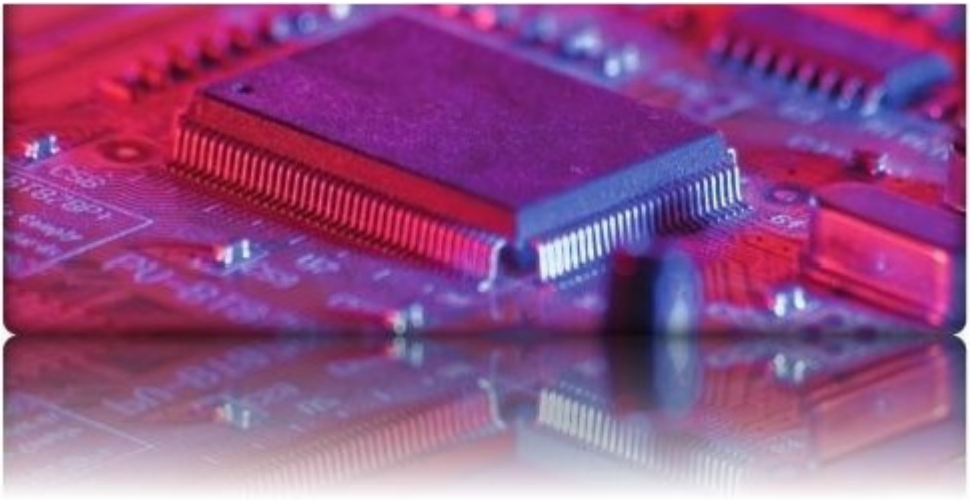
Eurosoft
computer reliability solutions

Pc-Check®

Professional computer testing, self-booting diagnostic software



Assuring Computer Hardware and Service Reliability

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Pc-Check®

Diagnostic Software

072020MPCCV8.0X

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Floating point arithmetic in *Pc-Check* is implemented via “SoftFloat”.

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Section 1

INTRODUCTION

1.1 General Features

1.1.1 Overview

Pc-Check is a fast, accurate and easy-to-use diagnostic tool from Eurosoft that enables you to check completely the configuration and reliable operation of IBM-AT-compatible PCs. *Pc-Check* is extremely useful to manufacturers and repairers of PCs, informing all user levels of the architecture and operational reliability of PC hardware. Stringent routines test the entire PC by exercising each hardware component and indicating those areas that fail to respond perfectly.

Note: *We recommend that you run Pc-Check regularly to ensure that the machines for which you are responsible are running reliably.*

When you run the *Pc-Check* software on a PC, its simple menu selection allows you to choose the tests and reports which you require. The program can test that all the components are functioning correctly. It provides a thorough summary of the system configuration, including all memory areas, floppy, hard and CD-ROM/DVD drives, the nature and address of I/O ports, type of display, and so on. You are then guided by a menu to select the advanced diagnostic facilities that will lead you easily and logically to the area causing problems, or to verify hardware accuracy.

As an alternative to this fully interactive method of use, *Pc-Check* can be operated in batch mode ("Burn-In" mode), which enables a required set of tests to be pre-defined. These can then be run repeatedly on the same machine from time to time, or on many different machines in a production environment, without further user intervention.

Although this manual assumes that the reader has a good understanding of PC architecture, it can be used equally well by those who are less confident to determine whether a fault actually exists. The user will be able to follow the steps shown on the test screens, and the following chapters in this manual are arranged in the same order as the tests. When more help is needed, this manual provides the information.

The only requirements to allow *Pc-Check* to test, verify and report in detail on your PC are: a working system core and central processor unit; enough memory to load the program; a CD-ROM drive, USB port, or floppy disk drive.

Pc-Check is supplied with all the instructions and software you need to test your system. Loop-back and USB plugs, and a CD-ROM Test Disc facility, are also supplied, to enable you to test peripheral ports. Multi-layer DVD Test Discs, and additional test plugs and dedicated CD Test Discs, are available from Eurosoft.

1.1.2 Modes of Operation

Normally, *Pc-Check* is run in self-boot mode. ***Pc-Check Self-Boot*** allows you to perform diagnostics without fear of interference or limitation by an Operating System such as Windows or Linux, the associated driver and security layers, etc. These are automatically eliminated and thus ensure a 'clean' testing environment.

Since *Pc-Check Self-Boot* runs independently of the machine's normal operating system, there is no need to have either a bootable DOS diskette or a hard disk in order to run tests.

Note: *To boot Pc-Check on systems that use UEFI, Compatibility Support Mode (often called CSM) will need to be enabled in the system setup; systems that support Secure Boot will need to have Secure Boot disabled while booting Pc-Check; users may need to consult their system manual or system manufacturer on how to enable CSM and disable Secure Boot, CSM and Secure Boot are considered security features and are sometimes hidden.*

There are just a few special circumstances in which a full DOS environment might be required for particular tests. Instructions on how to operate *Pc-Check* under a full DOS are given in Appendix A.

1.1.4 System Requirements

Pc-Check requires approximately 512KB of base memory and is designed to operate on machines which are 100% IBM PC-AT compatible. A Pentium (or equivalent) or higher processor is a minimum requirement. Unsurprisingly, some tests may require specific processor or device capabilities in order to execute.

1.1.5 Contents and Index

Rather than provide an Index, this manual contains a comprehensive Contents Section, which inherently lists every sub-section topic in the same logical order as the items in the *Pc-Check* menus. Where the main reference for a given topic has additional cross-references, these will then be found within the text itself.

1.1.6 *Pc-Check* Updates

Pc-Check is periodically updated so that it remains abreast of the latest PC hardware innovations and enhancements. Users are recommended to obtain these updates.

If the system under test is significantly newer than the version of *Pc-Check* being used, *Pc-Check* will produce an advisory note, recommending that an update is desirable. *Pc-Check* will continue to work, and is not restricted in any way. If the equipment and the version of *Pc-Check* are of similar age, no message is produced.

1.1.7 Other Options from Eurosoft

Note: *Eurosoft can provide other methods of implementation, by separate licence, for the special requirements of some manufacturers. Please contact Eurosoft for further details of these specialist versions.*

Note: *Pc-Check is one of a range of products available from Eurosoft. Other items include diagnostic software such as Eurosoft's PC Builder, a complete test management suite for system manufacturing processes and service warranty tracking.Other products include Pc-Check UEFI, Pc-Check Windows and Zerodata.*

1.2 Package Contents

Note: *To set up Pc-Check ready for use, a license file is required. Existing users will obtain their license file directly from Eurosoft via e-mail, and will upgrade via the Eurosoft Website. They should therefore ignore the remainder of this Section "Package Contents".*

Confirm that your *Pc-Check* package was in good physical condition when it was supplied to you.

Check the contents against the printed checklist supplied.

IMPORTANT

Before you can use the product, you must have a license file. This is supplied by Eurosoft when you purchase the product.

You may register online via the Eurosoft Website:

www.eurosoft-uk.com/register.php

You will receive your license files via e-mail.

Registering your product with us entitles you to immediate support, and provides the opportunity to be notified of updates, enhancements and special offers on maintenance and diagnostic products from Eurosoft.

In the unlikely event that you receive corrupted media, please return it to your nearest Eurosoft address, or to an authorised representative, for replacement.

Section 2

CUSTOMISING AND RUNNING *Pc-Check*®

2.1 Modes

The user can create *Pc-Check* to run in either of two modes:

Interactive Mode runs diagnostic tests under user keyboard control, via a series of on-screen menus;

Burn-In Mode runs pre-defined Burn-In tests in non-interactive mode, requiring little or no user attention.

Note: *There are several ways in which Burn-In Mode can be invoked, they are described and assessed in the section of this manual entitled "Continuous Burn-In".*

2.2 Running Pc-Check

You should now have a bootable media which contains *Pc-Check*.

Take note of the caveats described in the following sections before running *Pc-Check* in a given machine.

To use it in a target machine, load the media and boot the computer. *Pc-Check* should then run, and promptly execute the Burn-In tests specified in any test script. If *Pc-Check* does not run, modify your BIOS settings, as described under "Configuring the Boot Sequence" below.

Once the Burn-In tests are complete, control passes to standard *Pc-Check* interactive mode. If no Burn-In tests were specified, interactive mode is initiated immediately.

2.2.1 Important Notes on running Pc-Check

Do not restart a system that is currently providing network services.

Do not execute *Pc-Check* in any operating system environment other than EuroDOS, MS-DOS or OpenDOS/DR-DOS. Disable any Power Management system.

Pc-Check is normally shipped as a version which requires its supplied USB Preferred Port Plug (sometimes called a "dongle") to be fitted, for security control and for USB port testing.

WARNING

Eurosoft USB Preferred Port Plug damage!

The Eurosoft USB Preferred Port Plug can be damaged if the wiring to the USB port inside the computer system is incorrect. In the event of a USB port or socket being soldered directly to the motherboard, this is unlikely to apply. However, it is very common to encounter additional ports that are connected via a wired connection to a header on the motherboard. If the connections to these headers are not 100% correct, it will very likely damage ANY USB device that is connected to it, including the Eurosoft USB Preferred Port Plug.

Many USB devices such as cameras, PDAs, etc. are expensive items. Checking that a USB connection is correct before installing or inserting any USB device, including an Eurosoft USB Preferred Port Plug, is a small sacrifice to make to save destruction of USB equipment.

Please make sure a careful inspection is carried out BEFORE connecting ANY USB device to such ports.

Eurosoft and its associated companies cannot be held responsible for any damage to the Eurosoft Preferred Port Plug. Should you damage your Eurosoft USB Preferred Port Plug, you may purchase another one.

Typically, *Pc-Check* is held on a removable "program medium" (USB memory stick). Do not remove it while running the program, unless you are prompted to do so for a specific test.

For reasons which are discussed in Appendix B, which are caused by the fundamental nature of PC design, the drive letter which is associated with the USB memory stick depends upon the program medium from which you are running. To summarise: when booting from USB memory stick, the machine's USB memory drive is the C: drive;
The manual will use a phrase such as "the appropriate drive letter" to remind you of this situation where necessary.

2.2.2 Configuring the Boot Sequence

Commonly, PCs are configured to boot from removable media such as USB when you switch on or reset. So, in many cases, it should not be necessary to make any changes to system settings in order to start *Pc-Check*.

However, if *Pc-Check* fails to load automatically, you will need to select the boot device. If you are not familiar with how to use the BIOS Setup to alter the boot sequence, study the information below.

Many BIOS provide a 'boot menu' option, commonly accessed by pressing the F10 or F12 key. Watch carefully for a prompt soon after the PC is started, to find out what key to press. If there is a boot menu option which permits the selection of Floppy Disk, CD or USB Drive for just one boot, there is then no need to enter the full BIOS Setup and make changes to the configuration. Merely select the appropriate device from which to boot *Pc-Check.*

If BIOS Setup changes must be made in order to boot *Pc-Check*, look for 'boot order' or 'boot priority' options, in either a separate 'Boot' or an 'Advanced BIOS' page. BIOS Setup design varies between vendors:

please consult your system documentation for further information on how to do this.

When selecting a USB device for boot, a choice of device type might be given: typically this should be selected as USB HDD for Flash Memory devices.

Note: *If configuration changes were necessary using BIOS Setup, remember to reverse your changes when you have finished using Pc-Check, to restore the machine to its normal working mode.*

2.2.3 Loading *Pc-Check*®

1. Insert the medium containing *Pc-Check* in the appropriate drive or socket, and switch on or reset the computer.

2. *Pc-Check* self-boot includes its own version of DOS, called EuroDOS. A summary of its facilities and restrictions is given in Appendix D.

3. Unless you require the Advanced Start-up Options (described later), allow *Pc-Check* to boot normally. After a short while, you will see one or other of the following.

   The *Pc-Check* Main Interactive Menu, if no Burn-In testing had been set up;

   The automatic commencement of Burn-In testing, if this had been set up.

4. Proceed with your testing, as described in the following Sections, but take note of the Limitations described below.

   A message is given if you attempt to select a menu option that is not available.

5. When you exit *Pc-Check,* note the instructions for removal of the *Pc-Check* program medium, because the machine will normally attempt to reboot.

2.2.4 Limitations of Self-Boot Mode

When running *Pc-Check* Self Boot, the following options are unavailable owing to the appropriate device drivers not being loaded:

CD-ROM/DVD Tests (non ATA), and the PCMCIA Information.

Note: *SCSI hard disks can be tested using the standard hard disk diagnostic facilities.*

Appendix A describes how to operate *Pc-Check* under a full DOS environment, in order to access these drivers, should they be required.

2.2.5 Overview of Running Mode Options

As we have seen, *Pc-Check* can be run in either of two modes:

Interactive Mode runs manual diagnostic tests under user keyboard control, via a series of on-screen menus;

Burn-In automatically runs pre-specified tests in non-interactive mode, requiring little or no user attention.

Interactive Mode

When *Pc-Check* is booted normally (with no burning scripts), the user is presented with a menu-driven interactive user-image. This allows access to all the available diagnostic information and tests, which can be run directly and selectively. Interactive mode is particularly useful for running specific tests quickly and easily, and for gaining experience of how the various diagnostic tests behave.

Burn-In Mode

This mode allows the user fully to define a set of tests which can be run on repeated occasions, or run on more than one machine, or run with little or no user intervention. It is particularly useful for continuous burn-in testing.

For burn-in testing, two data files need to have been generated. One (generically called the Burnfile) contains a specification of the diagnostic tests which are to be performed. The other (the Command-

Line file) specifies additional parameters which control the overall running of the tests, the output reports required, etc.

Pc-Check provides a variety of methods for constructing these control files in advance. The various alternatives – each with their advantages for specific situations are examined in the Section on Continuous Burn-In.

Advanced Start-Up Options

One method of specifying Command Line parameters is worthy of summarising here, since it is invoked during the *Pc-Check* boot process.

As *Pc-Check* starts to load, it displays an option to access Advanced Start-Up Options, by pressing the F8 key once. This facility provides a convenient on-screen method of specifying the Command Line parameters used to control non-interactive and semi-interactive operation of *Pc-Check*.

This option is discussed in detail within the section of the manual describing Command Line Operation.

2.2.6 Interactive Mode Menu Controls

In Interactive Mode, after the introductory screens, the Main Menu is displayed. You will return to the Main Menu on completion of each option you select.

You should use the arrow keys on your keyboard to highlight your choice and press <ENTER> to start the procedure. Instructions are given on-screen about which keys to press. Generally: the arrow keys enable you to highlight your choice; the <ENTER> key starts the operation; and the <ESC> key returns you to the previous menu level.

The Main Menu contains an option “About PC-CHECK”: detailing version and copyright information.

The final option is “Exit”, which prompts the user to confirm the actions if the results have not yet been reviewed on-screen or written as a report, before exiting *Pc-Check* when the system can be shut down or restarted.

Note: *When you exit Pc-Check, remove any program media, and reset your computer.*

2.2.7 Errors and Failures

There is an important distinction between the two problem conditions upon which *Pc-Check* reports.

A Failure Message indicates that a component has failed a specific test, implying that *Pc-Check* has detected a faulty component in the machine under test.

An Error Message indicates an unexpected event due to a compatibility issue or a lack of resources, such that a pass or failure cannot be determined for the component under test, i.e. it does not necessarily imply a faulty component, but rather that a test could not be performed for some reason, which is explained in the message.

On the first occurrence of an error result, *Pc-Check* displays a message advising the user of the distinction between errors and failures.

The following Sections provide the appropriate descriptions for the tests you wish to run.

Section 3

COMMAND LINE OPERATION

3.1 Overview

Pc-Check can be run either interactively under user keyboard control, as described in later sections of the manual, or via command line operation, which requires either no attention, or only minimal attention (when user acknowledgement of visual information is required).

You can run *Pc-Check* from the command line by providing control information on two levels: a set of command line "switch" parameters; and a burnfile. The command line switches control the overall running of the tests, such as the duration of some specific tests, and the generation and location of various output reports. The burnfile defines which diagnostic tests are to be performed.

Typically, Command Line Operation is used to operate *Pc-Check* in Continuous Burn-in mode, where the command line switches are saved to a text file, which itself references a burn-in file. *Pc-Check* assists in the construction of both these files by enabling the required options to be defined interactively.

It is also possible to set up the command line switches for a single "special needs" boot session, without the need to save them to a file.

Pc-Check can be run in a full DOS environment, rather than in self-boot mode. Information is provided in Appendix A on how this method differs from the self-boot mode of operation, together with a discussion of the special circumstances in which you might wish to use it.

3.2 The Command Line File

As there is no command prompt available with *Pc-Check* Self-Boot, the Command Line options normally have to be written to a file called CMDLINE.TXT. The system is then re-booted to enable *Pc-Check* to read and use the commands.

The CMDLINE.TXT file can be constructed and saved via on-screen help, using any of the following methods:

(i) Interactively, via the "Advanced Start-Up Options" facility, described later in this Section. This is the most flexible method.

(ii) Interactively, via the "Start-Up Options" facility located in the System Information Menu.

(iii) *Pc-Check*'s own Text File Editor (accessed via the System Information Menu) to define the switches manually.

(iv) The file may be also be prepared using another text editor, such as Windows® NOTEPAD, or a DOS editor.

3.3 Command Line Switches

The command line switch parameters follow the normal DOS convention and are defined below.

All arguments (including the name of the Burnfile) are non-positional and case-insensitive. The argument template is as follows:

[/AR Num] [/BB] [/BC] [/BD] [/BE Num]
[/BFA] [/BP] [/BR] [/BT] [/CC Name]
[/DF] [/EC] [/ED] [/ET Num] [/HA] [/HB] [/HC] [/HDD Num]
[/HDL Num] [/HF] [/HI] [/HMC Num] [/HMD Num]
[/HME Num] [/HMS Num] [/HR] [/HS] [/HT Num] [/IC Name] [/ID Name]
[/IE] [/IF] [/IO Name] [/IP] [/IS] [/IT] [/JA] [/JF Name] [/JS] [/JT]
[/JX] [/KS] [/LD] [/LX] [/MH Num] [/MI] [/MP] [/MV] [/NS]
[/OS] [/PD] [/PL Num] [/PT] [/QM] [/RA] [/RC] [/RD]
[/RF Name] [/RJ] [/RL Num] [/RM Name]
[/RP] [/RS Num] [/RT Name] [/RX] [/SD Num] [/SE Name] [/SG] [/SM Name]
[/SP] [/SS] [/ST Name] [/SV] [/SX] [/TF] [/TM] [/UK] [/UM] [/UP Num]
[Burnfile Name]

Square brackets [ ] indicate optional items.

