PC-Doctor® 5 for Windows Test Descriptions Guide

Test Descriptions and Test Coverage for PC-Doctor for Windows 5

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PC-Doctor for Windows 5 2000/XP Access Path Diagram

PC-Doctor for Windows 5 uses two general hardware access paths when running under Windows 2000/XP:

- Through the Windows Kernel

- Through a Windows Device Driver

This drawing illustrates PC-Doctor for Windows 5 primary access methods for accessing hardware when running under Windows 2000/XP.
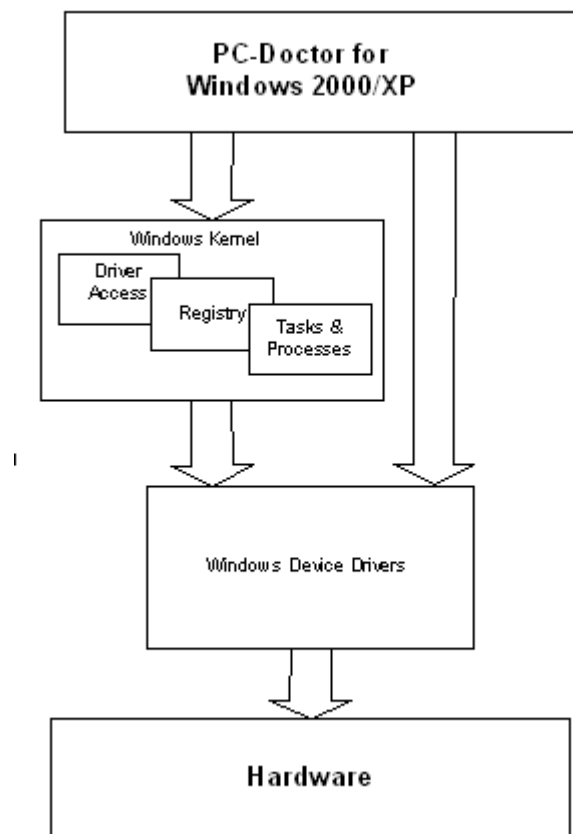
Note In some cases, PC-Doctor for Windows 5 requires access to different devices. For example, the network test requires access to the network card to communicate with the network. For this reason, to install or launch PC-Doctor for Windows 5 you must have administrative privileges.

PC-Doctor for Windows 5 Device Enumeration

Before testing begins, PC-Doctor for Windows 5 checks the system under test and enumerates (identifies and counts) all devices and components. This allows the diagnostics to identify all testable devices and makes device specific testing possible, while also providing useful device information.

PC-Doctor for Windows 5 uses pre-defined properties to identify basic device characteristics it finds in a PC. The test modules use this information to inform the diagnostic engine what tests will run on what devices. The diagnostic engine reports this information to the client program, which records the test results in the test log after running the appropriate tests. PC-Doctor for Windows 5 uses the following four pre-defined properties:

- Caption

- Description

- OS Locator

- HW Locator

Pre-defined Properties of Enumeration
The following briefly describes the four pre-defined properties PC-Doctor for Windows 5 uses:

CAPTION — identifies the device with a "user friendly" label. When Caption information is not available, PC-Doctor for Windows 5 uses the "user friendly" device label from Description.

DESCRIPTION — provides a basic description for the device in the PC. When Caption information is not available, Description displays the "user friendly" label for the device.

OS LOCATOR — identifies what device PC-Doctor for Windows 5 is testing to the Operating System.

HW LOCATOR — identifies the device location in the PC.

PC-Doctor for Windows 5 Test Patterns

Some PC-Doctor for Windows 5 diagnostic modules will write data to a device as part of the test. The test data PC-Doctor for Windows 5 uses is a default set of 18 numbers called "patterns." These patterns are specially designed to simulate worst-case scenarios during testing. The table below displays the test pattern values that PC-Doctor for Windows 5 uses (in order of use, reading horizontally from left to right):

PC-Doctor for Windows 5 Default Test Patterns

0xFFFFFFFF	0x00000000	0xF0F0F0F0
0x0F0F0F0F	0xAAAAAAAA	0x55555555
0x80808080	0x40404040	0x20202020
0x10101010	0x08080808	0x04040404
0x02020202	0x01010101	0x11111111
0x22222222	0x44444444	0x88888888

During testing, PC-Doctor for Windows 5 writes the patterns to the device and reads them back for verification. Tests will write to registers, memory or a storage media depending on the device. If PC-Doctor for Windows 5 does not read the patterns back correctly, it will log an error in the test log.

For non-media tests (such as PCDrMemory, PCDrCPU or PCDrCMOS) the patterns are hard coded and you cannot change the number of patterns the tests use. For storage media tests (such as PCDrHardDrive or PCDrDvdRam), you can configure the number of patterns the tests use, with no limit to the number of patterns you specify. However, the more patterns PC-Doctor for Windows 5 uses, the more test duration increases.

To specify the number of patterns a test will use, change the value for the "NumberOfPatterns=" parameter. You can modify this value for each module through the associated configuration file (.p5i file).

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Test Coverage and Environments

The following is a break down of the life-cycle environments in which PC-Doctor for Windows 5 is used:

- Prototypes and design

- Manufacturing

- End-user support and end-user self-diagnosis

- Field engineering/service engineering

Each of these areas has distinct parameters ranging from test fixtures to requirements. Consideration of prototype, design and manufacturing test environments is not within the scope of this document. In this document, test coverage will focus primarily on considering both the end-user support, end-user self-diagnosis and the field engineering/service engineering testing environments.

End-user support and end-user self-diagnosis

The purpose of end-user diagnostic testing is to aid a technical support call or enable an end-user to diagnose hardware issues on their own. The primary purpose of diagnostic tools for end-user diagnosis is to give an accurate and consistent analysis of hardware failures enabling a more efficient resolution process.

Field engineering/service engineering

Field engineering/service engineering generally deals with the error log files that end-user self-diagnosis produces. However, performing thorough quality assurance using concepts of manufacturing level diagnosis is crucial prior to releasing "fixed" products back to customers. Complete coverage is ideal for this environment even if it comes at the price of lengthier testing. Lengthier testing is most important for refurbishment operations because the intention is to ship functional "like new" product, even if the refurbished hardware was originally returned for functional problems.

Other test coverage considerations

Defining and determining the criteria for effective test coverage is difficult. Different factors affect test coverage for a device such as:

- Built-in hardware or software support for diagnostic testing

- Availability of test fixtures (such as loopback adapters)

- Available time for testing

- Availability of evaluation hardware and its release state (is it available in prototype or pre-production form only?)

- Different ways the device exists in the field (device permutations)

- General user knowledge of the device under test.

Please note that PC-Doctor for Windows 5 has the built-in capability for 100% coverage of all components. Environment specific variables and feature requirements affect the values that are shown as less than 100%. The criteria for test coverage in this document is subjective based on an analysis of past issues, measured diagnostic effectiveness and perceived capabilities. Measured effectiveness is based on known false negative cases, and in the case of the end-user environment, on false-positives. Research into test coverage assessment is ongoing and will continue with the goal of achieving a reasonable consensus for what defines effective test coverage for a device.

Test Duration Times

The test duration time is an approximation of the amount of time for each test run in Normal test mode. The following are the base line system specifications used for determining test duration times:

- Intel Chipset P4 2.4GHz CPU

- 512MB/133 RAM

- Toshiba 30GB hard drive

- HL-DT-STCD-RW/DVD drive

- Intel852-chipset video

- Sigam Tel-C audio

- On-board Pro/1000 NIC

- Microsoft, Windows, XP Home

The test duration times this document lists are only representations of typical test times. They are an approximation of how much time to expect when running tests on a similar machine. Actual testing times will vary depending on the specific computer's hardware configuration. Other factors that may effect test duration times are test environment variables such as the amount of data that is on DVD, CD or tape media used for testing.

PC-Doctor for Windows 5 Configuration Files

Each PC-Doctor for Windows 5 diagnostic module has a corresponding configuration file, also known as a p5i file. Each configuration file has the same name as the associated module. For example, the PCDrCPU.p5i file is the configuration file for the PCDrCPU diagnostic module. Configuration files enable you to control testing functionality and performance by specifying values for test parameters (also called "keys"). In each p5i file, you will find descriptions of the module's available configuration parameters. Each p5i file contains one or more parameters with values that you can modify.

Any line in a configuration file beginning with a pound sign (#) is disabled. Use pound signs to create comment lines for informational purposes about the configuration file. You can edit any PC-Doctor for Windows 5 p5i file with any text editor, such as Notepad. Use integer values or boolean expressions as required for specifying parameters. For example, the parameter "Enabled=true" enables a PC-Doctor for Windows 5 test, whereas a value of "false" disables a PC-Doctor for Windows 5 test.

Non-Interactive Diagnostic Module Descriptions

Non-Interactive Modules run without direct user interaction. The user starts the module and nothing else is required of the user to complete testing. PC-Doctor for Windows 5 performs the tests in the module automatically and then records the test result in the test log. Interactive tests require user interaction before testing is complete. See the section "Interactive Diagnostic Module Descriptions" later in this document for more information on Interactive tests.This section details the available non-interactive diagnostic modules in PC-Doctor for Windows 5.

Note Although this document details all available PC-Doctor for Windows 5 modules, some modules or tests may not appear in your build. Contact *support@pc-doctor.com* for information on defining build requirements and customizing PC-Doctor for Windows 5 builds.

IEEE 1394 Module

The PCDr1394 module has two tests for the IEEE 1394 bus architecture. The diagnostic begins by loading the PCDRSRVC.SYS for computers that run Windows 2000/XP.

Note PC-Doctor for Windows 5 enumerates a device physically attached to the 1394 bus even if the power on the device is turned off.

Test Descriptions:
Controller Config ROM test
This test displays controller information and verifies that each detected controller for each 1394 bus device has a valid CRC value. If the Controller Test finds controllers for each bus device, it queries the controller config ROM for information. The test then obtains the CRC directly from the controller config ROM and checks its value against a freshly computed value. For some older 1394 controllers, the CRC is computed using an outmoded algorithm. If the computed CRC does not match the CRC read from the controller config ROM, the test uses the older method of computing the CRC. If the old method succeeds, the test logs as PASSED.

Bus Reset Test
The Bus Reset Test uses the bus reset generation count to verify the 1394 bus is operating properly. The test resets the 1394 bus, captures the bus reset generation count, and then resets it again. It then compares the final bus reset generation count to the previous reset count to see if there is an increase in the value. If the final count value is less than the previous reset count, the test logs as FAILED.

