2229
CARTRIDGE TAPE DRIVE

OVERVIEW

The Wang Cartridge Tape Drive is a peripheral device that utilizes a 1/4 inch magnetic tape cartridge to store data. The Cartridge Tape Drive was designed primarily to provide reliable backup for Wang systems with fixed disk drives. The versatility of the Cartridge Tape Drive allows users to define other applications, including storage of word-processing documents, copying specified files (including documents) and transferring information to compatible Wang systems. Three stand-alone models are available: the Model 2229, supported by the 2200 system, and Models 6529 and 2529V, supported by OIS and VS systems respectively.

Model	Wang System
2229	2200
6529	OIS
2529V	VS

The 1/4 inch magnetic tape cartridge is a convenient, cost-effective medium that can replace floppy diskettes or removable hard disks in many applications. The magnetic tape is contained on two hubs within a sturdy protective shell. This shell design incorporates a cover which automatically closes over the tape surface when the cartridge is not in use. An integral write-protect selector can be engaged to prevent a tape from being inadvertently recorded over. The Cartridge Tape Drive utilizes four recording tracks and a recording density of 6400 bits per inch. Depending upon the system and application, up to 15M bytes of data can be stored on a 450 ft tape cartridge. Tape cartridges (part number 725-1227) are available from Wang Supplies Division.

The Cartridge Tape Drive is a start/stop device that employs a serpentine recording technique. This technique records (or reads) data for the entire length of one track, stops, reverses tape direction, and records (or reads) the full length of the logically adjacent track. This process continues until all 4 tracks have been recorded or read. Tape speeds are 30 inches per second (ips) during record/read, and 70 ips during rewind.

APPLICATIONS

2200 Series

The Model 2229 Cartridge Tape Drive provides an alternative to using diskettes to backup 2200 systems configured with fixed 2M, 4M, 8M, 16M, and 32M byte disk drives. Menu selections allow the user to backup a disk to tape, recover data from the disk, backup individual files to tape, recover individual or all files from tape, and view instructions. When using a 16K character block size to record data, up to 15M bytes can be stored on one tape cartridge. For instance, an LVP user can conveniently backup almost an entire 16M byte fixed disk onto one tape cartridge. Up to 16 dual-sided, double-density diskettes (each approximately 1M byte capacity) would be required to back up the same disk. In applications such as these, the tape cartridge is more economical, faster, and requires much less operator intervention.

OIS

The Model 6529 is ideally suited to backing up the OIS 105 and 115 series. These systems are configured with fixed disk drives of 4.2M, 8.4M, 16M, or 32M bytes capacity. In addition, the cartridge tape drive is compatible with all OIS systems except Models 125 and 130. The OIS Tape Utilities menu allows a choice of operations: copy, retrieve, backup, and restore (full or incremental). For copy, a volume name and partial file name are specified, then individual files can be selected for copy from disk. For retrieve, a list of tape files is displayed, then files can be specified for retrieval from tape to a specified disk volume. Full backup is performed by specifying a volume name and file name; this option does not allow individual files to be selected. The incremental backup option allows the user to specify a date; only files created or altered after the specified date are backed up. For restore, the entire tape is copied to a specific disk volume. Using 4096 (4K) character blocks, up to 9M bytes of data can be stored on a tape cartridge. The tape cartridge offers a more efficient and cost-effective alternative to the single-sided, single-density diskettes (each approximately 300K bytes capacity) used on the OIS.

VS

The Model 2529V provides an efficient means to backup VS25 and VS45 systems configured with fixed 34M and 68M byte disk drives. By using the VS Backup Utility, a specified range of files, libraries, or volumes can be backed up to or restored from a tape cartridge. Using 4K character data blocks and no tapemarks, up to 13.7M bytes of data can be stored on one 450 ft tape cartridge. The Cartridge Tape Drive is supported by all VS processors.

SUMMARY OF FEATURES

- Reliable - utilizes proven recording technology
- Cost effective - one cartridge tape can replace numerous diskettes or removable hard disk cartridges
- Convenient - less operator handling required than with diskettes
- Versatile - supports multiple applications