'Name' and 'Num' indicate the need to supply appropriate text and numerical information, respectively.

Note: *If no burn-in file is included with the set of command line parameters in a CMDLINE.TXT file, then, when you reboot, Pc-Check obviously has no information to tell it which tests you wish to perform. Therefore it will bring up the main menu. It will also "register" the command line options, which it has found in the CMDLINE.TXT file, for the duration of the current session. You can then use interactive facilities to complete your particular requirements.*

This hybrid "semi-interactive" technique can be used for a number of purposes. For example, you can generate a fixed set of command line switches, but with the flexibility to use them with a variety of interactively defined tests. These tests can themselves be run interactively or via continuous burn-in.

Alternatively, you can easily add the burnfile name to the CMDLINE.TXT file, if it had been omitted by mistake.

These facilities are described later in the appropriate sections of the manual.

/AR Set the duration of autoscroll for the results page.

/BB repeatedly outputs a sequence of beep codes when items under test fail. (See "POST Codes and Beep Codes" in the "Continuous Burn-In" Section of the manual for a definition of each beep code.)

/BC sounds a repeated two-tone beep to indicate completion of burn-in. This is NOT a Beep code.

/BD specifies that the system returns to the DOS prompt on test completion. This is particularly useful when you run the tests from a batch file. *Pc-Check* exits with an error level set in the range 0 to 3 as defined below. A batch file can detect this and initiate different appropriate action. Required if any reports are to be generated, or if POST or SIB output is requested.

The error levels provided by /BD are:

0 everything ran, with no errors
1 everything ran but there were failures
2 burn-in was interrupted by the user
3 bad option on the command line.

/BE causes *Pc-Check* to abort the Burn-In testing if the number of device failures reaches the specified value.

/BFA if a memory stick, hard disk or processor core has reported a failure further device tests will not run and be reported as Not Run.

/BP causes *Pc-Check* to output diagnostic codes to a POST (Power On Self Test) Card during Burn-In testing. (See "POST Codes and Beep Codes" in the "Continuous Burn-In" Section of this manual for a list of POST Codes). You may wish to use /BD in conjunction with /BP.

/BR causes *Pc-Check* to display the results summary screen on exiting. The results report file, if specified, will have been written after the results are displayed. Can be used in conjunction with /BD to prevent *Pc-Check* from returning to the main menu.

/BT causes burn-in time written to test reports to accumulate when successive scripts are ran.

/CC causes *Pc-Check* to use the specified colour (text attribute) value for the highlighted item in menus. Use if you are using console redirection to control *Pc-Check*, and the display for "selected item" is not clearly visible. The value is specified as a two-digit hexadecimal text attribute value, where the first digit specifies the background colour, and the second digit specifies the foreground colour. Example: /CC 5F.

/DF creates a small file named 'done' on the Pc-Check media as the program exits. The existence of this file can be used as verification of, or as a signal that, Pc-Check has been run and that results have been written. Consider use with /PT.

/EC Enable legacy system timer test.

/ED Enable legacy DMA test.

/ET in the System Stress Test, sets the threshold at which ECC events cause failure of the memory test. Default is 10.

/HA causes *Pc-Check* to use only direct ATA commands for the detection and control of hard disks. The BIOS is not used, and some hard disks may not be listed, including non-ATA devices. Used for special investigation of a specific issue, under instruction. Option /HB overrides this option.

/HB causes *Pc-Check* to use only the BIOS interface for the detection and control of hard disks. No direct ATA commands are issued to devices. Information on, and test options for hard disks may be reduced. Use if hard disk identification information appears incorrect, especially when using RAID.

/HC causes *Pc-Check* **not** to use EDD BIOS call 'Set Hardware Configuration' to configure hard disks for maximum DMA throughput. Use when experiencing problems with hard drive detection or operation, especially with non-DMA ATA devices, such as an ATA flash adaptor.

/HDD Hard Disk Device test Duration: sets the duration limit for hard disk device tests (adaptive level). Format: [##h] [##m] [##s]. Ignored if the time actually required for the disk tests is less than this value.

/HDL Hard Disk Device testing Level: sets the test level for hard disk device tests (fixed level). Entered as a number between 1 and 100, indicating the percentage coverage required. For example, if set to 50, then only half the amount of tests will be performed.

/HF checks the hard disk SMART log for errors before testing.

The default is that SMART logs are not checked prior to commencing other hard drive tests during burn-in. When this switch is present, the SMART summary error log is checked, such that, if the log has recorded a previous failure of the commands used by a test which is starting, the test will immediately fail.

/HI ignores a hard disk on BIOS LUN 80h. When booting the system from a USB flash device (or similar), the BIOS will create an emulation of a hard disk to support the boot. This device will then ordinarily appear in reports and diagnostics as if a real device, commonly failing in items such as the Stress test. This switch suppresses the emulated drive.

/HMC Hard Disk Media Coverage: sets the level of coverage for hard disk media tests (fixed coverage). Entered as a number between 1 and 100, indicating the percentage coverage.

/HMD Hard Disk Media Duration: sets the duration limit for hard disk media tests (adaptive coverage). Format: [##h] [##m] [##s]. Ignored if the time actually required for the disk tests is less than this value.

/HME Set the end sector for hard disk media test. Enter as hexadecimal.
/HMS Set the start sector for hard disk media test. Enter as hexadecimal.

/HR The value represents the number of sequential (slow) block reads required to fail. Typical value is 2. Drive manufactures do not normally consider slow data blocks as failures.

/HS allows access to PCI sub-class 6 (custom SATA). Model, serial number and firmware information can be obtained, and SMART testing performed.

/HT Hard Disk Timeout Value. *Pc-Check's* timeout default for hard disk operations is 2 seconds. Use to override the default if detection problems are suspected, or operations are timing out unexpectedly.

/IC specifies the filename of a reference image used as a comparison with current burn-in CA. Files must be in .XML format.

/ID specifies a filename to which to write a component audit image (CA) or machine ID descriptor. Default format is .XML.

/IE Ignore ECC errors if correction of memory data is successful.

During a memory test, if the ECC has successfully corrected an error, the memory test would normally still fail the component: this switch allows suppression of these failures.

/IF causes the file requested by /ID to be output as text (.TXT).

/IO specifies an output filename which lists any differences between the burn-in CA and the reference image.

/IP Ignores non-standard PCI serial devices.

/IS causes *Pc-Check* to ignore serial port hardware. Use if you are using serial port hardware for console redirection or Serial Over LAN, and *Pc-Check* interrupts the output.

/IT exits program after writing component audit image (CA).

/JA writes a journal log line for each selected component which is found to be or appears to be absent (for example if no CD-ROM drive is present).

/JF should be followed by the filename (and path) of a file into which error-logging information is written during Burn-In testing. This journal will contain a list of the tests that failed during Burn-In, stating the device reference, if applicable, and the pass number in which the device failed. The filename supplied may also refer to DOS devices such as PRN for the printer and COM1 for the first serial port, or a nul will ensure no journal file is created. The journal can be viewed with any text editor.

Note: *A new journal file is created for each Pc-Check "session". If Pc-Check is used "semi-interactively" to run more than one script in the same session, the output from all scripts run during that session are appended successively.*

/JS writes a summary of the tests to the journal at the end of testing. This option is selected in default operation.

/JT logs the start and end of each test in the journal: if not included, then only failed tests are logged.

/JX causes the journal to be written as XML format. If omitted, journals are written as plain text.

/KS disables keyboard self-test: use if you experience problems running the Keyboard Controller Test.

/LD disables legacy DMA testing for channels 0 and 1, to accommodate new chipset designs which will otherwise fail.

/LX Write an error log on completion.

/MH Set hundredths of a second per MB for uTL Memory Test. Default 50 (1.5 sec/MB). See the topic "Set uTL Test Time" in the "Advanced Diagnostic Tests" Section for further explanation.

/MI enables "Memory Intelligent Preservation" for all tests that access extended memory (above 1MB). Use when extended memory holds data which must not be destroyed by testing, e.g. for PXE boot.

/MP forces use of MPS tables for multiprocessor.

/MV switches off a specific memory validation check. Normally, *Pc-Check* compares the total available memory reported by the BIOS against the total of the individual memory modules installed. A significant discrepancy causes *Pc-Check* not to analyse memory by individual modules, but only by overall available memory. Certain genuine situations, such as the use of PXE, can trigger this effect unnecessarily. /MV allows this validation test to be suppressed in such known situations.

/NS cause *Pc-Check* to not check the SMART log for errors.

/OS *Pc-Check* outputs the operating system detected to system overview.

/PD causes *Pc-Check* to power down the PC after burn-in.

/PL restricts the number of logical processors (cores or hyperthreads) tested to a defined maximum (evenly distributed). If set to 1, tests only the bootstrap processor.

/PT effectively turns off the 'Thank you' screen seen at the end of testing, when running *Pc-Check* from EuroDOS. Instead of offering to reboot or shut down the system, it instead exits directly to EuroDOS. Under normal circumstances this would simply result in EuroDOS restarting the system or requesting media removal to restart.

Note: *The customer using this option will have been in contact with Eurosoft and supplied with, or instructed on, customisation of EuroDOS to provide additional software phases and/or reboot behaviours.*

/QM suppresses module mapping assumptions in the Memory Test. Normally, *Pc-Check* uses information obtained from the system, to deduce which physical addresses map onto which memory modules, in order to pin-point which module is faulty. Sometimes the system information is incomplete or very obviously inaccurate: in these cases *Pc-Check* will attempt to deduce the mapping if it is safe to do so. However, if the /QM switch is set, then, if *Pc-Check* detects the slightest problem with the system data, it will instead resolve all memory to one device entitled "nnnMB accessible system memory".

/RA modifies the operation of the **/RF** report generation. The normal default is to list only the tests actually run during Burn-In, but adding the /RA switch causes the report to list all tests whether they are run or not.

/RC writes a report after each pass during burn-in. Causes a slight delay between passes. Do not use on read only media.

/RD omits the starting, ending and duration of burn-in on the last page of reports.

/RF causes a summary of the system configuration and the results of all tests to be written to the burn-in report. It should be followed by the filename (and path) of the Burn-In tests report file. This is the same output as you get from the '**Write Results Report**' when you select that option from the Main Menu, except that the variable fields for the machine name, tester's name etc. are left blank (unless modified by /RM and /RT). The filename supplied may also refer to DOS devices such as PRN for the printer and COM1 for the first serial port. Normally used in conjunction with /BD, to return control to the DOS prompt. The report can be viewed with any text editor.

***Note**: If the filename you nominate does not already exist, Pc-Check creates it for you. If the file does exist, then the new data overwrites any existing data, unless /RJ is specified, in which case data is appended to the existing file.*

/RJ causes *Pc-Check* to join (append) report output to existing reports in a single file. If this switch is not specified, the default behaviour is to overwrite existing reports: where possible, one back-up copy of the last file to be overwritten is saved (LASTRPT.BAK). Recommended for use with /RA.

/RL allows the page length for the report to be specified.

/RM allows a machine name to be entered, which will be displayed in reports and logs. Maximum of 21 characters. See Note below for options.

/RP writes a report after the testing of each component in the burn-in has completed.

Note: This option causes a significant delay between the testing of components.

/RS specifies a machine serial number which appears on reports requested from the command line, and also as the default serial number when a report is requested interactively. Maximum of 20 characters. See Note below for options.

/RT specifies a user/tester name which appears on reports requested from the command line, and also as the default tester name when a report is requested interactively. Maximum of 30 characters. See Note below.

Note: *If the name/number following* ***/RM****,* ***/RS*** *and* ***/RT*** *contains spaces, the text string must be included in double quotes, eg "John Smith".*

If the first character of the name/number following ***/RM, /RS, /RT*** *is ? (for example /RT ?Smith), then an interactive window appears which allows changes to be made to, say, what had been specified in a default batchfile. For example, if the default batch file includes:*

/RM *machine name* /RS ? /RT "John Smith"

then the interactive window appears with the machine name and tester filled in, and the serial number blank. All three fields can then be changed.

/RX generates the results report as XML instead of text. The XML contains the tests grouped by final result for other software to import and process. A sample style sheet is also provided for viewing results in a browser. The XML file contains no hardware summary: this should be obtained via /ID and appropriate program logic or style sheet.

/SD Set duration of System Stress test. Format: [##h] [##m] [##s].

/SE Ignores one or more serial ports with the base IO address specified. List must be enclosed with quotes and is specified as one or more Four digit hexadecimal number separated by a space or comma.

/SG Sanity checks on serial ports. Use if issues with 'ghost' PCI ports.

/SM Write the SMBIOS information to file

/SP By default, standardised serial port IRQ assignments are assumed. This gives faster start up and avoids possible IRQ conflicts during serial port detection. If non-standard IRQ assignments are suspected, then enabling this option permits Pc-Check serial port detection code actively to probe for both IRQ assignments and legacy I/O port addresses.

/SS use strict identification when searching for PCI serial ports.

/ST facilitates scripted selection of individual System Stress Tests. Each test is specified by a single letter; multiple tests are specified by juxtaposing letters in any order into a "word".

C = CDROM/DVD	P = Processors
M = Memory	H = Hard Disks
V = Video	W = Writes permitted to Hard Disk

/SV Ignore PCI devices with matching vendor code from PCI serial Port detection.

/SX should be followed by the filename (.XML) of a file into which SMART immediate test data information is written.

/TM forces text mode only start-up (no splash screen).

/TF writes a debug trace log to a file

/TP prints a debug trace log to LPT1.

/UK causes *Pc-Check* to retain control of the USB system rather than hand it back to the BIOS. Overcomes problems with legacy devices on some system BIOSes. However, BIOS-controlled legacy USB devices such as keyboards or floppy drives will cease to operate.

/UM causes Pc-Check to disregard memory module mapping by resolving all memory into a single logical memory module.

[Burnfile Name]

represents the name of the script file containing the list of Burn-In tests. This file can be generated, edited and saved interactively, as described in the Section "Continuous Burn-In" in this manual.

As described later, a full list of command line switches can be viewed via the "Start-Up Options" subpanel of the System Information Menu, or, on boot-up, via the Advanced Start-Up Options. Both facilities can be used to generate the CMDLINE.TXT file.

Note: *When Pc-Check is started with a Burn-In file, all devices requested at the time the burn-in file was created will be tested if they are available.*

Note: *The instructions for Command Line options when running under a full DOS environment are the same as for Pc-Check Self-Boot, except that an initial keyword PCCHECK is included. See Appendix A for full details.*

If you attempt to run *Pc-Check* Self-Boot with an invalid CMDLINE.TXT file (for instance, it contains an invalid switch), you are presented with the full list of command line switches, followed by the contents of CMDLINE.TXT. You will then be prompted to re-boot the system. You should use a text editor to correct CMDLINE.TXT and then try again.

3.4 Command Line Example

Suppose that you wish to generate a report containing a summary of the system configuration and the final burn-in results, and a journal which logs any errors.

The main report is to be written to a file which we shall name BURN03.RPT, and the error-logging journal is to be called ERRORS.FIL. The burn-in file is called BURNFILE.DAT.

This is achieved by constructing the following command:

```
/JF ERRORS.FIL /RF BURN03.RPT                    /RA
/BS BURNFILE.DAT
```

You can use file names and extensions of your choice.

Note: *If these files are to be stored in a different directory from the one in which the Pc-Check software resides, you must give the full path ahead of the file name.*

3.5 Creating Command Line Files

3.5.1 Options

There are various ways of producing a set of command line instructions, and generating a CMDLINE.TXT file. They can be typed directly into any suitable text editor (including *Pc-Check's* own text editor, located via the System Information Menu) and then saved. However, *Pc-Check* has interactive facilities which largely automate the process. These are the "Advanced Start-Up Options" which can be invoked at the start of the *Pc-Check* boot process, and the "Start-Up Options" subpanel of the System Information Menu. The user-images of these two facilities are essentially the same, although the Start-Up Options facility is more restricted in its function.

3.5.2 Advanced Start-Up Options

As soon as the initial startup panel of *Pc-Check* appears, it displays an option to access "Advanced Start-Up Options" by pressing the F8 key once. This will immediately lead to a Start-Up Menu which provides the ability to set command line switches, with interactive support. There is the following choice:

Current Session

The values which are set apply only to the current *Pc-Check* session, and are not saved to a file. They apply to the current interactive session, including the Immediate Burn-In option. This feature can be used to set up "special needs" switches for a single session.

All Sessions

The values chosen are saved to a CMDLINE.TXT file. The file is constructed with interactive support, rather than having to be typed manually.

Note: *The location of the CMDLINE.TXT file will depend upon the program medium being used. For USB flash device the file will be written to that medium by default.*

Choosing either option will lead to the Start-Up Options Editor. All the command line parameters are listed in alphabetical order, with a one-line summary of their function. Navigate through the list with the Up/Down arrow keys and Page-Up/Page-Down keys.

Highlight a required switch and press <ENTER>. A more detailed description appears, together with the following options:

Yes	Include this option in the command line.
No	Omit this option from the command line. Used to remove a switch from the current command line data.
Cancel	Do not change the current status of this switch.

If "Yes" is selected, and there is an additional value required (name or number), a panel appears which enables this argument to be inserted. Do not include double quotes around text strings.

Each time that you press <ENTER> after setting an individual parameter, the main parameter list reappears, with the full revised command line contents displayed at the bottom. Double quotes are automatically inserted for text strings containing blanks.

When you have completed all your settings, press <Esc>. The "All Sessions" option will give you the chance to choose whether you do wish to save the instructions, and then *Pc-Check* will load the main interactive menu.

3.5.3 Start-Up Options (System Information Menu)

The System Information Menu is described in detail in the next Section of the manual. One of its sub-panels is "Start-Up Options", which brings up the same panel as has just been described under "Advanced Start-Up Options", which can be used as an alternative method of setting command line switches.

Note: *Unlike the Advanced Start-Up Options, the Start-Up Options facility cannot be used to define or modify data for the* ***current*** *interactive session: it can only be used to generate a CMDLINE.TXT file for use in a subsequent Pc-Check session.*

3.6 Creating Self-Boot Batch Jobs

To create a self-boot *PC-Check* batch job requires a CMDLINE.TXT file, constructed as above, which includes the filename of the required burn-in file. A full description of how to construct burn-in files is given in the Section on "Continuous Burn-In", but the process is summarised here.

