
H/Z-100 Series Disk-Based Diagnostics

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Essential requirements for using the H/Z-100 Series Disk Based Diagnostics:

- a. Distribution Media: One 5.25-inch soft-sectored 48-tpi disk
- b. Machine Configuration (minimum): H/Z-100, 128K memory, one floppy disk drive, and CRT
- c. Operating System: Z-DOS 1.1 (supplied)
- d. Microcomputer Language: Not applicable

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Part I

Introduction

Z-100 Diagnostics

Diagnostics for the Z-100 Desktop Computer are provided in two forms, ROM-based and disk-based. This manual is primarily concerned with the disk-based diagnostics.

The diagnostic tests were designed to function with a minimum of operator interface and special test hardware. Emphasis has been placed on ease of operation, consistency of screen messages, and clarity of information given to the operator. The information obtained with these tests can be used by service personnel to greatly reduce service costs and hardware down time.

Goals

The optimum goal for any test is to detect 100% of the errors in the system. However, this goal may not always be obtainable. Maximum detection of errors is strived for.

The normal goal is to resolve 95% of detected faults to two subassemblies or less, and 90% of detected faults to one subassembly. Whenever possible, faults are resolved to the most likely LSI and supporting ICs. RAM and ROM faults are always resolved to the IC level by disk-based diagnostics.

Due to the nature of some tests (I/O port interface, for example) additional hardware may be required.

Features

The following features are present in the diagnostics:

- Run all automatic tests — Testing of all portions of the hardware that can be accessed without operator input is initiated by a single keystroke.
- Audible and visual error indicators — Errors are denoted by an audible alarm and by a distinct display which is easily recognized and is consistent in all tests.

INTRODUCTION

Z-100 Diagnostics

- On-screen fault information — Fault information required to correct errors is given on the screen. Included is the failing function detected, the most likely hardware that can cause the problem, information about data when the fault occurred, and the contents of all processor registers at the time of the fault.
- Consistent test information — Because of the diagnostic monitor approach, test modes, error counters, etc., are available for all tests. These features and the associated screen displays are consistent from test to test.
- Retention of system configuration — Configuration information for the system is stored on the mass storage media with the diagnostic tests. The system configuration need be entered only once for any given set of hardware.
- Printing of screens and fault information — Any display on the screen can be transferred to a printer by pressing the CTRL and P keys. Also, all faults are automatically printed when testing in CONTINUE ON ERROR mode. This feature makes it easy to retain fault information and to convey information about test operation and faults. Since a real time clock is maintained on the screen, all printouts contain the date and time of the error for later reference.
- Test repetition — Tests may be run from 1 to 99 times or continuously. This feature makes it convenient to uncover intermittent faults or run long term tests on hardware.
- Help screens — Help screens may be accessed at all menu and fault displays. This provides instant information on the screen format and options that are available. In addition, the bottom three lines of the screen normally display information about options available to the operator.

INTRODUCTION

Z-100 Diagnostics

Hardware Requirements

Minimum requirements for both the ROM- and disk-based diagnostics is a Z-100 Desktop Computer consisting of:

- a 95-key keyboard,
- an H/Z-100 Motherboard with a minimum of 128K of RAM,
- an H/Z-100 video board with at least 32K of RAM,
- a floppy disk controller board, and
- one disk drive.

If additional hardware is available on the system under test, the disk-based diagnostics can be configured to test this hardware.

The ROM-based diagnostics require that an MTR100 ROM (containing version 2.0 or greater) be installed in the system. The disk-based diagnostics will operate on any H/Z-100 Desktop Computer without hardware modification. The tests must, however, be configured properly for the machine under test.

ROM-Based Diagnostics

The ROM-based diagnostics are resident in the boot ROM and run each time the Computer is powered up. Included in these routines is a set of detection tests that check all hardware necessary to load programs from the floppy disk. No additional operator interface is required unless an error is detected or a special operation is desired. This test executes in 4.5 seconds or less if no errors are detected.

Several optional test routines are available in the boot ROM. Access to these tests is provided by pressing the T key at the pointing finger prompt. This results in the following display:

INTRODUCTION

Rom-Based Diagnostics

CHOOSE ONE OF THE FOLLOWING:

1. DISK READ TEST
2. KEYBOARD TEST
3. MEMORY TEST
4. POWER-UP TEST
5. EXIT

ENTER YOUR CHOICE:

During the Keyboard Test, pressing a key on the keyboard will cause the screen to be filled with that character or if the key is a non-displayable character the message NON-DISPLAYABLE CHARACTER is displayed on the screen.

Except for the Memory Test, once selected, a test continues to execute until the **DELETE** key is pressed.

To stop the Memory Test press **CTRL-RESET**.

Disk-Based Diagnostic

Diagnostic Monitor

The Diagnostic Monitor is a program designed to integrate operation of the many test routines used to check the computer system. It performs the functions of test selection, loading, sequencing, and displaying data that are common to all tests. It makes available to tests a set of often used utility functions that would otherwise have to be duplicated for each test program.

The Diagnostic Monitor is automatically started when the diagnostic disk is booted. It may also be invoked by typing [DIAG filename.ext] at the Z-DOS prompt. The optional file name designates a configuration file to use while testing. The default is DIAG.CFG.

INTRODUCTION

Disk-Based Diagnostic

Diagnostic Tests

The diagnostic tests contain all the actual test code used to check the computer system. Each diagnostic consists of sections that check particular areas of the unit under test. Individual tests or sections may be accessed by expanding the program menus.

Configuration

NOTE: Before performing any test using a newly installed diagnostic disk or when hardware changes have occurred, the Diagnostic Monitor and several of the Diagnostic Tests need to be configured for the system under test. Failure to do so may result in incomplete testing or inaccurate failure messages.

Configuration of the Diagnostic Monitor and the Diagnostic Tests will be discussed in their respective sections of this manual.

Part II Disk-Based Diagnostics

CHAPTER 2 THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

Program Menu

Diagnostic tests are accessed by first loading the diagnostic monitor from the mass storage device. This is done automatically if a diagnostic diskette as supplied from Zenith Data Systems is used. Entry from the operating system is done by typing **DIAG** and pressing the **RETURN** key at the system prompt. Upon entry, the following display is shown:

HEATH/ZENITH DIAGNOSTIC - REV. P1.OK 08/23/83 08:01:02

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*** WARNING ***

The accuracy and completeness of diagnostic tests depends upon providing correct hardware configuration information. Whenever operating on a new system, or after changing system hardware, select miscellaneous function four (CONFIGURATION) and modify the configuration data to correspond with the system hardware. This step is not necessary after configuration information has been saved on the mass storage media.

Type any key to continue: _

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

Pressing any key results in the following display:

HEATH/ZENITH DIAGNOSTIC - REV. PI.0A	9/9/83	14:52:53
STATUS: STOPPED	STARTS:	0
MODE: STOP ON ERROR	PASSES:	0
RUN: 01 PASS	ERRORS:	0

PROGRAM MENU

1. DIAGNOSTIC TESTS
2. SYSTEM EXERCISER
3. MISC. FUNCTIONS
4. RETURN TO SYSTEM

INPUT _

PRESS: "F0" FOR ALL AUTOMATIC TESTS	"CTRL-R" FOR CONT/SINGLE PASSES
NUMBER TO EXPAND MENU ENTRY	"CTRL-S,L,C" FOR MODE CHANGE
"HELP" FOR MORE INFORMATION	ENSURE CONFIGURATION IS CORRECT

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

The various areas of the display correspond to the following:

Header line — Name and revision of current monitor program followed by the current system date and time.

Status — The current state of the test.

STOPPED if the test is not running.

RUNNING if the test is running.

PAUSED if the test is paused.

LOOPING if the test is looping on error.

LOADING if a test is being loaded from disk.

Mode — The action to be taken if an error is encountered.

STOP ON ERROR stops the test and waits for operator input.

CONT ON ERROR prints the error on the configured printer and continues the test operation.

LOOP ON ERROR repetitively loops on the failure.

Run — The number of times each test is run.

CONTINUOUS continues repeating the test until stopped by the operator from the keyboard.

n PASS where n may be any number from 1 to 99.

Starts — The number of times the test was started.

Passes — The number of times the test passed without error.

Errors — The number of errors found since starting the test.

The menu in the center of the screen provides a list of selectable items for execution.

The information at the bottom of the screen lists the options available.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

Help Screens

Help screens are available at all menus and fault displays. Pressing the **HELP** key at the Program Menu will cause the following screen to be displayed:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0A
Program menu help information:

08/27/83 08:30:32

Typing "F0" results in running all available automatic tests in sequence. A "NO ERRORS FOUND" message is displayed if no hardware faults are detected in the system. If a fault is encountered the tests stop and data pertaining to the fault, and its correction, is displayed on the screen.

Menu entries are selected by typing the menu number followed by the "RETURN" key.

Selecting "SYSTEM EXERCISER" currently results in running all automatic tests, i.e. same function as the "F0" key.

Selecting "MISC. FUNCTIONS" results in a menu of the available utility functions. Prior to operation of a newly installed diagnostic disk, or whenever hardware changes occur, the configuration should be selected and, if necessary, modified to accurately correspond with hardware. Failure to do this may produce incomplete testing or inaccurate failure messages.

Selecting "RETURN TO SYSTEM" results in a return to the operating system monitor.

"HELP" for more information, "RETURN" to return to the menu

This help screen briefly describes the options and menu selectable items available from the Program Menu.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

Pressing the **RETURN** key will return you to the Program Menu. Pressing the **HELP** key again presents the following screen which lists the control keys available and their action:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0A

08/27/83 08:31:11

Program menu help information:

Control keys used to modify operation consist of:

Mode change:

S = Set mode to stop on error

C = Set mode to continue on error

L = Set mode to loop on error

Run counter:

R = Toggle run counter between continuous and the current run count

Misc. functions:

F = Display miscellaneous functions menu

P = Print the current contents of the display

Test control:

X = Return to previous menu

W = pause/continue test

Fault display:

Y = Display test/fault screen

"HELP" for more information, "RETURN" to return to menu

Each of these control functions can be used by first pressing and holding the **CTRL** key and pressing the letter key indicated.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

Pressing the **RETURN** key will return you to the Program Menu. Pressing the **HELP** key at this screen presents a display describing the information on the first five lines of the Program Menu and Test displays:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0A

08/27/82 08:31:23

Program menu help information:

The information contained on the top five lines of the screen corresponds to the following:

Header line = Name and revision of this program

Status = The current state of the test (stopped, running, paused, looping, or loading)

Mode = The action to be taken if an error is found (stop, continue, loop). This may be changed by typing the control S, L, or C keys. If the continue on error mode is selected errors are printed on the operating system configured printer.

Run = The number of times each test is run. This may be changed by a miscellaneous function.

Starts = The number of times the test was started

Passes = The number of times the test passed without error

Errors = The number of errors found since starting the test
Press "RETURN" to return to menu

As indicated by the last line of this display, your only option now is to return to the Program Menu since there are no more help screens.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

Configuring the Diagnostic Monitor

Before performing any tests using a newly installed diagnostic disk or when hardware changes have occurred, the diagnostic monitor and several of the tests need to be configured for the system under test. Failure to do so may result in incomplete testing or inaccurate failure messages.

Select 3. MISC. FUNCTION by pressing the **3** and **RETURN** keys. The Miscellaneous Function Menu will be displayed in the center of the screen:

MISCELLANEOUS FUNCTION MENU

1. SET RUN COUNTER
2. SET DATE AND TIME
3. RUN ALL TESTS N TIMES
4. CONFIGURATION

Select 4. CONFIGURATION by pressing the **4** and **RETURN** keys. The Configuration Menu will be displayed:

CONFIGURATION MENU

00. DIAGNOSTIC MONITOR (C)
01. RAM DIAGNOSTIC (C)
02. I/O PORT DIAGNOSTIC
03. DISPLAY DIAGNOSTIC (C)
04. FLOPPY DIAGNOSTIC (C)

NOTE: The display on your Computer may be different than shown.

The letter C in parentheses (C) indicates which tests need to be configured to the system under test.

THE DIAGNOSTIC MONITOR AND TESTS

Diganostic Monitor

Select the Diagnostic Monitor by pressing **0** and **RETURN**. A list of Test Program Files will be displayed:

TEST PROGRAM FILES:

- 01. RAM .DIA
- 02. IO .DIA
- 03. DISPLAY .DIA
- 04. FLOPPY .DIA

NOTE: The display on your computer may be different than shown.

In order for the monitor program to run a test, it needs to know what the file name of the test is. The diagnostic test files are identified by a .DIA extension.

A newly installed diagnostic disk will have all the diagnostic test files listed. However, from time to time new diagnostic tests or updates may become available and you will want to add them to your disk. This portion of the configuration utility allows you to add or delete a file.

To add a test file, press **A** and **RETURN** and the message `TYPE FILE NUMBER PRECEDING NEW FILE:` is displayed. Enter the next number in sequence to the list. The file name is then requested, enter the file name followed by a period and the extension. The test is then loaded into memory, checked for proper format, and parameters required by the monitor are loaded into the configuration tables. If all information verifies correctly, a new menu is then displayed that includes the new test.

To delete a file, press **D** and **RETURN** and the message `TYPE FILE NUMBER TO DELETE:` is displayed. Enter the number of the file to be deleted and press **RETURN** and the menu is updated with the deleted file omitted from the list.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

If the list of test program files is correct then press **C** and **RETURN**. The following display will appear on the screen:

```
CURRENT MEMORY SIZE = 128K
```

```
IS MEMORY SIZE CORRECT (<Y>,N)?
```

NOTE: The memory size can be determined by pressing the **S** key at the pointing finger prompt.

The monitor requires the memory size when loading sequential tests in memory at the same time. If the memory size is incorrect press **N** and **RETURN** and a new memory size is requested. If the memory size is correct press **Y** and **RETURN**.

Exiting Configuration

After the monitor configuration information is correct, the Configuration Menu is redisplayed. Each test requiring configuration should be configured. After all tests have been configured, press **CTRL-X** to exit the configuration utility. The following message is displayed:

```
WRITE CONFIGURATION TO DISK (Y,<N>)?
```

If you press **Y**, then a request for a file name is displayed:

```
FILE NAME(DEFAULT=DIAG.CFG):_
```

Normally, the default file is used. However, it is possible to save various configurations in different files and invoke them by typing the file name (e.g. `DIAG [filename.ext]`) at the Z-DOS prompt.

