codex

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Test and Diagnostics Manual

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CODEX INTELLIGENT TERMINAL SYSTEMS
TEST AND DIAGNOSTICS MANUAL

VERSION 1

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CHAPTER 1 - INTRODUCTION

This manual provides detailed test and diagnostics information that the reader can apply to his or her Codex system environment. It is written in a step-by-step format and supplemented with detailed tables and illustrations.

1.1 MANUAL ORGANIZATION

All information in the manual is divided into three chapters as follows.

1. CHAPTER 1 - INTRODUCTION. This chapter introduces the reader to test and diagnostics procedures essential to the proper implementation of Codex systems. In addition, it provides a physical breakdown of the manual and a description of each chapter.

2. CHAPTER 2 - ROM-BASED SYSTEM SELF-TESTS. This chapter provides summarized procedures for executing the ROM-Based System Self-Test programs. Those procedures that will be explained include:
   a. Cluster Self-Test
   b. Floppy Diskette-Based System Self-Test
   c. Hard Disk-Based System Self-Test
   d. CObug Firmware Routine

3. CHAPTER 3 - DISK-BASED TESTS/CODOS UTILIZATION. This chapter defines the use of CODOS in a test environment and provides procedures for loading and executing test and diagnostics programs available on disk under CODOS.

CHAPTER 2 - ROM-BASED SYSTEM SELF-TESTS

This chapter provides summarized procedures for executing the ROM-Based System Self-Test programs. These programs are automatically entered when the system is powered on, or the RESET Switch is pressed on the back of the master terminal. The procedures involved include the Cluster Self-Test, Floppy Diskette-Based System Self-Test, Hard Disk-Based System Self-Test, and CObug Firmware Routine. Each is described in sections 2.1 - 2.4, respectively.

2.1 CLUSTER SELF-TEST

To initiate the minimum (installation) Cluster Self-Test sequence, proceed as follows. For the debug monitor routine, refer to subsection 2.1.1.

NOTE: Terminals are numbered 1 - 8; printers are numbered 1 - 2 in the following steps. The master terminal is terminal 1. The "number" of each of the remaining terminals and printers is determined by the connector at the rear of the master terminal to which it is connected.

All system interconnect cables must be installed (except the modem cable) and power applied to all subsystems.

1. Press the RESET Switch at the rear of the master terminal. This causes the Cluster Controller to re-enter the Cluster Self-Test (CST) firmware.

2. Allow sufficient time (five seconds minimum) for the Cluster Self-Test to complete all default tests. These tests include:
   a. Reset and initialization of all I/O ports.
   b. Test of the Programmable Timer (PTM) on the SBC/D Module.
   c. Test for the readiness of all I/O ports.
   d. Test of all RAM memory in the Cluster Controller.

   NOTE: If these tests pass, no error messages are displayed. If any test fails, the corresponding "Err" message will be displayed on the master terminal display, or output to printer 1.

3. Press the RESET Switch at the rear of the master terminal. This causes the Cluster Controller to re-enter the Cluster Self-Test (CST) firmware.

4. Observe the indicator on the ALT PORT key on the master terminal keyboard. This indicator should turn on and

then off twice. (When this indicator turns off the second time, there is a two second "window" during which the next step must be performed.)

5. At the master terminal keyboard, simultaneously press the SHIFT and ENTER keys. The following should be displayed on the master terminal display.

CLUSTER SELF TEST 1.0X

6. Enter the appropriate data from Table 2-1 at the master terminal keyboard (unless otherwise specified).

TABLE 2-1. CLUSTER SELF-TEST (INPUT AND TEST/TEST "PASS" RESULT)

INPUT	TEST/TEST "PASS" RESULT
CTRL-W	Display Polling Address. Polling address is correct. Otherwise, modify the strapping on the Dual Communications Module to agree.
CTRL-E	3270 Firmware CRC Check. No error occurs.
CTRL-G	Polynomial Generator (PGC) Test. No error occurs.
CTRL-Y	Internal Loopback Test of Communication Channel (To Modem). No error occurs. NOTE: CST Release 1.01 does not include this test.
CTRL-A	Readiness of All ACIA's. "ACIA 1,2,...Ready" will be displayed. ACIA 1 should be ready for Model/10; 1, 2, 3, 4 for Model/11; 1 through 8 for Model/12.
CTRL-T	Readiness of All Terminals. "Terminals 1, 2, ... Ready" will be displayed. Terminal numbers must correlate with the terminals connected and powered on. The minimum is terminal 1 (Model/10).
CTRL-S, then "2" ("1" for Model/10)	(Enable Terminal Selection and Select Terminal "2" to Start For Model/10, "1" selects Master Terminal).

TABLE 2-1. CLUSTER SELF-TEST (INPUT AND TEST/TEST "PASS" RESULT) (CONT.)

INPUT	TEST/TEST "PASS" RESULT
CTRL-X	Continuously Exercise All Terminals. A test pattern will be output to the master terminal (always) and to terminal 2, then 3, then 4, etc., updating to the next terminal number at approximately 7-second intervals. Along with the test pattern, the selected terminal "number" is also output to the selected terminal. Verify the test pattern and terminal number at each terminal as follows. 1. Master Reset (clear display). 2. Cursor Home (High Intensity). 3. Cursor Home (Low intensity). 4. ALT PORT key (indicator on, then off). 5. "Cluster Self-Test 1.0X" display. 6. Test Pattern all displayable characters. (This includes worse-case focus characters "w" and "m", and "E" characters for observing linearity and size. It also includes high and normal intensity characters. The test pattern is displayed in the "Fast Paint" mode. 7. Terminal Number. Terminate the test by pressing the RESET key on the master terminal keyboard.
CTRL-S, then "2" ("1" for Model/ 10)	Select Terminal Number 2.
CTRL-I	"INS-CHAR" LED On-Off Test. Verify LED on and off at the master and selected slave terminal.
CTRL-H	Master Reset. Display cleared and cursor home at the master and slave terminals.

TABLE 2-1. CLUSTER SELF-TEST (INPUT AND TEST/TEST "PASS" RESULT) (CONT.)

INPUT	TEST/TEST "PASS" RESULT
CTRL-K	Keyboard Test. Press the printable character(s) on the terminal keyboard. The selected character(s) must appear on the master and slave terminal displays. (Nondisplayable characters display the corresponding HEX code.)
CTRL-S, #, then CTRL-I, H,K,etc.	Repeat the aforementioned test for each terminal in the cluster, by first selecting the terminal number and then each test.
CTRL-N, then "1"	Select Printer 1.
CTRL-P	Test Selected Printer. Output at the printer is "CLUSTER SELF-TEST 1.0X" followed by two lines including the entire printable ASCII set, then a form feed to the top of the form.
CTRL-N, then "2", then CTRL-P	Test Printer 2 As Previously Mentioned, If Applicable.
ENTER	Terminate Test Mode, Revert to 3270 Mode.

2.1.1 DEBUG MONITOR ROUTINE

Enter "CTRL-C" after the entry of the System Self-Test, or after completion of any of the subtests defined in Table 2-1. ("CTRL-B" may alternately be used to avoid initialization of interrupt vectors and internal variables.)