In interactive mode, select "Immediate Burn-In Testing" or "Deferred Burn-In Testing" from the Main Menu, and select the tests which you require. When your selections are complete, choose the option "Save Burn-In Script" and supply a filename, say "BURNFILE.DAT", so that your selections are saved. This must be the filename referenced in the CMDLINE.TXT file. If necessary, include the full pathname of the burn-in file.

Leaving the *Pc-Check* writable media in place, reboot the computer. *Pc-Check* will start up and immediately execute your required tests.

Note: *Upon completion, remember either to delete or to rename the CMDLINE.TXT file, otherwise the tests will be repeated the next time you run Self-Boot Pc-Check!*

Note: *The procedure for running batch jobs in a full DOS environment, i.e. not via self-boot, is based on the same combination of CMDLINE.TXT file and burnfile, with one change in syntax. Appendix A describes the steps required to operate Pc-Check under DOS.*

Section 4

SYSTEM INFORMATION MENU

This is the first option from the Main Menu. If you press the <ENTER> key while the SYSTEM INFORMATION MENU is highlighted, you will be presented with the corresponding menu screen. The subsections on the following pages explain each option in turn.

4.1 System Overview

Pc-Check examines your machine's configuration and produces a summary of what it finds. Check that the reported configuration is what you would expect, and investigate any irregularities before you go any further.

Note: *On legacy configurations, incorrect values for the total amount of memory may be given when 286 & 386 Memory Managers such as QEMM, Bluemax, 386MAX & LIMSIM are operating.*

Note: *Pc-Check lists physical hard drives, not logical volumes, so a hard drive that has been partitioned into* **two** *volumes (C: and D:, for example) is treated as* **one** *drive.*

4.2 Component Audit Menu

A Component Audit (CA) is a file, stored in a format that is convenient for further processing, which contains a detailed configuration snapshot of the host PC. These files can be used for inventory records.

Comparisons can be made against previously saved images, either from the same machine, or from a "reference machine", and used to pinpoint configuration changes. The latter technique can be used to identify unauthorised or forgotten component changes.

Customised layouts can also be produced.

Selecting Component Audit Menu leads to a screen which is split into left and right panels.

The left panel gives the following general information:

CA can create an XML document describing your system. This file can be viewed and printed by using it in conjunction with the .XSL file provided with Pc-Check (CA.XSL) and internet browsing software that imports XML.

XML Documents can be used in production to ensure identical builds. Such a comparison can be included in a burn-in. In maintenance they can be used to identify components that have since been added or removed.

Note: *Advanced XML Options are discussed in Appendix C, including customising comparisons against a reference configuration.*

The right hand panel is the CA Management Menu.

Note: *Remember to use the full path name, including the appropriate drive letter. See Appendix B for more information, which includes advice on possible problems caused by certain legacy BIOSes.*

4.2.1 Write System CA as XML File

Selecting this first option shows the selected file type of XML, and prompts for input of a filename. Pressing escape at this time aborts back to the menu. If the entered filename has no extension, .XML will automatically be appended. Having entered a filename, press <ENTER>. A central window pops up with a 0% - 100% progress bar, first showing the progress of Component Audit capture (i.e. to memory). The bar then resets to 0% and shows progress of file write operation. The text changes to reflect which pass the program is on.

Note: *XML CA files are not compatible with HII files from earlier versions of Pc-Check.*

4.2.2 Compare System CA with XML File

You are first prompted to identify the existing XML file which contains the original system specification, against which you wish to compare the current machine specification. This file might originate from the same machine, or from a reference machine. *Pc-Check* then obtains the current

specification, and undertakes a comparison of the two specifications. The result, either a message confirming that they match, or a list of differences, is then displayed. You may press <X> or <T> to save any difference information as either an XML or TXT file respectively.

Note: *When operating interactively, if there are very large numbers of differences between the original and current system specifications, the* ***on screen*** *output might be truncated, but the XML file will always contain the complete difference set, with no omissions.*

4.2.3 Write System CA as TXT File

This option shows the selected file type of TXT and prompts for input of a filename. Pressing escape at this time aborts back to the menu. If the entered filename has no extension, .TXT will automatically be appended. Having entered a filename, press <ENTER>. A central window pops up with a 0% - 100% progress bar. In this instance capture and write are performed together, such that the bar moves across once only.

Note: *The format of the text CA is compatible with that produced in previous versions of Pc-Check, including HII text.*

Upon completion of either write operation you are returned to the CA Management menu.

Exit takes you back to the System Information Menu, as does <ESC>.

Note: *File compare utilities such as 'fc' can be used to compare CA files taken on different occasions: this will highlight configuration changes to the PC.*

Note: *The TXT format is a convenient general format for users who wish to store CA files in their own databases. Some databases may support XML files.*

4.3 System Management Information

Displays information obtained from the system BIOS for a variety of aspects of the system. To view the information select an option from the list and press <ENTER>.

IMPORTANT

This information is read from text and numerical information held in the BIOS. Unfortunately, not all system BIOS have been updated in line with changes to actual hardware. Experience shows that the more modern the BIOS, the more reliable the information tends to be. Discretion is therefore required when interpreting these displays, but the facility is included because some of this information is difficult to obtain elsewhere. In some cases, there is no BIOS information at all, in which case the following message is displayed:

"System Management BIOS extensions not found"

Options available to Browse or Write SMBIOS Information to a text file Browsing will allow you to view BIOS, System, Motherboard, Chassis and OEM information strings. Writing the contents to file will bring up the File browser window to select file name and drive save location.

4.4 PCI Bus Information

The PCI Bus is scanned, and information presented about the Bus and devices found, including: Vendor, Device, Class and Description. Selecting any device in the list gives the sub menu for Manufacturer, the type of device details and any interrupt information.

4.5 IRQ Routing Information

Displays the devices which are attached to the 16 system IRQs and which loaded program or device driver is in control of them.

IRQs which are enabled are marked “Active: YES”, otherwise “NO”. Vector shows the memory location where the interrupt is serviced, and (for the DOS version of *Pc-Check* only) Owner contains the name of the controlling program or device driver. This information is followed by a list of devices. The devices whose IRQs are detected include:

Serial Port (up to 8), Parallel Port, Hard Drive, CD-ROM/ DVD Drive, Mouse, Soundcard, Network card, and any devices on the PCI bus.

All of the standard AT devices are also confirmed on the display and their active status noted. These are:

System Timer, Keyboard, Cascade, Real-Time Clock, Co-Processor.

To detect to which IRQ each parallel port is attached requires that a *Pc-Check* loopback plug is inserted in each parallel port.

In order to detect the used IRQ of some devices, e.g. a network card, the relevant driver may need to be loaded. Therefore the usage data may be incomplete if the appropriate programs are not present.

4.6 Memory Browser

Displays the contents of memory in 512-byte blocks, either low memory only (the first 1MB) or else all memory.

An introductory panel allows selection of address format, either segment:offset for low memory display or else linear for all memory.

Note: All linear addresses are rounded down to the nearest paragraph (16 byte) boundary, i.e. the last digit is rounded down to zero.

The top of the display gives the memory area currently being shown. Pressing the key “I” brings up a Help Panel, giving navigational shortcut keys appropriate to the selected address format. The keys common to both Help Panels are as follows:

↑↓	**Moves up/down 1 line**
PgUp/PgDn	**Moves up/down 1 page**
Home	**Moves to the start of the block**
End	**Moves to the end of the block**
+	**Moves to the next 512 byte block**
-	**Moves to the previous 512 byte block**
Esc	**Allows a new address format to be selected**

The address format-specific keys are the following:

Segment:offset address format:

O	**Allows a new OFFSET to be set**
S	**Allows a new SEGMENT to be set**

Linear address format:

L	**Allows a new LINEAR ADDRESS to be set**

Press any key to clear the Help Panel before pressing your chosen key. Segments and offsets may be up to 4 digits long, linear addresses up to 8 digits.

Press <ESC> to return to the introductory panel allowing selection of an address format. Press <ESC> again to exit the Memory Browser.

4.7 Sector Browser

For floppy and hard drives, displays contents per sector in hexadecimal and ASCII, with offset. Sector locations for floppy drives are given in cylinder, head and sector (CHS) format. For hard drives they are given as linear block addresses (LBAs). An introductory panel allows selection of a drive.

If you select the floppy drive you will be prompted to swap the *Pc-Check* boot disk, if one is being used.

Pressing the key “I” brings up a Help Panel, giving navigational shortcut keys appropriate to the address format. The keys common to both Help Panels are as follows:

↑↓	**Moves up/down 1 line**
PgUp/PgDn	**Moves up/down 1 page**
Home	**Moves to the start of the sector**
End	**Moves to the end of the sector**
+	**Moves to the next sector**
-	**Moves to the previous sector**
Esc	**Exits to previous menu**

The keys that vary are as follows:

Floppy drive, CHS:

C	**Allows a new CYLINDER to be set**
H	**Allows a new HEAD to be set**
S	**Allows a new SECTOR to be set**

Hard drive, LBA:

L	**Allows a new LBA low to be set**
H	**Allows a new LBA high to be set (sets the high 32 bits of a 64 bit sector address, for hard disks of greater than 2TB)**

Press any key to clear the Help Panel before pressing your chosen key. When you press <ESC> to exit the floppy drive display, you will be prompted to reinsert the *Pc-Check* boot disk, if appropriate.

To exit the Sector Browser, press <ESC> when the introductory panel is showing.

4.8 Text File Editor

The text file editor can be used as an editor or browser for any file. Backup files (.BAK) are created whenever a file is saved in the editor therefore it is possible to restore a previous file version. If *Pc-Check* is run under DOS, rather than in self-boot mode, it searches for the presence and location of the following files on the hard disk: AUTOEXEC.BAT, CONFIG.SYS, WIN.INI, and SYSTEM.INI. It then presents those which have been found with their full pathname, together with another option "Other File", which presents a "file open" dialogue to allow you to choose a file from another location.

Note: *Please ensure that the medium containing the file being edited is not write protected.*

The editor uses the following keys:

←↑↓→	**Move in the chosen direction**
Ctrl- ←	**Back one word**
Ctrl- →	**Forward one word**
Page Up	**Back one page**
Page Down	**Forward one page**
Home	**Beginning of current line**
End	**End of current line**
Ins	**Toggle Insert / Overwrite mode**
Del	**Delete current character: if pressed at the end of the line then the line below is joined to the current line**
BkSp	**Backspace and delete previous character**
Enter	**Open a new line: splits current line if pressed in the middle**
Alt-X	**Finish editing and ask whether to save the file: can be escaped to return to editing.**

The screen will scroll left and right as necessary, to show the end of lines which are longer than the screen width.

4.9 Start-Up Options

This option is very similar in function and user-image to the "Advanced Start-Up Options" invoked via the F8 key when *Pc-Check* boots.

The most important difference is that it **cannot** be used to define or modify data for the **current** interactive session. Its job is to generate a CMDLINE.TXT file for a subsequent *Pc-Check* session. Hence the following panel appears on the screen when the option is entered:

IMPORTANT

This option edits the content of the CMDLINE.TXT file only. Changes made to the command line at this time will not take effect until the next and subsequent sessions.

Pressing <ENTER> will lead to the Start-Up Options Editor. All the command line parameters are listed in alphabetical order, with a one-line summary of their function. Navigate through the list with the Up/Down arrow keys and Page-Up/Page-Down keys.

Highlight a required switch and press <ENTER>. A more detailed description appears, together with the following options:

Yes	Include this option in the command line.
No	Omit this option from the command line. Used to remove a switch from the current command line data.
Cancel	Do not change the current status of this switch.

If "Yes" is selected, and there is an additional value required (name or number), a panel appears which enables this argument to be inserted. Do not include double quotes around text strings.

Each time that you press <ENTER> after setting an individual parameter, the main parameter list reappears, with the full revised command line contents displayed at the bottom. Double quotes are automatically inserted for text strings containing blanks.

When you have completed all your settings, press <ESC>. A panel allows you to choose whether you wish to resume editing, save your instructions, or discard them. *Pc-Check* will return to the System Information Menu, after writing the CMDLINE.TXT file if you requested it.

Note: *The location of the CMDLINE.TXT file will depend upon the program medium being used. For USB flash device, the file will be written to that medium by default.*

Section 5

ADVANCED DIAGNOSTIC TESTS

The Advanced Diagnostic Tests are selected from the Main Menu. You will find that the screen display normally gives all the information required to determine the nature of any fault detected, but these notes give further explanation where necessary.

Test results can be viewed in the Results Summary or printed in the Results Report, both accessed from *Pc-Check*'s Main Menu. A few options provide a results viewing facility within the option itself, for instance Floppy Disks and Hard Disks: in these cases, you may choose between viewing the results on screen, sending them to a printer or saving them to disk.

In the following sub-sections, error messages and comments appear as overlay boxes on the screen. They are usually self explanatory. In some cases, the overlay boxes require a decision by the user, either by a sub-menu selection or by a key press.

Looking at the screen menu, the order of description of the Advanced Diagnostic Tests in the manual is: top to bottom in column 1, followed by the second column, etc.

5.1 Processor Diagnostics

When the Processor Diagnostics are selected, the left-hand side of the screen provides processor details and the status of the tests, while the right-hand side contains a menu of these tests.

Processor details include type, speed, CPU signature and SSE level. Processor tests cover the Core Processor, AMD 64/EM64T Core, Maths Co-Processor, MMX Extensions, 3DNow! Extensions, SSE Instruction Set, and MP Symmetry.

If you're using a multiprocessor system, all processors are selected for testing by default. 'Select Processor' allows selection of a particular processor for testing. *Pc-Check's* Processor Diagnostics support systems with up to 160 logical processors (threads/cores).

"CPU Information" produces a scrolling window which indicates whether the CPU supports individual features and extensions. No tests are invoked.

For the Core Processor test, *Pc-Check* will ensure that the processor is performing satisfactorily by running a series of functions. Once tested, the result is given as PASSED or FAILED.

If a Maths Co-processor is detected, *Pc-Check* verifies the correct operation of the co-processor with a series of comparison and arithmetic functions. After testing, the result is given as PASSED or FAILED.

On Pentiums and above, the Pentium division (FDIV) bug is tested for: this should only fail on Pentium 60MHz and early 90MHz processors. The FIST bug is also tested for: this should only fail on some Pentium Pro and Pentium II processors.

If MMX Extensions are detected, *Pc-Check* verifies correct operation of the MMX unit. After testing, the result is given as PASSED or FAILED.

If 3DNow! Extensions are detected, *Pc-Check* performs various checks on arithmetic operations.

Various processors incorporate various levels of SSE Instructions. By default, for each processor in turn, a set of tests is performed for each implemented SSE Level which is currently supported by *Pc-Check*.

For multiprocessor (MP) systems, *Pc-Check* performs various symmetry comparisons between the bootstrap processor and other processors. There may be a short pause at the beginning while checks are made on the additional processors under test. The test only functions if all processors are selected. The symmetry test will fail if the additional processors are not identical to the bootstrap processor.

Error Messages and Comments

'MMX Extensions Not Detected'

'3DNow! Extensions Not Detected'

'SSE Instruction Set not supported by this processor'

'Symmetry tests have no direct relevance for the bootstrap device or to single processor configurations'

5.2 Memory Diagnostics

Note: *With large modern memory modules, testing can be time-consuming. On older systems, or systems with large amounts of memory, full testing can take an extended period. Accordingly, the Memory Diagnostics include options for restricting which memory modules are tested, and over what range. If desired, the types of test can also be restricted.*

However, some BIOS systems report inaccurate information, such that Pc-Check can only test the entire memory as a single item, and cannot resolve a failure to a specific memory module. If so, a warning message to this effect will appear on-screen.

The upper half of the screen initially contains a Memory Tests Menu, and the lower half, which remains in view throughout most tests, lists the memory installed, with its current test status.

The Memory Tests Menu is divided into three parts, as follows:

Test System Memory	Test Cache Memory	Test Video Memory
Test Module	Benchmark Memory	Set Test Set
Test Range	Cache Profiler	Set Test Reps
User Pattern Test	Module Details	Set uTL Test Time

The left portion of the menu allows the user to choose between testing all or part of the memory, and to choose the test pattern to be used.

The centre portion of the menu initiates direct testing of Cache Memory, Benchmark Memory and Cache Profiler. Information about memory can be viewed via Module Details.

The rightmost portion of the menu accesses the Video Memory Tests, and also provides options for which tests to run, and how many times they are to be repeated.

Note: *It is necessary to complete your choices, if any, for test set and number of repeats* ***before*** *initiating testing. Except for the User Pattern Test, Benchmark Memory and Cache Profiler, all tests utilise these settings, defaulting to all tests being performed once.*

Memory errors are displayed in white on a red background. For the last failure detected, the memory address, the expected value and the actual value are reported. The lower half of the screen indicates which module failed. Testing then continues, unless <Esc> is pressed, which halts testing at the next appropriate point.

Very rarely, a memory module may appear listed in grey, if the system information about the module indicates that there are no accessible memory locations that map to that module, making it effectively untestable. The module is given the result N/A. An attempt to test such a module using the 'Test Module' menu option gives the following message:

"The selection cannot be tested because the physical address range does not include any regions that are accessible to the CPU. Memory may be masked in this way if it occupies the same space set aside for memory mapped PCI devices and there is no provision in the memory controller to remap it at a higher address. This may in turn be because the module is paired with other modules for performance."

5.2.1 Test System Memory

Initiates testing of all installed memory modules. Information is displayed for: Current Test; Status (e.g. Testing, Passed); Current Step; Last Failure.

5.2.2 Test Module

Allows the memory in each socket bank to be tested individually. Press <ENTER> and then use the Up/Down cursor keys to select the required memory module from the pop-up list. Pressing <ENTER> for a second time starts the testing. This option can save time if, for example, an additional memory module has been added, and the original modules do not require re-testing.

Note: *Some systems do not supply sufficient information to detect individual memory devices, in which case an explanatory message is displayed, and the "Test All Memory" option should be used.*

5.2.3 Test Range

Allows the user to define the start and end memory addresses to be tested. Once the range has been input, pressing <F10> immediately initiates testing.

5.2.4 User Pattern Test

Allows users to define an additional memory test using their own bit pattern. It is available only as an interactive option.

5.2.5 Test Cache Memory

Tests all levels of cache using memory test algorithms. The result for each cache level is reported separately.