2D/3D Video Module

This module checks 2-D and 3-D video functionality. Using the DirectX API, the PCDr2D3DVideo module uses the 2-D component of DirectX (DirectDraw) and the 3-D component of Direct X (Direct3D) to test this functionality. To test 2-D functionality, the module uses a video memory test, line draw test and polygon draw test. For 3-D functionality, it uses a texture mapping and 3-D test.

The PCDr2D3DVideo Module begins by determining which video modes the video card and monitor support. The recommended and default screen resolution for this module is 640 X 480, at 8, 16, 24, and 32 bit depths.

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Each test checks the DirectX return values to verify successful execution. If the return value is different than the value PC-Doctor for Windows 5 expects, the wrong video driver might be installed on the PC, or Direct X is incorrectly configured. In such cases, PC-Doctor for Windows 5 records a CANNOT RUN test result in the test log.

The test also checks the data output to the screen to verify correct execution. If the data output value to the screen is different than the value PC-Doctor for Windows 5 expects, PC-Doctor for Windows 5 records FAILED in the test log.

Test Descriptions:

Memory Test

The Video Memory test is a 2-D video test that checks for video memory errors. It uses the 18 data patterns outlined at the beginning of this document to test the video memory available to the video adapter. Each surface is filled with a data pattern, and each pixel's data value is verified. The test repeats this process for each data pattern. The test has an on-screen and an off-screen portion. The off-screen portion differs from the on-screen portion in that it is not apparent to the user. Users are informed via text output displayed onscreen of the current surface tested, the pattern used, and the video mode tested.

Wireframe Line Test

The goal of this test is to apply a significant processing stress on a system's graphic processing unit (GPU) in order to catch defects in the heat dissipation mechanism and catch defects in the driver implementation of the rendering pipeline. This test loads the graphic device with drawing resources, such as textures and vertices, and renders these resources to the screen as often as allowed by the system. In this scenario, the test renders Earth's solar system in a textured wireframes to stress test the GPU while testing the video driver's line drawing capability.

If a system does not have a GPU, the test will run on the video driver's software emulation of the GPU.

Note The test is available only on systems with DirectX 9.0 and above.

Fixed Transformation and Lighting Test

The goal of this test is to apply a significant processing stress on a system's graphic processing unit (GPU) in order to catch defects in the heat dissipation mechanism and catch defects in the driver implementation of the rendering pipeline. This test loads the graphic device with drawing resources, such as textures and vertices, and renders these resources to the screen as often as allowed by the system. In this scenario, the test renders a fully textured version of the Earth's solar system to stress test the GPU while testing the video driver's line drawing capability.

If a system does not have a GPU, the test will run on the video driver's software emulation of the GPU.

Note The test is available only on systems with DirectX 9.0 and above.

ADSL Module

The PCDrADSL module verifies that an internal ADSL modem is correctly configured. This module contains two tests.

Test Description

Configuration Test

The Configuration Test verifies proper configuration of internal ADSL modems by comparing the modem's configuration to the manufacturer's .DLL file.

Connection Test

The ADSL Connectivity Test verifies that you ADSL modem is properly connected. To run this test, you must make sure the ADSL enabled phone line is plugged into the ADSL modem. If the test is unable to detect ADSL connectivity, it will log as FAILED.

AMD CPU Module

The PCDrAMDCPU module uses test patterns and operands to verify various AMD CPU functions work correctly. If a PCDrAMDCPU test fails, it will report the specific register or operation code that produced the failure in the test log. If a PC has more than one AMD CPU, the PCDrAMDCPU module will enumerate and test all AMD CPUs it detects.

Test Descriptions

AMD FPU Test

This test verifies that AMD CPUs correctly determine Floating Point Units (FPU).

AMD MMX Test

This test verifies that AMD CPUs correctly identify Multimedia Extensions (MMX) commands.

AMD SSE Test

This test verifies that AMD CPUs correctly interpret Streaming SIMD Extensions (SSE) commands.

Audio Module

This module consists of eleven tests that verify sound reproduction capabilities of your sound card and sound card drivers. PC-Doctor for Windows 5 runs all tests in 16-bit stereo playback/sampling mode. Settings for the configuration parameters can be specified for each test by entering values for the appropriate keys in the PCDrAudio.p5i file.

All PCDrAudio tests, with the exception of the CD Audio Cable and the Modem Audio Cable, require a standard "stereo" audio loopback cable. Use of the "mono" line may result in false errors. Use LINE-IN rather than MIC-IN (most microphone inputs are mono, not stereo), and set the left and right channel frequencies to the same value.

Test Descriptions:

Rough Audio Test

This test checks that the overall audio sub-system is functioning correctly.

Card Reader Module

The Card Reader Test verifies that your MulitMediaCard (MMC) is functioning correctly. A MMC is a tiny memory card that uses flash memory to provide portable storage among various devices. There are currently a wide range of devices that use MMCs such as car navigation systems, cellular phones, eBooks, PDAs, smartphones, digital cameras, music players, video camcorders, and

personal computers to name just a few. MMCs weigh approximately two grams and are about the size of a postage stamp. This is similar to the Secure Digital (SD card), and smaller than older memory card formats, such as the SmartMedia card and CompactFlash (CF card).

There are two tests available in the Card Reader module: Patterns Test, and Scan Test. The following is a description of the two tests.

Test Descriptions:

Scan Test

This test starts by checking for proper media and prompts for proper media if it is unable to detect it. It then attempts to access memory locations on the MMC in a linear fashion, moving from one memory location to the next until the entire card is tested. If the Scan Test is unable to access any of the tested memory locations, the Scan Test logs as FAILED.

Patterns Test

This test is used to determine if the MMC is recording data correctly and starts by checking for proper media, prompting for proper media if it is unable to detect it. For each memory location to test, the test first saves the original contents of the location. The test writes a data pattern to the MMC memory locations (how many patterns and which patterns the test will use are configured in the PCDrPCCardReader.p5i). The test then attempts to read the data pattern written to the memory location. If the test reads a different data pattern then the one that was written, it will log as FAILED. When the test completes testing of a memory location, it restores the original contents and moves on to the next memory location.

! WARNING ! Although this test will restore data upon competition of testing, PC-Doctor for Windows 5 recommends that you use media with unimportant data.

CD Drive Module

The PCDrCdDrive module tests a CD drive's capability to move and reposition the drive heads to various locations on the disc media, tests for defects on the inserted disc media and that CD audio is functioning correctly. The PCDrCDDrive module enumerates and tests drives that support CD-ROM media. However, PCDrCDDrive will also run with a burned CD data disc (CD-R or CD-RW) as long as there is data on the disc. In order for testing to take place, you must have suitable disc media present in the drive.

Three types of tests are available:

- Seek — tests the capability of the CD drive's laser assembly and track-ing mechanism to access various locations on the disc media.

- Read Compare — tests the drive's data reading functions.

- CD Audio — tests that the drive transmits audio correctly when reading audio CDs.

All of the seek tests divide the inserted disc media into logical blocks and ignore track designations. In most cases, logical blocks correspond to "sectors". The actual size and format of logical blocks varies depending on the type of data that is stored there. All tests begin by scanning the inserted media to determine the number of logical blocks.

Test Descriptions:

Linear Seek Test

In order to perform this test you must have a valid CD in the drive. The Linear Seek test verifies a CD drive's capability to move and reposition the drive heads to specific locations on the disc media in a linear sequence. The specific locations on the disc media correspond to logical blocks on the disc, which the Linear Seek Test accesses one block at a time. If the Linear Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrCDDrive.p5i. Test times are not affected by the amount of data on the disc.

Random Seek Test

In order to perform this test you must have a valid CD in the drive. The Random Seek test verifies a CD drive's capability to move and reposition the drive heads on the disc media by moving them to random logical blocks on the disc. If the Random Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrCDDrive.p5i. Test times are not affected by the amount of data on the disc.

Funnel Seek Test

In order to perform this test you must have a valid CD in the drive. The Funnel Seek Test verifies a CD drive's capability to move and reposition the drive heads on the disc media by moving them in a funnel fashion across the disc media. The drive heads start from the first logical block on the drive and repositions to the last logical block. The Funnel Seek Test then moves the drive heads to the second logical block and repositions them to the second to last logical block, then to the third logical block and third to the last logical block, and so on. The Funnel Seek Test continues in this fashion until it has tested the specified range of logical blocks. If the Funnel Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrCDDrive.p5i. Test times are not affected by the amount of data on the disc.

Linear Read Compare Test

In order to perform this test you must have a valid CD in the drive. The Linear Read Compare Test verifies a CD drive's ability to correctly read data from a CD. The test performs a linear read operation across each sector on the disc. The test then reads each sector a second time and compares the value read with the value attained from the first read. If the two values read do not match, the test records the error in the test log. You can specify the percentage or range of logical blocks to test in the PCDrCDDrive.p5i, which is not affected by the amount of data on the disc.

CD Audio Test

This is an interactive test that verifies the CD drive can play audio CDs, that the audio cables are connected correctly, and that the speakers transmit sound.

CD-RW Module

The PCDrCDRW module tests the ability of CD rewritable (CD-RW) drives to write and read data correctly to CD-RW disc media. The test enumerates and tests only those drives that support the writing of CD-RW discs. For testing to take place, a valid CD-RW disc must be in the drive. Using invalid media (non CD-RW discs, CD-RW discs with audio tracks, or CD-RW discs closed improperly the last time data was written to them) causes the CD-RW test to halt testing and log a result of N/A or FAILED in the test log.

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Test Descriptions:
Read Write Test
This test verifies the CD-RW drive's ability to accurately write and read test data to a CD-RW disc by writing test data to blocks on the disc and reading it back to verify the data was written correctly. To run this test, you must insert a CD-RW disc in the drive under test.

! WARNING ! This test will erase any previously existing data on the CD-RW disc

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CMOS Module

CMOS is a semiconductor fabrication technology using a combination of n- and p-doped semiconductor material to achieve low power dissipation. In CMOS technology, Positive (P-type) and Negative (N-type) transistors use each other in a complementary way to form a current gate that forms an effective means of electrical control.

CMOS transistors use almost no power when not needed. As the current direction changes more rapidly, however, the transistors become hot. This characteristic tends to limit the speed at which microprocessors can operate.