Providing a file name, or pressing **RETURN** to use the default file, saves the information provided in the configuration session on the disk and therefore, need not be resupplied for later use on the same system. An **N** response at the `WRITE CONFIGURATION TO DISK (Y,<N>)?` message returns control to the Program Menu but does not save the data on the disk. In either case, the new configuration is retained in memory and is used for the remainder of the diagnostic session.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

Upon exiting from the configuration program, the Program Menu is redisplayed.

Other Miscellaneous Functions

Press **3** and **RETURN** at the Program Menu to access the Miscellaneous Function Menu:

MISCELLANEOUS FUNCTION MENU

1. SET RUN COUNTER
2. SET DATE AND TIME
3. RUN ALL TESTS N TIMES
4. CONFIGURATION

Set Run Counter

Selection of the SET RUN COUNTER function produces a request for the number of times to run a test:

NUMBER OF TIMES TO RUN TESTS (1-99)_

This function allows setting the number of times a test is to be run to any value between 1 and 99.

NOTE: If the run counter shows CONTINUOUS when this function is started it is automatically changed to the finite mode.

Set Time and Date

The SET TIME AND DATE function is used to set the time and date that appears on the header line of the displays. It is very important that this be done prior to running continuous tests that log errors so that the time recorded for failures is correct.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Monitor

DATE (MM/DD/YY)_

Where **MM** is a number from 1 to 12 representing the month,
DD is a number from 1 to 31 representing the day,
YY is a number from 00 to 99 representing the year, and
/ is the separator between numbers.

After entering the date and pressing **RETURN**, the request for the time input appears:

TIME (HH:MM:SS)_

Where **HH** is a number between 0 and 23 representing the hour,
MM is a number between 0 and 59 representing the minutes,
SS is a number between 0 and 59 representing the seconds, and
any non-numeric character can be used as the separator between numbers.

Run All Tests N Times

The **RUN ALL TESTS N TIMES** function is used to set up long tests on a system.

NUMBER OF TIMES TO RUN EACH SECTION (1-99)_

This function allows running each test section between 1 and 99 times. Note that if the **RUN** counter is set to 99 and this function is used to run each section 99 times the result is a test that runs all tests 99 times and each section 99 times for a total of 9,801 times.

While in the **RUN ALL TESTS N TIMES** mode tests are always run in a sequential manner.

Exiting to the System

Upon completing the entry for each Misc. Function you are returned to the Program Menu.

Selecting **RETURN TO SYSTEM** clears the screen, displays the system prompt and returns control to the Z-DOS operating system.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Selecting 1. DIAGNOSTIC TESTS at the Program Menu results in a display showing a list of the tests available:

DIAGNOSTIC TEST MENU

01. RAM DIAGNOSTIC R1.0 (A)
02. I/O PORT DIAGNOSTIC R1.0 (A)
03. DISPLAY DIAGNOSTIC R1.0 (C)
04. FLOPPY DIAGNOSTIC R1.0 (C)

INPUT _

PRESS: "F0" FOR ALL AUTOMATIC TESTS	"CTRL-X" FOR PREVIOUS MENU
MENU NUMBER TO EXPAND MENU ENTRY	"CTRL-R" FOR CONT/SINGLE PASSES
"HELP" FOR MORE INFORMATION	"CTRL-S, L, C" FOR MODE CHANGE

Help Screens

Just as at the Program Menu level, additional information is available at this menu level in the form of help screens. Pressing the **HELP** key results in the following display:

```
HEATH/ZENITH DIAGNOSTICS - REV. P1.0                08/27/82 08:32:02
Diagnostic test menu help information
```

Typing "F0" results in running all available automatic tests in sequence. A "NO ERRORS FOUND" message is displayed if no hardware faults are detected in the system. If a fault is encountered the tests stop and data pertaining to the fault, and its correction, is displayed on the screen.

Menu entries are selected by typing the menu number followed by the "RETURN" key.

Selection of a test results in loading the test into memory and displaying a menu of the available test sections on the screen. In general each test corresponds to a particular circuit in the unit under test. It represents the smallest individually selectable part of the diagnostic.

"HELP" for more information, "RETURN" to return to menu

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Pressing the **RETURN** key at this point will return you to the Diagnostic Test Menu. Pressing **HELP** a second time displays the following screen:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Diagnostic test menu help information

08/27/82 08:32:02

Control keys used to modify operation consist of:

Mode change:

- S = Set mode to stop on error
- C = Set mode to continue on error
- L = Set mode to loop on error

Run counter:

- R = Toggle run counter between continuous and the current run count

Misc. functions:

- F = Display miscellaneous functions menu
- P = Print the current contents of the display

Test control:

- X = Return to previous menu
- W = pause/continue test

Fault display:

- Y = Display test/fault screen
- "HELP" for more information, "RETURN" to return to menu

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Press **RETURN** to return to the Diagnostic Test Menu. Press **HELP** for more information:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Diagnostic test menu help information

08/27/82 09:16:37

The letters at the end of each test or section menu entry signify:

A = AUTOMATIC (The program is completely automatic and requires no operator input.)

M = MANUAL (The program requires operator input for execution.)

C = COMBINATION (The program contains both manual and automatic sections.)

NOTE: Only automatic sections (type A) are run during the all automatic test sequence. Manual sections (type M) are run only if selected individually from the test section menu.

Press "RETURN" to return to menu

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Diagnostic Section Menu

Selection of a diagnostic test from the Diagnostic Test Menu results in the loading of the test and the display of a menu of sections available in that test. Shown below is a sample menu that would be displayed had you selected the RAM DIAGNOSTIC:

RAM DIAGNOSTIC SECTION MENU

- 01. PARITY GENERATOR/CHECKER TEST (A)
- 02. MAPPING TEST (A)
- 03. SYSTEM MEMORY TEST (A)
- 04. VIDEO MEMORY TEST (A)

INPUT _

PRESS: "F0" FOR ALL AUTOMATIC TESTS "CTRL-X" FOR PREVIOUS MENU
 MENU NUMBER FOR SINGLE SECTION "CTRL-R" FOR CONT/SINGLE PASSES
 "HELP" FOR MORE INFORMATION "CTRL-S, L, C" FOR MODE CHANGE

The automatic and manual sections of the tests are identified by (A) and (M) respectively.

As indicated by the information at the bottom of the display, Help Screens are available at this menu level also.

Running Display

While a diagnostic test is running a display is presented on the screen giving the test and section name of the test. The center ten lines of the screen contain information displayed by the test to denote progress or request input from the operator.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

A sample display of the RAM DIAGNOSTIC might appear as follows:

```
RAM DIAGNOSTIC - R1.0  
SYSTEM MEMORY TEST
```

```
MEMORY BANKS AVAILABLE: 00-01
```

```
CURRENT TEST:
```

```
BANK:      01  
ADDRESSES: 10000-1FFFF  
PATTERN:   MOVING INVERSIONS
```

```
PRESS: "CTRL-X" TO RETURN TO MENU  
      "CTRL-W" TO PAUSE/CONTINUE TEST
```

Test Complete Indication

Upon completion of testing a display in the following format is shown:

```
RAM DIAGNOSTIC - R1.0  
MOVING INVERSION SECTION
```

```
ALL TESTS COMPLETE  
NO ERRORS FOUND
```

```
TYPE ANY CHARACTER TO CONTINUE:
```

The NO ERRORS FOUND message is displayed only if the error count is zero. If the error count is greater than zero the message ERRORS DETECTED is displayed.

If all sections of a test were run the section name is omitted from the display. If all tests were run both the test and section names are omitted from the display.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Error Indications

If an error is encountered during testing a display in the form shown below is displayed:

```
RAM DIAGNOSTIC TEST  
MOVING INVERSION SECTION
```

```
RAM FAILURE AT ADDRESS 1FF23  
REPLACE RAM CHIP U151
```

```
AX=0046 BX=00F3 CX=0000 DX=0002 SP=00A6 BP=0001 SI=000C DI=029E  
DS=002B ES=0BAC SS=0B7D CS=0BAC IP=0137 NV UP DI PL ZR NA PE NC
```

```
PRESS: "CTRL-X" TO RETURN TO MENU      "CTRL-Y" FOR TEST/FAULT SCREEN  
       "SPACE BAR" TO CONTINUE          "CTRL-R" FOR CONT/SINGLE PASSES  
       "HELP" FOR MORE INFORMATION      "CTRL-S,L,C" FOR MODE CHANGE
```

The first line of information under the section name always indicates the failing function. Beginning with the second line a list of possible hardware causes of the fault are given. These are in the order of most likely to least likely cause. Any additional lines of information indicate the content of registers to help engineering resolve the cause of the fault if this becomes necessary.

Two lines of data are used to display the contents of processor registers when the fault occurred.

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Help Screens

Following are the help screens available at the Section Menu level:

HEATH/ZENITH DIAGNOSTICS – REV. P1.0D
Diagnostic section menu help information

08/27/82 08:32:02

Typing "F0" results in running all available automatic sections in sequence. A "NO ERRORS FOUND" message is displayed if no hardware faults are detected in the unit. If a fault is encountered the tests stop and data pertaining to the fault, and its correction, is displayed on the screen.

Menu entries are selected by typing the menu number followed by the "RETURN" key.

Selection of a section results in immediate execution of the section. All sections displayed are available using this method.

"HELP" for more information, "RETURN" to return to menu

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Pressing the **RETURN** key at this point will return you to the Diagnostic Test Menu. Pressing **HELP** a second time displays the following screen:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Diagnostic section menu help information

08/27/82 08:32:02

Control keys used to modify operation consist of:

Mode change:

- S = Set mode to stop on error
- C = Set mode to continue on error
- L = Set mode to loop on error

Run counter:

- R = Toggle run counter between continuous and the current run count

Misc. functions:

- F = Display miscellaneous functions menu
- P = Print the current contents of the display

Test control:

- X = Return to previous menu
- W = pause/continue test

Fault display:

- Y = Display test/fault screen
- "HELP" for more information, "RETURN" to return to menu

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Pressing the **RETURN** key will return you to the Diagnostic Test Menu. Pressing the **HELP** key again will bring up another help screen:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D 08/27/82 08:31:23

Diagnostic section menu help information

The information contained on the top five lines of the screen corresponds to the following:

Header line = Name and revision of this program

Status = The current state of the test (stopped, running, paused, looping, or loading)

Mode = The action to be taken if an error is found (stop, continue, loop). This may be changed by typing the control S, L, or C keys. If the continue on error mode is selected errors are printed on the operating system configured printer.

Run = The number of times each test is run. This may be changed by a miscellaneous function.

Starts = The number of times the test was started

Passes = The number of times the test passed without error

Errors = The number of errors found since starting the test
"HELP" for more information, "RETURN" to return to menu

THE DIAGNOSTIC MONITOR AND TESTS

Diagnostic Tests

Press **RETURN** to return to the Diagnostic Test Menu. Press **HELP** for more information:

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Diagnostic section menu help information

08/27/82 09:16:37

The letters at the end of each test or section menu entry signify:

A = AUTOMATIC(The program is completely automatic and requires no operator input.)

M = MANUAL(The program requires operator input for execution.)

C = COMBINATION(The program contains both manual and automatic sections.)

NOTE: Only automatic sections(type A) are run during the all automatic test sequence. Manual sections(type M) are run only if selected individually from the test sections menu.

Press "RETURN" to return to menu

Introduction

This test requires a Z-100 with a minimum of 128K of RAM. No special hardware is required to run the test. If three or more 64K banks of RAM are present the first three banks must reside on the motherboard. Additional memory must reside on Z-205 256K S100 boards and each board must be configured for the maximum RAM prior to using the next board. A maximum of three Z-205 boards are allowed for a maximum of 960K of RAM. The banks are numbered 0-14 with banks 0-2 on the motherboard, banks 3-6 on the first Z-205 board, banks 7-10 on the second Z-205 board and banks 11-14 on the third Z-205 board.

Special sections have been included in the RAM Diagnostics to detect faults in the parity generation/detection and memory mapping circuits. The main types of RAM faults tested for and the associated test are:

- Stuck bits — March II Test
- Address uniqueness — March II Test
- Write recovery — March II Test
- Sense Amplifier recovery — Diagonal (Barber Pole) Test
- Access Time — Address Compliment (Ping-Pong) Test
- Adjacent Pattern Interference (Static) — Srini's Test (API4)
- Data Sensitivity — Moving Inversions (MOVI) Test
- Refresh — Refresh Test

RAM DIAGNOSTICS

Configuration

Prior to operating the RAM Diagnostic on a new system or whenever RAM changes have been made in a system, the configuration program should be selected and the RAM configuration updated. The configuration routine is accessed through the Miscellaneous Function Menu of the Diagnostic Monitor.

Select 3. MISC. FUNCTION at the PROGRAM MENU.

Select 4. CONFIGURATION at the MISCELLANEOUS FUNCTION MENU.

Select the RAM DIAGNOSTIC test by typing the number preceding the file name and press RETURN. A display like the following will be displayed:

```
RAM DIAGNOSTIC  
CONFIGURATION
```

```
SYSTEM MEMORY BANKS = 0-11  
VIDEO MEMORY = GREEN(32K), RED(32K), BLUE(32K)  
ALL TESTS ENABLED
```

```
ARE ALL PARAMETERS CORRECT (<Y>,N)?
```

NOTE: The system memory size can be determined by pressing the **S** key at the pointing finger prompt immediately after power-up of the system. If autoboot is enabled, press the **DELETE** key during power-up to get the pointing finger prompt.

Each system memory bank consists of 64K. Therefore, a system with 192K would contain $192/64=3$ banks of memory which are numbered 0, 1, and 2.

Video memory is either monochrome, which corresponds to the green bank, or color, which corresponds to the red, green, and blue banks.