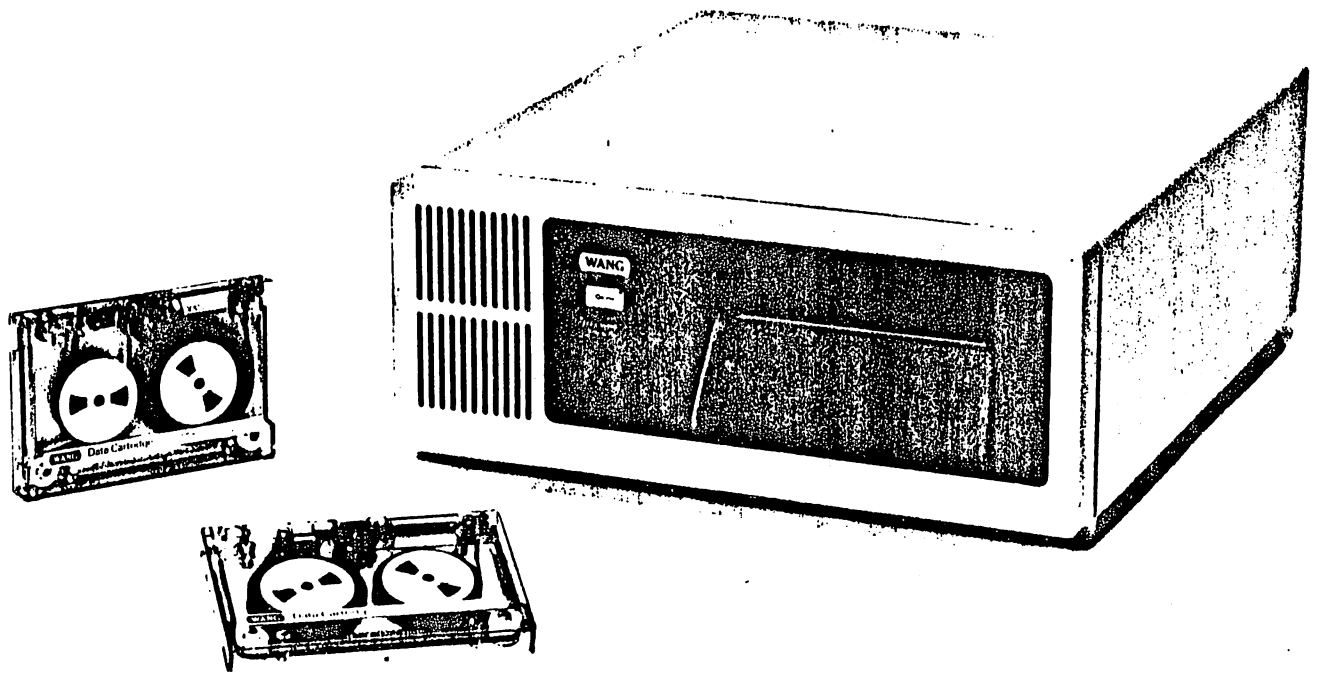
SPECIFICATIONS

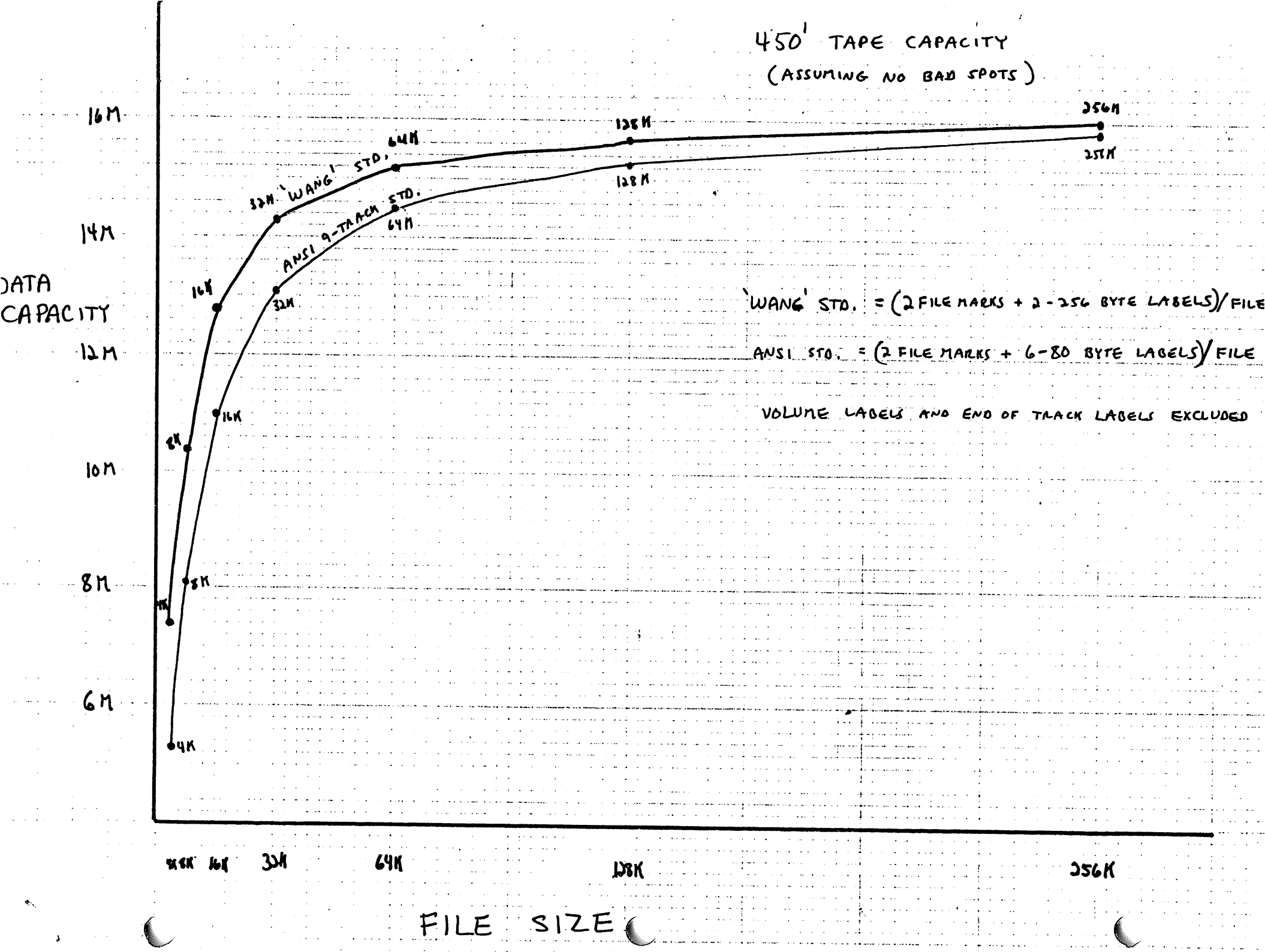
Tape	
Width	0.25 in. (0.64 cm)
Length	450 ft (137.16 m)
Recording	
Recording Density	6400 bpi
Physical Tracks	4
Formatted Capacity	Up to 15 Mb with 450 ft tape
Record Format	Single Track, serial
Tape Transport	
Tape Speed (Normal)	30 ips
Tape Speed (Rewind)	70 ips
Read Operation	Serial/Serpentine
Write Operation	Serial/Serpentine
Start/Stop Time	
Read/Write Operations	25 ms
Rewind/Search Operations	75 ms
Start/Stop Displacement	
Read/Write Operations	0.38 in. (0.97 cm)
Rewind/Search Operations	3.38 in. (8.59 cm)
Tape Head	
Recording Head	Serpentine, Read after Write, Selective Erase

Data Transfer Rate (drive to controller)

192,000 bits per second
(24,000 bytes per second)

Dimensions	
Height	6.69 inches (16.99 cm)
Width	15.38 inches (37.07 cm)
Depth	17.81 inches (45.24 cm)
Weight	28.5 lbs (12.96 kg)
Cables	Model 2229; 10 ft (3.05 m) parallel cable from Tape Drive to CPU
	Models 6529, 2529V; 25 ft (7.6 m) dual coaxial cable from Tape Drive to CPU (optional lengths up to 2000 ft (609.6 m))
Fuses	**2 amp @ 115 VAC** **1 amp @ 220 VAC**
Operating Environment	50° to 90° (20°C to 32°C) 35% to 65% relative humidity, noncondensing (recommended) 20% to 80% relative humidity, noncondensing (allowable)
Power Requirements	115 VAC, 50/60 Hz (98 VAC - 128 VAC allowable) consumption: 1.4 amp - 2 amp @ 115 V
	220 VAC, 50/60 Hz (196 VAC - 256 VAC allowable) consumption: 0.7 amp - 1 amp @ 220 V
Controls	On-Line, Power On/Off
Indicators	On-Line Fault Tape Loaded Power On


WANG
WANG
Data Cartridge
WANG


450' TAPE CAPACITY
(ASSUMING NO BAD SPOTS)
16M
14M
12M
10M
8M
6M
DATA CAPACITY
256M
128M
64M
32M
16K
8K
4K
'WANG' STD.
ANSI 9-TRACK STD.
'WANG' STD. = (2 FILE MARKS + 2-256 BYTE LABELS)/FILE
ANSI STD. = (2 FILE MARKS + 6-80 BYTE LABELS)/FILE
VOLUME LABELS AND END OF TRACK LABELS EXCLUDED
FILE SIZE

TIME TO WRITE 16K BLOCK ON TAPE: 733 m Sec (INC. RAMP UP/DN)

TIME TO READ 16K BLOCK FROM DISK AND TRANSFER TO TAPE CONTROLLER:

16K BLOCK WAS READ USING VARIABLE VAU SIZE, WITH AVERAGE (DEFINED BY DISK MFG. AS 1/3 FULL) SEEK BETWEEN EACH VAU READ —

Phoenix

VAU (sect)	READ 16K (sec)	TRANS. TO TAPE CONT. (sec)	TOTAL (sec)
4	.960	.2	1.160
8	.600	.2	.8
16	.480	.2	.68

LVP - Quantum

VAU (sect)	READ 16K (sec)	TRANSFER TO TAPE CONT (sec)	TOTAL (sec)
4	1.3	.2	1.5
8	.8	.2	1.0
16	.54	.2	.74

Bruce Patterson m/s 1383

1/4" CARTRIDGE DRIVE BUSSINESS PLAN
COMPANY CONFIDENTIAL

GREG PELLETIER
2/16/82

KENNEDY 1/4" CARTRIDGE DRIVE

A) PRODUCT NEED

To this point, flexible disk drives have served the multiple purpose of being the archive and interchange medium as well as the backup device for the 4 and 8 mbyte Winchester drives presently utilized. However, the inclusion of the 16 and 32 mbyte Quantum Winchester disk drives into our product lines requires a faster, higher capacity device to provide a cost effective, reliable backup which minimizes customer media handling and cost.
Specific areas of use are: 1) 2200 LVP 2) OIS 120 and 3) VS25 and 4) Tempest applications; all of which have need for high capacity disk backup.

B) PRODUCT DESCRIPTION:

The product is the Kennedy Model 6455 1/4" tape cartridge drive utilizing serpentine recording and 4 tracks recording at 6400 Bits Per Inch. The drive is a DC only device thus meaning that there are no 50/60 Hz implications. Serpentine recording may be described as the reading/writing of data along one track in one direction only until the end of the track has been reached. Data is then read/written along the adjacent track in the opposite direction and so forth until all tracks have been used. The drive is a start/stop device which operates in read/write mode at 30 ips and rewind/search mode of 90 ips. Unlike the true streamer type drives available on the market which can be used only as a backup device due to their positioning method, this device may be used as a true tape drive since individual files and data blocks can be addressed in the same way 1/2" reel to reel tape drives are utilized. This feature allows potential useage as an archive device for word processing documents as well as for useage as a software distribution medium. For example, today the VS operating system requires 17 diskettes and these must be shipped with each system.
The drive utilizes a tape cartridge which which is available in lengths of 300, 450 and 600 feet. However, the 600 foot cartridge is manufactured by 3M and is not readily available in large quantities. The other two cartridges have been in production for several years and is produced by two vendors: 3M and Verbatim both of which are suppliers for other magnetic media devices. Capacity of the drive as well as backup time is based on the block length utilized in the drive and both are shown in Figures 1 and 2 being based on a 450 foot tape.
Kennedy produces basically two models of the same drive with the difference being only physical size. The unit as originally presented to us had the same height and width dimensions as a floppy but was significantly longer tham a floppy. This additional length was caused by board size only. However due to many requests to produce a unit of floppy footprint size, Kennedy has modified boards to fall in this physical size. The longer version of this drive has been in production for several months at the rate of 30 units per week and with over 800 units in the field. This production rate is not a manufacturing limitation but instead an order constraint.

