PC

286/386 Common Diagnostics and Troubleshooting Guide

Worldwide
Information
Systems

Bull

286/386 COMMON DIAGNOSTICS AND TROUBLESHOOTING GUIDE

SUBJECT

Procedures for Creating a Working Copy of the Diagnostics Master Diskette and Instructions for Using Tests (Release 1.12)

The following notice is provided in accordance with the United States Federal Communications Commission's (FCC) regulations.

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient the receiving antenna
Relocate the computer with respect to the receiver
Move the computer away from the receiver
Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the seller or an experienced radio/television technician for additional suggestions.

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USER COMMENTS FORMS are included at the back of this manual. These forms are to be used to record any corrections, changes, or additions that will make this manual more useful.

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Section 1
INTRODUCTION

In this section:

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Using the Diagnostics	1-2
Be Sure To Use the Correct Diskette	1-3
Familiarity With MS-DOS	1-3
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ABOUT THE DIAGNOSTIC PROGRAM

Summary

The Diskette-Based Diagnostic Program is to be used as part of a regular maintenance program for your PC. The tests can help pinpoint problems in your system.

NOTE: This manual covers the diagnostics used with the following Bull PC series: AP-M; AP-X; SX; and SP-V20.

The "*SX User's Diagnostic*" referred to in this manual is used with the following Bull PC series: SX; AP-M; and AP-X.

When To Use the Diagnostic Program

The Diskette-Based Diagnostic Program should be used when:

- Installing a new system
- Your system doesn't seem to be operating properly
- You install new options
- The power-on diagnostic tests produce an error message.

Refer to the *PC Fact Folder* for information about assistance and service alternatives.

Using the Diagnostics

The diskette-based diagnostics are menu-driven; that is, after the program is loaded into your system, you select a desired option from a menu of options. All that is required is for you to type a number that corresponds to your choice and press the <Enter> key.

Most tests require a response from you, such as pressing keys or making a judgment about your PC's performance during execution of a test. See each test's procedures for your role during the test.

Be Sure To Use the Correct Diskette

As part of this product you should have received a diskette labeled "*SX User's Diagnostic*" or "*SP-V20 User's Diagnostic.*" That diskette has a Release Level that agrees with the Release Level noted on the title page of this guide. Never use a User's Diagnostic diskette whose Release Level is different.

Familiarity With MS-DOS

If you have not already done so, learn how to use the more common MS-DOS commands such as FORMAT and COPY. You may need knowledge of other commands as well.

COPYING THE DIAGNOSTICS DISKETTE

Summary — The diskette that ships with this product should be kept as a master diskette. If you have not already done so, make a working copy of the User's Diagnostics Diskette, and put the master copy in a safe place for later use.

NOTE: The instructions that follow assume that you are using a single diskette drive system. If you have a second drive and wish to use it, use the DOS DISKCOPY command rather than these instructions.

Step 1 — Start the diagnostic program by rebooting your system with the Master User's Diagnostic Diskette in the default disk drive (drive A). The menu shown in Figure 1-1 is displayed.

```
                    INTRODUCTION

These diagnostics should only be run with your working copy of the
master diskette.


Press <F1> for DISKCOPY or any key to continue.
```

Figure 1-1. Introductory Diagnostics Screen

Step 2 Press <F1> when the screen in Figure 1-1 is displayed. The following message then displays:

```
Insert SOURCE diskette in drive A:
Press any key when ready. . .
```

Step 3 Insert the master Diagnostic Diskette in drive A and press any key to continue. The following message displays:

```
Copying 40 tracks
9/Sectors/Track, 2 Side(s)
```

Step 4 When the master diskette's contents have been loaded into memory, the following message displays:

```
Insert TARGET diskette in drive A:
Press any key when ready . . .
```

Step 5 Remove the master diskette and store it in a safe place.

Step 6 Put a blank diskette into Drive A and press any key to continue. When the copy is complete, the following message displays:

```
Copy another diskette?
```

Step 7 If you want another copy, type Y and return to step 6. If not, type N to continue with the diagnostic load procedure (refer to Section 2).

Section 2
RUNNING DIAGNOSTIC PROGRAMS

In this section:

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The Diagnostics Menu	2-4
Running a Single Test Continuously	2-6
Running All Tests Together	2-6
Test Results	2-7

LOADING THE DIAGNOSTICS PROGRAM

After copying the master User Diagnostic Diskette, you can display the main menu and begin testing your system. Follow these steps:

Step 1 — Insert a copy of the diagnostics diskette into drive A.

Step 2 — Turn the power on or reboot the system (<Ctl>+<Alt>+<Del>).

Step 3 — Follow the displayed instructions to complete loading the diagnostics. The following screen displays:

```
                    INTRODUCTION

These diagnostics should only be run with your working copy of the
master diskette.


Press <F1> for DISKCOPY or any key to continue.
```

Step 4 — Either:

- Press <F1> to make a copy of the diagnostics diskette (refer to section 1),

OR

- Press <Enter> to continue with the program load. The following screen appears:

```
                  SYSTEM CONFIGURATION

No other drivers or programs should be loaded with the system while
running diagnostics.

If the displayed configuration does not match your system's actual
configuration, check for these possible problems:

  Wrong values entered during "HARDWARE SETUP'
  Incorrect switch settings
  Incorrect installation of boards or peripherals

NOTE:  the following configuration check may take up to a couple of
       minutes to complete.

Press any key to continue.
```

Step 5 Press <Enter> to continue with the program load. The following screen displays:

```
                    SYSTEM CONFIGURATION

640 KB installed Conventional Memory
384 KB installed Extended Memory
  0 KB installed Expanded Memory
ROM-BIOS Version 7.2
Frequency Switch installed
Standard/Advanced keyboard attached
2 Flex Drives installed
  Drive A - 360 KB diskette in 1.2 MB Drive
  Drive B - No diskette in 360 KB Drive
1 Fixed Disk Drive(s) installed
  Drive 0: Type  4  -   65,384,448 Bytes
  1 Serial Port(s) and 1 Parallel Port(s) installed}
Numeric Coprocessor not installed


Press any key to continue
```

Step 6 Press <Enter>. The second page of the System Configuration screen appears.

Step 7 Press <Enter>. The first page of the diagnostics menu appears.

THE DIAGNOSTICS MENU

Figure 2-1 illustrates the first of two Main Menu screens. To run a test, type its corresponding number and press <Enter>. In addition to the diagnostic tests, this menu lists the following options that can be invoked by the function keys:

<F1> Display a brief explanation of the tests.

<F6> Display a menu of utility programs, which includes the following:

INITFIX. The Initialize Fixed Disk program, which initializes a hard disk and puts the primary format on it.

PARK. The Position Hard Disk Head for relocation program, which positions the read/write head for transportation.

ERR LOG. The Error Log maintenance program.

<F7> Run all tests once without user intervention (see instructions on the Execute All Test menu).

<F8> Continuously run all tests that do not require operator interaction (see instructions on the Execute All Test menu).

<F4> Stop continuous testing.

<F9> Add or delete tests from main menu (see Section 6 for details).

<F10> Return to the MS-DOS operating system.

<PgUp> Go to next Main Menu page.

<PgDn> Go to previous Main Menu page.

<F2> (Not displayed) Return to Main Menu after running a test once.

You can run tests from the second page of the Main Menu by pressing the test number followed by <Enter>, <F7>, or <F8>.

```
                                MAIN MENU

                                                              Page 1 of 2

Available Tests (highlighted)                    Completed Cycles:    0
     1  Conventional Memory
     2  Extended and Expanded Memory
     3  Main Processor Board
     4  Keyboard
     5  Monochrome Adapter
     6  Color Graphics Adapter
     7  Enhanced Graphics Adapter
     8  Video Graphics Array Adapter

<F1>   Main Menu Help                    <F7>    Run All Tests Once
<F6>   Utilities                         <F8>    Run All Tests Continuous
<F9>   Edit Main Menu                    <PgUp>  Previous Page
<F10>  Exit to DOS                       <PgDn>  Next Page

Select test(s) and <ENTER> for running test(s) once  OR
Select test(s) and <F8> for continuous run of test(s)   (<F4> to stop)
```

Figure 2-1. Diagnostics Main Menu -- Page 1

```
                                MAIN MENU

                                                              Page 2 of 2

Available Tests (highlighted)                    Completed Cycles:    0
     9  Flexible Disk
    10  Fixed Disk
    11  Printer/Communications Adapter
    12  Numeric Coprocessor
    13  Auxiliary Device Port Test


<F1>   Main Menu Help                    <F7>    Run All Tests Once
<F6>   Utilities                         <F8>    Run All Tests Continuous
<F9>   Edit Main Menu                    <PgUp>  Previous Page
<F10>  Exit to DOS                       <PgDn>  Next Page

Select test(s) and <ENTER> for running test(s) once  OR
Select test(s) and <F8> for continuous run of test(s)   (<F4> to stop)


Note: Test 13 is on SP-V20 User's Diagnostic diskette only.
```

Figure 2-2. Diagnostics Main Menu -- Page 2

RUNNING A SINGLE TEST CONTINUOUSLY

You can run a single test continuously, if you suspect a component is failing intermittently. To do so, just enter the test number followed by <F8>.

