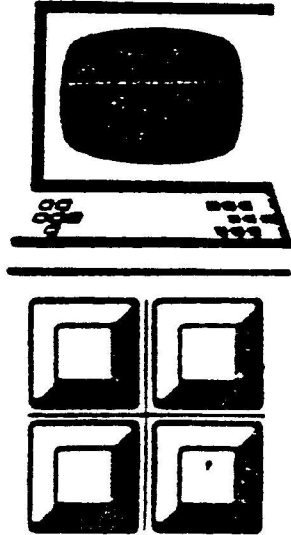


System 6300/6350 Diagnostics Manual



MOTOROLA
Information Systems

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Running the Diagnostics
Section 1: Running The Diagnostics

INTRODUCTION

This manual describes diagnostic tests for use in field servicing the Motorola Series 6300/6350 Computer. The Series 6300/6350 contains one Motorola MC 68010-based processor board.

When executing diagnostics, you can select an entire test or an individual subtest. In addition, you may execute test sequences, which are combinations of specific tests and subtests, by entering a single command.

Series 6300/6350 diagnostics are a powerful tool for validating boards and for locating faults.

Series 6300/6350 diagnostics test the following Series 6300/6350 hardware components:

- o Main Processor board
- o Winchester Disk drives
- o RS-232 8-Port Expansion board
- o Quarter-inch cartridge tape drive
- o Ethernet Expansion board
- o Floppy Disc Drive
- o Combination 8-Port/Ethernet Expansion board
- o Expansion Memory
- o Quarter-Inch Tape Cartridge Interface (QICI) board

NOTE

This manual does not describe procedures for correcting hardware problems but does indicate some likely causes for certain malfunctions. For information regarding remedial procedures, refer to the Series 6300 or 6350 Service Manual.

Running The Diagnostics

Diagnostic Distribution Media

The following describe the media which contain Series 6300/6350 diagnostics. The media listed here are bootable.

Series 6300/6350 diagnostics are distributed on a single diskette.

Partition 0 of the Series 6300/6350 distribution diskette includes a CTIX volume home block and a loader. The remainder of the disk (partition 1) is a CTIX file system that contains the Series 6300/6350 diagnostic load image, /minidiag, which is linked to /unix.

Status and Error LED Display

While running, the bootstrap program and the diagnostics, display status and error information in the rear panel LEDs. For a complete description of Bootstrap and error displays, refer to the Series 6300 or 6350 Service Manual.

CRT Terminal Display

If a terminal is connected to your system, you can run the diagnostics by entering commands. In addition, you can optionally run the diagnostics in four general output modes described in General Output Modes below and access an interactive HELP feature discussed at the end of this section.

The following describes and illustrates the ways to connect a display terminal to your system before executing diagnostic programs.

There are two classes of RS-232 terminals you may use when executing diagnostic programs. One uses any terminal with asynchronous RS-232 protocol, such as a Freedom 100 or VT-100. The other is the TM6000 Programmable Terminal (PT) or TM7000 Graphics Terminal (GT) which may be used to emulate or operate as an RS-232 terminal.

The following describes how to connect the terminals discussed above.

NOTE

When connecting a cable between the Series 6300/6350 and a terminal, be sure the cable contains a line for data set ready (DSR). The diagnostics use DSR to determine that a terminal is connected.

RS-232 Terminal

To connect an RS-232 terminal, other than the Motorola TM6000 PT or TM7000 GT, connect an RS-232 cable between the terminal and either RS-232 port on the Series 6300/6350.

There are two ways to connect and enable a Motorola TM6000 PT or TM7000 GT for use as an RS-232 terminal to run diagnostics. These are,

- o Emulator mode
- o RS-232 download

To connect a PT or GT in either of these two ways, follow the instructions provided below (Figure 1-1).

NOTE

NOTE

Directions provided in this section for executing diagnostics assume that the diagnostics are being executed from the standard RS-232 download and not from Emulator Mode. Refer to this section and Appendix D for directions on executing diagnostic tests in Emulator mode.

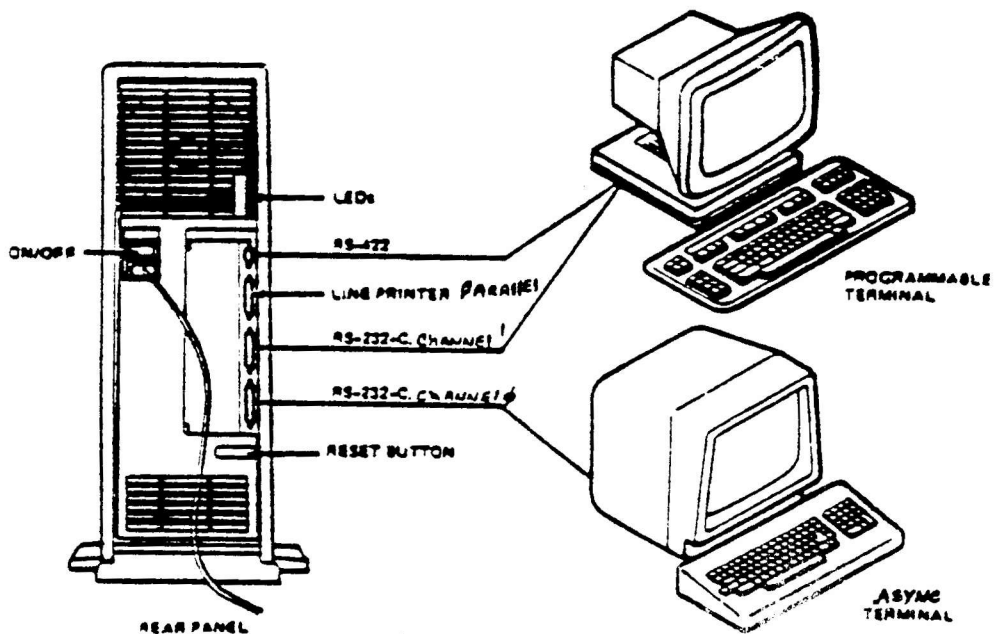


Figure 1-1. Rear Panel Terminal Connections

Running The Diagnostics

Emulator Mode

In Emulator Mode, the host system sees the TM6000 PT or TM7000 GT as an RS-232 terminal. The terminal operates from the terminal boot ROM only and does not permit RAM software download as is the case when using the regular RS-232 download. Instructions for entering emulator mode are provided here and in Appendix D.

NOTE

This manual assumes that your TM6000 Programmable Terminal or TM7000 Graphics Terminal is equipped with boot ROM version 2.0. Version 2.0 differs substantially from version 1.0 with respect to boot ROM operation (emulate mode) and RS-232 software download protocol. Appendix d documents emulator mode for version 1.0 and version 2.0 boot ROMs.

To set up and use a Motorola TM6000 PT or TM7000 GT in emulator mode to run diagnostics, do the following:

1. Connect an RS-232 cable from your terminal's RS-232 port (Serial Port) to channel 7 on the main board of your system.
2. With the terminal off, hold down the terminal's space bar and turn the terminal on. Keep the space bar down until the boot ROM prompt appears.
3. Press the E key to enter emulate mode.

RS-232 Download

Setting up a Motorola TM6000 PT or TM7000 GT booted with the RS-232 download image involves using the RS-422 cluster to boot the terminal, and the RS-232 port to communicate with the Series 6300/6350. The Series 6300/6350 must already be booted and operating normally before connecting the terminal. Follow the steps below to enable your TM6000 PT or TM7000 GT this way.

1. With the terminal off, connect an RS-422 cable from your terminal's RS-422 port to the RS-422 cluster port on the main processor PCA.
2. Connect an RS-232 cable from your terminal's RS-232 serial port to channel 7 on the main board of your system.
3. Hold down the terminal's space bar and turn the terminal on. Keep the space bar down until the boot ROM prompt appears.
4. Press the T key. An equal = sign appears.
5. If the terminal is a TM6000 PT, type 101. If the terminal is a TM7000 GT, type 201.

Running The Diagnostics

6. Press the B key (upper or lower case). If the Series 6300/6350 system you are connected to is booted, horizontal rows of dots appear on the terminal screen. This indicates that the terminal is booting. When the TM6000 PT or TM7000 GT terminal boot is complete, and the CLI prompt \$ appears on the screen, the terminal is usable as an RS-232 terminal.

```
VX.X
B,C,E,F,M,R,S,T:T
=101
B,C,E,F,M,R,S,T:B
```

Terminal Parameters

When executing diagnostic program from the CLI port, configure it to the following parameters:

- o Baud rate 9600
- o Data bits 8
- o Stop bits 1
- o Parity none

Refer to the 2.0 BOOT ROM's installation instructions when configuring parameters.

NOTE: This refers only to a terminal with a 2.0 Boot ROM.

TYPES OF DIAGNOSTICS

There are three types of Series 6300/6350 diagnostics:

- o subtests
- o tests
- o test sequences

Subtests and Tests

Subtests are simple checks. For example, one subtest verifies that timer 0 is working correctly.

A test is a group of related subtests. For example, the memory test is comprised of write 0's, write 1's, and write addresses subtests; and the parity test consists of read and execute parity error subtests.

Running The Diagnostics

The specifications for running subtests is a pair of positive integers. The specification for running tests only is just the test number. The first number of a pair is the test number, and the second number is the subtest number. Examples of a subtest specification and a test specification follow:

```
.8,5  
.8
```

In the first example, the pair specifies subtest 5 of test 8. In the second example the single number specifies test 8 and all subtests available for test 8. The default for the second value is zero.

Test Sequences

Test sequences are predefined combinations of tests and subtests. Some test sequences (e.g., the parity test sequence) consist of a single test. Other test sequences (e.g., the default test sequence) consist of multiple tests.

Alphabetic characters denote test sequences. To run a test sequence from a terminal, specify only the command letter that denotes the given test sequence. For example, to execute the default test sequence, type only the letter d and press the RETURN key.

Appendix A lists the test sequences that include multiple tests.

LOADING THE DIAGNOSTICS

Use the following steps to load the diagnostics:

1. Power on
2. Go to emulator mode
3. Insert the floppy diskette containing the diagnostic program into the floppy disc drive and close the door.
4. Wait for the disk to initialize.
5. Press the RESET button.

If a terminal is connected, the following prompt appears:

```
MINIFRAME DIAGNOSTICS - X.X (XX)  
Parity interrupts disabled  
Memory tests will begin at XXXXX, end at YYYYY
```

```
command>
```

where

X.X(XX) is the version number of the Series 6300/6350 diagnostics.

XXXXX is the memory start address in hexadecimal at which memory tests start.

YYYYY is the address of the last valid 32-bit word in memory.

Make sure that the memory end address (in hexadecimal) and the amount of memory in your system correspond as follows:

7FFFC = 512 kbyte
FFFFC = 1 Mbyte
17FFFC = 1.5 Mbyte
1FFFFC = 2 Mbyte

Inputting Diagnostic Commands

If a terminal is connected, a command prompt indicates that the diagnostic program is ready to accept your commands. This prompt always appears after the diagnostic executes a test.

command>

After you type a diagnostic command, press RETURN to enter it. To correct a typographical error, use the BACKSPACE key to move the cursor to the left to erase the mistake and type the correct data over the typographical error.

NOTE

The diagnostic program is case insensitive. For example, typing uppercase D results in the same response as typing lowercase d.

Error Reporting Modes

The error reporting modes for running the diagnostics are

- o Unattended
- o Attended
 - Long
 - Continuous

Running The Diagnostics

Unattended Mode

Unattended mode is the only output mode available where using a terminal is not possible (e.g., in an oven in a manufacturing environment). In unattended mode, you can run the default set of diagnostics. If an error occurs, unattended mode lights the top red LED in the back panel and waits for an operator to connect a terminal to print more information about the error. The top yellow back panel LED indicates an interrupt when a terminal is connected.

