape cartridge firmly and pull straight out of the drive. Place the tape cartridge in its protective case and store safely.

3.4.2 Wangtek Tape Backup Units.

If your system employs a Wangtek tape backup unit, as described in Paragraph 1.1.1 of this manual, insert and remove the tape cartridge as follows:

Inserting Cartridge. Position the tape so that the metal bottom plate is facing left and the tape path is pointing upward, as shown in Figure 3-3. Slide the tape cartridge into the tape drive until you feel some resistance, then push it firmly all the way in. You will hear a click as the latch activates. Now, release the tape. It will begin to slide out and stop with about 1/2" of the cartridge protruding from the tape drive. This is the normal operating position.

Removing Cartridge. First make sure that the tape is not moving. Push the tape cartridge in firmly until you hear a click

(just as you did when inserting the cartridge). Then, release the cartridge. It will slide part way out, whereupon you can pull it out completely. Put the tape cartridge into its protective case and store it safely away.
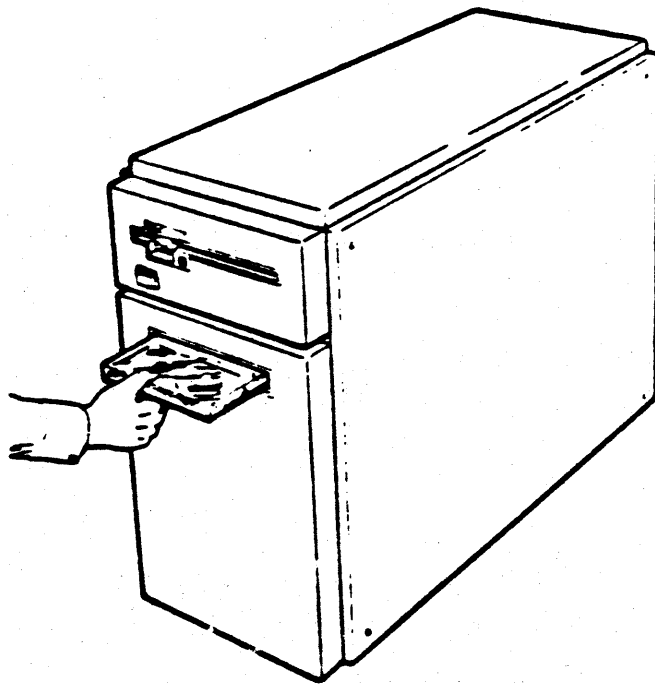
Figure 3-2. Inserting Tape Cartridge In An Archive
Tape Backup Unit.

CONFIGURING SYSTEM FOR OFF-LINE TAPE BACKUP OPERATION USING LTAPE

This chapter explains how to use the LTAPE program for performing tape backup in the off-line mode. This procedure is to be used with systems that do not have a Tape Application Processor (T.AP). (Program is not intended for Series 9 computers.) For off-line backup, the system must be operated in the Diagnostic Mode (Paragraph 5.1), the disk configuration must be checked (Paragraph 5.2), and then the LTAPE program is run by making selections from the Tape Backup Option Menu (Paragraph 5-3).

5.1 DIAGNOSTIC MODE

To use the LTAPE program in the off-line mode, all users must log off and the system must be configured for Diagnostic Mode, using a Diagnostic Mode Cable between the File Processor terminal I/O port and the system terminal, as shown in Figure 5-1.

<div align="center">

—————CAUTION—————

Diagnostic Mode setup and operation
is only to be performed by the System
Administrator or other qualified per-
sonnel.

</div>

To bring up the system in Diagnostic Mode, proceed as follows:

1.   Configure system for Diagnostic Mode operations by connecting a Diagnostic Mode cable between the File Processor and the terminal you are using as shown in Figure 5-1.

2.   Insert a bootable Tape Utility Diskette (refer to Paragraph 1.1.3) in the diskette drive.

3.   Press the <BREAK> key on the terminal connected to the

RIBBON CABLE

REAR PANEL

A—PORT (TERM)

DIAGNOSTIC MODE CABLE

P1

B—PORT (PRINT)

FILE PROCESSOR

P8

TERMINAL RS232 CONNECTOR

SYSTEM TERMINAL

DIAGNOSTIC MODE TERMINAL CONNECTION

RIBBON CABLE

m/BUS

APPLICATION PROCESSOR

A—PORT (J3)

SYSTEM CABLE

B—PORT (J4)

TERMINAL RS232 CONNECTOR

SYSTEM TERMINAL

MULTI—USER MODE TERMINAL CONNECTION
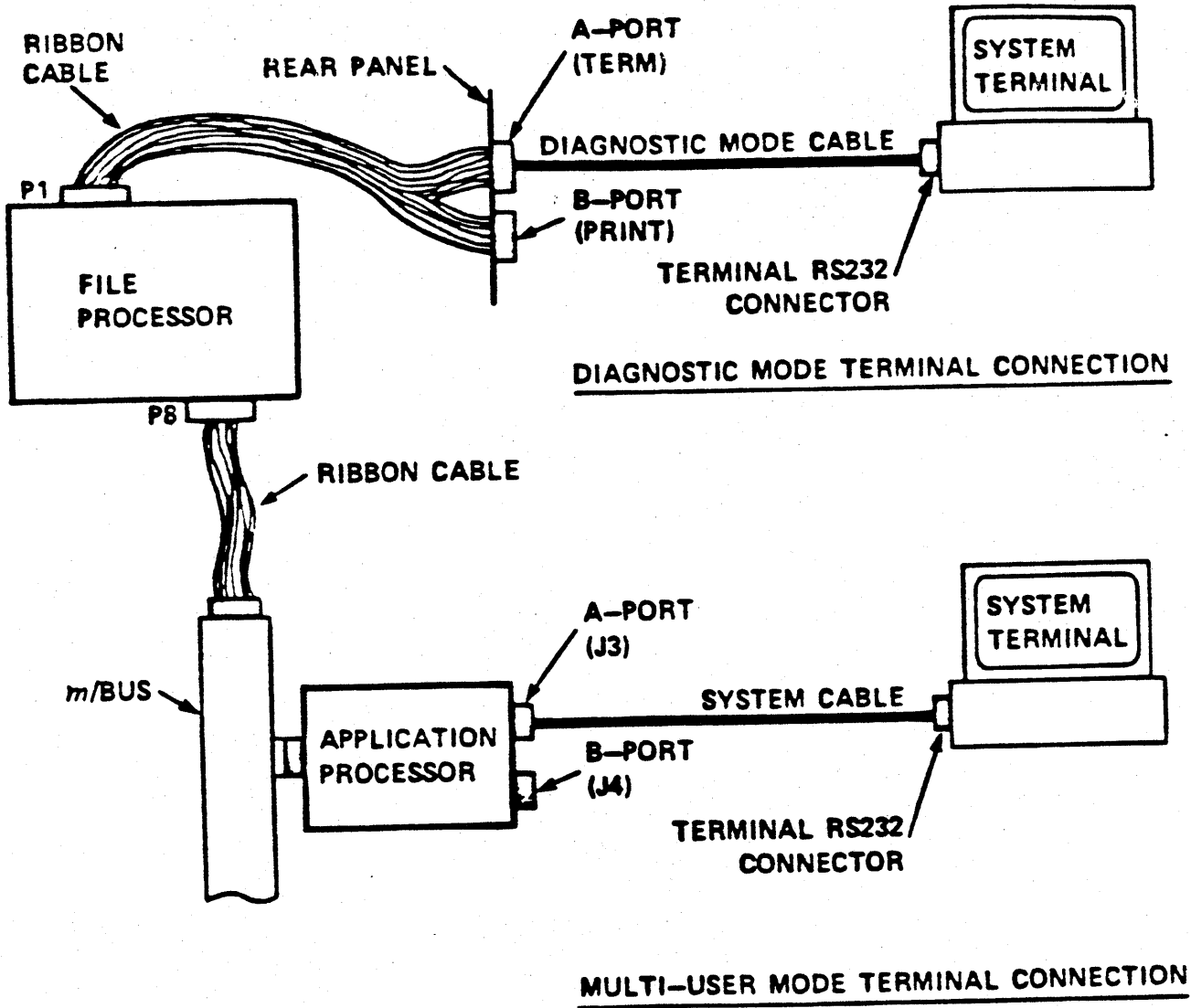
Figure 5-1. Diagnostic Mode Cable Configuration.