The commands shown in Table 2-2 are available in the CST Monitor. (Most of these are a subset of CObug.)

TABLE 2-2. COMMANDS AVAILABLE IN THE CST MONITOR

COMMAND	FUNCTION
n/	Open byte addressed by n.
n/m c	Open byte addressed by n; (CObug displays memory "m"); and replaces contents with "c".
(LF)	Open next sequential location.
^	Open previous sequential location.
(CR)	Close location; return to Monitor.
PRNT	Display or print memory contents.
X	Return to Monitor.
n;G	Execute program starting at location n.
;P	Continue execution from current location.
$R	Display/change MPU registers.
RSTR	Restart Cluster Self-Test.
CTRL-H	Clear home master terminal.
CTRL-R	Reset master terminal.

2.2 FLOPPY DISKETTE-BASED SYSTEM SELF-TEST

To initiate the minimum (installation) System Self-Test, proceed as follows. Refer to subsection 2.2.1 for the debug monitor routine.

NOTE: All system interconnect cables must be installed (except modem cables) and power applied to all subsystems. Also, no diskettes can be installed in the disk drive.

1. Press the RESET Switch at the rear of the master terminal. This causes the SBC/D System to re-enter the System Self-Test (SST) firmware, which then re-initializes the system, performs the ($0-$100) RAM test and disk controller firmware CRC test and COBug CRC Test, outputs the System Self-Test banner to the display, and outputs the following message to the display.

   Insert Disk 0.

2. Enter the appropriate data from Table 2-3 at the master terminal keyboard.

TABLE 2-3. FLOPPY DISKETTE-BASED SYSTEM SELF-TEST (INPUT AND TEST/TEST "PASS" RESULT)

INPUT	TEST/TEST "PASS" RESULT
CTRL-K	Keyboard Test. Press printable character(s) on the terminal keyboard. The selected character(s) must appear on the display. (Nonprintable characters display the corresponding HEX code.) NOTE: Do not press the ALL CAPS, AUTO LF, ON LINE, PAGE MODE, and AUX ENB keys.
CTRL-P	Printer Test. The following is output at the printer. System Self-Test 4.XX It is followed by two lines including the entire printable ASCII set, then a form feed to the top of the form.
NOTE: Additional input for the floppy diskette-based system is shown as part of the following steps.	

3. Insert a system, diagnostic, or scratch diskette into drive 1 and close the door. Insert a second diskette into drive 0 and close the door. Enter CTRL-R and press the RETURN key. At the completion of the tests, the following message will be displayed.

```
End Disk Test
Depress RETURN to continue.
```

4. Remove the diskettes from both drives. Then, press the RETURN key. The following should be displayed.

```
Insert Disk 0.
```

5. Enter CTRL-W. Press the RETURN key. This is the Write Disk Test. The following response appears.

```
WRITE Disk Test
Depress RETURN to continue
```

   NOTE: This test should only be used with formatted scratch diskettes. It will destroy data on any installed diskette.

6. Insert a scratch diskette into drive 1 and close the door. Insert a second scratch diskette into drive 0 and close the door. Press the RETURN key. Disk write tests will proceed automatically. At the completion of all tests, the following message will be displayed.

```
End Disk Test
Depress RETRUN to continue.
```

7. Remove the diskettes from both drives. Then, press the RETURN key. The following should be displayed.

```
Insert Disk 0.
```

8. At this point, insert a diagnostic diskette or system diskette (containing CODOS) into drive 0. The remaining self-tests (RAM and diskette tests) should be automatically completed, and the following should be displayed.

```
32K memory operational    (or other RAM size)
END SYSTEM SELF-TEST
CODOS X.X
=
```

The system is now operating under CODOS.

If you wish to abort the system self-test, enter CTRL-A and press the RETURN key. The following will be displayed.

```
END SYSTEM SELF TEST
Waiting for Drive 0
...or Bootloads CODOS if Drive 0
is READY
```

2.2.1 DEBUG MONITOR ROUTINE

Enter "CTRL-C" after the entry of the System Self-Test, or after completion of any of the aforementioned subtests that were defined.

The CObug firmware routine is included in this System Self-Test package. (Refer to section 2.4 for further information.)

2.3 HARD DISK-BASED SYSTEM SELF-TEST

To initiate the minimum (installation) System Self-Test sequence, proceed as follows. Refer to subsection 2.3.1 for the debug monitor routine.

NOTE: The following test sequence steps must be taken with the system setup.

- All system interconnect cables must be installed (except the modem cable) and system installation procedures completed.
- Power must be applied to all subsystems. At the disk drive, place the front panel control switches in the following positions.
  -- DISK POWER: ON (up)
  -- PROT FIXED: OFF (down)
  -- PROT RMVBL: ON
  -- DISK DRIVE: OFF
- Wait for the SAFE indicator to come "ON". Install a removeable disk pack in the drive, and press the "lock" lever.

Then, perform the following.

1. Press the RESET Switch at the rear of the master terminal. This causes the SBC/D System to re-enter the System Self-Test (SST) firmware, which then performs the following.
   a. Re-initializes the system.
   b. Performs the ($0-$100) RAM test and Disk Controller firmware CRC test.
   c. Outputs the System Self-Test banner to the display.
   d. Outputs the following message to the display.

      Depress RETURN to continue.

2. Enter the appropriate data from Table 2-4 at the terminal keyboard.

TABLE 2-4. HARD DISK-BASED SYSTEM SELF-TEST (INPUT AND TEST/ TEST "PASS" RESULT)

INPUT	TEST/TEST "PASS" RESULT
CTRL-K	Keyboard Test. Press printable character(s) on the terminal keyboard. The selected character(s) must appear on the display. (Nonprintable characters display corresponding HEX code.) NOTE: Do not press the ALL CAPS, AUTO LF, ON LINE, PAGE MODE, and AUX ENB keys.
CTRL-P	Printer Test. The following is output at the printer. System Self-Test 5.XX It is followed by two lines including the entire printable ASCII set, then a form feed to the top of the form.
CTRL-R	Read Disk Test. The following response appears. READ Disk Test Depress RETURN to continue.

3. At the front panel of the disk drive, move the disk drive to the ON (up) position. Wait until the READY indicator on the disk drive front panel comes ON. Then, press the RETURN key. At the completion of the tests, the following message will be displayed.

   End Disk Test
   Depress RETURN to continue.

4. Enter CTRL-W. Press the RETURN key. This is the Write Disk Test. The following response appears.

   WRITE Disk Test
   Depress RETURN to continue

   NOTE: This test is a "write/read" test to sectors 23 and 24 only and is, therefore, nondestructive. These are reserved for testing.

5. Press the RETURN key. At the completion of this test, the following will be displayed.

```
End Disk Test
Depress RETURN to continue.
```

6. Press the RETURN key. The remaining self-tests (RAM and disk-seek tests) should then be automatically completed, and the following should be displayed.

```
32K memory operational      (or other RAM size)
END SYSTEM SELF-TEST
CODOS X.X
=
```

The system is now operating under CODOS.

