QUARTER-INCH CARTRIDGE TAPE FOR NGEN[R]

Specifications Subject to Change.

First Edition   (June 1985)   A-09-00990-01

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┌──────────────────────── CAUTION ────────────────────────┐
│                                                          │
│  You must follow the guidelines outlined below to ensure │
│  satisfactory  performance  and  full  service  life  of │
│  your quarter-inch cartridge (QIC) drive and tapes.  Be  │
│  sure the write-protect cam is in the correct position.  │
│  You should attain a soft (correctable) error rate of 1  │
│  in 1x10^8 bit transfers, a cartridge life of 2000       │
│  passes (one pass is equivalent to winding the tape a    │
│  full length from one end to the other), and a drive     │
│  life of 5 years.                                        │
│                                                          │
│  Failure to follow these guidelines can result in poor   │
│  performance (excessive errors); damage to the tape      │
│  cartridges, tape drive, or both; loss of                │
│  interchangeability; or a combination of these           │
│  conditions.                                             │
│                                                          │
└──────────────────────────────────────────────────────────┘
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Drive and Cartridge Care. Treat cartridges with care and use them in an environment with the following conditions:

o   Maximum wet bulb temperature: 79°F (26°C)
o   Operating temperature: 41°F to 113°F (5°C to 45°C)
o   Relative humidity: 20% to 80% noncondensing
o   Altitude: -1000 feet to 15,000 feet

Be sure to retension the cartridge before its initial pass (see below). Protect the drive and cartridges from excessive shocks, which can impair the drive alignment and cartridge tension. Do not expose the tape cartridge to magnetic fields such as CRT screens or power sources.

Approved Cartridge Use. Use only approved tape cartridges to attain the specified error rate standard. Other cartridges may initially meet this standard, yet degrade in reliability over the specified cartridge life. The following cartridge tapes are approved: the DC-600A and DC-615A (3M Corp.), and the 10000FTPI (Data Electronics, Inc.)

Cartridge Retensioning. Keep the cartridge properly tensioned to ensure full life service and data reliability. Failure to adequately tension the cartridge will damage the cartridge and destroy data on the tape. To retension the cartridge, use the tape unit retension command. (See Section 4 for details.)

With normal use, retension the cartridge every eight hours. When using the tape drive extensively in start/stop mode, retension the cartridge once every two hours.

Tape Head Cleaning. Clean the tape drive read/write head assembly after any initial pass of a new cartridge once after two hours (of actual tape movement) when using a new cartridge, and at least once every eight hours thereafter for the life of the tape. Failure to clean the heads will result in excessive data errors and may decrease the life of the drive. (See Appendix B for details.)

CONTENTS

LIST OF FIGURES

The documents described below provide additional information related to the contents of this manual.

Context Manager Engineering Update

Context Manager Manual

CTOS™ Operating System Manual

Diagnostics Manual

Executive Manual

MagTape: Half-Inch Magnetic Tape for IWS

Quarter-Inch Cartridge Tape Hardware Manual

Quarter-Inch Cartridge Tape Release Notice (software)

Status Codes Manual

The Context Manager Manual describes and teaches the use of the Context Manager, which allows the user to run applications concurrently and interchange them on the screen almost instantly.

The Context Manager Engineering Update updates the Context Manager Manual for the 2.0 release of Context Manager.

The CTOS™ Operating System Manual describes the CTOS™ operating system. It specifies services for managing processes, messages, memory, exchanges, tasks, video, disks, keyboard, printer, timer, communications, and files. In particular, it specifies the standard file access methods: SAM, the sequential access method; RSAM, the record sequential access method; and DAM, the direct access method.

The NGEN Diagnostics Manual outlines the tests used to verify proper operation of the modules of a workstation. The manual describes tests for individual modules, along with bootstrap procedures and customization programs.

The Executive Manual describes the command inter-
preter, the program that first interacts with the
user when the system is turned on. It describes
available commands and discusses command execu-
tion, file management, program invocation, and
system management. It also addresses status in-
quiry, volume management, the printer spooler, and
execution of batch jobs.

MagTape: Half-Inch Magnetic Tape for IWS de-
scribes installation, testing, and use of the
hardware and software used with half-inch magnetic
tape and the IWS workstation.

The Quarter-Inch Cartridge Tape Hardware Manual
describes the NGEN Quarter-Inch Cartridge Tape
Module.

The Quarter-Inch Cartridge Tape Release Notice
accompanies the quarter-inch cartridge tape
software distribution diskette. It describes
software installation, hardware and memory re-
quirements, and so on, for a given version of the
software.

The Status Codes Manual contains complete listings
of all status codes, bootstrap ROM error codes,
and CTOS initialization codes. The codes are
listed in numerical order along with any message
and an explanation.

TYPES OF MAGNETIC TAPE

QIC refers to quarter-inch cartridge tape.

Half-inch magnetic tape is referred to as such.

NUMBERS

Numbers are decimal except when suffixed with "h"
for hexadecimal.

1 OVERVIEW

Quarter-inch magnetic tape is a fast and efficient data storage medium. This manual explains how to use quarter-inch cartridge tape on the NGEN* workstation.

You can use the Quarter-Inch Cartridge Tape Module (hereafter called the tape module) in the following ways:

o   Use the Tape Backup or Tape Selective Backup utilities to archive or transport files generated on an NGEN

o   Use the Tape Copy utility to copy one file at a time from disk to tape, or to copy one tape file at a time from tape to disk.

Both Tape Backup and Tape Copy are discussed in more detail in later sections.

The QIC Tape Module can be installed on any NGEN
workstation. If the tape module is installed on
an NGEN master workstation, then all NGEN work-
stations on the cluster can use it. If the tape
module is installed on a standalone or cluster
NGEN workstation, then only that workstation can
use that module.

HARDWARE INSTALLATION

INSTALLATION INSTRUCTIONS

For step-by-step, pictorial installation instruc-
tions, see the installation sheet that is packed
with your tape module.

DIAGNOSTICS

Your tape module should function correctly if you
have installed it correctly. If at any time you
need to run tape diagnostics on the module, see
the appropriate diagnostics release notice for
instructions. For general information, see the
Diagnostics Manual.

COMPATIBLE TAPE

The tape cartridges approved for use with the tape
module are the DC-600A and DC-615A (3M Corp.) and
the 10000FTPI (Data Electronics, Inc.). Use only
approved tape cartridges to attain the specified
error rate standard. Other cartridges may ini-
tially meet this standard, yet degrade in relia-
bility over the specified cartridge life.

