Diagnostic Program Documentation

Documentation Release: 9735

Software Releases:

<table>
<thead>
<tr>
<th>Category</th>
<th>Disk Type</th>
<th>Part Number</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>8&quot; DSDD</td>
<td>732-0002G</td>
<td>6734</td>
</tr>
<tr>
<td>Printers/Plotter/Terminals</td>
<td>8&quot; SSSD</td>
<td>702-0293</td>
<td>6591</td>
</tr>
<tr>
<td>Magnetic Media</td>
<td>5-1/4&quot; DSDD</td>
<td>732-0005B</td>
<td>6591</td>
</tr>
<tr>
<td></td>
<td>8&quot; SSSD</td>
<td>702-0292B</td>
<td>6734</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>5-1/4&quot; DSDD</td>
<td>732-0049B</td>
<td>6734</td>
</tr>
<tr>
<td></td>
<td>8&quot; SSSD</td>
<td>702-0294</td>
<td>6436</td>
</tr>
<tr>
<td></td>
<td>5-1/4&quot; DSDD</td>
<td>732-0051</td>
<td>6436</td>
</tr>
<tr>
<td>CPU/Memory Test</td>
<td>8&quot; SSSD</td>
<td>702-0293</td>
<td>6436</td>
</tr>
<tr>
<td></td>
<td>5-1/4&quot; DSDD</td>
<td>732-0050</td>
<td>6436</td>
</tr>
</tbody>
</table>

NOTE: DSDD means Double-Sided Double-Density
SSSD means Single-Sided Single-Density

Documentation Part Number: 760-00298

Package Part Number: 195-2956-08  ECO Number: xxxxx

Program Name: 2200 Diagnostic Package

Date: April 15, 1987

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Appendix C: Options for Telecommunications
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Diagnostic Engineering Department
WANG Laboratories, INC.
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Lowell, Massachusetts 01851
1.0 REFERENCE DOCUMENTATION


2.0 CONFIGURATION REQUIREMENTS

2.1 Hardware

Minimum required configuration

2200 system
Check the configuration requirements for the program that is going to be run.

NOTE: Ensure that the partition size is large enough and the Device Table is properly configured.

2.2 Software

MVP CPU software must be rev. 1.8 or higher

VP CPU software must be rev. 2.1 or higher

Check the configuration requirements for the program that is going to be run.

3.0 PROGRAM DESCRIPTION

These are menu driven disks containing a combination of the diagnostics, utilities and exercisers for the 2200 MVP/LVP/SVP/VP systems. These programs are divided into four categories:

1. Printers/Plotters/Terminals
2. Magnetic Media
3. Telecommunications
4. CPU/Memory Test

The entire Diagnostic Package is contained on either one 8" Double-Sided Double-Density (DDDS) disk, four 8" Single-Sided Single-Density (SSSD) disks or four 5-1/4" Double-Sided Double-Density (DSDD) disks. The four disk set has the package divided into the four categories previously listed (one category per disk).
4.0 LOAD PROCEDURES

1. Select the device address with a 'SELECT DISK ###' statement (###
equals the device address where program resides).

2. Input command 'LOAD RUN' to load if there is a "START" file. Input
command 'LOAD RUN T"@MENU"', if there is no start file.

5.0 OPERATING INSTRUCTIONS

The menus in this package run the same as the system menus except the
screening is revised. The Terminal number, Partition number and the
size of the partition will be displayed in the lower right corner of the
screen. Also the menus can be stepped backwards with 'PREV SCRN',
CLEAR, or SF'31 keys.

Selection is made with the 'BACK SPACE', 'SPACE' bar, and the cursor
arrows. When the desired selection is made (large dot before the name
and the line is highlighted), press 'RUN' or 'RETURN' to initiate the
selection. If the selection is another menu, then it will be
displayed. If the selection is a program, then it will be loaded and
run.

In order to support all of the 2200 LVP/SVP/MVP systems the diagnostic
package needs to be available on 8" DSDD, 8" SSSD and 5-1/4" DSDD. The
package is divided into four categories. Each category is small enough
that it will fit on a SSSu 8" (or DSDD 5-1/4") disk. The entire package
is on one 8" DSDD disk, four 8" SSSD or four 5-1/4 DSDD disks. The
instructions for these disks are as follows:

<table>
<thead>
<tr>
<th>Disk Type</th>
<th>Category</th>
<th>refer to Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>8&quot; DSDD</td>
<td>All</td>
<td>7.1</td>
</tr>
<tr>
<td>8&quot; SSSD &amp; 5-1/4&quot; DSDD</td>
<td>Printers/Plotters/Terminals</td>
<td>7.2</td>
</tr>
<tr>
<td>8&quot; SSSD &amp; 5-1/4&quot; DSDD</td>
<td>Magnetic Media</td>
<td>7.3</td>
</tr>
<tr>
<td>8&quot; SSSD &amp; 5-1/4&quot; DSDD</td>
<td>Telecommunications</td>
<td>7.4</td>
</tr>
<tr>
<td>8&quot; SSSD &amp; 5-1/4&quot; DSDD</td>
<td>CPU/Memory test</td>
<td>7.5</td>
</tr>
</tbody>
</table>

5.1 2200 LVP/SVP Diagnostic Package

After the menu is loaded the following four selections will be displayed
on the screen:

- Printers/Plotters/Terminals
- Magnetic Media
- Telecommunications
- CPU/Memory test

Proceed to section 7.2
Proceed to section 7.3
Proceed to section 7.4
Proceed to section 7.5

Select one of the above, using the normal menu selection procedure, and
proceed with the corresponding instructions below.
5.2 Printers/Plotters/Terminals

When this menu is loaded the following options are available by the normal menu selection procedure:

- Printers and Plotters
- Terminals/Keyboards

The options for these selections are described in Appendix A.

5.3 Magnetic Media

When this menu is loaded, the following options are available by the normal menu selection procedure:

- PLL/VCO Adjustments
- Alignment Routines
- Disk Utilities
- Disk Exercisers
- Mag Tape

The options for these selections are described in Appendix B.

5.4 Telecommunications

When this menu is loaded, the following options are available by the normal menu selection procedure:

- 2228 D/E/F Power-Up Diagnostic Error Code Interpreter
- 2228 D/E/F 7 Board Burn In
- 2228 E/F Field Service Diagnostic
- 2228 D Field Service Diagnostic Rev. 2
- 2228 D Field Service Diagnostic Rev. 1
- 2227B/2228B T/C Diagnostic

For these procedures, numbers and names see Appendix C.

5.5 CPU/Memory Test

When this menu is loaded, the following options are available by the normal menu selection procedure:

- CPU Instruction Exerciser
- CPU/Memory Diagnostic Procedure
- Memory Error Chip Identifier

For these procedures, numbers and names see Appendix D.

6.0 MISCELLANEOUS

SSSD means Single-Sided Single-Density
DSDD means Double-Sided Double-Density

Revision numbers are explained in Appendix E.
7.0 PROGRAM REVISION HISTORY

6734 Added support for 22100 and RAM Disk to MULTDISK and FTU. Also fixed time out errors on long cabled mux. Added old style hashing routine to SUPERZAP.

6591 Internal change. Ell update needed.

6534 Added 2209CM printer test to package.

64A7 MULTDISK has been modified to check for intermittent writing. STARTPLL was renamed to PLL and address selection was added. General Disk was converted to an FTU and named FTU. Phoenix Alignment was renamed to 2280ALIGN and now has address selection.

6436 The package has been broken into four sections for use on Single-Sided Single-Density disks and the 5-1/4" disks. The programs have been updated to the latest revisions. MECI and FILZAP have been added.

6396 This package has been expanded to exercise the 2209A Tape Drive Unit.
APPENDIX A

OPTIONS FOR PRINTERS/PLottERS/TERMINALS
Select the desired test and refer to the appropriate documentation for the procedures.

<table>
<thead>
<tr>
<th>Documentation</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu selection</td>
<td>Program Name</td>
</tr>
<tr>
<td>. PRINTERS/PLOTTERS</td>
<td></td>
</tr>
<tr>
<td>. 2201L</td>
<td>2201L</td>
</tr>
<tr>
<td>. 222ODW</td>
<td>222ODW</td>
</tr>
<tr>
<td>. 2221W</td>
<td>2221W</td>
</tr>
<tr>
<td>. 2231W-1</td>
<td>2231W-1</td>
</tr>
<tr>
<td>. 2231W-2</td>
<td>2231W-2</td>
</tr>
<tr>
<td>. 2231W-3</td>
<td>2231W-3</td>
</tr>
<tr>
<td>. 2231W-6</td>
<td>2231W-6</td>
</tr>
<tr>
<td>. 2232</td>
<td>2232</td>
</tr>
<tr>
<td>. 2235</td>
<td>2235</td>
</tr>
<tr>
<td>. 2245</td>
<td>2245</td>
</tr>
<tr>
<td>. 2251</td>
<td>2251</td>
</tr>
<tr>
<td>. 2261W</td>
<td>2261W</td>
</tr>
<tr>
<td>. 2263-1</td>
<td>2263-1</td>
</tr>
<tr>
<td>. 2263-2</td>
<td>2263-2</td>
</tr>
<tr>
<td>. 2263-3</td>
<td>2263-3</td>
</tr>
<tr>
<td>. 2273-1</td>
<td>2273-1</td>
</tr>
<tr>
<td>. 2273-2</td>
<td>2273-2</td>
</tr>
<tr>
<td>. 2281W</td>
<td>2281W</td>
</tr>
<tr>
<td>. 2282</td>
<td>2282</td>
</tr>
</tbody>
</table>

| TERMINALS/KEYBOARDS | | | | |
| . 2200 Universal Keyboard Test | uTextTst | 760-1265 | 1294 | 9434 |
| . Burn-In Test | 36debin | (see note 2) | | |
| . Local Printer Test | 36ptrloc | (see note 2) | | |
| . Character/Attributes Test | 36chratb | (see note 2) | | |
| . CRT Alignment Test | 36cating | (see note 2) | | |
| . Partition Monitor | 36parton | (see note 2) | | |

Notes
1 - Part of General Printer Exerciser | 760-1257 | 6441 | 9434 |
2 - Part of 2236DE/DW Field Service Diag. | 760-1270 | 11B1 | 9434 |

Revision numbers are explained in Appendix E.
APPENDIX B

OPTIONS FOR MAGNETIC MENIA
Select the desired test and refer to the appropriate documentation for the procedures.

<table>
<thead>
<tr>
<th>Menu selection</th>
<th>Documentation</th>
<th>Revision Program Name</th>
<th>Part Number</th>
<th>Soft Doc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLL/VCO Adjustments</td>
<td>PLL</td>
<td>760-1250B</td>
<td>84A5</td>
<td>94A5</td>
</tr>
<tr>
<td>PL Adj. (DSDD/Winchester)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCO Adj. (DSDD/Win. w/o scope)</td>
<td>2200 VCO</td>
<td>760-1263</td>
<td>81B4</td>
<td>9434</td>
</tr>
<tr>
<td>Alignment Routines</td>
<td>850ALIGN</td>
<td>760-1223A</td>
<td>8448</td>
<td>9434</td>
</tr>
<tr>
<td>DSDD Drive (85G/851)</td>
<td>2280ALIGN</td>
<td>760-1264A</td>
<td>84A4</td>
<td>94A4</td>
</tr>
<tr>
<td>Phoenix</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk Utilities</td>
<td>Field Test UnitFTU</td>
<td>760-1261B</td>
<td>8734</td>
<td>9734</td>
</tr>
<tr>
<td>Volume Zap</td>
<td>SUPERZAP</td>
<td>760-1260A</td>
<td>8734</td>
<td>9734</td>
</tr>
<tr>
<td>Alternate Sector Test</td>
<td>PLL</td>
<td>760-1250B</td>
<td>84A5</td>
<td>94A5</td>
</tr>
<tr>
<td>Disk Exerciser</td>
<td>MULTIDSK</td>
<td>760-1209B</td>
<td>6734</td>
<td>9734</td>
</tr>
<tr>
<td>Multiple Disk Exerciser</td>
<td>DPU BI</td>
<td>760-1262</td>
<td>41B4</td>
<td>9434</td>
</tr>
<tr>
<td>LVP DPU Burn In</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mag Tape</td>
<td>2209A Tape DriveIO9A010A</td>
<td>760-1269</td>
<td>2.0</td>
<td>9434</td>
</tr>
<tr>
<td>Kennedy Archiving Tape Drive</td>
<td>TAP 29M</td>
<td>760-1103A</td>
<td>7320</td>
<td>9434</td>
</tr>
</tbody>
</table>

Revision numbers are explained in Appendix E.
APPENDIX C

OPTIONS FOR TELECOMMUNICATIONS
2200 Diagnostic Package - Diagnostic Program Documentation

Select the desired test and refer to the appropriate documentation for the procedures.

<table>
<thead>
<tr>
<th>Menu selection</th>
<th>Program Name</th>
<th>Part Number</th>
<th>Soft</th>
<th>Doc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2228 D/E/F Power-up Diag.</td>
<td>280EFEI</td>
<td>760-1121A</td>
<td>3370</td>
<td>9434</td>
</tr>
<tr>
<td>2228 D/E/F 7 Board Burn In</td>
<td>7BDEBSI</td>
<td>760-1124B</td>
<td>4370</td>
<td>9434</td>
</tr>
<tr>
<td>2228 E/F F.S. Diag.</td>
<td>28FESR2</td>
<td>760-1122A</td>
<td>1370</td>
<td>9434</td>
</tr>
<tr>
<td>2228 D F.S. Diag. Rev. 2</td>
<td>28DFS3R2</td>
<td>760-1267</td>
<td>1158</td>
<td>9434</td>
</tr>
<tr>
<td>2228 D F.S. Diag. Rev. 1</td>
<td>28DFS3R1</td>
<td>760-1268</td>
<td>1121</td>
<td>9434</td>
</tr>
<tr>
<td>2227B/2228B T/C Diagnostic</td>
<td>STARTTC</td>
<td>760-1275</td>
<td>1381</td>
<td>9434</td>
</tr>
</tbody>
</table>

Revision numbers are explained in Appendix E.
APPENDIX D

OPTIONS FOR CPU/MEMORY TEST
Select the desired test and refer to the appropriate documentation for the procedures.

<table>
<thead>
<tr>
<th>Menu selection</th>
<th>Program Name</th>
<th>Documentation Part Number</th>
<th>Revision Soft</th>
<th>Doc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Instruction Exerciser</td>
<td>SYSI(note 2)</td>
<td>760-1256</td>
<td>1.0</td>
<td>9434</td>
</tr>
<tr>
<td>CPU/Memory Diagnostic Procedure</td>
<td>@@ (note 2)</td>
<td>760-1271</td>
<td>1164</td>
<td>9434</td>
</tr>
<tr>
<td>Memory Error Chip Identifier</td>
<td>MECI</td>
<td>760-1272</td>
<td>8434</td>
<td>9434</td>
</tr>
</tbody>
</table>

Notes:

1. The CPU/Memory Diagnostic Procedure explains how to load (boot) the CPU/Memory diagnostic. The documentation number and revision numbers are for the CPU/Memory diagnostic.

2. This test contains many files on the media. The file names are listed in the documentation for the program.

Revision numbers are explained in Appendix E.
APPENDIX E

EXPLANATION OF REVISION NUMBERS
### Rev.

