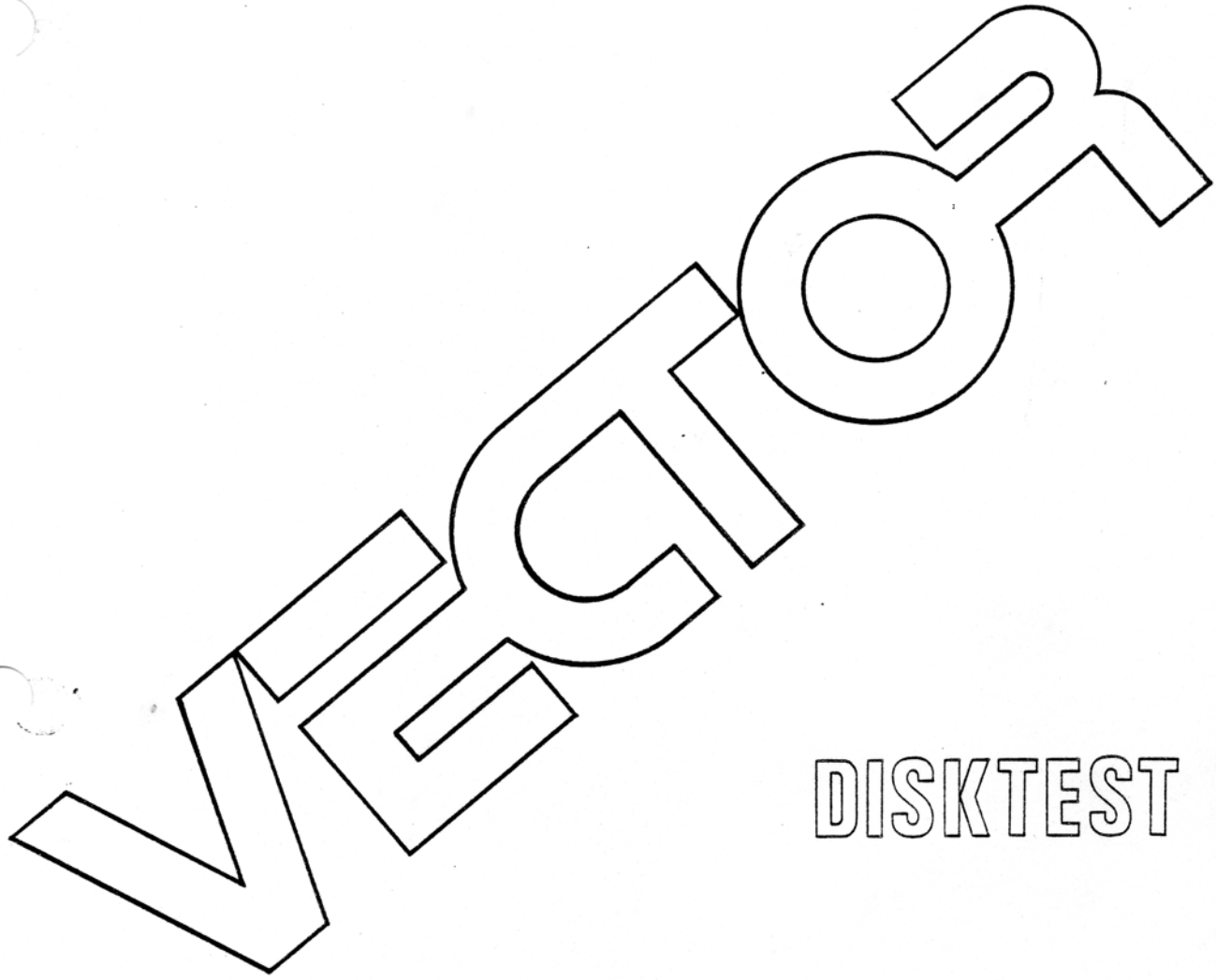

DISKTEST

User's Manual

DISKTEST

USER'S MANUAL

Revision A

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I. Introduction:

DISKTEST can be used for a variety of purposes. It can determine whether a system failure is due to a hardware or software problem. Additionally, DISKTEST is used for obtaining the required patterns when performing an alignment on the Tandon drive. DISKTEST can be run on either the 5 1/4 inch or 8 inch hard disk drive, as well as the 5 1/4 inch Tandon floppy. It will not run on the 2800, System B or VIP systems which use Micropolis drives.