RAM DIAGNOSTICS

Configuration

The following chart shows examples of some common memory configurations:

Display resulting from pressing S at the pointing finger prompt

128Kb of contiguous RAM
64Kb Video memory
Monochrome

192Kb of contiguous RAM
32Kb Video memory
Color

448Kb of contiguous RAM
64Kb Video memory
Color

704Kb of contiguous RAM
64Kb Video memory
Color

RAM Test Configuration

System memory banks = 0-1
Video memory = Green (64K)

System memory banks = 0-2
Video memory = Green (32K),
Red (32K), Blue (32K)

System memory banks = 0-6
Video memory = Green (64K),
Red (64K), blue (64K)

System memory banks = 0-10
Video memory = Green (64K),
Red (64K), Blue (64K)

If all parameters are correct, press **Y** and **RETURN** in response to the prompt and the configuration session is ended. If the parameters are incorrect, then press **N** and **RETURN** and the screen changes to:

RAM DIAGNOSTIC
CONFIGURATION

SYSTEM MEMORY SIZE

FIRST BANK TO TEST(0-14): 00

LAST BANK TO TEST(1-14): 02

ARE ALL PARAMETERS CORRECT (<Y>,N)?_

RAM DIAGNOSTICS

Configuration

The cursor first appears at the **ARE ALL PARAMETERS CORRECT (<Y>,N)?** question. If the parameters are correct, press **Y** and **RETURN** and the configuration proceeds to the next display. If the parameters are not correct, pressing **N** and **RETURN** will move the cursor to the default value for the first question. If the value is to be changed, then enter the value and press **RETURN**. If the value is correct, then just press **RETURN** and the cursor will move to the next question.

When both questions have been answered, the screen will be updated to show the values just entered, and will allow you a second chance to review the parameters.

When all the parameters are correct, press **Y** and **RETURN**. The configuration session will continue to the video memory configuration and display:

RAM DIAGNOSTIC
CONFIGURATION

VIDEO MEMORY CONFIGURATION:

GREEN PLANE (Y,N): Y SIZE (32, 64): 64
RED PLANE (Y,N): N
BLUE PLANE (Y,N): N

ARE ALL PARAMETERS CORRECT (<Y>,N)?_

If the parameters are correct, press **Y** and **RETURN** and the program will proceed to the next display. If the parameters are not correct, press **N** and **RETURN**. Answer each question as the cursor appears at each parameter by entering the correct parameter and pressing **RETURN** or, if the parameter is correct, by pressing **RETURN**.

RAM DIAGNOSTICS

Configuration

Next, a list of the sections of the test are displayed:

RAM DIAGNOSTIC
CONFIGURATION

TEST CONFIGURATION:

MARCH II (Y,N) : Y
REFRESH (Y,N) : Y
PING-PONG (Y,N) : Y
DIAGONAL (Y,N) : Y
MOVI (Y,N) : Y
API4 (Y,N) : Y
PARITY (Y,N) : Y

ARE ALL PARAMETERS CORRECT (<Y>,N)?_

By default, all sections are enabled. If you wish to leave them enabled, press **Y** and **RETURN**.

To disable a test, respond with an **N** and use the **RETURN** key to move the cursor to the default answer of the test you want to disable; then enter **N** and **RETURN**.

After the Test Configuration is completed, the first RAM DIAGNOSTIC CONFIGURATION display is redisplayed allowing a second chance to review the parameters.

Pressing **Y** and **RETURN** will return you to the Configuration menu. At this point you can elect to continue on and configure another test or exit from configuration.

Pressing **CTRL-X** to exit the Configuration Utility will cause the message to be displayed:

WRITE CONFIGURATION TO DISK (Y,<N>)?

If you press **Y**, then a request for a file name is displayed:

FILE NAME (DEFAULT=DIAG.CFG):_

RAM DIAGNOSTICS

Configuration

Normally, the default file is used. However, it is possible to save various configurations in different files and invoke them by typing the file name (e.g. DIAG [filename.ext]) at the Z-DOS prompt.

Providing a file name, or pressing **RETURN** to use the default file, saves the information provided in the configuration session on the disk and therefore, need not be resupplied for later use on the same system. An **N** response at the WRITE CONFIGURATION TO DISK (Y,<N>)? message returns control to the Program Menu but does not save the data on the disk. In either case, the new configuration is retained in memory and is used for the remainder of the diagnostic session.

RAM Diagnostic Section Menu

Selection of the RAM DIAGNOSTIC test from the Diagnostic Test Menu causes the following section menu to be displayed:

RAM DIAGNOSTIC SECTION MENU

01. PARITY GENERATOR/CHECKER TEST (A)
02. MAPPING TEST (A)
03. SYSTEM MEMORY TEST (A)
04. VIDEO MEMORY TEST (A)

Parity Generator/Checker Test

Running Display

No running display is presented and no operator interface is required.

RAM DIAGNOSTICS

RAM Diagnostic Section Menu

Error Display

When a Parity Generator/Checker error is detected on the motherboard a display similar to the following is presented:

```
PARITY GENERATOR/CHECKER FAILURE
BANKS 0-2
REPLACE MOTHERBOARD CHIP U153
REPLACE MOTHERBOARD CHIP U176
REPLACE MOTHERBOARD CHIP U152
REPLACE MOTHERBOARD
R(DH) =PARITY USED, R(DL) =DATA USED
```

When a Parity Disable error is detected on the motherboard a display similar to the following is presented:

```
PARITY DISABLE FUNCTION FAILURE
BANKS 0-2
REPLACE MOTHERBOARD CHIP U153
REPLACE MOTHERBOARD CHIP U176
REPLACE MOTHERBOARD CHIP U152
REPLACE MOTHERBOARD
R(DH) =PARITY USED, R(DL) =DATA USED
```

When a Parity Generator/Checker error is detected on a Z-205 board a display similar to the following is presented. The UXX is replaced by either U42 or U43 depending upon whether the high or low banks are being tested.

```
PARITY GENERATOR/CHECKER FAILURE
BANKS 3-6
REPLACE Z205 CHIP UXX
REPLACE Z205 CHIP U150
REPLACE Z205 CHIP U23
REPLACE Z205 BOARD
R(DH) =PARITY USED, R(DL) =DATA USED
```

RAM DIAGNOSTICS

RAM Diagnostic Section Menu

When a Parity Disable error is detected on a Z-205 board a display similar to the following is presented. The UXX is replaced by either U42 or U43 depending upon whether the high or low banks are being tested.

```
PARITY DISABLE FUNCTION FAILURE
BANKS 3-6
REPLACE Z205 CHIP UXX
REPLACE Z205 CHIP U150
REPLACE Z205 CHIP U23
REPLACE Z205 BOARD
R(DH) =PARITY USED, R(DL) =DATA USED
```

Memory Mapping Test

Running Display

No display is presented and no operator interface is required for this test.

Error Display

When an error is detected in this test, a display similar to the following is presented. The XXX in the first line is replaced by the mode being tested when the failure occurred.

```
MAPPING MODE XXX FAILURE
REPLACE MOTHERBOARD CHIP U159, U179
REPLACE MOTHERBOARD CHIP U110, U111
REPLACE MOTHERBOARD CHIP U176
REPLACE MOTHERBOARD
R(AL) =MAPPING MODE, R(BH) =EXPECTED TAG, R(BL) =ACTUAL TAG
```

RAM DIAGNOSTICS

RAM Diagnostic Section Menu

System Memory Test

Running Display

A display similar to the following is shown while the System Memory Test is running in banks 0-14:

```
RAM DIAGNOSTIC  
SYSTEM MEMORY TEST
```

```
MEMORY BANKS AVAILABLE: 0-4  
CURRENT TEST:  
  BANK: 2  
  ADDRESSES: 20000-2FFFF  
  PATTERN: MARCH II
```

A display similar to the following is presented while the test is running in the lower banks. Since the clock cannot be updated while the test is running in the low banks, the key click is sounded periodically to indicate that the test is still in progress.

```
RAM DIAGNOSTIC  
SYSTEM MEMORY TEST
```

```
MEMORY BANKS AVAILABLE: 0-4  
CURRENT TEST:  
  BANK: 0  
  ADDRESSES: 00000-0FFFF  
  PATTERN: MARCH II
```

```
**** CLOCK DISABLED WHILE TESTING LOW BANKS ****
```

RAM DIAGNOSTICS

RAM Diagnostic Section Menu

Error Display

When an error is detected in the first 192K of system memory a display similar to the following is presented. The chip number shown corresponds to the failing memory chip on the motherboard and is different for each bit and each bank of memory.

```
SYSTEM MEMORY FAILURE
BANK=1, BIT=0
REPLACE MOTHERBOARD CHIP U109
REPLACE MOTHERBOARD
R(AH)=EXPECTED DATA, R(AL)=ACTUAL DATA, R(BX)=OFFSET
```

If the error is detected in the memory above 192K the display would appear similar to the following. The bank and bit numbers given correspond to the location on the (Z-205) memory expansion board.

```
SYSTEM MEMORY FAILURE
BANK=4, BIT=7
REPLACE Z205 CHIP U80
REPLACE Z205 BOARD R(AH)=EXPECTED DATA, R(AL)=ACTUAL DATA, R(BX)=OFFSET
```

Video Memory Test

Running Display

A display similar to the following is presented while the Video Memory Test is running. If more than one color is available, the display will show up behind the patterns generated by the test. If only one color is available, only the test patterns are displayed while the test is in operation.

```
RAM DIAGNOSTIC
VIDEO MEMORY TEST
```

```
MEMORY BANKS AVAILABLE: 0-2
CURRENT TEST:
  BANK: 14
  ADDRESSES: E00000-E0FFFF
  PATTERN: MARCH II
```

RAM DIAGNOSTICS

RAM Diagnostic Section Menu

Error Display

When an error is detected on the video board RAM the following display is presented. The chip number given corresponds to the failing memory chip on the video board and is different for each bit and each bank of memory.

```
VIDEO MEMORY FAILURE
REPLACE VIDEO CHIP U352
REPLACE VIDEO BOARD
R(AH) = EXPECTED DATA, R(AL) = ACTUAL DATA, R(BX) = OFFSET
```

Help Screens

Help screens are available at both the Section Menu level and at the error displays. Refer to "Appendix A, Help Screens."

CHAPTER 4

INPUT/OUTPUT PORT DIAGNOSTICS

Introduction

The Serial Port Diagnostics test the two 2661-2 Enhanced Programmable Communications Interface Chips (EPCI) used in Z-100 Computers.

NOTE: To perform all the tests required for complete diagnostics, a special test cable must be installed. Minimal (internal loopback) testing may be done without a loopback cable. The remote and asynchronous tests may be performed using a standard serial printer cable part number 134-1076 or a special test cable part number 134-1418. Synchronous tests may be performed using only the special test cable part number 134-1418. These cables are available from your local Heathkit Electronic Center or Zenith Data Systems dealer. For more information about test cables refer to "Appendix B, Test Cables."

Parallel Port Diagnostics test most of the Data Direction registers of the 68A21 Peripheral Interface Adapter (PIA).

The serial test displays special parameters used to operate the 2661-2 EPCI in addition to those parameters displayed by the Diagnostic Monitor.

Configuration

The Input/Output Port Diagnostics require no configuration.

Test Section Menu

Selecting SERIAL PORT DIAGNOSTIC at the Diagnostic Test Menu results in the following Test Section Menu display:

I/O PORT TEST SECTION MENU

01. Register Test (A)
02. Local Loop Back Test – PORT A (A)
03. Local Loop Back Test – PORT B (A)
04. Remote Loop Back Test (M)
05. External Loop Back Test Asynchronous Protocol (M)
06. External Loop Back Test Synchronous Protocol (M)
07. Parallel Port (A)

INPUT/OUTPUT PORT DIAGNOSTICS

Test Section Menu

Register Test

Running Display

No running display is presented during this test.

Error Display

If an error occurs during this test, a display like the following is presented. The XXX notation for the chip location is replaced by 242 or 243.

```
REGISTER READ/WRITE ERROR  
CHECK CHIP AT LOCATION UXXX ON MOTHER BOARD  
CHECK CHIP AT LOCATION U174 ON MOTHER BOARD  
REGISTERS      AH = EXPECTED DATA      AL = ACTUAL DATA
```

Local Loop Back Test

Running Display

During this test the following display is presented.

PARAMETERS UNDER TEST					
MODE	BAUD RATE	# OF STOP BITS OR SYN BYTE	PARITY	CHAR LENGTH	CPU
ASN	110	1.0	NONE	5	INT

INPUT/OUTPUT PORT DIAGNOSTICS

Test Section Menu

The parameter values that appear in the test display are:

Mode — (chip programmed for asynchronous or synchronous operation)

Asyn
Syn

Baud Rate — (transmission rate in information bits per second)

110	4800
300	9600
600	19200
1200	38400
2400	

Number of stop bits and SYN bytes —

1
1.5
2

Parity — (for parity check on data)

None
Odd
Even

Char length — (number of information bits per character transmitted)

5
6
7
8

CPU mode — (method used to determine when to service the serial ports)

Int (interrupt)

INPUT/OUTPUT PORT DIAGNOSTICS

Test Section Menu

Error Display

A Local Loop Back error display may appear like the following. The XXX notation for the chip location is replaced by either 242 or 243.

```
INTERNAL TRANSMIT/RECEIVE ERROR  
CHECK CHIP AT LOCATION UXXX ON MOTHER BOARD  
CHECK CHIP AT LOCATION U240 ON MOTHER BOARD
```

A Local Loop Back Mode Compare error display may appear like the following. The XXX notation for the chip location is replaced by either 242 or 243.

```
INTERNAL TRANSMIT/RECEIVE ERROR  
DATA COMPARE ERROR  
CHECK CHIP AT LOCATION UXXX ON MOTHER BOARD  
CHECK CHIP AT LOCATION U240 ON MOTHER BOARD  
REGISTERS      DH = EXPECTED DATA      DL = ACTUAL DATA
```

Remote Loop Back Test

This test requires a special test cable, either a standard serial printer cable part number 134-1076 or a special test cable part number 134-1418, to interconnect the two serial ports together. The cable plugs into the port connectors, J1 and J2, on the rear panel of the computer. The following prompt will appear to request the cable be installed:

```
Attach serial port test cable part number 134-1418  
between rear panel connector J1 and J2
```

```
IF THE CABLE IS INSTALLED - PRESS RETURN
```

Running Display

A display similar to the Local Loop Back Test display is shown.

INPUT/OUTPUT PORT DIAGNOSTICS

Test Section Menu

Error Display

A remote Loop Back error may appear like the following:

```
TRANSMIT/RECEIVE ERROR BETWEEN PORTS
REPAIR CABLE
CHECK CHIPS AT LOCATIONS U243 AND U242 ON MOTHER BOARD
CHECK U230, U245, U247, U248, R128 ON MOTHER BOARD
```

A Remote Loop Back Compare error display like the following will appear if the data buffers fail to compare:

```
TRANSMIT/RECEIVE ERROR BETWEEN PORTS
DATA COMPARE ERROR
REPAIR CABLE
CHECK CHIP AT LOCATIONS U243 AND U242 ON MOTHER BOARD
CHECK CHIP U230, U245, U247, U248, R128 ON MOTHER BOARD
REGISTERS      DH = EXPECTED DATA      DL = ACTUAL DATA
```

External Loop Back Test

This test requires a special test cable to interconnect the two serial ports together. Asynchronous tests may be performed using either a standard serial printer cable part number 134-1076 or a special test cable part number 134-1418. Synchronous tests may be performed using only the special test cable part number 134-1418. The cable plugs into the port connectors, J1 and J2, on the rear panel of the computer. The following prompt will appear to request the cable be installed:

```
Attach serial port test cable part number 134-1418
between rear panel connector J1 and J2
```

```
IF THE CABLE IS INSTALLED - PRESS RETURN
```

Running Display

A display similiar to the Local Loop Back Test display is shown.