1st Position = Kind of Diagnostic

- Not Supported: 0
- Diagnostic Program: 1
- Monitor Package: 2
- Monitor Program: 3
- Burn In: 4
- Power Up: 5
- Exerciser: 6
- Board Repair: 7
- Utility: 8
- Document only: 9
- Reserved: A-F

2nd Position = Last Digit of Year

Self-explanatory: 0-9

3rd Position = Month of Revision

- January: 1
- February: 2
- March: 3
- April: 4
- May: 5
- June: 6
- July: 7
- August: 8
- September: 9
- October: A
- November: B
- December: C

4th Position = Type of Change

- Brand New: 0
- Software Fix: 1
- Test Added: 2
- Enhancement: 4
- Hardware Change: 8

These numbers can be added together (in hex) to include more than one type of change.
1.0 **TITLE**
2209A Tape Drive Diagnostic

2.0 **REVISION/DATE**

<table>
<thead>
<tr>
<th>Date:</th>
<th>May 3, 1984</th>
</tr>
</thead>
<tbody>
<tr>
<td>Package Part Number:</td>
<td>195-2956-0</td>
</tr>
<tr>
<td>Documentation Part Number:</td>
<td>760-1269</td>
</tr>
<tr>
<td>Documentation Release:</td>
<td>9434</td>
</tr>
<tr>
<td>Software Release:</td>
<td>2.0</td>
</tr>
</tbody>
</table>

3.0 **REFERENCE DOCUMENTS**


4.0 **CONFIGURATION REQUIREMENTS**

4.1 **Hardware**

MVP/LVP/SVP/VP with the minimum required configuration

At least 16K bytes of user memory

2236DE/DW or equivalent terminal

4.2 **Software**

LVP CPU software must be rev. 1.8 or higher

VP CPU software must be rev. 2.1 or higher

Media containing the 2209A Tape Drive diagnostic which is made up of the following programs:

- **IO9A010A** - start module
- **TO9A010A** - memory test
- **TO9A020A** - tape function test
- **TO9A030A** - exerciser

5.0 **PROGRAM DESCRIPTION**

This program was designed to insure that the 2209A I/O Board, Formatter, Tape Drive, and I/O memory is free of hardware faults. Also, designed into the program, were error messages and a halt on error mode.
6.0 LOAD PROCEDURE

6.1 Load Directly from Disk

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)
2) Input command 'LOAD RUN T"I09A010A"

6.2 Load from 2200 Diagnostic Package

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)
2) Input command 'LOAD RUN'
3) If 'MAGNETIC MEDIA' disk, proceed with step 4
   Under '2200 DIAGNOSTIC PACKAGE' menu, select 'Magnetic Media'
4) Under 'MAGNETIC MEDIA' menu, select 'Mag Tape'
5) Under 'MAG TAPES' menu, select '2209A Tape Drive'

Note 1: (### equals the device address where program resides)

7.0 OPERATING INSTRUCTIONS

7.1 Description of Operation

The 2209A Tape Drive Diagnostic is modularized into four different modules. The main monitor called "I09A010A" loads in first and inputs the test parameters. The monitor will then load and run the three tests (run in the order listed below), monitor them and handle error recovery when errors occur. Due to the monitor loading in the programs as they are run the floppy disk, on which the programs are stored, must remain as the SELECTed drive when the diagnostic is running.

1  I09A010A - Memory Test
2  I09A020A - Tape Function Test
3  I09A030A - Mixed Commands Exerciser

7.2 Procedures

When the program is initially loaded, the operator will have to input (via the command screens displayed on the next page) the following:

Tape Drive Address
CPU Type
Halt On Error?
Print Errors?

Once these inputs are completed the program will proceed with running the tests (listed above). If the 'PRINT ERRORS' answer is 'N', then no further questions are displayed and the tests will begin.
2209A TAPE DRIVE DIAGNOSTIC - SYSTEM VERSION
SELECT TAPE CONTROLLER ADDRESS? 2
1. 07A   2. 07B   3. 07C
4. 07D   5. 07E   6. 07F

SELECT CPU TYPE? 2
1. 2200T   2. VP/MVP

HALT ON ERROR (Y OR N)? Y
PRINT ERRORS (Y OR N)? Y
TYPE IN YOUR NAME PLEASE? xxxx xxxxxx
TODAY'S DATE (MM/DD/YY)? mm/dd/yy
WHAT TIME IS IT (HH:MM)? hh:mm
SERIAL #? #######

Each question will appear as the preceding one is answered.

7.3 Test Descriptions
See Appendix A.

8.0 REVISION HISTORY
Rev. 2.0:
Unknown history.

Rev. 1.0:
Initial Release.

9.0 MISCELLANEOUS
None.
APPENDIX A
2209A TEST DESCRIPTIONS

MEMORY TESTS

This part of the diagnostic tests the 4K of ram located on the tape I/O board. If an memory error occurs, the IC number in which the error appeared to occur, will be displayed on the CRT as,

'MEMORY IC L? IS BAD'

Fifty passes are run (as displayed on the CRT (see below)) before the memory test loads the function tests.

NOTE

It should be taken into account that this program cannot distinguish between a bad ram and/or a bad buffer which exists between the ram and the data bus.

Each memory pass can be broken down into six different test patterns. They are:

1. Alternate pattern (55AA)
2. Reverse alternate pattern (AA55)
3. Incremental pattern (00,11,22,33, FF,10,21,32,etc.)
4. Rotated incremental pattern (00,22,44,66,etc.)
5. Random pattern (different each time)
6. Rotated random pattern.

PASS # 0

* * * 2209A TAPE DRIVE DIAGNOSTIC * * *
* MEMORY *
* TEST IN PROGRESS *
* * * * * * * * * * * * * * *
Function and Mixed Commands, will display a status table at the end of each tape operation. The format of the status table is:

* * * 2209A TAPE DRIVE DIAGNOSTIC * * *
* xxxxxxxxx *
* yyyyy *
* TEST IN PROGRESS * *

TAPE STATUS TABLE
(( X = CONDITION TRUE))

<table>
<thead>
<tr>
<th>READY</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>WRITE ENABLE</td>
<td>0</td>
</tr>
<tr>
<td>TAPE ERROR</td>
<td>0</td>
</tr>
<tr>
<td>BUFFER OVERFLOW</td>
<td>0</td>
</tr>
<tr>
<td>BOT</td>
<td>0</td>
</tr>
<tr>
<td>EOT</td>
<td>0</td>
</tr>
<tr>
<td>EOF</td>
<td>X</td>
</tr>
<tr>
<td>Byte Count</td>
<td>1234</td>
</tr>
</tbody>
</table>

In the title block:

xxxxxxx will be the test currently running
yyyyy will be the function being done.

Byte count always displays four digits and it indicates how many bytes were transferred in a Read or Write.

'BOT' = beginning of tape marker.
'EOT' = end of tape marker.
'EOF' = end of file marker.

An "X" next to a status name means the condition exists.
An "0" next to a status name means the condition does not exist.
A blank means it hasn't been checked yet.

If an error occurs, '*ERROR=*' will be printed under '((X = CONDITION TRUE))' and an '*' is printed to the right of the failing status name. The error conditions relate to the failing status and the possibilities are:

1. Tape not ready
2. No write enable ring
3. Tape error
4. Buffer overflow
5. EOT encountered in any test other than "WGAP to EOT"
6. Byte count not equal to internal program byte count
FUNCTION TESTS

This portion of the diagnostic is included to insure that each software command, available to the programmer, works as described and documented in the tape drive manual. This is done by:

- checking status bits
- keeping internal byte counts so they can be compared to status byte counts
- doing read/write data comparisons
- keeping internal counts of all operations performed

For this test, a status table is displayed, and the function currently being executed is displayed in the test identifier block on the CRT.

After the 20 steps (below) are completed, the test loads the MIXED COMMANDS TEST. The function test is run in the order listed below:

1. Rewind
2. Write 64 blocks of data with random data patterns starting with a 64 byte block and incrementing each block by 64 bytes until 4096 is reached
3. Rewind
4. Read/compare written blocks
5. BSR to BOT
6. FSR to the last written block
7. Read/compare
8. Rewind
9. Write random # of gaps
10. Write check record
11. Rewind
12. Read/compare check record
13. Rewind
14. Write random # of EOF's
15. Write check record
16. BSF to BOT
17. FSF to check record
18. Read/compare check record
19. Write GAP to EOT  Note: It is recommended that short tapes be used or that the EOT marker be placed closer to BOT. Otherwise, it will take quite a long time to reach EOT
20. Rewind
MIXED COMMANDS

The function test which verifies that each command works, does not test the tape drive thoroughly enough.

By continuously running different command sequences in fast order, and then by doing error checking on these sequences, the program is able to run a worst case diagnostic. This will determine if any commands produce errors. During this test, a status table is displayed, and the function currently being executed is displayed in the test identification block on the CRT. There is also the following list of statements (with the number of occurrences) displayed to the left of the identifier block:

0000 DATA ERROR
0000 BOT
0000 MISSING BOT
0000 FILE MARK
0000 MISSING FILE MARK
0000 COUNT ERROR       internal byte counts compared to status
                        byte counts
0000 DATA NOT EQUAL    doing read/write data comparisons

After one pass is complete, the memory test is restarted.
1.0 TITLE
2200 Kennedy Tape Field Service and Board Repair Diagnostic

2.0 REVISION/DATE

Date: May 3, 1984
Package Part Number: 195-2956-0
with listing: 195-2552-0
Documentation Part Number: 760-1103A
with listing: 760-1119A
Documentation Release: 9434
Software Release: 7320

3.0 REFERENCE DOCUMENTS
Kennedy 6455 Tape Cartridge System Manual
Kennedy 1/4 Inch Tape Controller Spec.

4.0 CONFIGURATION REQUIREMENTS

4.1 Hardware
LVP/MVP with the minimum required configuration
ZeBug Unit
Kennedy 1/4 Tape Formatter
Kennedy Tape Controller Board

4.2 Software
Minimum System Basic Rev. Level 2.1
56K Basic Memory Partition
2200 Kennedy Tape Drive Basic Monitor
Z-80 Prom Based Board Repair or Field Service Aid
Z-80 Ram Loadable Tape Function Code
Media containing the 2200 Kennedy Tape Field Service and Board Repair Diagnostic which is labeled:

TAP 29M
TAPEHOST
5.0 PROGRAM DESCRIPTION

5.1 Uses

This program is used for the diagnosing of 2200 Kennedy Tape Controller Boards and error detection on Kennedy 1/4 inch Tape Formatter Drives.

5.2 User Interface

It is recommended that the user should use a Zebug while interfacing to this diagnostic. If only the Power Up tests are to be checked, then the Zebug and source list are required. If the user wants to interface with the monitor, then a disk containing the monitor "TAP 29M" and down loadable RAM code "TAPEHOST" is required.

5.3 Hardware Tested

Kennedy Tape controller Mother and Daughter Boards
Kennedy Tape Formatter Drive
2200 Controller interfacing hardware

5.4 Tests in the Program

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Test</th>
<th>Hardware Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Led Visual Test</td>
<td>LEDs on Controller and Drive</td>
</tr>
<tr>
<td>02</td>
<td>Prom Checksum Test</td>
<td>Check integrity of prom code</td>
</tr>
<tr>
<td>03</td>
<td>Send Board Status</td>
<td>Sends 2200 current board status</td>
</tr>
<tr>
<td>16</td>
<td>RAM Moving Inversions Test</td>
<td>Extended Testing of RAM</td>
</tr>
<tr>
<td>21</td>
<td>PIO A Port Register Test</td>
<td>Checks PIO A Port Data Register</td>
</tr>
<tr>
<td>22</td>
<td>PIO B Port Register Test</td>
<td>Checks PIO B Port Data Register</td>
</tr>
<tr>
<td>23</td>
<td>PIO OBS - IBS Test</td>
<td>Checks PIO to 2200 transfer</td>
</tr>
<tr>
<td>31</td>
<td>CTC Timing Interrupt Test</td>
<td>Checks CTC Timing Interrupt</td>
</tr>
<tr>
<td>32</td>
<td>CTC Priority Interrupt Test</td>
<td>Checks CTC Priority Interrupts</td>
</tr>
<tr>
<td>41</td>
<td>DMA Reset Status Test</td>
<td>Checks the reset status of DMA</td>
</tr>
<tr>
<td>42</td>
<td>DMA Temporary Register Test</td>
<td>Checks the DMA Temporary Reg.</td>
</tr>
<tr>
<td>43</td>
<td>DMA Register Integrity Test</td>
<td>Checks DMA Reg. Integrity</td>
</tr>
<tr>
<td>44</td>
<td>DMA Memory to Memory Test</td>
<td>Checks DMA Mem to Mem Transfer</td>
</tr>
<tr>
<td>45</td>
<td>DMA Off Board Transfer Test</td>
<td>Checks DMA interface to 2200</td>
</tr>
<tr>
<td>50</td>
<td>Tape Rewind Function Test</td>
<td>Checks Tape Drive Rewind func.</td>
</tr>
<tr>
<td>51</td>
<td>Tape Load Function Test</td>
<td>Checks Tape Drive Load func.</td>
</tr>
<tr>
<td>52</td>
<td>Tape Unload Function Test</td>
<td>Checks Tape Drive Unload func.</td>
</tr>
<tr>
<td>53</td>
<td>Tape Track Sel Function Test</td>
<td>Checks Tape Drive Track Select</td>
</tr>
<tr>
<td>54</td>
<td>Tape Erase Function Test</td>
<td>Checks Tape Drive Erase func.</td>
</tr>
<tr>
<td>55</td>
<td>Tape Space Fwd Func Test</td>
<td>Checks Tape Drive Space Fwd.</td>
</tr>
<tr>
<td>56</td>
<td>Tape Space Rev Func Test</td>
<td>Checks Tape Drive Space Rev.</td>
</tr>
<tr>
<td>57</td>
<td>Tape Space Fwd FM Test</td>
<td>Checks Tape Drive Space Fwd FM</td>
</tr>
<tr>
<td>58</td>
<td>Tape Space Rev FM Test</td>
<td>Checks Tape Drive Space Rev FM</td>
</tr>
<tr>
<td>59</td>
<td>Tape Reset Function Test</td>
<td>Checks Tape Drive Reset func.</td>
</tr>
<tr>
<td>5A</td>
<td>Tape Parity Function Test</td>
<td>Checks Tape Drive Parity func.</td>
</tr>
<tr>
<td>5B</td>
<td>Tape Write FM Function Test</td>
<td>Checks Tape Drive Write FM func.</td>
</tr>
<tr>
<td>5C</td>
<td>Tape Write Rec Function Test</td>
<td>Checks Tape Drive Write Rec</td>
</tr>
<tr>
<td>5D</td>
<td>Tape Read Rec Function Test</td>
<td>Checks Tape Drive Read Rec func.</td>
</tr>
<tr>
<td>5E</td>
<td>Send 8 bytes of I/O Buffers</td>
<td>Send 1st 8 bytes I/O buffs</td>
</tr>
<tr>
<td>5F</td>
<td>Tape Erase Track Test</td>
<td>Checks Tape Track Erase func.</td>
</tr>
</tbody>
</table>
LOAD PROCEDURE

6.1 To Run Board Repair or Field Service Tests with ZEBUG and Monitor

1) To run Board Repair or Field Service Tests the controller board configuration switches must be set according to section 6.4 below.