File Processor. After a few moments, you will hear the
diskette drive loading data from the diskette and its
light will blink on and off. After a few more moments,
the following information displays:

```
|Molecular*xx nnMB Diagnostic Diskette
|
|56K CP/M V3.0
|A>
|
~
```

You are now operating the computer in Diagnostic Mode;
no other terminals can access the system until you
return it to Multi-User Mode operation. Note that you
are operating the system with CP/M (Version 3.0). This
allows you to backup and restore files and partitions
greater than 8 megabytes. This operating system can be
used on any Molecular Computer system setup for Off-Line
Tape Backup and Restore, and is the ONLY operating
system acceptable by Molecular Computer for Off-Line
Tape Operations.

4.   If this is the _first time_ that you are running the LTAPE
      program, you must now check the disk configuration as
      described in Paragraph 5.2. However, if you have pre-
      viously checked the disk configuration, proceed to
      Paragraph 5.3 for off-line backup.

5.2 DISK CONFIGURATION CHECK

To operate the LTAPE program, a file on the Tape Utility Diskette
called TAPEDISK.DAT must contain the partitions on the hard disk
to be backed up. Before beginning the backup procedure, check
that this file contains the partition letters that correspond to
your system configuration.   The check the disk configuration,
follow the procedure in Paragraph 4.3 _the first time_ you attempt
off-line tape backup.

—————CAUTION—————

> You must use the SELDRIVE Utility
> (refer to Appendix A) if you are do-
> ing tape backup using the LTAPE pro-
> gram under the following three con-
> ditions:
>
> 1. You are doing off-line backup.
>
> 2. Your system has multiple hard
>   disks (D1 or D1/D2 add-on drives).
>
> 3. Your system is a Supermicro 35-32,
>   a 70-32, a 60-32, or a 30-16.

Remember that when you run your computer in Diagnostic Mode, the A partition of the hard disk becomes the B partition because the diskette becomes the A: drive. This means that Volumes which reside on the A partition of your hard disk in Multi-user Mode will be located on the B partition while you are operating in Diagnostic Mode. This is important - keep it in mind when you are using the LTAPE program. (To backup or restore the Multi-User A partition, you must specify the B partition.) In our example above, the partitions under Multi-User Mode have the following correspondence:

```
Diagnostic Mode Partitions:  B   C   D   E   F   G   J   K
                             |   |   |   |   |   |   |   |
                             |   |   |   |   |   |   |   |
Multi-User Mode Partitions:  A   B   C   D   E   F   I   J
```

(Remember that in Multi-User Mode, the G, H, O, and P partitions are reserved for diskette operation — their corresponding Diagnostic Mode partitions [H, I, P, and Q] have no purpose when operating in Diagnostic Mode.)

5.3 USING LTAPE TAPE BACKUP OPTION FOR OFF-LINE BACKUP

With the system in Diagnostic Mode, the LTAPE Utility Diskette in
the diskette drive, and the A> prompt on your screen, enter:

        A>LTAPE <RETURN>

The screen displays the Tape Backup Menu:

```
|                        Molecular Tape Backup Utility
|
|                        Ver n.nn              mm/dd/yy
|
|
|
|                        B = Back up disk files to tape
|                        R = Restore disk files from tape
|                        V = Verify tape
|                        D = List tape directory
|                        T = Re-tension tape
|                        Q = Quit
|
|                        Select option  ( )
|
|
```

Proceed to Chapter 6 for instructions on running the LTAPE
program using the Tape Backup Option Menu.

CHAPTER 6

TAPE BACKUP OPERATION USING THE LTAPE PROGRAM

All operations performed with the LTAPE Tape Backup program are the same whether you are using on-line tape backup or off-line tape backup. The information in this chapter applies to both methods. It does not apply, however, to Streaming Mode, which is covered separately in Chapter 7.

----NOTE----

> The following instructions discuss hard
> disk partitions in general terms.   You
> must remember that with offline tape
> backup (with the system in Diagnostic
> Mode), you must specify the B parti-
> tion to backup the [Multi-User Mode] A
> partition, the C partition to back up
> the B partition, and so forth.

6.1 LTAPE OPTION MENU

To perform tape backup operations with LTAPE, first make sure that the T.AP is configured properly if you are doing on-line backup (Paragraphs 4.1.1 and 4.1.2). Then make sure that the LTAPE program is loaded onto the hard disk (Paragraph 4.2) and that the TAPEDISK.DAT file is correctly configured (Paragraph 4.3). Then, if you are using TLINK, follow the procedure in Paragraph 4.4; if you are using OLTSERVE, follow the procedure in Paragraph 4.5.

To perform tape backup operations with LTAPE, you must select options from the Tape Backup Option Menu. To evoke this menu, proceed as follows:

1.   Insert a tape cartridge. Make sure cartridge SAFE switch
     is in SAFE position (refer to Paragraph 3.3).

2.   Enter: **A>LTAPE <RETURN>**
     The screen displays the Tape Backup Menu:

```
|————————————————————————————————————————————————
|                      Molecular Tape Backup Utility
|
|              Ver n.nn              mm/dd/yy
|
|
|
|              B = Back up disk files to tape
|              R = Restore disk files from tape
|              V = Verify tape
|              D = List tape directory
|              T = Re-tension tape
|              Q = Quit
|
|              Select option  ( )
|
|
|
```

3.   From the Tape Backup Option Menu, you can select the
     backup operation you wish to perform.

     It is recommended that you start by re-tensioning the
     tape, as follows:

     (This step and the next step can be skipped if LTAPE
     Version 1.22 or higher is used. The program performs an
     automatic re-tension for each backup and restore.)