This module tests the integrity of the CMOS memory by writing and reading data patterns, and by performing a CRC count comparison.

Test Descriptions:
Checksum Test
This test scans CMOS memory and calculates a cyclic redundancy check (CRC) of the bytes read. CMOS memory is read through the device IO control interface.

Patterns Test
Test writes and reads patterns to the CMOS memory, comparing the test patterns that were written to those read back. CMOS memory is read through the device IO control interface. Any errors are reported. The CMOS memory contents are saved before testing begins and replaced after testing is completed.

CPU Module

This module tests the various functions of the CPU and math coprocessor. All CPU registers, arithmetic, string commands, logic operations, math registers and MMX commands are tested for proper operation using test patterns and operands (see test descriptions below). In the case of a failure, the specific register or operation code is reported in the test log. If the system contains multiple CPUs, all are tested.

Moreover, the PCDrCPU Module supports processors such as Intel's Xeon with Hyper-Threading Technology (i.e., a single CPU that operates as two logical processors that can execute different tasks concurrently).

Test Descriptions:
Register Test
The CPU registers test uses the default test patterns defined above. If errors are detected, the failed registers are listed. Tests verify the proper operation of string moves, the proper function

of arithmetic commands with 32-bit operands (ADC, ADD, DEC, DIV, IDIV, IMUL, INC, MUL, SBB and SUB) and the proper operation of logical operations CMP and TEST

Math Test
Tests coprocessor register stack, pointers and commands (both arithmetic and transcendental). Tests coprocessor commands:

• FADD	• FMUL	• FNOP	• FPTAN
• FDIV	• FSUB	• FSTCW	• FYL2X
• FIADD	• FCLEX	• FSTSW	• FYL2XP1
• FIDIV	• FFREE	• FWAIT	
• FIMUL	• FINCSTP	• F2XM1	
• FISUB	• FINIT	• FPATAN	

If errors are detected, the failed steps and commands are listed.

Level 2 Cache Test
PC-Doctor for Windows 5 implements special system RAM testing that indirectly tests Level 2 cache memory as it is performed. Various sized blocks of RAM are accessed using the eighteen test data patterns that exercise multiple bit combinations (for example, FFFFFFFF, 00000000, F0F0F0F0, 0F0F0F0F). The RAM accessed in this way forces the CPU to repeatedly access the Level 2 cache memory. As the test data is passed through the cache memory, the Level 2 cache itself is tested. The Level 2 cache is reported defective if a bit combination written to RAM does not match the bit combination read back. Any failures are indicated by test-block type and locations.

MMX Test
Tests the following sets of MMX commands:

• PADD, PSUB, PMUL and PMADD

• PAND, PANDN, POR and PXOR

• PSLL and PSRL

• MOVD and MOVQ

• PCMPEQ, PCMPGT, PACKSS, PACKUS, PUNPCKLH and PUNPCK

If errors are detected, the failed commands are listed.

SSE Test
Tests the following sets of SSE specific commands:

• MOV, ADD and SUB

• MUL and DIV

• AND, ANDN, OR and XOR

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- SQRT, MAX and MIN

- RCP, RSQRT, SHUFPS, UNPCK, CMP, COMISS and UCOMISS

- CVT, PEXTRW and PINSRW

- PMAXUB and PMINUB

- PMULHUW, MOVNTPS, PREFETCH, LDMXCSR and STMXCSR

If errors are detected, the failed commands are listed.

The test will also intensely exercise all eight of the 128-bit XMM registers. In addition, there are certain conversion functions, which will exercise a single MMX register in conjunction with the XMM registers. The conversion functions (CVT) that use both the MMX register and the XMM registers are cvtps2pi and cvtpi2ps

Note This test is dependent on an SSE capable processor, such as the Intel Pentium III's and newer. Also, some newer AMD CPUs are possibly SSE capable.

SSE2 Test
Tests the following sets of SSE2 specific commands:

- MOV, ADD and SUB

- MUL and DIV,

- AND, ANDN, OR and XOR

- SQRT, MAX and MIN

- SHUFPD, UNPCK,CMP, COMISD and UCOMISD

- CVT, PADD and PSUB

- MOVDQ2Q and MOVQ2DQ

- PSLLDQ and PSRLDQ

If errors are detected, the failed commands are listed.

Like the SSE Test, this test also intensely exercises all eight of the 128-bit XMM registers. In addition, there are certain conversion functions, which will exercise a single MMX register in conjunction with the XMM registers. The conversion functions (CVT) that use both the MMX register and the XMM registers are cvtpd2pi and cvtpi2pd.

Note This test is dependent on an SSE2 capable processor, such as the Intel Pentium IV's and newer.

DVD Drive Module

The PCDrDvdDrive module tests the DVD-ROM drive's capability to move and reposition the drive heads to various locations on the disc media and tests for media defects. The PCDrDVDDrive

module can test only non-blank DVD-ROM discs and therefore requires a DVD disc with data in the drive. DVD data discs (not audio or video) that are either burned or stamped media are acceptable for testing.

Two types of tests are available:

- Seek — tests the capability of the DVD drive's laser assembly and tracking mechanism to access various locations on the disc media.

- Read Compare — tests the drive's data reading functions..

All of the seek tests divide the inserted disc media into logical blocks and ignore track designations. You can assume that the logical blocks correspond to "sectors" in most cases. The actual size and format of logical blocks varies depending on the type of data that is stored there. All tests begin by scanning the inserted media to determine the number of logical blocks. The range or coverage of actual logical blocks tested can be specified in the module's configuration file.

Test Descriptions:

Linear Seek Test
In order to perform this test you must have a valid disc in the drive. The Linear Seek test verifies a DVD drive's capability to move and reposition the drive heads to specific locations on the disc media in a linear sequence. The specific locations on the disc media correspond to logical blocks on the disc, which the Linear Seek Test accesses one block at a time. If the Linear Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrDvdDrive.p5i. Test times are not affected by the amount of data on the disc.

Random Seek Test
In order to perform this test you must have a valid disc in the drive. The Random Seek test verifies a DVD drive's capability to move and reposition the drive heads on the disc media by moving them to random logical blocks on the disc. If the Random Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrDvdDrive.p5i. Test times are not affected by the amount of data on the disc.

Funnel Seek Test
In order to perform this test you must have a valid disc in the drive. The Funnel Seek Test verifies a DVD drive's capability to move and reposition the drive heads on the disc media by moving them in a funnel fashion across the disc media. The drive heads start from the first logical block on the drive and repositions to the last logical block. The Funnel Seek Test then moves the drive heads to the second logical block and repositions them to the second to last logical block, then to the third logical block and third to the last logical block, and so on. The Funnel Seek Test continues in this fashion until it has tested the specified range of logical blocks. If the Funnel Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrDvdDrive.p5i. Test times are not affected by the amount of data on the disc.

Linear Read Compare Test
In order to perform this test you must have a valid disc in the drive. The Linear Read Compare Test verifies a DVD drive's ability to correctly read data from a disc. The test performs a linear read operation across each sector on the disc. The test then reads each sector a second time and compares the value read with the value attained from the first read. If the two values read do not match, the test records the error in the test log. You can specify the percentage or range

of logical blocks to test in the PCDrDvdDrive.p5i, which is not affected by the amount of data on the disc.

DVD-RAM Drive Module

This module tests a DVD-RAM drive's capability to move and reposition the drive heads to various locations on the disc media and that the drive writes and reads data correctly. It also tests for defects on the inserted disc media. The PCDrDvdRamDrive module enumerates and tests only those drives that support DVD-RAM media. For testing to take place, you must have DVD-RAM disc in the drive.

Three types of tests are run:

- Seek — tests the capability of the DVD-RAM drive's laser assembly and tracking mechanism to access various locations on the disc media.

- Surface Scan — tests for surface defects on the disc media.

- Patterns — tests to ensure the DVD-RAM drive performs read and write operations without error.

All of the seek tests divide the entire disc into logical blocks and ignore track designations. You can assume that the logical blocks correspond to "sectors" in most cases. With logical blocks, the actual size and format of disc sectors varies depending on the type of data that is stored there.

All tests begin by scanning the inserted disc to determine the number of logical blocks. Since it would take too long to read from every logical block, all seek tests scan a subset of logical blocks spread over the entire disc.

Test Descriptions:

Linear Seek Test

In order to perform this test you must have a valid DVD-RAM disc in the drive. The Linear Seek test verifies a DVD-RAM drive's capability to move and reposition the drive read/write heads to specific locations on the disc media in a linear sequence. The specific locations on the disc media correspond to logical blocks on the disc, which the Linear Seek Test accesses one block at a time. If the Linear Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrDvdRamDrive.p5i. Test times are not affected by the amount of data on the disc.

Random Seek Test

In order to perform this test you must have a valid DVD-RAM disc in the drive. The Random Seek test verifies a DVD-RAM drive's capability to move and reposition the drive read/write heads by moving them to random logical blocks on the disc. If the Random Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrDvdRamDrive.p5i. Test times are not affected by the amount of data on the disc.

Funnel Seek Test

In order to perform this test you must have a valid DVD-RAM disc in the drive. The Funnel Seek Test verifies a DVD-RAM drive's capability to move and reposition the read/write heads by moving them in a funnel fashion across the disc. The drive read/write heads start from the first logical block on the disc and repositions to the last logical block. The Funnel Seek Test then

moves the drive heads to the second logical block and repositions them to the second to last logical block, then to the third logical block and third to the last logical block, and so on. The Funnel Seek Test continues in this fashion until it has tested the specified range of logical blocks. If the Funnel Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrDvdRamDrive.p5i. Test times are not affected by the amount of data on the disc.

Linear Read Compare Test
In order to perform this test you must have a valid disc in the drive. The Linear Read Compare Test verifies a DVD drive's ability to correctly read data from a disc. The test performs a linear read operation across each sector on the disc. The test then reads each sector a second time and compares the value read with the value attained from the first read. If the two values read do not match, the test records the error in the test log. You can specify the percentage or range of logical blocks to test in the PCDrDvdRamDrive.p5i, which is not affected by the amount of data on the disc.

Surface Scan Test
This test scans for surface defects on the disc media by performing and verifying read operations on logical blocks. The percentage or range of coverage is specified in the PCDrDvdRamDrive.p5i file. If this test fails, try another disc to verify defective disc media is the cause. A valid DVD-RAM disc must be in the drive.

Patterns Test
This test performs write and read operations on the disc media. A DVD-RAM disc must be in the drive.

