PC-Doctor, Inc.
The global leader in system health

PC-Doctor for DOS Diagnostics User Manual for the IBM System x3100 M3 Platform

How to Test the IBM System x3100 M3 Platform using PC-Doctor for DOS

January 29, 2010

Contents

Welcome to PC-Doctor for DOS

PC-Doctor streamlines manufacturing processes from incoming inspection to final systems test. Using a comprehensive set of hardware diagnostic and system information tools, PC-Doctor provides reliable testing of PCs, components and subassemblies during manufacturing to improve product quality and reduce costs.

Designed for the rigorous demands of a PC manufacturing environment, PC-Doctor provides the following key benefits:

- Test incoming parts and subassemblies
- Ensure systems are configured correctly
- Perform burn-in testing on headless units
- Carry out final system verification

PC-Doctor can be customized to suit specific test requirements. Hardware manufacturers and vendors can integrate their own diagnostics using the Diagnostic Application Programming Interface (DAPI). Test scripts and command line capabilities can support a wide variety of features. In addition, PC-Doctor is versatile enough to run from a RAM drive or floppy diskette, allowing it to function in a stand-alone test environment regardless of the installed operating system.

The PC-Doctor Factory Reference Guide is a comprehensive collection of reference information for using PC-Doctor, including available command line switches and parameters.

Diagnostic and System Information Access Paths

PC-Doctor for DOS employs several methods to collect test results and system information. The diagram below illustrates the three primary access methods: through the BIOS, through a DOS Device Driver, and directly to the hardware.

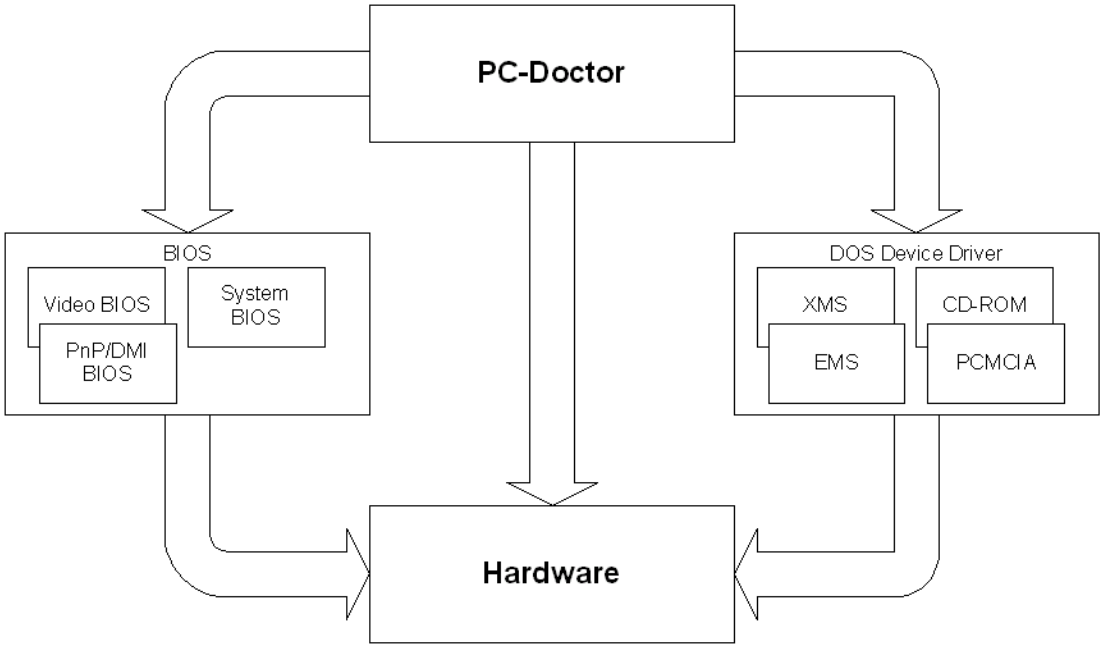

Figure 1: Information Access Paths for PC-Doctor for DOS Components

Using PC-Doctor for DOS

The following describes how to use the DOS interface.

Starting PC-Doctor for DOS

To start PC-Doctor for DOS:

Note: PC-Doctor for DOS must run in DOS; it cannot run under the Windows operating system in a DOS window.

1. Power down the system.
2. Place the PC-Doctor for DOS bootable CD in the optical drive.
3. Re-boot the system.

   The system will boot up and immediately launch the PC-Doctor for DOS startup menu.

   Note: You may need to configure the system BIOS to boot from the optical drive. For more information on configuring the BIOS, contact the system or motherboard manufacturer.

Running PC-Doctor for DOS

PC-Doctor for DOS allows you to run diagnostics on systems no matter what operating system is installed.

Three different menus are available: **Available Tests**, **Available Tools**, and **Select Log Drive**. Select the drive on which you wish to log test results by pressing the key that corresponds to the drive letter shown in the menu. The drives shown will vary depending on system configuration and the number of USB drives inserted. In the example shown below, for example, press the **C** key to select the virtual RAM disk labeled as **C:**.

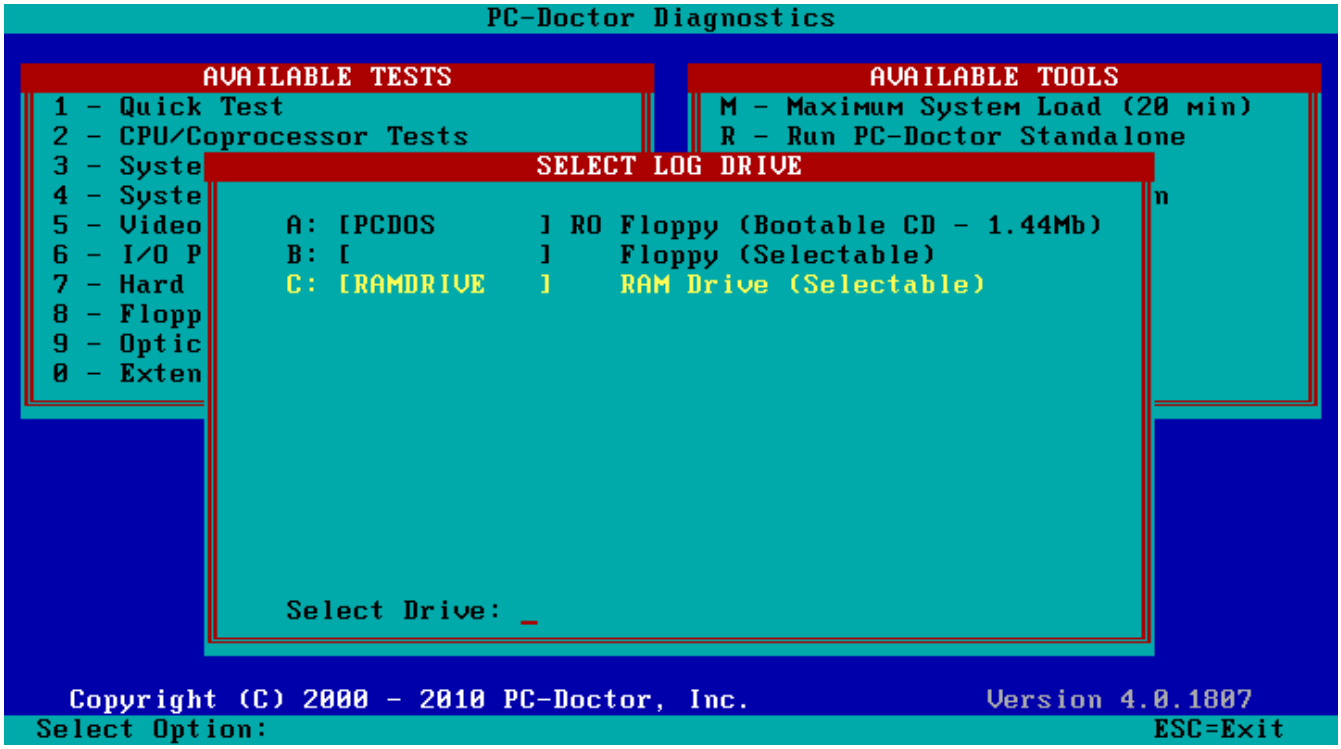

Figure 2: The PC-Doctor for DOS startup menu

After selecting a log option, run any of the other options in the **Available Tests** or **Available Tools** menu by pressing the corresponding number or letter key. For example, to run the Quick Test, press the **1** key, or to run PC-Doctor in standalone mode, press the **R** key.

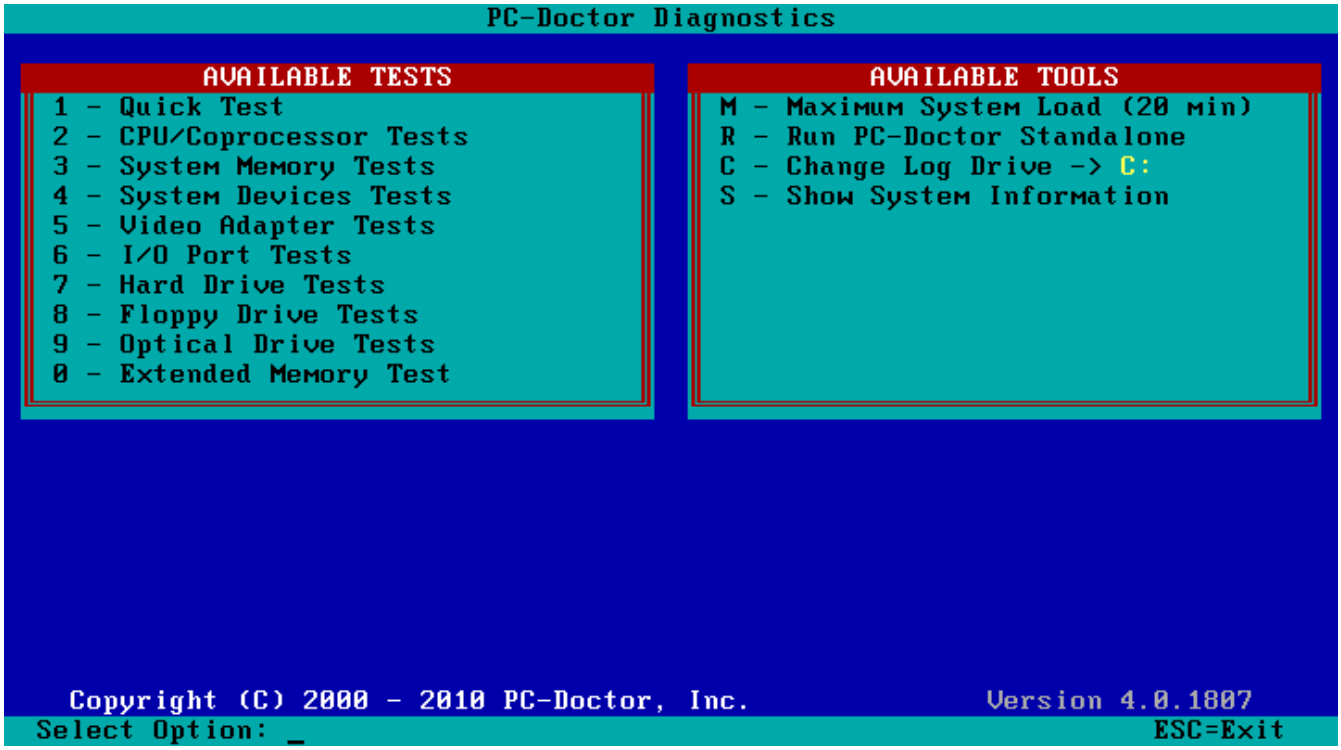

Figure 3: Available tests and tools

Available Tests for the IBM System x3100 M3 Platform

The PC-Doctor for DOS build for the IBM System x3100 M3 platform includes 10 test scripts shown above, which were designed specifically for IBM:

👉 **Note:**

To test an I/O port, insert the corresponding loopback adapter into the port before running the test.

👉 **Note:** PC-Doctor for DOS does not detect any tape drive devices, regardless of the type of port used, including external USB, SATA, or any SAS PCIe card. Other devices not listed in this manual also may not be detected by PC-Doctor for DOS.

👉 **Note:** Some devices, such as CD-ROM drives, pointing devices, PC Cards (PCMCIA), network cards, modems, audio cards, SCSI devices and others require DOS device drivers to function in DOS. If you wish to test any of these devices, you must load the supported device driver into memory before running the diagnostic.

Quick Test

The Quick Test script performs the following tests:

CPU/Coprocessor Test Category:

1. CPU Registers
2. CPU Arithmetics
3. CPU Logical Operations
4. CPU String Operations
5. CPU Misc Operations
6. CPU Interrupts/xceptions
7. CPU Buffers/ Cache
8. Coprocessor Registers
9. Coprocessor Commands
10. Coprocessor Arithmetics
11. Coprocessor Transcendental
12. Coprocessor Exceptions
13. MMX Test

System Memory Test Category:

1. Memory Fault Test
2. Address Fault Test

System Board Test Category:

1. System Timer
2. BIOS Timer
3. IRQ Controller
4. DMA Channels
5. RAM Refresh
6. RTC Clock
7. CMOS RAM
8. Keyboard
9. External Cache
10. PCI

11. USB Port

Video Adapter Test Category:

1. Video Memory
2. Video Pages
3. VGA Controller Registers

Serial Port Test Category:

1. Registers and Interrupts
2. FIFO Buffers (16550A)

Fixed Disk Test Category:

1. Controller
2. SMART Status Check
3. SMART Self-Test Short

Miscellaneous Test Category:

1. DIMM/RIMM EEPROM ID
2. SMBUS
3. Intel Network

SCSI Disk Test Category:

1. Track to Track Seek
2. Random Verify

CPU/Coprocessor Tests

The CPU/Coprocessor Test script performs the following tests:

CPU/Coprocessor Test Category:

1. CPU Registers
2. CPU Arithmetics
3. CPU Logical Operations
4. CPU String Operations
5. CPU Misc Operations
6. CPU Interrupts/xceptions
7. CPU Buffers/ Cache
8. Coprocessor Registers
9. Coprocessor Commands
10. Coprocessor Arithmetics
11. Coprocessor Transcendental
12. Coprocessor Exceptions
13. MMX Test

System Memory Tests

👉 **Note:** With 4GB of RAM, the System Memory Tests script takes approximately 15 minutes to complete.

The System Memory Tests script performs the following tests:

System Memory Test Category:

1. Memory Fault Test

2. Address Fault Test
3. Short Advanced Pattern Test

System Devices Tests

The System Devices Tests script performs the following tests:

System Board Test Category:

1. System Timer
2. BIOS Timer
3. IRQ Controller
4. DMA Channels
5. RAM Refresh
6. RTC Clock
7. CMOS RAM
8. Keyboard
9. External Cache
10. PCI
11. USB Port

Miscellaneous Test Category:

1. DIMM/RIMM EEPROM ID
2. SMBUS
3. Intel Network

Video Adapter Tests

The Video Adapter Tests script performs the following tests:

Video Adapter Test Category:

1. Video Memory
2. Video Pages
3. VGA Controller Registers
4. VGA Color-DAC Registers

I/O Port Tests

The I/O Port Tests script performs the following tests:

Serial Port Test Category:

1. Registers and Interrupts
2. Internal Loopback
3. External Loopback
4. FIFO Buffers (16550A)

Hard Drive Tests

The Hard Drive Tests script performs the following tests:

SCSI Disk Test Category:

1. Funnel Seek

2. Track to Track Seek
3. Linear Verify

Fixed Disk Test Category:

1. Controller
2. SMART Status Check
3. SMART Self-Test Short
4. Read Surface Scan

Floppy Drive Tests

The Floppy Drive Tests script performs the following tests:

Diskette Test Category:

1. Funnel Seek
2. Track to Track Seek
3. Linear Verify

Optical Drive Tests

The Optical Drive Tests script performs the following tests:

Optical Drive Scan Test Category:

1. Insert Media
2. Linear Seek
3. Random Seek
4. Funnel Seek
5. Remove Media Test

Extended Memory Test

👉 **Note:** With 4GB of RAM, the Extended Memory Test script takes approximately 2 hours to complete.

The Extended Memory Test script performs the following tests:

System Memory Test Category:

1. Extended Advanced Pattern Test

Available Tools for the IBM System x3100 M3 Platform

The available tools are described in the table below:

Table 1: Available Tools

Option	Description
Maximum System Load (20 min)	A stress-level test that runs a series of diagnostic exercises designed to produce stress on the PC under test.
Run PC-Doctor for DOS Standalone	Starts Service Center for DOS in standalone mode.

Option	Description
Change Log Drive	Specify where to store the test log.
Show System Information	Displays hardware configuration information for the system.

PC-Doctor for DOS at a Glance

PC-Doctor for DOS uses a text based drop-down menu interface. Five main menus are available on the menu bar: **Diagnostics**, **Interactive Tests**, **Hardware Info**, **Utility** and **Quit**. The available menus provide the following:

- **Diagnostics** menu: Provides access to both non-interactive and interactive diagnostic tests.
- **Interactive Tests** menu: Provides access to tests that require user interaction.
- **Hardware Info** menu: Provides access to tools for collecting detailed information about installed hardware components.
- **Utility** menu: Provides access to additional tools such as a text file editor, memory debugger, CMOS editor and others.
- **Quit** menu: Exit PC-Doctor for DOS or reboot your PC.

At the bottom of the main window is the instruction line, which provides information when navigating the interface. The line above it is the description line, providing a brief description about any active function, highlighted menu or menu item. See below.