5.2.6 Benchmark Memory

Invoked directly from the Memory Tests Menu by highlighting via the cursor keys, and pressing <ENTER>. Performs linear 32-bit writes to memory with the cache system both enabled and disabled. The throughput is displayed as a two-bar chart.

5.2.7 Cache Profiler

Invoked directly from the Memory Tests Menu by highlighting via the cursor keys, and pressing <ENTER>. Plots in real time on logarithmic scales the access time for random scattered memory access over an increasing range of memory. Indicates the increase in access time as greater amounts of level 1, level 2, level 3 cache and then main memory are used. The shape of the plot can be influenced by the characteristics of the cache and the speed of main memory.

5.2.8 Module Details

Gives information about the memory module, if available; otherwise it reports N/A (not available). A particular memory module is first selected via the Up/Down cursor keys. Pressing <ENTER> returns directly to the main memory test screen.

5.2.9 Test Video Memory

The first time the test is selected a cautionary message will appear:

Note: On some systems the entire screen may become black or white for prolonged intervals: this is normal during the operation of this test.

The selected tests are run in turn, and typically take several minutes. The Memory Tests Menu re-appears when the tests are complete.

5.2.10 Set Test Set

Allows the following tests to be included or excluded:

Module Seating Test
Inversion Tree Test
Stride Isolation Test
Small Block Stride Test
Chaotic Addressing Test
Block Rotation Test
Microtopology Test

Note: *The Module Seating Test performs a connection test to ensure that a memory module has simply 'made good' in its socket. Intended for use as a quick test for previously tested memory that has been temporarily removed from the system.*

By default, all tests are selected. Pressing <ENTER> or <SPACE> toggles an option off or on (the latter is designated by a • symbol), and then moves to the next item. The Up/Down cursor keys move between items without changing their status. Pressing <F10> accepts the choices and returns to the previous panel. The most recent selection will be retained until the end of the Pc-Check session, i.e. if the user returns to the Memory Test option, the choices will not have reverted automatically to the default.

5.2.11 Set Test Reps

Controls how many times the selected tests are to be run in succession (the default is once only).

5.2.12 Set uTL Test Time

Microtopology (uTL) provides an exceptionally rigorous method of testing PC memory, and produces a highly reliable diagnostic report. It is a time-based test using a special "Microtopological Locality" algorithm, and is exceptionally sensitive to issues of noise and timing in the memory system as a whole.

The menu can be used to adjust the test time, which is expressed as hundredths of a second per megabyte. For example, if 100 (i.e. 1 second, Long) were entered on a system with 512MB, the test would last for 512 seconds (eight and a half minutes). The default value is 50, which is usually sufficient to expose all but the most obscure faults. uTL short has a setting of 33.

Note: *A succinct definition of the Microtopological Locality algorithm used here is: "a mathematical addressing method designed to stimulate physically adjacent bit cells, effective even where the precise ordering is unknown".*

5.3 Motherboard Diagnostics

The motherboard tests are extensive, consisting of various low-level tests as detailed in the sections below. The left-hand side of the screen provides motherboard details and the status of the tests, while the right-hand side contains a menu of these tests. Operator action is only required if the CMOS RAM clock and system clock differ by more than a few seconds. If you only want to perform selected tests you can do this from the Burn-In menu option (see the Burn-In Section of the manual).

Note: *Some chipsets may not implement all the features of the original Intel design. In some cases, this can result in some tests failing. If this happens, you should consult the chipset manufacturer's literature or consult with the motherboard manufacturer.*

DMA Controller Tests

If required Legacy DMA Tests can be enabled by using a /ED command line switch. This test exercises the DMA controller's 3 types of registers (page, address and count), displaying PASSED or FAILED against each one.

These results are mainly informative to engineers. Some chipsets may not support the standard full set of page registers, as not all of them

are used on the PC. The set of registers tested has been restricted to the common minimum.

System Timer Tests

If required tests for Counter/Timer 1 can be enabled by using a /EC command line switch. These test the system timer chip (i.e. NOT the Real-Time-Clock).

Clock ticking checks that the chip is generating interrupts. A clock tick check is followed by the frequencies of the three channel timers. The reload interval values are shown for information only: they may be of benefit to an experienced engineer.

Channel 0 tests the counter associated with timer 0 to make sure it conforms with the operational characteristics of the standard Intel 8254 counter/timer chips or chipsets incorporating these functions.

Channels 1 and 2 run similar tests. Channel 1 is normally associated with memory refresh, and Channel 2 is normally connected to the speaker. (The speaker is disabled during testing: upon completion of the test, a beep will be heard of the currently programmed frequency).

Interrupt Controller Tests

Pc-Check tests some basic CPU interrupts, namely divide-by-zero, single-step (trace), breakpoint, overflow, invalid opcode, master controller and slave controller. The main program sets up an interrupt handler for each of these, generating the appropriate problem, and then checking that the interrupt occurred.

The interrupt controller test checks out the 8259 chip, or its chipset equivalent. Specifically, it checks the “Mask” register which allows selective disabling of a given type of interrupt. This is the only register that can be tested because it can be read and written to. All others are read or write only. This test is unavailable if memory managers are loaded (see Appendix A).

Keyboard Controller Tests

Pc-Check performs a series of six keyboard controller tests, returning either a pass or a fail for each. In the event of a failure, one of the following messages may appear which better describes the fault.

Error Messages and Comments

"FAILED: No reply"

"Clock Low"
"Clock High"
"Data Low"
"Data High"

Check the motherboard for physical faults and/or contact a qualified technician.

PCI Bus Tests

Scans the PCI Bus, accesses the devices found, checks the configuration and exercises the PCI BIOS functions. The process completes rapidly. This test is unavailable if memory managers are loaded (see Appendix A).

Non-Volatile CMOS RAM Tests

Checks the power-sense pin of the RTC (Real-Time Clock) which will fail if the battery is flat. The test then exercises the standard CMOS RAM locations with a walking bit test. The CMOS checksum is then calculated and compared with the stored value.

Note: *If you are running Pc-Check on a PS/2 system, a password is stored in CMOS but is locked out of read and write operations by hardware. This will cause the CMOS RAM tests to be skipped.*

The test also confirms that the Real-Time Clock is running. The RTC's status or mode registers are then checked to ensure that they contain standard IBM PC values. If not, "Non-Standard Mode" is displayed, but this is not considered to be a failure of the RTC.

The RTC's alarm operation is checked by setting an alarm time 2 seconds ahead and waiting for it with a timeout delay. This also tests the RTC's alarm IRQ generation.

The clock synchronicity test checks that the CMOS RAM clock and the system clock are running at the same rate and that their times are not more than 3 seconds apart. Should the times differ by more than 3 seconds, a prompt will appear, giving you the option to resync the system clock with the CMOS RAM clock.

Finally, the system (DOS) and CMOS (RTC) date & time are displayed (and continuously updated). Press the <ENTER> key to exit the test.

If you were asked to set the date and time when you booted the system, you can check that they are correct.

5.4 Hard Disk Diagnostics

WARNING

The Non-Destructive Write Test and Internal Cache Test described below can, under certain circumstances such as power failure, result in corruption of data. The Destructive Write Test erases all data on the currently selected disk. Please ensure you have read the advice given in the appropriate sections before selecting these options.

Note: *If Pc-Check detects a BIOS which does not support 48-bit LBA addressing (required for ATA drive media capacities over approximately 134GB), it will issue a warning when a test is running which is about to fail owing to the lack of support.*

There is support for up to 64 hard disk drives on one system.

Note: *For each media test under the hard drive group there are predefined tests. These predefined tests are Quick of 3minutes, Standard of 30 minutes and Full for 100% coverage.*
For the device type the Mechanical Stress also has predefined tests being Quick of 3 minutes, Standard of 50% and Full for 100% coverage.

5.4.1 Menu Layout

The *Pc-Check* Hard Disk Diagnostics screen is split into two panels. The left panel shows information pertaining to the menu options displayed in the right panel.

5.4.2 The Hard Disk Information Panel

The information panel contains the overall status of the current disk and the results of any previously run tests. Disk status will be shown as N/A if no tests have been run, PASSED if all previously run tests have passed, or FAILED if any previously run tests have failed. In interactive mode, re-running a test will overwrite the previous result.

5.4.3 The Select Disk Menu

In this menu, the information panel on the left provides an overview of the currently highlighted disk. This description includes the model number, firmware revision, serial number and capacity of the disk (including the Host Protected Area if one has been set). The information panel may show the disk as 'Unidentified' for non-IDE (i.e. non-ATA / non-SATA) disks and disks connected via custom controllers.

Selecting a disk will reset the test range to cover the entirety of the disk's surface (this applies to media tests only) and clear the error log. If the error log is not empty, you will be prompted that errors exist, before it is cleared and the current disk is changed.

Selecting 'Exit' or pressing <Esc> in this menu will return you to the parent menu without changing the current disk.

Error Messages and Comments

'No Response from Hard Disk - Error'

Unable to determine disk capacity: as a result, the hard disk tests are likely to fail for this disk.

5.4.4 The Test Settings Menu

The Test Settings Menu allows you to configure the testing parameters used by the tests presented in the Hard Disk Tests Menu. Tests are split

into two classes: media tests and device tests. Media tests diagnose integrity failures with the data stored on the disk's media. Device tests diagnose faults pertaining to the firmware logic and mechanical operations of the device.

Number of Retries

This option allows you to select the number of retries per test performed after a test operation fails (e.g. a read, write, seek etc.). Any failure, regardless of the number of retries set, will be logged in the error log, but it will not be counted as an error until the specified number of retries has been exhausted. For example, if this value is set to two, the test will try an operation three times (logging each failed attempt in the error log) before counting this operation as an error (and failing the device). See Test Settings >> Set Maximum Errors for a description on how to stop testing when a number of errors have occurred.

Note: *The default value for this setting is one. This means that failed operations will be retried once before being considered errors.*

Maximum Errors

This option allows you to select the maximum number of errors per test that may occur before a test terminates. If this value is set to fifty, the fiftieth error will cause this test to terminate (give up). The first error will cause the device to fail. See Test Settings >> Set Number of Retries for a description of what is considered an error.

Note: *The default value for this setting is 50. This means that testing will continue until 50 errors have been logged.*

Check SMART First

Enables/disables the "Check SMART First" facility.

Note: *Many modern hard disks incorporate SMART (Self Monitoring Analysis and Reporting Technology), which attempts to predict device failure. SMART software on the HDD monitors the internal performance of motors, media, heads and electronics of the disk. SMART software on the host monitors the overall reliability status of the disk. Any errors are logged by the disk firmware.*

SMART only functions if it is switched on at the level of the disk firmware, typically via a disk manufacturer's utility. Pc-Check also facilitates the switching on or off of SMART, via the "Enable SMART" and "Disable SMART" options in the Utilities Menu of the Hard Disk Tests (q.v.).

IMPORTANT

Just because SMART generates an alert, do not assume that there is definitely a disk problem. Conversely, do not assume that the lack of an alert means the disk cannot possibly be faulty.

If *Pc-Check* detects a SMART alert, you are recommended to stop using the disk, and contact your disk manufacturer's technical support department for instructions. They may ask you to run additional diagnostics using their own dedicated disk utilities. *Do not ignore the alert.*

Assuming that SMART itself is enabled, then, if Check SMART First is also enabled, the Read Test, Read Verify Test, Non-destructive Write Test, Destructive Write Test, Mechanics Stress Test and Internal Cache Test perform an initial 'quick check' of the SMART Summary Error Log for the commands that they issue. For example, the Read Test will check for previous failures of the READ SECTOR(S) and READ SECTOR(S) EXT commands prior to executing the actual test.

If any failures are found, the test is failed outright, because SMART has already established that the disk is faulty. This can decrease test time significantly for disks that support the SMART feature set, and which have already logged failures via SMART.

Note: *"Check SMART First" should not be confused with "Enable SMART". The latter ensures that SMART itself is activated on the disk at a fundamental level, and continues to apply after Pc-Check has terminated. The former is an option within a Pc-Check session which causes Pc-Check to behave in the way described above.*

HPA Protection

The Host Protected Area is an area located at the end of the physical disk. Applications and certain operating system functions cannot access this area. This area is typically used to store system restoration data (so you can restore your operating system etc. to the state they were in when you or your manufacturer imaged your machine). It can also have other functions such as storing incremental backups etc.

When HPA protection is enabled, (potentially) destructive tests (Non-Destructive Write, Destructive Write and Internal Cache Test) will NOT test this area for safety reasons. The Read Test, Read Verify Test, and Mechanics Stress Test will always test this area.

When HPA protection is disabled, all tests will use this area during testing. A prominent warning is displayed on screen when the user disables HPA protection, to ensure that they understand what they are doing.

The Media Test Settings

The Media Test Settings are done via the media test menu and subsequent test name, then selection of the custom test option which allows you to configure testing parameters for the Read Test, Read Verify Test, Non-Destructive Write Test, and Destructive Write Test.

Note: *The default testing condition is 100% coverage, i.e. the tests will take as long as necessary to test every sector of the disk. Should you wish to run for a specific time or at a specified lower coverage, either use the menus below, or the Command parameters /HMC or /HMD. For example, to run for 10 minutes at a coverage which permits this, you can set /HMD=10m.*

Select Test Duration

Setting media tests to test by duration will cause them adaptively to alter their coverage to complete within the requested time frame.

The user is presented with a frame that shows the time in the format “##h ##m ##s”. The two digits left of the hours field will be highlighted.

Up, down, left and right cursor keys can be used to move between fields. Pressing <ENTER> on a field will allow the user to edit the value in that field. Pressing <ENTER> again (after typing a number or not) will

commit the field value; pressing <Esc> will cancel editing the field and the field will not be committed. Pressing <Esc> when no fields are being edited will exit out of the set duration dialogue.

If any field values have been committed, the whole duration will be committed. If no fields have been committed, the duration will not be changed.

The duration entered here will only limit the duration of media tests. It will not extend them. When tests are selected to test by duration, the coverage is calculated automatically as the test runs, to ensure that the test completes in the requested time frame. If the test is taking too long, the coverage is reduced. If the test is running too quickly, i.e. it will complete before time with the current coverage percentage, then the coverage is increased. Coverage never exceeds 100%; i.e. no one part of the disk is tested more than once in a single test instance. Setting a test duration value changes the test coverage to Auto.

Select Test Coverage

Setting media tests to test by coverage will cause them to take as long as is necessary to cover a specified percentage of the selected test range.

The user is presented with a frame that shows a filled bar and a percentage. Up, down, left and right cursor keys can be used to modify the coverage value by 1%. Page up and page down cursor keys can be used to modify the coverage value by 10%. Pressing <ENTER> commits changes. Pressing <Esc> cancels and changes are not committed. Setting a test coverage value changes the test duration to Auto.

Test Range

The user is presented with a frame requesting the start and end sectors. Start of range is inclusive, end of range is exclusive (e.g. hexadecimal 00000000:00000000 to 00000000:00000010 will test exactly 16 sectors starting at the beginning of the disk).

The end sector must be at least one higher than the start sector. The end sector may not be greater than the first inaccessible sector of the disk (one past the end sector). Any attempt to violate these rules will be automatically corrected for you.

Note: *When changing disks, the test range is set to span the entirety of the disk's media.*

The Device Test Settings Menu

The Device Test Settings Menu allows you to configure testing parameters used by the Mechanics Stress Test and Internal Cache Test.

Select Test Duration

Same as Test Settings >> Media Test Settings >> Select Test Duration, but for device tests. When device tests are set to test by duration, the testing level is automatically adjusted in order for the test to complete within the specified time frame. Setting test duration changes the test level to Auto.

Select Test Level

Similar to Test Settings >> Media Test Settings >> Select Test Coverage, but instead of specifying the percentage of the test range that will be covered, it specifies the 'level' of the testing performed. In short, a value of 50% will mean the test is half as effective as it would otherwise be at 100%. For example: the full Mechanics Stress Test performs 50,000 seeks – a setting of 50% would make it do 25,000 seeks; the Internal Cache Test hits as many cache locations as possible – a setting of 50% would make it hit half of them. Setting test level changes the test duration to Auto.

5.4.5 Check Performance

Performs a media 'sweep' for visual analysis of performance stutter, followed by distributed transfer rate measurements with minimum, maximum, and standard deviation values (distributed so as to account for zone encoding producing different transfer rates at different positions on the media). A "from cache" transfer rate and average random access time are also displayed (ms).

Note: This option does not produce a pass or fail - the operator must interpret the values to make this decision. This test is for fault indication purposes only – a message to this effect is included.

Advanced Note: Interpretation of Results

Different parts of a hard disk transfer data at different rates (zone encoding). Therefore differences are to be expected between the minimum and maximum transfer rates, even for a healthy disk. Standard Deviation (SD) is a measure of the spread of the results, such that the smaller the value, the closer the bulk of the results tend to be to the average; the larger the value, the greater the spread of transfer speeds measured. SD is clearly also going to be affected by zone encoding, which enforces a degree of spread of transfer speeds, which in turn increases the SD value.

At first sight, therefore, it would seem that maximum, minimum and SD values are of little use in trying to determine if a hard disk is suspect. However, if a similar hard disk which already has a clean bill of health has been analysed, and the results noted, it becomes possible to build up a knowledge base of expected performance for various types of hard disk. This can help the experienced user to identify potentially problematic hard disks quickly, using this test with an understanding of the result parameters.

5.4.6 Read Test

This is a media class test. The Read Test reads sectors from the currently selected hard disk (within the selected test range). This test diagnoses the device's mechanical functionality, media integrity and ability to transfer data to the host controller. The test screen (as with all media tests) shows the name of the test (Hard Disk Diagnostics – Read Test) for the title, followed by a section containing the model number, firmware revision, serial number, capacity, and status of the disk under test. The next screen section contains a table. A typical snapshot might resemble the following:

	Elapsed	Remaining	Total
Duration	15m	45m	1h
Coverage	25.00%	75.00%	100.00%
Data	50.00 GB	150.00 GB	200.00 GB
Sectors	00000000:05D21DBA	00000000:1176592E	00000000:174876E8

The duration-elapsed field shows that the test has been running for 15 minutes. The duration-remaining field shows that the test will

take another 45 minutes to complete. When media tests are set to test by coverage, the duration-remaining and duration-total fields are estimated.

The coverage-elapsed field shows that 25% of the selected test range has been tested so far. The coverage-remaining field shows that 75% of the selected test range is still to be tested before the test will complete. When media tests are set to test by duration, the coverage-remaining and coverage-total fields are estimated.