DVD+RW Module

The PCDrDvdRw module tests the ability of DVD+RW drives to write and read data correctly to DVD+RW disc media. The test enumerates and tests only those drives that support the writing of DVD+RW discs. For testing to take place, you must have a valid data DVD+RW disc in the drive.

Test Descriptions:
Read Write Test
This test verifies the DVD+RW drive's ability to accurately write and read test data to a DVD+RW disc by writing test data to blocks on the disc and reading it back. Using invalid media (Non-DVD+RW discs, DVD+RW discs with audio tracks, DVD+RW discs closed improperly the last time data was written to them, etc.) causes the test to halt and log a result of N/A or FAILED in the test log.

! WARNING ! This test will erase any previously existing data on the DVD+RW disc.

DVD-RW Module

The PCDrDvdMinusRw module tests the ability of DVD-RW disc drives to ensure the drive writes and reads data correctly. The test enumerates and tests only those drives that support the writing of DVD-RW media. For testing to take place, you must have a DVD-RW disc in the drive.

Test Description:
Read Write Test
This test verifies the DVD-RW drive's ability to accurately write and read test data to a DVD-RW disc, by writing test data to blocks on the disc and reading it back.

! WARNING ! This test will erase any previously existing data on the DVD-RW disc.

Floppy Module

The PCDrFloppy module tests the capability of floppy disk drives to move the drive read/write heads to various locations on the disk media and write/read, and verifies the integrity of the floppy disk media. Both conventional and USB-based floppy disk drives are tested. Multiple floppy drives in one system can be enumerated and tested.

Three types of tests are available:

• Seek — tests the capability of the floppy disk drive(s) read/write heads and actuator to access various locations on a floppy disk.

• Surface Scan — tests for surface defects on a floppy disk.

• Patterns — tests to ensure the floppy disk drive(s) perform write operations without error.

Note Defective disks may cause apparent floppy drive test failures and can lead to incorrect interpretation of test results. If a test reports a failure, run the test again using another disk to confirm test results before concluding the drive itself is defective.

All of the seek tests divide the inserted disk media into logical blocks and ignore track designations. You can assume that the logical blocks correspond to "sectors" in most cases. The actual size and format of logical blocks varies depending on the type of data that is stored there. All tests begin by scanning the inserted disk media to determine the number of logical blocks. The range or coverage of actual logical blocks tested can be specified in the module's configuration file.

Test Descriptions:
Linear Seek Test
In order to perform this test you must have a valid floppy disk in the drive. The Linear Seek test verifies the floppy disk drive's capability to move and reposition the drive heads to specific locations on a floppy disk in a linear sequence. The specific locations the Linear Seek Test accesses correspond to logical blocks on the disk, which the Linear Seek Test accesses one block at a time. If the Linear Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrFloppy.p5i. Test times are not affected by the amount of data on the floppy disk.

Random Seek Test
In order to perform this test you must have a valid floppy disk in the drive. The Random Seek test verifies the floppy disk drive's capability to move and reposition the drive read/write heads by moving them randomly to logical blocks on floppy disk media. If the Random Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrFloppy.p5i. Test times are not affected by the amount of data on the floppy disk.

Funnel Seek Test

In order to perform this test you must have a valid floppy disk in the drive. The Funnel Seek test verifies the floppy disk drive's capability to move and reposition the read/write heads by moving them in a funnel fashion across a floppy disk. The drive read/write heads start from the first logical block on the disk and repositions to the last logical block. The Funnel Seek Test then moves the drive read/write heads to the second logical block and repositions them to the second to last logical block, then to the third logical block and third to the last logical block, and so on. The Funnel Seek Test continues in this fashion until it has tested the specified range of logical blocks. If the Random Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrFloppy.p5i. Test times are not affected by the amount of data on the floppy disk.

Surface Scan Test

This test scans for surface defects on the floppy disk media. The integrity of the disk media is verified by performing read operations to logical blocks. The percentage or range of coverage of logical blocks tested is specified in the configuration file. If this test fails, try another disk to confirm the disk itself is defective and that a defective drive is not the cause. A floppy disk must be inserted in the drive under test.

Patterns Test

This test verifies write and read operations on the inserted disk media using default test number patterns. The default setting for this test is "enabled=true" in the configuration file. A floppy disk must be inserted in the drive under test.

Hard Drive Module

The PCDrHardDrive module tests the capability of hard disk drives to accurately perform movement of the drive heads, write and read operations and verifies the integrity of the hard disk media. All hard disk drives in the system are enumerated and tested. Both IDE and SCSI drives are tested, as are drives in a serial ATA (SATA) RAID configuration.

Three types of tests are run:

- Seek — tests the capability of the hard disk drive's read/write head assembly and actuator arm to access various locations on the hard disk.

- Surface Scan — tests for surface defects on the hard disk media.

- Patterns — tests to ensure the hard disk drive performs read and write operations without error.

Note Specified coverage for seek tests on hard disk drives should be less than 1%. Performing seek operations continuously on a hard disk drive for an extended period of time can cause damage.

All of the seek tests divide the hard disk media into logical blocks and ignore track designations. You can assume that the logical blocks correspond to "sectors" in most cases. The actual size and format of logical blocks varies depending on the type of data that is stored there. All tests begin by scanning the hard disk media to determine the number of logical blocks. The range or coverage of actual logical blocks tested can be specified in the PCDrHardDrive.p5i file.

Short Hard Drive Test

The Short Hard Drive Test consists of six individual SMART and Hard Drive tests; SMART Status test, SMART Short Self-test, Random Seek test, Funnel Seek test , and two Surface Scan tests. The SMART Status test checks the status of predictive failures for IDE and SCSI hard disk drives that support SMART technology. The SMART Short Self-test executes the self-test routine on drives that support off-line data collection (self-test). The Random Seek and Funnel Seek tests check the hard disk controller and read/write heads using random and funnel access methods respectively. The first Surface Scan test scans for surface defects on the inner 5 GB of the hard drive and the second Surface Scan test tests the outer 5 GB. Test duration for the Short Hard Drive Test is less than five minutes. SEE ALSO Test Descriptions

Full Hard Drive Test

The Full Hard Drive Test contains five individual SMART and Hard Drive tests; SMART Status test, SMART Short Self-test, Random Seek test, Funnel Seek test, and one Surface Scan test. The Full Hard Drive Test performs the same testing functions as the Short Hard Drive Test, with the exception of the Surface Scan test checking for surface defects on the entire hard disk media. Consequently, depending on the size of the drive being tested, the Full Hard Drive Test can take 30 min. to 2 hrs. or longer. SEE ALSO Test Descriptions

Test Descriptions:

Linear Seek Test

The Linear Seek test verifies the hard disk controller and the drive read/write heads function correctly by moving and repositioning the drive read/write heads to specific locations on the disk media in a linear sequence. The specific locations on the disk media correspond to logical blocks. The Linear Seek Test moves the drive read/write heads to each logical block on the disk media one block at a time. If the Linear Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrHardDrive.p5i. Test times are not affected by the amount of data on the disk.

Random Seek Test

The Random Seek test verifies the hard disk controller and the drive read/write heads function correctly by moving and repositioning the drive read/write heads to random locations on the disk media. The specific locations on the disk media correspond to logical blocks. If the Random Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrHardDrive.p5i. Test times are not affected by the amount of data on the disk.

Funnel Seek Test

The Funnel Seek test verifies the hard drive's capability to move and reposition the read/write heads by moving them in a funnel or "butterfly" fashion across the disk media. The Funnel Seek Test moves the drive read/write heads from the first logical block on the hard disk media, then to the last, then to the second logical block, then to the second to last, then to the third logical block, then to the third to last, and so on. When the drive reaches the center of the disk media, it continues seeking back to the innermost and outermost logical blocks of the disk media in the same butterfly fashion. If the Funnel Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrHardDrive.p5i. Test times are not affected by the amount of data on the disk.

Surface Scan Test

This test scans for surface defects on the hard disk media by performing read operations to logical blocks. It tests the hard disk controller, the drive read/write heads, and the platter surfaces. The percentage or range of coverage is specified in the PCDrHardDrive.p5i file.

Patterns Test

The Patterns Test checks the hard disk controller and the drive read/write heads by verifying that write and read operations perform correctly. Using default test number patterns, the Patterns Test writes test patterns to a disk sector then reads the sector to verify the data was written correctly. Before writing test patterns, the Patterns Test saves the sector contents and restores them once the test is complete, then moves on to the next sector.

Note This test will not run on hard drives that contain the operating system by default because it overwrites existing data.

LS-120 Drive Module

The PCDrLSDrive module tests the ability of LS-120/240 disk drives to accurately move the drive read/write heads, perform write/read operations to LS-120 and LS-240 disk media and verifies the integrity of the disk media. Both conventional and USB-based drives are tested. Multiple drives in one system can be enumerated and tested.

- Seek — tests the capability of the LS 120/240 drive(s) read/write heads and actuator to access various locations on the disk media.

- Surface Scan — tests for surface defects on the inserted disk media.

- Patterns — tests to ensure the drive(s) perform write operations without error.

Note Defective LS-120 or 240 disks may cause apparent drive test failures and can lead to incorrect interpretation of test results. If a test reports a failure, run the test again using another disk to confirm test results before concluding the drive itself is defective.

All of the seek tests divide the inserted disk media into logical blocks and ignore track designations. You can assume that the logical blocks correspond to "sectors" in most cases. The actual size and format of logical blocks varies depending on the type of data that is stored there. All tests begin by scanning the inserted disk media to determine the number of logical blocks. The range or coverage of actual logical blocks tested can be specified in the module's configuration file.

Test Descriptions:

Linear Seek Test

In order to perform this test you must have a valid LS-120 or LS-240 disk in the drive. The Linear Seek test verifies the LS drive's capability to move and reposition the drive read/write heads to specific locations on a LS 120 or LS 240 disk in a linear sequence. The specific locations the Linear Seek Test accesses correspond to logical blocks on the disk, which the Linear Seek Test accesses one block at a time. If the Linear Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrLSDrive.p5i. Test times are not affected by the amount of data on the disk.

Random Seek Test

In order to perform this test you must have a valid LS-120 or LS-240 disk in the drive. The Random Seek test verifies the LS drive's capability to move and reposition the drive read/write heads randomly to logical blocks on a LS 120 or 240 disk. If the Random Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrLSDrive.p5i. Test times are not affected by the amount of data on the disk.

