

SYSTEM 80 DISK & MEMORY DIAGNOSTIC

=====  
System 80 Diagnostic programs come on a 40 track, single-sided, single density diskette. The disk has its own loader/boot program and does not need any other DOS.

Place the disk into drive 0 and reset. After a few seconds, the screen will clear and you will be prompted by:

1=MEMORY 2=DISK :

Press either 1 or 2, depending on which of the tests you require. The test program will load and prompt you for further information. Remove the diagnostic program disk from the drive at this point.

RUNNING THE MEMORY TESTS

=====  
When the memory test program has loaded, it will ask you for information as follows:

ENTER SYSTEM MEMORY SIZE (1=16K 2=32K 3=48K) \_

Type the appropriate number (1-3, NOT 16/32/48 !)

PAUSE ON ERRORS (Y OR N) \_

Enter Y if you want the program to pause after displaying an error message. To retain this during a program run, press Y to restart the test. If you want to disable the pause on error function, press any other key.

RUN EXECUTE TEST (Y OR N) \_

Enter Y to run both the READ/WRITE test and the EXECUTE test, or N to run only the READ/WRITE test.

MEMORY DIAGNOSTIC will now commence to RAM testing and will report any errors as they occur. At the end of each pass through the tests, the number of passes and the cumulative total of errors will be reported. Each pass will take up to half an hour, depending on memory size and whether you selected to run the execute test.

WRITE/READ TEST: Each address is written to and immediately read to check write accuracy. This continues through to top of RAM. Then, each address is re-read to verify that data has not been lost or written over. On each pass, this test is performed 260 times. An on-screen loop counter keeps you informed of progress.

EXECUTE TEST: In this test, the entire RAM is written with Z-80 RST38H (0FFH) instructions. Then a block of machine code is written to the bottom of the test area and an attempt is made to execute it. If the attempt is successful, the block is moved up one address and a new attempt is made to execute it. This continues until all available RAM has been tested. If the Z-80 should encounter one of the RST38H instructions instead of the expected code, it will jump to location 38H then branch to a special error-handling routine. While the test is running, screen messages will indicate the address of the current test block, and which loop (0-3) is running.

ERROR MESSAGES

=====

WRITE/READ TEST: This test announces the address at which an error was found, the data that should have been read, and the actual data found. All address and data are expressed in HEX. A typical message would look like this:

ERROR: ADDRESS=7F21 EXPECTED DATA=AA ERROR DATA=8A

```
DATA BIT(S)  7    6    5    4    3    2    1    0
-----
IN CONSOLE  :                               C12
```

This message indicates that data bit 1 could not be correctly read. The reference number 'C12' shows which memory IC can be suspected of causing the error. The location of the chip can be found from the following table.

DATA BITS	IN SYSTEM80 CONSOLE	ON S100 RAM CARD (4010 EXPANDER.)	ON EXP UNIT (4020 EXP.)
0 . . .	C11:Z27 . . .	U11:Z1	U21:Z11 . . . .U11:Z18 U21:Z8
1 . . .	C12:Z28 . . .	U12:Z2	U22:Z12 . . . .U12:Z17 U22:Z7
2 . . .	C13:Z29 . . .	U13:Z3	U23:Z13 . . . .U13:Z16 U23:Z6
3 . . .	C14:Z30 . . .	U14:Z4	U24:Z14 . . . .U14:Z15 U24:Z5
4 . . .	C15:Z31 . . .	U15:Z5	U25:Z15 . . . .U15:Z14 U25:Z4
5 . . .	C16:Z32 . . .	U16:Z6	U26:Z16 . . . .U16:Z13 U26:Z3
6 . . .	C17:Z33 . . .	U17:Z7	U27:Z17 . . . .U17:Z12 U27:Z2
7 . . .	C18:Z34 . . .	U18:Z8	U28:Z18 . . . .U18:Z11 U28:Z1

In the example above, the error message indicated chip 'C12', or Z28 on the circuit board. This is the one responsible for storing bit 1 at address 7F21H in the System 80 console.

This type of analysis presumes that one of the RAM ICs will be at fault, but that is not always the case. The actual error could be in the address decoding circuitry, data routing, or RAM power supplies. If substituting the suspected chip with a known good one does not correct the error, one of the latter could be the problem.

EXECUTE TEST: Any error encountered in this test will cause termination of the test and an error message of the following form will be displayed:

```
*** ERROR IN EXECUTE TEST ***
ADDRESS OF 1ST BYTE OF CODE = MMMM
MACHINE CODE EXPECTED AT THAT ADDRESS ==>>7D 55 AA C3 B6 44
ACTUAL MACHINE CODE AT ERROR ADDRESS ==>>NN NN NN NN NN NN
```

In this message, 'MMMM' represents the address of the first byte of the test block where the error occurred. 'NN' represents the code which was read from the test block. Because faults encountered by this test are often due to borderline timing problems, the actual code re-read from RAM by the error routine may at times be identical to the expected code, even though it did not agree when read during a CPU instruction fetch.