If you wish to abort the system self-test, enter CTRL-A and press the RETURN key. The following will be displayed.

```
END SYSTEM SELF TEST
Waiting for Drive 0
...or Bootloads CODOS if Drive 0
is READY
```

2.3.1 DEBUG MONITOR ROUTINE

Enter "CTRL-C" (or "CTRL-B") after entry of the System Self-Test, or after completion of any subtests previously defined. ("CTRL-B" may be used to avoid initialization of interrupt vectors and internal variables.)

The CObug Firmware Routine is included in this System Self-Test package. Refer to section 2.4 for further information.

2.4 COBUG FIRMWARE ROUTINE

"CTRL-C" (or "CTRL-B") is entered in the system while stopped in the System Self-Test, or upon detection of certain error conditions. Refer to Table 2-5 for a command summary of COBug.

NOTE: * is used as the prompt.

TABLE 2-5. COMMAND SUMMARY FOR COBUG

COMMAND	FUNCTION
n/	Open byte addressed by n.
n/m c	Open byte addressed by n; (COBug displays memory "m"); and replace contents with "c".
(LF)	Open next sequential location.
^	Open previous sequential location.
(CR)	Close location; return to Monitor.
PRNT	Display or print memory contents.
LOAD	Load CODOS and execute.
X	Return to Monitor.
n;V	Set a breakpoint at location n.
;U	Remove all breakpoints.
n;U	Remove breakpoint at location n.
n;G	Execute program starting at location n.
;P	Continue execution from current location.
$R	Display/change MPU registers.
RSTR	Restart Cluster Self-Test.
$V	Display all breakpoints.
$R	Display/change registers.

CHAPTER 3 - DISK-BASED TESTS/CODOS UTILIZATION

Section 3.1 defines the use of CODOS in a test environment and provides procedures for loading and executing test and diagnostics programs that are available on disk under CODOS (5.1 or above) as shown in sections 3.2 - 3.8.

3.1 CODOS (CODEX DISK OPERATING SYSTEM)

CODOS is a file-oriented system used on the floppy diskette-based and hard disk-based systems. A separate version of CODOS exists for each, but their operation is basically the same.

On a floppy diskette-based system, using the FS4 disk drive, the disk capacity is approximately 500K bytes per drive. The disk is divided into sectors that contain 128 bytes per sector. The FS4/2 disk drive contains two drives, designated drive 0 and drive 1. Up to two additional drives may be added. The additional drives are designated drive 3 and drive 4. In every case, drive 0 (left drive) is the source for loading CODOS into the system.

On a hard disk-based system, using the Western Dynex 10 Megabyte disk drive, the disk capacity is approximately 5 Megabytes per disk. The disks are divided into sectors containing 256 bytes per sector. The drive includes a fixed disk (referred to as LUD 0) and a removeable disk pack (referred to as LUD 1). In this case, LUD 0 is the source for loading CODOS into the system.

Sections 2.2 and 2.3, respectively, cover the System Self-Test procedure for the floppy diskette-based and hard disk-based systems, through the loading and entry of CODOS. Initially, the following message is displayed on the terminal screen.

```
CODOS 5.XX
=
```

The equal prompt (=) indicates that the command interpreter is awaiting input from the system console.

The commands described in subsections 3.1.1 - 3.1.4 should be utilized (after Self-Test procedures have been completed) to verify system operation and to gain familiarity with the CODOS operating system and use of the disk drives. The remaining command descriptions are provided for use as required in Table 3-1.

NOTE: In the following sections:
DISK 0 (1) = LUD 0 (1) - (HARD DISK).
DISK 0 (1) = DISKETTE IN DRIVE 0 (1) - (FLOPPY).

TABLE 3-1. CODOS INITIALIZATION ERRORS (FLOPPY DISKETTE-BASED SYSTEM)

MESSAGE	PROBABLE CAUSE
E1	A cyclical redundancy check (CRC) error was detected while reading the resident operating system into memory.
E2	The diskette has the write protection tab punched out. During the initialization process, certain information is written on the diskette. However, the diskette is not damaged and can still be used for a system diskette, but the write protection tab must be covered with a piece of opaque tape to allow writing to the diskette.
E3	The drive is not ready, the door is open, or the diskette is not yet turning at the proper speed.
E4	A deleted data mark was detected while reading the resident operating system or CODOS diagnostic into memory.
E5	A timeout occurred. This indicates that a diskette controller function was not completed within the allotted time.
E6	The diskette controller has been presented with a cylinder-sector address that is invalid. This error message suggests a hardware problem.
E7	A seek error occurred while trying to read the resident operating system into memory.
E8	A data mark error occurred while trying to read the resident operating system into memory.
E9	A CRC error was found while reading the address mark that identifies sector locations on the diskette.

TABLE 3-1. CODOS INITIALIZATION ERRORS (FLOPPY DISKETTE-BASED SYSTEM)(CONT.)

MESSAGE	PROBABLE CAUSE
E?	This error indicates that the RIB (Retrieval Information Block) of the resident operating system file CODOS.SY is in error. The operating system cannot be loaded. The diskette may not be a CODOS system diskette, or the system files have been moved from their original locations.
EM	This error indicates that there was insufficient memory to accomodate the resident portion of the operating system.
EI	The version and revision of CODOS already loaded into memory are not the same as those on the diskette. This error usually occurs as the result of switching diskettes in drive 0 without following the initialization procedure.
ER	The addresses of the RIBs of the CODOS overlays are not the same as those at the time of the last initialization. This error could occur for the same reasons as the EI error message.
EU	An input/output system function returned an error during initialization. Errors of this sort indicate possible memory problems, or the opening of the door to drive 0 while initialization was taking place.
EV	One of the system files is missing or cannot be loaded into memory. If a file cannot be loaded, the diskette should be regenerated. This error could also occur if the door is opened during initialization.

3.1.1 DIR

The DIRectory command is used to display the directory of the disk. The general format of this command is:

DIR FILENAME.SUFFIX:DISK#;OPTIONS

where

FILENAME is the 1-8 character name of the file. The amount of directory information displayed will depend on the options specified.

SUFFIX is the 1-2 character qualifier which will identify a file where there are more than one file with the same name.

DISK# is either 0 or 1 indicating which disks contain the directory information.

OPTIONS identifies options that are available for use with this command as follows.

- A = Display complete allocation information for every file with segment information.
- E = Display complete allocation information for every file except segment information.
- L = Directory output will be directed to the line printer.
- S = All files with system allocation information will be included in the directory search display.

3.1.2 BACKUP

Execution of this command means that data on disk 0 will be copied onto disk 1. The general format of this command is:

BACKUP;OPTIONS

where

OPTIONS identifies options that are available for use with this command as follows.

- V = Verify. This implies that the sectors on disk 0 will be compared to the sectors on disk 1, once a BACKUP has been done or to verify a disk.
- N = Null. This blank statement will make a one for one duplication of disk 0 to disk 1.