6.2 Load Directly from Disk

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)
2) Input command 'LOAD RUN T"TAP 29M"'

6.3 Load from 2200 Diagnostic Package

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)
2) Input command 'LOAD RUN'
3) If 'MAGNETIC MEDIA' disk, proceed with step 4
   Under '2200 DIAGNOSTIC PACKAGE' menu, select 'Magnetic Media'
4) Under 'MAGNETIC MEDIA' menu, select 'Mag Tape'
5) Under 'MAGNETIC TAPES' menu, select 'Kennedy Archiving Tape Drive'

Note 1: (### equals the device address where program resides)

6.4 Configuration Switch Settings (sw1)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Switch Settings -

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>(Power Up)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>(Field Service/Repair Aid)</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>(Error Loop)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>(Scope Loop)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(Loop on Power Up)</td>
</tr>
</tbody>
</table>

Symbol Definitions -

0 = switch open(+5v) = 1
1 = switch closed(+0v) = 0
x = don't care

NOTE
If the controller is not responding properly, it is necessary to run Power Up tests. For more information look under 2200 Kennedy Tape Power Up Diagnostic Documentation (760-1102).
7.0 OPERATING INSTRUCTIONS

The first menu will request the tape controller Device Address.

Device Address 018 is the only address that should be used.

If the Device Address is not accepted, then check the address switches on the controller board and reload the Device Address. If the Device Address has been accepted, then continue with next step.

The Device Address having been accepted, the monitor will ask the following 3 questions:

1) Is loop on error wanted?
2) Are instructions wanted?
3) How many passes are wanted?

After these questions have been answered, then the GO/NOGO test are run. These include a re-run of the Power Up tests, a PIO CBS-IBS Interface test and a DMA Interface test. If any of the GO/NOGO tests failed, see ERROR CODES AND DESCRIPTION OF FAILURE (Appendix A.). If the monitor has run through all the GO/NOGO tests successfully, the tape function code "TAPEHOST" should now be located in RAM. The controller is now ready to accept instructions from the monitor. The monitor is waiting in the Unit Test Select Menu. Depress the SF' key which pertains to the operation desired (see below).

Unit Test Select Menu

SF 0 - RE-KEY Parameters
SF 1 - Re-run Automatic Tests
SF 2 - Controller Tests Menu
SF 3 - Formatter Tests Menu
SF 4 - Board Repair or Field Service Chain Mode

SF 0 - will first the following three questions:
1) Do you want to loop on error 'Y' or 'N'
2) Do you want to display instructions 'Y' or 'N'
3) How many passes (less than 10000, default =1)

After this information has been filled in, the monitor will either return to the Unit Test Select Menu or if the host code has not yet been loaded into RAM, then the GO/NOGO tests are run again.

SF 1 - re-run the GO/NOGO tests.
SF 2 - this will put the user in the menu that contains all of the controller tests. This menu will allow the user to select each individual controller test which makes it easier to segregate any problems on those boards. A description of each test can be found under the heading Controller Tests Menu of Appendix B.

SF 3 - this will put the user in the menu containing all the tape function tests. This menu will allow the user to select each individual tape function test which makes it easier to segregate any problems on the tape drive, the interface from the controller to the drive, or the controller hardware used in accessing the drive. A description of each test can be found under the heading Formatter Tests Menu of Appendix B.

SF 4 - this will run all the controller tests and selected tape functions tests in a chain. All parameters for these tests are pre-determined by the monitor. This test may be exited at any time by depressing the Return key.

7.0 REVISION HISTORY

Rev. 7320:

Initial Release.

9.0 MISCELLANEOUS

None.
APPENDIX A

ERROR CODES AND DESCRIPTION OF FAILURE
Controller Errors Descriptions

NOTE
(Please note that it is impossible to always know immediately what has caused a failure. The descriptions of Probable Cause are merely to assist in the recovery effort, by indicating what the most likely cause(s) of failure not necessarily the only cause(s).)

Monitor Error Messages:

"Checking Device Ready/Busy Status............Ready/Busy Test Failed"

Controller Should be ready after power on reset, but the board is still busy.

Probable Cause of Failure:
 a) Check Ready/Busy lines on the controller
 b) Address switches set incorrectly
 c) Bad Data Line(s)
 d) Bad Address Line(s)
 e) Bad clock to controller

"Checking Power Up................................Power Up Failed"

Either there was a Power Up Test Failure, or the controller never became ready after the Power Up Tests were run.

Probable Cause of Failure:
 a) Power Up Test Failure. Power Up should be run using Zebug interface (see Power Up documentation)
 b) PIO control signal failure

"Controller is not responding properly. Run Power Up Tests using Zebug for more informative error detection. Also see Power Up Diagnostic documentation for probable cause of failure."

Monitor has timed out waiting for information from controller.

Probable Cause of Failure:
 a) bad connection to controller
 b) Bad Ready/Busy signal
 c) Bad strobe signal
 d) Unknown controller failure. Run Power Up tests
<table>
<thead>
<tr>
<th>Rtn.No.</th>
<th>Err.No.</th>
<th>Error Description and Probable Causes of Failure</th>
</tr>
</thead>
</table>
| 01     | 00     | **LED visual test** - all LED are lit and then unlit. Error analysis must be determined by visual sighting.  
Probable Cause of Failure:  
1) if none of the LEDs are lit;  
a) no power to tape drive unit  
b) bad connection from controller  
c) bad data bus on controller  
d) no clock on controller  
2) if only one LED is failing;  
a) bad LED  
b) bad connection to that LED. Lath is L30 to L17 of motherboard to drive to LED.  
c) bad address line on A3, A2, A1, A0  
d) bad driver line, I/O6 to L30 |
| 02     | 01     | **Prom Checksum Error** - indicates that the prom has bad data.  
Probable Cause of Failure:  
a) bad prom chip at L6 of daughter board  
b) bad data line(s)  
c) bad address line(s)  
d) bad ROM select from L14 pin 4 daughter  
e) bad memory request from L22 pin 8 daughter  
f) bad voltages |
| 03     | 00     | **Readboard configuration switch** - this can be used with a Zebug to determine the current settings of the configurations switches at any time. However the reading when using this diagnostic in Repair Aid mode will be BIN XXXX-10X1. If this is not so, then the program never would have gotten this far. |
| 16     | 01     | **RAM data error** - expected and received data are not the same. Expected data is in D', received data is in E', and the current address is in HL'.  
Probable Cause of Failure:  
a) bad data line(s)  
b) bad data cell at current address  
c) RAM memory request timing error |
| 21     | 01     | **PIO Port A Data Error** - expected and received data are not the same. Expected data is in D', received data is in E'.  
Probable Cause of Failure:  
a) bad data line(s)  
b) bad PIO Port A Data Register(L27 mother)  
c) bad M1 or I/O select line |
Error Description and Probable Causes of Failure

**Rtn.No.**  **Err.No.**  **Error Description**  **Probable Cause of Failure**

22  01  PIO Port B Data Error - expected and received data are not the same. Expected data is in D', received data is in E'.

a) bad data line(s)
b) bad PIO Port B Data Register (L27 mother)
c) bad M1 or I/O select line

23  00  PIO 2200 Interface Test - this test should not indicate errors. It will either hang waiting for a strobe from the 2200 or the monitor program on the 2200 side will indicate a data error.

a) bad strobe signal from 2200
b) bad data line on the 2200 side of the controller
c) bad board select
d) I/O drivers (L46, L40, L45, L35)

31  01  CTC Timing Mode Error - the interrupt was received sooner than was expected. D' contains the current CTC channel being used. E' contains the prescalar value for the current channel.

a) system clock is not timing correctly
b) bad CTC channel (L20 mother)
c) bad control line(s) to CTC
d) bad data line(s)

31  02  CTC Timing Mode Error - the interrupt was never received in the time allowed. D' contains the current CTC channel being used. E' contains the prescalar value for the current channel.

a) system clock is not timing correctly
b) bad CTC channel (L20 mother)
c) bad control line(s) to CTC
d) bad data line(s)
e) problem with CPU interrupt circuitry

32  01  CTC Channel 0 Priority Interrupt Error - the channel 0 interrupt either never happened or occurred in the wrong priority order.

a) bad CTC (L20 mother)
b) bad control line(s) to CTC
c) problem with CPU interrupt circuitry
<table>
<thead>
<tr>
<th>Rtn.No.</th>
<th>Err.No.</th>
<th>Error Description and Probable Causes of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>02</td>
<td>CTC Channel 1 Priority Interrupt Error - the channel 0 interrupt either never happened or occurred in the wrong priority order.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) bad CTC(L20 mother)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) bad control line(s) to CTC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) problem with CPU interrupt circuitry</td>
</tr>
<tr>
<td>32</td>
<td>03</td>
<td>CTC Channel 2 Priority Interrupt Error - the channel 0 interrupt either never happened or occurred in the wrong priority order.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) bad CTC(L20 mother)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) bad control line(s) to CTC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) problem with CPU interrupt circuitry</td>
</tr>
<tr>
<td>32</td>
<td>04</td>
<td>CTC Channel 3 Priority Interrupt Error - the channel 0 interrupt either never happened or occurred in the wrong priority order.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) bad CTC(L20 mother)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) bad control line(s) to CTC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) problem with CPU interrupt circuitry</td>
</tr>
<tr>
<td>41</td>
<td>01</td>
<td>DMA Reset Error - the DMA has been reset but the DMA status word was not clear. D contains the expected status(00) and E contains the received status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) DMA caught in a state waiting for DREQ acknowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) bad reset line to DMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) bad data line</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) bad DMA status register(L14 mother)</td>
</tr>
<tr>
<td>42</td>
<td>01</td>
<td>DMA Temporary Register Error - the DMA has been cleared using the Master Clear but the DMA temporary register was not clear. D contains the expected status(00) and E contains the received status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) DMA caught in a state waiting for DREQ acknowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) bad reset line to DMA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) bad data line</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) bad DMA temporary register(L14 mother)</td>
</tr>
</tbody>
</table>
APPENDIX A

Error Description and Probable Causes of Failure

43  01 DMA Low Order Channel Register Error - a pattern has been written to the current address or word count register. However, the pattern written is not the same as the pattern read back. C' contains the current channel port address, D' contains the expected data and E' contains the received data.

Probable Cause of Failure:
   a) DMA caught in a run state
   b) bad data line
   c) bad DMA low order channel register (L14 mother)

43  02 DMA High Order Channel Register Error - a pattern has been written to the current address or word count register. However, the pattern written is not the same as the pattern read back. C' contains the current channel port address, D' contains the expected data and E' contains the received data.

Probable Cause of Failure:
   a) DMA caught in a run state
   b) bad data line
   c) bad DMA high order channel register (L14 mother)

44  01 DMA Memory to Memory Transfer Error - 16k of data has been transferred from 16k of memory starting at address X'6000' to another 16k block of memory starting at location X'A000'. The data was sent through channel 0 and received through channel 1. The operation ran to completion but the data that was sent was not the same as the data that received. D' contains the expected data, E' contains the received data, HL contains the receiving address, DE contains the sending address.

Probable Cause of Failure:
   a) bad addressing line
   b) bad data line
   c) bad DMA control signal
   d) bad channel register

45  01 DMA from 2200 Transfer Error - the 2200 is attempting to send data to the controller via the DMA but the operation never completed. DMA channel 2 is being used for this operation.

Probable Cause of Failure:
   a) bad strobe from the 2200
   b) bad DMA Request on channel 2
   c) bad EOP (acknowledge)
   d) bad clock to PIO or DMA
   e) incorrect values in the channel 2 registers
<table>
<thead>
<tr>
<th>Rtn.No.</th>
<th>Err.No.</th>
<th>Error Description and Probable Causes of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>02</td>
<td><strong>DMA to 2200 Transfer Error</strong> - the 2200 is attempting to receive data from the controller via the DMA but the operation never completed. DMA channel 3 is being used for this operation.</td>
</tr>
</tbody>
</table>

**Probable Cause of Failure:**
- a) bad strobe from the 2200
- b) bad DMA Request on channel 3
- c) bad EOP(acknowledge)
- d) bad clock to PIO or DMA
- e) incorrect values in the channel 3 registers
APPENDIX A

Formatter Error Descriptions

Since many of the error messages are the same for the various Formatter Tests, a list of these errors and their possible causes are listed in Table 2. below. Error Description can then be found by going to the Routine and Error Numbers wanted, beside these numbers there will be the words Error Description #(# is equal to some number). Go to Table 2. and find the comparable # and read the description given. If the error description is unique, then it will be listed beside the Routine and Error Numbers.

B' - contains the routine number
C'  - contains the error number
D'  - contains expected data(exceptions are noted)
E'  - contains received data(exceptions are noted)
HL' - contains the address in question if applicable(exceptions are noted)

Table 2.
Error Description # Error Description and Probable Cause of Failure

01  Timeout waiting for Formatter to read its status command. CBSY or STRB was never received. Check the 2200 monitor for error information.

Probable Cause of Failure:
 a) bad interface to the formatter drive
 b) bad formatter
 c) bad CREQ signal
 d) bad STRB signal
 e) bad CBSY signal

02  Timeout waiting for Formatter to respond to function command. CBSY or STRB was never received. Check the 2200 monitor for error information.

Probable Cause of Failure:
 a) bad interface to the formatter drive
 b) bad formatter
 c) bad CREQ signal
 d) bad STRB signal
 e) bad CBSY signal

03  Timeout waiting for Formatter to complete its current function. CBSY was never received. Check the 2200 monitor for error information.

Probable Cause of Failure:
 a) bad interface to the formatter drive
 b) bad formatter
 c) bad CREQ signal
 d) bad CBSY signal
 e) in the case of write or read functions the DRDY circuitry may be bad

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Page (12)
<table>
<thead>
<tr>
<th>Error Description #</th>
<th>Error Description and Probable Cause of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Formatter status error was encountered. Check the 2200 monitor for error information.</td>
</tr>
<tr>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td>Check the KENNEDY Model 6455 Tape Cartridge System Operation and Maintenance Manual for more information pertaining to status errors.</td>
</tr>
<tr>
<td>05</td>
<td>Tape should be positioned at LBOT but is not. Check the 2200 monitor for error information.</td>
</tr>
<tr>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td>a) bad interface to the formatter drive</td>
</tr>
<tr>
<td></td>
<td>b) bad formatter</td>
</tr>
<tr>
<td></td>
<td>c) bad CREQ signal</td>
</tr>
<tr>
<td>06</td>
<td>Tape should be positioned at LEOT but is not. Check the 2200 monitor for error information.</td>
</tr>
<tr>
<td></td>
<td><strong>Probable Cause of Failure:</strong></td>
</tr>
<tr>
<td></td>
<td>a) bad interface to the formatter drive</td>
</tr>
<tr>
<td></td>
<td>b) bad formatter</td>
</tr>
<tr>
<td></td>
<td>c) bad CREQ signal</td>
</tr>
<tr>
<td>07</td>
<td>Tape is currently positioned at LEOT. Therefore, the current operation, which moves the tape in a forward direction, cannot be performed until the tape is positioned back from LEOT.</td>
</tr>
<tr>
<td>08</td>
<td>Tape is currently positioned at LLP. Therefore, the current operation, which moves the tape in a reverse direction, cannot be performed until the tape is positioned back from LLP.</td>
</tr>
</tbody>
</table>
The following Error Descriptions refer to the descriptions in table 1 on the previous pages.