4.   Enter: **T** to select re-tensioning option.

     Wait for re-tensioning process to complete (approximat-
     ely 2 1/2 minutes).

6.2 BACKUP DISK FILES TO TAPE (OPTION "B")

To backup disk files to tape using the LTAPE program, proceed as
follows:

1.   Evoke the LTAPE Backup Option Menu as described in
     Paragraph 6-1.

2.   Enter: **B** Do not press <RETURN>. The screen displays:

~

|
|Enter today's date (MM/DD/YY): (/ /)
|
~

3. Enter the date in the format shown.

Do not press <RETUR.>. Note that the cursor automatic-
ally skips over the "/" as you enter just the numbers
for the date. The screen then displays:
~

|
|Today is mm/dd/yy, correct (Y/N)? ( )
|
~

4. If you entered the correct date, now enter: **Y**

........to continue. If you are in Diagnostic Mode and
have booted the system under CP/M 2.2 Operating System,
the screen displays:
~

|
|WARNING: Offline LTAPE Operations is supported under
| CP\M Plus Only!!!
|
~

The program then returns the user to the 'A>' system
prompt. If this occurs, the user should re-boot into
Diagnostic Mode using CP/M Plus (CP/M 3.0), and
restart the LTAPE Program.

If you are in Multi-User Mode, the screen displays:
~

|
|Do you want to do volume locking backup (Y/N)? ( )
|
~

----NOTE----

If you are operating in Diagnostic
Mode, you will not be asked the
above question. Instead, you will
be asked the "changed-only" question
in Step 5, below.

If you are in Diagnostic Mode, skip to the "changed-only
backup" question in Step 5, below.

5. Enter: Y if you want to perform Volume locking backup.

----NOTE----

Refer to Paragraph 2.2.1 for Volume
locking information.

The screen displays:

Volume name(s):

You are asked to enter the names of n/STAR Volumes to
back up. Press <RETURN> after each Volume name you
enter, and press <RETURN> without making an entry to
finish the entry cycle.

Enter N if you do not want to perform Volume locking
backup.

Either a Y or an N response causes the following message
to display:

|
|Enter FP address (e.g., FE) to be backed up:
|
7

If you are backing up a system having multiple File
Processors connected by the Molecular Modular Intercon-
nect (MMI), and you wish to back up hard disk(s) files
on the hard disk controlled by the MMI/2 File Processor,
you should enter the FP address (in hex) for that FP
and press <RETURN>. However, if your system is not
operating with MMI, or if it is operating with MMI

~~but you are backing up files on the hard disk controlled by the MMI/1 File Processor, just press <RETURN> and the default address of FF will be entered.~~

~~After entering your response, the screen displays:~~

```
|
|Do you want to do changed-only backup (Y/N)?   ( )
|
```

ALWAYS → *N*

6. This option lets you specify that you only want to back up files which do not have their ARC (archive) bit set. If the ARC bit was originally set (see Step 7 below), it is cleared whenever you modify the file. Therefore, by selecting this option, you can back up only those files which have been modified since your last backup.

----NOTE----

Refer to Paragraph 2.2.1 for information on changed-only backup.

If you want to use this option, press Y. If you do not want to use this option, press N. Either response causes the following message to display:

```
|
|Do you want to set the archive bit (Y/N)?   ( )
|
```

ALWAYS → *N*

7. If you answer Y to the "archive bit" question in Step 6, above, the ARC bit of each file backed up will be set. Thereafter, modifying the file will clear the ARC bit, flagging it for another backup operation. If the file is not modified, and you answer Y in Step 6, above, that file will not be backed up again until the ARC bit is cleared by modifying the file.

----NOTE----

For information on the Archive Bit
(ARC), refer to Paragraph 2.2.1.

If you answer N to this question, the ARC bit will not
be changed during the backup process.

If you answered Y to the "volume locking backup"
question in Step 4, skip to the "File names to be backed
up" question in Step 10. If you answered N to the Volume
Locking question, the screen displays:

```
|
|Do you want to back up all disk files (Y/N)?  ( )
|
```

8. If you answer Y, skipto the "Are all the above entries
    correct" question in Step 14 for further instructions.

    If you answer N, the screen displays instructions for
    answering questions concerning disk names or ranges,
    user numbers or ranges, and filenames to be backed up,
    as follows:

```
|
|Disk names or ranges (e.g. A or B-D):
|
```

9. At this point, you may enter a letter or a range to
    indicate which disk names you want backed up. Press
    <RETURN> between each letter or range entered, and press
    <RETURN> again when you are finished responding to this

question. Or, if you want all logical drives backed up,
press <RETURN> as your first entry. The screen then
displays:

```
~
|
|User numbers or ranges (e.g. 0 or 9-15):
|
~
```

10. Now you can enter the CP/M User Numbers you want to back
    up. The format for entry is the same as for the pre-
    vious question. Enter a number or a range of numbers,
    then press <RETURN> and enter another number or range.
    Use your Volume ID chart to identify the User Numbers at
    which the Volumes you want to back up are located.

    When you have entered all User Numbers desired, press
    <RETURN> again to continue. Or, if you want to back up
    all User Numbers, simply press <RETURN> as your first
    entry. The screen displays:

```
~
|
|Filenames to be backed up (* and ? allowed, e.g. *.COM, TEST.DA*, or XYZ.H??):
|
~
```

11. Enter either an ambiguous or unambiguous file name, then
    press <RETURN> and enter another. When you have entered
    all desired file names, press <RETURN> a second time to
    continue. Or, if you want to back up all files in the
    specified drives and User Numbers, simply press <RETURN>
    as your first entry.

----NOTE----

        An ambiguous file name is one which
        contains wildcards (? and/or *). An
        unambiguous file name is a specific
        file name.