SOFTWARE INSTALLATION

To install the quarter-inch cartridge tape
software, see the step-by-step instructions
provided in the Quarter-Inch Cartridge Tape
Release Notice that accompanies your distribution
diskette.

UTILITIES

The quarter-inch cartridge tape software performs three classes of functions:

o   Archiving functions, including the utilities

   -    Tape Backup

   -    Tape Selective Backup

   -    Tape Restore

o   A copying function for transfer of one file at a time:

   -    Tape Copy

o   Two utilities for tape maintenance:

   -    QicRetension

   -    QicErase

TAPE BACKUP

The archiving or tape backup utilities allow you to archive data in the same way as you would with other archiving media, such as floppy disks. Archiving is much faster with tape than with floppy disks, and a hard disk can be archived on one tape instead of several dozen floppy disks.

The Tape Selective Backup utility is also a good way to transfer files from one NGEN to another.

TAPE COPY

The Tape Copy utility copies one file at a time from disk to tape, or from tape to disk.

You can use Tape Copy to place any single disk file on a tape; or you can use it to duplicate a tape by the method discussed under "Tape Copy," in Section 4, "Using the Tape Software."

TAPE MAINTENANCE

QicRetension winds the entire tape in one direc-
tion and then rewinds it. New tapes should always
be retensioned before use.   If you are unsure
whether the tape has been used, it should also be
retensioned.   (See the subsection, "Tape Mainte-
nance," in Section 4, "Using the Tape Software.")

QicErase erases an entire tape.

TAPE FORMAT

Unlike the case with disks, there is no concept of
a "volume" with tape.   A unit of tape is a
cartridge.   A tape cartridge contains tape files.
A tape file is the data between file marks.   A
tape file can span multiple tape cartridges.

The format of a tape file generated by Tape Backup
is shown in Figure 3-1.   Each tape file ends with
a file mark.   _

Files on a tape differ from disk files in that
they do not have file names and are not grouped
into directories.   They are identified by sequen-
tial numbers: 0, 1, 2, and so on.   Also, a tape
file can contain many disk files.   When you use
Tape Backup to archive an entire hard disk, all
the files from that disk are placed in one long
tape file.   The tape file is divided into data
blocks.

The size of a tape block (second bar from the top
in Figure 3-1) is constant at 1536 bytes.   The
size of records within the tape block varies
because the data portion of the record can vary
from 0 to 512 bytes.   The first record in a block
contains the disk file header, and its data
portion is usually 256 bytes long.   Succeeding
records contain 512-byte portions of the disk file
data.   The last record corresponding to that file
contains the remainder of the disk file data, and
its data portion is thus some number between 1 and
512 bytes.

Because a block has a fixed length of 1536 bytes,
a record may span the end of one tape block and
the beginning of the next.   In this case, the
pointer to the start of the first complete record
in the block, which is shown in the block header
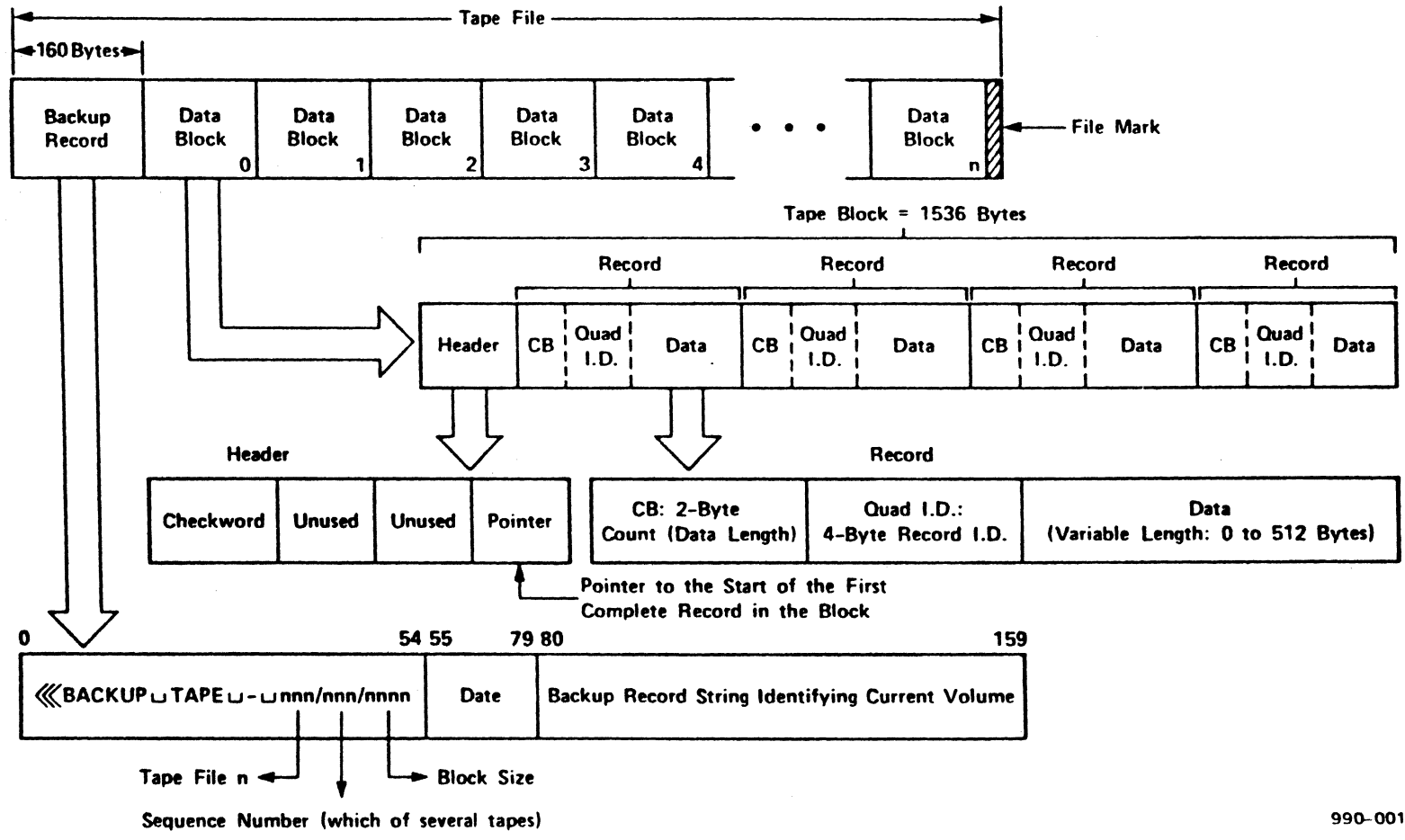
Figure 3-1.   Backup Tape File Format.

in the third line of Figure 3-1, actually points
to the first complete record in the next block.