To end the testing, press <F4>. The Main Menu will display after the current test is finished.

RUNNING ALL TESTS TOGETHER

All tests that require no operator intervention can be run in series, either once, or continuously). The tests are:

- Conventional Memory
- Extended and Expanded Memory
- Main Processor Board
- Keyboard
- Flex Disk
- Fixed Disk
- Printer/Communication
- Monitor
- Auxiliary Device Port.

Some of the continuously run test differ from the individually run tests described in Section 3. For example, the individual keyboard test allows you to test each key, while the continuously run keyboard test checks only the keyboard/controller interface.

Procedure

Step 1 — If you have two diskette drives, insert a formatted scratch diskette (one without data you want to save) in drive B before you begin the continuous testing.

Step 2 — Press <F7> to run all tests without intervention one time. press <F8> to run all tests continuously.

Step 3 — The Execute All Tests Screen (Figure 2-3) will display. Follow instructions on the screen to either run the tests, or return to the Main Menu. If you are running all tests once, the diagnostics will return to the Main Menu after testing is finished.

```
EXECUTE MULTIPLE TESTS

Prepare following devices for the test:

  1)  Leave your diagnostic diskette in drive A.  If you have a
      second disk drive, insert a formatted scratch diskette in drive
      B.

      ATTENTION:  DATA ON NON-DIAGNOSTIC DISKETTES WILL BE DESTROYED.

  2)  Disconnect printer cable from the printer or the system if
      attached.

Press <F4> to stop test once started
Press <F3> to Return to previous menu or <ENTER> to continue
```

Figure 2-3. Execute All Tests Screen

TEST RESULTS

After running a test, a "PASSED" or "FAILED" message appears on the same line as the title of that test. If a test fails, refer to Section 3 for test details and helpful hints. Also, refer to the *PC Fact Folder* for information on service alternatives.

```
                                MAIN MENU

                                                              Page 1 of 2

Available Tests (highlighted)                    Completed Cycles:    1
    1  Conventional Memory                          PASSED
    2  Extended and Expanded Memory                 PASSED
    3  Main Processor Board                         PASSED
    4  Keyboard                                     PASSED
    5  Monochrome Adapter                           PASSED
    6  Color Graphics Adapter                       PASSED
    7  Enhanced Graphics Adapter                    PASSED
    8  Video Graphics Array Adapter                 PASSED

<F1>   Main Menu Help                    <F7>   Run All Tests Once
<F6>   Utilities                         <F8>   Run All Tests Continuous
<F9>   Edit Main Menu                    <PgUp> Previous Page
<F10>  Exit to DOS                       <PgDn> Next Page

Select test(s) and <ENTER> for running test(s) once  OR
Select test(s) and <F8> for continuous run of test(s)   (<F4> to stop)
```

Figure 2-4. Test Results Screen

Section 3
TEST DESCRIPTIONS

In this section:

	See page
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Extended and Expansion Memory Test	3-4
Main Processor Board Test	3-5
Keyboard Test	3-7
Monochrome Display Adapter Test	3-11
Color Graphics Adapter Test	3-16
Enhanced Graphic Adapter Test	3-22
Video Graphics Array (VGA) Test	3-28
Disk Drive Tests	3-34
Flexible Disk Test	3-35
Fixed Disk Test	3-38
Printer/Communications Adapter Test	3-40
Numeric Coprocessor Test	3-43
Auxiliary Device Port Test	3-44

CONVENTIONAL MEMORY TEST

Summary The Conventional Memory Test examines all of the base random-access memory (RAM) in your system.

When To Use Run this test when a program runs properly on another computer of the same model, but fails to run on your computer, or when you get a "Parity Error" message.

User Intervention None required.

What It Does The Conventional Memory test:

- Determines the amount of system memory
- Writes the first of several test patterns to the first 64 KB memory segment
- Reads the segment just written and compares it with the original pattern
- Reports errors (if they exist)
- Repeats the above steps for all test patterns
- Repeats the above steps for all 64 KB memory segments.

How to Run the Test

Step 1 Display the Diagnostics Main Menu.

Step 2 Type 1 (or 01) and then <Enter>. The test will run in the order shown below. You will see a series of screens similar to Figure 3-1.

1. RAM Pattern test
2. RAM Address test
3. RAM Parity test
4. RAM Check test

Step 3 To end the testing, press <F2> and return to the Main Menu.

Interpreting Test Results

At power-on, your computer determines how much RAM is installed. This figure is used during this test. Thus, when you know your system has 640 KB of RAM, but 384 KB is displayed at power-on, there is a problem with the RAM. Only the first 384 KB of RAM is tested during this Test.

```
                CONVENTIONAL MEMORY, Version:  n.nn
        Memory to be Tested = 640 KB as Defined in CMOS RAM

RAM PATTERN                                                  PASS  4
PASSED                                                576 KB - 640 KB
```

Figure 3-1. Conventional Memory Test Results Screen

EXTENDED AND EXPANSION MEMORY TEST

Summary The Extended and Expansion Memory Test examines all extended and expanded memory in your system.

When To Use Run this test when a program runs properly on another computer of the same model, but fails to run on your computer, or when you get a "Parity Error" message.

User Intervention None required.

What It Does The Extended and Expansion Memory test:

- Determines the amount of each kind of memory
- Runs similarly to the RAM Pattern and RAM Parity tests for Conventional memory.

How to Run the Test

Step 1 Display the Diagnostics Main Menu.

Step 2 Type 2 (or 02) and then <Enter>. You will see screens similar to Figure 3-2.

NOTE: If you do not have expansion memory, Test 2 will not be highlighted, and the test can not be run.

NOTE: Only expanded memory (running in Protected Mode) is tested. Memory that uses bank switching (Real Mode) is not tested.

Step 3 To end the testing and return to the Diagnostics Main Menu, press <F2>.

```
          EXTENDED AND EXPANDED MEMORY, Version:  n.nn
    Memory to be Tested:  384 KB Extended        0 KB Expanded

EXTENDED RAM PATTERN                                        PASS  4
PASSED                                                320 KB - 384 KB
```

Figure 3-2. Extended and Expanded Memory Test Results Screen

MAIN PROCESSOR BOARD TEST

Summary — The Mainboard Test checks the proper operation of all accessible controllers and the Central Processing Unit (CPU).

When To Use — Run this test when:

- Your system can not access all of RAM
- Your system displays repeated "Parity Error" or "Partial Book" messages
- The speaker emits extra long or short tones.
- The clock fails to keep correct time.
- Whenever you run other tests.

User Intervention — None required.

What It Does — Each of a number of circuits is tested, and the results (either "PASSED" or "FAILED") are flashed under the name of the test. After the individual tests have been run, the net result ("PASSED" or "FAILED") is displayed next to "*03 Main Processor Board*" on the Diagnostics Main Menu.

How To Run The Tests

Step 1 Display the Diagnostics Main Menu.

Step 2 Type 3 (or 03) and then <Enter>. You will see a series of screens similar to Figure 3-3, which display the results of the following tests:

Note: Tests run will vary depending on which user diagnostics (SX or SP-V20) you are using.

CPU test
DMA Controller test
Flexible Disk test
Interval Timer test
Interrupt Controller test
Port Controllers tests
CRT Controller test/*Speaker Parity Port test
Keyboard Controller test
CMOS RAM and Real-Time Clock test
Processor Speed Switch test
*Write Protect test
*A20 Enable/Disable test

*SP-V20 only tests

Step 3 To end the testing, press <F2> and return to the Diagnostics Main Menu.

```
MAIN PROCESSOR BOARD,  Version:  n.nn

Processor speed switch circuitry
PASSED
```

Figure 3-3. Main Processor Board Test Results Screen

KEYBOARD TEST

Summary	The keyboard test checks the interface to the controller and allows testing of individual keys on the keyboard. This test will not run if the keyboard interface is not working, or if all the "4" keys are not working.
When To Use	Run the keyboard test whenever you replace or suspect a problem with the keyboard.
User Intervention	Yes.
What It Does	The Keyboard test: • Verifies the keyboard controller interface • Verifies that each pressed key sends the correct signals to the processor.
How To Run the Test	*Step 1* Make sure the keyboard is properly connected. *Step 2* Display the Diagnostics Main Menu. *Step 3* Type 4 (or 04) and then <Enter>.

Keyboard Interface Test

The Keyboard test first tests the interface to the controller, and displays the result on a screen similar to the one shown in Figure 3-4. If the interface is faulty, a "FAILED" message appears next to "*04 Keyboard*" on the Diagnostics Main Menu. This screen is automatically replaced by the Single Key Test screen (Figure 3-5).

```
                    KEYBOARD,  Version: n.nn

KEYBOARD INTERFACE
PASSED
```

Figure 3-4. Keyboard Interface Test Screen

Single Key Test

A screen similar to the one shown in Figure 3-5 displays. To display a facsimile of your keyboard, answer the question on the screen with Y (yes) or N (no) as appropriate. Refer to your keyboard installation guide for information on keyboard layout.