Attended Mode

If a terminal is connected, you can run the diagnostics in any of the attended modes. In the attended modes, you enter commands at the terminal to run the diagnostics and to specify the desired attended submode, either long or continuous. (See the command format subsection below for more information.) Like unattended mode, the attended mode displays errors in the top red LED in the back panel and indicates taking the interrupt by illuminating the top yellow LED. The attended modes are describe in more detail below.

Attended Mode is the default operation mode, when a terminal is connected to the processor. If an error is detected in attended mode, the diagnostic stops executing, and the error is displayed on the terminal. The system then re-initializes and is ready for a new test. If the terminal is removed while a test is running, the test continues and errors are handled as if the test were running in unattended mode.

Long Mode

Long mode keeps track of errors by test and subtest using an internal table. At the completion of the specified test sequence, long mode prints the total number of errors detected, the number of errors detected by each test and subtest, and as many applicable error descriptions that can fit in the buffer.

Continuous Mode

Continuous mode is the same as attended mode except that after displaying an error, continuous mode returns to continue the test.

CAUTION

Be careful when using continuous mode. It forces the diagnostic to continue after detecting error conditions. This can be hazardous to the contents of the disk.

To enable the error reporting modes discussed above, follow the directions later in this section called The Diagnostic Command.

General Output Modes

The four output modes for running diagnostics are

- o Parity
- o Page
- o Line Printer Echo
- o Disk Ignore

These modes are not mutually exclusive. They work as overlays and provide more options when you run diagnostics. The modes are turned on and off by typing commands. Since all output mode commands function as toggle switches, the commands that disable the modes also enable them. For example, if you type PM (uppercase or lower case) to enable the page mode, you type PM (uppercase or lower case) again to disable it.

Parity Mode

By default, parity interrupts are disabled when you initially load the diagnostics. To enable parity interrupts, type the letters PE (uppercase or lowercase) after the command prompt and press RETURN. (To disable parity interrupts if they are on, type PE (uppercase or lowercase) after the command prompt and press the RETURN key.) Parity interrupts are always disabled after an error message.

Page Mode

By default, the diagnostic output scrolls automatically (Page Mode is off). With Page Mode on, you can scroll output manually to allow more time for reading output. To turn Page Mode on, enter the letters PM (uppercase or lowercase) after the command prompt. With Page Mode on, the following prompt appears at the bottom of each full page of output:

<l=next line, e=disable page mode, anything else=next page>

Press l to see the next line, press e to disable Page Mode, or press any other terminal key to go to the next page. With page mode enabled, you must press one of these keys before the diagnostic testing continues.

Line Printer Echo Mode

By default, Line Printer Echo mode is off. Line Printer Echo mode prints all display output on the printer, if one is present. To enable line printer echo, enter LE (uppercase or lowercase) after the command prompt. If any of the diagnostic test return an error, Line Printer Echo automatically disables. (Line Printer Echo is not valid for clock test.)

Running The Diagnostics

Disk Ignore Mode

By default, Disk Ignore mode is off. With Disk Ignore mode off, if a disk drive is not present and you try to run a test sequence that includes a disk test, the diagnostic returns an error and terminates. With Disk Ignore mode on, enter DI (uppercase or lowercase) after the command prompt.

TRANSMIT ON/OFF

Diagnostics can be interrupted by pressing the CONTROL key and S at the same time. This stops the diagnostic output (Transmit Off). To resume diagnostic testing, press any character. This enables Transmit On and the test continues.

THE DIAGNOSTIC COMMAND

The commands that run diagnostics specify the following information:

- o The test sequences, test, or subtests to execute
- o The number of times each test sequence, test, or subtest executes, and in which order
- o The error reporting mode

The command syntax for running a simple diagnostic is as follows:

[RepeatCount].Test[.SubtestNumber] [L/C]

Table 1-1. Command Syntax

Parameter	Explanation
RepeatCount	A positive integer that specifies the number of times the diagnostic command executes.
.	A (.) indicates the next parameter is an integer.
Test	A letter that specifies the test sequence to run or a positive integer that specifies the number of the test to run. If this parameter is an integer, a period (.) always precedes it.
,SubtestNumber	A positive integer that specifies the individual subtest to run. This parameter is allowed only if the previous parameter is an integer and not a letter. If Subtest Number is 0 (the default), the entire test specified executes. If both test and subtest numbers are specified, the required delimiter between the integers is a comma (,).
L/C	A letter that specifies the error reporting mode for the diagnostic; can be either L (or l) for long mode or C (or c) for continuous mode. This parameter is optional and, if omitted, defaults to attended.

A simple diagnostic executes RepeatCount times before the command prompt reappears. To combine multiple diagnostics into a single command, separate the simple diagnostics with semicolons as follows:

SimpleDiag;SimpleDiag;SimpleDiag;...;SimpleDiag

You can specify as many simple diagnostics in a single command as fit on one line. You can also add a repeat count that applies to the entire sequence of diagnostics in the command. To do this, start the command by entering the number of repetitions followed by a vertical bar (|). For example

RepeatCount|SimpleDiag;SimpleDiag;SimpleDiag;...;SimpleDiag

executes the sequence of diagnostics specified in the command RepeatCount repetitions. Individual diagnostics can still have repeat counts that only apply to them.

An example of a simple diagnostic command could be

command> m

Running The Diagnostics

This command executes test sequence m one time in interactive mode. The following commands

```
command> .8  
command> .8,0
```

both execute all subtests available for test 8. (Note the period before the test number.) Another command

```
command> 100.8,6C
```

executes subtest 6 of test 8 in continuous mode 100 times. The following more complicated command:

```
command> 50|2.0,1L;3.1,1L
```

execute subtest 1 of test 0 twice in long mode, followed by three repetitions of subtest 1 of test 1 in long mode. This entire sequence repeat 50 times. The last example

```
command> 20|2m;3.1,1L;p
```

executes a mix of test sequences and subtests. Test Sequence m executes 2 times. Next, subtest 1 of test 1 executes in long mode 3 times. Then test sequence p executes 1 time. Finally, this whole sequence just described executes 20 times.

USING THE HELP FEATURE

If you are using a terminal, you can access an interactive Help feature for on-line assistance in running the diagnostics. Help provides the following information:

- o Command format
- o List of test sequences
- o List of tests and subtests
- o List of two-letter command toggles

Command Format and List of Test Sequences

To display the command format and a complete list of available test sequences, type a slash (/) after the command prompt and press the RETURN key. For example,

```
command> /
```

displays the command format and the list of test sequences.

Commands formatted as follows:

[<repeat-count>]<command-letter>[L | C] or
[<repeat-count>]:<test-number>[,<subtest-number>][L | C]

P[E | M] toggles Parity Enable | Page Mode

Multiple commands may be separated by ;

d Default test sequence
s Complete system test sequence
v Functional verification test sequence
a Map RAM Test
b Trap to debugger
c Clock tests
e Page protection tests
f Page fault tests
k RS-422 Tests
l Line Printer Tests
m Memory read, write and refresh tests
p Page map tests
r Parity tests
u User I/O error test
o Floppy disk test
h RS-232 (8274) test
y WD1010 Drive 1 disk test
w WS1010 Drive 0 disk test
n Ethernet local area network test
i System installation sequence
t Quarter-inch cartridge tape test
z FCC test

For help on other commands type ?? or //

List of Tests and Subtests

To request a list of tests and subtests in a given test sequence, type a slash (/) followed by the command letter to denote the test sequence and press RETURN. For example,

```
command> /d
Default test sequence. Includes Memory Test, Map RAM Test, Parity Test,
Page Tests, User Mode Tests, Processor Register Test, Clock Test, LP
status
Test, RS-232 Test and RS-422 Auto Test.
```

displays the tests that execute in the default test sequence. If the test sequence consists of only one test, the HELP message contains the test number and a list of subtests.

Running The Diagnostics

List of Two Letter ~~Command~~ Toggles

To display the complete list of available two-letter command toggles, type two slashes (//) after the command prompt and press RETURN. For example,

```
command> //
```

```
The two letter commands toggle a mode
```

```
PM    toggles Page Mode.
```

```
PE    toggles Parity Enable.
```

```
LE    toggles Line Printer Echo (Hard Copy).
```

```
RC    Either toggles through selected disk repeat states
```

```
       OR a numeric parameter may be given to specify the repeat count.
```

```
RE    Reboots the System.
```

```
DI    toggles ignoring Inoperable Disks.
```

```
MM    toggles Manufacturing Mode.
```

```
ST    toggles stringent disk mode.
```

These commands may be entered in upper or lower case.

Section 2: Tests and Subtests

This section presents the tests in numeric order and describes the subtests available for each test and lists the test sequence to which they belong. Table 2-1 lists the tests. In addition, this section tells you which tests display prompts that ask you to specify parameter values. (Each prompt specifies a default value.)

Table 2-1. Diagnostic Tests

Test Number	Test Name	Sequence*	Subtests In Sequence
0	Memory Read, Write, and Refresh Test	m	12
1	Map Translation Test	p	2
2	Page Fault Test	f	2
3	Parity Test	r	3
4	Clock Test	c	3
5	User I/O Error Test	u	2
6	WD1010 Drive 0 Disk Test	w	29
7	WD1010 Drive 1 Disk Test	y	29
8	Floppy Disk Test	o	29
10	Map RAM Test	a	6
11	RS-232-C (8274) Test	h	6
12	Page Protection Test	e	2
13	Line Printer Test	l	2
14	Fast Communication Port Test	k	5
15	Ethernet Test	n	1
16	QIC Diagnostic Test	t	3

DO NOT USE

NOTE: Sequence B (Trap to Debugger), I (System Installation Sequence) and Z (FCC Test) are not supported.

The diagnostic tests produce two types of errors: operator and hardware. Operator errors occur when the diagnostic is unable to recognize the test specification input by the operator. If an error is present in the command line, the name of the routine that gives the message appears in parentheses ().

Tests and Subtests

The second type of error reports hardware malfunctions detected by the diagnostics. These error messages list the diagnostic that detected the error, and give some information about the error. For example, an error message could be

```
Test:10, Subtest:5: Memory overlap error: location and contents
read back are 4003FE, 1F2E
```

In this example, subtest 5 and test 10 discovered a memory overlap error at 4003FE.

There is another special form of error message. These are called Response errors and can occur while executing diagnostics disk tests, (tests 6, 7 and 8). The following is the list of the response errors, what they indicate and the likely causes.

- Response 1 Cannot boot hard disk. This problem has four equally likely causes:
- Corrupted data in RAM memory
 - Corrupted data on the hard disk
 - A defective main CPU board
 - A defective hard disk drive
- Response 2 Cannot initialize disk
- This can be caused by a bad hard disk drive or the main CPU board.
- Response 3 Cannot boot either hard disk or diskette
- Response 4 Bad or invalid diskette
- This can be caused by a bad diskette drive or the main CPU board.
- Response 5 Cannot format hard disk.
- This can be caused by either a bad Main CPU board or a bad hard disk drive.

The following test discussions include a list of all possible errors, and where practical, output for a sample test run. In the lists of errors, x is a hexadecimal value; d is a decimal value; and s is a string. Some of the tests ask questions that require a response before the test continues. In the sample outputs, user input is shown in boldface.

Remember that you must press the RETURN key to enter both default values and your typed responses.

Tests and Subtests

Test 0: Memory Read, Write and Refresh Test (m)

The memory test checks every location in memory. The test comprises the following subtests:

1. Write and read 0's. (32-bit)
2. Write and read F's. (32-bit)
3. Write and read 0xaaaaaaaa's. (32-bit)
4. Write and read 5xaaaaaaaa's. (32-bit)
5. Write and read addresses. (32-bit)
6. Write and read complements of addresses. (32-bit)
7. Write and read 0's. (16-bit)
8. Write and read F's. (16-bit)
9. Write and read 0xaaaaaaaa's. (16-bit)
10. Write and read 5xaaaaaaaa's. (16-bit)
11. Write and read addresses. (16-bit)
12. Write and read complements of addresses. (16-bit)

Subtests 1-4 and 7-10 check the working order of each memory cell. The remaining subtests, 5, 6, 11 and 12, make sure that the address lines are functioning correctly. Each subtest has two versions: a 32-bit version (subtests 1-6) and a 16-bit version (subtests 7-12).

