NOTE TO USER

FOR

SADIE VERSION 3.5

Document Number: Ø3-Ø244-Ø5

Zilog, Inc.

October, 1984

1.1. INTRODUCTION

This document provides an overview of the Stand-Alone Diagnostic Interactive Executive (SADIE) 3.5 release and the supporting documentation.

SADIE is intended for use by qualified service personnel with adequate technical knowledge and training on the theory of operation of the System 8000 and major components.

2.1. DOCUMENTATION

The documentation package for SADIE 3.5 consists of the following:

SADIE Note To User, Version 3.5 (03-0244-05)
SADIE Reference Manual (03-3264-02)
SADIE Reference Manual 3.5 Update Package (U3-3264-A2)
SADIE Quick Reference Guide (03-3274-01)

The Update Package consists of changed pages that, when incorporated into the existing SADIE Reference Manual, describe the SADIE 3.5 release.

3.1. DESCRIPTION OF SOFTWARE RELEASE

SADIE 3.5 supports the High Performance Central Processing Unit (HPCPU) based systems and all earlier versions.

Refer to Apppendix A in the System 8000 SADIE Reference Manual for a complete list of the SADIE diagnostics.

4.1. CHANGES FROM PREVIOUS RELEASE

Three tests have been added since SADIE 3.4 that check the HPCPU board which are:

CIOTST -- HPCPU on-board CIO test

SCCTST -- HPCPU on-board SCC test

CACHETST -- HPCPU on-board CACHE Memory test

The test sequence has been changed to follow a more logical order of diagnostic groupings for the user's convenience.

SIOMODEM, SIOTEST, CENT.PRT, and DP.PRT tests can support up to four SSB boards.

When the CPU board type affects a test, the program checks for and announces the existence of an HPCPU board. SIOMODEM and SIOTEST menus, for example, offer different choices depending on the type of CPU board in use.

5.1. SYSTEM REQUIREMENTS

SCCTST, CACHETST, and CIOTEST must have an HPCPU board installed.

SCCTST and ICPTST3 require Zilog part number 59-Ø327 Revision B cable assembly. Contact Zilog Field Service personnel for availability.

SIOMODEM, ICPTST2, and ICPTST3 require the Zilog part number 59-Ø293 null modem cable assembly. Contact Zilog Field Service personnel for availability.

CPU board and SSB board jumper changes are necessary for CENT.PRT and DP.PRT test execution. Refer to CENT/DP.PRT in the SADIE Reference Manual for these changes.

6.1. INSTALLATION

The following subsections provide a SADIE materials checklist and initialization instructions.

6.1.1. Materials Checklist

Cartridge Tape, SADIE 3.5 Release, 14-ØØØ9-Ø9
SADIE Note To User, Version 3.5, Ø3-Ø244-Ø5

6.1.2. Installation Instructions

To initialize SADIE, follow these steps:

1. Ensure that the System Administrator has taken the system down and already backed up all files before proceeding.

2. Insert the cartridge tape into the cartridge tape drive.

3. Press RESET.

4. Enter T<cr>. This command executes System Power-Up Diagnostics (SPUD) in the prom monitor on the (HP)CPU board. If no errors are observed, proceed to step 5, otherwise investigate and correct the error condition before proceeding.

5. Enter Z T<cr>. A command level menu is now displayed. (Refer to the SADIE Reference Manual for further information and instructions.)

7.1. KNOWN BUGS AND LIMITATIONS

CACHETST cannot be performed without an HPCPU jumper change. Some early versions of the board do not contain the required jumper selection, and CACHETST **cannot** be performed on such boards, (PCB fabrication, revision 2 or older).

CENT.PRT and DP.PRT cannot detect the presence of an SSB board in the system, and will appear to execute these tests without errors even though no SSB board is installed for the printer port under test.

When using SADIE "WDCFMT" or "WDCMON" to format disks with WDC firmware Version 7.1, ignore the sector numbers in the bad sector display. Version 7.1 uses track sparing instead of sector sparing, therefore, only the cylinder and head numbers are relevant.

In FPPTST, the program does not generate all possible numbers to check the instruction "Fremstep".

MTCMON is not operational at this time.

DOCUMENT CHANGE NOTICE

CHANGE INFORMATION

MANUAL TITLE System 8000 SADIE Reference Manual

PUBLICATION NUMBER 03-3264-02 **ISSUE DATE** 7-84

OR 03-3264-01 with Update Packages U3-3264-A1 and U3-3264-B1

DCN NUMBER U3-3264-A2 **DATE ISSUED** 9/4/84

This document Change Notice (DCN) contains instructions for changes made to this manual subsequent to the latest revision. The affected manual title, publication number, and document change notice number, are identified.

The DCN statement clearly defines the pages affected and, as required, the purpose of the change. The type of change may be specified as "add", "delete" or "replace". The attached change pages will remain in effect for subsequent releases unless specifically amended by another DCN or superseded by a publication reprint. Each change page is marked with the issue date at the bottom of the page so that it can be clearly identified as such after it is integrated into the manual.

Retain the Revision Record behind the manual's cover page to maintain a record of changes.

DESCRIPTION OF CHANGES

The changes described herein reflect SADIE version 3.5. Three new tests are added to support the HPCPU board, and eleven old tests are to be replaced with changed tests. ICPTST4 will become a separate document and is replaced with a single page of explanation. The title page, preface and front matter of section 2 are replaced to support the new documentation. The table of contents is amended to include four appendices, which are added for convenience.

INSTRUCTIONS

Refer to the revision record and insert and replace tests as indicated.

REVISION RECORD

DCN NUMBER	DATE	RELEASE	TYPE CHANGE	SHEETS AFFECTED
U3-3264-A2	10-15-84	3.5	Replace	Title Page
U3-3264-A2	10-15-84	3.5	Replace	Preface - iii-iv
U3-3264-A2	10-15-84	3.5	Add	Table of Contents Page vi
U3-3264-A2	10-15-84	3.5	Replace	Section 2, pages 2-1 - 2-4
U3-3264-A2	10-15-84	3.5	Add	CACHETST after Sect.2, page 2-4
U3-3264-A2	10-15-84	3.5	Replace	CENT/DP.PRT
U3-3264-A2	10-15-84	3.5	Add	CIOTST after CENT/DP.PRT
U3-3264-A2	10-15-84	3.5	Replace	ICPTST3
U3-3264-A2	10-15-84	3.5	Replace	ICPTST4
U3-3264-A2	10-15-84	3.5	Replace	MDCCRC
U3-3264-A2	10-15-84	3.5	Replace	MDCFMT
U3-3264-A2	10-15-84	3.5	Replace	MDCMEDIA
U3-3264-A2	10-15-84	3.5	Replace	MDCMON
U3-3264-A2	10-15-84	3.5	Replace	MDCTEST
U3-3264-A2	10-15-84	3.5	Replace	MMUTST
U3-3264-A2	10-15-84	3.5	Add	SCCTST after MTCOM
U3-3264-A2	10-15-84	3.5	Replace	SIOMODEM
U3-3264-A2	10-15-84	3.5	Replace	SIOTEST
U3-3264-A2	10-15-84	3.5	Add	Appendices A-D after WDCTEST

Address all comments concerning this publication to Zilog or use the enclosed reader comment card located in the back of this publication.

SYSTEM 8ØØØ SADIE REFERENCE MANUAL
SADIE Release 3.5

10/25/84

Preface

The System 8000 SADIE Reference Manual describes the organization, operation, and test functions of the Stand-Alone Diagnostic Interactive Executive (SADIE) diagnostic tape library.

NOTE

The manual is addressed to field engineers and service personnel and supercedes any SADIE documentation contained in the System 8000 Hardware Reference Manuals.

The manual is organized in this manner:

Section 1 -- Introduction to SADIE Documentation

Section 2 -- SADIE Tests

Appendices A through D

Section 1 explains the purpose, organization, and operation of the SADIE diagnostic tape, and the various command level test functions and displays.

Section 2 is an alphabetical library of the SADIE diagnostic tests.

Appendix A provides an alpha-numeric cross reference of SADIE tests.

Appendix B defines mWDC packet commands and tape controller status bits for use with MDCMON and TCUMON tests, respectively.

Appendix C provides lap summary content information for disk controller tests.

Appendix D contains two SPUD error lists. The first list applies to systems using a CPU board other than the HPCPU. The second list applies to systems using an HPCPU board with Monitor firmware, Version 10.0 and above.

This manual and the related manuals listed below provide technical documentation for the System 8000.

Title	Zilog Part Number
Hardware Reference Manual, Models 21/31, 21 Plus, 31 Plus	03-3237
Maintenance Manual, Models 22/32	03-3281 *
User Guide, Models 22/32	03-3286
Hardware Reference Manual, Models 11/11 Plus	03-3227
ZEUS Reference Manual	03-3255
ZEUS Utilities Manual	03-3250
ZEUS Languages/Programming Tools Manual	03-3249
ZEUS Administrator Manual	03-3246
UNIX™ A Quick Reference Guide to Zilog's Enhanced Unix System	03-3269
Zilog Components Data Book	00-2034
Hardware Reference Manual, Winchester Disk Controller	03-3203
Hardware Reference Manual, Nine-Track Magnetic Tape Controller	03-3262
Subsystem Operation and Maintenance Manual, Nine-Track Tape	03-3253
Hardware Subsystem Manual, 5 1/4" Drive	03-3289
Hardware Reference Manual, Central Processing Unit	03-3200
Hardware Subsystem Manual, High Performance Central Processing Unit (HPCPU)	03-0315
Hardware Reference Manual, Secondary Serial Board	03-3201
SADIE Quick Reference Card	03-3274

* Scheduled for future release

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Table of Contents

SECTION 2
SADIE TESTS

2.1. Introduction

This section describes the System 8000 tests that appear on the SADIE test tape. All tests listed can apply to all Models of the system, with the following exceptions:

All tests prefixed by "MDC" apply only to systems with 5-1/4 inch disk drives. Tests beginning with "WDC" apply to systems with 8 inch disk drives and tests beginning with "SMD" apply to systems with 14 inch disk drives.

CACHETST, CIOTST, and SCCTST are designed solely for systems using an HPCPU board. ICPTST4, for Exxon Office Systems use only, is not documented here.

The test name prefix is associated with a sub-system controller, a printed circuit board, or board component. The test name suffix defines test function. For example:

```
MDCMON  = mini-Winchester Disk Controller Monitor
MDCFMT  = mini-Winchester Disk Controller Formatting
SCCTST  = Serial Communications Controller Test
TCOM    = Tape Command Exerciser
SMDCRC  = Storage Module Device Read Error Check
MTCOM   = Mag-Tape Controller Command Exerciser
FPPMON  = Floating Point Processor Board Set Monitor
```

2.2. SADIE Monitor Diagnostic Tests

The SADIE monitor diagnostics are interactive tests designed to allow the user full access and control of the subsystem for System 8000 troubleshooting. All SADIE tests with the "-MON" suffix (i.e., WDCMON, TCUMON) are similar in structure and user interface. Some commands are shared by all SADIE monitors, while others are unique to each monitor type.

Most commands may be abbreviated to the first group of characters that uniquely defines the command during user interaction. For example, "DISPLAY" may be shortened to "DISP". Some commands have special abbreviations for convenience, such as "RD" for "READ", in MDCMON and SMDMON.

Monitor commands are always entered in UPPER CASE.

Command parameters must be entered after the command and on the same line, separated from the command and other parameters by one or more blanks.

Most commands have default parameters that are described in the individual monitor documentation.

Parameters are interpreted as decimal unless followed by an "H".

EXAMPLE:

a. 256 is interpreted as 256 decimal.
b. 100H is interpreted as 100 hexadecimal, which is 256 decimal.

NOTE

The following examples use MDCMON commands.

A simple command is defined as a command name followed by zero or more parameters.

EXAMPLE: Simple Commands

a. EI
b. SU 1
c. RD 1 0 5 200
d. WR 2 0 1 200

A complex command is one of the following:

a. An optional repeat factor followed by a simple command.

b. An optional repeat factor followed by a parenthesized complex command.

c. A parenthesized complex command followed by any number of parenthesized complex commands.

EXAMPLE: Complex Commands

a. 1Ø RD 1 Ø 5 2ØØ
b. (WR 2 Ø 1 2ØØ)(RD 1 Ø 1 2ØØ)
c. 1Ø((WR 2 Ø 1 2ØØ)(RD 1 Ø 1 2ØØ)(CMP 2 Ø 1 Ø 1)(IBLK 1))

Example c first writes one sector beginning at disk block 2ØØ from memory segment 2, offset Ø.

Then one sector, beginning at disk block 2ØØ, is read into memory segment 1, offset Ø.

The data stored in memory segment 2, offset Ø is then compared with the data read into memory segment 1, offset Ø. The data from one segment only is compared.

Finally, the block number is incremented by 1. The sequence is repeated 1Ø times.

A command line is a simple or complex command followed by a carriage return.

Omitted parameters take on their previous values (or default values if not set explicitly).

```
Example:        Command?
                RD 1 Ø 5 2ØØ
                Command?
                RD
```

The first RD (read) command reads 5 sectors beginning at disk block 2ØØ into memory segment 1, offset Ø. The second RD command does the same thing.

```
Example:        WR 1 Ø 1 2ØØ
                RD 2 Ø 1 2ØØ
                CMP 1 Ø 2 Ø 1
                1ØØ((WR)(RD)(CMP))
```

The first three lines above write a sector from segment 1, read the same sector back into segment 2, then compare the two copies. The fourth line will repeat those three operations one hundred times, using the same parameters.

Some commands will check for boundary conditions and if the bound is exceeded, will display a message to that effect and otherwise ignore the command.

For example, if the current block number is 19999, issuing an "IBLK 1" command for a drive with only 2ØØØØ blocks available (Ø-19999) will result in an error message.

CAUTION

Monitor diagnostics will not protect the user from destroying either data in memory (i.e., segment Ø SADIE or diagnostic code) or on a device (i.e., a disk with the ZEUS operating system on it). Generally, memory segment Ø should never be touched by the user of a monitor diagnostic.

For details of command syntax specific to a particular monitor diagnostic, type the "HELP" command while the diagnostic is invoked.

2.3. List of Diagnostics

The list below represents the order in which SADIE 3.5 tests are documented in the following text. Refer to Appendix A for a numeric list of tests as they are presented on the SADIE menu.

- CACHETST (for HPCPU testing)
- CENT-DP.PRT
- CIOTST (for HPCPU testing)
- ECCTEST
- FPPMON
- FPPTST
- FPPWHET
- ICPTST1
- ICPTST2
- ICPTST3
- ICPTST4 (for Exxon Office Systems only)
- MDCCRC
- MDCFMT
- MDCMEDIA
- MDCMON
- MDCTEST
- MEMTEST
- MMUTST
- MTCMON (not operational at this time)
- MTCOM
- SCCTST (for HPCPU testing)
- SIOMODEM
- SIOTEST
- SMDINTRO (For supplemental information only)
- SMDCRC
- SMDFMT
- SMDMEDIA
- SMDMON
- SMDTEST
- TCOM
- TCUMON
- TEX
- WDCCRC
- WDCFMT
- WDCMEDIA
- WDCMON
- WDCTEST

1.1. CACHETST

The text which follows provides an overview of CACHETST; set up and parameter entry information; a general test sequence flow chart; and error message and lap summary descriptions.

CACHETST performs a thorough test of the HPCPU board cache memory.

Up to five tests are selected during parameter entry, and execute in order of test number for each selected bank. The test sequence is repeated the number of times specified during SADIE #REPS entry, and ends with a lap summary.

Four parameter entry options allow:

- Selection of cache bank to be tested
- Cross checking between both cache banks during tests 3 and 4
- Creation of a test window

A brief description of each test follows:

(1) Test 1 checks the eight high order bits of each tag register in the bank currently under test. Test time: ≈ 5 seconds per bank

(2) Test 2 tests individual tag register address lines from the CPU side of the cache. Test time: ≈ 11.5 minutes per bank

(3) Test 3 checks individual tag register read/write updating from the Ziloq Bus Interface (ZBI) side of the cache. Test time: ≈ 24 minutes per bank (without cross-checking)

(4) Test 4 checks updating function for the selected tag bank, referencing odd segments for data due to even/odd cache segment mapping described in Subsection 1.2. Test time: ≈ 5 seconds per bank (without cross-checking)

(5) Test 5 checks cache memory, slot (4 bytes) by slot. Test 5 uses a 16K main memory block separate from the other memory locations to access the slot under test.

This method checks the four tag register low order bits that are inaccessible during tests 1 through 4. Test time: ≈ 7Ø minutes per bank

The five tests will run in sequence unless parameters 3 and 4 (Subsection 1.3) are set to create a shorter sequence. If, for example:

Parameter 3 = 2 Parameter 4 = 3

Only tests two and three will be executed, in that order. To run one test only, enter the selected test number for both parameter 3 and 4.

Test three and test five perform extensive register and memory tests and therefore require allocation of a large block of test time. These tests could be entered on a test list (via parameters 3 and 4) and executed at the user's convenience, without user interaction.

1.2. Set Up

To ensure proper test execution, the HPCPU board must be jumpered to map out even memory segments so that CACHETST can separate the code and data spaces. Refer to the System 8000 Hardware Subsystem HPCPU Manual for additional information on cache memory mapping.

NOTE

The jumper selection described below does not exist on some early versions of the HPCPU board. DO NOT ATTEMPT TO EXECUTE THIS TEST IF JUMPER SELECTIONS E13-E14 and E14-E15 ARE NOT PRESENT. Execution of CACHETST on such boards will result in error message displays. The required jumper selection is found on HPCPU boards marked Revision 3 and above on the solder side.

Prior to running CACHETST, make the following jumper change:

Remove jumper E13-E14
Install jumper E14-E15

NOTE

For proper HPCPU performance, the jumper installed at E14-E15 must be removed and restored to its original E13-E14 position upon test completion.

If a parity memory board is in use, ensure that the fabrication part number is 10-0304-XX, regardless of core memory size. The 10-0217-XX parity memory board does not allow cache circuitry to read a 32-bit data word, and cannot be used with an HPCPU board that has cache enabled.

1.3. Parameter Entry

This test uses standard SADIE parameter entry prompts described under "SADIE" in this manual.

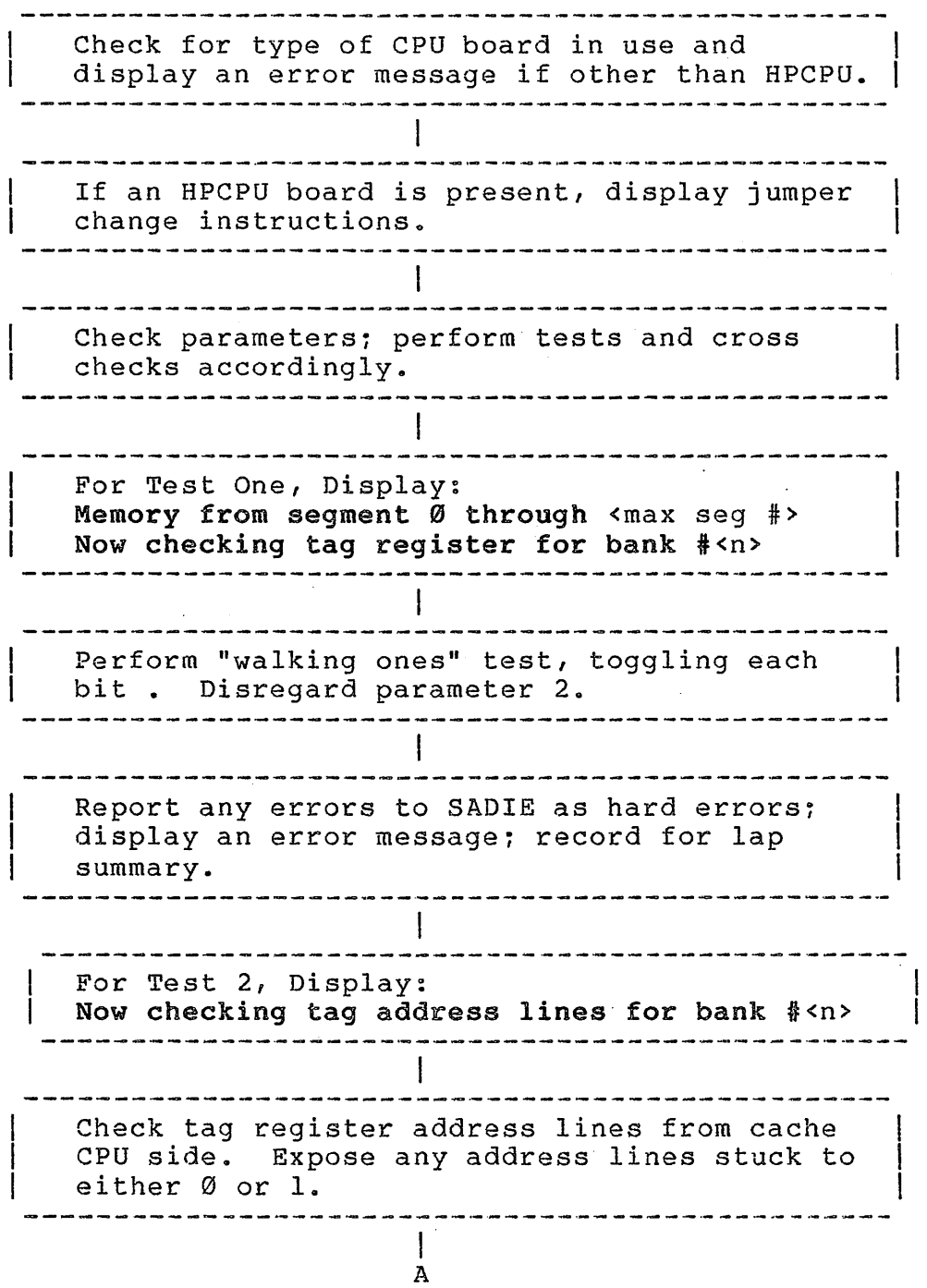
After CACHETST selection from the SADIE test list menu, the program prompts for parameter entry and number of repetitions desired.