In the last record of the last data block in a
tape file, the 2-byte count and 4-byte record
identifier fields of the record (third line of
Figure 3-1) both have the value 0. These values
signal the end of the file. No data follows them.

TAPE DRIVE MODE

The tape module is a streaming-mode backup device.
In streaming mode, the tape can move rapidly,
without stopping between blocks. This mode makes
it highly suitable for rapid archiving.

See the Quarter-Inch Cartridge Tape Hardware
Manual for details about the tape module's
operation.

SEMANTICS OF TAPE FILE NAMES

Tape file names have the general form

    [QICm]n

where

    m = 0 or 1

    for reading from tape,
    n = blank, 0, 1, 2, . . .
        (+ illegal; blank = 0)

    for writing to tape,
    n = blank or +
        (0, 1, 2 . . . illegal)

Within this name, the m field designates the tape
drive you are using, if there is more than one. If
you do not supply a value, m defaults to 0. Thus,
if there is only one tape drive on your system, it
is called [QIC]. If you have two tape drives,
then the left drive is [QIC0] (or simply [QIC])
and the right drive is [QIC1]. Only two drives
per NGEN system are supported.

Be sure to make the distinction between having
several tape drives, which is what we are
discussing here, and using several tape cartridges

to do a very large archiving job. The tape drive
name does not indicate which of a series of tapes
is referred to.

The n field in the tape file name designates the
tape file being referred to. (A number in this
field is used only for reading, not writing.) If
you do not specify a value for n, it defaults to
the blank character, which has the same meaning as
0 here.

Thus [QICm]0 and [QICm] both refer to the first
file on a given tape or series of tapes, [QICm]4
refers to the fifth tape file, and so on. (This
usage differs slightly from that for half-inch
magnetic tape, where [TAPEm]0 and [TAPEm] do not
have the same meaning. [TAPEm] means "continue
from the current location." Continuing from the
current location is not supported by the quarter-
inch tape module. See MagTape: Half-Inch
Magnetic Tape for IWS for details on the file name
syntax for half-inch tape.)

For example, if you want to restore more than one
consecutive tape file, you must give the file
number each time. If you restore file 4 and then
wish to restore file 5, you must give the second
Restore command using the syntax [QICm]5.

Finally, the special name [QICm]+ is used only for
appending, or writing another file after the last
existing file on the tape. Overwriting an
existing file is not permitted: you cannot
specify the number of an existing tape file (such
as [QICm]4) in a Tape Backup command.

WHAT TAPE SHOULD YOU USE?

Use one of the following approved tapes: DC-600A
or DC-615A (3M Corp.) or 10000FTPI (Data Elec-
tronics, Inc.).   The DC-600A tape will hold
between 55M and 60M bytes of backup information.

THE TAPE BACKUP UTILITIES

The Tape Cartridge Backup utilities look much the same to the user as does Backup Volume in the Executive. If you have backed up to floppy disks before, you will recognize the procedure.

TAPE BACKUP FEATURES

Multiple Backups on One Tape

You can place more than one backup on one tape by appending them. (One tape file is created per backup.) To append a tape file at the end of the last existing tape file, use the name [QIC]+ to denote the new tape file.

Backup to More Than One Tape Cartridge

A large backup may make use of more than one tape. The continuation must take place at the start of the second tape.

Continuation tapes are not checked to see whether they already contain valid information. They are simply overwritten. To avoid accidents, use the SAFE knob on the tape cartridge to write-protect any tape that you want to preserve. (See "Loading the Tape," later in this section.)

Recovery of Tape Errors

Tape error recovery is completely handled by the tape drive hardware and its associated firmware. The tape drive operates in read-after-write mode so that every block written is verified. If a verification error occurs, the tape drive attempts to rewrite the block until it is successful.

During a read operation, the tape drive attempts to recover from an error by retrying the read operation up to 16 times. An error is reported only if the data is unrecoverable.

Tape heads become dirty with repeated use and can cause errors to be reported. For details about

cleaning the heads, see the Quarter-Inch Cartridge Tape Hardware Manual. See also the cautionary note "Quarter-Inch Tape: Use and Maintenance," at the beginning of this manual.

Corrupt Tapes

When handling cartridge tapes, be careful not to touch the tape inside. Doing so can cause errors and possible loss of information. If such an input/output error occurs, the tape becomes unreadable from that tape position on.

USING TAPE BACKUP VOLUME

The Tape Backup Volume utility is used to archive an entire disk to one or several tapes. Tape Backup Volume can

o   Do a full backup: that is, archive all disk files.

o   Do an incremental backup: archive only those files modified on or after a specified date, or date and time.

o   Verify the integrity of the volume control structures on the disk without backing up the files. (See the CTOS Operating System Manual for a discussion of the volume control structures.)

o   Recognize a formatted volume (disk) that is too scrambled to be automatically recognized by the operating system. Backup Volume is capable of searching for a valid Volume Home Block (VHB) if the working VHB is corrupted. Often, some or all data can be recovered from a damaged disk in this way.

o   Clean up a fragmented disk. You can use Tape Backup Volume, the IVolume command in the Executive, and then Tape Restore to recover the data from a fragmented disk, reformat the disk, and replace the data on it in cleaner form.

o   Write a log of the Backup Volume operation to a file or a printer if you want to.

Tape Backup Volume is intended for use by the person in charge of your system. It displays passwords for all directories and files. If this information should be kept confidential, protect your disk with a volume password, so that the person who does Tape Backup Volume must supply this password to gain access to the system.

Housekeeping Before a Backup

Both users and the system itself create disk files that are temporarily useful but are not needed in the long term and can be deleted from disk before a routine backup. The exact names and natures of these files differ among installations, but they may include file names ending in -New and -Old, files with the suffix .tmp, and files within directories of the class <$nnn>. You may also wish to delete old log files from previous routine backups. Do not, however, delete Log.sys. This file is required for normal system operation.

Note that deleting temporary files while other people are working on the cluster can disrupt their work. Check with them before beginning.

To do these deletions, refer to the Executive Manual for a discussion of the Delete command. In the same manual, also see "Wild Card Characters," in the section on "Basic Concepts." If you do the same kind of housekeeping deletions routinely, see "Using a Submit File," in the section on "Advanced Concepts." Creating a submit file is a good idea, because once correctly created, it cannot make the kinds of human errors that lead to deletion of large amounts of valuable data from a disk. It also saves time.

Should You Disable the Cluster?