First, all subtests of this test write and read data to every location in memory. Next, every location in memory is read a second time to test the refresh cycle. If any of the read and writes do not match, an error returns.

Subtests 1 and 7 write and read a zero (0) to each location in memory. Subtests 2 and 8 are the same as subtests 1 and 7 except that they write and read an F instead of a 0. Subtests 3 and 9 write bit patterns of alternating 0's and 1's to each address in memory. Subtests 4 and 10 write the one's complement of subtests 3 and 9. Subtests 5 and 11 write and read the address of each location in memory; subtests 6 and 12 write and read the complements of addresses to every location in memory.

Errors

Test 0 can return the following errors:

- Memory error at Address x: Wrote 0's; Read Back x.
- Memory error at Address x: Wrote 1's; Read Back x.
- Memory error at Address x: Wrote x's; Read Back x.
- Memory overlap error: Location and contents read back are x x.

Test Output:

Output for a run of the memory test with no errors is as follows:

```
MEMORY TEST
MEMORY SUBTEST 1
MEMORY SUBTEST 2
MEMORY SUBTEST 3
MEMORY SUBTEST 4
MEMORY SUBTEST 5
MEMORY SUBTEST 6
MEMORY SUBTEST 7
MEMORY SUBTEST 8
MEMORY SUBTEST 9
MEMORY SUBTEST 10
MEMORY SUBTEST 11
MEMORY SUBTEST 12
```

Test 1: Map Translation Test (p)

The map translation test checks the status bits and page table entry swapping. The subtests are

1. Read and write memory test
2. Map tests

Subtest 1 operates as follows:

1. Set register to status=valid (Page status bits, PS 1-10 =01).
2. Read from the page addressed by register.
3. Read register and check to make sure that status=accessed (10).
4. Write to the page addressed by the register.
5. Read register again and check to see if status=modified (11).

Subtest 2 checks mapping to the correct physical memory location and operates as follows:

1. Write to two locations on different pages.
2. Swap the page table entries for the two pages.
3. Read back the two locations and check to make sure that the values are swapped.

Tests and Subtests

Errors

Test 1 can return the following errors:

Page dirty bit not set for page number.
Page mapping error: map number, logical address, and address read back
are x x x.
Page access bit not set for page number.
Page access bits wrong: page number and page bits are x x.
No interrupt on executing protected page.

Test Output

Output for a run of the map translation test is as follows:

```
MAP TRANSLATION TEST
MAP TRANSLATION SUBTEST 1
MAP TRANSLATION SUBTEST 2
```

Test 2: Page Fault Test (f)

The page fault test verifies that (1) the 68010 processor can successfully restart instructions and (2) pages having a "not valid" status code cannot be accessed. This test sets each map register to "not valid" and then tries to write, read, and execute. Each of these attempts should generate a bus error, and the tests verify that a page fault returns. If not, the operation aborts, and an error message returns. The subtests are

1. Test page faults caused by reading and writing.
2. Test page faults caused by trying to execute.

Subtest 1 sets the page table entry to "not valid" and tries to read and write to the mapped memory. Subtest 2 sets the page table entry to "not valid" and tries to execute that page.

Errors

Test 2 can return the following errors:

Page fault does not occur when read nonmapped page.
Page fault does not occur when executes nonmapped page.
No page fault received on write.
No page fault received on read.
Write/Read-back not continued properly.
No page fault received on execution test.
Page fault when none expected.

Tests and Subtests

Test Output

Output for a run of the page fault test is as follows:

```
PAGE FAULT TEST
PAGE FAULT SUBTEST 1, Read/Write test
PAGE FAULT TEST
PAGE FAULT SUBTEST 2, Execution test
```

Test 3: Parity Test (r)

The parity test checks the parity logic and makes sure that the processor, bus status registers (BSR's) and the general status register (GSR) handle exceptions correctly. The parity test subtests are:

1. Read a Parity Error through memory to check the BSR
2. Execute a Parity Error
3. Read complementing pattern of subtest 1 Parity Error

Subtest 1 forces a parity error at every memory address and takes the interrupt, thus forcing all addresses through the BSR. Subtest 2 writes an instruction containing a parity error to memory and tries to execute it. Subtest 3 is exactly like subtest 1 except that the parity errors that it forces to every memory address are opposite to the ones used in subtest 1.

Errors

Test 3 can return the following errors:

```
No Parity Interrupt at location x.
BSR incorrect after parity error at location x.
BSR0=x.
BSR1=x.
No Parity Interrupt during execution test-User mode.
No Parity Interrupt during execution test-Supervisor mode.
BSR incorrect after parity error during execution.
BSR0=x.
BSR1=x.
```

NOTE: Parity test cannot be run in DEFAULT/CONTINUOUS MODE as that command (RC) is one of the two letter command toggles and either toggle through selected disc repeat states or a numeric pattern is given to specify the repeat count.

Tests and Subtests

Test Output

Output for a clean run of the parity test for a 512 Kbyte memory is as follows:

```
PARITY TEST
PARITY TEST - SUBTEST 1 WRITE/READ TEST
Reached Address 50000
Reached Address 60000
Reached Address 70000
Reached Address 80000
Reached Address 90000
Reached Address A0000
Reached Address B0000
Reached Address C0000
Reached Address D0000
Reached Address E0000
Reached Address F0000
PARITY TEST - SUBTEST 2 EXECUTION TEST
PARITY TEST - SUBTEST 3 WRITE READ TEST
Reached Address 50000
Reached Address 60000
Reached Address 70000
Reached Address 80000
Reached Address 90000
Reached Address A0000
Reached Address B0000
Reached Address C0000
Reached Address D0000
Reached Address E0000
Reached Address F0000
```

Test 4: Clock Test (c)

The clock test verifies that the three clocks contained in the system are working correctly. The subtests are

1. Test Timer 0
2. Test Timer 1 and Counter 2
3. Test Timer 0 and 8259A

Subtest 1 verifies that timer 0 (programmable timer) causes interrupts. This subtest operates as follows:

1. Program the timer
2. Take one interrupt from timer 0

Subtest 2 verifies timer 1 (60 Hz clock) and Counter 2 (tick count). This subtest operates as follows:

1. Run timer 1 for 10 seconds.
2. Every second, print number of seconds remaining (countdown).
3. Check to see that Counter 2 matches the number of interrupts received.

Tests and Subtests

Subtest 3 programs timer 0. Subtest 3 operates as follows:

1. Take 6,000 interrupts.
2. Reset timer between each interrupt.

Errors

Test 4 can return the following errors:

- Stray interrupt from fast clock.
- No interrupt generated by the fast clock.
- Stray interrupt from slow clock.
- N ticks missed.
- N more clock interrupts processed than count ticks (N/2) recorded.

Test Output

Output for a run of the clock test is as follows:

```
CLOCK TEST
Subtest 1 - Timer 0 TEST

Subtest 2 - Timer 1/Counter 2 TEST
9 8 7 6 5 4 3 2 1

Subtest 3 - Timer 0/8259 TEST
```

Test 5: User I/O Error Test (u)

The user input/output error test makes sure that neither the external processor registers nor input/output registers, located in the input/output space (all virtual memory above 4 Mbytes), can be accessed in user mode. Any attempt to access these registers in user mode should generate an exception. This test also verifies that the general status register (GSR) and the bus status register s(BSR's) are set correctly. The subtests are

1. Accesses Processor Register
2. Accesses I/O Address Space

Subtest 1 tries to access the GSR and should generate an exception; subtest 2 tries to access and I/O address register and also should generate an exception.

Errors

Test 5 can return the following errors:

- No interrupt on User I/O test.

Tests and Subtests

Test Output

Output for a run of the user I/O error test is as follows:

```
USER I/O ERROR TEST
USER I/O ERROR SUBTEST 1
USER I/O ERROR SUBTEST 2
```

Tests 6, 7 and 8: Disk Tests — Winchester and Floppy (w, y and o)

Motorola Series 6300 and 6350 systems contain a Winchester hard disk drive, a floppy disk drive and for Series 6350 systems, an optional second Winchester disk drive. (For more information about disk drives, see the Series 6300 or Series 6350 Service Manual.) The Series 6300/6350 disk tests are:

```
Test 6. WD1010 Drive 0 Disk Test (w)
Test 7. WD1010 Drive 1 Disk Test (y)
Test 8. Floppy Disk Test (o)
```

The same subtests are provided for both disks except that an additional subtest, read track N, is provided for the floppy disk. The subtests are

1. Recal
2. Format (disk)
3. Write test
4. Read test
5. Random seeks
6. Write multiple blocks (interactive)
7. Read multiple blocks (interactive)
8. Spare a Sector (interactive)
9. Force DMA faults
10. Initialize VHB and BBT
11. Write VHB and BBT after aborted Test 3
12. Print VHB + BBT
13. Download to Disk
14. Toggle Alien Disk mode
15. Read track N
16. Receive from fast comm and write to disk
16. Read from disk and send via fast comm. (first)
18. Reserved
19. Reserved
20. Reserved
21. Find unreadable blocks
22. Compare RS-422 input to local disk
23. Surface test
24. DMA load test
25. Sort (BBT) Bad Block Table
26. Copy to disk from RS-422 (first)
27. Copy disk to RS-422
28. Switch partition table style
29. Harmonic Seek Stress test

Again, note that subtest 15 is used only to test the floppy disk.

Tests and Subtests

- Subtest 1: Subtest 1, Recal (recalibrate), initializes the disk, brings the head back to the beginning of the disk (sector 0), and tries to read and verify the first two blocks of the disk. The first block is the volume home block (VHB), which contains descriptive information (number of cylinders, number of tracks per cylinder, and number of sectors per track), and the second block contains the bad block table (BBT). Subtest 1 can result in a number of error conditions, but the two most common are Response=4 (can't recal) and Response=1 (can't read the volume home block).
- Subtest 2: Subtest 2, Format, is more a utility than a diagnostic. First, the subtest prompts for information to create the Volume Home Block and to format the disk. An operator must be present at the terminal to enter this information. Next, subtest 2 performs the format of the disk. After the format is done, the disk is then surface tested. The surface test looks for any defects -- hard or soft errors -- that might be found. At the end of the surface test, any defects found are incorporated in the bad block table if they don't already exist.
- Subtest 3: Subtest 3 is designed to verify the functionality of all disk related circuitry. The test assumes that the disk media is in a known state in terms of mapped defects. Subtest 3 writes one track at a time. It then reads back the tracks and verifies the pattern. After the whole disk is tested this way, a read-check operation is performed which reads the whole disk, track by track, checking data CRC. If any of these operations fail, the track is tested further for defects, (hard or soft errors). Next, the error information prints out to the operator before the diagnostic stops. If subtest 3 aborts for any reason, you should immediately run subtest 11 to rewrite the volume home block and bad block table.
- In Attended Mode, subtest 3 allows you to specify the data pattern in hex, the start block, the number of blocks to transfer, the maximum transfer size, and the number of subtest repetitions.
- In Unattended Mode, the subtest runs using defaults. The default pattern is a generated address pattern based on where you are in the disk. By default, subtest 3 writes over the entire disk, reading the data after it has been written (in increments of the selected transfer size). After completing the write phase, the same area of disk is read again to verify that no addressing problems exist. Refer to Appendix E for more details.

Tests and Subtests

CAUTION

Specifying the blocks that contain the diagnostics causes the diagnostics to be overwritten.