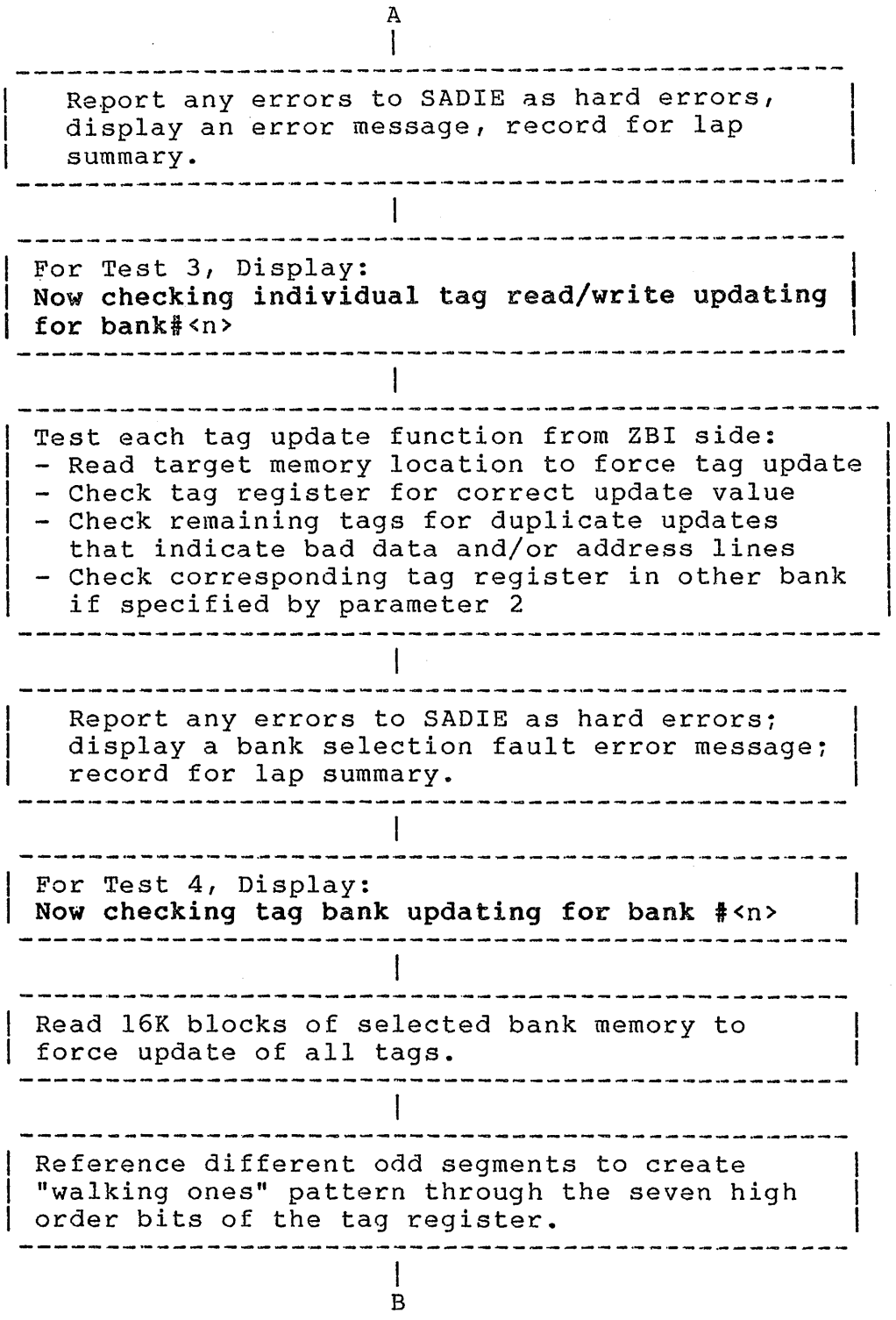
Parameters allow the following test modifications:

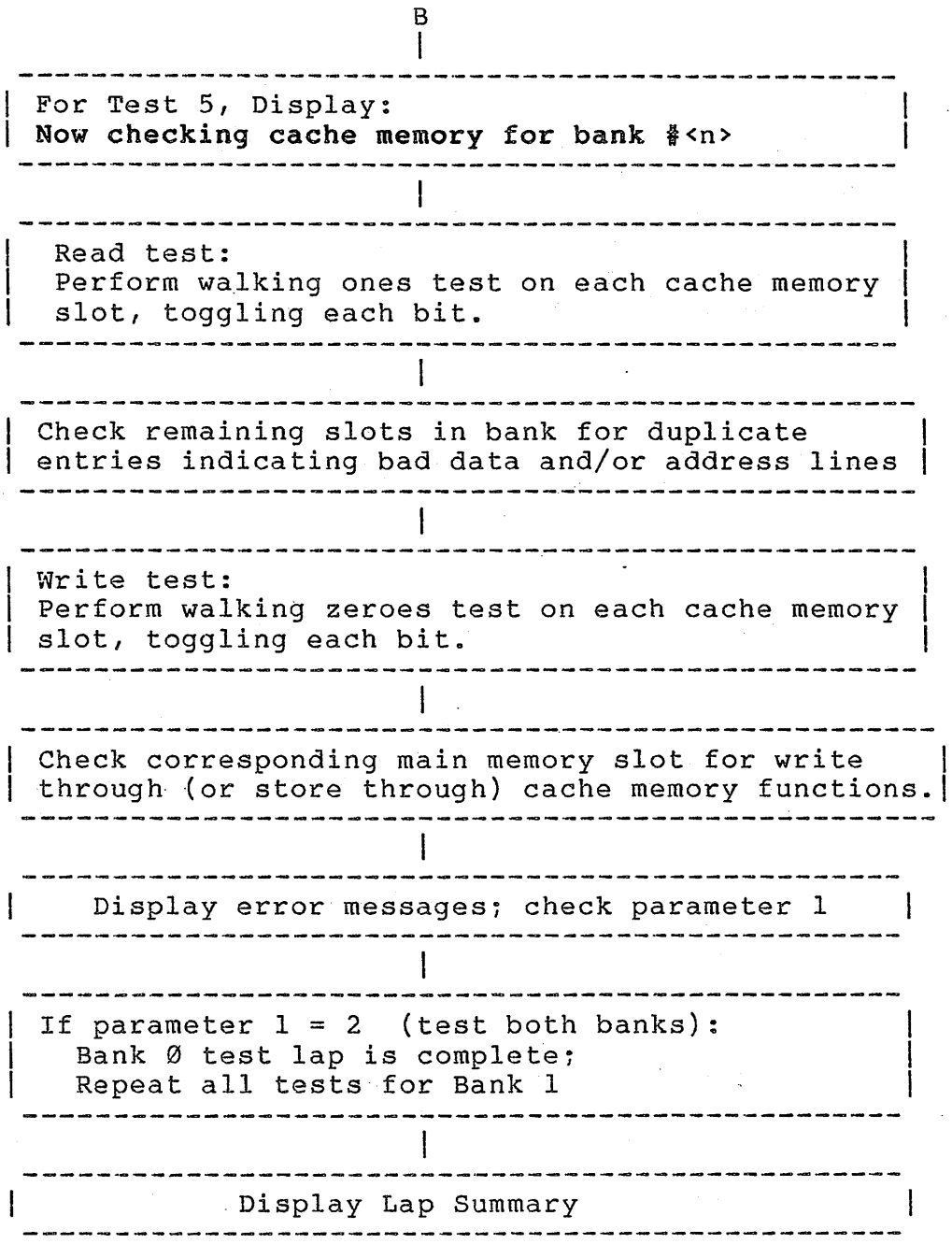
Parameter	Purpose
1	Selects number of cache bank to be tested. 0 = Bank 0 1 = Bank 1 2 = Both banks Default: bank=2
2	Flag to cross check between both cache banks. 0 = Disables cross checking 1 = Checks bank 1 for abnormal effects while testing bank 0, and vice versa Default: xcheck=1
3	Select starting test number. Use with parameter 4 to create a test window. Default: Start # = 1
4	Select ending test number. Use with parameter 3 to create a test window. Default: End # = 5

1.4. Test Sequence

The test sequence flowcharted below assumes that all five tests are running.




A
Report any errors to SADIE as hard errors, display an error message, record for lap summary.
For Test 3, Display:
Now checking individual tag read/write updating for bank#<n>
Test each tag update function from ZBI side:
- Read target memory location to force tag update
- Check tag register for correct update value
- Check remaining tags for duplicate updates that indicate bad data and/or address lines
- Check corresponding tag register in other bank if specified by parameter 2
Report any errors to SADIE as hard errors; display a bank selection fault error message; record for lap summary.
For Test 4, Display:
Now checking tag bank updating for bank #<n>
Read 16K blocks of selected bank memory to force update of all tags.
Reference different odd segments to create "walking ones" pattern through the seven high order bits of the tag register.
B


B
For Test 5, Display:
Now checking cache memory for bank #<n>
Read test:
Perform walking ones test on each cache memory slot, toggling each bit.
Check remaining slots in bank for duplicate entries indicating bad data and/or address lines
Write test:
Perform walking zeroes test on each cache memory slot, toggling each bit.
Check corresponding main memory slot for write through (or store through) cache memory functions.
Display error messages; check parameter 1
If parameter 1 = 2 (test both banks):
Bank Ø test lap is complete;
Repeat all tests for Bank 1
Display Lap Summary

1.5. Error Messages

This subsection lists error messages displayed when CACHETST detects the referenced fault. Variable values are shown enclosed in < > symbols. Boldface text represents duplication of the actual display.

Error description abbreviations:

TB.....Tag Bank
CB.....Cache Bank
.....number
act.....actual value
exp.....expected value
adr.....address of tag register or cache memory
err adr.....error address
targt adr....target address
data.....register contents

CACHETST ERROR LIST

All CACHETST error messages begin with:

ERROR IN: CACHETST

Possible error displays are listed below, followed by a brief explanation of the source of each message.

Not an HPCPU board!!

CACHETST does not recognize the CPU board under test as an HPCPU board, and aborts the test.

No main memory above segment Ø!!

Indicates that CACHETST has detected no main memory above segment zero. The test will abort following this message.

TB<#> bad compare: adr=<####>, exp=<##>, act=<##>

The tag register at the specified address contains the value shown at 'act' rather than the expected value, 'exp.'

TB<#> dupl write: targt adr=<####>, err adr=<####>, data=<##>

A tag register at 'err adr' was erroneously accessed during check of tag register at 'targt adr.' Probable Cause: Bad tag address lines.

TB<#>bad update: adr=<####>, exp=<##>, act=<##>

The tag register at "adr" was updated with the "act" value rather than the expected value "exp."

TB<#> unexpd updt: targt adr=<####>, err adr=<####>, data=<##>

A tag register at "err adr" was erroneously updated instead of or along with the target tag register at "targt adr." The contents of the register at the erroneous address are shown after "data". Probable Cause: Bad tag address lines.

TB<#> wrong bank selected for updt: adr=<####>, data=<##>

The wrong tag bank was updated. Probable Cause: Bank comparator circuitry which performs the selection.

CB<#> bad read: adr=<####>, exp=<########>, act=<########>

The cache memory slot at "adr" contains the value shown as "act," which differs from the expected value, shown as "exp." Probable Cause: The slot did not update correctly during a read from main memory into the location.

CB<#> dupl rd: targt adr=<####>, err adr=<####>, data=<########>

Cache memory slot at "err adr" was erroneously accessed during "targt adr" slot check. The "data" value represents the contents of the slot at "err adr." Probable Cause: Bad cache memory address lines.

CB<#> bad write: adr=<####>, exp=<########>, act=<########>

The cache memory slot at the address "adr" did not update correctly during a write operation to that location. Consequently, the expected value "exp" and actual value, "act," do not match.

CB<#> bad wrt thru: adr=<####>, exp=<########>, act=<########>

The main memory location which corresponds to the cache memory slot at the address "adr" did not update or incorrectly updated to the value, "act." The contents expected at that memory location are shown after "exp."

1.6. Lap Summary

Upon completion of each test series, CACHETST displays the lap number and error counts for each bank. Acronyms used to display the cumulative error tally for each bank are defined in the table below.

Tag Banks

CMP	tag register compare error
RDUP	tag update error during read
UNEXUP	unexpected tag update
DUPWRT	duplicate tag register write error
WRTUP	tag update error during write
BKSEL	bank selection error

Cache Banks

RD	cache memory slot read error
DUPRD	duplicate slot read
WRT	cache memory write error
WRTHRU	slot write through error

Note that an identical lap summary, with the addition of a status line, is available via the SADIE 'PAUSE' menu.

Press the system START button to interrupt the test in progress and access the 'PAUSE' menu. Select 'E' from the menu to view a detailed error log for the current test.

1.1. CENT/DP.PRT

CENT/DP.PRT represents two printer tests:
CENT.PRT (CENTRONICS printer interface test)
DP.PRT (DATA PRODUCTS printer interface test)

CENT.PRT and DP.PRT are interactive tests for the Centronics and Data Products printer interface, respectively. The printer port tests prompt the user to verify that the printer is online.

If the printer is online, the tests send the printable character set to PIO Channel B, the number of times entered during SADIE #REPS parameter entry. To stop the test, the user presses any character on the console keyboard.

These tests do not check for the presence of SSB boards in the system. Therefore, if a printer test is initiated when an SSB board is not mounted for the selected port, the test appears to execute without errors.

PIO interrupts are disabled during these tests. The PIO is polled by the test.

1.2. Set Up

The printer tests require jumper changes relevant to the port selected for test, and to the printer type. The table on page two of this test lists jumper settings for printer ports on the standard CPU board and secondary serial boards (SSB). Note that there is no printer port on the HPCPU board.

1.3 Parameter Entry

Port selection parameters will vary with the type of CPU board in use. The chart which follows defines parameter entry choices.

For the HPCPU:	For the standard CPU:
Port:	Port:
1 = first SSB printer port 2 = second SSB printer port 3 = third SSB printer port 4 = fourth SSB printer port	Ø = CPU board printer port 1 = first SSB printer port 2 = second SSB printer port
No default value	Default = Ø

Note: A 'Ø' port selection entry when an HPCPU is in use will result in an error message display.

Printer type parameters are the same for systems with either CPU board in use:

Type: Ø = Centronics
1 = Data Products

Before running a test, ensure that the proper jumpers are in place:

\ PRINTER PORT \ TYPE	CENTRONICS	DATA PRODUCTS
HPCPU Board	no I/O port for printer	no I/O port for printer
Ordinary CPU Board	E17-E18 E13-E14	E16-E17 E14-E15
SSB 1	E2-E3 E1Ø-E11 * E4-E5 E13-E14 * E7-E8	E1-E2 E1Ø-E11 * E5-E6 E13-E14 * E7-E8
SSB 2	E2-E3 E1Ø-E11 * E4-E5 E13-E14 * E8-E9	E1-E2 E1Ø-E11 * E5-E6 E13-E14 * E8-E9
SSB 3	E2-E3 E11-E12 * E4-E5 E13-E14 * E7-E8	E1-E2 E11-E12 * E5-E6 E13-E14 * E7-E8
SSB 4	E2-E3 E11-E12 * E4-E5 E13-E14 * E8-E9	E1-E2 E11-E12 * E5-E6 E13-E14 * E8-E9

* Applies to SSB board assembly revision level C and above.

1.4. Error Messages

A "Printer Busy Too Long" message is displayed if the proper connection does not exist between the System 8ØØØ and the printer. Ensure that the printer is online and that cable connections are secure.

If a zero is entered as the port selection when an HPCPU board is in use, the program announces:

ILLEGAL printer port is entered

and presents a menu of allowed choices.

1.1. CIOTST

CIOTST is made up of two tests designed for use if HPCPU clock problems are suspected. The test will run only when an HPCPU board is in use. Attempting to run CIOTST without an HPCPU installed in the system will result in an error message described in error message paragraphs.

Test 1 checks HPCPU board Z8536 CIO data paths, and Test 2 checks counter/timer functionality.

One test lap is complete in approximately three seconds.

CIOTST is entirely software controlled and requires no special cable or jumper changes.

1.2. Parameter Entry

When CIOTST is selected from the SADIE test menu, the program announces the test and prompts for #REPS and parameter entry.

Respond to the following prompt with the desired test number, or press the carriage return to accept the default value:

Parameter 1 test_num=<current value>
Enter value in decimal or <CR> to leave value the same

The only parameter entry required for this test chooses which test will run. Test 1 is the default test and will run if Parameter 1 is not changed, or if an invalid test number is entered.

1.3. CIOTST Screens

Following test selection, CIOTST displays:

This is CIOTST - Version <version #>
This is a pair of tests of the HPCPU onboard CIO.

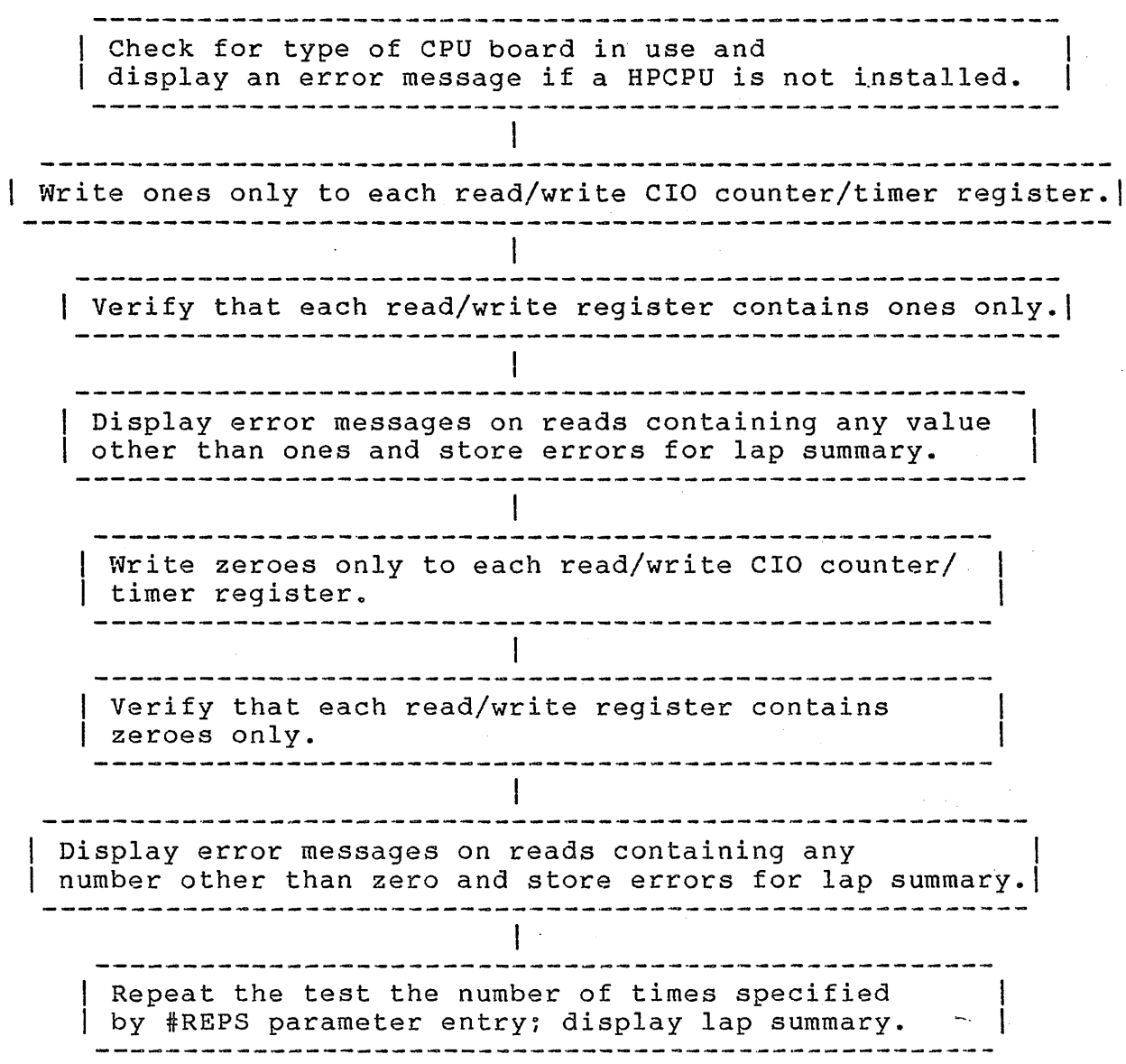
The test is described, and after completion of a test lap, the program summarizes:

<Test type>: **lap:1 Total Errors <#> Errors This Lap<#>**

On completion of the specified number of repetitions, CIOTST adds to the display: **Exiting CIOTST.** The test is finished and the SADIE command level menu returns.

1.4. Test One

Test 1 is a counter/timer register write/read test which functions as follows:



1.4.1. Test One Error Messages

CIOTST first checks for presence of an HPCPU board. If it finds none, the test is aborted and this message displayed:

HOST PROCESSOR IS NOT AN HPCPU - TEST ABORTING

When Test 1 is run, any error will result in this message at the end of the lap:

REGISTER ERROR: REG <reg#> **IS** <value read> **SHOULD BE** <value written>

This message means that the value shown as SHOULD BE was written to the named register and, when read, returned the value displayed after IS.

1.4.2. Test One Lap Summary

The lap summary, displayed at the end of each lap, provides this information for Test 1:

REGISTER TEST: LAP: <lap #> **TOTAL ERRORS:** <#cumulative errors>
ERRORS THIS LAP: <#errors>

If errors occurred during the test lap, the display reads:

> **REG** <register #> **IS** <value read> **SHOULD BE** <value written>

Refer to Paragraph 1.4.1 for interpretation of this error.