C) SPECIFICATIONS

Recording Density	6400 BPI
Number of Tracks	4
Recording Head	Serpentine, Read after Write, Selective Erase
Record Format	Single Track, Serial
Normal Tape Speed	30 IPS
Rewind/Search Tape Speed	90 IPS
Start/Stop Time	
Read/Write	25 Msec
Rewind/Search	75 Msec
Start/Stop Displacement	
Read/Write	0.38 Inches
Rewind/Search	3.38 Inches
Error Rate	
Soft	1 Error in 10^{10} Bits
Hard	1 Error in 10^{11} Bits
Data Transfer Rate	192,000 Bits Per Sec (24,000 Bytes Per Sec)
Instantaneous Speed Variation	+/- 3%
Long Term Speed Variation	+/- 2%
Write	Serial - Bidirectional
Read	Bidirectional
Power Requirements	5 VDC +/- 5%: 2.5A Average, 5A Peak
	24 VDC +/- 25%: 1.5A Average, 3A Peak
Total Power Consumption	21W Idle, 27 W Read/Write 39 Watts Rewind/Search
Interface	TTL Low - True
Weight	8 Lb
Dimensions	8.50 in W X 4.5 in H 14.25 in D
MTBF	Greater than 5000 Hours
MTTR	Less than 30 Minutes
Price	$850

D) RISKS

1) Technical Risks

There is very little technical risks on our part in the area of this drive. The design of this drive is based on historical tape technology methods and is a consistent with bit and track densities achievable with cartridge being utilized. Also, controller design is simplified and software impact is minimized by having chosen a start/stop device over a streaming device since significant throughput problems are realized if system level solutions are not implemented to keep the drive busy.

2) Marketing Risks

We have two areas of exposure in this product: Time and price.

i) Time

Since deliveries of the Quantum drives is not gated by delivery of the backup device, there will be higher capacity systems in the field with no means of backup other than floppy. Thus it is important to bring begin delivery of this device as quickly as possible such as to minimize our exposure in this backup area.

in) Price

Pricing will be an extremely sensitive area. Since this drive will primarily be used for backup, it is expected that customer demand for the drive will very elastic over a small variation in drive price. Thus the drive price should be held to a minimum to maximize customer usage.

E) PACKAGING

The Kennedy drive will be packaged in a standalone box which will contain a switching power supply, drive and a controller. The controller will come in two flavors: 1) A single serial controller for the OIS and VS will be utilized and will physically reside in same package as the drive with interconnection via a data port. 2) The 2200, on the other hand, will attach to the drive via a parallel connection with the controller residing in the CPU. Due to the particular requirements of the Tempest product; packaging considerations must be addressed separately.

F) SCHEDULE

Vendor Selection Complete	12/15/81
Functional Specification	1/22/82
Controller Design Begins	2/12/82
Build 100 Pilot Boards	8/20/82
Announce Product	7/7/82
First Customer Shipment	11/4/82

G) COMPETITION

There are many smaller system houses who have announced subsystems utilizing

some form of low cost tape backup. However, there are only two large vendors who have announced a backup device as listed below:

1) Data General
Model Number: 6125
Type: 1/2" Reel to Reel streaming tape drive
Capacity: 25 Mbyte
Manufacturer: Data General
Price: $6,800

2) Hewlett Packard
Model Number: Tape drive is packaged with either 27 or 64 mbyte 14" Winchester drive priced as shown:

27 mbyte Disk Drive with cartridge drive	$12,500
64 mbyte Disk Drive with cartridge drive	$15,000

Type: 1/4" Cartridge Start/Stop
Capacity: 67 Mbytes
Manufacturer: 3M
Comments: This drive utilizes a preformatted cartridge only manufactured by 3M and not readily available in large quantity.

3) IBM - Have been shipping 64 mbyte 8" fixed media product for several years utilizing floppy disks housed in a magazine type device.

H) FORECAST
In order to forecast this device it is necessary to make the following assumption:
1) 2200
   a) That 20% of all 16 mbyte sales will utilize a Kennedy cartridge
   b) That 40% of all 32 Mbyte sales will utilize a Kennedy cartridge

2) OIS
   a) That 20% of all 16 mbyte sales will utilize a Kennedy cartridge
   b) That 40% of all 32 mbyte sales will utilize a Kennedy cartridge

3) VS
   a) That 40% of all 34 mbyte sales will utilize a Kennedy cartridge
   b) That 60% of all 68 mbyte sales will utilize a Kennedy cartridge

4) Tempest: Product volume not readilty definable at this time.

I) COST/PRICING

Drive Cost:	$850
Estimated Packaging Cost:	$95
Estimated Power Supply Cost:	$150
Estimated Controller Cost:	$350
TOTAL ESTIMATED SYSTEM COST	$1445
Burdened at 115%	$217
TOTAL ESTIMATED BURDENED COST	$1662
Proposed Pricing:	$4500
GROSS PROFIT MARGIN	63%

I) FUTURE PRODUCTS

Kennedy is in the development stage of a higher capacity 1/4" start/stop cartridge tape drive; the Model 6470. The drive will have approximately 40 mbytes of capacity and will utilize the same interface as the device available today, and will have the capability of being able to read cartrdiges written on Model 6455 drives.

WANG LABORATORIES, INC.

Company Confidential

Subject: Cassette Tape Formats

To: Cassette File

From: Sheila Currier
Ken Kelly

Date: 03/18/82

Representatives from the OIS, VS, and 2200 groups within Wang decided to adopt a universal format to be used on Magnetic Cassette Tapes. The format had to be flexible enough to allow for differences in file naming conventions and record allocation, as well as for future expansion of each product line.

This Wang Standard Tape Volume Format will aid in direct data portability between the OIS/VS/2200 groups. This document outlines the Wang Standard Tape Volume Format and the Tape Data Format.

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Wang's Standard
Tape Volume Format (TVF)

1.1 Definitions

1.1.1 Label Blocks

Label blocks are symmetric about the tape volume and about files. There are two types of labels - Volume and File. The first label on the tape will be the VHDR (volume header) label and the last label on the tape will be the VEND (volume end) label. These label blocks are used to give the application programs some information about the tape such as the tape's volume name, creation date, and the length of the tape. If the VHDR label block is not found within 3ft of the beginning of the tape (BOT) the tape is considered not initialized.

The File label blocks are used to give information that is more "file oriented" such as the file name and the number of blocks in the file. Also information about the format used to record the file data is found here. This information is used to retrieve the data from the tape. A FHDR (file header) label will be written before each file and a FEND (file end) label will be written at the end of each file. The FEND block will contain the number of blocks in the file.

1.1.2 Tape Marks

Tape Marks (File Marks) will identify the next physical block as a label block. This will aid in scanning the tape during file read/write.

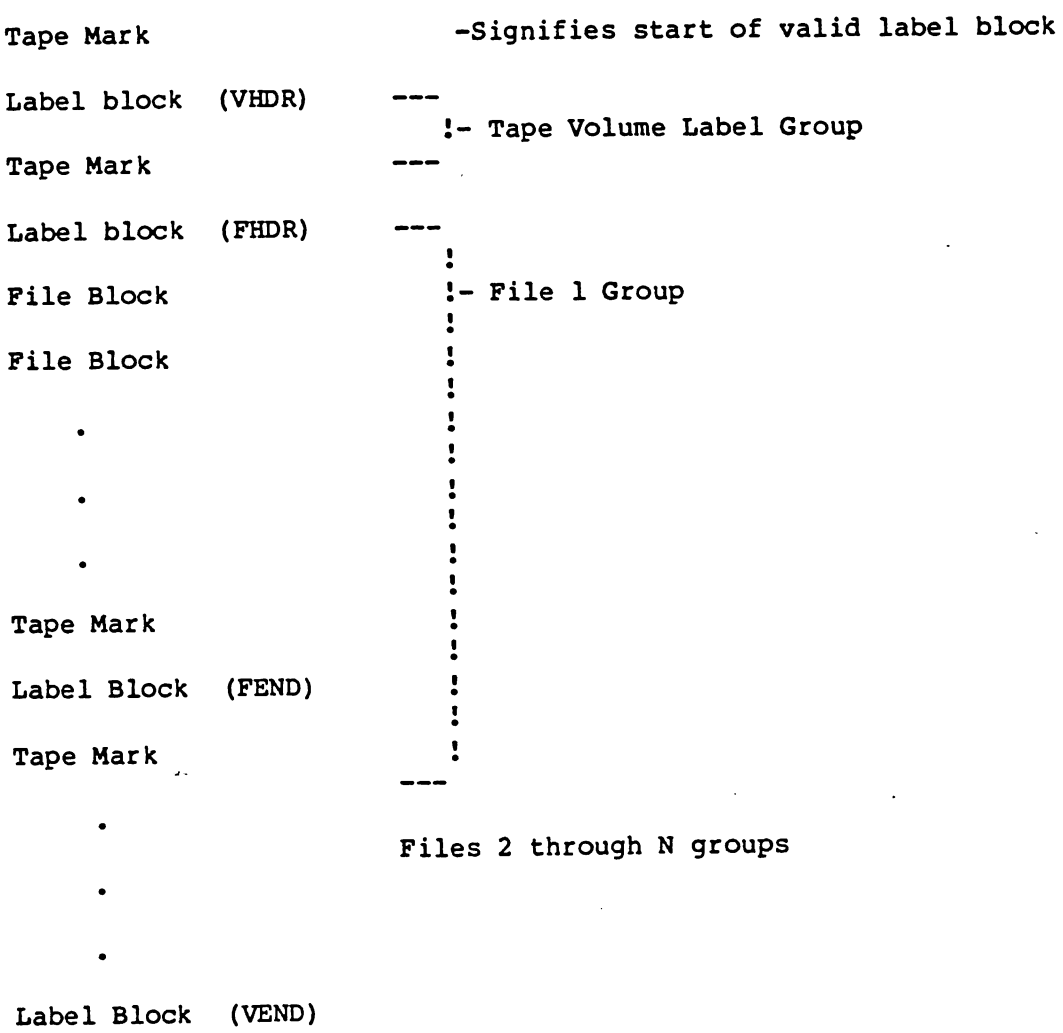
1.1.3 Multi-Tape Files

If a file is being written to tape when a Logical End Of Tape (LEOT) is reached (track 3), the file must be continued onto another tape. An FEND label block, containing a non-zero "Continuation Flag" to indicate that the end of the file is on anther tape, must be written. Also a VEND label block must be written.