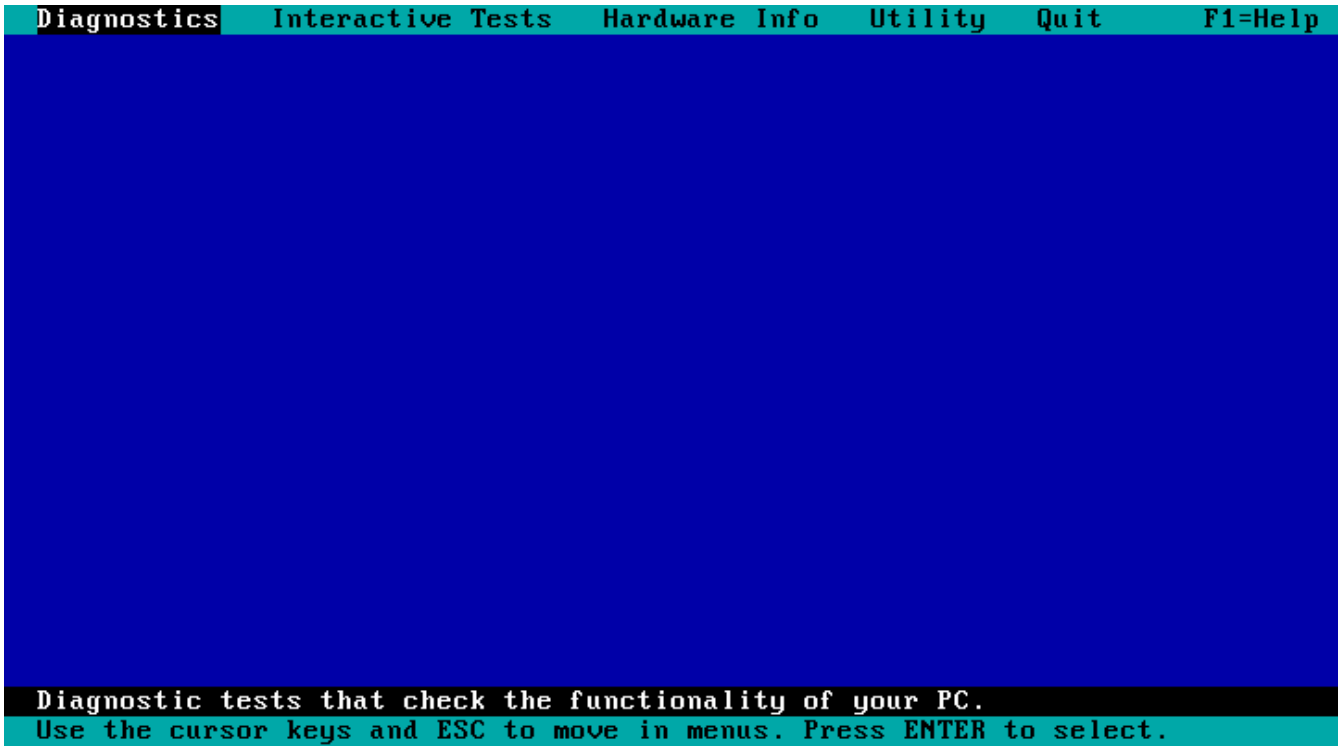

Figure 4: The PC-Doctor for DOS interface

Navigating Menus

- Use the LEFT and RIGHT arrow keys to select a menu, then open the selected menu by pressing the **Enter** key.
- You can also use the LEFT and RIGHT arrow keys to navigate through menus and available features. Use the ENTER key to open an available menu or launch a selected menu item.

Press the ESC key at any time to cancel any active function.

Mouse Shortcuts

PC-Doctor for DOS provides six mouse shortcuts at the bottom of any test category window. To use an available short-cut, click it with the mouse. See below.

Figure 5: Available mouse shortcuts

The available shortcuts do the following:

- **[Clear All]:** select or deselect all of the tests for the current test category.
- **[Run Screen]:** run all selected tests for the open test category.
- **[Run All]:** run all of the selected tests in every test category.
- **[Options**]: access the **Test Options** menu.
- **[Next Cat]:** go directly to the next test category window.
- **[Prev Cat**]: go directly to the previous test category window.

Running Diagnostic Tests

Available diagnostics are organized into component categories. Each menu item is a test category corresponding to a hardware component such as the CPU, memory, video, and so on. You can include any test from the **Diagnostics** menu in an automated test script. See *Automating PC-Doctor for DOS* on page 29 for more information.

To run a test from the **Diagnostics** menu, open the menu and select a test category. The **Test Category** window will display all available tests for that test category. The **Diagnostics** menu also provides access to interactive tests. Interactive tests require user interaction (such as pressing all available keyboard keys) to complete the test. Interactive tests are also available through the **Interactive Tests** menu. This allows you to include interactive tests in custom test scripts.

Note: Any interactive tests you include in a test script will still require user interaction to complete the test. Test scripts containing interactive tests will halt testing when launching an interactive test and will not continue until the user provides the necessary input or interaction.

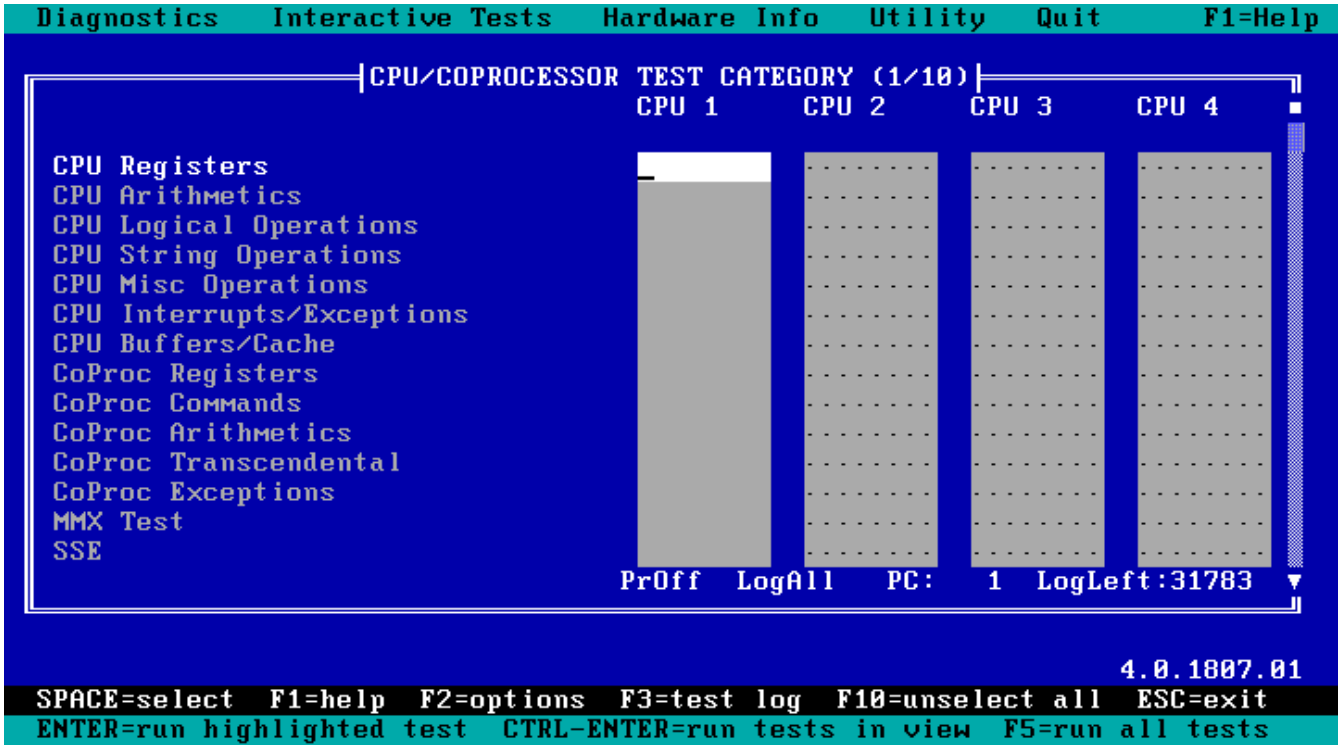

Figure 6: The Diagnostics menu

Caution:

Two tests in the Diskette Drives category will overwrite existing data on a floppy disk: **Linear Write/Read** and **Linear Write/Random Read**. Use a blank or unimportant floppy diskette when running these tests. By default, both tests require you to manually select them if you intend to use them.

Before either test runs, a warning message will display stating the test will overwrite existing data on the diskette. If you do not take action after approximately 30 seconds, testing will automatically begin. Press the SPACE BAR to begin or press the ESC key to cancel. You can cancel the test in progress by pressing the ESC key, however, this may corrupt the remaining data on the diskette.

Test Category Window

When you select a test category from the **Diagnostics** menu, a **Test Category** window opens displaying the available tests in that test category. On the left side is the list of available tests. On the right side is the test results column that displays the test result for each test you run (**Passed**, **Failed**, **Aborted** and **N/A**). See below.

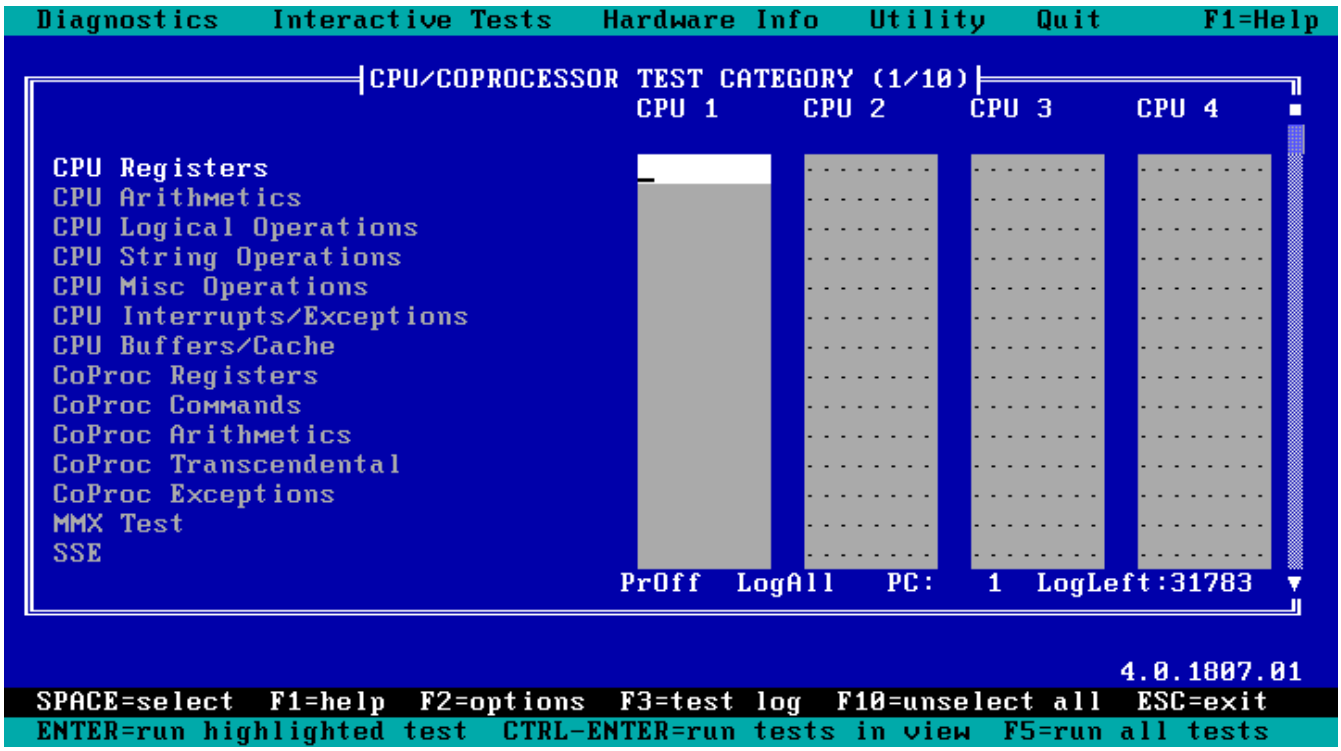

Figure 7: A Sample Test Category window

Table 2: Test Category Window Functions

Function	Key(s)
To select or deselect a single test...	Use the ARROW KEYS to highlight the test and the SPACEBAR to select it. **Note:** When you select a test to run, a chevron (>>) appears next to its test result field. The chevron is removed if you de-select a test.
To select or deselect all tests in a test category...	Press the F10 key
To go directly from one test category window to another...	Press the PAGE UP or PAGE DOWN key.
To run the currently highlighted test...	Press the ENTER key.
To run all selected tests in the test category...	Press the CTRL+ENTER keys.
To run all selected tests in all test categories...	Press the F5 key.
To access the **Test Options** menu	Press the F2 key.
To open the test log...	Press the F3 key.
To open the help menu...	Press the F1 key.
To cancel testing at any time...	Press the ESC key or right click the screen

Status Fields

Status fields at the bottom of each test category window display basic diagnostic parameter statuses. You can set these through the **Log Options** menu, which is available through the **Test Options** menu. See below.

Figure 8: Test Category Status Fields

The following describes how to use the basic diagnostic parameters:

Table 3: Basic Diagnostic Parameters

Parameter	Description
Halt (or blank)	Shows the status of the Halt on Errors parameter. If on, Halt on Errors will halt testing each time it produces a failed test result. When on, this field displays *Halt*. Otherwise, the field is blank (no text is visible). You can set the halt on errors state by selecting Halt on Errors from the **Test Options** menu.
Print or PrOff	Indicates whether a test will automatically rout log information to a device or a file you specify as testing progresses. If the field displays as Print, diagnostics will rout test results to the file or device you specify. If the field displays as **PrOff**, diagnostics will save test results to the test log. This field is set by selecting **Enable Printing** or **Disable Printing** from the **Log Options** menu.
LogAll or ErrOnly	This field indicates how diagnostics will handle test logging. **LogAll** will force diagnostics to record all test results to the test log. **ErrOnly** will force diagnostics to only record non-passing test results (**Failed**, **Aborted** or **N/A**).This field is set by selecting **Log Errors Only** or **Log All Test Results** from the **Log Options** menu.
PC: xxxx	Shows the *pass count*, or the consecutive number of times the current test or test set will run. You can set the pass count to any number between 1-9,999. The pass count is set by selecting **Set Pass Count** from the **Test Options** menu.
LogLeft:xxxx	Indicates the total test log space left (in bytes). The test log has a maximum size of 32,000 bytes. Diagnostics will begin overwriting previous test results (in the order logged) if the log reaches the 32,000 byte limit.

Test Options Menu

Press the F2 key or click **[Options]** on any test category window to access the **Test Options** menu. See below.

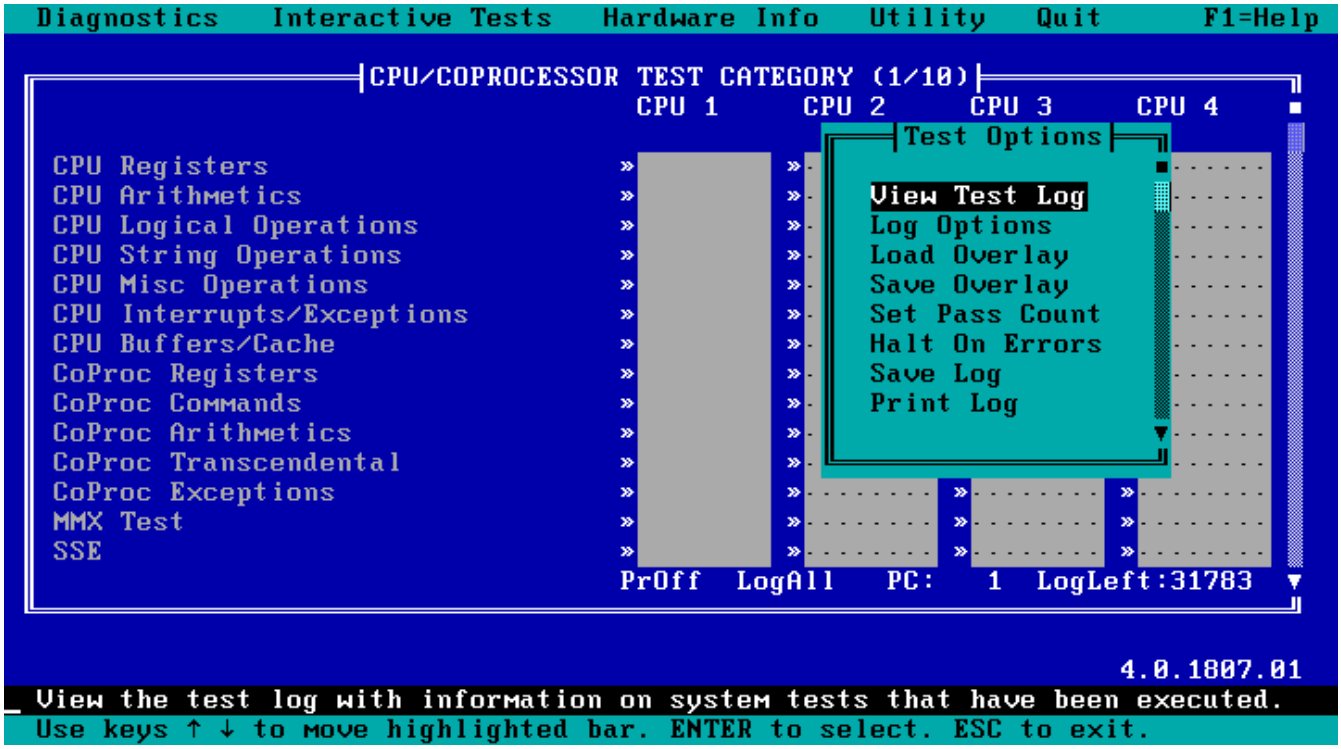

Figure 9: The Test Options menu

The Test Options menu includes the following functions:

Available Option	Description
View Test Log	Display the contents of the test log
Log Options	Open a Log Options menu
Load Overlay	Load an overlay
Save Overlay	Save the current test set as an overlay
Set Pass Count	Set the number of times the test set runs
Halt On Errors	Diagnostics will halt testing when it encounters an errors
Save Log	Save the current test log
Print Log	Print the current test log
Drive Utilities	**Note:** This option is only available when accessing Fixed Disks (SEE ALSO, *Fixed Disk Options*), SCSI Fixed Disk, Optical Drive Scan, and Optical Drive Write from the Diagnostics menu.

Log Options Menu

The **Log Options** menu is a submenu accessible from the **Test Options** menu, containing functions for controlling test log output. See below.