The command and resulting terminal display would be as follows.

```
=BACKUP

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BACKUP FROM     0 to 1?
```

Respond with Y (Yes). Any other response will terminate the BACKUP process. The Y response will cause the disk copy or verification to take place.

After a disk has been duplicated, use the V OPTION statement as an added precaution. The two disks should be compared against each other after a BACKUP duplication has been done. If any messages are displayed during the verification process, the disk should be reformatted, BACKUP performed, and verified again.

3.1.3 REPAIR

The REPAIR command is used to verify that the vital portions of the disk necessary for proper operation are in order. The general format of this command is:

REPAIR :DISK#

where

DISK# is either 0 or 1 indicating which disk is to be repaired.

The REPAIR command is a useful diagnostic utility when a disk is suspected or is malfunctioning. The response once the REPAIR command is invoked appears as follows.

```
=REPAIR

DISK ID:DNTCODOS
VERSION:03
REVISION:01
DATE:121779
USER:CODEX CUST. SERVICE
22 GOOD FILES 00 FILES WITH BAD RIBS
RECONSTRUCTED C.A.T. MATCHES DISK
=
```

3.1.4 FORMAT

The FORMAT command is used to format a diskette. Normally, the diskette comes from a vendor with the software sector marks on it (IBM 3740 format). Under some conditions, these sector marks are deleted or are not formatted, which will cause errors making the diskette unreadable. The FORMAT command is used to regenerate these software sector marks on the diskette, thus making it useable again. The disk to be formatted should be in drive 1. The general format of this command is:

FORMAT

This command is a destructive command, so the CODOS system will inquire the following.

```
FORMAT DRIVE 1?
```

If a reply other than Y for yes is indicated, then the function of FORMAT will be terminated. A Y response will continue the action of the FORMAT command.

The FORMAT process will write the software sector marks on the diskette. This will start from the first sector on track 0 to the last sector on track 77. The FORMAT process will destroy any prior information in that sector. All previously recorded data is lost. Each track will be read to verify that the CRC marks generated will correspond to the CRC marks on the diskette for that sector.

The FORMAT command can be used as a last resort to repair an unuseable diskette.

The command is entered as follows with the resulting response appearing on the terminal screen.

```
=FORMAT

FORMAT DRIVE 1?

Y
=
```

3.2 TRMTST (DISPLAY TERMINAL SYSTEM TEST PACKAGE)

TRMTST is a test and diagnostics program to exercise and evaluate the operation of the terminal, its keyboard, and firmware options. Program execution and test commands are discussed in detail in subsections 3.2.1 and 3.2.2, respectively.

3.2.1 PROGRAM EXECUTION

To select the TRMTST program, enter the following command in response to the equal sign prompt. The response should appear as follows.

```
=TRMTST

DISPLAY TERMINAL SYSTEM TEST PACKAGE X.XX

?
```

The prompt ? informs you that the test program is ready to accept the next 2-letter command followed by a carriage return.

3.2.2 COMMAND ENTRIES

Command entries and their descriptions are shown in Table 3-2.

TABLE 3-2. COMMAND ENTRIES AND DESCRIPTIONS

ENTRY	DESCRIPTION	RESULTING ACTION
BE	Bell	The command BE causes the bell to sound for 1/2 second.
HM	Home Cursor	The command HM causes the cursor to return to the home position (upper left-hand corner of the screen).
HT	Horizontal Tab	The command HT causes the cursor to tab over 10 positions to the right without line rollover.
FF	Form Feed	The command FF causes the cursor to move one position to the right without line rollover.

TABLE 3-2. COMMAND ENTRIES AND DESCRIPTIONS (CONT.)

ENTRY	DESCRIPTION	RESULTING ACTION
BS	Back Space	The command BS causes the cursor to move left one line with line rollover.
CR	Carriage Return	The command CR causes the cursor to move to the left margin of the next line.
DC	Down Cursor	The command DC causes the cursor to move down one line in the same column. If the cursor is in the last line, scroll is executed and the last line is blanked.
LC	Cursor Left	The command LC causes the cursor to move left one space without line rollover.
LF	Line Feed	The command LF causes the cursor to move down one line in the same column.
RC	Cursor Right	The command RC causes the cursor to move right one space without line rollover.
ED	Extended Display	The command ED causes a full screen of data to be present with the blinking characters and underscore lines that do not blink. Verify that the half-bright characters are approximately half the full bright intensity. Adjust the brightness control until raster lines appear. Then, turn down the brightness until the lines appear.
SV	Set Inverted Video	The command SV causes the entire screen to be video-inverted.
RV	Reset Inverted Video	The command RV causes the entire screen to return to noninverted video.

TABLE 3-2. COMMAND ENTRIES AND DESCRIPTIONS (CONT.)

ENTRY	DESCRIPTION	RESULTING ACTION
CH	Clear Display and Home	The command CH is used to verify that the screen is cleared and the cursor is returned to the home position.
KT	Keyboard Test	After the command KT is entered, follow the instructions that are displayed. Ensure that all the strings of keys can be successfully entered without an error message (except those keys that are not tested). Any line instruction test can be bypassed by pressing the space bar. The keyboard test is completed when TRMTST prompts the operator with a "?". Omit the following tests by depressing the space bar. ● INS CHAR ● CLEAR HOME ● DEL CHAR ● LINE SEND PAGE ● SET TABS ● AUX SEND ● AUX LINE test instructions for normal, shifted, and control.
WP	WRITE PAGE	The command WP causes the screen to be immediately cleared and a 4-quadrant screen displayed. 1. Quadrant 1. Is entered and tested by pressing Function Key F1. Quadrant 1 is in PROTECT MODE; the unprotected fields and cursor are video-inverted and are underscored. Enter several alphanumeric characters to ensure that they all display only in the video-inverted, underscored, and unprotected fields.

TABLE 3-2. COMMAND ENTRIES AND DESCRIPTIONS (CONT.)

ENTRY	DESCRIPTION	RESULTING ACTION
		2. Quadrant 2. Is entered and tested by pressing Function Key F2. Quadrant 2 is in PAGE MODE. Observe a display of all printable ASCII characters in PAGE MODE (i.e., no scrolling). Each additional line output goes on top of the previous contents of the next line. Do not continue until character output stops. 2. Quadrant 3. Is entered and tested by pressing Function Key F3. Quadrant 3 is in SCROLL MODE. Observe a display of all printable ASCII characters in SCROLL MODE (i.e., after the quadrant is full, each additional line is inserted at the bottom of the field and all other lines are scrolled upward. Do not continue until the scrolling stops. 3. Quadrant 4. Is entered and tested by pressing Function Key F4. Quadrant 4 is in PROTECT MODE. Enter several characters to see that they all are displayed only in half-bright, underscored, and unprotected fields. Press F5 to end the subtest.
ST	SET TRANSPARENT MODE	The command ST sets the transparent mode operation. The cursor should not change position.
RT	RESET TRANSPARENT MODE	The command RT resets the transparent mode operation. The cursor should not change position.

TABLE 3-2. COMMAND ENTRIES AND DESCRIPTIONS (CONT.)