To test a key, press the key on the keyboard. The highlighted key position on the screen will change to two (2) asterisks if the key is working properly. If not, the position will remain highlighted.

If you press a key and get either no response, or an incorrect response, refer to the *PC Fact Folder* for information on service alternatives.

To end this part of the keyboard test, press <F1> and then <F10>. The system will prompt:

```
Are all pressed keys displayed with asterisks?
```

You must respond to this question. If you type N, a "FAILED" message appears next to *04 Keyboard* on the Diagnostics Main Menu. The message is also copied to the ERROR.LOG file.

NOTE: The Bull Multifunction keyboard has its own diagnostic. Use it instead of the SX/SP-V20 keyboard test.

```
                    KEYBOARD,  Version: n.nn

KEYBOARD

Do you have an advanced keyboard
with function keys F11 - F30?  (Y/N)
```

Figure 3-5. Keyboard Screen

Keylock Test

The final part of the keyboard test is the keylock test. If you choose to test your keylock, insert the key into the lock (behind front panel). Once you answer "Yes" to the screen prompt, you have ten seconds to lock the keyboard, and ten seconds to unlock it. Failure to respond in time will result in a KEYBOARD ERROR message.

```
                    KEYBOARD,  Version: n.nn

  KEYBOARD LOCK TEST

If you want to perform the keyboard lock switch test, keep your key
ready.

Do you want to test the keykboard lock switch?  (Y/N)
```

To end the test and return to the Diagnostics Main Menu, press <F2>.

MONOCHROME DISPLAY ADAPTER TEST

Summary The Monochrome Display Adapter test check the operation of the monitor and its controller.

When To Use Run the Monochrome Display Adapter test when:

- You want to test the monitor and controller
- Whenever you run the Main Processor Board test or any of the memory tests (all are related to proper operation of the monitor).

User Intervention Yes.

What It Does This test checks both text and graphics display capabilities of a high-resolution monochrome monitor, its controller, and other PC circuits that influence the monitor.

How To Run The Test

Step 1 Display the Diagnostics Main Menu.

Step 2 Type 5 (or 05) and then <Enter>.

Step 3 Follow the screen prompts to determine when user intervention is required.

Test Failures If the test fails or gives erratic results, the problem can be caused by incorrect switch settings. Check the Primary Display switch in the system unit, and any switches on the monitor controller board(s). Refer to the appropriate installation guides, if necessary.

If a test fails, a "FAILED" message appears, and the error is recorded in the ERROR.LOG file.

How To Stop Testing To stop testing and return to the Diagnostics Main Menu, press <F2>. The main menu will display with "PASSED" or "FAILED" status next to "*5 Monochrome Adapter.*"

CRT Access Test

The CRT control registers are tested with a write/read test.

CRT RAM Test

The memory is tested by a write/read test and an address test. Up to 32 KB of memory is tested.

CRT Extended RAM Test

This test is performed only if you have a monochrome graphics controller installed in the system unit. Video memory from 32 KB to 64 KB is tested with a write/read test and an addressing test.

Cursor Test

This test verifies the correct positioning of the cursor. The cursor should appear to the right of the arrow as shown in Figure 3-6. Enter the appropriate response to the screen prompt (if your response is N, the error is recorded in the ERROR.LOG file).

NOTE: Because the monitor controller determines the type of cursor, the cursor may not appear as a solid block. Press Y and continue unless you know that the cursor does not match the cursor defined by your controller.

```
MONOCHROME ADAPTER, Version: n.nn
4 KB video memory installed

___  Cursor shape and position test

The cursor should be a blinking solid block positioned at the end of
the arrow
     ------------------------->

Is the cursor shape and position ok (Y/N)?
```

Figure 3-6. Cursor Test Screen -- Monochrome Adapter

Scroll Test

The scroll test verifies that the monitor can scroll the display from the bottom of the screen to the top. The display is a screen similar to the one shown in Figure 3-7. Enter the appropriate response to the screen prompt.

```
MONOCHROME ADAPTER, Version: n.nn
4 KB video memory installed

___  CRT scroll test

Are the lines at the top of the screen (Y/N)?
```

Figure 3-7. CRT Scroll Test Screen -- Monochrome Adapter

CRT Attribute Test

This test verifies the following monitor attributes:

Normal/high intensity
Inverse video
Blinking video
Underlined video
Low intensity video.

To verify each attribute, the program displays a sample text line that describes the attribute being tested (Figure 3-8). Compare each line with its description, and then enter the appropriate response to the screen prompt.

```
                MONOCHROME ADAPTER, Version: n.nn
                  4 KB video memory installed

___  CRT attribute test

White on black, low  intensity, not underlined, not blinking
White on black, high intensity, not underlined, not blinking
Black on white,                 not underlined, not blinking
White on black, low  intensity,     underlined, not blinking
White on black, low  intensity, not underlined,     blinking
White on black, high intensity,     underlined, not blinking
White on black, high intensity, not underlined,     blinking
Black on white,                 not underlined,     blinking
White on black, low  intensity,     underlined,     blinking
White on black, high intensity,     underlined,     blinking
***   This line should not be visible!   ***

Are the attributes as described (Y/N) ?
```

Figure 3-8. CRT Attributes Test Screen -- Monochrome Adapter

Character Set Test

The character set test verifies that all valid characters are generated correctly. The program displays all 256 characters that are available (uppercase and lowercase alphabetic, numeric, and special characters).

If an invalid character is displayed, or if a valid character is displayed more than once, an error has occurred. Enter the appropriate response to the screen prompt.

Monochrome Graphics Test

This test is performed only if you have a monochrome graphics controller installed. The monochrome graphics test checks the graphics capability of a monochrome graphics controller. Two screens of 720 by 348 resolution are displayed. Enter the appropriate response to the screen prompt.

COLOR GRAPHICS ADAPTER TEST

Summary The Color Graphics Adapter test checks the operation of the monitor and its controller.

When To Use Run the Color Graphics Adapter test when:

- You want to test the monitor and controller
- You question the quality of the display
- You run the Main Processor Board test or any of the memory tests (all are related to proper operation of the monitor).

User Intervention Yes.

What It Does This test checks both text and graphics display capabilities of a color monitor, its controller, and other PC circuits that influence the monitor.

How To Run The Test

Step 1 Display the Diagnostics Main Menu.

Step 2 Type 6 and then <Enter>.

Step 3 Follow the screen prompts to determine when user intervention is required.

Test Failures If the test fails or gives erratic results, the problem can be caused by incorrect switch settings. Check the Primary Display switch in the system unit, and any switches on the monitor controller board(s). Refer to the appropriate installation guides, if necessary.

If a test fails, a "FAILED" message appears, and the error is recorded in the ERROR.LOG file.

How To Stop Testing To stop testing and return to the Diagnostics Main Menu, press <F2>. The main menu will display with "PASSED" or "FAILED" status next to "*6 Color Graphics Adapter*."

CRT Access Test

The CRT control registers are tested with a write/read test.

CRT RAM Test

The memory is tested by a write/read test and an address test. Up to 32 KB of memory is tested, as is the memory paging system.

Cursor Test

This test verifies the correct positioning of the cursor. The cursor should appear to the right of the arrow as shown in Figure 3-9. Enter the appropriate response to the screen prompt (if your response is N , the error is recorded in the ERROR.LOG file.

NOTE: Because the monitor controller determines the type of cursor, the cursor may not appear as a solid block. Press Y and continue unless you know that the cursor does not match the cursor defined by your controller.

```
COLOR GRAPHICS ADAPTER, Version: n.nn
16 KB video memory installed

___  Cursor shape and position test

The cursor should be a blinking solid block positioned at the end of
the arrow
     ------------------------------>

Is the cursor shape and position ok (Y/N)?
```

Figure 3-9. Cursor Test Screen -- Color Graphics Adapter

Scroll Test

The scroll test verifies that the monitor can scroll the display from the bottom of the screen to the top. A screen similar to the one shown in Figure 3-10 displays. Enter the appropriate response to the screen prompt.

```
COLOR GRAPHICS ADAPTER, Version: n.nn
16 KB video memory installed

___  CRT scroll test

Are the lines at the top of the screen (Y/N) ?
```

Figure 3-10. CRT Scroll Test Screen -- Color Graphics Adapter

CRT Attribute Test

This test verifies the following monitor attributes in both monochrome and color:

- Normal/high intensity
- Inverse video
- Blinking video
- Low intensity video.

To verify each attribute, the program displays a sample text line that describes the attribute being tested.