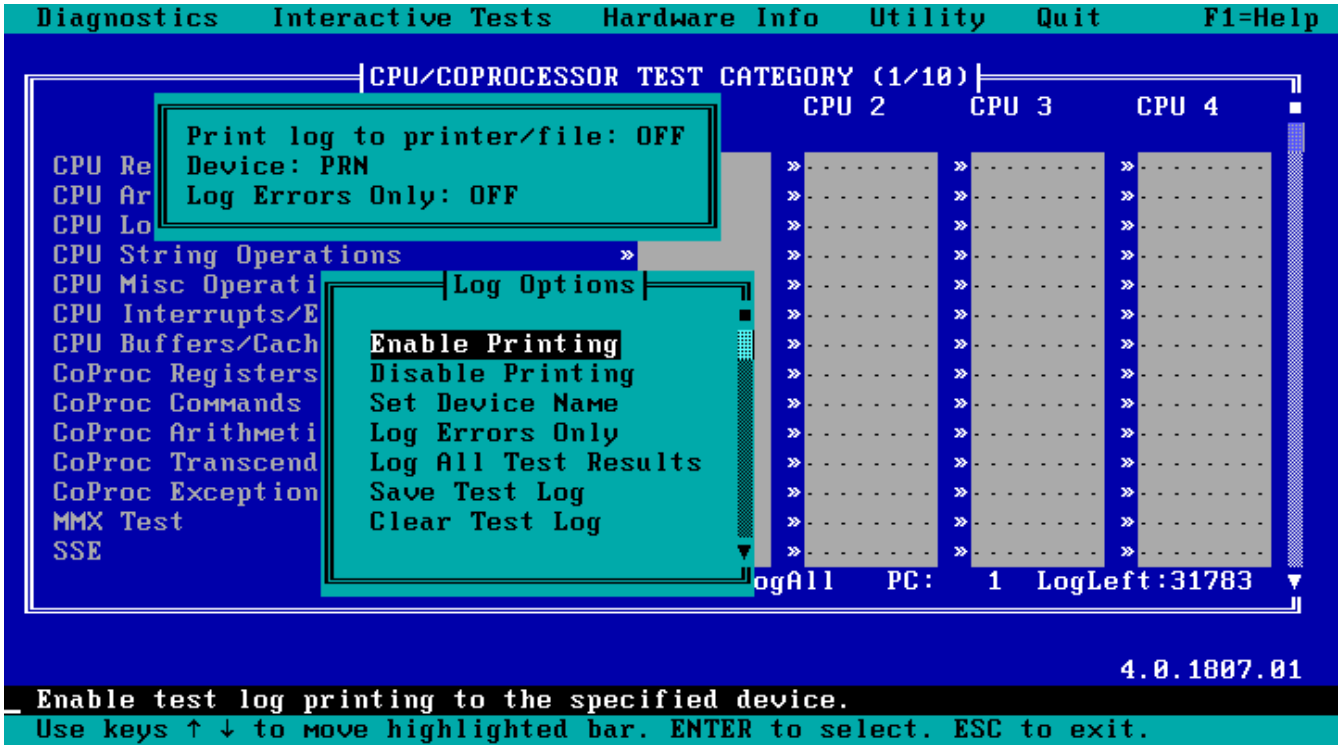

Figure 10: The Log Options Menu

From the **Log Options** menu you can:

Table 4: Log Option Menu Functions

Available Option	Description
Enable Printing	All test results written to a specific file or device as testing occurs.
Disable Printing	All test results written to the standard test log.txt file.
Set Device Name	When Enable Printing is active, specifies the device or file name test log output is sent to.
Log Errors Only	Specifies test log output to not include **Passed** test results.
Log All Test Results	Report all test results to the test log.
Save Test Log	Save the test log to a file when Enable Printing is not turned on.
Clear Test Log*	Erase all the current contents in the test log.

When Enable Printing is active, use the **Set Device Name** option to specify the device or file name you will use to record test results. When you specify a device or file name, you must also specify the location. You can specify any device or file name allowed by DOS. For example, to save the test results to a text file named *Testlog* to a storage device labeled as the A drive, you would set the device name as `A:\testlog.txt`.

Note: Do not specify a device for Set Device Name if you intend to test that device. For example, do not specify COM1 for Set Device Name if you intend to test all serial ports.

Log Options Settings

When you open the **Log Options** menu, a window displays above it showing information on three test log settings:

Table 5: Available Test Log Options

Available Options	Description
Print log to printer / file	Indicates the current setting (ON or OFF) for the Enable Printing parameter.
Device	When Enable Printing is active, this indicates the device or file name where the test will save test results.
Log Errors Only	Indicates the current setting (ON or OFF) for logging all test results except **Passed**.

Test Results and the Test Log

PC-Doctor stores all test start times, stop times and result in the test log. To access the test log, press the F3 key. Alternatively, click **[Options]** or press F2 and then select **View Test Log** from the **Test Options** menu.You have the option of printing the test log or saving it to a file. See below.

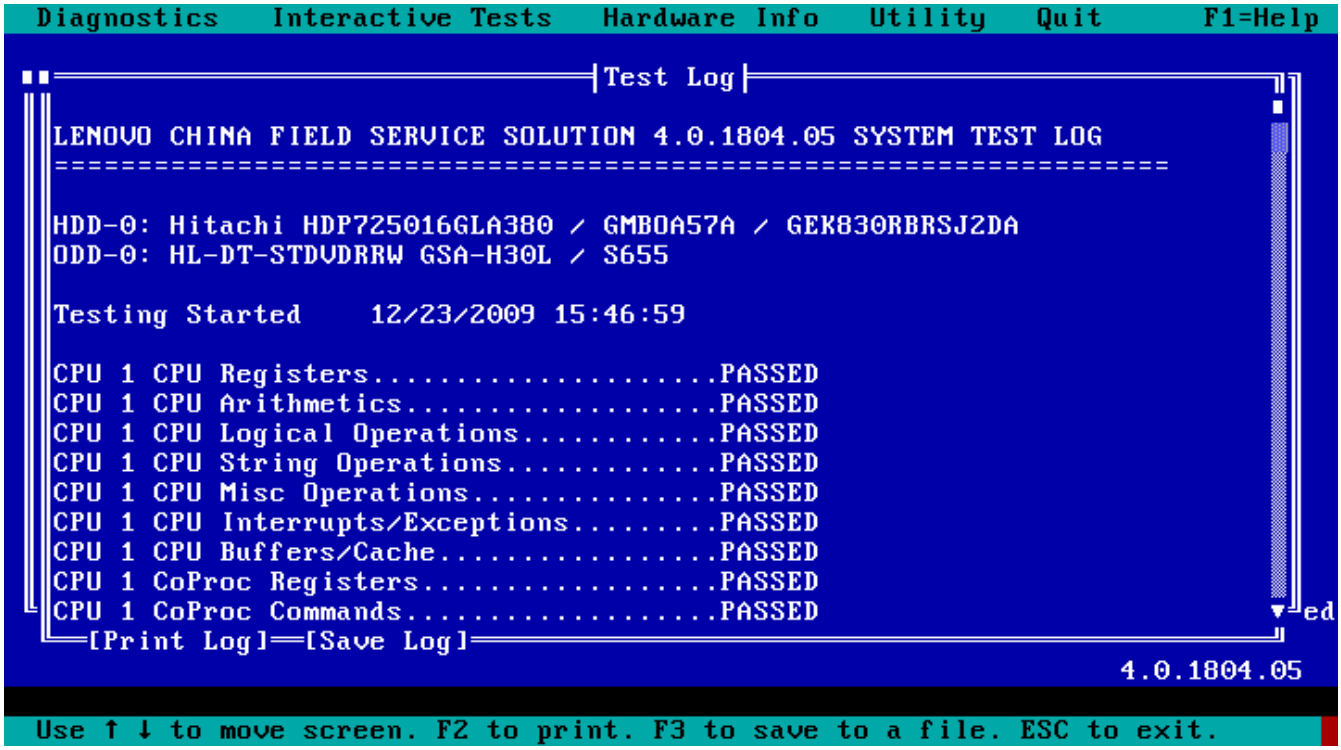

Figure 11: The Test Log

When the test is complete (or if aborted by the user), PC-Doctor will record one of the following result in the test log:

Table 6: Possible Test Results and Descriptions

Result	Description
PASSED	No errors were detected.
FAILED	One or more errors caused the test to fail. Additional details are added to the test log.
ABORTED	The test was canceled by the user.
N/A	The selected device is not available or the current state of the computer prevented testing.
<ERROR>	An error not related to testing occurred or a module returned an unexpected return code. Additional details are added to the test log.

Note: The test log will only record test results for tests you run from the **Diagnostics** menu and does not include interactive test results.

When viewing the test log, the following keys are available:

- UP or DOWN ARROW keys will move one line up or down.
- PAGE UP or PAGE DOWN keys to move one screen page up or down.
- F2 to print the test log.
- F3 to save the test log to a file.

By default, test results are recorded in the test log after testing completes. New test results are appended to the end of the existing log each time you run a test. If you test for long periods of time without clearing the test log, it will grow very large. The test log can store up to 32,000 bytes of test result data. When the log reaches the 32,000 byte limit, old log entries are deleted as new entries append, starting with the oldest entry. See *Log Options Menu* on page 17 for available test log options.

Note: If Enable Printing is disabled, you will lose test log content if the test log becomes full.

Caution: **Check the LogLeft** status field to see how much space is available in the test log.

Saving Test Log Output

You can save test logs to any valid drive or filename regardless of how you configure the test log to function. While viewing the test log, click **Save Log** or press F3 to save it to a file. You can also select **Save Log** from the **Test Options** menu or **Save Test Log** from the **Log Options** menu. In the Save dialog, enter a path and file name and then press ENTER. For example, to save the test log as a file named *Testlog* to a storage device labeled as the A drive, you would specify `A:\testlog.log` in the **Save** dialog. See below.

Note: If you do not specify a directory path, the test log is saved to the location you specify on initial startup.

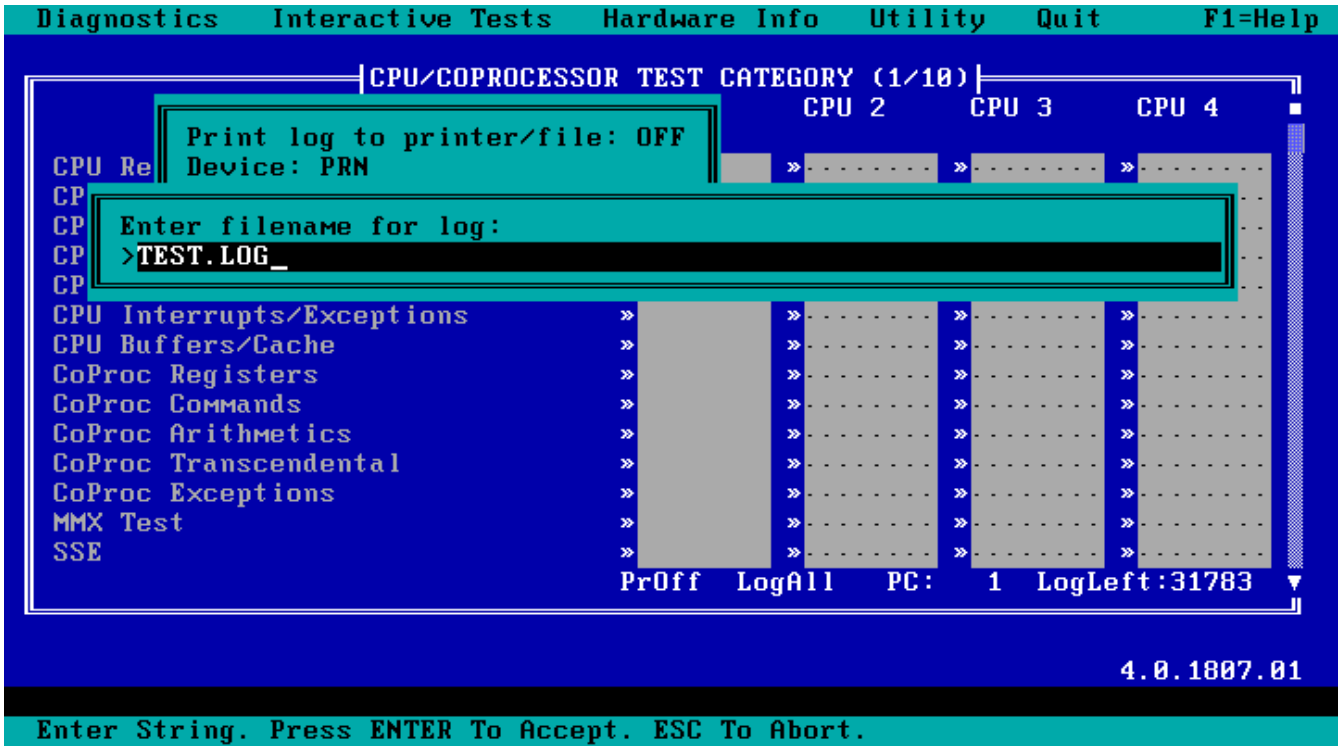

Figure 12: The Test Log Save Dialog Box

Printing the Test Log

You can print test results by clicking **Print Log** or pressing F2 while viewing a test log. To print a test log from any test category window, click **[Options]** or press F2 and then select **Print Log** from the **Test Options** menu.

Clearing the Test Log

Select **Clear Test Log** from the **Log Options** menu to permanently erase the current test log contents. Exiting PC-Doctor also permanently clears the test log. Always save or print the test log before exiting PC-Doctor if you wish to preserve the test log contents!

Caution: Use **Clear Test Log** with caution. PC-Doctor will clear the test log without warning.

About Test Patterns

Many tests in PC-Doctor use a set of 18 numbers called “test patterns.” These patterns are specially designed to create worst case scenarios for whatever device is used to store the data. PC-Doctor for DOS test patterns are meant to encapsulate into a single set of patterns what defacto industry tests are doing for storage related devices. The patterns are not specific to video and are not geared toward any specific video card manufacturer. The test pattern values are listed in order of use:

```
FFFFH 0000H F0F0H 0F0FH AAAAH
5555H 8080H 4040H 2020H 1010H
0808H 0404H 0202H 0101H 1111H
2222H 4444H 8888H
```

Each of these patterns in turn are written (to either memory or disk) and then read back. If the read pattern does not match the written pattern, an error has occurred.

About Test Durations

The elapsed times provided for the tests were generated on a representative sample system with the following configuration:

IBM System x3100 M3
Xeon 4GB RAM
4-250GB SATA Hard Drives
IBM ServeRAID Controller

Test Environment

IBM PC-DOS Startup CD
PC-Doctor for DOS version 4.0.1807.05
Diagnostics executed from RAM drive

DOS Return Codes

The following codes are returned to DOS in the ERRORLEVEL environment variable. Return codes can be used in DOS batch files to determine branching for automated testing.

Table 7: Return Codes for PC-Doctor Test Results

PC-Doctor Test Results	Return Code
PASSED	0

PC-Doctor Test Results	Return Code
FAILED	1
ABORTED	2
N/A	3
OTHER ERROR	4

Running Interactive Tests

Interactive tests are designed to test PC components using direct interaction or input from the user and are available from the **Interactive Tests** menu. User input or interaction sometimes involves following test instructions (for example, “Insert a floppy disk”) but usually involves simply viewing the test performance and interpreting the test results.

Similar to the **Diagnostics** menu, interactive tests are organized by device type category. See below.

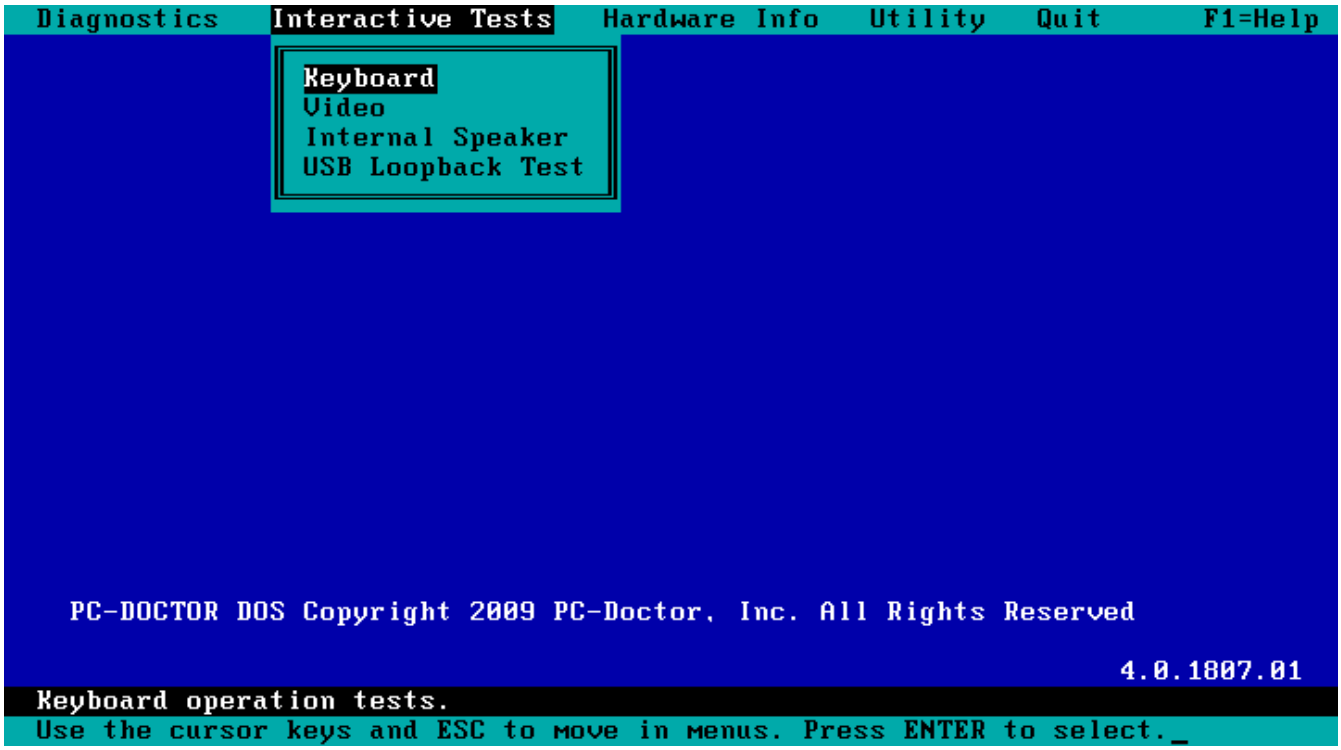

Figure 13: The Interactive Tests menu

To run an interactive test, click the desired test category or highlight the desired test category using the arrow keys and press ENTER. If an interactive test contains subtests you can run individually, click the desired test or highlight the desired test you want to run and press ENTER.

Note: The test log records interactive test results when run from the Diagnostics menu only.