INPUT/OUTPUT PORT DIAGNOSTICS

Test Section Menu

Error Display

The display for an External Loop Back error may appear as follows:

```
EXTERNAL LOOP BACK MODE ERROR  
REPAIR CABLE  
CHECK CHIP AT LOCATION U243 AND U242 ON MOTHER BOARD  
CHECK CHIP U230, U245, U247, U248, R128 ON MOTHER BOARD
```

The display for an External Loop Back Compare error may appear as follows:

```
EXTERNAL LOOP BACK MODE ERROR  
DATA COMPARE ERROR  
REPAIR CABLE  
CHECK CHIP AT LOCATION U243 AND U242 ON MOTHER BOARD  
CHECK CHIP U230, U245, U247, U248, R128 ON MOTHER BOARD  
REGISTERS      DH = EXPECTED DATA      DL = ACTUAL DATA
```

Parallel Port Test

Running Display

No display is presented while this test is running.

Error Display

Should an error be detected, the following display would be presented:

```
PIA Register Test Failure  
Check Chip U114
```

INPUT/OUTPUT PORT DIAGNOSTICS

Help Screens

Help screens are available at both the Section Menu level and at the error displays. Refer to "Appendix A, Help Screens."

CHAPTER 5

DISPLAY DIAGNOSTICS

Introduction

For the purpose of this test, both the keyboard control circuitry and the video monitor circuitry are considered to be the "Z-100 Display." All versions of the Z-100 Computer have the same keyboard circuitry. Although there are several different configurations of monitors, most of the control circuitry is common between them.

Since the video portion of this diagnostic depends on the integrity of the video RAM, that portion of the RAM Diagnostic should be run and any faults detected should be corrected.

This test requires a Z-100 with at least 128K of memory, and at least one color and/or monochrome video display. The video alignment test requires the usual TV alignment tools (i.e. small screwdrivers, etc.). The light pen test requires a light pen.

Configuration

Before operating the Display Diagnostics on a new system, or whenever display hardware changes have been made, the diagnostic configuration should be selected and the Display Diagnostics updated.

Select 3. MISC. FUNCTIONS at the PROGRAM MENU.

Select 4. CONFIGURATION at the MISCELLANEOUS FUNCTIONS MENU.

A display like the following will be presented:

DISPLAY DIAGNOSTIC

VIDEO MEMORY = GREEN (64K), RED (64K), BLUE (64K)

THERE IS NO LIGHT PEN ATTACHED

ARE ALL PARAMETERS CORRECT(<Y>,N)? _

DISPLAY DIAGNOSTICS

Configuration

If the parameters are correct, press **Y** and **RETURN** or just press **RETURN** and the configuration session will be ended.

If the parameters are not correct, press **N** and **RETURN** and the screen will change to:

DISPLAY DIAGNOSTIC

VIDEO MEMORY CONFIGURATION:

GREEN PLANE (Y,N): Y SIZE (32, 64): 64
RED PLANE (Y,N): N
BLUE PLANE (Y,N): N

ARE ALL PARAMETERS CORRECT (<Y>,N)? _

If the parameters are correct, press **Y** and **RETURN** or just **RETURN**.

If the parameters are not correct, pressing **N** will cause the cursor to move to the **Y** for the green plane.

If there is a green plane, press **Y** and the cursor moves to the 64 for the green plane. Enter the correct value (**32** or **64**) and **RETURN** and the cursor moves to the **N** for the red plane.

If there is not a green plane, press **N** and **RETURN** and the **SIZE (32, 64)** option disappears for the green plane.

Repeat this procedure for the red and blue planes.

When the parameters for the Video Memory Configuration are correct the following display is presented:

DISPLAY DIAGNOSTIC

THERE IS NO LIGHT PEN ATTACHED

IS THERE A LIGHT PEN ATTACHED (Y,N)? _

DISPLAY DIAGNOSTICS

Configuration

Enter the correct response. The first configuration display is repeated showing the parameters updated according to this configuration session. Responding **Y** will return you to the Configuration Menu.

Pressing **CTRL-X** to exit the Configuration Utility will cause the following message to be displayed:

```
WRITE CONFIGURATION TO DISK(Y,<N>)?
```

If you press **Y**, then a request for a file name is displayed:

```
FILE NAME (DEFAULT=DIAG.CFG) : _
```

Normally, the default file is used. However, it is possible to save various configurations in different files and invoke them by typing the file name (e.g. DIAG [filename.ext]) at the Z-DOS prompt.

Providing a file name, or pressing **RETURN** to use the default file, saves the information provided in the configuration session on the disk and therefore, need not be resupplied for later use on the same system. An **N** response at the WRITE CONFIGURATION TO DISK (Y,<N>)? message returns control to the Program Menu but does not save the data on the disk. In either case, the new configuration is retained in memory and is used for the remainder of the diagnostic session.

Display Diagnostic Section Menu

Selecting DISPLAY DIAGNOSTIC at the Diagnostic Test Menu causes the following display to be presented:

```
DISPLAY DIAGNOSTIC SECTION MENU
```

01. KEYBOARD CONTROLLER TEST (M)
02. KEY TEST (M)
03. VIDEO TEST PATTERNS (M)
04. VIDEO CONTROLLER TEST (M)
05. LIGHT PEN TEST (M)
06. READ/WRITE REGISTERS TEST (A)
07. RESET KEY TEST (M)

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

For most of these sections, an error on the part of the operator could cause an incorrect error message to appear. In order to minimize the possibility of this, any time a fault is detected that could have been caused by the operator, verification of this fault will be obtained by having the operator rerun that portion of the test.

Keyboard Controller Test

The Keyboard Controller has two addressable ports—a command port and a data port—as well as an I/O port that interfaces the controller to the keyboard scanning and audible signal generating circuits. Also, the controller has internal memory (ROM and RAM). Any failure in this IC will result in an error in the execution of one or more of its programmed functions.

All of the functions of the keyboard controller as well as the associated scanning and audible signal generating circuits can be checked by the following ten tests:

1. **Minimized Key Test** — This test verifies the operation of the scanning circuitry by testing at least one key in each row and column of the matrix.
2. **Autorepeat Command On/Off (01/02) Test** — This test verifies that the autorepeat function is enabled at power-up by having the operator hold down the **A** key so that it repeats.

The “Autorepeat Off” command is sent to the controller and the **A** key is again held down to verify that it does not repeat.

Lastly, the “Autorepeat On” command is sent to the controller and the **A** key is held down so that it repeats.

3. **Two-Key Lock-Out Function Test** — During this test, the **SPACE BAR** is pressed; while it is being held down, the **B** key is pressed; while both are being held down, the **N** key is pressed. This verifies that the first two keys produce their correct codes and that the third key is locked out.

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

4. Key Click Command On/Off (03/04) Test — This test determines that the key click was enabled at power-up by having the operator press the **SPACE BAR** and verify that a click was heard.

The “Key Click Off” command is sent to the controller and the **SPACE BAR** is pressed to determine that the key click is disabled.

Lastly, the “Key Click On” command is sent to the controller and the **SPACE BAR** is pressed to determine that the key click is again enabled.

5. Reset Command (00) Test — During this test commands are sent to the controller that cause it to enter the Down/Up scanning mode and to disable the autorepeat and key click functions. Then, when the **RETURN** key is pressed, the “Reset” command is sent and the first parts of tests one and three are repeated to verify that the power-up configuration is restored.
6. Fifo and Clear Fifo Command (05) Test — During this test the **BREAK** key is held down and allowed to repeat until the clicking stops, indicating that the controller’s fifo (part of its RAM) is filled. The **BREAK** key code (AAH) is verified to have been loaded 16 times in the fifo and once in the output buffer.

This same procedure is repeated using the shifted **U** (55H) key.

The third time, the controller’s fifo is filled with **SPACE BAR** code. The “Empty Fifo” command is sent to the controller, the output buffer is emptied, and it is determined that the fifo is empty.

7. Click Command (06) Test — The “Click” command is sent to the controller several times and the operator is asked to verify that a click was heard.
8. Beep Command (07) Test — The “Beep” command is sent to the controller several times and the operator is asked to verify that the beep was heard.

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

9. Enable/Disable OBF Interrupt Command (OC/OD) Test — This test determines that the interrupt is disabled at power-up by verifying that no interrupt occurred while the operator pressed the **SPACE BAR** once during a five-second window.

Then the "Enable Interrupt" command is sent to the controller and by having the operator press the **SPACE BAR** the system determines that an interrupt was caused.

Finally, the "Disable Interrupt" command is sent to the controller and it is determined that no interrupt occurs by having the operator press the **SPACE BAR** once during a five-second window.

10. Enable/Disable Keyboard Command (08/09) Test — The keyboard is determined to be enabled (as in test nine) except that the status register is polled instead of waiting for an interrupt.

The "Disable" and "Enable" commands are tested as they were in test nine.

Running Display

After selecting the Keyboard Controller Section Test, a display is presented that gives you instructions for performing each of the test sections. For example:

```
DISPLAY DIAGNOSTIC  
KEYBOARD CONTROLLER TEST
```

```
AUTO REPEAT FUNCTION  
DEFAULT TEST
```

```
PRESS THE "A" KEY AND HOLD IT DOWN, ALLOWING IT TO REPEAT  
MORE THAN THREE TIMES.
```

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

Error Display

If an error occurs during the Keyboard Controller Test, the following display is presented:

KEYBOARD CONTROLLER ERROR

CHECK U204

If an error occurs in the sound generator chips, the following display appears:

SOUND GENERATING CIRCUIT ERROR

CHECK U218, U232

Key Test

Running Display

Selecting the Key Test causes the following display to be presented:

DISPLAY DIAGNOSTIC

KEY TEST

THIS TEST REQUIRES YOU TO PRESS EVERY KEY ON THE KEYBOARD.

IF THE KEYBOARD SWITCHES ARE NOT SUSPECT THEN YOU MAY SKIP THIS TEST.

DO YOU NEED TO RUN THIS TEST(<Y>,N): _

If you do not need to test the key switches, then press **N** and the Display Diagnostic Section Menu is redisplayed.

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

If you do want to test the key switches, press **Y** and the following message is displayed:

DISPLAY DIAGNOSTIC
KEY TEST

THE KEY TEST CONSISTS OF PRESSING EACH KEY ON THE KEYBOARD TWICE. YOU WILL BE SHOWN A REPRESENTATION OF THE KEYBOARD WITH THE KEY BEING TESTED DISPLAYED IN REVERSE VIDEO. PRESS THIS KEY TWICE AND THE NEXT KEY WILL BE DISPLAYED IN REVERSE VIDEO. PROCEED IN THIS MANNER UNTIL ALL NECESSARY KEYS HAVE BEEN TESTED.

PRESS ANY KEY TO BEGIN _

When you have read this message, press any key and the following display is presented (The "F0" is displayed in reverse video):

DISPLAY DIAGNOSTIC
KEY TEST

RE F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 10 11 12 1C	IL	H[] [] []
BR ES 1 2 3 4 5 6 7 8 9 0 - 5 ' BS		7 8 9 []
HE TA Q W E R T Y U I O P [] [] DE		4 5 6 -
CA CT A S D F G H J K L ; ' RETRN \		1 2 3 E
FA SHIFT Z X C V B N M , . / SHIFT LF		-0- . N
_____SPACEBAR_____		

KEY BEING TESTED: (F0) IN NORMAL MODE

After you press the F0 key once, NORMAL changes to UP/DOWN. After you press it again the F1 key is displayed in reverse video. This continues until all keys have been tested or an error is detected.

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

Error Display

If a failure is detected before one key in each row and column has been tested, then the following display is presented:

```

DISPLAY DIAGNOSTIC
KEY TEST

RE F0 F1 F2 F3 F4 F5 F6 F7 F8 F9 10 11 12 1C   IL       H[] [] []
BR ES 1 2 3 4 5 6 7 8 9 0 - 5 ' BS       7 8 9 []
HE TA Q W E R T Y U I O P [ ] [] DE     4 5 6 -
CA CT A S D F G H J K L ; ' RETRN \    1 2 3 E
FA SHIFT Z X C V B N M , . / SHIFT LF   -0- . N
      _____
      SPACEBAR

```

```

***** A FAILURE HAS BEEN DETECTED *****
      ---TO ISOLATE THE FAULTY COMPONENT PLEASE CONTINUE ---
KEY BEING TESTED: (INS LINE) IN NORMAL MODE

```

If a key switch is determined to be faulty, the following display is presented. The X will be changed to the name of the bad key:

```

KEYBOARD "X" SWITCH ERROR
CHECK KEYBOARD SWITCH

```

If the error is determined to be in the scanning circuit, the following display is presented. The "U" numbers will be listed in order from the most likely to the least likely faulty chip.

```

KEYBOARD SCANNING CIRCUIT ERROR

CHECK KEYBOARD CONNECTORS
CHECK U184
CHECK U199
CHECK U204

```

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

Video Test Patterns

When the Video Test patterns is selected, the following display appears:

DISPLAY DIAGNOSTIC-R1.0
VIDEO TEST PATTERNS

01. ALIGNMENT GRID (ADJUST HORZ. AND VERT. POSITION)
 02. FINE GRID (ADJUST FOCUS)
 03. CONCENTRIC CIRCLES (ADJUST HORZ. AND VERT SIZE)
 04. COLOR BARS (SHIFT LEFT WHEN SPACEBAR IS HIT)
 05. CHARACTER SET GRID (CHANGE DISPLAY MODES WHEN SPACEBAR IS HIT)
- INPUT: _

HIT RETURN TO RETURN TO THIS MENU.

IF YOU ARE NOT ABLE TO CORRECTLY ADJUST THE DISPLAY, CHECK THE MONITOR'S VERTICAL AND HORIZONTAL SWEEP CIRCUITS AND CRT.