The data-elapsed field shows that 50 GB of the test range has been tested (this is calculated from the test range size multiplied by the elapsed coverage). The data-remaining field shows that 150 GB of the test range is still to be tested before the test will complete. When media tests are set to test by duration, the data-remaining and data-total fields are estimated.

The sector fields show the same information as the data fields but in hexadecimal logical block address notation.

Following that you will see the current sector number and a progress bar spanning the width of the screen.

The final section of the screen is filled with the bottom of the error log (most recently logged information).

5.4.7 Read Verify Test

The Read Verify Test checks the media of the currently selected hard disk for bad sectors etc. This test causes the device physically to read the media but NOT transfer the data to the host controller. This results in faster testing, with much the same benefits. However, unlike the Read Test, this test does not test the device's ability to transfer data to the host computer.

See "Read Test" for a description of the screen layout.

Note: *This test cannot be run on non-IDE disks and disks connected via custom controllers. When run on these disks, this test will display an appropriate error message and set the result of the test to N/A.*

5.4.8 Non-Destructive Write Test

WARNING

Please ensure you have a valid up-to-date backup of your data before running this test. If this test is interrupted by power loss or user reboot, data corruption will occur.

This is a media class test. Although this test is theoretically safe, it does involve temporary changes to the disk, and is therefore vulnerable to the effects of power loss etc. Therefore the user is requested to repeat the challenge key 'YES' (case insensitive) before the test executes. This challenge will be presented on entry to the test (in interactive mode) and at the start of burn-in (in burn-in mode).

This test will take approximately double the time which the Destructive Write Test takes to complete (unless, of course, media tests are set to test by duration, in which case, they will both take the same amount of time to complete).

See "Read Test" for a description of the screen layout.

5.4.9 Destructive Write Test

WARNING

Please ensure you have a valid up-to-date backup of your data before running this test.

THIS TEST WILL DESTROY THE ENTIRE CONTENTS OF YOUR DISK.

This is a media class test. Due to the destructive nature of this test, you are requested to repeat a random 8-character challenge key. This challenge will be presented on entry to the test (in interactive mode) and at the start of burn-in (in burn-in mode).

See "Read Test" for a description of screen layout.

5.4.10 Mechanics Stress Test

This is a device class test. This test exaggerates the mechanical stresses caused by fragmented file systems in the day-to-day use of a disk. It can show up faulty seek logic, overshoot and undershoot problems, etc.

The test screen begins with a section containing the model number, firmware revision, serial number, capacity, and status of the disk under test. Following that is a section containing a table. A typical snapshot might resemble the following:

Elapsed	**Remaining**	**Total**	
Duration	15m	45m	1h
Level	25.00%	75.00%	100.00%

The duration-elapsed field shows that the test has been running for 15 minutes. The duration-remaining field shows that the test will take another 45 minutes to complete. When device tests are set to test by level, the duration-remaining and duration-total fields are estimated.

The level-elapsed field shows that 25% of the test has been executed so far. The level-remaining field shows that 75% of the test is still to be executed before the test will complete. When device tests are set to test by duration, the level-remaining and level-total fields are estimated.

Following that you will see a position bar that shows the current position of the head in the Mechanics Stress Test and the (theoretical) current cache read/write address in the Internal Cache Test. This is followed by a progress bar spanning the width of the screen.

The final section of the screen is filled with the bottom of the error log (most recently logged information).

5.4.11 Internal Cache Test

WARNING

Owing to the active nature of *Pc-Check's* cache-sizing algorithm, this test can be potentially destructive, if, for example, it is interrupted by power loss or user reboot.

Please ensure you have a valid up-to-date backup of your data before running this test.

This is a device class test. Because this test can be potentially destructive, the user is requested to repeat the challenge key 'YES' (case insensitive) before the test executes. This challenge is presented on entry to the test (in interactive mode) and at the start of burn-in (in burn-in mode).

The integrity of the disk's internal cache is tested. Hard disks currently support RLA (read look-ahead) and write caching.
See 'Mechanics Stress Test' for the screen layout description.

Standby Test

The hard disk is put into standby mode (power saving mode) and after a short time returned to running mode. If the disk is traditional rotating media type (not SSD) the device will spin down and spin up. The progress/response of the drive to these operations is monitored and the ability to respond to read operations on resumption is checked.

5.4.12 SMART Test Menu

Note: *Refer to the notes under the "Check SMART First" option for more information and advice about SMART.*

Some hard disk service organisations will no longer accept hard disk returns unless at least a SMART short self test function has been ran.

Theoretically the self tests also benefit from sensors and specific knowledge to which *Pc-Check* cannot obtain access. However it should be remembered that the precise implementation and performance of the test is entirely under the control of the hard disk manufacturer and their individual firmware implementation.

Note: *If SMART operations had been disabled for this disk, they are temporarily enabled for the duration of these tests, and then reset to disabled.*

Note: *Some of these tests, especially the Extended Self-Test, might take a long time to run, characterised by periods of apparent inactivity. A "spinner" alongside the progress bar gives reassurance that the test is still functioning. A number of supportive messages might also appear, such as a reminder that the hard disk activity LED might not be lit - which does not indicate that the test has hung.*

SMART Immediate Test

Checks the entire SMART Error Log for previous failures of all hard disk commands (0x01 to 0xff). If errors are found, the number of errors is reported and warnings are displayed for those commands that have failed. If the disk has experienced so many, or such severe, problems that the disk has exceeded a manufacturer-defined threshold, the disk status is then set to failed. Where possible, additional diagnostic information is displayed.

All errors that appear in the SMART log are of physical significance, i.e. they do not relate to programmatic errors, such as out of range sector values. However, these errors may have come to pass due to something as simple as a sharp knock or power fluctuation during operation. Therefore a disk's status may remain as passed, even though warnings of command failures have been listed during the test.

However, because short-falls in some vendor implementations have been know to pass disks which otherwise exhibit clear problems, this test will fail a disk with an excessive error count, irrespective of the disk's own reported SMART status (vendor firmware status). In interactive mode, this test will recommend the use of SMART Self-Test options, where it has detected suspicious log activity.

In the case of a disk with more than two warnings, it is good practice to monitor the disk more closely in future, in case this is an early indicator of a more serious problem.

SMART Short Self-Test

A bar reports progress in 10% increments. On completion, the result is displayed in the bottom section of the screen.

Typically, this test should not take more than 10 minutes.

SMART Extended Self-Test

Note: *If the SMART Short Self-Test fails, there is no point in running this Extended Test.*

If both of these tests are selected under burn-in, then, should the SMART Short Self-Test fail, the SMART Extended Self-Test will automatically be set to failed, and the burn-in will move on.

This test will (typically) test the entire medium, but might do so far more quickly than a *Pc-Check* 100% coverage test. This is because the test takes place entirely on the disk by the disk's own controlling processor, and no data need pass out of the disk. However, bear in mind the caveat given above regarding the manufacturer's implementation of the test.

The user interface for this test is identical to that of the SMART Short Self-Test. The duration of the SMART Extended Self-Test is dictated by media size, and could take several hours

SMART Conveyance Test

This test is intended as a quick test to identify damage incurred on the Device, only available on ATA drives.

5.4.13 View Error Log

Shows error log screen. The Error Log looks like this: -

```
Read Test: Disk 80H (Primary Master)
   Read error at sector 00000000:00041F5C
   Read error at sector 00000000:0021CF20
Read Verify Test: Disk 80H (Primary Master)
   Read error at sector 00000000:00041F5C
```

…etc.

Press ‘C’ to clear the error log (you will be prompted for confirmation);
‘S’ to save the error log to disk (you will be prompted for a filename);
‘P’ to print the error log to line printer (LPT1); or <Esc> to exit.

5.4.14 The Utilities Menu

Note: *These facilities function for BIOS driven hard disks as well as those for which model information can be obtained.*

Save Master Boot Record

Saves a copy of the currently selected hard disk master boot record (MBR) to a floppy disk. You are asked to provide a floppy disk filename for the MBR being saved: the default name includes the LUN value, e.g. MBR_80PM.BIN. Several MBR files can be saved to the same floppy disk by giving them different filenames. Read the important notes below.

Restore Master Boot Record

Restores the MBR for the currently selected hard disk from a copy held on a floppy disk in drive A:. You are prompted to enter the filename from which you wish to restore the MBR. See important notes below.

IMPORTANT

If you are running *Pc-Check* from a floppy diskette, remember to replace the program disk AS SOON AS the Save/Restore operation with the backup disk is completed.

Always be sure to restore saved data only to the hard disk from which it was saved. Check that the appropriate hard disk is indeed the one currently selected.

Enable SMART Operations

Enables SMART operations for the currently selected disk. Future errors will be logged by the disk (even while Pc-Check is not running) and will cause it to fail the next time the Smart Immediate Test is run.

Disable SMART Operations

Disables SMART operations for this disk – future errors won't be logged at any time until the feature is re-enabled by whatever means.

5.5 Optical Device Diagnostics

5.5.1 Configuration requirements

You will require just one CD-ROM/DVD drive, regardless of the medium from which you are running *Pc-Check*. Both the Transfer Test and the Random Seek Test require a data only CD-ROM or DVD (as appropriate).

The CD-ROM / DVD Test Disc Read requires either:

a Eurosoft CD Test Disc (which is typically an integral part of a *Pc-Check* CD-ROM Program Disc)

or:

a Eurosoft DVD Test Disc. The latter is a multilayer DVD9 disc, and is required to perform the DVD Laser Refocus Test.

Note: *Contact Eurosoft if you require a multilayer DVD Test Disc.*

For ATA CD-ROMs/DVDs, *Pc-Check* will drive the device directly in the absence of a DOS device driver. For other types of CD-ROMs/ DVDs, the user must have loaded the relevant DOS device driver. Hence these tests won't work under Self-Boot *Pc-Check* for non-ATA CD-ROMs/DVDs. See Appendix A for advice on how to test such drives by running *Pc-Check* under a full DOS.

Note: Execution Times for CD-ROM Tests. *Older CD-ROM drives transfer data at a considerably slower rate than more recent models. Inherently, comprehensive testing of older drives can take a considerable time to run to completion.*

During testing, the upper area of the screen lists a number of technical parameters for the CD-ROM/DVD drive and interface, together with a continually updated display of the sector under test.

Use the cursor keys to highlight the required option and press <ENTER>.

5.5.2 Select CD/DVD Device

If more than one such device is fitted, allows a particular drive to be selected; otherwise states that only one device is present.

5.5.3 CD/DVD Transfer Test

Determines the sustained transfer rate of the CD-ROM or DVD drive by reading the inserted disc for a given period. The result is displayed in Kilobytes per second, and will be given a speed rating. Should the drive not deliver more than 150KB/sec, then it does not even provide the minimum CD-ROM data rate required for the reproduction of CD audio, and will be deemed to have failed the test.

Note: *The inserted disc will need to have at least 100,000 sectors containing data before it can be used to run the test. The more data on the disc, the more likely that the test will exhibit the full performance of the drive.*

Error Messages and Comments

'This test requires a CD-ROM/DVD data disc'

5.5.4 CD/DVD Random Seek Test

Produces the average seek time for the CD-ROM/DVD drive by reading random sectors from the inserted disc for a given period. The test will fail if the average seek time is more than 1 second: this represents the minimum acceptable standard for early multi-media systems.

Note: *The inserted disc will need to have at least 66,000 sectors before it can be used to run the test, but the results may not be accurate unless the disc has at least 260,000 sectors: a warning will appear on the screen in this case.*

Error Messages and Comments

'This test requires a CD-ROM/DVD data disc'

'The inserted disc has less than 66,000 data sectors: it is too small to give meaningful results'

'The inserted disc only has a small number of data sectors: this may adversely affect the results'

5.5.5 CD/DVD Tray Test

This test is for tray-loading CD-ROM/DVD drives **only**. Ejects and closes the CD-ROM/DVD tray and confirms the success of each operation.

IMPORTANT

Do not run this test if you are using a slot loading CD-ROM/DVD drive, because such drives cannot perform the "close" operation. The consequences are:

The test will be logged as a failure. This could possibly distort the final outcome of the test report.

If Pc-Check is being run unattended, the disc will no longer be available!

5.5.6 CD/DVD Test Disc Read

This test requires a Eurosoft CD or DVD Test Disc which is specially laid out to test CD-ROM or DVD drives fully. The test reads from the beginning of the proprietary test file contained on the disc to the end of the file, ensuring that each block is readable, and verifies that it contains exactly the correct information.

The test can be interrupted by pressing <Esc>, giving an aborted result.

Note: *If your package does not include a CD or DVD Test Disc, and you require one, contact Eurosoft.*

5.5.7 DVD Laser Refocus Test

This test is for multilayer DVD drives, and requires the Eurosoft multilayer DVD Test Disc. If your are not running from the CD-ROM/ DVD drive, insert the DVD Test Disc. If you are running from CD-ROM, you will be prompted to swap out the program disc and insert the DVD Test Disc.

The test moves back and forth between the layers, ensuring that the test data is read accurately.

If appropriate, you will be prompted to replace the CD program disc.

5.6 TPM (Trusted Platform Module)

This test displays information about the TPM device, before running the test and displaying the results.

Note: *A Trusted Platform Module (TPM) is a hardware device built to the specification of the Trusted Computing Platform Alliance (TCPA). Essentially it consists of a secure micro-controller plus cryptographic functions. It works with supporting software and firmware to prevent unauthorised access to passwords and other sensitive data, and to support secure transactions.*

If Pc-Check does not detect a configurable device which supports a TCPA implementation, an appropriate error message is displayed.

TPM testing first invokes a self-test, which can be likened to SMART testing of a hard disk – the TPM module checks its internal state and functions for consistency and signs of tampering. The test then attempts to subvert the TPM module to reveal information it should not. It does this in a non-destructive manner and ensures that the TPM provides protection.

5.7 Serial Port Diagnostics

Note: *A set of loop-back plugs may be ordered separately from Eurosoft by contacting us at the address or phone/fax numbers given at the beginning of this manual.*

One test (Serial Port Internal Loopback) does not require a serial loopback plug. For all other tests, please ensure that your serial loopback plug is inserted into the correct port before you begin these tests.

The screen is divided into two parts: the left-hand panel shows details of the selected serial port, including the current results status of the tests, while the right-hand panel contains a serial port selection menu.

5.7.1 Serial Port Selection Menu

The menu displays all the serial ports in the system with the port number, I/O address and IRQ level for each port. Additionally, up to 16 serial ports are supported on PCI adaptor cards.

Once a serial port has been selected, the next screen displays details of this port and the status of the tests in the left-hand panel, and a menu of tests in the right-hand panel.

5.7.2 Serial Port Tests Menu

The right-hand panel uses the standard cursor keys to permit selection of a particular serial port, and to decide whether to run all tests or individual tests.

The serial port tests are full duplex and interrupt driven to apply maximum stress to the components during testing.

IRQ Test

The IRQ test will already have a result at this stage: it cannot subsequently be run. Since the serial port tests are interrupt driven, then, if this test has failed, the problem must be corrected before any other tests can be run: a message to this effect will appear on the screen.

5.7.3 Select Another Serial Port

Displays the Serial Port's Selection Menu again, or gives a message if only one port was detected.

5.7.4 Run All Serial Port Tests

When you select this option, all the tests listed below on the menu are run in sequence on the currently selected port. You can then insert the loop-back plug into the next port and choose "Select Another Serial Port". The option "Run All Serial Port Tests" will repeat all the tests on the Serial Port Test Menu in sequential order as before.

5.7.5 Serial Port Line Control Test

This tests the serial port's ability to transmit and receive data with various combinations of parity, stop and data bits. Once started, the right hand panel shows data transmitted and received from the serial port, whilst the message at the bottom of the screen shows the current line control status.

5.7.6 Serial Port Handshake Test

This tests eight signals of an RS232 serial port. The panel on the right of the screen will indicate a PASS/FAIL result individually for each signal, whilst an overall result is recorded in the results of the left hand panel.

5.7.7 Serial Port Loopback Test

This tests the serial port's ability to transmit and receive data simultaneously (Full duplex) at various baud rates. Once started, the right hand panel shows data transmitted and received from the serial port, whilst the message at the bottom of the screen shows the current line control status.

5.7.8 Serial Port Internal FIFO Test

This tests the serial port's ability to transmit and receive data simultaneously (Full duplex) at 115,200 baud using the advanced serial port's internal FIFO buffer (First in first out). Once started, the right hand panel shows data transmitted and received from the serial port, whilst the message at the bottom of the screen shows the current line control status.

This test will refuse to run if the port under test does not have an internal FIFO, and will display an appropriate message for five seconds.

5.7.9 Serial Port Internal Loop Test

This test permits signals to be looped internally in the UART (port driver chip) using a special diagnostic mode supported by most chips. This means that some testing is possible without inserting a loopback device.

Note: *By looping internally to the device, there is no test of the electronic tracking, and/ or cable connections, to the physical port on the system case, and the number of handshake signals tested is reduced. For these reasons an external loopback device remains the preferred method of testing.*

5.7.10 Serial Port Divisor Clock Test

This test sets the speed of the serial ports clock to test slowing down the clock (meaning set speed) by sending the clock a divisor from the serial driver to a register in the port.

5.9 ATA

These tests probe for and perform basic register checks on ATA controllers of both parallel and serial type.

Note: *It is possible that you might see the message: "No serial ATA controllers were identified", even though such devices exist. Furthermore, you might possibly find that they are tested and listed under* ***Parallel*** *ATA Tests. The explanation is as follows.*

Some earlier serial controllers were given a generic class type, or in some cases, the existing (parallel) ATA class code. For those devices given the generic storage class, it is not possible to differentiate the device from other controller types, and so these devices will not be tested.

However, those classed as if they are parallel ATA devices will test as PATA, but, because SATA controllers provide a parallel compatible interface subset, the test will still pass.

5.9.1 Parallel ATA Test

This test displays vendor and device information, various command base addresses, and a Pass/Fail indication.

5.9.2 Serial ATA Test

The tests and display are very similar to those for the Parallel ATA test.

5.10 USB

Note: *If present, USB support in the BIOS* ***must*** *be enabled before running these tests.*

Pc-Check's USB diagnostics support multiple-controller configurations.

No USB devices should be inserted or removed during testing.