Collecting Hardware Information

The **Hardware Info** menu provides tools for collecting hardware component and configuration information. Like the **Diagnostics** and **Interactive Tests** menus, the **Hardware Info** menu organizes the hardware information modules according to device categories. The exception to this is *System Configuration*, which provides a list summarizing the major PC components. See below.

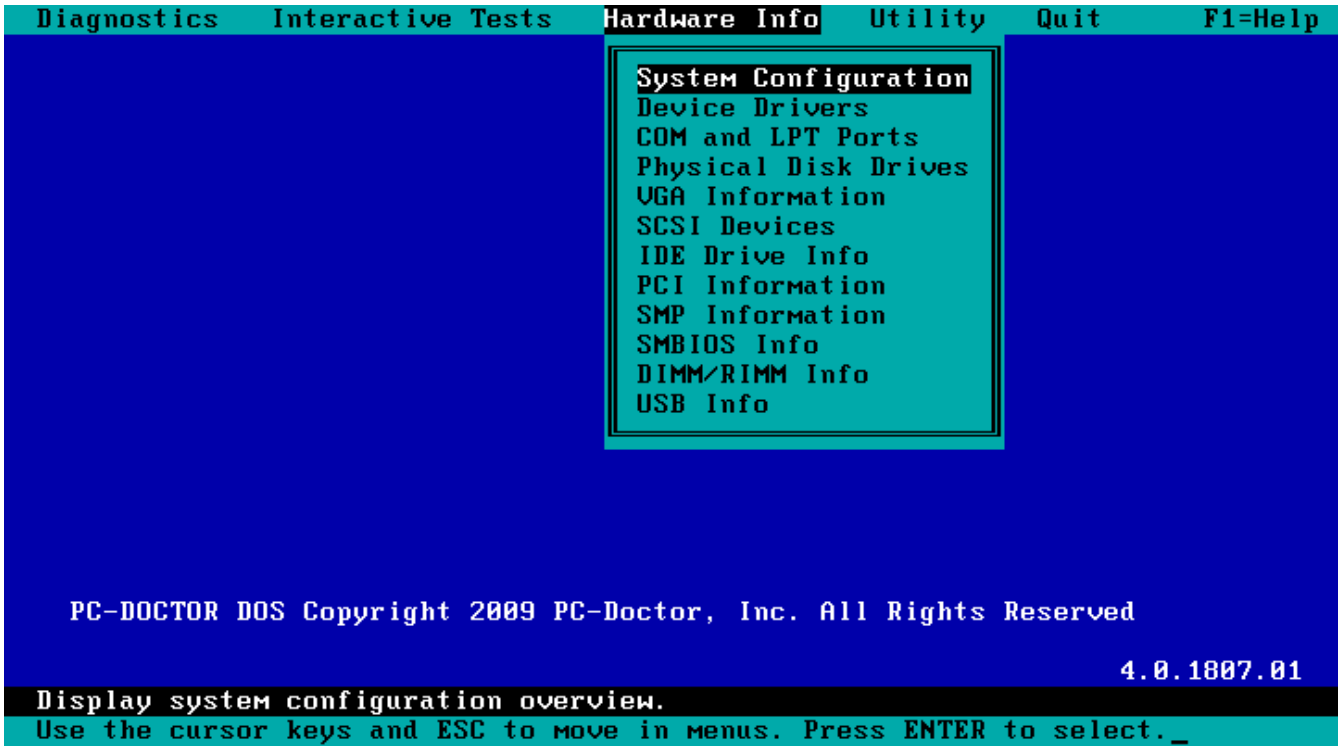

Figure 14: The Hardware Info menu

Generating a Hardware Info Report

To generate a hardware information report:

1. Open the **Hardware Info** menu.

   You can open the **Hardware Info** menu by clicking it or highlighting it and pressing ENTER.

2. Click on a category or use the arrow keys to highlight the desired category and press ENTER.

   The Hardware Info report will display on screen when complete.

3. Save the Hardware Info report.

   You can save a Hardware Info report by clicking **[Save Log]** or press F3 and enter a path and file name in the dialog. Alternatively, you can print out Hardware Info reports by clicking **[Print Log]** or press F2 while the Hardware Info report is in view.

Note: You can use the **Tech Support Form** on the **Utility** menu to run several or all of the Hardware Info reports at one time, putting the output from all of them into one report. SEE ALSO *Tech Support Form* on page 25.

Combining Reports

You can combine hardware information reports and diagnostic test results into one report using switches. For example, you can combine DOS commands with the DOS redirection symbol (>) or merge commands in the following:

Command	Description
`pcdr /si:1 > config`	Runs the first information module on the Hardware Info menu, System Configuration, and saves the report to a file named config.
`pcdr /rt:cpu&* /pr:cputest`	Runs all the CPU/Coprocessor subtests and saves the results to a file named cputest.
`copy config + cputest a:\results`	Merges the config file and cputest file into one file named results and saves it to drive `A:`.

The Utility Menu

The **Utility** menu provides access to tools that help you manage your PC. This includes access to external applications and functions that provide support for PC-Doctor for DOS. See below.

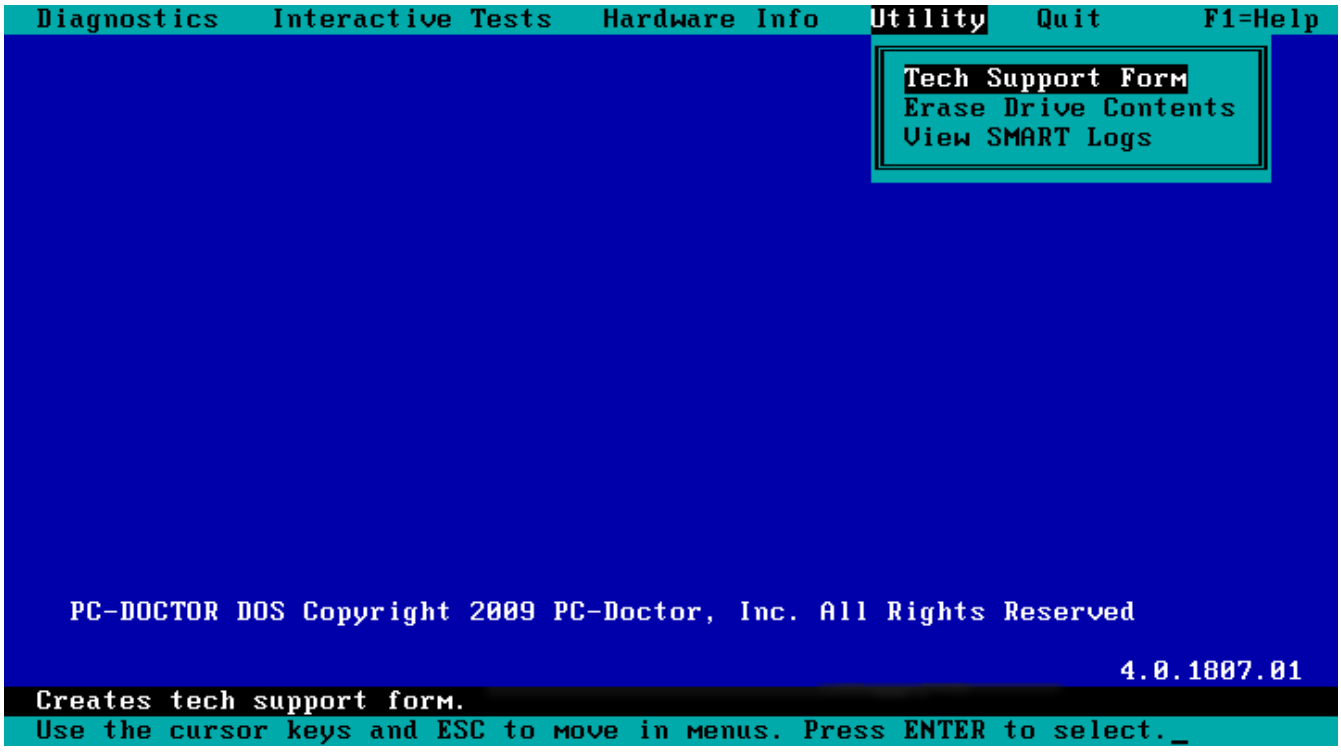

Figure 15: The Utility menu

To select a **Utility** menu function, click it or highlight it using the arrow keys and press ENTER. The **Utility** menu contains the following:

Table 8: Utility Menu Functions

Menu Function	Description
Surface Scan Hard Disk	Scans the media surfaces of any installed hard disk drive for physical defects. These tests are potentially destructive if power failure occurs during testing.
Tech Support Form	Automatically run all or selected hardware information reports as a group with output in a single report. SEE ALSO, *Tech Support Form* on page 25.
Erase Drive Contents	Erase hard drives quickly or to DoD specifications. SEE ALSO, *Erase Hard Drive Contents* on page 26
View SMART Logs	View contents of the SMART Test Log, SMART Error Log, or the SMART Attribute Log.

Tech Support Form

The Tech Support Form allows you to run one or more hardware information reports as a group and collect all output in a single report. It uses the same hardware information reports available from the **Hardware Info** menu. Use the Tech Support Form to speed up support calls with service technician or to inventory your PC hardware configuration.

Generating a Tech Support Form

To generate a Tech Support Form:

1. Open the **Utility** menu.
2. Select **Tech Support Form**. See below.

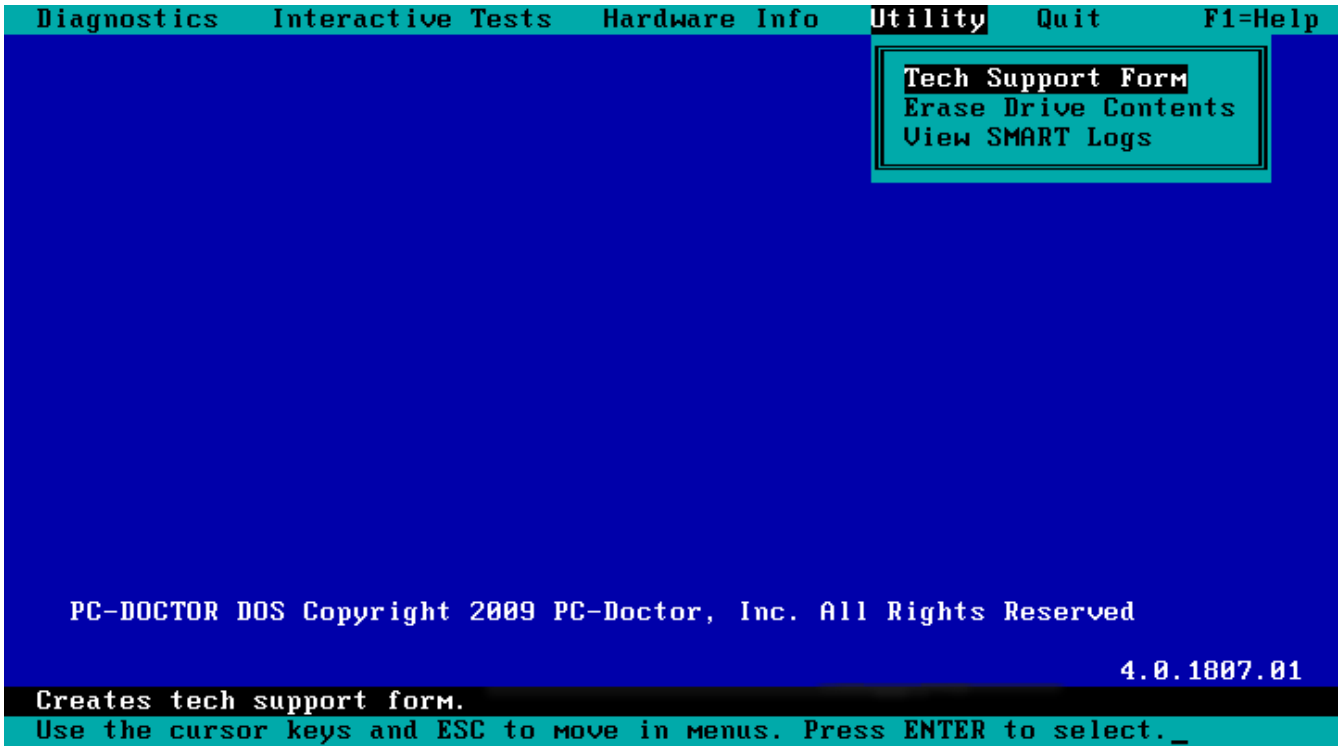

Figure 16: Finding the Tech Support Form

A complete list of available hardware information reports will display. By default, all available hardware information reports are automatically selected.

3. Select all information reports you want to include in the Tech Support Form by clicking them or highlighting the report and pressing ENTER.

   A check mark next to a report indicates it will be included in the Tech Support Form.

4. Deselect all information reports you want to exclude from the Tech Support Form by clicking them or highlighting the report and pressing ENTER.

   A missing check mark indicates a report *will not* be included in the Tech Support Form. You can deselect all reports at once by pressing the F10 key.

5. After you select and deselect the desired reports, press the F5 key to generate the Tech Support Form.

To save the report to a file, click **Save Log** or press F3 and enter a path and file name in the **Save** dialog. You can also print the Tech Support Form by clicking **Print Log** or pressing the F2 key.

Erase Hard Drive Contents

The drive erase tool erases hard drives quickly or to DoD specifications for confidential information.

To Erase all Contents from a Hard Drive:

1. Click the **Utility** menu, then click **Erase Drive Contents**.

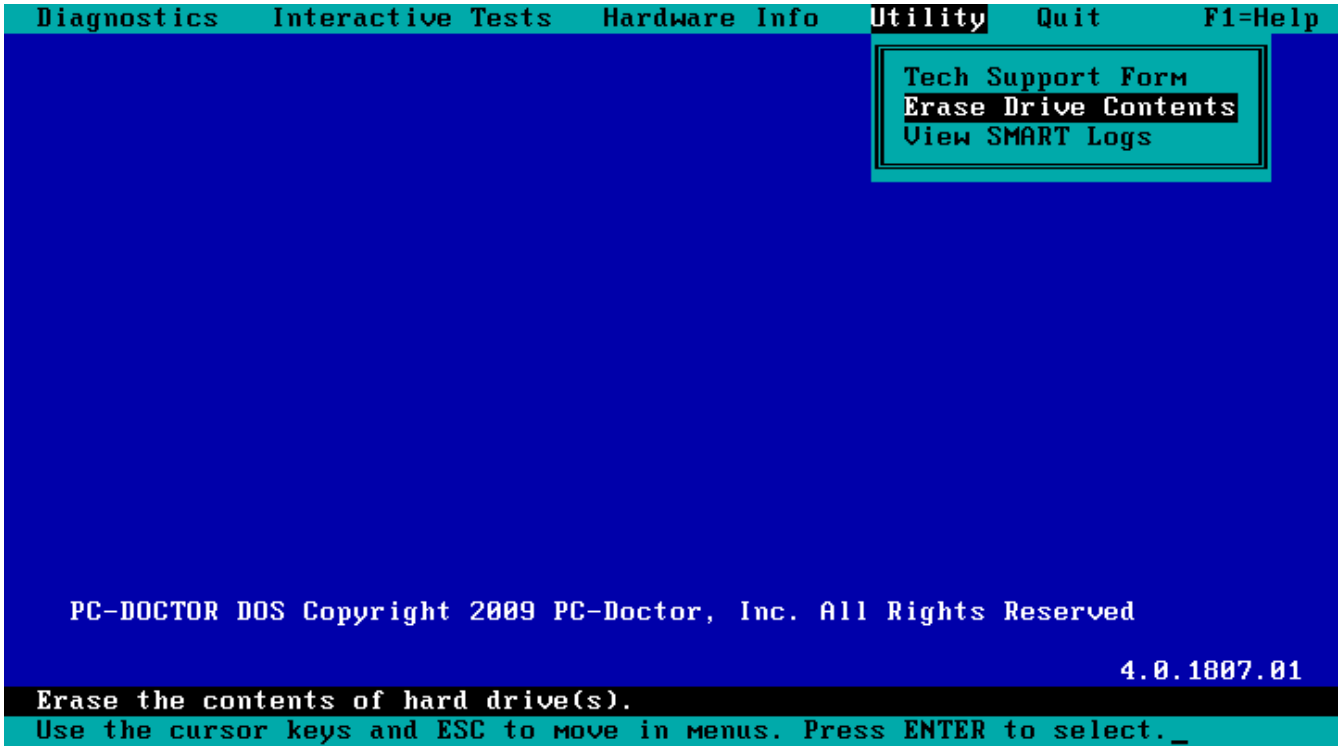

Figure 17: The Utility Menu

2. Ensure that you want to completely erase the hard drive.

   Note: If the system includes more than one drive, a drive select menu will be displayed. The drives will be listed in the order in which the operating system lists them. To ensure that the correct drive is erased, PC-Doctor highly recommends that you disconnect power to all drives except the target drive before initiating the drive erase.

3. Select between two erase methods and one verify method:

- **Clear Hard Drive:** This method will erase the drive by writing zero to each byte in every sector on the drive. This operation is conducted in one pass of the media.
- **Sanitize Hard Drive:** This method will erase the drive in four complete passes of the drive media. The first two passes write a pre-determined pattern. The third pass writes a random value over the entire media, and the last pass verifies that the pattern in pass three was written to the drive. This erase method conforms to United States Department of Defense specifications.
- **Verify Erase:** This utility will determine if the drive has already been erased by one of the methods listed above. If the drive has not been erased, you will notified, and have the option to erase the drive using one of the erase methods.