II. Operating Procedure:

DISKTEST is a COM file used in conjunction with a compatible version of CP/M. The appropriate DISKTEST version is shipped with each system disk and can be used on any of the systems drives.

Caution: DISKTEST may alter data on the disk. For this reason be sure to back up all data before running this program. The following list of instructions will be based on a Vector Graphic 3005 system configuration. The prompts will be listed with the user response underlined.

1. Load DISKTEST into the system by typing DISKTEST following the CP/M prompt.

   A>DISKTEST

2. The program title along with warning information will appear on the screen followed by a prompt telling you to continue (press "Y") or to exit the program (press any other key or <RETURN>). Press "Y" to continue.

   Press "Y" to continue, or any other key to return to CP/M: Y

3. After entering "Y" the program will display a prompt requesting the TYPE OF DISK your system uses for the physical "0" drive (see Exhibit 2-1). Press "1" for the 5 inch Hard Disk.

   SELECT UNIT 0 DISK (0 = FLOPPY, 1 = 5" HARD, 2 = 8" HARD) : 1

4. This procedure initailizes the DISKTEST program. The next prompt will allow you to select a specific operation. This operation can be one of eleven different types of operation commands (see Exhibit 2-2), or one of four interrupt commands. The interrupt commands can be used any time after the DISKTEST program has been initialized.

EXHIBIT 2–1 STANDARD DRIVE ASSIGNMENTS

Physical Drives	SYSTEMS							
	1600* 2600 3100		3100 3005			3032		
	Logical Drive	Drive Description	Logical Drive		Drive Description	Logical Drive	Drive Description	
0	B	Left Floppy	A	A,B	Hard Disk	A,B,C,D	Hard Disk	
1	A	Right Floppy	B	C	Left Floppy	E	Right Floppy	
2	C	Extra Floppy	C	D	Extra Floppy	F	Extra Floppy	
3	D	Extra Floppy	D	E	Extra Floppy	G	Extra Floppy	

* Physical Drive 0 or 1 can be used for its single Tandon Drive (Drive is dual addressed).

EXHIBIT 2–2 OPERATION COMMANDS

Command-Title	Description
[SR] Seek and Read (Randomly)	: The disk drive head searches the disk randomly and reads sector data into the DISKTEST buffer.
[SO] Seek Only (Randomly)	: The disk drive head searches the disk randomly.
[RS] Read Current Sector	: The disk drive head is located over the current track. The information from the current physical sector is read into the DISKTEST buffer as the disk rotates (DISKTEST reads same physical sector each time disk rotates).
[RT] Read Current Track	: The disk drive head is located on the current track. The information from that track is read into the DISKTEST buffer in 1 sector increments (DISKTEST reads each physical sector of this track).
[RD] Read Entire Disk	: The disk drive head reads data (and format codes) and puts that information in the DISKTEST buffer.
[RP] Read Current Platter	: The 8 inch Quantum drive has 4 surfaces, the 5 inch Seagate drive has 2 surfaces and the Tandon floppy drive has 1 surfaces. The information from that surfaces is read into the DISKTEST buffer.
[W(V)S] Write Sector (Verify)	: This command can be used with or without the verify feature. If the verify feature is used the information will be written to the disk and verified by reading into the DISKTEST buffer. If the verifying feature is not used the DISKTEST buffer will contain information that was written to the disk.
[W(V)T] Write Track (Verify)	: This command can be used with or without verifying. See operation command [WVS].
[W(V)D] Write Disk (Verify)	: This command can be used with or without verifying. See operation command [WVS].
[W(V)P] Write Platter (Verify)	: This command can be used with or without verifying. See operation command [WVS].
[MEM] Memory Test	: This command will test the DualMode Controllers memory (1K buffer). Each memory cell will have information written to it followed by a separate read operation.

The four interrupt commands are:

Command Name Key(s) pressed	Description
[ESC]	Sends user to system Monitor. Program can be re-entered by pressing U or G 00100.
[SPACE BAR]	Sends user to parameter input prompt (5.). From this point you can select another operation command, use one of the other interrupt commands or press [RETURN] to enter the default value (operation command prior to interrupt).
[CTRL C]	Sends user to CP/M.
"?"	Displays helpscreen.