The left-hand panel provides USB details and the status of the tests, while the right-hand panel contains a test menu with the following options:

5.10.1 Test USB Controllers

A series of tests is performed on the USB, including BIOS Handoff, Initialise Controller and Register Tests. Details of detected USB controllers are displayed below the test results. Press <ENTER> to continue.

Note: *If the BIOS is using the USB controller(s) to provide boot/keyboard support to Pc-Check, a less intensive controller test will be performed on those controllers, with no result being returned for "BIOS Handoff". This is to avoid potential problems with hand-back protocol which could have affected some systems, if the full tests had been performed.*

5.10.3 USB Device Information

Device data relating to the USB root hub ports is first read and cached before being displayed to screen. The data includes controller number, device number and vendor ID. Press <ENTER> to continue.

5.10.4 Exit USB Tests

Returns to the Advanced Diagnostics Menu.

5.11 Firewire (IEEE 1394)

Tests controllers for FireWire (IEE1394, DV, iLink). The left-hand screen panel provides FireWire information, and the right-hand side displays the test menu.

5.11.1 Test Controllers

Runs a series of controller tests, displaying measured results and pass/ fail conditions.

5.11.2 Controller Information

Produces a scrollable display of FireWire controller information.

5.13 System Stress

Performs effectively simultaneous device access (time sliced) to hard disk, memory, CD/DVD and video, while loading the CPU. Support is provided for multiple CPUs, multiple CD/DVD drives, and unbalanced mirrored RAID assemblies.

Memory testing will fail if an excessive number of ECC (Error-Correcting Code) events are detected: the default is 10, which can be altered via the command switch /ET.

The menu allows the various tests to be included or omitted (toggled via the <ENTER> key), and for setting the duration of the test. Writing to hard disks can be toggled on or off.

Note: If writing to hard disks is enabled, and the system is reset or powered off during the test, there could be a loss of data.

Note: There are predefined tests. These predefined tests are Quick for 3minutes, HyperTransport / Quick Path Interconnect for 5 minutes and Standard Full test is 20 minutes.

Custom test allows you to select settings. As an example, to alter the test duration to 5 minutes, type: 0h 5m 0s and press <ENTER>.

During the Stress test, the video testing runs first at one task priority (say a low one). After a while, it stops and removes itself from the screen. During this interval of 'no video', the testing of the other components still continues. The video test will later restart at a new task priority (say a high one) until the next interval, and so on until the whole stress test duration is over.

Begin the test by selecting "Perform Tests". The main test screen displays information and progress for the individual and collective test processes. During the periods of video testing, a rotating cube is displayed on-screen: when it is not running, the usual "activity bars" are displayed.

5.14 Keyboard Diagnostics

This test requires operator interaction, by pressing all the keyboard keys and checking that the display responds in the expected manner.

On initial selection, a menu of keyboard types is presented, in decreasing order of key numbers. For DOS *Pc-Check,* keyboards which are suitable for the current DOS country code setting (as set up in config.sys) are highlighted: the first of these will be selected. This menu has no top-to-bottom wrap: you may need to scroll if a large number of keyboard types is listed. After selecting a keyboard, the Keyboard Tests menu appears.

5.14.1 Verify Keyboard

Displays a representation of the selected keyboard type. Since the exact layout of any one keyboard will vary slightly from others of the same class, occasionally there may be slight differences in the placement of keys. For keyboard types that do not support LED switching under software control (typically 83 or 84 key keyboards), you will be requested to enable the CAPS lock if it is not already on. If this is the case, then the test will proceed the moment that CAPS becomes enabled, or that another key is pressed (for instance if CAPS is faulty).

You should press every key at least once. When each key is pressed, the on-screen key is highlighted both on the key top (legend) and on the bar at the bottom of the key representation. The key legend remains highlighted only when the key is pressed, while the bar will remain highlighted once the key has been 'visited'. If all keys are successfully highlighted, the test ends with a pass result. Note that for mono screens, the key "disappears" when pressed and the legend becomes bright: only the key top returns when the key is released.

During testing, the CAPS lock and Shift keys retain their normal behaviour and the CAPS lock LED will light as per normal. Note that the Scroll Lock and Num Lock LEDs will **not** operate during this test. When either the state of the CAPS lock is changed or a Shift key is depressed, the legends of the keyboard representation will be altered appropriately.

At the bottom of the screen, the current hardware scan code is listed, along with the state of the CAPS Lock and Shift keys. Opposite, the state of the currently- or last-pressed key is given, along with the legend of the key in both the shifted and unshifted state.

To exit this test without pressing all keys, <Esc> must be pressed twice. You will be asked to confirm this action. A selection of keys is provided for both the positive and negative responses in the various dialogues of this test.

If, on exit from this test, either through completion, or by user action, *Pc-Check* believes that certain keys may have become stuck down during testing, it will list them and ask if you wish to record a pass or fail result. If a fail result is recorded, no further questions are asked.

If all keys have not been pressed, you will again be asked if you still wish to record a pass result. You will then be returned to the tests menu.

5.14.2 Keyboard Controller Tests

Automatically asks the keyboard controller to perform its self-test and interface test, using the same method as in the appropriate 'Motherboard Test' (*qv.*) under which the result of this testing will be stored.

5.14.3 Key Repeat Test

You will be requested to press and hold an alpha-numeric key. The key must be held until the program requests its release (about 2 seconds). If the key is released early or other keys are pressed, the test will fail. After the key is released, the test will report pass or fail, and you may return to the tests menu.

5.14.4 Keyboard LED Test

If you are using a keyboard type that does not support LED switching under software control (typically 83 or 84 key), then you will be informed that this test is not possible. Otherwise, each LED will be lit in turn and you will be asked to confirm that this and only this LED has lit. This will occur for all LEDs regardless of the result for previous LEDs. When all LEDs have been tested, the result is displayed and you may return to the tests menu.

5.15 Mouse Diagnostics

If no mouse is connected a message to this effect is displayed. Otherwise information relating to the mouse as well as the status of tests is displayed in the left-hand panel, with the following message in the right-hand panel:

In order to perform the mouse tests the video mode will require to be changed. If your video card and monitor have not been configured for use in these modes some screen distortion may occur. This will not harm your system but may make some tests difficult to complete.

Press a key to continue or <Esc> to abort testing now.

If you press a key to continue, the first mouse test (the Button Test) starts. The right-hand panel holds a diagram of a mouse: as each button is pressed in turn, the colour of the screen 'button' changes. However, if you failed to respond within the test's timeout period, or the buttons on your mouse are faulty, the test status is set to FAILED and you are returned to the Advanced Diagnostic menu. Tests for the CENTRE button will only respond if your mouse has 3 buttons and its driver is configured to recognise the centre button. *(Refer to the manufacturer's manual).*

Otherwise, if the test passed, the next test begins (the Ballistic Test); for this and subsequent tests, the X and Y co-ordinates of the mouse are displayed along the bottom of the screen. There are two versions of both the Positioning and Area Redefine tests, one for text mode, the other for graphics mode. The final test, Graphics Cursor Redefine, is by implication for graphics mode only.

All tests have a timeout period (of fair duration for a correctly functioning mouse). Failure to complete the test successfully in this time leads to a test failure and subsequent exit from the mouse option. You may terminate any test by pressing <Esc>; the test status is set to ABORTED, and the option exits.

For the Ballistic test, you are asked to confirm the ability to change the speed of response of the mouse. For the Positioning tests, click the left mouse button over the four extreme corners of the full screen (not the dots on the diagram!). For the Area Redefine tests, confirm that the cursor cannot move outside the rectangular area, and then click on the four corners as indicated. For the Graphics Cursor Redefine test, you are asked to click on the box that best describes the appearance of the cursor; the test passes if you click on the appropriate box.

5.16 Beeper Test

This test will play the "William Tell Overture" through the PC Speaker for about 40 seconds. You are prompted to confirm hearing the speaker: if you can hear the tune, press 'Y' to pass the test, otherwise press 'N' to fail.

Note: *Failure to produce a sound from this test might be the result of a BIOS setting.*

Note: *This test can be used on all systems, including those where there is no sound card, and for HD Audio laptops that mute the beeper when the HD chipset is initialised.*

Note: *On some laptop systems, the Beeper is shared with other Audio devices, and can be left disabled after testing these devices.*

5.17 Audio Tests

Performs tests on High Definition (HD) or AC'97 integrated audio, according to which hardware is present.

For HD Audio, wherever possible, all output "jacks" will be configured for audio out, so, for example, headphones should monitor an output signal from each audio jack.

The user images are similar for both HD and AC'97 hardware. In the case of HD Audio, a diagram is briefly displayed at the start of tests, reflecting the internal organisation and configuration of the device.

Results of these tests can be viewed in the Results Summary or printed in the Results Report, both accessed from *Pc-Check*'s Main Menu.

Note: The sound levels from different tests can vary considerably. Try each test first with a low volume setting, and if necessary repeat at a higher level, to avoid distressing headphones, speakers and ears.

5.17.1 Real-time PCM Test

You should immediately hear a constant tone from both the left and right speakers. Once again you will be asked to confirm hearing the sound. Press 'Y' or 'N' as before.

5.17.2 Streamed PCM Test

A progress bar "Reading PCM Data" should be followed by music from both speakers, and a message "Can you hear the audio stream, and does it sound correct?" Press 'Y' or 'N' as before.

Note: If you do not hear the expected sound through your loudspeakers when running the Real-time and Streamed PCM tests, try the following before declaring that the tests have failed.

1 Ensure that any volume and mixer levels for the external speakers are high enough.

2 As a temporary measure, reply "N" to the test, and then connect the speakers successively to the other audio sockets, as follows. Switch off the speakers. Remove the speakers' mini-jack plug from the normal computer audio output socket (typically coloured green on many modern sound systems), and insert it into any other available audio output socket. Switch the speakers back on, and rerun the tests. If this does not produce sound, repeat the sequence by connecting to the audio line-in socket (often coloured blue).

Then choose "Y" or "N" according to whether you do eventually hear the sound. Replace the loudspeaker lead into its normal position on completion of the tests.

Note: *This apparently anomalous effect, whereby an ostensible input channel provides an output, and an output channel does not, can be the result of running audio hardware, designed to be used under Windows® control, in a DOS environment.*

5.17.3 SPDIF Run DMA Test

This test is available for some chipsets. A message is displayed if *Pc-Check* does not support SPDIF for the audio card.

A message is displayed for a few seconds indicating that the test is running, and that it may cause a tone to be emitted from connected SPDIF capable hardware. The test then sets the final result and returns to the Audio Tests menu.

5.18 Video Diagnostics

This menu gives a comprehensive range of tests, most of which require user intervention. Test results can be viewed in the Results

Summary or printed in the Results Report, both accessed from *Pc-Check's* Main Menu.

Note: *The screen may go blank for a short while at the beginning of some tests, and when changing to a different video mode.*

Note: *If the overlaid instructional text on a test screen obscures the test display itself, it can be toggled off/on by pressing the <H> (Hide) and <S> (Show) keys respectively.*

5.18.1 Warning – Video Test Initialisation

On first-time entry only, the following message is displayed:

> **Pc-Check is about to test all the video modes that are supported by your graphics card. This will cause your screen either to flicker, or to go blank. This process usually takes only a few seconds but may take longer on some systems. This will not damage your hardware and will only occur the first time these tests are run.**
>
> **Please also note that these tests make all supported modes available for testing, some of which may have scan rates too high for your monitor. Please deselect incompatible modes using the mode selection menu. Thank you.**

This panel will not be displayed again until after *Pc-Check* is restarted. The panel does not appear during Burn-In testing.

If the video card is unable to change into all the modes which it reports as supported, these modes will be automatically removed from the Select Modes for Testing list (see below): a message to this effect is displayed.

5.18.2 Video Driver Information

Lists basic information about the Video card configuration.

5.18.3 Select Modes for Testing

A table of video modes is presented, initially all preceded by a small symbol, indicating that they are selected for testing. Pressing <SPACE>

or <ENTER> against an entry toggles between selection and non-selection of that mode. Press <F10> when the selection is complete. You will be unable to exit with either no modes selected or only 8 bit mode(s) selected: messages to this effect are displayed in these circumstances. <Esc> cancels any selection changes and exits the panel.

5.18.4 Check Gamma

Provides an estimate of the current Gamma value of the monitor. The lower half of the screen is a horizontally-graduated, calibrated grey-scale rectangle. The point at which the brightness of the top solid rectangle matches the lower gradient is the current gamma value. Press any key to return.

5.18.5 Colour Linearity

Tests for Red+Green (yellow), Green+Blue (cyan) and Blue+Red (magenta) are run in succession at the highest available resolution. Press <Esc> to quit the tests, or any other key to move to the next test.

5.18.6 Colour Purity Test

The Colour Purity Test displays four screens of solid colour: red, green, blue and white, each at full intensity. The control keys are as follows:

<Esc> key	**Returns to the video tests menu and records an 'ABORTED' result.**
Y key	**Records a 'PASSED' result.**
N key	**Records a 'FAILED' result.**

5.18.7 True/High Colour Test

For each selected video mode, two display screens are generated. The first of each pair shows the additive and subtractive primary colours as stripes, from black through maximum intensity to white. The second displays squares of graduated primary or secondary colour combinations. The control keys are as for the Colour Purity Test.

5.18.8 Alignment Test

For each selected video mode, a rectangular grid pattern with concentric circles is displayed, to check for distortion on CRTs, and also projector displays. The control keys are as for the Colour Purity Test.

This is a test of the monitor and will confirm that the coils and magnets have been correctly aligned on the tube and that the vertical and horizontal amplitude and linearity are correctly adjusted. If the test fails you should firstly check that all cables and connectors are securely attached and then check for transit damage; otherwise you may need to replace the monitor if adjustment of the display controls (horizontal/ vertical/pincushion etc) does not correct the misalignment.

***Note**: On no account should untrained personnel open a monitor.*

***Note:** On some LCD screens, pixels in certain modes may be displayed square where they would be rectangular on a VGA monitor. The effect will be to produce an elliptical rather than a circular pattern for this test. Likewise, if the resolution is not the 'native' display resolution, the lines may appear blocky or blurry. These effects do not imply misalignment.*

5.18.9 LCD Test

Tests for dead pixels by displaying a series of checkerboard screens: Red+Green, Green+Blue, and Blue+Red, mapped pixel-for-pixel with the LCD screen. This checkerboarding makes dead pixels more obvious than solid colour, and indicates which colour sub-pixels are stuck on or off. The control keys are as for the Colour Purity Test.

5.18.10 Test Card

Provides a quick visual check of the performance of several video parameters, at each of the selected screen modes. The control keys are as for the Colour Purity Test.

***Note:** The screen will blank (go black) while the video mode is changing: this process may take several seconds.*

5.18.11 Video Memory

This option employs exactly the same series of tests described under the "Test Video Memory" option of "Memory Diagnostics", and indeed automatically diverts to that screen panel.

On first-time entry only, the following message is displayed:

> **Your video card's memory will be tested using the standard Pc-Check memory test algorithms, and hence the same options are available to video memory as to ordinary memory.**
>
> **Pc-Check will now enter the Memory Tests menu where you will find the 'Test Video Memory' option. When you leave the Memory Tests menu, you will return here to the Video menu. This message will not appear next time.**

When the Memory Diagnostics screen appears, use the cursor keys to select "Test Video Memory". The tests may take several minutes, during which a variety of patterns will occupy the screen. After the tests are complete, the main Memory Diagnostics panel reappears. Pressing <Esc> returns to the Video Diagnostics panel.

5.18.12 Exit Tests

Returns to the main Advanced Diagnostics Menu.

5.20 PCI Express Links

Note: *This test can be run from the Advanced Diagnostics menu or selected for Burn-in. It requires the user to pre-supply a configuration file, as described below.*

This configuration file must reside alongside the Pc-Check executable, except in the case of a CD-ROM boot, when it can reside separately on a floppy diskette (allocated as drive B:).

The test compares the link configuration of installed PCI Express devices against a description held in a configuration file.

PCI Express slots come in an assortment of performance levels. The performance level of each slot is dictated by the number of 'lanes' of data that are available to devices installed in that slot – either 1x, 2x, 4x, 8x, 12x or 16x. This is known as the link width. Initial communication with a PCI Express device is always at 1x, and then, after a negotiation phase, the slot reconfigures to the best mutual connection.

If the desired configuration is known and static, a description of the slots and the expected link widths can be setup in a configuration file, which *Pc-Check* can verify as part of a burn-in script.

Unfortunately, the system BIOS support for PCI Express configuration data is often overlooked. For example, the system BIOS might lack any extended configuration information, or these records might have been filled out incorrectly by the system BIOS.

Therefore *Pc-Check* first runs a number of validation checks. If the *Pc-Check* data validation fails, the link width test will not be run, suitable warnings are generated, and the information is displayed in its original form.

Unless you have been given a validation failure message, you should not see:

a) slots with the same number;

b) slots which have a current configuration greater than the maximum possible;

c) a zero value for the maximum.

The configuration file is simple and takes the following form:

* Comment lines that start with a semicolon character are ignored.

* Configuration lines shall contain ‘s=x, w=y’ where ‘x’ is the slot number and ‘y’ is the link width (either 1, 2, 4, 8, 12 or 16). Multiple width options may appear for the same slot if desired on separate lines in the file.

Example file content:

```
; s=slot number, w=required link width
s=2,w=8
s=1,w=16
```

The file must be called ‘PCIELINK.TXT’ and either be in the default directory or on B:\ if *Pc-Check* is booted from CD.

If a mismatch occurs ensure that the failed result is attributed to the correct slot.

Section 6

CONTINUOUS BURN-IN TEST

It is important for a newly assembled or a repaired PC system to be subjected to a 24-hour or more *Pc-Check* Burn-In Test before delivery to the end user. It is also very sensible for the user to subject a machine in regular use, especially where corruption or loss of data could lead to costly or time-consuming rework, to the kind of tests performed by *Pc-Check* that will expose any weakness that may have started to develop. You should do this after regular maintenance, at 3 to 6 month intervals or shortly after a repair or system rework.

Note: *These diagnostics are usually used for reliability testing and not for casual fault-finding. As one would expect, if a component FAILS during Burn-In, this will be the final result regardless of subsequent passes during Burn-In testing.*

6.1 Options for Setting Up Burn-In

Burn-In testing can be set up from within *Pc-Check*.

Burn-In via *Pc-Check*

6.1.2

Advantages:

Either Immediate or Deferred Testing is available (see below).

Ability for applying individual tests to different hardware devices of the same type,
e.g. two hard drives can have different tests applied.