<table>
<thead>
<tr>
<th>Rtn.No.</th>
<th>Err.No.</th>
<th>Error Description and Probable Causes of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>01</td>
<td><strong>Rewind Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>50</td>
<td>02</td>
<td><strong>Rewind Routine</strong> - Error Description 04</td>
</tr>
<tr>
<td>50</td>
<td>03</td>
<td><strong>Rewind Routine</strong> - Error Description 02</td>
</tr>
<tr>
<td>50</td>
<td>04</td>
<td><strong>Rewind Routine</strong> - Error Description 03</td>
</tr>
<tr>
<td>50</td>
<td>05</td>
<td><strong>Rewind Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>50</td>
<td>06</td>
<td><strong>Rewind Routine</strong> - Error Description 04</td>
</tr>
<tr>
<td>50</td>
<td>07</td>
<td><strong>Rewind Routine</strong> - Error Description 05</td>
</tr>
<tr>
<td>51</td>
<td>01</td>
<td><strong>Load Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>51</td>
<td>02</td>
<td><strong>Load Routine</strong> - Formatter Status indicates that there is no tape cartridge in the drive.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Probable Cause of Failure:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) tape cartridge not in drive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) tape cartridge not inserted properly</td>
</tr>
<tr>
<td>51</td>
<td>03</td>
<td><strong>Load Routine</strong> - Error Description 02</td>
</tr>
<tr>
<td>51</td>
<td>04</td>
<td><strong>Load Routine</strong> - Error Description 03</td>
</tr>
<tr>
<td>51</td>
<td>05</td>
<td><strong>Load Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>51</td>
<td>06</td>
<td><strong>Load Routine</strong> - Error Description 04</td>
</tr>
<tr>
<td>51</td>
<td>07</td>
<td><strong>Load Routine</strong> - Error Description 05</td>
</tr>
<tr>
<td>52</td>
<td>01</td>
<td><strong>Unload Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>52</td>
<td>02</td>
<td><strong>Unload Routine</strong> - Error Description 04</td>
</tr>
<tr>
<td>52</td>
<td>03</td>
<td><strong>Unload Routine</strong> - Error Description 02</td>
</tr>
<tr>
<td>52</td>
<td>04</td>
<td><strong>Unload Routine</strong> - Error Description 03</td>
</tr>
<tr>
<td>52</td>
<td>05</td>
<td><strong>Unload Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>Rtn.No.</td>
<td>Err.No.</td>
<td>Error Description and Probable Causes of Failure</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>52</td>
<td>06</td>
<td>Unload Routine - Tape Drive should have responded with a Drive Not Ready status after Unload command. However, the formatter status was still indicating Drive Ready. <strong>Probable Cause of Failure:</strong>&lt;br&gt;a) bad interface to controller&lt;br&gt;b) bad data line&lt;br&gt;c) bad formatter</td>
</tr>
<tr>
<td>52</td>
<td>07</td>
<td>Unload Routine - Tape should be positioned at EOT(bit 3 of position status) but is not. Check the 2200 monitor for error information. <strong>Probable Cause of Failure:</strong>&lt;br&gt;a) bad interface to the formatter drive&lt;br&gt;b) bad formatter&lt;br&gt;c) bad CREQ signal</td>
</tr>
<tr>
<td>53</td>
<td>01</td>
<td>Track Select Routine - Error Description 01</td>
</tr>
<tr>
<td>53</td>
<td>02</td>
<td>Track Select Routine - Error Description 04</td>
</tr>
<tr>
<td>53</td>
<td>03</td>
<td>Track Select Routine - Error Description 02</td>
</tr>
<tr>
<td>53</td>
<td>04</td>
<td>Track Select Routine - Timeout waiting for Formatter to accept Track # parameter. CBSY or STRB was never received. Check the 2200 monitor for error information. <strong>Probable Cause of Failure:</strong>&lt;br&gt;a) bad interface to the formatter drive&lt;br&gt;b) bad formatter&lt;br&gt;c) bad CREQ signal&lt;br&gt;d) bad STRB signal&lt;br&gt;e) bad CBSY signal</td>
</tr>
<tr>
<td>53</td>
<td>05</td>
<td>Track Select Routine - Error Description 03</td>
</tr>
<tr>
<td>53</td>
<td>06</td>
<td>Track Select Routine - Error Description 01</td>
</tr>
<tr>
<td>53</td>
<td>07</td>
<td>Track Select Routine - Error Description 04</td>
</tr>
<tr>
<td>53</td>
<td>08</td>
<td>Track Select Routine - Error Description 05</td>
</tr>
<tr>
<td>53</td>
<td>09</td>
<td>Track Select Routine - Error Description 06</td>
</tr>
<tr>
<td>53</td>
<td>10</td>
<td>Track Select Routine - Track that was selected is not the track that the heads are currently on(see position status).</td>
</tr>
<tr>
<td>54</td>
<td>01</td>
<td>Erase Space Routine - Error Description 01</td>
</tr>
<tr>
<td>54</td>
<td>02</td>
<td>Erase Space Routine - Error Description 04</td>
</tr>
<tr>
<td>Rtn.No.</td>
<td>Err.No.</td>
<td>Error Description and Probable Causes of Failure</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>54</td>
<td>03</td>
<td>Erase Space Routine - Error Description 07</td>
</tr>
<tr>
<td>54</td>
<td>04</td>
<td>Erase Space Routine - Error Description 02</td>
</tr>
<tr>
<td>54</td>
<td>05</td>
<td>Erase Space Routine - Error Description 03</td>
</tr>
<tr>
<td>54</td>
<td>06</td>
<td>Erase Space Routine - Error Description 01</td>
</tr>
<tr>
<td>54</td>
<td>07</td>
<td>Erase Space Routine - Error Description 04</td>
</tr>
<tr>
<td>55</td>
<td>01</td>
<td>Space Forward Routine - Error Description 01</td>
</tr>
<tr>
<td>55</td>
<td>02</td>
<td>Space Forward Routine - Error Description 04</td>
</tr>
<tr>
<td>55</td>
<td>03</td>
<td>Space Forward Routine - Error Description 07</td>
</tr>
<tr>
<td>55</td>
<td>04</td>
<td>Space Forward Routine - Error Description 02</td>
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<tr>
<td>55</td>
<td>05</td>
<td>Space Forward Routine - Error Description 03</td>
</tr>
<tr>
<td>55</td>
<td>06</td>
<td>Space Forward Routine - Error Description 01</td>
</tr>
<tr>
<td>55</td>
<td>07</td>
<td>Space Forward Routine - Error Description 04</td>
</tr>
<tr>
<td>56</td>
<td>01</td>
<td>Space Reverse Routine - Error Description 01</td>
</tr>
<tr>
<td>56</td>
<td>02</td>
<td>Space Reverse Routine - Error Description 04</td>
</tr>
<tr>
<td>56</td>
<td>03</td>
<td>Space Reverse Routine - Error Description 08</td>
</tr>
<tr>
<td>56</td>
<td>04</td>
<td>Space Reverse Routine - Error Description 02</td>
</tr>
<tr>
<td>56</td>
<td>05</td>
<td>Space Reverse Routine - Error Description 03</td>
</tr>
<tr>
<td>56</td>
<td>06</td>
<td>Space Reverse Routine - Error Description 01</td>
</tr>
<tr>
<td>56</td>
<td>07</td>
<td>Space Reverse Routine - Error Description 04</td>
</tr>
<tr>
<td>57</td>
<td>01</td>
<td>Space Forward FM Routine - Error Description 01</td>
</tr>
<tr>
<td>57</td>
<td>02</td>
<td>Space Forward FM Routine - Error Description 04</td>
</tr>
<tr>
<td>57</td>
<td>03</td>
<td>Space Forward FM Routine - Error Description 07</td>
</tr>
<tr>
<td>57</td>
<td>04</td>
<td>Space Forward FM Routine - Error Description 02</td>
</tr>
<tr>
<td>57</td>
<td>05</td>
<td>Space Forward FM Routine - Error Description 03</td>
</tr>
<tr>
<td>57</td>
<td>06</td>
<td>Space Forward FM Routine - Error Description 01</td>
</tr>
</tbody>
</table>
## Error Description and Probable Causes of Failure

<table>
<thead>
<tr>
<th>Rtn.No.</th>
<th>Err.No.</th>
<th>Description</th>
<th>Probable Causes of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>07</td>
<td>Space Forward FM Routine - Error Description 04</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>08</td>
<td>Space Forward FM Routine - No File Marks(FM) were found on the tape. To test this function first the Write File Mark function must be performed on this track.</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>01</td>
<td>Space Reverse FM Routine - Error Description 01</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>02</td>
<td>Space Reverse FM Routine - Error Description 04</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>03</td>
<td>Space Reverse FM Routine - Error Description 08</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>04</td>
<td>Space Reverse FM Routine - Error Description 02</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>05</td>
<td>Space Reverse FM Routine - Error Description 03</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>06</td>
<td>Space Reverse FM Routine - Error Description 01</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>07</td>
<td>Space Reverse FM Routine - Error Description 04</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>08</td>
<td>Space Reverse FM Routine - No File Marks(FM) were found on the tape. To test this function first the Write File Mark function must be performed on this track.</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>01</td>
<td>Formatter Clear Routine - Error Description 03</td>
<td></td>
</tr>
<tr>
<td>5A</td>
<td>01</td>
<td>Formatter Parity Routine - Error Description 01</td>
<td></td>
</tr>
<tr>
<td>5A</td>
<td>02</td>
<td>Formatter Parity Routine - a formatter parity trap was expected but never received.</td>
<td></td>
</tr>
</tbody>
</table>

### Probable Cause of Failure:

- a) bad tape parity chip(L2 mother))
- b) bad drive (L9 mother)
- c) bad reverse parity signal
- d) bad formatter

<p>| 5B      | 01      | Write FM Routine - Error Description 01 |
| 5B      | 02      | Write FM Routine - Error Description 04 |
| 5B      | 03      | Write FM Routine - Error Description 07 |
| 5B      | 04      | Write FM Routine - the tape is currently write protected(see position status). No write operations may be performed until the write protect is removed. |
| 5B      | 05      | Write FM Routine - Error Description 02 |</p>
<table>
<thead>
<tr>
<th>Rtn.No.</th>
<th>Err.No.</th>
<th>Error Description and Probable Causes of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5B</td>
<td>06</td>
<td>Write FM Routine - Error Description 03</td>
</tr>
<tr>
<td>5B</td>
<td>07</td>
<td>Write FM Routine - Error Description 01</td>
</tr>
<tr>
<td>5B</td>
<td>08</td>
<td>Write FM Routine - Error Description 04</td>
</tr>
<tr>
<td>5C</td>
<td>01</td>
<td>Write Record Routine - Error Description 01</td>
</tr>
<tr>
<td>5C</td>
<td>02</td>
<td>Write Record Routine - Error Description 04</td>
</tr>
<tr>
<td>5C</td>
<td>03</td>
<td>Write Record Routine - Error Description 07</td>
</tr>
<tr>
<td>5C</td>
<td>04</td>
<td>Write Record Routine - the tape is currently write protected (see position status). No write operations maybe performed until the write protect is removed.</td>
</tr>
<tr>
<td>5C</td>
<td>05</td>
<td>Write Record Routine - Error Description 02</td>
</tr>
<tr>
<td>5C</td>
<td>06</td>
<td>Write Record Routine - Error Description 03</td>
</tr>
<tr>
<td>5C</td>
<td>07</td>
<td>Write Record Routine - Error Description 01</td>
</tr>
<tr>
<td>5C</td>
<td>08</td>
<td>Write Record Routine - Error Description 04</td>
</tr>
<tr>
<td>5D</td>
<td>01</td>
<td>Read Record Routine - Error Description 01</td>
</tr>
<tr>
<td>5D</td>
<td>02</td>
<td>Read Record Routine - Error Description 04</td>
</tr>
<tr>
<td>5D</td>
<td>03</td>
<td>Read Record Routine - Error Description 07</td>
</tr>
<tr>
<td>5D</td>
<td>04</td>
<td>Read Record Routine - Error Description 02</td>
</tr>
<tr>
<td>5D</td>
<td>05</td>
<td>Read Record Routine - Error Description 03</td>
</tr>
<tr>
<td>5D</td>
<td>06</td>
<td>Read Record Routine - Error Description 01</td>
</tr>
<tr>
<td>5D</td>
<td>07</td>
<td>Read Record Routine - Error Description 04</td>
</tr>
<tr>
<td>5D</td>
<td>08</td>
<td>Read Record Routine - data compare error. The data that was written or expected was not the data that was received. Check the 2200 monitor for more error information.</td>
</tr>
</tbody>
</table>

Probable Cause of Failure:

a) bad RAM memory cell
b) bad RAM addressing
c) bad data line
d) bad DMA transfer on channel 1
e) formatter bad
<table>
<thead>
<tr>
<th>Rtn.No.</th>
<th>Err.No.</th>
<th>Error Description and Probable Causes of Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5E</td>
<td>01</td>
<td>Transfer 8 Bytes of DMA I/O Buffers to 2200 - this routine timed out waiting for the 8 byte DMA to complete.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Probable Cause of Failure:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) bad IBS strobe from 2200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) bad DMA control signals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) bad DMA chip</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) bad system clock</td>
</tr>
<tr>
<td>5F</td>
<td>01</td>
<td><strong>Erase Track Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>5F</td>
<td>02</td>
<td><strong>Erase Track Routine</strong> - Error Description 04</td>
</tr>
<tr>
<td>5F</td>
<td>03</td>
<td><strong>Erase Track Routine</strong> - Error Description 07</td>
</tr>
<tr>
<td>5F</td>
<td>04</td>
<td><strong>Erase Track Routine</strong> - Error Description 02</td>
</tr>
<tr>
<td>5F</td>
<td>05</td>
<td><strong>Erase Track Routine</strong> - Error Description 03</td>
</tr>
<tr>
<td>5F</td>
<td>06</td>
<td><strong>Erase Track Routine</strong> - Error Description 01</td>
</tr>
<tr>
<td>5F</td>
<td>07</td>
<td><strong>Erase Track Routine</strong> - Error Description 04</td>
</tr>
<tr>
<td>5F</td>
<td>08</td>
<td><strong>Erase Track Routine</strong> - Error Description 06</td>
</tr>
<tr>
<td>61</td>
<td>00</td>
<td>Online Switch Error - the Online switch on the front of the drive has not been activated. This switch must first be depressed before any tape functions can be performed.</td>
</tr>
</tbody>
</table>
Controller Tests Menu

SF 0 - Return to Unit Select Menu
SF 1 - LED Visual Test
SF 2 - Check Sum Test
SF 3 - Read Contlr. Config. Switch
SF 4 - RAM Data Line Integrity Test
SF 5 - RAM High Address Lines Test
SF 6 - RAM Low Address Lines Test
SF 7 - RAM Data Cell Integrity Test
SF 8 - RAM Parity Checking Test
SF 9 - RAM Moving Inversions Test
SF 10 - PIO A Reg. Data Test
SF 11 - PIO B Reg. Data Test
SF 12 - PIO OBS IBS Test
SF 13 - CTC Timer Mode Test
SF 14 - CTC Priority Interrupt Test
SF 15 - DMA Reset Test
SF 16 - DMA Temporary Register Test
SF 17 - DMA Channel Select Test
SF 18 - DMA Mem to Mem Transfer Test
SF 19 - DMA 2200 Interface Test

SF 0 - return the user to the Unit Tests Select Menu (see previous pages).

SF 1 - test controller and tape drive leds using visual verification

SF 2 - prom checksum test, tests whether the prom is good or bad

SF 3 - read the current Controller Configuration switches.

SF 9 - extensive test of the RAM address and data lines. Allow approximately 17 seconds for this test to run.

WARNING - Running the RAM MOVING INVERSIONS TEST will cause all executable code previously in RAM to be destroyed!!!

If this test has been run and the user wants to recover the RAM code that was destroyed. Run the DMA 2200 Interface Test (SF 19).

SF 10 - checks the PIO A Port data register.