The screen displays:

```
|
|Do you want to specify files to be excluded from the backup (Y/N)?
|
```

12, If you answer N, skip to step 14. However, if you answer Y, the screen displays:

```
|
|File names to be excluded (same format as above)
|
```

13. Now you may enter the names of files already specified that you actually do not want to back up. For example, if you specified that you wanted to backup files B:*.DOC, and you don't want to back up any files that start with G and have the DOC extension, you could enter:

    B:G*.DOC

    and only those files that have the extension DOC and do not begin with the letter G will be backed up. Press <RETURN> between each filename you specify, and press <RETURN> again when you have entered all filenames to be excluded. The screen then displays:

```
|
|Enter a description of this backup tape:
|
```

14. Enter a description of up to 79 characters; end it by
    pressing <RETURN>. The screen then displays:

    ```
    ~
    |
    |Are all the above entries correct (Y/N)?  ( )
    |
    ~
    ```

15. Enter Y or N. If you enter N, the backup program starts
    over and asks you all questions again. If you enter Y,
    the screen displays:

    ```
    Please insert backup tape to be written. Ready (Y/N)?  ( )
    ```

16. If you have not already done so, make sure the write
    protect switch on the data tape cartridge is <u>not</u> in the
    SAFE position (see Figure 3-1), and insert the tape
    cartridge into the tape drive slot on the front of the
    cabinet.

17. Enter: Y Do not press <RETURN>. The screen momentarily
    displays:

    ```
    ~
    |
    |Preparing tape  (retension)...
    |
    ~
    ```

    ......then proceeds with the backup operation. During
    backup, your terminal indicates backup progress as it
    displays:

    ```
    ~
    |
    |Reading: d:filename.ext [User n] nnn files written to tape
    |
    |n soft (recovered) tape errors
    |
    ~
    ```

    TAKE NOTE OF THIS NUMBER
    IF > 50 THEN TRY ANOTHER TAPE
    IF ALL TAPE > 50 CLEAN HEAD

where:

d	=	disk drive
filename	=	valid CP/M file name
ext	=	valid CP/M file name extension
n	=	number of User, number of files written
		to tape, onumber of soft errors

If you answer N to the above question, you will be re-
turned to the LTAPE option menu.

18. If the tape cartridge will not hold all the data from
the backup process, when the tape becomes full the
screen displays:

```
|
|Tape full, insert another tape for Volume n of this backup.Ready(Y/N)?
|
```

where n is the number of the tape cartridge in the
sequence. If this message displays, remove the tape
cartridge from the tape drive, and place another tape in
the drive.

Then enter: Y

Do not press <RETURN>. Again, the screen displays the
progress of the tape backup process. When all desig-
nated files have been backed up, the screen displays:

```
|
|nnn file(s) not backed up
|
|nnn soft (recovered) tape errors
|
|Backup completed.  Ready (Y/N)?  ( )
```

(Soft errors are non-fatal errors and are explained in
Paragraph 9.1)

----NOTE----

See Chapter 9 for information pertain-
ing to the allowable number of soft
(recoverable) tape errors.

18. Either a **Y** or **N** response returns you to the Tape Backup
Menu.

6.3 VERIFY TAPE (OPTION "V")

You should always verify a tape after doing a backup, to ensure
the integrity of the data. If the tape does not verify, you
should clean the tape head (refer to Chapter 8) and try again.
If the tape still does not verify, you should backup again on a
new tape.

To verify a tape, follow these steps:

1. Evoke the LTAPE Backup Option Menu as described in
Paragraph 6-1.

2. Enter:**V** Do not press <RETURN>. The screen displays:

```
|
|Please insert tape cartridge.  Ready (Y/N)? ()
|
```

3. Set the protect switch on the tape cartridge to the SAFE
position (refer to Paragraph 3.3), then insert the tape.

4. Enter **Y**. The screen displays:

```
|
|Verifying tape...
|
```

When the verification process completes, the screen
displays:

```
|
|Tape is verified.  Ready (Y/N)? ( )
|
```

5.   Enter either Y or N to return to the Tape Backup Menu.

6.4 LIST TAPE DIRECTORY (OPTION "D")

To display or print a directory of the files that are currently
on a backup tape, first make sure that the Tape Backup Menu is
displayed on your screen.

1.   Evoke the LTAPE Backup Option Menu as described in
     Paragraph 6-1.

2.   Enter: D Do not press <RETURN>. The screen displays:

```
|                    Molecular Tape Backup Utility
|                    Ver n.nn              mm/dd/yy
|
|                        *** Press the ESC key to cancel ***
|
|          C = list to console, P = list to printer, B = both  ( )
|
|Listingtape file directory
|
```

3. Enter a letter to indicate your choice. If you select a
   printer, output will go to the LST:= device specified in
   the ASSIGN program. After you make a selection, the
   screen displays:

```
|
|Please insert tape cartridge.  Ready (Y/N)?  ( )
|
```

4. Make sure the Write Protect switch on the data cartridge
    isin the SAFE position (refer to Paragraph 3.3), then
    place the tape into the tape drive.

5. Enter:Y Do not press <RETURN>. The screen momentarily
    displays:

    |
    |Preparing tape for directory listing...
    |

    then displays:

    |
    |Tape format 1
    |
    |Tape Backup Created mm/dd/yy(Volume n). Description is:
    |description of tape
    |
    |Continue (Y/N)? ( )
    |

    (Note: "Tape format 1" indicates that the tape was
    backed up using LTAPE. STREAM produces a message indi-
    cating tape format 2. You must use the same program for
    both backup and restore.)

6. Enter: Y or N. If you enter N, your terminal asks you to
    insert another tape. If you enter Y, your terminal
    displays a listing of all files on the tape.

7. You may enter either a Y or an N to return to the Tape
    Backup Menu.

6.5 RESTORE DISK FILES FROM TAPE (OPTION "R")

Use the following procedure if you need to restore a backed-up
file from the tape onto the hard disk. To begin, make sure the
tape backup menu is displayed on your terminal screen.

1. Evoke the LTAPE Backup Option Menu as described in
    Paragraph 6-1.

2. Enter: R Do not press <RETURN>. If you are in Diagnostic
    Mode and have booted the system under CP/M 2.2 Operating
    System, the screen displays:

    ```
    |
    |WARNING: Offline LTAPE Operations is supported under
    |         CP\M Plus Only!!!
    |
    |
    ```

    The program then returns the user to the 'A>' system
    prompt. If this occurs, the user should re-boot into
    Diagnostic Mode using CP/M Plus (CP/M 3.0), and
    restart the LTAPE Program.

