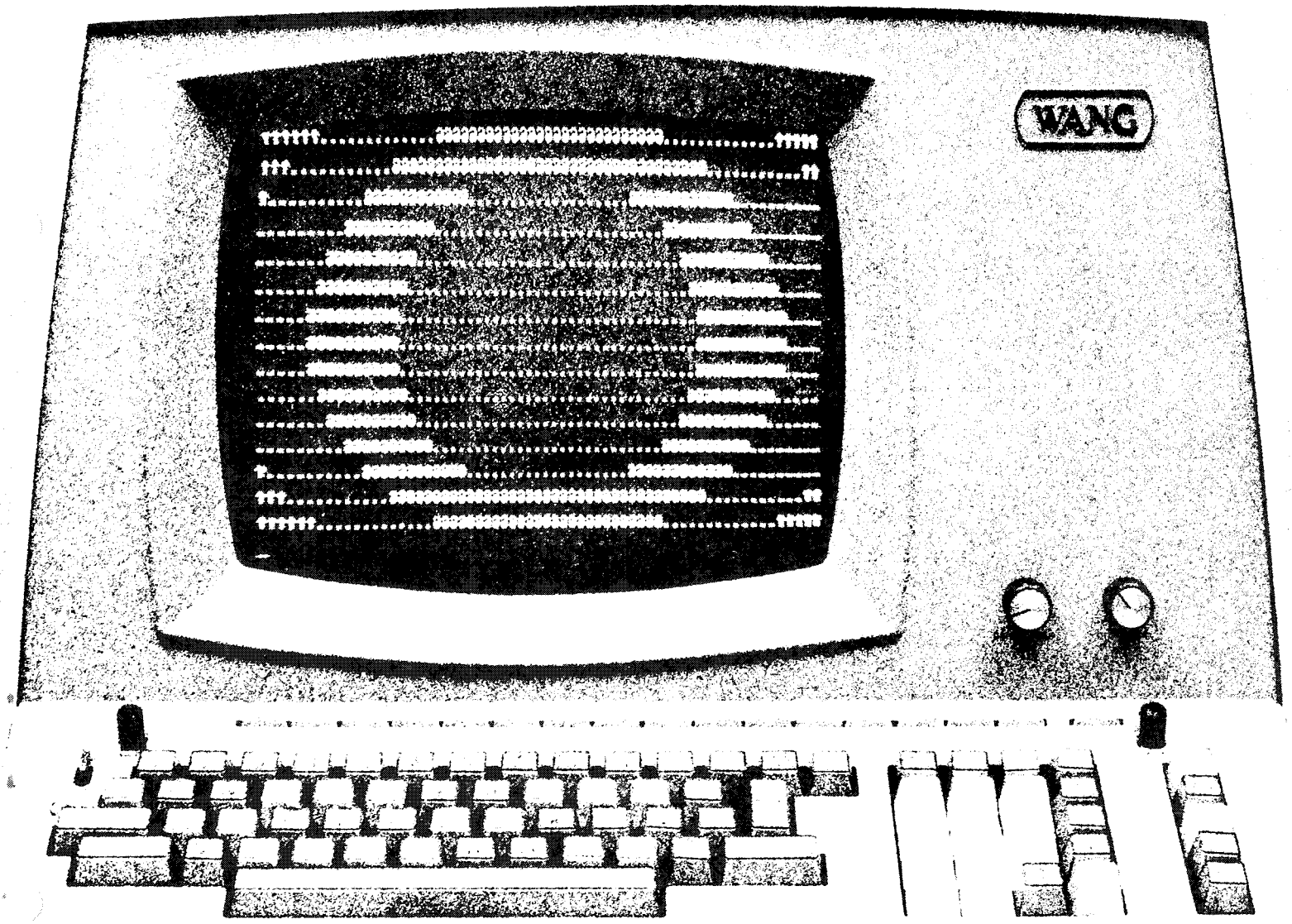
WANG

HARDWARE DIAGNOSTIC OPERATING MANUAL

SYSTEM 2200



Hardware Diagnostic Operating Manual

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CHAPTER 1 OVERVIEW

The 2200 Hardware Diagnostic System is a software system designed to help maintain the maximum efficiency of your Wang system. It contains programs which exhaustively test the hardware components of the system and which attempt to pinpoint any malfunctions. The nature of these programs forces their operation outside the Processing Day, as that is defined by the Integrated Support System (ISS).