1.5. Test Two

Test 2, a counter/timer interrupt test, checks linked counter/timers 1 and 2 for ability to count and interrupt. The Z8536 is set to interrupt 16 msec from the beginning of the count. Failure to do so within 20 msec results in an error message described in Paragraph 1.5.1.

1.5.1. Test Two Error Messages

CIOTST first checks for presence of an HPCPU board. If it finds none, the test is aborted and this message displayed:

HOST PROCESSOR IS NOT AN HPCPU - TEST ABORTING

When Test 2 is running, the Z8536 timers on the HPCPU board are linked and set to interrupt 16 msec from the beginning of the count. If the counters fail to interrupt within 20 msec, the console displays:

COUNTER/TIMER DID NOT INTERRUPT

1.5.2. Test Two Lap Summary

The lap summary for Test 2 provides the following information:

COUNTER/TIMER TEST: LAP: <lap #> **TOTAL ERRORS** <cumulative#>
ERRORS THIS LAP: <#errors this lap>

If an error occurred during the lap, the lap summary includes the message:

COUNTER/TIMER DID NOT INTERRUPT

Refer to Paragraph 1.5.1 on Test 2 error messages for an interpretation of this message.

1.1. ICPTST3

ICPTST3, Phase III of ICP testing, is an interactive exercise monitor for systems which include an Intelligent Communications Processor (ICP) board and an ICP I/O panel.

ICPTST3 is a menu driven, interactive program, and as such requires no parameter entries. It is not intended for use in an automated, comprehensive "test list". The test provides a special detailed error log accessed from the SADIE "PAUSE" mode menu, which identifies faulty integrated circuits.

ICPTST3 interacts with the user similarly to ICPTST2. An ICP board jumper change as well as special cable connections are required to run the test, and are described under the "set-up" subsection for each test.

ICPTST3 provides a choice of asynchronous or bisynchronous loopback tests. Menu choice 'I' invokes the asynchronous test and menu choice 'B' invokes the bisynchronous test. A "Q" selection returns the SADIE executive menu. ICPTST3 menu choices are presented this way:

SELECT OPTION FOR SADIE TEST OF ICP<selected ICP port>:

"I" = INTERNAL LOOP TEST OF SCC CHANNELS
"B" = EXTERNAL LOOP TEST OF THE BISYNCHRONOUS MODEM PORT
"Q" = QUIT

NOTE

When the program references TTY ports Ø-7, for example, it does not refer to the I/O ports associated with the CPU or SSB boards which are labeled TTY. The TTY ports referenced in ICPTST3 prompts are ICP I/O panel ports associated with ICP board SCC channels.

1.2. Internal Loopback Test

The internal loopback test runs an asynchronous local loopback on SCC channels Ø through 7 in the polled mode.

1.2.1. Internal Loopback Test Set Up

Press I to invoke the test, and the program prompts the user to remove all "TTY cables" and make these jumper connections on the ICP board:

```
CONNECT
E12-E13 ..To set ICP ports 6 and 7 to asynchronous mode
E17-E18  \
E2Ø-E22   \......Factory installed - check only
E23-E25   /
E24-E26  /
ENTER "R" WHEN READY
```

Disconnect all ICP port cables for the Internal Loopback Test, make the jumper change, and enter "R". FAILURE TO REMOVE CABLES FROM THE ICP I/O PANEL WILL RESULT IN ERROR MESSAGES.

1.2.2. Internal Loopback Test Sequence

Each lap transfers 1Ø24 characters on each port, then displays:

INTERNAL LOOPBACK TRANSMISSION TEST, <# characters> CHARS TRANSFERRED, <# errors> ERRORS

1.3. Bisynchronous Loopback Test

Command "B" entry invokes the Bisynchronous Loopback Test. This test runs a 96ØØ baud bisynchronous loopback test between the 6th and 7th ICP ports, using the first five ports as external clock sources.

1.3.1. Bisynchronous Loopback Test Set Up

When the program prompts for jumper changes, remove ICP board jumper E12-E13 to set the ICP ports to the synchronous mode, and verify that the factory installed jumpers are in place as for the internal loopback test.

The program then prompts :

Interconnect ports 6 and 7, then connect clock to a port (Ø-5) and enter its port number when ready.

To connect the I/O test cable (Zilog part number 59-Ø327):

Connect P1 to the sixth port, and P2 to the seventh port. Connect P3 to any other ICP I/O port selected as a clock source. Contact a Zilog Field Service Representative concerning cable availability.

Type in the selected clock port number as prompted.

1.3.2. Bisynchronous Loopback Test Sequence

On each lap, 256 characters are transferred in both directions, followed by the prompt:

BISYNCHRONOUS TRANSMISSION TEST, <#characters> CHARS TRANSFERRED EACH WAY, <#errors> ERRORS

1.4. Error Messages

All error messages are preceded by an audible "beep" on the console. Hard errors reported on the console terminate the test and return the ICPTST3 menu.

To view a simple error log at the end of the test, enter "Q" from the ICPTST3 menu, or press the system START button for the Pause menu, and then enter "D" via the console. For information on the detailed error log, refer to paragraph 1.4.1. **DO NOT PRESS START TO INITIATE A PAUSE WHILE ICPTST3 IS RUNNING.**

Error messages are listed below in boldface type, with variable values shown as <#>. Error message interpretation follows.

SCC TRANSMIT BUFFER EMPTY FLAG WAS NOT SET, ICP<#>, TTY<#>

Bit 2 of Read register Ø was not set on the transmit port during the internal loopback transmission test.

SCC RECEIVE CHARACTER AVAILABLE FLAG WAS NOT SET, ICP<#>, TTY<#>

Bit Ø of Read register Ø was not set on the receive port during the internal loopback transmission test.

CTS NOT SEEN BY TTYd, ICP<#>

Bit 5 of Read register Ø (CTS) did not go high when RTS in transmit port was set high during the bisynchronous loopback transmission test.

DCD NOT SEEN BY TTYd, ICP<#>

Bit 3 of Read register Ø (DCD) of the receive port did not go high when transmit port DTR was set high during the bisynchronous loopback transmission test.

RECEIVE SYNCHRONIZATION NOT ACHIEVED BY TTY<#>, ICP<#>

The receive port failed to achieve synchronization within three 5Ø sync character tries.

SLAVE MEMORY PARITY ERROR, STATUS=<##>

A slave memory parity error caused a non-vectored interrupt in the host. STATUS is the hexadecimal value of offending ICP Status register.

SLAVE SOFTWARE NO LONGER RUNNING

The slave CPU has not responded to the host within the maximum allowable time.

SLAVE OUT OF SYNCHRONIZATION WITH HOST, ICP<#>

A non-vectored interrupt occurred in the slave processor with Bit 15 of the non-vectored interrupt flag equal to zero.

INVALID OPTION RECEIVED BY ICP<#>

A non-vectored interrupt occurred in the slave processor with an unexpected value in the non-vectored interrupt flag.

UNKNOWN MESSAGE FROM SLAVE

A non-vectored interrupt occurred in the host processor with an unexpected value in the non-vectored interrupt flag.

1.4.1. Detailed Error Summary

An "E" PAUSE menu choice summons a detailed error log display which provides chip-level ICP board fault isolation when errors have occurred during ICPTST3.

To access the PAUSE menu, press the system START button at a time when no test is in progress, and the program is waiting for user input.

Enter "E" to view this detailed error log for the current test:

INTERNAL LOOPBACK TEST SUMMARY:

TEST	ICP	TTY	RESULT	FAILING TEST PATH
I	<#>	<#>	PASS	
or				
I	<#>	<#>	FAIL	U<#>.....U<#>

BISYNCHRONOUS LOOPBACK TEST SUMMARY:

TEST	ICP	TTY	TTY	RESULT	FAILING TEST PATH
B	<#>	<#>	<#>	PASS	
or					
B	<#>	<#>	<#>	FAIL	U<#>.....U<#>

The program isolates problem ICs in this way:

The ICP board contains 145 chips, which, for fault isolation purposes, form a 145 dimensional vector space.

This vector space contains test paths in which:

i-th component = 1 if Ui is in the test data path

i-th component = Ø if Ui is not in the test data path

ICPTST3 stores IC designations in tables for each test path, which enables board fault isolation to the chip level. ICP port selection(s) determine which path the test will take.

The program displays "PASS" under "RESULTS" when the test is successful, and "FAIL" when the test is unsuccessful.

PASS = the union of all successful test paths
FAIL = the union of all unsuccessful test paths

The set complement of PASS together with FAIL determine a set of components in one or more failing paths. (The set complement of PASS represents a set of ICs which are not in a successful test path, such as those in untested paths.)

Test paths from the input connector P1 to the CPU (U63) are assumed to PASS, and test path reporting is limited to those paths between the CPU and connector P2.

1.5. Lap Summary

The number of characters transferred and the number of errors is displayed after each lap.

1.1 ICPTST4

ICPTST4 is an EXXON OFFICE SYSTEM customer option and, as such, is not documented in this manual.

1.1. MDCCRC

MDCCRC is a nondestructive verification of the data on a 5-1/4" mini-Winchester disk.

1.2. MDCCRC Overview

MDCCRC reads every track on the disk unit specified by parameter 1. Parameter 1 = unit number to be tested (default: unit = Ø)

Before the test begins, MDCCRC issues a software reset command to the mini-Winchester Disk Controller (mWDC). If the mWDC does not respond or fails to pass its self-test, a message is displayed and MDCCRC aborts the test. Otherwise, MDCCRC issues an mWDC firmware identifier read command to determine the firmware version.

Whenever a read error is detected, an error message is displayed and logged. The message identifies the type of error encountered, the start disk address and whether the error was corrected (soft error) or uncorrectable (hard error).

MDCCRC repeats the test the number of times specified by SADIE #REPS entry.

The disk drive heads move to the innermost cylinder at the end of the test.

1.3. Initialization and Self Test Error Messages

MDCCRC displays one of the following error messages whenever an mWDC initialization or self-test error occurs:

MDC NOT RESPONDING DURING INIT!!

> The test initiated a software reset to the host and sent the segment and offset of a packet. The mini Winchester Disk Controller did not indicate self-test start and thereby acknowledge receipt of the reset.

DMA OR RAM ERROR: PACKET NOT CLEARED!!

> The mWDC began self test, thereby acknowledging receipt of reset from the host. However, the packet was not cleared by the mWDC, indicating that there is a Direct Memory Access or memory problem.

MDC TIMED-OUT ON SELF-TEST!!

The mWDC must indicate completion of its self-test within 1.5 minutes of its start. MDCCRC waited the correct amount of time and the mWDC had not yet indicated end of self-test.

MDC SELF-TEST ERROR: PROM CRC!!

The mWDC failed its PROM checksum test during self-test.

MDC SELF-TEST ERROR: RAM ERROR AT <RAM offset>

The mWDC on-board RAM test failed during self-test. The RAM offset where the error occurred is a hexadecimal number.

MDC SELF-TEST ERROR: INVALID COMPLETION CODE: <####H>

The mWDC returned an unrecognizable self-test completion code (shown in hexadecimal) in the packet dispatch word. The host interprets this as a fatal self-test error.

1.4. Read Error Messages

This heading lists possible read error messages displayed during the test as an error occurs.

1.4.1. Error Description Conventions

Conventions used to describe possible read error messages are:

Non-variable messages such as "DISK=" are shown as displayed. Variable information which further defines error types is indicated within "< >" symbols; <pattern read>, for example.

Disk unit and logical block numbers are decimal numbers; addresses, data patterns, and buffer contents are hexadecimal numbers.

Any of the messages listed below may appear in place of <error>:

"Wait Abort"
"Parity"
"Write Fault"
"Seek Not Complete"
"Cylinder Not Found"
"Drive Not Selected"
"Block Not Found"
"Invalid Command"
"No Track Ø Found"
"Drive Not Ready"
"Bad Interrupt"
"Bad Defect Map"
"Illegal Cylinder"
"Burst Error"
"Read Abort"
"Unknown"

1.4.2. Error Descriptions

A brief description of the error message source follows each error listed in the following text.

HARD ERR--<error> DISK=<unit#,blk#> READ 17 SECS

The mWDC returned an uncorrectable error status in Command Word 5 status field upon completion of a packet command.

Example Display:

HARD ERR--Burst Error DISK=Ø,2ØØ READ 17 SECS

This error message indicates an uncorrectable Burst Error (data error) occurred while read ing disk unit Ø, block 2ØØ.

SOFT ERR--<error> DISK=<unit#,blk#> READ 17 SECS

The mWDC returned a correctable error code in the status field of Command Word 5 upon completion of a read packet command.

Example Display:

SOFT ERR--Burst Error DISK=1,1333 READ 17 SECS

This error message indicates a correctable Burst Error (data error) occurred while reading disk unit 1, block 1333.

1.5. Lap Summary

At the end of each lap, the program displays a lap summary of cumulative statistics for all laps completed in the current MDCCRC test run. Appendix C provides details of lap summary content.

1.1. MDCFMT

MDCFMT is a DATA DESTRUCTIVE formatting of the entire mini Winchester Disk. This text first provides a general description of the test, followed by parameter and error message definitions.

1.2. MDCFMT Overview

Before disk formatting begins, MDCFMT issues a software reset command to the mini-Winchester Disk Controller (mWDC).

If the mWDC does not respond or fails to pass its self-test, an error message is displayed and MDCFMT aborts the test. Otherwise, MDCFMT issues an mWDC firmware identifier read command to determine the firmware version.

If the mWDC initialization sequence is successful and the controller board switch settings are set to a drive type that MDCFMT recognizes, no drive parameters need be entered.

If mWDC switch settings indicate that universal drive types 7 exists for the current disk unit, the program prompts for entry of disk drive parameters for the number of heads and physical cylinders, and the reduced-write current cylinder number. To obtain these parameters, refer to the hardware reference manual appropriate for the system under test.

When the program is satisfied with the disk parameters, it displays:

The following physical limitations will be used for unit#<#>, #blocks<##> #cylinders <##> #heads <#> #sectors<##> per track

MDCFMT then formats the disk track by track. The number of repetitions (#REPS) entered in the test line determines the number of times MDCFMT repeats the format. If, however, #REPS is more than one, the defect map does not carry over from one repetition to another. The disk drive heads move to the innermost cylinder at the end of the test.

Disk formatting proceeds automatically unless parameter 4 specifies manual defect map entry, in which case the program prompts for appropriate entries. Manual defect map entry is normally not required (refer to Subsection 1.4 for more information).

For each track, MDCFMT sets up a buffer with sector header information and sends the FMT packet command to the mWDC. Defective blocks are added to a memory resident, temporary

defect map, which can accommodate up to 127 defective blocks depending on the firmware version used on the mWDC.

NOTE

MDCFMT will not tolerate any defective sectors on cylinder Ø, and will abort the formatting if any defects,including soft defects, are found on that cylinder number..

After all tracks are formatted, MDCFMT writes a copy of the defect map on the first block of every track on cylinder Ø. It also displays the defective physical block numbers on the console.

The disk drive parameters (number of cylinders, number of heads, number of blocks/cylinder, etc.) are also written to the second block of each track on cylinder Ø.

1.3. MDCFMT Parameters

The program prompts for these parameter entries. If a value is not entered, the default value is used for the test.

Parameter 1 = The disk unit number to be formatted. (Default: unit = Ø).

Parameter 2 = The number of scans during surface analysis. (Default: scans = 5, max scans number is 7).

Parameter 3 = The informative messages displayed on the console. If zero, only error messages are allowed. (Default: verbose = 1).

Parameter 4 = The defect map entry mode. If non-zero, MDCFMT will find the defective sectors during surface analysis.

If zero, the user must enter the defect map, using the defect table provided by the disk drive manufacturer. (Default: automap = 1).

Parameter 2 determines the quantity of surface analysis to be done.

WHERE:

Scans = Ø	MDCFMT formats only (not usual procedure; does not map defects)
Scans = <n>	MDCFMT performs <n> write-read-and-compare tests in addition to read and compare tests.

Data patterns used are:

1) 6DB6DB6DB6DB
2) B6DB6DB6DB6D
3) DB6DB6DB6DB6
4) FFFF
5) ØØØØ
6) AAAA
7) 5555

The pattern used when Scans = Ø is ØØØØ. This chart illustrates the result of each Parameter 2 choice:

# Scans	Result
1	Format plus write/read 6DB6H
2	Scan 1 plus write/read B6DBH
3	Scan 2 plus write/read DB6DH
4	Scan 3 plus write/read FFFFH
5	Scan 4 plus write/read ØØØØØ
6	Scan 5 plus write/read AAAAH
7	Scan 6 plus write/read 5555H

A non-zero parameter 3 (verbose) entry produces test progress report displays on the console. If parameter 3 is Ø, only error messages will be displayed.

If parameter 4 (automap) is non-zero, MDCFMT will find the defective sectors on the disk drive during surface analysis (scans > Ø). If parameter 4 is zero, the defect map must be manually entered (refer to Subsection 1.4).

MDCFMT checks all the parameters entered for validity. The number of heads and cylinders are checked for values zero through the number of heads minus one, and one through the number of cylinders minus two, respectively.

1.4. Manual Defect Map Entry

CAUTION

Manual entry of the media defect table should have already been performed at the factory, and is normally not required of Zilog Field Service personnel.

To initiate manual defect map entry:

1. Set Parameter 4 to zero to allow manual defect map entry.
2. Enter drive parameters if necessary.
3. Obtain head, cylinder and byte-from-index parameters for the defective drive from the drive manufacturer's defect table and enter when prompted.

If the byte-from-index parameter does not fall within a data section of the track, the program displays:

BYTE-FROM-INDEX IS NOT WITHIN A SECTOR DATA FIELD-- ENTRY NOT ALLOWED

Press <CR> and proceed to the next input following this display.

If the entry is allowed, the program displays:

ADDING PHYSICAL BLOCK# <block#> to DEFECT MAP -- ENTRY# <defect count>

If the entry already exists in the defect map (which can occur when two byte-from-indexes lie within the same sector), the user is informed:

PHYSICAL BLOCK# <block#> ALREADY IN MAP -- <current defect count> ENTRIES

Press <CR> to proceed to the next input after this message.

The message, **HARD ERR-- Too many defects on disk**, indicates that the defect map is full and no more entries are allowed.

Parameters 2 and 4 should be used in conjunction. For example:

Parm 2	Parm 4	Result
Scans = 5	Automap = Ø	additional surface analysis defects added to user entered defect map
Scans = Ø	Automap = Ø	user entered defect map only entered onto disk drive

1.5. Error Messages

MDCFMT displays an error message whenever an mWDC initialization error or self-test error occurs. These error messages are described in the documentation of MDCCRC.

Other error messages are described in the following text. Messages are shown in boldface type, and variable values indicated inside < > symbols.

One of the following error status messages will be displayed in place of <error>:

"Parity"
"Write Fault"
"Seek Not Complete"
"Cylinder Not Found"
"Drive Not Selected"
"Block Not Found"
"Invalid Command"
"No Track Ø Found"
"Drive Not Ready"
"Bad Interrupt"
"Bad Defect Map"
"Illegal Cylinder"
"Burst Error"
"Read Abort"
"Unknown"

HARD ERR--<error> RECALIBRATING DRIVE

Before MDCFMT begins the formatting and after it finishes formatting the last track, it issues a HOME packet command to the mWDC. This message appears when an uncorrectable error status is returned.

SOFT ERR--<error> RECALIBRATING DRIVE

MDCFMT sensed a correctable error status upon completion of a HOME packet command.

HARD ERR--<error> FORMATTING CYL <cylinder #> HEAD <head #>

MDCFMT senses an uncorrectable error status upon completion of a FMT packet command. The decimal numbers identifying the cylinder and head being formatted are given.

SOFT ERR--<error> FORMATTING CYL <cylinder #> HEAD <head #>

MDCFMT senses a correctable error status upon completion of a FMT packet command. The decimal numbers identifying the cylinder and head being formatted are given.

HARD ERR--<error> WRITING-<data pattern>, Cyl Ø, Blk <block#>
HARD ERR--<error> WRITING-<data pattern>, DISK=<unit#,block#>

MDCFMT sensed an uncorrectable error status upon writing a data pattern to the indicated physical block number. The first message appears if the block was on cylinder Ø, and indicates a fatal disk defect.

The second message appears if the block was not on cylinder Ø, which means that the block will be added to the defect map. The data pattern being written is shown in hexadecimal after WRITING.

SOFT ERR--<error> WRITING-<data pattern>, Cyl Ø, Blk <block#>
SOFT ERR--<error> WRITING-<data pattern>, DISK=<unit#,block#>

These messages are similar to the previous messages, but indicate a correctable error status was returned upon completion of the write. If the first message appears, the defect was on cylinder Ø, and it is considered fatal even though it was correctable.

HARD ERR--<error> READING-<data pattern>, Cyl Ø, Blk <block#>
HARD ERR--<error> READING-<data pattern>, DISK=<unit#,block#>

This message appears when MDCFMT senses an uncorrectable error status upon reading a data pattern to physical block number shown.

The first message appears if the block is on cylinder Ø, and it is considered a fatal error. The second message appears if the block is not on cylinder Ø, which means that the block will be added to the defect map.

SOFT ERR--<error> READING-<data pattern>, Cyl Ø, Blk <block#>
SOFT ERR--<error> READING-<data pattern>, DISK-<unit#,block#>

These messages are similar to the previous messages, but indicate a correctable error status was returned upon completion of the read. If the block is on cylinder Ø, it is considered fatal, even though it was correctable.

HARD ERR--COMPARING-<data pattern>, Cyl Ø, Blk <block#>
HARD ERR--COMPARING-<data pattern>, DISK-<unit#, block#>

MDCFMT compared a buffer written to the physical block number shown with another buffer read from the same block, and a mismatch was found. The pattern written is displayed in hexadecimal.

The first message appears if the block was on cylinder Ø, which is considered fatal. The second message appears if the block is not on cylinder Ø, which means that the block will be added to the defect map.