You can back up a system from the master workstation without disabling the cluster. In this case, files that are exclusively open are not backed up. If you want to archive every file on the disk, all users must be logged off, and you must disable the cluster beforehand (see "Disable Cluster," in Section 6, "Commands," in the Executive Manual) and resume the cluster afterward (see "Resume Cluster" in the same source).

If you are doing a backup at the master workstation without disabling the cluster, the master workstation continues to poll the cluster workstations during the backup. If there are only a few cluster workstations, this polling is not significant. However, above a certain threshold number of cluster workstations, polling severely slows down the backup.

This problem does not occur with backup done at a cluster workstation to its own local tape module.

Changing Screen Setup

During a backup session, the log of the backup is displayed on the screen. As each file is backed up, its name is written on the next screen line. When the screen is filled, the process pauses until you press NEXT PAGE to allow more file names to be written. This can be time consuming and annoying if you have to walk away from a backup in progress.

To eliminate this problem for a large backup, you can use any of these methods:

o   CODE-NEXT PAGE

o   Screen Setup command in the Executive (all versions)

o   Video command in the Executive (version 10.0 and later)

CODE-NEXT PAGE. To use the first method, hold down the CODE key and press the NEXT PAGE key when the first screen message requesting NEXT PAGE appears. Thereafter, the pauses are suppressed. To reinstate these pauses after you have finished the backup, use the Screen Setup command.

Screen Setup Command. To suppress pauses by the second method, use the Screen Setup command and fill out the form as follows.

```
Command   Screen Setup
  [Reverse Video?]                            n _____
  [80 Characters?]                            y _____
  [Screen length (default = full screen)]       _____
  [Suppress character attributes?]              _____
  [Suppress pause between pages?]             y _____
  [Color (e.g., Green)]                         _____
  [Screen time out (in minutes)]                _____
```

Video Command. To suppress pauses by the third
method, use the Video command (available in
Executive versions 10.0 and later).

```
Command   Video
  [Suppress pause between pages?]   y _____
  [Screen time out (in minutes)]      _____
  [Color (e.g., Green)]               _____
  [132 Columns (IWS only)?]           _____
```

Reinstating Pauses. No matter which method you
used to suppress pauses, reinstate them after you
have finished the backup by using the Screen Setup
command or the Video command and entering N in the
["Suppress pause . . ."] field.

Loading the Tape

Using a DC-600A or DC-615A (3M) or 10000FTPI (Data
Electronics, Inc.) tape cartridge, insert the tape
in the tape drive as follows. (See Figure 4-1.)

```
┌──────────────────────────────────────────────────┐
│                      NOTE                          │
│                                                    │
│  To write-protect a tape, use a coin to turn       │
│  the small black slotted knob on the plastic       │
│  side of the tape cartridge so that the slot is    │
│  aligned with the position marked "SAFE."  If a    │
│  tape is SAFE, it cannot be overwritten.   If      │
│  the small knob points away from the word SAFE,    │
│  then the tape is write-enabled.                   │
└──────────────────────────────────────────────────┘
```
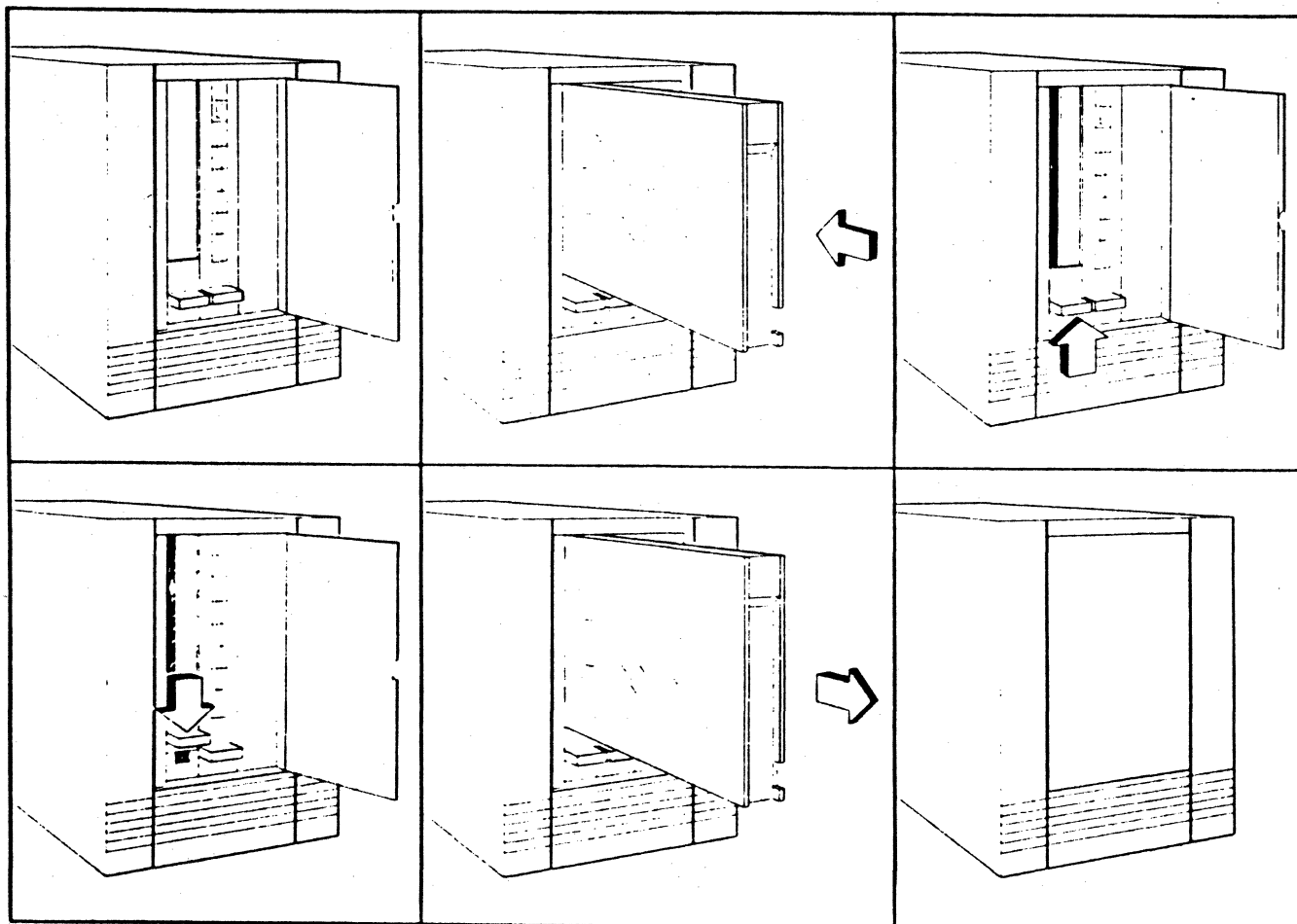
990-002

Figure 4-1.   Inserting the Tape Cartridge.