Monochrome attributes are tested first (Figure 3-11). Compare each line with its description, and then enter the appropriate response to the screen prompt. Color attributes are tested next (Figure 3-12). Again, compare each line with its description, and then enter the appropriate response to the screen prompt.

```
                COLOR GRAPHICS ADAPTER, Version: n.nn
                     16 KB video memory installed

___   CRT attribute test

White on black, low  intensity, not blinking
White on black, high intensity, not blinking
Black on white,                 not blinking
White on black, low  intensity,     blinking
White on black, high intensity,     blinking
Black on white,                     blinking
***   This line should not be visible!   ***

Are the attributes as described (Y/N) ?
```

Figure 3-11. Color Adapter Test: Monochrome Attributes

```
                COLOR GRAPHICS ADAPTER, Version: n.nn
                     16 KB video memory installed

___   CRT attribute test

Blue  on black, low  intensity, not blinking
Blue  on black, high intensity, not blinking
Blue  on black, low  intensity      blinking
Blue  on black, high intensity,     blinking
White on blue , high intensity, not blinking
White on green, high intensity, not blinking
White on red  , high intensity, not blinking
Blue on white , high intensity, not blinking
Green on white, high intensity, not blinking
Red on white  , high intensity, not blinking
Foreground colors: blue green red cyan magenta brown white
   high intensity: blue green red cyan magenta yellow white
Background colors: blue green red cyan magenta brown white

Are the attributes as described (Y/N) ?
```

Figure 3-12. Color Adapter Tests: Color Attributes

Character Set Test

The character set test verifies that all valid characters are generated correctly. The program displays all 256 characters that are available (uppercase and lowercase alphabetic, numeric, and special characters).

Characters are displayed in two screen formats: one is 40 characters by 25 rows and the other is 80 characters by 25 rows.

If an invalid character is displayed, or if a valid character is displayed more than once, an error has occurred. Enter the appropriate response to the screen prompt.

B/W Graphics Test

The B/W graphics test checks the black and white graphics capability of the controller. One screen of 320 by 200 resolution is displayed, followed by one screen of 640 by 200 resolution. Enter the appropriate response to the screen prompts.

Color Graphics Test

The 320 by 200 Color Graphics test checks the medium resolution* capabilities of the color monitor and the monitor controller board. A limited number of colors can be displayed in 320 by 200 graphics mode. Normally, you can mix any combination of colors as long as no more than four colors are on the screen at one time.

Follow the instructions on the screen to see the various color combinations. When finished, press <Enter>. The following prompt appears:

```
Is the screen correct?  (Y/N)
```

Enter the appropriate response to exit the test.

Test Pictures

In this test, control picture(s) are displayed. They can be used for monitor alignment.

Light Pen Test

This test verifies that the light pen (if attached) is working properly. Follow the screen prompts to perform this test.

*Resolution is the systems ability to display a certain number of addressable points (called pixels) on the CRT. Each pixel is defined by its horizontal and vertical position. Thus, resolution is expressed as the maximum number of horizontal and vertical axes (e.g. a resolution of 320 by 200 = 320 horizontal axes and 200 vertical axes, for a total of 64,000 pixels).

ENHANCED GRAPHIC ADAPTER TEST

Summary

The Enhanced Graphic Adapter test checks the monitor and monitor controller board(s). Make sure that your Enhanced Graphics Adapter is configured for EGA before running these tests. If you wish to test your EGA configured for monochrome or color graphics, use the diagnostics that came with your EGA controller.

When To Use

Run the Enhanced Graphics Adapter test when:

- You want to test the monitor and controller
- You question the quality of the display
- You run the Main Processor Board test or any of the memory tests (all are related to proper operation of the monitor).

User Intervention

Yes.

What It Does

This test checks both text and graphics display capabilities of a color monitor, its controller, and other PC circuits that influence the monitor.

How To Run The Test

Step 1 Display the Diagnostics Main Menu.

Step 2 Type 7 and then <Enter>.

Step 3 Follow the screen prompts to determine when user intervention is required.

Test Failures

If the test fails or gives erratic results, the problem can be caused by incorrect switch settings. Check the Primary Display switch in the system unit, and any switches on the monitor controller board(s). Refer to the appropriate installation guides, if necessary.

If a test fails, a "FAILED" message appears, and the error is recorded in the ERROR.LOG file.

How To Stop Testing

To stop testing and return to the Diagnostics Main Menu, press <F2>. The main menu will display with "PASSED" or "FAILED" status next to "*7 Enhanced Graphics Adapter*."

EGA Access Test

The EGA board internal data bus and, in a limited way the 6845 CRT-Controller (or compatible) chip are tested by writing/reading from the cursor location register.

EGA Memory Test

EGA memory is tested by a write/read test and an address test. Up to 256 KB of memory (divided into four planes) is tested.

EGA ROM-BIOS Test

The EGA BIOS is checked by calculating, but not displaying, the checksum (adding the bytes stored in ROM).

Cursor Test

This test verifies the correct positioning of the cursor. The cursor should appear to the right of the arrow as shown in Figure 3-13. Enter the appropriate response to the screen prompt (if your response is N, the error is recorded in the ERROR.LOG file).

NOTE: Because the monitor controller determines the type of cursor, the cursor may not appear as a solid block. Press Y and continue unless you know that the cursor does not match the cursor defined by your controller.

```
ENHANCED GRAPHICS ADAPTER, Version: n.nn
256 KB video memory installed

___  Cursor shape and position test

The cursor should be a blinking solid block positioned at the end of
the arrow
     ------------------------------>

Is the cursor shape and position ok (Y/N)?
```

Figure 3-13. Cursor Test Screen -- EGA Adapter

Scroll Test

The scroll test verifies that the monitor can scroll the display from the bottom of the screen to the top. A screen similar to the one shown in Figure 3-14 displays. Enter the appropriate response to the screen prompt.

```
ENHANCED GRAPHICS ADAPTER, Version: n.nn
256 KB video memory installed

___  CRT scroll test

Are the lines at the top of the screen (Y/N) ?
```

Figure 3-14. CRT Scroll Test Screen -- EGA Adapter

CRT Attribute Test

This test verifies the following monitor attributes in both monochrome and color:

- Normal/high intensity
- Inverse video
- Blinking video
- Low intensity video.

To verify each attribute, the program displays a sample text line that describes the attribute being tested.

Monochrome attributes are tested first (Figure 3-15). Compare each line with its description, and then enter the appropriate response to the screen prompt. Color attributes are tested next (Figure 3-16). Again, compare each line with its description, and then enter the appropriate response to the screen prompt.

```
                ENHANCED GRAPHICS ADAPTER, Version: n.nn
                    256 KB video memory installed

___  CRT attribute test

White on black, low  intensity, not blinking
White on black, high intensity, not blinking
Black on white,                 not blinking
White on black, low  intensity,     blinking
White on black, high intensity,     blinking
Black on white,                     blinking
***   This line should not be visible!   ***

Are the attributes as described (Y/N) ?
```

Figure 3-15. EGA Adapter Test: Monochrome Attributes

```
                ENHANCED GRAPHICS ADAPTER, Version: n.nn
                    256 KB video memory installed

___  CRT attribute test

Blue  on black, low  intensity, not blinking
Blue  on black, high intensity, not blinking
Blue  on black, low  intensity      blinking
Blue  on black, high intensity,     blinking
White on blue , high intensity, not blinking
White on green, high intensity, not blinking
White on red  , high intensity, not blinking
Blue on white , high intensity, not blinking
Green on white, high intensity, not blinking
Red on white  , high intensity, not blinking
Foreground colors: blue green red cyan magenta brown white
   high intensity: blue green red cyan magenta yellow white
Background colors: blue green red cyan magenta brown white

Are the attributes as described (Y/N) ?
```

Figure 3-16. EGA Adapter Tests: Color Attributes

Character Set Test

The character set test verifies that all valid characters are generated correctly. The program displays all 256 characters that are available (uppercase and lowercase alphabetic, numeric, and special characters).

Characters are displayed in two screen formats: one is 40 characters by 25 rows and the other is 80 characters by 25 rows.

If an invalid character is displayed, or if a valid character is displayed more than once, an error has occurred. Enter the appropriate response to the screen prompt.

EGA Switches Test

The current setting of the switches on your EGA adapter is checked to see if they are properly set.

EGA Graphics Test

This test checks the resolution* capabilities of the monitor, its controller, and the EGA board. The following EGA resolution modes are supported:

- 320x200 monochrome (mode 4)
- 640x200 monochrome (mode 6)
- 320x200 4 colors (Mode 5)
- 640x200 16 colors (mode 14)
- 640x350 16 colors (mode 16)

Follow the instructions on the screen to step through the different modes.

*Resolution is the system's ability to display a certain number of addressable points (called pixels) on the CRT. Each pixel is defined by its horizontal and vertical position. Thus, resolution is expressed as the maximum number of horizontal and vertical axes (e.g. a resolution of 320 by 200 = 320 horizontal axes and 200 vertical axes, for a total of 64,000 pixels).

Test Pictures

In this test, control pictures are displayed. They can be used for monitor alignment.

Light Pen Test

This test verifies that the light pen (if attached, and if the EGA is in color mode) is working properly. Follow the screen prompts to perform this test.