The diagnostic programs of this system should be executed:

(1) once every 60 to 80 hours of operation;

(2) whenever a hardware malfunction is suspected;

(3) whenever a Wang Service Representative requests their execution.

In addition, the memory diagnostic should be executed whenever the memory diagnostic of ISS's IPL detects a problem.

It is best to execute diagnostic routines as close as possible to the time of observation of a suspected problem. This ensures that the environmental conditions of the test most closely resemble those under which the problem may occur.

Six basic diagnostics are offered. They are Memory, CPU, Printer, Disk Instructions, Disk, and Disk Platter Verify. There are two types of memory and disk diagnostic, known as the System diagnostic and the Burn-in diagnostic. These differ in the number of times each part of the subject system is tested. The Burn-in diagnostic performs the tests many more times than the System diagnostic, and is recommended when an intermittent system problem seems to have eluded the System diagnostic.

The Disk Platter Verify diagnostic is provided for the purpose of testing disk platters and diskettes. The contents of the tested disk are destroyed.

The Disk, Disk Instructions, and Platter Verify diagnostics require occasional operator attention. The other diagnostic routines do not, and may be left to operate outside of normal system working hours.

A Copy and Verify program is provided with the diagnostics to facilitate copying them from the diskette to a rigid type 2230 or 2260 drive. The diagnostics can operate from either a rigid or diskette type drive at address 310, 320, 350, B10, B20, or 360.

NOTE:

The Disk diagnostic can test both rigid and diskette type drives. For each disk unit, specific disk addresses are selected for testing. Disk contents at the selected addresses are destroyed. Therefore, be sure to copy any valuable disk contents at the selected addresses before executing the Disk diagnostic.

The Disk Instructions diagnostic operates at a selected address but uses the complementary address to test the COPY and MOVE statements. Optionally, the operator may forgo COPY and MOVE testing. The contents of the disk mounted at the selected address is destroyed by the Disk Instructions diagnostic. Disk contents at the complementary address are also destroyed when COPY and MOVE are tested.

The approximate execution times for representative diagnostics are given below.

TEST	CONFIGURATION	TIME
Memory (System diagnosis)	8K	10 min.
	16K	17 min.
	24K	24 min.
CPU	Not Significant	13 min.
Printer	2221W	6 min.
Disk Instructions (with COPY and MOVE)	Not Significant	4 min.
Disk (System diagnosis)	Single Drive Diskette	38 min.
	2230-3, both platters	2 hrs. 22 min.
Disk Platter Verify	Diskette	8 min.

The diagnostics output results to a printer or CRT display. The detailed output exceeds the capacity of the display; therefore, whenever a printer is available, it is recommended that the hardcopy option be selected. Results which indicate malfunctions should be saved for use by Wang Field Service Representatives.

After all tests are executed a pass/fail summary of the results is displayed. At this point the operator has the option of passing control to the IPL module of an ISS diskette, or returning to the 2200 Hardware Diagnostic System master menu.

The minimum hardware required for execution of the 2200 Hardware Diagnostic System is either:

a) A WCS system with 8K of memory and a single diskette drive.

b) A 2200T CPU with a keyboard, CRT, 8K of memory and a single diskette drive. (The system can also operate from, and is available on, a flexible disk, for the 2240 series disk drives.)

NOTE:

The protect feature of diskette systems must not be invoked for the 2200 Hardware Diagnostic System diskette. That is, the write protect hole must be covered.

CHAPTER 2 OPERATING INSTRUCTIONS

DISPLAY	INSTRUCTIONS
1.	1. To load the 2200 Hardware Diagnostic System START module, mount the system disk and key CLEAR RETURN(EXEC) LOAD DC {F / R} /XXX, "START" where XXX = the device address of the diagnostic system disk.

NOTE:

If the Disk diagnostic for diskette drives is to be run, then be sure scratch diskettes are available. If the disk diagnostic is to be run for a rigid type (2260/2230) disk drive, be sure all valuable contents at the addresses to be tested have been copied. Disk contents at tested addresses are destroyed.

Disk Instructions requires at least one scratch disk, or two, mounted at complementary addresses, to test COPY and MOVE.