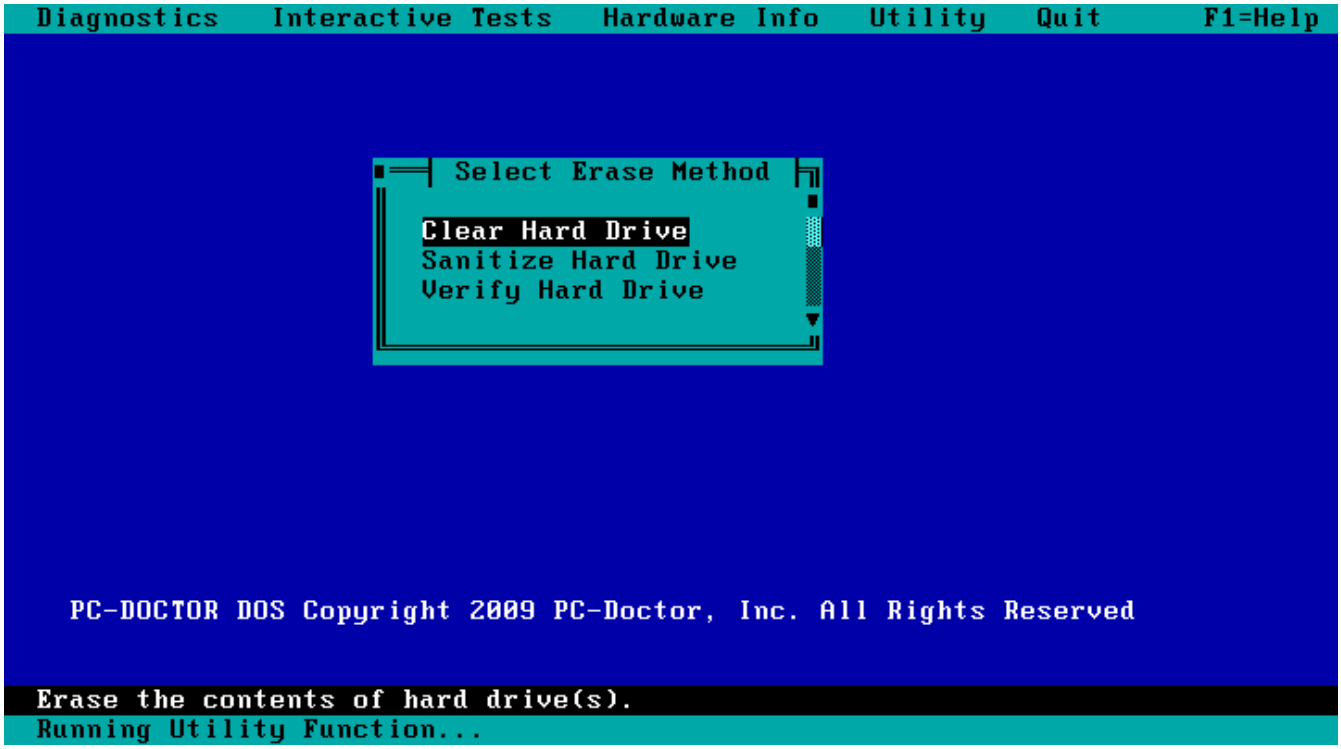

Figure 18: Erase Drive Method Selection Dialog

4. Confirm erasure. If you selected either of the erase methods you will be asked to confirm that you want to erase the drive.

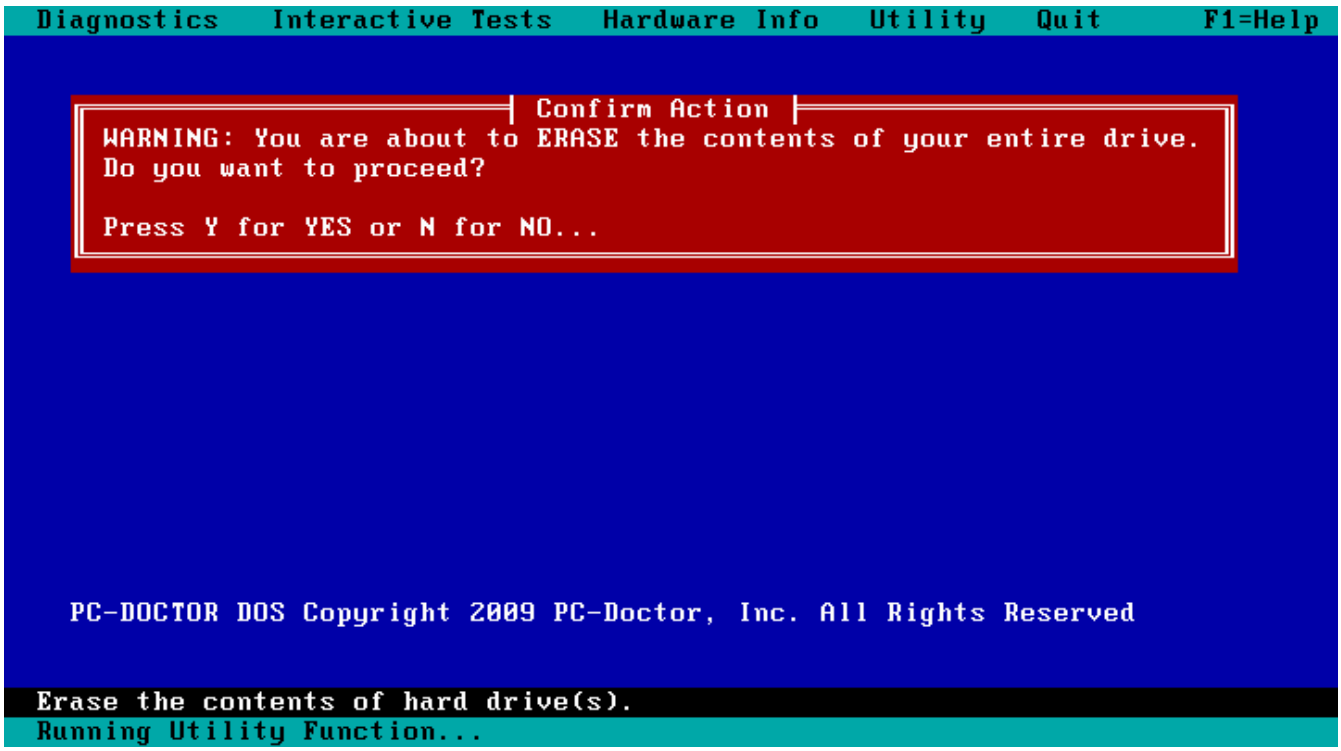

Figure 19: Erase Drive Confirmation Dialog

5. The erasure progress is displayed as shown here. The ESC key will abort the erasure, but will not restore any portion of the drive erased before the process was aborted.

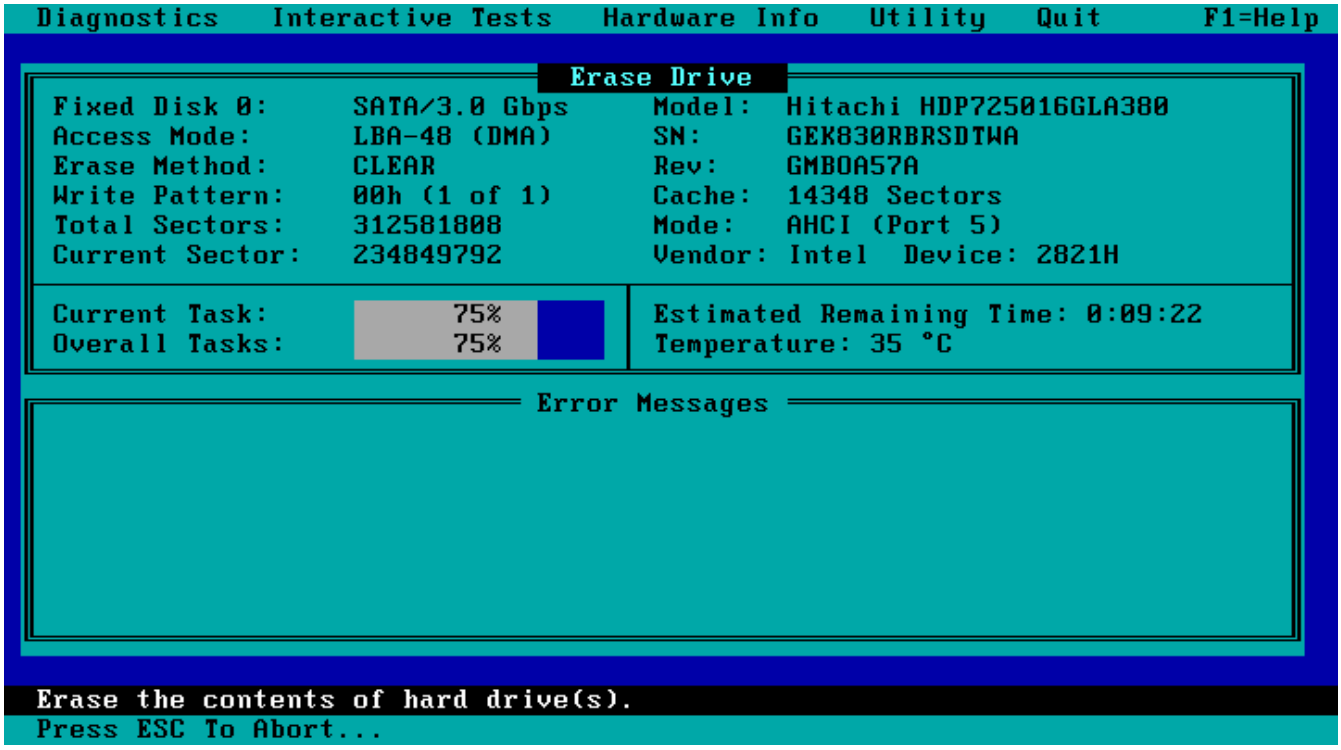

Figure 20: Erase Drive Progress Screen

6. This screen is displayed when the drive has been completely erased.

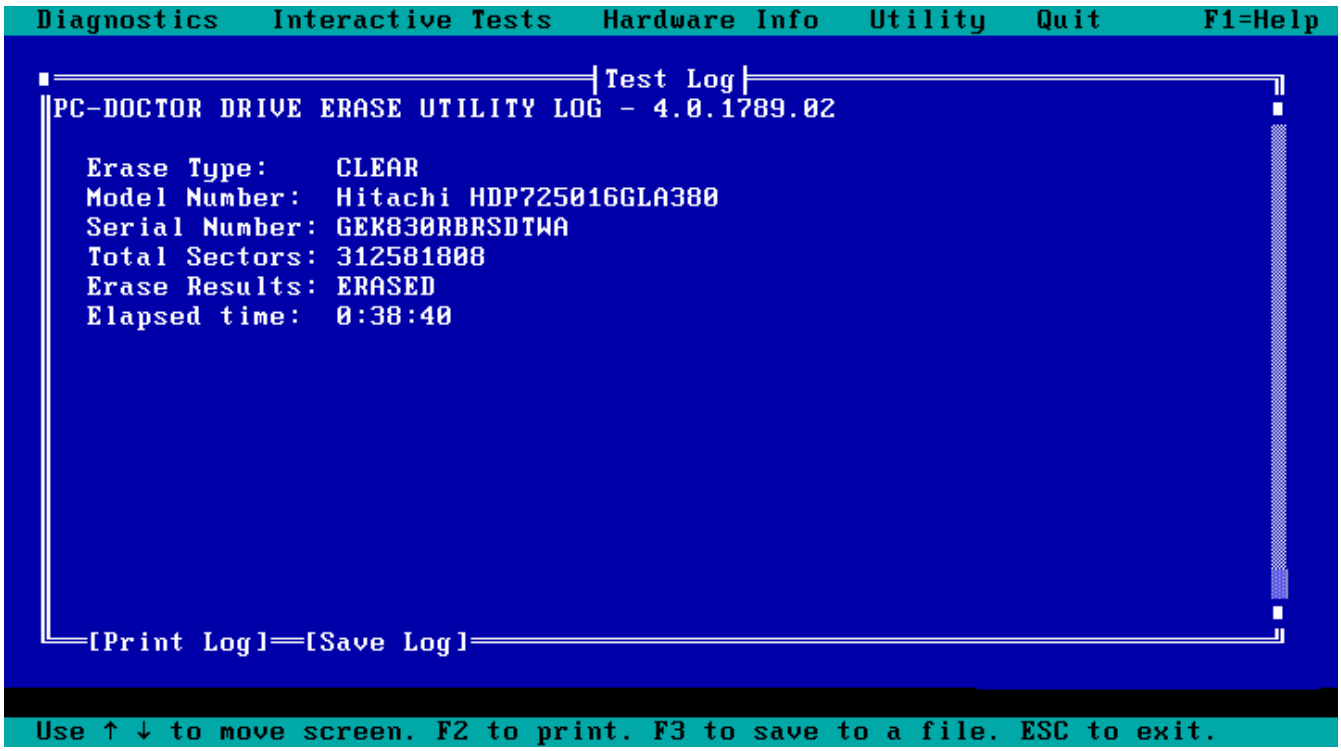

Figure 21: Erase Drive Results Screen

7. Press ESC to return to the main menu. If the drive has more than one drive, the drive selection screen will appear.

Automating PC-Doctor for DOS

You can run diagnostic and system information functions automatically using the PC-Doctor for DOS interface, from a command line on the DOS prompt or from a batch file. You can automate testing by using test IDs (SEE ALSO, *Supported Test IDs*) and switches on the command line without starting PC-Doctor for DOS or creating your own test sets (called *Overlays*).

An overlay is a user-created custom test set. You can create test overlays to test components in a specific PC or create device specific test sets. For example, you can create an overlay specifically for CPU testing by selecting only the CPU category subtests and deselecting all other tests and subtests.

PC-Doctor for DOS lists all the available overlays in numbered slots, which you can see in the Select Overlay window. You can save up to 10 overlays, one in each slot. If empty slots are not available, you can save a new overlay in a slot that already contains one, erasing the previous overlay. See below.

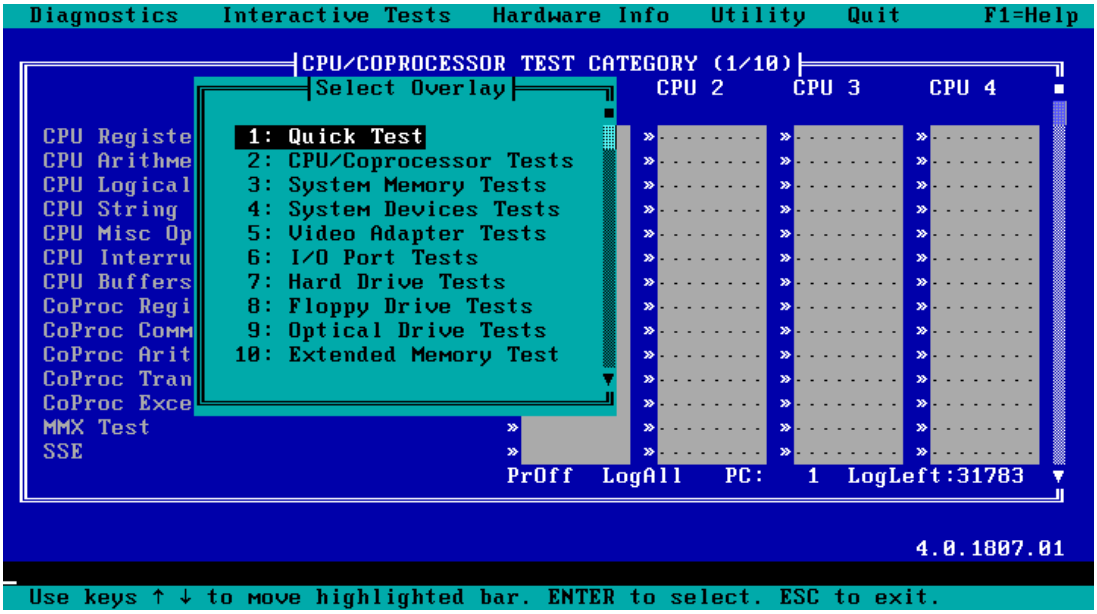

Figure 22: The Select Overlay window

Creating and Saving an Overlay

To create and save an overlay:

1. Select a category from the **Diagnostics** menu.
2. Select one or more subtests you want to include in the overlay and deselect all others.

   Press the F10 key to quickly deselect or select all subtests in the **Test Category** window. To select or deselect individual subtests, highlight the desired subtest and press the SPACEBAR.
3. When you have finished selecting tests for a test category, press the PAGE UP or PAGE DOWN key to move to another **Test Category** window.
4. Select or deselect subtests you wish to include or exclude, continuing this process for each test category.
5. When you finish selecting tests, click **[Options]** or press F2 to open the **Test Options** window and select **Save Overlay**. See below.

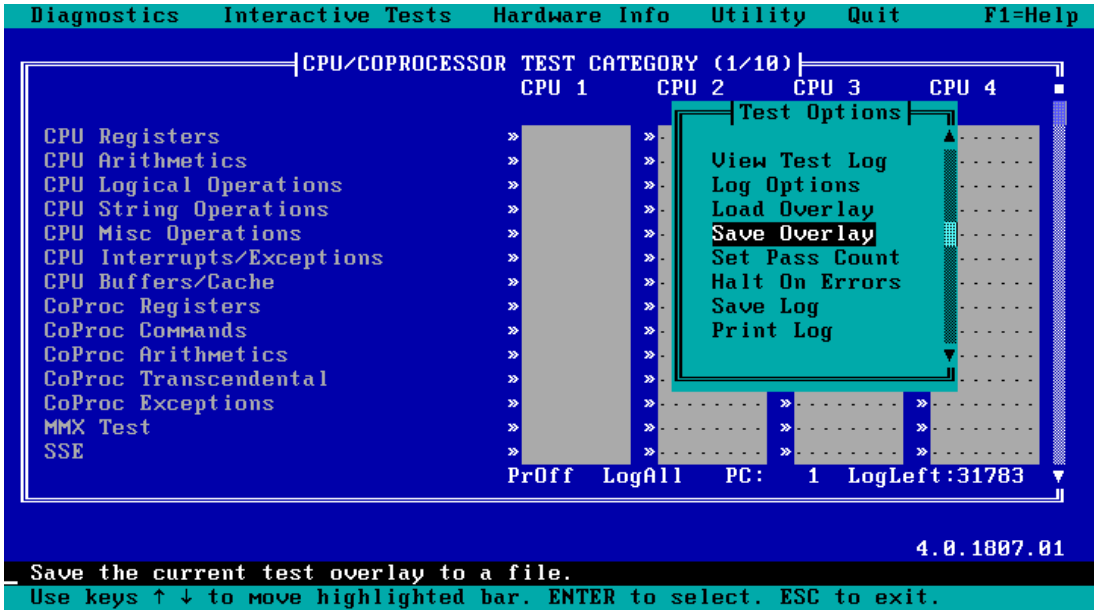

Figure 23: Saving a Test Overlay

6. Select a slot to save the overlay and press ENTER.
7. Provide a name or description for the overlay in the **Save** dialog and press ENTER (the name or description can not exceed eight characters).

After creating your overlay, press the F5 key to run it.

Note: Overlays work for the current session only. You can not save an overlay for later use unless you save the overlay to another location after exiting PC-Doctor for DOS (see below). Once you restart the PC, the overlay is no longer available.