Funnel Seek Test

In order to perform this test you must have a valid LS-120 or LS-240 disk in the drive. The Funnel Seek test verifies the LS drive's capability to move and reposition the read/write heads by moving the drive laser in a funnel fashion across a LS 120 or 240 disk. The drive laser starts from the first logical block on the disk and repositions to the last logical block. The Funnel Seek Test then moves the drive read/write heads to the second logical block and repositions them to the second to last logical block, then to the third logical block and third to the last logical block, and so on. The Funnel Seek Test continues in this fashion until it has tested the specified range of logical blocks. If the Funnel Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrLSDrive.p5i. Test times are not affected by the amount of data on the disk.

Surface Scan Test

This test scans for surface defects on the inserted disk media. The integrity of the disk media is verified by performing read operations to logical blocks. The percentage or range of coverage of logical blocks tested is specified in the configuration file. If this test fails, try another disk to confirm the drive itself is defective and that a defective disk is not the cause. An LS-120 or LS-240 disk must be inserted in the drive under test.

Patterns Test

This test verifies write and read operations on the inserted disk media using default test number patterns. The default setting for this test is "enabled=true" in the configuration file. An LS-120 or LS-240 disk must be inserted in the drive under test.

Memory Module

This module writes data to the system memory (RAM) and reads it back, verifying that the data written matches the data read back The Memory Patterns test performs the traditional "walking 1's and 0's" test. It writes and reads a set of patterns to memory blocks in a linear fashion using large block sizes. For 2000/XP, the physical memory tested is not contiguous.

The length of the test depends on the amount of installed RAM. All types of memory chips and modules are tested: DRAM, SDRAM, EDO, SIMM, DIMM, SODIMM, and so on. The Rambus (RDRAM) architecture is also supported.

Test Descriptions:

Memory Test

The Patterns test uses a pre-defined set of patterns to test memory locations as described in the PC-Doctor for Windows 5 Test Patterns section at the beginning of this document. If errors are detected, the address of the DWORD where the error was detected is indicated in the event log.

Advanced Patterns Test

This test checks for memory cell corruption from adjacent cells being read/written to (cells are individual bits). It is run from memory address 0 through each memory cell sequentially to the top of extended memory, then from the top down to memory address 0.

Note This test will only work for Extended Memory.

Because each version of the Windows operating system has an absolute minimum amount of physical memory that must be available to it at all times, the above algorithm can cause a lot of paging in the process of trying to determine the optimum test size. This can potentially lead to a test time in excess of several hours. To address this issue, an absolute minimum amount of memory to leave free has been hard coded for each version of Windows as follows:

Minimum Free Memory

Operating System	Minimum Memory
2K Professional	40MB
2K Server	75MB
XP	40MB
XP Server	175MB

Modem Module

This module verifies that installed modems are configured and operating correctly. PC-Doctor for Windows 5 opens the modem via the COM port driver. The modem must not be in use by another application. If the modem is available, PC-Doctor for Windows 5 establishes communication with the modem via a COM port. In builds prior to May 20, 2003, the modem module supports modems on ports up to COM 256.

Important When performing the modem test, it is important that no other programs (i.e. telephone, communications, fax, or voice mail programs) access the modem while the test is in progress. For example, the computer cannot be connected to the internet via a modem while attempting to run the Modem Test. This could cause the test to display the message "Modem Test: Can Not Run" or other error messages.

Test Descriptions:

Dialtone Test

This test verifies the modem's ability to initiate a dial tone and then to hang up. Please note that the modem must be connected to a phone line to perform this test. By determining if a valid dial tone is present, this test helps to identify such problems as a faulty line connection, bad connector, or configuration error. The presence of a dial tone also indicates the ability of the phone line to connect to a remote system.

Modem Loopback Test

A set of common data class AT commands is issued to the modem. By sending various AT commands, this test identifies problems with the modem hardware itself, such as configuration problems or problems related to a driver. See Appendix B "Common Modem AT Commands" for a description of modem commands used by this module

FAX Command Test

This test supports each service class (Class 1, Class 2, or Class 2.0) that the modem supports using a specific set of AT commands for each class. Testing is class dependent; specific AT

commands can be issued only if the modem is in the correct service class. For example, to retrieve the manufacturer's name from the modem by issuing command "AT+FMRF?" the modem needs to be set to "Class 2" or the command will return an error.

Last Call Test

This test displays diagnostic information about the last call made from the modem, including why a connection could not be set up or why a connection was lost.

This test tests the success or failure of the last call made by the modem, as opposed to directly testing the modem hardware itself. Because of this, the Last Call Test is designed to never return a result of FAILED. However, this test will generate error events describing why the last call failed

Network Module

The PCDrNetwork module verifies both that the network card is correctly configured and working, and that network communication is functioning. The module may detect other problems such as electrical interference (noise), damaged circuitry, loose connectors, and crimped or bad network cables.

The PCDrNetwork module tests DSL or cable internet connections, which operate within a network environment. However, this test does not test the DSL or cable modem used for accessing the Internet.

Test Description
Network Communication Test

The Network Communication test verifies proper network communication with connected computers. The test is implemented using Microsoft's Winsock DLL. Winsock version 2.0 or greater is required. Because the test uses raw sockets, the user must have administrative privileges to run the test on Windows 2000/XP. The test locates remote computers connected to the network under test and sends out Internet Control Message Protocol (ICMP) request packets. If a certain number of packets are echoed back by any one of the remote computers, the test passes.

The test enumerates network cards using functions from the IP Helper API DLL (IPHLPAPI.DLL) installed on the user's machine. This DLL is available with Windows 98, Windows 2000, and Windows NT service pack 4 or greater, and is required for the PCDrNetwork module.

The PCDrNetwork module uses the ICMP (ping) protocol of the TPC/IP protocol suite for testing. Only network cards to which the TCP/IP protocol is bound will appear on the list of enumerated network cards. Other network protocols, such as IPX, are not supported. The test may reveal that a network card is present without a driver installed. Such cards are not likely to be displayed on a machine's list of enumerated network cards. This may cause the test to return a result of "NOT APPLICABLE," meaning no network cards were detected.

Note PC-Doctor for Windows 5 can only test network cards that are properly configured. Network cards that are not configured properly are not detected by the test.

TCP/IP Internal Loopback Test

This test verifies that Windows is properly configured for the TCP/IP protocol. If PC-Doctor for Windows 5 can not verify that the TCP/IP protocol is properly configured for the operating system, the TCP/IP Internal Loopback test will log as **Failed**.

Network Cable Test
This test verifies a network cable is attached to the tested network card. If PC-Doctor for Windows 5 is unable to detect an attached network cable, the Network Cable Test logs as **No Cable**.

Network External Loopback Test
This test uses a loopback adapter to verify a network card can successfully establish a link with other devices attached to the network. It sends out a series of Ethernet packets to the loopback adapter, and attempts to read the incoming packets. If the percentage of packets the network card fails to read exceeds the percentage threshold, the test logs as **Failed**.

Network Link Test
This test verifies a network card can successfully establish a link with other devices attached to the network. It sends out a series of Ethernet packets to another device, such as a router or another PC, and determines the percentage of data packets the device sent back. If the percentage of packets the device failed to send back exceeds the percentage threshold, the test logs as **Failed**.

Parallel Port Module

This module verifies the proper operation of all the parallel ports by writing to and reading back a series of data patterns to each enumerated parallel port. If the parallel port address is changed in the BIOS, it must also be changed in the OS to match. If a valid base address is not found then the particular port will not be enumerated and can therefore not be tested. The port base addresses are obtained from the registry and do not change between enumeration and testing.

Test Descriptions
Internal Read and Write Test
This test checks if the parallel port controller circuitry of the I/O chip is working. It does this by writing data to the parallel port and reading back the data for comparison. Any errors are reported. Test does not halt on a minimum number of errors.

External Read and Write Test
Tests the parallel port's ability to negotiate bi-directional communications by writing data to the parallel port. This test requires that a standard loopback adapter is plugged into each parallel port being tested. It first writes data to the parallel port and then reads it back through the loopback adapter to compare the data read back to the data written.

PC Card Module

This module scans the PC Card (PCMCIA) socket adapter to check that it can communicate with PC Card sockets and that all sockets are functioning properly.

Test Description:
Status Test
The PC Card status test checks for any installed card services, counts the number of available PC Card sockets on your laptop, and ensures that all detected sockets are functioning correctly.

PCI Module

Tests general PCI capability and checks all PCI devices.

Test Description:

Config Test

Checks for presence of PCI devices and then scans the configuration data for all PCI card devices for proper communication. Testing halts if more than 10 errors are detected.

PCI Express Module

Touted as a replacement to the AGP 8x bus, PCI Express is an emerging bus technology standard. The standard PCI bus, introduced in the early 90's, runs at 33mhz and shifts data at 133MB/s. By contrast, a system with an AGP 8x bus can shift data at 2.1 GB/s. The PCI bus's speed limitations produces a noticeable bottle-neck for today's high speed systems. With the development of the PCI Express X16 slot for video cards, PCI Express is poised to take over video I/O and render the AGP standard for video I/O obsolete. The 164-pin PCI Express X16 slot theoretically provides 4GB/s, nearly double the data rate of the AGP 8x bus

The PC-Doctor for Windows 5 PCI Express test verifies that devices that support PCI Express work, enumerating all devices that support PCI Express. It uses the following test:

Test Description

Status Test

The Status Test begins by reading the status register contained inside the PCI Express capability structure. If the fatal error bit is set inside the status register, the Status Test will log as **Failed**. If the non-fatal error bit or the correctable error bit is set, the Status Test will log as **Passed**.

SCSI Module

This module tests the SCSI subsystem and all its attached devices using SCSI's built-in self-test functions to ensure the SCSI subsystem is intact and that the devices are responding correctly. It requires that a device is attached to the SCSI port, and the attached device must support self-diagnostic commands. The PCDrSCSI Module supports all versions of SCSI, including SCSI 1, 2, Wide, and Ultra Wide.

Test Description

Self-Diagnostic Test

Tests using the standard SCSI interface calls to detect attached SCSI devices, then for every identified device the test runs its self-test function. A device must be attached for each SCSI port found. For any detected errors, the device and type of failure are reported in the test log. If a port does not have a device attached, or if a device requires media for testing but it is not present, the test reports N/A.