SF 11 - checks the PIO B Port data register.

SF 12 - checks the interface between the 2200 and the controller through the PIO.

SF 13 - check the CTC Timer Mode circuitry.

SF 14 - check the CTC interrupt handling on priority levels.

SF 15 - check the DMA Reset circuitry.
APPENDIX B

SF16 - check the integrity of the DMA temporary register.
SF17 - check the DMA Channel registers.
SF18 - check the DMA Memory to Memory Transfer circuitry.
SF19 - check the interfacing between the 2200 and the controller via the DMA.

Formater Tests Select Menu

SF 0 - Return to Unit Select Menu
SF 1 - Load Tape
SF 2 - Unload Tape
SF 3 - Load - Unload Chain Mode
SF 4 - Select Track(0-3) Test
SF 5 - Space Forward Test
SF 6 - Space Reverse Test
SF 7 - Space Rev-Rev Chain Mode
SF 8 - Space Forward FM Test
SF 9 - Space Reverse FM Test
SF10 - Space Rev-Rev FM Chain Mode
SF11 - Erase Track Test
SF12 - Erase Space Test
SF13 - Erase-Reverse Chain Mode
SF14 - Rewind Tape Test
SF15 - Tape Parity Checking Test
SF16 - Write File Mark(FM) Test
SF17 - Write FM-Rev FM Chain Mode
SF18 - Write Record(s) Test
SF19 - Read Record(s) wo/cmp Test
SF20 - Read record(s) w/cmp Test
SF21 - Write-Read Rec(s) Chain Mode
SF22 - Reset Tape Drive
SF23 - 8 Bytes of DMA I/O Buffs

SF 0 - return the user to the Unit Tests Select Menu (see previous pages).

SF 1 - check the tape load function.

SF 2 - check the tape unload function.

SF 3 - check both the tape load and unload functions in sequence.

SF 4 - check the drives ability to select track 0 through 3 and position the heads at LLP or LEOT. After selecting the track select function, a second menu will request the track and where the heads are to be positioned. Enter the position of the heads in the high order number, 0 for LEOT and 0 for LLP. Enter the track wanted in the low order number, 0 through 3 are valid.

EXAMPLE: 83 - indicates that track 3 is wanted and the heads are to be positioned at LEOT.

SF 5 - check the space forward function of the drive. After selecting this test, another menu will be displayed requesting the number of spaces to be forwarded.

SF 6 - check the space reverse function of the drive. After selecting this test, another menu will be displayed requesting the number of spaces to be reversed.
SF 7 - check the space forward and space reverse functions of the drive in chain sequence. After selecting this test, another menu will be displayed requesting the number of spaces the tape is to be moved.

SF 8 - check the space forward file mark function of the drive. After selecting this test, another menu will be displayed requesting the number of file marks to be forwarded.

SF 9 - check the space reverse file mark function of the drive. After selecting this test, another menu will be displayed requesting the number of file marks to be reversed.

SF 10 - check the space forward file mark and space reverse file mark functions of the drive in chain sequence. After selecting this test, another menu will be displayed requesting the number of file marks the tape is to be moved.

SF 11 - check erase track function. This is done by erasing the currently selected track from its current position to LEOT of that track.

SF 12 - check the erase space function of the drive. After selecting this test, another menu will be displayed requesting the number of spaces to be erased.

SF 13 - check the erase space and space reverse functions of the drive in chain sequence. After selecting this test, another menu will be displayed requesting the number of spaces the tape is to be moved.

SF 14 - check the tape rewind function. Rewinding the tape to LBOT of track 0.

SF 15 - check the tape parity circuitry.

SF 16 - check the write file mark function of the drive. After selecting this test, another menu will be displayed requesting the number of file marks to be forwarded.
MEMORANDUM

TO: Distribution
FROM: Gail Stanwyck
DATE: October 21, 1980
SUBJECT: 2200 Diagnostic Release

The enclosed diagnostics are being released for the convenience of our employees out in the field who may not have these classic 2200 diagnostics at this time.

This package contains the following items:

Mass Storage diagnostics for the 2200 702-0078
Peripheral diagnostic for the 2200 702-0079
BASIC diagnostic for the 2200 702-0080

Please be informed that the 2200 Diagnostic Release has no documentation. These items are copies of older diagnostic programs that have been used on 2200 VP/MVP systems and are assumed to already exist in the Field.

It is our intention to support the 2200 Diagnostic Release on a replace/rewrite basis only. That is, if a problem arises which requires any significant modification to any of the programs contained on this diskette we will rewrite that entire program.

If you should have any questions or problems concerning these diagnostics, please contact Lynda Derby at Wang Corporate Headquarters extension 4667.
MEMORANDUM

TO:     Distribution
FROM:   Gail Stanwyck
DATE:   December 19, 1980
SUBJECT: Recent Diagnostic Release

The 2228D TC Field Service Diagnostic has been released. This diagnostic will only run on Rev 1 boards. The Field Service Monitor Program and Microcode Diagnostics are stored on the 702-0097 Floppy Diskette under file names 28DFSR1 and FSDIAGS respectively. The Monitor Program handles all screening, test control, and error reporting. The part number is 702-0097.

Please contact Lynda Derby at Wang Corporate Headquarters extension 2314, if you should have any questions or problems concerning this diagnostic.
1.0 TITLE

2228D TC Field Service Diagnostics for Rev. 1 only.

2.0 REVISION/DATE

! Date: November 5, 1980
! Documentation Release: Rev. 1.0
! Software Release: Rev. 1.0
! Part Number: 702 - 0097

3.0 REFERENCE DOCUMENTS

Z80 - Assembly Language Programming Manual
Z80 - PIO Technical Manual
Z80 - CTC Technical Manual
Z80 - SIO Technical Manual
Am9517 - Technical Information Sheet
MOSSTEK 1979 Memory Data Book and Designers Guide
2228D Telecommunications Controller Hardware Specification 1/8/80
Addendum to 2228D Telecommunications Controller Hardware Spec. 6/11/80
WANG BASIC 2 Language Reference Manual

4.0 CONFIGURATION REQUIREMENTS

4.1 Hardware

Minimum required configuration

2200 VP or MVP with 2236MXD or equivalent and 80 X 24 Terminal
2228D Rev. 1 Telecommunications Controller Board with 378 - 4219
Power-Up From
RS232 Loop Back Connector
RS449 Loop Back Connector
Requires 56K bytes of user Memory

4.2 Software

MVP BASIC 2 Rev. 2.1 or VP BASIC 2 Rev. 2.3

5.0 PROGRAM DESCRIPTION

The Field Service Monitor Program and Microcode Diagnostics are stored
on the 702 - 0097 Floppy Diskette under file names 28DFSRL and FSDIAGS
respectively.

The Monitor Program handles all screening, test control, and error
reporting. Following is a description of the normal screens (shown in
Appendix B) that will be encountered when using this diagnostic.
SCREEN 1 - This is a warning screen identifying the intended use of this diagnostic.

SCREEN 2 - This screen requests operator input of the correct device address for the controller, (default is 01C). After the operator depresses RETURN the Monitor program checks the device for a Ready/Busy condition. The result is displayed to the operator. NOTE: a Busy response indicates either the device address is wrong or the controller will be unable to respond to any future requests from the Monitor program.

SCREEN 3 - This screen requests operator input of the condition the controller is in, (LED ON or OFF). If the LED is OFF the operator will answer Y. The monitor will immediately enter a communications test between the controller and the 2200. NOTE: the communications test is only run upon initial entry of this diagnostic or upon a restart request by the operator from the menu.

If the LED is ON or Flashing the operator will answer N. The next question that will appear asks the operator if the LED is Flashing. If the operator answers N, indicating the LED is ON solid an error screen will be displayed and no further testing will take place. If the answer is Y, indicating the LED is Flashing the monitor will check the controller's power up diagnostic error reporting routine for the error that was detected. If a RAM failure of some type exists an error screen will be displayed and no further testing will take place. If any other type of error exists, the controller will be forced into the operating system firmware portion of the prom and the communications test will be invoked. NOTE: if the communications test is invoked after determining no RAM errors exist, the LED may remain ON or OFF, ignore this condition.

SCREEN 4 - This screen displays the conditions of the first communications test. Any errors will be reported on this screen and no error looping will be used. If a CPU Time Out error IBS occurs, no further testing will take place. If a failure to get an IBS from the controller occurs, no further testing can take place. Both failures indicate a fault in either the DMA or PIO.

SCREEN 5 - This screen displays the conditions of the second communications test. Any errors will be reported on this screen and error looping will be automatically invoked.

SCREEN 6 - This screen requests testing parameter inputs from the operator. The parameters are Loop or Halt On Error, Display or no Display of instruction/information screens, and the number of passes each test is to make.

SCREEN 7 - This screen displays the conditions encountered by the controller after successful completion of the communications tests. It is at this time that the microcode diagnostic program file is downline loaded from the disk to the controller memory, starting at location 0900.

SCREEN 8 - This is the menu screen and indicates that the microcode was successfully loaded into the controllers memory and that the controller has been sent to this program and is awaiting test requests from the monitor.
The remaining screens are test screens and are self-explanatory. Each test will provide the operator with error information indicating the cause of failure.

The following is a brief description of each test that will or can be performed using this diagnostic. These tests are more exhaustive checks of the various capabilities of the controller not performed in the power up diagnostic.

Automatic Testing - These two tests check the communications capability of the controller utilizing the firmware microcode portion of the prom. The tests check the ability of the controller and 2200 to communicate utilizing the PIO and DMA chips.

The first test transfers a 256 byte incremental data pattern to the controller memory starting at address 0900. It then reads back and compares the data sent with the expected data. Successful functioning of this test will result in advancement to the next communications test.

The second test is designed to check the high order address bit multiplexer for the DMA chip. A unique byte is placed in each of the memory locations shown below. Then each unique byte is read at the specific address and checked with the expected byte. Successful completion of this test will result in advancement to the parameter inputs by the operator and eventual loading of the microcode diagnostic program.

ADDRESS AND BYTE = 8000 (00), 8100 (01), 8200 (02), 8400 (04), 8800 (08)
                   9000 (10), A000 (20), C000 (40)

The remaining tests are invoked by the operator from the menu of the Monitor program.

RE-KEY INPUT PARAMETERS - This routine allows the operator to re-input the Loop On Error or Halt On Error, Instruction/Information Display, and Number of Passes parameters. After reentry the microcode program is again downline loaded into controller memory.

MOVING INVERSIONS MEMORY TEST - This test program performs a more exhaustive RAM memory check using the moving inversions test procedure with a AA/55 test pattern. NOTE: If all banks are to be tested, the number of passes must be set to 4 and chain mode requested. Otherwise, the test requests which bank you desire to test and will test only this bank for the number of passes requested during the input parameters screen. NOTE: If an error is detected it will display the address of failure, the expected and actual data patterns. If the data patterns are equal this indicates a Parity RAM failure has occurred.

SIO EXTERNAL LOOP - This test requires that the RS232 Loop Back connector be installed. The test runs a more extensive test of the SIO and associated circuitry utilizing Async, Bisync, and SDLC modes of operation. Error messages are more detailed then the SIO External Loop Test for the power up diagnostic. No option switch setting is required.
SIO/DMA TEST - The RS232 Loop Back Connector is required for this test. The test performs a interaction check between the SIO, DMA, and CTC utilizing the Async mode of operation. Transfers of 256 bytes, 512 bytes, 1K, 2K, 4K, 8K, and 16K are performed with error checking after each transfer completion. A time out feature is also incorporated in case no transfer operation takes place as expected, indicating an SIO DMA problem exists.

CONTROL CHARACTER RAM TEST - The RS232 Loop Back Connector is required for this test. The test operates in two modes. First the Control Character RAM is flooded not to recognize any characters. With the SIO and DMA (Receive channel only) activated 256 characters 00 to FF are transmitted and received. The CTC is monitored, as well as the DMA, checking each character that did not cause a downcount of CTC channel 0 after completion of each transfer. The Control Character RAM is then flooded to recognize all characters as control characters. The CTC channel 0 is monitored after each transfer to insure a downcount occurred indicating a control character was recognized.

PRIORITY INTERRUPT TEST - The RS232 Loop Back Connector is required for this test. The test will check the IEI/IEO line connected between the SIO, CTC, and PIO to see if it is functioning properly. It also insures the priority scheme with the SIO having the highest and the PIO the lowest is maintained.

RS449 LOOP BACK TEST - The RS449 Loop Back Connector is required for this test, also the switch on the rail must be in the RS449 position. The tests performed are the same as those performed by the SIO EXTERNAL LOOP Test.

OPTION SWITCH TEST - This test allows the operator to test SW2 on the controller motherboard. After test entry the screen will display the current switch setting. The operator need only change the setting of the switch at will and the screen display will automatically reflect the new setting. To exit the test the operator must depress RETURN.

CHAIN MODE - This test invokes the tests associated with Special Function Keys 1, 2, 3, 4, and 5. This program will invoke each test one at a time for the number of passes entered during parameter entry. The bank number for the Moving Inversions Test will automatically be incremented. If a minimum of 4 passes was selected by the operator, each bank of memory will be tested once by Moving Inversions.

RESTART - This entry forces a software reset of the controller to location 0000 of the prom. The Monitor program is also reset to the first screen. NOTE: If an error existed during the power up diagnostic and if bank number 4 of the moving inversions test was not run, the operator will have to wait for the power up diagnostic to complete before proceeding. However, if neither of these conditions mentioned exist, the operator may begin immediately.
6.0 LOAD PROCEDURE

The operator must request the loading of file 28DFSR1 using the LOAD RUN DC F or R and "28DFSR1" RETURN procedure.

7.0 OPERATING INSTRUCTIONS

All operating instructions are screen prompted and require no detailed explanation.

8.0 REVISION HISTORY

None.

9.0 MISCELLANEOUS

None.
APPENDIX A

TEST AND ERROR INFORMATION TABLE
<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>TEST NAME</th>
<th>ERROR CODE</th>
<th>FAILING MODULE or DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DMA/PIO</td>
<td>NONE</td>
<td>Screen display of the expected data and actual data.</td>
</tr>
<tr>
<td>2</td>
<td>DMA MULTIPLEXER TEST</td>
<td>NONE</td>
<td>Screen display of the failing address, expected data and actual data.</td>
</tr>
<tr>
<td>3</td>
<td>MOVING INVERSIONS</td>
<td>NONE</td>
<td>Screen display of the failing address, expected data and actual data.</td>
</tr>
<tr>
<td>4</td>
<td>SIO EXTERNAL LOOP</td>
<td>F0</td>
<td>Receiver failed to enter hunt mode in either Bisync or SDLC mode of testing. Display will give mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F1</td>
<td>Transmitter failing to send sync or flag characters during Bisync or SDLC mode of testing. Display will give mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F2</td>
<td>Receiver failed to receive sync or flag character and exit hunt mode. Display will give mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F3</td>
<td>Transmitter failing to transmit data characters. Display will give mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F4</td>
<td>Receiver failed to receive transmitted character. Display will give mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F5</td>
<td>Data error between transmitted and received character. Display will give mode of testing, expected and actual character.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F6</td>
<td>Transmit interrupt failed to occur during Bisync mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F7</td>
<td>Receive interrupt failed to occur during Bisync mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F8</td>
<td>Overrun interrupt failed to occur during Bisync mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F9</td>
<td>CTS interrupt failed to occur during Bisync mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FA</td>
<td>DCD interrupt failed to occur during Bisync mode of testing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FB</td>
<td>DCD interrupt occurred when DCD was supposed to be turned off during Bisync mode of testing.</td>
</tr>
</tbody>
</table>
5 SIO/DMA F0
CTC channel 2 downcounter failed to decrement as a result of EOP from the DMA.