1.   Open the door of the drive.

2.   Hold the tape so that the metal backplate faces right and the tape head access door faces down.

3.   Be sure the locking lever (the black knob below the tape slot) on the tape drive is all the way down.

4.   Insert the tape into the slot with its plastic side to your left. Push the tape all the way in; push the metal part of the tape to the right to lock the tape in place while you close the latch.

5.   Raise the latch (the black knob below the cartridge slot) to lock the cartridge in place and put the drive in a ready state (a condition in which it is ready to use).

Invoking Tape Backup Volume

Type the command, Tape Backup Volume (or T B V if unique), to start the backup. Then press RETURN. The form shown on the following page appears.

```
+-------------------------------------------------+
|                      NOTE                       |
|                                                 |
| If your tape module is at an NGEN master        |
| workstation and you want to use it from a       |
| cluster workstation, you must install the Tape  |
| Server on the master workstation.  If you do    |
| not plan to do tape backup or restore across    |
| the cluster to another workstation, you need    |
| not install the Tape Server.                    |
|                                                 |
| To install the Tape Server, give the command    |
| Install Qic Server (or a unique abbreviation).  |
| You cannot install the Tape Server at a work-   |
| station where the Context Manager is in-        |
| stalled.  If the Context Manager is installed,  |
| log out, sign on under a user name that does    |
| not install the Context Manager automatically,  |
| and install the Tape Server.  (See the Context  |
| Manager Manual or the Context Manager Engi-     |
| neering Update for details.)                    |
|                                                 |
+-------------------------------------------------+
```

```
Tape Backup Volume
   Volume or device name
   [Volume or device password]        _____
   [Incremental from (e.g., Mon       _____
       Jun 1 1981 8:00 pm)]           _____
   [Suppress backup?]                 _____
   [Suppress verification?]           _____
   [Tape name]                        _____
   [Delete existing archive file?]    _____
   [Log file]                         _____
   [Display structures?]              _____
```

The meanings of the fields are as follows:

Volume or device name
> is the volume or device name of the
> disk to be backed up.

Volume or device password
> is the password (if one exists) of
> the volume or device to be backed
> up.   The volume password must be
> supplied if the volume is recog-
> nized by CTOS.   Otherwise, the de-
> vice password must be specified.

Incremental from (e.g., Mon Jun 1 1981 8:00 pm)
> is the date from which files are to
> be backed up.   Only files modified
> on or after the specified date are
> backed up.   If you leave this field
> blank,   the entire disk is backed
> up.   (Incremental backup is dis-
> cussed further at the end of this
> parameter list.)

Suppress backup? -
> is Yes or No.   No is the default.
> Yes verifies the integrity of the
> volume control structures without
> performing a backup.   (You can use
> this option to check the condition
> of your disk without doing a
> backup.)

Suppress verification?
> is Yes or No.   No is the default.
> Yes performs only the backup pass
> and suppresses the verification
> pass.   Backup without verification
> is much faster than that with
> verification.

Tape name   specifies the tape drive (and, for
                     appending, the tape file) upon
                     which tape backup will begin.
                     Usually this entry is [QIC].

                     Note that if you give a tape name
                     of the form [TAPEm]n, the software
                     looks for a half-inch tape drive.
                     For a discussion of the correct
                     semantics for quarter-inch car-
                     tridge tape, see "Semantics of Tape
                     File Names," in Section 3, "Soft-
                     ware Structure and Tape Format."

Delete existing archive file?
                     is Yes or No. No is the default.
                     If this parameter is Yes, any
                     existing archive file is auto-
                     matically overwritten. If this
                     parameter is No, and the system
                     finds a preexisting archive file on
                     the tape, you receive a prompt
                     telling you that the file already
                     exists and asking if you wish to
                     delete it.

                     When you use the tape file name
                     [QICm]+ to append to a tape, this
                     field becomes irrelevant.

Log file   is the name of the disk file to
                     which to write a report of the
                     backup. You create this file with
                     this name by placing the name in
                     this field.

                     If the log file already exists, the
                     log of this backup is appended to
                     it.

                     If you do not name a log in this
                     field, the log of the backup
                     appears only on the video display.

                     (It is a good practice to copy this
                     log file to a floppy disk after
                     doing the backup. You can use it
                     to find out quickly what is on this
                     tape or set of tapes.)

Information written to the screen
and the log during backup is not
exactly synchronized with the
writing of data to tape. When the
log indicates that the archiving of
a certain file is "done," this
means that the file has been
completely written into a 64K-byte
buffer, not that the buffer has
been written to tape. Thus a file
reported as "done" shortly before
the change-of-tape information line
may be on the tape where it is
reported, but also may be near the
beginning of the next tape. Any
file reported as "done" after the
change-of-tape line definitely is
on the second tape.

Display structures?

is Yes or No. No is the default.
Yes gives a detailed analysis of
the volume control structures.
(This option is intended for use by
system programmers.)

Once you have filled this form out as you wish,
press GO to start the backup. Screen messages
then instruct you as necessary. You may see a
screen message to the effect that "volume verifi-
cation may be suspect." This message appears
because you are essentially using a file on your
disk to examine that same disk. In the case of
tape backup, there is no alternative but to do so,
so you should ignore this message.

As the backup pass is made, the names of the files
are written to the screen as they are archived.
The reporting of archived files to the screen and
the log is not exactly synchronized with actual
writing to tape, because the files are written to
a 64K-byte buffer before being written to tape in
order to allow streaming mode to be used. The
report indicates only that the file has been
written to the buffer, not to the tape.

After the backup pass is complete, and if you did
not suppress verification, the system seems to sit
idle while a verification pass is performed. (You
can tell that the system is working because the
disk drive light flickers.) Eventually the screen

displays the results of the verification. The
Executive then displays the command line, and the
backup is complete.

To remove the tape from the tape drive, first make
sure the drive activity light is off. Then press
down on the black knob below the cartridge slot.
The tape then pops out. You can set the write-
protect knob located on the plastic front of the
tape cartridge to "SAFE" to write-protect your
backup.

Incremental Backup

If you do backup to duplicate disk files as a
protection against data loss, it can be time
consuming to do a full backup daily, even with the
speed of tape. In many installations, it is more
efficient to do a full backup weekly or at some
other interval, and to do an incremental backup
daily between full backups, giving the date of the
last full backup in the [Incremental from . . .]
field of the Tape Backup Volume form. Because an
incremental backup archives only those files that
have been modified since the date specified, it
takes much less time than does a full backup.