If a rigid type disk drive is included in your system but is not going to be used in any of the diagnostics, then turn off the power to this disk drive to ensure the safety of its files.

If the printer diagnostic is to be run, mount 11" by 17" paper on the printer. If only a hardcopy printout of the other diagnostics is desired, 8-1/2" by 11" paper is adequate.

2. 2200 HARDWARE DIAGNOSTIC MENU
ENTER THE NUMBER TO CHOOSE THE PROGRAM DISK ADDRESS?

   1. 310 4. B10
   2. 320 5. B20
   3. 350 6. 360

2. Enter the selection number for the address at which the Diagnostic System disk is mounted.

3. 2200 HARDWARE DIAGNOSTIC MENU
DO YOU DESIRE A HARD COPY (Y OR N)
?---

3. Enter Y if a printer is available and a hardcopy record of the detailed test results is desired. Enter N for a summary report only, to appear on the display. For hardcopy go to step 4, otherwise skip to step 5.

4. ENTER 1 FOR 2201 PRINTER,
0 FOR OTHERS

4. Enter one if the output is to the 2201 printer. Otherwise enter zero.

5. 2200 HARDWARE DIAGNOSTIC MENU
SEARCH THE INDEX PROGRAMS

5. Temporary display appears while the index of programs is searched.

6. 2200 HARDWARE DIAGNOSTIC MENU
ENTER THE PROGRAM # TO CHOOSE THE DIAGNOSTIC (0 TO STOP)

   1. MEMORY
   2. CPU
   3. PRINTER
   4. PLATTER VERIFY
   5. DISK INST.
   6. DISK
   7. PERIPHERALS
   8. COPY/VERIFY

6. Enter the number of each program to be executed. As each number is entered an asterisk appears next to the selection. Enter zero to indicate that all desired selections have been made.

NOTE 1:

The COPY/VERIFY utility is intended to operate as a stand-alone program. It should not be chosen together with diagnostics.

NOTE 2:

The diagnostics are executed in selection number sequence. Selection 7 causes the system to display a mount disk request after all other diagnostics have been executed. This provides access to additional diagnostics, which reside on other diagnostic diskettes.

7. 2200 HARDWARE DIAGNOSTIC MENU
IF OK. ENTER 0, IF NOT ENTER 1.
? /
(SELECTED DIAGNOSTICS)

7. Verify the selections made in step 6 above. Enter zero if they are correct. Go to the next step for diagnostics; for COPY/VERIFY go to step 33.

8.

8. For each of the following operations, go to the listed step for entry of additional parameters:

   MEMORY - step 9
   PRINTER - step 12
   PLATTER VERIFY - step 14
   DISK - step 17

   After the additional parameters for all the selected diagnostics have been entered, go to Step 21.

9. 2200 HARDWARE DIAGNOSTIC MEMORY
ENTER THE MEMORY SIZE
(BY NUMBER)

   1. 4K 5. 20K
   2. 8K 6. 24K
   3. 12K 7. 28K
   4. 16K 8. 32K

9. Enter the selection number for the amount of memory in the CPU. If less memory is indicated than is actually present, the test results are meaningless.

10. CHOOSE THE TYPE OF TEST
   1. SYSTEM DIAGNOSTIC
   2. BURN-IN DIAGNOSTIC

10. Choose the System diagnostic unless there is a strong independent indication that an intermittent memory malfunction has escaped detection by it. Under these circumstances the Burn-in diagnostic may be chosen. It runs until a malfunction is detected or approximately 5 days have elapsed.