PC-Doctor for DOS stores information defining each overlay in the `PCDR.pdo` file. If a `PCDR.pdo` file does not exist when you save an overlay, PC-Doctor for DOS automatically creates one and stores it in the main PC-Doctor for DOS directory. To permanently save any existing overlays, you must exit PC-Doctor for DOS and copy the `PCDR.pdo` file to another location.

Loading an Overlay

You can load overlays from any test category using the **Load Overlay** command on the **Test Options** menu. See below.

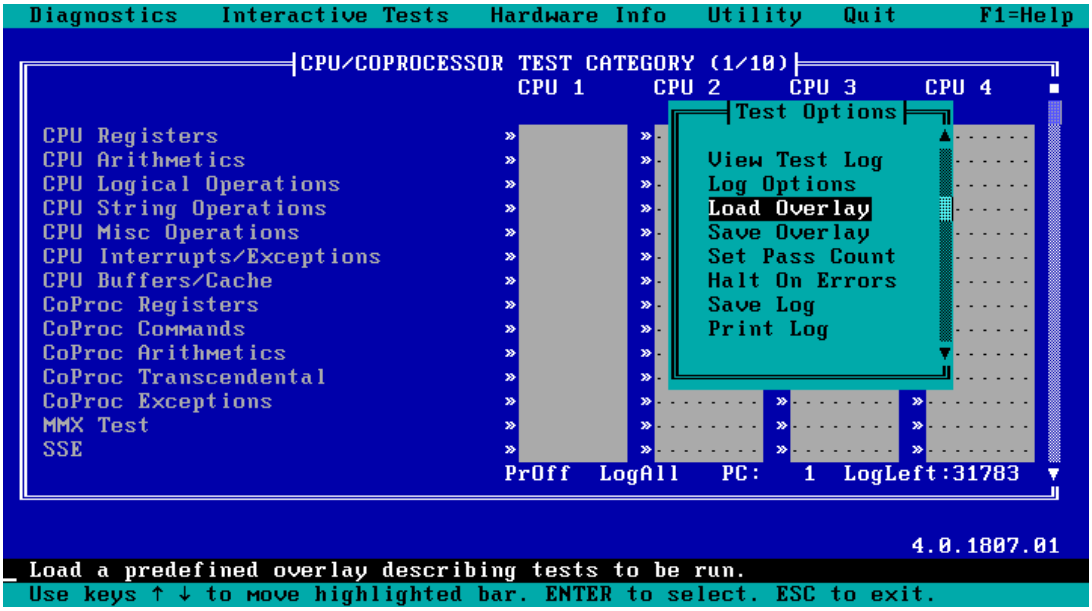

Figure 24: Loading a Test Overlay

To load an overlay:

1. Select any test category from the **Diagnostics** menu.
2. Press F2 to bring up the **Test Options** menu.
3. Choose **Load Overlay**.
4. Highlight the slot containing the overlay you want to use and press ENTER.
5. Press the F5 key to run the selected overlay.

Deleting an Overlay

To delete an overlay and replace it with another:

1. Select **Save Overlay** from the **Test Options** menu.
2. Highlight the slot containing the overlay you want to replace and press ENTER.

   A dialog will appear asking you to confirm that you want to delete the existing overlay.
3. Select **Yes** or press the Y key to confirm the overlay replacement.

Note: To erase all custom overlays, delete the `PCDR.pdo` file.

Running PC-Doctor for DOS from the Command Line

Running PC-Doctor for DOS from the command line is ideal when testing systems in a manufacturing environment. Testing systems from the command line allows you to bypass the user interface, and when using batch files, allows you to avoid using a keyboard or monitor.

The command line is available under the Startup menu. On the command line, type `pcdr` to bypass the Startup menu and start PC-Doctor for DOS. Starting PC-Doctor for DOS in this way is the same as selecting option 5 from the startup menu.

Typing `pcdr` with the appropriate command line switch performs additional functions. Type `pcdr /?` on the command line to see a partial list of the available switches.

For more information on available command line switches, see the “Service Center Advanced User Guide”.

After performing an action from the command line, type `menu` and press ENTER to return to the PC-Doctor for DOS Startup menu.

General Command Line Format

The general command line format is `pcdr /xx /xx`, where *xx* represents a command line switch. You must always precede a command line switch with the `pcdr` command. The command and switches are not case sensitive. You can use up to 256 characters per command line, allowing you to include several switches on one command line. For example, to start PC-Doctor for DOS, run all currently selected tests as a set for 10 repetitions, and to halt testing if PC-Doctor for DOS detects an error, type `pcdr /pc:10 /he`. Here is a breakdown of this command:

Table 9: Sample Command Line Breakdown

Command Line Switch	Function
`pcdr`	Starts PC-Doctor for DOS
`/pc:10`	Runs all currently selected tests as a set for 10 iterations
`/he`	Halts testing if PC-Doctor DOS detects an error

Note: When you include multiple switches on one command line, you must separate each switch with a space.

The testing parameters Pass Count, Halt on Errors, and Log Errors Only or Log All Test Results affect how overlays function. For example, to automatically run an overlay more than one time, include the `/pc:xx` switch on the command line to control the pass count. Type `pcdr /ba:1 /pc:20` to start PC-Doctor DOS for DOS and run overlay #1 for 20 repetitions.

Among the many available switches, three in particular control automated testing:

Command Line Switch	Function
`/ba:xx`	Switch for running overlays
`/rt`	Switch for running a specific test on a specific device. There are three variations of the `/rt` switch. For more information on available command line switches, SEE ALSO the “Service Center Advanced User Guide”.

Running Overlays from the DOS Command Line

Use the `/ba:xx` switch to run overlays from the DOS command line. In PC-Doctor for DOS, running overlays from the command line using this switch is called batch-mode diagnostics. The command to start PC-Doctor DOS using this switch is `pcdr /ba:xx`, where *xx* is the number of a saved overlay (from 1 through 10).

You must use the overlay slot number from the **Select Overlay** list when using the `/ba:` switch so PC-Doctor DOS can identify the correct overlay. For example, the switch `/ba:1` runs the overlay in the number 1 slot on the **Select Overlay** list.

Note: You can only use the `/ba:xx` switch once on a command line. Also, you can not use the `/ms:xx` or `/rt` switches in combination with the `/ba:xx` switch.

Running Individual Tests from the DOS Command Line

Use the `/rt` group of switches to run individual tests from the command line. The `/rt` switches use specific test IDs that PC-Doctor for DOS assigns to each test. There are three variations of the `/rt` switch:

- `/rt:nn`
- `/rt:nn,x`
- `/rt:nn/x`

The *nn* variable represents the test ID and the *x* variable represents the device to test.

Use the `/rt:nn` switch to specify a test to run on all available devices using its test ID. The format for the command starting PC-Doctor for DOS using the `/rt:nn` switch is `pcdr /rt:nn`. For example, the test ID for the first CPU/Coprocessor subtest is `CPU&1`. To start PC-Doctor for DOS and run only the first CPU/Coprocessor subtest on all available CPUs in the system, type `pcdr /rt:cpu&1`.

Use the `/rt:nn,x` and `/rt:nn/x` variations to specify a test to run on a specific device or devices. You can also use standard DOS wild cards, such as the asterisk (*), when using test IDs with command line switches. For example, type `pcdr /rt:cpu&*` to start PC-Doctor for DOS and run all of the CPU/Coprocessor subtests.

You can combine up to 10 different `/rt` switches on a single command-line, but you can only specify one test category with each one. For example, type `pcdr /rt:cpu&* /rt:mem&1 /rt:vid&*` to start PC-Doctor for DOS, run all the CPU/Coprocessor subtests, the first memory subtest, and all of the video subtests.

You can also use the `/rt` switch to run interactive tests from the command line. For example, type `pcdr /rt:i_vid&3` to run the interactive video monitor test. You can also specify interactive tests in DOS batch files in the same way. Keep in mind you will still need to provide interactive input if a test requires it.

Running Hardware Information Modules from the DOS Command Line

You can run hardware information modules from the DOS command line or in a DOS batch file using the `/si:xx` command line switch. The format is `pcdr /si:xx`. The *xx* variable specifies the hardware information module to run. PC-Doctor for DOS does not assign unique IDs to specific hardware information modules, you specify them using their location on the **Hardware Info** menu.

The following is how Hardware Info modules are listed in order of appearance, which corresponds to the value used when using the `/si` command:

Table 10: Hardware Info Module IDs

xx Value	Module Order in the Hardware Info menu
1	System Configuration
4	Device Driver
5	COM and LPT Ports
6	Physical Disk Drives
8	VGA Information
10	SCSI Devices
12	IDE Drive Info
15	PCI Information
16	SMP Information
18	DMIBIOS Info

xx Value	Module Order in the Hardware Info menu
19	DIMM/RIMM Info
20	USB Info

For example, System Configuration is the first selection on the **Hardware Info** menu so its corresponding value is 1. To run the System Configuration report from the command line, type `pcdr /si:1`.

Saving or Printing from the DOS Command Line

Use the `/pr:` switch to save test results or system information reports from the command line. You can save a file to a specific location or print the file. For example, type `pcdr /rt:cpu&1 /pr:a:\test1.log` to do the following:

1. Start PC-Doctor for DOS.
2. Run the first CPU/Coprocessor subtest.
3. Log the results into the text file named `test1.log`.
4. Save `test1.log` to drive `A:`.

   You can view this file either with a text editor or using standard DOS commands from the DOS prompt, such as the `type` command.

   Note: You can also use the `/pr:` switch to print from the command line.

Using DOS Batch Files

You can use DOS batch files to automate PC-Doctor testing with any of the available command line switches and test IDs. The DOS rules about creating and running batch files apply to PC-Doctor DOS batch files as well. See your DOS manual for complete information about DOS batch files.

You can create a batch file with any text editor. PC-Doctor DOS comes with a text editor allowing you to create batch files without exiting PC-Doctor DOS (select **File Editor** on the **Utility** menu).

Once you create a batch file, provide a name for it such as `set1.bat` and save it to a safe location. Remember to include the bat extension (.bat) in the file name. To run the batch file, type the batch file name on the command line.

Here is a sample PC-Doctor DOS batch file:

```
@echo off
;  This batch file starts PC-Doctor for DOS, runs overlay number 02
;  and saves the results in a file named test1.log.
;
;  The command-line uses these arguments:
;   /ba:02 == runs overlay number 02
;   /pc:05 == runs overlay 02 five times
;   /pr:a:\test1.log == saves the test results to drive a:
 ; in the file test1.log
pcdr /ba:02 /pc:05 /pr:a:\test1.log
```

The above sample DOS batch file contains comment lines marked with a semi-colon. These comments provide information only and do not perform any functions. The only two lines in this batch file that actually perform functions are the first and last line. The comment lines explain the functions the last line performs.

Determining and Using Bitmap Values

A bitmap is a data structure in memory that represents information in the form of a collection of individual bits. The following gives an explanation of how to determine and use bit values in a bitmap.

A bitmap is a set of bits with a single bit representing a 0 or a 1.

> This is an example of a bit mask with all bits set to zero.
>
> ```
> 00000000
> ```

Bits are numbered from right to left in a bitmap. The far right bit is bit number 0. The next bit to the left is bit number 1, the next bit to the left of bit number 1 is bit number 2 and so on.

> This is an example of bit order. Bit values are read from right to left.
>
> ```
> 76543210
> ```

Starting from bit number 0, each bit has a value that is half the value of the bit on its immediate left (the bit value is not the same as the bit order). Bit number 0 has a value of 1, bit number 1 has a value of 2, bit number 2 has a value of 4, bit number 3 a value of 8 and so on.

> This is an example of bit values.
>
> ```
> 128 64 32 16 8 4 2 1
> ```

Each bit in a bitmap can be used to represent a subtest in a test category or an installed hardware device. You can also use bitmaps to indicate features or devices that you want to use or mask. For example, in the `PCDR.INI` file a bitmap can disable specific subtests in a test set.

Bitmaps can also be used on the command line. For example, a bitmap can be used with the `rt` switch (SEE ALSO *`rt:nn`*) to define a device count (four hard drives, four serial ports, two USB ports and so on).

The first subtests or device represented in a bitmap is designated with a value of 0. Bit number 0 represents the first subtest or device, bit number 1 represents the second subtest or device, bit number 2 represents the third subtest or device and so on.

The effects of a bitmask depend on how it is used. A bitmask can be used to prevent specific subtests from running or to designate specific devices for testing. To enable a subtest or device in a bitmask, you would switch its assigned bit to 1.

For example, using the bitmap in the `PCDR.INI` file, to indicate that you do not want to run the first and third CPU subtests their assigned bits (bits 0 and 2) are set to 1. Used with the `rt` switch (SEE ALSO *rt:nn*), the same bitmap would run tests on the first and third hard drives in a system with four hard drives.

> This is an example of a bitmap that is defined to filter out the first and third subtests or running available tests on the first and third device.
>
> ```
> 00000101
> ```

Specified subtests and devices are defined by the sum total of the bit values for bit numbers set to 1. For example,

The above bit map can be defined by an integer value of 5. Bit number 0 contains a bit value of 1, bit number 2 contains a bit value of 4. The sum total of the bit values for bit number 0 and bit number 2 is 5.

`00000101` = 4+1 or 5

Diagnostic Test Descriptions

Available diagnostics are primarily found in the first available menu (commonly referred to as the **Diagnostics** menu). Diagnostics found in the first menu are considered *automated*, meaning they run to completion and record the test result in the test log without user interaction.

CPU/Coprocessor Tests

The CPU/Coprocessor Test category contains all diagnostics that verify the CPU, the math coprocessor and CPU-related functions are in good working order. These diagnostics support both single-core and dual-core configurations.

CPU/Coprocessor Test Access Path

- Accesses the device directly.
- Tests all installed CPUs conforming to SMP specifications

Test Duration

Each individual CPU diagnostic requires less than one second to complete. When run consecutively, all CPU diagnostics takes less than three seconds to complete.

Test Descriptions

CPU Registers

This test verifies all CPU registers excluding `CS` and `IP` successfully retain values by writing a default set of test patterns to the registers. On 32-bit CPUs, the extended registers are also verified as functional. If the test detects any errors, it identifies the failed registers and logs as **Failed**.

CPU Arithmetics

This test verifies the CPU can accurately perform arithmetic calculations while exercising arithmetic operations `ADC`, `ADD`, `DEC`, `DIV`, `IDIV`, `IMUL`, `INC`, `MUL`, `SBB` and `SUB` using 16 and 32-bit operands. If the test detects any errors, it identifies the failed operands and logs as **Failed**.

CPU Logical Operations

This test verifies the CPU can accurately perform logical operations while exercising logical operations `AND`, `NOT`, `OR` and `XOR` using 16 and 32-bit operands. If the test detects any errors, it identifies the failed operands and logs as **Failed**.

CPU String Operations

This test verifies the CPU can accurately perform string transfers while exercising string operations `LODS`, `MOVS`, `SCAS` and `STOS` using 8, 16 and 32-bit operands. If the test detects any errors, it identifies the failed operands and logs as **Failed**.

CPU Misc Operations

This test verifies the Read Time Stamp Counter (RDTSC) instruction by reading the timer twice and checking for duplicate values. If the test detects duplicate values for the RDTSC, it logs as **Failed**. If the CPU under test does not support the instruction, the RDTSC is disabled or the CPU does not permit access to the timer, the test will log as **N/A**.

CPU Interrupts/Exceptions

This test verifies the CPU successfully manages software interrupts and real-mode accessible exceptions. If the test detects any errors, it identifies the failed software interrupt numbers, identifies the failed exception names and logs as **Failed**.

CPU Buffers/Cache

This test verifies 386/486 Translation Lookaside Buffer (TLB) and the 486 on-chip cache is functional in two steps. First, the test verifies if the address for each register is accurate. If the test determines that register addressing is accurate, it verifies the registers successfully retain values by writing a default set of test patterns to each register. If the test detects any errors, it identifies the errors and logs as **Failed**.

👉 **Note:** This test will only operate with the CPU in Real Mode (no memory manager loaded). Otherwise, the test will log as **N/A** and record a message in the test log that the CPU was in protected mode.

CoProc Registers

This test verifies the register stack and pointers are accurate. In addition, the test exercises the following constants: `FLDLZ`, `FLDPI`, `FLDLN2`, `FLDLG2`, `FLDL2T`, `FLDL2E` and `FLD1`. If the test detects any errors, it identifies the failing command and logs as **Failed**.

CoProc Commands

This test verifies the coprocessor successfully conducts the following coprocessor commands: `FBLD/FBSTP`, `FILD/FIST`, `FLD/FST`, `FXCH`, `FCOM`, `FICOM`, `FTST`, `FXAM` and `FUCOM`. If the test detects any errors, it identifies the failing command and logs as **Failed**.

CoProc Arithmetics

This test verifies the coprocessor successfully conducts the following arithmetic commands: `FADD`, `FDIV`, `FIADD`, `FIDIV`, `FIMUL`, `FISUB`, `FMUL`, `FSUB`, `FABS`, `FCHS`, `FPREM`, `FRNDINT`, `FSCALE`, `FSQRT`, `FXTRACT` and `FPREM1`. If the test detects any errors, it identifies the failing commands and logs as **Failed**.

CoProc Transcendental

This test verifies the coprocessor successfully conducts the following transcendental commands: `F2XM1`, `FPATAN`, `FPTAN`, `FYL2X`, `FYL2XP1`, `FCOS`, `FSIN` and `FSINCOS`. If the test detects any errors, it identifies the failing commands and logs as **Failed**.

CoProc Exceptions

This test verifies the coprocessor successfully identifies the following exceptions `Invalid Operation`, `Denormal Operand`, `Division by Zero`, `Overflow`, `Underflow`, `Precision` and `Stack Fault`. If the test detects any errors, it identifies the failing exceptions and logs as **Failed**.

MMX

This test verifies the CPU can successfully interpret and conduct the MMX (also referred to as MultiMedia eXtension) SIMD instruction set. If the test detects any errors, it identifies the failing instructions and logs as **Failed**.

👉 **Note:** If the CPU does not support the MMX instruction set, the test will log as **N/A**.

Floppy Diskette Drive Tests

A floppy disk drive is a device used to read and write to floppy disks, one of the first widely used removable data storage mediums. The term floppy disk is derived from early forms of the 5.25" floppy disk, which were contained in a soft or “floppy” material casing that rendered the floppy disk sensitive to physical damage. Most floppy disk drives use 3.5" floppy disks, which generally have a capacity of 1.44 megabytes and are contained in a more durable plastic casing.