Using Tape Selective Backup

Tape Selective Backup is much like Tape Backup
Volume, except that you can choose to back up only
certain directories or files from a hard disk.
This utility is designed to allow individual users
other than a system manager to back up their
personal files. Tape Selective Backup requires
only read access to the files being archived.
Tape Backup Volume, on the other hand, requires
device-level access (that is, the user must know
passwords that give access to protected system
files.) ·

Tape Selective Backup can

o   archive individual files or directories

o   archive only those selected files modified on
     or after a specified date, or date and time
     (incremental backup)

o   optionally write the log of the Selective
     Backup operation to a file or printer. (The
     log always appears on the video display.)

Tape Selective Backup does not work with a corrupt
disk. Use Tape Backup Volume for this purpose.

For general instructions for a backup operation,
read "Using Tape Backup Volume," earlier in this
section.

Give the command Tape Selective Backup (or T S B,
if unique). The following form appears, with
fields as described below.

Tape Selective Backup
  File list   _____
  [Incremental from   _____
       (e.g., Mon Jun 1 1981 8:00 pm)]   _____
  [Confirm each?]   _____
  [Tape name]   _____
  [Delete existing archive file?]   _____
  [Log file]   _____

File list   is a list of the files to archive.
                  The list can include single files,
                  directories, or sets of files. You
                  can use wild card characters to
                  designate more than one of a
                  category. (See "Wild Card Charac-
                  ters," in Section 4, "Basic Con-
                  cepts," in the Executive Manual.)

Incremental from (e.g., Mon Jun 1 1981 8:00 pm)
                  is the date from which files are to
                  be archived. Only files modified
                  on or after this date are archived.

Confirm each?   is Yes or No. No is the default.
                  If you enter Yes, each file name is
                  displayed and you are asked to
                  confirm or deny that it should be
                  archived.

Tape name,
Delete existing archive file?,
Log file
                  For descriptions of these fields,
                  see "Using Tape Backup Volume,"
                  earlier in this section.

Using Tape Restore

Tape Restore is a utility that reads data from a tape backup and places it on a hard disk. Its main purpose is to restore data that either has been lost from a disk because of damage or has been taken from a fragmented disk that needs to be cleared (with the IVolume command) and rewritten in a cleaner form.

Tape Restore can

o   restore an entire volume, creating any needed directories on the destination volume

o   restore selected files to the same or different file specifications

o   restore a file's characteristics (creation date, protection level, and so on) as they existed at the time of backup

o   optionally write the log of the Restore operation to a file or a printer, in addition to the log that appears on the video display

Tape Restore is similar to the other Tape Backup utilities, except that data is transferred from the tape to the disk. For general instructions, see "Using Tape Backup Volume," earlier in this section.

Give the command Tape Restore (or T R, if unique). The following form appears:

```
Tape Restore
   [Tape name]              _____
   [File list from]         _____
   [File list to]           _____
   [Overwrite ok?]          _____
   [Confirm each?]          _____
   [Sequence number]        _____
   [Merge with existing file?]  _____
   [List files only?]       _____
   [Log file]               _____
```

These fields have the following meanings:

Tape name   is the tape drive from which the restored data should be taken. Normally this entry is [QIC].

File list from

is a list of the disk-type files to restore. (A tape file can contain many disk files.) The file specifications are of the form

<dirname>filename

where <dirname> is the name of a directory and filename is the name of a file. No volume name is permitted.

If you make no entry in this field, all the disk-type files within the named archive (tape) file are restored to the disk.

To restore the contents of an entire disk directory, enter

<dirname>*

File list to

is a list of the file specifications to receive the restored files. The file specifications are of the form

[volname]<dirname>filename

The volume name and directory name are optional. If only a file name is specified, the files are restored to the volume and directory to which you logged in.

If you make no entry in this field, the files are restored to the same directory and file from which they were taken during backup, but to the logged-in volume.

You can use the wild card character in the directory and file names. (See "Wild Card Characters," in Section 4, "Basic Concepts," in the Executive Manual.)

Overwrite ok?   is Yes or No.   No is the default.

> If you enter Yes, an existing file
> of the same name is automatically
> deleted before a new one is
> restored.
>
> If you enter No, you are prompted
> for confirmation before an existing
> file is deleted.

Confirm each?   is Yes or No.   No is the default.

> If you enter Yes, the utility asks
> you to confirm that you want each
> file restored as it comes up.
>
> If you enter No, the Restore pro-
> ceeds without interacting with you.

Sequence number

> is the first tape cartridge with
> which to begin the Tape Restore
> operation. Fill in this field only
> if your backup required more than
> one tape cartridge and you do not
> want to start restoring from the
> first one. The default value is 1.

```
 _____

                        NOTE

  If the Restore operation does not begin with
  the first tape cartridge, or if the tape was
  produced by Selective Backup, Restore creates
  any required directories 10 sectors in size
  and unprotected.
 _____
```

Merge with existing file?

> is Yes or No.   No is the default.
>
> With this parameter you can choose
> to protect data that exists on the
> disk when the same data is not
> readable on the tape.

If you enter Yes, the sectors of
the target file (the disk file with
the same name) are bypassed if the
corresponding sector on the tape
cannot be read.

If you enter No, the sectors of the
target file are written with zeros
if the tape data cannot be read.

List files only?

is Yes or No. No is the default.

If you enter Yes, the utility lists
the contents of the tape file on
the video display but does not
write them on the disk.

```
┌─────────────────────────────────────────────┐
│                   CAUTION                     │
│                                               │
│  You should always run Tape Restore once with │
│  Yes  in  the  "List files only?"  field before │
│  doing an lVolume command and an actual Restore │
│  operation to disk.   If  for  some  reason  your │
│  tape contains the wrong data or no data, you │
│  can   protect   yourself   in   this   way   from │
│  overwriting a disk with it and losing what was │
│  on the disk.                                 │
└─────────────────────────────────────────────┘
```

Log file   See the corresponding entry under
                  "Using Tape Backup Volume," earlier
                  in this section.

TAPE MAINTENANCE

The maintenance utilities are provided to reten-
sion and erase cartridges.

USING QicRetension

The tape cartridge should be retensioned every
eight hours with normal use. When the tape drive
is used extensively in start/stop mode, the car-
tridge should be retensioned once every two hours.