11. MEMORY SIZE = XXX TYPE = (test type) ENTER 0 TO ACCEPT, 1 TO RE-ENTER THE VALUES	11. Verify the entries. If they are correct, enter zero and go to step 8. Otherwise, enter one and go to step 9.
12. 2200 HARDWARE DIAGNOSTIC PRINTER ENTER THE PRINTER MODEL NO. (BY NUMBER) 1. 2201 4. 2231 2. 2221 5. 2261 3. 2221W	12. Enter the selection number for the printer model to be tested. Be sure the printer is on and selected.
13. ENTER 0 TO ACCEPT, 1 TO RE-ENTER THE VALUES PRINTER MODEL = (Model Number)	13. Verify the entry. If it is correct, enter zero and go to step 8. Otherwise, enter one and go to step 12.
14. 2200 HARDWARE DIAGNOSTIC - PLATTER VERIFY ENTER THE DISK DEVICE ADDRESS BY NUMBER) 1. 310 4. B10 2. 320 5. B20 3. 350 6. 360	14. Enter the selection number for the address of the disk device to be used for testing the disk platter or diskette.
15. ENTER THE DISK MODEL NO. (1-5) 1. 2230-1 4. 2260 2. 2230-2 5. DISKETTE DRIVE 3. 2230-3	15. Enter the selection number for the disk model to be used for testing the disk platter or diskette.
16. ENTER 0 TO ACCEPT, 1 TO RE-ENTER THE VALUES DISK ADDRESS = XXX DISK MODEL = (Model Name)	16. Verify the entry. If it is correct, enter zero and go to step 8. Otherwise, enter one and go to step 14.
17. 2200 HARDWARE DIAGNOSTIC - DISK ENTER THE NUMBER OF UNITS TO BE TESTED (1,2)	17. Enter one or two to indicate the number of disk units to be tested. A dual or triple diskette drive is considered as one unit.
18. ENTER THE UNIT-NUMBER TO CHOOSE DISK(S) 1. 2230-1 5. SINGLE DRIVE 2. 2230-2 6. DUAL DRIVE 3. 2230-3 7. TRIPLE DRIVE 4. 2260	18. Enter the selection numbers for the types of disk drives to be tested. Only one diskette and one rigid disk drive may be tested in a single execution of the diagnostic system. When two units are tested, the rigid disk unit is tested first.

19. CHOOSE THE TYPE OF DIAGNOSTIC (1,2)_____ 1. SYSTEM DIAGNOSTIC 2. BURN-IN DIAGNOSTIC	19. For the diskette systems there is no difference between the Burn-in and the System diagnostic. Choose 1 for diskette only tests. Choose the Burn-in diagnostic only if there is strong indication that an intermittent malfunction in the rigid disk drive has escaped detection by the System diagnostic. It will run until a malfunction is detected or 10 to 16 hours have elapsed.
20. ENTER 0 TO ACCEPT, 1 TO RE-ENTER TYPE (Test Type) UNIT 1 = (Unit) UNIT 2 = (Unit)	20. Verify the entries. If they are correct, enter zero and go to step 21. Otherwise, enter one and go to step 17.
21.	21. The tests are executed.

NOTE 1:

For any diagnostic except Memory, to discontinue execution and return to the main menu, key HALT/STEP followed by Special Function key 15.

NOTE 2:

For the Disk, Disk Instructions, and Disk Platter Verify tests, additional parameters must be entered immediately before the test is executed. See "Additional Parameters" section, below.

Additional Parameters for Platter Verify, Disk Instructions, and Disk Tests

Platter Verify Additional Parameters

22. MOUNT SCRATCH DISK IN UNIT XXX KEY (EXEC) TO RESUME?	22. Mount the disk platter to be tested at the indicated address. Key EXEC to resume; the test begins.
	CAUTION: The disk contents are destroyed by the test.
23. ANY MORE PLATTERS TO BE VERIFIED (Y/N)	23. The test has ended. See Chapter 3 for interpretation of test results. Enter Y to test additional platters at the same address; go to step 22. Otherwise, enter N and go to the next step.
24. MOUNT THE PROGRAM DISK, KEY (EXEC) TO RESUME?	24. If the diagnostic system disk was removed, remount it at the address selected in step 2.

Disk Instructions Additional Parameters

25. ENTER THE DISK ADDRESS (BY NUMBER) 1. 310 4. B10 2. 320 5. B20 3. 350 6. 360	25. Enter a selection number to choose the device address for testing the disk instructions.
26. ENTER 0 TO ACCEPT, 1 to REENTER (SELECTED ADDRESS)	26. If the selected address is correct, enter 0, and go to step 27. If incorrect, enter 1 and go to step 25.
27. ENTER 1 TO TEST 'COPY/MOVE' (REQUIRES BOTH DRIVES), 0 TO SKIP	27. To test the COPY and MOVE instructions, enter 1. Disks mounted at the selected address and at the complementary address are used. Their contents are destroyed. To use just one disk and forgo testing COPY and MOVE, enter 0. (310 and B10 are complementary addresses, as are 320 and B20.)