5. The operation command RS will be used to demonstrate some of DISKTEST'S capabilites.

   SELECT OPERATION (? FOR HELP): RS

6. The next prompt allows you to designate which "physical drive" you want to be tested (see Exhibit 2-1). This prompt will be the same for any Vector Graphic system (controller board can handle up to 4 units). Hard disk drive 0 will be selected for illustrative purposes.

   SELECT UNIT: (0 THRU 3): 0

7. After completing this selection it is necessary to determine which disk drive HEAD will be used. If your selected UNIT was a floppy drive you will be shown a prompt which gives a selection of 2 heads. If your selected UNIT was a 8 inch hard disk drive you will see a prompt that gives a selection of 8 heads. The following prompt is given for a 5 inch hard disk drive. Head 0 is selected.

   SELECT HEAD: (0 THRU 3): 0

8. The next two prompts are used to select the TRACK and SECTOR of the disk drive you are testing. The following chart shows the different options.

UNIT SELECTED	TRACK OPTIONS	SECTOR OPTIONS
Floppy	0-76	0-15
5 Inch Hard Disk	0-152	0-31
8 Inch Hard Disk	0-511	0-31

These prompts can be answered in one of three ways. If you give a track number that is less than 3 digits or a sector number that is less than 2 digits you must press [RETURN]. However, if you give a track number that uses the full number of digits your entry will automatically be entered without pressing [RETURN].

If this is the initial running of the program the default values of these parameters will be zeroes. The default values will be a specific set of numbers (previous track and sector values) if this is the second (or greater) entry into the SELECT OPERATION program loop. The default values are entered by pressing [RETURN].

Track 05 ([RETURN] pressed) and sector 01 ([RETURN] not pressed) will be used.

SELECT TRACK: (0 THRU 76/152/511): 05
SELECT SECTOR: (0 THRU 15/31): 01

9. To answer the next two prompts it is necessary to understand what and how ECC logic is used.

The DualMode disk controller board generates a 4 byte ECC (Error Correction Code) when data is written to the disk. This code tells how the data is recorded and can be used as a diagnostic tool. If ECC LOGIC AND CORRECTION is enabled (through DISKTEST prompts) the eventual data (from sector and track you are checking) will be corrected to within the tolerances of the ECC logic.

These tolerances provide for correction of data that consists of 5 or less contiguous bits (the detection span is for 19 or less contiguous bits). If an error is located in a segment larger than this size the ECC logic will not correct it. In order to check the buffers data and see the exact values of the ECC bytes (before correction) it is necessary to disable ECC CORRECTION and review the particular sector (see Exhibit 2-3).

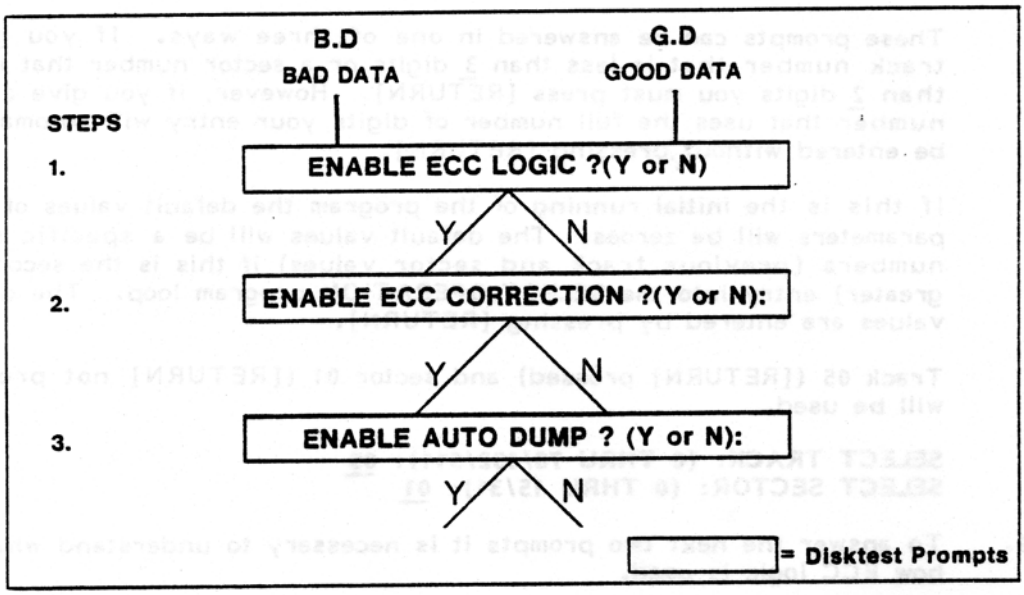
It should be noted that certain Controller boards have the ECC LOGIC permanently wired into them. On these boards it is not possible to disable the ECC LOGIC. The Controller boards which have this feature are listed below.