F1
Data error between transmitted and received data. Display give expected and actual data.

F2
Parity error occurred during DMA transfer.

F3
Timed out waiting for Transfer to complete.

6 CC RAM F0
Character was recognized during non-recognition test. Display gives character that caused failure which equivocates to the RAM address.

F1
Character failed to recognized during recognition test. Display gives character that caused failure which equivocates to the RAM address.

7 PRIORTY F0
CTC interrupt failed to occur in allotted time.

F1
SIO interrupt failed to occur after CTC interrupt had occurred and before a return from interrupt was executed.

F2
PIO interrupt occurred before completion of service to the CTC interrupt i.e. a return from interrupt has not been executed.

F3
PIO interrupt failed to occur within the allotted time.

8 RS449 LOOP BACK TEST
SAME ERRORS AS SIO EXTERNAL LOOP
APPENDIX B

MODULE DESCRIPTIONS
SIO EXTERNAL LOOP BACK TEST

Testing of the SIO chip is done in three distinct phases. The SIO is tested using Async, Fisync, and SDL. The CTC Channel 1 is set to clock at 9f00 baud. Clocks are provided externally via the loop back.

ASYNC MODE: In this mode the SIO chip is initialized to transmit and receive characters in the Async mode using 1 stop bit. An incremental data pattern of 00 to FF is used with the exclusion of a hex 32. The 32 is excluded because Fisync testing uses this same routine.

FISYNC MODE: In this mode the SIO chip is initialized to transmit and receive characters in the Fisync mode. An incremental data pattern is again used excluding the sync byte hex 32. Several error reportable checks are made here that are not made in the Async mode. The status of the receiver is checked to see that it entered the Hunt mode from a command given during initialization. The transmitter is then enabled and checks are made to determine if it is sending Sync characters. The receiver is then checked to determine if it is receiving Sync characters after completion character transmission and reception with checking.

SDL MODE: In this mode tests are made on the flag character transmission and reception and also transmission and reception to two data patterns AA and 5f. Except for interrupts some of the same checks as Fisync mode are made prior to transmission of the two data patterns.

All errors will be reported via the 2200 basic test monitor program and should be easily understood by the user.
This test is downline loaded from disk into controller memory and runs starting at location 0500. The function of this test is to check the ability of the S10 to transfer bytes out of memory and receive them via loop back and put the received characters into memory. The inter-action between the DMA and S10 is tested here. Data is transferred from memory locations 4000 to 4100 in the BISync mode. After completion of the data transfer from and to memory the data is checked by the Z80 for validity and the pass or fail parameters are passed onto the 2200 via the iron resident host routine.
Stat File  Value No.  Line  Source Statement

            Ex  Loc Code

0000  830  500  NO LIST
0000  6f8  LIST
1001  6e9
1002  670  *CONTROL CHARACTER RECOGNITION RAM TEST*
1003  671  *
1004  672  *
1005  673  *This test is downline loaded from disk into controller memory and*
1006  674  *runs starting at location 0900. The function of this test is to check*
1007  675  *the ability of Control Character Recognition RAM to detect control char-
1008  676  *acters during an SIG/DMA transfer. The output of the RAM will trigger the*
1009  677  *CTC channel 2. On the first pass the RAM will be set to not recognize*
1010  678  *any characters by flooding it with all ones using an OUT 31 command and*
1011  679  *a 256 byte incremental data pattern to accomplish this. Then using an*
1012  680  *OUT 30 command and the same data pattern the RAM will be set to recognize*
1013  681  *all characters as control characters. The end result will a down count*
1014  682  *of the CTC channel 2 after the transfer of each character. Any failure*
1015  683  *will be reported to the 22CC monitor program.
## Priority Interrupt Line Test for SI0/CTC/PIO

The function of this test is to check the priority scheme of the IEI/IEO line that runs between the SIC/CTC/PIO chips is functioning.

The test will allow an interrupt from the CTC then while in the service routine will create an interrupt from the SI0. When this interrupt is received the SI0 service routine should be entered verifying the SI0 has a higher priority then the CTC. The 2200 will then be informed to send a character which will cause a PIC interrupt, once enabled. A return from Interrupt will be executed thus the routine should exit the SI0 routine and return to the CTC routine. After verification of entry into the CTC routine is completed another return from interrupt will be performed which then should allow the 2200 interrupt to occur signifying successful test completion. Any errors will be reported to the 2200 for display on the monitor.
<table>
<thead>
<tr>
<th>Ex Loca Code</th>
<th>Value No.</th>
<th>Line Source Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFFF</td>
<td>1141</td>
<td>MOVLIST</td>
</tr>
<tr>
<td>FFFF</td>
<td>1276</td>
<td>MOVLIST</td>
</tr>
<tr>
<td>FFFF</td>
<td>1277</td>
<td>MOVLIST</td>
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<td>FFFF</td>
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<td>1279</td>
<td>MOVLIST</td>
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<td>FFFF</td>
<td>1280</td>
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<td>FFFF</td>
<td>1281</td>
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<td>FFFF</td>
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<td>MOVLIST</td>
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<td>FFFF</td>
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<td>FFFF</td>
<td>1294</td>
<td>MOVLIST</td>
</tr>
<tr>
<td>FFFF</td>
<td>1295</td>
<td>MOVLIST</td>
</tr>
</tbody>
</table>

**Movin Inversions RAM Test for Bank 1**

The MOVING INVERSIONS RAM Test is used to check the functionality of the 16K RAM chips. This test should be run only after the RAM Test has passed since this test is done line loaded into memory. This test will find the bad RAM's not detected by the RAM test which should catch most common RAM failures. MOVING INVERSIONS should find the flakey failures that a cheap and dirty RAM test like the MARCHING 1's and 0's won't. The error reporting is done via the 220C monitor. The expected data, actual data read and the address of the failure will be displayed on the screen.

This MOVING INVERSIONS test uses all increment values for 16K RAM chips. The test uses only two patterns ('AA'+'15'), because the RAMS are single bit.

**Time to Run: Approx = 45 Seconds**

---

<table>
<thead>
<tr>
<th>Ex Loca Code</th>
<th>Value No.</th>
<th>Line Source Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFFF</td>
<td>1297</td>
<td>MOVLIST</td>
</tr>
<tr>
<td>FFFF</td>
<td>1502</td>
<td>MOVLIST</td>
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<tr>
<td>FFFF</td>
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<td>FFFF</td>
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<td>MOVLIST</td>
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<tr>
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<td>MOVLIST</td>
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<tr>
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<td>MOVLIST</td>
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<tr>
<td>FFFF</td>
<td>1508</td>
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<tr>
<td>FFFF</td>
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<tr>
<td>FFFF</td>
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<td>FFFF</td>
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<td>MOVLIST</td>
</tr>
<tr>
<td>FFFF</td>
<td>1521</td>
<td>MOVLIST</td>
</tr>
</tbody>
</table>

**Movin Inversions RAM Test for Banks 2,3,4**

The MOVING INVERSIONS RAM Test is used to check the functionality of the 16K RAM chips. This test should be run only after the RAM Test has passed since this test is done line loaded into memory. This test will find the bad RAM's not detected by the RAM test which should catch most common RAM failures. MOVING INVERSIONS should find the flakey failures that a cheap and dirty RAM test like the MARCHING 1's and 0's won't. The error reporting is done via the 220C monitor. The expected data, actual data read and the address of the failure will be displayed on the screen.

This MOVING INVERSIONS test uses all increment values for 16K RAM chips. The test uses only two patterns ('AA'+'15'), because the RAMS are single bit.

**Time to Run: Approx = 45 Seconds**
OPTION SWITCH TEST

This test is designed to test the option switch (SW2) on the 7658 board of the controller. Upon entry into this test the 2200 will be notified of the current switch setting. The user will have the opportunity to change the switch and save the setting displayed by the 2200. This test will terminate when instructed to do so by the 2200 monitor.
APPENDIX C
RS232 AND RS449
LOOP BACK CONNECTOR
WIRING DIAGRAMS
RS232 LOOP BACK CONNECTOR

Protective Ground

Transmitted Data

Received Data

Request to send

Clear to Send

Data Set Ready

Signal Ground

Carrier Detector

Reserved for Data Set Testing

Reserved for Data Set Testing

Secondary Carrier Detector

Secondary Clear to Send

Secondary Transmitted Data

Transmitted clock

Secondary Received Data

Received clock

Unassigned

Secondary Request to Send

Data terminal Ready

Signal Quality Detector

Ring Indicator

Data signal rate selector

Transmitted Clock

Unassigned

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APPENDIX D

SAMPLE SCREENS
WARNING FIELD SERVICE DIAGNOSTIC FOR 2228D REV 1 ONLY

KEY 'RETURN' TO CONTINUE

2228D TC FIELD SERVICE DIAGNOSTICS REV 1.0

Available device addresses are:  Requires MVP BASIC Revision 1.9

01C 01F

What is the device address? 01C

DEVICE IS READY

KEY 'RETURN' TO CONTINUE
Device address '01C' will be used for all tests

Is the LED OFF? 'Y' or 'N' * Y

CHECKING DMA/PIO

SENDING 256 BYTES OF DATA TO CONTROLLER MEMORY

! READING & COMPARING 256 BYTES OF DATA FROM CONTROLLER MEMORY

! DMA/PIO TEST PASSED

DMA MULTIPLEXER TEST

SENDING UNIQUE ADDRESS PATTERNS

! READING AND COMPARING UNIQUE ADDRESS PATTERNS

! DMA ADDRESS MULTIPLEXER TEST PASSED
Device address 'O1C' will be used for all tests

Do you want to loop on error 'Y' or 'N' N
* The program will STOP on error
Do you want to display instructions 'Y' or 'N' Y
* Instructions will be displayed
How many passes do you wish to make (less than 10000)? 4
* All tests will make 4 pass(es)

KEY 'RETURN' TO CONTINUE

SENDING MICROCODE TEST PROGRAMS TO CONTROLLER MEMORY
TRANSFER OF MICROCODE SUCCESSFUL
FORCING CONTROLLER INTO MICROCODE TEST PROGRAM
TEST SELECTION MENU

SF 0 - RE-KEY INPUT PARAMETERS
SF 1 - MOVING INVERSIONS MEMORY TEST
SF 2 - SIO EXTERNAL LOOP
SF 3 - SIO/DMA TEST
SF 4 - CONTROL CHARACTER RAM TEST
SF 5 - PRIORITY INTERRUPT TEST
SF 6 - RS449 LOOP BACK TEST
SF 7 - OPTION SWITCH TEST
SF 8 - CHAIN MODE
SF 9 - RESTART

STRIKE THE SPECIAL FUNCTION KEY ASSOCIATED WITH THE DESIRED TEST

WHICH TEST DO YOU DESIRE?

MOVING INVERSIONS TEST

This test will run a more complete RAM check and is bank selective. In the Chain Mode bank selection will be an automatic function.

KEY 'RETURN' TO CONTINUE
MOVING INVERSIONS TEST

RAM MEMORY WILL ONLY BE TESTED ON 1 BANK AT A TIME

ENTER 1 FOR BANK 1 ADDRESS 2000 TO 3FFF
ENTER 2 FOR BANK 2 ADDRESS 4000 TO 7FFF
ENTER 3 FOR BANK 3 ADDRESS 8000 TO BFFF
ENTER 4 FOR BANK 4 ADDRESS C000 TO FFFF

ENTER THE NUMBER OF THE BANK YOU WISH TO TEST  ? 3

PASS# 1

MOVING INVERSIONS TEST

WAITING FOR CONTROLLER TO COMPLETE TESTS

CURRENTLY TESTING BANK # 3

PASS# 1

MOVING INVERSIONS TEST

MOVING INVERSIONS TEST PASSED

CONTROLLER IS BACK IN HOST
This program tests the controller's SIO external loop back circuitry. The tests are conducted in all 3 modes ie Async, Bisync and SDLC. In addition 3 vectored interrupt tests are performed, Transmit, Receive, Overrun, CTS, & DCD.

KEY 'RETURN' TO CONTINUE

PASS# 1

SIO EXTERNAL LOOP

WAITING FOR CONTROLLER TO COMPLETE TESTS

PASS# 1

SIO EXTERNAL LOOP

SIO EXTERNAL LOOP PASSED

CONTROLLER IS BACK IN HOST
SIO/DMA TEST

This test requires the RS232 LOOP BACK Plug. The test checks the ability to transfer data from one section of memory to another. The test is run in the Async mode. This test checks transfers of 256 bytes, 512 bytes, 1k, 2k, 4k, 8k, and 16k.

KEY 'RETURN' TO CONTINUE

PASS# 1

SIO/DMA TEST

WAITING FOR CONTROLLER TO COMPLETE TESTS

PASS# 1

SIO/DMA TEST

SIO/DMA TEST PASSED

CONTROLLER IS BACK IN HOST
CONTROL CHARACTER RECOGNITION RAM TEST

This program checks the static ram using the SIO in Async mode. The failing character is interpreted as the RAM address. INSTALL RS232 LOOP BACK

KEY 'RETURN' TO CONTINUE

PASS# 1

CONTROL CHARACTER RECOGNITION RAM TEST

WAITING FOR CONTROLLER TO COMPLETE TESTS.

PASS# 1

CONTROL CHARACTER RECOGNITION RAM TEST

CHARACTER RAM TEST PASSED

CONTROLLER IS BACK IN HOST
This test checks the IEI and IEO line between the SIO, CTC, and PIO chips. The test insures also that higher priority is observed. INSTALL RS232 LOOP BACK

KEY 'RETURN' TO CONTINUE

PASS# 1

WAITING FOR CONTROLLER TO COMPLETE TESTS

PASS# 1

PRIORITY INTERRUPT TEST PASSED

CONTROLLER IS BACK IN HOST
This program tests the controller's SIO external loop back circuitry for the RS449 plug. The RS449 LOOP BACK must be INSTALLED and the Toggle switch switched. Testing is the same as for the SIO External Loop Test.

KEY 'RETURN' TO CONTINUE

PASS# 1

RS449 LOOP BACK

WAITING FOR CONTROLLER TO COMPLETE TESTS

PASS# 1

RS449 LOOP BACK

RS449 LOOP BACK PASSED

CONTROLLER IS BACK IN HOST
OPTION SWITCH TEST

This program tests the user option switch on the daughter board. The user sets the switch to the desired switch setting which will automatically be updated on the screen. To exit the routine the user must key RETURN.

KEY 'RETURN' TO CONTINUE

OPTION SWITCH TEST

1 2 3 4 5 6 7 8
0 0 0 0 0 0 0 0
N F F F F F F F F
↑ F F F F F F F F

USER OPTION SWITCH (SW2)

KEY RETURN TO EXIT TEST
TEST SELECTION MENU

SF 0 - RE-KEY INPUT PARAMETERS
SF 1 - MOVING INVERSIONS MEMORY TEST *
SF 2 - SIO EXTERNAL LOOP *
SF 3 - SIO/DMA TEST *
SF 4 - CONTROL CHARACTER RAM TEST *
SF 5 - PRIORITY INTERRUPT TEST *
SF 6 - RS449 LOOP BACK TEST
SF 7 - OPTION SWITCH TEST
SF 8 - CHAIN MODE
SF 9 - RESTART

STRIKE THE SPECIAL FUNCTION KEY ASSOCIATED WITH THE DESIRED TEST

WHICH TEST DO YOU DESIRE?