Vertical Retrace Interrupt

This test checks for presence of the Vertical Retrace Interrupt (an internal circuit function that controls the integrity of your display).

VIDEO GRAPHICS ARRAY (VGA) TEST

Summary The Video Graphics Array test checks the VGA color and monochrome monitor and monitor controller board(s).

When To Use Run the Video Graphics Array test when:

- You want to test the monitor and controller
- You question the quality of the display
- You run the Main Processor Board test or any of the memory tests (all are related to proper operation of the monitor).

These tests verify the *general operation* of your video board. For more comprehensive testing, use the diagnostics that came with your VGA board.

User Intervention Yes.

What It Does This test checks both text and graphics display capabilities of a VGA color monitor, its controller, and other PC circuits that influence the monitor.

How To Run The Test

Step 1 Display the Diagnostics Main Menu.

Step 2 Type 8 and then <Enter>.

Step 3 Follow the screen prompts to determine when user intervention is required.

Test Failures If the test fails or gives erratic results, the problem can be caused by incorrect switch settings. Check the Primary Display switch in the system unit, and any switches on the monitor controller board(s).

If a test fails, a "FAILED" message appears, and the error is recorded in the ERROR.LOG file.

How To Stop Testing To stop testing, press <F2>. The main menu will display with "PASSED" or "FAILED" status next to "*8 Video Graphics Array Adapter*."

VGA Access Test

The VGA board internal data bus and, in a limited way the CRT-Controller (or compatible) chip are tested by writing/reading from the cursor location register.

VGA Memory Test

VGA memory is tested by a write/read test and an address test. 256 KB of memory (divided into four planes) is tested.

VGA ROM-BIOS Test

The VGA BIOS is checked by calculating, but not displaying, the checksum (adding the bytes stored in ROM).

Cursor Test

This test verifies the correct positioning of the cursor. The cursor should appear to the right of the arrow as shown in Figure 3-17. Enter the appropriate response to the screen prompt (if your response is N , the error is recorded in the ERROR.LOG file.

NOTE: Because the monitor controller determines the type of cursor, the cursor may not appear as a solid block. Press Y and continue unless you know that the cursor does not match the cursor defined by your controller.

```
VIDEO GRAPHICS ARRAY (VGA), Version: n.nn
256 KB video memory installed

___  Cursor shape and position test

The cursor should be a blinking solid block positioned at the end of
the arrow
     ------------------------------>

Is the cursor shape and position ok (Y/N)?
```

Figure 3-17. Cursor Test Screen -- VGA Adapter

Scroll Test

The scroll test verifies that the monitor can scroll the display from the bottom of the screen to the top. A screen similar to the one shown in Figure 3-18 displays. Enter the appropriate response to the screen prompt.

```
VIDEO GRAPHICS ARRAY (VGA), Version: n.nn
256 KB video memory installed

___ CRT scroll test

Are the lines at the top of the screen (Y/N) ?
```

Figure 3-18. CRT Scroll Test Screen -- VGA Adapter

CRT Attribute Test

This test verifies the following monitor attributes in both VGA monochrome and VGA color monitors:

Normal/high intensity
Inverse video
Blinking video
Low intensity video.

To verify each attribute, the program displays a sample text line that describes the attribute being tested.

Monochrome attributes are tested first (Figure 3-19). Compare each line with its description, and then enter the appropriate response to the screen prompt. Color attributes are tested next (Figure 3-20). Again, compare each line with its description, and then enter the appropriate response to the screen prompt.

```
                VIDEO GRAPHICS ARRAY (VGA), Version: n.nn
                     256 KB video memory installed

___   CRT attribute test

White on black, low  intensity, not blinking
White on black, high intensity, not blinking
Black on white,                 not blinking
White on black, low  intensity,     blinking
White on black, high intensity,     blinking
Black on white,                     blinking
***   This line should not be visible!   ***

Are the attributes as described (Y/N) ?
```

Figure 3-19. VGA Adapter Test: Monochrome Attributes

```
                VIDEO GRAPHICS ARRAY (VGA), Version: n.nn
                     256 KB video memory installed

___   CRT attribute test

Blue  on black, low  intensity, not blinking
Blue  on black, high intensity, not blinking
Blue  on black, low  intensity      blinking
Blue  on black, high intensity,     blinking
White on blue , high intensity, not blinking
White on green, high intensity, not blinking
White on red  , high intensity, not blinking
Blue on white , high intensity, not blinking
Green on white, high intensity, not blinking
Red on white  , high intensity, not blinking
Foreground colors: blue green red cyan magenta brown white
   high intensity: blue green red cyan magenta yellow white
Background colors: blue green red cyan magenta brown white

Are the attributes as described (Y/N) ?
```

Figure 3-20. VGA Adapter Tests: Color Attributes

Character Set Test

The character set test verifies that all valid characters are generated correctly. The program displays all 256 characters that are available (uppercase and lowercase alphabetic, numeric, and special characters).

Characters are displayed in two screen formats: one is 40 characters by 25 rows and the other is 80 characters by 25 rows.

If an invalid character is displayed, or if a valid character is displayed more than once, an error has occurred. Enter the appropriate response to the screen prompt.

VGA Color DAC Test

This test checks the correct operation of the Digital-to-Analog Control (DAC) circuits. Three color bars are displayed. The color bars should flow from dark to light with no *abrupt* changes.

VGA Graphics Test

This test checks the resolution* capabilities of the monitor, its controller, and the VGA board. The following VGA resolution modes are supported:

- 320x200 monochrome (mode 4)
- 640x200 monochrome (mode 6)
- 320x200 4 colors (mode 5)
- 640x200 16 colors (mode 14)
- 640x350 16 colors (mode 16)

Follow the instructions on the screen to step through the different modes.

Test Pictures

In this test, control pictures are displayed. They can be used for monitor alignment.

*Resolution is the system's ability to display a certain number of addressable points (called pixels) on the CRT. Each pixel is defined by its horizontal and vertical position. Thus, resolution is expressed as the maximum number of horizontal and vertical axes (e.g. a resolution of 320 by 200 = 320 horizontal axes and 200 vertical axes, for a total of 64,000 pixels).

DISK DRIVE TESTS

Summary

The Flex Disk and Fixed Disk tests each check the read/write capabilities of the disk drive(s) as well as the integrity of the magnetic media.

When To Use

Run one or more of the disk tests whenever you have problems with any diskette or hard disk drive connected to your system. In particular, run the tests whenever you have:

- Repeated disk errors
- "Errors reading/writing sectors"
- "Sector not found" errors.

CAUTION

A power failure during the write portion of this test can partially erase the disk. DO NOT use the master copy of the diagnostic diskette when running this test! Also, *backup the hard disk before testing that drive.*

Errors While Testing

Errors found during execution of the hard disk tests are copied automatically to the ERROR.LOG file, and the program continues testing the rest of the drive.

When the drive or diskette passes a test -- but only after one or two retries were performed -- an *"XX retries performed"* message is displayed at the end of the test (XX = the number of retries before the drive or diskette passed the test).

This may indicate that the drive or diskette is performing marginally; that is, the drive may be out of alignment, or there may be badly worn areas on the diskette or hard disk.

Retry errors do not always indicate a serious problem. but when they persist, you should suspect the diskette. Run the test with a different diskette. If the retry errors do not persist, then the previous diskette is bad.

FLEXIBLE DISK TEST

CAUTION

Use a working copy of the Diagnostics diskette. Data on the sector being tested can be lost if a power failure occurs during the test. In addition, using a working copy of the diskette protects against loss of the diagnostic program.

User Intervention: Yes

How To Run the Tests

Step 1 Display the Diagnostic Main Menu.

Step 2 Type 9 (or 09) and then <Enter>.

The diagnostics perform three types of tests on the diskette drive(s):

- Read-only
- Write/read
- Disk-change-line.

These tests are run for each diskette drive (internal drives A and B, and any external drives that may be attached).

Read-Only Test

The test reads all sectors on the diskette and, after all sectors have been read, a seek test is performed in which the first sector of every track is read in the track sequence 0,max,1,max-1, 2, max-2, and so forth.

Write/Read Test

The screen in Figure 3-21 displays when you select this test.

The Write/Read test is performed on the test tracks which are reserved on the diagnostic diskette. The tests are performed on Heads 0 and 1. Tracks 9, 37, 38, and 39 are used on a 40 track diskette. Tracks 9, 77, 78, and 79 are used on an 80 track diskette. The contents of these tracks are destroyed during the test.

Up to four formats are used for the Write/Read test, as shown below.

Format Number	Format Size	Bytes/ Sector	Sectors/ Track
1	360/720 KB	256	16
2	360/720 KB	512	9
3	1.2/1.4 MB	256	31
4	1.2/1.4 MB	512	15

The first two formats are used for 360 KB and 720 KB diskettes; all four formats are used for 1.2 MB and 1.4 MB diskettes.

During the test the format and disk parameter tables are set to the programs table, and the disk system is reset. Then the test tracks are formatted. A test pattern is then written to the test tracks, the tracks are then read, and the data is compared.