HARD ERR--<error> WRITING MAP ON BLOCK <block#>

MDCFMT was writing a copy of the completed defect map onto the block number indicated, and an uncorrectable error status was returned.

SOFT ERR--<error> WRITING MAP ON BLOCK <block#>

This message is similar to the previous message, but indicates a correctable error status was returned.

HARD ERR--<error> WRITING DRIVE PARMS, BLOCK <block#>

MDCFMT was writing a copy of the drive parameters onto the indicated block, and an uncorrectable error status was returned.

SOFT ERR--<error> WRITING DRIVE PARMS, BLOCK <block#>

This message is similar to the previous message, but indicates a correctable error status was returned.

HARD ERR--Too many defects on disk

More than the maximum number of defective blocks were found during the surface analysis. This is considered a fatal error because the map can hold only a fixed number of entries.

1.6. Lap Summary

A lap summary is displayed at the conclusion of each lap of MDCFMT. The lap summary is a table of statistics that is cumulative for all laps completed so far in the current run of MDCFMT. Lap summary contents are described in Appendix C.

1.1. MDCMEDIA

MDCMEDIA is a DATA-DESTRUCTIVE test of the disk media. This text first provides test parameter descriptions, followed by the test sequence, information on error messages.

1.2. Overview

To exercise the disk, MDCMEDIA performs a write-read or write-read-compare test on each track, dependent on parameter settings. Write pattern choices are listed below under parameter 3.

1.3. Parameters

Parameter 1 = Unit to be tested (default: unit = 1)

Parameter 2 = Compare pattern read with pattern written.

If compare = Ø compare step skipped
If compare = 1 compare step done

(default: compare = 1)

Parameter 3 = Patterns used to test the disk medium.

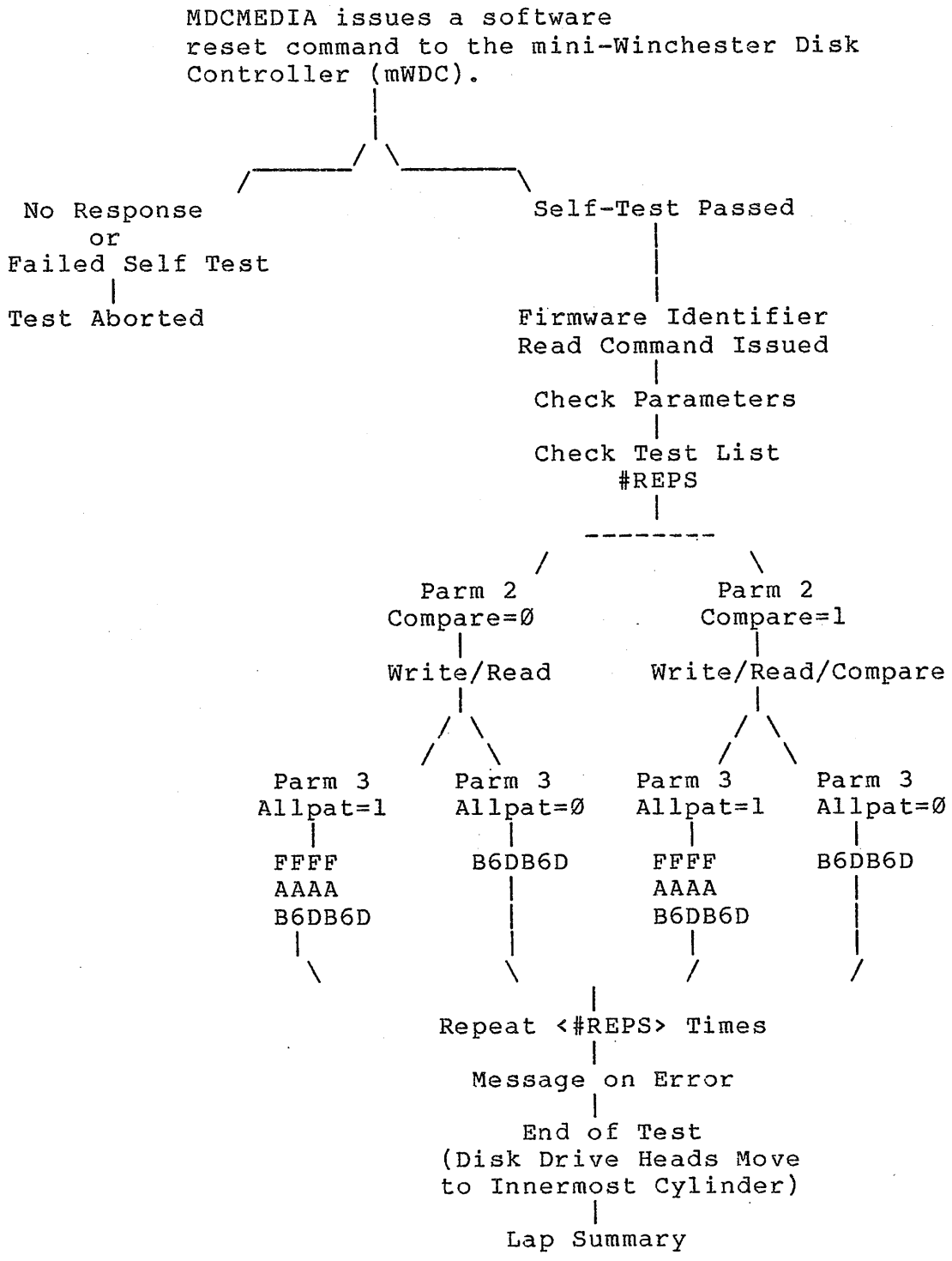
If allpat = Ø only worst-case MFM pattern, "B6DB6DB6DB6D", is used.

If allpat = 1 all patterns used: "FFFF", "AAAA" and "B6DB6DB6DB6D".

(default: allpat = 1)

1.4. Test Sequence

An overview of the test sequence is flowcharted below:



1.5 Error Messages

This heading lists possible error messages displayed as an error occurs, other than initialization and self-test error messages, which are documented under MDCCRC.

Refer to Appendix B for error status code descriptions.

Conventions used to describe possible error messages are:

Non-variable messages such as "DISK=" are shown as displayed. Variable information that further defines error types is indicated within "< >" symbols; <pattern read>, for example.

Disk unit and logical block numbers are decimal numbers; addresses, data patterns, and buffer contents are hexadecimal numbers.

Any of the messages listed below may appear in place of <error>:

"Wait Abort"
"Parity"
"Write Fault"
"Seek Not Complete"
"Cylinder Not Found"
"Drive Not Selected"
"Block Not Found"
"Invalid Command"
"No Track Ø Found"
"Drive Not Ready"
"Bad Interrupt"
"Bad Defect Map"
"Illegal Cylinder"
"Burst Error"
"Read Abort"
"Unknown"

A brief description of the error message source follows each error listed in the following text.

HARD ERR--<error> DISK=<unit#,blk#> WRITE-<pattern written>

The MDC returned an uncorrectable-error code in the status field of Command Word 5 upon completion of a write packet command.

SOFT ERR--<error> DISK=<unit#,blk#> WRITE-<pattern written>

The MDC returned a correctable-error code in the status field of Command Word 5 upon completion of a write packet command.

HARD ERR--<error> DISK=<unit#, blk#> READ-<pattern read>

The MDC returned an uncorrectable-error code in the status field of Command Word 5 upon completion of a read packet command.

SOFT ERR--<error> DISK=<unit#, blk#> READ-<pattern read>

The MDC returned a correctable-error code in the status field of Command Word 5 upon completion of a read packet command.

COMP ERR: DISK=<unit#,blk#> ADDR=<offset> GOOD=<source buffer contents> BAD=<destination buffer contents>

A mismatch was found when a source buffer containing a pattern written to a sector was compared with a destination buffer read from that sector. The data read from the destination buffer is displayed after "BAD".

The address number is the offset in the buffer where the compare error occurred.

1.6 Lap Summary

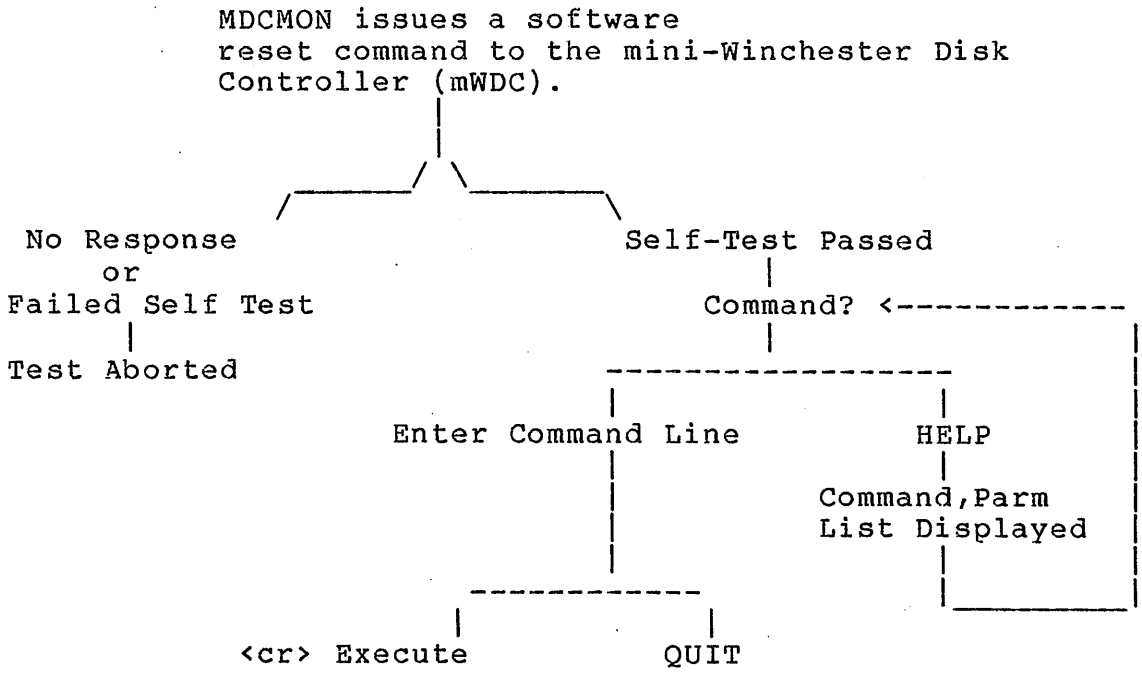
A lap summary is displayed at the conclusion of each MDCMEDIA test lap. The lap summary is a table of statistics which includes errors accumulated during all completed laps of the current test run. Refer to Appendix C for more information on lap summaries.

1.1. MDCMON

MDCMON is a POTENTIALLY DATA DESTRUCTIVE interactive monitor for testing mini-Winchester Disk Controller (mWDC) board function. The user enters command lines via the system console keyboard and thereby controls the mWDC.

1.2. Test Sequence

The flowchart below provides an overview of user interaction with the MDCMON program:



CAUTION

A read into segment Ø will destroy parts of the memory resident SADIE code, the MDCMON code, the SADIE catalog or other information stored there.

1.3. Command Description Conventions

The following conventions apply to MDCMON command descriptions:

1. Basic commands are shown in upper-case letters. Lower case acronyms which describe values to be entered represent optional arguments. The entire command syntax is in boldface type.

Command names may be abbreviated to the shortest string that uniquely defines the command, in which case, default values may replace arguments.

Arguments are shown in the order in which they must be entered.

Example:

```
IBLK  incval
  |      |_____ Sets value by which the block number
  |               increments (optional)
  |
  | If not followed with above argument, increments
    block by last value entered. If no previous
    value exists, block number increments by default 1.
```

2. Some commands are described together for convenience. In these cases, a slash ("/") separates the commands.

   Example:

   a. BMODE / RMODE
   b. SMD/SME

   Each example represents two distinct commands which are related in function.

3. This text may show memory addresses as displayed, with the segment enclosed in greater than and lesser than symbols, and the offset number immediately following. For example, <1>Ø refers to segment 1, offset Ø.

4. MDCMON operates in one of two modes:

Block Mode	Raw Mode
Disk address entries interpreted as block number.	Disk address entries interpreted as cylinder-head-sector.

In this text, arguments for each mode are shown. For example:

```
RD rseg roff blkcnt blk            (block mode)
RD rseg roff blkcnt cyl head sec   (raw mode)
```

MDCMON always maintains the current disk address in both the block and raw representations. If MDCMON is in block mode and the current block number is changed, the current cylinder, head, and sector numbers are also changed.

5. Command arguments remain the same until explicitly changed.

1.4 MDCMON Commands

The following text describes commands used to run MDCMON. Commands are in alphabetical order.

BMODE / RMODE

BMODE sets MDCMON into block mode. Block mode means that all disk address parameters are interpreted as a block number. MDCMON is in block mode, by default.

RMODE sets MDCMON into raw mode. Raw mode means that all disk address parameters are interpreted as cylinder, head, and sector numbers.

Example	Interpretation
BMODE RD 1 Ø 5 2ØØ	Block mode: 2ØØ = block #
RMODE RD 1 Ø 5 4 2 7	Raw mode: 4 = cylinder # 2 = head # 7 = sector #

CEC unitnum clearall / REC unitnum

CEC with no arguments clears error and command statistics for the currently selected disk unit.

If a unit number value (unitnum) is entered, MDCMON clears error and command statistics for that unit number.

A non-zero clear-all value entry clears:

- Error and command counts for specified unit
- Messages for specified unit
- SADIE cumulative error log
- Global MDCMON error counter

The lap count always resets to 1.

REC with no arguments displays the error and command statistic table for the current disk unit.

Enter REC and a unit number to view the error statistics table for a specific unit.

NOTE: The unit number entered does not become the current unit number.

Example Command	Description
SU Ø	Selects unit Ø (long form = SUNIT)
REC 1	Displays error stats for unit 1 (current unit is Ø)
CEC	Clears error counts for unit Ø, the current unit

COMPARE srcseg srcoff destseg destoff count

srcseg - source buffer segment number
srcoff - source buffer offset number
destseg - destination buffer segment number
destoff - destination buffer offset number
count { - sector count in block mode
(#words-per-sector * count)
- word count in raw mode

A compare error message is displayed if a mismatch occurs.

The default source buffer begins at <2>Ø. The default count is 1 block.

Example:

```
BMODE
CMP  2  Ø  1  Ø  5
```

BMODE sets block mode. CMP compares the source buffer at segment 2, offset Ø with the destination buffer at segment 1, offset Ø. The length compared is 5 times the number of bytes in a sector.

```
RMODE
CMP  2  Ø  1  Ø  2ØØH
```

RMODE sets raw mode. CMP compares the first 2ØØ (hex) words of the source buffer at segment 2, offset Ø with the destination buffer at segment 1, offset Ø.

DBLK decvalue

DBLK decrements the current disk block number by decvalue.

If the decrement would cause underflow (block number < Ø), a warning message is issued and the block number remains unchanged.

The block number decrement causes MDCMON to change the cylinder, head, and sector numbers into the equivalent disk address, regardless of whether MDCMON is in block or raw mode.

(See IBLK to increment the current disk block number.)

Example:

```
SBLK  5          Sets block number to 5
DBLK  1          Decrements current block
                 number to 4
```

DINT / EINT

DINT sets MDCMON into polled mode. Subsequent packet commands are issued without the Enable-Interrupt bit set.

EINT sets MDCMON into interrupt mode. Subsequent packet commands are issued with the Enable-Interrupt bit set. Default mode = EINT set.

```
Example                    Description

DINT                       Issues read command
RD  1  Ø  5  2ØØØ          in polled mode.

EINT                       Issues read command
RD  1  Ø  5  2ØØØ          in interrupt mode
```

DISPLAY dseg doff lnth

DISPLAY displays the contents of memory beginning at <dseg>doff for lnth words. Default display buffer begins at <1>Ø. Default length is 1 word.

```
Example                    Description

DISPLAY 1 Ø 1ØØH           Displays 1ØØ (hex) words
                           beginning at segment 1, offset Ø
```

DOPKT opcode cw1 cw2 cw3 cw4 cw5

DOPKT allows the user to issue an arbitrary packet command to the currently selected disk unit. Refer to Appendix B for packet command descriptions.

Opcode is sent in Command Word Ø, along with the Enable-Interrupt bit and/or Sector- Map-Disable bit, depending upon the current state of MDCMON. Command words cw1, cw2, cw3, cw4, and cw5 become the packet-command parameters. MDCMON initializes opcode, cw1, cw2, cw3, cw4 and cw5 to Ø.

Example Command:

DOPKT 1ØH 2ØØØ 6 1 Ø

This syntax issues the packet command 1Ø (hex), a read multisector command, to the mWDC.

Command parameters are: cw1 = 2ØØØ, cw2 = 6, cw3 = 1 and cw4 = Ø.

DPRINT / EPRINT

DPRINT disables MDCMON informative message printing. It does not affect error message printing, which cannot be disabled.

Recommended application: Enter DPRINT before entering command lines with large repeat factors.

EPRINT enables printing of informative messages. When a command is parsed, MDCMON may echo information concerning a command which it will issue to the mWDC.

Default mode = EPRINT

DRDY

DRDY issues a Test Drive Ready packet command to the current unit. If the drive is not ready, an error message is displayed.

FBLK

FBLK fills the current write buffer with the current disk block number in hexadecimal. It fills the buffer with the exact number of words in a sector.

The current write buffer (wseg woff) is filled with 256 words of the current block number in hexadecimal. (Refer to the MDCMON WRITE command for information on setting the "wseg woff" address.)

FILL wseg woff lnth fpat

This command fills the write buffer beginning at <wseg>woff with lnth words of the pattern fpat.

Default parameters are:

wseg = 2, woff = ØØØØH
lnth = 1, fpat = 6db6H

Example Command:

FILL 2 Ø 256 AAAAH

256 words of the pattern "AAAA" (hex) are put into the write buffer beginning at segment 1, offset Ø.

HALT / NOHALT

HALT causes MDCMON to pause and display a message after any uncorrectable error occurs during command execution. The user must then enter a carriage return to resume processing.

NOHALT causes MDCMON to continue processing without pausing when an uncorrectable error is encountered during command execution.

Default mode = NOHALT

HALT and NOHALT are effective on all subsequent commands.

Example Command:

HALT
1ØØ((WR 3 Ø 1 5Ø)(RD 2 Ø 1 5Ø)(CMP 3 Ø 2 Ø 1))

Any hard errors occurring during execution of the command syntax which follows HALT will cause an error display and a pause in the read, write or compare process.

MDCMON then prompts the user to enter a carriage return to resume execution of the command line.

Example Command:

```
NOHALT
1ØØ((WR 3 Ø 1 5Ø)(RD 2 Ø 1 5Ø)(CMP 3 Ø 2 Ø 1))
```

MDCMON will execute the command following nohalt without pausing for hard errors.

HELP

This command causes MDCMON to display the list of available commands. Press the carriage return key to scroll through the list, one screen at a time.

HOME

The HOME packet command is issued to the mWDC to recalibrate the disk drive.

IBLK incval / ICYL incval / IHEAD incval / ISEC incval

IBLK increments the current block number by incval.
ICYL increments the current cylinder number by incval.
IHEAD increments the current head number by incval.
ISEC increments the current sector number by incval.

If no parameter value is entered after IBLK, ICYL, IHEAD, or ISEC, the the block number is incremented by the last value entered.

If no previous incval was entered, the default value of 1 is used.

Whenever the current block number is incremented, the current cylinder, head, and sector numbers are changed to the equivalent disk address; and conversely, whenever the cylinder, head, or sector numbers are changed, the current block number is changed to the equivalent disk address.

MDCMON checks to see if the maximum block number on the current disk unit will be exceeded before executing an increment command. If the maximum will be exceeded, the command does not change the current disk address.

Example Command:

(SBLK 5) (IBLK 1Ø)

This command sets the current block to 5 and increments by 1Ø, resulting in a block number of 15. The current cylinder, head, and sector numbers are changed to the equivalent disk address.

ILC

The Incremental Lap Counter (ILC) maintains a lap counter to simulate running laps. When selected, ILC begins with 1 and increments the lap counter by 1. The table invoked by the REC command displays the lap count.

Example Command	Description
CEC	Resets lap counter to 1
ILC	Increments lap counter to 2

INITMDC

MDCMON performs a software reset of the mWDC.

QUIT

MDCMON quits and returns to SADIE.

RAND rndseg rndoff rblkcnt (block mode)
RAND rndseg rndoff rwords (raw mode)

rndseg - source buffer segment number
rndoff - source buffer offset number
rblkcnt - words per sector * random block count
rwords - random words

MDCMON randomizes the contents of the buffer beginning at <rndseg>rndoff. If in block mode, MDCMON fills the buffer with #words-per-sector * rblkcnt words. If in raw mode, MDCMON fills the buffer with rwords words.

The default random-buffer address is the same as the write-buffer address. The default buffer size is 1 sector, or 256 words.

Example Command:

```
BMODE
RAND  2  Ø  5
```

BMODE sets MDCMON to block mode. The next command syntax fills segment 2, offset Ø with 256 * 5 words of random data.

Example Command:

```
RMODE
RAND  2  Ø  5
```

RMODE sets MDCMON to raw mode. The RAND syntax fills segment 2, offset Ø with 5 words of random data.

RBLK / RCYL / RHEAD / RSEC

RBLK randomizes the current disk block number.
RCYL randomizes the current disk cylinder number.
RHEAD randomizes the current disk head number.
RSEC randomizes the current disk sector number.

These commands result in a random disk address that is within the range of blocks on the disk.

RBLK randomizes the current physical block number which in turn increments or decrements the cylinder/head/sector count. The new block number lies between Ø and the maximum block on the disk.

Conversely, when RCYL, RHEAD or RSEC randomize the current cylinder, head and sector numbers, the physical block number increments or decrements to correspond with the change.

RDDRV

The Read Drive Parameters command is sent to the mWDC.