CHAIN MODE TEST ROUTINE

THIS TEST WILL CALL AND EXECUTE ALL MARKED (*) TESTS
THE ENTIRE TEST WILL BE EXECUTED 4 TIME(S)

KEY 'RETURN' TO CONTINUE
Diagnostic Program Documentation

Documentation Release: 9735
Software Release: 6735
Documentation Part Number: 760-1209C

Program Name: 2200 Multiple Disk Exerciser
Date: April 10, 1987

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Diagnostic Engineering Department
WANG Laboratories, INC.
One Industrial Ave.
Lowell, Massachusetts 01851
1.0 REFERENCE DOCUMENTS

2200 Multiple Disk Exerciser

2.0 CONFIGURATION REQUIREMENTS

2.1 Hardware

Minimum required configuration

2200 with the minimum required configuration

Soft-sectored diskettes are not supported on 2270A controllers

2236DE/DW or equivalent terminal

If a printer is used, it must have a column width of at least 66 characters

2.2 Software

MVP CPU software must be rev. 1.8 or higher

VP CPU software must be rev. 2.1 or higher

Media containing the 2200 Multiple Disk Exerciser which is labeled: MULTIDSK

3.0 PROGRAM DESCRIPTION

The 2200 Multi-Disk Exerciser is a disk burn-in/exerciser with error logging capabilities. The exerciser tests eight sequential sectors for each random selection of: function, disk address and sector address.

4.0 LOAD PROCEDURES

4.1 Load directly from disk

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)

2) Input command 'LOAD RUN "MULTIDSK"'
4.2 **Load from 2200 Diagnostic Package**

1) Select the device address with a 'SELECT DISK ###' statement (see note 1)
2) Input command 'LOAD RUN'
3) If 'MAGNETIC MEDIA' disk proceed with step 4
   Under '2200 DIAGNOSTIC PACKAGE' menu, select 'Magnetic Media'
4) Under 'MAGNETIC MEDIA' menu, select 'Disk Exercisers'
5) Under 'DISK EXERCISERS' menu, select 'Multiple Disk Exerciser'

**Note 1:** (### equals the device address where program resides)

5.0 **OPERATING INSTRUCTIONS**

5.1 **Description of Operation**

The first two screens of the exerciser require operator input to select the processes, the function, and amount of testing. The third screen displays the functions running, device being tested, number of errors, and the number of accesses that have been completed. When inputs are needed, it is indicated and all the options are listed at the bottom of the screen.

7.2 **Screen Descriptions**

On each screen, lines:

a) 20 and 21 will describe any status or error information.
b) 22 and 23. (in box), describe all input/command options for the current screen.

7.3 **Procedures**

1) For the exercisers set up procedure and screens see Appendix A.
2) For a description of the run time screen see Appendix B.
3) For a description of standard input and command options see Appendix C.

6.0 **MISCELLANEOUS**

6.1 **Definitions**

**Hard error** A disk operation that failed during normal testing and would not successfully execute during ten retries.

**Soft error** A disk operation that failed during normal testing and was successfully executed in less than eleven retries. Also a data compare error is considered a soft error.
7.0 PROGRAM REVISION HISTORY

Rev. 6735:

Added support for 2200DS and RAM Disk. Also fixed time out errors on long cabled mux.

Rev. 64A4:

Added a routine to zero the sector to R/A/W test so intermittent write problems would show up.

Removed the zero retries function.

Added the 30 MEG to the 2275.

Rev. 6441:

Corrected counter problem during init read and write.

Rev. 639C:

The 2275 option (Winchester and 5 1/4" floppy disk) have been added to the list of recognizable devices.

The screening has been made more user friendly. This will speed up the time it takes to initiate the test and also made it easier to understand.

Rev. 61B4:

The Quantum drives have been added to the list of recognizable devices. Since the Quantum Q2040 responds to two addresses it is treated as two separate devices.

Rev. 61A4:

Firmware retries on error are now suppressed on Disk Processing Unit's that have the ability.

Rev. 1.1:

Sector write backfill is now randomly selecting worst case data patterns.
APPENDIX A

IMPORTANT: THIS EXERCISOR WILL RENDER ALL RESIDENT DATA IN THE RANGE OF THE SELECTED SECTORS INVALID AND TOTALLY USELESS.

A.1 INITIAL INPUT and SCREEN

1. The operator is instructed to mount platters in all the drives that are to be tested. For a device to be testable it must:
   a) have a scratch platter mounted.
   b) not be write protected.
   c) be operable enough for the address to be recognized as available.

2. Press 'RUN' or 'RETURN' and the program will scan all the possible disk addresses. The routine tries to ascertain what types of devices are at what addresses and reports this information on the Test and Parameter Select screen.

NOTE: If desired the default parameters can be altered by pressing SF'2 and then editing to the desired parameters (as described by appendix A.2). These parameters will then be inserted as the test parameters. If a sector selected is out of range of a device then the parameter used will be as close to the the altered default as possible.

A.2 TEST and PARAMETER SELECTION

1. A display of all devices available for testing is given with the following information:
   a) test options
   b) device address (see note 2)
   c) model number
   d) address of the first sector to be tested
   e) address of the last sector to be tested

Note 2: (If the address was recognized, but an error occurred, the error is printed to the left of the device address).

2. The user prompts are as follows:

   A) "Are all the above parameters correct?"

   'N' (no), enters the edit mode, and 'CONT'/ 'CTNUE' will exit the edit mode. The option select menu may be edited using the following options:

   a) Test    'yes' or 'no'    If no, then no functions will be run on that device.

   b) Frmt    'yes' or 'no'    Format device?
A) (continued)

c) Init 'yes' or 'no' Initialize the device. Write a test pattern on every sector selected for test.
d) Ver 'yes' or 'no' Verify the device. Read the test pattern from every sector selected for test.
e) Address 'xxx' xxx-address of the device to be tested.
f) Model 'xxxxxxx' Model number. (not used in exerciser operation)
g) Sec. Range 'xxxx/yyyy' Sectors to be tested, from xxxxx to yyyy. (must be greater than 8)
h) Accesses 'xxxxxxx' Number of sectors to be read. Type infinite for infinite.

'Y' (yes) or 'CONT'/ 'CTNUE', then the system proceeds to the next prompt.

B) "To proceed type ENABLE WRITING "

The operator MUST enter 'ENABLE WRITING' to proceed further. If the phrase has already been entered correctly, and the exerciser has not been returned to the first screen (A1), then the phrase will not be requested again and the exerciser will by-pass this prompt.

C) "'WARNING: All resident data will be DESTROYED by this exercise'"

This is the final step and warning before any WRITING is done. Ensure that all devices to be tested have scratch media installed.

Depressing CONT/CTNUE will start the exerciser.
A.3 Miscellaneous

1 No further operator commands are needed UNLESS:
   
a) An error occurs during format, at which time the exerciser will have to be restarted.
   
b) A format is requested on a device that can't be software formatted.

2 If an error occurs during Init, then the device is eliminated from the test and the exerciser continues.

3 The model descriptions of the drives are as follows;
   
850 DSDD  - Double Sided Double Density floppy
1000      - internal winchester
1002      - internal winchester
1004      - internal winchester
Q2040     - internal winchester
Q2020     - internal winchester
2200DS RAMD- 2200 Data Storage Cabinit ram disk
2200DS FLPK- 2200 Data Storage Cabinit 320/360K floppy
2200DS FLPM- 2200 Data Storage Cabinit 1.2 meg floppy
2200DS WINr- 2200 Data Storage Cabinit removable carterage winchester
2200DS WIN - 2200 Data Storage Cabinit winchester
2230-1    - external disk drive
2260-1/2   - external disk drive
2260-1/4   - external disk drive
2266       - external disk drive
2275 WIN   - 2275 winchester
2275 FLPM- 2275 1.2 meg floppy
2275 FLPK- 2275 320/360K floppy
2270       - external floppy drives
2270a      - external floppy drives
2280       - external disk drive
SYSTEM RAMD- System ram disk
APPENDIX B

The following screen/test descriptions are in the order in which they occur.

B.1 If no devices have been selected to test, then the following message will be displayed on line 20 and the exerciser will wait for a command.

"RECHECK PARAMETERS, NO DEVICES ARE SELECTED"

Pressing 'RETURN' or 'RUN' will cause the routine to return to the Test and Parameter Select Menu.

B.2 Format

1 If a device is selected for Test and Format, and:

a) It can be software formatted, then the following message will appear on line 22 and the format will begin.

"CHECK: to ensure that the device is formatting and the system isn't hung"

b) It can not be software formatted, then the exerciser will stop, print the following message on line 20, and will wait for a command.

"Press the format button for xxx" (where xxx is the device address to be formatted)

2 When all of the devices requesting a format are formatted, then the initialize and/or test routines will commence.
B.3 Run Screen

The run screen will be displayed with the following information of all the devices that are to be tested.

a) the disk address
b) the function (see note 3)
c) the number of accesses
d) the sector range being tested
e) the number of hard errors (see note 4)
f) the number of soft errors (see note 4)

Note 3: The current function (if in process) or the last function (if not in process) processed. During init "w" or "r" is printed next to "init" to indicate whether reading or writing.

Note 4: During init this column will stay blank. Init terminates testing of the device if an error is encountered.

The line containing the parameters of the device currently being processed is highlighted and the function updated, when applicable.

B.4 Initialization

1 Init A lower case 'w' appears to the right of the function name (Init) while the media is being written.

All disks sectors to be tested must be written, in the data field, with the current sector and disk addresses and then back-filled with a worst case data pattern.

2 Ver A lower case 'r' appears to the right of the function name (Init) while the media is being verified. Seek location is also checked whenever a read is performed.

A) If media verification was selected, all sectors to be tested are read. The sector and disk addresses written in the data field are compared with the current sector and disk addresses for equality (i.e., to see if the heads seek to the correct location).

B) If media verification was not selected, the first, middle and last sectors to be tested on the disks are verified.
B.5 Test

This is the exerciser portion of the "EXERCISER". The device, sector address, and function are reselected after eight sequential accesses.

1. All the devices selected for Test are assembled in a device list and the device to be tested is randomly selected.

2. The function is randomly selected from one of the following four:
   a) VERIFY Verifies the sectors selected and reports controller detected errors.
   b) READ Reads the selected sectors and checks that the correct data was read.
   c) WRITE Writes the selected sectors with same information that Init does and will report controller detected errors.
   d) R/A/W Writes the 8 sectors selected then immediately reads them and reports any errors.

3. The sector address is randomly selected from within the range allowed by the test parameters. That address PLUS 7 are the eight sectors tested (the range of sectors allowed for test can vary up to eight greater than the maximum address selected in the test parameters but not more than the system allows).

4. These parameters are combined, the test is run, and the above selection process is redone. Each device will be accessed (access = 1 sector R/A/W, READ, WRITE or VERIFY) as many times as was specified.

B.6 Error Recovery

1. Four types of errors can occur:

   A) The first error is a hardware error. When a hardware error occurs the statement "CHECKING ERROR" appears at the top center of the screen. This statement remains while the program does up to ten retries of the current function on the failing sector and then reports the error.

   B) The second type of error is a seek error (the disk and sector address read from the media, as written by Init, did not compare with the addresses requested). If this error is detected, the error is reported, counted as a soft error and the test continues.
C) The third type of error is a data compare error (the data read from the disk didn't compare with the data that was expected from the disk, as written by Init). If this error is detected, the error is reported, counted as a soft error and the test continues.

D) The fourth error is a format error. If an error occurred during a Format operation, then the exerciser will stop, report the error, and wait for another command.

2 Errors are reported with the device address, sector address, function that was being performed, and the type of error that occurred.

A) The last error that occurred is displayed on line 21 of the RUN SCREEN. If the screen has been changed (define an error or to change the page) then the error is not redisplayed, but new ones will be displayed when they occur.

B) Errors can be printed on either printer 204 or printer 215. If the printer is selected, 500 errors will be printed and then printing will cease, unless SF 14 (printer select key) is toggled or the exerciser screen is changed (to a different page or screen), but the screen error display will constantly update.
APPENDIX C

This is a description of the commonly used commands/inputs. All commands or inputs can be used when defined at the bottom of the screen (in the box).

SF'15/31  change the page. If there are more than 17 devices to be listed, then at the top right corner of the screen "More" will be printed. This applies to the Parameter Select, Test and Run screens, if more than 17 devices are available for testing.

SF'0  "Define error I-xx" will be displayed. There is an explanation of errors I-90 through I-99 in the "Exerciser". xx is the last error encountered or selected by the operator, if neither has occurred then default is 90. xx can be left or changed to select 90-99. When the explanation is displayed the exerciser continues operation.

RETURN  displays the explanation of the error selected.

SF'0  returns to the normal screen.

SF'14  printer select. The currently selected printer option is displayed in the upper left corner of each screen. To change selection press SF'14, the selected printer option will toggle between 204, 215, and off (no printer selected), until the desired option is selected.

CLEAR/PREV SCRN  Returns to the last functional screen or menu.

CONT/CTNUÉ  RETURN or Y  These are general usage keys which cause a continuation to the next step.
Diagnostic Program Documentation

Program Name: Volume Zap Utility
Date: April 10, 1987

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Diagnostic Engineering Department
WANG Laboratories, INC.
One Industrial Ave.
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1.0  REFERENCE DOCUMENTATION

2200 Disk Reference Manual

2.0  CONFIGURATION REQUIREMENTS

2.1  Hardware

Minimum required configuration

MVP/LVP/SVP/VP with at least 10K of data memory

2.2  Software

LVP CPU software must Rev. 1.8 or higher
VP CPU software must Rev. 2.1 or higher

Media containing Volume Zap which is labeled: SUPERZAP

3.0  PROGRAM DESCRIPTION

This utility will give the user the ability to inspect and/or alter any valid, formatted sector of a disk. Any legal system sector can be accessed and will be displayed on the CRT in both ASCII and hex.

Format, Read and Write errors will be reported and handled as a standard system error. This program can not override hardware errors.

4.0  LOAD PROCEDURES

4.1  Load Directly from Disk

1. Select the device address with a 'SELECT DISK ###' statement (see note 1)
2. Input command 'LOAD RUN T"SUPERZAP"

4.2  Load from 2200 Diagnostic Package

1. Select the device address with a 'SELECT DISK ###' statement (see note 1)
2. Input command 'LOAD RUN'
3. If 'MAGNETIC MEDIA' disk, proceed with step 4
4. Under 'MAGNETIC MEDIA' menu, select 'Disk Utilities'
5. Under 'DISK UTILITIES' menu, select 'Volume Zap'

Note 1: (### equals the device address where program disk resides)
5.0 OPERATING INSTRUCTIONS

When the program is running the user must input the address of the device and sector that is to be loaded first. The address and sector information will be displayed on the top line, two left blocks. When they are waiting for input, or any other input is required, a prompt will be highlighted at the top of the display.

When the sector address has been input, the selected sector will be displayed. The display will provide both ASCII and HEX displays of the sector. Listed at the bottom of the screen are the options that can be run with this utility. These options are selected with SF keys.

There are two modes that this program runs in, one is the Display Mode which allows examining the sectors. The other mode is Edit Mode. Edit Mode allows the operator to edit the sector and save it on the media.

See Appendix A for a description of the options.

6.0 MISCELLANEOUS

This utility will allow writing on the media. The operator must be cautious not to inadvertently alter any parameters on the media.
7.0 PROGRAM REVISION HISTORY

8734 Added file hashing option.

8434 Added use of the cursor move arrows and modified the file limits selection. Added decimal to hex conversion function. Changed the file name from "FILEZAP" to "SUPERZAP".