    If you are in Multi-User Mode, the screen displays:

    ```
    |
    |Do you want to restore all files from tape (Y/N)?  ( )
    |
    ```

3. If you enter Y, skip to the "Do you want to redirect
    disk/user...." question in Step 9.

4. If you enter N, the screen displays:

    ```
    |Answer the following questions to specify the files to be restored.  Press
    |the RETURN key after each response.  To select more than one choice for a
    |question, press RETURN after each choice, and an extra RETURN to move on to
    |the next question.  To select "all" for a particular question, press RETURN
    |by itself as the first response.
    |
    |Disk names or ranges (e.g. A or B-D):
    |
    ```

5. At this point, you may enter a letter or a range to
    indicate which disk names you want restored.

Press <RETURN> between each letter or range entered, and
press <RETURN> again when you are finished responding to
this question. Or, if you want all logical drives
restored, press <RETURN> as your first entry. The
screen then displays:

```
|
|User numbers or ranges (e.g. 0 or 9-15):
|
```

6. Now you can enter the CP/M User Numbers you want to
    restore. The format for entry is the same as for the
    previous question. Enter a number or a range of num-
    bers, then press <RETURN> and enter another number or
    range. When you have entered all User Numbers desired,
    press <RETURN> again to continue. Or, if you want to
    restore all User Numbers, simply press <RETURN> as your
    first entry. The screen displays:

```
|
|File names to be restored (* and ? allowed, e.g. *.COM, TEST.DAT, or XYZ.H??): _
|
```

7. You respond to this question in the same manner as the
    previous two questions. That is, enter either an ambig-
    uous or unambiguous file name, then press <RETURN> and
    enter another. When you have entered all desired file
    names, press <RETURN> a second time to continue. Or, if
    you want to restore all files in the specified drives
    and User Numbers, simply press <RETURN> as your first
    entry. The screen displays:

```
|
|Do you want to specify files to be excluded from the restore (Y/N)?  (_)
|
```

8. If you answer **N**, skip to Step 11. However, if you answer **Y**, the screen displays:

```
|
|File names to be excluded (same format as above)
|
```

9. Now you may enter the names of files already specified that you actually do not want to restore. For example, if you specified that you wanted to restore files B:*.DOC, and you don't want to restore any file that start with G and have the DOC extension, you could enter:

```
|
|B:G???????.DOC
|
```

and <u>do not</u> begin with the letter G will be restored. Press <RETURN> between each file name you specify, and press <RETURN> again when you have entered all file names to be excluded. The screen then displays:

```
|
|Enter FP address (e.g., FE to be restored):
|
```

If you are backing up a system having multiple File Processors connected by the Molecular Modular Intercon- nect (MMI), and you wish to back up hard disk(s) files on the hard disk controlled by the MMI/2 File Proces- sor, you should enter the FP address (in hex) for that FP and press <RETURN>. (Refer to Paragraph 1.3 to reference the MMI User's Guide.) However, if your system is not operating with MMI, or if it is operating with MMI but you are backing up files on the hard disk controlled by the MMI/1 File Processor, just press <RETURN> and the default address of FF will be entered.

After you enter your response, the screen displays:

```
|
|Do you want to redirect disk/user (Y/N)? ( )
|
```

By entering Y to this question, you can change the direction of the backup,(e.g. if you backup from 0 you can restore to B5).

10. If you enter N, the screen displays:

```
|all files on tape will be restored.
|
|Are all the above entries correct?
|
```

Since this is the same question as in Step 11, below, skip to the "Are all the above entries correct..." question in step 11.

If you enter Y, the screen displays:

```
|
|Disk name (e.g. A):
|
```

Enter the name of the disk you to which you wish to redirect the restore operation. Press <RETURN> after your entry. The screen displays:

```
|
|User number (e.g. 0):
|
```

Enter the user number of the user to which you wish to redirect the restore operation. Press <RETURN> after your entry.

The options available to you in Step
10, above, only permit the entry of
one disk and one user number to
which you can redirect the files you
wish to restore.

11. The screen displays:

```
|
|Are all the above entries correct (Y/N)?  ( )
|
```

12. If you enter N, the restore program starts over by ask-
     ing the question "Do you want to restore all files....."
     in Step 2, above.

     If you enter Y,the screen displays:

```
|
|Please insert tape to restore files from.  Ready (Y/N)? ( )
|
```

13. If you have not already done so, make sure the write
     protect switch on the data tape cartridge is in the
     SAFE position (refer to Paragraph 3.3), and insert the
     tape cartridge into the tape drive slot on the front of
     the cabinet.

14. Enter: Y Do not press <RETURN>. The screen momentarily
     displays:

```
|
|Preparing tape (retension)...
|
```

......then:

```
|
|Tape format 1
|
|Tape backup created on mm/dd/yy (Volume n). Description is:
|description name
|
|OK (Y/N)?  ( )
|
```

15. If you enter **N**, the program returns to Step 11. Howe-
    ver, if you enter **Y**, the recovery process begins. As
    recovery proceeds, your terminal indicates its progress:

```
|
|Restoring to: d:filename.ext [User n] nnn files restored to disk
|
```

.........where:

d	=	disk drive
filename	=	valid CP/M file name
ext	=	valid CP/M file name extension
n	=	User number
nnn	=	number of files written to tape

16. If the tape cartridge reaches its logical end of tape
    before all files are restored, the screen displays:

```
|
|End of tape, please insert Volume n of the same backup.  Ready (Y/N)?  ( )
|
```

If this message displays, remove the tape cartridge from
the tape drive, and place the next tape in the sequence
into the drive.

After inserting the next cartridge, the screen displays:

```
|
|Tape format 1
|
|Tape backup created on mm/dd/yy (Volume n). Description is:
|description name
|
|OK (Y/N)?  ( )
|
```

......where n is the number of the tape cartridge in the sequence.

Enter: Y   Do not press <RETURN>. If you insert a cartridge out of sequence, the screen displays:

```
|
|Warning:  This is not the next volume of the same backup. OK (Y/N)?  ( )
|
```

Enter Y to proceed with the cartridge that is inserted. Enter N to tell the program that you are going to insert a different cartridge. Again, the screen displays the progress of the restore process. When all designated files have been restored, the screen displays:

```
|
|Restore completed.  Ready (Y/N)?  ( )
|
```

17. Either a Y or N response returns you to the Tape Backup Menu.

6.6 RE-TENSION TAPE (OPTION "T")

To re-tension the tape, proceed as follows:

1. Evoke the LTAPE Backup Option Menu as described in Paragraph 6-1.

2. Enter: **T** Do not press <RETURN>. The screen displays:

```
-
|
|Please insert tape cartridge. Ready (Y/N)?
|
-
```

If you enter **N**, the program returns you to the LTAPE option menu.

If you enter **Y**, the screen displays:

```
-
|
|Re-tensioning tape
|
-
```

......while the tape drive retensions the tape. This process takes approximately 2 1/2 minutes. When done, the screen displays:

```
-
|
|Tape is re-tensioned. Ready (Y/N)? ( )
|
-
```

3. Enter: **Y** or **N** to return to the Tape Backup Menu.

6.7 QUIT (OPTION "Q")

To quit the Tape Backup program and return to the n/STAR prompt, enter:

Q

If you used the on-line method of tape backup with the TLINK method, enter:

<CTRL>-]

(press and hold down the CONTROL key, then press the right bracket key (]), then release both keys.) When the TLINK menu displays, press <RETURN> to return to the n/STAR prompt of the AP to which your terminal is connected.