Video Controller Test

Running Display

When the Video Controller is selected, the following display is presented:

DISPLAY DIAGNOSTIC
VIDEO CONTROLLER TEST

FOR THIS TEST YOU WILL BE ASKED TO VERIFY THAT A SPECIFIC PATTERN OF DATA IN THE VIDEO RAM APPEARS IDENTICAL TO A TOTALLY DIFFERENT PATTERN WHEN THE CRT CONTROLLER HAS BEEN RECONFIGURED TO CAUSE THIS TO OCCUR. WHEN YOU BEGIN THIS TEST, A GRID PATTERN WILL APPEAR ON THE SCREEN. NOTING THE SIZE AND LOCATION OF THIS PATTERN, HIT THE SPACE BAR AND THIS SAME PATTERN WILL APPEAR AGAIN AT THE SAME LOCATION. CHECK TO SEE THAT THIS PATTERN IS THE SAME SIZE AND IN THE SAME LOCATION. HIT THE SPACE BAR AND THIS SAME PATTERN WILL AGAIN APPEAR. CONTINUE IN THIS MANNER UNTIL ALL THE PATTERNS HAVE BEEN TESTED.

PRESS ANY KEY TO BEGIN

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

When you have read this message, press any key and then the space bar as the instructions indicate. After a sequence of patterns appear, the following will be displayed:

```
DISPLAY DIAGNOSTIC
VIDEO CONTROLLER TEST
```

```
WOULD YOU LIKE TO RERUN THESE PATTERNS (Y,<N>): _
WERE ALL THE PATTERNS THE SAME (<Y>,N):
```

If you answer **Y** to the first question, the previous sequence of patterns is repeated. If you answer **N**, the cursor moves to the second question.

If you answer **Y** to the second question, the next pattern sequence is run. This procedure is repeated for several pattern sequences.

Error Display

If you answer **N** to the second question, the following display is presented:

```
DISPLAY DIAGNOSTIC
VIDEO CONTROLLER TEST

CRTC ERROR
CHECK   U330
CHECK   U331,U338, AND U345
CHECK   U360 AND U373
```

Light Pen Test

Running Display

The selection of the Light Pen Test results in the following display:

```
DISPLAY DIAGNOSTIC
LIGHT PEN TEST
```

```
IN ORDER TO CALIBRATE YOUR LIGHT PEN FOR THIS TEST, PRESS
THE LIGHT PEN TO THE BOXES BELOW AS THEY LIGHT UP:
```

1. 2. 3.

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

The first of the small boxes will be displayed in inverse video (lighted). After the light pen is pressed to it, the next one will light up. After all three have been done, the following display will be presented:

DISPLAY DIAGNOSTIC
LIGHT PEN TEST

WHEN YOU BEGIN THIS TEST A LIGHTED BOX WILL APPEAR ON THE SCREEN. PRESS THE LIGHT PEN TO THIS BOX AND ANOTHER BOX WILL APPEAR IN A DIFFERENT LOCATION. PRESS THE LIGHT PEN TO THIS BOX AND ANOTHER WILL APPEAR. THIS IS REPEATED 28 TIMES.

PRESS ANY KEY TO BEGIN: _

Error Display

If an error occurs in the Light Pen circuitry the following display is presented:

LIGHT PEN CIRCUITRY ERROR

CHECK LIGHT PEN SENSITIVITY ADJUSTMENT AND LENS
CHECK U114 AND U131 ON MOTHERBOARD
CHECK U330 AND U356 ON VIDEO BOARD

LIGHT PEN REG. VALUE IN R(BX), EXPECTED VALUE IN R(CX),
CHARACTERS DELAY FROM CALCULATION IN R(DL)

A value in R(DL) greater than 0AH indicates that the light pen sensitivity is too high.

Read/Write Registers Test

Running Display

Once this section is selected, the screen will be saved since some of the video RAM is written over during the test. The screen is then restored after the test is completed.

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

Error Display

If an error occurs in the PIA, the following display is presented:

```
VIDEO BOARD PIA ERROR
CHECK U345 ON VIDEO BOARD
```

If an error occurs in the CRTIC, the following display is presented:

```
CRTC ERROR
CHECK U330 ON VIDEO BOARD
```

```
THE PORT ADDRESS BEING TESTED IS IN R(DX)
IF R(DX) IS DATA PORT: LAST DATA WRITTEN TO CTRL/ADR REG IS IN R(BH)
THE ERRONEOUS VALUE IS IN R(CH)
THE EXPECTED VALUE IS IN R(BL)
```

RESET Key Test

Running Display

When you select the RESET Key Test, the following display is presented:

```
DISPLAY DIAGNOSTIC
RESET KEY TEST
```

```
*****
```

```
----- NOTICE -----
```

```
THE EXECUTION OF THIS TEST WILL CAUSE YOUR SYSTEM TO RE-BOOT
*****
WITHIN FIVE SECONDS FROM THE TIME YOU BEGIN THIS TEST,
PRESS THE CTRL AND RESET KEYS TOGETHER AT THE SAME TIME.
```

```
(THIS TEST WILL BE ABORTED IF YOU CHOOSE NOT TO BEGIN.)
```

```
DO YOU WANT TO BEGIN THIS TEST (<Y>,N): _
```

DISPLAY DIAGNOSTICS

Display Diagnostic Section Menu

Error Display

If the RESET key does not function, the following display will appear:

```
DISPLAY DIAGNOSTIC  
RESET KEY TEST
```

```
KEYBOARD "RESET" SWITCH ERROR
```

```
CHECK KEYBOARD CONNECTORS  
CHECK RESET KEY SWITCH  
CHECK U183 AND U185 ON MOTHERBOARD
```

Help Screens

Help screens are available at both the Section Menu level and at the error displays. Refer to "Appendix A, Help Screens."

CHAPTER 6

FLOPPY DISK DIAGNOSTICS

Introduction

The Floppy Disk system in the Z-100 can consist of up to two Z-207 controllers, eight 5.25-inch drives, and eight 8-inch drives. This Diagnostic Test is designed to detect most faults in the drive and controller and to provide information required to repair or adjust the controllers and drives.

Possible faults are assumed to reside in the disk controller, drive or media. The types of errors checked for and the associated tests are listed in table 5.1

Table 5.1. Disk Errors Checked

Fault	Test	Section
Controller access	Read status	1
Data register	Shift pattern through register	1
Track register	Shift pattern through register	1
Sector register	Shift pattern through register	1
Command register	Issue command/read status	1
Status register	Issue command/read status	1
CRC generator	Compare computed/actual CRCs	2
Precompensation switch	Read switch	1
TPI switch	Read switch	1
Track 0 detector	Seek to track 0 and read switch	1
Recording density	Write track of 0's in double density. Read 1's in single density	2
Side selection	Read headers from disk	2
Rotation speed	Time between index marks	2
Address mark detector	Read any header	2
Index mark detector	Time between index marks	2
Index sensor position	Time index and address marks	2
Radial alignment	Write/read data	2
Data separator	Read any data	2
Head load time	Time command to read response	1
Write protect sensor	Use protected/unprotected disks	2
Power cable	Write/read data	2
Data cable	Write/read data	2
Precompensation	Write/read data	2
Write amplitude	Write/read data	2
Signal to noise ratio	Write/read data	2
Dynamic head positioning	Seek test	2
Access time	Seek test	2
Head azimuth	Write/read data	2
Instantaneous speed var	Write/read data	2
Head pressure	Write/read data	2
Data integrity	Check CRCs on data	3
Data format	Check format of sectors	3

FLOPPY DISK DIAGNOSTICS

Introduction

Sections 1, 2, and 3 in the table correspond to the selections on the Section Menu. These are the Controller Test, Drive Test, and Media Test respectively. The Media Test provides a method of checking data on a user disk and also has utilities that may be used to read sector information for data recovery purposes.

In addition to the diagnostic tests, an alignment section is provided that can be used to check and (if necessary) adjust many of the parameters on the disk drive. If a DDD alignment disk is available, it can display quantitative measurements of disk parameters on the screen. In some cases adjustment can be made directly with the DDD disk. Facilities are also provided for application of the standard alignment disk measurements and adjustments. These require additional equipment: a multimeter, oscilloscope, and a frequency counter.

This Test requires a Z-100 system with at least 128K of memory, and at least one 5.25-inch or 8-inch floppy disk drive. The drive test requires a scratch diskette. The media test requires the media to be tested. The alignment test requires either an analog alignment standard disk (5.25-inch = Dysan 282 Alignment Disk or equiv., 8-inch = Dysan 360/2 Alignment Disk or equiv.) or a digital alignment disk (5.25-inch = Dysan model 508-400 rev. B or equiv., 8-inch = Dysan model 808-400 rev. B or equiv.).

This test will handle the following disk formats:

Size	Sides	Density	TPI	Tracks/ Side	Sectors Track	Bytes/ Sector
5.25-inch	1	Double	48	40	8 or 9	512
5.25-inch	2	Double	48	40	8 or 9	512
5.25-inch	2	Double	96	80	8 or 9	512
8-inch	1	Single	48	77	26	128
8-inch	2	Double	48	77	8	1024

FLOPPY DISK DIAGNOSTICS

Configuration

Prior to operating the Floppy Disk Diagnostic on a new system, or whenever disk hardware changes have been made, the diagnostic configuration should be selected and the Floppy Disk Diagnostic configuration updated. Failure to do so may result in incomplete testing or inaccurate failure messages.

Select 3. MISC. FUNCTIONS at the PROGRAM MENU.

Select 4. CONFIGURATION at the MISCELLANEOUS FUNCTION MENU.

Enter the number for the Floppy Disk Diagnostic and press RETURN. A display similar to the following will appear:

```

FLOPPY DISK DIAGNOSTIC

          CONTROLLER 0          CONTROLLER 1
          DRIVE      TYPE          DRIVE      TYPE
0 (A)    5 1/4", DS, DD, 48TPI    0 (I)    5 1/4", DS, DD, 48TPI
1 (B)    5 1/4", DS, DD, 48TPI    1 (J)    NOT CONFIGURED
2 (C)    NOT CONFIGURED          2 (M)    NOT CONFIGURED
3 (D)    NOT CONFIGURED          3 (N)    NOT CONFIGURED
4 (E)    8", SS, SD, 48TPI        4 (K)    8", DS, DD, 48TPI
5 (F)    8", DS, DD, 48TPI        5 (L)    NOT CONFIGURED
6 (G)    NOT CONFIGURED          6 (O)    NOT CONFIGURED
7 (H)    NOT CONFIGURED          7 (P)    NOT CONFIGURED
ARE ALL PARAMETERS CORRECT (<Y>,N) : _

PRESS: "CTRL-X" TO RETURN TO MENU
      "CTRL-W" TO PAUSE/CONTINUE TEST

```

If the parameters are correct for the system under test, press **Y** and **RETURN** or just press **RETURN** and the Configuration Menu will be redisplayed.

If the parameters are not correct, press **N** and **RETURN**. The following prompt appears:

```
NUMBER OF CONTROLLERS TO CONFIGURE(0-2): 1
```

This prompt refers to the number of controller boards in the system under test.

FLOPPY DISK DIAGNOSTICS

Configuration

If the number is correct, press **RETURN**. If the number is incorrect, enter the correct number and press **RETURN**.

The parameters for each of the eight possible drives for the first controller is displayed.

```
DRIVE SELECTION:
CONTROLLER: 0   PORTS: B0-B5
DRIVE:      0   SIZE: 5 1/4"
SIDES(0,1,2): 2
TRACKS/INCH(48,96): 48
```

ARE ALL PARAMETERS CORRECT(<Y>,N): _

If the parameters for the drive are correct, press **RETURN** and the program will proceed to the next drive parameters. However, if the parameters are not correct, enter **N** and press **RETURN**. The cursor will move to the default answer for the number of sides.

Entering the correct number of sides for this drive will move the cursor down to the TRACKS/INCH(48,96): question. Respond with the proper number.

Entering **0** at the SIDES(0,1,2): prompt indicates that this drive does not exist and the following display will appear:

```
DRIVE SELECTION:
CONTROLLER: 0   PORTS: B0-B5
DRIVE:      0   SIZE: 5 1/4"
NOT CONFIGURED
```

ARE ALL PARAMETERS CORRECT(<Y>,N): _

Should a display like that shown above appear for a drive that does exist, answering **N** will cause the following display to appear:

```
DRIVE SELECTION:
CONTROLLER: 0   PORTS: B0 -B5
DRIVE:      0   SIZE: 5 1/4"
SIDES(0,1,2): _
TRACKS/INCH(48,96):
```

FLOPPY DISK DIAGNOSTICS

Configuration

Enter the correct parameters for the number of sides and tracks.

After the parameters for all possible drives have been reviewed, the complete list is redisplayed for a final review. Responding **Y** to the `ARE ALL PARAMETERS CORRECT (<Y>,N):` question causes the Configuration Menu to be redisplayed.

Pressing **CTRL-X** to exit the Configuration Utility will cause the following message to be displayed:

```
WRITE CONFIGURATION TO DISK (Y,<N>)?
```

If you press **Y** then a request for a file name is displayed:

```
FILE NAME (DEFAULT=DIAG.CFG): _
```

Normally, the default file is used. However, it is possible to save various configurations in different files and invoke them by typing the file name (e.g. `DIAG [filename.ext]`) at the Z-DOS prompt.

Providing a file name, or pressing **RETURN** to use the default file saves the information provided in the configuration session on the disk and therefore need not be resupplied for later use on the same system. An **N** response at the `WRITE CONFIGURATION TO DISK (Y,<N>)?` message returns control to the Program Menu but does not save the data on the disk. In either case, the new configuration is retained in memory and is used for the remainder of the diagnostic session.

Floppy Disk Diagnostic Section Menu

Selection of the `FLOPPY DIAGNOSTIC` test from the Diagnostic Test Menu causes the following section to be displayed:

```
FLOPPY DISK DIAGNOSTIC SECTION MENU
```

01. CONTROLLER TEST (A)
02. DRIVE TEST (M)
03. MEDIA TEST (M)
04. ALIGNMENT TEST (M)

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Section Menu

Controller Test

Running Display

No display is presented and no operator interface is required for this test. All configured controllers are tested in sequence.

Error Display

If the disk controller can not be accessed, the following display is presented:

```
FLOPPY CONTROLLER ACCESS FAILURE  
CONTROLLER X  
CHECK CONTROLLER PORT ADDRESS SWITCHES  
REPLACE CONTROLLER
```

The controller specification x is modified to indicate the failing controller.