The first FHDR of the next tape for that continued file will contain an incremented "Tape File Section" number. See "File Labels" for more information.

1.2 Tape Structure

The tape will be structured as follows:



where:

each Label Block is 256 bytes
each File Block is 2 - 17 K bytes (hardware restrictions).

1.3 Volume Labels

The volume labels will be formatted as follows:

Bytes	Size	Description
0-3	4	VHDR or VEND (ASCII) = four byte area defines the label block. The first label block of the tape volume is the Volume Header (VHDR) label block. The last label block on the tape will be called the Volume End (VEND) label block.
4-11	8 LJ, padded with zeroes	Tape Volume Name (ASCII). A Tape identification containing up to 8 ASCII characters.
12-13	2 17K	Max Tape Block Size (0000 - FFFF hex). The maximum number of bytes that can be written to one tape block. This will usually be a hardware constraint.
14-19	6	Date Tape Volume Initialized ddmmyy (ASCII)
20-25	6	Time Tape Volume Initialized hhmmss (ASCII)
26	1	Label Format Version ID (01 - FF hex). This number identifies this Volume/File label block's "release number". It will will start as '01' for the first Volume/File label block format. As fields are added to either the Volume label block or the File label block, this number will change.
27-34	8	Access Control word (unused for now). Any tape security password or access control number can be stored here.
35	1	Length of Tape. 1 = 300' 2 = 450' 3 = 600'
~~36-255~~		~~Future definition*~~
36-43		PREVIOUS VOLUME (HEADER) } LJ, pad with 00
44-255		NEXT VOLUME (TRAILER) }

* For definition of these fields contact Ken Kelly or OIS Development.

1.4 File Labels

The file labels will be formatted as follows:

Bytes	Size	Description
0-3	4	FHDR or FEND (ASCII) = four byte area defines the label block. The first label block of each file is the File Header (FHDR) label block. The last label block of each file will be called the File End (FEND) label block.
4-5	2	Tape File Sequence number. Numbers 0001-FFFF hex are used here. The first file of this tape will have a File Sequence number of 0001. The second file of this tape will have a 0002 etc.. This number is tape oriented only and is not affected by the Tape File Section number.
6	1	Tape File Section number (for continuing volumes). Hex numbers 1-FF are used here. This byte informs the application programs that previous sections of the file are located on other tapes. The byte is incremented for each tape used to contain the file.
7-14	8	Tape Volume Name of the tape volume which contains the start of this file. This is needed for files which use many tapes. This could contain the current tape volume name if the start of this file is on this tape.
15-20	6	Date Tape File Created ddmmyy (ASCII)
21-26	6	Time Tape File Created hhmmss (ASCII)
27-29	3	Tape File Block Count (used in FEND only). This is the number (000000 - FFFFFF hex) of blocks contained in the file just written. This count is tape oriented and reflects only the number of blocks following the last FHDR label block. It does not define the total number of blocks of the original file.

The following bytes allow extra flexibility within the Label Block structure.

30	1	Record Format (00 - FF hex) reserved as follows: x'01' - x'10' OIS group x'11' - x'20' 2200 group x'21' - x'30' VS group x'FF' Wang standard record size. This byte will help identify the use of the Block Size and the Record Size bytes which follow.
31-32	2	Tape File Block Size for this file (hex). A "Block" is a data area which can be read or written by one read or write command.
33-34	2	Tape File Record Size for this file (hex). A "Record" is a section within a block which contains actual data. A block size of 2K for example, may contain 8 256 byte subdivisions or "8 Records". Another implementation may be that a block contains block identifiers or data identifiers and a record or records. This is to say that a record size need not be an integer division of the block size.
35	1	System ID (00 - FF hex) reserved as follows: x'01' - x'10' OIS group x'11' - x'20' 2200 group x'21' - x'30' VS group Do not use x'FF' Wang Standard Tape File Format. This byte will help determine the type of system which wrote this file: VS-100,VS-25 etc. OR determine that the tape files have been written using Wang Standard Tape File Format.
36-43	8	User Defined Bytes 1-8. Some of these bytes are defined for the Wang Standard Tape File Format.
44	1	Continuation Flag used in the FEND label block. Defined as : 00 hex = End of entire file FF hex = File continued onto another Tape Volume.

NO CURRENT 'STANDARD' FILE → FORMAT

The File Name starts here :

45-52	8	System name: 8 ASCII characters left justified padded with x'00'.
53-60	8	Volume name: 8 ASCII characters left justified padded with x'00'.
61-68	8	Library Name: 8 ASCII characters left justified padded with x'00'.
69-~~184~~ 196		File Name terminated by x'00'.
~~185~~ 197-255		Future definition*

* For definition of these fields contact Ken Kelly or OIS Development.

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Wang's Standard
Tape Data Format (TDF)

The Wang Standard Tape Data Format uses the Tape Volume Format as described in the previous sections. The purpose of the standard data format is to allow complete data transportability between the various Wang systems. For example this will allow files written onto a tape by VS to be read from the tape by the 2200 as though it were written by the 2200. This means that all file storage/retrieval programs will normally be looking for the data in this format. Any application programs which handle multiple format types must handle the Wang format as the "normal" type. This standard must also be adopted by new systems using tape as a file storage media to assure media compatibility with all other Wang products.

TO: Distribution

FROM: John Thibault

SUBJ: MARKET REQUIREMENTS - 1/4 INCH TAPE CARTRIDGE

DATE: May 3, 1982

The following outlines the "major" product applications for the 1/4 inch tape device currently under development. These requirements apply to both the 2200 and VS product lines. Obviously, Wang cannot force a customer to use a device in which they purchased for any specific application. In addition to the base functionality which will allow this device to be at minimum, a functional tape drive, we must offer the utilities specific to this device which allows for a "user friendly" interface to the systems.

1. Back-up - Without doubt, the primary use of this device will be for system back-up. We highly recommend users back-up their systems on a regular basis for protection. With the availability of high capacity (10-15 MEG) back-up device, the time and effort required to back-up fixed disks are reduced. The basic functionality required is twofold: 1) The user must have the ability to back-up and restore a complete disk surface regardless of content; 2) The user must also have the ability to selectively back-up or restore any portion of a disk surface. This could be defined in any number of ways (i.e. volume, library, file or combination thereof) and driven by a reference file or procedure. These functions must be executable at the users discretion in either interactive or batch mode.

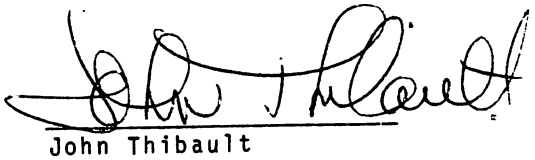
2. SOFTWARE TRANSPORT - The user must have the ability to effectively use the cartridge as a transport medium. This could be in either of two modes, alike-type system to system (i.e. VS to VS) or product line to product line (i.e. 2200 to VS) in any combination. This assumes a compatible tape format, and it is understood the VS will not support a compatible format until early Spring 1983.

3. ARCHIVING - Since all Wang systems support word processing, it is highly desirable to have the ability to create WP archive tapes. This must be in a compatible archive format so all systems can read/write WP archive files without USER conversion.

4. SYSTEM IPL - It's worth noting that due to the transfer speed of tape devices, and as long as Wang systems continue to offer system diskettes, there is not a requirement to IPL systems from 1/4 inch tape.

5. SOFTWARE DISTRIBUTION With the capacity available today, and the anticipated capacity increases in the near future the tape cartridge presents itself as a very attractive software distribution medium. A utility should be developed for the purpose of formatting and creating tapes for distribution. This would be used internally by our software distribution group and major accounts/vendors/system houses for their own distributions.