28. MOUNT SCRATCH DISKS IN ALL TEST DRIVES KEY EXEC TO RESUME	28. Mount scratch disks at the selected address, and at the complementary address if COPY/MOVE is to be tested. The message "DATA ON SCRATCH DISKS WILL BE DESTROYED." flashes on the screen. Key EXEC to resume. The test begins.
29. MOUNT PROGRAM DISK KEY (EXEC) TO RESUME	29. The test is complete. If the diagnostic system disk has been removed, remount it at the address selected in step 2.

Disk Diagnostic Additional Parameters

30. SELECT ADDRESSES FOR (DISK DRIVE) KEY (EXEC) TO RESUME 1. 310 4. B10 2. 320 5. B20 3. 350 6. 360	30. Enter the selection number for all the disk addresses to be tested at the specified drive. Be careful not to inadvertently select addresses at other drives.
31. ENTER 0 TO CONTINUE 1 TO RE-SELECT ADDRESSES (SELECTED ADDRESSES)	31. If the selected addresses are correct, enter 0. Otherwise, enter 1. If an additional drive is to be tested, go to step 30. Otherwise, go on to the next step.
32. MOUNT SCRATCH DISKS IN ALL TEST DRIVES KEY (EXEC) TO RESUME	32. Mount scratch disks at all selected addresses. The contents of disks mounted at the selected drives, are destroyed by the disk diagnostic. Key EXEC to execute the tests.

COPY/VERIFY Parameters

33. ARE THE PARAMETERS OK? (Y/N)
-/?

COPY/VERIFY UTILITY

1. FUNCTION = COPY/VERIFY
2. EXTRA SECTORS = 0
3. MODE = ALL
4. INPUT ADDRESS = 310
5. OUTPUT ADDRESS = B20

33. The display shows the complete default parameters for COPY/VERIFY. Parameters 1,2, and 3 should not be changed for copying the diagnostic system. If items 4 or 5 must be changed, enter N and go to the next step. Otherwise, enter Y and go to step 36.

> NOTE:
>
> The output disk must have a catalog established on it.

34. ENTER THE NUMBER OF THE ITEM TO BE CHANGED. (0 = END)
(DEFAULT SELECTIONS)

34. Enter 4 or 5 to change the input or output addresses; go to the next step. Enter zero and go to step 36, if displayed parameters are correct.

35. ENTER THE NUMBER OF THE DESIRED (INPUT or OUTPUT) ADDRESS

ADDRESSES AVAILABLE

1.	310	4.	B10
2.	320	5.	B20
3.	350	6.	360

35. Enter the selection number for the desired address.

> NOTE:
>
> Input and output addresses cannot be the same. To reverse input and output addresses, first select a third address for input. Set output address to 310, then input address to B20.

Go to step 34.

36. MOUNT PLATTERS AT INDICATED ADDRESSES
KEY RETURN(EXEC) TO RESUME?__

36. Mount the input and output disks at the selected addresses. Key RETURN(EXEC) to begin processing.

37. COPYING FILE XXX
VERIFYING FILE XXX

37. Processing display.

38. MOUNT PROGRAM PLATTER
KEY RETURN(EXEC) TO RESUME?

38. If the diagnostic system platter was removed from the address selected at step 2, remount it at that address. Go to step 2.

CHAPTER 3 TEST RESULTS

All tests are executed regardless of the outcome of previous tests.

It must be recognized that environmental factors can have a major effect upon system performance. In evaluating diagnostic test results, these factors cannot be ignored. In general, every effort should be made to secure an operating environment which, if not optimal, at least falls within the ranges described in 2200 INSTALLATION GUIDE.

There are two types of problems which are attributable to poor operating environment: random intermittent problems, and permanent component failures.

Random intermittent problems are problems which, though they may be similar in nature, do not repeat themselves at the same component location on subsequent tests. For example, the memory diagnostic might report a particular chip as being bad and then, run a second time, report a different chip as being bad. The disk diagnostic might report a particular sector read as bad and then a different sector the second time. Problems of this sort are often attributable to static electricity or EMI environmental problems. An environment with excessive airborne dust and dirt can also produce such problems, especially for disk devices. (After prolonged operation, a dirty environment produces permanent failure.) The only solution to random intermittent problems of this sort is to correct the responsible environmental condition. The problems reported do not reflect actual equipment failure.