- Subtest 4: Subtest 4 performs only the read part of subtest 3 (see above). Subtest 4 reads a disk, checking for either the default pattern or a hex pattern that you specify. Subtest 4 asks all the same questions that subtest 3 asks (see above).
- Subtest 5: Subtest 5 performs random seeks to different sectors in the disk and then reads the sectors, checking to make sure that seek works consistently and that the head goes to the correct place. Subtest 5 allows you to specify the maximum block number and the number of subtest repetitions (random seeks) to execute.
- Subtests 6 and 7: Subtests 6 and 7, respectively, write and read multiple sectors to the disk from memory. These subtests allow you to specify the area of memory to write to the disk, or, conversely, to read from some place on the disk. Parameters are the start address in memory, the start block on disk, and the number of blocks to transfer.

CAUTION

For subtest 6, specifying the blocks that contain the diagnostics overwrites the diagnostics.

- Subtest 8: Subtest 8, more a utility than a diagnostic, allows you to specify bad blocks in the bad block table, so that you can avoid using known bad blocks. Subtest 8 asks you to specify either the track number (for example, cylinder number and head number) and byte number, physical sector, or logical block of the bad block.
- Subtest 9: Subtest 9 forces parity errors and page faults during a disk transfer. This subtest verifies that the appropriate nonmaskable interrupt (NMI) occurs and that the GSR and BSR are functioning correctly.
- Subtest 10: Subtest 10 allows you to create the volume home block and the bad block table. This subtest is the same as subtest 2, except that subtest 10 does not format the disk, saving the data previously on the disk. Subtest 10 prompts for the same information that is requested by subset 2.

Tests and Subtests

- Subtest 11: Subtest 11 restores the volume home block and bad block table -- if they are lost as a result of running either subtest 3 or 23. Normally, subtest 3 automatically saves the volume home block and bad block table in an internal buffer. However, if subtest 3 or 23 inadvertently write over the volume home block and bad block table (which is the case with the default parameters), you can run subtest 11 to rewrite the volume home block and the bad block table automatically when the test completes. If subtest 3 aborts for any reason, you should immediately run subtest 11 to rewrite the volume home block and bad block table.
- Subtest 12: Subtest 12 prints the contents of the volume home block and bad block table.
- Subtest 13: Subtest 13 Download to disk. This test is reserved for the manufacturer.
- Subtest 14: Subtest 14 toggles the alien mode flag for the disk type specified. When the alien mode flag is set, subtests 1, 6, and 7 interpret the disk as a nonstandard format disk (for example, no volume home block and different bad block handling). No other subtests are valid on a disk that is in alien mode. The alien mode flags for the various disks are separate and can be set and cleared independently. Subtest 14 asks the same questions asked by subtest 2 so that the disk driver can drive the disk.
- Subtest 15: Subtest 15 is reserved for the manufacturer.
- Subtests 16 and 17: Subtests 16 and 17 receive and transmit, respectively, data stored on disk through the fast communication (RS-422) port. Like subtests 2 and 3 of the fast communication port test, subtests 16 and 17 require two computers: one to send data and one to receive it. Subtests 16 and 17 prompt for the disk start block and the number of blocks to be transferred. Start the transmit subtest (17) before the receive subtest (16).
- Subtests 18-20: Tests 18 through 20 are reserved.
- Subtests 22: Subtest 22, which verifies correct data transmission in conjunction with subtest 17, is identical to subtest 16 (see above), except that in addition to receiving data, subtest 22 compares the data with the data on disk and prints only the differences that are found. The input sequence for subtests 22 and 17 is the same as for subtests 16 and 17. Start subtest 17 first. Subtest 22 does not write to disk.

Tests and Subtests

- Subtest 23: Subtest 23 surface tests the disk media. This test assumes that the disk related circuitry works and that the disk drive mechanics also work. Rotating db6 patterns are written onto the disk one track at a time. The track is then read and the data verified. When all tracks have been tested, the disk goes through a read-check pass. This pass reads each track, looking at the data CRC. If any errors are encountered, the offending track is tested, sector by sector. The errors can be a defect -- hard or soft error. The disk's bad block table is ignored. Defects may be found that already exists in the media bad block table, in which case they are printed for the operator, but not added to the bad block table again. (See Appendix E of this manual for a description of the track error test procedure).
- Subtest 24: Subtest 24 repeatedly loads the bus to see if any stray interrupts occur. Subtest 24 reads the first disk cylinder over and over while initializing RS-422 transmissions.
- Subtest 25: Subtest 25 sorts the Bad Block Table numerically by cylinder, then by track and physical sector numerically within the cylinder.
- Subtests 26 and 27: Subtests 26 and 27 have a master/slave relationship and require two machines to execute. As the master, subtest 27 reads the volume home block of the disk on the first machine and transmits it to the slave over the fast communications port. The slave, subtest 26, receives the volume home block and writes it to the disk on the second machine. Subtest 26 then transmits the volume home block back over the fast communications port to subtest 27 for verification. Subtest 27 then transmits the rest of the disk contents over the fast communication port to subtest 26. Subtest 26 receives the rest of the disk data and transmits it back to subtest 27 for verification.

NOTE

In running these subtests, it is important that the disks on both systems be of the same size and number of heads. Start subtest 26 before starting subtest 27.

- Subtest 28: Subtest 28 converts an old style volume home block partition table into a new style partition table or vice versa, depending upon the current style of the volume home block.

Tests and Subtests

Subtest 29: Subtest 29 is a harmonic seek stress test. After successfully reading the volume home block on the disk, it performs fixed length seeks and reads from the low disk cylinders to the high disk cylinders. Next, it does seeks and reads from the middle cylinders to the outer cylinders. Finally it performs seeks and reads, increasing in length from 0 cylinders to N-1 cylinders, and then seeks decreasing in length from N-1 cylinders back to 0 cylinders.

Errors

Tests 6, 7 and 8 can return the following errors:

Error during Disk Format:Response = x.
Not on Cylinder zero after Recal:Maybe on d,Response = x.
Can't Recal:Response = x.
Can't Write the new VHB:Response = x.
Can't Write the new Bad Block Table:Response = x.
Error on Write:response = x,Start Block = d.
Error on Re-Read;Response = x,Start Block = d.
Re-Read Data Fail:Start Block = d.
Error on Read:Response = x,Start Block = d.
Bad Block Table Overflow when adding Sector d.
Bad Block Table:Multiple use of alternate d.
Disk is not MiniFrame Format.
No parity error on disk DMA.
Improper BSR after disk DMA parity error.
Improper BSR after disk DMA page fault.
No page fault on disk read.
Page status not = accessed after disk write, reg = x.
Page status not = modified after disk read, reg = x.
No Bad Block Recovery for Floppy Disk.
Disk Error on write: response=x.
Disk Error on Read Track: response=x.
Read Track time out.
Invalid mode switch.

Test Output for Floppy

Output for the floppy disk drive subtests follow.

Output for Subtest 1

DISK TEST DRIVE 2 (Floppy)
(Subtest 1) Recal Disk.

Tests and Subtests

Output for Subtest 2

DISK TEST DRIVE 2 (Floppy)

(Subtest 2) Format Disk.

Do you want to format the Drive 2 (Floppy) (erasing contents)? y

Give # of Cylinders (RETURN = default of 80):

Give # of Tracks per Cylinder (RETURN = default of 2):

Give # of Sectors per Track (RETURN = default of 8):

Cylinders = 80, Tracks = 2, Sectors = 8

Give Pack Name (RETURN = default of Floppy):

Give Density (RETURN = default of 2):

Give Step Rate (RETURN = default of 0):

Give Size of Partition 0 (RETURN = default of 640):

Do you want a Loader? (Answer (Y:y) or (N:n): y

Give start Logical Block (RETURN = default of 1):

Give size in Blocks (RETURN = 12):

Do you want a Dump Area? (Answer (Y:y) or (N:n): n

Do you want a Down Load File? (Answer (Y:y) or (N:n): n

Give Interlace Factor (Default = 1):

The Bad Block Table contains 0 entries.

Output for Subtest 3:

DISK TEST DRIVE 2 (Floppy)

(Subtest 3) Disk Write and Check Read test

Do you want to write to Drive 2 (Floppy). y

Volume Name: Floppy

Give Data Pattern in hex (RETURN = default of cyclic):

Give start Logical Block (RETURN = default of 16):

Give # of Blocks to transfer (RETURN = default of 624):

Give Max transfer size in Blocks (RETURN = default of 4):

Give # of Times to Repeat (RETURN = default of 1):

Data Pattern = 0X2, Start Block = 16, # Blocks = 624, Increment = 4,
Repeats = 1

Drive 2 (Floppy):Initiating Check Read for pass 0

The Bad Block Table contains 0 entries.

Output for Subtest 4:

DISK TEST DRIVE 2 (Floppy)

(Subtest 4) Disk Read test

Volume Name: Floppy

Give Data Pattern in hex (RETURN = default of cyclic):

Give start Logical Block (RETURN = default of 16):

Give # of Blocks to transfer (RETURN = default of 624):

Give Max transfer size in Blocks (RETURN = default of 4):

Give # of Times to Repeat (RETURN = default of 1):

Data Pattern = 0X2, Start Block = 16, # Blocks = 624, Increment = 4,
Repeats = 1

Output for Subtest 5:

DISK TEST DRIVE 2 (Floppy)

(Subtest 5) Random Seek test
Volume Name: Floppy
Give Maximum Block # (RETURN = default of 640):
Give # of Times to Repeat (RETURN = default of 100):
Maximum Block = 640, Repeat Count = 100

Output for Subtest 6:

DISK TEST DRIVE 2 (Floppy)

(Subtest 6) Disk Write function
Do you want to write to Drive 2? y
Volume Name: Floppy
Give Buffer Addresss in hex (RETURN = default of 0X4B400):
Give start Logical Block (RETURN = default of 2):
Give # of Blocks to transfer (RETURN = default of 640):

Buffer Address = 0X4B400, Start Block = 2, # Blocks = 640

Output for Subtest 7:

DISK TEST DRIVE 2 (Floppy)

(Subtest 7) Disk Read function
Volume Name: Floppy
Give Buffer Addresss in hex (RETURN = default of 0X4B400):
Give start Logical Block (RETURN = default of 2):
Give # of Blocks to transfer (RETURN = default of 640):

Buffer Address = 0X4B400, Start Block = 0, # Blocks = 640

Output for Subtest 8:

DISK TEST DRIVE 2 (Floppy)

(Subtest 8) Spare a Sector function
Volume Name: Floppy
Specify Spare: [1:RETURN] = (Cylinder, Head and Byte)
 [2] = Physical Sector
 [3] = Logical Block:
 [4] = Cylinder, Head and Physical Sector on track:

Give Cyliner Number:
Give Head Number:
Give Byte Number:
No Bad Block Recovery for Floppy Disk.

Tests and Subtests

Output for Subtest 9:

DISK TEST DRIVE 2 (Floppy)

(Subtest 9) Force DMA Faults
10 Retries during Subtest 9

Output for Subtest 10:

DISK TEST Floppy

(Subtest 10) Initialize VHB and BBT.
Do you want to change the VHB on Drive 2? (Floppy):y
Give # of Cylinders (RETURN = default of 80):
Give # of Tracks per Cylinder (RETURN = default of 8):
Cylinders = 80, Tracks = 2, Sectors = 8
Give Pack Name (RETURN = default of Floppy):
Give Density (RETURN = default of 2):
Give Step Rate (RETURN = default of 0):
Give Size of Partition 0 (RETURN = default of 640):
Do you want a Loader? (Answer (Y/y) or (N/n):y
Give start Logical Block (RETURN = default of 1):
Give size in Blocks (DEFAULT = 12):
Do you want a Dump Area? (Answer (Y/y) or (N/N):n
Do you want a Down Load FILE? (Answer (Y/y) or (N/N):n
Give Interlace Factor (Default = 1):
The Bad Block Table contains 0 entries.

Output for Subtest 11

DISK TEST DRIVE 2 (Floppy)

(Subtest 11) Write VHB and BBT after aborted Test 3.
The Bad Block Table contains 0 entries.