A crosstalk test is then performed. Track 38 (78) is formatted and a test pattern is written to all sectors. Then tracks 37 and 39 (77 and 79) are are formatted. All sectors of track 38 (78) are read again and the data is compared to the expected test pattern

Finally, the parameter tables are set back to the DOS tables, the test tracks are reformatted to the DOS format, and a seek test is performed.

```
FLEXIBLE DISK DRIVE TEST, Version:  n.nn
2 Flex Drives installed

Write/Read test drive B

W A R N I N G:

This test will destroy data on all disks other than the diagnostic
diskette.

Please insert a formatted scratch disk or Diagnostic disk into drive B
and press <ENTER>
or press <F3> to cancel test.
```

Figure 3-21. Diskette Drive Test Screen

Disk-Change-Line

This test may not be performed on all drives. The disk-change-line is a sensor which checks whether a diskette is inserted and the latch is closed. Every time the diskette is removed, the disk-change-line becomes active, until it is reset by the software (for example, by a read operation via ROM BIOS).

At the beginning of the test, the disk-change-line is reset by a read operation. At this time you are prompted to remove the diskette (see Figure 3-22).

```
FLEXIBLE DISK DRIVE TEST, Version:  n.nn
2 Flex Drives installed

  Disk-change-line test drive A

360 KB diskette in 1.2 MB Drive

Remove Disk from drive A and press <ENTER>
```

Figure 3-22. Disk-Change-Line Test Screen

Press any alphanumeric key. The disk-change-line signal is checked to see if it is active. You are prompted to re-insert the diskette. A dummy read operation is performed to reset the disk-change-line state. Finally the disk-change-line signal is checked again. This time it must be inactive. This test is not run during continuous testing.

Completion of Tests

The test status is displayed when testing of drive A is completed. Testing continues for other diskette drives (if present) as described above. To return to the Diagnostics Main Menu, press <F2>.

FIXED DISK TEST

CAUTION

It is strongly recommended that you back up your hard disk before running the Fixed Disk test. Data on the hard disk cylinder being tested can be lost if a power failure occurs during the Write/Read test.

User Intervention

None required

How To Run the Tests

Step 1 Back up the hard disk.

Step 2 Display the Diagnostics Main Menu.

Step 3 Type 10 and then <Enter>.

The diagnostics perform three tests on the hard disk drive:

- Hard Disk Controller test
- Read/Write Maintenance Track test
- Seek test.

The status of each test is reported on the screen.

Hard Disk Controller Test

This test initiates the Fixed Disk Controller self-diagnostic.

Maintenance Track Tests

The maintenance track is the innermost track not used by DOS and applications. It is kept free for testing purposes.

After the controller test is performed, the drive is checked for readiness. If it is ready, the maintenance track is formatted. The disk drive heads are recalibrated* (moved to track 0), and then the first test pattern is written to the maintenance track. The heads are again recalibrated, after which the maintenance track is read and the data is compared with the written data. This process is repeated with a second test pattern. Finally, the hard disk system is reset.

Seek Test

The third, and final test is a complete recalibration of the drive. The first sector of every track is read in the sequence 0,max, 1,max-1, 2,max-2, and so forth. The hard disk system is reset at the end of this test.

Completion of Tests

When the tests have been completed, press <F2> to return to the Diagnostics Main Menu.

PRINTER/COMMUNICATIONS ADAPTER TEST

Summary The Printer/Communications Adapter test checks the system serial and parallel ports. No devices should be connected to the ports during this test, unless you are prompted to connect a printer during testing.

When To Use Run this test whenever you get a "COM PORT" error message, or when you want to verify the operation of the serial and parallel ports.

User Intervention Optional.

What it Does This test verifies operation of the communications adapter and its ports. A parallel printer can also be tested if desired.

How To Run the Test

Step 1 Disconnect all devices from the serial and parallel communications ports.

Step 2 Display the Diagnostics Main Menu.

Step 3 Type 11 and then <Enter>. The screen in Figure 3-23 displays.

```
PRINTER/COMMUNICATIONS ADAPTER, Version: n.nn

Please disconnect the printer cable.
Press any key to continue.
```

Figure 3-23. Port Test Screen

Serial Port Test

The serial port test allows you to verify operation of serial ports on your system. Serial ports are referred to as COM1 and COM2. Each port is tested separately. The serial ports are addressed as follows:

- If one serial port is installed, and its address is between 3F8 and 3FF or 2F8 and 2FF, MS-DOS recognizes it as COM1.

- If two serial ports are installed, addresses between 3F8 and 3FF are recognized as COM1, and addresses between 2F8 and 2FF are recognized as COM2.

Parallel Port Test

This test verifies operation of the parallel port by testing:

- The entire port interface
- The port's internal data and control registers.

At the end of the parallel port test, the systems asks if you want to test a parallel printer:

```
PRINTER/COMMUNICATIONS ADAPTER, Version: n.nn

Do you want to test the parallel printer (port 1)  (Y/N) ?
```

If you answer yes (Y), the system prompts:

```
PRINTER/COMMUNICATIONS ADAPTER, Version: n.nn

GENERIC PRINTER (PORT 1) (0378H)

Connect parallel printer with the adapter (port 1)
Switch on printer.
Press any key to continue.
```

Follow the screen instructions to begin the test. The following characters should print:

```
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRST
UVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~
```

This is NOT a complete printer test. Its purpose is to verify that test characters can be sent to the printer. Your printer may have its own diagnostic test that is more comprehensive.

Completion of Tests

When the tests have been completed, press <F2> to return to the Diagnostics Main Menu.

NUMERIC COPROCESSOR TEST

Summary — The numeric coprocessor test checks the 80387 Mathematics Coprocessor commands for proper operation.

When To Use — Run this test whenever you have done any "work" inside the system unit (such as adding option boards), or any time you want to check the general operation of the system unit.

User Intervention — None required.

How To Run the Test

Step 1 Display the Diagnostics Main menu.

Step 2 Type 12 and then <Enter>. The results of the test are displayed as shown in Figure 3-24.

```
                    NUMERIC COPROCESSOR TEST

  NUMERIC COPROCESSOR 80387
PASSED

<F2> Terminate Test module.
```

Figure 3-24. Numeric Coprocessor Test Screen

AUXILIARY DEVICE PORT TEST

Summary	The auxiliary device port test checks the auxiliary device (optional mouse) port. This test will run with or without a mouse connected to the port.
When to Use	Run this test if you are having problems with the operation of your installed mouse.
User Intervention	None.
What it Does	This test verifies the operation of the internal circuits associated with the mouse port.
How to Run the Test	Step 1 Display the Diagnostics Main menu. Step 2 Type 13 and then <Enter>. The results of the test are displayed as shown in Figure 3-25.

```
                    AUXILIARY DEVICE PORT TEST

   INTERFACE TEST
PASSED

<F2> Terminate Test module.
```

Figure 3-25. Auxiliary Device Port Test Screen

Completion of Tests

When the tests have been completed, press <F2> to return to the Diagnostics Main Menu.

Section 4
UTILITY PROGRAMS

In this section:

	See page
The Utilities Menu	4-2
Initialize Fixed Disk	4-3
Position Head for Relocation	4-3
Error Log Maintenance	4-4

THE UTILITIES MENU

Summary

The utilities module on the diagnostic diskette allows you to initialize a fixed disk, park the read/write heads, use the error log, and set up the system.

How To Run Utilities

Step 1 Display the Diagnostics Main Menu.

Step 2 Press <F6>. The utilities menu displays (Figure 4-1).

Step 3 Follow the screen prompts to run the desired utility program.

```
                              UTILITIES

Available Utilities (highlighted) Page 1 of 1
  1  Initialize Fixed Disk Drive(s)
  2  Position Head for Relocation
  3  Error Log Maintenance
  4  System Setup


<F1>  Utilities Menu Help                <PgUp>  Previous Page
<F3>  Return to Main Menu                <PgDn>  Next Page
<F9>  Edit Utilities Menu


Press selection and <ENTER> to choose from available selections.
SELECTION =>
```

Figure 4-1. Utilities Menu

INITIALIZE FIXED DISK

Summary — The INITFIX (INITialize a FIXed disk) utility initializes the hard disk by writing the primary format to it.

CAUTION

INITFIX erases (destroys) the contents of your fixed disk.

When To Use — Run the utility when:

- You install a new, unformatted fixed disk.
- Your fixed disk fails after having been formatted and partitioned.
- Your fixed disk must be rebuilt and you do not want to save the data on it.

How To Run the Utility — You will be led through the initialization by screen prompts. *Follow the instructions very carefully.*

After You Finish — After running INITFIX, you must partition and format the hard disk. Refer to your operating system manuals for information on these procedures.

POSITION HEAD FOR RELOCATION

Summary — This program places the fixed disk read/write heads on an unused portion of the disk.

When To Use — Run this utility program every time you move the system unit.

After running this utility, the computer will not respond to commands unless you first turn the power off and reboot it.