ENTRY	DESCRIPTION	RESULTING ACTION
SC	SET SCROLL MODE	The command SC causes the cursor to move to the home position. The display is now in SCROLL MODE with PAGE and PROTECT MODEs reset.
CT	CURSOR TEST	The command CT causes the following to appear on the display. ? CURSOR POSITIONING TEST =+ :* - + = : * Pattern should match below =+ :* - + = : * NOTE: The command CH should immediately follow the CT command.
FB	FULL BRIGHT	The command FB causes the screen to be filled with full-bright character Zs.
HB	HALF-BRIGHT	The command HB causes the screen to be filled with half-bright character Zs.
OS	DISK OPERA-TING SYSTEM	The command OS will allow the exit from TRMTST and return to the Disk Operating System.
TR	TERMINAL RESET	The command TR causes the ON LINE key red indicator to go out momentarily and the screen to remain clear.

3.3 PRNTST (PRINTER SYSTEM TEST PROGRAM 4.00)

The Printer System Test and Diagnostic program tests and helps to evaluate the operation and performance of the system printer. This program can be selected to test either 80- or 132-character position width printers. Program execution is described in subsection 3.3.1.

3.3.1 PROGRAM EXECUTION

To select the PRNTST program, enter the following commands in response to the equal sign prompt.

```
=PRNTST
```

The following message is then displayed.

```
PRINTER SYSTEM TEST AND DIAGNOSTIC X.XX
80 or 132 Characters/line? Enter 8 or 1 =
```

You must select 8 (for 80 characters) or 1 (for 132 characters) to match the paper width of the printer in use. A test pattern then results that includes every printable ASCII character.

NOTE: By using CTRL-W, the test can be halted for viewing a particular line pattern and then resumed by pressing any character except the BREAK key.

The PRNTST program can be terminated by pressing the BREAK key.

Table 3-3 lists symptoms and associated procedures that might aid in correcting problems with the system printer.

TABLE 3-3. CORRECTING PROBLEMS WITH THE SYSTEM PRINTER

PROBLEMS	CORRECTIVE PROCEDURES
Select lamp lit; printer does not print.	Check the interrconnect cabling printer interface module.
Paper skewing; holes tearing; perforation.	Position the paper feed tractor; secure the locking lever.
Ink ribbon tracking problem.	Check for the proper ribbon installation.
Poor print quality; smudging or light.	Adjust the head penetration.
Printer fault or out of paper messages	Check the printer flow and paper sense switches.
Printer not selected, busy, or time-out messages	Printer PIA and driver, printer are not selected. Interrconnect the cable.
Paper does not advance.	Check the clutch and paper advance mechanism.
One or more missing characters.	Check the printer logic board character ROM and circuitry for damage.

3.4 TSTHIMEM (SYSTEM HIGH MEMORY TEST)

TSTHIMEM tests all of system memory starting address 4000_{16}.

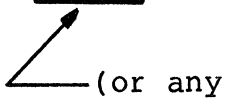
The program allows for comprehensive testing of the system RAM memory. Besides the complete memory bit testing, subtests can be selected to provide memory block tests which are at a default value of 0400 hexadecimal byte blocks. For the block and entire memory testing, the memory addresses tested are from 4000 to E7FF which equates to the upper portion of a 58K RAM memory. Also, another feature allows the system line printer to provide a printout of the program messages. This capability allows you to exercise the system line printer as well as the system memory.

Program execution is described in subsection 3.4.1. Memory error detection is described in subsection 3.4.2.

3.4.1 PROGRAM EXECUTION

To select the TSTHIMEM program, enter the following in response to the equal prompt.

```
=TSTHIMEM;E=E7FF S=(C-K-L-M-N-O-P-Q-R-S-T)
```



(or any other top of memory address)

where

TSTHIMEM is the command file statement.

E=E7FF is a statement which sets the last address to be tested. The start address is 4000 (defaults).

S=(x-x) is a statement which commands the program to perform certain subtests in the memory block, and to delete others.

The tests which are performed are:

1. Walking Address All-Memory Subtest.
2. Random Values Subtest.
3. 10101010 Bit-Pattern All-Memory Subtest.
4. 01010101 Bit-Pattern All-Memory Subtest.
5. Walking Address In-Blocks Subtest (0400 hex block size).
6. 10101010 Bit-Pattern In-Blocks Subtest.
7. 01010101 Bit-Pattern In-Blocks Subtest.

To select the TSTHIMEM program for printer use, enter the following.

```
TSTHIMEM; P E=E7FF S=(C-K-L-M-N-O-P-Q-R-S-T)
```

where

P is a statement that commands the program to output console messages to the system line printer.

Once the command statement has been entered, the following will be displayed.

```
=TSTHIMEM;E=E7FF S=(C-K-L-M-N-O-P-Q-R-S-T)

SYSTEM HIGH-MEMORY TEST X.XX

-TEST ALL OF MEMORY AT ONCE-

WALKING ADDRESS ALL-MEMORY SUBTEST
RANDOM VALUES SUBTEST
10101010 BIT-PATTERN ALL-MEMORY SUBTEST
RANDOM VALUES SUBTEST
01010101 BIT-PATTERN ALL-MEMORY SUBTEST
RANDOM VALUES SUBTEST
```

Once the entire (All-Memory) memory tests are completed, the next test phase is to test the upper RAM memory in 0400 blocks under the same parameter test as just completed.

If, during the execution of the program, you wish to halt the tests, press the BREAK key. The following is displayed.

```
**USER BREAK DETECTED
```

Then, you will be asked the following on the system console.

```
Enter any character to CONTINUE, return only to TERMINATE
```

3.4.2 MEMORY ERROR DETECTION

In the event an error is detected during the testing process, the following error message will be displayed.

```
MEMORY FAILED at address E000 with value 00 instead of E0
                          [000.....]
```

The address and data values are identified in hexadecimal. If the expected and faulty data values agree that a particular bit should be zero, a period "." is displayed for that bit position. A colon ":" is displayed for the case of it being one. If they disagree on a particular bit position, the value of the faulty data is displayed as a "0" or "1".

The aforementioned statement shows a failure of [000.....] where the faulty data are the 000; the data bits should have been 1's. This diagnostic error message can easily determine faulty address locations.

3.5 TSTLOMEM (SYSTEM LOW MEMORY TEST)

TSTLOMEM tests all of the system memory starting at address 0000 to $3FFF_{16}$.

The program allows for comprehensive testing of the system RAM memory. This test is identical to that of TSTHIMEM which provides for All-Memory and Block-Memory testing. Refer to section 3.4 for information concerning TSTHIMEM

Program execution, memory error detection, and use of the BREAK key are discussed in subsections 3.5.1 - 3.5.3, respectively.

3.5.1 PROGRAM EXECUTION

To select the TSTLOMEM program, enter the following in response to the equal prompt.

```
=TSTLOMEM;P S=(C-K-L-M-N-O-P-Q-R-S-T)
```

where

P is a statement which commands the program to output console messages to the system line printer.