7.6 EXITING THE STREAMING TAPE PROGRAM

When you are finished with the STREAM tape program, press:

<CTRL>-C

The STREAM program now restarts n/STAR and allows users to log on.

----NOTE----

You should always use <CTRL>-C to exit from STREAM; otherwise, n/STAR will not come up and you will have to hit <BREAK>.

CHAPTER 8

TAPE BACKUP PREVENTATIVE MAINTENANCE

This chapter provides information on steps you should take on a regular basis to ensure continued trouble-free operation from your tape backup system.

Preventive maintenance consists of cleaning the read/write head assembly and tape hole sensor assembly at regular intervals. The recommended frequency of cleaning is after every eight hours of tape motion. In addition, you should clean the drive after the first pass of a new cartridge. (If only new cartridges are used, clean the unit every two hours.)

8.1 TAPE CARTRIDGE HANDLING

Tapes will not last forever. Keep enough tape cartridges on-hand to cover the possible failure of one or two cartridges. How long they will last depends apon the enviroment they are in, how they were treated, and how often the tape drive is cleaned. The handling of tapes is very similer to floppy diskettes. Do not keep in direct sunlight, near magnetic fields, or expose to large temperature extremes. Do not touch the tape with anything.

Do store the tapes in their plastic container, on edge, at a constant temperature. Do clean the tape drive head with a clean, lintless swab and an IBM (or equivalent) head cleaning solution. If unavailable, use isopropyl (not rubbing) alcohol. Be careful not to apply excessive cleaning solution to adjacent parts. Head cleaning should be done with the power off, and after every eight hours of tape motion, or after the initial pass of a new cartridge.

Tape cartridges are expensive, but the data they contain is more expensive. Use common sense in handling, and rotate the tapes used frequently. If errors start to occur, the tape cartridge should be suspected first.

8.2 ARCHIVE HEAD CLEANING PROCEDURE

To clean an Archive drive, refer to Figure below and clean the read/write head and tape hole sensor assembly using a clean, lintless swab and head cleaning solution. (If cleaning solution is not available, Isopropyl alcohol solution not rubbing alcohol may be used.)

TAPE HOLE SENSOR BLOCK   R/W HEAD ASSEMBLY

Figure 8-1. Cleaning an Archive Drive.
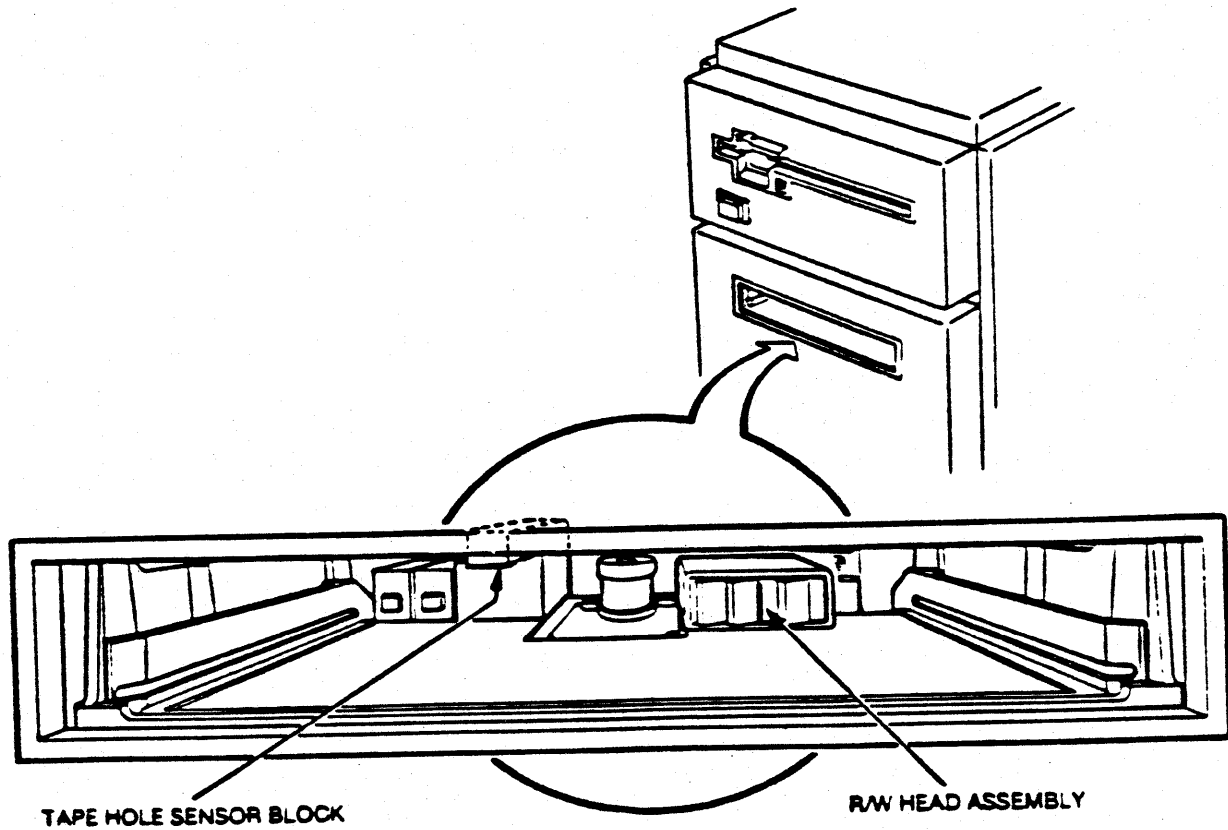
8.3 WANGTEK HEAD CLEANING PROCEDURE

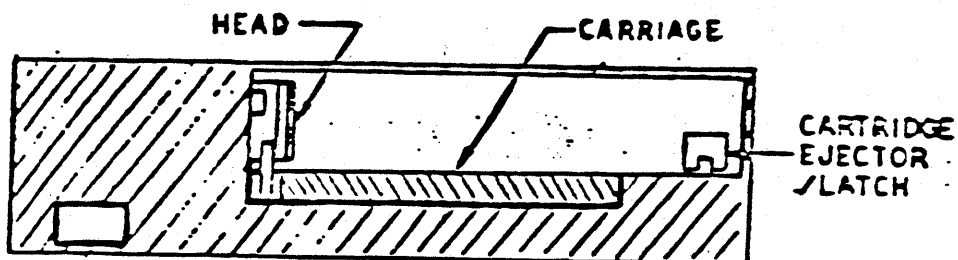1. Disconnect the power.
2. Remove tape cartridge.

Figure 8.2. Front View

3.   Slowly push the cartridge ejector/latch toward the back.
Stop pushing when the latch "clicks". The eraser end of a pencil
is preferred as an actuater. See Figure 8.2.