When an error is detected on the disk controller chip the following display is presented:

```
FLOPPY CONTROLLER FAILURE  
CONTROLLER X  
CHECK CONTROLLER CHIP U22  
REPLACE CONTROLLER
```

If an error is detected in the controller switch settings, the following display is presented:

```
FLOPPY CONTROLLER SWITCH ERROR  
CONTROLLER X  
CHECK Y SWITCH  
REPLACE CONTROLLER
```

The switch specification y is modified to give the failing switch position (precompensation or TPI).

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Section Menu

If an error is detected in moving the head to the track zero indicator the following error message is generated:

```
FLOPPY DRIVE ERROR
CONTROLLER 0 DRIVE 2
INSURE POWER IS TURNED ON AT DRIVE
CHECK CABLE CONNECTIONS TO DRIVE
REPLACE DRIVE
```

Drive Test

Running Display

Upon selection of the drive test, the following display is presented to inform the operator that a write protected disk is required. To check the write protect sensor, place a write protected disk (protect tab *present* on a 5.25-inch disk, protect tab *removed* from an 8-inch disk) into the drive and press **RETURN**. To skip this test press the **SPACE BAR**.

NOTE: In the following displays, the first controller card in the card cage is referred to as Controller 0 and the second controller card in the card cage is referred to as Controller 1. Disk drives are referenced in a similar manner, the first drive is Drive 0, the second is Drive 1, etc.

```
FLOPPY DIAGNOSTIC
DRIVE TEST
```

```
CONTROLLER TO TEST(0,1,<A>LL CONTROLLERS AND DRIVES):
DRIVE TO TEST(0-7,<A>LL DRIVES):
```

```
INSERT A WRITE PROTECTED DISK INTO DRIVE 0(A)
TYPE SPACE TO SKIP THIS TEST.
TYPE ANY OTHER KEY TO CONTINUE.
```

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

If you skip the Write Protect Test or when the test continues, the following display is presented:

FLOPPY DIAGNOSTIC
DRIVE TEST

CONTROLLER TO TEST(0,1,<A>LL CONTROLLERS AND DRIVES):
DRIVE TO TEST(0-7,<A>LL DRIVES):

PLACE A SCRATCH DISK IN THE DRIVE(S) UNDER TEST.

***** ALL DATA ON SCRATCH DISK(S) WILL BE DESTROYED *****

TYPE THE RETURN KEY TO BEGIN TESTING

NOTE: The drive question only appears if a single controller is selected.

While the test is running the following display is shown:

FLOPPY DIAGNOSTIC
DRIVE TEST

TEST:	WRITE DATA			
CONT:	0		CURRENT	TOTAL
DRIVE:	0 (A)	TRACKS (S)	25	1882
SIDE:	0	SECTORS (S)	09	20628

ROTATIONAL SPEED: 301 RPM

ERRORS:	RECOVERABLE	NONRECOVERABLE
DATA	1	0
SEEK	1	0
WRITE	2	0
READ	0	0

Counters on the screen are cleared whenever the test is aborted using CTRL-X or when testing on a new drive begins. If an error is detected, two retries are made in an attempt to recover the data successfully. If one of the retries succeeds then the appropriate recoverable error counter is incremented. If all three retries fail then the nonrecoverable counter is incremented and the test continues with the next sector.

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

Any nonrecoverable error, or a total of two recoverable errors of all types in any one pass (per pass if the same drive is tested), will result in an error message. If the SPACE BAR is pressed at the error message, the test continues and no additional error messages are displayed. After the SPACE BAR has been pressed, the counters continue to record detected faults regardless of the number of previous errors.

Errors recorded consist of the following:

- DATA:** Data read from a sector was incorrect but the "record not found," "lost data," or "CRC error" flags were not set by the controller. This error resulted from returning the wrong sector, incorrect data that was not detected by the CRC and lost data circuits, or data that was corrupted after passing through the disk error detection circuits.
- SEEK:** The "record not found" flag was returned by the disk controller when attempting to read or write a sector. This error resulted from seeking to the wrong track or from an incorrectly formatted disk.
- WRITE:** The "write protect," "write fault," or "lost data" flags were returned by the disk controller when it attempted to write a sector. This error resulted from a spike on the write protect sensor, an incorrectly formatted disk, or any malfunction that prevented the processor from loading data quickly enough to keep up with the disk controller.
- READ:** The "lost data" or "CRC error" flags were returned by the controller when it attempted to read a sector. This error is normally caused by reading incorrect data from the disk. It can, however, result from the processor not reading data quickly enough to keep up with the disk controller.

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

Error Display

If the drive test fails, any of the following error messages may be displayed:

Write Protect Error

WRITE PROTECT ENABLE ERROR
ENSURE PROTECT TAB IS PROPERLY AFFIXED TO DISK
CHECK DISK DRIVE
REPLACE FLOPPY CONTROLLER
REPLACE DRIVE

Index Mark Detection Error

INDEX MARK DETECTION ERROR
CONTROLLER 0 DRIVE 2
ENSURE DISK IS PRESENT AND PROPERLY SEATED IN DRIVE
CHECK DISK DRIVE
REPLACE DRIVE

Rotational Speed Error

ROTATIONAL SPEED ERROR
CONTROLLER 0 DRIVE 2
CHECK DISK DRIVE
REPLACE DRIVE

Write Protect Disable Error

WRITE PROTECT DISABLE ERROR
CONTROLLER 0 DRIVE 2
ENSURE WRITE PROTECT TAB IS REMOVED FROM DISK
CHECK DISK DRIVE
REPLACE FLOPPY CONTROLLER
REPLACE DRIVE

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

Recording Density Error

RECORDING DENSITY ERROR
CONTROLLER 0 DRIVE 2
CHECK CONTROLLER CHIP U30
REPLACE FLOPPY CONTROLLER

Address Mark Detection Error

ADDRESS MARK DETECTION ERROR
CONTROLLER 0 DRIVE 2
ENSURE DISK IS PRESENT AND PROPERLY SEATED IN DRIVE
CHECK CONTROLLER CHIP U30
REPLACE FLOPPY CONTROLLER

CRC Generator/Checker Error

CRC DETECTION ERROR
CONTROLLER 0 DRIVE 2
ENSURE DISK IS PRESENT AND PROPERLY SEATED IN DRIVE
CHECK CONTROLLER CHIP U30
REPLACE FLOPPY CONTROLLER

Side Selection Error

SIDE SELECTION ERROR
CONTROLLER 0 DRIVE 2
ENSURE DISK IS PRESENT AND PROPERLY SEATED IN DRIVE
CHECK DISK DRIVE
CHECK CONTROLLER CHIP U30
REPLACE DISK
REPLACE DRIVE
REPLACE FLOPPY CONTROLLER

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

The next two displays result when any of the error rates established by the test are exceeded.

Nonrecoverable Error Rate Exceeded

NONRECOVERABLE ERROR RATE EXCEEDED
ENSURE DISK IS PRESENT AND PROPERLY SEATED IN DRIVE
CHECK DISK DRIVE
REPLACE DISK
REPLACE DRIVE

Recoverable Error Rate Exceeded

RECOVERABLE ERROR RATE EXCEEDED
ENSURE DISK IS PRESENT AND PROPERLY SEATED IN DRIVE
CHECK DISK DRIVE
REPLACE DISK
REPLACE DRIVE

Media Test

Running Display

Upon selection of the Media Test the following display is presented:

FLOPPY DIAGNOSTIC
MEDIA TEST

1. DATA FORMAT CHECK
2. DATA INTEGRITY(CRC) CHECK
3. READ TRACK UTILITY

TYPE NUMBER OF THE DESIRED SELECTION: _

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

After the test has been selected the following display is presented to allow selection of a disk drive:

```
FLOPPY DIAGNOSTIC
MEDIA TEST
```

```
CONTROLLER TO USE(<0>,1):
DRIVE TO USE(<0>-7):
```

```
INSERT THE DISK TO BE CHECKED INTO THE SELECTED DRIVE
```

```
TYPE ANY KEY TO CONTINUE: _
```

Data Format Check

The Data Format Check computes the disk format from information contained in the configuration on the disk. The results are displayed as shown below:

```
FLOPPY DIAGNOSTIC
MEDIA TEST
```

```
DATA FORMAT CHECK
```

```
DISK SIZE:      5 1/4"
DENSITY:        DOUBLE
SIDES:          2
TRACKS/SIDE:    40
SECTORS/TRACK: 09
BYTES/SECTOR:  0512
```

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

Data Integrity Check

The Data Integrity Check reads each sector on the disk and checks for CRC errors. If an error is detected, an error message is displayed. While the test is running, the following display is presented:

```

FLOPPY DIAGNOSTIC
MEDIA TEST

DATA INTEGRITY (CRC) CHECK

CURRENT SIDE:    0
CURRENT TRACK:   01
CURRENT SECTOR:  02

```

Read Track Utility

The Read Track Utility is used to read the contents directly from a disk. While the test is running, the following display is presented:

```

FLOPPY DIAGNOSTIC
MEDIA TEST

TRACK(0-39): 00 SECTOR(1-09): 01 side(0-1): 0
ADR 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F      ASCII
000 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F      .....
010 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F      .....
020 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F      !"#$%&'()*1,-./
030 30 31 32 33 34 35 36 37 38 39 3A 3B 3C 3D 3E 3F      0123456789:'<=>?
040 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F      @ABCDEFGHIJKLMNO
050 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F      PQRSTUVWXYZ[\]^_
060 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F      'abcdefghijklmno
070 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F      pqrstuvwxyz{|~

```

A=ADVANCE SECTOR, C=CHANGE LOCATION, N=NEXT SCREEN, P=PREVIOUS SCREEN

To view information on the disk first enter the track, sector, and side of the data to be accessed. At this point, the first 128 bytes of data from the sector are visible on the screen. Each time **A** is pressed the next

FLOPPY DISK DIAGNOSTICS

Floppy Disk Diagnostic Selection Menu

sector will be displayed. To view successive data, press **N** and the next 128 bytes from the buffer are displayed. To view previous data, press **P** and the previous 128 bytes are displayed. To change locations on the disk, press **C** and the sequence will start again. Note that no checking is done on the input values to determine if they are correct.

Error Display

If data can not be read from the disk to determine the format, the message NOT ABLE TO READ DISK is displayed in place of the parameter display.

If an error occurs during the Data Integrity Check, the following display is presented. The error type displayed will vary according to the type of error detected.

```
CONTROLLER 0    DRIVE 3
SIDE 0, TRACK 12, SECTOR 03
CRC ERROR IN ID FIELD
ENSURE DISK IS PROPERLY SEATED IN DRIVE
```

Alignment Tests

The alignment test is divided into digital and analog sections. The digital test is used to determine if an alignment problem exists on a drive. The analog test is used to correct alignment problems.

Selection of the Alignment Test results in the following display:

```
FLOPPY DIAGNOSTIC
ALIGNMENT TEST
```

1. DIGITAL ALIGNMENT (REQUIRES DIGITAL STANDARD DISK)
2. ANALOG ALIGNMENT (REQUIRES ANALOG ALIGNMENT DISK)

TYPE NUMBER OF THE DESIRED SELECTION: _

FLOPPY DISK DIAGNOSTICS

Alignment Tests

Selection of the either of the alignment tests results in the following display:

FLOPPY DIAGNOSTIC
DRIVE TEST

CONTROLLER TO USE(<0>,1):
DRIVE TO TEST(0-7): _

Digital Alignment Test

NOTE: This test currently will work only on 48 TPI drives.

After the drive has been selected, the following display is presented to request installation of the digital diskette. Refer to Page 6.2 for the model numbers of the required digital diskettes.

FLOPPY DIAGNOSTIC
ALIGNMENT TEST

INSERT DIGITAL ALIGNMENT DISK INTO DRIVE 0(A)

TYPE ANY KEY TO CONTINUE:

After the test begins, the following display is presented:

FLOPPY DIAGNOSTIC-R1.3
ALIGNMENT TEST

DIGITAL ALIGNMENT TEST	- TESTING DISK 0 (A)		MINIMUM VALUES
ROTATIONAL SPEED:	300 RPM		300 RPM ~1.5%
PHOTO-INDEX TIMING:	2.2 MSEC		02 MSEC ~20%
MARGINS	SIDE 0	SIDE 1	
RADIAL ALIGNMENT:	08><13	08><13	08><08 M"
HEAD HYSTERESIS:	09><13	08><13	08><08 M"
LINEARITY-INSIDE:	08><11	08><13	08><08 M"
OUTSIDE:	09><13	* 09><13	08><08 M"
CLAMPING ACCURACY:	08><09	08><09	08><08 M"
HEAD AZIMUTH:	42><42	42><42	30><30 '

*** CONSISTENTLY INCORRECT VALUES SHOULD BE VERIFIED USING A ***
*** STANDARD ANALOG ALIGNMENT DISK BEFORE DRIVE REPLACEMENT. ***

FLOPPY DISK DIAGNOSTICS

Alignment Tests

The digital alignment test depends upon correct seating of the disk in the drive. Parameters often change from pass to pass and several runs of the test should be made to verify results. The test automatically repeats until stopped by pressing either the CTRL-W or CTRL-X keys. An asterisk is placed next to the value currently being computed so that you may track the progress of the test. If the computed values are consistently below the minimum values indicated, then the drive should be replaced or aligned using the analog alignment techniques.

The values displayed are arranged in the following manner: $X > < Y$. Where X indicates the maximum amount that data can be off track centerline toward the spindle and still be read reliably. Y indicates the maximum amount that data can be off track centerline away from the spindle and still be read reliably. In the case of Radial Alignment, Head Hysteresis, and Linearity, data is read from a single track which has records written off centerline by progressive amounts. Clamping accuracy is determined from reading tracks where all data is written off centerline by the same amount. For Head Azimuth, data has been recorded on the disk with a head adjusted at various angles from perpendicular. X indicates the maximum amount (in minutes) that data can be off in a clockwise direction and still be read. Y indicates the maximum amount that data can be off in the counterclockwise direction.

Rotational speed — The time required to receive 10 index pulses is converted to revolutions per minute.

Photo-index timing — The program waits for an index pulse from the drive then issues a read track command. The time between this command and setting of the lost data flag is defined as the photo-index timing.

Radial alignment — The program steps from track 0 (the outside of the disk) toward the middle in progressive, offset tracks and compares data from even and odd sector pairs on the disk. The offset of the first even/odd sector pair with mismatching data is determined and displayed. Sector pairs are written with offsets of 6 to 13 milli-inches.