S=(x-x) is a statement which commands the program to perform certain subtests in the memory block and to delete others.

3.5.2 MEMORY ERROR DETECTION

In the event an error is detected during the testing process, an error message is displayed with the format and conditions as TSTHIMEM. Refer to section 3.4 for further information.

3.5.3 USE OF THE BREAK KEY

The program can be halted by pressing the BREAK key. The following message is displayed once the BREAK key is pressed.

```
**USER BREAK DETECTED

Enter any character to CONTINUE, return to TERMINATE
```

3.6 TSIO (ACIA LOOPBACK TEST AND DIAGNOSTICS PROGRAM)

TSIO is a diagnostic program for the evaluation of the proper operation of the ACIA module.

To prepare for the TSIO program, configure a Break-out Box in the following manner.

1. Jumper PIN 2 to PIN 3
2. Jumper PIN 5 to PIN 20

Place the Break-out Box on the RS-232C connector of the ACIA module.

Program execution is discussed in subsection 3.6.1.

3.6.1 PROGRAM EXECUTION

To select the TSIO program, enter the following in response to the equal sign prompt.

```
=TSIO
```

The following message is then displayed.

```
=TSIO

ACIA Loopback Test and Diagnostic Program X.XX
       Copyright © 1979 by CODEX Corp.

SELECT ACIA BASE ADDRESS:
Enter full 4-digit hexadecimal address.
Enter Q to return to CODOS.
Base Address=$----
```

Then, enter the base address value of $EC26, and press the RETURN key. The following appears.

```
Base Address=$EC26
Is this a signal ACIA board, configured as a MODEM?? (Y/N)
```

Enter "Y" and then press the RETURN key. An improper response to the question will cause the test program to detect a modem control line error and terminate the test.

If the ACIA test successfully completes its full test procedure, the message "Passed multiple format sub-test" will be displayed on the video screen approximately three to seven seconds into the test. This will be shortly followed by "ACIA test complete. Device passed."

The entire message response should appear as follows.

```
=TSIO

ACIA Loopback Test and Diagnostic Program
       Copyright © 1979 by CODEX Corp.

SELECT ACIA BASE ADDRESS:
Enter full 4-digit hexadecimal address.
Enter Q to return to CODOS.
Base Address=$EC26
Is this a single ACIA board, configured as a MODEM?? (Y/N)Y

Passed multiple format subtest.


                          ACIA-Test complete.  Device passed
.

SELECT ACIA BASE ADDRESS:
Enter full 4-digit hexadecimal address.
Enter Q to return to CODOS.
Base Address=$----
```

To return to CODOS, enter "Q" and press the RETURN key.

If an error occurs while the program is testing the ACIA module, a unique message will be displayed on the screen and the program will return control to CODOS. Table 3-4 lists some of the possible error messages and causes.

TABLE 3-4. ERROR MESSAGES ENCOUNTERED DURING TSIO

MESSAGE	EXPLANATION
MODEM CONTROL PINS NOT WORKING	This error message may result from several sources. The most common problem is that the board is not responding to the base address entered. This could be caused by the improper setting of the address select switches or a defective module.
DEVICE FAILED TO RESET	The ACIA has probably failed.

TABLE 3-4. ERROR MESSAGES ENCOUNTERED DURING TSIO (CONT.)

MESSAGE	EXPLANATION
TDRE NOT WORKING. POLLED	Check for intermittent connections. Incorrect loopback connections on the RS-232C connector exists.
BREAK NOT WORKING	The ACIA chip will not send a BREAK (continuous space condition). The device is defective.
DATA DID NOT CHECK	The data received was not the same as what was expected. If Phase 1 testing completes without errors, the following message is displayed. Passed Multiple Format Sub-test If an error occurs before this message is displayed, there is a good possibility that a configuration error is at fault. Check the module seating and loopback connections. There is a defective ACIA module. The ACIA module should be carefully checked for proper configuration before the test is executed. More failures occur from incorrect or incomplete configuration than any actual hardware malfunction.

In summary, ensure the following is done.

1. Select TSIO and connect the Break-out Box.

2. Enter the Base Address EC26 and press the RETURN key.

3. Enter Y and press the RETURN key.

Testing should then occur. The proper message response will indicate the device passed. Then, enter "Q" and press the RETURN key to return to CODOS.

3.7 DISK4 (SYSTEM TEST AND DIAGNOSTIC PROGRAM)

DISK4 is a comprehensive diagnostic to exercise and evaluate the performance of the floppy disk system. Program execution is discussed in subsection 3.7.1.

3.7.1 PROGRAM EXECUTION

To select the DISK4 program, enter the following in response to the equal sign prompt.

```
=DISK4
```

The following message is then displayed.

```
=DISK4

DISK4 SYSTEM TEST AND DIAGNOSTIC PROGRAM

Install scratch diskettes, depress RETURN to begin test
```

Then, install the scratch diskettes in drive 0 and 1. (The diskettes which are used must be formatted).

A few seconds must pass before the RETURN key is pressed. This will provide time to allow the diskettes to reach full speed. Once the RETURN key is pressed, the following message will be displayed.

```
Initial test of drives/diskettes is in progress
```

If this test is successful, it will consume approximately 51 seconds of time. Any error which might occur during the initial testing is fatal (i.e., the test will be aborted and control returned to the equal sign prompt). Possible errors are displayed by error numbers. Table 3-5 lists possible system errors.

TABLE 3-5. ERROR MESSAGES ENCOUNTERED DURING DISK4

ERROR MESSAGE	EXPLANATION
E1 Data Cyclical Redundancy Check	This usually means an error exists on the diskette. It could be the Disk Controller Module. Reformat the diskette.
E2 Write Protected	The diskettes are write protected. Check the diskettes. Also, check the interconnect cabling.
E3 Disk Not Ready	This is usually an operator error (i.e., door(s) ajar, diskettes not allowed sufficient time to reach operating speed, or power is off). Try again.
E4 Read Deleted Data Mark	This is usually the diskette. It could be the Disk Controller Module. Reformat the diskette(s).
E5 Timeout	There is an operator error. Check the configuration. Try again.
E6 Invalid Disk Address	This is usually the system memory or Disk Controller Module and not the diskette(s). Perform system memory tests.
E7 Seek Error	This is usually the drive or diskette, or Disk Controller Module. Reformat the diskette(s).
E8 Data Mark Error	This is usually the diskette. Reformat the diskette(s). It could be the Disk Controller Module.
E9 Address Mark Cyclical Redundancy Check	This could be the diskette(s) or Disk Controller Module. Reformat the diskette(s). Try again.