ERROR LOG MAINTENANCE

Summary

The ERROR.LOG file contains codes for errors detected during diagnostic tests. This utility allows you to display, print, and initialize the ERROR.LOG file.

When To Use

Run this utility program whenever you want to examine the error history of your computer, or when you want to delete that history and start over, with an empty file.

How To Run the Utility

Step 1 Display the UTILITIES menu (selection <F6>) on the Diagnostics Main Menu.

Step 2 Type 3 and then <Enter>. The ERROR LOG MAINTENANCE UTILITY screen displays (Figure 4-2).

To Display: Type 1 and then <Enter> to display the content of the ERROR.LOG file. If there are no errors, the screen will be blank.

To Print: Type 2 and then <Enter> to print the content of the ERROR.LOG file.

To Reset Type 3 and then <Enter>. The ERROR.LOG file is cleared.

```
ERROR LOG MAINTENANCE UTILITY,  Version: n.nn
          Length of "ERROR.LOG":    2 KB

Available Selections (Highlighted):

 1    Error Log Display            - Displays the contents of "ERROR.LOG"
 2    Error Log Print              - Prints the contents of "ERROR.LOG"
 3    Initialize Error Log         - Creates an empty "ERROR.LOG"



<F2> Return to Utilities menu

Press selection and <ENTER> for running selection
SELECTION =>
```

Figure 4-2. Error Log Maintenance Screen

Section 5
ERROR MESSAGES

In this section:

	See page
01 Conventional Memory Test	5-2
02 Extended and Expanded Memory Test	5-2
03 Main Processor Board Test	5-3
04 Keyboard Test	5-4
05 Monochrome Adapter Test	5-4
06 Color Graphics Adapter Test	5-4
07 Enhanced Graphics Adapter Test	5-5
08 Video Graphics Array Test	5-5
09 Flexible Disk Test	5-6
10 Fixed Disk Test	5-7
11 Printer and Communications Test	5-8
12 Numeric Coprocessor Test	5-9
13 Auxiliary Device Port Test	5-9

Summary This section lists and describes the error codes that can occur during the diskette-based diagnostic tests described in this guide.

01 CONVENTIONAL MEMORY TEST

Code	Condition
00:00	Memory test is loaded past 128K boundary
01:01	RAM pattern error duplicated on first retry
01:02	RAM pattern error duplicated after first retry
01:04	RAM pattern error not duplicated after several retries
02:01	RAM segment addressing conflict (A16 – A19)
02:02	RAM address error A8–A15
02:03	RAM address error A0–A7
03:00	RAM parity error detected on parity latches only
03:01	RAM parity error interrupt received
03:02	RAM parity error on processor board RAM
03:04	RAM parity error on expansion RAM
03:05	RAM parity interrupt
04:01	RAM walking ones error
05:01	RAM–BIOS checksum error

02 EXTENDED AND EXPANDED MEMORY TEST

Code	Condition
01:01	Extended RAM pattern error duplicated on first retry
01:02	Extended RAM pattern error duplicated after first retry
01:04	Extended RAM pattern error not duplicated after several retries
02:01	Extended RAM pattern error segment addressing
02:02	Extended RAM pattern error A8–A15
02:03	Extended RAM pattern error A0–A7
03:00	Extended RAM parity error detected on parity latches only
03:01	Extended RAM error interrupt occurred
03:04	Extended RAM error on external RAM
03:05	Extended RAM parity interrupt
04:01	Extended RAM walking ones error
05:01	Extended RAM refresh error
05:02	Extended RAM refresh parity error
06:01	ROM–BIOS checksum error
06:02	Extended memory controller configuration register error
06:03	Extended memory controller page and configuration error
07:01	Expanded RAM pattern error duplicated on first retry
07:02	Expanded RAM pattern error duplicated after first retry
07:04	Expanded RAM pattern error not duplicated after several retries
08:01	Expanded RAM addressing error within 16K page
08:02	Expanded RAM addressing error between 16K pages
09:01	Expanded RAM parity interrupt received
09:04	Expanded RAM parity error and no interrupt received
10:01	Expanded RAM walking ones error
11:01	Extended RAM overwritten by expanded RAM
11:02	Expanded RAM overwritten by extended RAM

03 MAIN PROCESSOR BOARD TEST

Code	Condition
01:00	Processor Error
02:1x	DMA controller A Register x read/write error
02:2x	DMA controller B register x read/write error
02:3x	DMA page register x read/write error
03:10	Diskette controller not ready
03:11	Bad status returned from diskette controller
03:12	Incorrect status returned from diskette controller
04:12	Timer 2 read/write error
04:2x	Timer x too fast
04:3x	Timer x too slow
04:6x	Second timer x too fast
04:7x	Second timer x too slow
04:42	No output from timer 2
04:50	No realtime clock periodic interrupt
04:90	Speed switching failure
05:10	Interrupt controller A mask register read/write error
05:20	Interrupt controller B mask register read/write error
06:00	Speaker port read/write error
07:0E	Monochrome CRT controller register 0E (hex) read/write error
07:0F	Monochrome CRT controller register 0F (hex) read/write error
08:0E	Color CRT controller register 0E (hex) read/write error
08:0F	Color CRT controller register 0F (hex) read/write error
09:10	Keyboard controller input buffer full error
09:11	Keyboard controller output buffer full error
09:12	Keyboard controller selftest error
09:90	Keyboard controller does not accept command
10:10	CMOS RAM read/write error
10:11	CMOS RAM power down error
10:12	CMOS RAM checksum error
10:20	Real time clock error
10:21	Real time clock too fast
10:22	Real time clock too slow
10:50	No real time clock periodic interrupt
11:00	Write protect failure
11:01	Processor speed not switchable
12:10	KBD A20 on, override off, couldn't enable A20
12:20	KBD A20 on, override on, couldn't enable A20
12:30	KBD A20 off, override off, couldn't disable A20
12:40	KBD A20 off, override on, couldn't enable A20
12:50	KBD A20 could not be turned on

04 KEYBOARD TEST

Code	Condition
01:01	Keyboard interface error
01:02	Keyboard controller failed to respond
01:03	No interrupt from keyboard controller
01:04	Keyboard failed to interrupt
01:05	Keyboard selfcheck failed
02:01	Wrong data from keyboard
02:02	Error in keyboard lock switch

05 MONOCHROME ADAPTER TEST

Code	Condition
01:01	Access error, cursor address register HI
01:02	Cursor address register LO
02:01	RAM pattern error
02:02	RAM address error
03:01	Pattern error
03:02	Address error
04:01	Cursor shape and/or position error
05:01	Scroll error
06:01	Monochrome attribute error
07:01	80 x 25 character set error
08:00	Graphics page 0 error
08:01	Graphics page 1 error

06 COLOR GRAPHICS ADAPTER TEST

Code	Condition
01:01	Access error, Cursor address Register HI
01:02	Cursor address register LO
02:01	Base RAM pattern error
02:02	Base RAM address error
03:01	Extended RAM pattern error
03:02	Extended RAM address error
04:01	Cursor shape and/or position error
05:01	Scroll error
06:01	Monochrome attribute error
06:02	Color attribute error
07:01	40 x 25 character set error
07:02	80 x 25 character set error
08:01	320 x 200 monochrome
08:02	640 x 200 monochrome
08:03	640 x 400 monochrome
09:01y	320 x 200 color palette y, color graphic error
09:02y	640 x 400 color palette y, error
10:01	Test pictures error
11:01	No response from light pen
11:02	Light pen address error

07 ENHANCED GRAPHICS ADAPTER TEST

Code	Condition
01:01	Access error, cursor address register, HI
01:02	Access error, cursor address register, LO
02:01y	RAM pattern error, plane y
02:02y	RAM address error, plane y
03:01	BIOS checksum error
04:01	Cursor shape and/or position error
05:01	Scroll error
06:01	Monochrome attribute error
06:02	Color attribute error
07:01	40 x 25 character set error
07:02	80 x 25 character set error
08:01	Auto-switch error
08:02	Invalid switch setting
09:10	320 x 200 monochrome mode error
09:20	640 x 200 monochrome mode error
09:30	640 x 350 monochrome mode error
09:04y	320 x 200 color mode, color set y
09:05y	640 x 200 color mode, color set y
09:06y	640 x 350 color mode, color set y
10:01	Test picture error
11:01	No response from light pen
11:02	Address error
12:01	No interrupt occurred
12:02	Interrupt occurred too early
12:03	Interrupt did not occur a second time
12:04	Interrupt occurred while disabled

08 VIDEO GRAPHICS ARRAY TEST

Code	Condition
01:01	Access error, cursor address register, HI
01:02	Access error, cursor address register, LO
02:01y	RAM pattern error, plane y
02:02y	RAM address error, plane y
03:01	BIOS checksum error
04:01	Cursor shape and/or position error
05:01	Scroll error
06:01	Monochrome attribute error
06:02	Color attribute error
07:01	40 x 25 character set error
07:02	80 x 25 character set error
09:01	320 x 200 monochrome mode error
09:02	640 x 200 monochrome mode error
09:03	640 x 350 monochrome mode error
09:04y	320 x 200 color mode, color set y
09:05y	640 x 200 color mode, color set y
09:06y	640 x 350 color mode, color set y
10:01	Test picture error
12:01	No interrupt occurred
12:02	Interrupt occurred too early
12:03	Interrupt did not occur a second time
12:04	Interrupt occurred while disabled

09 FLEXIBLE DISK TEST

Code	Condition
11:xx	Read-only test drive A
12:xx	Read-write test drive A
13:xx	Disk-change-line test drive A
21:xx	Read-only test drive B
22:xx	Read-write test drive A
23:xx	Disk-change-line test drive B

Where xx =
- :00 FDC-RESET error
- :01 FDC-FORMAT error
- :02 FDC-WRITE error
- :03 FDC-READ error
- :04 COMPARE error
- :05 SEEK error
- :06 Disk-change-line error
- :07 Error while determining drive/diskette

ROM BIOS ERROR CODES (These errors can also occur while running the flexible disk test.)