a. All Controller boards used in the 1600, 2600, 3100 and 3032 systems.
b. All 3005 Controller boards with a revision number of 5 or later.

For this example the ECC logic (hardware) will be turned on but the ECC correction logic (software) will be turned off.

ENABLE ECC LOGIC ? (Y OR N): Y
ENABLE ECC CORRECTION ? (Y OR N): N

EXHIBIT 2–3 ECC LOGIC USE



Examples

G.D 1(Y) ECC LOGIC is enabled and 4 00H bytes are generated by ECC hardware.
2(N) ECC CORRECTION is disabled and software does not correct data.
3(N) Operation is executed. This sequence is used for aligning floppy drives (see Section IV).

B.D 1(Y) ECC LOGIC is enabled and 4 xxH (x≠0) bytes are generated by the ECC hardware.
2(N) ECC CORRECTION is disabled and software does not correct data.
3(N) The error reports are normally disabled (default value). In order to have the error messages displayed it is necessary to press the loop command E following the AUTO DUMP prompt. For this example it is assumed the error reports have been enabled.
Sector and track locations are displayed along with error messages. Program continues through this loop (executing specific operation) until interrupt or loop command is entered.

B.D 1(Y) ECC LOGIC is enabled and 4 xxH (x≠0) bytes are generated by the ECC hardware.
2(Y) ECC CORRECTION is enabled and software attempts to correct errors in data.
3(Y) It is assumed the error reports have been enabled (see second example).
If first sector error is correctable, the sector contents will be displayed along with the error message (see Section III). If first sector error is uncorrectable, the sector contents will be displayed along with 4 non-zero ECC bytes and an ECC error message (non-zero ECC bytes represent values from previous disk operation).

B.D 1(Y) ECC LOGIC is enabled and 4 xxH (x≠0) bytes are generated by the ECC hardware.
2(N) ECC CORRECTION is disabled and software does not correct data.
3(Y) It is assumed the error reports have been enabled (see second example).
First sector with error is displayed along with error message. ECC bytes are non-zero (represent ECC value from previous disk operation).

10. After answering these prompts DISKTEST will display a prompt asking if you want an auto dump. Enabling an auto dump will cause the program to display the contents of the DISKTEST buffer and show errors. If you press [RETURN] the program will continue the operation (given in prompt 5 on page 4) until another error is encountered.

There are numerous commands you can use while within the operation loop. They are described in Exhibit 2-4. The editing sub-group of loop commands will cause an exit from the operation loop. Otherwise it is necessary to use one of interrupt commands to terminate the program.

ENABLE AUTO DUMP ? (Y OR N): Y

III. Error Messages and Corrective Procedures

Error messages can be generated by media and/or hardware malfunctions. The following list gives a description of each DISKTEST error along with possible corrective measures.

Media Errors

The floppy disk may have dust particles or other material on its surface which causes disk read errors. In this case it may be necessary to replace the diskette.

Hardware Errors

There are standard trouble shooting techniques which can be used when an error is located.

- Replacing or exchanging the parts until you have isolated the problem.
- Check the sector header (see Exhibits 3-1, 3-2) and see if the fields are filled with the correct information.
- Look at jumper areas A and B on the disk controller board. The jumper pads should be jumpered as follows.