RDMAP rseg roff

The Read Sector Defect Map packet command is issued to the mWDC, and the read buffer begins at <rseg>roff.

The maximum number of entries in a sector defect map is 45. Each entry is one word.

The entry offset plus the entry is a physical block number where a defect was found by the mWDC during format.
Example Command: RDMAP 1 Ø

READ rseg roff blkcnt blk (block mode)
READ rseg roff blkcnt cyl head sec (raw mode)

This command issues the Read multisector packet command to the mWDC.

The read buffer is at <rseg>roff. The blkcnt sectors are read.

The disk address is either a block number or a cylinder, head, sector address; depending upon whether MDCMON is in block or raw mode.

The default read-buffer begins at <1>Ø. The default block number (and cylinder, head, sector numbers) is Ø.

Note: RD is a special abbreviation of READ.

Example Command:

```
BMODE
RD 1  Ø  6  155
```

BMODE sets MDCMON to block mode. The RD syntax causes a 6 sector read into segment 1, offset Ø, beginning at block 155.

Example Command:

```
RMODE
RD 1  Ø  6  7  Ø  2
```

RMODE sets MDCMON to the raw mode. The RD syntax causes a 6 sector read into segment 1, offset Ø, beginning at cylinder 7, head Ø, sector 2.

SBLKCNT blkcnt / IBLKCNT blkinc

SBLKCNT sets the current block count to blkcnt.
IBLKCNT increments the current block count by blkinc.

Default blkcnt is ØØØ1H, and default blkinc = 1.

Example Command:

```
SBLKCNT  5Ø
SBLK  Ø
1ØØ((WR  3  Ø)(RD  2  Ø)(CMP  3  Ø  2  Ø)(IBLK  1))
```

All the commands above use a block count of 5Ø, because the SBLKCNT command sets it to 5Ø, and no block counts are specified in any of the WR, RD or CMP commands.

Example Command:

```
IBLKCNT 5Ø
1ØØ((WR  3  Ø)(RD  2  Ø)(CMP  3  Ø  2  Ø)(IBLK  1))
```

The block count was set to 5Ø in the first example, and increments by 5Ø in this example, resulting in a block count of 1ØØ for the ensuing WR, RD, and CMP commands.

SBLK blk / SCYL cyl / SHEAD head / SSEC sec

SBLK sets the current block number to blk. SCYL, SHEAD and SSEC set the current cylinder, head, and sector numbers to cyl, head, and sec values, respectively.

MDCMON always changes the block-mode disk address to the equivalent raw-mode address whenever the block number changes. Similarly, it changes the raw-mode disk address to the equivalent block-mode address whenever the cylinder, head, or sector number changes.

Default values for all four commands are the last parameters used for that command or Ø if no parameter has been entered.

Example Commands:

```
SCYL  5
SHEAD   Ø
SSEC 14
SBLK  Ø
```

The SBLK command sets the block number to Ø. It also sets the cylinder, head, and sector numbers to Ø.

SDRIVE

SDRIVE prompts the user for the correct number of physical cylinders and heads, and the reduced write current cylinder number for the current disk unit.

SEEK blk (block mode) **SEEK cyl** (raw mode)

The Seek packet command is issued to the mWDC. SK is a special abbreviation of SEEK.

Example Command: SK 5

If in raw mode, MDCMON requests the mWDC to seek to cylinder 5. In block mode, the mWDC is asked to seek to block 5.

SHIP

SHIP moves the disk drive heads to the shipping/loading zone, which is the innermost cylinder.

SMD / SME

SMD requests MDCMON to issue all subsequent packet commands in Sector-Map-Disable mode. In this mode, the mWDC interprets the block number as a physical block number rather than a logical block number. Use of this command provides the only direct access to physical cylinder Ø.

SME requests MDCMON to issue all subsequent packet commands in Sector-Map-Enable mode. All block numbers in packet commands are interpreted by mWDC as logical block numbers. The mWDC uses the Sector Defect Map to translate the logical block number into the appropriate physical block number.

MDCMON uses SME mode by default.

NOTE

After the disk has been formatted, the drive parameters and defect table reside in Ø and 1, respectively, on all heads in physical cylinder Ø. If SMD mode has been previously entered, commands which invoke random block numbers and do writing could destroy the contents of physical cylinder. Physical cylinder Ø is only vulnerable to write operations invoked in the monitor when SMD mode has been entered.

Example Command:

```
SMD
RD  1  Ø  1  Ø
```

This command reads physical block Ø on the current unit, which is the first sector on cylinder Ø, head Ø.

Example Command:

```
SME
RD
```

This command reads logical block Ø, which is not the same address as physical block Ø, because cylinder Ø is reserved for the Sector Defect Map and for diagnostics.

SMEM maxseg

This command sets the largest memory segment number available to MDCMON. Any commands that increment the read or write segment numbers check against the "maxseg" value for possible overflow.

Example Command:

```
SMEM 15
```

STATUS

MDCMON displays the current status of the current disk unit, including:

1. The unit number
2. The mode, block or raw
3. The current disk address in both block number and cylinder, head, sector representations
4. The drive parameters. Indicates the number of blocks, cylinders, heads and sectors
5. The dispatch word in the packet
6. All five command words in the unit's subpacket
   a. Command Word Ø -- opcode
      + Enable-Interrupt bit
      + Sector-Map-Enable bit
      + Soft-Error bit
   b. Command Word 1 -- Block number
   c. Command Word 2 -- Block (sector) count
   d. Command Word 3 -- Transfer address bits Ø-15 (Offset)
   e. Command Word 4 -- Transfer address bits 16-31 (Segment)
   f. Command Word 5 -- Interrupt vector Command Completion Status

SUNIT unit

This command sets the current unit number. All subsequent packet commands issued to the mWDC are set into the sub-packet for the current unit, and the dispatch word bits for the current unit are set to command-pending.

The default unit number is unit Ø.

Example Command:

```
SUNIT 1
```

WRITE wseg woff blkcnt blk (block mode)
WRITE wseg woff blkcnt cyl head sec (raw mode)

The Write multisector packet command is issued to the mWDC. The write-buffer begins at <wseg>woff and is blkcnt sectors long.

In block mode, "blk" represents a block number.

In raw mode, the syntax "cyl head sec" represents cylinder, head, and sector numbers. WR is a special abbreviation of WRITE.

Example Command:

```
BMODE
WR  1  Ø  1  2ØØ
```

BMODE sets the block mode. The WR syntax writes to block 2ØØ. MDCMON converts the block number into the equivalent cylinder, head, and sector numbers.

Example Command:

```
RMODE
WR  1  Ø  1  2ØØ
```

RMODE sets raw mode. The WR syntax writes to cylinder 2ØØ.

The head and sector number values carry over from the first WR.

1.5. Error Messages

The ensuing subsections explain conventions used in this text to define possible MDCMON error messages, and provide

error message examples and interpretations. Information on the error statistics table is also included.

Refer to Appendix C for error status code descriptions.

Information on SADIE initialization and self test error messages is found in MDCCRC documentation.

1.5.1. Error Description Conventions

Conventions used to describe possible error messages are:

Non-variable messages such as "DISK=" are shown as displayed. Variable information which further defines error types is indicated within "< >" symbols; <pattern read>, for example.

Disk unit and logical block numbers are decimal numbers; addresses, data patterns, and buffer contents are hexadecimal numbers.

Any of the messages listed below may appear in place of <error>:

"Wait Abort"
"Parity"
"Write Fault"
"Seek Not Complete"
"Cylinder Not Found"
"Drive Not Selected"
"Block Not Found"
"Invalid Command"
"No Track Ø Found"
"Drive Not Ready"
"Bad Interrupt"
"Bad Defect Map"
"Illegal Cylinder"
"Burst Error"
"Read Abort"
"Unknown"

1.5.2. Error Descriptions

A brief description of the error message source follows each error listed in the following text.

HARD ERR--<error> **DISK=**<unit#,blk#> **PACKET CMD=**<hex value>

The mWDC returned an uncorrectable error status in Command Word 5 status field upon completion of a packet command.

Example Display:

HARD ERR--Burst Error DISK=Ø, 2ØØ PACKET CMD=1Ø

This error message indicates an uncorrectable Burst Error (data error) occurred while reading disk unit Ø, block 2ØØ. The opcode for the Read multisector packet command is 1Ø (hex).

SOFT ERR--Burst Error DISK=1, 1333 PACKET CMD=11

This error message indicates a correctable Burst Error (data error) occurred while writing disk unit 1, block 1333. The opcode for the Write multisector packet command is 11 (hex).

CMP ERR DISK=<unit#,blk#> **ADDR=**<offset> **GOOD=**<source buffer contents> **BAD=**<destination buffer contents>

A mismatch was found when a source buffer containing a pattern written to a sector was compared with a destination buffer read from that sector. The corrupted data read from the destination buffer is displayed after "BAD".

Example Display:

CMP ERR DISK=Ø, Ø ADDR=8ØØØ GOOD=b6db, BAD=ffff

The mismatched data was: b6db (hex) in the source buffer and ffff (hex) in the destination buffer. The offset address of the destination buffer was 8ØØØ (hex). The current disk address (and presumably the last disk block read) is unit Ø, block Ø.

1.6. Error Statistics

MDCMON is an interactive monitor, and as such, does not run laps and display a lap summary. Use of the REC (Read Error Counters) command, however, provides a table of statistics which contains error information. Refer to Appendix C for more information on the table of statistics.

To see error statistics for the currently selected disk unit:

Enter **REC** (Read Error Counters)

To see error statistics for any other unit:

Enter **REC [unit #]** — Displays statistics for disk unit named, regardless of selected unit.

To clear error statistics for the currently selected disk unit:

Enter **CEC** (Clear Error Counters)

To clear error counters for a non-selected unit:

Enter **CEC [unit #]**

1.1. MDCTEST

MDCTEST is a pair of DATA-DESTRUCTIVE random tests of the mini-Winchester Disk Controller (mWDC).

1.2 Parameters

Parameter 1 = unit to be tested. (default: unit = Ø)

Parameter 2 = test number to be performed.
If test# = 1, test 1 is performed.
If test# = 2, test 2 is performed.
(default: test# = 1)

1.3. MDCTEST Overview

MDCTEST consists of two tests, each of which is described below. The test to be performed is selected by parameter 2. If an invalid test number is in parameter 2, test 1 will be performed.

Before either test begins, MDCTEST issues a software reset command to the mWDC. If the mWDC does not respond to the reset or fails to pass its self-test, a message is displayed and MDCTEST aborts the test. Otherwise, MDCTEST issues a mWDC firmware identifier read command to determine the firmware version.

The selected test repeats the number of times specified as #REPS in the test line.

The disk drive heads move to the inner most cylinder at the end of the test.

1.4. Test One

Test 1 is a random seek test. Initially, test 1 creates a queue of 128 random logical disk sector addresses. Associated with each element of the queue is a unique single sector source buffer in memory segment 1 and destination buffer in segment 2. All 128 source buffers are filled with random data.

Then for each repetition of test 1:

1. All 128 source buffers are written to their associated disk sectors.

2. For each disk sector number in the queue:

   a. The sector is read into the associated destination buffer.

   b. The source and destination buffers are compared.

   c. A new random sector number is generated and checked for uniqueness against all other sector numbers in the queue. If it is not unique, another random sector number is generated, and so on. When a unique number is found, it replaces the old sector number in the queue.

   d. The associated source buffer is re-randomized.

Test 1 displays an error message for all disk read, disk write and compare errors. On all write and read error messages, the disk address, a description of the error, and the disk command (read or write) are shown.

Compare error messages show the last disk sector address read and the data in both the source and destination buffers where the mismatch occurred. The segment offset where the mismatch occurred is also shown.

1.5. Test Two

Test 2 is a test of random-length writes and reads. Initially, memory segments 1 through 3 are set to a background pattern, 'AAAA'. Then, for each lap, the following series of steps repeat 50 times:

1. A source buffer is randomly chosen which is a random multiple of the sector length, up to 64 sectors. The source buffer may cross segment boundaries, but must be wholly contained within segments 1 through 3. The source buffer is filled with random data.

2. A destination buffer of the same length as the source buffer is randomly allocated. The same restrictions apply to the location of this buffer as to the source buffer, and, in addition, it must not collide with the source buffer.

3. A random disk sector address is found, such that writing the source buffer beginning at that sector will not overflow the disk pack.

4. The source buffer is written to the disk address; the disk address is read to the destination buffer; and the write and read buffers are compared.

5. The source and destination buffers are filled with the background pattern.

6. Segments 1-3 are checked for corruption in the area outside the two buffers which may have occurred during the write or read.

Test 2 displays and logs an error message whenever it encounters a read, write, or compare error. The error message format is the same as that for test 1 errors.

1.6. Error Messages

MDCTEST displays an error message whenever an mWDC initialization error or self-test error occurs. These error messages are described in MDCCRC documentation.

Error messages which may be displayed during MDCTEST are described in the following text. Information in boldface type represents the error message as displayed. Variable values are shown enclosed in < > symbols.

One of the following messages will will be displayed in place of <error>.

"Wait Abort"
"Parity"
"Write Fault"
"Seek Not Complete"
"Cylinder Not Found"
"Drive Not Selected"
"Block Not Found"
"Invalid Command"
"No Track Ø Found"
"Drive Not Ready"
"Bad Interrupt"
"Bad Defect Map"
"Illegal Cylinder"
"Burst Error"
"Read Abort"
"Unknown"

Test 1 and Test 2 display the following error messages whenever an error occurs:

TEST 1 ERROR MESSAGES

HARD ERR--<error> DISK=<unit #,block#> WRITE SECTOR

The mWDC returned an uncorrectable error status upon completion of a write packet command.

SOFT ERR--<error> DISK=<unit #,block#> WRITE SECTOR

The mWDC returned a correctable error status upon completion of a write packet command.

HARD ERR--<error> DISK=<unit #,block#> READ SECTOR

The mWDC returned an uncorrectable error status upon completion of a read packet command.

SOFT ERR--<error> DISK=<unit#,block#> READ SECTOR

This message has a similar meaning as the previous message, but indicates the error status was for a correctable error.

CMP ERR IN BUFFERS: SRC<segment#,offset#>=<data> DST<segment#, offset#>=<data>

**ORIG BUFS: WR<segment#,offset#> RD<segment#,offset#>
L=<buffer length> DISK=<unit#,block#>**

This 2-line error message indicates a compare error occurred when comparing a source buffer written to a destination buffer read from the same disk block.

The exact segment and offset addresses and the mismatched data found there are displayed following SCR and DST.

The start address of the source and destination buffers follow WR and RD. The buffer length in words is shown after 'L'.

TEST 2 ERROR MESSAGES

HARD ERR--<error> DISK=(unit#,block#) WRITE <# sectors> SECS

The mWDC returned an uncorrectable error status upon completion of a write multisector packet command.

SOFT ERR--<error> DISK=(unit#,block#) WRITE <# sectors> SECS

The mWDC returned a correctable error status upon completion of a write multisector packet command.

HARD ERR--<error> DISK=<unit#,block#> READ <# sectors> SECS

The mWDC returned an uncorrectable error status upon completion of a read multisector packet command.

SOFT ERR--<error> DISK=<unit#,block#> READ <#sectors> SECS

The mWDC returned a correctable error status upon completion of a read multisector packet command.

CMP ERR IN BUFFERS: SRC<segment#,offset#>=<data> DST<segment#, offset#>=<data>

ORIG BUFS: WR<segment#,offset#> RD<segment#,offset#> L=<buffer length> DISK=<unit#,block#>

This 2-line error message shows that a mismatch occurred when comparing a buffer written with a buffer read from the same disk address. The message fields are the same as for the compare error message for test 1.

CMP ERR IN BACKGR: SRC<segment#,offset#>=<data> DST<segment#,offset#>=<data>

ORIG BUFS: WR<segment#,offset#> RD<segment#,offset#> L=<buffer length> DISK=<unit#,block#>

This 2-line compare error message shows that a mismatch occurred upon comparison of two words in 'background'. Background is defined as all memory in segments 1-3 outside of the current write and read buffers.

This error indicates that the last multisector read package command caused corruption of memory locations outside the intended read buffer.

The background locations with the mismatched data follow SRC and DST. The current write and read buffer addresses are shown after WR and RD, respectively, followed by the buffer length in words.

1.7. Lap Summary

A lap summary is displayed at the conclusion of each lap of MDCTEST. The lap summary is a table of statistics that is cumulative for all laps completed so far in the current run of MDCTEST. Refer to Appendix C for more information on lap summaries.

1.1. MMUTST

MMUTST performs a series of tests on the Code, Data and Stack Z8Ø1Ø Memory Management Units (MMUs).

Each test begins with a message which announces the test and cites the type of CPU board (HPCPU or other) to be tested and whether the operating system is segmented or non-segmented.

Tests run in the order listed below unless otherwise specified:

1. A CONTROL register test, where random data is written to each control register, then read and verified.

2. A random data and random access test of the Segment Descriptor Registers (SDRs).

3. A "5555" and "AAAA" data test on all SDRs.

4. A block random data test of all SDRs.

5. A test of the READ-ONLY flags.

6. A test of the LIMIT registers.

7. A test of the DIRW (direction and warning) flags.

8. An address translation test which uses each SDR to test:

   - Data accesses for DATA and STACK MMUs
   - Instruction accesses for the CODE MMU

1.2. Error Messages

MMUTST reports all errors to SADIE as HARD errors. Error messages which indicate where the MMU error occurred display whenever an access violation causes a segment trap.

1.3. Lap Summary

On completion of each repetition of the series of tests, MMUTST displays the lap number, error count, and for each MMU:

1. The number of block data errors.

2. The number of random SDR errors.

3. The number of "5555" and "AAAA" data errors.

4. The number of these control register errors:

   Segment Address Register (SAR)
   Descriptor Selection Counter Register (DSCR)
   Mode Register

5. The number of access violations of the following types:

   a. read only

   b. limit

   c. direction

   d. translation

For information about the MMUs, refer to:

Z8Ø1Ø Z-MMU Memory Management Unit Product Specification, March, 1981

1.1. SCCTST

This text provides:

- an overview of the four tests which make up SCCTST
- set up and user interaction information
- sequential screen displays
- detailed test and error message descriptions

1.2. Overview

SCCTST is an interactive test of the HPCPU onboard Serial Communications Controller (SCC), and related modem signals. The test is intended only for use on systems with an HPCPU board.

SADIE requires no parameter entry for this interactive test, and errors are summarized at the end of each test within SCCTST, rather than in a lap summary.

SCCTST tests these SCC functions:

- Character transmission, local loop mode
- Character transmission, polled mode
- Character transmission, interrupt mode
- SCC modem signals (RTS, CTS, DTR, DCD), polled mode
- SCC modem signals, interrupt mode
- Transmit interrupts
- Receive interrupts
- External status interrupts
- Character transmission at all standard baud rates

After port selection, the four tests described below automatically run in the order shown unless the user responds when prompted with an entry which returns to the SCCTST menu or ends all tests (refer to Paragraph 1.3.1).

1. Local Loop Mode Character Test	Tests SCC character transmission in local loop mode at 9600 Baud
2. Polled Mode Character/Modem Test	Tests character transmission and SCC modem signals at 9600 Baud
3. Modem/Character Interrupt Test	Tests character transmission at 9600 Baud in interrupt mode where "status affects vector" is true. Tests: SCC modem signals Transmit Interrupts Receive Interrupts External/Status Interrupts
4. Interrupt Mode Character Test	Tests character transmission in interrupt mode where "status affects vectors" is true. Tests all standard baud rates.

1.3. Test Sequence

This subsection provides a description of the sequence of events which follows SCCTST initiation. Subsections 1.6, 1.7, 1.8 and 1.9 describe individual test results which are output to the console screen.

The SCC port selected for test is configured to loop transmission and control signals back to the same port.

The four tests will run continuously for either selected port until a console key is pressed, or until an error occurs.

NOTE

Do not press the system START button for a non maskable interrupt (NMI) while the test is running. Console I/O is redirected following SCCTST menu test selection, and an attempted NMI could disable the system.

1.3.1. SCCTST Screens

After SADIE initiation and SCCTST selection, the console displays:

```
Checking Test List

This is a test of HPCPU on-board serial I/O (TTY) ports
It tests the selected TTY port for:

   1. Local loop mode transmission at 9600 Baud
   2. Polled mode modem controls and transmission at
      9600 Baud
   3. Interrupt mode modem controls and transmission
      at 9600 Baud
   4. Interrupt mode transmission at six baud rates

Console I/O is redirected during parts of the test.
Therefore DO NOT PRESS START BUTTON during test,
unless waiting for a main menu response (below).
To exit, enter "Q" in response to test prompts.
NOTE:  THIS TEST REQUIRES SPECIAL SERIAL I/O
       NULL MODEM PLUG  (SEE DOCUMENTATION IN
       SYSTEM 8000 SADIE REFERENCE MANUAL).
```

The menu that provides port selection appears next. At this time SCCTST allows the user to press the system START (NMI) key for PAUSE menu access.

```
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
|                                                               |
|                                                               |
|        SELECT PORT TO BE TESTED:                              |
|           A = DIAGNOSTIC PORT (TTYØ)                          |
|           B = CONSOLE PORT (TTY1)                             |
|           Q = END ALL TESTS                                   |
|                                                               |
|                                                               |
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
```

If any key other than A, B or Q is pressed, SCCTST issues the following message, then returns to the menu:

Invalid Choice -- Try again!!

Following an acceptable menu selection, SCCTST provides connector installation instructions for selected port "A" or "B", or returns to the SADIE menu in response to menu choice"Q".

1.4. Set Up

SCCTST requires no HPCPU modifications, but does require installation of a specially wired connector to carry the modem signals. Test one, the local loop mode test, will function with or without the connector.

The connector is installed in the I/O panel TTY Ø port to test SCC channel A (the diagnostic port), or TTY 1 port to test SCC channel B (the console port).