Serial Port Module

The PCDrSerialPort module tests internal and external registers, control signals, and data integrity on up to ten serial ports. In addition, PCDrSerialPort also performs internal and external loopback testing.

Note External loopback testing requires you to attach a loopback adapter to the serial port under test.

Test Descriptions:

External Register

Uses communication signals to test the external serial port registers to verify that all registers contain valid values. This test requires that you insert a loopback adapter in the serial port under test.

External Loopback Test

Sends test data through a loopback adapter attached to the serial port to verify the data can accurately be sent and received from the port. This test requires you to attach a loopback adapter to the serial port under test.

Internal Register Test

Performs an internal loopback test on the internal serial port registers to verify that all registers contain valid values. After testing, serial port registers are returned to their pre-test state. No loopback adapter is required for this test. The first port found determines the base address.

Control Signals Test

Performs an internal loopback test on the serial port control signals using a set of test patterns. While the port control signals are tested the port is closed. No loopback adapter is required for this test. The first port found determines the base address.

Internal Send and Receive Test

Tests the serial port's send and receive capability. The port is closed during testing. This test is an internal serial port test that uses test data and various baud rates to verify the port can send and receive data accurately. This test is similar to the serial port Loopback test, except that it performs internal loopback testing while the Loopback test performs external loopback testing and requires a loopback adapter in the port. No loopback adapter is required for this test. The first port found determines the base address.

SMART Module

Performs low-level testing on SMART capable hard disk drives by checking for either predictive or imminent failures. This module checks both IDE and SCSI drives. All installed hard disk drives are tested.How the SMART status is obtained differs depending on whether the hard disk drive is IDE or SCSI compatible. In an IDE environment, driver software on the system interprets the alarm signal from the drive generated by the SMART "report status" command. The driver polls the drive on a regular basis to check the status of this command and if it signals imminent failure, sends an alarm to the OS. This causes the OS to send an error message to the user.

In a SCSI environment, the failure decision occurs at the hard disk drive, and the host notifies the user for action. The SCSI specification provides for a sense bit to be flagged if the drive determines that a reliability issue exists.

Test Descriptions

Status Test

Checks the status of predictive failures for IDE and SCSI hard disk drives that support SMART technology.

Short Self-Test

Executes the SMART drive self-test routine. This test runs only on IDE drives that support off-line data collection or self-test.

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Extended Self-Test
Executes the SMART drive extended self-test routine. This test runs only on IDE drives that support off-line data collection or self-test.

Systemboard Module

The PCDrSystemBoard module tests the Real-Time Clock (RTC) rollover and RTC accuracy functions of the system motherboard. Due to the preemptive characteristics of Windows, the testing results from this module may vary from one run to the next, and the longer the test, the better the results. This is because the test cannot directly access the RTC via Windows. Windows uses its own high-performance timer functions and generates these timed events as WM_Timer messages. PCDrSystemBoard uses the Windows WM_Timer messages to determine the system clock accuracy.

PCDrSystemboard runs as a process in memory and reads counter messages at regular intervals, until it completes the count for a predefined duration. However, as with any process running in memory, other running processes can pre-empt PCDrSystemboard by taking priority for the timer cycle when the test is trying to read the counter messages. PCDrSystemBoard will then wait until the next available cycle to take its sample, resulting in an inconsistency between the current timer count and the expected timer count. Therefore, the longer the test is run, the more accurate the results

Test Descriptions
RTC Rollover
This test checks the accuracy of the RTC when date or time rollovers occur. If PC-Doctor for Windows 5 detects errors with the RTC rollover, the test logs a result of FAILED and reports additional details in the test log.

RTC Accuracy
This test checks for problems with system time updates, periodic interrupts, and alarm interrupts. It checks the accuracy of the RTC (real-time clock) on the motherboard and compares it to the CPU's clock to determine if the motherboard and CPU clock are synchronized. If PC-Doctor for Windows 5 detects errors with the RTC accuracy the test logs a result of FAILED and reports additional details in the test log.

Tape Drive Module

The PCDrTapeDrive module tests the tape drive capability to accurately perform movement of the drive read/write heads on tape media. The Prepare Tape functions include lock, unlock, and rewind are also checked.

The tape drive is tested using SCSI commands. The drive performs self-diagnostics using the SCSI Send Diagnostic command. This module requires that tape media is present in the tape drive.

Test Descriptions:
Linear Seek Test
In order to perform this test you must have valid tape media in the drive. The Linear Seek test verifies a tape drive's capability to move and reposition the drive heads to specific locations on the tape media in a linear sequence. The specific locations on the tape media correspond to logical blocks, which the Linear Seek Test accesses one block at a time. If the Linear Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the

test log. You can specify the percentage or range of logical blocks to test in the PCDrTapeDrive.p5i. Test times are not affected by the amount of data on the tape.

Random Seek Test

In order to perform this test you must have valid tape media in the drive. The Random Seek test verifies a tape drive's capability to move and reposition the drive heads on the tape media by moving them to random logical blocks. If the Random Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrTapeDrive.p5i. Test times are not affected by the amount of data on the tape.

Funnel Seek Test

In order to perform this test you must have valid tape media in the drive. The Funnel Seek Test verifies a tape drive's capability to move and reposition the drive heads on the tape media by moving them in a funnel fashion. The drive heads start from the first logical block on the drive and repositions to the last logical block. It then moves the drive heads to the second logical block and repositions them to the second to last logical block, then to the third logical block and third to the last logical block, and so on. The Funnel Seek Test continues in this fashion until it has tested the specified range of logical blocks. If the Funnel Seek Test detects any problems with the movement of the drive heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrTapeDrive.p5i. Test times are not affected by the amount of data on the disc.

Surface Scan Test

This test scans for surface defects on the inserted tape media. The integrity of the tape media is verified by performing read operations on logical blocks. The percentage or range of coverage of logical blocks tested is specified in the PCDrTapeDrive.p5i file. If this test fails, try another tape to confirm the drive itself is defective and that a defective disk is not the cause. Valid tape media must be inserted in the drive under test to conduct testing.

Patterns Test

This test verifies write and read operations on the inserted tape media using default test number patterns. Any data already on the areas of the media to be tested is saved and is restored after testing completes. Valid tape media must be inserted in the drive under test.

USB Module

This module checks the installation and configuration of the USB root hub and devices, making sure the devices communicate correctly with the operating system. PCDrUSB is compatible with USB standards 1.0 and 1.1. It also supports the USB 2.0 standard for testing in the same scope in which it tests the previous USB standards, but does not implement any testing functionality for any features unique to the 2.0 standard at this time.

Test Description

USB Status Test

Performs a configuration test to verify Windows is correctly detecting USB devices. If any connected devices are not configured correctly, or are disabled or uninstalled in Windows, the test results in failure.

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Zip Drive Module

The PCDrZipDrive module tests the ability of ZIP disk drives to accurately perform movement of the drive read/write heads, write/read operations to ZIP disk media, and verifies the integrity of the ZIP disk media. Both conventional and USB-based ZIP disk drives are tested. Multiple ZIP drives in one system can be enumerated and tested.

Three types of tests are available:

- Seek — tests the capability of the ZIP disk drive read/write heads and actuator mechanism to access various locations on the ZIP disk.

- Surface Scan — tests for surface defects on the ZIP disk media.

- Patterns — tests to ensure the ZIP disk drive performs write operations without error.

Note Defective ZIP disks may cause apparent drive test failures and can lead to incorrect interpretation of test results. If a test reports a failure, run the test again using another disk to confirm test results before concluding the drive itself is defective.

All of the seek tests divide the inserted disk media into logical blocks and ignore track designations. You can assume that the logical blocks correspond to "sectors" in most cases. The actual size and format of logical blocks varies depending on the type of data that is stored there. All tests begin by scanning the inserted disk media to determine the number of logical blocks. You can specify the range or coverage of actual logical blocks to test in the PCDrZipDrive.p5i file.

Test Descriptions

Linear Seek Test
In order to perform this test you must have a valid Zip disk in the drive. The Linear Seek test verifies the Zip drive's capability to move and reposition the drive read/write heads to specific locations on a Zip disk in a linear sequence. The specific locations the Linear Seek Test accesses correspond to logical blocks on the disk, which the Linear Seek Test accesses one block at a time. If the Linear Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrZipDrive.p5i. Test times are not affected by the amount of data on the Zip disk.

Random Seek Test
In order to perform this test you must have a valid Zip disk in the drive. The Random Seek test verifies the Zip drive's capability to move and reposition the drive read/write heads randomly to logical blocks on a Zip disk. If the Random Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrZipDrive.p5i. Test times are not affected by the amount of data on the Zip disk.

Funnel Seek Test
In order to perform this test you must have a valid Zip disk in the drive. The Funnel Seek test verifies the Zip drive's capability to move and reposition the drive's read/write heads by moving the drive laser in a funnel fashion across a Zip disk. The drive laser starts from the first logical block on the disk and repositions to the last logical block. The Funnel Seek Test then moves the drive read/write heads to the second logical block and repositions them to the second to last logical block, then to the third logical block and third to the last logical block, and so on. The Funnel Seek Test continues in this fashion until it has tested the specified range of logical

blocks. If the Funnel Seek Test detects any problems with the movement of the drive read/write heads, it will log a result of FAILED in the test log. You can specify the percentage or range of logical blocks to test in the PCDrZipDrive.p5i. Test times are not affected by the amount of data on the Zip disk.

Surface Scan Test

This test scans for surface defects on the inserted Zip disk media. The integrity of the disk media is verified by performing read operations on logical blocks. The percentage or range of coverage of logical blocks tested is specified in the configuration file. If this test fails, try another disk to confirm the drive itself is defective and that a defective disk is not the cause. A Zip disk must be inserted in the drive under test.

Patterns Test

This test verifies write and read operations on the inserted disk media using default test number patterns. Any data already on the areas of the media to be tested is saved and is restored after testing completes. A Zip disk must be inserted in the drive under test.

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Interactive Diagnostic Module Descriptions

PC-Doctor for Windows 5 interactive diagnostics are different than the tests described in the previous section in that they require user interaction. They require that the user confirm the proper operation of a feature or functionality of a system component and therefore require user input or participation via dialogs or prompts. Interactive test modules test primarily system peripheral components such as the mouse, keyboard, monitor or printer.

Avi Module

This module verifies your system's ability to play an **A**udio **V**ideo **I**nterleaved (AVI) file on systems that support video and sound playback.