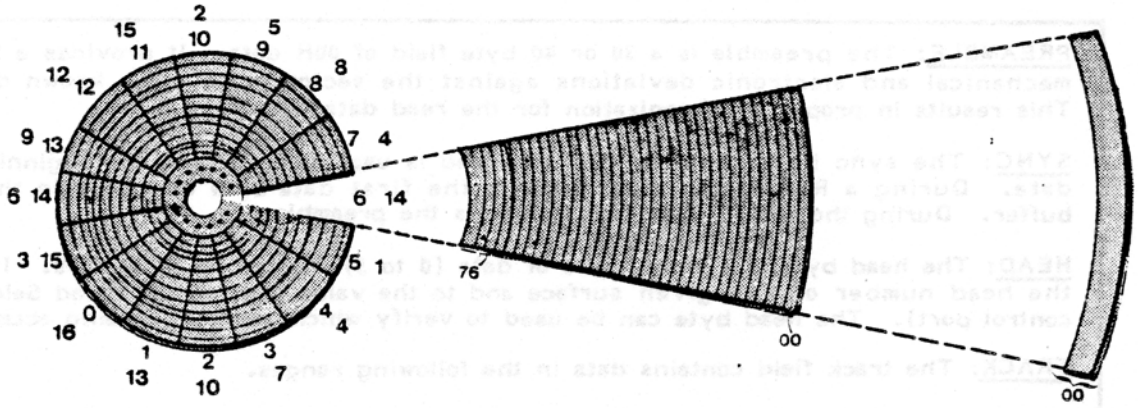
	Hard Drive Systems	Floppy Drive only Systems
Jumper Area A	1 to 2	2 to 3
Jumper Area B	1 to 2	none

- In the case of a floppy drive check the diskettes and see if they comply with the standard Vector Graphic disk drive protocol. i.e. proper density and quality.

EXHIBIT 2–4 LOOP AND EDITING COMMANDS

Entered Character	Command Description	Screen Display	
LOOP COMMANDS			
C	Displays current parameters.	C	Unit, head, track and sector numbers.
D	Dumps buffer contents (256 bytes of data plus sector control bytes). Used to check accuracy of buffer's contents-especially when it has been filled with a certain value.	D	Unit, head, track and sector numbers are located at top of 16 X 18 hex grid. ASCII equivalents are in adjacent column.
E	Enables error reports. Used during normal operation of DISKTEST to print errors.	E	Error reports enabled.
H	Steps the head value (see + and - commands).	H	
I	Inhibits error reports. Used when aligning Tandon drives (default value).	I	Error reports inhibited.
S	Steps the sector value (see + and - commands).	S	
T	Steps the track value (see + and - commands) for formatted disks only.	T	
Z	Moves head to "0" track and back to original location. Checks accuracy of head positioning.	Z	Information at original location.
+	Disk head direction is stepped inward. Examples: +TTT causes the head to be stepped 3 tracks (new address is 3 more than old address). +SSS causes head to be stepped 3 sectors (If old address was track 10, sector 15 then the new address would be track 11, sector 2-for a 16 sector disk). + is the default value for all T, S and H movements.	+	
-	Disk head direction is stepped outward. Examples: see previous command.	-	
EDITING COMMANDS			
F	Fills the buffer with one of 8 fill patterns or any HEX value. See DISKTEST helpscreen for a description of the fill patterns.	F	256 byte buffer is filled with pattern.
P	Program buffer with hex value. After P is pressed the 16 X 18 hex grid is displayed on the screen. You can then go to a specific location (using arrow keys) and make the nibble or byte changes.	P	New bytes are shown on a 16 X 18 hex grid.

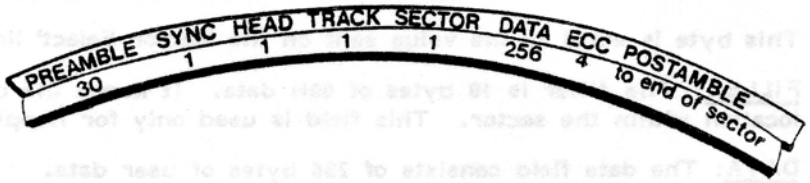
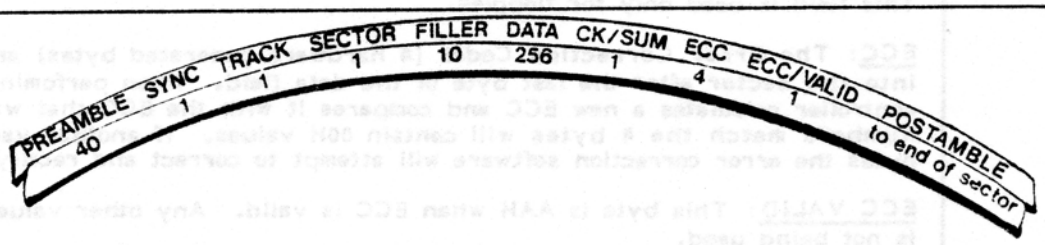
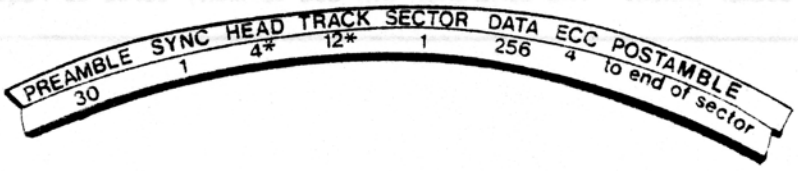
EXHIBIT 3–1 SECTOR FORMATS