If the initial test is successful, a comprehensive test begins, indicated by the following message.

```
Comprehensive test in progress
```

Assuming no errors occur, this test consumes approximately 15 minutes and 15 seconds. At the completion of the comprehensive test, a final report as shown in Figure 3-1 is displayed.

```
DISK4 SYSTEM TEST AND DIAGNOSTIC FINAL REPORT

DRIVE 00
   E0       E1       E2       E3       E4       E5
 0007D3   000000   000000   000000   000000   000000
   E6       E7       E8       E9     SOFT     DATA
 000000   000000   000000   000000   000007   000000

DRIVE 01
   E0       E1       E2       E3       E4       E5
 0007D3   000000   000000   000000   000000   000000
   E6       E7       E8       E9     SOFT     DATA
 000000   000000   000000   000000   000007   000000
```

Figure 3-1. DISK4 System Test and Diagnostic Final Report

The report shows the accumulated history of errors for each drive. E0 through E9 are 3-byte counts of return status. SOFT errors are totals of retries. DATA errors are those where data did not verify properly. The report illustrated shows the worst possible test results that are acceptable. The E0 count for drive 0 and 1 must be 0007D3 and the SOFT error count for drive 0 and 1 must be no larger than 000007. The E1 through E9 count must be 000000 and the DATA count must be 000000.

After the final report is displayed, the following will be displayed.

```
Install normal system diskette(s), depress RETURN to bootload system.
```

The scratch diskettes must be removed and the diagnostic diskette placed in drive 0.

3.8 DISK5 (HARD DISK TEST AND DIAGNOSTICS PROGRAM 5.00)

DISK5 is a test and diagnostic tool that allows an operator to evaluate the operation of a CDX-DS/FR Hard Disk subsystem. System requirements and preparation are discussed in subsections 3.8.1 and 3.8.2. Also, unlike previous Codex disk test programs, DISK5 allows numerous options and operates in an interactive mode with the operator. These subtests and their relevant options are discussed in detail in subsection 3.8.3. The result interpretation of these subtests is discussed in subsection 3.8.4. Finally, the DISK5 exit is discussed in subsection 3.8.5.

3.8.1 SYSTEM REQUIREMENTS

To use DISK5 to evaluate a CDX-DS/FR Hard Disk subsystem requires not only the CDX-DS/FR under test, but the following additional components.

1. CDX-68 Display System with Extended Display Feature, user definable keys F1-F8, a CDX-SBC/D Single Board computer, and a minimum of 32K of contiguous RAM starting at address 0000 are necessary. The system must be operating under CODOS 5.00 or later.

2. If the CDX-DS/FR under test does not have CODOS on the fixed disk, another drive chassis with CODOS resident on the fixed disk must be used and assigned as logical units 0 and 1. The CDX-DS/FR drive chassis under test may be assigned to any other valid logical unit designators.

3. The Hard Disk Test and Diagnostic program (DISK5) version 5.00 or later must be used.

4. Optionally, the CDX-SPx printer and cable could be used. It is only required if a hard copy of the results is desired. The SP4 printer is not supported in version 5.00, but will be available in later versions.

3.8.2 PREPARATION

To prepare the system for DISK5, proceed as follows.

1. Configure the complete system so that a functional hard disk drive is assigned to logical units 0 and 1.

2. Apply the system power and load and execute CODOS.

3. At the equal sign prompt, give the command DISK5. The DISK5 program will then load and sign on.

After the copyright notice is displayed for about three seconds, the display will clear and a menu of subtests will appear as shown in Figure 3-2.

```
<<DISK5 System Test & Diagnostic>>

          Select Sub-Test:

    F1    All-Sector Read

    F2    All-Sector Write

    F3    Seek Test Series

    F4    Controller Tests

    F5    Return to CODOS
```

Figure 3-2. DISK5 Subtest Menu

3.8.3 OPERATION

To enter any of the subtests, or to return to CODOS, press one of the user-definable keys along the top of the keyboard. During the entire time that DISK5 is operating, only the keys F1-F8 are used. Since DISK5 performs its own console interface, any user-defined function of these keys is ignored and only the functions available on the displayed menu are supported.

The following paragraphs give a brief explanation of the operation of the subtests and the options available under each.

1. All-Sector Read. It is entered by pressing F1. The new menu displayed is the Unit Selection Menu. This determines on which logical unit the subsequent test is to be performed. The operator should press the key associated with the desired unit under test.

NOTE: A complete drive chassis consists of two (2) logical units which must be separately tested to ensure complete functionality of a drive chassis.

After selecting the logical unit to test, the Option Selection Menu is displayed. The first five (5) entries in the menu are the available options and are alternately enabled and disabled by pressing the associated key. When the

option is enabled, an asterisk (star) will appear on the same line as the option definition. When it is disabled, the beginning of the line is blank. There is no limit to the number of times an option may be alternately enabled and disabled before pressing the test start key, F6.

The first four (4) options relate to the areas to test on the disk surface. To shorten the time required for such a large volume of data, each logical unit (disk) is divided into four areas of 102 cylinders. This permits localized testing of the disk surface and also speeds repetitive testing.

The fifth option is called "Auto-Repeat" and is used mostly for exhaustive or long-term testing. The normal subtest sequence of events is to run the test once on each of the designated areas, and then display a report of the test results. The Auto-Repeat option will make the test loop back and continue running on the designated areas until the abort key, F7, is pressed. At that point, the result table is displayed. A test invoked without the Auto-Repeat option may also be aborted by pressing F7. The current result table is is then displayed.

If a disk error is encountered during the progress of the test, a short message giving the error type, location, and unit number is displayed on the CRT and the printer, if selected. Also, in the unlikely event that one of the result counts should overflow more than 16,777,216 decimal, a short message indicating overflow is displayed. No indication of which count overflowed is given, but it should be simple to determine from the number of error messages printed. Neither of these conditions stops the test, however.

The actual procedure used in the All-Sector Read subtest is as follows.

a. Find the first sector of the first area to check.

b. Read one track of 24 sectors.

c. Repeat step b until the end of the current area.

d. Proceed to the next designated area and repeat steps b and c until the end of the disk is reached.

It should be noted that no check of the sector data is made. The read operation only tests the readability of the recorded data, the proper operation of shared memory, and the validity of the header and data check codes. The operation will detect locked-out sectors, bad media, bad CRC's, etc.

When the subtest is complete, a result report (as shown in Figure 3-4) is displayed. Pressing the F8 key will return to

the subtest selection menu.

2. All-Sector Write. It is virtually the same as that described for the All-Sector Read subtest. The menus are the same and the options are also the same. The difference is in the function performed to the disk. In this subtest, a track of 24 sectors is written with the data $E5 over its entire length. The proper header information is maintained. The data just written is then compared with the source in shared memory. Any difference is logged as an error.

3. Seek Test Series. After selecting this subtest and designating a logical unit to test, a menu of several different head seek tests is displayed (as shown in Figure 3-3).