Output for Subtest 12

DISK TEST DRIVE (Floppy)

(Subtest 12) Print VHB.
Volume Name: Floppy
80 Cylinders. 2 Heads per Cylinder
There are 8 Physical Sectors (of 512 bytes) per Track.
16 Physical Sectors per Cylinder, 1280 Physical Sectors per Disk.
There are 4 Logical Blocks (of 1024 bytes) per Track.
8 Logical Blocks per Cylinder, 640 Logical Blocks per Disk.
The Floppy is Double Density.
The Step Rate supplied to the Controller is 0.
Partition 0: Start Track=0, size (in blocks)=640
Loader starts at Block 1 (size=12 blocks).
The Bad Block Table Contains 0 entries.

Output for Subtest 13 (Reserved)

Output for Subtest 14

DISK TEST DRIVE 2 (Floppy)

(Subtest 14) Toggle Alien Disk Mode
Give # Cylinders (RETURN = default of 80):
Give # of Tracks per Cylinder (RETURN = default of 2):
Give # of Sectors per Track (RETURN = default of 8):

Cylinders = 80, Tracks = 2, Sectors = 8
Give Pack Name (RETURN = default of Floppy):
Give Density (RETURN = default of 2):
Give Step Rate (RETURN = default of 0):
Give Interlace Factor (Default = 1):
Floppy: Alien mode enabled

Output for Subtest 15

DISK TEST DRIVE 2 (Floppy)

(Subtest 15) Floppy Read Track
Give required Track Number (Default = 0):
Give required Density (Default = 2):
68676 words of Track 0 data are at address 4B400

Output for Subtest 16

DISK TEST DRIVE 2 (Floppy)

(Subtest 16) Write to disk from fast comm port.
Do you want to write to Drive 2 (Floppy)? y
Volume Name: Floppy
Give start Logical Block (RETURN = default of 2):
Give # of Blocks to transfer (RETURN = default of 638):

Output for Subtest 17

DISK TEST DRIVE 2 (Floppy)

(Subtest 17) Send from disk to fast comm port.
Volume Name: Floppy
Give start Logical Block (RETURN = default of 2):
Give # of Blocks to transfer (RETURN = default of 638):

Output for Subtests 18-20 (Reserved)

Tests and Subtests

Output for Subtest 21

DISK TEST DRIVE 2 (Floppy)

Volume Name: small
Enter start block (Default = 0):
Enter # of blocks (Default = 640):
Enter repeat count (Default = 1):
Starting at Block 0 for 640 blocks, 1 times

Output for Subtest 22

DISK TEST DRIVE 2 (Floppy)

(Subtest 22) Compares RS-422 input to local disk
Volume Name: small
Give start Logical Block (RETURN = default of 2)
Give # of Blocks to transfer (RETURN = default of 638)
Format: byte:remote, local

Output for Subtest 23

DISK TEST DRIVE 2 (Floppy)

(Subtest 23) Surface test
Do you want to write to Drive 2 (Floppy)? y
Volume Name: Floppy
Give Data Pattern in hex (RETURN = default of DB6) :
Give start Physical Sector (RETURN = default of 32) :
Give # of Sectors to Transfer (RETURN = default of 1248) :
Give # Retrys required per Sector (RETURN = default of 10) :
Give # of Times to Repeat (RETURN = default of 1) :
Data Pattern = 0XDB6, Start Sector = 32, # Sectors = 1248,
Increment = 8, Retrys = 10, Repeats = 1

Drive2 (Floppy):Initiating Check Read for pass 0
The Bad Block Table contains 0 entries.
1 Passes found 0 Defects 0 Hard Errors 0 Soft Errors

Output for Subtest 24

DISK TEST DRIVE 2 (Floppy)

(Subtest 24) DMA load test.

Output for Subtest 25

DISK TEST DRIVE 2 (Floppy)

(Subtest 25) Sort Bad Block Table
Do you want to sort the BBT on Drive 2 (Floppy)? y
Volume Name: Floppy
Saving alternate sector data.
The Bad Block Table contains 0 entries.
Restoring alternate sector data.

Output for Subtest 26

DISK TEST DRIVE 2 (Floppy)

(Subtest 26) Write to Disk from Fast Comm Port.
Do you want to write to DRIVE2 (Floppy)?

Output for Subtest 27

DISK TEST DRIVE 2 (Floppy)

(Subtest 27) Send from Disk to Fast Comm Port.
Volume Name: Floppy
FORMAT:byte:REMOTE,local

Output for Subtest 28

DISK TEST DRIVE 2 (Floppy)

(Subtest 28) Switch partition table style.
Volume Name: Floppy
Do you want to change the old/new style partition table to a new/old style
partition table? y

Output for Subtest 29

DISK TEST DRIVE 2 (Floppy)

(Subtest 29) Harmonic Seek Stress test.
Volume Name: Floppy
Seeks: Low to High
Seeks: 0 <-Middle-> 80
Seeks: Increasing to 80 then decreasing seeks to 0

Test Output for Winchester

Output for the Winchester hard disk drive and an optional second Winchester
disk drive subtests follow.

Tests and Subtests

Output for Subtest 1

DISK TEST Drive0 (Winchester)

(Subtest 1) Recal Disk.

Output for Subtest 2

DISK TEST Drive0 (Winchester)

(Subtest 2) Format Disk.

Do you want to format Drive0 (Winchester) (erasing contents)? y

Give # of Cylinders (RETURN = default of 645):

Give # of Tracks per Cylinder (RETURN = default of 17):

Cylinders = 645, Tracks = 7, Sectors = 17

Give Pack Name (RETURN = default of Winche):

Does the drive use head select bit 3 (hitech) (RETURN=Y):

Does the drive need reduced write current (RETURN=Y):

Give Step Rate (RETURN = default of 0):

Give Size of Partition 0 (RETURN = default of 36120):

Give Size of Partition 1 (RETURN = default of 33672):

Give Size of Partition 2 (RETURN = default of 17672):

Give Size of Partition 3 (RETURN = default of 13672):

Give size of BBT in blocks (Default=1):

Do you want a Loader (Answer [Y|y] or [N|n]):

Give start Logical Block (RETURN = default of 2):

Give size in Blocks (Default = 12):

Do you want a Dump Area (Answer [Y|y] or [N|n]):

Give start Logical Block (RETURN = default of 12):

Give size in Blocks (Default = 2436):

Do you want a Down Load File (Answer [Y|y] or [N|n]):

Give start Logical Block (RETURN = default of 2448):

Give size in Blocks (Default = 148):

Beginning Surface Test

Defect found at Cyl 28 Trk 6 Sec 8 (Physical Sector 3442)

Defect found at Cyl 222 Trk 6 Sec 2 (Physical Sector 26522)

Defect found at Cyl 311 Trk 6 Sec 16 (Physical Sector 37127)

Defect found at Cyl 556 Trk 2 Sec 15 (Physical Sector 66213)

Defect found at Cyl 557 Trk 2 Sec 15 (Physical Sector 66332)

Defect found at Cyl 593 Trk 6 Sec 4 (Physical Sector 70673)

The Bad Block Table contains 36 entries.

Output for Subtest 3

DISK TEST Drive0 (Winche)

(Subtest 3) Disk Write and Check Read test

Do you want to write Drive0 (Winche) ?

Volume Name: Winche

Give Data Pattern in hex (RETURN = default of cyclic):

Give start Logical Block (RETURN = default of 16):

Give # of Blocks to transfer (RETURN = default of 36104):

Give Max transfer size in Blocks (RETURN = default of 8):

Give # of Times to Repeat (RETURN = default of 1):

Data Pattern = 0X2, Start Block = 16, # Blocks = 36104,

Increment = 8, Repeats = 1

Drive0 (Winche):Initiating Check Read for pass 0

The Bad Block Table contains XX entries.

Output for Subtest 4

DISK TEST Drive0 (Winche)

(Subtest 4) Disk Read test

Volume Name: Winche

Give Data Pattern in hex (RETURN = default of cyclic):

Give start Logical Block (RETURN = default of 16):

Give # of Blocks to transfer (RETURN = default of 36104):

Give Max transfer size in Blocks (RETURN = default of 8):

Give # of Times to Repeat (RETURN = default of 1):

Data Pattern = 0X2, Start Block = 16, # Blocks = 36104,

Increment = 8, Repeats = 1

Output for Subtest 5

DISK TEST Drive0 (Winche)

(Subtest 5) Random Seek test

Volume Name: Winche

Give Maximum Block # (RETURN = default of 36120):

Give # of Times to Repeat (RETURN = default of 1000):

Maximum Block = 36120, Repeat count = 1000

Tests and Subtests

Output for Subtest 6

DISK TEST Drive0 (Winche)

(Subtest 6) Disk Write function

Do you want to write to Drive0 (Winche) ?

Volume Name: Winche

Give Buffer Address in hex (RETURN = default of 0X4B400):

Give start Logical Block (RETURN = default of 2):

Give # of Blocks to transfer (RETURN = default of 36118):

Buffer Address = 0x4B400, Start Block = 2, # Blocks = XXXXX

Output for Subtest 7

DISK TEST Drive0 (Winche)

(Subtest 7) Disk Read function

Volume Name: Winche

Give Buffer Address in hex (RETURN = default of 0X4B400):

Give start Logical Block (RETURN = default of 2):

Give # of Blocks to transfer (RETURN = default of 36118):

Buffer Address = 0x4B400, Start Block = 2, # Blocks = XXXXX

Output for Subtest 8

DISK TEST Drive0 (Winche)

(Subtest 8) Spare a Sector function

Volume Name: Winche

Specify Spare: [1|RETURN] = (Cylinder, Head and Byte):

[2] = Physical Sector

[3] = Logical Block

[4] = Cylinder, Head and Physical sector on Track:

If you specify 1 or RETURN,

Give Cylinder Number:200

Give Head Number:1

Give Byte Number:20

Added Bad Block: Cylinder 200, Track 1, Sector 0.

Used Track 1401 as the Alternate.

Another? (Default: RETURN = Yes:n

The Bad Block Table contains 38 entries.

If you specify 2,

Give Physical Sector Number:200

Added Bad Block: Cylinder 1, Track 4, Sector 13.

Used Track 11 as the Alternate.

Another? (Default: RETURN = Yes:n

The Bad Block Table contains 39 entries.

Tests and Subtests

If you specify 3,

Give Logical Block Number:200
Added Bad Block: Cylinder 3, Track 4, Sector 0.
Used Track 25 as the Alternate.
Added Bad Block: Cylinder 3, Track 4, Sector 1.
Used Track 26 as the Alternate.
Another? (Default: RETURN = Yes:n
The Bad Block Table contains 41 entries.

If you specify 4,

Give Cylinder Number:200
Give Head Number:1
Give Physical Sector on Track:10
Added Bad Block: Cylinder 200, Track 1, Sector 10.
Used Track 1401 as the Alternate.
Another? (Default: RETURN = Yes:n
The Bad Block Table contains 5 entries.

Output for Subtest 9

DISK TEST Drive0 (Winche)

(Subtest 9) Force DMA Faults
10 Retries during Subtest 9.

Output for Subtest 10

DISK TEST Drive0 (Winche)

(Subtest 10) Initialize VHB and BBT.
Do you want to change the VHB on Drive0 (Winche) ?
Give # of Cylinders (RETURN = default of 645):
Give # of Tracks per Cylinder (RETURN = default of 7):
Give # of Sectors per Track (RETURN = default of 17):

Cylinders = 645, Tracks = 7, Sectors = 17
Give Pack Name (RETURN = default of Winche):
Does the drive use head select bit 3 (hitech)(RETURN=Y):
Does the drive need reduced write current (RETURN=Y):
Give Step Rate (RETURN = default of 0):
Give Size of Partition 0 (RETURN = default of 36120):
Give Size of Partition 1 (RETURN = default of 32120):
Give Size of Partition 2 (RETURN = default of 16120):
Give Size of Partition 3 (RETURN = default of 12120):
Give size of BBT in blocks (Default=1):
Do you want a Loader (Answer [Y|y] or [N|n]):
Give start Logical Block (RETURN = default of 2):
Give size in Blocks (Default = 12):
Do you want a Dump Area (Answer [Y|y] or [N|n]):
Give start Logical Block (RETURN = default of 14):

Tests and Subtests

Give size in Blocks (Default = 3986):
Do you want a Down Load File (Answer [Y|y] or [N|n]):
Give start Logical Block (RETURN = default of 314):
Give size in Blocks (Default = 148):
The Bad Block Table contains XX entries.