DISK

TRACK 00, SECTOR 6 (PHYSICAL)

Each concentric track is divided into sectors. The inner circle of numbers represent the physical location of sectors (used in Sector Formats). The outer ring of numbers denote the logical location of sectors (used by CP/M). This floppy disk has 77 tracks with 16 sectors.

TYPE OF DISK	SPECIFIC SECTOR FORMATS**
5 ¼" Hard	
5 ¼" Floppy	
8" Hard	

*HEAD= 4 bits, TRACK= 12 bits

**Field size given in bytes. See Exhibit 3–2 on next page for descriptions of each field.

EXHIBIT 3–2 SECTOR FIELD DESCRIPTIONS

PREAMBLE: The preamble is a 30 or 40 byte field of 00H data. It provides a tolerance for mechanical and electronic deviations against the sector pulse and a known data pattern. This results in proper synchronization for the read data decoder.

SYNC: The sync byte contains FFH data and is used to determine the beginning of useful data. During a READ, the sync byte is the first data byte to appear in the DISKTEST buffer. During the WRITE operation it follows the preamble.

HEAD: The head byte is a single byte of data (0 to 3) written to all sectors. It is equal to the head number of any given surface and to the value sent on the 'Head Select' lines (to control port). The head byte can be used to verify which surface is being accessed.

TRACK: The track field contains data in the following ranges.

5 1/4" floppy disk	0 - 76
5" hard disk	0 - 152
8" hard disk	0 - 511

The track byte can be used to verify which track is being accessed.

SECTOR: The sector byte contains a single byte of data in the following ranges.

5 1/4" floppy disk	0 - 15
5" , 8" hard disk	0 - 31

This byte is equal to the value sent on the 'Sector Select' lines to the control port.

FILLER: The filler is 10 bytes of 00H data. It keeps the data field located at a "standard" location within the sector. This field is used only for floppies.

DATA: The data field consists of 256 bytes of user data.

CHECKSUM: The checksum is 1 byte of data resulting from the software add with carry instruction. It covers all bytes from the track byte through the last byte of the data field. This field is used only for floppies.

ECC: The Error Correction Codes (4 hardware generated bytes) are automatically inserted into the sector after the last byte of the data field. When perfoming a READ operation the controller calculates a new ECC and compares it with the ECC that was written. If the two numbers match the 4 bytes will contain 00H values. If another value is found in the ECC bytes the error correction software will attempt to correct and rectify it (see section I).

ECC VALID: This byte is AAH when ECC is valid. Any other value indicates that the ECC is not being used.

POSTAMBLE: The postamble is a field of 00H data from the end of the ECC byte to the next sector pulse. The controller will use as many zeros as required for each particular sector.

Error Listing

RESTORE ERROR- Track 0 not found.

TIMEOUT ERROR- on seek complete.

TIMEOUT ERROR- on controller busy.

SELECT ERROR- Controller not jumpered for hard disk at unit 0.

SELECT ERROR- Controller not jumpered for floppy at unit 0.

SELECT ERROR- Drive not ready.

CONTROLLER ERROR- Loss of sync.

READ ERROR- sync byte not FF.

READ ERROR- head byte in error.

READ ERROR- track byte in error.

READ ERROR- sector byte in error.

READ ERROR- read/write checksums don't match.

READ ERROR- ecc byte is non-zero.

READ ERROR- floppy checksums don't match.