Floppy Diskette Drive tests verify:

- floppy disk drives can successfully move the drive heads to various locations on the disk media.
- floppy disk drives can accurately read and write data.
- the integrity of the floppy disk media.

This test supports both conventional and USB-based floppy disk drives. Multiple floppy drives in one system are identified and tested. Three types of tests are available:

- Seek — tests the read/write heads and actuator arm by attempting to access various locations on a floppy disk.
- Verify — similar to seek tests with the added step of comparing sector contents with a calculated CRC value of the tested sector.
- Write/Read — verifies the drive accurately writes and reads data.

👉 **Note:** Using a defective test disk may result in false-negative test results (logs as **Failed** even though the drive is defect free). If a test reports as **Failed**, re-run the test using a different disk before concluding the drive is defective.

Tests that use BIOS Access

All tests use BIOS access.

Test Duration

Use the following table to determine the elapsed time (HH:MM:SS) for each test.

Table 11: Estimated Test Durations for Floppy Diskette Tests

Test	Duration
Hi-Low Seek	0:00:46
Funnel Seek	0:01:03
Track To Track Seek	0:00:26
Random Seek	0:00:37
Linear Verify	0:00:58
Random Verify	0:01:18

Test Descriptions

Hi-Low Seek

This test verifies the tested drive can accurately move the read/write heads to specific locations on the media. Drive read/write heads are moved from the lowest sector to the highest sector and back. This is repeated 30 times. If the test detects errors with the movement of the drive heads, it records the error locations and logs as **Failed**.

Funnel Seek

This test verifies the tested drive can accurately move the read/write heads to sector locations in a funnel fashion across the media. Drive read/write heads are moved from the first track (track 0) to the last track, then from the second track to the second to the last track, then from the third track to the third to the last track and so on. If the test detects errors with the movement of the drive heads, it records the error locations and logs as **Failed**.

Track To Track Seek

This test verifies the tested drive can accurately move the read/write heads to sequential locations on the media. Drive read/write heads are moved from track 0 to the maximum track one track at a time. If the test detects errors with the movement of the drive heads, it records the error locations and logs as **Failed**.

Random Seek

This test verifies the tested drive can accurately move the read/write heads to random locations on the media. Drive read/write heads are moved to random sectors for 100 repetitions. If the test detects errors with the movement of the drive heads, it records the error locations and logs as **Failed**.

Linear Verify

This test verifies the tested drive can move to sector locations in a linear fashion and accurately calculate the sector contents. If the test detects a discrepancy between the sector contents and the CRC for the sector contents, it records the error locations and logs as **Failed**.

Random Verify

This test verifies the tested drive can move to 100 random sector locations and accurately calculate the sector contents. If the test detects a discrepancy between the sector contents and the CRC for the sector contents, it records the error locations and logs as **Failed**.

Fixed Disk Tests

👉 **Note:** Some of these tests may not be available depending on your build environment. Contact your PC-Doctor representative if you have questions about these tests or their availability.

A fixed disk (commonly referred to as “hard drive”) is a large capacity storage device that typically is the main storage medium for PCs. Hard drives usually contain a PC's operating system, which controls the interaction between the hardware and the user. Hard drives come in a wide range of storage capacities, and offer much faster access to files and data than other storage options such as floppy or optical drives.

This category tests the hard disk controller and the drive actuator arm and read/write head mechanisms. It also tests SMART functionality for drives that support SMART technology.

👉 **Note:** These tests are `INT13H` based and do not change PCI register values.

The seek tests determine if the drive actuator arm mechanism can accurately position the read/write heads at specific track locations. In comparison, the verify tests confirm the read/write heads can accurately read data from specific track locations. They function the same as the seek tests, except verify tests read sector data and calculate a CRC checksum for the data. Once a verify test calculates a CRC checksum, it compares that value with the CRC value stored on the media for the tested sector. A verify test will fail if it is unable to verify that the two values match and will provide additional details on the failing sector in the test log.

PC-Doctor can test all installed fixed disks. Each available drive has its own ID, beginning with “Disk 0” for the first drive. The Fixed Disk Test Category screen displays four columns, each representing an available hard disk drive for testing. The columns are labeled “Disk 0” thru “Disk 3” and individual tests for this category can be selected or deselected

independently for each column. Test selections may be configured uniquely for the first three hard disk drives (Disk ID's 0, 1, 2). For remaining drives (ID 3 and above) test selections are identical to those for Disk ID 3. The drive IDs are passed to BIOS as the Fixed Disk Test runs the read/seek tests.

Additional fixed disk testing may be available from the Utilities menu with the Surface Scan Hard Disk function. This function tests the hard disk platter media surfaces. However, it should be used with caution as it includes destructive Write/Read and Write/Verify tests that will destroy existing data on the hard disk.

Tests that use Direct Access

All tests use direct access and BIOS. Failure analysis includes direct hard drive controller access if testing an IDE drive.

Test Duration

Use the following table to determine the elapsed time (HH:MM:SS) for each test. Times will vary based on the size of the tested drive:

Table 12: Estimated Test Durations for Fixed Disk Tests

Test	Duration
Controller	0:00:01
Hi-Low Seek	0:00:01
Funnel Seek	0:00:21
Track To Track Seek	0:00:07
Random Seek	0:00:02
Linear Verify	0:24:33
Random Verify	0:00:05
SMART or SMART Status Check	0:00:01
SMART or SMART Status Check	0:00:01
Read Surface Scan	0:00:40 (on 373GB RAID array)
SMART Self-Test Long	0:45:00 (80 GB)

Test Descriptions

Controller

The internal diagnostic test of the fixed disk controller is performed 4 times. Then the drive is reset. If an error is detected, the test reports FAILED in the test log.

Note: Depending on the version of PC-Doctor, this function may report a Data Loopback Error if the hard disk drive has never been partitioned (such as by DOS FDISK.EXE). If this occurs, partition the drive and retest.

Hi-Low Seek

The Hi-Low Seek test verifies a hard disk drive's actuator arm can accurately move the read/write heads to specific locations on the disk media. Fixed disk drive read/write heads are moved from the lowest to the highest sector number and back. This is repeated 50 times. If the Hi-Low Seek test detects errors with the movement of the drive heads, it will log a test result of FAILED and report additional details in the test log.

Funnel Seek

The Funnel Seek test verifies a drive's actuator arm can accurately move the read/write heads to sector locations in a funnel fashion across the disk media. It moves the drive read/write heads from the first track (track 0) to the last track, then from the second track to the second to the last track, then from the third track to the third to the last track, and so on. If the Funnel Seek test detects errors with the movement of the drive heads, it will log a result of FAILED and report additional details in the test log.

Track To Track Seek

The Track to Track Seek test verifies a drive's actuator arm can accurately move the read/write heads to sequential locations on the disk media. It moves the drive read/write heads from track 0 to the maximum track one track at a time. If the Track To Track Seek test detects errors with the movement of the drive read/write heads, it will log a result of FAILED and report additional details in the test log.

Random Seek

The Random Seek test verifies a drive's actuator arm can accurately move the read/write heads to random locations on the disk media. It moves the drive read/write heads to random sectors for 300 repetitions. If the Random Seek test detects errors with the movement of the drive read/write heads, it will log a result of FAILED in the test log and report additional details in the test log.

Linear Verify

Verify tests are similar to seek tests, except that in addition the sector data is read and a CRC checksum is calculated for the data and compared with the CRC value stored on the media for the sector from which the data was read. The linear verify test checks all sectors on the disk media in sequence. If errors are detected, the sector number is reported in the test log.

👉 **Note:** Any defective sectors should also be flagged by DOS as “bad” in the DOS File Allocation Table (FAT), assuming the hard disk is formatted in DOS. To see if DOS is aware of defective sectors, run the Surface Scan Hard Disk function on the PC-Doctor for DOS Utility menu.

Random Verify

Verify tests are similar to seek tests, except that in addition the sector data is read and a CRC checksum is calculated for the data and compared with the CRC value stored on the media for the sector from which the data was read. The random verify test checks 300 random sectors on the hard disk media. Verify errors are reported in the test log.

👉 **Note:** Any defective sectors should also be flagged by DOS as “bad” in the DOS File Allocation Table (FAT), assuming the disk is formatted in DOS. To see if DOS is aware of defective sectors, run the Surface Scan Hard Disk function on the PC-Doctor for DOS Utility menu.

SMART Status Test

The SMART (Self Monitoring, Analysis and Reporting Technology) test (also called SMART Status Check) determines if a SMART-capable hard drive is predicting a failure. If SMART is not enabled or cannot be enabled on the drive, the test may not enumerate for the drive. If SMART is enabled, the test sends a SMART READ STATUS command to the drive and records pass or fail based on the results returned by the drive.

SMART Self-Test Short

This SMART Self-Test Short executes a short SMART self-test on drives that support SMART. The Self-test is contained on the drive, and the drive reports an estimated time to complete when the test starts. Once the estimated time elapses, the test begins checking every 8 seconds to see if the Self-test is still running. This test will timeout if it takes more than twice (2x) as long to finish as the drive estimates.

SMART Extended Self-Test

This SMART Self-Test Short executes a long SMART self-test on drives that support SMART. The Self-test is contained on the drive, and the drive reports an estimated time to complete when the test starts. Once the estimated time elapses, the test begins checking every 8 seconds to see if the Self-test is still running. This test will timeout if it takes more than twice (2x) as long to finish as the drive estimates. The SMART Extended Self-Test extends the SMART Short Self-Test to thoroughly check devices. Test duration is significantly longer than the short self-test.

Read Surface Scan

Scans the entire drive under test by reading data from a configured number of sector blocks. This test ensures that data can be transferred from the drive to the host controller. If any errors occur, PC-Doctor for DOS records them in the test log and logs the test as **Failed**.

Other Devices Tests

This category holds tests for a number of other devices. The following are the access paths used to test all other devices.

Tests that use Direct Access

DIMM EEPROM ID
SMBUS

Test Duration

Use the following table to determine the elapsed time (HH:MM:SS) for each test.

Table 13: Estimated Times for Other Device Tests

Test	Duration
DIMM EEPROM	0:00:08
SMBUS	0:00:03
Gigabit Ethernet Card	

Test Descriptions

DIMM EEPROM ID

This tests uses Intel chipsets to talk directly with DIMM memory modules to check for valid checksum values and make sure the EEPROM’s are write protected.

Note: This test is only available on Intel based systems.

SMBUS

The SMBus test makes sure that SMBus is present, enabled, and working properly. The SMBus is used in personal computers and servers for low-speed system management communications, allowing a computer host to communicate with internal (on-board) system devices. It is used to communicate between ICs, temperature sensors, Smart battery charges, and Smart batteries.

There are two versions of this test. The first version (Simple test) ensures that a SMBus controller is present and working properly. The second version (Complex test) ensures that a SMBus controller is present, then scans the bus looking for devices. If the test detects any controller or bus errors during the scan, it records them in the test log. Several SMBTEST.INI options control which version of the test is used, when the test should stop scanning, and when detected devices should be displayed in the test log. SEE ALSO the “SMBTEST.INI” section for more information.

Note: This test is only available on Intel based systems.

Intel Gigabit Ethernet Card

Note: This module will only run on Intel specific Gigabit Ethernet adapters.

This module runs tests that check the adapter’s memory regions, performs loopback testing, and checks the card’s ability to link to a network. There are two tests that this module uses to check the functionality of Intel Gigabit Ethernet cards: Intel Network and Intel Network Link/External Loopback.

Intel Network Test – Uses the following functions to test the various features of the adapter:

- Device Registers - Tests the memory regions of the adapter’s main registers.
- Intel Network Link External/Loopback Test – Checks the adapter’s ability to send and receive data through its external jack.

Note: Before running this test on all 10/100 Ethernet adaptors, you must connect the adapter to either a LAN or RJ45 external loopback plug. Before running this test on all Pro/1000 Gigabit adapters, you must connect the adapter to a LAN.

SCSI Fixed Disk Tests

This category tests the SCSI hard disk controller, the SCSI drive mechanism and the disk surface itself. PC-Doctor tests all installed SCSI fixed disks. Each drive has their own drive number that is given to BIOS as the Fixed Disk Test runs the read/seek operations. In order to run the SCSI Fixed Disk Test you must load the proper SCSI and ATAPI drivers.

You can individually configure the test settings for the first three disks (Disk ID’s 0, 1, 2). Tests for remaining disks (ID 3 and above) are identical to settings for Disk ID 3. Additional disk testing is available in the Utilities category under the heading Surface Scan Hard Disk. This Utility function includes destructive Write/Read and Write/Verify tests (Factory/Service Center Only). The following are the access paths that the SCSI Fixed Disk Test uses:

Tests that use BIOS Access

Most all test functionality is accessible through BIOS. Failure analysis includes direct hard drive controller access (if the drive is IDE).

Test Duration

Use the following table to determine the elapsed time (HH:MM:SS) for each test. Test times will vary depending on the size of the tested drive:

Table 14: Estimated Test Times for SCSI Fixed Disk Tests

Test	Duration
Controller	0:00:01
Read Surface Scan	2:35:00 (373GB RAID array)
Hi-Low Seek	0:00:01

Test	Duration
Funnel Seek	0:02:09
Track To Track Seek	0:00:10
Random Seek	0:00:03
Linear Verify	0:08:57
Random Verify	0:00:32

Test Descriptions

Controller

The internal diagnostic test of the SCSI fixed disk controller is performed 5 times. Then the drive is reset. If an error is detected, reports FAILED in the test log.

Note: Depending on the version of PC-Doctor, this function may report a Data Loopback Error if the hard disk has never been low-level formatted or partitioned (such as by DOS FDISK.EXE). If this occurs, partition the drive and retest.

Hi-Low Seek

The Hi-Low Seek test verifies a SCSI fixed disk drive’s actuator arm can accurately move the read/write heads to specific locations on the disk media. SCSI Fixed disk drive read/write heads are moved from the lowest to the highest sector number and back. This is repeated 50 times. If the Hi-Low Seek test detects errors with the movement of the drive heads, it will log a test result of FAILED and report additional details in the test log.

Funnel Seek

The Funnel Seek test verifies a SCSI fixed disk drive's actuator arm can accurately move the read/write heads to sector locations in a funnel fashion across the disk media. It moves the drive read/write heads from the first track (track 0) to the last track, then from the second track to the second to the last track, then from the third track to the third to the last track, and so on. If the Funnel Seek test detects errors with the movement of the drive heads, it will log a result of FAILED and report additional details in the test log.

Track To Track Seek

The Track to Track Seek test verifies a SCSI fixed drive's actuator arm can accurately move the read/write heads to sequential locations on the disk media. It moves the drive read/write heads from track 0 to the maximum track one track at a time. If the Track To Track Seek test detects errors with the movement of the drive read/write heads, it will log a result of FAILED and report additional details in the test log.

Random Seek

The Random Seek test verifies a SCSI fixed drive's actuator arm can accurately move the read/write heads to random locations on the disk media. It moves the drive read/write heads to random sectors for 300 repetitions. If the Random Seek test detects errors with the movement of the drive read/write heads, it will log a result of FAILED in the test log and report additional details in the test log.

Linear Verify

Verify tests are similar to seek tests, except that in addition the sector data is read and a CRC checksum is calculated for the data and compared with the CRC value stored on the media for the sector from which the data was read. The linear verify test checks all tracks on the disk media in sequence. If errors are detected, the track number is reported in the test log.

Note: Failed track should also be flagged as “Bad” in the DOS File Allocation Table (FAT) assuming the disk is formatted in DOS. To see if DOS is aware of failed disk tracks, run the Surface Scan Hard Disk function on the PC-Doctor for DOS Utility menu.

Random Verify

Verify tests are similar to seek tests, except that in addition the sector data is read and a CRC checksum is calculated for the data and compared with the CRC value stored on the media for the sector from which the data was read. The random verify test checks 300 random tracks on the disk media. Verify errors are reported in the test log.

Note: Failed track should also be flagged as “Bad” in the DOS File Allocation Table (FAT) assuming the disk is formatted in DOS. To see if DOS is aware of failed disk tracks, run the Surface Scan Hard Disk function on the PC-Doctor for DOS Utility menu.

Read Surface Scan

Scans the entire drive under test by reading data from a configured number of sector blocks. This test ensures that data can be transferred from the drive to the host controller. If any errors occur, PC-Doctor for DOS records them in the test log and logs the test as **Failed**.

Serial Port Tests

This category tests the internal functions of the serial chips as well as the connectivity of the 9-pin and 25-pin serial ports. Testing of Universal Serial Bus (USB) is performed in the Systemboard category. PC-Doctor tests up to four serial ports. The following are the access paths that Serial Port tests use to test each device:

Tests that use Direct Access

All tests use direct access

Test Duration

Use the following table to determine the elapsed time (HH:MM:SS) for each test.

Table 15: Estimated Test Times for Serial Port Tests

Test	Duration
Registers & Interrupts	0:00:01
Internal Loopback	0:00:13
External Loopback	0:00:13
FIFO Buffers (16550A)	0:00:13

Test Descriptions

Registers And Interrupts

Pattern tests serial port baud rate divisor register, divisor latch access bit, line control register, modem control register, and makes sure the port can interrupt the system. If errors are detected, the location of it is displayed.

Internal Loopback

This function tests the serial port for proper operation when internal loopback is active. 96 characters are transmitted at the following speeds (bits per second): 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. Since interrupts are not possible during internal loopback, PC-Doctor polls the serial port for received characters.

This test also checks for the correct operation of RTS, DTR output, the CTS and DSR input, and the change indicators for CTS and DSR. Errors for transmission tests are listed with the baud rate, number of characters sent and received, and an error message if the received data does not match the sent data. RTS, DTR, CTS and DSR are listed by name if one of them should fail.

External Loopback

This function tests the serial port for proper operation using the serial port external loopback adapter. 96 characters are transmitted at 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bits per second. Data is received using the interrupt of the serial chip.

Correct operation is also checked for the RTS, DTR output, the CTS and DSR input, and the change indicators for CTS and DSR. Errors for transmission tests are listed with the baud rate, number of characters sent and received, and an error message if the received data does not match the sent data. RTS, DTR, CTS and DSR are listed by name if one of them should fail.

See Appendix B for information about how to use the PC-Doctor serial port loopback adapter with this test.