Head Hysteresis — The head is moved five tracks toward the spindle then brought back to the middle offset track and the radial alignment is repeated.

Positioner linearity — The alignment test is repeated on tracks that reside on the inside, middle, and outside of the disk. The worst case results are displayed.

FLOPPY DISK DIAGNOSTICS

Alignment Tests

Clamping eccentricity — The head is positioned over an alternate offset track with an offset of 7 millinches (all odd sectors offset +7 millinches, all even sectors offset -7 millinches) and all data on the track is verified. This test is repeated on alternate offset tracks with offsets of 8 and 9 millinches. The offset of the first track with mismatching data is displayed.

Head Azimuth — The head is positioned over the azimuth rotation track (sector pairs written with head azimuth angles of 21, 24, 27, 30, 33, 36, 39, and 42 minutes) and sector pairs are checked for mismatching data. The angle of the first sector pair that does not match is displayed.

Analog Alignment Test

If the Analog Alignment Test is selected, the following display is presented:

```
FLOPPY DIAGNOSTIC  
ALIGNMENT TEST
```

```
INSERT ANALOG ALIGNMENT DISK INTO DRIVE 0(A)
```

```
TYPE ANY KEY TO CONTINUE: _
```

After the test is running the following display is presented:

```
FLOPPY DIAGNOSTIC-R1.3  
ALIGNMENT TEST
```

```
ANALOG ALIGNMENT TEST
```

```
TESTING DISK 0(A)
```

```
TRACK NUMBER:    05  
SIDE NUMBER(0,1): 1
```

```
TYPE "T" TO CHANGE TRACK OR SIDE
```

FLOPPY DISK DIAGNOSTICS

Alignment Tests

Error Display

No error display is presented by the alignment tests.

Help Screens

Help screens are available at both the Section Menu level and at the error displays. Refer to "Appendix A, Help Screens."

CHAPTER 7

Z-204 SERIAL DIAGNOSTICS

Introduction

This test looks for a single fault on the Z-204 Multiport Serial Card by putting into operation all devices in as many modes as possible.

This test requires a Z-100 with at least 128K of memory, one 5-1/4" floppy disk drive, and a Z-204 Card installed in the card cage with appropriate cables to attach the card to peripherals.

NOTE: Some of the tests require a special test cable be attached to the back panel of the Z-100. Asynchronous loopback tests can be performed using a standard serial printer cable part number 134-1076 (model HCA-11) or a special test cable part number 134-1418. Synchronous loopback tests may be performed using only special test cable part number 134-1418. The Parallel Port test requires special test cable part number 134-1417. These cables are available from your local Heathkit Electronic Center or Zenith Data Systems dealer. For more information about the test cables refer to "Appendix B, Test Cables."

Configuration

Prior to operating the Serial Diagnostic on a new system or whenever changes have been made on the Serial Card, the configuration program should be selected and the Serial Diagnostic configuration should be updated. Failure to do so may result in incomplete testing or inaccurate failure messages.

Select 3. MISC. FUNCTIONS at the PROGRAM MENU.

Select 4. CONFIGURATION at the MISCELLANEOUS FUNCTION MENU.

Select the Z-204 SERIAL DIAGNOSTIC test by typing the number preceding the file name and pressing **RETURN**. The following display is presented:

CHANNEL	MODE/INTERFACE	JUMPERS/STATUS
1	Synchronous Clock In Interface Cable	J105, J134-ON; J106, J131, J132-OFF No
2	Transmit handshake	J109 pos. 2-3 J110 pos. 1-2
	Normal handshake polarity	J133 pos. 1-2
	Interface Cable	Yes

ARE THE PARAMETERS CORRECT (<Y>,N)?_

Z-204 SERIAL DIAGNOSTICS

Configuration

A **Y** response will cause the display for channels 3 and 4 to be displayed.

Channel	Mode	Jumpers
3	Custom Clock	----
	Interface Cable	Yes
4	Asynchronous Clock	None
	Receive Handshake	J114 pos. 1-2
		J115 pos. 2-3
	Normal Handshake	J126 pos. 1-2
	polarity	
	Interface Cable	No

ARE THE PARAMETERS CORRECT (<Y>,N)?_

A **N** response to either of the two previous displays will cause all the selection menus applicable to the channels on that display to be presented. Following are examples of the selection menus for channel three.

Clock Select Menu.

```

CHANNEL 4 PARAMETER SELECTION
1. Synchronous Clock In      J121, J122 ON; J123, J124, J129, J130 OFF
2. Synchronous Clock Out    J123, J124, J129, J130 ON; J121, J122 OFF
3. Synchronous Clock Out/In J123, J122, J129 ON; J121, J124, J130 OFF
4. Asynchronous Clock       J129, J130 - ON; J121, J122, J123, J124 - OFF
5. Custom Clock             ----
6. Interface Cable          Yes

```

CLOCK SELECTION: 2

IS THE CABLE INSTALLED (<Y>,N)?_

Z-204 SERIAL DIAGNOSTICS

Configuration

Handshake Select Menu.

- | | |
|--------------------------------|--------------------------------|
| 1. Transmit Handshake | J114 pos. 1-2
J115 pos. 2-3 |
| 2. Receive handshake | J114 pos. 2-3
J115 pos. 1-2 |
| 3. No Handshake | J114 pos. 2-3
J115 pos. 2-3 |
| 4. Normal handshake Polarity | J126 pos. 1-2 |
| 5. Inverted handshake Polarity | J126 pos. 2-3 |

CHANNEL 4 HANDSHAKE SELECTION: 3

CHANNEL 4 HANDSHAKE POLARITY: 4

The following display is presented for configuring the parallel ports:

PARALLEL PORT CONFIGURATION

Parallel Input Port Handshake, J104 :

(1=Internal (pos. 2-3), 2=External (pos. 1-2), 3=None)

Interface Cable : Yes

ARE THE PARAMETERS CORRECT? (<Y>,N):_

After all parameters are correct you are returned to the Configuration Menu. Pressing **CTRL-X** to exit the Configuration Utility will cause the following message to be displayed:

WRITE CONFIGURATION TO DISK (Y,<N>)?

If you press **Y**, then a request for a file name is displayed:

FILE NAME (DEFAULT=DIAG.CFG):_

Normally, the default file is used. However, it is possible to save various configurations in different files and invoke them by typing the file name (e.g. DIAG [filename.ext]) at the Z-DOS prompt.

Z-204 SERIAL DIAGNOSTICS

Configuration

Providing a file name, or pressing **RETURN** to use the default file, saves the information provided in the configuration session on the disk and therefore, need not be supplied for later use on the same system. An **N** response at the **WRITE CONFIGURATION TO DISK (Y,<N>)?** message returns control to the Program Menu but does not save the data on the disk. In either case, the new configuration is retained in memory and is used for the remainder of the diagnostic session.

Z-204 Serial Diagnostic Section Menu

Selecting **Z204 SERIAL DIAGNOSTIC** at the Diagnostic Test Menu results in the following display:

Z204 DIAGNOSTIC-R1.0A SECTION MENU

01. Interrupt Generator Test (A)
02. Register Test (A)
03. Local Loop Back Test - Channel 1 (A)
04. Local Loop Back Test - Channel 2 (A)
05. Parallel Port Test (M)
06. Asynchronous Serial Test (M)
07. Synchronous Serial Test (M)
08. SDLC Synchronous Serial Test (M)

Running Display

The following display is used for most of the tests performed on the Z-204 Serial Card:

PARAMETERS UNDER TEST					
MODE	BAUD RATE	# OF STOP BITS OR SYN BYTE	PARITY	CHAR LENGTH	CPU
ASN	110	1.0	NONE	1	INT

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

The parameter values that appear in the test display table are:

Mode — (chip programmed for asynchronous or synchronous operation)

Asyn
Syn

Baud Rate — (transmission rate in information bits per second)

110	4800
300	9600
600	19200
1200	38400
2400	

Number of stop bits or SYN bytes —

1
1.5
2

Parity — (for parity check on data)

None
Odd
Even

Char length — (number of information bits per character transmitted)

5 through 8

CPU mode — (method used to determine when to service the serial ports)

INT (interrupt)

Channel One and Two Register Test

No running display is presented during this test.

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

Interrupt Test

No running display is presented during this test.

Channel One and Two Local Loop Back Test

During this test, the running display mentioned above is presented.

Asynchronous and Synchronous Serial Tests

Selecting these tests results in a display like the following, which requests the selection of a channel to be tested:

1. Channel 1
2. Channel 2
3. Channel 3
4. Channel 4

Select one of the channels above for external asynchronous testing

After a channel is selected, a message like the following is displayed requesting that a test cable be installed between the selected channel and a compatible channel:

```
Z204 DIAGNOSTIC-R1.0  
Asynchronous Serial Test
```

```
On the back panel of the Z100 Install special test cable 134-1418  
or printer cable 134-1076 between  
Channel 1 and Channel 2
```

```
Is the cable installed? (<Y>,N):
```

Asynchronous test may be performed using either a standard printer cable part number 134-1076 or a special test cable part number 134-1418. Synchronous tests may be performed using only special test cable part number 134-1418.

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

Channel One Asynchronous Test

This test is performed if the configuration of either channel two or four is compatible with channel one for asynchronous communication. In addition, the operator is requested to install the special test cable between channel one and the other compatible channel, only if the cable has not been installed previously.

The running display mentioned earlier is presented during this test.

Channel One Synchronous External Loop Back Test

This test is performed if the configuration of channel one is compatible with channel four for synchronous communication. In addition, the operator is requested to install the special test cable (part number 134-1418) between channels one and four only if the cable has not been installed previously.

The running display mentioned earlier is presented during this test.

Channel Two Asynchronous Test

This test is performed if the configuration of either channel one or four is compatible with channel two for asynchronous communication. In addition, the operator is requested to install the special test cable between channel two and the other compatible channel only if the cable has not been installed previously.

The running display mentioned earlier is presented during this test.

Channel Three Asynchronous Test

This test is performed if the configuration of either channel two or four is compatible with channel three for asynchronous communication. In addition, the operator is requested to install the special test cable between channel three and the other compatible channel only if the cable has not been installed previously.

The running display mentioned earlier is presented during this test.

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

Channel Three Synchronous Test

This test is performed if the configuration of channel four is compatible with channel three for synchronous communication. In addition, the operator is requested to install the special test cable (part number 134-1418) between channel three and channel four only if the cable has not been installed previously.

The running display mentioned earlier is presented during this test.

Channel Four Asynchronous Test

This test is performed if the configuration of either channel one or three is compatible with channel four for asynchronous communication. In addition, the operator is requested to install the special test cable between channel four and the other compatible channel only if the cable has not been installed previously.

The running display mentioned earlier is presented during this test.

Channel Four Synchronous Test

This test is performed if the configuration of either channel one or three is compatible with channel four for synchronous communication. In addition, the operator is requested to install the special test cable (part number 134-1418) between channel four and the other compatible channel only if the cable has not been installed previously.

The running display mentioned earlier is presented during this test.

Parallel Port Test

This test requests that a special test connector be installed on the back panel parallel port connector. The following display will be presented:

On the back panel of the Z100 install special test
cable 134-1417 between P106 and P107.
Note the markings on the cable assembly when installing.

Is the cable installed (<Y>,N)?

No display is presented during the running of this test.

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

Error Displays

Following are examples of error messages that may be presented if any faults are detected during the running of these tests.

Register Test

```

ERROR DETECTED
REGISTER READ/WRITE ERROR
CHECK CHIP AT LOCATION U116 ON Z204 BOARD
REGISTERS          DH = EXPECTED DATA          DL = ACTUAL DATA
  
```

Interrupt Test

```

EEROR INDICATED
Z204 Interrupt Test Failure
Interrupt Generation on Z204 Card Malfunctioned
On Z024 Card, Check U101, U102, U104, U108, U112, U111, U114, U150, U133
On Z204 Card, Check U115, U116, U117, U118, U119, U134, U135, U137
Replace Z204 Card
  
```

Channel One and Two Local Loop Back Test

```

Z204 DIAGNOSTIC-R1.0
Local Loop Back Test - Channel 1
  
```

```

ERROR DETECTED
INTERNAL TRANSMIT/RECEIVE ERROR
CHECK CHIP AT LOCATION U117 ON Z204 BOARD
CHECK CHIP AT LOCATION U139 ON Z204 BOARD
  
```

```

Z204 DIAGNOSTIC-R1.0
Local Loop Back Test - Channel 2
  
```

```

ERROR DETECTED
INTERNAL TRANSMIT/RECEIVE ERROR
CHECK CHIP AT LOCATION U116 ON Z204 BOARD
CHECK CHIP AT LOCATION U139 ON Z204 BOARD
  
```

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

Channel One Asynchronous Test

Asynchronous Serial Test

ERROR DETECTED

EXTERNAL LOOP BACK MODE ERROR

TRANSMIT/RECEIVE ERROR BETWEEN PORTS

REPAIR CABLE

Check U116, U121, U122, U124 on the Z204 Board

Check U117, U123, U125, U124, U140 on the Z204 Board

Replace Z204 Card

The display shown above appears when the communication is between channels zero and one.

When the communication link is between channels one and four, then CHECK U118, U115, U128, U129, U130, U151, U125, U120 is substituted for the one of the lines in the check instruction.

Channel Two Asynchronous Test

Asynchronous Serial Test

ERROR DETECTED

EXTERNAL LOOP BACK MODE ERROR

TRANSMIT/RECEIVE ERROR BETWEEN PORTS

REPAIR CABLE

Check U116, U121, U122, U124 on the Z204 Board

Check U117, U123, U125, U124, U140 on the Z204 Board

Replace Z204 Card

The display shown above appears when the communication is between channels one and two. If inverted handshaking is used, then U150 is added.

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

When the communication link is between channels two and three, then CHECK U118, U126, U127, U128, U119 is substituted for one of the lines in the check instruction. If inverted handshaking is used for channel three, then U150 is added.

Channel One Synchronous Test

Synchronous Serial Test

ERROR DETECTED

EXTERNAL LOOP BACK MODE ERROR

TRANSMIT/RECEIVE ERROR BETWEEN PORTS

REPAIR CABLE

Check U116, U121, U122, U124 on the Z204 Board

Check U118, U115, U128, U129, U130, U151, U125, U120 on the Z204 Board

Replace Z204 Card

During this test, channel one is linked to channel four.