The base functionality mentioned above should cover most functions provided by a diskette, except system IPL. This outlines product marketing primary requirement. I am sure there are many uses/applications for this device not listed in this document which should also be considered. Any input would be appreciated.



John Thibault

0056S/EMS

WANG LABORATORIES, INC., ONE INDUSTRIAL AVENUE, LOWELL, MA 01851 • TELEPHONE (617) 459-5000, TWX 710-343-6769, TELEX 94-7421

WANG

TO: Distribution

FROM: Scott Tagen

SUBJ: $GIO commands for 1/4" Cartridge Tape Controller

DATE: 01/11/83

This document represents the final $GIO commands for the 2229 cartridge tape drive.

Distribution:

Neeraj Sen
Pete Seymour
Max Blomme
Bruce Patterson
Jerry Sevigny

Need on VP, as well as, MVP?
Should user see any of this?
Will manual describe when to use commands, as well as, what they are?
Flag

2229 $GIO commands

COMMAND	hex code	
Hard Reset	01	
Board status	02	
Rewind	03	
Load	04	
Unload	05	
Erase to end of track	07	
Space IBG	08	
Space reverse IBG	09	
Space File Mark	0A	
Space rev File Mark	0B	
Read	0C	
Write	0D	
Write File Mark	0F	
Erase IBG	12	
Endwrite	20	
Soft reset	30	
Error status	31	
Change write current	32	
Download	40	See note below
End download	41	

Any other commands will return ILLEGAL result (ret rn code = hex(01))

NOTE: Download and end download function only when operating out of PROM. Soft reset, hard reset and board status function out of both PROM and RAM. All other commands function out of RAM only.

The default address for the 2229 is 018.
All response codes are in hex unless otherwise indicated.

HARDWARE RESET

This command functions identical to a power on sequence. The microcode will have to be downloaded after the powerup diagnostics complete (see DOWNLOAD).

CBS 01

Note that the CBS command does NOT wait for ready. The controller will go busy until the powerup diagnostics are complete.

$GIO/018 (4501)

BOARD STATUS:

WR/CBS x'02'

WR/IBS xx # of status bytes to follow (not counting this one)

WR/IBS

Controller PROM rev	2 ASCII
Controller software rev	2 ASCII
Tape drive PROM rev	1 hex
Controller switches	1 hex (low 4 bits valid)
Last TAPE STATUS 1	1 hex
Last TAPE STATUS 2	1 hex
Code execution	1 hex
Fault byte	1 hex
Powerup diagnostic list	6 hex

```
DIM S$30,R$16

$GIO/018 (4402 8701 1800 C340,R$)STR(S$,1,VAL(STR(R$,1,1)))
```

Explanation of Board Status bytes:

Controller PROM rev	This is the revision of the 2732A PROM mounted on the tape controller daughter board (L6 on 8259 board). It contains the powerup diagnostics, the bootstrap for downloading, as well as most of the board repair diagnostics.
Controller software rev	If the controller microcode has been loaded, this will reflect the current revision.
Tape drive PROM rev	This is the revision of the 2732 PROM located on the formatter board of the Kennedy tape drive.

Controller switches — Status of 4 bit switch on daughter board (SW1 on 8260 board).

Switch 4 is on for normal use, off for diagnostic use.
Switch 1 is on for a 4 track drive, off for 7 track drive
Switches 2 and 3 are not normally used at this time.

Last TAPE STATUS bytes — These 2 status bytes are from the tape drive, and represent the results of the last tape operation.

Status Byte 1

Bit	Meaning
80	Not ready
40	Drive fault
20	No cartridge
10	Formatter error
08	Command error
04	Parity error
02	Length error
01	Data error

Status Byte 2

Bit	Meaning
80	Logical load point
40	Logical end of tape
20	File mark detected
10	Write protected
08	End of tape
04	Track bit 2
02	Track bit 1
01	Track bit 0

Code execution — 00 = prom, 01 = ram

Fault byte

If the controller response to a command is Drive/controller fault, hex (08), this byte can be checked to see what caused the fault.

DRIVE/CONTROLLER FAULTS:

decimal code	error description
11	CBSY true when no command executing
12	Control Request timeout (Cable not connected)
13	CBSY not set true after command strobe
14	Tape drive received command from controller with bad parity
15	Track status incorrect on track select command
16	Track select command failed
17	Track status incorrect on track select command
18	Track select command failed
19	Tape status byte 1 shows fault before LOAD or REWIND command
20	LOAD command failed
21	LOAD command did not bring tape to LLP
22	UNLOAD command failed
23	UNLOAD command did not bring tape to EOT
24	REWIND command failed
25	REWIND command did not bring tape to LLP
26	ERASE TRACK command did not bring tape to LEOT
27	ERASE TRACK command failed
28	SKIP FILE MARK command failed
29	SKIP FILE MARK REVERSE command failed
30	SKIP FILE MARK REVERSE command failed
31	SPACE IBG command failed
32	SPACE IBG REVERSE command failed
33	WRITE FILE MARK command did not detect File Mark
34	WRITE FILE MARK command failed
35	ERASE GAP command failed
36	Overflow of Kennedy parity errors
37	Repositioning error during write error recovery
38	Read error while repositioning tape
39	Error on read (not Data Error)

Powerup diagnostic list	6 bytes of error information, only valid if Fault byte is x'0A' (dec 10)

NOTE: Ram parity error will flash all lamps on drive and lamp on controller. This condition can be cleared only by resetting the controller.

REWIND:

WR/CBS x'03'

WR/IBS
- 00 Operation OK
- 03 Drive not ready
- 05 Write results pending
- 08 Drive/controller fault

$GIO/018 (4403 8701,R$)

Rewind will position tape at Logical Load Point on the first track, clear all caches, and wait for a new command. Note that a LOAD command is not required after a rewind.

LOAD:

WR/CBS x'04'

WR/IBS
- 00 Operation OK
- 03 Drive not ready
- 05 Write results pending
- 08 Drive/controller fault

$GIO/018 (4404 8701,R$)

LOAD causes the tape formatter to perform a self-test, followed by a tape tensioning procedure. No other commands (except STATUS, RESET and ERROR STATUS) can be executed until a LOAD is successful.

UNLOAD:

WR/CBS x'05'

WR/IBS
- 00 Operation OK
- 03 Drive not ready
- 05 Write results pending
- 08 Drive/controller fault

$GIO/018 (4405 8701,R$)

UNLOAD causes a fast forward to the end of tape, after which the tape cartridge can be removed.

ERASE to end of track:

WR/CBS x'07'

WR/IBS	00	Operation OK
	02	Out of tape
	03	Drive not ready
	04	Write protected
	05	Write results pending
	08	Drive/controller fault

$GIO/018 (4407 8701,R$)

The tape is erased from the present position to the end of the track.

SPACE IBG:

WR/CBS x'08'

WR/IBS	00	Operation OK
	02	Out of tape
	03	Drive not ready
	05	Write results pending
	07	File mark detected
	08	Drive/controller fault

$GIO/018 (4408 8701,R$)

The tape will position itself to the next Inter-Block Gap. If a File Mark or End of Tape is encountered, it will be reported.

SPACE REVERSE IBG:

WR/CBS x'09'

WR/IBS	00	Operation OK
	02	Out of tape
	03	Drive not ready
	05	Write results pending
	07	File mark detected
	08	Drive/controller fault

$GIO/018 (4409 8701,R$)

This command is same as SPACE IBG, except that tape moves in reverse direction.

SPACE FILE MARK:

WR/CBS x'0A'

WR/IBS	00	File mark found
	02	End of Tape
	03	Drive not ready
	05	Write results pending
	08	Drive/controller fault

$GIO/018 (440A 8701,R$)

This command will advance to tape to the next File Mark, or end of tape, whichever comes first.

SPACE FILE MARK REVERSE:

WR/CBS x'0B'

WR/IBS	00	File mark found
	02	Out of tape (at beginning of tape)
	03	Drive not ready
	05	Write results pending
	08	Drive/controller fault

This command is same as Space File Mark, except tape moves in reverse direction.