Click the **Play** button to see an AVI file play in a small window. This AVI includes sound as well. After the AVI file plays, click **Yes** in the dialog to indicate the video and sound played correctly and that the test passed, or click **No** to indicate the AVI file did not play correctly.

Note If no action occurs when the PLAY button is selected (be sure your system is configured for AVI playback), try to play another AVI file from another source.

Joystick Module

The interactive PCDrJoystick module verifies the functionality of the axes, buttons, and point of view controls on the joystick(s) connected to your system. The dialog box is shown here.

Test Modes:
There are two test modes for testing PC joysticks: Partial and Complete.

Partial Test Mode: When performing partial testing, only activated controls that the test recognizes will be included in the test results. Users test the joystick functions and report PASS or FAIL by clicking the associated button in the test dialog box. Any combination of parts can be included in a partial test. The only event messages that PC-Doctor for Windows 5 generates for this test is PASS or FAIL.

Complete Test Mode: The complete test requires that a user activate a certain percentage of the joystick's functionality before the test will PASS. This testing percentage threshold is configured through the pcdrjoystick.p5i file. After activating a certain percentage of the controls, the user clicks the FINISH button. If the user does not reach the testing percentage threshold for the joystick, the result is FAILED.

When you begin the test, a test dialog window opens divided into four sections: **Axes**, **Point of View**, **Buttons** and a brief set of instructions on how to run the tests. The three test sections serve as indicators of joystick functions PC-Doctor for Windows 5 displays on-screen. You can test the three joystick functions in any order.

> **Axes**: To test the main (x, y) axes, the test dialog window displays a box containing a grid. If the joystick is correctly calibrated, the crosshair displayed in the grid box will accurately follow the movements of the joystick along the main axes. If the joystick has the capability of using additional axes (for example, a rudder or throttle control), an additional box is displayed for each

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additional axis. This box contains a status bar that will accurately indicate the movements of its corresponding axis.

Point of View: To test the point of view control, operate the control and ensure that the dot in the middle of this circle moves to appropriate locations on the circle. The Point of View control is usually located on top of the joystick as a joystick-like button that you move in various directions using your thumb.

Buttons: A numbered box in the test dialog window represents each button on the joystick. The number of boxes corresponds to the number of buttons on the joystick. Press each button and ensure the corresponding box on screen lights up. Boxes that don't light up indicate a button that is not working.

Keyboard Module

The interactive PCDrKeyboard module verifies that each keyboard key registers correctly when pressed.

1. Click the **Yes** button to begin the test. A test dialog window will open displaying your keyboard configuration. See **Figure 5** on the next page.

2. Select the type of keyboard you wish to test by clicking the DOWN ARROW tab next to the Keyboard Type field or by pressing the **Alt+UP ARROW** keys or **Alt+DOWN ARROW** keys. Normally, PC-Doctor for Windows 5 will detect your keyboard type by default.

3. Press each key on the keyboard. As you press a key, the corresponding key on screen will disappear indicating it functions. If you need to reset the keyboard display, click the **Start** button or press the **Alt+S** keys.

4. If all onscreen keys are removed, click the **PASS** button or press the **Alt+P** keys to indicate the test passed.

5. If any onscreen keys are not removed after being pressed, click the **FAIL** button or press the **Alt+F** keys to indicate the test failed. PC–Doctor for Windows 5 records the test result that you indicate in the test log.

6. Click the **ABORT** button or press the **Alt+A** keys at any time to end the test without indicating **PASS** or **FAIL**. If you abort the test, PC-Doctor for Windows 5 logs the test as **CANCELLED**.

Different types of keyboards can be selected for testing from a list in the Keyboard Type window. Click the arrow button to the right of the window to display the list. Support for additional custom keyboards may be added upon customer request. This test supports standard PS/2, USB, and infrared keyboards.

Note On keyboards with special key arrangements and keys that perform special functions such as accessing the internet or audio CD controls are not supported. However, the standard and common keys on those keyboards are supported and can be tested.

Microphone Module

The interactive PCDrMicrophone module checks your microphone, sound card and related drivers for proper recording and playback operations.

1. Click the **Record** button to record a short sound file.

2. Click the **Play** button to play the file you just recorded. A dialog box will appear prompting you to indicate if the test passed or not.

3. If you hear the sound file, click the **Yes** button to indicate the test passed.

4. If you do not hear the sound file, click the **No** button to indicate the test failed. The results indicated by the user are reported in the test log.

5. Click the **Close** button at any time to abort the test without indicating either PASSED or FAILED. If you abort the test, PC-Doctor for Windows 5 records a test result of CANCELLED in the test log.

Note If the microphone is not installed correctly, the test may appear to function correctly, but fail to record any sound.

Monitor Module

This module checks for the proper functioning of the monitor, including correct graphics display, alignment, and focus. The three interactive test elements—Solid Color, VESA Patterns, and Combination—test the following.

Solid Color (LCD Pixel): This test element verifies that all LCD pixels are displaying color correctly on notebooks and laptops. Clicking the **Red**, **Green** or **Blue** buttons covers the screen in that color. This allow you to visually determine all pixels display color correctly. If a pixel is malfunctioning, it will appear as a black dot. You must test will all three colors before you can record a test result in the test log.

VESA Patterns: Clicking the **Luminance**, **Geometry** and **Focus** buttons fills the screen with a test pattern. These tests are intended for professional measurement use.

Combination - Click the **Combination** button to visually verify the alignment, color depth and resolution of the monitor display. This test simultaneously displays a combination of patterns, text and colors.

• For verifying alignment, four crosshair patterns (one in each corner of the screen) enable you to verify correct horizontal and vertical alignment at each corner.

• For color depth, RGB spectrum arrays enable you to verify that color gradations are smooth.

• For resolution, horizontal and vertical bars containing lines that progressively appear closer together allow you to verify the monitor's high-resolution capabilities.

Mouse Module

The interactive PCDrMouse module tests mouse buttons, scroll wheel, drag and drop capability, double clicking, and cursor position. Test functionality is determined by the configuration of each mouse.

PC-Doctor for Windows 5 supports many types of mouse devices, including some USB devices. New mouse devices with unique capabilities, especially those with a center wheel, usually require special coding that may be supported upon customer request. Optionally, mouse devices with three buttons can be configured to exclude one button and be made to appear for testing as a two-button mouse device.

When you start the Mouse Test, a test dialog window opens divided into four sections: Mouse Status, Drag And Drop Test, Double Click Test and a brief set of instructions describing how to run the tests. You can run these tests in any order.

Once you are done testing a mouse, click the **Close** button to close the test dialog window. PC-Doctor for Windows 5 will display a prompt asking "Did the test pass?" Indicate the test passed by clicking **Yes** or indicate the test failed by clicking **No**. You must test at least one feature of the mouse before you can indicate a test result. If you click the **Close** button without testing at least one feature of the mouse, the test will log as CANCELED. For more information on how the Mouse module functions, click the **More Info** button. See the following page for descriptions and images of the available mouse tests

Note Windows, mouse drivers and other applications can modify mouse functionality. For example, the middle button on a three-button mouse may be configured to function as a left button.

Drag And Drop Test: This tests your mouse's drag and drop functionality. To run this test:

1. Left click the floppy disk picture keeping the left mouse button pressed.

2. Keeping the left mouse button pressed, drag the picture of the floppy disk over the picture of the floppy disk drive.

3. Release the left mouse button.

4. If the **Drag And Drop Test** is successful, the floppy disk will appear as if its in the floppy drive.

Double Click Test: This tests your mouse's double-click functionality. To run this test:

1. Position the mouse pointer over the picture of the monitor.

2. Click on the picture of the monitor twice. Make sure not to pause between clicks.

3. If the **Double Click Test** is successful, a yellow happy face will appear in the picture of the monitor.

Mouse Status: This test verifies that your mouse is reporting the right position and the mouse buttons function. To run this test:

1. Move the mouse around and note its position. The position **Mouse Status** reports is relative to the resolution of your monitor.

2. Click any mouse button. The corresponding button on screen will light up indicating the button function.

3. Spin the scroll wheel up or down. An arrow indicating which direction you are scrolling appears in the upper right hand corner of the **Mouse Status** section.

Printer Module

This module prints a test page that verifies printer operation. To print the test page:

1. Click the **Test** button.

2. Select a printer from the dropdown list.

3. Click **OK**.

There are five items to check on the page:

Circles: The two circular graphics at the top of the page allow you to determine the relative resolution of your printer. The greater the resolution of your printer, the more clearly you will be able to see the rays of the circle.

Type Face: Use the sampling of TrueType fonts to check your printer's text output. TrueType is the scalable font format used by Windows.

Color Blocks: Use the solid color squares to check your printer's color output. This test uses the three primary colors for print output: Yellow, Red, and Cyan.

Font Size: Use the sampling of different font sizes, from 6 point to 22 point, to see how much the quality of print degrades as font sizes increase or decrease.

Printer Toner: A black horizontal bar across the bottom of the page to check the consistency of your printer toner. If the printer toner is low, the bar across the page may appear faded or incomplete.

This test supports parallel, USB, and network printers.

Sound Module

The PCDrSound module tests your sound card, sound drivers and surround sound speaker channels. PCDrSound also verifies your PC's WAV file sound reproduction, MIDI file sound reproduction and internal system beep.

When you start PCDrSound, a test dialog window opens divided into four sections: **Surround Sound**, **MIDI**, **Internal Speaker** and **Help**. You can run PCDrSound tests in any order. If your PC's

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speaker configuration fails these tests, click the **More Info** button. Clicking the **More Info** button provides additional troubleshooting steps to try.

At the bottom of the test dialog window are three buttons for indicating test results: **Pass**, **Fail** and **Cancel**. When testing is complete, use these buttons to record the final test result for PCDrSound in the test log. Click the **Cancel** button at any time to abort the PCDrSound test. See the following page for descriptions and images of the available PCDrSound tests.

To Test Surround Sound Reproduction:

- Click each of the speaker buttons (Front Left, Rear Right, Center and so on). PCDrSound attempts to play a .wav file through the selected speaker channel. If a tested speaker channel is functioning, you will hear a female voice announce which channel you are testing.

- Click the **Test All** button: PCDrSound attempts to sequentially test each channel and will continue to do so until you stop the test. To stop this test, click the **Stop Playing** button.

To Test MIDI File Sound Reproduction:
Click the **Play MIDI** button. PCDrSound attempts to play a five second MIDI music file through both speakers.