FIFO Buffers (16550A)

This test checks performance of the First In First Out (FIFO) buffered serial port (16550A chips) in internal loopback mode. 96 characters are transmitted at 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bits per second. Characters are written as a set of 14 at a time to check the FIFO capability. FIFO interrupt limit is set to 14 characters, but because internal loopback disables interrupts, the test polls for the interrupt state.

In addition, correct operation is checked for the RTS, DTR output, the CTS and DSR input, and the change indicators for CTS and DSR. Errors for transmission tests are listed with the baud rate, number of characters sent and received, and an error message if the received data does not match the sent data. RTS, DTR, CTS and DSR are listed by name if one of them should fail.

Systemboard Tests

This category tests the major systemboard components: BIOS, RTC, IRQ, keyboard, external cache, etc.

Systemboard Test Access Path

The following is the access path that Systemboard tests use to test each device.

Tests that use Direct Device Access

Tests that use BIOS for Device Access

BIOS Timer
PCI Bus: Access through PCI BIOS
USB Port
USB External Loop

Test Duration

Use the following table to determine the elapsed time (HH:MM:SS) for each test.

Table 16: Estimated Test Durations for Systemboard Tests

Test	Duration
System Timer	0:00:01
BIOS Timer	0:00:03
IRQ Controller	0:00:01
DMA Channels	0:00:01
RAM Refresh	0:00:01
RTC Clock	0:00:03
CMOS RAM	0:00:03
Keyboard	0:00:03
PCI Bus	0:00:01
USB Port	0:00:01
External Cache	0:00:02
USB Port External Loopback	0:00:10

Test Descriptions

System Timer

This test confirms that all three system timers are counting correctly. The control lines of the freely programmable clock 2 are also tested. If the tests fail, the source of the error is listed.

BIOS Timer

This test checks the BIOS timer for correct operation in three ways: the generation of IRQ 0, the generation of software interrupt 1CH and correct roll-over at date change (i.e. change of the counter to 0 at midnight).

IRQ Controller

This test checks the IRQ controllers' mask register, request register, in-service register, poll command, nonspecific EOI command and specific EOI command. If errors are detected, the failed functions are listed.

DMA Channels

This test checks the DMA controllers for proper operation. First, DMA registers and page registers are pattern tested. Second, a DMA read and a write transfer is performed. If errors are detected, the failed operation and channel number is listed.

Note: On PC/XT's, page registers are write only and thus can't be tested.

RAM Refresh

This test checks a bit of the PC/AT 8042 keyboard controller that indicates if RAM Refresh is occurring. If the bit does not change state, an error is displayed.

RTC Clock

The Real Time Clock (RTC) of PC/AT class computers is tested for time updates, periodic interrupt, alarm interrupt, time/date rollover, and accuracy. If errors are detected, the failed functions are listed.

External Cache

Also known as the L2 or level 2 cache test, this tests the off-CPU cache memory available to the CPU. External cache test issues are reported as parity errors or pattern failures.

CMOS RAM

PC-Doctor for DOS writes test patterns to addresses 10H-3FH of the nonvolatile Real Time Clock (RTC) CMOS RAM. Upon completion of writing patterns to CMOS RAM, PC-Doctor for DOS performs a checksum count of the contents to verify the test patterns were written correctly. If PC-Doctor for DOS detects any errors, it reports the failed functions in the test log.

👉 **Note:** If remote testing is detected by way of EBDA 40:B4 Bit 1 or EBDA 40:E4 Bit 7, then the test will return N/A and log the following message: “This test is not available during remote testing.”

Keyboard

The keyboard interface is tested with the built-in keyboard self-test and a function to test the keyboard IRQ. If the keyboard controller chip is PC/AT (8042) compatible, a controller and interface self-test is initiated. Failed steps are listed.

👉 **Note:** If remote testing is detected by way of EBDA 40:B4 Bit 1 or EBDA 40:E4 Bit 7, then the test will return N/A and log the following message: “This test is not available during remote testing.”

PCI

This is a test of the PCI bus. All PCI devices are detected and their configuration space checked. A failure will be generated if no devices are detected, or there are problems checking the configuration spaces for the devices.

USB Port

This test uses PCI to search for the presence of USB BIOS devices using the UHCI interface (Intel chipsets) via PIIX4 and LPT port. PC-Doctor for DOS talks directly to the USB controller to get this information If found, a register check is then performed.

USB Port External Loop

This test verifies the system can successfully communicate with external USB devices. This is accomplished by determining the total number of available USB ports and correctly identifying ports that are populated with an external USB device.

Setting up the USB Port External Loop Test

Before running this test, you will need to adjust the `USBTEST.INI` file to match your USB port configuration.

The following instructions will guide you in modifying the `USBTEST.INI` file to support your USB port configuration.

1. In the `USBTEST.INI`, ensure the value of the iUsingUSBwrap parameter is set to 0.

   This parameter is used to switch between using any standard USB device or the PC-Doctor USB/parallel port loopback adapter to conduct testing. The default value is 0 (can use any standard USB device to conduct testing).

2. Locate the szPortMask parameter.

   The szPortMask parameter allows you to define a bit mask for your USB port configuration. The bit mask is then used as a filter to determine if a port is tested or not tested.

> **Note:** For more information on using bit masks, SEE ALSO *Determining and Using Bitmap Values* on page 36.

3. In some systems, PC-Doctor will detect USB devices that are not attached to an external USB port. For example, PC-Doctor may detect a USB keyboard on a laptop as a USB device. Since the USB port the keyboard is connected to is an internal USB port, it can not be tested with the USB Ports External Loop Test. You will need to define the szPortMask to filter out the ports you do not want to test.

   To figure out which values in the bit mask represent the different ports in your system:

   a) Plug a USB device into all the ports you want to test.
   b) Under the **Interactive Tests** menu, run the **USB Loopback Test**.
   c) Make note of all the controller/ports that identify a USB device.
   d) Unplug all of the USB devices from the ports.
   e) Run the **USB Loopback Test** again.

      Any USB port/controller populated with a USB device is an *internal* USB port. Since this test is designed for external USB devices, you will want to mask out (filter) any internal USB port using your bit mask.

   f) Make note of the USB controller/ports still showing as active.

      This will give you a clear indication of which USB ports are internal (not supported by this test) and external (supported by this test).

4. Modify the szPortMask parameter value so that the ports you identified as internal are filtered from testing.
5. Save the `USBTEST.INI` file.

The USB Ports External Loop Test should now run without error.

> **Note:** The USB Ports External Loop Test (located in the **Diagnostics** menu) and the USB Loopback Test (located in the **Interactive Tests** menu) are the same test. The reason for this is so you can include the USB Ports External Loop Test in a test script. Diagnostics contained by the **Interactive Tests** menu can not be included in a test script.

Video Adapter Tests

This category checks the main functions of the video adapter. All types of video RAM are checked: SGRAM, WRAM, etc.The following are the access path that Video Adapter tests use to test each device:

Tests that use direct device access

Video Memory: Accesses BIOS for video mode selection. Direct access for memory
VGA Controller Registers
VGA Color DAC Registers

Tests that use BIOS for access

Video Pages

Test Duration

Use the following table to determine the elapsed time (HH:MM:SS) for each test.

Table 17: Estimated Test Durations for Video Adapter Tests

Test	Duration
Video Memory	0:02:43
Video Pages	0:01:05
VGA Controller Registers	0:00:07
VGA Color-DAC Registers	0:00:05

Test Descriptions

Video Memory

The Video Memory Test flips through all possible video modes and fills the video buffer with 18 test patterns. On VESA Super-VGA adapters, all VESA compliant video modes are tested as well. The test obtains a list of available video modes through the VESA BIOS and switches to each one, writing to and then reading back test patterns. Using VESA calls, one full screen of memory is tested for each video mode as a single block. All video memory on the card is tested. If the Video Memory Test reads back a different value than the written value, it logs as **Failed**. If errors are detected, the mode and memory plane (if it is a multi-planed display mode) are recorded in the test log.

Note: The Video Memory Test looks for VGA compatible adapters, and only tests the standard VGA memory addresses.

Video Pages

The Video Pages Test flips through all possible video modes and pages, and fills the video buffer with the page number. The test flips the pages back starting with 0 and reads the first character on screen. If the character does not match the page, the test logs as **Failed**. For VESA Super-VGA cards, all VESA compliant modes are tested. If errors are detected, the mode and page number is recorded in the test log.

VGA Controller Registers

The VGA Controller Registers Test reads VGA card registers RAM enable, Map Mask Register, Data Rotate Register and Read Map Select Register. If the test detects any errors, it logs as **Failed** and the name of the register is recorded in the test log.

VGA Color-DAC Registers

The VGA Color-DAC Registers Test reads VGA color-DAC registers in mode 13H (320x200 in 256 colors) for all possible values. Only the standard 6-bit register values are used (262144 different color values). If the test detects an error, it logs as **Failed** and the register number is recorded in the test log.

Optical Drive Read Tests

The Optical Drive Read Test verifies optical drives can successfully move and reposition the drive heads to various locations on the test media.

In order for testing to begin, suitable test media must be in the tested drive. All tests begin by scanning the inserted media to determine the number of sectors. Since it would take too long to read from every sector, a significant subset of sectors spread over the entire disc are tested. To improve test coverage, use test media with as much data on it as possible.

👉 **Note:** The Optical Drive Read Test will also run with a burned data disc as long as the test media contains some data (CD-R, CD-RW, DVD+R, DVD-R, DVD+RW, DVD-RW, DVD-RAM, HD DVD-RAM, BD-RE).

Funnel Seek Test

The Funnel Seek test verifies the drive actuator arm can accurately move the read/write heads to sector locations in a funnel fashion across the disc. It moves the drive read/write heads from the first track (track 0) to the last track, then from the second track to the second to the last track, then from the third track to the third to the last track, and so on. If the Funnel Seek test detects errors with the movement of the drive heads, it will log a result of **Failed** and report additional details in the test log.

Insert Media Test

This test verifies that tested drives can accurately detect if media has been inserted. If the drive is unable to detect an inserted disc, it logs as **Failed**.

Linear Seek Test

The Linear Seek test verifies the drive actuator arm can accurately move the read/write heads to sector locations, starting with the first track and moving in a linear fashion across the disc. If the Linear Seek test detects errors with the movement of the drive heads, it will log a result of **Failed** and report additional details in the test log.

Random Seek Test

The Random Seek test verifies the drive actuator arm can accurately move the read/write heads to random sector locations. If the Random Seek test detects errors with the movement of the drive heads, it will log a result of **Failed** and report additional details in the test log.

Remove Media Test

This test verifies if the drive can accurately detect if an inserted disc has been removed. If the test is unable to determine a previously inserted disc has been removed, it logs as **Failed**.

Advanced Memory Tests

This category tests the system Random Access Memory (RAM) in protected mode (PM). Advanced memory tests are similar to standard memory tests except they support testing a much larger configuration of memory (up to 64GB) and will still run in a 32-bit environment.The length of the test depends on the amount of installed memory. All types of memory chips are tested, as are all module types: DRAM, SDRAM, EDO, SIMM, DIMM, SODIMM, and so on. All memory tests also support RAMBUS memory, checking the RAMBUS configuration and warning of disabled devices or invalid configurations.

Address Fault

This test uses unique addressing to determine if the memory address decoder is prone to specific failures. This is accomplished by controlling the order in which patterns are read and written to memory. The types of failure this test looks for are:

- A disconnected address.
- A misdirected address.
- Multiply selected addresses.
- Multiply selected cells.

Random Pattern Test

This test writes random patterns to each memory cell, then reads that cell and compares what was read with what was written. If an error is detected, the segment address of the failed memory block is recorded in the test log and the test logs as Failed.

👉 **Note:** This test can be used only on Extended Memory.

Extended Advanced Pattern Test

This test fills a memory location with a test pattern, then reads the memory location to verify the pattern was written correctly. When done testing a memory location, it moves on to the next memory location. Test passes occur from the first available memory address to the highest available address and back to the first available address.

This test runs with the CPU in protected mode to provide 32-bit operations. The main differences between the Advanced Pattern and PM Advanced Pattern tests are speed and test coverage. The Advanced Pattern test is much slower than the PM Advanced Pattern test but provides significantly more test coverage..

The main difference between the Short Advanced Pattern test and the Extended Advanced Pattern test is the number of patterns and test phases used. For this reason, the Extended Advanced Pattern will run significantly longer than the Short Advanced Pattern but has the potential to uncover significantly more defects.

Memory Fault

This test uncovers memory bits that are affected by a “stuck-at” fault. Sometimes referred to as a “sticky bit”, a “stuck-at” fault is an error with the memory module circuitry that causes a bit to permanently retain its value when changed. Once the bit obtains a specific value (0 or 1), it will retain this value no matter what is written to the location. This test uncovers “stuck-at” faults by writing a known pattern across all testable memory, then reading and comparing what was read to what was written. If the test detects a mismatch between the written and read data, it records the error in the test log and logs as **Failed**.

Short Advanced Pattern Test

This test fills a memory location with a test pattern, then reads the memory location to verify the pattern was written correctly. When done testing a memory location, it moves on to the next memory location. Test passes occur from the first available memory address to the highest available address and back to the first available address.

This test runs with the CPU in protected mode to provide 32-bit operations. The main differences between the Advanced Pattern and PM Advanced Pattern tests are speed and test coverage. The Advanced Pattern test is much slower than the PM Advanced Pattern test but provides significantly more test coverage..

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Extended Advanced Pattern Test

This test fills a memory location with a test pattern, then reads the memory location to verify the pattern was written correctly. When done testing a memory location, it moves on to the next memory location. Test passes occur from the first available memory address to the highest available address and back to the first available address.

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The main difference between the Short Advanced Pattern test and the Extended Advanced Pattern test is the number of patterns and test phases used. For this reason, the Extended Advanced Pattern will run significantly longer than the Short Advanced Pattern but has the potential to uncover significantly more defects.

Interactive Test Descriptions

Unlike the automated tests, interactive tests require input or interaction from the end user or support technician to assess whether the test passed or failed. The interactive tests are located in the Interactive Tests menu, and include (in the order that they appear on the menu): Keyboard Test, Video Test, Internal Speaker Test, Mouse Test, Joystick Test, Diskette Test, Printer Test, SCSI Test, CD-ROM/DVD Test, Stereo Speaker Test, Maximum System Load Test, and the LCD Panel Test.

PC-Doctor for DOS prompts users to indicate whether a test passed or failed once the test completes. In most cases, this involves the user monitoring the test progress to assess if there are legitimate problems. Once a test completes, users must indicate either “yes” or “no” that the test passed and the results are reported in the test log.

Internal Speaker Test

This test programs the internal speaker to produce a constant sound at the specified frequency, which can be adjusted with certain keyboard keys. The speaker volume should be observed at different frequencies. The lowest possible frequency is 18 Hz; the highest is 30,000 Hz. Use the Cursor Up/Down, Shift- Cursor Up/Down and Page Up/Down keys to change the frequency. Press the ESC key to exit.

Keyboard Test

Keyboard testing centers on the correct operation of the keyboard itself, not the keyboard interface. The Keyboard Test may be executed via PCDRAUTO.INI if the Interactive Test category (INT) has been removed. For keyboards that use USB, PC-Doctor checks every USB controller found on the test unit and talks directly to the controller. When in UHCI USB mode, the test checks for enabling of USB keyboard emulation.

Note: To test the keyboard interface, refer to the non-interactive Keyboard diagnostic test on the Diagnostics Menu.

Keyboard Keys

This function tests that each key on the keyboard registers properly when pressed. PC-Doctor is shipped with definitions for several of the most frequently used keyboard layouts. Press every key in order and verify they register on-screen. When you press a key, the next key to test will blink. You can also observe the scan codes sent by the keys when they are pressed and released. Press the ESC key (or the SPACE BAR) three times to exit.

Keyboard LEDs

This checks the three keyboard LEDs (Num Lock, Caps Lock and Scroll Lock) and their programming interface. The LEDs are lit in eight different combinations (or patterns) as shown on the screen. Press the SPACE BAR to change the next pattern. You may also press the appropriate key to see its status change on the screen. Press the ESC key to exit.

Keyboard Repeat

This test verifies the key repeat signal function is working. Hold down any key until PC-Doctor recognizes the repeat signal. If no repeat signal is detected within 20 seconds, the test aborts automatically.

USB Loopback Test

This test verifies the system can successfully communicate with external USB devices by attempting to loop data through the port.

Video Tests

The Video test analyzes the video adapter and the monitor with four functions:

Character Sets

This test will switch the video adapter to any of the indicated modes and display the standard character set or available colors. Modes can be switched through the mode selection menu, or by pressing Page Up/Down in the test mode. All standard video modes for the indicated adapter will be displayed. If a VESA Super-VGA card is installed, all VESA compliant Super-VGA modes are also available.

- **Character Set Modes 1-13H:** Displays the default character set for the selected mode.
- **Character Set Super-VGA Modes (14H+):** Displays the default character set for the selected mode. The actual number of Super-VGA modes available depend on the capabilities of the specific video adapter.

Color Palettes

This test will switch the video adapter to any of the indicated modes and display the standard character set or available colors. Modes can be switched through the mode-selection menu, or by pressing Page Up/Down in the test mode. All standard video modes for the indicated adapter will be displayed. If a VESA Super-VGA card is installed, all VESA compliant Super-VGA modes are also available.

- **Colors Modes 1-13H:** Displays all colors and color attributes for the selected mode.
- **Colors Super-VGA Modes (14H+):** Displays all colors and color attributes for the selected mode. The actual number of Super-VGA modes available depend on the capabilities of the specific video adapter.

Monitor Quality

This function tests monitor quality through high contrast patterns. If patterns produce monitor distortions, it indicates the monitor has trouble adjusting to the image. Press ESC to exit any of these tests.

VGA Functions

Displays various VGA features.

- Horizontal Pan - move the display by 8 dots.
- Vertical Pan - move the display by 16 dots.
- Display Start Address - demonstrates how the VGA can change the location of the video buffer.
- Split Screen - demonstrates 2 screens in one function.
- Split Screen With Horizontal Pan - demonstrate the 2 screens in one function. This test also performs simultaneous horizontal panning (same as Horizontal Pan, above).
- 512 Display Characters - Switches the VGA to a special mode in which a total of 512 characters are displayed simultaneously. Character codes 256-511 are loaded from the VGA 8x8 character font, which demonstrates the function more dramatically.

For More Information

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