4.   Push the carriage toward the back and release. The carriage
will slide forward.
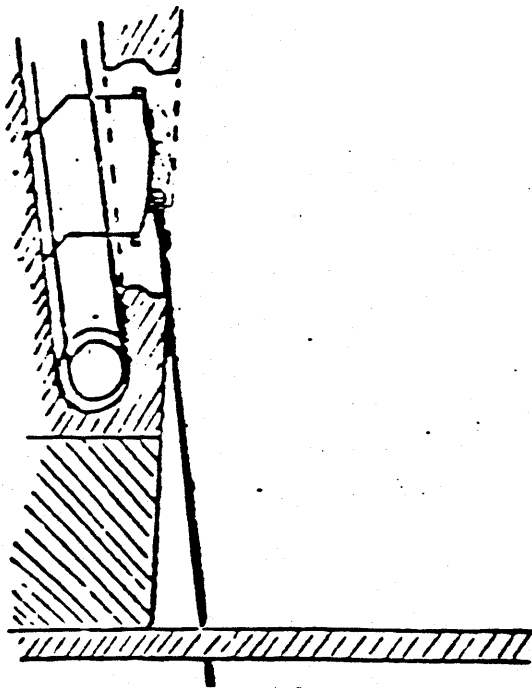
Figure 8.3 Top View
Cleaning Head Surface
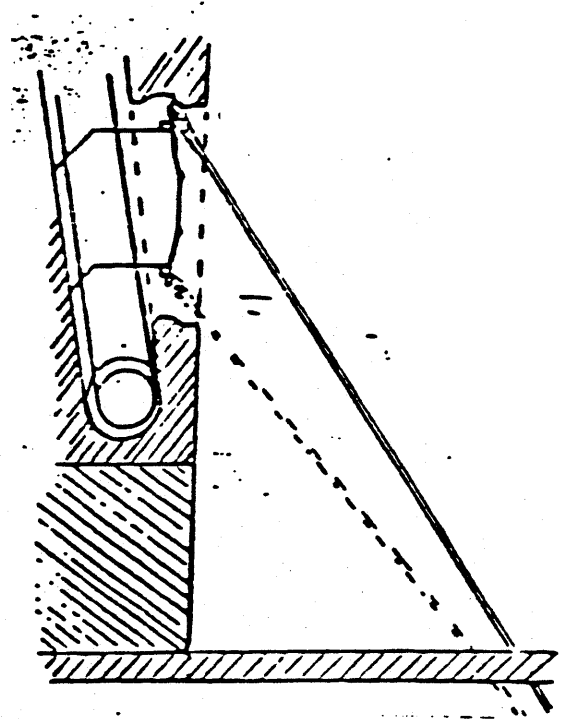
Figure 8.4 Top View
Cleaning Tape Cleaners

NOTE: The capstan rarely needs to be cleaned. Use water only
       when dirty, no Freon TF or solvents.

1. Clean the head surface and tape cleaners with six-inch
    cotton swab moistened with Freon TF or 98% isopropyl
    alcohol. Use a top-to-bottom motion on the head surface and
    the edges of the tape cleaners. See Figures 8.3 and 8.4.

2. Slowly push the cartridge ejector/latch toward the back.
    Stop pushing when the latch "clicks".

3. Push the carriage back until it stops and release. The
    carriage is now locked in place.

4. Allow the Freon TF (and the water if the capstan was cleasned) to dry.

5. Reconnect the power. The tape drive is now ready for use.

CHAPTER 9

TAPE PROGRAM ERROR MESSAGES

This chapter lists and explains messages relating to tape backup operation and covers some important points about errors during operation.

9.1 SOFT (RECOVERED) TAPE ERRORS

The most common error you will encounter during tape operation is:

<u>nnn</u> Soft (recovered) tape errors

This error is the result of the tape backup unit automatically rewriting a data block after sensing that the data written may be marginally recorded. The tape backup unit performs a rewrite function whenever it tests the data and finds that it does not meet pre-established tolerances. Reasons for a block of data not meeting pre-established tolerances are:

- imperfections in the tape surface.

- mechanical tolerance variations.

- instantaneous tape speed variations.

The tape backup unit automatically rewrites marginal data up to 16 times before deciding that there is a true, non-recoverable problem. If the data block is successfully verified before the 16th retry, operation resumes and the next block of data is written to tape.

Each time the tape backup unit performs an automatic retry, it stores a retry count. When the tape backup operation completes, the program determines how many retrys occured and reports this figure in the above error message. This accumulated count of retries should be considered an indication of tape quality and should not be interpreted as recoverable write errors.

The following indicates the allowable number of retries for a
qualified tape cartridge:

Typical operation: less than 100 blocks rewritten

Acceptable operation: less than 400 blocks rewritten

Defective tape car-   more than 400 blocks rewritten
tridge or drive

If you are using a tape cartridge that is causing more than 400
blocks to be rewritten during a tape backup operation, take the
cartridge out of service and try another cartridge. If this does
not solve the problem, make sure you are following the preventive
maintenance procedures and that the read/write head is being kept
clean.

9.2 ERROR LISTING

Following is a list of error messages relating to Tape Backup
System operation and their probable causes.

Message	Probable cause
Drive not online	Operator error - follow procedure for using Tape Backup
End of tape reached	Tape drive problem - tape end should not be reached during normal operation
Error in tape buffer map	Tape media problem - try a new cartridge
Error $\underline{n}$ writing file	CP/M disk error - see below for explanation of $\underline{n}$.
Illegal command to controller	Tape Drive problem

Message	Probable Cause
No data on tape	Tape drive problem, or trying to read a blank tape.
No files on tape	Wrong tape in drive.
Soft (recovered) tape error	See Paragraph 9.1 for a complete explanation of this problem.
Tape not inserted	Make sure tape cartridge is fully seated.
Tape positioned at beginning of tape	Operator error - the function you are trying to perform cannot be performed when the tape is at the beginning.
Tape reset occured	Tape drive problem.
Tape write protected	Operator error - you are trying to write on a tape that has its write-protect switch in the SAFE position.
Unable to close file	CP/M disk error.
Unable to create file	CP/M disk error.
Unable to read tape header	Tape media problem.
Unrecoverable data error	Tape unit retried a number of times to rewrite the data block and could not verify a successful write operation. Tape media or tape drive problem.
Warning: hole at EOF.ready	Data file contents are incomplete - warning only, operation continues.
Warning: this is not the next volume of the same backup	Tape cartridge is not the next one in the sequence of a multiple-tape backup
Unrecognizable tape format	Tape written under an incompatable program was inserted.

The following are CP/M error numbers and meanings which are part
of the error message "Error $\underline{n}$ writing file." Refer to the
CP/M Operating System Manual for additional information about
these errors.

Number	Meaning
01	Accessing unwritten data or uncreated extent.
02	Insufficient room to restore file (disk full).
03	Cannot close current extent.
04	Seek to unwritten extent.
05	Directory overflow.
06	Seek past physical end of disk.