$GIO/018 (440B 8701,R$)

READ RECORD:

WR/CBS x'0C'

WR/IBS
- 00 Read successful
- 02 Out of Tape
- 03 Drive not ready
- 05 Write results pending
- 06 Data error
- 07 File Mark detected
- 08 Drive/controller fault

(Operation continues only if previous byte was 00)

WR/IBS High byte of byte count
WR/IBS Low byte of byte count

WR/IBS data block

NOTE: Read data array must allow for maximum record length that is written on tape

```
$GIO/018 (440C 8701,R$)       If STR(R$,1,1) = hex (00) then continue

$GIO/018 (8702 8703,R$)       Get record byte count

$GIO/018 (1800 C340,R$) STR(A$(),1,VAL(STR(R$,2,2),2))
```

WRITE:

WR/CBS x'OD'

WR/OBS High byte of block count
WR/OBS Low byte of block count

WR/IBS
00	OK
01	Illegal length
02	End of Tape
03	Drive not ready
04	Write protected
05	Write results pending
08	Drive/controller fault

Operation continues only if previous byte was 00

WR/OBS Data Block

Write tells the controller to accept a new block of data. The tape controller can cache two blocks of data in order to allow overlap of disk reads and tape writes. Write commands will be accepted continuously until either an error occurs or the end of tape is reached. The block length can be from 2 bytes to 16386 bytes. Any other length will generate an ILLEGAL response.

```
B = length of record (2 to 16386 bytes)
STR(R$,2,2) = BIN(B,2)                    convert byte count to hex
$GIO/018 (440D 4220 4230 8701,R$)         operation continues if STR(R$,1,1)
                                          = hex (00)

$GIO/018 (1300 A000,R$)STR(A$(),1,VAL(STR(R$,2,2),2)) transfer data
```

NOTE: The last write command must be followed by an ENDWRITE command. Also, if the response byte is 05 (results pending), the next command MUST be an ENDWRITE command.

WRITE FILE MARK:

```
WR/CBS   x'0F'

WR/IBS   00   OK
         02   End of Tape
         03   Drive not ready
         04   Write protected
         05   Write results pending
         06   Data error
         08   Drive/controller fault

$GIO/018 (440F 8701,R$)
```

ERASE IBG:

```
WR/CBS   x'12'

WR/IBS   00   OK
         02   End of Tape
         03   Drive not ready
         04   Write protected
         05   Write results pending
         08   Drive/controller fault

$GIO/018 (4412 8701,R$)
```

ENDWRITE:

Endwrite terminates a sequence of 1 or more write commands by requesting the final results as well as any blocks unwritten (in the case of an error condition). Once a write command has been accepted, no other commands except additional writes or a reset will be accepted until an endwrite is performed.

```
WR/CBS   x'20'

WR/IBS   00        All writes successful
         02        End of tape
         03        Drive not ready
         06        Data error
         08        Drive/controller fault

WR/IBS   xx        Number of blocks unwritten

$GIO/018 (4420 8701 8702,R$)
B = VAL(STR(R$,2,1))     B = number of blocks not written
```

Not on MVP.

SOFTWARE RESET

The software reset will terminate any operations in progress, clear all caches, and clear the tape formatter. This is identical to the HARDWARE RESET except that the microcode in the controller is not cleared. Note that if the 2200 RESET key is pressed in the middle of communication to the tape controller, a HARDWARE RESET may be the only way to re-establish communications.

WR/CBS 30 $GIO/xyz (4530,R$)

The controller will respond by going busy until all the above operations are complete.

ERROR STATUS:

WR/CBS x'31'

WR/IBS xx # of status bytes to follow (not including this one)

WR/IBS	Write retries (last write)	1 hex
	Read retries (last read)	1 hex
	Accumulated write retries	2 hex
	Accumulated read retries	2 hex
	Tape to Controller parity errors	1 hex
	Controller to tape parity errors	1 hex

All error information is cleared after taking error status.

CHANGE WRITE CURRENT:

WR/CBS x'32'

WR/IBS	00	Command complete
	03	Drive not ready
	05	Write results pending
	08	Drive/controller fault

The currently available tape cartridges are DC300 (300') and DC300XL (450'). If and when 600 foot cartridges are available, the write current will be different. The tape drive defaults to the 'normal' current for 300 and 450 foot tapes. Executing the CHANGE WRITE CURRENT command will allow 600 foot tapes to be used. A SOFT RESET or HARD RESET will change the current back to 'normal'.

2229 $GIO commands

These 2 commands only function when the controller is operating out of PROM. The controller can always be brought back to the PROM code by executing a HARD RESET.

DOWNLOAD:

WR/CBS x'40'

WR/OBS Address of data (high byte, low byte)

WR/OBS # of bytes

WR/OBS data block

The download sequence will repeat for all sectors of the microcode data file.

END DOWNLOAD:

WR/CBS x'41'

This command terminates the download routine and starts code execution at the start of ram (x'1000').

SUGGESTED DOWNLOADING PROCEDURE:

Controller status should be read to insure that the power up diagnostics passed (see BOARD STATUS command)

```
10 DIM R$16,X$2,X1$3,X$(4)60,D$3
20 LINPUT "Disk Address ",D$                get disk address
30 SELECT#1,[D$]                            select disk
40 LIMITS T#1, "@2229",A,B,C,D              check that microcode file is on disk
50 IF A =2THEN60                            else error
60 DATALOAD DC OPEN T#1, "@2229"            open data file
70 DATALOAD DC #1, X$,X1$,X$()              read data
80 IF END THEN 150                          jump if end of file
90 IF STR (X$,1,1) = HEX(01) THEN 120       jump if data
100 REM else record is comment - X$() can be printed if desired
110 GO^TO 70
120 STR(R$,1,2)=X1$                         starting address
130 STR(R$,3,1)=STR(X1$,3)                  byte count
140 $GIO/018 (4440 4210 4220 4230 1800 1300 A000,R$)
    STR(X$(),1,VAL(STR(X1$,3))):GO^TO 70    send data

150 $GIO/018 (4441,R$)                      send 'end download'
```

Board status should then be read to check if code is now executing out of RAM.

2229 Diagnostic Test

This test will exercise the 2229 controller and tape drive in a manner similar to the actual tape utilities.

WARNING:

This diagnostic will overwrite any data on the tape!!!

Overview of diagnostic:

The tape is filled with random length records of random data. The tape is then completely read. Any errors found will terminate the test. The test will run continuously until either stopped by the user (by pressing RESET) or an error occurs. This test should be left running overnight if possible. The failure messages and test conditions are as follows:

'Unexpected end of tape on read'

This message indicates that the number of records written on the tape were not equal to the number of records read from the tape. This would be either a bad controller or tape drive.

'Error on tape load'

The tape drive is offline, powered off, or a cartridge is not inserted. Also, a bad controller, tape drive; or unconnected cable could cause the problem.

'Error on write'

An error occurred during a tape write. This would probably be a fault with the tape drive or tape cartridge, or possibly the controller.

'Error on read'

This error indicates that a record could not be read within the maximum number of retries. A bad tape drive would be the most likely problem.

'The number of bytes read is not equal to the number of bytes written'

This is most likely a controller problem.

'Data compare error'

This is most likely a controller problem.

'Illegal record length'

A record was read which was outside the range of records written to the tape. The controller or tape drive would be the most likely suspects.

Error messages also may produce an error or result byte (i.e. ERROR 3 ON TAPE LOAD). Some of the errors should never happen, but they are listed here anyways.

ERROR 1	ILLEGAL COMMAND
ERROR 2	OUT OF TAPE
ERROR 3	TAPE NOT READY
ERROR 4	TAPE WRITE PROTECTED
ERROR 5	WRITE RESULTS PENDING
ERROR 6	DATA ERROR (read or write)
ERROR 7	TAPE FILE MARK FOUND
ERROR 8	DRIVE CONTROLLER FAULT

The test is named '2229DIAG'. Copy the file to the disk which contains the 2229 utilities (this test MUST be on the same disk, as it uses some of the files provided by the utilities). Select the disk which contains the utilities (i.e. SELECT DISK D11), and type LOAD RUN "2229DIAG" (press RETURN). The test will start up in the same way as the 2229 utilities. The operator will be warned about the test destroying the data on the tape, and prompted to press SF '00 to start the test.

TECHNICAL SERVICE BULLETIN
SECTION: SoftWare Technical

NUMBER: SWT 6032 REPLACES: _____ DATE: 02/26/86 PAGE 1 OF 1

MATRIX ID.: 4303 PRODUCT/RELEASE# 2200 2229 Cartridge Tape Drive

TITLE: 2229 CARTRIDGE TAPE DRIVE BACKUP/RESTORE

PURPOSE:

To inform the field of known problem with the 2229 cartridge tape drive.

EXPLANATION:

There is a known intermittent problem with the 2229 Controller board, when restoring from a backup tape. If the condition exists, then during the restore one of several errors may occur. They could be intermittent error code '8', Tape Read Error, Label is not 256 bytes, Data not on Page or any other error during system backup. When restoring from the 2229, the data will appear to be garbage even though the original backup appeared to run without a problem, but now the data has random 00's or FF's in it.

ECO has been processed, so that more boards (#210-8260) can be updated & sent out.