Output for Subtest 11

DISK TEST Drive0 (Winche)

(Subtest 11) Write VHB and BBT after aborted Test 3.
Do you want to write to Drive0 (Winche) ? y
The Bad Block Table contains 41 entries.

Output for Subtest 12

DISK TEST Drive0 (Winche)

(Subtest 12) Print VHB.
Volume Name: Winche
645 Cylinders. 7 Heads per Cylinder.
There are 17 Physical Sectors (of 512 bytes) per Track.
119 Physical Sectors per Cylinder, 76755 Physical Sectors per Disk.
There are 8 Logical Blocks (of 1024 bytes) per Track.
56 Logical Blocks per Cylinder, 36120 Logical Blocks per Disk.
Reduced write current is valid (Cylinder 128).
The Step Rate supplied to the Controller is 0.
Partition 0: start Track=0, size (in Blocks)=2448
Partition 1: start Track=306, size (in Blocks)=16000
Partition 2: start Track=2306, size (in Blocks)=4000
Partition 3: start Track=2806, size (in Blocks)=13672
Loader starts at Block 2 (size=10 Blocks).
Bad Block Table starts at Block 1 (size=1 Blocks).
Dump Area starts at Block 400 (size=2048 Blocks).
Down Load File starts at Block 12 (size=300 Blocks).
Cylinder 28, Track 6, Physical Sector 8, uses Track 202 as Alternate.
Cylinder 222, Track 6, Physical Sector 2, uses Track 1560 as Alternate.
Cylinder 311, Track 6, Physical Sector 16, uses Track 2183 as Alternate.
Cylinder 557, Track 6, Physical Sector 15, uses Track 3901 as Alternate.
The Bad Block Table contains 4 entries.

Output for Subtest 13 (RESERVED)

Output for Subtest 14

DISK TEST Drive0 (Winche)

(Subtest 14) Toggle Alien Disk mode.
Give # of Cylinders (RETURN = default of 645):
Give # of Tracks per Cylinder (RETURN = default of 7):
Give # of Sectors per Track (RETURN = default of 17):

Tests and Subtests

Cylinders = 645, Tracks = 7, Sectors = 17
Give Pack Name (RETURN = default of Winche):
Does the drive use head select bit 3 (hitech)(RETURN=Y):
Does the drive need reduced write current (RETURN=Y):
Give Step Rate (RETURN = default of 0):
DRIVE0 (Winche):Alien mode enabled

OR

DISK TEST Drive0 (Winche)

(Subtest 14) Toggle Alien Disk mode.
Drive0 (Winche): Alien mode disabled

Output for Subtest 15

DISK TEST Drive0 (Winche)

Subtest 15 only implemented for Floppy.

Output for Subtest 16

DISK TEST Drive0 (Winchester)

(Subtest 16) Write to disk from fast comm. port.
Do you want to write to Drive0 (Winchester) ? y
Volume Name: atasi
Give start Logical Block (RETURN = default of 2):
Give # of Blocks to transfer (RETURN = default of 36118):

Output for Subtest 17

DISK TEST Drive0 (Winchester)

(Subtest 17) Send from disk to fast comm. port.
Do you want to write to Drive0 (Winchester) ? y
Volume Name: Winche
Give start Logical Block (RETURN = default of 2):
Give # of Blocks to transfer (RETURN = default of 36118):

Output for Subtest 18

DISK TEST Drive0 (Winchester)

No longer supported.

Output for Subtest 19

DISK TEST Drive0 (Winchester)

No longer supported.

Tests and Subtests

Output for Subtest 20

DISK TEST Drive0 (Winchester)

Volume Name: Winche

Enter partition number to describe (Default = 1):

#inodes=0 fs size=0

NOTE: This subtest NOT supported.

Output for Subtest 21

DISK TEST Drive0 (Winchester)

Volume Name: Winche

Enter start block (Default = 0):

Enter # of blocks (Default = 36120): 10

Enter repeat count (Default = 1):

Starting at block 0 for 10 blocks, 1 times

Output for Subtest 22

DISK TEST Drive0 (Winchester)

(Subtest 22) Compare RS-422 input to local disk.

Volume Name: Winche

Give start Logical Block (RETURN = default of 2):

Give # of Blocks to transfer (RETURN = default of 36118): 1

Format: byte:remote, local

Output for Subtest 23

DISK TEST Drive0 (Winchester)

(Subtest 23) Surface test.

Do you want to write to Drive0 (Winchester) ? y

Volume Name: Winche

Give Data Pattern in hex (RETURN = default of DB6):

Give start Physical Sector (RETURN = default of 51):

Give # of Sectors to transfer (RETURN = default of 76704): 10

Give # Retrys required per Sector (RETURN = default of 10):

Give # of Times to Repeat (RETURN = default of 1):

Data Pattern = 0XDB6, Start Sector = 51, # Sector = 10,

Increment = 17, Retrys = 10, Repeats = 1

Drive0 (Winche):Initiating Check Read for pass 0

The Bad Block Table contains 41 entries

1 Passes found 0 Defects 0 Hard Errors 0 Soft Errros

Output for Subtest 24

DISK TEST Drive0 (Winchester)

(Subtest 24) DMA load test.

Output for Subtest 25

DISK TEST Drive0 (Winchester)

(Subtest 25) Sort Bad Block table.

Do you want to sort the BBT on Drive0 (Winche) ? y

Volume Name: Winche

Saving alternate sector data.

Added Bad Block: Cylinder 28, Track 6, Sector 8.

Used Track 202 as the Alternate.

Added Bad Block: Cylinder 222, Track 6, Sector 2.

Used Track 1560 as the Alternate.

Added Bad Block: Cylinder 311, Track 6, Sector 16.

Used Track 2183 as the Alternate.

Added Bad Block: Cylinder 557, Track 2, Sector 15.

Used Track 3901 as the Alternate.

The Bad Block Table contains 4 entries.

Restoring alternate sector data.

Output for Subtest 26

DISK TEST Drive0 (Winchester)

(Subtest 26) Write to disk from fast comm port.

Do you want to write to Drive0 (Winchester) ? y

Output for Subtest 27

DISK TEST Drive0 (Winchester)

(Subtest 27) Send from disk to fast comm port.

Volume Name: Winche

Format: byte:remote, local

Format: byte:remote, local

Output for Subtest 28

DISK TEST Drive0 (Winchester)

(Subtest 28) Switch partition table style.

Volume Name: Winche

Do you want to change the new style partition table
to an old style partition table?

OR

Do you want to change the old style partition table
to a new style partition table?

Tests and Subtests

Output for Subtest 29

DISK TEST Drive0 (Winchester)

(Subtest 29) Harmonic Seek stress test.

Volume Name: Winche

Seeks: Low to High

Seeks: 0<-Middle->645

Seeks: increasing to 645 then decreasing seeks to 0

Test 9 (Reserved)

Test 9 is reserved for manufacturer.

Test 10: MAP RAM Test (a)

The map RAM test verifies the memory used for virtual memory translation tables. The subtest are:

1. Write and read 0's. (16-bit)
2. Write and read -1's. (16-bit)
3. Write and read 0xaaaa's. (16-bit)
4. Write and read 0x5555's. (16-bit)
5. Write and read addresses. (16-bit)
6. Write and read complements of addresses. (16-bit)

These subtests correspond exactly to subtests 7-12 of the memory tests (see above), except that the map RAM tests ignore the three unused bits in the page table entries.

Errors

Test 10 can return the following errors:

Memory error at Address x: Wrote 0's; Read Back x.

Memory error at Address x: Wrote 1's; Read Back x.

Memory error at Address x: Wrote x's; Read Back x.

Memory overlap error: Location and contents read back are x x.

Test Output

Output for a map RAM test is as follows:

```
MAP RAM TEST
MAP RAM SUBTEST 1
MAP RAM SUBTEST 2
MAP RAM SUBTEST 3
MAP RAM SUBTEST 4
MAP RAM SUBTEST 5
MAP RAM SUBTEST 6
```

Tests and Subtests

Test 11: RS-232-C (8274) Tests (h)

When executing the RS-232-C tests on a basic Series 6300/6350 System, from a terminal, connect a loopback terminator plug for each RS-232-C port that is not being used. The following lists the pin connections made on the loopback connector. See figure below.

P/N Connections

- 2-3
- 4-5
- 14-16
- 6-20-22

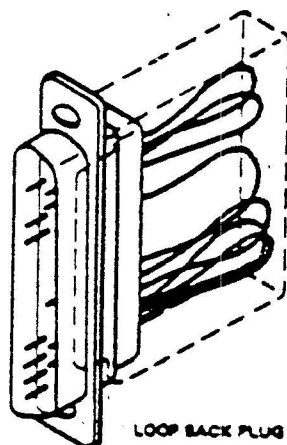


Figure 2-1. Loopback Connector

Test 11 tests the RS-232-C port. The subtests for Test 11 are

1. Program all options via loopback
2. Data transfers via loopback
3. Force Error Conditions via loopback
4. Select port for subtest 1
5. Select port for subtest 2
6. Select port for subtest 3

Subtest 1 programs the Intel 8274 chip and sends a small amount of data through the RS-232-C port in loopback mode, which means that what goes out of Port 1 comes back in Port 1. This subtest executes at all available speeds. Subtest 2, also performed in loopback mode, transfers large amounts of data at 19,200 baud. Both subtests take interrupts. Subtest 3 forces the various error conditions, such as framing errors, that can occur via loopback, and makes sure that the 8274 handles and detects errors properly.

Tests and Subtests

Errors

Test 11 can return the following errors:

Carrier not on.
Didn't receive frame Error.
Corrupted data at specific byte (RX/TX data) : x.
Data not transmitted after 2 seconds for d.
Not all the data has been received, so far: x.
Unknown Port.
Bad RS-232 port (d).
TX Underrun on tty d.

Test Output

8274 TEST
(Subtest 1) Test 8274 Control options. tty1
8274 TEST
(Subtest 2) Data Transfer test. tty0 & tty1
8274 TEST
(Subtest 3) Error Condition test. tty1

Test 12: Page Protection Test (e)

The page protection test checks all combinations of the various factors used to control page access, ensuring that the combinations permit access and generate exceptions as required. This test also verifies instruction restart. The test sets the page protection variables to a combination and then tries to access the page. The variables tested are page status code (not valid/valid), write enable (set/not set), address (<512K/> 512K/virtual), and mode (supervisor/user). Some combinations should always generate an exception (e.g., any combination that tries to write below 512K in user mode). The page protection test contains two subtests:

1. Test 1/2Mb Kernel virtual address space
2. Test 1 Mb Kernel virtual address space

NOTE: Subtest 2 always FAILS, 1 Mb Kernel not supported by Motorola.

Errors

Test 12 can return the following errors:

No Page fault received on write.
No Page fault received on read
Write/Read-back not continued properly.
No page fault received on execution test.
Page fault when none expected.

Test Output

PAGE PROTECTION TEST
PAGE PROTECTION SUBTEST 1, 1/2 Mb Kernel
PAGE PROTECTION SUBTEST 2, 1 Mb Kernel

Tests and Subtests

Test 13: Line Printer Test (1)

The line printer test checks the status register of the line printer and verifies that a line printer can print data correctly. The subtests are:

1. Check the line printer status register and print the observed status.
2. Print a rotating pattern on the printer using interrupts. Check the status on each interrupt.

Subtest 1 checks the status of the data/status register, returns the status, and makes sure that the status is valid (both line printer present and line printer selected, or line printer out of paper). For each repetition, subtest 2 prints one full page of wallpaper patterns, consisting of 132-column rotations of the ASCII character set.