A tape cartridge that has been exposed to low
temperatures (below 41°F or 5°C) or high tem-
peratures (above 113°F or 45°C) for any length of
time, or a tape that has been stored unused for a
long time, should be rewound one complete cycle
before being used for data interchange. Any tape
cartridge being used for the first time should be
retensioned. The QicRetension utility is used to
do this. Insert the tape cartridge into the tape
module and invoke the utility by the following
command:

QicRetension
   [Device (default = [QIC])] _____

Device   is the tape drive into which the
                      tape cartridge to be retensioned
                      has been inserted. This field de-
                      faults to [QIC].

USING QicErase

The QicErase utility is provided so that a tape
cartridge can be completely erased.

Insert the tape cartridge into the tape module and
invoke the utility with the following command:

QicErase
   [Device (default = [QIC])] _____

Device   is the tape drive into which the
                      tape cartridge to be erased has
                      been inserted. This field defaults
                      to [QIC].

TAPE COPY

Tape Copy is not designed for archiving. It
copies one file at a time from disk to tape or
from tape to disk. You can use Tape Copy, for
example, to place any single disk file on a tape.
You can also use it to duplicate tapes, as
follows.

Suppose Tape A is the original tape and Tapes B, C, and so on are to be the copies.

1. Place Tape A in the tape module.

2. Use Tape Copy to copy the image on Tape A to a hard disk. Tape Copy copies everything up to the first tape file mark it encounters into one disk file. (It is a good thing to have enough available disk space so that this disk file can be contiguous.)

3. Remove Tape A from the tape module and replace it with Tape B.

4. Use Tape Copy to copy the single disk file that contains the image of Tape A onto Tape B. If the disk file is contiguous, this copy goes very rapidly.

5. Use Tape Copy as many more times as necessary to make additional duplicate tapes from the same disk file.

Note that not all tapes are exactly the same length physically. Furthermore, two physically identical tapes are not functionally the same length because of variances in media. Thus, a copy of one completely full tape may require two tapes. Tape Copy does not work with tape files that span tape cartridges.

Tape Copy transfers data in multiples of 512 bytes only. If a file copied to tape is 513 bytes long, the first block holds 512 bytes of data, and the second block holds 1 byte of data and 511 zeroes. If you then copied this file back from tape to disk, the file read back would be 1024 bytes long, and the first 513 bytes of data would match the original file.

Tape Copy considers all data up to the file mark to be one file.

To copy one file from disk to tape or vice versa, give the command Tape Copy. The following form appears:

Tape Copy
    File from   _____
    File to   _____
    [Overwrite ok?] _____
    [Confirm each?] _____

File from   In this field, specify the source
                     file name. If copying a file from
                     tape to disk, specify the tape
                     name. Otherwise, specify the disk
                     file name to copy to tape. Use the
                     tape name format discussed under
                     "Semantics of Tape File Names," in
                     Section 3, "Software Structure and
                     Tape Format."

File to   Specify the destination file name.
                     If copying a file from disk to
                     tape, specify the tape file name.
                     (Tape Copy appends if you use the
                     name [QICm]+. See "Semantics of
                     Tape File Names," in Section 3,
                     "Software Structure and Tape
                     Format.") Otherwise, specify the
                     disk file into which the contents
                     of the tape file are to be copied.

Overwrite ok?   This field is applicable only when
                     you are copying from tape to disk.
                     If you specify Yes, Tape Copy
                     overwrites files of the same name
                     on the disk without asking you for
                     confirmation.

Confirm each?   Specify Yes if you wish to be asked
                     to confirm the operation.

To copy the first file from a tape, specify the
tape file name in the "Copy from" field. To copy
a disk file to tape, specify the tape file name in
the "Copy to" field.

APPENDIX A: STATUS MESSAGES

This appendix lists errors that you may encounter during tape operation. The following status codes are used in addition to those described in the Status Codes Manual.

Decimal Value	Meaning
9016	Cartridge not inserted, or drive is busy (for example, rewinding).
9044	The QIC tape server is in use. A user, perhaps a cluster workstation, is using the installed QIC server.
9059	XBIF not installed. The X-Bus interrupt handler, Xbif.run, has not been installed. You must have XBIF installed before using quarter-inch tape.
9071	Bad buffer alignment. A data buffer sent to the tape server must fall on a word boundary.
9073	Cartridge was removed. The tape cartridge was removed during an operation.
9074	An illegal command was sent to the tape controller. This error is internal.
9080	Buffer too small. A QIC tape buffer must be at least 512 bytes.
9099	Tape already installed. The server is already installed.

QUARTER-INCH CARTRIDGE TAPE

The tape drive uses a QIC tape with a tape length
of 600 feet. It is recommended that you use 3M
DC-600A tape cartridges. Figure B-1 shows the
internal components of the DC-600A, and how the
components interact with the tape drive. Figure
B-2 shows the safe and unprotected positions of
the write-protect plug.

The QIC tape drive has a MTBF (mean time between
failures) of 500 power-hours and a MTTR (mean time
to repair) of one half-hour. Recommended full
service life is five years.
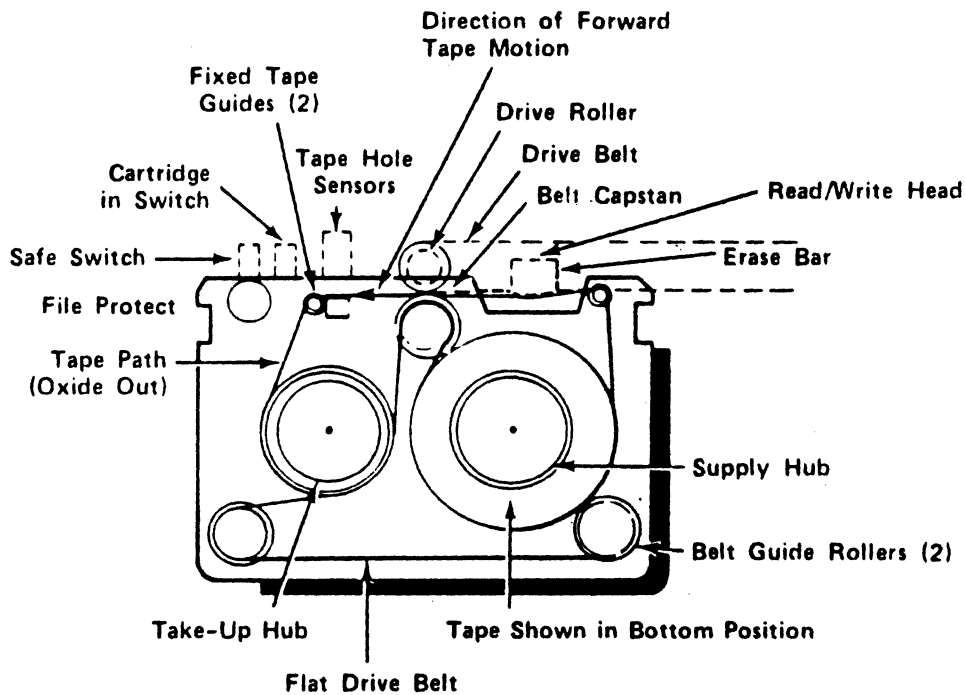
990-003