On the other hand, if the same problem is detected twice at the same location by a diagnostic, then it is virtually certain that an actual failure is involved. This is true even if the failure of the specified component is reported only intermittently.

If one of the shorter diagnostic tests reports an error it should be repeated before your Wang Field Service Representative is summoned. For the more time consuming tests, this procedure is also recommended if the operating environment is known to be less than optimal.

Permanent component failure which results from poor environmental conditions requires both repair and correction of the environmental problem.

Memory Test

The display indicates the number of test loops to be executed and the current loop.

If the hardcopy option is selected the message

```
2200 SYSTEM DIAGNOSTIC - MEMORY
-----------------------------------------------
MEMORY SIZE = XXK MEMORY TEST PASSED
```

appears if the test is completed without error detection.

A detected malfunction causes a message such as

```
424C0100EC05   9FDE     BOARD 3    CHIP #  3  IS BAD
```

to appear and terminates the memory test.

CPU Diagnostic

The CPU diagnostic tests each general purpose BASIC instruction. The following CPU test segment typifies the hardcopy output when no errors are detected.

```
2200 SYSTEM DIAGNOSTIC - CPU

     TESTING LOAD DCF.....................OK
     TESTING LOAD DCF *NAME*..............OK
     TESTING LET, IF/THEN.................OK
     TESTING IF/THEN......................OK
     TESTING FOR/NEXT.....................OK
     TESTING DIM..........................OK
     TESTING DIM, STRING ARRAYS...........OK
```

If errors are encountered for any instruction, the number of erroneous results obtained are printed and the test continues. The following CPU test segment reflects such a result:

```
     TESTING AND,OR,XOR..................OK
     TESTING ROTATE......................OK
     TESTING ADD.........................  1 ERROR
     TESTING ON (GOTO/GOSUB).............OK
     TESTING NUM.........................OK
     TESTING VAL,BIN.....................OK
```

Platter Verify

The Platter Verify diagnostic produces no hardcopy output. The message PLATTER IS O.K. FOR USE is displayed if the platter check is completed without detecting a problem. The message PLATTER IS BAD AT SECTOR #XXXX-XXXX appears if a problem is detected. In either case the option message ANY MORE PLATTERS TO BE VERIFIED (Y/N) is displayed. A Y entry allows the immediate testing of the same type disk at the same address, if that is desired. If a platter tests bad, reformatting it may correct the problem. If, after reformatting, it still tests bad, it may be assumed to be defective.

Disk Instructions

The Disk Instructions diagnostic prints each BASIC disk instruction as it is tested together with the results of the test. The following test segment illustrates the test results.

```
2200 SYSTEM DIAGNOSTIC - DISK INSTRUCTION
DATA SAVE DA OK
DATA LOAD DA OK
DATA SAVE BA OK
DATA LOAD BA OK
SCRATCH DISK OK
MOVE END OK
```

If only a single diskette drive is available the MOVE and COPY statements cannot be tested.

An automatic error report can occur during this test. It causes a test result such as DATALOAD BA ERROR XX AT STMT. #XXXX. If such an error occurs, reformat the disk and run the test again.

Disk

The Disk diagnostic generates no hardcopy output. A display continuously reports the test operation being performed and the current sectors under test. Three types of malfunction reports can occur: A data error is reported as

```
DATA ERROR ON SECTOR XXXX
```

This occurs if the data read from the indicated sector is incorrect. A location error is reported as

```
ERROR ON SECTOR XXXX
```

This occurs if, in attempting to read the specified sector, a different sector was read.

Lastly, an automatic error report may occur. This causes a display such as

```
ERROR XX AT STMT #XXXX
```

At the end of the test, the pass/fail results are saved. They are displayed after all selected diagnoses have been performed.

Printer

The printer diagnosis is not internally evaluative. It simply consists of executing all the printer functions in a format which rigorously tests printer operation and which also lends itself to evaluation by the operator. Horizontal and vertical tab operations which appear on the printed output should be checked carefully for accuracy. Character patterns should be checked for consistency, readability, and completeness.
?

To help us to provide you with the best manuals possible, please make your comments and suggestions concerning this publication on the form below. Then detach, fold, tape closed and mail to us. All comments and suggestions become the property of Wang Laboratories, Inc. For a reply, be sure to include your name and address. Your cooperation is appreciated.

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