Errors

Test 13 can return the following errors:

Unrecognized LP status x.
LP not present.

Test Output

Output for a run of the line printer test is as follows:

```
LINE PRINTER TEST
LINE PRINTER SUBTEST 1, Status Test
LP Selected
LINE PRINTER SUBTEST 2, Transfer Test.
```

At this point in the test, the line printer prints a full page of rotations of the ASCII character set.

NOTE: This tests the parallel printer port.

Test 14: Fast Communications (RS-422) Port Test (k)

Test 14 verifies the fast communication (RS-422) port. Like subtests 16 and 17 of the disk tests, test 14 requires two computers. One is to transmit data and the second to receive it. The system whose RS-422 port is receiving data should be ready to receive data before the transmission subtest starts. The subtests are:

Fast comm port tests (test 14) contains four subtests:

- (1) - Auto send/receive test combining (A) & (B)
 - (A) Transmit increasing sized packets.
 - (B) Receive the packets sent by (A).
- (2) - Transmit and Receive user specified port.
- (3) - Transmit user specified block of memory.
- (4) - Receive user specified block of memory.

This test sequence includes only subtest 1.

Tests and Subtests

Subtest 1 determines which computer begins transmitting. The packet size for the first transmission is four words long. For each subsequent transmission, the packet size doubles. Transmissions continue until the packets reach a word count of 32,768 (2^{15}). Subtest 2 requires an expansion communication board which is not offered by Motorola. Subtests 3 and 4, respectively, transmit and receive blocks of memory. For subtests 3 and 4, you must specify the start address in memory and the number of words to transfer. Start the receive subtests before the transmit subtests to avoid transmitting data before it can be accepted.

NOTE: Subtest 2 is not supported by Motorola.

Errors

Test 14 can return the following errors:

- Timeout on package receive complete. Packet size = x.
x words left to transfer.
- Receive data invalid. Got x, expected x, transferring x words.
- No read status changes received.
- Invalid status while waiting for read complete, polling returned x.
- Unknown synch down data received: x.
- Fast comm line has uninterrupted carrier.
- Carrier signal doesn't come on after clock is disabled.
- Timeout waiting for carrier to go after disabling clock.
- Transmit underrun error on transfer.
- Terminal count not received after read end of message.
- Erroneous read status returned = x.
- Loss of carrier before completion of RS-422 operation.
Counter = x.
- No carrier loss after terminal count on transmit.

Test Output

FAST COMMUNICATION PORT TEST

NOTE

When Test 14 (k) is running in "Long Mode", (p. 4 sec 11), you cannot escape or interrupt the test. Once the test has begun, no input is available from the keyboard. All errors are logged at the end of the test.

Tests and Subtests

Test 15: Ethernet Test (n)

This diagnostic tests the AM7990 chip and associated Ethernet hardware on the Ethernet board. It contains eight subtests which are listed below. The test is run interactively and displays the following output.

ETHERNET TEST

Enter number of buffers (Default = 16) :
Enter buffer size (Default = 128) :
Enter current station address:
Enter logical address filter:
Operate in selective mode (Default = y):

Available Ethernet tests are:

- 0 - Exit Ethernet Tests
- 1 - Do Loopback, CRC and Collision Tests
- 2 - Send a test packet.
- 3 - Retransmit packet sent in subtest 2.
- 4 - Do Time Domain Reflectometry test.
- 5 - Toggle Debug mode.
- 6 - Toggle Packet Print mode.
- 7 - Transmit Serially Numbered Packets.
- 8 - Ping-Pong w/data check.
- 9 - Toggle Broadcast Packet Print.
- 10 - Display Status Address.

Choose test number:

The following describes the subtests within the Ethernet test. To send data across the Ethernet line, during the following subtests, press (Control) and D at the same time.

Subtest 0: Subtest 0 is used to exit the Ethernet test.

Subtest 1: Subtest 1 performs internal loopback testing and verifies that all the major components of the Ethernet board are functioning correctly before it begins transmitting on the Ethernet line and interacts with other systems on the line.

Subtest 2: Subtest 2 transmits a test packet of information out to a specific address on the Ethernet line. This is to check for accurate transmission of the test packet and to check for any serious transmission problems within the Ethernet line. To receive the test packet on the terminal of another system, enable that system by selecting the appropriate address when starting the Ethernet test on that system.

Subtest 3: Subtest 3 allows retransmitting the same test data used in subtest 2. The address parameters for the test packet can be redefined.

Tests and Subtests

- Subtest 4: Subtest 4, the time domain reflectrometry test checks for discontinuity in the Ethernet cable. It is used to determine the approximate location of the discontinuity in the Ethernet line.
- Subtest 5: Subtest 5 is the debug mode for the Ethernet test. It points to fault locations in various descriptors (blocks of memory) when it is toggled on. By default, it is off.
- Subtest 6: Subtest 6 is used to display packets when they are received across the Ethernet line.
- Subtest 7: Subtest 7 sends serially numbered packets to another system.
- Subtest 8: Subtest 8 sends test data packets to a target receiver in the Ethernet line. The target machine receives it and transmits them back. The test packets are checked for CRC errors. Any errors are displayed.

To exit Ethernet testing during an Ethernet subtest, press Q and RETURN.

Test 16: Quarter-Inch Cartridge Tape Test (t)

Test 16 tests the Quarter-Inch tape interface and drive mechanism. It contains the following subtests:

1. Tape initialization test
2. Read controller interface signals
3. Rewind tape test
4. Tape diagnostics (interactive)
5. Tape utilities (interactive)
6. Tape write test
7. Tape read test
8. Change default tape read/write test parameters
9. Erase tape test
10. Retension tape command

- Subtest 1: Subtest 1 resets and reads the status of the Quarter-Inch tape cartridge. When it executes, it displays a six-byte display field (hex). Table 2-2 below, describes the bits within the six byte status field.
- Subtest 2: Subtest 2 tests the tape controller status. When it is executed, it displays a one-byte status field (hex). Table 2-3 below, describes the bits within the one-byte status field.
- Subtest 3: Subtest 3 rewinds the tape.
- Subtest 4: Subtest 4 is an interactive subtest. It displays the following options available when selected.

*** CAUTION - SUBTEST 4 IS NOT FULLY DOCUMENTED AT THIS TIME ***
*** USE SUBTESTS 6 AND 7 TO TEST READ AND WRITE ***

Tests and Subtests

- (0) Run utilities
- (1) Run a tape test
- (2) Issue write command
- (3) Issue read command
- (4) Write a block
- (5) Read a block
- (6) Display control lines
- (7) Set interrupt control lines
- (8) Issue write filemark
- (9) Issue read filemark
- (a) Reset controller
- (b) Send command to controller
- (c) Issue read status command
- (d) Dump blocks w/filemark
- (e) Read blocks up to filemark
- (f) Display page(s) to memory
- (g) Display previous tape status
- (q) Return to main diagnostic

NOTE

Before running any of the tests, issue the reset controller command (a). Upon encountering an exception from the quarter-inch tape, issue the read status command (option c of subtest 4) to clear the exception. This will allow tape testing to continue.

To test the tape write function under interactive diagnostics (subtest 4), perform the following functions:

- a reset controller
- c read status
- 2 issue write command
- 4* specify how many blocks desired to write
- 8 write a filemark to terminate the write

To test read function, perform the following functions:

- a reset controller
- c read status
- 2 issue read command
- 5* specify how many blocks desired to read
- 9 to terminate the read operation

* Options 4 and 5 may be repeated if desired.

For option 7 of Subtest 4, the available input is:

- 1) 20 to enable exception interrupt
- 2) 18 to enable ready interrupt
- 3) 0 to disable interrupt
- 4) 38 to enable exception and ready interrupt.

Tests and Subtests

Subtest 5: Subtest 5 also is an interactive subtest. It displays the following options when selected:

*** CAUTION - SUBTEST 5 IS NOT DOCUMENTED AT THIS TIME ***
*** MOST TESTS ARE OBVIOUS, HOWEVER ***

- (0) Run diagnostics
- (1) Restore disk to tape
- (2) Restore disk from tape
- (3) Copy disk partition to tape w/filemark
- (4) Restore disk partition from tape
- (5) Run Tape Write/Read Test
- (6) Run Write Phase only
- (7) Run Read Phase only
- (8) Tape data format
- (9) Erase test
- (a) Reset tape
- (b) Tape functions: rewind/retension/erase tape
- (c) Read tape status
- (q) Quit utilities menu

NOTE Before running any of the utilities, issue the reset controller command (a). Upon encountering an exception from the quarter-inch tape, issue the read status command (option c of subtest 5) to clear the exception. This will allow tape testing to continue.

Subtest 6 Subtest 6 writes data on the tape and verifies that the data was written correctly. Its main purpose is to check the write function.

Subtest 7 Subtest 7 reads data from the tape and verifies that the data can be read correctly. Its main purpose is to check the read function.

Subtest 8 Subtest 8 can be used to change the read and write parameters for performing the read and write tests.

Subtest 9 Subtest 9 erases a length of the tape and verifies that the tape was erased.

Subtest 10 Subtest 10 moves the tape forward to the second spool and rewinds it for smoother tape operation. It verifies that the retension function is performed correctly.

Tests and Subtests

The following table describes the bytes in the six-byte status display field when subtest 1, the Quarter-Inch Tape Status test, executes.

Table 2-2. Tape Interface Status Summary

Byte 0

Data Bit Name	7	6	5	4	3	2	1	0
	STO	CNI	USL	WRP	EOM	UDA	BNL	FIL

- Bit 0 This is the File Mark Detection bit. It is set when a file mark is detected during a Read Data or Read File Mark Sequence. The bit is reset by a Read Status command.
- Bit 1 This is the Block in Error Not Located bit. It is set when an unrecoverable read error occurs and the tape controller cannot confirm that the last block transmitted was the block in error. The bit is reset by a Read Status command.
- Bit 2 This is the Unrecoverable Data bit. It is set when the tape controller experiences a hard error during read or write operations. The bit is reset by a Read Status command.
- Bit 3 This is the End of Media bit. It is set when the logical early warning hole of the last track is detected during a write operation. This bit will remain set as long as the drive is at the logical end of media. The EOM bit is not reset by a Read Status sequence.
- Bit 4 This is the Write Protection bit. It is set if the cartridge write protection plug is set in the file protection position "safe". The operator must change the write protect plug position before this status bit is reset.
- Bit 5 This is the Drive Unselected bit. It is set if the selected drive is not physically connected or is not receiving power. The operator must correct the condition before the status bit can be reset.
- Bit 6 This is the Cartridge Not In Place bit. It is set when a cartridge is not fully inserted into the cartridge tape drive. The operator must correct the condition before the status bit can be reset.
- Bit 7 This is the status byte 0 bit. It is set if any other bit in Status Byte 0 is set.

Tests and Subtests

Byte 1

Data								
Bit	7	6	5	4	3	2	1	0
Name	ST1	ILL	NDT	MBD	BOM	RES	RES	POR

- Bit 0 This is the Power On Reset bit. It is set after the host asserts a reset command or when the tape controller is powered up. The bit is reset when the Read Status command is activated.
- Bit 1 This bit is reserved for the end of recorded media.
- Bit 2 This bit is reserved for a bus parity error.
- Bit 3 This is the Beginning of Media bit and is set whenever the tape cartridge is logically at the beginning of the tape, at track 0. It is reset when the tape moves away from the beginning of the tape position or when the tape moves away from the logical end of media position or when a Reset occurs.

NOTE

This is the only bit in this byte that does not set an exception when it goes true. Also, it is not reset by the Read Status command.

- Bit 4 This is the Marginal Block Detection bit. It is set when the tape controller determines that a data block is marginal. The bit is reset when a read status command is executed.
- Bit 5 This is the No Data Detection bit. It is set when an unrecoverable data error occurs due to a lack of recorded data, which is the failure to detect a data block within a tape controller time-out. The bit is reset by a read status command.
- Bit 6 This is the Illegal Command bit. It is set if any of the following six conditions occur:
- o A select command is issued with no drives or more than one drive indicated.
 - o The On-Line signal is not asserted when a write, Write File Mark, Read or Read File Mark command is issued.
 - o A command other than Write or Write File Mark is issued while a Write Data command is in progress.
 - o A command other than Read or Read File Mark is issued when a Read Data sequence is in progress.