Constraints:

Construction takes place in a non-GUI environment.

Some knowledge of the syntax of the scripts and lists is required.

In some situations, the Test Script and Command Line List have to be stored on a different media from the *Pc-Check* program media, a procedure requiring some care.

6.2 Immediate and Deferred Burn-In

Pc-Check provides two methods of continuous Burn-In testing: immediate and deferred, both of which are available from the main menu.

Immediate Burn-In Testing is for the creation of a script sequence appropriate to the system currently executing *Pc-Check*, and is held in memory for immediate execution.

Deferred Burn-In Testing is for the creation of script files of a generic nature, written to media, only for later execution by *Pc-Check* on that or on other machines.

Note: *For convenience, it is possible to load and save files from the Immediate Burn-In menu. Loading a script file permits the user to start it manually, without the need to pass the name of the file via the command line. When a generic script is loaded under Immediate Burn-In, devices not present on the system are discarded from the sequence.*

The remainder of the present Section deals with creating both Immediate and Deferred Burn-In testing via the interactive menu facility of *Pc-Check* itself.

The user-images for the two options differ in only two respects, which are now summarised:

(i) The menu for Immediate Burn-In contains an extra option to allow the tests to be performed, which by definition is not available for Deferred Burn-In.

(ii) The range of tests available for Immediate Burn-In is restricted to those devices which are actually present on the machine. For Deferred Burn-In, a complete list of tests is provided, since in general the specification of the target machine is not known.

6.3 The Burn-In Menu

Selecting either of the Burn-In Testing options from the Main Menu leads to the Burn-In menu. An information panel at the top of the screen displays the current options, which can be altered by the Change Options menu described below.

6.3.1 Load Burn-In Script

The name of a prepared script file of Burn-In commands can be entered. The files available on each available drive can be seen in the file browser. When this is loaded, the contents can be altered via other menu options if required. See the note below for the source of the file.

6.3.2 Save Burn-In Script

The Burn-In options selected can be saved as a script file for future use, perhaps for regular reliability testing, or, in the case of Deferred Burn-In, for transfer to another machine. Any valid DOS filename is allowed, for instance BURNFILE.DAT. The file can be edited with any text editor, including *Pc-Check's* own. The files available can be seen in the file browser.

Note: *If you are running from USB flash device, you can use either the flash device itself or a floppy diskette to save or load your Burn-in scripts.*

Note: *Remember to supply the full pathname of the file, including the appropriate drive letter (see Appendix B for details).*

6.3.3 Change Options

This leads to a sub-menu of Burn-In options, which allow the parameters in the panel at the top of the screen to be altered. Some options lead to yet another sub-menu, some allow a Yes/No toggle via the <ENTER> key, while others allow a value to be entered directly from the keyboard.

In some cases the options are interdependent: for example, if Pass Control is set to “Individual Passes”, then Duration is always “N/A” (Not Applicable). If Pass Control is set to “Overall Time”, the units of Duration are hours and minutes (ranging from 00:01 to 99:59); the default Duration is 1 hour (01:00).

If the Pause on Error option is set to “Yes”, a screen panel will appear during burn-in testing if an error is detected, allowing the user either to resume, or to abort the entire Burn-In test.

The journal options allow you to control the display of results on exit based on only a failure result.

6.3.4 Select Tests

This option leads to a panel which allows the available devices and tests to be selected from a list. Pressing <F1> brings up a Help panel detailing the keys which control the selections:

↑↓	Chooses device or test
<ENTER>	Toggles testing of the highlighted item
<TAB>	Toggles testing of all devices
<ESC>	Exits to the previous menu

When “Individual Passes” has been selected from the Change Pass Control option, use the numeric keys to enter the number of times to run each test.

Selecting a device will display a list of individual tests. All selected items are prefixed with a diamond symbol. The key controls given in the Help panel can then be used to amend the list. If “Individual Passes” has been selected under Pass Control, then the number of passes for each test can be specified (default 1, maximum 9999). For the other Pass Control options, you can choose between running the test or not (Y/N). On completion, use <ESC> or <F10> to save your selections and return to the Burn-In Menu.

If the number of tests selected overflows the page, the list can be scrolled using the cursor or PgUp/PgDn keys. Arrows are shown to indicate when there are more tests above or below the displayed section of the list.

6.3.5 Perform Burn-In Tests

This option is only present for Immediate Burn-In Testing. If the Hard Disk Non-Destructive Write Test has been selected, a special panel will appear advising that a suitable back-up should exist before continuing. If required, the Non-Destructive Write Test can be disabled by pressing <ESC>. The remaining Burn-In tests will then continue.

During testing, information at the top of the screen monitors progress of the current test and the overall tests, including information about the last three errors found. If <ALT-S> is pressed at any time during the running of the tests, the display toggles between the panel and the detailed description of the tests in progress.

Note: *Command Line switches set via the Advanced Start-Up Options in the current session will apply to Immediate Burn-In testing.*

Note: *When testing serial/parallel/USB ports ensure that loopback plugs are inserted in the appropriate connectors.*

Note: *There is a time-out at the beginning of each printer test during Burn-In to allow for the previous pass to finish. This will be observed as a delay of up to two minutes before the test begins again. The Pass number is printed during Burn-In.*

Note: *Ensure appropriate disks are inserted for the CD-ROM/DVD tests. However, remember that the program medium must not be swapped out, unless the activity is specifically sanctioned by Pc-Check.*

Note: *Some tests entail a delay in updating the screen, in which case a message to that effect is displayed (except for video tests).*

Burn-In testing can be interrupted at any time by pressing the <ESC> key. After a short pause, a dialogue box will appear to say that testing has been interrupted. You are offered three options:

1. Resume from where testing stopped by pressing ‘R’.
2. Abort the current test and skip to the next test by pressing ‘S’.
3. Stop completely by pressing <ESC> again.

6.4 Running *Pc-Check*® with Beep Codes

Pc-Check can output beep error codes when items under test fail during Burn-In testing mode.

Note: *The Advanced Diagnostics tests do not give beep codes.*

To utilise beep codes, include parameter /BB in the command line parameter list (as described in the Section of the manual "Command Line Operation").

For instance, either type:

/BB <ENTER>

or an optional file name of your choice may be added:

/BB [Burnfile Name] <ENTER>

Note: *Refer to the Section "Command Line Operation" for Burn-In filename instructions.*

A short high beep 'S' is defined as a single continuous tone of 880Hz for approximately 200mS Duration. A long low beep 'L' is defined as a single continuous tone of 440Hz for approximately 300mS duration.

When an error condition has occurred the associated beep code will be played and repeated approximately every 2 to 2.5 seconds. The user may press <ESC> to terminate the beep code, and may optionally continue testing or stop Burn-In and go to the *Pc-Check* results screen for further information.

When an error beep code is issued, the detected error is automatically sent to the Results Summary and may be printed from the *Pc-Check* Results Report section.

The Beep codes for the nineteen groups of POST Card Diagnostics are given in the sub-section "Post Codes and Beep Codes" below.

6.5 Post Codes and Beep Codes

To enable *Pc-Check* to output diagnostic codes to a POST Card during Burn-In, include the parameters /BP and /BD in the command line parameter list (as described in the Section of the manual "Command Line Operation").

While a burn-in test is running, its POST test code is displayed in hexadecimal on the POST card; when the test completes, the test code and either 00 (for Pass) or FF (for Fail) are flashed alternately on the card.

The audible Beep code is derived from the binary representation of the decimal value of the Group Number, where 0 = Long ("L") and 1 = Short ("S"), as shown below.

POST Test Code (decimal)	(hex)	Test	Group	Beep Code
1	(01H)	CPU Core Processor	1	S
2	(02H)	CPU TT_AMD64	1	S
3	(03H)	CPU Maths Co-Processor	2	SL
4	(04H)	CPU Known Design Faults	2	SL
5	(05H)	CPU MMX Extensions	1	S
6	(06H)	CPU 3D-Now! Extensions	1	S
7	(07H)	CPU SSE	1	S
8	(08H)	CPU SSE2	1	S
9	(09H)	CPU MP Symmetry	1	S
10	(0AH)	Motherboard DMA Controller	3	SS
11	(0BH)	Motherboard System Timer	3	SS
12	(0CH)	Motherboard Interrupt Controller	3	SS
13	(0DH)	Motherboard Keyboard Controller	3	SS
14	(0EH)	Motherboard PCI Bus	3	SS
15	(0FH)	Motherboard Real-Time Clock	3	SS
16	(10H)	Memory Seating	4	SLL
17	(11H)	Memory Inversion Tree	4	SLL
18	(12H)	Memory Stride Isolation	4	SLL
19	(13H)	Memory Chaotic Addressing	4	SLL
20	(14H)	Memory Block Rotation	4	SLL
21	(15H)	Memory Microtopology	4	SSL

POST Test Code (decimal)	(hex)	Test	Group	Beep Code
22	(16H)	Cache Inversion Tree	4	SLL
23	(17H)	Cache Progressive Inversion	4	SLL
24	(18H)	Cache Chaotic Addressing	4	SLL
25	(19H)	Cache Block Rotation	4	SLL
26	(1AH)	Cache Microtopology	4	SLL
31	(1FH)	HD Read Test	6	SSL
32	(20H)	HD Read Verify	6	SSL
33	(21H)	HD Non-Destructive Write	6	SSL
34	(22H)	HD Destructive Write	6	SSL
35	(23H)	HD Mechanics Stress	6	SSL
36	(24H)	HD Internal Cache	6	SSL
37	(25H)	HD SMART Immediate	6	SSL
38	(26H)	HD SMART Short	6	SSL
39	(27H)	HD SMART Extended	6	SSL
40	(28H)	Video Memory Inversion	7	SSS
41	(29H)	Video Memory Progressive Inversion	7	SSS
42	(2AH)	Video Memory Chaotic Addressing	7	SSS
43	(2BH)	Video Memory Block Rotation	7	SSS
44	(2CH)	Video Memory Microtopology	7	SSS
45	(2DH)	Video Colour Purity	7	SSS
46	(2EH)	Video True Colour	7	SSS
47	(2FH)	Video Alignment	7	SSS
48	(30H)	Video LCD	7	SSS
49	(31H)	Video Test Card	7	SSS
50	(32H)	Serial Line Control	8	SLLL
51	(33H)	Serial Handshake	8	SLLL
52	(34H)	Serial Loopback	8	SLLL
53	(35H)	Serial Internal FIFO	8	SLLL
54	(36H)	Serial Internal Loopback	8	SLLL

POST Test Code (decimal)	(hex)	Test	Group	Beep Code
58	(3AH)	CD/DVD Read	11	SLSS
59	(3BH)	CD/DVD Seek	11	SLSS
60	(3CH)	CD/DVD Disc	11	SLSS
61	(3DH)	CD/DVD Lens	11	SLSS
65	(41H)	Audio Internal Speaker	14	SSSL
66	(42H)	Audio Direct PCM	14	SSSL
67	(43H)	Audio Stream PCM	14	SSSL
68	(44H)	Audio Direct SPDIF	14	SSSL
69	(45H)	Keyboard	16	SLLLL
70	(46H)	Mouse	17	SLLLS
71	(47H)	Parallel ATA	18	SLLSL
72	(48H)	Serial ATA	18	SLLSL
73	(49H)	USB Controllers	19	SLLSS
75	(4BH)	CA Compare	20	SLSLL
76	(4CH)	FireWire Controller	21	SLSLS
78	(4EH)	System Stress	25	SSLLS
79	(4FH)	Trusted Platform Module	26	SSLSL
80	(50H)	PCI Express	27	SSLSS

Section 7

SHOW RESULTS SUMMARY

The status of those Advanced Diagnostic Tests which have been run is displayed, grouped by device. If your computer has more than one processor, for example, then the primary processor results will be in column 1, the secondary processor results will be in column 2, and so on.

Each test will have one of the following results:-

PASSED	The test was completed successfully
FAILED	The tested device did not perform satisfactorily, i.e. *Pc-Check* detected that the component was faulty. The failed device is also displayed below the overall result.
ERROR	The test was not performed satisfactorily, owing to a compatibility issue or a lack of resources. Does not necessarily indicate that the component is faulty.
N/A	The test was not applicable

***Note**: If a test invokes a FAILED status then the test will remain FAILED irrespective of any following tests during Burn-In. Likewise, an ERROR status is preserved.*

ABORTED	The test was not completed, either due to operator interference, or machine limitations
ABSENT	The test cannot be performed as the relevant equipment is not available
NOT RUN	The test was not selected for testing

If you attempt to exit *Pc-Check* after running tests without having displayed the Results Summary, a warning message appears to remind you that the results have not been displayed and ask if you are sure that you want to quit.

Section 8

WRITE RESULTS REPORT

Pc-Check reports facility is very useful for all users. In particular, manufacturers and repair professionals can keep file and/or printed copies to maintain a formal record of their quality-control procedures and standard practices. They can also track distribution and service to the customer. *Pc-Check* assists in reporting errors throughout manufacturing by identifying a drop in quality or failure in components bought in from other suppliers. For the independent machine user, a set of reports maintained over the life of the machine provides a record of any significant changes.

When selling a machine that has reached a stage where further upgrading will not be advantageous, the records will indicate to a buyer the machine's past history and its reliability.

Pc-Check can produce an output text or xml file of the test results in the form of a summary of each PASSED, FAILED or ERROR test result. You are first requested to type in details to identify the machine and the tester, plus the number of copies of the report required. You are also asked if you want to include all test names on the list even though some may not have been carried out.

Instruction Summary

Type in Machine Name.

Type in Tester Name.

Type in Machine Serial Number.

Request XML output instead of text Y/N? Type <Y> for XML output.

Type in Number of Copies Required or Press <ENTER> for one copy.

Do you want to report only on tests that are run? In response to the 'Y/N' prompt, type <Y> to restrict the report to only the tests run, or type <N> to report all tests.

Press <TAB> to move between entries.

Press <F10> to generate the report.

'File or Device to report to' has a default value of REPORT.TXT. This output filename can be modified:

Using the value PRN directs text output to the first parallel port, which can be used to print the results immediately, provided that you have a printer which supports ASCII text (see note below).

Use the suffix .XML instead of .TXT if you have chosen to save your output as an xml file.

Note: *Remember to include the full pathname with the appropriate drive letter, in order to save your results to the correct medium.*

Note: *If the filename for the output is invalid, for example if you are attempting to write to the Pc-Check program CD, a warning message is displayed. Pressing <ENTER> then returns to the main menu. Re-entering the Write Results Report will enable you to re-direct the output.*

Note: *Because text output is in ASCII form, it cannot be handled by either Postscript or GDI (so-called "Windows®") printers. If such a printer is connected to the machine under test, output MUST be saved to a file, for subsequent off-line printing by a suitable device, i.e. the "PRN" option cannot be used.*

Note: *USB printers are not supported by Pc-Check.*

Output

Output is in the form of a Quality Assurance Report, divided into two main sections: Machine Configuration, and Quality Assurance Testing Results.

There is a section on the output where the tester can sign to certify the report, and a certification code is produced, which can be used to check for results tampering.

For Burn-In testing, a 3-line summary section at the end of the Report indicates when testing began and ended, and gives the duration.

Customization

Each Pc-Check installation includes a template XSL style-sheet and banner image to use with the outputted report xml file. These files will also be present in any Pc-Check boot media created.

When reading the xml report file use either a text editing application or when opening with a browser the report file output XML does not predefine display properties for specific elements. Therefore, the XML requires a separate style sheet that specifies how the XML data should be displayed. This separation of XML content from its presentation allows the content to be easily repurposed.

Note: It is beyond the scope of this document to describe XML and XSL in detail: the user is referred to the many specialist publications on these subjects. A knowledge of XSL would allow the user to generate reports which, for example, contained the company logo, or otherwise complied with the corporate image.

Section 9

TECHNICAL SUPPORT

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Appendix A

RUNNING *PC-CHECK* UNDER DOS

A.1 Reasons for running under DOS

Self-boot *Pc-Check* successfully insulates itself from the normal operating system environment of the computer under test. This is achieved by having its own internal version of the DOS operating system (EuroDOS), which is loaded instead of the normal OS for the duration of the *Pc-Check* session. More information about EuroDOS is contained in Appendix D.

However, there are a number of situations where it is necessary to operate *Pc-Check* in a full version of a Microsoft-compatible DOS, in order to provide particular functions.

1 There are a few device drivers which EuroDOS cannot supply, which affect non-ATA CD-ROM/DVD tests and the PCMCIA information. The reason for these exceptions is the plethora of low-level drivers which exist for individual devices: it is not possible to provide generic device drivers. However, SCSI hard drives can be tested under Self-boot *Pc-Check* via the hard drive diagnostics facility.

2 Advanced users might wish to include a *Pc-Check* session within a larger context, regaining control after it has finished, in order to perform additional activities. This can also be achieved by operating *Pc-Check* under a full DOS environment.

A.2 Overview of Method

The user must boot DOS onto the machine under test from a suitable media or other source.

Required device drivers must be loaded and referenced.

There must not be any memory managers loaded with this DOS.

Do not run *Pc-Check* on a PC which is being used as a file server, or under any version of Windows®, OS/2, Linux or Desqview.

Any Power Management system must be disabled.

A.3 Producing an appropriate DOS Environment

A.3.1 Set up bootable DOS

Install a version of DOS onto a suitable bootable media or other source.

A.3.2 Manual Configuration

Device Drivers

If any of the device drivers listed earlier are required, they will have to be obtained, loaded and referenced manually.

This is because the CD-ROM/DVD Tests (other than ATA), and the PCMCIA Information cannot function with a completely "clean-booted" DOS, as the relevant device drivers will not be loaded.

You will require appropriate knowledge in order to perform such a manual configuration. The process involves installing the required drivers onto the bootable DOS medium, and editing DOS system files such as CONFIG.SYS and AUTOEXEC.BAT, in order to access these drivers.

Memory Managers

Further editing of DOS system files may be required in order to avoid reference to memory management software, such as HIMEM.SYS or EMM386.EXE, or to other inappropriate features.

A.3.3 Loading DOS

Insert the medium containing the bootable version of DOS into the machine under test, and reset the computer. After a short time you will see a prompt. Then remove the boot medium.

You are now ready to insert your *Pc-Check* programme medium, as described below.

A.4 Running *Pc-Check* under DOS

A.4.1 Loading *Pc-Check*

Having loaded DOS as described above, including supplying any device drivers, etc, insert the *Pc-Check* programme medium.