Connector P3 of the ICP test cable Zilog PN 59-Ø327, Rev. B, is intended for use as the "null modem plug" referenced in this test. The standard RS232, 25 pin male connector which carries the modem signals is modified to a loop configuration:

Signal	Pin#	jumper to	Pin#	Signal
Xmit Data	2	----	3	Receive Data
RTS	4		5	CTS
DSR	6	----	2Ø	DTR

SCCTST refers to pin 6 (DSR by RS232C standards) as DCD.

Following port selection, the program prompts for necessary cable and/or connector changes.

To ensure proper test function, follow program prompts in the order described below.

1.4.1. Port A Cable Connections

Port A has been selected from the menu, and SCCTST prompts:

Now connect null modem plug to TTY Ø
Hit R when ready or S to return to menu
Or Q to end all tests

Install P3 of the ICP cable in the HPCPU I/O panel TTY Ø port at this time, then press "R" to begin the test.

1.4.2. Port B Cable Connections

Port B has been selected from the menu, and SCCTST prompts:

Plug console terminal into TTY Ø
Type R when ready

Respond to the prompt in this way:

1. Remove P3 (the null modem plug), if present, from TTYØ, and disconnect the console cable from TTY 1.

2. Connect the console I/O cable to the TTY Ø port, then press "R" on the console keyboard.

The next prompt instructs:

Now connect null modem plug to TTY 1
Hit R when ready, or S to return to menu
or Q to end all tests

To begin Test 1 on SCC port B (console port), connect P3 of the test cable to the I/O port labeled TTY 1, then press "R".

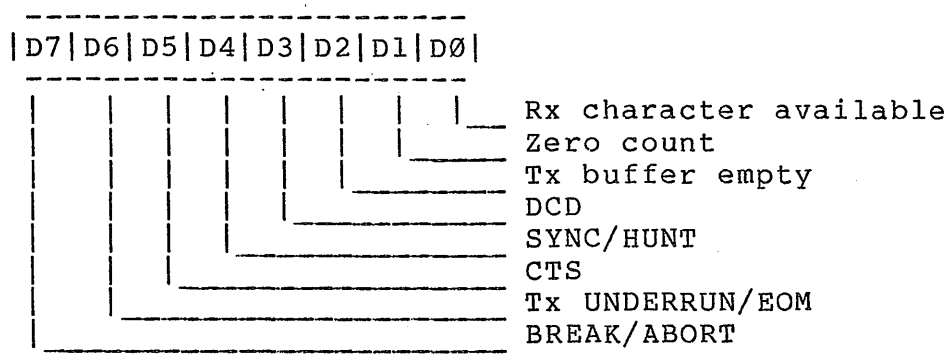
1.5. Error Message Conventions

If an error occurs:

1. The console "beeps".
2. The test stops.
3. The program displays an error message.
4. The port selection menu returns.

After each test description in this text, pertinent error messages are shown in boldface type, followed by a brief description of the error source.

Values shown after CHAR= refer to 8-bit ASCII characters. The value shown for TTY represents the SCC channel selected for test. Status refers to read register Ø contents for the selected port.
SCC read register Ø status bit definitions are:



For more information on SCC registers, refer to the current Zilog Components Data Book.

1.5.1. Display Description Conventions

In this text, messages identical to those seen on the console screen are reproduced in boldface type. Variable data is shown inside < > symbols.

1.6. Local Loop Mode Test

When the proper connectors are in place (refer to Subsection 1.4), press "R" to begin tests 1 through 4. The first test is the local loop mode test which prompts:

LOCAL LOOP MODE TEST, TTYØ
HIT ANY CHARACTER TO GO ON TO NEXT TEST

At this point, allow the test to run, or enter any character, including the space bar, to skip this test and go on to the polled mode character test.

The test runs in the asynchronous mode at 9600 baud with bit 4 of write register 14 set. One test cycle is complete when 256 characters have been successfully transmitted.

A summary of errors and characters transmitted since test initiation for the current port selection displays at the end of each test cycle:

LOCAL LOOP TEST ON TTY#:<port #> <###> CHARS, <##> ERRORS

The error count represents the number of times the character received differs from the character transmitted.

Paragraph 1.6.1 discusses error messages which may interrupt the test.

1.6.1. Local Loop Mode Test Error Messages

All error messages are preceded by an audible 'beep'. Conventions and status code definitions found in Subsection 1.5 apply to the error descriptions below.

LOCAL LOOP MODE ERROR MESSAGES

NO CHARACTER RECEIVED, LOCAL LOOP MODE, TTY<#>, CHAR=<##>

The ASCII character shown after CHAR= was transmitted, but no character was received.

CHAR MISMATCH, LOCAL LOOP MODE, TTY<#>, OUT = <##>, IN = <##>

OUT= character transmitted
IN= next character received IN and OUT do not match.

1.7. Polled Mode Test

The polled mode test transmits 256 ASCII characters at 9600 baud with the SCC in polled mode, and then displays:

POLLED TEST ON TTY<#>, <###> CHARS, <##> ERRORS

CHARS represents the total number of ASCII characters transmitted.

The error count represents the number of times the character received differs from the character transmitted.

Both totals are cumulative from the beginning of the current SCC port test: the message remains constant on the screen while the totals increment.

The test continues to cycle until a character is entered via the console.

1.7.1. Polled Mode Test Error Messages

All error messages are preceded by an audible 'beep'. Conventions and status code definitions found under Subsection 1.5. apply to the errors described below.

When error messages occur during the polled mode test, check the "null modem plug" for broken jumper wires or loose pins.

POLLED MODE ERROR MESSAGES

NO CHARACTER RECEIVED, POLLED MODE, TTY<#>, CHAR=<##>

The character represented by CHAR was transmitted asynchronously at 9600 baud, but no character was received.

CHAR MISMATCH, POLLED MODE, TTY<#>, OUT = <##>, IN = <##>

The character shown after OUT was transmitted, and the next character received was that shown after IN.

MODEM ERROR STATUS = <reg 0 contents>, DCD AND/OR CTS SET, TTY<#>

When testing transmit modem signals in the polled mode, RTS and DTR were reset, but DCD and/or CTS failed to reset. (Check P3 of the ICP test cable for broken wires or loose pins.)

MODEM ERROR STATUS = <reg 0 contents> CTS NOT BACK ON, TTY<#>

During polled mode modem signal testing, RTS was set high; DTR was set low. The expected RS232 line conditions did not occur. Expected test results: DCD low CTS high

MODEM ERROR STATUS = <reg 0 contents>, DCD NOT BACK ON, TTY<#>

During polled mode modem signal testing, DTR was set high; CTS was set low, and expected RS232 line conditions did not occur. Expected test results: DCD high CTS low

1.8. Modem Interrupt Test

A successful modem/character interrupt test transmits 256 ASCII characters at 9600 baud, then displays this summary:

MODEM INTERRUPTS ON TTY<#>: <###> CHARS, <##> ERRORS

CHARS represents the total number of ASCII characters transmitted.

The error count represents the number of times the character received differs from the character transmitted.

Both totals are cumulative from the beginning of the current SCC port test: the message remains constant on the screen while the totals increment.

The test continues to cycle until a character is entered via the console.

1.8.1. Modem Interrupt Test Error Messages

All error messages are preceded by an audible 'beep'. Conventions and status code definitions found under Subsection 1.5. apply to the errors described below.

MODEM INTERRUPT ERROR MESSAGES

CTS INTERRUPT NOT RECEIVED, TTY<#>, STATUS=<reg Ø contents>

RS232 signals RTS and DTR were reset during modem signal interrupt mode testing. A subsequent DCD and CTS reset should then have generated an interrupt, but failed to do so.

Note: If both polled mode and interrupt mode modem tests fail, carefully check the wiring inside P3 of the test cable. If only one modem test fails, the SCC is the probable cause.

CTS NOT SET/DCD CLEARED AFTER RTS SET, TTY<#>, STATUS=<reg Ø contents>

An interrupt occurred following RTS and DTR reset, but DCD and CTS did not reset.

DCD INTERRUPT NOT RECEIVED, TTY<#>, STATUS=<reg Ø contents>

DCD was set true; DTR was set; yet interrupt did not occur.

DCD NOT SET/CTS RESET AFTER DTR SET, TTY<#), STATUS=<reg Ø contents>

DTR was set and the interrupt occurred, but the expected DCD true and CTS false status did not occur.

NO CHAR RECEIVED, MODEM INTERRUPT TEST, TTY<#> CHAR=<##> STATUS=<register Ø contents>

An SCC character-received interrupt failed to occur during interrupt mode modem testing. CHAR= character which failed to transmit.

CHAR MISMATCH, MODEM INT TEST, TTY<#>, OUT =<##> IN = <##>

The value after OUT = is the character transmitted, and the value after IN = represents the next character received.

MODEM LINES DROPPED ON TTY<#> STATUS=<register Ø contents>

An external/status interrupt - which indicates a change in one of the modem signal states - occurred during character transmission.

NO TRANSMIT INTERRUPTS, MODEM INT TEST, TTY<#>, STATUS=<reg Ø contents>

No transmit buffer empty interrupts have occurred on the transmit modem during transmission of 256 characters.

1.9. Interrupt Mode Test

The interrupt mode test uses 'character received' interrupts to signal receipt of each character, and 'transmit buffer empty' to signal character transmission.

Characters from ØØ to FF are transmitted at these standard baud rates:

19200	1200
9600	300
4800	110

The test transmits 256 ASCII characters at each of the baud rates listed above, reducing the number of characters sent as the baud rate decreases. The display updates accordingly:

SPEED = <baud rate> BAUD, TEST CYCLE <#>

When a console key is pressed to terminate the test, this message appears:

SPEED = <current baud rate> BAUD, TEST CYCLE <#> LAST CYCLE
The current test cycle is completed, then this summary is displayed:

INTERRUPT TEST ON TTY<#>: <###>CHARS, <##> ERRORS

CHARS represents the total number of ASCII characters transmitted.

The error count represents the number of times the character received differs from the character transmitted.

Both totals are cumulative from the beginning of the current SCC port test: the message remains constant on the screen while the totals increment.

1.9.1. Interrupt Mode Test Error Messages

All error messages are preceded by an audible 'beep'. Conventions found under Subsection 1.5. apply to the interrupt test errors described below.

INTERRUPT MODE ERROR MESSAGES

TRANSMIT INTERRUPT NOT RECEIVED, TTY#<port#>, CHAR=<char xmitted>

The transmit buffer empty interrupt failed to occur during interrupt mode testing.

RECEIVE INTERRUPT NOT RECEIVED, TTY#<port #>, CHAR=<char xmitted>

Character received interrupt failed to occur during interrupt mode testing.

CHAR MISMATCH, INTERRUPT MODE, TTY#<port #>, OUT=<##>, IN=<##>

The OUT value represents the character transmitted; the IN value represents the next character received.

1.1Ø. Special Error Condition

The error message shown below represents an interrupt which should not occur as a result of any currently implemented SCC test:

ERROR: SPECIAL RECEIVE CONDITION INTERRUPT

The message indicates that the SCC modem believes it detects a serious error condition such as a parity or framing error.

1.1. SIOMODEM

SIOMODEM is a test of the Serial Input/Output Controllers (SIOs), including modem signals. SIOMODEM is an interactive test; it receives no parameters from SADIE. Errors are summarized at the end of the test rather than in a lap summary.

SIOMODEM tests the following SIO functions:

- Character transmission, polled-mode
- Character transmission, interrupt-mode ("status affects vectors" is false)
- Character transmission, interrupt-mode ("status affects vectors" is true)
- SIO modem signals (RTS,DCD,DTR,CTS), polled-mode
- SIO modem signals, interrupt-mode
- Transmit interrupts
- External status interrupts
- Character transmissions, mismatched baud rates
- Character transmission at all standard baud rates

The tests are arranged in three different test sequences, all of which are performed for each selected SIO port pair. The tests are:

1. The polled mode test, which performs a character transmission and SIO modem signal test.
2. The interrupt mode test, which performs a character transmission test in the interrupt-mode, where "status affects vectors" is false. It tests character transmission of mismatched baud rates, and tests all standard baud rates.
3. The modem control test, which performs a character transmission test in the interrupt-mode, where "status affects vectors" is true; and tests SIO modem signals, transmit interrupts, and external status interrupts. This test is recommended for extended testing, since it tests for the greatest number of possible errors.

SIOMODEM prompts for the appropriate SIO cable connections. The program presents a menu appropriate to the type of CPU board in use.

For example, the menu presented for systems that use a CPU board other than the HPCPU references console and diagnostic port tests; the menu for systems with an HPCPU board does not.

When an HPCPU board is installed in the system under test, SIOMODEM tests only the SSB board ports. (Use SCCTST for HPCPU on-board serial I/O testing.)

Each test continues indefinitely, until a console key is pressed to terminate the test. **(To prevent execution of inadvertent menu choices, do not type ahead.)**

All errors produce an audible "beep" and a message on the console screen explaining the error. A "beep" also signifies that the program expects input from the console.

NOTE

Do not press the system START button for a non-maskable interrupt (NMI) while the test is running. Console I/O is redirected during SIOMODEM execution, and an attempted NMI could disable the system.

1.2. Set Up

SIOMODEM requires a null-modem cable to carry the modem signals between SIO ports.

The interconnecting cable is terminated with two standard RS232, 25-pin male connectors, wired as follows:

	A		B	
xmitted data	2	-----	3	received data
rcvd data	3	-----	2	transmitted data
RTS	4	-----	5	CTS
DSR	6	-----	20	DTR
CTS	5	-----	4	RTS
signal ground	7	-----	7	signal ground
DTR	20	-----	6	DSR

Only the signals listed should be wired. Pin 6, DSR in the RS-232C standards, is referred to as DCD in this test.

If a null modem cable is not available, modem tests cannot be performed, and SIOTEST diagnostics should be used instead. The program prompts for cable connections corresponding to the ports selected for test.

1.2.1. User Interaction When an HPCPU Board is Not Used

When testing a system with a CPU board other than the HPCPU, CPU board SIO ports as well as SSB board DART ports may be tested. The program first prompts for board selection, then for port pair connection. For example:

```
SELECT TEST TO BE PERFORMED:

Ø = CPU BOARD ONLY (TTY Ø - TTY7)
1 = SSB-1 BOARD ONLY (TTY 8 - TTY15)
2 = SSB-2 BOARD ONLY (TTY16 - TTY23)
3 = SSB-3 BOARD ONLY (TTY24 - TTY31)
4 = SSB-4 BOARD ONLY (TTY32 - TTY39)
5 = ALL BOARDS (TTYØ - TTY39)
```

If "Ø" is selected, SIOMODEM prompts for null modem cable connection between ports 2 and 6 and tests those ports; then repeats prompts for port pair 3 and 7:

```
NOW CONNECT TTY3 WITH TTY7
HIT "R" WHEN READY, OR "S" TO SKIP THIS TEST
OR "Q" TO END ALL TESTS
```

An "S" response proceeds to the next TTY pair, while a "Q" entry returns the SADIE executive test menu.

To test ports 3 and 7, connect the null modem cable to those ports and press "R".

On test completion, SIOMODEM prompts:

```
DO YOU WANT TO MOVE CONSOLE PORT TO ANOTHER PORT SO SIOMODEM
CAN TEST PORTS <yet untested port #s>?
TYPE VALID PORT NUMBER (Ø-39) FOR NEW CONSOLE PORT, OR 99 TO
SKIP TEST
```

A "99" entry returns the SIOMODEM test menu. To test untested ports, including TTY1, enter the number of a previously tested port, and connect the console cable to that I/O port when prompted:

```
PLUG CONSOLE TERMINAL INTO <selected port #>
TYPE "R" WHEN READY
```

Type "R" as prompted, and SIOMODEM prompts:

NOW CONNECT TTY<#> WITH TTY<#>.
HIT "R" WHEN READY, OR "S" TO SKIP THIS TEST
OR "Q" TO END ALL TESTS

Use the null modem cable to interconnect the ports as prompted, then enter "R"; or enter "S" to proceed to the next untested port pair. SIOMODEM then programs the selected channel as the console, and tests ports deferred when the console was TTY 1.

When the test is complete, the program prompts for return of the console to its original channel. Remove the null modem cable, and reconnect the console cable to the I/O panel TTY1 port to continue testing. Press "R" as prompted, then, on test completion, press "Q" to return to the SADIE executive command menu.

1.2.2. User Interaction With an HPCPU Board in the System

When the program detects an HPCPU board, it prompts for SSB board selection:

1 = SSB-1 BOARD ONLY (TTY2 - TTY9)
2 = SSB-2 BOARD ONLY (TTY1Ø - TTY17)
3 = SSB-3 BOARD ONLY (TTY18 - TTY25)
4 = SSB-4 BOARD ONLY (TTY26 - TTY 33)
5 = ALL BOARDS (TTY2 - TTY33)

When "5" is entered to test all SSBs in the system, the null modem cable must be connected to TTY 2 and TTY 18 to begin testing. The next pair tested is TTY 3 and TTY 19. TTY ports are paired in this manner until all ports have been tested.

Any other menu selection initiates prompts for the appropriate null modem cable connection. For example, when "1" is selected from the board menu, this display appears:

NOW CONNECT TTY2 WITH TTY6.
HIT "R" WHEN READY, OR "S" TO SKIP THIS TEST
OR "Q" TO END ALL TESTS

SIOMODEM does not move the console port for systems using an HPCPU board. Use SCCTST to test on-board HPCPU console and diagnostic port functions.

Enter "S" when prompted to defer testing of any port pair. Enter "R" to begin the test, and SIOMODEM will continually

update the display with the test information described in Subsections 1.4 through 1.6.1.

To stop the test, enter any character.

1.3. General Error Messages

The error messages that follow, as well as the statements concerning status codes and chips, apply to all the tests within SIOMODEM. Errors that pertain to a particular test are defined under the subsection that discusses that test.

All error messages are preceded by an audible "beep" on the console. The status codes displayed are the contents of read register Ø on the appropriate SIO or DART chip.

The SIOs are located on the CPU boards other than the HPCPU, and the DARTs are located on the SSB boards. For additional information on the SIO and DART registers, refer to the Zilog Components Data Book.

These error messages could appear during any SIOMODEM test:

SPECIAL RECEIVE CONDITION INTERRUPT

No test currently implemented should cause the above referenced interrupt to occur. The receive SIO modem believes it is detecting a serious error condition, such as a parity or framing error.

Can Not Test TTYs on HPCPU board

This message is displayed when an HPCPU is installed in the system and a zero is entered in response to SELECT TEST TO BE PERFORMED. A zero entry is reserved for CPU boards which contain I/O ports Ø to 7. Only the console and diagnostic I/O ports exist on the HPCPU board, and are not tested by SIOMODEM. SCCTST is designed to test HPCPU on-board console and diagnostic channels.

INVALID CHOICE -- TRY AGAIN!!

SIOMODEM displays this message when an entry is made that differs from the menu choices. For example, a "6" entry in response to SELECT TEST TO BE PERFORMED constitutes an invalid choice.

SKIPPING TEST OF <port#> AND <port#> -- SERIAL I/O HARDWARE NOT PRESENT !!

This message indicates that the null modem cable is not connected to the selected ports, and typically occurs when the "all boards" menu selection is chosen, and TTY ports 2 and 18 have not been connected.

1.4. Polled Mode Test

This message is displayed at the completion of each cycle of the polled-mode test (after 256 characters have been successfully transmitted in each direction):

POLLED TEST ON TTY#<port #>, <###> CHARS, <##> ERRORS,
ON TTY#<port #>, <###> CHARS, <##> ERRORS

Totals are cumulative from initiation of the test for the current pair of SIO ports.

If the error count is zero in both directions, the test is successful. The error count represents the number of times that the character received differed from the character transmitted.

The polled-mode test continues until a character is input on the console.

1.4.1. Polled Mode Error Messages

This subsection describes the source of error messages that may be displayed during the polled mode test.

NO CHARACTER RECEIVED, POLLED MODE, TTY#<port #>, CHAR=<##>

No character was transmitted between the ports in a polled-mode transmission. All possible ASCII characters from ØØ to FF are transmitted in both directions, and the error text reveals which character was attempting to be transmitted.

Probable Cause: If the failed character was ØØ, check the cable used to connect the port pair under test. This message occurs if one of the connectors is loose, a wire is broken, a pin has come loose, or if the cable is connected to the wrong port.

TTY# <port #> RECEIVE MODEM ERROR STATUS1 = <##>, DCD AND/OR CTS SET

An error occurred during transmit modem signal polled mode testing. RTS and DTR were reset in the receive modem, but DCD and/or CTS failed to be reset in the transmit modem. Check the interconnecting cable for broken wires or loose pins.

TTY#<port #> TRANSMIT MODEM ERROR STATUS1 = <##>, DCD AND/OR CTS SET

An error has occurred during transmit modem signal polled mode testing. RTS and DTR were reset in the receive modem, but DCD and/or CTS failed to be reset in the transmit modem. Check the interconnecting cable.

TTY#<port #> RECEIVE MODEM ERROR STATUS2 = <##>, CTS NOT TURNED BACK ON

Error in polled-mode testing of modem signals. RTS and DTR were set high in the transmit modem, but the expected receive modem status, DCD low and CTS high, did not occur.

TTY#<port #> TRANSMIT MODEM ERROR STATUS2 = <##>, DCD NOT TURNED BACK ON

Error in polled-mode testing of modem signals. DTR was set in the receive modem, but the expected transmit modem status, DCD high and CTS low, did not occur.

1.5. Interrupt Mode Test

This message is displayed at the beginning of each interaction of the interrupt mode test:

SPEED= <####> BAUD, TEST CYCLE <##>

The interrupt-mode test is similar to the polled-mode test, except that SIO character received interrupts signal the receipt of each character.

Characters from ØØ to FF are transmitted in each direction for each of the standard line speeds: 19,2ØØ, 96ØØ, 48ØØ, 12ØØ, 3ØØ, and 11Ø baud. The number of characters transmitted decreases with slower baud rates.