GROUP: VS/2200 Software Support MAIL STOP: 0115

WORKSTATION 118 - USER PEM - PAUL MORIN X-60350

10:19:05 AM MONDAY MAY 20, 1985

```
**********************************************************************************
****      1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
**********************************************************************************
* *                                                                              * *
* 1*  VS EXPRESS:  DISPLAY A MEMO                                                * 1*
* 2*                                                                             * 2*
* 3*  TO:       PAUL MORIN VS100-1                                               * 3*
* 4*  FROM:     KEN MAILLOUX VS100-1                                             * 4*
* 5*  SENT:      1/15/85     9 29                                                * 5*
* 6*  SUBJECT: 2229 UTILITIES CREATE RE                                          * 6*
* 7*                                                                             * 7*
* 8*                                                                             * 8*
* 9*    ------------------------------------------------------------------------ * 9*
*10*       IN THE 2229 CARTRIDGE UTILITIES: CREATE REFERENCE FILE PROGRAM WILL   *10*
* 1*    APPEAR TO ACCEPT MORE THAN 1000 FILES. HOWEVER THE REFERENCE FILE THAT IS * 1*
* 2*    ACTUALLY CREATED WILL CONTAIN ONLY THE FIRST 1000 FILES CHOSEN.  WHEN THE * 2*
* 3*    UTILITY "BACKUP FILES TO TAPE" IS SUBSEQUENTLY USED WITH THE BOGUS       * 3*
* 4*    REFERENCE FILE, ONLY THE FIRST 1000 FILES WILL BE RECOVERED.  CIRCUMVENTION: * 4*
* 5*    USE "BACKUP PLATTER TO TAPE" FOR NOW.  SCOTT TAGEN WILL BE SENDING US A FIX * 5*
* 6*    SHORTLY.                                                                 * 6*
* 7*    --------------- MESSAGE REPLY  FROM (KEN MAILLOUX VS100-1    ) ---------- * 7*
* 8*                                                                             * 8*
* 9*                                                                             * 9*
*20*                                                                             *20*
* 1*                                                                             * 1*
* 2*                                                                             * 2*
* 3*                                                                             * 3*
* 4*    ------------------------------------------------------------------------ * 4*
* *                                                                              * *
**********************************************************************************
****      1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
**********************************************************************************
```

(1/15) SAVE/PRINT
(^2) REROUTE
(4/5) PREV/NEXT MEMO
(8) DELETE MEMO
(^13) SPECIAL OPTIONS
(14/^14) INS/DEL LINE
(16/^16) RETURN/EXIT

WORKSTATION 118 - USER PEM - PAUL MORIN X-60850

10:18:56 AM MONDAY MAY 20, 1985

```
****************************************************************************************
****         1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
****************************************************************************************
*  *                                                                                *  *
* 1*  VS EXPRESS:  DISPLAY A MEMO                      (1/15)    SAVE/PRINT         * 1*
* 2*                                                   (^2)      REROUTE            * 2*
* 3*  TO:        PAUL MORIN VS100-1                    (4/5)     PREV/NEXT MEMO     * 3*
* 4*  FROM:      KEN MAILLOUX VS100-1                  (8)       DELETE MEMO        * 4*
* 5*  SENT:       1/15/85      9 29                    (^13)     SPECIAL OPTIONS    * 5*
* 6*  SUBJECT: 2229_TAPE_CARTRIDGE_____                (14/^14)  INS/DEL LINE       * 6*
* 7*                                                   (16/^16)  RETURN/EXIT        * 7*
* 8*                                                                                * 8*
* 9*   ---------------------------------------------------------------------------  * 9*
*10*       IN THE 2229 UTILITIES:                                                   *10*
* 1*            IF RECOVER PLATTER OPTION ENDS PREMATURELY WITH THE MESSAGE:        * 1*
* 2*                                                                                * 2*
* 3*               "DATA NOT ON PAGE BOUNDARY"                                      * 3*
* 4*                                                                                * 4*
* 5*            THE ORIGINAL BACKUP TAPE WAS WRITTEN INCORRECTLY WITH THE           * 5*
* 6*            BACKUP PLATTER UTILITY AND THE ERROR IS JUST NOW SHOWING UP.        * 6*
* 7*                                                                                * 7*
* 8*            THE PROBLEM INDICATES THAT THE CONTROLLER HAS AN INCORRECT          * 8*
* 9*            CHIP IN LOCATION 14.  IT SHOULD BE AN INTEL 40 PIN CHIP BUT         * 9*
*20*            SOME BOARDS ARE OUT THERE WITH AMD CHIPS.                           *20*
* 1*                                                                                * 1*
* 2*            ONE SECTOR OF DATA IS BAD ON THE TAPE AND IF IT IS ESSENTIAL        * 2*
* 3*            R&D WILL BE ABLE TO RECOVER IT FOR THE CUSTOMER.                    * 3*
* 4*   ---------------------------------------------------------------------------  * 4*
*  *                                                                                *  *
****************************************************************************************
****         1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
****************************************************************************************
```

```
WORKSTATION 118  -  USER PEM  -  PAUL MORIN X-60350

10:17:32 AM    MONDAY        MAY 20, 1985


**********************************************************************************
****          1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
**********************************************************************************
*  *                                                                             *  *
* 1*  VS EXPRESS:  DISPLAY A MEMO                          (1/15)   SAVE/PRINT    * 1*
* 2*                                                       (^2)     REROUTE       * 2*
* 3*  TO:       PAUL MORIN VS100-1                         (4/5)    PREV/NEXT MEMO * 3*
* 4*  FROM:     KEN MAILLOUX VS100-1                       (8)      DELETE MEMO    * 4*
* 5*  SENT:      1/15/85     9 31                          (^13)    SPECIAL OPTIONS* 5*
* 6*  SUBJECT: 2229 TAPE CASSETTES                        (14/^14) INS/DEL LINE   * 6*
* 7*                                                       (16/^16) RETURN/EXIT   * 7*
* 8*   ------------------------------------------------------------------------   * 8*
* 9*       PRICE OF THE CARTRIGES USED WITH THE 2229 IS $34.50                    * 9*
*10*       PART # 725-1227                                                        *10*
* 1*   ---------------- MESSAGE REPLY  FROM (KEN MAILLOUX VS100-1     ) ---------- * 1*
* 2*                                                                             * 2*
* 3*                                                                             * 3*
* 4*                                                                             * 4*
* 5*                                                                             * 5*
* 6*                                                                             * 6*
* 7*                                                                             * 7*
* 8*                                                                             * 8*
* 9*                                                                             * 9*
*20*                                                                             *20*
* 1*                                                                             * 1*
* 2*                                                                             * 2*
* 3*                                                                             * 3*
* 4*   ------------------------------------------------------------------------   * 4*
*  *                                                                             *  *
**********************************************************************************
****          1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
**********************************************************************************
```

```
WORKSTATION 118  -  USER PEM  -  PAUL MORIN X-60350

10:23:01 AM     MONDAY        MAY 20, 1985


**********************************************************************************
****          1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
**********************************************************************************
*  *                                                                             *  *
* 1*  VS EXPRESS:  DISPLAY A MEMO                                                * 1*
* 2*                                                                             * 2*
* 3*  TO:       PAUL MORIN VS100-1                                                * 3*
* 4*  FROM:     KEN MAILLOUX VS100-1                                              * 4*
* 5*  SENT:      1/15/85     9 15                                                 * 5*
* 6*  SUBJECT: 2229 FILE BACKUP FIX                                               * 6*
* 7*                                                                             * 7*
* 8*                                                                             * 8*
* 9*      A CUSTOMER WHO HAS LARGE DATA FILES AND CHOOSES FILE BACKUP INSTEAD OF  * 9*
*10*  PLATTER BACKUP CAN HAVE A PROBLEM.  IF THE FILES ARE LARGE ENOUGH TO SPAN  *10*
* 1*  TAPES THE RECOVERY WILL NOT WORK.  RECOVER FILES FROM TAPE WILL RECOVER THE* 1*
* 2*  FIRST TAPE CORRECTLY AND THEN PROMPT FOR THE SECOND TAPE.  THE USER LOADS  * 2*
* 3*  TAPE 2 AND THE ERROR MESSAGE "MOUNT FILE BACKUP, TAPE MOUNTED IS PLATTER  * 3*
* 4*  BACKUP" AND THE RECOVERY PROCESS (ABOUT 75% COMPLETE) CANNOT CONTINUE.    * 4*
* 5*                                                                             * 5*
* 6*      THANKS TO LEE AND SCOTT TAGEN(LEE SPOKE TO HIM ON A FRIDAY AND HE CALLED* 6*
* 7*                                LEE BACK FIRST THING ON A MONDAY AFTER WORKING* 7*
* 8*                                ON IT OVER THE WEEKEND) WE HAVE A FIX:       * 8*
* 9*                                                                             * 9*
*20*            PROGRAM IS 2229FR INSERT  GOTO 300: TO LINE 295.  IT WILL BE THE *20*
* 1*                FIRST STATEMENT IN THE LINE THUS SKIPPING THE OTHER SIX.     * 1*
* 2*                              YOURS TRULY IN MAGNETIC MEDIA,                 * 2*
* 3*                              K. DENIS MAILLOUX                              * 3*
* 4*  ------------------------------------------------------------------------   * 4*
*  *                                                                             *  *
**********************************************************************************
****          1         2         3         4         5         6         7         8 ****
**** 12345678901234567890123456789012345678901234567890123456789012345678901234567890 ****
**********************************************************************************

(1/15)    SAVE/PRINT
(^2)      REROUTE
(4/5)     PREV/NEXT MEMO
(8)       DELETE MEMO
(^13)     SPECIAL OPTIONS
(14/^14)  INS/DEL LINE
(16/^16)  RETURN/EXIT
```

2229 UTILITIES version 1.8
(Final release will be 2.0)

Scott Tagen
x77197
0455m
03/10/86

Version 1.8 of the 2229 utilities is now ready for internal test. Please DO NOT send it to anyone outside of the city limits of Lowell until it is officially released. Read the following pages before starting any testing. If you know of any other problems, let me know ASAP. The utilities disk has @MENU, etc. , so you can select the disk and type LOAD RUN to start.