To Test Internal System Beep:
Click the **Beep** button. PCDrSound attempts to play a beep of varying pitch using your PC's internal speaker.

After testing is complete
Click the **Pass** button if all three tests successfully produced audio tones. Click the **Fail** button if at least one of the tests failed to produce audio tones. Click the **More Info** button to display troubleshooting steps.

USB Loopback Module

The USB Loopback Test verifies that a PC correctly detects USB devices and that the USB ports function. Before running this test, you must insert the PC-Doctor parallel port loopback adapter into the parallel port. You must also insert the USB plug ends from the parallel port loopback adapter into the USB ports you wish to test.

The main test window contains a tree view showing the available USB ports and devices. It also displays a brief set of instructions describing how to run the test. To run the test, click the Run Test button located at the bottom left corner. To abort the test, click the Exit button located at the bottom right corner. The test starts by checking for the presence of the parallel port loopback adapter. If the test does not detect the parallel port loopback adapter, it will display an error message and testing will not continue. Attach the parallel port loopback adapter to the parallel port and run the test again.

The test works by sending a signal to the parallel port, then looping the signal from the parallel port to the USB port. If the USB port detects the signal, the tree view in the test window displays PASSED for the tested USB ports. When testing is complete, the USB Loopback test will open a dialog box asking if the test passed. Click Yes if all tests passed successfully or click No if one or more of the ports produces a FAILED test result. The USB Loopback test log will reflect the result you specify.

WAV Module

The PCDrWav module tests your's sound card, sound drivers and speaker configuration. PCDrWav also verifies your PC's WAV file sound reproduction, MIDI file sound reproduction and internal system beep.

When you start PCDrWav, a test dialog window opens divided into four sections: WAV, MIDI, Internal Speaker and a brief set of instructions describing how to run the tests. You can run PCDrWav tests in any order. If your PC's speaker configuration fails these tests, click the More Info button. Clicking the More Info button provides additional troubleshooting steps to try.

At the bottom of the test dialog window are three buttons for indicating test results: **Pass**, **Fail** and **Cancel**. When testing is complete, use these buttons to record the final test result for PCDrWav in the test log. Click the **Cancel** button at any time to abort the PCDrWav test. See the following page for descriptions and images of the available PCDrWav tests.

To Test WAV File Sound Reproduction:

- Click the Left Channel button. PCDrWav attempts to play a .wav file through the left speaker for two to three seconds.

- Click the **Right Channel** button. PCDrWav attempts to play a .wav file through the right speaker for two to three seconds.

- Click the **Both Channels** button. PCDrSound attempts to play a .wav file using both channels for two to three seconds.

To Test MIDI File Sound Reproduction:
Click the **Both Channels** button in the MIDI section. PCDrWav attempts to play a MIDI file (.mid) for five seconds.

To Test Internal System Beep:
Click the **Beep** button. PCDrWav attempts to play a beep of varying pitch using your PC's internal speaker for two to three seconds.

After Testing is Complete:
Click the **Close** button. A dialog box appears asking if the test passes. Click the **Yes** button if all three tests produced audio tones. Click the **No** button if at least one of the three tests did not produce an audio tone. If you click the **Close** button without running at least one PCDrWav test, PCDrWav will record a test result of CANCELED in the test log. Click the **More Info** button at any time to display troubleshooting steps.

Appendix A. – PC-Doctor for Windows 5 Module and Test Names

Module Name	Test Name
1394 Module	1394 Bus Reset Test 1394 Config ROM Test
2D/3D Video Module	Memory Test Wireframe LineTest Fixed Transformation and Lighting Test
ADSL Module	Configuration Test Connection Test
AMD CPU Module	FPU Test MMX Test SSE Test
Audio Module	Rough Audio Test
Avi Module	AVI Interactive Test
Card Reader Module	Scan Test Pattern Test
CD Drive Module	Linear Seek Test Random Seek Test Funnel Seek Test Linear Read Compare Test CD Audio Test
CD-RW Module	Read Write Test
CMOS Module	Checksum Test Patterns Test
CPU Module	Registers Test Math Register Test Level 2 Cache Test MMX Test SSE Test SSE2 Test
DVD Drive Module	Linear Seek Test Random Seek Test Funnel Seek Test Linear Read Compare Test
DVD-RW Module	Read Write Test

DVD-RAM Drive Module	Linear Seek Test Random Seek Test Funnel Seek Test Surface Scan Test Patterns Test
DVD-RW Module	Read Write Test
Floppy Module	Linear Seek Test Random Seek Test Funnel Seek Test Surface Scan Test Patterns Test
Hard Drive Module	Linear Seek Test Random Seek Test Funnel Seek Test Surface Scan Test Patterns Test
Joystick Module	Joystick Interactive Test
Keyboard Module	Keyboard Interactive Test
LS-120 Drive Module	Linear Seek Test Random Seek Test Funnel Seek Test Surface Scan Test Patterns Test
Memory Module	Memory Test Advanced Patterns Test
Microphone Module	Microphone Interactive Test
Modem Module	Dial Tone Test Modem Loopback Test FAX Command Test Last Call Test
Monitor Module	Monitor Interactive Test
Mouse Module	Mouse Interactive Test
Network Module	Network Communication Test TCP/IP Internal Loopback Test Network Cable Test Network External Loopback Test Network Link Test
Parallel Port Module	Internal Read and Write Test External Read and Write Test
PC Card Module	Status Test

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PCI Module	Config Test
PCI Express Module	Status Test
Printer Module	Printer Interactive Test
SCSI Module	Self-diagnostic Test
Serial Port Module	External Register Test External Loopback Test Internal Register Test Control Signals Test Internal Send and Receive Test
SMART Module	Status Test Short Self-Test Extended Self-Test
Sound Module	Interactive Sound Test
Systemboard Module	RTC Accuracy Test RTC Rollover Test
Tape Drive Module	Linear Seek Test Random Seek Test Funnel Seek Test Surface Scan Test Patterns Test
USB Loopback Module	USB Loopback Test
USB Module	Status Test
WAV Module	WAV Interactive Test
Wireless Keyboard Module	Wireless Keyboard Interactive Test
Wireless Mouse Module	Wireless Mouse Interactive Test
Zip Drive Module	Linear Seek Test Random Seek Test Funnel Seek Test Surface Scan Test Patterns Test

Appendix B. — Common Modem AT Commands

The following is a description of the modem AT commands that can be used by the Modem test of the PCDrModem diagnostic module.

Common AT Commands

AT&Wn
This command writes (stores) the user profile to memory, where "n" is the profile number 0, 1, 2, etc.

ATV1
This command will display result codes in verbose form.

ATL0
This command sets the speaker volume control according to the parameter supplied. The parameter value, if valid, is written to S22 bits 0 and 1. For example, ATL0 would set the modem speaker volume to LOW or OFF.

ATL1
This command sets the modem speaker volume to low.

ATL2
This command sets the modem speaker volume to medium.

ATX0
This command configures the modem to not recognize a dial tone and busy tone. The modem does not wait for a dial tone, and blind dialing is enabled. The modem returns a CONNECT result code when a connection is established.

ATX1
This command configures the modem to not recognize a dial tone and busy tone. The modem does not wait for a dial tone, and blind dialing is enabled. The modem returns a CONNECT XXXX result code, indicating the serial port speed when a connection is established

ATX2
This command configures the modem to not recognize a busy tone, but wait for a dial tone before dialing. If a dial tone is not detected within 5 seconds, a NO DIALTONE result code is returned. The modem returns a CONNECT XXXX result code indicating the serial port speed if a connection is established.

ATX3
This command configures the modem to not recognize a dial tone. If a busy tone is detected, a BUSY result code is returned. The modem does not wait for a dial tone, and blind dialing is enabled. The modem returns a CONNECT XXXX result code indicating the serial port speed if a connection is established.

ATX4
This command configures the modem to return a NO DIALTONE result code if a dial tone is not detected within 5 seconds. If a busy signal is detected, a BUSY result code is returned. The modem returns a CONNECT XXXX result code indicating the serial port speed if a connection is established.

AT&Fn
This command configures the modem settings back to factory defaults. Possible values for "n" can be 0 or 1.

ATS1?
This command reads the value of the S-Register 1.

ATS2?
This command reads the value of the S-Register 2.

ATS3?
This command reads the value of the S-Register 3.

ATS4?
This command reads the value of the S-Register 4.

ATS5?
This command reads the value of the S-Register 5.

ATS6?
This command reads the value of the S-Register 6

ATS7?
This command reads the value of the S-Register 7.

ATZ
This command (in which n=0 or 1) resets the modem to the configuration profile stored in non-volatile memory location 0 or 1.

Using AT Commands in a Test Script
The following is a list describing parameters and commands that can be used in making up a test script, followed by an explanation of how the script works:

NAME=<modem name>
The NAME= key identifies the name of the modem manufacturer.

IDCOMMAND=AT16
The IDCOMMAND= identifies a specific modem model, in this example the model is identified by the code AT16.

IDSTRING=RCV336
The IDSTRING= key specifies a value that is returned to the modem when the IDCOMMAND= is issued.

AT1=ATZ
The AT1= key indicates the first AT step following the modem identification process. In this example ATZ is the software reset command that is executed by the script.

AT2=AT+FCLASS=?
The AT2= key indicates the second AT step and in this example AT+FSCLASS=? is the command that is executed by the script to identify supported service classes.

AT2RESPONSE=0,1,2.0
The AT2RESPONSE= key indicates the modem service classes returned to the modem when the AT2=AT+FCLASS=? is issued.

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AT3=AT&W
>   The AT3= key indicates the key's value that is issued by the test to run the appropriate modem specific script. In this example AT&W is the key value that is issued by the test to run the RockwellScript script.

SCRIPT<N>=<script name>
>   The script that is run by the Modem Test for a specific modem determined when the AT3= key is executed. "N" is the modem script number 0, 1, 2, etc.
>
>   In the example below, if the modem returns the response "Rockwell" when given the ID command "ATI6", the script is executed. The script first runs the AT1 command ATZ to issue a software reset. Then it runs the AT2 command AT+FCLASS=? to identify supported service classes, which the ATRESPONSE= key identifies as 0, 1 and 2.0. Next, the AT3= key specifies to use the script called "RockwellScript." The AT1 and AT2 keys in the "RockwellScript" script are executed. The AT1key executes the AT&K0 command and the AT2 key executes the AT&T0 command.

For More Information

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