THE DISK DIAGNOSTIC PROGRAM  
=====

After the DISK DIAGNOSTIC program has loaded, you will be prompted for further information as below. Before proceeding, however, remove the DIAGNOSTIC disk

from the drive, and place FORMATTED (single side, single density) disks into the drives you wish to test.

If you make an error in entering any of the requested information, press <BREAK> to restart the question. Once the diagnostic is running, you may terminate it by holding down the <NEWLINE> key.

ENTER THE DRIVES TO BE TESTED? (0-3) \_

To test drives 0 and 1, you would enter '01<NEWLINE>'

HOW MANY TRACKS? (1=35 2=40) \_

TRACK-TO-TRACK ACCESS TIME (1=40ms 2=20ms 3=12ms) \_

TESTS? (A-E) \_

ENTER the letters to indicate the tests to be performed. For instance, if you wanted to do tests B, C, E twice, you would enter BCEBCE<NEWLINE>. A sequence of up to 50 tests may be entered this way.

RUN CONTINUOUSLY? (Y OR N) \_

Enter Y to run the tests repeatedly, or N for a single pass.

TERMINATE TEST ON EXCESSIVE ERRORS? (Y OR N) \_

Except for test A and parts of B, some errors can cause the program to loop endlessly. The Y option will terminate the test after 10 errors have occurred.

OPERATOR INTERVENTION? (Y OR N) \_

To fully utilize test A and to allow the diskette interchangeability test to be run, you must enter Y to this. The option is disabled after one pass of a multiple-pass test run.

TEST DISKETTE INTER-CHANGEABILITY? (Y OR N) \_

This will be asked if you answered N to the previous question. If you answer Y to this, and have selected tests D & E, you will later be asked to exchange disks between drives in order to assess drive-to-drive compatibility. This option also is disabled after the first pass.

After you have answered all of the above, the tests will run. Each test announces itself at the start, and any errors during the run. At the end of each pass, cumulative error totals will be reported, as well as the pass number.

TEST A: This test checks the write-protect, index, and track 0 sensors, and the 'busy indication'. The controllers track register is tested and verified by stepping off track 0 and back, and by seeking the highest track.

TEST B: Tests read and track seek functions. First the drive is selected and the head restored to track 0. The track address is then read and verified. The track register is then loaded with an incorrect value and a 'read sector' command is issued to the controller, which is then checked to verify that a 'record not found' error has been reported. The test then attempts to perform a multiple sector read/write operation. Finally, a rigorous track seek is performed to expose mechanical defects, such as binding and excessive play, in the head positioner as well as problems associated with the positioner electronics. All possible seek lengths are attempted, and the track address is verified at each step.

TEST C: Checks write/read operations

TEST D: Checks for track-to-track interference by writing tracks alternately with all 0s and all 1s. All sectors are verified one at a time starting at zero, and then re-verified by reading backwards (sector/track 0 is last). The test will also prompt you to move the disk to another drive if the interchangeability option has been selected.

TEST E: All possible data patterns are written and verified across the entire diskette, and a second interchangeability test will be done if that option was selected.

E                                 DISK DIAGNOSTIC ERROR MESSAGES

=====

ERROR MESSAGE	FAULT CODE
DRIVE SENSED READY WHEN NOT SELECTED	2/4
WRITE PROTECT NOT SENSED	1/2/4/8/11
BUSY FLAG NOT SENSED	2/4/8
DRIVE NOT READY	1/2/4
INDEX MARK SENSED WHEN NOT EXPECTED	1/2/4/12
INDEX MARK NOT SENSED	1/2/4/12/14
WRITE PROTECT SENSED	1/2/4/8/11
CONTROLLER EXCEEDED TIME LIMIT FOR OPERATION	2/4/8
TRACK REGISTER IS NOT BEING UPDATED	2/4/8
TRACK 0 NOT SENSED CORRECTLY	2/4/8/10/11/13
DATA IS NOT BEING TRANSFERRED TO CONTROLLER	2/4/5/9
FORCED RECORD-NOT-FOUND-ERROR DID NOT OCCUR	2/4
FORCED LOST-DATA-ERROR DID NOT OCCUR	2/4
FAILED MULTIPLE SECTOR I/O OPERATION	2/4/7/9
DATA READ FROM DISK IS INCORRECT	2/4
RECORD NOT FOUND	2/3/4/5/6/7
SEEK ERROR	2/3/4/5/6/7/10/13
CRC ERROR	2/3/4/5/6/7/9
LOST DATA	2/3/4/5/6/7/9

-----  
FAULT CODE    POSSIBLE CAUSE

- 1.....Operator Error.
  - 2.....Defective connections between controller and drive.
  - 3.....Incorrect motor speed.
  - 4.....Defective controller &/or expander circuitry.
  - 5.....Defective drive circuitry.
  - 6.....Incorrect read/write head alignment.
  - 7.....Flawed or unformatted diskette.
  - 8.....Defective controller clock.
  - 9.....Defective head load pad.
  - 10.....Defective head positioning mechanics.
  - 11.....Faulty or misaligned write-protect or track 0 sensor.
  - 12.....Defective index sensor.
  - 13.....Defective stepper motor.
  - 14.....Defective drive motor.
-