The interrupt-mode test continues until a character is input on the console. When a character is input, the test terminates on completion of the current cycle. The LAST CYCLE

display appears after the test cycle number, indicating that no new cycle will be started.

This message is displayed at the end of each iteration of each cycle of the interrupt-mode test:

INTERRUPT TEST ON TTY#<port #>, <####>CHARS, <##>ERRORS,
ON TTY#<port #>, <###>CHARS, <##>ERRORS

Character and error counts are cumulative for all test cycles. Zero error counts in both directions indicate a successful test. The error count is the number of times that the transmitted character failed to match the received character.

1.5.1 Interrupt Mode Error Messages

The following error messages may occur during interrupt mode test execution.

INTERRUPT NOT RECEIVED, TTY#<port #>, FAILED ON CHARACTER <##>

Character-received interrupt failed to occur in interrupt-mode testing ("status affects vectors" = false, interrupt vector =Øx2Ø). The TTY number of the receive port is given.

CHARACTERS MATCH WITH MIS-MATCHED BAUD RATES!!

Indicates that 256 characters were successfully transmitted despite differing baud rates in the transmit and receive ports. Probable cause: The baud rate clocks are not correctly set.

CTS INTERRUPT NOT RECEIVED, TTY#<port #>, STATUS= <##>

An error occurred in interrupt-mode testing of modem signals. RTS and DTR were reset in the transmit modem, which should have generated an interrupt in the receive modem when DCD and CTS are reset.

If both polled-mode and interrupt-mode modem tests fail, the interconnecting cable should be carefully checked. If only one modem test fails, the SIO is probably at fault.

DCD AND/OR CTS NOT CLEARED AFTER RTS/DTR CLEARED,
TTY#<port #>, STATUS= <##>

The interrupt described in the previous error occurred in the receive SIO modem; however, the expected status of zero for both DCD and CTS did not occur.

CTS INTERRUPT NOT RECEIVED, TTY#<port #>, STATUS= <##>

RTS was set on the transmit modem, which should have caused an interrupt on the receive modem when CTS is set.

TTY# CTS NOT SET AND DCD CLEARED AFTER RTS SET, STATUS = <##>

The interrupt described in the previous error occurred; however, the expected status, CTS set and DCD reset, did not occur.

DCD INTERRUPT NOT RECEIVED, TTY#<port #>, STATUS= <##>

DTR was set on the receive port, which should have caused an interrupt on the transmit port when DCD was set true.

TTY# DCD NOT SET AND CTS RESET AFTER DTR SET, STATUS= <##>

The interrupt described in the previous error occurred, but the expected status, DCD true and CTS false, did not occur.

1.6. Modem Interrupt Test

This message is displayed on completion of each iteration of the modem interrupt test (after 256 characters are successfully transmitted in each direction):

MODEM INTERRUPTS ON TTY#<port #>, <##>CHRS, <##>ERRORS,
ON TTY#<port #>, <#>CHRS, <##>ERRORS

The character and error counts are cumulative from the beginning of the test. The error count is the number of times the character transmitted did not match the character received. The test is successful when the error count is zero in both directions.

1.6.1 Modem Interrupt Test Errors

This subsection provides explanations for error messages that may be displayed during the Modem Interrupt Test.

NO CHAR RECEIVED, MODEM INTERRUPT TEST ON TTY#<port #>, RECEIVE STATUS= <##> FAILED ON CHARACTER= <##>, TRANSMIT STATUS= <##>

A character-received interrupt failed to occur on the receive SIO during interrupt-mode modem testing. The interrupt-mode character test is repeated, except that "status affects vectors" is true, and interrupt vectors Øx24 and Øx2C are used for character interrupts, instead of Øx2Ø.

The status of the transmit and receive modems and the character attempting to be transmitted are given.

MODEM LINES HAVE DROPPED BETWEEN TTY#<port #> AND TTY#<port #>, RECEIVE STATUS= <##>, TRANSMIT STATUS= <##>

An external/status interrupt, indicating a change in one of the states of the modem signals, occurred during the transmission of characters. The status of the receive and transmit modems is given. It may not be possible to recover from this error, in which case the test is restarted.

NO TRANSMIT INTERRUPTS OCCURRED, MODEM INTERRUPT TEST, TTY#<port #>, STATUS= <##>

No transmit buffer empty interrupts have occurred on the transmit modem during the transmission of 256 characters.

1.1. SIOTEST

SIOTEST is an interactive, menu-driven test of the SIOs and CTCs not used by the console. (SADIE uses SIO Ø, Channel B, to communicate with the console. The test assumes that SIO Ø, Channel B, is functioning.)

SIOTEST was called S16SIO in earlier versions of SADIE (Release 3.1 and below). SIOTEST reflects increased serial I/O test capability, depending on board types; and corrects some known problems and limitations associated with the older S16SIO.

If a CPU board other than an HPCPU is in use, seven on-board SIO channels may be tested in addition to the SSB board I/O ports.

Serial Communications Controllers (SCCs) provide console and diagnostic port serial I/O for the HPCPU board, and SCCTST tests those devices.

When an HPCPU board is present in the system under test, all other serial I/O resides on Secondary Serial Boards (SSBs), or optional Intelligent Communications Processor Boards (ICPs). SIOTEST tests the serial I/O devices on the SSB boards, and ICPTST1 through ICPTST3 tests support ICP board serial I/O channels.

Regardless of CPU board type, all SSB board serial I/O may be tested with SIOTEST. SIOTEST determines the type of CPU board in use, then displays the appropriate menu.

1.2. Set Up

This test requires a auxiliary terminal, which SIOTEST calls AUX. The auxiliary terminal must not be connected to the selected TTY until SADIE transfers

The test menu allows the user to select the board to be tested, then the TTY port that corresponds to the selected SIO channel.

The test prompts the user to plug the auxiliary terminal into a specified port on the system rear panel. Any key pressed on the console signals the test to proceed.

Press "X" after the menu appears, to exit the test.

1.3. Test Sequence

After any console key is pressed, SIOTEST displays the entire set of ASCII printable characters continuously, until any key on the console is pressed again.

If SIOTEST fails to respond to <CR>, ensure that the auxiliary terminal is connected to the correct port, then press several keys in succession on the console.

When testing any channel except SIO Ø, channel A, any character pressed on AUX is echoed back to AUX. Any console keystroke terminates "echo mode" and returns to the SIOTEST menu.

When testing SIO Ø, channel A, there is no echo mode, and the first key pressed on the console returns the board menu.

NOTE

Do not press the system START button for a non-maskable interrupt (NMI) while the test is running. Console I/O is redirected during SIOTEST execution, and an attempted NMI could disable the system. The menu provides the option to exit SIOTEST.

APPENDIX A
SADIE TEST AND MONITOR CROSS REFERENCE

A.1. GENERAL

Page two of this appendix lists SADIE 3.5 tests and monitors as displayed on the Choose and Run a Single Test Menu accessed when "T" is pressed following boot-up. Tests are listed numerically.

Page three of this appendix lists SADIE tests and monitors alphabetically, as they appear in this manual, followed by a description and the corresponding test number.

A.2. NUMERICAL LISTING OF SADIE TESTS AND MONITORS

No.	Name	Description
1	CONTROL	Display menu of test-list control lines
2	MDCFMT	Mini-disk format program; DESTRUCTIVE
3	MDCMEDIA	Mini-disk media test; DESTRUCTIVE
4	MDCTEST	Mini-disk random tests; DESTRUCTIVE
5	MDCMON	Mini-disk monitor; DESTRUCTIVE
6	MDCCRC	Read-only test of Mini-disk
7	SMDFMT	DATA-DESTRUCTIVE format of SMD disk
8	SMDMEDIA	Test of SMD disk media; DESTRUCTIVE
9	SMDTEST	Random SMD disk tests; DESTRUCTIVE
1Ø	SMDMON	Interactive SMD Monitor; DESTRUCTIVE
11	SMDCRC	Read-only test of SMD disk
12	WDCFMT	DATA-DESTRUCTIVE format of 8" WDC disk
13	WDCMEDIA	8" WDC disk media test; DESTRUCTIVE
14	WDCTEST	8" WDC random test; DESTRUCTIVE
15	WDCMON	Interactive 8" WDC monitor; DESTRUCTIVE
16	WDCCRC	Read-only test of 8" WDC disk
17	TCUMON	Interactive TCU tape monitor; DESTRUCTIVE
18	TCOM	TCU tape command exerciser; DESTRUCTIVE
19	TEX	Tape media verification test
2Ø	CIOTST	HPCPU on-board CIO test
21	SCCTST	HPCPU on-board SCC test
22	CACHETST	HPCPU CACHE test-must set jumper
23	MEMTEST	Thorough memory test
24	MMUTST	Thorough test of MMUs
25	CENT.PRT	Tests CENTRONICS printer interface
26	DP.PRT	Tests DATA PRODUCTS printer interface
27	SIOTEST	Interactive SIO and CTC test
28	SIOMODEM	Interactive SIO test w/MODEM controls
29	ECCTEST	ECC error correction/detection test
3Ø	MTCMON*	Interactive 9-track tape monitor
31	MTCOM	9-track tape command exerciser
32	ICPTST1	Host/ICP communication test
33	ICPTST2	Async interrupt mode test
34	ICPTST3	Async polled mode & bisync test
35	ICPTST4	Test EXXON office System
36	FPPTST	The Go/NoGo FPP board diagnostic
37	FPPMON	Control store loader and FPP monitor
38	FPPWHET	Whetstone benchmark and test of FPP

* Not operational at this time

A.3. ALPHABETICAL LISTING OF SADIE TESTS AND MONITORS

Name	Description	Test No.
CACHETST	HPCPU CACHE test-must set jumper	22
CENT.PRT	Tests CENTRONICS printer interface	25
CIOTST	HPCPU on-board CIO test	20
CONTROL	Display menu of test-list control lines	1
DP.PRT	Tests DATA PRODUCTS printer interface	26
ECCTEST	ECC error correction /detection test	29
FPPMON	Control store loader and FPP monitor	37
FPPTST	The Go/NoGo FPP board diagnostic	36
FPPWHET	Whetstone benchmark and test of FPP	38
ICPTST1	Host/ICP communication test	32
ICPTST2	Async interrupt mode test	33
ICPTST3	Async polled mode & bysync test	34
ICPTST4	Test EXXON Office System	35
MDCCRC	Read-only test of Mini-disk	6
MDCFMT	Mini-disk format program; DESTRUCTIVE	2
MDCMEDIA	Mini-disk media test; DESTRUCTIVE	3
MDCMON	Mini-disk monitor; DESTRUCTIVE	5
MDCTEST	Mini-disk random tests; DESTRUCTIVE	4
MEMTEST	Thorough memory test	23
MMUTST	Thorough test of MMUs	24
MTCMON*	Interactive 9-track tape monitor	30
MTCOM	9-track tape command exerciser	31
SCCTST	HPCPU on-board SCC test	21
SIOMODEM	Interactive SIO test w/MODEM controls	28
SIOTEST	Interactive SIO test and CTC test	27
SMDCRC	Read-only test of SMD disk	11
SMDFMT	DATA-DESTRUCTIVE format of SMD disk	7
SMDMEDIA	Test of SMD disk media; DESTRUCTIVE	8
SMDMON	Interactive SMD Monitor; DESTRUCTIVE	10
SMDTEST	Random SMD disk tests; DESTRUCTIVE	9
TCOM	TCU Tape command exerciser; DESTRUCTIVE	18
TCUMON	Interactive TCU Tape monitor; DESTRUCTIVE	17
TEX	Tape media verification test	19
WDCCRC	Read-only test of 8" WDC disk	16
WDCFMT	DATA-DESTRUCTIVE format of 8" WDC disk	12
WDCMEDIA	8" WDC disk media test; DESTRUCTIVE	13
WDCMON	Interactive 8" WDC monitor; DESTRUCTIVE	15
WDCTEST	8" WDC random test; DESTRUCTIVE	14

* Not operational at this time

APPENDIX B
mWDC PACKET COMMANDS/TAPE CONTROLLER STATUS BITS
For Use With MDCMON and TCUMON Tests

B.1. GENERAL

The tables in this appendix provide command and dispatch word definitions which make up the mWDC command packet buffer, as well as tape controller status bit definitions. The information provided is intended for use when running MDCMON and TCUMON SADIE tests.

Table B-1, which briefly describes mWDC drive command words that make up the drive command packet buffer, is followed by bit definitions for those words. Table B-2 provides mWDC command set descriptions, and Table B-3 contains tape controller status bits.

Table B-1 mWDC Drive Command Packet Buffer

COMMAND WORD	FUNCTION
DWO	Dispatch Word
	SUBPACKET FOR DRIVE Ø
CWØ*	Command Field and Opcode
CW1*	Logical Block Number
CW2*	Transfer Sector Count
CW3*	Transfer Address Bits Ø-15
CW4*	Transfer Address Bits 16-31
CW5*	Status and Interrupt Vector

* CWØ through CW5 describe a single subpacket for a disk unit.

There are four units and four subpackets, each identical to the other except for unit number. The command word and bit descriptions are:

DWØ DISPATCH WORD

```
MSB    15  . . .  8   7 6   5 4   3 2   1 Ø   LSB
        x --------- x   b a   b a   b a   b a
          Reserved      Unit 3 Unit 2 Unit 1 Unit Ø
```

Bit a = Input from host indicating that the subpacket is ready to be read for the appropriate unit.

Bit b = Output to host indicating a command is pending (command has been read but not yet completed).

Bit x = Reserved, must be zero.

The dispatch word (DWØ) implements a handshake between the controller and the host system.

Setting any unit's bit "a" indicates to the controller the command subpacket for the unit is ready to be read.

Bit "b" is set when the controller has finished reading the command subpacket. The host must not issue a command when bits "a" and "b" are set. The mWDC will clear bits "a" and "b" when the command is complete.

CWØ Command Word (COMMAND FIELD AND OPCODE)

```
MSB 15   14 x x x 1Ø  8   9  7 x x x x x x Ø  LSB
    Retry  Reserved   EI SMD  Command Opcode
```

COMMAND FIELD BITS	FUNCTION
Bit 15	After command completion, if a correctable error occurred, this bit will be a 1. Otherwise, it will always be zero.
Bits 1Ø through 14	Reserved
Bit 9	SMD Mode (Sector Map Disabled)
Bit 8	Enable Interrupt on command complete.

COMMAND OPCODE

Bits Ø through 7 — Specific controller command codes are input to the controller through these bits.

CW1 LOGICAL BLOCK NUMBER WORD

Bits Ø through 15 — The mWDC I accepts a 16-bit block number from the host.

Bits Ø through 31 — The mWDC II or III accepts a 32-bit block number from the host.

CW2 TRANSFER SECTOR / BLOCK COUNT WORD

Bits Ø through 15 — The host may pass up to sixteen bits that signify the number of sectors to be transferred when the mWDC I board is in use. If this causes a pack overflow, an illegal cylinder error is returned.

Bits Ø through 31 — A 32-bit sector count transfer when the mWDC II or III board is in use.

CW3 TRANSFER ADDRESS BITS Ø - 15 WORD

Bits Ø through 15 — The host must pass a 24-bit address to the controller for commands involving I/O. This transfer address is the location of the first word of a block of memory allocated for the transfer. The direction of transfer is determined by the command. Read sector moves data from the disk to host memory. Write sector moves data from the host to the disk. These bits are used to pass the low order 16 bits of a 24-bit transfer address.

CW4 TRANSFER ADDRESS BITS 16 - 31 WORD

Bits Ø through 7 — These bits are used to pass the high order 8 bits of a 24-bit transfer address (Segment number).

Bits 8 through 15 — Reserved for transfer of address Bits 24-31.

CW5 STATUS WORD

Bits Ø through 7 — Interrupt Vector: Input from host indicating the desired interrupt vector for the current command. (Non-significant if in polled mode.)

Bits 8 through 12 — At command completion, the output from the mWDC is the completion status code.

BINARY 12 8	COMPLETION CODE
ØØØØØ	No error
ØØØØ1	Read abort
ØØØ1Ø	Wait abort condition (Fatal)
ØØØ11	Parity error during bus transfer
ØØ1ØØ	Write fault condition (Fatal)
ØØ1Ø1	Seek not complete (Fatal)
ØØ11Ø	Cylinder not found
ØØ111	Drive not selected (Fatal)
Ø1ØØØ	Head and/or sector/record not found
Ø1ØØ1	Invalid command
Ø1Ø1Ø	No track Ø found (Fatal)
Ø1Ø11	Drive not ready (Fatal)
Ø11ØØ	Bad interrupt generated within mWDC
Ø11Ø1	Cylinder Ø defective or greater than 45 bad sectors on disk (Fatal)
Ø111Ø	Illegal cylinder selected or beyond disk boundary
Ø1111	Burst Error Processor (BEP) error
1ØØØØ	Soft BEP error
1ØØØ1	Soft head and/or sector not found
1ØØ1Ø	Soft cylinder not found
1ØØ11	Soft read abort

Bits 13 through 15 On command completion, the logical unit number

BIT 15	14	13	LOGICAL UNIT
Ø	Ø	Ø	Unit number Ø mini-disk
Ø	Ø	1	Unit number 1 mini-disk
Ø	1	Ø	Unit number 2 mini-disk, Models 21+ and 22 only
Ø	1	1	Unit number 3 mini-disk, Models 21+ and 22 only
1	Ø	Ø	Not used
1	Ø	1	Not used

Bits 8 - 15 On command input, these bits are normally set by the host to zeros. However, the host may request that only part of the last sector (see CW2) be transferred by setting bits 8-15 to the number of words to be read from the last sector.

CONTROLLER COMMAND SET

The command set for the mWDC is described in Table B-3 for the following binary command opcodes (Bit 7- Bit Ø).

OPCODE	COMMAND
ØØØØØØØØ LSB	Test Drive Ready
ØØØØØØØ1	Read Drive Parameters
ØØØØØ1Ø1	Read Sector Sparing Map
ØØØ1ØØØØ	Read Multiple Sector
ØØØ1ØØØ1	Write Multiple Sector
ØØØ1ØØ11	Recalibrate Drive
ØØØ1Ø1ØØ	Format Track
ØØØ1Ø1Ø1	Seek

Table B-2 mWDC Command Set Descriptions

COMMAND	DESCRIPTION
TEST DRIVE READY / UNIT/	Test Drive Ready selects the drive and verifies drive ready.
READ DRIVE PARAMETERS /UNIT/ ADDRESS	The host reads the drive parameters at the address specified.
READ SECTOR SPARING MAP /UNIT/ ADDRESS	The host reads the sector sparing map at the address specified.
READ MULTI SECTOR /UNIT/ LOGICAL BLOCK NUMBER / BLOCK COUNT / ADDRESS	Generates an implicit seek. Requires disk address (unit, logical block number) and system buffer address (block count, address).
WRITE MULTI SECTOR /UNIT/ LOGICAL BLOCK NUMBER / BLOCK COUNT / ADDRESS	Generates an implicit seek. Requires disk address (unit, logical block number) and host system buffer address (block count, address).
RECALIBRATE /UNIT/	Positions drive heads to Track Ø restoring the drive seek logic. Execution is slower than seek command.
FORMAT TRACK / UNIT/ LOGICAL BLOCK NUMBER/ ADDRESS	Format a track designated by target cylinder, head, and sector numbers. The host provides the appropriate format buffer.
SEEK / UNIT / LOGICAL BLOCK NUMBER	The mWDC does an explicit seek and read and then compares the cylinder number for the correct cylinder.

Table B-3 Tape Controller Status Register Bit Definitions

BIT	NAME	DEFINITION
Bit Ø	NOTAP	No tape cartridge in drive
Bit 1	FMDET	File mark detected during read or skip blocks
Bit 2	HWERR	Hardware error
Bit 3	INVAL	Invalid command
Bit 4	INAP	Inappropriate command
Bit 5	(Not Used)	
Bit 6	BPARM	Bad DMA parameters
Bit 7	BLKTAP	Blank tape
Bit 8	PROT	Tape cartridge write protected
Bit 9	LBOT	Tape at logical beginning of tape
Bit 1Ø	LEOT	Tape at logical end of tape
Bit 11	RTRYAT	One or more retries attempted
Bit 12	UNITØ	Tape drive address Bit Ø
Bit 13	UNIT1	Tape drive address Bit 1
Bit 14	TRKØ	Track address Bit Ø
Bit 15	TRK1	Track address Bit 1

APPENDIX C
LAP SUMMARY CONTENTS

C.1. General

This appendix lists types of information found in lap summaries for:

MDC Tests
WDC Tests
SMD Tests

A lap summary is a table of statistics that are cumulative for all laps completed so far in the current test run.

The lap summary includes:

- test name
- lap number
- unit number
- total number of errors of all types
- list of each packet command issued or status bit returned during test, and number of times issued
- tallies of hard, soft and other error types, and when occurred (during which process)

The remainder of this appendix provides a more detailed description of commands and error types found in specific lap summaries, beginning with MDC.

C.2. MDC Test Lap Summaries

This text documents the type of information found in lap summaries displayed at the end of MDCCRC, MDCFMT and MDCTST. The SADIE "REC" command provides a means of viewing error statistics when running MDCMON.