Please test the following FIRST:

Run tape verification (2229VER) on all old tape backups, both File and Platter. The utility should run on all existing tapes. Any errors found will stop the utility. You may find that tapes written with controllers which were recently updated with the hardware fix may have unrecoverable read errors, or garbage records. Successfull completion will print the message 'Tape Verification Done - No Errors Found'. If you find any tapes which will not pass the verification test, save them and call me.

Run the tape diagnostic (a modified BUTEST41, if you know what that means). It will show any problems with your controller or drive. Note that it prints out the drive PROM revision - it should be 16.

Run Platter or File recovery on all old tape backups. The new recovery programs should run on old backups. Again, call me if you have any problems.

If all goes well, try the changes to 'Create Reference File'.

Finally, test the remaining utilities in any way you can. There are some additional menu picks which will NOT be on the 'real' release. You may use them for your testing purposes, but please DO NOT give them to customers or other field organizations . They are hacks which I used for my testing - they are very crude, and can easily crash due to user errors. They function as follows:

'File Compare' - compares 2 files, and displays them on the screen. Press a key to see the next 256 bytes.

'Another File Compare' - Doesn't stop on each screen - look fast at the 'Same/Not Same' message.

'Display tape records' - The tape microcode must be loaded, and a cartridge inserted for this to work. It will read and display the Volume and File labels, as well as the data records.

'Compare two platters (sector compare)' - Enter two platter addresses, and all sectors (up to the current catalog end of the reference platter) will be compared. Any sectors which differ will be printed on the screen.

'Compare all files on two platters' - The index is searched on the reference platter for all files on the disk. Each file is then compared to the test disk for existence, size, and data. Any descrepancies are displayed on the screen.

The following menu picks are primarily for my use - be careful if you play with them:

'Make uCode file' - You won't need this.

'Command exerciser' - (This is 'BU' in disguise). This allows one to exercise individual tape commands. You can play with it, but I don't know what you will gain.

'Copy files to floppy' - This is used for moving all of the tape related files to another disk. (I use it for backup during development). It will not expand files, so if you have problems, use '@MOVEFIL'.

The following changes have been made to the 2229 utilities since the first (only) release. If you know of any other problems, please let me know ASAP.

All files:

Copyright notices have been added
A comment 'version 1.8' has been added
Many messages have been made clearer (i.e. the message 'Read error' has been changed to 'Tape read error')

Platter Backup:

The 'System ID', byte 35 of the File Header and Trailer, has been changed from x'11' to x'12' in order to recognize tapes made with the new utilities.

Platter Recovery:

The System ID is checked for the proper range (x'11' to x'20) which identifies 2200 backups.

When recovering a platter, a bad block will not halt the recovery. The unrecoverable sectors will be displayed (i.e. sectors 128 to 191), and the user will have the option of skipping the block and continuing. The utility will pick up writing the disk at the correct spot upon finding the next good block.

After reading a record from the tape, the next tape read is initiated before writing the data to the disk. This makes platter recovery run faster.

Recover Individual File from Platter Backup:

The System ID is checked for the proper range (x'11' to x'20) which identifies 2200 backups.

If the disk image on tape had an index sector size of 1, only the first file name would be displayed when the user printed out the catalog index.

File Backup:

The 'System ID', byte 35 of the File Header and Trailer, has been changed from x'11' to x'12' in order to recognize tapes made with the new utilities.

If the number of sectors in a file was 1 greater than an even number of 16K blocks, the last sector (the trailer record) would not be written to the tape.

The file names contained on the tape were not being properly saved in the index (PROBE F400191).

File Recovery:

The System ID is checked for the proper range (x'11' to x'20) which identifies 2200 backups.

When recovering a file, a bad block will not halt the recovery. The unrecoverable sectors will be displayed (i.e. sectors 128 to 191), and the user will have the option of skipping the block and continuing. The utility will pick up writing the disk at the correct spot upon finding the next good block.

After reading a record from the tape, the next tape read is initiated before writing the data to the disk. This makes recovery run faster.

Create Reference File:

The disk index search for file names stops at the last index sector, rather than one plus the last sector (PROBE # F009109).

A maximum of 2048 files are saved in the reference file, rather than only the first 1000 (PROBE # F400190).

Special function keys 00, 01, 02, and 03 now allow the user to select all Active Programs, Active Data, Scratched Programs, or Scratched Data files to be included in the reference file (see attached screen dump).

Subroutines (Used by backup and recovery programs):

A controller reset was added to the tape load routine to handle a possible problem with a load being attempted when the tape drive was powered off.

The 'start look-ahead read' subroutine was added.

The read routine was modified to allow handling of bad blocks.

Records read from the tape are checked for an illegal length, which is a symptom of a problem in the tape controller. If an illegal length record is found, the following message is printed:

"Drive/Controller error - tape record too large"
"Tape controller possibly not latest hardware revision"

Tape Diagnostic:

A diagnostic has been added to allow users to test the drive/controller. This diagnostic has proven effective in determining whether the controller has the recent hardware problem (see attached screen dump).

Verify tapes:

This new utility allows the user to verify the integrity of either a recent or old backup. The complete tape (or tape set) is read, testing the following:

All file marks, labels, and data blocks can be read
All data blocks and labels are the proper length
All label information is intact and correct
The correct number of files are on the tape
The correct number of sectors and blocks are in each file
The correct number of tapes (in a tape set) are found

This utility works similar to a disk verify; the data are verified that they can be read, but are not compared to the disk data. This coupled with the tape diagnostic, should give the user confidence in his backups (See the sample screen dumps attached).

NOTE: Tapes written with controllers which did not have the recent hardware E.C.O. are likely to fail this test - in other words, this test will find problems with the tape writing process. If you have any questions regarding the results of this test, call me at 77197.

CREATE REFERENCE FILE

Disk address D22
Files selected 2

Name	Type	Sectors
.2229	P	9
.STARTD	SD	3
2229COMP	P	9
2229CONV	P	14
2229DIAG	P	16
2229DISP	P	48
2229FB	P	50
2229FR	P	62
2229FS	P	46
2229IFR	SP	46
2229PB	P	72
2229PC	P	10
2229PFC	P	24
2229PR	P	54
2229SAVE	SP	10
2229STRT	P	16

ACTIVE KEYS

Cursor Up/Down
Space/Backspace
Insert/Delete
A / Select all files
N / Next Screen
P / Previous Screen
SF '00 - All P
SF '01 - All D
SF '02 - All SP
SF '03 - All SD

Press RUN when done

NEW 'CREATE REFERENCE FILE'.

SF '02 key has been pressed - thus selecting all Scratched Programs.

(The printer is responsible for the indentation problem)

2229 Write/Read Diagnostic

Tape drive PROM rev 16

Tape	Pass	Mode	Record	Bytes	Data
	1	Write	11	9104	5060708090A0B0C0

Sample diagnostic program output

TAPE VERIFICATION

Tape volume name	SYSFILES	Tape Sequence number 01
Date	030386	819 sectors in backup
Time	112317	
Comments:	D20 SYSTEM FILES - PLATTER BACKUP - MAR 3, 1986	

Reading file number 1
D20 BASIC-2 platter backup

Sectors read	192
Blocks read	3

SAMPLE TAPE VERIFICATION

ON PLATTER BACKUP

TAPE VERIFICATION

Tape volume name SYSFILES
Date 030386
Time 111800
Comments: D21 SYSTEM FILES BACKUP - MARCH 3, 1986

Tape Sequence number 01
11 files in backup

Reading file number 5
@GENPART

Sectors read 280
Blocks read 5

SAMPLE SCREEN FOR TAPE VERIFICATION OF 'FILE BACKUP'