3.9 Initial Release.
APPENDIX A

OPTION DEFINITIONS
The following options are available in Edit and/or Display Mode determined by which column it is listed in below. In the program, it is available when it is listed at the bottom of the screen.

Mode
Display  Edit

SF'0  Change sector - Any valid sector address may be selected for display. The sector address is displayed and input on the top line leftmost box.

SF'0  Switch Hex/ASCII - Allows the Edit mode to input either ASCII characters or Hex numbers.

SF'1  Change device - Select any valid device address. The device address is displayed and input on the top line second box from the left.

SF'2  SF'2  Decimal to hex - Converts any positive decimal number less than 65535 to the hex equivalent. This display and input is on the top line rightmost box.

SF'3  SF'3  Decimal to hex - Converts any positive hex number less than FFFF to the decimal equivalent. This display and input is on the top line rightmost box.

SF'4  End of sector - Move the cursor to the last byte of the sector.

SF'5  Down - Move the cursor down one line.
(Down arrow)

SF'6  Up - Moves the cursor up one line.
(Up arrow)

SF'7  Start of sector - Moves the cursor to the first byte of the sector.

SF'8  Fill sector - Fills the displayed sector with a specified byte. The operator will be prompted (top line middle of the screen) for the byte to fill with.

SF'12  Next sector - Display the next sequential sector.
(NEXT SCRN)

SF'12  Left - Moves the cursor left one byte.
(Left arrow)
Previous sector - Display the previous sector.

Right - Moves the cursor right one byte.

Recall original data - Reads and displays the sector from the media.

Save changes - Copies the sector onto the media exactly as it is displayed.

File limits - Operator must input the filename and the device that it resides on. The starting and ending sectors, the number of sectors used and the number of free sectors will be displayed on the second and third lines left side of the screen.

File hashing - Determines what index sector the file is listed in. If the specified sector is full then decrement one sector till the file name is found.

Exit program - Exits the program and loads the menu (if it is available).

Edit mode - Switches the program into the edit mode.

Display mode - Switches the program into the display mode.

Next sector - Display the next sequential sector.

Previous sector - Display the previous sector.

Left - Moves the cursor left one byte.

Right - Moves the cursor right one byte.

Down - Move the cursor down one line.

Up - Moves the cursor up one line.
Diagnostic Program Documentation

Documentation Release: 9734
Documentation Part Number: 760-1261C
Software Release: 8734

Program Name: 2200 FTU
Date: April 15, 1987

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Diagnostic Engineering Department
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Lowell, Massachusetts 01851
1.0 REFERENCE DOCUMENTATION


2.0 CONFIGURATION REQUIREMENTS

2.1 Hardware

Minimum required configuration
MVP/SVP/LVP/VP with the minimum required configuration
At least 50K of CPU user memory
Soft-sectored diskettes cannot be used on 2270A controllers
CRT must be 24 x 80

2.2 Software

MVP CPU software must be rev. 1.8 or higher
VP CPU software must be rev. 2.1 or higher
Media containing the 2200 FTU which is labeled: FTU

3.0 PROGRAM DESCRIPTION

This program is a troubleshooting aid and a general disk utility for
disk and controller faults. Alignments can also be done with this using
the head positioning function.

This program has no software limitations, any parameter can be input
through the software. If a parameter is determined, by the software, to
be out of limits it will be flagged but will not halt operation unless a
system error occurs which can't be ignored.

4.0 LOAD PROCEDURES

4.1 Load Directly from Disk

1) Select the device address with a "SELECT DISK ###" statement (see
note 1)

2) Input command "LOAD RUN T"FTU""
4.2 Load from 2200 Diagnostic Package

1) Select the device address with a "SELECT DISK ###" statement (see note 1)

2) Input command "LOAD RUN"

3) If "MAGNETIC MEDIA" disk, proceed with step 4
   Under "2200 DIAGNOSTIC PACKAGE" menu, select "Magnetic Media"

4) Under "MAGNETIC MEDIA" menu, select "Disk Utilities"

5) Under "DISK UTILITIES" menu, select "Field Test Unit"
   
   Note 1: (### equals the device address where program resides)

5.0 OPERATING INSTRUCTIONS

5.1 Operating Procedures

When the program is loaded the primary screen will be displayed requesting that the user:

"Load all devices to tested"

When this is done key "RETURN" and the program will scan all possible device addresses and attempt to determine what devices are available.

When all the devices are scanned a table will be displayed giving the "Available Addresses", the "Disk Model", and the "Ending Sector". If any errors occurred, other than I-93, 95 or 96 they will be displayed next to the associated address. If I-93, 95 or 96 is encountered then the device is not listed and is considered not available.

When the device list is displayed the operator will be prompted (at the bottom of the screen) to:

"Select the address of the device to be tested".

NOTE: This address does not have to be in the "Available Addresses" list.

When the address is submitted, the program then scans that address for a device and its "End Sector" boundary. Finally the Test Selection Menu is displayed with the parameter options.

The "TEST SELECTION MENU" displays all the routines in this program and the parameter options that the routines run with. These parameters are not restricted by software, any legal system parameters can be input.

Warnings (parameters blinking) are given when a parameter is determined to be invalid. These warnings will not stop the running of any routines, but errors may occur if the routines are run.
If a device error occurred when entering this "TEST SELECTION MENU" the error number will be displayed next to the device address in the parameter list.

No write tests can be performed unless the device has first been write enabled (SF'8).

At the bottom of each screen is a box which contains any input options available at that time.

NOTE

The write enable writes a Hex(FF) in byte 7 of sector zero. This is an unused byte in a normal index sector, this "should" do no damage to a device.

See Appendix A for a description of the "TEST SELECTION MENU".

5.2 Test Descriptions

See Appendix B

5.3 Error Reporting

Errors are reported as they occur during the running of the routines. The last error that occurred will be displayed on line 21 and the number of errors that have occurred is displayed to the right of the screen on line 20.

If a printer is selected, up to 500 errors will be printed. To reset the printer counter, exit the test and restart it from the menu screen.

6.0 MISCELLANEOUS

6.1 Definitions

Loop on Error  
Executes a particular routine continuously from the beginning to an error or the end of the routine until the it is aborted.

All errors are counted and if a printer is selected then errors will be reported on the printer.

Loop on Test  
Runs an entire routine continuously from the beginning to the end until the routine is aborted. All errors are counted and if a printer is selected then errors will be reported on the printer.

If either loop is selected, then a pass counter is displayed on right side of the screen line 20. The pass counter counts the number of loops, back to the beginning of the routine, have been made.

If no loop is selected, the routine will run to completion or till an error occurs.
6.2 Notes

1. If the Disk Model is not accurate on the Available Addresses screen, then the max sector address may be inaccurate (lower than actual).

2. The word "Checking" flashes on the screen when the device(s) are being scanned for availability and size. If "checking" stops blinking for more than 30 seconds, check for a hung system.

3. If write lock is selected and the device is not write enabled (sector zero byte seven), no changes are made. Otherwise a Hex(00) is written in place of the Hex(FF).

4. Since the 30-MEG Winchester on the 2275 and the 40-MEG Win-chester in the LVP (Q2040) respond to two addresses, they are treated as two separate devices.

7.0 PROGRAM REVISION HISTORY

6735 Added support for 2200DS and RAM Disk. Also fixed time out errors on long cabled mux.

854E The program has been rewritten to emulate an FTU, also renamed "FTU". The password lock has been removed. The 2275 has been added to the list of recognizable devices.

61B4 Disk Initialization has been changed to Disk Write Enable for clarity of function. The Quantum Drives have been added to the list of recognizable devices.

1.2 The 'Re-run This Program' routine has been replaced by 'Phoenix/LVP/SVP DPU Status' routine.

1.1 Display A Sector routine is now much faster.
APPENDIX A

TEST SELECTION MENU
TEST SELECTION MENU  Rev. xxxx

! SF 01 - Compare Disk
! SF 02 - Compare File
! SF 03 - Display a Sector   WRITE LOCKED
! SF 04 - Verify
! SF 05 - Read
! SF 06 - Position Head(s)
! SF 07 - Code Revs

Device D10  **********
Start Sector 0  Track 0
End Sector xxx  Track xx  Maximum = xxx
Hex Data Pattern BBBBBBBBBBBBBBBBBBBBBBBBB
Printer OFF (204, 215, OFF)
Loop N (N = no, T = on Test, E = on Error or test)
Mode I (I = sequential step In, A = Alternate step)
      (O = sequential step Out, R = Random step)
# Random Operations 1000
APPENDIX B

MENU
MENU

CAUTION
BACKUP ANY CUSTOMER DATA BEFORE RUNNING WRITE TESTS

TEST SELECTION MENU  Rev. xxxx

SF 01 - Compare Sector(s)  SF 08 - Write Enable
SF 02 - Compare File  SF 09 - Write Lock
SF 03 - Display a Sector WRITE LOCKED SF 10 - Scratch Disk
SF 04 - Verify  SF 11 - Format Disk
SF 05 - Read  SF 12 - Write
SF 06 - Position Head(s)  SF 13 - Read After Write
SF 07 - Code Revs  SF 14 - Instruction Test

TEST DESCRIPTIONS

SF'01 - Compare Sector(s)

This will compare sector(s) on one or two devices. This utility is useful after a COPY has been performed to see if the data was copied exactly.

The device address and the sector boundaries on the option list are the parameters for the first device. When entering the routine the user must input the device address and starting sector to compare to.

SF'02 - Compare File

This compares file(s) on one or two devices. This utility is useful for comparing files of different names to see if they are the same.

The device address from the options list is used for the first device. At the beginning of the routine, the user inputs the second device address and the file(s) to be compared. The files are then located and compared. Any difference is flagged as a data compare error.
SF'03 - Display a Sector

This routine reads any sector, if readable without error, from any device and displays it in Hex and ASCII.

The "Start Sector" and "End Sector" are used as the parameters. If mode "O" (sequentially step out) is selected, the "End Sector" is displayed first. If any other mode is selected, the "Start Sector" is displayed first.

If the loop is set to "T" or "E" the routine will automatically step through and display the sectors in incrementing or decrementing order depending on the "Mode" selected. If an error is encountered, the stepping will stop until a "RETURN" is hit.

If the routine is not looping, the "Start Sector" and "End Sector" parameters are ignored.

SF'04 - Sequential Verify

This routine verifies any device from "Start Sector" to the "End Sector". Checks verify function and sequential seeking ability of the device.

When the routine is loaded, the operator must select fast or slow test.

The slow test will verify each sector with a separate Verify statement and display the number of the sector currently being verified.

The fast test will verify the selected sectors all in one statement. This test gives no indications that it is running until it is complete or a detectable error occurs.

If an error occurs, key "RETURN" to continue the Verify.

SF'05 - Read

This routine reads any device from the "Start Sector" to the "End Sector" and compares the data read with the "Hex Data Pattern". Checks read function and sequential seeking ability of the device.

SF'06 - Position Head(s)

This routine will move the heads to the specified start track and load the heads until the routine is exited. The heads can be stepped from track to track with the "RETURN" and "BACKSPACE" keys.

The start and end parameters and any errors are ignored when stepping between tracks.
SF'07 - Code Revs

This routine polls all Disk Processing Units that will respond via a special statement requesting the DPU type and the revision level of the proms. The Operating System revision is also given.

The information is printed to the right of the device address on the "TEST SELECTION MENU" screen.

SF'08 - Write Enable

This routine writes a Hex(FF) on sector zero byte seven (this is an unused byte of a normal index sector). Write operations via this program can not be executed if this Write Enable byte has not been written.

If a device is unreadable a warning is displayed and the routine can be continued. Once this routine has been performed on a device, the program is capable of writing on the device.

SF'09 - Write Lock

If a device is write enabled, a Hex(FF) in byte seven of sector zero, this routine writes a Hex(00) in place of the Hex(FF).

Write operations via this program can not be executed if this byte has other than Hex(FF). Once this routine has been performed on a "Write Enabled" device, the program can no longer write on the device.

If the device wasn't write enabled then the routine does no writing.

SF'10 - Disk Scratch

This routine is used to Scratch a disk. The user inputs the number of sectors for the catalog index and for the catalog area if other than default values are desired.

SF'11 - Disk Format

This routine will initiate a device FORMAT if the selected device can be formatted by software. The device will be write enabled after the format is completed.
SF'12 - Write

This routine writes the selected device from the "Start Sector" to "End Sector" with the "Hex Data Pattern". Checks write function and sequential seeking ability of the device.

This pattern is written sixteen times per sector (256 bytes/sector).

SF'13 - Read After Write

This routine writes, reads and then compares the data on the selected device from "Start Sector" to "End Sector" using the "Hex Data Pattern". Checks read after write function and sequential seeking ability of the device.

SF'14 - Instruction Test

This routine tests all of the Basic II disk commands except move and copy commands to ensure that all commands function properly. Checks write and read functions as well as disk scratch and move end commands.

CAUTION

This routine will destroy any data on the media.

The "Start Sector" must be at least fifteen less than the last "End" sector or errors will occur. The "Start Sector" is used for most of the test but the entire device will be altered.
APPENDIX C

OPTIONS
OPTIONS

Device D10
Start Sector 0  Track 0
End Sector xxxx  Track xx  Maximum = xxxx
Hex Data Pattern B8B8B8B8B8B8B8B8B8B8B8B8
Printer OFF (204, 215, OFF)
Loop N (N = no, T = on Test, E = on Error or test)
Mode I (I = sequential step In, A = Alternate step)
      (O = sequential step Out, R = Random step)
# Random Operations 1000

DEVICE

Selects the device to be tested. The device will be checked for accessibility and then the "Maximum" value set equal to the ending sector address for that device.

******* - when the device is being scanned the word "searching" will be printed here. If there was an error, the error number is displayed here.

NOTE If the sector to track relationship is in question then use the sector address as the parameter and ignore the track parameter.

START SECTOR

First sector for all routines to utilize. Any changes to this will adjust the start track.

The "Start Sector" number will blink, if it is larger than the "End Sector".

TRACK (start)

This is the starting track with respect to the "Start Sector". A change to this will also cause the the "Start Sector" to change.

END SECTOR

Last sector for the routines to utilize. Any changes to this will adjust the end "Track".

The "Maximum" sector number will blink if the "End Sector" is larger than it.
TRACK (end)

This is the ending "Track" with respect to the "End Sector". A change to this will also cause the the "End Sector" to change.

HEX DATA PATTERN

This 32-character pattern is repeated 16 times to fill a sector. Any number of characters (up to 32) can be input. This character string is repeated x times until the 32-character pattern is complete.

PRINTER

Select a printer to print any errors. If no printer is selected then errors will be reported on the screen as they occur. The last error and a count of all errors that have occurred are displayed on the screen.

LOOP

"T" - Loop on a test and report errors.

"E" - Loop on the first error and report errors.

"N" - No loop, stop on error or at the end of the test.

Any of the Menu picks can be looped except "Write Lock" and "Write Enable".

MODE

"I" - The routine selected will step the heads from the outer edge of the device to the center.

"O" - The routine will step the heads from the center to the outer edge.

"A" - The routines will address the sectors in the following manor;
   "Start Sector" + 1 "End Sector" + 1
   "Start Sector" + 2 "End Sector" + 2
   etc. until
   "Start Sector" = "End Sector"

"R" - Randomly selects a sector between the start and end boundary. This is repeated for the number of operations indicated.
# RANDOM OPERATIONS

Number of random passes to make. This option is displayed only when Random Mode is selected.