C.2.1. MDC Packet Commands

Lap summaries for the various MDC tests include tallies of the number of times these packet commands were issued:

Command	Description
SEEK	Explicit Seek
READ	Read Multi-sector
WRITE	Write Multi-sector
FMT	Format Disk (entire volume)
HOME	Home (recalibrate) Drive
RDDRV	Read Drive Parameters
DRVRDY	Drive Ready
READMAP	Read Sector Defect Map

C.2.2. MDC Soft Error Tallies

The error statistic table includes a tally of the number of times each correctable (soft) error was returned upon completion of the following packet commands:

Command	Description
TOTAL	Total number of correctable errors
BEP	Burst Error
BNF	Block Not Found
CNF	Cylinder Not Found
RDABT	Read Abort
UE	Undefined error code

C.2.3. MDC Hard Error Tallies

The error statistic table provides a tally of the number of uncorrectable (hard) errors returned upon completion of the following packet commands:

Command	Description
TOTAL	Total number of uncorrectable errors
BNF	Block Not Found
NR	Drive Not Ready
WF	Drive Write Fault
CNF	Cylinder Not Found
SINT	Bad Interrupt
BEP	Burst Error
ABORT	Wait Abort
PAR	Parity
SNC	Seek Not Complete
NSEL	Drive Not Selected
NTRKØ	No Track Ø Signal
BDMAP	Bad Sector Defect Map
IC	Illegal Cylinder
INVC	Invalid Packet Command
RDABT	Read Abort
UE	Undefined error code

C.2.4. All Other MDC Hard Errors

All other uncorrectable errors are categorized and tallied as follows:

Error Type	Description
TOTAL	Total number of other errors
INIT	MDC Initialization or self-test errors
CMP	Compare errors
CYLØ	Cylinder Ø error during format
MAPOFL	Map Overflow

C.3. SMD Test Lap Summaries

These headings list statistics found in lap summaries which follow SMDFMT, SMDCRC, SMDMEDIA and SMDTST tests. Error statistics are accessible from SMDMON via the SADIE "REC" command.

C.3.1. SMD Packet Commands

SMD error statistic tables include the number of times these packet commands were issued:

Command	Description
TOTAL	Total packet commands issued
nop	NOP commands
wram	WRAM commands
rram	RRAM commands
sel	SELECT commands
pri	PRISEL commands
rel	PRIREL commands
rst	RESET commands
seek	SEEK commands
fmt	FMT commands
wlng	WLONG commands
wri	WRITE commands
frd	FRD commands
rlng	RLONG commands
read	READ commands
size	SIZE commands
inv	invalid packet commands

NOTE

"Invalid" packet commands may include valid commands issued by SMDMON via the DOPKT command.

C.3.2. SMD Soft Error Tally

The error statistic table tallies all soft errors reported by the SMD controller following packet command execution, including:

Error	Description
TOTAL	# times one or more error status bits (SB) returned when Ending Status (ES) indicated none occurred
rty	soft errors with retries attempted
corr	soft errors with correction attempted
rz	soft errors with disk rezero attempted

C.3.3. SMD Hard Error Tally

Error	Description
TOTAL	# times hard error returned in ending status
rty	hard data errors with retries attempted
corr	hard data errors with correction attempted
rz	hard data errors with disk rezero attempted

C.3.4. SMD Drive Error Tally

Drive errors encountered during execution of packet commands are tallied as:

Error	Description
TOTAL	# times one or more drive errors occurs during packet command execution
df	drive faults
se	drive seek errors
noc	drive not-on cylinder errors
nrdy	drive not ready errors
busy	dual-access busy errors

C.3.5. SMD Controller Time Out Errors

SMD controller timeout errors which occur during packet command execution are listed this way:

Timeout Type	Description
TOTAL	total # timeout errors
idle	timeouts in controller idle loop
ius	timeouts waiting for IP/IUS to clear
dma	timeouts waiting for DMA completion
oc	timeouts waiting for drive on cylinder
sclk	timeouts waiting for Servo clock
dclk	timeouts waiting for Data clock
mark	timeouts waiting for Sector/index mark
isnc	timeouts waiting for ID sync
dsnc	timeouts waiting for Data sync

C.3.6. Other Packet Command Errors

Other packet command errors found on the statistics table include:

Error Type	Description
TOTAL	number other packet command errors
init	initialization errors (SMD controller reports incomplete Dispatch Table address and/or Interrupt vector
so	sector overruns
me	memory parity errors
sel	select errors (Ø or multiple drives)
ct	byte/sector Count errors
rze	rezero errors (rezero did not clear a fault)
ae	address errors
ofl	pack overflows
pf	power-fail detected
snf	sector not found errors
wpv	write protect violations
inv	SMD controller reports invalid packet commands
unk	SMD controller returns unknown ending status code

C.3.7. Diagnostic Error Tally

This list describes errors types detected by the diagnostic:

Error Type	Description
TOTAL	number of diagnostic detected errors
cmp	errors detected during 2 buffer compare
htrk	# tracks with multiple hard error defects (reported by SMDFMT only)
strk	# tracks with soft defects unable to flag as bad due to presence of multiple soft defects or a hard defect on same track (reported by SMDFMT only)
resp	SMD controller not responding (polled-mode commands only)
sto	SMD controller timeout -- controller failed to interrupt within expected time (polled or interrupt mode)

C.4. WDC Soft Error Lap Summary

Lap Summaries associated with WDC tests include a tally of the number of times the disk controller returned the following status bits when a soft error occurred:

```
TOT  -- total number of errors
DAT  -- CRC errors
POS  -- sector not found
FOR  -- format error (sector header field error)
NR   -- unit not ready
SVE  -- servo error
RWF  -- read or write fault
SPE  -- speed error
PL   -- power loss
WPT  -- write protected
DSE  -- seek error
NCL  -- not on cylinder
GB   -- guard band error
PLE  -- PLO error
UNS  -- unsafe
DCE  -- invalid command
DTO  -- timeout error
P/M  -- POR/MR
ADE  -- address error
DF   -- drive fault
NOL  -- drive not on-line
CTO  -- controller operation timed out
CWP  -- write protect error
VF   -- verify failure
BD   -- bad disk:  excessive media defects
CRDT -- can't read defect table
ME   -- map error
```

C.4.1. WDC Hard Error Lap Summary

Lap summaries associated with WDC tests contain tallies of hard errors for the same status bits listed for soft errors, with the addition of:

```
INVC -- invalid command
CMP  -- compare error
INIt -- WDC not responding during initialization
```

Refer to the Winchester Disk Controller Hardware Reference Manual (Ø3-32Ø3-Ø1) for detailed disk controller command and status register information.

APPENDIX D
SYSTEM POWER UP DIAGNOSTICS ERROR LISTS

B.1. GENERAL

This appendix provides diagnostic error lists which interpret error code displays that may occur during system power up diagnostics.

The first list references error codes for systems using CPU boards other than the HPCPU.

The second list is applicable only to systems in which HPCPU monitor firmware version 1Ø.Ø and above is installed.

Note that the type of disk drive controller board (referenced in error numbers 1ØØØ through 1ØØ2 and 3ØØØ on the first list) may differ, depending on system configuration. Referenced boards may include the mWDC II, mWDC III, and the WDC.

SYSTEM POWER-UP DIAGNOSTIC (SPUD) ERROR LIST

ERROR #	P1	P2	P3	P4	CHRS * PRINTED	DESCRIPTION
0000	—	—	—	—	P	No External Memory**
0001	SEG #	ADDR	RD	—	O	Seg. Addr Fault **
0100	SEG #	ADDR	TD	RD	W	Mem. Addr Fault
0101	SEG #	ADDR	TD	RD		Data Line Fault
0102	SEG #	ADDR	TD	RD		'As' Data Fault
0103	SEG #	ADDR	TD	RD		'5s' Data Fault
0104	—	—	—	—		No Good Segments Above Zero**
0100	SEG #	ADDR	TD	RD	E	Segment Zero Memory Test
0101	SEG #	ADDR	TD	RD		(Descriptions As Above)
0102	SEG #	ADDR	TD	RD		
0103	SEG #	ADDR	TD	RD		
0200					R (sp)	ECC Single-bit Correction Failure
0201					U	ECC two-bit trap failure
0202					P (sp)	ECC two-bit error not reported
0203	SEG #	ADDR				ECC Check Byte RAM error
0300	MMU	SDR	TD	RD	D	MMU's Not Individually Addressable
	PORT #	FIELD #				
0301	MMU	SDR	TD	RD		SAR or DSCR Indexing Fault
	PORT #	FIELD #				
0302	MMU	SDR	TD	RD		SDR 'As' or '5s' Data Fault
	PORT #	FIELD #				
0303	MMU	TD	RD	—		MMU Control Register 'As' or '5s' Fault
	CMD #					
0304	REG #	TD	RD	—		System/Normal Break Register 'As' or '5s' Fault
0305	MMU ID #	SDR #	VDAT	—	I	Stack MMU Did Not Trap On Limit Test
0305					A	Unexpected Trap
0305					G	Unexpected Trap
0305					N	Data MMU Did Not Trap On Limit Test
0305					O	Stack MMU Did Not Trap On Read-Only Test
0305					S	Data MMU Did Not Trap On Read-Only Test
0306	MMU Port #	SDR #	TD	RD	T	Translation Fault On Data MMU
0307	MMU PORT #	SDR #	VDAT	—		Unexpected Trap
0308	MMU PORT #	SDR #	TD	RD	I	Translation Fault On Stack MMU
0309	MMU PORT #	SDR #	VDAT	—		Unexpected Trap
0310	MMU PORT #	SDR #	TD	RD	C	Translation Fault On Code MMU
0311	MMU PORT #	SDR #	VDAT	—		Unexpected Trap
0312	MMU PORT #	SDR #	—	—	S (sp)	No Trap On Code MMU Limit Test

SPUD Error List (continued)

ERROR #	P1	P2	P3	P4	CHRS * PRINTED	DESCRIPTION
1000	—	—	—	—		No WDC Board In System
1001	DS1	DS2	DS3	DS4		WDC Self Test Error
1002	—	—	—	—		WDC Drive 0 Error
2000	—	—	—	—		No TCC Board In System
2001	—	—	—	—		Busy Bit Always Set***
2002	REG #	TD	RD	—		'5s' Data Fault
2003	REG #	TD	RD	—		'As' Data Fault
2004	IV REG	STATO REG	MIC REG	—		TCC Self-Test Error***
2005	IV REG	STATO REG	MIC REG	—		TCC Hardware Error***
3000						WDC Not Responding
3001	ADDR	—	—	—		RAM Error (P1 holds location)
3002						PROM Checksum Error
3003						Time Out Condition
3004						Read ABORT Error
3005						Wait ABORT Error
3006						Parity Error
3007						Not Used But Reserved
3008						Seek Not Complete Error
3009						Cylinder Not Found
3010						Drive Not Selected
3011						Head/Secter Not Found
3012						Invalid Command
3013						No Track 0 Found
3014						Drive Not Ready
3015						Bad Interrupt
3016						Bad MAP
3017						Illegal Cylinder Selected
3018						BEP Error
4000						SMC Not Responding
4001						SMC Initialization Error
4002						SMC RAM Error
4003	STATUS	—	—	—		SMC Self Test Timed Out Host Waiting (P1 holds SMC status register)
4004						Drive 0 Not Selected
4005						Drive 0 Not Ready
4006						Drive 0 Not On Cylinder
4007						Drive 0 Read Only
4008						Drive 0 Drive Fault
4009						Drive 0 Seek Error
4010						Drive 0 Not Formatted (Can't Size Disk)
COMPLETE						Last Characters of SPUD Message

SPUD Error List (continued)

LEGEND

* → Characters of SPUD message printed before entering test

** → Fatal error preventing further memory-related tests from being run

*** → The TCU test may take up to two minutes if the drive is busy or if the 'busy' status bit is stuck. The last two TCU error messages dump out the contents of the status registers for troubleshooting.

Pn → Test parameters of error printed (in hexadecimal):

SEG #	→	segment number
ADDR	→	address offset
TD	→	test data
RD	→	returned data
MMU PORT #	→	full work port number of MMU under test
MMU CMD #	→	MMU port number with command 'ored' in
SDR FIELD #	→	indicates a particular SDR in the range 0-255
MMU ID #	→	ID of MMU(s) returned from a segment trap
	→	1 = code MMU
	→	2 = data MMU
	→	4 = stack MMU
SDR #	→	logical segment number or set of SDR's (0-63)
VDAT	→	violation data from a single MMU trapping
(HB)	→	bus cycle status register data
(LB)	→	violation type register data
DS1	→	WDC detailed status - always 0
DS2	→	- always 0
DS3	→	- operation error status
DS4	→	- self-test error status
REG #	→	register port number of unit under test
—	→	no parameter printed
STATUS	←	SMC status port contents

When the diagnostics are complete, the maximum available segment number will be displayed as follows (xx in hexadecimal):

MODEL 11 Plus

POWER UP DIAGNOSTICS
ACTIVE PERIPHERALS:
  MDC
  TCC
  ECC (optional)
  ICPn (optional)
  SSBn (optional),
    where n = board I.D. no.
COMPLETE
SEGMENTED JUMPERS
MAXSEG = <xx>

MODEL 21 PLUS (STD.CONFIG.)

POWER UP DIAGNOSTICS
ACTIVE PERIPHERALS:
  WDC
  TCC
  ECC (optional)
  SSB0, SSB1 (optional)
  MTC (optional)
  ICP0-7 (optional)
COMPLETE
SEGMENTED JUMPERS
MAXSEG = <xx>

MODEL 31 PLUS (STD.CONFIG.)

POWER UP DIAGNOSTICS
ACTIVE PERIPHERALS:
  SMC
  TCC
  ECC
  SSB0, SSB1 (optional)
  MTC (optional)
  ICP0-7 (optional)
COMPLETE
SEGMENTED JUMPERS
MAXSEG = <xx>

SYSTEM POWER UP DIAGNOSTICS (SPUD) ERROR LIST
(For HPCPU Monitor Firmware, Version 1Ø.Ø and Above)

ERROR #	P1	P2	P3	P4	CHRS PRINTED	DESCRIPTION
ØØ1Ø	-	-	-	-		PROM checksum error*
ØØ2Ø	-	-	-	-		Scratchpad RAM error*
ØØ3Ø	-	-	-	-		Console port SCC error*
ØØØØ	-	-	-	-	M	No external memory**
ØØØ1	SEG#	ADDR	RD	-	O	Segment address fault**
ØØ4Ø+	REG#	TD	RD	-	N	CIO register error
ØØ41+	-	-	-	-		CIO counter/timer error
ØØ5Ø+	REG#	TD	RD		I	Tag bank #0 register error
ØØ51+	REG#	TD	RD			Tag bank #1 register error
Ø1ØØ	SEG#	ADDR	TD	RD	T	Memory Address Fault**
Ø1Ø1	SEG#	ADDR	TD	RD		Data Line Fault**
Ø1Ø2	SEG#	ADDR	TD	RD		'As' Data Fault**
Ø1Ø3	SEG#	ADDR	TD	RD		'5s' Data Fault**
Ø1Ø4	-	-	-	-		No Good Segments Above zero***
Ø1ØØ	SEG#	ADDR	TD	RD	O	Segment Zero Memory Test
Ø1ØØ	SEG#	ADDR	TD	RD		(Description As Above)
Ø1Ø2	SEG#	ADDR	TD	RD		
Ø1Ø3	SEG#	ADDR	TD	RD		
Ø2ØØ	-	-	-	-	R(sp)	ECC Single-bit Correction Failure**
Ø2Ø1	-	-	-	-	P	ECC 2-bit Trap Failure**
Ø2Ø2	-	-	-	-		ECC 2-bit error not reported**
Ø3ØØ+	MMU PORT#	SDR FIELD#	TD	RD	O	MMUs Not Individually Addressable
Ø3Ø1+	MMU PORT#	SDR FIELD#	TD	RD		SAR or DSCR Indexing Fault
Ø3Ø2+	MMU PORT#	SDR FIELD#	TD	RD		SDR 'As' or '5s' Data Fault
Ø3Ø3+	MMU CMD#	TD	RD	-		MMU Control Register 'As' or '5s' Fault
Ø3Ø4+	REG#	TD	RD	-		Normal Break Register 'As', '5s', 'Fs' or 'Os' Fault
Ø3Ø5+	MMU ID#	SDR#	VDAT	-	W	Stack MMU Did Not Trap On Limit Test
Ø3Ø6+					E	Unexpected Trap

SPUD Error List for 10.0 Proms (continued)

ERROR #	P1	P2	P3	P4	CHRS PRINTED	DESCRIPTION
0307+					R(sp)	Unexpected Trap
0308+					U	Data MMU Did Not Trap On Limit Test
0309+					P(sp)	Stack MMU Did Not Trap On Read-Only Test
0310+					D	Data MMU Did Not Trap On Read-Only Test
0311+	MMU PORT#	SDR#	TD	RD	I	Translation Fault On Data MMU
0312	MMU PORT#	SDR#	VDAT	-		Unexpected Trap****
0313+	MMU PORT#	SDR#	TD	RD	A	Translation Fault On Stack MMU
0314	MMU PORT#	SDR#	VDAT	-		Unexpected Trap****
0315+	MMU PORT#	SDR#	TD	RD	G	Translation Fault On Code MMU
0316	MMU PORT#	SDR#	VDAT	-		Unexpected Trap****
0317+	MMU PORT#	SDR#	-	-	N	No Trap On Code MMU Limit Test
0400	REG#	TD	RD	-	O	Tag did not update correctly, bank #0
0401	REG#	TD	RD	-		Unexpected tag value (bank #1)
0402	SEG#	ADDR	TD	RD	S	Cache memory read-in data fault, bank #0
0403	REG#	TD	RD	-	T	Tag did not remain updated after write, bank #0
0404	SEG#	ADDR	TD	RD		Cache memory write-to data fault, bank #0
0405	SEG#	ADDR	TD	RD		Cache write through fault for bank #0
0410	REG#	TD	RD	-	I	Tag did not update correctly, bank #1
0411	REG#	TD	RD	-		Unexpected tag value, bank #0
0412	SEG#	ADDR	TD	RD	C	Cache memory read-in data fault, bank #1
0413	REG#	TD	RD	-	S	Tag did not remain updated after write, bank #1
0414	SEG#	ADDR	TD	RD		Cache memory write-to fault, bank #1
0415	SEG#	ADDR	TD	RD		Cache write through fault for bank #1

SPUD Error List For 10.0 Proms (continued)

ERROR #	P1	P2	P3	P4	CHRS PRINTED	DESCRIPTION
1000	-	-	-	-		WDC Not Responding
1001	DS1	DS2	DS3	DS4		WDC Self-Test Error
1002	-	-	-	-		WDC Drive 0 Error
2000	-	-	-	-		TCC Not Responding
2001	-	-	-	-		Busy Bit Always Set*****
2002	REG#	TD	RD	-		'5s' Data Fault
2003	REG#	TD	RD	-		'As' Data Fault
2004	IV REG	STATO REG	MIC REG	-		TCC Self-Test Error*****
2005	IV REG	STATO REG	MIC REG	-		TCC Hardware Error*****
3000	-	-	-	-		MDC Not Responding
3001	ADDR	-	-	-		RAM Error
3002	-	-	-	-		PROM Checksum Error
3003	-	-	-	-		Time Out Condition
3004	-	-	-	-		Read ABORT Error
3005	-	-	-	-		Wait ABORT Error
3006	-	-	-	-		Parity Error
3007	-	-	-	-		Write Fault (Should Never Occur)
3008	-	-	-	-		Seek Not Complete
3009	-	-	-	-		Cylinder Not Found
3010	-	-	-	-		Drive Not Selected
3011	-	-	-	-		Head/Sector Not Found
3012	-	-	-	-		Invalid Command
3013	-	-	-	-		No Track #0 Found
3014	-	-	-	-		Drive Not Ready
3015	-	-	-	-		Bad Interrupt
3016	-	-	-	-		Bad Map
3017	-	-	-	-		Illegal Cylinder Selected
3018	-	-	-	-		BEP Error
4000	-	-	-	-		SMC Not Responding
4001	-	-	-	-		SMC Initializing Error
4002	-	-	-	-		SMC RAM Error
4003	STATUS	-	-	-		SMC Timed Out Host Waiting For Interrupt
4004	-	-	-	-		Drive #0 Not Selected
4005	-	-	-	-		Drive #0 Not Ready
4006	-	-	-	-		Drive #0 Not On Cylinder
4007						Drive #0 Read Only
4008						Drive #0 Drive Fault
4009						Drive #0 Seek Error
4010						Drive #0 Not Formatted (Can't Size Disk)

SPUD Error List For 1Ø.Ø Proms (Continued)

```
+      - Loop on test applicable.
*      - Test executed only at power-on or reset.
**     - Power-on fatal error.
***    - Fatal error preventing further memory-related test execution.
****   - Error number only.  Loop on test number inapplicable.
*****  - The TCU test may take up to two minutes if the drive is busy or
         if the 'busy' status bit is stuck.  The last two TCU
         error messages dump out the contents of the status registers for
         troubleshooting.

Pn     - Test parameters of error printed (in hexadecimal):

           SEG#            - segment number
           ADDR            - address offset
           TD              - test data
           RD              - returned data
           MMU PORT#       - full work port number of MMU under test
           MMU CMD#        - MMU port number with command 'ORed' in
           SDR FIELD#      - indicates a particular SDR in the range Ø-255
           MMU ID#         - ID of MMU(s) returned from a segment trap
                               1 = code MMU
                               2 = data MMU
                               3 = stack MMU
           SDR#            - logical segment number or set of SDR's (Ø-63)
           VDAT            - violation data from a single MMU trapping
                               high byte - bus cycle status register data
                               low byte  - violation type register data
           DS1             - WDC detailed status - disk ready register
           DS2             -  "     "        "    - disk status register
           DS3             -  "     "        "    - operation error status
           DS4             -  "     "        "    - self-test error status
           REG#            - register port number of unit under test
           -               - no parameter printed
           STATUS          - SMC status contents
```

When the diagnostics are complete, the maximum available segment number will be displayed as follows. Peripherals listed are dependent on the system model number and options. The value <xx> is in hexadecimal.

```
MONITOR POWER UP DIAGNOSTICS
ACTIVE PERIPHERALS:

MDC  (models 12, 22)
SMC  (model 32)
TCC
SSBn (optional), where n = board I.D. no.
ICPn (optional), where n = board I.D. no.
MTC  (optional, model 32)
FPP  (optional, models 22,32)
COMPLETE

MAXSEG=<xx>
```