**Figure B-1.   Internal Components of the DC-600A
QIC Tape Cartridge.**

Write Permitted   Write Prohibited

990-004
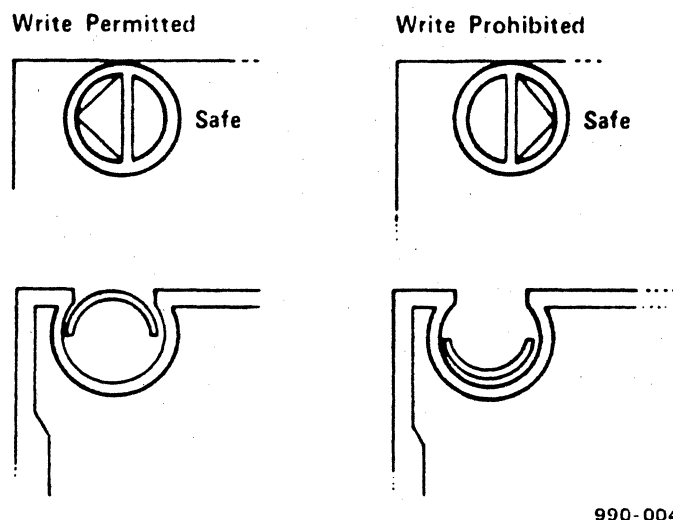
**Figure B-2.   QIC Tape Cartridge Write-Protect Plug
               Positions.**

TAPE DRIVE HEAD MAINTENANCE PROCEDURE

This section explains the procedure for cleaning
tape drive heads, to ensure maximum performance of
the tape drive.   If you are using new tape
cartridges, the heads must be cleaned after every
two hours of actual use.

For other cartridge conditions, cleaning should be
performed at eight-hour intervals during normal
use.   (Normal use is defined as two to three hours
of actual drive use in a regular eight-hour day.)
If normal use is exceeded, or if the tape is used
in extreme environments (high humidity or
temperature extremes), the heads may need to be
cleaned every four to six hours.

The following troubleshooting procedure suggests
some   of   the   more   common   sources   of   poor
performance.   -

If the drive is reading erroneous data, perform
the procedure to identify the source of the
problem as follows: Do the first step, then
attempt to read the drive; if the error persists,
do the second step, then attempt to read the data,
and attempt to read the drive again.   If the error
still persists, continue with the subsequent steps
in the procedure.

TROUBLESHOOTING PROCEDURE

1. Retension the cartridge by sending a Retension command to the drive.

2. Clean the tape heads, as detailed in the cleaning procedure that follows.

3. Send a Retension command to the drive.

4. Replace the cartridge with a known quality cartridge. The original cartridge may be worn.

5. Send a Retension command to the drive.

6. Change the tape drive.

7. Change the Quarter-Inch Cartridge Interface (QIC02) board.

8. Change the QIC02 Flex cable.

CLEANING EQUIPMENT

To clean the tape drive heads, you will need the Inmac Tape Drive Head Cleaning Kit (part number 7150), which contains the following items:

o   swabs

o   cleaning solution

o   aerosol can containing compressed air

CLEANING PROCEDURE

To clean the tape drive heads, perform the following steps:

1. Remove the cartridge from inside the drive by firmly moving the slide lever away from the cartridge until you reach the lever stop. The lever action causes the head assembly to retract away from the cartridge. The same action triggers an ejector, which lifts the cartridge clear of the retaining lip and pushes it out of the slot.

2. Move the head assembly into the tape contact position by moving the upper slide lever to the right-hand stop. Power down the tape drive.

3. Dampen a swab by dripping cleaning solution onto the dual-colored spade end of the swab. **Do not dip the swab into the cleaning solution.**

4. Insert the swab, spade end first, through the cartridge access slot until you touch the head.

5. Using the coarse, green side of the swab, clean the head with an up-and-down motion (toothbrush style).

6. Remove the swab and redampen it with another application of cleaning solution. **Do not dip the swab into the cleaning solution.**

7. Reinsert the swab and clean the head again with the fine, white side of the swab by using the same up-and-down motion you used with the coarse, green side.

8. Remove the swab. Now, insert a clean, dry swab and remove any residual cleaning fluid.

9. Discard both swabs. Store unused swabs so that they will not collect dust or debris.

10. Inspect the sensor holes, which are located on the inside near the head spring assembly. Clean the tape hole sensor openings as needed by using the aerosol container of compressed air.

11. Move the head assembly back into the retract position by moving the upper slide lever to the left-hand stop. The tape drive is now ready for use once the power is turned on.

append. To append is to add another file after the end of the last existing file on a tape.

archiving. See **backup.**

backup. Backup preserves hard-disk files by copying them onto other media that can be stored separately.

block. See **data block.**

data block. A tape file is divided into data blocks to minimize loss of data in the event of tape damage. A data block is 1536 bytes long and contains a header and variable-length records. See also **header** and **record.**

file. See **tape file.**

file mark. A file mark is written by the tape software at the end of a file.

header. A header is the first portion of a data block within a tape file. It describes the block.

incremental backup. An incremental backup preserves only those files changed after a specified date and time. See also **backup.**

log. A log is a record of all the files copied during a backup session. The log is written to the screen during the backup. You can also specify that it be written to a file at the same time. See also **backup.**

QIC. QIC stands for quarter-inch cartridge tape.

record. A record is a subunit of a tape block. Its first few bytes describe itself, and the balance is a variable-length portion of data, not exceeding 512 bytes.

restore. To restore is to copy back from tape to hard disk an image that had been taken from that or another hard disk earlier by use of backup.

retension. To retension a tape is to wind it completely in one direction and then rewind it completely to restore normal tension. A tape should be retensioned after it has been unused for a long time or has been exposed to the extremes of its normal temperature range.

selective backup. Selective backup is backing up some, but not all, files from a hard disk. See also **backup.**

streaming mode. In streaming mode, the tape runs rapidly without stopping at the ends of files.

tape file. A tape file is the data between file marks on a tape. Tape files are identified by numbers rather than by names, and they are not organized into a heirarchical file system as disk files are.