Channel Three Asynchronous Test

Asynchronous Serial Test

ERROR DETECTED

EXTERNAL LOOP BACK MODE ERROR

TRANSMIT/RECEIVE ERROR BETWEEN PORTS

REPAIR CABLE

Check U118, U126, U127, U128, U119 on the Z204 Board

Check U118, U115, U128, U129, U130, U151 U125, U120 on the Z204 Board

Replace Z204 Card

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

Channel Three Synchronous Test

Synchronous Serial Test

ERROR DETECTED

EXTERNAL LOOP BACK MODE ERROR

TRANSMIT/RECEIVE ERROR BETWEEN PORTS

REPAIR CABLE

Check U118, U126, U127, U128, U119 on the Z204 Board

Check U118, U115, U128, U129, U130, U151, U125, U120 on the Z204 Board

Replace Z204 Card

Channel Four Asynchronous Test

Asynchronous Serial Test

ERROR DETECTED

EXTERNAL LOOP BACK MODE ERROR

TRANSMIT/RECEIVE ERROR BETWEEN PORTS

REPAIR CABLE

Check U118, U126, U127, U128, U119 on the Z204 Board

Check U118, U115, U128, U129, U130, U151, U125, U120 on the Z204 Board

Replace Z204 Card

Channel Four Synchronous Test

Synchronous Serial Test

ERROR DETECTED

EXTERNAL LOOP BACK MODE ERROR

TRANSMIT/RECEIVE ERROR BETWEEN PORTS

REPAIR CABLE

Check U118, U126, U127, U128, U119 on the Z204 Board

Check U118, U115, U128, U129, U130, U151, U125, U120 on the Z204 Board

Replace Z204 Card

Z-204 SERIAL DIAGNOSTICS

Z-204 Serial Diagnostic Section Menu

Parallel Port Test

ERROR DETECTED

Z204 Parallel Port Test Failure

Check Cable

Check U135, U136, U137, U138

Replace Z204 Board

Help Screens

Help screens are available at both the Section Menu level and at the error displays. Refer to "Appendix A, Help Screens."

**Part III:
Appendix
and Index**

Introduction

Help screens are available at all menu and fault displays. All the Help Screens are reproduced here for easy reference.

Program Menu Help Screens

These Help Screens are Displayed if the HELP key is pressed while the Program Menu is displayed on the screen.

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D

08/27/82 08:43:58

Program menu help information:

Typing "F0" results in running all available automatic tests in sequence. A "NO ERRORS FOUND" message is displayed if no hardware faults are detected in the system. If a fault is encountered the tests stop and data pertaining to the fault, and its correction, is displayed on the screen.

Menu entries are selected by typing the menu number followed by the "RETURN" key.

Selecting "SYSTEM EXERCISER" currently results in running all automatic tests, i.e. same function as the "F0" key.

Selecting "MISC. FUNCTIONS" results in a menu of the available utility functions. Prior to operation of a newly installed diagnostic disk, or whenever hardware changes occur, the configuration should be selected and, if necessary, modified to accurately correspond with hardware. Failure to do this may produce incomplete testing or inaccurate failure messages.

Selecting "RETURN TO SYSTEM" results in a return to the operating system monitor.

"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Program Menu Help Screen

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D

08/27/82 08:43:58

Program menu help information:

Control keys used to modify operation consist of:

Mode change:

S = Set mode to stop on error

C = Set mode to continue on error

L = Set mode to loop on error

Run counter:

R = Toggle run counter between continuous and the current run count

Misc. functions:

F = Display miscellaneous functions menu

P = Print the current contents of the display

Test control

X = Return to previous menu

W = pause/continue test

Fault display:

Y = Display test/fault screen

"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Program Menu Help Screens

HEATH/ZENITH DIAGNOSTICS - REV. P1.0A 08/27/82 08:31:23

Program menu help information:

The information contained on the top five lines of the screen corresponds to the following:

Header line = Name and revision of this program

Status = The current state of the test (stopped, running, paused, looping, or loading)

Mode = The action to be taken if an error is found (stop, continue, loop). This may be changed by typing the control S, L, or C keys. If the continue on error mode is selected errors are printed on the operating system configured printer.

Run = The number of times each test is run. This may be changed by a miscellaneous function.

Starts = The number of times the test was started

Passes = The number of times the test passed without error

Errors = The number of errors found since starting the test
Press "RETURN" to return to menu

HELP SCREENS

Diagnostic Test Menu Help Screens

These Help Screens are available while the Diagnostic Test Menu is displayed.

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Diagnostic test menu help information

08/27/82 08:32:02

Typing "FO" results in running all available automatic tests in sequence. A "NO ERRORS FOUND" message is displayed if no hardware faults are detected in the system. If a fault is encountered the tests stop and data pertaining to the fault, and its correction, is displayed on the screen.

Menu entries are selected by typing the menu number followed by the "RETURN" key.

Selection of a test results in loading the test into memory and displaying a menu of the available test sections on the screen. In general each test corresponds to a particular circuit in the unit under test. It represents the smallest individually selectable part of the diagnostic.

"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Diagnostic Test Menu Help Screens

HEATH/ZENITH DIAGNOSTICS – REV. P1.0D
Diagnostic test menu help information:

08/27/82 08:43:58

Control keys used to modify operation consist of:

Mode change:

S = Set mode to stop on error

C = Set mode to continue on error

L = Set mode to loop on error

Run counter:

R = Toggle run counter between continuous and the current run count

Misc. functions:

F = Display miscellaneous functions menu

P = Print the current contents of the display

Test control:

X = Return to previous menu

W = pause/continue test

Fault display:

Y = Display test/fault screen

"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Diagnostic Test Menu Help Screens

HEATH/ZENITH DIAGNOSTICS - REV. P1.0A

08/27/82 08:31:23

Diagnostic test menu help information:

The information contained on the top five lines of the screen corresponds to the following:

Header line = Name and revision of this program

Status = The current state of the test (stopped, running, paused, looping, or loading)

Mode = The action to be taken if an error is found (stop, continue, loop).
This may be changed by typing the control S, L, or C keys.
If the continue on error mode is selected errors are printed on the operating system configured printer.

Run = The number of times each test is run. This may be changed by a miscellaneous function.

Starts = The number of times the test was started

Passes = The number of times the test passed without error

Errors = The number of errors found since starting the test
"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Diagnostic Test Menu Help Screens

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D 08/27/82 08:32:02
Diagnostic test menu help information

The letters at the end of each test or section menu entry signify:

A = AUTOMATIC (The program is completely automatic and requires no operator input.)

M = MANUAL (The program requires operator input for execution.)

C = COMBINATION (The program contains both manual and automatic sections.)

NOTE: Only automatic sections (type A) are run during the all automatic test sequence. Manual sections (type M) are run only if selected individually from the test section menu.

Press "RETURN" to return to menu

HELP SCREENS

Diagnostic Section Menu Help Screens

The following Help Screens are available while the Diagnostic Section Menu is being displayed.

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Diagnostic section menu help information

08/27/82 08:32:02

Typing "F0" results in running all available automatic sections in sequence. A "NO ERRORS FOUND" message is displayed if no hardware faults are detected in the unit. If a fault is encountered the tests stop and data pertaining to the fault, and its correction, is displayed on the screen.

Menu entries are selected by typing the menu number followed by the "RETURN" key.

Selection of a section results in immediate execution of the section. All sections displayed are available using this method.

"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Diagnostic Section Menu Help Screens

HEATH/ZENITH DIAGNOSTICS – REV. P1.0D
Diagnostic section menu help information

08/27/82 08:32:02

Control keys used to modify operation consist of:

Mode change:

S = Set mode to stop on error
C = Set mode to continue on error
L = Set mode to loop on error

Run counter:

R = Toggle run counter between continuous and the current run count

Misc. functions:

F = Display miscellaneous functions menu
P = Print the current contents of the display

Test control:

X = Return to previous menu
W = pause/continue test

Fault display:

Y = Display test/fault screen
"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Diagnostic Section Menu Help Screens

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D

08/27/82 08:31:23

Diagnostic section menu help information

The information contained on the top five lines of the screen corresponds to the following:

Header line = Name and revision of this program

Status = The current state of the test (stopped, running, paused, looping, or loading)

Mode = The action to be taken if an error is found (stop, continue, loop). This may be changed by typing the control S, L, or C keys. If the continue on error mode is selected errors are printed on the operating system configured printer.

Run = The number of times each test is run. This may be changed by a miscellaneous function.

Starts = The number of times the test was started

Passes = The number of times the test passed without error

Errors = The number of errors found since starting the test
"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Diagnostic Section Menu Help Screens

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Diagnostic section menu help information

08/27/82 09:16:37

The letters at the end of each test or section menu entry signify:

A = AUTOMATIC(The program is completely automatic and requires no operator input.)

M = MANUAL(The program requires operator input for execution.)

C = COMBINATION(The program contains both manual and automatic sections.)

NOTE: Only automatic sections(type A) are run during the all automatic test sequence. Manual sections(type M) are run only if selected individually from the test section menu.

Press "RETURN" to return to menu

HELP SCREENS

Error Display Help Screens

The following Help Screens are available during any error display.

HEATH/ZENITH DIAGNOSTICS – REV. P1.0D

08/27/82 08:54:45

Error display help information:

Line 7 of the display gives the failing test name.

Line 8 gives the failing test section name.

Line 10 gives the failing function name.

Line 11 – 16 contain a list of procedures most likely to correct the hardware problem in the machine, followed by additional information about the fault.

Values contained in the registers displayed on lines 18 – 20 are not significant except as described in the fault information on the screen.

Repair procedures are listed in most likely to least likely cause of the problem.

If an error message appears for hardware not on the system, or no error is detected in a unit you suspect of having problems, ensure that your diagnostic disk contains the correct configuration information(see miscellaneous functions).

"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Error Display Help Screens

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D

08/27/82 08:31:23

Error display help information:

The information contained on the top five lines of the screen corresponds to the following:

Header line = Name and revision of this program

Status = The current state of the test. (stopped, running, paused, looping, or loading)

Mode = The action to be taken if an error is found (stop, continue, loop). This may be changed by typing the control S, L, or C keys. If the continue on error mode is selected errors are printed on the operating system configured printer.

Run = The number of times each test is run. This may be changed by a miscellaneous function.

Starts = The number of times the test was started

Passes = The number of times the test passed without error

Errors = The number of errors found since starting the test
"HELP" for more information, "RETURN" to return to menu

HELP SCREENS

Error Display Help Screens

HEATH/ZENITH DIAGNOSTICS - REV. P1.0D
Error display help information:

08/27/82 08:32:02

Control keys used to modify operation consist of:

Mode change:

- S = Set mode to stop on error
- C = Set mode to continue on error
- L = Set mode to loop on error

Run counter:

- R = Toggle run counter between continuous and the current run count

Misc. functions:

- F = Display miscellaneous functions menu
- P = Print the current contents of the display

Test control:

- X = Return to previous menu
- W = pause/continue test

Fault display:

- Y = Display test/fault screen
- "HELP" for more information, "RETURN" to return to menu

APPENDIX B**TEST CABLES****Introduction**

Different cables may be used to perform some of the diagnostic tests documented in the Disk-Based Diagnostics manual.

Part number 134-1076 is Catalog No. HCA-11, a standard serial asynchronous cable.

Part numbers 134-1417 and 134-1418 are special test cables; 134-1417 is a parallel test cable and 134-1418 is a serial synchronous test cable.

These cables are available from your local Heathkit Electronic Center or Zenith Data Systems Dealer.

For Test	Use Cable:		
	134-1076	134-1418	134-1417

Input/Output Port Diagnostics

Remote Loop Back Mode Test	Yes	Yes	No
External Loop Back Mode Test (Asynchronous protocol)	Yes	Yes	No
(Synchronous protocol)	No	Yes	No

Z-204 Diagnostics

Asynchronous Serial Tests	Yes	Yes	No
Synchronous Serial Tests	No	Yes	No
SDLC Synchronous Serial Test	No	Yes	No
Parallel Port Test	No	No	Yes

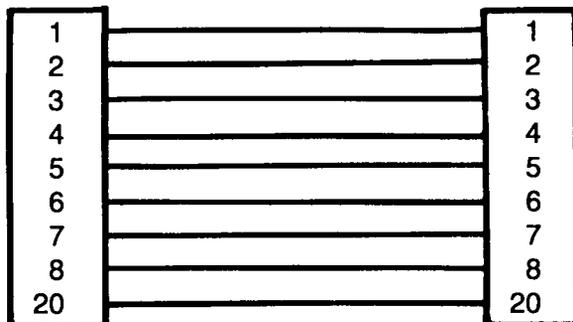
TEST CABLES

Pinouts

Part number 134-1076 (HCA-11), standard serial asynchronous cable.

Male 25-pin "D" connector

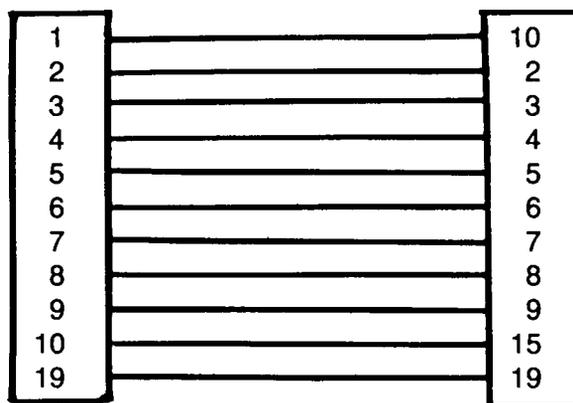
Female 25-pin "D" connector



Part number 134-1417, special parallel test cable.

Male 25-pin "D" connector
labeled P 106

Female 25-pin "D" connector
labeled P 107



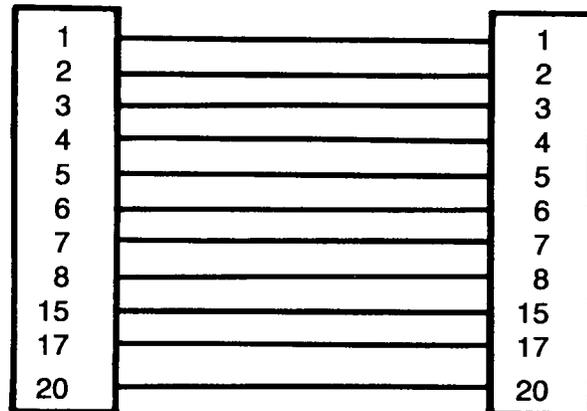
TEST CABLES

Pinouts

Part number 134-1418, special synchronous serial test cable.

Male 25-pin "D" connector

Female 25-pin "D" connector



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