Code	Condition
01	Bad command
02	Address mark not found
03	Disk is write-protected
04	Sector not found
06	Media removed
08	DMA data overrun
09	DMA 64 KB boundary error
0C	Media type not found
10	CRC error on reading
20	FDC failure
40	Seek error
80	FDC timeout error

10 FIXED DISK TEST

Code	Condition
02	Read sector error
03	Write sector error
05	Format error
0C	Seek error
10	Check ready error
11	Recalibrate error
14	Controller diagnostic error
20	Data compare error

ROM BIOS ERROR CODES (These errors can also occur while running the fixed disk test.)

Code	Condition
01	Bad command
02	Address mark not found
04	Sector not found
05	Reset failed
07	Initialization error
0A	Bad track
10	Bad ECC on read
11	Data corrected by ECC
20	Controller failed
40	Seek operation failed
80	Controller timeout
AA	Drive not ready
BB	Undefined error
CC	Write fault
E0	Status error/error register =0

11 PRINTER/COMMUNICATIONS TEST

Code	Condition
11:xx	Serial port 1 (COM1)
12:xx	Serial port 2 (COM2)
13:xx	Serial port 3 (COM3)
14:xx	Serial port 4 (COM4)

Where xx =
- :00 Status pattern error
- :01 Modem status not reset
- :02 Modem status not set
- :03 Transmit status error
- :04 Timeout during transmit
- :05 Status error during receive
- :06 Timeout during receive
- :07 Data error during receive
- :08 Bad INTR ID before INTR
- :09 Bad INTR ID after INTR
- :0A INTR on wrong channel

21:01	Parallel port 1 data error
21:02	Parallel port 1 control register error
21:03	Parallel port 1 Status register error
21:04	Parallel port 1 interrupt error
22:01	Parallel port 2 data error
22:02	Parallel port 2 control register error
22:03	Parallel port 2 Status register error
22:04	Parallel port 2 interrupt error
23:01	Parallel port 3 data error
23:02	Parallel port 3 control register error
23:03	Parallel port 3 Status register error
23:04	Parallel port 3 interrupt error
31:01	Printer port 1 timeout error
31:02	Printer port 1 input/output error
31:20	Printer port 1 out of paper
32:01	Printer port 2 timeout error
32:02	Printer port 2 input/output error
32:20	Printer port 2 out of paper
33:01	Printer port 3 timeout error
33:02	Printer port 3 input/output error
33:20	Printer port 3 out of paper

12 NUMERIC COPROCESSOR TEST

Code	Condition
01	General operations error

13 AUXILIARY DEVICE PORT TEST

Code	Condition
01:01	Clock line stuck low
01:02	Clock line stuck high
01:03	Data line stuck low
01:04	Data line stuck high
01:05	Data and clock lines shorted together
01:11	Keyboard controller does not accept command
01:12	Output buffer full line never asserted

Section 6
ADDING and DELETING TESTS ON MENU

In this section: See page

Where to Begin..... 6-2
Adding a Test..... 6-3
Deleting a Test..... 6-4
Editing a Test..... 6-5

Summary This section tells how to add, delete, or edit tests on the Diagnostics Main Menu.

WHERE TO BEGIN

To make changes on the Diagnostics Main Menu, perform the following steps:

Step 1 Display the Diagnostics Main Menu.

Step 2 Press function key <F9>. The *EDIT MAIN MENU* screen displays (Figure 6-1).

Step 3 Follow the screen prompts to edit the main menu.

```
                    EDIT MAIN MENU

Available Selections (highlighted)

   1  Add a module to the Main Menu
   2  Delete a module from the Main Menu
   3  Edit a module entry in the Main Menu

<F3>  Return to previous menu

Press selection number and <ENTER> to choose selections.
SELECTION =>
```

Figure 6-1. Edit Main Menu Screen

ADDING A TEST

When you select option 1, *Add a module to the Main Menu*, the *ADD TESTS* screen appears (Figure 6-2). To add a test to the menu, enter the information requested by the screen.

The file name must be as it appears on the directory for the diagnostic, and it must be left justified (from the file name extension). For example:

```
CRTM    .EXE
```

where four spaces are used to left justify the file name.

Press <End> to accept the entry.

```
                              ADD TESTS

Selection number on menu (others will be adjusted): __

Name to appear on menu:

_____________________________________________

Short Description of entry:

_____________________________________________________________

_____________________________________________________________

File name of module: _______.___


<ESC>  - abort entry                ( ← )  - left one character
<END>  - accept entry               ( → )  - right one character
<PgUp> - beginning of field         ( ↑ )  - up one field
<PgDn> - end of field               ( ↓ )  - down one field
(Del)  - delete current character   <BKSP> - delete prev character
INSERT IS OFF
```

Figure 6-2. Add Tests Screen

DELETING A TEST

When you select option 2, *Delete a module from the Main Menu*, the *DELETE TESTS* screen (similar to Figure 6-3) appears. To delete a test from the menu just follow the screen prompts.

```
                        DELETE TESTS

Current modules
  1  Conventional Memory
  2  Extended and Expanded Memory
  3  Main Processor Board
  4  Keyboard
  5  Flexible Disk
  6  Fixed Disk
  7  Printer/Communications Adapter
  8  Numeric Coprocessor


<PgUp>  Previous Page
<PgDn>  Next Page

Delete a module? (Y/N)
```

Figure 6-3. Delete Tests Screen

EDITING A TEST

When you select option 3, *Edit a module entry in the Main Menu*, the *EDIT TESTS* screen (similar to the Delete Tests screen shown in Figure 6-3) appears. If you answer "Y" to the question *"Edit a Module?"*, a screen similar to Figure 6-4 appears. To edit a test, enter the information requested by the screen.

The file name must be as it appears on the directory for the diagnostic, and it must be left justified (from the file name extension). For example:

```
memory  .dg
```

where two spaces are used to left justify the filename.

Press <End> to accept the entry.

```
                                EDIT TESTS

Selection number on menu (others will be adjusted): 1

Name to appear on menu:

Conventional memory

Short description of entry:

Conventional memory - Tests pattern, address, and parity of the first
640 KB of memory.  The ROM checksum is also verified.

File name of module: memory  .dg


<ESC>  - abort entry                    ( ← )  - left one character
<END>  - accept entry                   ( → )  - right one character
<PgUp> - beginning of field             ( ↑ )  - up one field
<PgDn> - end of field                   ( ↓ )  - down one field
(Del)  - delete current character       <BKSP> - delete prev character
INSERT IS OFF
```

Figure 6-4. Edit Tests Screen

Appendix A
IN CASE OF TROUBLE

In this appendix:

	See page
New Systems	A-2
Installed Systems	A-2
Calling for Help	A-3

Summary — This section contains helpful hints if you encounter problems with your PC.

NEW SYSTEMS

If this is a new installation, if an option has been added or removed, or if the configuration has been changed, do the following things:

- Run the diagnostics.
- Use SETUPPC to check the configuration.
- Check switches on the boards.
- Check cables for correct and solid connections.
- Rerun the diagnostics.

If the PC still fails, see "CALLING FOR HELP".

INSTALLED SYSTEMS

If you have problems with an installed system, and have not just made changes to it, do the following things:

- Run the diagnostics.
- Use SETUPPC to check the configuration. If necessary, correct it and rerun the diagnostics.
- If the diagnostics have been rerun, turn the PC off. Wait a few minutes, and then turn it on again.
- Use SETUPPC to check the configuration again. If it is still wrong, the battery in the system unit may be faulty. Replace the battery, reconfigure the system, and try again.

CALLING FOR HELP

Before calling for help, have the following information available:

- ROM BIOS version
- Operating system type and release level (or version)
- Amount of memory
- Configuration of system
- Co-resident programs you may have installed (such as Sidekick or Superkey)
- Description of the failure and how to duplicate its occurrence
- Any error message(s) displayed, or in the ERROR.LOG file.

Then follow the instructions in your *PC Fact Folder*.

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