If necessary set the path to the appropriate drive letter for the medium. Then type:

PCCHECK <ENTER>

This will bring up the *Pc-Check* Main Menu, allowing interactive use in the same way as with the self-boot method.

A.4.2 Command Line Syntax under full DOS

There is just one difference compared with running *Pc-Check* in self-boot mode. The word "PCCHECK" **must** be inserted at the start of the list of command line parameters. Thus the command line example used in the main section of the manual becomes:

PCCHECK /JF ERRORS.FIL /RF BURN03.RPT /RA /BD /BS BURNFILE.DAT

A.4.3 Command Line operation under DOS

You have a variety of options for running *Pc-Check* from the command line under DOS:

1 Type in instructions such as in the example above, and run jobs directly from the DOS prompt.

2 Write the command line parameters to a BAT file using a file editor, and run the job under DOS.

3 Instead of using a file editor, use the interactive facilities described in the main part of the manual to generate CMDLINE and burn-in files, as with self-boot *Pc-Check*, but remember to carry out the following additional steps:

(i) edit the command line string to insert "PCCHECK" at the start of the parameter list;

(ii) change the filename extension of the command line file to .BAT, e.g. change CMDLINE.TXT to CMDLINE.BAT

(iii) to run the session, type "CMDLINE.BAT" at the DOS prompt.

Appendix B

DRIVE LETTER ALLOCATION

As a consequence of the fundamental nature of PC design, the drive letters which are allocated to the various hardware drives depend upon which particular medium is being used to run *Pc-Check.*

The allocation table for booting *Pc-Check* from USB media is:

***Pc-Check* booted from:**	**Drive letter allocated for:** *Pc-Check* Floppy HD HD software Diskette (FAT) (Hidden)
USB	C: A: D: X:

If you are running from USB flash device, then *Pc-Check* itself is on the C: drive, and any floppy diskette has the drive letter A:.

"HD" is included above, because results output can be sent to a FAT hard drive partition (including hidden types), if desired. Additional available hard drives take the next available letters in their sequence, so a second hidden hard drive partition would be drive Y:.

A list of accessible drives appears during the *Pc-Check* boot process.

Note: Some legacy BIOSes cannot be relied upon to handle the above drive letter allocation correctly.

Assuming that you have set the correct full pathname, if you unexpectedly incur a "Write Error" message, your BIOS could be at fault.

Appendix C

ADVANCED XML OPTIONS FOR CA FILES

Note: *It is beyond the scope of this document to describe XML and XSL in detail: the user is referred to the many specialist publications on these subjects. A knowledge of XSL would allow the user to generate reports which, for example, contained the company logo, or otherwise complied with the corporate image. This Appendix is confined to providing guidance regarding the content of a typical XML CA file produced by the Pc-Check compare process, and providing hints on how it might be customised.*

Note: *XML CA files are not compatible with the HII files from earlier versions of Pc-Check..*

C.1 Basic CA Facilities

Section 4 of this manual describes how Component Audit (CA) files can be generated and used to ensure identical builds, or to identify and document component changes within a system. The CA facility can generate XML files for viewing and printing in a clear report format.

Two typical scenarios in which a reference configuration CA file can be used to compare against the current system are:

(i) Highlighting unauthorised or forgotten component changes. Support engineers can capture and retain CA images for the systems they maintain, allowing differences in machine build since the last CA “snapshot” to be identified.

(ii) For the manufacture of batches of identical systems, assembled systems can be checked to ensure an exact match with an original, tested, reference unit.

To permit automated use, the CA Compare feature is available as a burn-in test option. For unattended operation, command line switches facilitate input of the reference image name and the name of the output difference log. If selected, the test is performed once at the start of the burn-in sequence. See the description of switches /IC and /IO in the Command Line Operation Section of this manual for more information.

Without making any alterations to the captured CA file, this basic CA Compare feature already provides a powerful facility to ensure continuity of a hardware specification.

C.2 Advanced Facilities

Advanced facilities exist which enable customised reports to be generated, not only in order to modify the report layout, but also, of particular interest here, to specify more complex match rules. In order to customise the report, it is necessary to understand the structure of the XML file, so that it can be edited correctly. This is a far less daunting task than it might at first appear.

Note: *When viewed with a browser, the XML files, containing the CA configurations and the CA differences, refer to included XSL files, which control formatting of the CA data. This facilitates creation of a pleasing and clear report for display or print. Knowledge of XSL allows modifications to the XSL files to be made, in order to produce personalised report formats, without affecting the content of the CA files themselves.*

C.2.1 Structure of CA XML Files

We describe the structure of the XML script generated by CA, and how it can be edited, by means of an example.

Suppose that the specification of a given machine is such that running CA generates information on the following components:

System (details of manufacturer, serial number etc)
Motherboard
BIOS
Processor
Memory (two banks)
Serial Port
Disk Drive

The XML file would look something like the following:

```
<SystemProfile>
    <Eurosoft_System>
        <Manufacturer>ECS</Manufacturer>
        <Product>P4M800-M7</Product>
        <Version>1.0</Version>
        <Serial>00000000</Serial>
    </Eurosoft_System>
    <Eurosoft_Motherboard>
        <Manufacturer>ECS</Manufacturer>
        <Product>P4M800-M7</Product>
        <Version>1.0</Version>
        <Serial>00000000</Serial>
    </Eurosoft_Motherboard>
    <Eurosoft_BIOS>
        <Vendor>American Megatrends Inc.</Vendor>
        <Version>080012 </Version>
        <Release>12/26/2006</Release>
    </Eurosoft_BIOS>
    <Eurosoft_Processor>
        <Description>Intel(R) Celeron(R) CPU 2.53GHz</Description>
        <MaxSpeed>2527000000</MaxSpeed>
        <CoresPerUnit>1</CoresPerUnit>
        <LogicalProcessors>1</LogicalProcessors>
    <Cache>
        <Type Name=”L2UnifiedCache” Value=”1 x 128KBytes”></Type>
        <Type Name=”L1InstructionsCache” Value=”1 x 8KBytes”></Type>
        <Type Name=”L1DataCache” Value=”1 x 8KBytes”></Type>
    </Cache>
    </Eurosoft_Processor>
    <Eurosoft_Memory>
        <SPDSocket>DIMM1</SPDSocket>
        <SPDType>SDRAM</SPDType>
```

```
        <SPDSize>268435456</SPDSize>
    </Eurosoft_Memory>
    <Eurosoft_Memory>
        <SPDSocket>DIMM0</SPDSocket>
        <SPDType>SDRAM</SPDType>
        <SPDSize>268435456</SPDSize>
    </Eurosoft_Memory>
    <Eurosoft_SerialPort>
        <Address>1016</Address>
    </Eurosoft_SerialPort>
    <Eurosoft_DiskDrive>
        <ModelNumber>ST3802110A</ModelNumber>
        <SerialNumber>5LR233L8</SerialNumber>
        <FirmwareRevision>3.AAE</FirmwareRevision>
        <Capacity>00000012A1F16000H</Capacity>
    </Eurosoft_DiskDrive>
</SystemProfile>
```

Using the component list above as a guide, one can see that the XML script is structured by component. A given component is delimited by start and end tags, between which the various attributes of that component are presented. Thus, for disk drive in our example script, we have:

```
<Eurosoft_DiskDrive>
<ModelNumber>ST3802110A</ModelNumber>
<SerialNumber>5LR233L8</SerialNumber>
<FirmwareRevision>3.AAE</FirmwareRevision>
<Capacity>00000012A1F16000H</Capacity>
</Eurosoft_DiskDrive>
```

where <Eurosoft_DiskDrive> constitutes the start tag, and </Eurosoft_DiskDrive> is the end tag. These flank the information about the attributes of the component, which in this case is the single attribute defined as:

<ModelNumber>ST3802110A</ModelNumber> etc

Notice that for Memory, there are two pairs of component tags "Eurosoft_Memory", one pair for each of the two memory banks which were found in the machine when CA was run.

C.2.2 Modifying CA XML Files

Continuing with our example, suppose that the above file had been run on a "reference machine", and we now wish to run CA on a new machine, so that we can see whether this new machine has been built in exactly the same way as the reference machine, apart from some particular exceptions.

We will further suppose that, unlike the reference machine, the new machine must **not** have been fitted with a floppy drive, but if it has been, then *Pc-Check* should register a FAIL for the machine.

Looking at the component attributes for "System" and "Motherboard", you will see that each has a serial number. Clearly these values will be unique to a given machine. We need to ensure that CA does not cause *Pc-Check* to issue a FAIL when it finds that the new machine has different serial numbers from those of the reference machine.

So we have a total of three instances where we want to indicate to Component Audit that, when it runs its comparison between the reference machine and the new machine, it takes these issues into consideration.

This is achieved by editing the XML file for the reference machine, in order to define appropriate matching criteria, before running the CA comparison.

C.2.2.1 Matching Criteria

There are three types of matching criteria between the original and new XML files, they must be lower case:

required	*Pc-Check* issues a FAIL if the exact component or exact attribute is ABSENT in the new machine / new XML file. This is the default status.
excluded	*Pc-Check* issues a FAIL if the exact component or exact attribute is PRESENT in the new machine / XML file.
optional	Prevents a component or attribute from being adversely reported upon if its presence or absence in the new XML file is at variance with the original XML file.

Note: *A tolerance, acceptably close to the reference design, is automatically applied to the value of a parameter, if appropriate. E.g., a small variation in processor speed would be ignored, but a 2.8 GHz processor would be distinguished from one of 3.0 GHz.*

These matching criteria are applied using "Wrapper Tags", as described below. An alternative facility, "Wildcards", sometimes needs to be used instead of Wrapper Tags, as described later.

C.2.2.2 Specifying Matching Criteria with Wrapper Tags

Editing the reference machine's XML file takes the form of adding appropriate "wrapper tags" around a set of component tags, as shown below. There are three types of wrapper tag, corresponding to the three types of matching criteria.

In our example, both "System" and "Motherboard" contain a serial number as a component attribute. We need to tag these as "Optional", to avoid these components generating failure conditions. This is achieved by inserting pairs of "Optional" wrapper tags around the components, as shown below. Bold type has been used to highlight the changes to the script.

Note: *Because System and Motherboard happen to be adjacent in the script, one set of "Optional" wrapper tags has been placed around them both, as an alternative to their having individual pairs of wrapper tags.*

<Optional>
<Eurosoft_System>
<Manufacturer>ECS</Manufacturer>
<Product>P4M800-M7</Product>
<Version>1.0</Version>
<Serial>00000000</Serial>
</Eurosoft_System>
<Eurosoft_Motherboard>
<Manufacturer>ECS</Manufacturer>
<Product>P4M800-M7</Product>
<Version>1.0</Version>
<Serial>00000000</Serial>
</Eurosoft_Motherboard>
</Optional>

Our example also requires that CA must report a failure if the new machine is found to contain a disk drive. This is achieved by inserting a pair of "Excluded" wrapper tags around the component, as shown.

<Excluded>
<Eurosoft_DiskDrive>
<ModelNumber>ST3802110A</ModelNumber> etc..
</Eurosoft_DiskDrive>
</Excluded>

The complete edited reference machine file should now look like this:

<SystemProfile>
<Optional>
<Eurosoft_System>
<Manufacturer>ECS</Manufacturer>
<Product>P4M800-M7</Product>
<Version>1.0</Version>
<Serial>00000000</Serial>
</Eurosoft_System>

<Eurosoft_Motherboard>
<Manufacturer>ECS</Manufacturer>
<Product>P4M800-M7</Product>
<Version>1.0</Version>
<Serial>00000000</Serial>
</Eurosoft_Motherboard>
</Optional>
<Eurosoft_BIOS>
<Vendor>American Megatrends Inc.</Vendor>
<Version>080012 </Version>
<Release>12/26/2006</Release>
</Eurosoft_BIOS>
<Eurosoft_Processor>
<Description>Intel(R) Celeron(R) CPU 2.53GHz</Description>
<MaxSpeed>2527000000</MaxSpeed>
<CoresPerUnit>1</CoresPerUnit>
<LogicalProcessors>1</LogicalProcessors>
<Cache>
<Type Name=”L2UnifiedCache” Value=”1 x 128KBytes”></Type>
<Type Name=”L1InstructionsCache” Value=”1 x 8KBytes”></Type>
<Type Name=”L1DataCache” Value=”1 x 8KBytes”></Type>
</Cache>
</Eurosoft_Processor>
<Eurosoft_Memory>
<SPDSocket>DIMM1</SPDSocket>
<SPDType>SDRAM</SPDType>
<SPDSize>268435456</SPDSize>
</Eurosoft_Memory>
<Eurosoft_Memory>
<SPDSocket>DIMM0</SPDSocket>
<SPDType>SDRAM</SPDType>
<SPDSize>268435456</SPDSize>
</Eurosoft_Memory>

```
    <Eurosoft_SerialPort>
        <Address>1016</Address>
    </Eurosoft_SerialPort>
    <Excluded>
    <Eurosoft_DiskDrive>
        <ModelNumber>ST3802110A</ModelNumber>
        <SerialNumber>5LR233L8</SerialNumber>
        <FirmwareRevision>3.AAE</FirmwareRevision>
        <Capacity>00000012A1F16000H</Capacity>
    </Eurosoft_DiskDrive>
    </Excluded>
</SystemProfile>
```

Notice that none of the other components has any wrapper tags. The default matching criterion is “Required”. Therefore all the remaining components will be given this matching criterion, i.e. if any component is found to be missing, a failure will be reported. For these remaining components, you can add start and end wrapper tags of <Required> and </Required> if you wish, as a form of annotation, but the effect is the same as leaving them out.

Note: *XML is sensitive to character case.*

Note: *When adding wrapper tags, do not forget that the end tag contains a”/” character.*

Note: *When using excluded and/or optional components, ensure that they appear before required components of the same type, because the reference file will be evaluated “in order”. Otherwise a component might be “accepted” before the “excluded” or “Optional” criterion had been evaluated.*

C.2.2.3 Controlling Matching using Wildcards

In our example, where we do not want *Pc-Check* to report a failure just because of an inherent difference in serial numbers between two machines, an alternative solution is to introduce a Wildcard into the XML. This takes the form of using a single asterisk instead of an explicit field (in this case, serial number), as seen in the example below. Wrapper Tags are then not required for dealing with serial numbers in our example.

For both "System" and "Motherboard", notice that the serial number is defined by the line:

```
<Serial>00000000</Serial>
```

where "00000000" is the explicit serial number (a text string, despite its appearance). Replacing this by a wildcard gives:

```
<Serial>*</Serial>
```

and now *Pc-Check* will accept any value for the serial number field without issuing a FAIL condition in the comparison.

Note: *A wildcard is a single asterisk, and is only applicable to text fields, not numerical fields.*

In addition to their convenience, wildcards are necessary when the Wrapper Tag method described earlier cannot be used. For example, suppose that it is necessary to ensure that a 500GB hard disk is installed. The serial number of the hard disk needs to be ignored, but this cannot be done via "Optional" Wrapper Tags, or the crucial hard disk capacity (and the presence of the hard disk itself) will not be checked. Therefore a wildcard is used for the serial number.

Furthermore, if the manufacturer and model fields of the hard disk do not matter, these can also be given wildcards, since they are text fields.

C.2.3 Table of Components and their Attributes

The Component Audit reports on the following components and component attributes. "Field Depth" indicates their structure within the XML script.

Entity Field Name	Field Depth
SystemProfile	1
Eurosoft_System	2
Manufacturer	3
Product	3
Version	3
Serial	3
Eurosoft_Motherboard	2
Manufacturer	3
Product	3
Version	3
Serial	3
Eurosoft_BIOS	2
Vendor	3
Version	3
Release	3
Eurosoft_Processor	2
LogicalProcessors	3
Description	3
MaxSpeed	3
CoresPerUnit	3
Cache	3
Type	4
Eurosoft_Memory	2
SPDSocket	3
SPDSpeed	3
SPDSize	3
SPDType	3
Eurosoft_SerialPort	2
Address	3
Eurosoft_ParallelPort	2
Address	3

Eurosoft_DiskDrive	2
ModelNumber	3
SerialNumber	3
FirmwareRevision	3
Capacity	3
LogicalSectorSize	3
PhysicalSectorSize	3

Eurosoft_PCI	2
VendorID	3
DeviceID	3
ClassID	3
RevisionID	3
SubsystemVendorID	3
SubsystemDeviceID	3
BusLocation	3
DeviceLocation	3
ExpressSpeed	3
ExpressNegotiatedLanes	3
ExpressMaximumLanes	3

Appendix D

EURODOS

When *Pc-Check* is operated in self-boot mode, it loads and runs under its own version of DOS, called EuroDOS. This is not a full implementation of DOS. Some of the facilities and restrictions are summarised below.

EuroDOS understands all FATs (12, 16 and 32 bit) and will operate on all BIOS driven media – typically floppy and hard disk drives, but may sometimes include ZIP or LS120 drives, for example. When hard disk partitions are scanned, EuroDOS will recognise partitions of hidden type. Normal (visible) hard disk partitions are lettered in the normal sense (C:, D: etc), while hidden are given X:, Y: or Z: – so that consistent drive lettering is easy to arrange in manufacturing. See Appendix B for more information about drive lettering.

The restrictions of EuroDOS are as follows:

1 A maximum of 4 logical volumes are supported from the possible set of 2 removable floppy devices and 8 primary partitions of the first two logical hard drives. So, as an example, the 4 logical volumes might be: A: (floppy emulated by CD boot); B: (relocation of real floppy); C: (FAT32 Window 98 installation); X: (hidden FAT diagnostic results partition).

2 No paths capability: EuroDOS will only understand the root directory of each volume.

3 The medium from which *Pc-Check* is executing cannot be changed while it is running, because *Pc-Check* is 'paged' in sections.

4 There is no long filename support – all filenames must be 8.3 format, even for FAT32 partitions.

EuroDOS provides some advisory messages on a red banner across the top of the screen, including write protection, disk changed at the wrong time (files still open), no space left on the media, printer not ready, etc.

When EuroDOS launches *Pc-Check,* it will display the command it is executing, e.g. it will show the *Pc-Check* EXE name and any command line switches currently active in CMDLINE.TXT.

EuroDOS tests the memory that is subsequently used to load the *Pc-Check* program. If memory faults are found, it will attempt to load the program avoiding the fault. The result of this test is collected and used by *Pc-Check*.

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