Tests and Subtests

- o A drive is deselected by another Select command when the cartridge in the currently selected drive is not at the beginning of tape track 0.
- o Any unimplemented command is issued.

The bit is reset by executing a Read Status command.

Bit 7 This is the Status Byte 1 bit. It is set when any other bit in status byte 1 is set.

Bytes 2 and 3

These bytes are data error counters which count the number of blocks rewritten for Write operations and the number of soft read errors during read operations. These bytes are cleared by a Read Status Sequence.

Bytes 4 and 5

These bytes are the underrun counters which count the number of times the streaming was interrupted because the host failed to maintain the minimum throughput rate. These bytes are cleared by a Read Status Sequence.

The following table describes the bits within the one byte status field which displays when subtest 1 is executed.

Table 2-3. Tape Controller Status Summary

Bit Name	XD7	XD6	XD5	XD4	XD3	XD2	XD1	OXD
	1	1	BUSY	RDY	RDRDY	WRRDY	LEXP	LRDY
BUSY	This bit is set to 0 when the tape drive is under any type of operation. It gets cleared when the tape drive is ready for the next command.							
RDY	This bit is set to 0 and generates a CPU interrupt at the end of every command or every block of data during the Read/Write operation, if the Mask registers interrupt enable bit ENRDY is set.							
RDRDY	When this bit is set to 0, the tape controller has one word of data that is ready for a Read operation.							
WRRDY	When this bit is set to 0, the tape controller is ready to receive one word of data for a Write operation.							
LEXP	When this bit is set to 0, a tape controller Exception is in progress.							
LRDY	When this bit is set to 0, the tape controller is ready to begin an operation.							

Section 3: Unexpected Errors

Unexpected errors are errors that are not an expected part of a diagnostic, and indicate relatively serious system malfunctions. Unexpected errors can occur at any time during processing and while any diagnostic is executing. There are three types of unexpected errors which are discussed below.

Stray Bus Errors

A stray bus error is any bus error that is not an expected outcome of a diagnostic. This type of unexpected error has the following format:

Unexpected bus error, GSR=x, PC=x, RPS=x

Unexpected Nonmaskable Interrupts

Unexpected nonmaskable interrupts (NMIs) are high priority interrupts that are not an expected result (of any of the diagnostics) at the time they occur. An unexpected nonmaskable interrupt could originate at one of several locations, such as the parity board. Output for this type of unexpected error indicates the origin of the error and has the following format:

Unexpected NMI, PC=x, RPS=x
GSR=x BSR0=X BSR1=x
interrupt from level d, PC=x

RPS=x GSR=x
BSR0=x BSR1=x

For a definition and discussion of the registers indicated above, refer to the Series 6300 or 6350 Technical Manual.

Miscellaneous Unexpected Interrupts

All unexpected interrupts that are not NMIs or bus errors represent the third category of unexpected errors. For example, Subtest 24 of the disk test checks for stray interrupts.

Output for this type of unexpected error has the following format:

Unexpected interrupt from level d, PC=x, RPS=x, GSR=x, BSRO=x, BSR =y

Appendix A: Test Sequences, Test Sequences with Multiple Tests, and Two Letter Command Toggles

Series 6300/6350 test sequences are predefined combinations of tests and subtests. The Series 6300/6350 diagnostic test sequences include three sequences that run multiple tests and subtests. This appendix lists the available test sequences, including three sequences that contain multiple tests. It also lists the complete set of two letter command toggles.

List of Test Sequences

d	Default test sequence
s	Complete system test sequence
v	Functional Verification test sequence *CAUTION*THIS TEST WRITES ON DISCS*
a	Map RAM test
b	Trap to debugger
c	Clock tests
e	Page protection tests
f	Page fault tests
k	RS-422 tests
l	Line Printer tests
m	Memory read, write and refresh tests
p	Page map tests
r	Parity tests
u	User I/O error test
o	Floppy disk test
h	RS-232 (8274) test
y	WD1010 Drive 1 Disk test
w	WD1010 Drive 0 Disk test
n	Ethernet local area network test
i	System installation sequence
t	Quarter-Inch cartridge tape test
z	FCC test

NOTE: Tests d,s,v,k require two systems to run
Tests d,s,v,h require a RS-232 Loopback Plug
Tests b,i,z are not supported by Motorola

Test Sequences Including Multiple Tests

Default Test Sequence (d)

The following tests execute in the default test sequence (d):

1. Memory Read, Write and Refresh test
2. Map RAM test
3. Parity test
4. Map Translation test
5. Page Fault test
6. User I/O Error test
7. Clock test
8. Page Protection test
9. Line Printer test
10. RS-232-C (8274) test
11. Fast Communication Port test

Functional Verification Test Sequence (v)

*** CAUTION - THIS TEST WRITES ON READY DISCS ***

The functional verification test sequence (v) executes all tests included in the d test sequence (see above) except the fast communication port test. It also includes subtests 3 and 5 of the disk test. The v test sequence executes with disk ignore mode enabled with default values so the operator does not have to be present to press the RETURN key to continue the tests.

Complete System Test Sequence (s)

The system verification test sequence (s) requires two systems to execute. In addition to all tests included in the d test sequence (see above), this test sequence executes the disk test. The s test sequence executes with disk ignore mode enable and with default values so the operator does not have to be present to press the RETURN key to continue the test.

List of Two Letter Command Toggles

- PM Toggles Page mode
- PE Toggles Parity enable
- LE Toggles Line Printer Echo (hard copy)
- RC Either toggles through selected disk repeat states or a numeric parameter may be given to specify the repeat count.
- RE Reboots the system
- DI Toggles ignoring inoperable disks
- MM Toggles manufacturing mode
- ST Toggles stringent disk mode

Letter commands may be entered in upper or lower case.

Appendix B: Output for Default Test Sequence (d)

This appendix provides input and output for the default test sequence (d), which includes the following tests:

1. Memory read, write and refresh test
2. Map RAM test
3. Parity test
4. Map translation test
5. Page fault test
6. User I/O error test
7. Clock test
8. Line printer test
9. RS-232-C (8274) test
10. Fast communication port test

The following is the output of test sequence (d):

```
command> d
```

```
MEMORY TEST
MEMORY SUBTEST 1
MEMORY SUBTEST 2
MEMORY SUBTEST 3
MEMORY SUBTEST 4
MEMORY SUBTEST 5
MEMORY SUBTEST 6
MEMORY SUBTEST 7
MEMORY SUBTEST 8
MEMORY SUBTEST 9
MEMORY SUBTEST 10
MEMORY SUBTEST 11
MEMORY SUBTEST 12
MAP RAM TEST
MAP RAM SUBTEST 1
MAP RAM SUBTEST 2
MAP RAM SUBTEST 3
MAP RAM SUBTEST 4
MAP RAM SUBTEST 5
MAP RAM SUBTEST 6
PARITY TEST
```

PARITY TEST - SUBTEST 1 WRITE/READ TEST
Reached Address 50000
Reached Address 60000
Reached Address 70000
PARITY TEST - SUBTEST 2 EXECUTION TEST PARITY TEST -
SUBTEST 3 WRITE/READ TEST
Reached Address 50000
Reached Address 60000
Reached Address 70000

MAP TRANSLATION TEST
MAP TRANSLATION SUBTEST 1
MAP TRANSLATION SUBTEST 2
PAGE FAULT TEST
PAGE FAULT SUBTEST 1, Read/Write test
PAGE FAULT TEST
PAGE FAULT SUBTEST 2, Execution test
USER I/O ERROR TEST
USER I/O ERROR SUBTEST 1
USER I/O ERROR SUBTEST 2
CLOCK TEST
Subtest 1 - Timer 0 TEST

Subtest 2 - Timer 1/Counter 2 TEST

9 8 7 6 5 4 3 2 1 0

Subtest 3 - Timer 0/8259 TEST
8274 TEST
(Subtest 1) Test 8274 Control options.
8274 TEST
(Subtest 2) Data Transfer test.
8274 TEST
(Subtest 3) Error Condition test.
FAST COMMUNICATION PORT TEST.

Appendix C: Recommended Test Sequence

This appendix recommends a test sequence for initial testing of the Series 6300/6350 computer. This sequence is as follows:

1. Enter the following command sequence, which will run these tests:

```
command> m;a;r;p;f;u;c;e  
*Optional ;h
```

1. Memory read, write and refresh test
 2. Map RAM test
 3. Parity test
 4. Page map test
 5. Page fault test
 6. User I/O error test
 7. Clock test
 8. Page protection test (1/2 Mbyte kernel)
 9. Line printer test (optional)
 10. RS-232-C (8274) test (using the plug described in the special hardware requirements subsection in Chapter 1) (optional)
2. Subtests 1, 5, 9, 23 and 24 of the disk tests for both the hard and floppy disk drives (tests 6, 7 and 8).

NOTE: Subtest 23 destroys data on disc. Omit if customer's data is already loaded.

3. Line printer test (1), using a line printer connected to the parallel port (if applicable).

Appendix D: Using the TM6000 Programmable Terminals' RS-232-C Emulation Mode to Run Diagnostics

This appendix explains how to use RS-232-C emulation in the TM6000 Programmable Terminal's or TM7000 Graphics Terminal boot ROM version 1.0 and 2.0, to execute the diagnostics and describes some input considerations regarding this minimal implementation.

How to Enter RS-232-C Emulation Mode

Follow these steps to enter RS-232-C emulation mode:

1. Connect the terminal to the Series 6300/6350 computer, channel 0 with an RS-232 cable.
2. Depress the space bar and power on the terminal at the same time. The following menu appears:

B,C,E,F,M,R,S,T:
3. Type E. The terminal enters emulation mode.
4. Boot the diagnostics. After loading, the diagnostics program identifies itself. Program execution can begin.

Some Input Considerations for Boot ROM Version One

The following are some input considerations for using RS-232-C emulation mode when your TM6000 Programmable Terminal or TM7000 Graphics Terminal is equipped with boot ROM Version 1. These are as follows:

- o Do not use the SHIFT, LOCK, CODE or BACKSPACE keys.
- o Do not use the function, control, or cursor control keys.
- o Do not try to effect Transmit On/Off since this option is not available for boot ROM Version 1.
- o The numeric key pad generates only the shifted punctuation characters.

The diagnostics can be run with the restricted character set described above. The diagnostic program is case insensitive to alphabetic characters. Nonalphanumeric input that controls the diagnostic is available either in this character set or has the following alternative:

Normal Use	Alternative
:	.
?	/
!	\

Appendix E: Track Error Test Procedure

The algorithm for testing any of the Series 6300/6350 disks is the same. The following is a layout of the algorithm. In the following text, track is defined as having 17 physical sectors of 512 bytes each and N is initially defined as 10, for subtests 3 and 23 of the disk test (tests 6, 7 and 8).

Test each track on the disk, starting at cylinder 0, track 3, sector 0.

1. Write the track.
2. Read the track.
3. Compare written vs. read data for the track.
4. Check-Read from start to finish.

If an error happens at any given step, the following is executed:

1. Read each sector N times.
2. If all Reads pass, check for SOFT error by doing for N times:
 - a. Write the sector
 - b. Read the sector N times
 - c. If ANY of these operations fail, flag the sector as a defect.
3. If 1 through N-1 reads fail, flag the sector as a defect.
4. If the read fail N times, check for a HARD error by doing for N times:
 - a. Write the sector
 - b. Read the sector N times
 - c. If none of the operations fail, flag the track as having a HARD error.
 - d. If ANY of the operations fail, flag the sector as having a defect.
5. If all sectors pass without error, the track is flagged as having a SOFT error.