CORRECTABLE ECC ERROR: OFFSET = 0000 PATTERN = 0000

UNCORRECTABLE ECC ERROR: ECC BYTES = 00 00 00 00

IV. Using DISKTEST for Aligning Tandon Drives

DISKTEST allows you to position the drive head to any track on your alignment diskette. After the correct track has been located you can have DISKTEST read that particular track as many times as is required by your alignment procedure. At any time you can exit the operation loop (described in section II) by using an interrupt command.

The following example gives the procedure used to align the Tandon drive in a 3005 system.

1. Insert your alignment diskette into the Tandon drive.

2. Load DISKTEST into the system (from hard disk) by typing DISKTEST following the CP/M prompt. Press "Y" to continue the program and "1" to select the 5 inch hard disk. Section II gives descriptions of these two prompts.

3. Answers to the next questions depend upon the particular type of alignment diskette you are using. For this example it is assumed that the alignment diskette uses track 36 for the "cats eye" alignment procedure. Also, the default sector value (Sector 00) along with head 1 of the tandon drive will be used.

SELECT OPERATION (? FOR HELP): RT
SELECT UNIT: (0 THRU 3): 1
SELECT HEAD: (0 THRU 1): 1
SELECT TRACK: (0 THRU 76/152/511): 036 ([RETURN] not pressed)
SELECT SECTOR: (0 THRU 15/31): 00 ([RETURN] not pressed)

4. The default values are entered for the next 3 prompts (pressing [RETURN]).

ENABLE ECC LOGIC ? (Y OR N): Y
ENABLE ECC CORRECTION ? (Y OR N): N
ENABLE AUTO DUMP ? (Y OR N): N

5. Since the Tandon drive uses two heads it is necessary to toggle between each head to obtain a proper "cats eye" comparison. This is accomplished by pressing H every time you want to shift heads. The C key can be used between toggling to update your location.

V. Using DISKTEST With RECLAIM

RECLAIM is a program for use with all disk systems running the Vector Graphic CP/M operating system. * It will read and validate each sector of the user section of the disk. If any errors are encountered in the file space, the program will record and store the address of the bad sector and prevent other programs from using that space.

* See 5005 OVERVIEW MANUAL for a complete explanation of the RECLAIM program. RECLAIM will only save those sectors (in 1 CP/M block increments) which have read errors.

Occasionally your system may produce sporadic errors which RECLAIM cannot locate (RECLAIM makes a single pass). In this case you can use DISKTEST to locate the bad sector and make it usuable (by re-writing the sector several times) or make it unusable (by writing incorrect data in sector). If the sector is made unusable RECLAIM can be utilized to salvage the rest of the disk by reclaiming the bad sector. The following steps show how these procedures are accomplished.

Locate and Re-Write Bad Sector

1. Load in DISKTEST and go through the beginning prompts using the protocol described in the previous sections. Use RD for the SELECT OPERATION command and [RETURN] for the rest of the prompts (default values will be used).

2. After the bad sector is located, go to the SELECT OPERATION prompt and enter RS. Read the bad sector several times until it is confirmed that this sector is not usable.

3. Read the sector to make sure the data is valid. This is determined by looking at the ECC bytes. They can be 00H or have values with an error report (CORRCECTABLE ECC ERROR: OFFSET = xxxx PATTERN = xxxx).

   Exit this operation loop and return to the operation prompt. Insert WS, go through the other prompts (using default values), and exit this operation loop.

4. Read the faulty sector again to see if the re-writing procedure was successful. If it wasn't successful go to the next group of procedures.

Modify Bad Sector

1. Use the RS operation command and go through the prompts pressing [RETURN] to enter the previous values of SELECT UNIT, HEAD, TRACK and SECTOR. This is followed by disabling ECC LOGIC, ECC CORRECTION and AUTO DUMP.

2. Press P00 and the buffer (of the bad sector) will be filled with 00H bytes. The program will then exit from the operation loop and you will see the operation select prompt. Enter WS and press <RETURN>.

3. Use the default value (pressing <RETURN>) for the next four prompts.

4. Press N in response to the **ENABLE ECC LOGIC ? (Y OR N):** prompt. The rest of the prompts can be answered with the default value.

5. This procedure will result in a bad sector (with incorrect SYNC byte) being written to the disk. You can go through the operation loop again (using the RS command) and see the **READ ERROR- sync byte not FF** error displayed.