9.3 STREAMING MODE MESSAGES

This section lists the messages displayed by the Streaming Tape
program.

Message	Comments
Preliminary check of disk failed! Abort tape operation? (y/n)	Displayed after the program checks the specified hard disk drive and finds that it is not in working order (or does not exist).
Must be a number, e.g. 192 or COH	Displayed if user enters an invalid T.AP m/BUS address.
No response from AP, retrying...	Displayed after entering a valid T.AP address if there is no response to a test. Repeats forever at intervals of 10 seconds until T.AP responds or until user enters ^C. Usually caused by wrong address entered for T.AP.
Couldn't read disk configuration	A problem has been sensed with the specified hard disk drive. Program exits.

Message	Comments
Missing disk configuration block!	The disk configuration table could not be found. There is probably a disk or configuration problem. The program exits.
WARNING: backed-up disk had n heads, current disk has x heads	The backed-up disk had a different number of heads than the disk which the user is trying to restore.
WARNING: backed-up disk had n cylinders, current disk has x	The backed-up disk had a different number of cylinders than the disk which the user is trying to restore.
Empty tape (no data available to restore)	The tape is blank, and therefore cannot be restored. The program exits.
Tape contains file-by-file back-up; use the LTAPE utility	The tape was originally backed up using one of the non-streaming methods involving the LTAPE program. You must use the LTAPE program restore operation to restore this tape. The methods are not compatible. The program exits.
Tape contains unknown backup type (n)	The tape backup method is not compatible with either the LTAPE or the STREAM program. (It may have been made on the original Molecular TAPE program.) The program exits.

Message	Comments
Fatal error in writing tape header	An error occured while the program was writing the tape header.
Sector read error, (head n cyliner n, sector n	An error occurred during active backup or restore. A report of the type of error is also displayed.

9.3.1 Tape Errors.

Following are errors displayed while actively reading/writing to/from the tape using the STREAM program:

Timeout on tape response. still waiting...

    The tape is not responding, the program is still waiting.

Tape AP timed out, retrying download

    The program retries initializing the T.AP at 10 second intervals.
Tape never finished rewinding, retrying download...

    The program retries initializing and rewinding the tape at three minute intervals.

Tape AP finished rewinding, but never signaled READY; retrying download...

    The program retries downloading and rewinding at 10 second intervals.

The following messages may display whenever the program tries to talk to the tape drive. These are interpretations of error status returned by the tape controller:

Tape is missing!

Tape is write protected!

Tape ran out prematurely!

End of data detected.

Tape drive not online!

Unrecoverable tape data error!

Error caused last block restored to be garbage!

(tape controller BIE error)

File mark detected

INTERNAL ERROR: illegal/undefined controller command!

Unable to find further tape data

(previous tape backup may have been prematurely interrupted)

8 or more read retries performed, TAPE MAY BE WEARING OUT!

Tape is at beginning of media, track 0 (Not an error)
Undefined error $\underline{n}$?!, err

Power-on or reset occurred

Bad tape controller; error of undefined type!

(controller status is $\underline{n}$ $\underline{n}$ $\underline{n}$ $\underline{n}$ $\underline{n}$ $\underline{n}$)

INTERNAL ERROR: unknown tape error $\underline{n}$!

9.3.2 Disk Errors.

The following are interpretations of error status returned from the hard disk controller in the system, and can occur whenever disk read or write operati:ns are being performed using the STREAM program:

Data Address Mark not found after the ID field

Track zero not found after Restore command

Aborted inappropriate command

Undefined controller error code 8!

ID not found

CRC error in ID field

Uncorrectable data field error during Read command

Bad Block Mark on sector detected

Controller detected unknown error zero?!

Warning: Corrected disk error

--- n error(s) ---

    If more than one disk error happens at once, the count of the total number is supplied in the above format.

9.3.3 Internal Program Errors.

The following messages should not occur, and indicate program bugs in the STREAM program:

INTERNAL ERROR: sys2a() called with opcode of n, op

Unknown tape status code ignored (n)

Received unknown request n from FP

9.3.4 Tape Messages.

The following are messages (not errors) which display in normal operation or in response to entering a <CTRL>-T (tape status command) in the STREAM program:

(Tape is inactive)

(sent RESTORE/BACKUP command to tape AP, waiting for reply)

(backing up/restoring cylinder n (of n) head n)

Tape now rewinding. (wait)

Tape now retensioning (wait)

APPENDIX A

THE SELDRIVE UTILITY

The SELDRIVE Utility must be used if you are doing tape backup
operations under the following conditions:

1. You are doing backup/restore using the LTAPE program.

2. You are doing off-line backup/restore.

3. Your system has multiple hard disk drives (a D1 or a
   D1/D2 disk add-on kit has been installed in your sys-
   tem providing you with Drive 0 (original drive),
   Drive 1 (D1 add-on drive), and, in some cases, Drive
   2 (D2 add-on drive).

4. Your system is one of the following:

Supermicro	35-32
Supermicro	70-32
Supermicro X-Series	60-32
Supermicro X-Series	30-16

The purpose of using the SELDRIVE utility is do make the add-on
drives appear similar to Drive 0 in the TAPEDISK.DAT file.

To use the SELDRIVE utitity, proceed as follows:

1.   System must be up and running in Diagnostic Mode (refer
      to Figure 5-1); Tape Utility Diskette must be inserted
      in DisketteDrive; tape cassette must be inserted in
      tape backup unit (refer to Paragraph 3.4).

2.   Enter: A>SELDRIVE <RETURN>

-     The screen displays:

      Try "Drive n" where n = 0 thru 3
      A>

3. Enter: A>SELDRIVE n <RETURN> .....where n is the drive
    number (either 1 or 2) of the add-on drive you wish to
    backup.

    The screen displays:

    Logical drives A:B:C:D:
       have been assigned to physical drive 1.

    ....where "A:B:C:D:" are the Partition letters as
    they should appear in TAPEDISK.DAT (refer to 4.3). If
    these letters are not the same as in TAPEDISK.DAT,
    change the TAPEDISK.DAT file accordingly.

    The physical drive number displayed should be the same
    as the drive number you entered (i.e. either 1 or 2).

Use the SELDRIVE utility every time you back up an add-on disk.
Note that if you press <BREAK> during operations, you will have
to start over again and use the SELDRIVE once again before
continuing with backup operation.

Since SELDRIVE makes the add-on drives appear similar to Drive 0,
you should label the backup operation for Drives 1 and Drives 2
and such (for instance, SELDRIVE 1 and SELDRIVE 2). You can do
this by entering "SELDRIVE 1" or "SELDRIVE 2" in answer to the
"Enter a description of this backup tape:" question in the LTAPE
backup program.