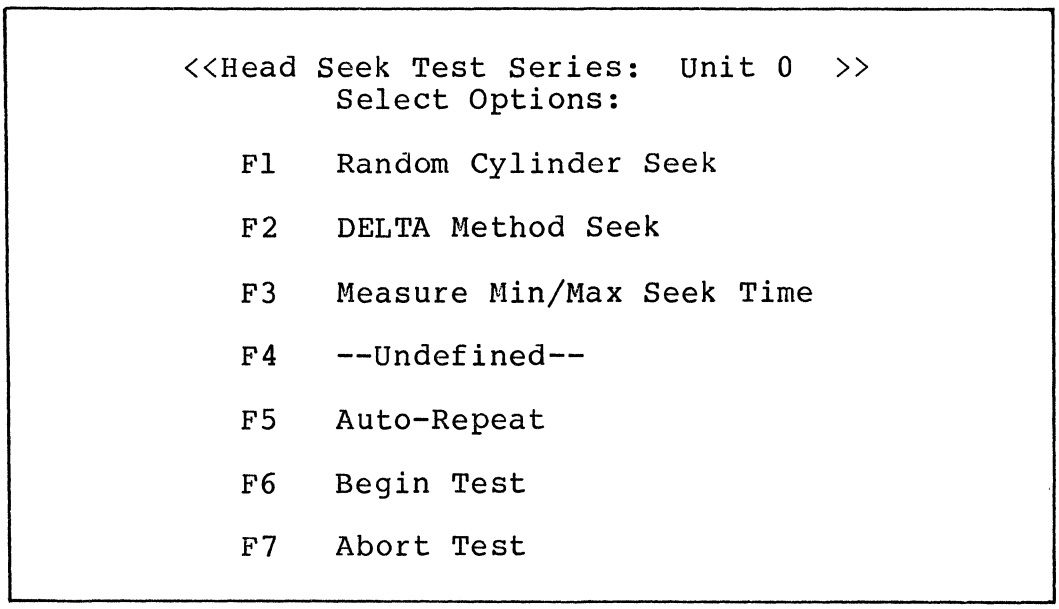


Figure 3-3. Seek Test Series Menu

Each of the three tests can be enabled and disabled exactly like the area designations on the Read and Write tests. When the "test begin" key, F6, is pressed, they will be executed in order on the specified unit. Since these are head seek tests designated to detect failures in the head-seek electronics, they are conducted over the entire disk surface to maximize the possibility of detecting malfunctions. Note that F4 is currently undefined. This option has no effect on the tests and, for now, is simply ignored. In release 5.00, the Measure Seek Time feature is not implemented and will give notice of this fact if it is used.

The Random Seek option is conducted using a linear congruential pseudo-random sequence generator implemented in the test software. The algorithm used in release 5.00 is as

follows.

```
RANDOM_NUMBER=((RANDOM_NUMBER*58653)+13849)MOD 65536
CYLINDER=(RANDOM_NUMBER*408)/65536
```

This algorithm will generate a pseudo-random sequence which exercises the head-positioning circuitry considerably. It uses unsigned 16-bit binary numbers for calculation. The time required for a full 408 seeks is about one minute, if no errors are encountered.

The Delta Seek is so named because of the value "delta", which is alternately added to the minimum cylinder and subtracted from the maximum cylinder number to yield the cylinder of the next seek destination. This operation is done a total of ten (10) times, as rapidly as possible, during the test. The time for a Delta Seek test is under 10 seconds, if no errors occur.

The Measure Seek Time test (not implemented in release 5.00) will measure the time it takes to move to the next adjacent track (minimum seek time) and also the time required for a full traversal of the disk platter (maximum seek time). These measurements are made to the nearest tenth of a millisecond with an error of one-tenth millisecond. These times are for comparison purposes only and should be interpreted only by qualified service personnel.

The fourth (unused) option is open for specification. Customer input on its future designation is requested on an informal basis.

The Auto-Repeat operation is the same as described earlier. Note that if more than one test is selected, the entire series of tests will be repeated indefinitely.

> CAUTION: To prevent excessive wear on the head and its positioning mechanism, it is not recommended that seek tests be performed for extended periods of time.

As in the other subtests, the "abort key", F7, may be pressed at any time. The test will stop and print any results gathered.

4. Controller Tests. This series of tests is designed to thoroughly exercise the Controller and Shared Memory modules and pinpoint trouble areas.

It is not implemented in release 5.00, but will be available in later versions.

3.8.4 RESULT INTERPRETATION OF SUBTESTS

The results of each subtest are displayed when the subtest reaches completion. The result counts are all expressed in hexadecimal numbers. An example of this report is shown in Figure 3-4.

```
Results of All-Sector Read Test.

.  Unit.  Hard.  Soft.Area 1.Area 2.Area 3.Area 4.Normal.
.    00.    00.    00.    00.    00.    00.    00.  032B.

.DatCRC.WRProt.NotRdy.BadSct.Incomp.InvAdr.HdSeek.Compar.DCFifo.BufLoc.RWSctr.
.    00.    00.    00.    00.    00.    00.    00.    00.    00.    00.    00.
```

Figure 3-4. Sample Result Report

As shown, the first line of the report labels the results as being from a particular subtest. Note that the results of the Seek Test series are tabulated for the entire series of tests. The column labelled "Unit" designates on which logical unit the test was conducted. "Hard" is the total count of all hard error returns from the system firmware. The hard errors are tabulated in the third line of the report. Soft errors are those in which an error occurred on the first try. The software attempted a retry instead of giving an immediate hard error indication. Soft errors are not supported in release 5.00. All errors encountered are logged as hard errors.

The four columns labelled "Area 1" through "Area 4" are the total hard error counts occurring in each area. An area is defined as one-fourth of the available storage of one disk platter. The ranges of each area (in decimal) are listed in Table 3-6.

TABLE 3-6. AREA RANGE DEFINITIONS

AREA	PHYSICAL SECTOR RANGE
1	0 through 4895
2	4896 through 9791
3	9792 through 14687
4	14688 through 19583

The count called "Normal" is the number of normal (no error) returns that occurred during the subtest operation. This number added to the total hard error count will give the total number of disk accesses during the test.

The separate error counts are given on the third line of the report. A short description of their meaning is given in Table 3-7.

TABLE 3-7. ERROR COUNTS ON THE RESULT REPORT

ERROR COUNTS	EXPLANATION
DatCRC: Error "1"	While reading a sector, the CRC's failed to match.
WrProt: Error "2"	An attempt to write data to the specified platter was made while it was write protected with the switches on the front panel of the drive.
NotRdy: Error "3"	The platter was not ready for a specified function.
BadSct: Error "4"	A header indicating a bad sector was read.
Incomp: Error "5"	The firmware timed out before the disk controller was able to complete its designated function.
InvAdr: Error "6"	An invalid sector address was sent to the disk firmware.
HdSeek: Error "7"	The head positioning mechanism was not able to find the specified cylinder within its allotted time (about one second).
Compar: Error "8"	After writing the data to the disk, the verify pass could not read back exactly what was written.
DCFifo: Error "9"	An unspecified error has occurred in the use of the data or control word FIFO's.
BufLoc: Error ":"	The sector buffer was not within the bounds of shared memory.
RWSctr: Error ";"	An unspecified error occurred while reading or writing a sector.

3.8.5 DISK5 EXIT

To exit DISK5 and return to CODOS, the Subtest Selection Menu must be displayed. At this point, pressing F5 will clear the screen and CODOS will reload and sign on after approximately seven seconds. The system will then be at the CODOS equal sign prompt level, ready for further commands.

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TEST AND DIAGNOSTICS MANUAL

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